Taste!
Energy Cookbook
Recipes for cooperation
The mission of Nordic Energy Research is to fund and promote Nordic cooperation within energy research and make a significant contribution to energy policymaking.
What is energy?
What is cooperation?
Is cooperation energy?
Is energy cooperation?

Yes!!!
In all cultures, stories evolve from the culinary experience. Conducting research, like preparing a meal, requires training and learning from our colleagues through the sharing of recipes.

Good cookbooks combine tradition with more recent innovations and offer a wide variety of options to meet diverse tastes and needs. They give us recipes for how to make well-known dishes, the ability to experiment to produce new ones and ideas for using ingredients creatively. In the same way, this energy cookbook gives you a variety of recipes for research cooperation. The book emphasizes the value of Nordic cooperation and promotes use of Nordic raw materials as green energy.

While ‘Taste’ is a collection of Nordic recipes, it is also a primer on one of the hottest global issues of the day - the “grand challenge” of energy and climate change. This Energy Cookbook is therefore a tempting treat for all to enjoy.

Why an Energy Cookbook?

The energy cookbook gives you a delicious collection of 16 recipes, representing the projects that Nordic Energy Research funded between 2007 and 2010. This is the result of the combined efforts of top-level researchers and industry across the Nordic and Baltic countries. The recipes are divided in two types: recipes for projects and formulas for networks. They all reflect technological and policy choices that are geared toward an efficient, secure and sustainable energy system.

A total of 86 million NOK (10,75 million EURO) has been provided by Nordic Energy Research to fund the projects behind the recipes. Adding external financing, the total budget becomes 147 million NOK (18,40 million EURO).

You may be puzzled by the refreshing photos of Nordic berries that accompany the research recipes. You can even find two new Nordic food recipes for energy smoothies, created by chefs Geir Skeie and Siggi Hall, both having excelled.
in the culinary world through their playful use of Nordic raw materials and their natural flavors. We believe there are many parallels between New Nordic Food and Nordic energy research. The Nordic Council of Ministers has initiated the New Nordic Food manifesto as a way of boosting the production and consumption of traditional food products. The philosophy behind this can easily be adapted to the field of energy. In a similar style, Nordic Energy Research is committed to the manifesto points of understanding the importance of a sustainable lifestyle, respect for nature, fair use of natural resources and an emphasis on resource efficiency.

Taste! is a pleasurable way to get inside energy research without spending your entire day slaving over a “hot stove” with dense and technical hard stuff. We have focused our attention on making the recipes easy to read and follow to ensure that you are able to make the most of your precious time. At Nordic Energy Research, we are always building bridges: between research and its users, like industry and policymakers, and between content and design, so that the flow of information is smooth and easy. Possibly the most effective aspect of the energy cookbook is that it will be used, rather than sitting on a shelf gathering dust. This helps Nordic Energy Research to accomplish our mission of promoting Nordic cooperation.

Is there a secret ingredient to success in energy research projects? Clearly it is about involving the most skilled people. Simply put, we can say that Nordic Energy Research funds people, not projects. Education of highly qualified PhDs and specialists in Nordic energy systems and resources has always been vital for us.

But how do you ensure this quality? Well, that’s where the secret ingredients come into play: building relationships. What we really do is to fund R&R: Research and Relationships. This was also underlined at our 25th anniversary in 2010, marking the end of our 4-year funding period and the beginning of a new research program with an even sharper focus on sustainable energy systems. The chairman at that time, Nicolai Zarganis, said: “It is the fact that the program facilitates true international technology collaboration that makes it exceptional. By binding the Nordic national research communities together we can achieve major synergies based on the five countries’ complementary strengths in the energy field.”

We hope this book will encourage researchers, industry and policymakers to explore Nordic cooking and cooperation. Because international collaboration accelerates the energy research and innovation we need to solve the “grand challenge” of energy and climate.

Enjoy!

Anne Cathrine Gjærde
Director


16 recipes

projects
A common culture, common goals and priorities
and small networks are factors that help enhance
research cooperation in the Nordic region...
Energy Smoothie
by Geir Skeie

1 dl plain yoghurt
2 tbs oatmeal
1 tbs brown natural sugar
1/2 dl blueberries
1 dl lingonberry juice
1/2 dl strawberries

Blend everything in a blender until smooth, adjust the sweetness with sugar.

Geir Skeie
Bocuse d’Or 2009
The raspberry is most common in the Southern parts of the Nordic countries. In addition to their great taste, raspberries are a nutrition powerhouse.
If we are to achieve our CO₂ targets, we need to get serious about understanding the energy markets. Efficient integration of distributed energy generation is a necessary condition for a well-functioning Nordic electricity market that provides security of supply at the lowest possible cost. Learn about adding flavors, or instruments, like green, white and black certificates to the energy market.

Combining *flavors* in the market

**Cooking time**
- 4 years of research

**Ingredients**
- 5 countries (Iceland, Finland, Sweden, Norway and Denmark)
- 9.4 million NOK
- 5 educational institutions
- 1 private partner
- 5 full-time project participants
- 8 doctorate degrees
- 150 publications
- 4 seminars
Taste
The project has resulted in a large number of publications and presentations. “We had several goals in doing this work”, says project leader Torstein Bye, Director of Statistics Norway. “It is partly about new insights conveyed as theoretical and applied economic articles in journals, and presentations for government and others involved in energy and environmental issues.”

Several papers are concerned with issues of sustainable development and the implementation and effects of a variety of instruments and regulatory regimes. Green certificates, white certificates and black certificates (permit markets) are all analyzed. Several papers consider one instrument at a time, while others discuss the effects of combining instruments. Other papers study the effect of discriminatory setups (some instruments are not evenly applied to all agencies involved).

An interesting example is the study showing that a green certificate market will benefit the dirtiest power producers when a carbon tax (or permit market) regime already exists. These research fields have directly influenced the public debate on sustainable development and the introduction of policy measures to combat climate change.

Other aspects raised are security of supply, different regulatory regimes, the role of public investments in energy markets – including uncertainty aspects – the functioning of and competition in retail and wholesale markets, different regimes for competition including elements of cross-subsidisation, forward markets for energy and the role of information in energy markets.

One interesting aspect is the research on volatility of electricity prices and security of supply, which has also indirectly had a substantial impact on policy debates within the Nordic countries. Several of the participants have been directly involved in ministerial commissions studying these issues, as well as participating in the intra-Nordic public debates.

Process
1. You need to develop new cookware to meet the main concerns of energy policy makers in the Nordic countries, including soaring energy prices and security of supply, coupled with environmental concerns. The consequence is an increased emphasis on instruments that can foster investment in new renewable capacity and the development of energy-saving clean technologies. As energy markets become more integrated, both geographically and across energy carriers, local markets are increasingly exposed to inter-regional effects.

2. Turn on the fundamental and applied research switch.

3. Add researchers from all the Nordic countries. Build on the research network successfully established through the previous Nordic Energy Research projects.

4. Set the target to further increase understanding of the functioning of energy markets, as well as how to improve the performance of these markets.

5. Apply case studies of distributed energy generation projects throughout the Nordic region, and collect empirical data that can be used to identify barriers to distributed generation integration, given the current regulatory setup.

6. Train doctoral students for continuous cooking in the future.
Cooperation how-to

Nordic Partners:
- Statistics Norway, Norway
- Stockholm School of Economics, Sweden
- Copenhagen University, Denmark
- Helsinki School of Economics, Finland
- Reykjavik University, Iceland

There is a significant upside to cooperating on these issues within a Nordic framework. The Nordic countries are small and have compact research communities, especially on new research areas such as energy markets. As a result of Nordic cooperation, it has been possible to reach “critical mass” in more areas than would otherwise be possible, which in turn elevates the quality of research.
Olli Kauppi, Helsinki School of Economics: In his dissertation, Olli Kauppi discusses the efficiency of competition in the Nordic wholesale power market. He develops a statistical model to depict the operations of a power market dominated by hydroelectricity. A special characteristic of the model is that, in addition to the competitive market, it allows for the examination of situations where the ownership of hydroelectricity is concentrated in the hands of major power corporations.

Stephanie Ropenus, Risø, DMU: The growth of distributed electricity supply of renewable energy sources (RES-E) and combined heat and power (CHP) – so-called distributed generation (DG) – can cause technical problems for electricity distribution networks. These integration problems can be overcome by reinforcing the network. Many European Member States apply network regulation that does not account for the impact of DG growth on the network costs. The project looked into the impact of high DG deployment on the electricity distribution system costs and the impact on the financial position of the DSO. Several ways for improving network regulation to compensate DSOs for increasing DG penetration were identified and tested.

Halvor Storrøsten, Statistics Norway: i) Emissions trading with updated allocation: Effects on entry/exit and distribution, which has been accepted for publication in Environmental and Resource Economics; ii) Investment in abatement technology: A tax versus emissions trading under imperfect competition; iii) “Price vs. tradable quantity regulation: Uncertainty and endogenous technology choice”; iv) Output-based allocation and investment in clean technology”.

Anne Sahari, Helsinki School of Economics: In her dissertation, which is due to be completed in 2012, Anna takes up several issues: i) The Finnish retail electricity markets, ii) Estimating the resource rent of hydropower producers and iii) Econometrics and Computational Economics.

Hanne Marit Dahlén, Statistics Norway, Norway: i) Implementing the EU renewable target through green certificate markets (finished) and ii) Analyzing the impact of economic analysis on the choice and design of policy instruments. How is cost-effectiveness understood and used by Norwegian policy makers? Research question: Taking cost-effectiveness into account when designing environmental policies. Norwegian politicians’ use of economic theory in their choice of instruments for reaching their (complex) targets.

Mette Graversen, Den Kongelige Veterinær og Lanbrukshøyskole, Denmark: In her thesis, Mette Graversen has included four papers about over-exploitation of natural resources and the consequences for armed conflicts: i) “Natural resources and conflict severity – what is the relationship”; ii) “Oil price shocks, institutional quality and conflict severity”; iii) “Heterogeneous natural resources and onset of heterogeneous conflict types”; iv) “Regulating water extraction in a river basin with upstream-downstream communities”.

Matti Ilonen, Helsinki School of Economics, Finland (lic): Matti Ilonen moved to work for the Finnish energy market authority and decided to complete his Licentiate thesis by 2012. The topic of the thesis is “Finish Retail Market Competition: an empirical assessment.” The thesis uses a recent database that covers all retail electricity contracts offered in Finland in the period 2006-2010. Using the data, it is possible to assess regional price dispersion and to evaluate the pricing practices of local suppliers versus national electricity traders. The aim is to develop an econometric model for the determinants of local prices that exhibit systematic deviations from the prevailing national price.

Sara Fogelberg, Research Institute of Industrial Economics (IFN): Sara fogelberg started her PhD work in 2010 and will probably deliver primo 2013. Her subject is Energy Security issues.
The garden strawberry is cultivated throughout all of the Nordic countries. It is an excellent source of Vitamin C, and it is one of the richest sources of antioxidants.
With rising energy costs, the consequence of saving energy in the mechanical pulping sector has an important impact on the future competitiveness of the Nordic pulp and paper industry. This recipe promotes increased energy efficiency through new knowledge about essential wood fibers.

