



norden

Nordic Energy Research

Annual Report 2008





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Collaboration the key to necessary solutions

CHAIRMAN OF THE BOARD LARS GULDBRAND
DIRECTOR OF RTD STRATEGY, SWEDISH ENERGY AGENCY



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The first Nordic Globalisation Forum held in Riksgränsen on April 8-9 was opened by Swedish Prime Minister Fredrik Reinfeldt with the words *"It was the best of times, it was the worst of times. Charles Dickens began his novel 'A Tale of Two Cities' with these words. It was a description of people's divided feelings around the time of the French Revolution. I don't wish to draw any general historical parallels, but doesn't that description sound exactly like the current debate on globalisation?"*. During the forum, the Nordic prime ministers agreed that research and innovation is a field in which we have much to gain by moving the Nordic region forward, strengthening it as a region for research excellence and facilitating cross-border research.

Our previous intentions, that we must immediately set a new course towards more sustainable systems, have taken on even more importance over the last year. We are quickly approaching a point of no return in our work towards sustainable development. The Nordic countries' priority areas were research and the development of technology and knowledge in efficient, sustainable, clean energy technologies and systems, as well as cross-border co-operation. This has become more important as globalisation has spread.

During 2008 it became increasingly clear that the future challenges in the field of energy and climate can only be resolved by close international cooperation and collaboration. In light of the financial crisis, we noted that joint ventures in energy technologies and the sustainable use of energy resources will, despite the unfavourable economic climate, provide opportunities for greater growth in future. Since the Nordic region is rich in renewable energy resources and is highly active in research to develop technologies and new solutions, the Nordic countries

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Det första nordiska Globaliseringsforumet, 8-9 april, i Riksgränsen inleddes av Sveriges statsminister Fredrik Reinfeldt med orden *"It was the best of times, it was the worst of times. Detta var de ord som Charles Dickens använde i inledningen av sin bok 'A Tale of Two Cities'. Då som en beskrivning av den tudelade känsla som människor kände under åren runt den franska revolutionen. Jag vill inte göra några historiska liknelser i övrigt, men låter inte själva beskrivningen väldigt lik dagens debatt om globalisering?"*. Under forumet enades de nordiska statsministrarna om att forskning och innovation är ett område där vi har mycket att vinna på att flytta fram Nordens positioner, stärka Norden region för toppforskning och möjliggöra gränsöverskridande forskning.

Våra tidigare intentioner att vi omgående måste lägga upp en ny kurs mot mer hållbara system förstärktes under året som gick. Vi når snart en point of no return i arbetet mot en hållbar utveckling. Prioriterade områden för de nordiska länderna var forskning, teknik- och kunskapsutveckling inom effektiva, hållbara och rena energitekniker och system samt samarbetet över landsgränserna som ökade i betydelse i takt med den ökade globaliseringen.

Det framgick under 2008 allt tydligare att de framtida utmaningarna inom energi- och klimatområdet enbart kan lösas genom ett nära internationellt samarbete och samverkan. I ljuset av finanskrisen noterade vi att gemensamma satsningar på energiteknik och hållbar användning av energiresurser trots lågkonjunkturen också fortsättningsvis kommer att skapa goda möjligheter för ökad tillväxt. Då Norden är rikt på förnybara energiresurser och har forskning inom utveckling av tekniker och nya lösningar har de nordiska länderna potential att

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have the potential to become leaders in the use of renewable energy, which can contribute greatly to the competitiveness and growth of the entire region.

In Energy Technology Perspectives 2008, the IEA (International Energy Agency) pointed to the fact that an energy revolution will be needed in order to counteract climate change. A radical shift to a more sustainable energy system will not only require considerable investment in research and development, but will also require greater international cooperation. Cooperation is a prerequisite if we are to succeed in achieving the momentum required to develop and implement new sustainable energy solutions. In this context, the Nordic countries have an advantage with their experience of many years' cooperation in the energy sector. They can join together to utilise this and take a leading role in cooperation on research and innovation within the EU and other international arenas, supporting the direction that developments in national and Nordic energy policies take.

On December 17 2008, the EU Parliament approved the amendments to the law that the climate package entails, thereby giving the green light to the implementation of closely-connected goals which aim to ensure that by 2020 the EU countries will meet targets of reducing emissions of greenhouse gases by 20%, phasing in an increase in the share of renewable energy in total EU energy consumption to 20%, increasing the share of renewable energy in the transport sector to 10% and reducing primary energy use by 20%.

For Nordic Energy Research, 2008 was a time for evaluation and looking forward. In 2007, the institution began a number of policy and innovation studies as part of our strategic activities. The aim of this initiative was to investigate where and how the Nordic research and innovation system should be strengthened and how cooperation could be made more efficient both within the Nordic region and between the Nordic region and other key partners. The results from these studies were presented and discussed on 1 December 2008 at a workshop for decision-makers in the energy sector. In 2008, Nordic Energy Research also began an evaluation of our activities to investigate how we can further strengthen the institution and its support for the development of joint Nordic energy solutions. The evaluation shows that Nordic

bli ledande när det gäller ökad användning av förnybar energi, vilket starkt kan bidra till hela regionens konkurrenskraft och tillväxt.

