

ENERGY SOLUTIONS FOR CO₂ EMISSION PEAK AND SUBSEQUENT DECLINE



Risø International Energy Conference 2009

At Risø National Laboratory for Sustainable Energy,
Technical University of Denmark, 14-16 September 2009

Preliminary Programme



INTRODUCTION

ENERGY SOLUTIONS FOR CO₂ EMISSION PEAK AND SUBSEQUENT DECLINE

The world is facing major challenges with regard to climate change and security of supply. At the same time it is necessary to provide energy services to accommodate economic growth and in particular to meet the growing needs of the developing countries.

We have been aware of these challenges for a number of years, however, the need for rapid action was made clear with the release of IPCC's 4th assessment report in November 2007.

IPCC states that in order to stabilize the concentration of GHGs in the atmosphere, emissions must peak soon and decline dramatically thereafter. Delay in reducing emissions significantly constrains opportunities to achieve lower stabilization levels and increases the risk of more severe climate change impacts.

The conference aims at identifying energy solutions on local, regional and global level which can lead to a peak in CO₂ emissions in 2015 - 2020 and a 50% reduction before 2050.

The conference focuses on the scientific development of new technologies, their market perspectives and realistic contributions to achieve these ambitious goals. Furthermore, the conference will address systems aspects, end use technologies and efficiency improvements.

The conference will aim at identifying mixes of existing and new energy technologies and future energy systems that can meet the CO₂ reduction requirements on a global, regional and local scale.

THE CONFERENCE IS SPONSORED BY:



United Nations
Environment Programme

THE CONFERENCE FOCUSES ON

- Future global energy development options
- Scenario and policy issues
- Measures to achieve CO₂ emission peak in 2015 - 2020 and subsequent decline
- Renewable energy supply technologies such as bioenergy, wind and solar
- Centralized energy technologies such as clean coal technologies
- Energy conversion, energy carriers and energy storage, including fuel cells and hydrogen technologies
- Providing renewable energy for the transport sector
- Systems aspects for the various regions throughout the world
- End-use technologies, efficiency improvements in supply and end use
- Energy savings

TARGET GROUP

The target group for the conference is researchers, industry, policy makers, energy sector decision makers, funding organizations, as well as international organizations, e.g. the EU, IEA and UN.

A number of prominent speakers are invited to address the conference in keynote presentations, and the programme contains 50 presentations selected on the basis of the previous call for papers.

SESSIONS OVERVIEW

MONDAY 14 SEPTEMBER 2009		
Room	Big lecture hall	Small lecture hall
08:00-09:00	COFFEE AND REGISTRATION	
09:00-10:30	OPENING SESSION FUTURE GLOBAL ENERGY DEVELOPMENT OPTIONS	
10:30-11:00	BREAK	
11:00-12:30	SESSION 1 SCENARIO AND POLICY ISSUES	
12:30-13:30	LUNCH	
13:30-15:00	SESSION 2 LONG TERM ENERGY SOLUTIONS	
15:00-15:30	BREAK	
15:30-17:00	SESSION 14 MECHANISMS	SESSION 5 EFFICIENCY IMPROVEMENTS
17:00-18:00	RECEPTION	

TUESDAY 15 SEPTEMBER 2009		
Room	Big lecture hall	Small lecture hall
09:00-10:30	SESSION 3 SYSTEMS ASPECTS I	SESSION 6 EFFICIENCY IMPROVEMENTS IN END-USE
10:30-11:00	BREAK	
11:00-12:30	SESSION 9 RENEWABLE ENERGY TECHNOLOGIES: BIOENERGY I	SESSION 8 RENEWABLE ENERGY TECHNOLOGIES: SOLAR
12:30-13:30	LUNCH	
13:30-15:00	SESSION 7 RENEWABLE ENERGY TECHNOLOGIES: WIND	SESSION 11 ENERGY FROM WASTE
15:00-15:30	BREAK	
15:30-17:00	SESSION 15 SYSTEMS ASPECTS II	SESSION 12 RENEWABLE ENERGY FOR TRANSPORT
17:00-18:00	BREAK	
19:00	CONFERENCE DINNER	