### Cooking time
2 years of research

### Ingredients
- 3 countries (Finland, Sweden and Norway)
- 9.68 million NOK
- 5 educational institutions
- 4 industry partners
- 8 full-time project participants
- 6 post-doctoral candidates
- 3 doctorate degrees
- 20 publications
- 10 seminars
Taste
Unfortunately, the project was unable to achieve its very ambitious target of a 30% reduction in energy use. However, significant theoretical progress has been made and new knowledge gained about what to do to get closer to this goal.

Much can be gained from the experience of the project, and the findings can to a large extent be directly applied to all paper-making companies in the Nordic region. This will help create greater opportunities for sustaining research and industrial drive as well as the Nordic region’s competitive strength in the pulping industry.

Based on the results of the project, scientists were able to reject several older hypotheses, concluding that there is a huge difference in how the splitting of the wood fibers takes place. One example is that you need 10-15% more energy to process pine pulp than spruce pulp.

An indirect result of the project spawned a startup company. Together with Nordic colleagues, Professor Gregersen has been involved in establishing the company Collimated Chipping Technology AB in Sweden. It is based on a patented production method, which they will develop in the coming years.

Process
1. Start by taking a look at the industry’s energy use in the Nordic countries. In 2002, Finnish industry consumed electrical energy of roughly 42 TWh, of which close to 25 TWh was consumed by the pulp and paper industry. The share of mechanical pulp production was some 10 TWh. For Swedish industry, the corresponding figures are roughly 56 TWh, 23 TWh and 7 TWh respectively. In Norway, the amount of energy used for mechanical pulping is lower. Between 2005 and 2006, the end-user price of electricity on the European market almost doubled. For an industry facing competition across the globe, these price hikes have meant tightening the belt and looking to new means of maintaining competitiveness. With the increasing cost of raw materials and especially the increase in energy prices, the outlook for sustaining the industry in the Nordic countries is that it will become tougher and tougher in the future.

2. Focus on paper industry problems. Basically, the problem is inefficient technology. It is estimated that only around 5-20% of the energy consumed in the production of mechanical paper in paper mills goes into the actual production of the mechanical pulp.

3. To solve the problem for the pulp and paper industry, build on Nordic strengths. The Nordic countries have long taken a leading role in developing value-added fiber products as well as the machines needed for producing the different paper and board grades. This leadership position is becoming ever stronger.

4. Invest in research as a tool for keeping this important industry from moving to sites with lower production costs.

5. Blend educational institutions, industry partners, full-time project participants, post-doctoral candidates and doctorate degrees. Be aware of the fact that the expertise, knowledge and research facilities you need are distributed among several research sites, including research centers and Universities. So to meet today’s requirements for radical improvements with insufficient resources, the evident solution is to combine all the top expert resources in Nordic cooperation projects.

6. Set the target to a radical reduction of the specific energy (30%) in the production of mechanical pulp.

7. Find ways to reduce production costs by developing new methods. Study and measure the effects of the different process steps on wood fibers. Find the essential fiber properties that can increase energy efficiency.

8. Finalize with publications and seminars.
One factor that may have enhanced cooperation between the Nordic countries is culture. In the Nordic region, the differences between the countries are quite small. The research culture and methodologies are similar, easing cooperation across the Nordic region. For the project, this meant that the interests and goals within mechanical pulping and energy savings were the same in all the Nordic countries.

The knowledge and experience generated from the mechanical pulping project is that a common culture, common goals and priorities and small networks are factors that help enhance research cooperation in the Nordic region. For the project, this meant that the interests and goals within mechanical pulping and energy savings were the same in all the Nordic countries.

When it comes to the pulping industry, it is important to protect competitiveness as this field is an important export commodity of common Nordic interest.

Project manager Mikael Lucander from KCL in Finland is eager to emphasize the Nordic dimension of the research project, “All project participants contributed with research that is essential for the project as a whole. For instance, without detailed knowledge of the rheological, morphological and chemical properties of our raw materials, we would have no firm basis for running a simulation of the process.” Within this project, each institution was responsible for its own sub-project. However, no partners worked alone; instead, everyone cooperated intensely with the other institutions. “We decided to work together not only to receive funding, but because of the great benefit generated from collaboration. We have been able to combine and integrate knowledge from the different partners in the project,” Lucander observed.

Research cooperation across borders seems to have clear benefits, but how does transnational cooperation affect the project results? According to Lucander, a Nordic project generates a greater number of publications than national projects. His project has resulted in 20 reports and publications and close to 10 international conferences and seminars.

Project manager Mikael Lucander highlights the importance of the region’s financial contribution to the pulp and paper sector. “As project manager, I think it is highly important to receive Nordic regional funding in addition to national funding. This creates a greater opportunity to sustain research and industrial drive, as well as the Nordic region’s competitive strength within the pulping industry. We have the knowledge and research environment – this field is our strength. We are very happy to see Nordic Energy Research take an interest in our work. The industry itself, faced with the need to cut costs in the wake of rising electricity prices, has so far been reluctant to fund research like ours. It is encouraging to see things turning around.”
Blueberries grow in most Nordic countries – both in the wild and in cultivation. The deep blue color is related to the berries’ high amounts of antioxidants that are said to be beneficial to health.
The Nordic Graduate School is an energy cooking school devoted to education in the art of biofuels science and technology. Students can acquire experience working in an international Nordic environment and receive specialized doctoral training.

Cooking time
4 years

Ingredients
4 countries
(Finland, Sweden, Norway and Denmark)
16 million NOK
4 universities
6 senior researchers
10 post-doctorates
16 doctorate degrees
123 publications
8 courses
Taste

The BiofuelsGS-2 consists of 16 doctoral students (partly funded directly by the school, partly funded by other sources) and their supervisors. Additional students from the four partners are also given the opportunity to participate with funding from other sources.

In summary, the School’s activities include:

- Tailor-made study and research plans for all participating students, including study and research visits to other Nordic universities.
- Intensive courses organized directly by the school in key biofuel conversion science and technology topics. Provided by senior researchers and professors within the participating universities or by invited lecturers from industry.
- Intensive courses organized by others. Additional courses were provided by cooperating partners of BiofuelsGS2, such as the Danish Graduate School of Chemical Engineering, “Molecular Product and Process Technology (MP2T)”, the Finnish Graduate School in Chemical Engineering (GSCE) and the Swedish postgraduate training program CeCost.
- Annual seminars where students present their work and exchange knowledge and opinions with each other.
- An Annual Book published at the annual seminars, consisting of progress reports by the School’s students.

Cooperation how-to

Nordic Partners:
- Chalmers University of Technology, Sweden
- Denmark: Technical University of Denmark, Denmark
- Norwegian University of Science and Technology (NTNU), Norway
- Åbo Akademi University, Finland

BiofuelsGS2 is a direct continuation to the former Nordic graduate school “biofuelsGS”, which was established in 2003. BiofuelsGS2 was funded by Nordic Energy Research for a period of four years, starting on 1 January 2007 and ending on 31 December 2010.

A team of senior researchers is cooperating closely on to organize the program planned for delivery in BiofuelsGS-2.

Project manager Professor Mikko Hupa commented: “I would particularly emphasize the importance that the doctoral school has had in building an academic network in this field in Scandinavia. The students and their mentors have had meetings where they presented their work and results for each other, and discussed and criticized the results and methods.”

Process

1. Combine competences from the four universities Chalmers University of Technology (CTU), Sweden, Technical University of Denmark (DTU), Denmark, Norwegian University of Science and Technology (NTNU), Norway, and Åbo Akademi University (ÅAU), Finland to form The Nordic Graduate School in Biofuels Science and Technology – Phase 2.

2. Raise the esteem and quality of doctoral training within the Nordic universities in the area of biomass and waste conversion to fuels, heat and power.

3. Aim to provide the basic scientific and technical knowledge to solve problems related to conversion of biofuels. This is achieved by collaboration in postgraduate course arrangements, shared student supervision via student and supervisor exchanges between the base universities, and intensive industry-academia networking.

4. Widely advertise the individual BiofuelsGS-2 courses and keep the school open to students at all participating Nordic universities. Spread information through the website of BiofuelsGS-2 and a biannual newsletter sent to participants and their supervisors.

5. Continue collaborating with other Graduate Schools in the Nordic countries through collaborative courses and seminars to maintain a high level of knowledge-sharing between students, researchers, university departments and industry.
The redcurrant is native to all parts of Scandinavia. It is an excellent source of vitamin C and other antioxidants. The berry is also a source of dietary fiber.
With this recipe, you achieve fuel cells that can be kept in freezing environments without being destroyed. Experience a fuel cell driven forklift that can be left outside in minus ten degrees, without causing startup problems. Reduced cooking costs of 40% are included.

Frozen Fuel cells

[Development and demonstration of an efficient and cost competitive PEMFC system for the cold Nordic climate.]

Cooking time
2 years of research

Ingredients
3 countries
(Denmark, Sweden and Norway)
8.8 million NOK
1 educational institution
4 industry partners
7 full-time project participants
1 publication
1 seminar
1 forklift
a niche market application reduced risk and provided an ideal approach to quickly enhance Nordic know-how on fuel cell system integration and sub-zero operation.

Fundamental knowledge was effectively linked to feedback from field tests to develop robust fuel cell technology systems for the development of materials, components and improved cell and system design. Realization of the potential and viability of PEMFC technology required system integration and testing in real applications. A transparent approach was taken by sharing experience in an open workshop with Nordic Original Equipment Manufacturers (OEMs) and small and medium-sized enterprises (SMEs), to facilitate the realization of new business opportunities.

Process
1. Join project participants from the Nordic countries and industry and financing.
2. Set the target to develop an efficient and durable PEMFC technology suitable for cold Nordic climate.
3. Make a plan to solve the main problem with fuel cell powered vehicles operated in sub-zero environments. When the vehicle is parked and the fuel cell is shut down, the water produced during run time must be removed to avoid core components of the fuel cell being destroyed by ice.
4. Select and develop system components with a clear focus on reliable and durable operation at reduced costs. This means looking at how to secure a PEMFC stack (Proton Exchange Membrane) and a system that would be operational in -20 to -50 degrees Celsius. Test the system for a fuel cell powered forklift.

Taste
The project resulted in a fully operational fuel cell powered forklift. The project partners were able to design a complete system with decommissioning and commissioning procedures to avoid freezing of fuel cells. This was achieved by removing the water in the fuel cells by blowing dry air through the fuel cell stack. The measuring sensors detect when the fuel cells are dry. The forklift driver does not need to worry about this procedure when she leaves the truck. As she turns off the engine, the system will automatically blow dry air through the fuel cells. This allows forklifts to stand in freezing temperatures – for example, in a cold store – without breaking down.

Another important part of the project was to bring down costs in the entire fuel cell system. By finding better and cheaper components and creating a better design for fuel cell plates, the cost per kilowatt hour decreased by 40% from 2006 to 2009. An additional benefit is that the fuel cell stack has less weight and volume. But costs must be reduced another 40% for the sub-zero fuel cells to be competitive with other regular types of energy.

By addressing an early market application with less stringent cost and dynamic requirements, the partners gained invaluable competence, experience and manufacturing capabilities for next-generation fuel cell systems exhibiting lower cost and improved reliability. Furthermore, introducing PEMFCs to

Cooperation how-to
Research institutions:
- SINTEF, Norway

Industry:
- PowerCell Sweden AB, Sweden
- Statoil Hydro ASA, Norway
- Volvo Technology AB, Sweden
- H2 Logic Aps, Denmark

Danish H2 Logic develops systems for hydrogen vehicles. Swedish PowerCell Sweden develops fuel cells. Volvo Technology, which at the time owned the power cell, is Volvo’s research department in Sweden. Statoil Hydro (now Statoil) was active in the development of a hydrogen market for the transport sector. SINTEF was the only research institution involved. Together, these agencies mobilized the critical mass needed to address the challenges and reach the project goals. Project partners worked closely together in small, efficient and dynamic Task Forces focused on solving specific problems such as System Requirements, Freeze Tolerance issues and System Integration and Modeling. Exchange of scientific personnel between Nordic Countries was a crucial factor in developing a strong Nordic cooperation.

