Nordic Energy Research

CCS in Nordic energy research - and Green Growth

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Final Conference NORDICCS, Oslo 10.november 2015

NER Goals

1. Build research cooperation and competencies within the development of sustainable energy solutions.
2. Provide research-based analytical support to energy technology decision- making.
3. Enhance the knowledge base for increased competitiveness of the Nordic energy system and disseminate Nordic sustainable energy solutions.

NEF guiding principles

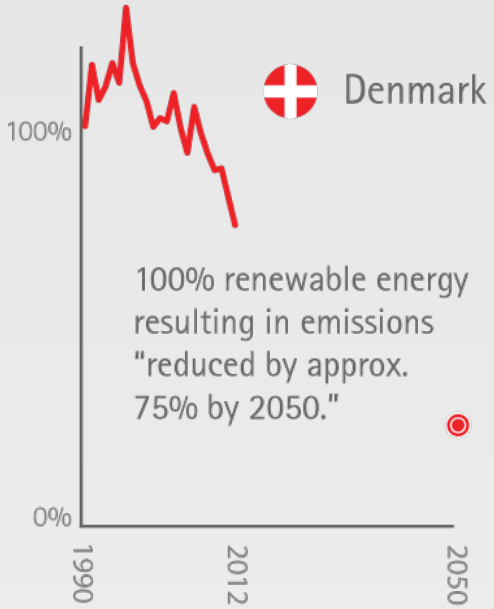
1. Nordic added value

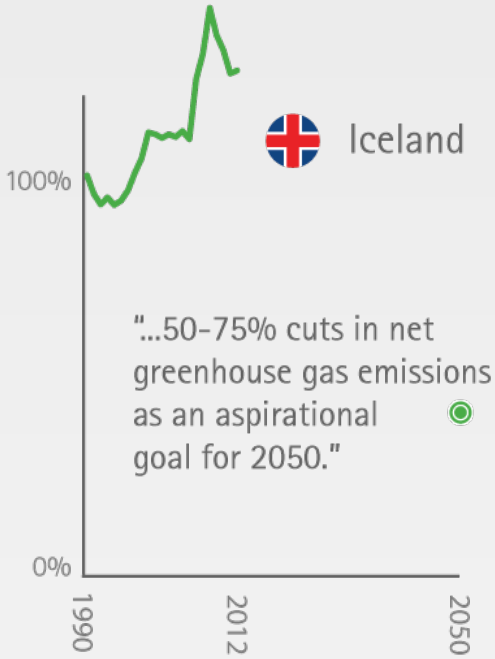
2. System perspective

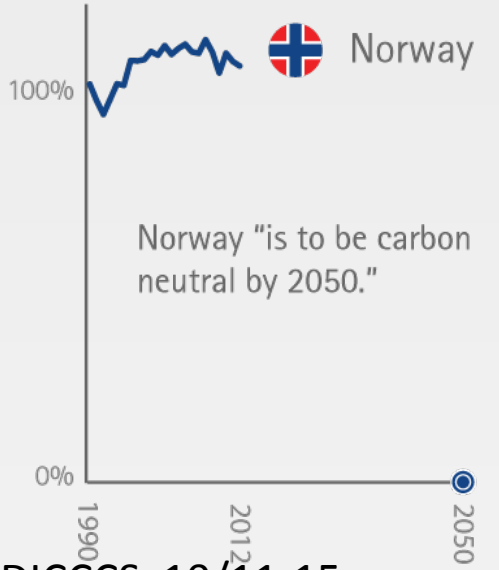
3. Politically relevant research results