WEDNESDAY 16 SEPTEMBER 2009		
Room	Big lecture hall	Small lecture hall
09:00-10:30	SESSION 10 FUEL CELLS AND HYDROGEN I	SESSION 4 RENEWABLE ENERGY TECHNOLOGIES: BIOENERGY II
10:30-11:00	BREAK	
11:00-12:30	SESSION 13 CARBON CAPTURE AND STORAGE	SESSION 16 FUEL CELLS AND HYDROGEN II
12:30-13:30	LUNCH	
13:30-14:45	PANEL DISCUSSION: WHAT ACTIONS ARE NEEDED NOW TO OBTAIN A PEAK IN CO ₂ EMISSIONS BEFORE 2020?	
14:45-15:00	CLOSING REMARKS	

PROGRAMME

MONDAY 14 SEPTEMBER 2009

08:00 – 09:00 COFFEE AND REGISTRATION

09:00 – 10:30 OPENING SESSION-
FUTURE GLOBAL ENERGY DEVELOPMENT OPTIONS

Big lecture hall

Chairman: Hans Larsen

KEYNOTE SPEECHES

- Global Energy Assessment (GEA), Nebojsa Nakicenovic, the International Institute for Applied Systems Analysis (IIASA), Austria
- Ogunlade Davidson, Energy Minister of Sierra Leone
- US speaker

10:30 – 11:00 BREAK

11:00 – 12:30 SESSION 1 – SCENARIO AND POLICY ISSUES

Big lecture hall

Chairman: Dieter Wegener

- **Presentation of Risø Energy Report 8: The intelligent energy system infrastructure for the future,** Hans Larsen, Risø DTU, Denmark
- **Renewable energies and efficiency are the solution for global CO₂ reduction - results of the energy (r)evolution 2008 scenario,** Thomas Pregger, DLR - German Aerospace Center, Germany
- **The connection between producer, distributor and end user,** Invited speaker

12:30 – 13:30 LUNCH

13:30 – 15:00 SESSION 2 – LONG TERM ENERGY SOLUTIONS

Big lecture hall

Chairman: Dan Arvizu

- **Indian energy system and global climate stabilization regimes,** P.R. Shukla, India Institute of Management, India
- **The electricity perspective,** Invited speaker
- **When will renewables be able to deliver 80 percent as fossils do now?** Jose Roberto Moreira, National Reference Center on Biomass, Brazil

15:00–15:30 BREAK

15:30–17:00 SESSION 14 – MECHANISMS

Big lecture hall

Chairman: Mark Radka

- **Support schemes and risk premiums for renewable energy technologies**, Poul Erik Morthorst, Risø DTU, Denmark
- **The interactions of renewable energy promotion schemes and energy efficiency support**, Pablo Del Rio, National Research Council of Spain, Spain
- **Influence of market rules for wind integration in the European power markets**, Peter Meibom, Risø DTU, Denmark

SESSION 5 – EFFICIENCY IMPROVEMENTS

Small lecture hall

Chairman: Henrik Carlsen

- **Comprehensive approach to energy and environment in the Eco Care Program for Design, Engineering and Operation of Siemens Industry Solution**, Dieter Wegener, Siemens AG, Germany
- **The role of high efficiency steam power plants - development status**, Rudolph Blum, DONG Energy, Denmark
- **Obtaining sustainable energy services through integrated energy**, Per Nørgaard, Risø DTU, Denmark