It is not always possible to find suitable industry partners in each country. For SINTEF, the project resulted in several research projects with industrial companies and access to large EU projects. As project manager Anders Ødegaard observed, “One of the finest aspects of Nordic Energy Research is that hydrogen operators can get financial support to cooperate with other Nordic partners”.

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The gooseberry bush is native to the Nordic region. It is rich in vitamin C and a source of vitamin B6 and antioxidants. Antioxidants protect the body’s tissues against damage from free radicals.
Learn how to mix green policies for efficient long-term integration of distributed generation in the Nordic market. Good for beginners, as you get a full overview of the main challenges and barriers to distributed generation, both technical and financial.

**Cooking time**
2 years

**Ingredients**
- 4 countries (Norway, Finland, Sweden and Denmark)
- 4,540 million NOK
- 1 state enterprise
- 1 energy directorate
- 15 industry partners
- 11 full-time project participants
- 3 reports
Process

1. Use plenty of industry partners working with participants from state enterprises, directorates and institutions, together with financing.

2. Investigate the prospects of distributed generation depending on technological and power market developments, based on a range of scenarios.

3. Identify the main barriers to development of distributed generation in the Nordic countries and in North-West Russia through a questionnaire sent to the majority of stakeholders, as well as interviews with selected stakeholders in these countries. Based on the barriers found in the survey, carry out focus group interviews in the different Nordic countries to elaborate the results of the survey.

4. Enter into dialogues with regulatory authorities in each of the countries to see which policy tools are best.

Taste

The main barriers to development of distributed generation in the Nordic countries and in North-West Russia were found to be:

- feed-in tariffs or other incentives too low or non-existent
- instability of politics
- public resistance issues
- environmental issues

The project recommends a mix of different national policies to develop distributed generation:

- Green certificates or transport tariffs should be introduced or continued in Norway, Sweden, Finland, North-West Russia
- More local involvement and local ownership in projects is needed in Norway, Sweden and Denmark
- Inform the public more about the positive effects of distributed generation facilities in Norway, Finland and Denmark
- Establish technology-neutral and long-term support in Norway and Sweden
- Form a joint Nordic TSO

Cooperation how-to

State enterprises, directorates and institutions:

- Norwegian Water Resources and Energy Directorate (NVE), Norway
- Statnett, Norway
- Enova, Norway

Industry:

- Norwegian Electricity Industry Association, Norway
- Elforsk, Sweden
- Kainuu Energia, Finland
- Kymppivoima, Finland
- Sogn & Fjordane Energy, Norway
- Skagerak Energi, Norway
- Smakkraft, Norway
- Statkraft, Norway
- Tussa Kraft, Norway
- Vattenfall Sverige, Sweden
- Vattenfall Danmark, Denmark
- Vestavind, Norway
- Ostfold Energi, Norway
- Enova, Norway

Studies were carried out by Sweco, Econ Pöyry, VTT Technology, Norwegian Electricity Industry Association and the Kola Science Center.

Stakeholders were involved through interviews and focus group dialogues.
The black currant is known in all Nordic countries. The black color indicates their high antioxidant content. Compared with the red currant, the black currant has 6 times as much vitamin C.
Efficient energy cooking requires the ability to compare different sources of primary or ‘raw’ energy in terms of their wastefulness. This recipe gives common standards for measuring exactly how much energy is lost along the way from energy production to the end-user in the building sector. Try out this new green cooking method for energy produced from combined heat and power plants.

Cooking time
4 years of research

Ingredients
4 Nordic countries (Finland, Sweden, Norway and Iceland)
1 Baltic country (Estonia)
13.380 million NOK
6 educational institutions
5 industry partners
6 doctorate degrees
2 post-doctorates
13 publications
3 seminars
41 seminar participants
Process

1. Junk food might taste good, but it doesn’t make you feel good. Electricity provides the foundation for our modern society. But a major part of the electricity in the EU and the rest of the world is still produced from fossil fuels in condensing power plants with low fuel efficiency. Starting a raw energy diet is becoming more and more common because everyone seems to want to waste less and feel better. The “Directive on the energy performance of buildings” and the mandated EN standards developed to support the implementation of this directive have created a strong movement in the whole EU environment. New energy performance indicators, “Primary energy use and CO2-production” have been introduced.

2. The overarching objective of the new green cooking method is to reduce the amount of CO2 released into the atmosphere for every kWh of energy consumed by end-users. The growing emphasis on Primary Energy Efficiency reflects the scientific and political communities’ growing realization that, if we want to combat the looming energy crisis, we must look at the number of units of primary energy – be it fossil or other energy sources – that go into supplying one unit of energy for the end-user to consume. This factor – the number of units produced per unit consumed – varies quite a lot depending on how that energy is produced and transported in the first place.

3. Gently blend educational institutions, industry partners, full-time doctorate students, post-doctorates and abundant financing. Allow them to develop systems, methods and credible data for calculating primary energy efficiency in general and for energy systems in the Nordic region with a special focus on energy systems applying CHP-technology with bio-based fuel in particular.

4. Demonstrate home cooking by supplying washing machines, dishwashers and dryers with heat from district heating systems to increase the market for useful heat. Analyze the economical consequences for CHP systems in general and systems based on renewable heat in particular.

Taste

Especially for co-generation, calculating the primary energy factors is complicated. It requires great technical skill and experience. The new methods developed by Finnish, Norwegian and Estonian doctoral fellows makes it easier for end-users to calculate primary energy use and identify their carbon footprint.

The Icelandic contribution can be characterized as pioneering work within the calculation of primary energy factors for geothermal systems. Values for the entire energy chain have been calculated, including work performed during drilling and operation. This has never been done before.

The PhD studies have concentrated on ways of making households and businesses less dependent on electrical energy by improving the technological and economic conditions for a market in district heating and cooling. The researchers focused largely on consolidating an infrastructure that will allow for the emergence of a market in district heating. The idea is to have technological solutions in place that allow other sources of heat, such as local industry, to provide this energy to the district heating scheme at a net profit. In addition to heating and cooling homes and offices, the project tried to further develop a concept whereby combined heat and power plants (CHP) could be adapted to produce biofuels for transportation.

Two of the PhD students, Patrick Lauenburg from Sweden and Eduard Latusov from Estonia, have already defended their theses and have received their PhD degrees. The other four doctoral candidates are expected to defend their theses in 2011.

Cooperation how-to

Nordic Partners:
- University of Iceland, Iceland
- Lund University, Sweden
- Malmö Stad, Sweden
- Krisberedskabsmyndigheten, Sweden
- Helsinki University of Technology, Finland
- Finnish Energy Research School, Finland
- Tampere University of Technology, Finland

Industry:
- VEKS, Denmark
- Orkuveita Reykjavikur, Iceland
- E.ON Sverige AB, Sweden
- Svensk Fjärnvärme AB, Sweden
- Göteborg Energi AB, Sweden
- ÅF-Estivo Ltd., Estonia

The project consisted of a joint PhD project with six PhD students in different Universities across the Nordic/Baltic research environment.
PhD patisseries

To go with “Raw energy”

Patrick Lauenburg: Improved supply of district heat to hydronic space heating systems
The main ambition of this thesis was to attempt to bring known ideas behinds district heating closer to practical applications. Modern building automation has made it possible to accomplish control of radiator systems, including controlling flow rate as well as more sophisticated connection schemes for substations. A new control algorithm has shown promise for a reduced district heating return temperature through a variation of not only the supply temperature but also the flow rate in the radiator system.

Eduard Latusov: Model for the analysis of Combined Heat and Power (CHP) production
This thesis presents a computer program that can analyze the technical and economic consequences of building a CHP plant based on renewable energy, combining heat and power systems and taking local conditions into account. The computer program also calculates primary energy use and CO₂ reduction potential for the actual plant.
Energy Smoothie
by Siggi Hall

5 dl Skyr - plain, natural
1 large (2 small) bananas
1 1/2 dl crowberry-rhubarb nectar
3 dl fresh wild blueberries, from the Icelandic mountain hillsides.
1 - 2 dl ice cubes.

Place all in a 2 liters Smoothie-mixer and mix until all is well together.
This recipe is for a cold refreshing energy smoothie in the afternoon.

The skyr is a very protein rich product, bananas give it a sweetness and filling but is also richness of nourishment, vitamins, proteins and minerals. The rhubarb and crowberry nectar made of equal parts of crowberries, rhubarb and raw sugar gives it the tangy taste of crowberries and the sour but appealing taste of the rhubarb but a little sweet as a nectar should be. The most important is the healthy fresh natural blueberries from the Icelandic hillsides - one of the best berries in the world. All this gives this smoothie a full energy and healthy natural taste in every sip.

It is important to put the ice cubes in because the whole process of mixing all together heats up the blend. For a more nutrient smoothie - a breakfast type add some wheetabix cookies or müsli for better content of fibers.
“A transparent approach was taken by sharing experience in an open workshop with Nordic Original Equipment Manufacturer (OEMs), in order to facilitate realization of new business opportunities.”

Frozen Fuel Cells, Final Project Report
“Projects like this are very important in building up the Nordic network in the biomass area. It helps increase the competencies of both the academic and industrial partners, and will ensure an effective path to good industrial products.”

Softwood Sugar, Project manager Karin Øyaas
– Paper and Fiber Institute (PFI), Norway
The blackberry grows in all Nordic countries, but in the coldest parts of the region only in small quantities. The berries are high in vitamin C and are a source of dietary fiber.
If sugar and maize crops are best left to feeding the world’s starving, why not use all the plants that people cannot eat to fuel their cars instead? To produce bio-ethanol from wood, you need to harness the sugars locked in the cellulose and convert them by fermentation. Too expensive? Not necessarily any more. Look at this cost-cutting recipe using Nordic softwood and hardwood.

### Cooking time
4 years of research

### Ingredients
- 4 countries (Iceland, Finland, Sweden and Norway)
- 12.7 million NOK
- 5 educational institutions
- 6 industry partners
- 10 full-time project participants
- 1 doctorate degrees
- 14 publications
- 2 seminars

[Innovative pre-treatment of Nordic wood for cost-effective fuel-ethanol production]
Taste

The project has concentrated on various types of pre-treatment of pine and aspen to find the best methods and make them as efficient as possible. The challenge is to extract the sugar that is bound up in the tree. This can be achieved using various combinations of heat treatment, steam and chemical treatment.

The main contributors to overall ethanol production costs for all processes are found to be raw material and equipment costs.

The project recommends developing processes or bio-refinery concepts for the co-production of biofuels, materials and chemicals that can make bio-energy production from local biomass in Scandinavia more profitable.

“This project has been very important in building up the Nordic network in this area. It has helped to increase the competence of both the academic and industrial partners and will ensure an effective path to good industrial products,” said project manager Karin Øyaas.

Further work will be done in a project starting in 2011 called SustBioFuel, funded by the Top Level Research Initiative, administrated by Nordic Energy Research.

