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Nordic Energy Research

Annual Report 2006

Contents

An exciting year for Nordic Energy Research

TROND MOENGEN, CHAIRMAN OF THE BOARD 2006

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The year 2006 was the year that energy really returned to the international agenda. Through an increased focus both on energy security as well as on the consequences of the present climate changes, energy became one of the very most important themes permeating international, national and regional politics.

In January 2006 a conflict arose between Russia, the largest single exporter of natural gas to the EU area, and the Ukraine, which the gas must cross in transit. This would turn out to be the first of two extensive crises relating to the delivery of natural gas from Russia to, primarily, Germany and Poland, but also to other EU member states. In the wake of this conflict, energy security was placed solidly on the EU's agenda – and also on the agenda of Germany, which currently holds the chairmanship of the EU.

The year 2006 was also the year when the greenhouse effect and the consequences of continued increases in emissions of greenhouse gases into the atmosphere really became recognised internationally – not least due to the Stern report. The Stern report is of high importance because it highlights the costs of global warming – in particular the costs of doing nothing with respect to current practices. The report led to an impressive increase in focus on energy and emissions within the economy.

Energy security and the focus on climate jointly led to an international recognition of how important energy supplies are for maintaining our way of life and the distribution of wealth – not only in a European and Western context, but also from the perspective of developing countries. The current energy technologies cannot ensure environmentally sound and secure energy supplies in the fu-

Et spennende år for Nordisk Energiforskning

TROND MOENGEN, STYREFORMANN 2006

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2006 var året da energi virkelig kom tilbake på den internasjonale dagsorden. Både gjennom et økt fokus på energisikkerhet, og gjennom mer fokus på konsekvensene av klimaendringene ble energi et av de aller viktigste temaene i internasjonal, regional og nasjonal politikk.

I januar 2006 oppsto det en konflikt mellom Russland, den største enkelteksportøren av gass til EU-området, og transittlandet Ukraina. Dette skulle vise seg å bli den første av to omfattende kriser i tilførselen av gass fra Russland til i hovedsak Tyskland og Polen, men også andre EU-land. I kjølvannet av denne konflikten kom energisikkerhet for fullt inn på EUs agenda – og også på agendaen til Tyskland, som har hatt formannskapet i EU den siste perioden.

2006 var også året da drivhuseffekten og konsekvensene av fortsatt økte utslipp av drivhusgasser i atmosfæren virkelig ble internasjonalt anerkjent – ikke minst på grunn av Stern-rapporten. Stern-rapporten er svært viktig fordi den setter fokus på kostnadene ved global oppvarming – og spesielt kostnadene ved å ikke gjøre noe med dagens praksis. Rapporten førte til en virkelig imponerende økning i fokuset på energi og utslipp i økonomien.

Sammen førte energisikkerhet og klimafokus til en internasjonal anerkjennelse av hvor viktig energiforsyning er for opprettholdelsen av vår livsførsel, og spredningen av velstand – ikke bare i en europeisk og vestlig kontekst, men også i et utviklingsperspektiv. Dagens energiteknologier kan ikke sikre tilgangen til miljøsikker energi i fremtiden. Det for- >>

ture. Comprehensive research is required on innovative technologies in order to ensure a more sustainable energy supply.

2006 was also an important year for Nordic Energy Research. It was a transition year in which we concluded our projects for the period spanning 2003 through 2006 and began the work for a new period.

It has been exciting to follow the course of the projects that have now been concluded. During the period, we have seen the completion of 35 doctoral dissertations (26% of these were women) and three applications for patents involving hydrogen technology, just to mention a few things. It is also a pleasure to see that these projects have resulted in over 800 articles being published in various scientific journals and magazines – over a third of these were published in internationally recognised ”peer review” journals.

The portfolio for the period spanning 2003 through 2006 consisted of 16 large projects, distributed across our five areas of focus: consequences of climate changes, integration of energy markets, renewable energy resources, hydrogen technology and energy efficiency. Even though there were substantial variations between the projects, it was important for us to maintain a focus on the Nordic and scientific value of the research results – in other words, regardless of the degree of commercialisation of the projects, they should still add something to the Nordic scientific community.

Nordic Energy Research began working on its new strategy and action plan in 2006, which will run from 2007 through 2010. During the first round, NOK 86 million was released for new research and innovation projects. Through a stringent application process with two phases, Nordic Energy Research has now started 16 new projects that will be conducted during this period. The emphasis throughout this process has also been on Nordic co-operation and scientific quality. The new projects are again distributed across Nordic Energy Research’s five areas of focus.