Den Internationella Energiagenturen IEA pekade i Energy Technology Perspectives 2008 på att det kommer att krävas en energirevolution för att kunna motverka klimatförändringen. En radikal omläggning till ett mer hållbart energisystem kommer inte bara att kräva avsevärda investeringar inom forskning och utveckling utan också ett ökat internationellt samarbete. Samarbeten är en förutsättning för att vi skall lyckas uppnå det momentum som behövs för att utveckla och implementera nya hållbara energilösningar. I detta sammanhang har de nordiska nationerna ett försteg med sina erfarenheter från ett mångårigt samarbete inom energisektorn. Detta kan nyttjas gemensamt för att ta en ledande roll i forsknings- och innovationssamarbetet inom EU och andra internationella sammanhang, och för att stödja beslutad inriktning av utvecklingen av nationell och nordisk energipolitik.

Den 17 december 2008 godkände EU-parlamentet de lagändringar som klimatpaketet innebär och gav därigenom grönt ljus för förverkligandet av de nära förbundna målsättningar som syftar till att säkerställa att EU länderna till 2020 kommer i mål med avseende på att reducera emissioner av växthusgaser med 20%, fasa in 20 % förnybar energi i EU:s samlade energiförbruk, öka andelen av förnybar energi i transportsektorn till 10 %, samt minska den primära energianvändningen med 20 %.

För Nordisk Energiforskning var 2008 en tid för framsynthet och utvärdering. Som en del av vårt strategiarbete igångsatte institutionen under 2007 ett antal policy- och innovationsstudier. Syftet med detta initiativ var att utreda var och hur det nordiska forsknings- och innovationssystemet borde stärkas och hur samarbetet kunde effektiviseras såväl inom Norden som mellan Norden och andra centrala parter. Resultaten från dessa studier presenterades och diskuterades 1 december 2008 på en workshop för beslutsfattare inom energisektorn. Nordisk Energiforskning igångsatte under 2008 också en utvärdering av våra aktiviteter för att utreda hur vi ytterligare kan styrka institutionen och dess stöd till utveckling av gemensamma nordiska energilösningar. Utvärderingen visar att Nor-

Energy Research fulfils many of the expectations held by those associated with us, even though there is always room for further improvement.

The results from our research project point to extensive activity during 2008 involving over 600 researchers, of which 80 were PhD students. 50 major events were held, which were attended by a total of over 2,000 participants, and over 400 publications were produced.

In autumn 2008, the Nordic countries joined forces on the largest ever Nordic research and innovation venture. *The Toppforskningsinitiativet* (Top-level Research Initiative) aims to contribute towards the development of sustainable energy solutions and at the same time strengthen the Nordic region's position as a leader in the field of research and innovation. The work will focus on the areas of climate and energy research in which the Nordic countries have a common interest and where the Nordic region can contribute solutions in an international perspective. Nordic Energy Research has played an active part in the development of the initiative and will have a central role in its implementation.

disk Energiforskning uppfyller många av de förväntningar omvärlden har på oss, även om det alltid finns utrymme för ytterligare förbättringar.

Resultaten från våra forskningsprojekt tyder på omfattande aktivitet under 2008 med ett deltagande av fler än 600 forskare varav 80 PhD studenter, 50 större arrangemang med sammanlagt fler än 2 000 deltagare samt utgivning av mer än 400 publikationer.

De nordiska länderna gick på hösten 2008 samman om den största nordiska forsknings- och innovationssatsningen någonsin. Det s.k. *Toppforskningsinitiativet* (TFI) syftar till att bidra till utarbetandet av hållbara energilösningar och samtidigt stärka Norden som en ledande region inom forskning och innovation. Fokus kommer att läggas på områden inom klimat- och energiforskning där de nordiska länderna har gemensamma intressen och där Norden kan bidra med lösningar i ett internationellt perspektiv. Nordisk Energiforskning har aktivt deltagit i utvecklingen av initiativet och kommer att ha en central roll i dess förverkligande.



We are quickly approaching a point of no return
in our work towards sustainable development.



Living a forward-looking life...

DIRECTOR BIRTE HOLST JØRGENSEN

UK>

Never in my wildest dreams would've I imagined at the beginning of the year that 2008 would bring with it alarming climate reports, massive oil price fluctuations and the worst financial crisis in living memory.

Life is lived forwards, but understood backwards, as the Danish philosopher Søren Kierkegaard once said. Viewed in retrospect, public and private investment in new energy technology solutions often seems to be governed by short-term economic considerations. Looking forwards, the economic and financial crisis ought to be an opportunity for governments to make the necessary framework conditions for, and ambitious investments in a cleaner, sustainable and efficient energy system.

And at the interface between retrospective and forward-looking considerations, both innovative solutions and the most value are created through cooperation, synergy and strategic partnership across sectors, institutions and national borders. Transnational energy research cooperation is a key component of this. In this area the Nordic countries have, via Nordic Energy Research, developed a sustainable and committed cooperation over many years. 2008 is another year with high ambitions, major commitments and visible results.

RESEARCH, NETWORKS AND STRATEGIC COOPERATION

The work of Nordic Energy Research has resulted in 16 Nordic R&D projects dedicated to developing new solutions within the fields of energy efficiency, renewable energy, energy markets, the hydrogen economy and the impact of climate change on the energy system. In addition to the Nordic R&D projects, most of our policy studies of energy technology have created new knowledge related to the framework conditions for Nordic energy research and innovation. In a globalised world this knowledge also includes interplay with the European Strategic Energy Technology



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Ikke i min vildeste fantasi havde jeg forestillet mig ved årets start, at 2008 ville byde på alarmerende klimameldinger, vældige olieprisfluktuationer og den værste finans- og økonomikrise i mands minde.

Livet leves forlæns, men forstås baglæns, som den danske filosof Søren Kierkegaard engang sagde. Baglæns betragtet synes offentlige og private investeringer i nye energiteknologiske løsninger ofte at være styret af kortsigtede økonomiske overvejelser. Forlæns betragtet bør den økonomiske og finansielle krise være en anledning for regeringer til at skabe de nødvendige rammer og ambitiøse investeringer i et renere, bæredygtigt og effektivt energisystem.

