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Nordic Energy Research

**Session Report: Nordic
Climate Solutions 2008**

**Investing in the future -
International R&D Cooperation**



Introduction and context

The Nordic Climate Solutions conference in 2008 took place at the Bella Centre in Copenhagen over the 25th and 26th of November. Over 1000 participants took part in discussing, showcasing and discovering Nordic climate and energy technology solutions. However, Nordic climate solutions are not limited to the technology available today, but include the knowledge and science that enable us to create the technology of tomorrow. As a part of the official programme at Nordic Climate Solutions 2008, Nordic Energy Research hosted a session on international research cooperation in energy.

The threat of climate change is real, and so is the Nordic commitment to solving the crisis. In light of the recent scientific reports on the possible temperature changes as a consequence of greenhouse gas (GHG) emissions, the IPCC estimate that we need to cut our emissions by 50-85 percent within the year 2050. Reaching only the minimum of this, 50 percent, will require extensive use of new technology in the energy sector.

Achieving the necessary technological and scientific development for combating climate change require the concerted efforts of the Nordic companies and governments in research, development and demonstration. Together the Nordic countries can achieve far more than we can as individual nations.

As an introduction to the session, three main questions were launched by Birte Holst Jørgensen, Director of Nordic Energy Research:

1. Picking the winners – technologies and systems in a clean clever and competitive energy future.
2. Opportunities and needs for energy RD&D cooperation across institutional and national boundaries.
3. Recommendations for better return of RD&D energy investments.

These questions or key focus areas for the discussion, outline the core of the challenges in energy RD&D. Should the governments and research funding agencies be in the business of picking winners, or should also the RD&D funding schemes be technology neutral?

While there is no doubt need for increased cooperation in energy RD&D, how this could be organised to facilitate optimal use of resources. As a continuation of this – how can we improve the returns of energy RD&D investments?

The moderator for the event was Birte Holst Jørgensen, Director of Nordic Energy Research. Keynote speakers were Mr Robin Martin Kåss, Deputy Minister for Petroleum and Energy, Norway, and Dr Pieter Boot, Director of the International Energy Agency's Long-Term Co-operation and Policy Analysis Office. The panellists were: Sverre Gotaas, Vice President, Statkraft; Knud Pedersen, Vice President, DONG-energy; and Teija Lahti-Nuuttila, Director of the Energy and Environment, Industrial Branch of TEKES.

For information about Nordic Climate Solutions see the conference website at: www.nordicclimatesolutions.com

Presentations

Norway's policies and plans for research and development for a cleaner energy future

Mr Robin Martin Kåss, Deputy Minister of Energy and Petroleum, Norway

The Norwegian government has set a target of a 30 percent reduction in GHG emissions by 2020. Two thirds of this reduction will be done domestically, the rest abroad. The aim is to be carbon neutral by 2030.

The two cornerstones in Norwegian climate policy are Carbon Capture and Storage (CCS) and large scale offshore wind installations.

For CCS, the technologies already exist, but combining the different elements of the CCS process requires much RD&D – here a joint Nordic effort is underway in Test Centre Mongstad, where StatoilHydro, Vattenfall and DONG-energy are involved.

The other key area of concern for the Norwegian government is the development of new technology in deepwater offshore wind turbines. In this area the technology is still very immature, while the theoretical potential for harvesting energy off the Norwegian coastline is huge. There is in fact a theoretical potential of up to 14 000 TWh if fully harvested (the total electricity consumption in Norway today (excl. offshore) is 130 TWh) – meaning great potential for the export of clean, renewable energy from the Nordic region.

Getting results in these areas requires joint efforts by both private and public actors, and with an international dimension. Energi21 – a Norwegian policy document – is a vehicle for achieving enhanced cooperation with the private sector – and a way to better channel the funding to specific areas of interest. This plan is supplemented by international cooperation, both in the Nordic region and in the EU.

International RD&D collaboration is crucial in order to facilitate faster development and deployment of cleaner energy technologies. For the Norwegian government the key institutions and channels for international RD&D cooperation are the EU's 7th Framework Programme, the EU Strategic Energy Technology Plan (SET-Plan) and Nordic Energy Research.