The organisation has distinguished itself not only in the Nordic landscape during 2006. During the course of 2006 we have also made our mark on various EU projects. The ERA- Net projects HY-CO and INNER have been the cornerstones of our commitment to

dres omfattende forskning i innovative teknologier for å sikre en mer bærekraftig energiforsyning.

Også for Nordisk Energiforskning var 2006 et viktig år. 2006 var et overgangsår, hvor vi avsluttet prosjektene fra perioden 2003 til 2006, og begynte arbeidet med en ny periode.

Det har vært spennende å følge utviklingen i prosjektene som nå er avsluttet. I perioden har vi sett ferdigstillelsen av 35 doktorgradsavhandlinger (26 % av disse var kvinner), samt tre søknader om patenter innen hydrogenteknologi, for å nevne noe. Gledelig er det også å se at prosjektene har resultert i over 800 artikler publisert i ulike vitenskapelige tidskrift og magasiner – over en tredjedel av disse er publisert i internasjonalt anerkjente ”peer-review” tidsskrifter.

Porteføljen fra perioden 2003 til 2006 besto av 16 store hovedprosjekter, fordelt over våre fem fokusområder: Konsekvenser av klimaendringer, Integrasjon av Energimarkeder, Fornybare energiresurser, Hydrogenteknologi og Energieffektivitet. Selv det var stor variasjon mellom prosjektene, var det viktig for oss å holde fokus på den nordiske og vitenskapelige verdien av forskningsresultatene – med andre ord skulle prosjektene uavhengig av kommersialiseringsgrad tilføre det nordiske vitenskapelige samfunnet noe.

Nordisk Energiforskning begynte i 2006 arbeidet med den nye strategi- og handlingsplan, som går fra 2007 til 2010. I første runde ble 86 millioner NOK utlyst til nye forsknings- og innovasjonsprosjekter. Gjennom en streng søknadsprosess i to faser har Nordisk Energiforskning nå startet 16 nye prosjekter, som skal kjøres i denne perioden. Også i denne prosessen har fokuset ligget på det Nordiske samarbeidet og vitenskaplig kvalitet. De nye prosjektene fordeler seg over Nordisk Energiforsknings fem fokusområder.

Organisasjonen har ikke bare markert seg i den nordiske landskapet i 2006. I løpet av 2006 har vi også markert oss innenfor ulike EU-prosjekter. ERA-Net projekterne HY-CO og INNER har vært hjørnesteiner i vårt EU-engasjement, hvor vi >>

We must face the fact that the international community at present is confronted with challenges that are even greater than previous ones; challenges that demand new solutions, energy technology and knowledge. These challenges need to be met and Nordic Energy Research is ready to contribute to a joint international effort.

the EU, which also entailed us being responsible for two international workshops at Holmenkollen in Oslo.

We are now entering 2007, a year in which it does not appear that the importance of energy and energy research will diminish. The legacy from 2006 was an intense focus on energy security and climate – something we can already see the results of early in 2007.

On 9 March 2007, the heads of government of the EU member states met to discuss energy policies, and resolved to set binding targets with respect to climate and renewable energy.

20-20-20 (10) BEFORE 2020
The EU's objective is to cut emissions of climate gasses by 20 percent by 2020. The EU's energy mix must also contain 20 percent renewable energy sources by 2020, plus there must be a 20 percent saving in energy along with biofuels having to comprise 10 percent of the fuel for transport, all before 2020.

Even though the EU's objectives have still not been rendered more tangible, they do represent a political objective that makes it possible to be a guarded optimist. The EU's goals are lower than some countries, and higher than others. Regardless of whether the EU meets its targets, and regardless of how much the individual member states actually follow up on them, we are nevertheless entering into a period where energy and energy research will be given a very high priority on the national agendas in the Nordic countries, the EU and the rest of the world.

Work begins on our new projects in 2007, and appropriately this year marks the 20th anniversary of the Brundtland report entitled "Our Common Future" – a report that marked the beginning of the present focus on climate and energy. We must face the fact that the international community at present is confronted with challenges that are even greater than previous ones; challenges that demand new solutions, energy technology and knowledge. These challenges need to be met and Nordic Energy Research is ready to contribute to a joint international effort.

også var ansvarlige for to internasjonale workshops på Holmenkollen i Oslo.