17:00–18:00 RECEPTION AT THE LOBBY TO THE AUDITORIUMS

TUESDAY 15 SEPTEMBER 2009

09:00 – 10:30 SESSION 3 – SYSTEMS ASPECTS I

Big lecture hall

Chairman: Nicolai Zarganis

- **Why go for less? - Denmark 100% CO₂ neutral before 2050**, Erik Wormslev, NIRAS A/S, Denmark
- **Large scale integration of wind**, Tommy Mølbak, DONG Energy, Denmark
- **Rural electrification in SSA in a context of fluctuating oil-prices: Is the time ready to move from SHS to hybrid PV-diesel systems?** Ivan Nygaard, Risø DTU, Denmark

SESSION 6 – EFFICIENCY IMPROVEMENTS IN END-USE

Small lecture hall

Chairman: Anders Stouge

- **High-power blu/red LED lighting system for future energy efficient artificial lighting in greenhouse production of potted plants**, Birgitte Thestrup, DTU Fotonik, Denmark
- **Automatic energy labeling of buildings using Smart Meters**, Henrik Madsen, DTU Informatics, Denmark
- **Magnetic refrigeration - an energy efficient technology for the future**, Christian R.H. Bahl, Risø DTU, Denmark

10:30 – 11:00 BREAK

11:00 – 12:30 SESSION 9 – RENEWABLE ENERGY TECHNOLOGIES: BIOENERGY I

Big lecture hall

Chairman: Kim Pilegaard

- **Developing feasible and sustainable biorefineries: A key to large scale deployment of bioenergy solutions**, Emmanuel Koukios, Bioresource Technology Unit, NTUA, Greece
- **Principles of sizing 2G biofuel plants and biorefineries**, Chresten Meulengracht, EthanoLease I/S, Denmark
- **Pre-treatment of biomass**, Martin Møller, DONG Energy, Denmark

SESSION 8 – RENEWABLE ENERGY TECHNOLOGIES: SOLAR

Small lecture hall

Chairman: Jim Skea

- **Option values of concentrating solar power and photovoltaics for reaching a 2°C climate target**, Robert Pietzcker, Potsdam Insitute for Climate Impacts Research, Germany
- **Solar energy - new photovoltaic technologies**, Peter Sommer-Larsen, Risø DTU, Denmark

12:30 – 13:30 LUNCH

13:30 – 15:00 SESSION 7 – RENEWABLE ENERGY TECHNOLOGIES: WIND

Big lecture hall

Chairman: Christian Kjaer

- **Off-shore wind**, Charles Nielsen, DONG Energy, Denmark
- **Nature's limit to the energy that can be extracted for human use**, Steen Frandsen, Risø DTU, Denmark
- **Offshore wind technology, possibilities and trends**, Peter Hauge Madsen, Flemming Rasmussen and Peter Hjulær Jensen, Risø DTU, Denmark

SESSION 11 – ENERGY FROM WASTE

Small lecture hall

Chairman: Jørgen Kjems

- **The organic farm as energy utility - environmental assessment of farm-scale combined heat and power production**, Marie Kimming, Swedish University of Agriculture, Sweden
- **Integrative approach for utilization of olive mill wastewater and Lebna's whey for ethanol production**, Mohammed Ibrahim, Royal Scientific Society, Jordan
- **Optimizing biogas production in the Arctic**, Marianne Willemoes Jørgensen, DTU, Denmark

15:00 – 15:30 BREAK

15:30 – 17:00 SESSION 15 – SYSTEMS ASPECTS II

Big lecture hall

Chairman: John Wood

- **Accelerated development of low carbon energy supply technologies - and its impact on energy system decarbonisation**, Mark Winkler, University of Edinburgh, UK
- **A sustainability strategy for Ireland's electricity network**, Andrew Keane, University College Dublin, Ireland
- **Ways towards low cost renewable electricity and a European supergrid**, Gregor Czisch, Transnational Renewables & University of Kassel, Germany

SESSION 12 – RENEWABLE ENERGY FOR TRANSPORT

Small lecture hall

Chairman: Lars Aagaard

- **Life cycle analysis of battery and fuel cell vehicles,**
Ulrich Wagner, Technische Universität München, Germany
- **Towards a low carbon transport sector: electricity or hydrogen?**
Martine Uyterlinde, ECN Policy Studies, Netherland
- **Transport and power system scenarios for Northern Europe in 2030,** Nina Juul, Risø DTU, Denmark

