Decarbonising the energy system
R&D in Norway

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The Global Energy Challenge

IEA World Energy Outlook 2009
The Global Climate Challenge

Energy related CO2 Emissions

- International marine bunkers and aviation
- Non-OECD - gas
- Non-OECD - oil
- Non-OECD - coal
- OECD - gas
- OECD - oil
- OECD - coal


Gigatonnes

IEA World Energy Outlook 2009

The Need for an Energy Revolution
Opens Enormous Markets for New Technology

Baseline emissions 57 Gt
BLUE Map emissions 14 Gt

- CCS 19%
- Renewables 17%
- Nuclear 6%
- Power generation efficiency and fuel switching 5%
- End-use fuel switching 15%
- End-use fuel and electricity efficiency 38%

WEO 2009 450 ppm case ETP2010 analysis

IEA Energy Technology Perspectives
Meeting the Challenges

- Technologies do exist that can cut emissions to half of today’s level by 2050
- Additional investment costs are high but offset by fuel savings
  - “From fuel markets to technology markets”
- Important energy security benefits
- Urgent action needed
  - Create markets
  - Deploy: Capital stock turnover is slow and retrofit expensive
  - Scale up R&D efforts

Strong increase in Norwegian Public Energy R&D

- A broad-based political agreement in Parliament
- Almost threefold increase in budgets for environmentally friendly energy R&D 2008-2010
- Enabled establishment of a strategic and structuring long-term effort
- Focus on areas where we have advantages
- Massive mobilization
- Significant participation from industry
Eight Centres for Environment-friendly Energy Research

- CO₂ capture and storage
- Offshore wind technology
- Offshore wind energy
- CO₂ storage
- Renewable energy systems
- Zero emission buildings
- Solar cell technology
- Bioenergy

Offshore Wind

- Drawing on Norway’s strong maritime and offshore competence
- Hywind: The world’s first floating offshore wind turbine
- Two new research centers on offshore wind
- One center on integration with hydropower (Europe’s potential “battery”)
- More than 50 partners are involved in the three centers
Solar Cell Technology

- Norwegian industry global market leader in both silicon feedstock and PV wafer supply
- Norwegian industry and research high level of competence in PV R&D
- New centre will give Norwegian solar industry access to world-leading technology and scientific expertise

CCS - Norway an early mover

- Experience from storage of CO₂ on the Sleipner field since 1996
- Two research centers on CCS
- Includes the whole value chain for CCS
- Strong industry involvement
- Builds on and is integrated with other CCS R&D activities
- International collaboration a priority
Conclusion

- We need a global energy revolution
- Without a successful R&D efforts the cost of the transition will be much higher
- R&D efforts must be scaled up early - will require significant involvement by governments
- Funding must be strategic and long-term
- R&D revolution in Norway
  - Structured to strengthen areas where we have advantages
  - Strong involvement by industry
  - International collaboration