Og i skæringsfeltet mellem baglæns og forlæns betragtninger skabes mest nytte og nye løsninger gennem samspil, synergi og strategisk partnerskab på tværs af sektorer, institutioner og landegrænser. Transnationalt energiforsknings samarbejde er en vigtig brik i dette. Her har de nordiske lande gennem Nordisk Energiforskning udviklet et bæredygtigt og engageret samarbejde gennem mange år. 2008 er endnu et år med høje ambitioner, stort engagement og synlige resultater.

FORSKNING, NETVÆRK OG STRATEGISK SAMARBEJDE

Nordisk Energiforskning har betydet, at 16 nordiske F&U projekter dedikeret har arbejdet med at udvikle nye løsninger indenfor energieffektivisering, fornybar energi, energimarkeder, hydrogenøkonomi og effekter af klimaændringer på energisystemet. I tillæg til de nordiske F&U projekter har størsteparten af vores politikstudier indenfor energiteknologi skabt ny viden om vilkår og rammebetingelser for nordisk energiforskning og innovation. I en globaliseret verden inkluderer denne viden også samspil med den europæiske strategiske energiteknolo-

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Internationally there is considerable interest in the Nordic experience of cooperation within energy research. Most recently, Nordic Energy Research was invited to take part in the IEA Expert Group on R&D Prioritisation and Evaluation, which among other things contributes to the G8 countries' plan of action for more cooperation on energy technology.



Plan (SET-Plan) and perspectives for R&D cooperation with key cooperative countries such as the US, Russia and China.

Since 2004 Nordic Energy Research has been a much sought-after partner in the development of cooperative relations between European research financiers. This is supported by the EU's framework programmes for research and efforts to create an internal market for knowledge – the ERA-networks. In 2008 the HY-CO ERA-network was concluded and activities are currently continuing under the auspices of a new European initiative, the Joint Technology Initiative for Hydrogen and Fuel Cells.

Through the INNER ERA-network and active Nordic commitment, a new Northern European basic research programme has been created for innovative energy technologies, the so-called N-INNER programme, which is being coordinated by Nordic Energy Research. The programme pooled together EUR 6.5 million surprisingly quickly for its first call for proposals. A further EUR 6 million was secured for a second call in 2008, and new national financiers have expressed interest in the third call.

Nordic Energy Research has been a key player in the birth of the Smart Grid ERA-network with Nordic and European partners. This is a particularly key field of research for the development of future transmission and distribution networks, which are in part intended to meet supply and demand, and in part to handle large quantities of renewable energy in the energy system.

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2008 was also a year in which Nordic Energy Research committed itself to the development of a Nordic Top-level Research Initiative within the fields of climate, energy and the environment. This is an initiative implemented by the Nordic Prime Ministers and developed as part of a cross-sector and cross-institutional cooperation effort. Great things are expected of this initiative – by researchers, by trade and industry and not least by the Nordic system. It goes without saying that Nordic Energy Research has a central role to play in this initiative.

giplan (SET-Plan) og perspektiver for F&U samarbejde med betydende samarbejdslande som USA, Rusland og Kina.

Siden 2004 har Nordisk Energiforskning været en efterspurgt partner i opbygning af samarbejdsrelationer mellem europæiske forskningsfinansierer. Dette støttes gennem EU's rammeprogrammer for forskning og bestræbelserne på at skabe et internt marked for forskning gennem de såkaldte European Research Area netværk. I 2008 blev HY-CO ERA-nettet afsluttet, og aktiviteterne fortsætter nu i regi af en ny europæisk satsning – Joint Technology Initiative for Hydrogen and Fuel Cells.

Gennem INNER ERA-nettet og et aktivt nordisk engagement er der skabt et nyt nord-europæisk grundforskningsprogram for innovative energiteknologier, det såkaldte N-INNER program, som koordineres af Nordisk Energiforskning. Programmet kom forbavsende hurtigt fra start med 6,5 M€ i første udlysning. Yderligere 6 M€ for en anden udlysning kom på plads i 2008, og nye nationale finansierer har meldt interesse for den tredje udlysning.

Nordisk Energiforskning har været en central aktør i tilblivelsen af Smart Grid ERA-net med nordiske og europæiske partnere. Det er et særdeles centralt forskningsfelt for at udvikle fremtidens transmissions- og distributionsnet, der dels skal matche udbud og efterspørgsel dels skal håndtere de store mængder fornybar energi i energisystemet.

Internationalt er der stor interesse for at høre om de nordiske erfaringer med energiforsknings samarbejde. Senest er Nordisk Energiforskning inviteret til at deltage i IEA Expert Group on R&D Prioritisation and Evaluation, der bl.a. bidrager til G8-landenes handlingsplan for øget energiteknologisk samarbejde.

2008 har også været et år hvor Nordisk Energiforskning har engageret sig i udvikling af et nordisk topforskningsinitiativ indenfor klima, energi og miljø. Det er et initiativ iværksat af de nordiske statsministre og udviklet i et tværsektorielt og tværinstitutionelt samarbejde. Det er derfor også et initiativ, som der stilles store forventninger til – fra forskerne, fra næringslivet og ikke mindst fra det nordiske system. I sagens natur har Nordisk Energiforskning en central rolle at spille i dette initiativ.