Cooperation how-to

Nordic Partners:
- Paper and Fiber Research Institute (PFI), Norway
- Innventia, Sweden
- Matis Prokaria, Iceland
- SINTEF, Norway
- VTT Technical Research Centre of Finland, Finland

Industry:
- Norwegian Forest Owners’ Association, Norway
- Norske Skog, Norway
- Borregaard Industries, Norway
- SEKAB E-technology AB, Sweden
- Nowozymes, Denmark
- STATOIL, Norway

During the project, the Finns worked mostly on the fermentation process and how it can be achieved most efficiently with as high a content of solids as possible. The Swedes contributed technical and economic analysis and an integration study of a possible pilot project at Mongstad. They also looked at one of the four pre-treatment processes. Norwegian researchers worked with the other preparation, in addition to looking at the potential for different types of yeast, while the Danish industrial company delivered enzymes.

The Icelandic contribution merits special focus. They studied whether there are other types of microorganisms that can contribute to the process, and actually found a type of bacterium - Thermoaerobacter islandicum - which can theoretically replace yeast.

Process

1. The world’s appetite for transportation fuels is huge and rising. According to the International Energy Agency, it is possible to reduce CO2 emissions in the transport sector by up to 80% by substituting gasoline with fuel-ethanol from lignocelluloses like wood.

2. Take advantage of the abundant local commodities of wood for home cooking. The forest balance in the Nordic countries amounts to a surplus of approx. 60 million m³, which can theoretically be converted to 30,000 million liters of fuel-ethanol, or approx. 80% of total gasoline consumption in the Nordic countries. Thus, Nordic forests represent a significant biomass resource that is of vital importance to the expansion of the biofuels industry in our region.

3. The level of difficulty for this recipe is increased by the problem of high production costs for deployment of wood-based fuel-ethanol. In particular, it is generally recognized that the front-end steps (pretreatment, fractionation, enzymatic hydrolysis) represent a major proportion (up to 60%) of the total costs. Thus, these steps offer great potential for improvement. A better understanding of the chemical and physical processes involved in wood pre-treatment is a prerequisite for the development of promising pre-treatment technologies.

4. Take a truly Nordic mix of researchers and industry participants together with financing, and let them conduct research into the entire process from the moment the biomass is harvested, through pre-treatment, hydrolysis, fermentation and final delivery to market. Their aim is to maximize efficiency at every stage of production to achieve profitability.

5. Allow the researchers to look at the place of biofuels in the broader energy system, such as the geographic distribution of infrastructure. For instance, it may make sense to locate processing plants near other industrial sites, such as oil refineries, to tap into residual heat. Alternatively, they may find that to minimize transport-related emissions, plants need to be located close to where the timber is.

6. Build a Nordic “center of competence” in the liquid biofuels area.
The plum can be cultivated in the entire Nordic region. Plum juice can be fermented into plum wine. Their strong antioxidant properties gives them celebrity status within a super food.
The recipe gives an insight into the future climate of the Nordic countries. It shows the sunny side of climate change, with increased potential for production of renewable energy. However, the future safety of the production systems can be at risk as uncertainty of the estimates is large.

Cooking time
4 years of research

Ingredients
5 countries (Iceland, Finland, Sweden, Denmark and Norway)
18,235 million NOK
7 educational institutions
7 industry partners
17 full-time project participants
15 post-doctorates
11 doctorate candidates
286 publications
8 conferences
Cooperation how-to

Nordic Partners:
- National Energy Agency (NEA), Iceland
- Swedish Meteorological and Hydrological Institute (SMHI), Sweden
- International Maritime Organization (IMO), Iceland
- University of Joensuu, Finland
- Risø, Denmark
- VTT Technical Research Centre (VTT), Finland
- SINTEF, Norway
- Norwegian Water Resources and Energy Directorate (NVE), Norway

Industry:
- Statkraft, Norway
- Elforsk, Sweden
- Finnish Energy Industries, Finland
- National Power Company, Iceland
- DONG Energy, Denmark

In the early 2000s, Nordic Energy Research initiated the pre-project “Climate, Water and Energy”, which developed a comprehensive research program addressing the impact of climate change on the Nordic energy system. This in turn resulted in the funding of a four-year Nordic-Baltic project from 2003-2006, which focused on possible developments of the Nord Pool electricity system up to 2050.

This development demonstrates the success of investments by the Nordic system in building up the capabilities, technology transfer and research innovation that are essential in addressing the challenges of adapting to climate change in the future.
Stakeholder dialogue

The project “Climate and Energy Systems: Risks, Potential and Adaption” had a structured dialogue with key stakeholders from the Nordic energy sector, such as the Swedish energy company Vattenfall. The objective was to discuss the relevance of the project and methods to stakeholder communication in the existing project phase, as well as to propose methods and approaches to increase stakeholder involvement and relevance in future research programs on climate effects on renewable energy.

The background for the stakeholder dialogue was the aim of the “Climate and Energy Systems” project to increase stakeholder involvement in the project. The energy sector is represented on the program committee and contributes to financing the program.

The dialogue group believed that the project web page was a very important source of communication. However, it could be improved, for example by making it simpler and easier to grasp.

The list of publications is important, but at present the publications cannot be downloaded. A future improvement would be to have a list of downloadable publications. A substantial improvement would be executive summaries of publications adapted for stakeholders.

Fact sheets could be an important way to inform stakeholders about the research. However, the fact sheets need to be more concise with less text and a more direct focus on the main messages for stakeholders.

To increase stakeholder involvement in future R&D programs on climate and energy, the dialogue group suggested several actions. One of the most important actions to increase involvement is direct contact with stakeholders at a strategic level, for example through visits, meetings and workshops. The steering group could also be an important communication channel to other stakeholders.

All research was considered relevant by the stakeholder dialogue group. The work within the topic of risk assessment was believed to be most stakeholder friendly and the risk assessment procedure was appreciated and considered stakeholder-relevant.

One key result of the stakeholder dialogue is that the “Climate and Energy Systems” project deals with very relevant issues that may considerably affect the energy sector. However, the potential effects of climate change on the energy sector are considered uncertain and long-term by many stakeholders. For this reason, these topics may be less prioritized than other issues of more immediate and everyday importance to the energy sector, such as mitigating greenhouse gas emissions, maintenance, etc.

Take away lessons:

- All research was considered relevant by the stakeholder dialogue group. The work within the topic of risk assessment was believed to be most stakeholder friendly and the risk assessment procedure was appreciated and considered stakeholder-relevant.
- The dialogue group believed that the project web page was a very important source of communication. However, it could be improved, for example by making it simpler and easier to grasp.
- The list of publications is important, but at present the publications cannot be downloaded. A future improvement would be to have a list of downloadable publications. A substantial improvement would be executive summaries of publications adapted for stakeholders.
- Fact sheets could be an important way to inform stakeholders about the research. However, the fact sheets need to be more concise with less text and a more direct focus on the main messages for stakeholders.
- To increase stakeholder involvement in future R&D programs on climate and energy, the dialogue group suggested several actions. One of the most important actions to increase involvement is direct contact with stakeholders at a strategic level, for example through visits, meetings and workshops. The steering group could also be an important communication channel to other stakeholders.

- The energy sector is represented on the program committee and contributes to financing the program.
Risks

Results so far show that global warming may have great significance for dam safety, flood risks and the production of hydroelectric power in Sweden. Milder and more unstable winters in the future also mean that there is a risk that spill will be released more often. This affects both dam safety and the lives of those who live along the rivers. At the same time, higher winter flows are beneficial to the production of hydroelectric power.

The results also show considerable uncertainty. The difference between the various climate scenarios is large when it comes to impacts on design floods. These floods can either increase or decrease, depending on how changing precipitation patterns interact with new snowmelt conditions.

Biomass

The results showed that changes both in climate and thinning regimes may substantially increase the production potential of energy biomass. In addition to this, energy biomass production will be enhanced by increasing initial planting density and basal area thinning thresholds compared in the current forest management recommendations.

Power production

Increased inflows to hydropower reservoirs help increase hydropower production by about 10 percent, while thermal power generation is expected to be eight percent less. In total, electricity consumption in Denmark, Norway, Sweden and Finland is expected to decrease by approximately two percent compared with 1990.

Energy market NordPool

Annual average thermal production is expected to decrease by 7-8% for the NordPool region. No particular seasonal pattern has been found. This is paired with an annual average demand decrease of 2-2.5% for the NordPool region. The decrease is relatively stronger during winter than summer.

Electricity spot prices will go down in all countries in the climatic scenarios. The reduction in Denmark is relatively small compared to other countries due to its strong connection to the European market and its lack of hydropower generation.

All countries (excluding Finland) increase their net export to continental Europe. The hydro-dominated systems (Norway and Sweden) also increase their net export to other NordPool countries. Total net export increases for hydro-dominated systems, while Denmark and Finland reduce their total net export.

Due to the reduction in thermal power production, all countries contribute to a reduced total CO2 emission in the Nordic region. The increased hydropower production stimulates increased exports to and reduced imports from mainland Europe.

Temperature

Temperature changes will be most marked during the winter season with between 1 and 5°C, mainly in the northern and eastern areas. In summer, the change will be between 1 and 3°C across all Nordic land areas. This will reduce snow supplies and spring floods while creating more rain floods.

Precipitation

The increase will be largest over parts of the Scandinavian region, most notably over the Scandinavian countries in winter and over the Baltic Sea in summer.

Forecast 2050
Hydrogen (H₂) is perceived as one of the most promising options for energy storage and transportation in the future. If H₂ can be produced from renewable energy sources, it could help to solve energy-related problems such as climate change, air pollution and energy supply. This recipe reveals the secrets of Nordic superior algae – high producers of Hydrogen.

Superior Algae

Cooking time
4 years of research

Ingredients
5 Nordic countries (Denmark, Iceland, Finland, Sweden and Norway)
2 Baltic countries (Estonia, Latvia)
8.145 million NOK
10 educational institutions
2 industry partners
11 full-time project participants
5 post-doctorates
17 doctorate degrees
200 publications
4 seminars

\[\text{Nordic BioH2: Renewable production of H}_2\text{ using a biological system}\]
Taste

The final report of the project concludes that it has been a success: “Good science, numerous publications, many PhD students and interactions and both European and International visibility for Nordic and Baltic bio-hydrogen research. The financial contribution from NER made a most significant contribution in reaching the results – in fact, without the Nordic BioH2 project support from Nordic Energy Research, they would never have been achieved.”

Cooperation how-to

Nordic Partners:
- Uppsala University, Sweden
- University of Bergen, Norway
- University of Turku, Finland
- The Royal Veterinary & Agricultural University, Denmark
- Prokaria (biotech company), Iceland
- SEI-Tallin, Estonia
- Roskilde University, Denmark
- Riga Technical University
- Mannvit (engineering company), Iceland

Industry:
- SEI-Tallin, Estonia
- Roskilde University, Denmark
- Riga Technical University

Project manager Peter Lindblad of Uppsala University observed that “The project has boosted Nordic basic research into bio-hydrogen and renewable energy. Internationally, Nordic BioH2 is viewed as a successful regional cooperation project.” Due to the many countries, researchers and PhD students involved in the project, the group held annual project meetings resulting in cross-border interactions. The high number of PhD students involved in the project resulted in many PhD theses being finished at the end of the project. This in turn led to increased international awareness of Nordic and Baltic science and competence in the field of BioH2.