17:00 – 18:00 BREAK

19:00 CONFERENCE DINNER AT THE BLACK DIAMOND, THE ROYAL LIBRARY, SØREN KIERKEGAARDS PLADS 1, 1221 COPENHAGEN

WEDNESDAY 16 SEPTEMBER 2009

09:00 – 10:30 SESSION 10 – FUEL CELLS AND HYDROGEN I

Big lecture hall

Chairman: Søren Linderoth

- **Hydrogen storage, NN**
- **SOFC and gas separation membranes,**
Anke Hagen, Risø DTU, Denmark
- **Production of synthesis gas by co-electrolysis of steam and carbon dioxide,** Sune Dalgaard Ebbesen, Risø DTU, Denmark

SESSION 4 – RENEWABLE ENERGY TECHNOLOGIES: BIOENERGY II

Small lecture hall

Chairman: Priyadarshi R. Shukla

- **Fuels and chemicals from biomass: The C-factor,**
Esben Taarning, Haldor Topsøe A/S, Denmark
- **Combined biogas and bioethanol production in organic farming,**
Jens Ejbye Schmidt, Risø DTU, Denmark
- **Biochar (black carbon) as soil additive to fight global warming,**
Esben Bruun, Risø DTU, Denmark

10:30 – 11:00 BREAK

11:00 – 12:30 SESSION 13 – CARBON CAPTURE AND STORAGE

Big lecture hall

Chairman: NN

- **Aqueous ammonia process for CO₂ capture,**
Victor Darde, DTU/Dong Energy, Denmark
- **CO₂ capture from flue gas using amino acid salt solutions,**
Benedicte Mai Lerche, DTU, Denmark
- **Energy demand for CO₂ solvent regeneration,**
Philip Loldrup Fosbøl, DTU, Denmark

SESSION 16 – FUEL CELLS AND HYDROGEN II

Small lecture hall

Chairman: Erik Lundtang Petersen

- **Solid ammonia as energy carrier: Possibilities and technology development for transport and mobile applications,**
Debasish Chakraborty, Amminex A/S, Denmark
- **Thermodynamic modeling of a biomass gasification, solid oxide fuel cell and gas turbine hybrid system,**
Christian Bang-Møller, DTU, Denmark
- **Integrating a SOFC plant with a steam turbine plant,**
Masoud Rokni, DTU, Denmark

12:30 – 13:30 LUNCH

13:30 – 14:45 PANEL DISCUSSION: WHAT ACTIONS ARE NEEDED NOW TO OBTAIN A PEAK IN CO₂ EMISSIONS BEFORE 2020?

Moderator: Henrik Bindslev, Director, Risø DTU, Denmark

In the panel:

Dan Arvizu

Niels Bergh-Hansen

Dieter Wegener

Anders Stouge

Hans Larsen

14:45 – 15:00 CLOSING REMARKS

Hans Larsen, Risø DTU, Denmark

INFORMATION

PRACTICAL INFORMATION

The venue for the conference is Risø National Laboratory for Sustainable Energy, Technical University of Denmark. All sessions will take place in the auditoriums at Risø.

Our suggestions for hotel accommodation in Copenhagen or Roskilde can be found on <http://www.risoe.dtu.dk/Conferences/energyconf09.aspx>. Booking is however your own responsibility. The conference organizers will arrange bus service from central points in Copenhagen and Roskilde.

Working language of the conference will be English, and no translation will be provided.

REGISTRATION

The registration fee includes a CD-Rom copy of the conference proceedings and lunches during the conference, reception, bus transport and conference dinner. We offer special discount for speakers, students, as well as PhD students and early birds, please refer to the table.

Please register no later than Friday 4 September 2009.