TWO SIDES OF THE SAME COIN

Policies for the development of new energy technologies are an integral part of a forward-looking energy policy and cover the entire spectrum from research and development to the pilot stage, demonstration and commercialisation. An intelligent combination of technological development and market incentives are a prerequisite to secure future energy supplies, combat climate change and create economic growth. The EU's announcement of the three binding 20% targets by 2020 is of particular importance for the ambitions and pace of development of new, efficient and sustainable technologies and solutions.

Nordic Energy Research assists energy policy cooperation efforts by providing secretariat support for the Nordic electricity market group, the renewable energy working group and Nordvind. Furthermore, in 2008 two projects were launched under the auspices of the Prime Ministers' globalisation initiatives – a showcase for Nordic energy solutions and a project focusing on Nordic electricity consumers.

EN ROUTE TO NEW GOALS

Since 1985 Nordic energy research collaboration has been rooted in national energy research and funded by national money. The activities are based on four-year strategy and action plans. As an element in the preparation of a new strategy for 2011-2014, the board decided to perform an evaluation of the activities in order to find out how energy research collaboration can be made even better in the future. A central message is that the institution creates genuine benefits for Nordic research fields, especially through the creation of networks. Despite relatively limited funding, it has been possible to generate visible results within energy research collaboration.

Global challenges require global solutions, and here an efficient, proactive and forward-looking international cooperation on energy research plays a significant role. Let me finish my retrospective thoughts on 2008 by citing nuclear physicist and Nobel Prize winner Niels Bohr's forward-looking reflection:

“Every great and deep difficulty bears in itself its own solution. It forces us to change our thinking in order to find it.”

TO SIDER AF SAMME SAG

Politikker for udvikling af nye energiteknologier er en integreret del af en fremsynet energipolitik og dækker hele spektret fra forskning, udvikling til test, demonstration og markedsintroduktion. En intelligent kombination af teknologiudvikling og markedsincitament er forudsætningen for at sikre fremtidens energiforsyning, bekæmpe klimaændringer og skabe økonomisk vækst. EU's udmelding om de tre bindende 20% mål i 2020 er særdeles afgørende for ambitionen og tempoet for udvikling af nye, effektive og bæredygtige teknologier og løsninger.

Nordisk Energiforskning assisterer det energipolitiske samarbejde gennem sekretariatsbistand for den nordiske elmarkedsgruppe, arbejdsgruppen for fornybar energi og Nordvind. I 2008 er der i tillæg søsat to projekter i regi af statsministrenes globaliseringsinitiativer – et udstillingsvindue om nordiske energiløsninger og et projekt med fokus på de nordiske el-forbrugere.

PÅ VEJ MOD NYE MÅL

Nordisk energiforsknings samarbejde har siden 1985 været forankret i den nationale energiforskningsindsats og finansieres af nationale midler. Aktiviteterne har afsat i fire-årige strategi- og handlingsplaner. Som led i forberedelsen af en ny strategi for 2011-2014 besluttede bestyrelsen at gennemføre en evaluering af aktiviteterne for at vurdere, hvordan det nordiske energiforsknings samarbejde kan blive endnu bedre i fremtiden. Centrale budskaber er, at institutionen skaber sand nordisk nytte for forskningsmiljøerne gennem især netværksskabelse. De relativt begrænsede midler til trods er det lykkedes at skabe synlige resultater i det nordiske energiforsknings samarbejde.

Globale udfordringer, kræver globale løsninger, og her spiller et velfungerende, proaktivt og fremsynet internationalt energiforsknings samarbejde en betydende rolle. Lad mig slutte mine baglæns betragtninger over 2008 med atomfysikeren og nobelprismodtageren Niels Bohr forlæns refleksion:

“Every great and deep difficulty bears in itself its own solution. It forces us to change our thinking in order to find it.” (Enhver stor vanskelighed har i sig sin løsning. Den udfordrer os til at ændre vores tankemåde for at finde den).

Portfolio

POLICY PROJECT PORTFOLIO WITHIN NORDIC RESEARCH AND INNOVATION AREA, NORIA, 2008-2009 (FUNDED BY NORDIC ENERGY RESEARCH)

Competitive Policies in the Nordic Energy Research and Innovation Area (eNERGIA)

2008, Antje Klitkou, NIFU STEP (NO), NIFU STEP (NO)

Patterns of Need Integration and Co-operation in Nordic Energy Innovation Systems

2008, Mads Borup, Risø DTU (DK), Norwegian School of Management (NO), Chalmers Univ. of Technology (SE)

Russian Energy Research and Innovation – Prospects for Co-operation on Renewables and Energy Efficiency

2008, Indra Øverland, NUPI (NO)

Governance and Research of Nordic Energy System Transition (GoReNest)

2008-2009, Annele Eerola, VTT (FI), CEM (ES)

Industrial Development and Export Opportunities for Nordic Energy Industry and other Companies in the Energy Field (Nordic Energy Perspectives)

2008-2009, Anders Sandoff, Univ. of Gothenburg (SE), Profu (SE), VTT (FI)

How to Bring Renewable Energies down their Learning Curves

2008-2009, Camilla Josephson, Lund Univ. (SE), Cinzia Daraio Univ. of Pisa (IT)

Nordic Opportunities for Collaboration with China in Energy Research and Innovation

2008, Jørgen Delman, NIAS (DK), Ministry of Science and Technology (CI), Lund Univ. (SE)

PROJECT PORTFOLIO WITHIN THE NORTHERN EUROPEAN INNOVATIVE ENERGY RESEARCH PROGRAMME, N-INNER, 2008-2010 (FUNDED BY THE PARTICIPATING COUNTRIES)