All Aboard! Energy efficiency, renewable energy and the energy revolution

Dr Pieter Boot, Director, Long-Term Co-operation and Policy Analysis Office, IEA

The conclusion from analyses within Energy Technology Perspectives 2008 and World Energy Outlook 2008 is that a technological revolution is needed. IPCC – the UN Panel on Climate Change – estimates that we need to reduce GHG emissions by 50 to 85 percent before 2050 if we are to stabilise the temperature increase at 2 degrees. To achieve just the minimum of 50 percent we need a revolution in energy technology. In the picture

presented by the IEA all technologies play a role, but the biggest reductions are expected to come from energy efficiency, renewables and CCS.

In energy technology we stand before great challenges. The need for new technology is dire. As a region, the Nordic countries are well placed to do something in this area. By employing clever support mechanisms much can be achieved. In the Nordic countries you are ideally placed to be the source of an energy revolution. Today the Nordic countries have a very high share of renewables in the energy mix, and several strong renewable energy companies.

All the IEA countries, including the Nordic ones, need to get serious about implementing the IEA energy efficiency recommendations – this could lead to large cuts in the consumption of energy.

The Nordic countries, especially Finland and Denmark, have come a long way in Combined Heat and Power (CHP) implementation. Finland has managed to move towards low-carbon fuels with CHP, achieving additional savings in emissions.

In energy efficiency the Nordic countries present a good, but mixed picture. Denmark especially has achieved a lot in the last 20 years in terms of efficiency – while the other countries also show a promising trend. However, much is still to be done.

The question now is how to combine energy RD&D with the other parts of the energy sector. No country in the IEA has really been successful in achieving the S curve. What we need is to include the RD&D efforts in a more comprehensive strategy of policy, business and research. Internationally there are a large variety of different support mechanisms for renewable energy. The IEA has performed a comprehensive examination of the available support schemes for renewable energy – and the results indicate that the feed-in tariff is the best – with others being less effective and more expensive.

In the past we spent more on energy RD&D than we do today, yet our economies have grown considerably. Overall the public funding for energy research has declined since the oil crisis in the late 1970s. The governments in the Nordic region and the rest of the IEA need to increase spending on energy research – and research needs to be part of an overall strategy.

Panel Discussion

Individual summaries

Sverre Gotaas, Vice President, Statkraft

As explained by Mr Kåss, the Energi21 work consisted of identifying key areas where we have the competence, skills and possibilities to make a difference.

Within these areas there are specific themes where Norwegian strengths are identified for further development. These strengths should also be seen in connection to competence

and know-how in the rest of the Nordic region. The Norwegian government followed the recommendations in Energi21, and granted us the financial support to pursue the goals outlined in the document.

As a part of the Energi21 initiative Norway is now establishing eight Centres of Excellence in energy research to focus on these areas.

The biggest challenge now is to close the gap between research and development on the one hand, and commercialisation on the other. To achieve this we need demonstration.

We also need to restructure the incentive system so that it follows the idea from basic research to commercialisation and use in the market.

Norway has been lucky when it comes to energy – there are an abundance of natural resources. Statkraft is now moving into ocean energy – especially wave and tidal energy. However there is a lack of competence in this area. Statkraft has therefore initiated a large cooperation between several Nordic universities within the field of offshore energy. In this particular project Statkraft cooperates with Uppsala University in Sweden, NTNU in Norway and DTU in Denmark. This ensures that the relevant competence is available when it is needed in four to six years' time.

Knud Pedersen, Vice President, DONG-energy

The three most important issues in energy now are 'energy efficiency, energy efficiency and energy efficiency'.

While in renewable energy the problem is often insufficient technological development, in energy efficiency the problem lies in the business model. The technology already exists – what we need is closer cooperation and dialogue with users in order to get the technology into use. If we can achieve the potential in energy efficiency we are well on our way to achieving our climate goals.

Based on the challenges ahead, and the perspectives raised earlier in the session, four key points need to be made:

1. We cannot have renewable energy on the scale presented by the IEA without substantial new investments in grids and smart infrastructure. We need to view the energy sector in a holistic perspective.
2. In biomass, significant new efforts are needed
3. CCS is the key to ensuring rapid response to the threat of climate change and meeting ambitious goals for GHG emission reductions.
4. The technology we choose should be global in applicability – not only Nordic. The Nordic companies have considerable potential – we need to develop technology for the global market.

The focus on RD&D needs to be part of an overall approach encompassing economic/business, climate and energy perspectives. This way we can achieve more in

terms of getting the technology out in the market, and inventing technology that there is real need for.

Teija Lahti-Nuuttila, Director of the Energy and Environment, Industrial Branch of TEKES.