Process

1. Turn on the basic science button. This recipe advances scientific knowledge related to both photobiological and fermentative hydrogen production. It also initiates the first life-cycle assessments of biological hydrogen production systems.

2. Cook up a network of educational institutions and industry players from Nordic and Baltic countries, involving full-time project participants and post doctorates.

3. Collect cyanobacterial strains from the Baltic Sea and Finnish lakes.

4. Use different types of inocula (sludge from farm-scale digester, sewage sludge, sludge from thermophilic laboratory digester, rumen fluid, compost, mesophilic granular sludge) mixed with grass silage, maize, cellulose and glucose for dark fermentation.

5. Gently characterize the best/superior H2 producers to enhance their capacity for H2 production.

6. Analyze the life-cycle of hydrogen produced biologically, bio-hydrogen. This enables you to compare different technologies in terms of environmental impact, energy needs and costs.

7. Apply doctorate degrees, publications and seminars as finishing touch.
You can get a quick and natural energy boost from pear juice, due largely to the pear’s high amounts of fructose and glucose.
Cooking in a changing electricity system requires renewal of the planning tools and system models, especially for wind farms. Several utilities already enjoy this new recipe for everyday work.

Wind-packed power goodness

Cooking time
4 years of research

Ingredients
4 Nordic countries (Finland, Sweden, Norway and Denmark)
1 Baltic country (Estonia)
11.082 million NOK
3 educational institutions
6 industry partners
6 full-time project participants
4 post-doctorates
2 doctorate degrees
35 publications
2 seminars
3 patents
Process

1. The impact of wind power generation in the power system is no longer negligible. For this reason, there is an urgent need for wind turbine models capable of accurately simulating the interaction between wind turbines or wind farms and the power system. One problem is that no standardized model of wind turbine for power system stability studies is currently available.

2. Allow Nordic and Baltic researchers to develop models for studying the implications of operating the Nordic grid with a large amount of the electric power and energy coming from wind farms. To achieve 10% of energy production from wind energy, it is necessary to install 15 GW of wind power. As a comparison, the present installed power capacity in nuclear power plants in Sweden and Finland is 12 GW.

3. Aim for a model with a substantial wind energy capacity installed into the grid. "Substantial" means electric energy production of at least 10-20% of total Nordic electricity consumption.

4. Add different amounts of fluctuating wind power into the real power system of the 6 MW Högsåra wind farm in Finland. Perform real scale tests of frequency control.

5. Toss PhD students, post-doctoral and senior researchers together to work on power system and market consequences involved in using large amounts of wind energy. Strengthen existing work relationships between the partner institutions in the project. Encourage mobility of PhD students.

6. Establish a wider Nordic forum for exchange of knowledge and experience within the field. This includes arrangement of Nordic Wind Power Conferences and reference group meetings.

Taste

Cooperation within the Nordic countries has meant that existing knowledge has been spread, new knowledge has been created and the results have been transferred to utilities. Over 35 journal or conference publications and five PhD theses have been presented. Two more PhD theses are on the way during 2011. Two Nordic Wind Power Conferences have been organized during the project period. The project set out to solve the problem of the lack of a standardized model of wind turbine for power system stability studies. The results show that the proposed models are able to simulate wind turbine responses with sufficient accuracy. The generic models proposed by this project can be seen as a contribution to the ongoing discourse on standardized models of wind power generation for power system stability studies.

The main conclusion is that development work with models for power system simulation has suggested several models that are suitable. These models have been transferred to the utilities and can be used in their everyday work. The generic models provide more opportunities for transmission system operators and wind farm developers to confidently perform system planning studies without being dependent on proprietary models or restricted by non-disclosure agreements with manufacturers. The method described in the project report concerning model validation against measurements is recommended for use in model development procedures.

The utilities involved in the project have been encouraged to use the models developed in this project and to test them further in simulations of larger, more complete power systems.

The tests carried out in the course of the project clearly show the limited capability of several wind turbines manufactures to pass the fault ride-through test. The project strongly recommends that the requirements in the Grid Codes are tested for every type of wind turbine against different grid parameters.

Cooperation how-to

Nordic Partners:
- Technical University of Denmark, Denmark
- Tallinn University, Estonia
- Chalmers University of Technology, Sweden

Industry:
- ABB, Sweden
- Vattenfall, Sweden
- Svenska Kraftnät, Sweden
- Vestas, Denmark
- Energinet.dk, Denmark
- Nelja Energia LLC, Estonia

This Nordic project has created a valuable link between national projects and international cooperation. Several of the partners also work together in EU and IEA projects. The partners in the project cover a broad category of electric power industries, from generator and wind turbine manufacturers to power utility companies and wind turbine operators.

Working with measurements is time consuming and cooperation, where a group of researchers share their measurement results, has shown itself to be very effective.
“A Nordic collaboration among economists provides a new common understanding of how energy markets work, and strengthens Nordic network and expertise”

Combining flavors in the market, project manager Torstein Bye Statistics Norway
“This Nordic project has also been a valuable link between national projects and international cooperation."

"Several of the partners are also working together in EU - as well as IEA-projects."

*Wind-packed Power Goodness, Final project report.*
Cooking Up Networks
Energy Foresight Forum has conducted an annual conference with great success throughout the 3-year project period. The conferences have brought together experts in the energy sector from across the Nordic and Baltic regions. Participants came from all parts of the energy sector, ranging from academia and the public sector to industry. A yearly study on selected topics in the energy sector has been presented and outstanding students have also been awarded with prizes for their work in the field.

The forum was a common initiative of four Nordic institutions: SINTEF Energiforskning AS, VTT Technical Center of Finland, Elforsk and DEFU. The initiative was inspired by plans for establishing a common Nordic retail electricity market. The main objective of the forum was to establish a common Nordic Automatic Meter Reading (AMR) Forum and to encourage cost-effective implementation of AMR solutions in the Nordic countries. In this way, it was intended to support the establishment of a common Nordic Electricity retail market.

Structural and organizational bases for the Nordic AMR Forum were developed, including a Forum Mandate with a formal organizational model and financial model for the Forum. The Mandate was approved by the Steering Group. Contacts and cooperation with the Nordic Regulators (NordReg), national electricity associations and other relevant players were established to ensure that the forum achieved its goal of being a truly Nordic platform.

However, the project group did not succeed in involving electricity suppliers and consumer organizations in the Forum. This was most likely due to the Forum’s current focus on concrete technical issues, which are important for the implementation of AMR.
The Nordic Centre of Excellence in Photovoltaic (PV) has strengthened the cooperation between universities, research institutes and industry in this field. Bilateral collaborations have been established, both between research institutes in the Nordic countries and between companies and research institutions.

A strong network for PhD students and a number of courses within the field of PV have resulted in a better understanding of the physics of solar cells. Candidates have been educated to meet the needs of a fast-growing PV industry. A better scientific foundation for increased business development has also been established. One of the key outcomes is the unlocking of synergy effects due to access to process and characterization equipment across the Nordic region.

The centre has also been a pool of PV knowledge and has formed a strategy for publication of popular science, thus creating an interest in PV across the Nordic/Baltic region. In the long run, this will help with the acceptance and introduction of PV in our region.

The Nordic Centre of Excellence in H2 storage is a research network of 12 research groups in the Nordic countries, including Baltic and North-West Russia.

The goal of the centre is to synthesize, characterize and model new materials that can be used as the primary component in hydrogen storage for mobile applications, such as cars and boats.

Many different lines of research have been pursued in this project because there is still no known material that satisfies all the requirements that have been specified for hydrogen storage in cars. Sharing of equipment, facilities and knowledge across national borders enabled a more comprehensive approach to the research and created an exciting international working environment for the students and post-docs.

Workshops, conferences and a summer school were all organized during the project period. Several students and post-docs have been hired and have undergone various types of training.
This forum was established for motivated participants who wanted to find relevant partners and the knowledge and skills required to ‘get sustainable energy projects happening’ in isolated areas of the Nordic region.

The network has organized several conferences and workshops in Greenland and Copenhagen, in addition to training courses on ‘sustainable energy solutions in Nordic regions’, run together with partners in the Arctic and Greenland and aimed at students and stakeholders. Furthermore, workshops with local communities, networking, conferences and workshops in Svalbard and Copenhagen have been held to ‘promote’ the project, to report on tasks, and to secure feedback from all stakeholders. Network members have participated in and held presentations at international arctic conferences.

The aim of the network is to build a strong partnership with commitment from the industry and to position the partnership towards EU demonstration activities. The vision is to make the Scandinavian Region one of the first regions in Europe where hydrogen is commercially available and used in a network of refuelling stations.

With support from Nordic Energy Research Norway, Denmark and Sweden established a partnership in 2007 to introduce hydrogen as fuel in cars. The Scandinavian Hydrogen Highway Partnership (SHHP) lasted two years, but its effects have been lasting. In 2008, the network had 40-50 partners, although Nordic Energy Research is no longer one of them.

Norway and Denmark are already well on the way to building a network of hydrogen fueling stations along the Norwegian HyNor hydrogen highway and the Danish Hydrogen Link. Meanwhile, Sweden has made plans to do the same along the country’s west coast. The development of hydrogen stations has progressed a little more slowly than the network projected in 2008, but the vision of achieving an operational network by 2015 is still fully achievable.
“It is highly important with Nordic funding in addition to national funding. This creates a greater opportunity to sustain the research and industrial drive as well as the Nordic competitive strength ...”

Essential Fibers, Project manager Mikael Lucander from the The Finnish Pulp & Paper Research Institute (KCL)
To be a success in the kitchen, you must have the right tools. Three types of funding instruments, or utensils were offered to the Nordic research communities and industry in the period 2007 to 2010.

1. Utensils for Capacity and Competence Building Projects
Key activities in capacity and competence building projects shall contribute to consolidating and developing the knowledge base in new energy technologies, markets and systems.
- Duration 4 years maximum.
- Require a minimum 15% of total project eligible costs to stem from other sources.
- Possibility for financing up to a maximum of 85% of the total project eligible costs.
- Apply for funds of up to 3 million NOK per year from Nordic Energy Research, or up to 12 million NOK over four years.

2. Utensils for Business Development and Innovation Projects
The key activities of business development and innovation may comprise pre-competitive activities related to the development, innovation and public acceptance of new energy technologies within the thematic focus areas.
- Duration maximum 2 years.
- Require industry participation and co-financing of minimum of 50% of the total project eligible costs.

3. Utensils for Integrated Projects
Integrated projects with elements from capacity building and innovation acknowledge that the speed under which knowledge creation and diffusion takes place is so rapid that it does not make sense to distinguish between more fundamental knowledge and pre-competitive market activities, but that knowledge creation takes place in close collaboration between producers and users of technology.
- Duration maximum 4 years.
- Require user participation and co-financing of minimum of 25% of the total project eligible costs should stem from users such as the energy sector, industry and others.
- Nordic Energy Research will finance up to a maximum of 75% of the total project eligible costs.
- Apply for funds up to 3 million NOK per year from Nordic Energy Research, or up to 12 million NOK over 4 years.