Synthesis and Durability of CNT based MEAs for PEMFC (Nanoduramea)

2008-2010, Pertti Kauranen, VTT (FI), HUT (FI), SINTEF (NO), NTNU (NO), SDU (DK), KTH (SE)

Optimizing Lipid Production by Planktonic Algae - LIPIDO

2008-2010, Timo Tamminen, SYKE (FI), Ludwig Maximilian Univ. (DE), Icelandic Energy Research Inst. (IS), NTNU (NO), Univ. of Oslo (NO)

Solar Hydrogen

2008-2010, Dinko Chakarov, Chalmers Univ. of Technology (SE), Univ. of Oslo (NO), DTU (DK), Univ. of Iceland (IS)

Evaluation Platform for Polymer Solar Cells – Morphoso

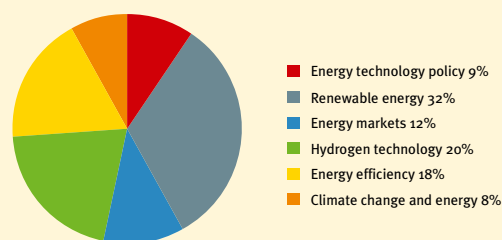
2008-2010, Michael Niggemann, Fraunhofer ISE (DE), Åbo Akademi Univ. (FI), Linköping Univ. (SE)

Novel High-Temperature Proton and Mixed Proton Electron Conductors for Fuel Cells and H₂-Separation Membranes

2008-2010, Reidar Haugsrud, Univ. of Oslo (NO), SINTEF (NO), Risø DTU (DK), Chalmers Univ. of Technology (SE), Research Centre Jülich GmbH (DE)

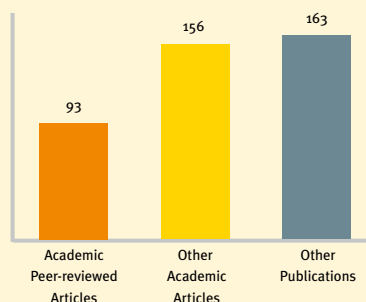
PORTFOLIO INDICATORS

BUDGET BY RESEARCH AREA 2008



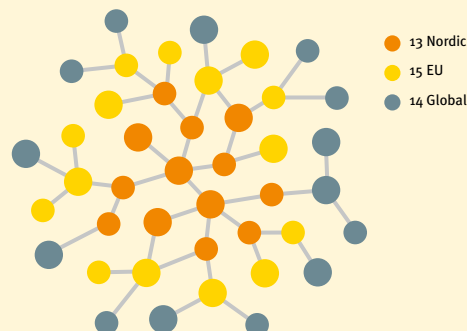
In 2008 a total of NOK 26.1 million was distributed to research projects. In addition to our five research areas (right) we funded projects within energy technology policy (top left).

PROJECT PUBLICATIONS 2008



During 2008 our 23 funded projects published 412 articles, far greater than yearly publications during the 2003 to 2006 project period.

INTERNATIONAL NETWORKS 2008



Our funded projects involved cooperation with 42 international research networks during 2008.

PROJECT PORTFOLIO 2007-2010 (FUNDED BY NORDIC ENERGY RESEARCH)

INTEGRATION OF THE ENERGY MARKET**Nordic Energy, Environmental Constraints and Integration**

2007-2010, *Torstein Bye, SSB (NO), 8.0 (9.4) MNOK*

Stockholm School of Economics (SE), Copenhagen Univ. (DK), Univ. of Iceland (IS), Helsinki School of Economics (FI), Univ. of Bergen (NO), Univ. of Oslo (NO), Gothenburg Univ. (SE), Risø DTU (DK)

Distributed Generation Integration in the Nordic Energy Market

2007-2008, *Berit Tennbakk, ECON Pöyry (NO), 1.3 (2.6) MNOK*

The Norwegian Electricity Industrial Association (NO), VTT (FI), Sweco Grøner (NO), Norwegian Univ. of Life Science (NO), Univ. Catholique de Louvain (BE), University of Copenhagen (DK), Norwegian School of Management (NO), Kola Science Centre (RU)

Initiation of Nordic Automatic Metre Reading Forum

2007-2008, *Andrei Morch, SINTEF (NO), 1.4 (2.7) MNOK*

VTT (FI), Elforsk (SE), DEFU (DK), Ekodoma Ltd (LV)

Energy Foresight Forum

2007-2009, *Einar Hope, NHH (NO), 0.9 (1.2) MNOK*

Univ. of Bergen (NO), Stockholm School of Economics (SE), Copenhagen Univ. (DK), Univ. of Iceland (IS), Helsinki School of Economics (FI)

RENEWABLE ENERGY**Nordic Graduate School II of Biofuel Science and Technology**

2007-2010, *Mikko Hupa, Åbo Akademi (FI), 8.0 (16.0) MNOK*

Chalmers Univ. of Technology, NTNU (NO), DTU (DK)

New Innovative Pre-Treatment of Nordic Wood for Cost Effective Fuel-Ethanol

2007-2010, *Karin Øyaas, PFI (NO), 8.0 (12.7) MNOK*

Prokaria EHF (IS), STFI-Packforsk AB (SE), SINTEF (NO), LTH (SE), VTT (FI)

Nordic Centre of Excellence in PV

2007-2010, *Arve Holt, IFE (NO), 8.0 (12.8) MNOK*

Univ. of Uppsala (SE), Helsinki Univ. of Technology (FI), Danish Technology Inst. (DK), NTNU (NO), Physico-Technical Inst. St. Petersburg (RU), Tallinn Univ. of Technology (EE)