TEKES is a Finnish national funding agency for technology and innovation; Energy and Environment is one of our focus areas, and in the sector there are great possibilities for new businesses and ideas. Last year (2007) we used around €150m on environmental and renewable energy projects.

Energy efficiency technologies and methods are involved in most of our projects in one way or another. The most important field for us though is renewable energy technology – especially bio-energy and bio-fuels. We have recently started a large technology programme dealing with bio-refineries and there is a big need for new renewable bio-based raw materials for energy production.

As we have seen, there is a need for radical new innovations in energy. There is no need for choosing the winner among the different technologies. All technologies are needed if we shall reach our climate and energy goals.

All in all, technology will only help us if it is utilised. Climate solutions are more than technology – the energy system surrounding the technology is equally important – as is designing business models that enable the successful commercialisation of new ideas.

There is indeed room for increased cooperation in energy RD&D. This is true both between the private and public sector, and between countries. Small countries like those in the Nordic region can really benefit from cooperation. On demonstration projects especially there is considerable room for cooperation. Demonstration is one area where government cooperation could really unlock great potential.

Discussion

Knud Pedersen followed up on Teija Lahti-Nuuttila's views on the need for demonstration collaboration. DONG-energy is active in a number of collaborative demonstration plants in both Europe and the Nordic region. DONG now participates in a large sustainable transport demonstration project in cooperation with Project Better Place, a company focusing on electric car transportation systems. DONG also participates in a range of demonstration projects to increase the efficiency of thermal power plants. The general opinion in the sector now is that no single company can do everything concerning one technology. You are successful in business through choosing good partners.

Sverre Gotaas agreed with Knud Pedersen on the importance of industry-government international collaboration on demonstration in energy research – noting that Statkraft is also part of both existing and forthcoming demonstration collaborations. For both Statkraft and DONG, CCS is an important technology for which several projects have been initiated.

Dr Pieter Boot received a direct question on the troubles with marketing Combined Heat and Power (CHP) and energy efficiency. The message to actors within energy efficiency was that a possible way forward is to focus on actual achievements in the field and concrete examples. While larger-scale efforts are needed in this respect, there are already positive initiatives underway. For example, in the IEA there is now a Combined Heat and Power Network which focuses on spreading positive examples and reports to interested parties.

The panellists underlined the need for policy-makers to see renewable energy and energy RD&D in connection with other issues – especially grid and market issues. Both the indigenous production and import of renewable electricity leads to grid balancing issues – due the fluctuating output of renewable technologies such as wind, and problems with electricity storage. Increased renewable energy production means increased strain on the grid and an increased need for balancing power. This is true both if the Nordic countries supply this power themselves and if they import large quantities of renewable energy from other regions. **Robin Martin Kåss** also underlined the potential of using the abundant Norwegian hydropower for balancing power in Europe. However he also emphasised that this would require new inter-connectors between the Nordic market and Europe.

Both **Gotaas** and **Pedersen** underlined the need for long-term research programmes, and stable long-term incentive arrangements. Governments need to take the lead, and then business will follow. There seemed to be agreement in the panel that the government should not pick the technological winners, but create stable conditions so that the market can develop the robust mix of different technologies that will be needed to solve the crises of climate change and security of supply while promoting economic growth. We need solutions for the short term – we need to ensure that existing technological solutions are commercialised and reach the global market, but we also need to invest in RD&D to find new solutions for the future.

Conclusions

Meeting even the minimum emission reduction goals outlined by the IPCC will require a range of technologies, many of which require significant RD&D to reach the market. This seminar at the Nordic Climate Solutions 2008 highlighted the need and potential for further cooperation in energy RD&D, both between government and private actors, and across national borders.

Investment in energy research is far lower than it has been in the past. Funding for RD&D must be increased, and channelled to where it is most needed, such as the demonstration stage – a crucial link between the development of a technology and its diffusion in the market. Increases in financial support for research cooperation can utilise a number of existing channels, such as the EU's Framework Programmes and Strategic Energy Technology Plan (SET-Plan), and institutions such as Nordic Energy Research.

The Nordic countries offer a diverse range of energy competencies, and as small economies they have much to gain from international cooperation in energy research.

International cooperation is best facilitated by long-term initiatives, regulations and incentives – enabling businesses and decision-makers to plan strategically and invest securely. A positive example is the recently established the Top Level Research Initiative, the largest ever Nordic joint research programme which will tackle energy alongside other research priorities. Through cooperation and the combination of diverse competencies, the Nordic region is well positioned to become a key source of clean and scalable energy technologies in the world market.