• Remaining 50% of the total eligible costs may be financed by Nordic Energy Research.
• Apply for funds up to 3 million NOK per year from Nordic Energy Research, or up to 6 million NOK over two years.
Who’s who
Participants and facts
Combining Flavors in the Market

[Nordic Energy, Environmental Constraints and Integration (NEECI)]

Period: 2007-2010
Project Manager: Torstein Bye, SSB, Norway, Nordforsk
Funding: Nordic Energy Research/Total: 8.0 (9.4) MNOK

Partners:
Stockholm School of Economics, Sweden
Copenhagen University, Denmark
University Of Iceland, Iceland
Helsinki School of Economics, Finland
University of Bergen, Norway
University of Oslo, Norway
Gothenburg University, Sweden
Rise Technical University Of Denmark, Denmark

Project Steering Group:
Torstein Bye, Statistics Norway, Norway
Lars Bergman, Stockholm School of Economics, Sweden
Jørgen Birk Mortensen, Copenhagen University, Denmark
Matti Liinkki, Helsinki School of Economics, Finland
Friðrik Baldursson, Reykjavik University, Iceland

PhD Candidates:
Mette Graversen, Copenhagen University, Denmark
Halvor Storøsten, Statistics Norway, Norway
Matti Ilenen, Helsinki School of Economics, Finland
Sara Fogelberg, Research Institute of Industrial Economics (IFN), Sweden
Hanne Marit Dahl, Statistics Norway, Norway
Anne Sahari, Helsinki School of Economics, Finland
Olli Kauppi, Helsinki School of Economics, Finland
Stephanie Rophenius, Rise Technical University Of Denmark, Denmark

PhD degrees:
Olli Kauppi, Finland, Helsinki School of Economics, Finland

Post-docs:
None listed

Other Participants:
Lennart Hjalmarsson, Gothenburg University, Sweden
Erik Amundsen, The Royal Veterinary and Agricultural University, Denmark
Nils Henrik March v.d. Fehr, Oslo University, Norway
Thomas Tangervás, Research Institute of industry studies, Sweden

PhD Degrees:
Olli Kauppil, Finland, Helsinki School of Economics, Finland

Post-docs:
None listed

Other Participants:
None listed

Essential Fibers

[Basic phenomena in mechanical pulping]

Period: 2007-2009
Project Manager: Mikael Lucander, KCL, Finland
Funding: Nordic Energy Research/Total: 4.0 (9.7) MNOK

Partners:
Mid Sweden University, Sweden
Norwegian University Of Science And Technology, Norway
Tampere University of Technology, Finland
Helsinki University of Technology, Finland

Project Steering Group:
Annikki Vehniäinen, KCL, Finland
Per Engstrand, Mid Sweden University, Sweden
Øyvind Gregersen, Norwegian University Of Science And Technology, Norway
Tapani Vuorinen, Helsinki University of Technology, Finland

PhD Candidates:
Marius Rusu, M.Sc., Norwegian University Of Science And Technology, Norway
Tuomas Hänninen, M.Sc., Tampere University of Technology, Finland
Ari Salmi, M.Sc., KCL, Finland

PhD Degrees:
Birgitta Svensson, Mid Sweden University, Sweden

Post-docs:
None listed

Other Participants:
Lis (Tech), Sari Liukkonen, KCL, Finland
Ph. Lis., Erkki Saharinen, KCL, Finland
M.Sc., Antti Fredriksson, KCL, Finland
M.Sc., Ilkka Nurminen, KCL, Finland
M.Sc., Valteri Saari, Tampere University of Technology, Finland
Prof., Øyvind Gregersen, Norwegian University Of Science And Technology, Norway
Prof., Per Gradin, Mid Sweden University, Sweden
M.Sc., Mikael Lucander, KCL, Finland
[Nordic Graduate School in Biofuel Science and Technology-phase 2]

**PhD Degrees:**
- David Pallares, Spain, Chalmers Technical University, Sweden
- Niels Bech, Denmark, Danish Technical University, Denmark
- Daniel Stanghelle, The Norwegian University of Science and Technology, Norway
- Robert Johansson, Sweden, Chalmers Technical University, Sweden
- Kim Hougaard Pedersen, Denmark, Danish Technical University, Denmark

**Post-docs:**
- Assoc. prof. Henrik Thunman, Chalmers University of Technology, Sweden
- Assoc. prof. Lars-Erik Åmand, Chalmers University of Technology, Sweden
- Assoc. prof. Flemming Frandsen, Technical University of Denmark, Denmark
- Assoc. prof. Peter Glarborg, Technical University of Denmark, Denmark

**PhD Candidates:**
- Sven Hermansson, Chalmers University of Technology, Sweden
- Stefan Hjärtstam, Chalmers University of Technology, Sweden
- Fredrik Lind, Chalmers University of Technology, Sweden
- Johanna Ohlsson, Chalmers University of Technology, Sweden
- Hao Wu, Technical University of Denmark, Denmark
- Norazana Ibrahim, Technical University of Denmark, Denmark
- Anders Rooma Nielsen, Technical University of Denmark, Denmark
- Muhammads Shafique Bashir, Technical University of Denmark, Denmark
- Linda Norskov, Technical University of Denmark, Denmark
- Geir Skjevrak, Norwegian University of Science and Technology, Norway
- Liang Wang, Norwegian University of Science and Technology, Norway
- Kavitha Patmananat, Norwegian University of Science and Technology, Norway
- Roger Kahlil, Norwegian University of Science and Technology, Norway
- Frida Claesson, Åbo Akademi University, Finland
- Markus Engholm, Åbo Akademi University, Finland
- Oskar Karlström, Åbo Akademi University, Finland
- Johan Lindholm, Åbo Akademi University, Finland

**Partners:**
- Chalmers University of Technology, Sweden
- Norwegian University of Science And Technology, Norway
- Technical University Of Denmark, Denmark

**Project Steering Group:**
- Bo Leckner, Chalmers University of Technology, Sweden
- Kim Dam Johanssen, Technical University of Denmark, Denmark
- Johan Hustad, Norwegian University of Science and Technology, Norway
- Mikko Hupa, Åbo Akademi University, Finland

**Coordination:**

**Coordinating assistant:**
- until April 2007: Mrs Frauke Mueller
- from April onwards MSc. Anne-Leena Gröning

**Funding Nordic Energy Research/(Total):**
- 80 (160) MNOK

**Period:** 2007-2010

**Project Manager:** Mikko Hupa, Åbo Akademi, Finland

**Other Participants:**
- None listed
**Mixed Green Policies**

**[Distributed generation integration in Nordic Energy Market]**

**Period:** 2007-2008  
**Project Manager:** Jesper Munksgaard, ECON, Denmark  
**Funding NEF /(Total):** 4.4 (8.8) MNOK  
**Partners:**  
Powercell Sverige AB, Sweden  
Volvo Technology, Sweden  
StatoilHydro, Norway  
H2 Logic, Denmark  
**Project Steering Group:**  
Per Ekdunge, PowerCell Sverige AB, Sweden  
Berre Tore Berresen, StatoilHydro, Norway  
Azra Selimovic, Volvo Technology Co, Sweden  
Steffen Møller-Holst, SINTEF, Norway  
Jacob Hansen, H2Logic, Denmark  
Anders Ødegård, SINTEF, Norway  
**PhD Candidates:**  
None listed  
**PhD Degrees:**  
None listed  
**Post-docs:**  
None listed  
**Other Participants:**  
None listed

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**Frozen Fuel Cells**

**[Development Demonstration of an efficient and cost-competitive PEMFC system for cold Nordic climate]**

**Period:** 2007-2008  
**Project Manager:** Steffen Møller-Holst, SINTEF, Norway  
**Funding Nordic Energy Research /(Total):** 4.4 (8.8) MNOK  
**Partners:**  
Powercell Sverige AB, Sweden  
Volvo Technology, Sweden  
StatoilHydro, Norway  
H2 Logic, Denmark  
**Project Steering Group:**  
Per Ekdunge, PowerCell Sverige AB, Sweden  
Berre Tore Berresen, StatoilHydro, Norway  
Azra Selimovic, Volvo Technology Co, Sweden  
Steffen Møller-Holst, SINTEF, Norway  
Jacob Hansen, H2Logic, Denmark  
Anders Ødegård, SINTEF, Norway  
**PhD Candidates:**  
None listed  
**PhD Degrees:**  
None listed  
**Post-docs:**  
None listed  
**Other Participants:**  
None listed
Softwood Sugar
[New innovative pretreatment of Nordic wood for cost-effective fuel-ethanol production]

**Period:** 2007-2010  
**Project Manager:** Karin Øyaas, PFI, Norway  
**Funding Nordic Energy Research/(Total):** 8.0 (12.7) MNOK  

**Partners:**  
Prokaria EHF, Iceland  
STFI-Packforsk AB, Sweden  
SINTEF, Norway  
Lund University, Sweden  
Tallinn Technical University, Estonia  

**Project Steering Group:**  
Karin Øyaas, Paper and Fiber Research Institute, Norway  
Niklas Berglin, INNVENTIA (formerly STFI-Packforsk), Sweden  
Nils Dyrset, SINTEF, Norway  
Jaana Uusitalo, VTT Technical Research Centre of Finland, Finland  
Gudmundur Oli Hreggvidsson, Matis of Prokaria, Iceland  
Johan Börjesson, Novozymes, Denmark  
Sune Wännström, SEKA E-technology AB, Sweden  
Bjørn Håvard Evjen, Norwegian Forest Owners, Norway  
Per Nygård, Statiol, Norway  
Martin Lersch, Borregaard Industries, Norway  

**PhD Candidates:**  
Marta Rós Karlsdóttir, University of Iceland, Iceland  
Per-Olof Johansson, Lund University, Sweden  
Patrick Lauenburg (Ljunggren), Lund University, Sweden  
Thomas Kohl, Helsinki University of Technology, Finland  
Edward Latosov, Tallinn Technical University, Estonia  
Monica Berner, Norwegian University Of Science And Technology, Norway  

**PhD Degrees:**  
Patrick Lauenburg, Lund University, Sweden (During year 2010)  

**Post-docs:**  
Patrick Lauenburg, Lund University, Sweden (During year 2010)  

**Other Participants:**  
None listed  

Raw Energy
[Primary energy efficiency (PEE)]

**Period:** 2007-2010  
**Project Manager:** Rolf Ulseth, SINTEF, Norway  
**Funding Nordic Energy Research/(Total):** 8.0 (13.4) MNOK  

**Partners:**  
University of Iceland, Iceland  
VEKS, Denmark  
Lund University, Sweden  
Helsinki University of Technology, Finland  
Tallinn Technical University, Estonia  

**Project Steering Group:**  
Olafur Petur Palsson, University of Iceland, Iceland  
Lars Gullev, VEKS, Denmark  
Swen Frederiksen, Lund University, Sweden  
Carl-Johan Fögelholt, Helsinki University of Technology, Finland  
Andres Siirde, Tallinn Technical University, Estonia  
Rolf Ulseth, Norwegian University Of Science And Technology/SINTEF, Norway  

**PhD Candidates:**  
Marta Rós Karlsdóttir, University of Iceland, Iceland  

**PhD Degrees:**  
Patrick Lauenburg, Lund University, Sweden (During year 2010)  

**Post-docs:**  
Patrick Lauenburg, Lund University, Sweden (During year 2010)  

**Other Participants:**  
None listed  

**PhD Degrees:**  
Patric Lauenburg, Lund University, Sweden (During year 2010)  

**Post-docs:**  
Patric Lauenburg, Lund University, Sweden (During year 2010)  

**Other Participants:**  
None listed  

**PhD Candidates:**  
Kanto K. Janga, Norwegian Institute Of Science And Paper And Fiber Research Institute, Norway (Defense during 2011)  