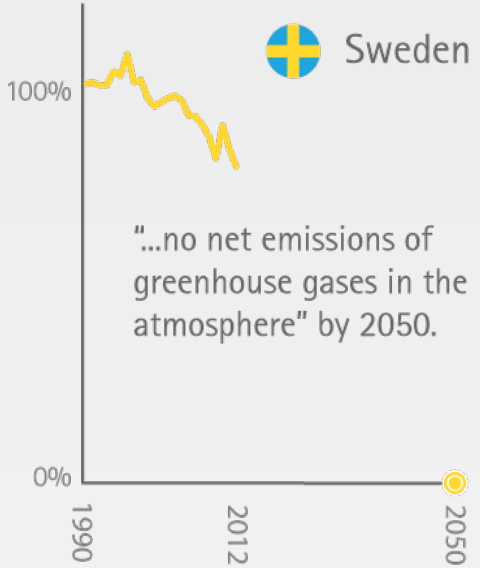
Ambitious Nordic climate targets

Domestic GHG emissions indexed to 1990.
Targets may be achieved using offsets.
Source: EEA & national governments









According to IPCC, WB and IEA: CCS and Carbon-negative options are essential!

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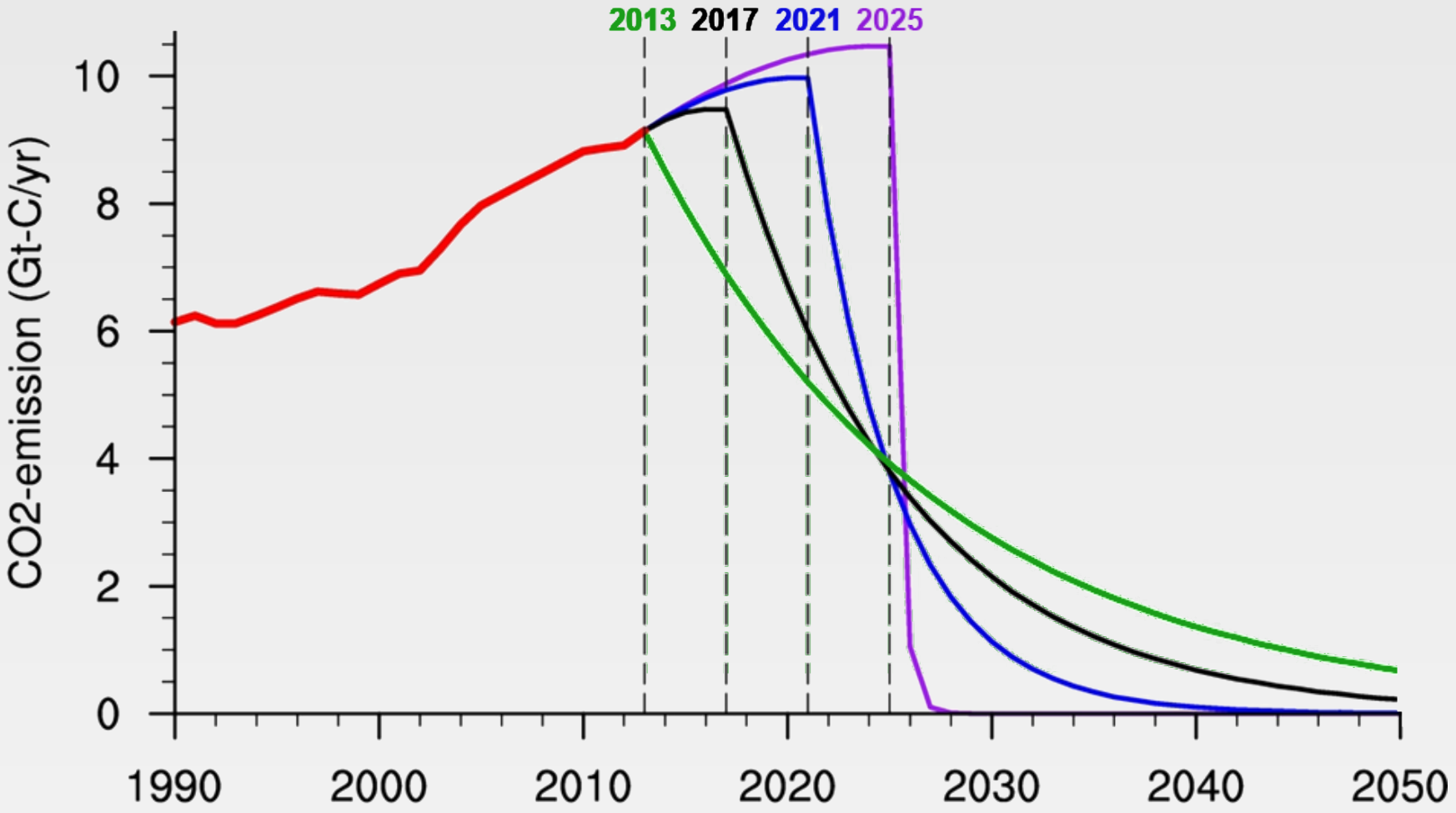
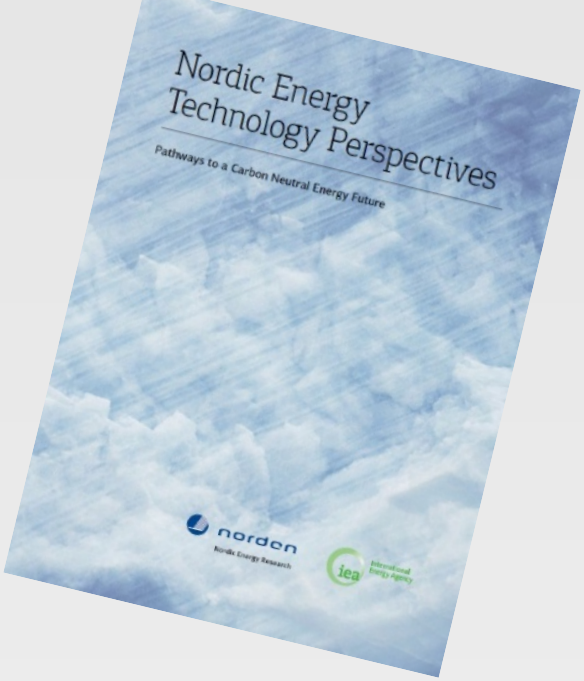
Global 2-degree scenarios