Vi går nå inn i 2007, et år hvor viktigheten av energi og energiforskning ikke ser ut til å synke. Arven fra 2006 var et tungt fokus på energisikkerhet og klima – noe vi allerede tidlig i 2007 kan se resultatene av.

9. mars 2007 møttes statslederne i EU for å diskutere energipolitikk, og bestemte seg for bindende mål i forhold til klima og fornybar energi.

20-20-20 (10) INNEN 2020
EUs målsetning er å kutte utslipp av klimagasser med 20 prosent innen 2020. Det skal også være 20 prosent fornybare energikilder i EUs energimiks innen 2020, 20 prosent energibesparelse innen 2020 inklusiv 10 prosent innslag av biodrivstoff til transport innen 2020.

Selv om EUs målsetninger enda ikke er konkretisert, så representerer de en politisk målsetning som gjør det mulig å være forsiktig optimist. EUs mål er lavere enn noen land, og høyere enn andre. Uansett om EU klarer målene sine, og uavhengig av hvor mye de enkelte medlemslandene følger dem opp, så går vi inn i en periode hvor energi og energiforskning kommer til å stå meget høyt på dagsorden, både i Norden, EU og resten av verden.

I 2007 begynner arbeidet med våre nye prosjekter, og passende nok er det i år 20 år siden Brundtland-rapporten "Vår Felles Framtid" kom – en rapport som representerte startskuddet for dagens fokus på klima og energi. Vi må nok slå fast at det internasjonale samfunnet nå står foran enda større utfordringer enn da, utfordringer som krever nye løsninger, energiteknologi og kunnskap. Men, utfordringene må møtes og Nordisk energiforskning er rede til å bidra i denne internasjonale dugnaden.

[There is a] need to strengthen energy research

in particular to accelerate the competitiveness

of sustainable energies, notably renewables,

and low carbon technologies and the further

development of energy efficiency technologies.

Council of the European Union (9 March 2007)

Towards a Nordic Research and Innovation Area in Energy

BIRTE HOLST JØRGENSEN, MANAGING DIRECTOR

After a year and a half as Managing Director of Nordic Energy Research, it has been confirmed to me time and time again that we in the Nordic countries possess core competencies in the fields of climate and energy. And these circumstances ought to be leveraged far better via working relationships involving research, innovation and demonstration of new, renewable and clean energy technologies.

Energy is a prerequisite for economic growth, yet at the same time the Nordic countries are showing that economic growth is not necessarily tied to increased energy consumption. Norway's solar cell industry, Iceland's geothermal energy, Denmark's wind turbine industry and the bioenergy technologies of Sweden and Finland show that an industry can be constructed for global markets in areas where consciously targeted competencies are being built up in combination with the available natural resources.

NEW KNOWLEDGE

The creation and application of new knowledge is not an issue of either research-driven or user-driven innovation, but rather of it being both. New knowledge covers the entire value chain from basic research through to market introduction in new technologies.

Under the auspices of the International Energy Agency, a working group has identifed precisely what types of basic research is necessary in order to be able to deliver new energy solutions. Basic research of materials science, ICT and biotechnology is crucial for technological break-through in a large number of energy technologies.

På vej mod et nordisk forskning- og innovationsrum i energi

BIRTE HOLST JØRGENSEN, DIREKTØR

Efter halv andet år i stolen som direktør for Nordisk Energiforskning er jeg gang på gang blevet bekræftet i, at vi i de nordiske lande har spidskompetencer indenfor klima og energi. Og disse forudsætninger bør vi udnytte langt bedre ved at samarbejde langt stærkere indenfor forskning, innovation og demonstration af nye, fornybare og rene energiteknologier.

Energi er forudsætning for økonomisk vækst, og samtidig viser de nordiske lande, at økonomisk vækst ikke nødvendigvis er koblet til øget energiforbrug. Norges solcelle industri, Islands geotermiske energi, Danmarks vindmølleindustri og Sverige og Finlands bioenergiteknologier viser, at der kan opbygges en industri på globale markeder indenfor områder, hvor der målrettet opbygges kompetencer i kombination med naturgivne ressourcer.

NY VIDEN

Skabelse og anvendelse af ny viden er ikke et spørgsmål om enten forskningsdreven eller brugerdreven innovation, men om både og. Ny viden dækker hele værdikæden fra grundforskning og til markedsintroduktion.