**PhD Degrees:**  
None listed  

**Post-docs:**  
None listed  

**Other Participants:**  
Professor Guide Zacchi, Lund Technical University, Sweden
**Superior Algae**

[Climate and energy systems: Risks, Potential and Adaption]

**Period:** 2007-2010  
**Project Manager:** Peter Lindblad, Uppsala University, Sweden  
**Funding Nordic Energy Research/(Total):** 60.8 (81) MNOK  
**Partners:**  
University of Bergen, Norway  
University of Turku, Finland  
University of Akureyri, Iceland  
Tampere University of Technology, Finland  
University of Jyväskylä, Finland  
Stockholm Environment Inst., Sweden  
Tallinn Centre, Estonia, Roskilde University, Denmark  
Riga Technological University, Latvia  
**Project Steering Group:**  
Peter Lindblad, Uppsala University, Sweden  
Svein Rune Erga, University of Bergen, Norway  
Stenbjörn Styring, Uppsala University, Sweden  
Eva-Mari Aro, University of Turku, Finland  
Paul Erik Jensen, The Royal Veterinary & Agricultural University, Denmark  
Johann Örlygsson, University of Akureyri, Iceland  
Jaakko Puhakka, Tampere University of Technology, Finland  
Jukka Rintala, University of Jyväskylä, Finland  
Titi Kailaste, SEI-Tallinn, Estonia  
Bent Sørensen, Roskilde University, Denmark

**PhD Candidates:**  
None listed

**PhD Degrees:**  
None listed

**Other Participants:**  
None listed

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**Sunny Side Up Climate**

[Nordic BioH2: Renewable production of H2 using biological system]

**Period:** 2007-2010  
**Project Manager:** Åsa Agervald, Uppsala University, Sweden  
**Funding Nordic Energy Research/(Total):** 6.0 (8.1) MNOK  
**Partners:**  
University of Bergen, Norway  
University of Turku, Finland  
University of Akureyri, Iceland  
Tampere University of Technology, Finland  
University of Jyväskylä, Finland  
Stockholm Environment Inst., Sweden  
Tallinn Centre, Estonia, Roskilde University, Denmark  
Riga Technological University, Latvia  
**Project Steering Group:**  
Árni Snorrason, National Energy Agency, Iceland  
Erik Kjellström, Swedish Meteorological and Hydrological Institute, Sweden  
Sten Bergström, Swedish Meteorological and Hydrological Institute, Sweden  
Tómas Jóhannesson, International Maritime Organization, Iceland  
Seppo Kellomäki, University of Joensuu, Finland  
Niels-Erik Clausen, Risø, Denmark  
Helena Kortelainen, VTT Technical Research Center of Finland, Finland  
Jari Schable, VTT Technical Research Center of Finland, Finland

**PhD Candidates:**  
None listed

**PhD Degrees:**  
None listed

**Other Participants:**  
None listed

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Wind-packed Power Goodness

[Model Development for Power System Analysis with a substantial wind energy capacity installed in the Nordic grid]

**Period:** 2007-2010

**Project Manager:** Ola Carlson, Chalmers University, Sweden

**Funding Nordic Energy Research/(Total):** 5.0 (11.1) MNOK

**Partners:**
- Technical University Of Denmark-Risø, Denmark
- SINTEF, Norway
- VTT Technical Research of Finland, Finland
- Tallinn University of Technology, Estonia

**Project Steering Group:**
- Jouko Niiranen, ABB, Finland
- Urban Axelsson, Vattenfall, Sverige
- Elisabet Norgren, Svenska Kraftnät, Sverige
- Philip Carne Kjaer, Vestas, Denmark
- Torsten Lund, Energinet.dk, Denmark
- Martin Kruus, Nelja Energia LLC, Estonia

**PhD Candidates:**
- Germán Tarnowski, MSc, Technical University of Denmark, Denmark
- Oleg Tsernobrovkin, MSc, Tallinn University of Technology, Estonia

**PhD Degrees:**
- Torsten Lund, Denmark, Technical University of Denmark, Denmark
- Abram Perdana, Indonesia, Chalmers University of Technology, Sweden
- Hannes Agabus, Estonia, Tallinn University of Technology, Estonia

**Other Participants:**
- Ass. Prof. Ola Carlson, Chalmers University, Sweden
- M.Sc. Sanna Uski-Joutsenvuo, VTT, Finland
- Prof. Kjetil Uhlen, Norwegian University of Science and Technology, Norway
- PhD Jarle EeK, Norwegian University of Science and Technology, Norway
- PhD Leif Warland, SINTEF, Norge
- PhD Anca D. Hansen, Risø, Denmark
- PhD Rein Oidram, TUT, Estonia

**Post-docs:**
- Dr. Peter Kellers, Uppsala University, Sweden
- Prof. Stenbjörn Styring, Uppsala University, Sweden
- PhD Allahverdiyeva Yagut, University of Turku, Finland
- Dogan Karadag, Yildiz Technical University, Turkey
- PhD Anne Menert, Tallinn University of Technology, Estonia

**Other Participants:**
- Docent Ann Magnusson, Uppsala University, Sweden
- Prof. Stenbjörn Styring, Uppsala University, Sweden
- Docent Fikret Mamedov, Uppsala University, Sweden
- Pritt Kalleste, SEI-Tallinn, Estonia
- Merje Michels, Tallinn University of Technology, Estonia

**Post-docs:**
- Dr. Peter Kellers, Uppsala University, Sweden
- Dr. Guiying Chen, Uppsala University, Sweden
- PhD Allahverdiyeva Yagut, University of Turku, Finland

**Other Participants:**
- Ass. Prof. Ola Carlson, Chalmers University, Sweden
- M.Sc. Sanna Uski-Joutsenvuo, VTT, Finland
- Prof. Kjetil Uhlen, Norwegian University of Science and Technology, Norway
- PhD Jarle EeK, Norwegian University of Science and Technology, Norway
- PhD Leif Warland, SINTEF, Norge
- PhD Anca D. Hansen, Risø, Denmark
- PhD Rein Oidram, TUT, Estonia

**Other Participants:**
- Docent Ann Magnusson, Uppsala University, Sweden
- Prof. Stenbjörn Styring, Uppsala University, Sweden
- Docent Fikret Mamedov, Uppsala University, Sweden
- Pritt Kalleste, SEI-Tallinn, Estonia
- Merje Michels, Tallinn University of Technology, Estonia

**Post-docs:**
- Dr. Peter Kellers, Uppsala University, Sweden
- Dr. Guiying Chen, Uppsala University, Sweden
- PhD Allahverdiyeva Yagut, University of Turku, Finland

**Other Participants:**
- Ass. Prof. Ola Carlson, Chalmers University, Sweden
- M.Sc. Sanna Uski-Joutsenvuo, VTT, Finland
- Prof. Kjetil Uhlen, Norwegian University of Science and Technology, Norway
- PhD Jarle EeK, Norwegian University of Science and Technology, Norway
- PhD Leif Warland, SINTEF, Norge
- PhD Anca D. Hansen, Risø, Denmark
- PhD Rein Oidram, TUT, Estonia

**Other Participants:**
- Ass. Prof. Ola Carlson, Chalmers University, Sweden
- M.Sc. Sanna Uski-Joutsenvuo, VTT, Finland
- Prof. Kjetil Uhlen, Norwegian University of Science and Technology, Norway
- PhD Jarle EeK, Norwegian University of Science and Technology, Norway
- PhD Leif Warland, SINTEF, Norge
- PhD Anca D. Hansen, Risø, Denmark
- PhD Rein Oidram, TUT, Estonia

Kajsa Havelius, Sweden, Uppsala University, Sweden
Tanai Cardona, Colombia, Uppsala University, Sweden
Margret Sigurðsdottir, Iceland, University of Akureyri, Iceland
Hilma Eidsdottir, Iceland, University of Akureyri, Iceland
Sigríður Sigurdardóttir, Iceland, University of Akureyri, Iceland
Vallo Korgmäe, Estonia, Tallinn University of Technology, Estonia
Peep Pritk, Estonia, Tallinn University of Technology, Estonia
Merje Michels, Estonia, Tallinn University of Technology, Estonia
Paulo Oliveria, Portugal, Uppsala University, Sweden
#1 Cooking up Networks:
[Energy Foresight Forum]

**Period:** 2007-2009  
**Project Manager:** Einar Hope, NHH, Norway  
**Funding Nordic Energy Research/(Total):** 0.9 (1.2) MNOK

**Partners:**  
- University of Bergen, Norway  
- Stockholm School of Economics, Sweden  
- Copenhagen University, Denmark  
- University of Iceland, Iceland  
- Helsinki School of Economics, Finland

**Project Steering Group:**  
- J.S. Vaagen, University of Bergen, Norway  
- P.A. Lindegaard, RISØ, Denmark  
- J. Keinonen, University of Helsinki, Finland  
- D. Rūdiņš, presently IAEA Vienna, Lithuania

PhD Candidates: None listed  
PhD Degrees: None listed  
Post-docs: None listed  
Other Participants: None listed

#2 Cooking up Networks:
[Initiation of Nordic Automatic Meter Reading Forum]

**Period:** 2007-2008  
**Project Manager:** Andrei Morch, SINTEF, Norway  
**Funding Nordic Energy Research/(Total):** 1.4 (2.7) MNOK

**Partners:**  
- VTT Technical Research Centre of Finland, Finland  
- Elforsk, Sweden  
- DEFU, Denmark  
- Ekodoma Ltd, Lithuania

**Project Steering Group:**  
- Andrei Z. Morch, SINTEF Energiforskning AS, Norway  
- Ingeborg Graabæk, SINTEF Energiforskning AS, Norway  
- Bernhard Haukland, Norwegian Electricity Industry Association, Norway  
- Seppo Määkkäinen, VTT Technical Research Centre of Finland, Finland  
- Kenneth Hanninen, Finnish Energy Industries, Finland  
- Åke Sjödin, Elforsk, Sweden  
- Anders Richert, Svensk Energi, Sweden  
- Henrik Weldingh, Danish Energy Association, Denmark  
- Hans Jørgen Jørgensen, Danish Energy Association, Denmark  
- Mika Matikainen, Forum of Nordic Regulators (EMV), Finland

PhD Candidates: None listed  
PhD Degrees: None listed  
Post-docs: None listed  
Other Participants:  
- Ove S. Grande, SINTEF Energiforskning AS, Norway  
- Astrid Lundquist, SINTEF Energiforskning AS, Norway  
- Pekka Koponen, VTT Technical Research Centre of Finland, Finland  
- Claudio Rochas, Edodoma Ltd., Latvia  
- Āris Dandens, Latvenergo, Latvia  
- Ivo Grinbergs, Latvenergo adales Tikls, Latvia
#3 Cooking up Networks:
[Nordic Center of Excellence in Photovoltaics]

**Period:** 2007-2010  
**Project Manager:** Arve Holt, Institute for Energy Technology, Norway  
**Funding Nordic Energy Research/(Total):** 8.0 (12.8) MNOK  
**Partners:**  
- University of Uppsala, Sweden  
- Helsinki University of Technology, Finland  
- Danish Technology Inst., Denmark  
- Norwegian University Of Science And Technology, Norway  
- Physico-Technical Inst. St. Petersburg, Russia  
- Tallinn University of Technology, Estonia  