Source: Drange (2015), based on Meinshausen et al. (2009)

Key challenges from IEA's Nordic Energy Technology Perspectives



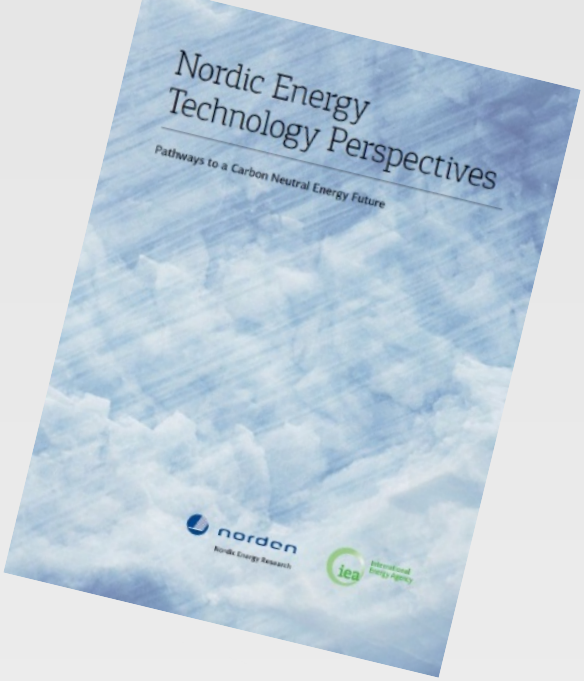
Infrastructure

Biomass Supply

CCS

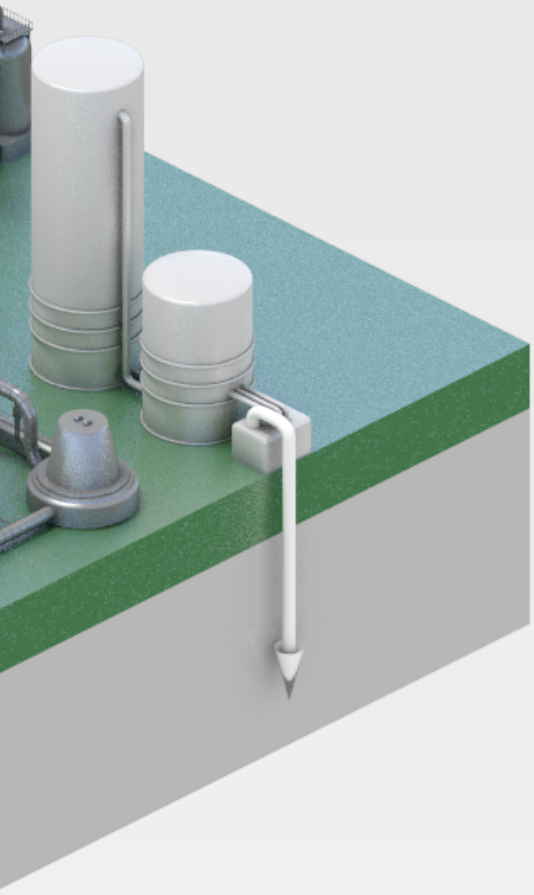
Energy Efficiency

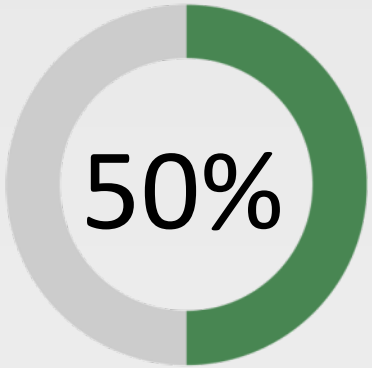
Key challenges from IEA's Nordic Energy Technology Perspectives



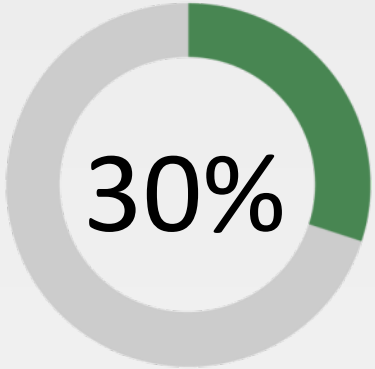
CCS

CCS utilisation in industry in 2050 in the IEA Carbon-Neutral Scenario





of cement plants



of iron & steel, chemical plants

Source: IEA/NER 2013 “Nordic Energy Technology Perspectives”

NORDICCS – a NER Sustainable Energy Systems - 2050 project

Main objective: boost the deployment of CCS

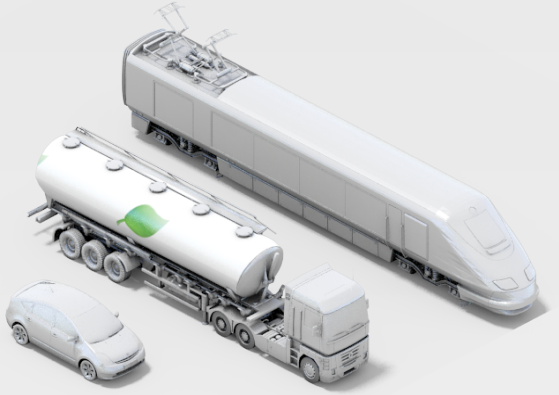
Provide Nordic industry-driven leadership within CCS innovation and realization:

1. Demonstrate how CCS can contribute to the Nordic portfolio of climate change mitigation options.
2. Enable the Nordic countries to join forces to become pioneers in large-scale implementation of CCS.
3. Multi-contextual focus to utilize Nordic differences for broad stakeholder and global relevance.
4. Strengthen the competitive power of the region by combining complementary capacities of the Nordic countries.

Nordic Flagship Projects

Flex4RES

Negative CO_2



Shift

Nordic Flagship Projects

Proposals
2 200 M NOK

Funding
80 M NOK

NER Flagship: Negative CO_2 Closed-loop Bio-CCS

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Goal:

- Enable CO_2 capture and negative CO_2 emissions with the lowest possible cost and energy penalty.
- Produce power and steam for industrial and other applications.
- Utilizes Nordic expertise and competence in fluidized bed technology.
- Sustainable use of available biomass: waste and wood

Partners:

SWEDEN

- Chalmers University of Technology (Chalmers)
  Sibelco Nordic AB (Sibelco)

NORWAY

- The Bellona Foundation (Bellona)
  SINTEF Energy Research (SINTEF ER)
  SINTEF Materials and Chemistry (SINTEF MC)

FINLAND

- VTT Technical Research Centre of Finland Ltd (VTT) Åbo Akademi University (Åbo Akademi)

Defining Green Growth?