In addition to being long-term, energy technology policy must be holistic – taking into consideration the intertwined aspects of environment, economic development and electricity grids and markets. It is also important that governments should not be in the business of picking winning technologies, and instead efforts should be directed towards creating conditions conducive to the development of the range of technologies we will need to meet our goals.

Investing in energy RD&D means investing in future energy solutions. In order to get the most out of the money invested we should build above and beyond what can be achieved at the institutional and national levels through international research cooperation.

Contributors

Birte Holst Jørgensen

Birte Holst Jørgensen is Director of Nordic Energy Research, a 23 year old Nordic energy research funding body under the Nordic Council of Ministers. She holds a M.Sc. in Business Economics from Copenhagen Business School and a Ph.D. in Political Science from the University of Copenhagen.

Prior to her affiliation to Nordic Energy Research in 2005, Birte Holst Jørgensen was a Senior Scientist at Risø National Laboratory where she specialised in science and technology policy, in particular in new energy technologies. Previous work experiences also include positions in private and public consultancy companies as well as a 3-year assignment at Escuela Politecnica Nacional in Ecuador.

Dr Pieter Boot

On 1 September 2008 Dr. Pieter Boot was appointed Director of the Office of Sustainable Energy Policy and Technology in the International Energy Agency.

After finishing his studies Pieter worked as an Assistant-Professor in the Universities of Tilburg and Amsterdam. In 1985 he joined the Dutch Ministry of Social Affairs and Employment. In 1992 he took up the position of Deputy Director for Energy Policy in the Ministry of Economic Affairs. In 2001, after a period in the Ministry of Transport and Water Management, he became Director for Energy Strategy and Consumption in the Ministry of Economic Affairs. In 2004 he became Deputy-General for Energy. He was appointed Director of the International Energy Agency's Long-Term Co-operation and Policy Analysis Office on 1 April 2008.

Robin Martin Kåss

Robin Martin Kåss (born 10 January 1977 in Dublin, Ireland) is a Norwegian politician for the Labour Party.

Kåss joined the Workers' Youth League at a young age, and was also active in the Norwegian chapter of Young European Federalists. Kåss was first elected to the Porsgrunn city council in 1995. He studied medicine in Liverpool, England, where he graduated in 2003 with honors. Starting as a family doctor in Skien, Kåss later became the medical director of the GP-led casualty unit. Kåss was elected for a second term to the Porsgrunn city council in 2007.

In October 2008 Kåss was appointed State Secretary to the Norwegian Ministry of Petroleum and Energy (MPE).

Sverre Gotaas

In 2006 Sverre Gotaas began working for Statkraft as Senior Vice President, responsible for R&D and Innovation.

Sverre Gotaas graduated as an engineer specializing in Technological Cybernetics from the Norges Tekniske Høyskole (NTH) in 1982. In the first years after his graduation Sverre worked as a researcher until 1986 where he was employed by Kongsberg Maritime AS. Sverre was working with Kongsberg Maritime AS up until 2006 and in this period he held numerous high level positions, i.e. Vice President in Industry. In 2000 he became the Senior Vice President in Technology Kongsberg Maritime AS (KM).

Knud Pedersen

Knud Pedersen graduated with a M.Sc. in Economy from the University of Copenhagen. In the period of 1978 - 1982 Knud was teaching national economy at the University of Copenhagen. In 1983 he became a Principal Officer for the Danish ministries of Environment and Energy, a position he held until 1988. In the two following years he was the ambassador of energy in the Danish delegation at OECD in Paris. In 1990 Knud returned to Denmark to work for DONG Energy, where he in 2005 became the Vice President in the R&D Group. In between the two different positions in DONG Knud was furthermore Head of division in the Danish Energy Authority from 1991 - 2005, and Vice President of the Danish Energy Authority from 1998-2005.

Teija Lahti-Nuuttila

Teija Lahti-Nuuttila is currently the Director of the Energy and Environment Industrial Branch of Tekes. She is responsible for the strategic issues and project funding in the field energy and environment.

She is a graduate of Åbo Akademi. After graduation she worked several years in the pulp and paper industry. In 1996 she started as senior adviser in the Ministry of Trade and Industry Energy. Since 2002 she has worked at Tekes, first as senior technical advisor and since 2004 as director. She has also international experience and has worked in several committees and steering groups both in Finland and abroad.