Model Development for Power System & Wind in the Nordic Grid

2007-2010, *Ola Carlson, Chalmers (SE), 5.0 (11.1) MNOK*

DTU-Risø (DK), SINTEF (NO), VTT (FI), Tallinn Univ. of Technology (EE)

Nordic Network for Sustainable Development in Isolated Locations

2007-2010, *David Pointing, DTU-Risø (DK), 4.0 (7.1) MNOK*

IFE (NO), DTU Arctic Technology Centre (DK), Greenland Innovation Centre (DK), Danish Polar Centre (DK), GRID-Arendal (NO), NCM "TBO" Task Force, IRD Fuel Cells (DK), StatoilHydro New Energy (NO), Pure project (UK), REEEP South East & Asia Pacific Secretariat (AUS)

ENERGY EFFICIENCY**Basic Phenomena in Mechanical Pulping**

2007-2009, *Mikael Lucander, KCL (FI), 4.0 (9.7) MNOK*

Mid Sweden Univ. (SE), NTNU (NO), Tampere Univ. of Technology (FI), Helsinki Univ. of Technology (FI)

Primary Energy Efficiency

2007-2010, *Rolf Ulseth, SINTEF (NO), 8.0 (13.4) MNOK*

Univ. of Iceland (IS), VEKS (DK), Lund Univ. (SE), Helsinki Univ. of Technology (FI), Tallinn Technical Univ. (EE)

THE HYDROGEN SOCIETY**Bio Hydrogen**

2007-2010, *Peter Lindblad, Uppsala Univ. (SE), 6.0 (8.1) MNOK*

Univ. of Bergen (NO), Univ. of Turku (FI), University of Copenhagen (DK), Univ. of Akureyri (IS), Tampere Univ. of Technology (FI), Univ. of Jyväskylä (FI), Stockholm Environment Inst. (SE), Tallinn Centre (EE), Roskilde Univ. (DK), Riga Technological Univ. (LV)

Nordic Centre of Excellence on H₂ Storage

2007-2010, *Hannes Jonsson, Univ. of Iceland (IS), 8.0 (10.8) MNOK*

IFE (NO), Univ. of Oslo (NO), Stockholm Univ. (SE), Uppsala Univ. (SE), DTU (DK), Risø DTU (DK), Helsinki Univ. of Technology (FI), Lithuanian Energy Inst. (LT), St. Petersburg State Univ. (RU)

Development & Demonstration of Competitive PEMFC

2007-2009, *Steffen Møller-Holst, SINTEF (NO), 4.4 (8.8) MNOK*

Powercell SV AB (SE), Volvo Technology (SE), StatoilHydro (NO), H2 Logic (DK)

Scandinavian Hydrogen Highway Partnership

2007-2008, *Ulf Hafselid, StatoilHydro (NO), 1.0 (2.2) MNOK*

Zero (NO), ETC Batteries and Fuel Cells Sweden AB (SE), Region Midtjylland (DK), H2 Logic (DK)

THE EFFECTS OF CLIMATE CHANGES ON THE ENERGY SECTOR**Climate and Energy Systems; Risks, Potential and Adaptation**

2007-2010, *Arni Snorrason, NEA (IS), 10.0 (18.2) MNOK*

Swedish Meteorological and Hydrological Inst. (SE), NVE (NO), VTT (FI), SINTEF (NO), Landsvirkjun (IS), Elforsk (DK), Finnish Energy Industries (FI), Dong Energy (DK), Statkraft (NO)

Energy policy activities

ELECTRICITY MARKET GROUP

The objective of the Nordic electricity market is to maximise social welfare in the Nordic region. The basis for participating in trade is long-term gains for all countries. The Electricity Market Group is charged with increasing the harmonisation of the Nordic electricity market and responsible for following through resolutions from the Nordic Council of Ministers for Energy. The Nordic electricity market is the most harmonised cross border market for electricity in the world – with well functioning cooperation between many different stakeholders. The Nordic electricity market has been a model market in a European context as well as globally. Although the market is world leading, there are still areas where continued and increased efforts are needed.

The Electricity Market Group reports to the Committee of Senior Officials for Energy and the Nordic Council of Ministers for Energy. As part of the annual reporting, the group submits a memo to the ministers and senior officials outlining the challenges and developments in the Nordic electricity market. The memo is public, and can be found at the Nordic Energy Research website; here you can also access all the Electricity Market Group publications and reports.

The Electricity market group is chaired by Flemming G. Nielsen from the Danish Energy Agency. The secretary for the Electricity Market Group is Amund Vik, adviser, Nordic Energy Research.

THE WORKING GROUP FOR RENEWABLE ENERGY

In recent years considerable efforts have been made in all the Nordic countries to develop and increase the use of renewable energy. The intention, amongst other things, is to limit dependence on fossil fuels and to reduce emissions of climate gases.

The long-term objective of the Nordic energy cooperation is to promote an efficient, competitive, secure and sustainable energy supply. The Nordic Working Group for Renewable Energy has the task of assisting and supporting the work of the Nordic countries in the area of renewable energy through the exchange of information and the development and implementation of cooperation projects. The Working Group shall also support the promotion and dissemination of Nordic technologies and knowledge in the field of renewable energy on the global arena.

In 2008, the Working Group for Renewable Energy focused on the possibilities for harmonising the support schemes for renewable energy in the Nordic countries. Another central project was the NordVind cooperation that aims to promote the sharing of experiences and developing of common approaches in the field of planning and permit processes for wind power. Furthermore the Working Group started the work with the web portal "Nordic Energy Solutions" to promote Nordic sustainable energy technology and services. The site was launched in February 2009 – www.nordicenergysolutions.org.