I regi af International Energy Agency har en gruppe arbejdet med at identificere, hvilken grundforskning der er nødvendig for at kunne levere nye energiløsninger. Grundlæggende forskning indenfor materialevidenskab, IKT og bioteknologi er ganske afgørende for teknologiske gennembrudd indenfor en lang række energiteknologier.

PRIORITIES

We must dare to prioritise, that is, to focus our Nordic efforts within defined areas, allowing us to attain a greater initial impact and thus critical mass. Essentially this means that there are things that we choose to not pursue, which will always be a source of conflict. Prioritisations must hence be made according to political relevance and in a dialogue between the users (governmental authorities, industry, general population, etc.) and researchers, as well as other producers of knowledge. Such a concerted effort must be secured via an overall strategic steering committee with appropriate representation for the producers and users of such knowledge, and under the leadership of a representative for the users. Nordic Energy Research has pursued such a policy throughout its more than 20 years of existence by focusing its efforts within specifically defined, yet central, areas of research.

REMEMBER THE BARCELONA OBJECTIVES OF 1/3 PUBLIC AND 2/3 PRIVATE R&D FINANCING

We must procure the requisite financing from both public and private sector sources. Opening up national research programmes is only one of a number of necessary measures that are needed in order to acquire the requisite funds. Other methods are to form public-private partnerships, for example in the form of technology platforms or via completely new and innovative organisational structures such as Joint Technology Initiatives. Additional possibilities include raising funds in the same way that private organisations have done for years with splendid experiences and results. On the other side of the Atlantic, there are of course the large foundations such as the Rockefeller Foundation, the Bill and Melinda Gates Foundation, Carnegie, etc. In the Nordic countries we have the Wallenberg Fund, the New Carlsberg Fund and the Rockwool Fund. The entire venture capital sector is also an area that is relevant for financing resource-intensive activities closer to the market.

INNOVATION IN R&D INCENTIVES AND MEANS

In the operationalisation of the individual research programmes we should be working in a much more goal-oriented manner towards innovation that is based upon robust incentives that:

PRIORITERING

Vi skal turde prioritere, dvs. fokusere vores nordiske indsats indenfor afgrænsede områder, således at der bliver større gennemslagskraft og kritisk masse. Det betyder nødvendigvis også et fravalg, som altid vil være konfliktfyldt. Prioritering skal derfor ske efter politisk relevans og i dialog med brugere (myndigheder, industri, borgere) og forskerne og andre videnproducenter. En sådan satsning bør sikres en overordnet strategisk styring med passende repræsentation af producenter og brugere af denne viden og under ledelse af en repræsentant for brugerne. Denne politik har Nordisk Energiforskning forfulgt i sine mere end 20 år ved at fokusere indsatsen indenfor afgrænsede men centrale forskningsområder.

HUSK BARCELONA-MÅLENE 1/3 DEL OFFENTLIG OG 2/3 PRIVAT F&U FINANSIERING

Vi skal tilvejebringe nødvendig finansiering fra både offentlige instanser og private. Åbningen af nationale forskningsprogrammer er kun en ud af flere nødvendige tiltag, der skal til for at tilvejebringe tilstrækkelige midler. Andre metoder er at lave offentlige-private partnerskaber, f.eks. i form af teknologiplatforme eller helt nye innovative organisations-konstruktioner som Joint Technology Initiatives. Andre igen kan være at fundraise midler på samme måde, som private organisationer har gjort i årevis og med glimrende erfaringer og resultater. På den anden side Atlanten har man jo de store foundations som f.eks. Rockerfeller foundation, Bill Gates foundation, Carnagie etc. I Norden har vi også nogle uafhængige finansieringsinstitutioner som Wallenbergfondet, Carlsbergfondet og Rockwoolfondet. Hele venture kapital markedet er også et område, som er relevant finansiering i de ressourcekrævende aktiviteter tættere på markedet.

NYTÆNKNING I F&U INCITAMENTER OG VIRKEMIDLER

I operationalisering af de enkelte forskningsprogrammer bør vi arbejde meget mere målrettet mod nytænkning, der er baseret på robuste incitamenter, der:

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1. Procure sufficient public and private financing over an appropriate number of years (projects should not be too small or have too short timeframes).
2. Involve the users (such as other experts, the general public, commercial or public buyers of knowledge, governmental authorities, etc.) in the individual projects, also as in basic research.
3. Ensure an optimal framework for excellent research, i.e. the identification and selection of new projects based upon open competition, quality and relevance, as well as good management and value growth.
4. Are rooted in an international environment.