World Bank

- Growth that is environmentally sustainable. It is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management in preventing physical hazards and excessive commodity price volatility.

UNEP

- One that results in improved human well-being and social equity, while signi cantly reducing environmental risks and ecological scarcities.

OECD

- Fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well- being relies.

In short:

- Green policies can, if well-designed, raise productivity and growth. In this way, green growth integrates the economic and environmental pillars of sustainable development.

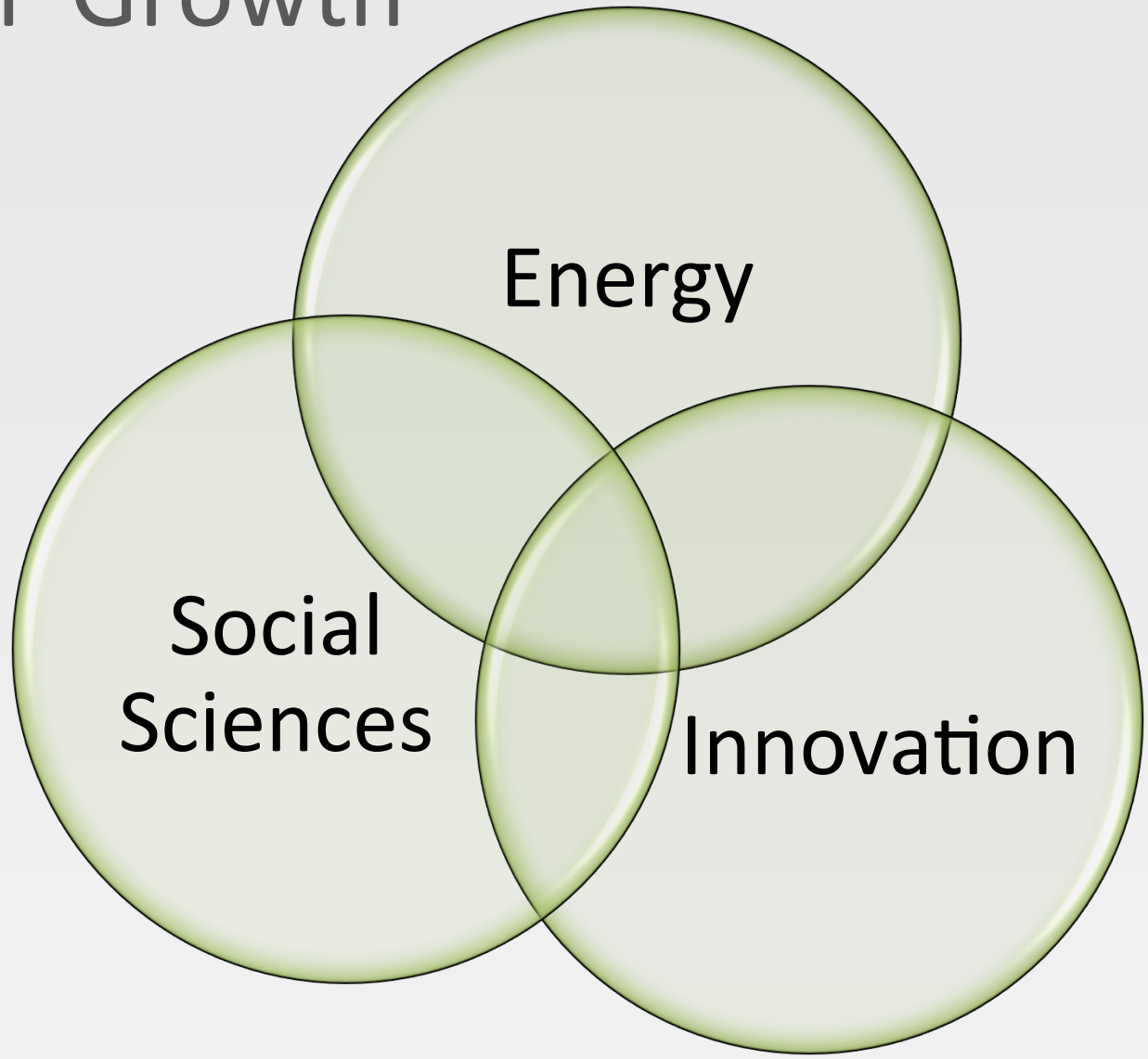
Sources: OECD 2011b; UNEP 2013; World Bank 2012b