The Working Group for Renewable Energy is chaired by Jørgen Calundann from the Danish Energy Agency. The secretary for the group is Vida Rozite, senior adviser, Nordic Energy Research.



Networking takes time and consistency, and this is something

Nordic Energy Research with its long history has been able to assist with.

TECHNOPOLIS EVALUATION OF NORDIC ENERGY RESEARCH, 2008 (P.54)

Nordic cooperation in a wider European perspective

During 2008 Nordic Energy Research participated in three ERA-NET (European Research Area Network). The ERA-NETs aim to increase cooperation and improve coordination between national research activities in Europe.

Specifically, Nordic Energy Research manages trans-national calls for proposals in both the INNER (Innovative Energy Research – ongoing) and HY-CO (Hydrogen and Fuel Cell Co-ordination – concluded in September 2008) ERA-NETs. The third ERA-NET – Smart Grid (ongoing) – commenced in 2008, where Nordic Energy Research leads a work package on trans-national research activities, which includes managing calls for proposals for joint research projects.

Through the INNER ERA-NET the North European Innovative Energy Research Programme (N-INNER) was established, a new trans-national programme involving funding agencies in Denmark, Estonia, Finland, Germany, Iceland, Norway, and Sweden. A first call was launched in 2007 and a second in the beginning of 2009.

Participation in ERA-NETs builds on the extensive experience of Nordic Energy Research in planning and implementing transnational programmes, expanding our network and experience and in turn benefiting our other management and research projects.

SMART GRID

PARTNER COUNTRIES/REGIONS IN THE SMART GRID

ERA-NET:

Austria, Basque region (Spain), Belgium, Croatia, Denmark, Former Yugoslav Republic of Macedonia, France, Greece, Netherlands, Norway, Slovenia, Spain, Switzerland, and Nordic Energy Research

OBJECTIVE

Smart Grid ERA-NET promotes research activities to speed up the development of a smart European electrical infrastructure, necessary for a successful realisation of the European Action Plan "Energy Policy for Europe".

HY-CO

PARTNER COUNTRIES/REGIONS IN THE HY-CO ERA-NET:

Austria, Basque region (Spain), Czech Republic, Denmark, Finland, Flemish region (Belgium), France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom, Wallon region (Belgium), and Nordic Energy Research

OBJECTIVE

HY-CO aims to harmonise the targets of the Hydrogen Fuel Cell (H₂FC) research programmes of participating European countries and regions. The programme also aims to implement joint trans-national R&D activities between partners.

INNER

PARTNER COUNTRIES IN THE INNER ERA-NET:

France, Germany, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, United Kingdom, and Nordic Energy Research

OBJECTIVE

The INNER project aims to encourage cooperation between European national research programmes, building coherence and coordination in the European Research Area. The project will include benchmarking and the establishment of a set of joint trans-national research activities designed to promote collaboration beyond the duration of the INNER project.

N-INNER

PARTNERS IN THE N-INNER PROGRAMME:

Academy of Finland (FI), Danish Council for Strategic Research (DK), Orkustofnun (IS), Projektträger Jülich (DE), Research Council of Norway (NO), Swedish Energy Agency (SE), Estonia Science Foundation (EE), and Nordic Energy Research

OBJECTIVE

N-INNER aims to support innovative and visionary energy research and to increase multidisciplinary cooperation and networking between Germany and the Nordic region.

Key events in 2008

ALLWAYSON NORDIC GREEN **21 - 22 APRIL 2008** **PALO ALTO, U.S.**

Held over two days in Silicon Valley, Nordic Green put together representatives of Nordic greentech companies and Californian entrepreneurs and investors. The result was a vibrant conference featuring presentations, exhibitions and debates on greentech business opportunities. The event covered a range of greentech fields, including renewable energy technologies, as well as energy storage, management and efficiency.

The event was organised by Innovation Center Denmark together with AlwaysOn, Innovation Norway, Finnnode, EAS Enterprise Estonia, FINNODE, VINNOVA, Nordic Innovation Centre and Nordic Energy Research. The event was hosted by SRI International.

ELECTRICITY MARKET SEMINAR **26 - 27 MAY 2008** **STOCKHOLM, SWEDEN**

The Swedish chairmanship of the Nordic Council of Ministers hosted an electricity market seminar in May to inform relevant stakeholders about harmonisation efforts on specific areas of the Nordic electricity market. The main purpose of the seminar was to enable a stakeholder discussion about the key challenges in the further harmonisation of the Nordic electricity market and to discuss the possible harmonisation of renewable energy support mechanisms.

The first day of the seminar was dedicated to the presentation of findings from the Electricity Market Group concerning congestion management and the establishment of a Nordic Transmission System Operator. Day two of the seminar was dedicated to the Working Group for Renewable Energy's work on the harmonisation of support mechanisms for renewable energy.

SCANDINAVIAN RENEWABLE ENERGY FORUM **(SCAN-REF)** **1 - 2 OCTOBER 2008** **OSLO, NORWAY**

The first annual Scan-REF conference set a high precedent as a leading meeting place for executives and other high level stakeholders in the renewable energy industry. The conference consisted of a numerous different sections and seminars, featuring more than 75 top-level industry speakers, including 5 Energy Ministers.

The exhibition area allowed a diverse range of actors to present technical, policy and business solutions to conference participants. Nordic Energy Research (alongside sister organisations Nordic Innovation Centre and NordForsk) was represented in the exhibition area with a popular Nordic Centre stand, presenting the Nordic Council of Ministers' efforts within energy research and innovation.