FIRST-CLASS RESEARCH ADMINISTRATION

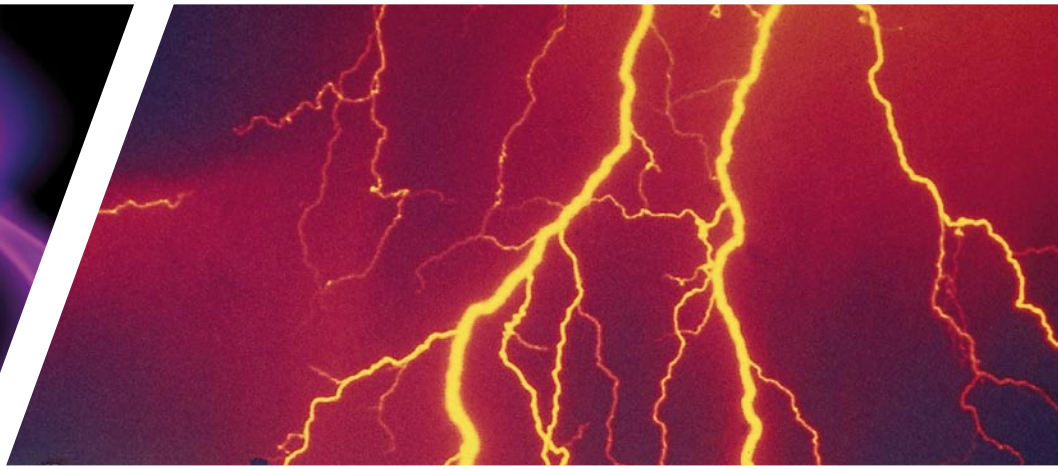
Last but not least we should be striving to create an ambitious and modern research administration that is among the best and most user-friendly in the world. My belief is that we, as a financier of research, are able to contribute to optimal framework conditions for the development of knowledge by making the administration flexible, efficient and facilitative, so Nordic knowledge environments will be able to use most of their efforts on development of knowledge and as little as possible on administration. These are competencies that are in fact intimately connected with highly developed welfare economies. Nordic Energy Research is also in this area striving to be among the best.

1. Tilvejebringer tilstrækkelig offentlig og privat finansiering over en passende årrække (ikke for små og ikke for tidsbegrænsede projekter).
2. Inddrager brugerne (det kan være andre eksperter, borgere, kommercielle eller offentlige aftagere af viden, myndigheder m.fl.) i de enkelte projekter også indenfor grundforskning.
3. Sikrer optimale rammer for excellent forskning, dvs. identifikation og udvælgelse af nye projekter baseret på åben konkurrence, kvalitet og relevans, god ledelse og værditilvækst.
4. Er internationalt forankret.

FREMMESTE FORSKNINGSADMINISTRATION

Sidst men ikke mindst bør vi stræbe efter en ambitiøs og moderne forskningsadministration, der er blandt de bedste og mest brugervenlige. Min hypotese er, at vi som forskningsfinansierende organisation kan bidrage til optimale rammebetingelser for videnudvikling ved at gøre administrationen fleksibel, effektiv og faciliterende, så nordiske videnmiljøer kan bruge krudtet på videnudvikling og mindst mulig på administration. Det er kompetencer, der er tæt knyttet til højt udviklede velfærdsøkonomier. Nordisk Energiforskning tilstræber også på dette område at være blandt de fremmeste.

Energy is a prerequisite for economic growth, yet at the same time the Nordic countries are showing that economic growth is not necessarily tied to increased energy consumption.



The creation and application of new knowledge is not an issue of either research-driven or user-driven innovation, but rather of it being both. New knowledge covers the entire value chain from basic research through to market introduction of new technologies.