New Nordic Green Growth programme

Goal

- The programme will provide the Nordic societies with excellent research, policy advice, know-how and innovation to develop a sustainable and green Nordic region by:
- sustainable regional and urban development.
- reducing existing industries' environmental footprint.
- increasing the competitiveness of Nordic industries in the growing international markets for clean technologies, products and services

Green Growth



New Nordic Green Growth programme

1. Sustainable regional and urban development
2. Global competitiveness among Nordic businesses
3. Efficient production and use of natural resources and energy

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NordForsk

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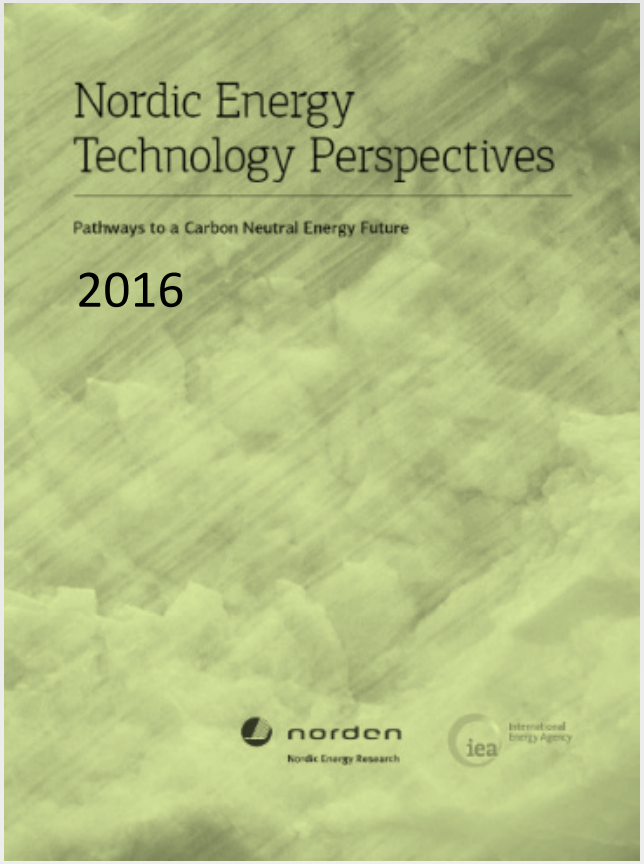
Nordic Innovation



Nordic Energy Technology Perspectives 2016

- May 2016
- Urban energy systems
- Integration of variable renewables

iea International Energy Agency

VTT

IVL Swedish Environmental Research Institute

DTU

IFE

UNIVERSITY OF ICELAND

Ea Energy Analyses

profu

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Decoupling GDP and GHG – Lessons learned in the Nordic Countries

Wednesday December 9th, 2015

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

13:00	**Dagfinn Høybråten**, Secretary General, Nordic Council of Ministers
13:05	**Fatih Birol**, Executive Director, IEA
13:25	**Hans Jørgen Koch**, Nordic Energy Research
13:30	**Nordic Ministers** present experiences **Lars Christian Lilleholt**, Danish Energy, Utilities and Climate Minister **Kimmo Tiilikainen**, Finnish Agriculture and Environment Minister (TBC) **Tine Sundtoft**, Norwegian Climate and Environment Minister **Ibrahim Baylan**, Swedish Energy Minister
14:10	Panel debate moderated by **Christian Friis Bach**, Under-Secretary-General, United Nations

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iea International Energy Agency

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Thank you for the attention!