Nordic Energy Research truly provides an added Nordic value. This Nordic value consists of:

- Providing a useful platform for specific Nordic (research) collaborations and an enabler of such collaborations
- A basis for networking across national borders that would otherwise not take place
- Leverage to enter into or strengthen other collaborative research projects

TECHNOPOLIS EVALUATION OF NORDIC ENERGY RESEARCH, 2008 (P.1)

NORDIC CLIMATE SOLUTIONS 25 - 26 NOVEMBER 2008 COPENHAGEN, DENMARK

The first annual Nordic Climate Solutions event attracted over 1200 participants, making it the largest climate change and cleantech conference, trade show and networking event in Northern Europe. The event had a strong business focus, providing a networking platform for cleantech and other business solutions within the fields of climate, environment and energy. Nordic Climate Solutions was held in partnership with the Nordic Council of Ministers, in order to promote strong Nordic competencies in these fields.

Nordic Energy Research (with sister organisations Nordic Innovation Centre and NordForsk) operated a Nordic Centre stand in the trade show, as well as organising a session on "Investing in the future – Energy research cooperation", which included a range of recognised energy specialists as keynote speakers. In addition Nordic Energy Research hosted the Young Scientists Lounge, an arena for networking between young scientists and cleantech companies, where 30 young scientists presented their research projects over the two day conference.

The second annual Nordic Climate Solutions will take place in Copenhagen over the 8th and 9th of September 2009. It will focus on transport, energy efficiency, renewable energy and intelligent energy, providing the business side of the political and scientific story provided by the United Nations climate

change conference (COP15) held in Copenhagen later in the year.

NORIA-ENERGY POLICY SEMINAR 1 DECEMBER 2008 OSLO, NORWAY

The NORIA-Energy Policy seminar (Nordic Research and Innovation Area) concluded the seven NORIA energy technology policy projects commissioned by Nordic Energy Research between 2007 and 2008. The seminar featured the presentation of findings from the projects, covering a variety of different policy aspects and business opportunities for Nordic energy stakeholders.

Key messages from the seminar included the need for improved coordination and inclusiveness of energy technology policies to create cohesive and predictable framework conditions for energy research and innovation. This could benefit from the development of a Nordic scorecard for performance of, and framework conditions for, energy technologies. Participants also noted a lack of both venture capital and collaboration between start-ups and established energy companies.

A final key message was the potential for increased Nordic research collaboration, and the need to brand Nordic countries jointly as a region, building on each other's strengths to tap lucrative and expanding overseas markets in the energy field.

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Annual accounts 2008

	2008	2007
REVENUES/Inntekter		
Ordinary budget funds from NCM/ Ordinære budsjettmidler fra NMR	5,676,000	5,540,000
National grants/ Nasjonale bidrag*	27,526,032	21,067,410
Other revenues/ Øvrige inntekter	1,492,037	2,042,031
Financial revenues/ Finansielle inntekter	1,788,583	1,464,677
Project grants from NCM/ Prosjektmidler fra NMR	3,585,478	1,587,505
TOTAL REVENUES / Totale inntekter	40,068,130	31,701,623

EXPENSES/Utgifter		
Secretariat/ Sekretariat	11,462,769	8,930,728
Project expenses/ Prosjektutgifter	26,898,869	21,133,911
Other expenses/ Øvrige utgifter	5,003	1,460
TOTAL EXPENSES/ Totale utgifter	38,366,641	30,066,099

NET PROFIT/Årets resultat	1,701,489	1,635,524
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ASSETS/Aktiver (NOK)		
Trade debtors / Debitorfordringer m.m	169,118	
Grants/ Prosjektfordringer	1,220,483	1,428,474
Costs paid in advance/ Forskuddsbetalte omkostninger		18,249
Cash at bank/ Bankkonto	38,938,220	28,879,497
TOTAL ASSETS / Aktiver i alt	40,327,821	30,326,220

LIABILITIES/Passiver (NOK)		
Trade creditors/ Kreditorgjeld m.m	1,207,766	3,664,654
Project advance payment/ Prosjektforskudd	34,957,839	20,816,952
Accounts payable/ Skyldige omkostninger	842,411	4,209,090
Transfers / Overførte midler	3,319,805	1,635,524
TOTAL LIABILITIES/Passiver i alt	40,327,821	30,326,219

*National grants 2008:	Nordic activity	Activities in adjacent areas	Total
Denmark	6,021,175	602,118	6,623,293
Finland	4,747,975	474,798	5,222,773
Iceland	344,825	34,482	379,307
Norway	7,055,650	705,565	7,761,215
Sweden	8,355,375	835,538	9,190,913
Total	26,525,000	2,652,501	29,177,501

*National grants appear as revenues of only NOK 27,526,032, with the remainder appearing in the balance
I regnskapet er det kun inntektsført NOK 27,526,032, resten av nasjonale bidrag er ført i balansen.

The annual accounts are audited by the Office of the Auditor General in Norway
Regnskapet er revidert av riksrevisjonen i Norge

The administration



From left: Amund, Birte, Lise, Mats, Ina, Bjørn, Mikael, Unni, Ben, Emma, Vida.

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Nordic Energy Research

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The overall objective for technology policy
is to expand the global market for low-
carbon technology thus providing incentives
for needed innovations. Success would be a
competitive supply of low carbon technologies,
declining rapidly in cost over time, resulting in the
substitution away from higher-carbon alternatives
in both production and consumption.

KEY ELEMENTS OF A GLOBAL DEAL
ON CLIMATE CHANGE,
NICHOLAS STERN, 2008 (P.30)

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