Project portfolio 2003-2006

Project Title	Project Leader
Impacts of Climate Change on Energy	Orkustofnun, IS (Árni Snorrason) System (CE)
Nordic CO_2 Sequestration ($NoCO_2$)	Chalmers Univ. of Technology, SE (Anders Lyngfelt)
Underground cold storage for cooling of buildings (REKYL)	COWI A/S, DK (Reto Hummelshøj)
Nordic and Baltic Applied Fuel Cell Network (Nordic FC-net)	Institute for Energy, Technology NO (Preben Vie)
Hydrogen Production – Electrolysis	Risø, DK (Finn W. Poulsen)
Integration of advanced hydrogen storage materials and systems (NORSTORE)	Institute for Energy Technology, NO (V. A. Yartys)
Nordic Hydrogen Energy Forsight	Risø, DK Per D. Andersen)
New Metal Hydrides for Hydrogen Storage	IFE, NO (Bjørn Hauback)
Bio Hydrogen	Uppsala Univ., SE (Peter Lindblad)
Nordic Graduate School of Biofuel Science and Technology (Biofuel GS)	Åbo Akademi Univ., FI (Mikko Hupa)
Competitive Solar Heating for Residential Buildings (REBUS)	Technical Univ. of Denmark (Simon Furbo)
Solar Electricity – from Materials to System Integration	Institute for Energy Technology, NO (Arve Holt)
Large-Scale Integration of Wind Energy into Nordic Grid	Chalmers Univ. of Technology, SE (Ola Carlson)
Nordic Energy Market Integration, Energy Efficiency and Climate Changes (NEMIEC)	Statistics Norway (Torstein Bye)
Comparison of Nordic Regulatory Models	EBL – Kompetanse, NO (Arne Utne)
Nordic Energy Perspectives	Profu, SE (Bo Rydén)

Participating Institutions	Total Budget (MNOK)	NER contribution (MNOK)	Project period
Danish Environmental Research Institute, Ilmatieteen laitos. (FI), CICERO (NO), Linköping Univ. (SE)	13.2	11.4	2003-2006
NTNU (NO), Helsinki Univ. of Technology (FI), Kaunas Univ. of Technology (EST)	15.6	13.3	2003-2007
Lund Univ. (SE), Technical Univ. of Denmark, VTT (FI), Vilinius Gediminas Technical Univ. (LT)	1.3	7	2003-2005
Technical Univ. of Denmark, Statkraft (NO), Royal Institute of Technology (SE)	1.8	1.4	2003-2006
University of Oslo (NO), NTNU (NO)	4.5	2.0	2003-2006
IFE (NO), Studsvik Neutron Research Lab. (SE), St.Petersburg Univ. (RU), Helsinki Univ. of Technology (FI), Academy of Science (RU), Risø (DK), Univ. of Iceland	9.0	9.0	2003-2007
VTT (FI), FOI (SE), Univ. of Iceland, Hydro Energy (NO), H2 Forum (SE), Fortum Oil (FI), Wärtsilä (FI), Society of Danish Engineers, Energi E2 (DK), Aga (SE), IRD Fuel Cells (DK), Vattenfall (SE), ABB (SE), Dansk Gasteknisk Center	6.1	1.5	2003-2005
Univ. of Oslo (NO) Uppsala Univ. (SE), Stockholm Univ. (SE), Univ. of Iceland, Technical Univ. of Denmark, Helsinki Univ. of Technology (FI)	4.4	4.4	2003-2006
Norwegian Institute of Water Research, Linköping Univ. (SE), Icelandic Fisheries Laboratories, Tampere Univ. of Technology (FI), Roskilde Univ. (DK), Estonian Institute for Sustainable Development, Riga Technical Univ. (LV)	15	6.0	2003-2006
Danish Univ. of Technology, NTNU (NO), Chalmers Univ. (SE)	17.0	17.0	2003-2006
Riga Technical Univ. (LV), Technical Univ. of Denmark, Univ. of Oslo (NO), SolarNor AS (NO), Lund Inst. of Technology (SE)	13.8	7.7	2003-2006
Danish Technological Institute, Univ. of Uppsala (SE), Helsinki Univ. of Technology (FI), NTNU (NO)	14.4	14.4	2003-2006
Risø (DK), SINTEF (NO), VTT (FI)	9.8	4.9	2003-2006
Helsinki School of Economics (FI), Stockholm School of Economics (SE), Copenhagen Univ. (DK), Univ. of Iceland	16.8	16.8	2003-2007
ECON (NO), Fortum Distribution (FI), Statkraft (NO), Elforsk (SE)	0.650	0.125	2003-2004
VTT (FI), ECON (NO/DK), Stockholm Univ. (SE), Göteborg Univ. (SE), RAM-Løse edb (DK), COWI (DK), Elforsk (SE), EME-Analys (SE), VATT (FI)	5 MSEK	0.750 MSEK	2004-2006