	DKK excl. VAT	DKK incl. VAT	Euro excl. VAT	Euro incl. VAT
Normal fee	5.600	7.000	750	938
Early bird - registration before 1 June 2009	5.000	6.250	670	838
Speakers fee	4.480	5.600	600	750
Students fee	2.240	2.800	300	375

Registration form can be found on <http://www.risoe.dtu.dk/Conferences/energyconf09.aspx>

CONTACT

Vivi Nymark Morsing

Risø National Laboratory for Sustainable Energy

Technical University of Denmark

Frederiksborgvej 399, P.O. Box 49

DK-4000 Roskilde, Denmark

Phone +45 46 77 51 51

Fax +45 46 77 51 99

Email viha@risoe.dtu.dk

<http://www.risoe.dtu.dk/Conferences/energyconf09.aspx>

SCIENTIFIC PROGRAMME COMMITTEE

Hans Larsen (chairman), Risø National Laboratory for Sustainable Energy,
Technical University of Denmark

Lars Aagaard, Danish Energy Association, Denmark

Dan Arvizu, NREL, USA

Niels Bergh-Hansen, DONG Energy, Denmark

Ogunlade Davidson, Energy Minister of Sierra Leone

Christian Kjaer, EWEA - European Wind Energy Association, Belgium

Jose Roberto Moreira, National Reference Center on Biomass, Brazil

Mark Radka, UNEP, Paris

Priyadarshi R. Shukla, Indian Institute of Management, India

Jim Skea, UK Energy Research Centre, UK

Anders Stouge, Danish Energy Industries Federation, Denmark

Dieter Wegener, Siemens, Germany

John Wood, Imperial College London, UK

Nicolai Zarganis, Danish Energy Agency, Denmark

LOCAL ORGANIZING COMMITTEE

Hans Larsen (chairman), Risø DTU

Henrik Bindslev, Risø DTU

Henrik Carlsen, DTU Mechanical Engineering

Kim Dam-Johansen, DTU Chemical Engineering

Jørgen Kjems, DTU Electrical Engineering

Søren Linderoth, Risø DTU

Erik Lundtang Petersen, Risø DTU

Niels Michael Petersen, Risø DTU

Leif Sønderberg Petersen, Risø DTU

Kim Pilegaard, Risø DTU

LOCATION

ROSKILDE

Historically, the town dates back to the Viking Age around the 990s. This is reflected through the Viking Ship Museum in Roskilde, which is the Danish museum for ships, seafaring and boatbuilding culture in ancient and medieval times. In the Middle Ages, Roskilde was considered one of the most important cities in Northern Europe. Queen Margrethe I was buried in Roskilde Cathedral in the year 1412, and the Cathedral has been the burial place of the Royal Family ever since.

In 1847, the first railway line in Denmark was built between Roskilde and Copenhagen. After that, the town grew as a commercial centre, and today it has a central role as a traffic junction and a centre of education, research, trade, and tourism. Roskilde is placed centrally on the island of Zealand. The bridge over Øresund opened in July 2000, and with the Great Belt Bridge and the ferries to and from Germany, Zealand is close to both Europe and Scandinavia.



COPENHAGEN

The Danish capital is only 20 minutes away by train from Roskilde. Copenhagen is a dynamic and trendy metropolis, attracting attention with everything from exciting architecture to design, art, and fashion.

In December 2009 Copenhagen hosts United Nations Climate Change Conference, COP15. For more information see www.cop15.dk/en.

THE ØRESUND REGION

Comprising both the Danish and Swedish sides of the Strait of Øresund, the Øresund Region is Northern Europe's new dynamic region. The Øresund Region is rapidly emerging as a dynamic centre for technology-based industries in Northern Europe. The Øresund Region is home to a wide range of advanced, knowledge-based companies within the biotech, pharmaceutical, food science and IT sectors.

THE WEATHER

September means Indian summer in Denmark with an average day temperature close to 17 degrees C.