Project portfolio 2007-2010

Project Title	Project Leader
Climate and Energy Systems; Risks, Potential and Adaptation	Orkustofnun, IS (Árni Snorrason)
Model development for Power System Analysis with a substantial wind energy capacity installed in the Nordic Grid	Chalmers Univ. of Technology, SE (Ola Carlson)
New, innovative pretreatment of Nordic wood for cost-effective fuel-ethanol production	PFI, NO (Karin Øyaas)
Nordic network for sustainable energy systems in isolated locations	Risø, DK (Gordon Mackenzie)
Nordic Centre of Excellence in Photovoltaics (PV)	IFE, NO (Arve Holt)
Biofuels GS	Åbo Akademi, FI (Mikko Huppa)
Nordic Centre of Excellence on Hydrogen Storage Materials	Univ. of Iceland, IS (Hannes Jonsson)
Scandinavian Hydrogen Highway Partnership	Norsk Hydro, NO (Ulf Hafseld)
BioH2; Renewable production of H2 using biological systems	Uppsala Univ., SE (Peter Lindblad)
D&D of an efficient and cost competitive PEMFC system for cold Nordic climate	SINTEF, NO (Steffen Møller-Holst)
Basic Phenomena in Mechanical Pulping	KCL, FI (Mikael Lucander)
Primary Energy Efficiency (PEE)	SINTEF/NTNU, NO (Rolf Ulseth)
Nordic Energy, Environmental Constraints and Integration (NEECI)	Statistics Norway (Torstein Bye)
Energy Foresight Forum	NHH, NO (Einar Hope)
Distributed Generation Integration in the Nordic Energy Market (DIGINN)	ECON, NO/DK (Berit Tennbakk)
Nordic AMR Forum (Automatic Metre Reading)	SINTEF, NO (Andrei Z. Morch)

Participating Institutions	Total Budget (MNOK)	NER contribution (MNOK)	Project period
Swedish Meteorological and Hydrological Institute (SE), Norwegian Energy and Water Directorate, VTT (FI), SINTEF (NO), Landsvirkjun (IS), Elforsk (DK), Finnish Energy Industries, DONG Energy (DK), Statkraft (NO)	15	10	2007-2010
Risø (DK), SINTEF (NO), VTT (FI), Tallinn Univ. of Technology (EST)	7	5	2007-2010
Prokaria EHF (IS), STFI-Packforsk AB (SE), SINTEF (NO)	11.3	8	2007-2010
IFE (NO), Danish Technical Univ.'s Arctic Technology Centre, Greenland Innovation Centre, Danish Polar Centre, GRID-Arendal (NO), Nordic Council's "TBO" Task Force, IRD Fuel Cells (DK), Statoil New Energy (NO), PURE Project (Shetland), REEEP South East & Asia Pacific Secretariat	5.7	4	2007-2010
Univ. of Uppsala Sweden (SE), Helsinki Univ. of Technology (FI), Danish Technological Institute, Norwegian Univ. of Science and Technology (NO), Physico-Technical Institute in St. Petersburg (RU), Tallinn Univ. of Technology (EST)	10.6	8	2007-2010
Chalmers Univ. of Technology (SE), NTNU (NO), Technical University of Denmark	17	8	2007-2010
IFE (NO), Univ. of Oslo (NO), Stockholm Univ. (SE), Uppsala Univ. (SE), Technical Univ. of Denmark, Risø (DK), Helsinki Univ. of Technology (FI), Lithuanian Energy Institute, Saint-Petersburg State Univ. (RU).	10.6	8	2007-2010
Zero (NO), ETC Batteries and FuelCells Sweden AB, Region Mitdtjylland (DK), H2 Logic (DK)	1.3	1	2007-2010
Univ. of Bergen (NO), Univ. of Turku (FI), The Royal Veterinary and Agricultural Univ. (DK), Univ. of Akureyri (IS),Tampere Univ. of Technology (FI), Univ. of Jyväskylä (FI), Stockholm Environment Institute (SE), Tallinn Center (EST), Roskilde Univ. (DK), Riga Technological Univ. (LV)	9	6	2007-2010
Powercell Sv. AB (SE), Volvo Technology (SE), Statoil (NO), H2 Logic (DK)	8.8	4.4	2007-2008
Mid Sweden Univ., NTNU (NO), Tampere Univ. of Technology (FI), Helsinki Univ. of Technology (FI)	8	4	2007-2009
Univ. of Iceland (IS), VEKS (DK), Lund Univ. (SE), Helsinki Univ. of Technology (FI), Tallinn Technical Univ. (EST)	10.7	8	2007-2010
Stockholm School of Economics (SE), Copenhagen Univ. (DK), Univ. of Reykjavik (IS), Helsinki School of Economics (FI), Univ. of Bergen (NO), Univ. of Oslo (NO), Gothenburg Univ. (SE), Risø (DK)	9.4	8	2007-2010
Univ. of Bergen (NO), Stockholm School of Economics (SE), Dept. of Economics at Copenhagen Univ.(DK), Univ. of Iceland, Helsinki School of Economics (FI)	1.2	0.9	2007-2009
The Norwegian Electricity Industry Association, VTT (FI), Sweco Grøner (NO), Norwegian Univ. of Life Science, Universitè Catholique de Louvain (BE), Royal Veterinary and Agricultural Univ. (DK), Norwegian School of Management, Kola Science Centre (RU).	4.5	1.5	2007-2008
VTT (FI), Elforsk (DK), DEFU (DK), Ekodoma Ltd (LV)	2.7	1.4	2007-2008

Annual Accounts 2006

Regnskab 2006

REVENUES / Indtægter (NOK)	2006	2005
Ordinary budget funds from NCM/Ordinære budgetmidler fra NMR	1 155 900	1 150 000
Project grants from NCM/Projektbevillinger fra NMR	1 395 886	2 419 892
National grants/Nationale bevillinger*	32 704 694	34 680 567
Other revenues (interest/transfers etc.)/Andre indtægter	3 023 404	4 621 432
TOTAL REVENUES / Totale indtægter	**38 279 884**	**42 871 891**
EXPENSES / Udgifter (NOK)		
Secretariat/sekretariat	7 558 444	577 1433
Project expenses/Projektudgifter**	3 2704 694	37 100 458
TOTAL EXPENSES/Totale udgifter	4 0263 138	42 871 891
NET PROFIT/Årets nettoresultat* **	**(1 983 254)**	**–**
ASSETS / Aktiver (NOK)		
Trade debtors/Debitorfordringer m.m.	79 659	–
Grants receivable/Projektfordringer	247 551	701 514
Costs paid in advance/Forskudsbetalte omkostninger		3 106
Cash at bank/Bankkonto	28 004 507	43 399 563
TOTAL ASSETS/Aktiver i alt	**28 331 717**	**44 104 183**
LIABILITIES / Passiver (NOK)		
Trade creditors/Kreditorgæld m.m.	465 512	99 517
Project advance payment/Projektforskud	26 744 968	40 871 303
Accounts payable/Skyldige omkostninger	536 927	365 799
Transfers/Overførte midler	584 310	–
Appropriation to the institution/Afsætning til institutionen		2 767 564
TOTAL LIABILITIES/Passiver i alt	**28 331 717**	**44 104 183**

*National grants 2006:	Nordic activity	Activities in Baltic states/NW Russia
Denmark/Danmark	5 700 000	570 000
Finland	4 475 000	447 500
Iceland/Island	275 000	27 500
Norway/Norge	6 575 000	657 500
Sweden/Sverige	7 975 000	797 500

** Of which Baltic states/NW Russia / Heraf Baltikum/NV Rusland NOK 2 155 770.

*** The ordinary budget funds from NCM in 2006 are not sufficient to cover the administrative expenses. The Board therefore decided an appropriation to cover the expected deficit. The deficit is within the frame of the Board's decision. / Det administrative bidrag fra NMR i 2006 er ikke tilstrekkelig til å dekke institusjonskostnadene. Styret vedtok derfor å gjøre en avsetning til dekning av forventet underskudd i administrasjonsomkostninger. Underskuddet ligger innenfor rammen av styrets vedtak.

The annual accounts are revised by the Office of the Auditor General in Norway.

Regnskabet er revideret af Riksrevisjonen i Norge

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Senior Advisor

Amund Vik,
Project Assistant

Vivi Mathiesen,
Senior Advisor

Coherent, urgent and broadly based action requires international understanding and co-operation. These may be embodied in formal multilateral agreements that allow countries to pool the risks and rewards for major investment in R&D including demonstration projects and dedicated international programmes to accelerate key technologies.

Stern Review on the Economics of Climate Change (2007)

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We live in an era in the history of nations when there is greater need than ever for co-ordinated political action and responsibility [..] Responsibly meeting humanity's goals and aspirations will require the active support of all of us.
Brundtland Report; Our Common Future (1987)

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