**Project Steering Group:**  
- Marika Edoff, Uppsala University, Sweden  
- Peter Lund, Helsinki University of Technology, Finland  
- Jens Christiansen, Danish Technological Institute, Denmark  
- Turid W. Reenaas, Norwegian Institute of Science and Tehcnology, Norway  
- Arve Holt, Institute for Energy Technology, Norway  
- Vladimir Khvostikov, Ioffe Physico-Tehnical Institute in St. Peterbrug, Russia  
- Enn Mellikov, Prof., Tallinn University of Technology, Estonia

**PhD Candidates:**  
- Jo Jessing, Institute for Energy Technology, Norway  
- Jonas Pettersson, Sweden  
- Kerttu Aitola, Finland  
- Anders Rand Andersen, Denmark  
- Nikolay A. Kalyuzhnyy, Russia  
- Kristi Timno, Estonia  
- Tor Nordam, Norwegian University Of Science And Technology, Norway

**PhD Degrees:**  
No listed

**Post-docs:**  
None listed

**Other Participants:**  
- Dr. Erik Stensrud Marstein, Institute for Energy Technology, Norway  
- Asemund Suliha, University Graduate Center (Kjeller), Norway  
- Mare Altossaar, Tallinn University of Technology, Estonia  
- Charlotte Platzer-Björkman, Uppsala University/ Institute for Energy Technology, Sweden/Norway

**Project Steering Group:**  
- Marika Edoff, Uppsala University, Sweden  
- Peter Lund, Helsinki University of Technology, Finland  
- Jens Christiansen, Danish Technological Institute, Denmark  
- Turid W. Reenaas, Norwegian Institute of Science and Tehcnology, Norway  
- Arve Holt, Institute for Energy Technology, Norway  
- Vladimir Khvostikov, Ioffe Physico-Tehnical Institute in St. Peterbrug, Russia  
- Enn Mellikov, Prof., Tallinn University of Technology, Estonia

**PhD Candidates:**  
- Jo Jessing, Institute for Energy Technology, Norway  
- Jonas Pettersson, Sweden  
- Kerttu Aitola, Finland  
- Anders Rand Andersen, Denmark  
- Nikolay A. Kalyuzhnyy, Russia  
- Kristi Timno, Estonia  
- Tor Nordam, Norwegian University Of Science And Technology, Norway

**PhD Degrees:**  
No listed

**Post-docs:**  
None listed

**Other Participants:**  
- Dr. Erik Stensrud Marstein, Institute for Energy Technology, Norway  
- Asemund Suliha, University Graduate Center (Kjeller), Norway  
- Mare Altossaar, Tallinn University of Technology, Estonia  
- Charlotte Platzer-Björkman, Uppsala University/ Institute for Energy Technology, Sweden/Norway

**Project Steering Group:**  
- Marika Edoff, Uppsala University, Sweden  
- Peter Lund, Helsinki University of Technology, Finland  
- Jens Christiansen, Danish Technological Institute, Denmark  
- Turid W. Reenaas, Norwegian Institute of Science and Tehcnology, Norway  
- Arve Holt, Institute for Energy Technology, Norway  
- Vladimir Khvostikov, Ioffe Physico-Tehnical Institute in St. Peterbrug, Russia  
- Enn Mellikov, Prof., Tallinn University of Technology, Estonia

**PhD Candidates:**  
- Jo Jessing, Institute for Energy Technology, Norway  
- Jonas Pettersson, Sweden  
- Kerttu Aitola, Finland  
- Anders Rand Andersen, Denmark  
- Nikolay A. Kalyuzhnyy, Russia  
- Kristi Timno, Estonia  
- Tor Nordam, Norwegian University Of Science And Technology, Norway

**PhD Degrees:**  
No listed

**Post-docs:**  
None listed

#4 Cooking up Networks:
[Nordic Center of Excellence in H2 storage]

**Period:** 2007-2010  
**Project Manager:** Hannes Jonsson, University of Iceland , Iceland  
**Funding Nordic Energy Research/(Total):** 8.0 (10.8) MNOK  
**Partners:**  
- Institute for Energy Technology, Norway  
- University of Oslo, Norway  
- Stockholm University, Sweden  
- Uppsala University, Sweden  
- Technical University Of Denmark, Denmark  
- Risé Technical University Of Denmark, Denmark  
- Helsinki University of Technology, Finland  
- Lithuanian Energy Inst., Lithuania  
- St. Petersburg State University, Russia

**Project Steering Group:**  
- Hannes Jónsson, Faculty of Science VR-II, Iceland  
- Sveinn Ólafsson, University of Iceland, Iceland  
- Bjørn Hauback, Institute for Energy Technology, Norway  
- Helmer Fjellvag, University of Oslo, Norway  
- Dag Noréus, Stockholm University, Sweden  
- Yvonne Andersson, Uppsala University, Sweden  
- Björgvin Hjörvarsson, Uppsala University, Sweden  
- Jens Oluf Jensen, Technical University of Denmark, Denmark  
- Tejs Vegge, Risoe National Laboratory and Technical University of Denmark, Denmark  
- Markku Lampinen, University of Technology, Finland  
- Darius Milcius, Lithuanian Energy Institute, Lithuania  
- Valery Uzdin, Professor, Saint-Petersburg State University, Saint-Petersburg, Russia

**PhD Candidates:**  
- Finnbogi Oskarsson, University of Iceland, Iceland  
- Anna-Karin Eriksson, University of Iceland, Iceland  
- Arni Sigurður Ingason, University of Iceland, Iceland  
- Marit Riktor, Institute for Energy Technology, Norway  
- Jon Erling Fonnemel, Institute for Energy Technology, Norway  
- Heidi Orby, Institute for Energy Technology, Norway  
- Henrik Fahlquist, Stockholm University, Sweden  
- Martin Sahlgberg, Uppsala University, Sweden  
- Hossein Raanaei, Uppsala University, Sweden  
- Nicolai Christian Bork, Riss, Denmark  
- Jon Bergmann Maronsson, Risø, Denmark  
- Jon Steinar Gardarsson Myrdal, Riss, Denmark  
- Steen Lysgaard, Risø, Denmark  
- Martynas Lelis, Lithuanian Energy Inst., Lithuania  
- Martin Sahlberg, Uppsala University, Sweden  
- Jan Prinz, Uppsala University, Sweden  
- Gunnar Palsson, Uppsala University, Sweden
#5 Cooking up Networks:

[Nordic Network for sustainable development in isolated areas]

## Period:
2007-2010

## Project Manager:
David Pointing, Technical University Of Denmark-Rise, Denmark

## Funding Nordic Energy Research/(Total):
4.0 (7.1) MNOK

## Partners
- Institute for Energy Technology, Norway
- Technical University Of Denmark, Arctic Technology Centre, Denmark
- Greenland Innovation Centre, Denmark
- Danish Polar Centre, Denmark
- GRID-Arendal, Norway
- Nordic Council of Ministers “TBO” Task Force, Greenland
- IRD Fuel Cells, Denmark
- StatoilHydro New Energy, Norway
- Pure project, United Kingdom
- REEEP South East & Asia Pacific Secretariat, Australia

## Project Steering Group:
- David Pointing, Rise Centre, Denmark
- Gordon Mackenzie, UNEP Rise Centre, Denmark
- Daniel Aklil, PURE Energy Energy Ltd., Shetland Islands
- Kathrine Johnsen, UNEP GRID-Arendal, Norway
- Elizabeth Johnsen, PURE Energy Energy Ltd., Shetland Islands
- Arne Willumsen, Center for Arctic Technology (Technical University Of Denmark), Denmark
- Margrethe Sørensen, Nordic Council’s “TBO” Task Force, Greenland

## PhD Candidates:
- Andreas Flensborg, UNEP Rise Centre, Denmark
- Mette Annelie Rasmussen, UNEP Rise Centre, Denmark
- Daniel Aklil, PURE Energy Energy Ltd., Shetland Islands
- Anders Holm Foosnæs, DONG Energy, Denmark
- Bill Simple, Canadian Mortgage Housing Corporation, Canada
- Sigurdur Inge Fridleifsson, Energy Agency, Iceland
- Walter Parson, Nalcor Energy, Canada
- Leivur Hansen, SEV, Faroe Islands
- Sten Dieden, Actualytics, Sweden
- AnneSolgaard, UNEP GRID-Arendal, Norway
- Ranneig Nielsen, UNEP GRID-Arendal, Norway

## PhD Degrees:
- Anders Blomqvist, Uppsala University, Sweden
- Nicolai Bork, Uppsala University, Sweden
- Marit Rüt, Institute for Energy Technology, Norway
- Marit Riktor, Institute for Energy Technology, Norway
- Imantas Baranauskas, Lithuanian Energy Inst., Lithuania
- Andreas Pedersen, University of Iceland, Iceland
- Andreas Vestbo, Danish Technical University, Denmark
- Johannes Voss, Rise Danish Technical University, Denmark
- Nadir Aliche, Institute for Energy Technology, Norway

## Post-docs:
- StatoilHydro New Energy, Norway
- Pure project, United Kingdom
- REEEP South East & Asia Pacific Secretariat, Australia

## Other Participants:
- Anniken Mosegaard, UNEP GRID-Arendal, Norway
- Ranneig Nielsen, UNEP GRID-Arendal, Norway
- Petre Vladykova, Danish Technical University, Denmark
- Jens Peter B. Henriksen, Nuksioskift, Greenland
- Peter Kjeldmann, Nuksioskift, Greenland
- Vilhjalmur Nielsen, Bitland, Faroe Islands

- Prof. Torben Jensen, Aarhus University, Denmark
- Prof. Rajeev Ahuja, Uppsala University, Sweden
- Ponniah Vajeeston, Oslo University, Norway
- Karim Kadir, Stockholm University, Sweden

- Ph.D. Nadir Aliouane, Institute for Energy Technology, Norway
- Ph.D. Stefano Deledda, Institute for Energy Technology, Norway
- Ph.D. Hilde Grove, Institute for Energy Technology, Norway
- Ph.D. Isavel Llamas Jansa, Institute for Energy Technology, Norway
- Ph.D. Sabrina Sartori, Institute for Energy Technology, Norway
- Ph.D. Evangelos Papaioannou, Uppsala University, Sweden
- Ph.D. Johannes Voss, Rise, Denmark
- Ph.D. Didier Blanchard, Rise, Denmark
- Ph.D. Adem Teken, Rise, Denmark

- Anders Blomqvist, Uppsala University, Sweden
- Dorthe Ravnsbæk, Aarhus University, Denmark
- Lene Mosegaard, Aarhus University, Denmark
- Line Rude, Aarhus University, Denmark
- Thomas Kollin Nielsen, Aarhus University, Denmark
- Dadi Sveinbjörnsson, Riso/DTU, Denmark
- Andreas Vestbo, Danish Technical University, Denmark
- Adam Solgaard, UNEP GRID-Arendal, Norway
- Petre Vladykova, Danish Technical University, Denmark
- Jens Peter B. Henriksen, Nuksioskift, Greenland
- Peter Kjeldmann, Nuksioskift, Greenland
- Vilhjalmur Nielsen, Bitland, Faroe Islands
#6 Cooking up Networks:
[Scandinavian Hydrogen Highway Partnership]

**Period:** 2007-2008
**Project Manager:** Ulf Hafseld, StatoilHydro, Norway
**Funding Nordic Energy Research/(Total):** 1.0 (2.2) MNOK

**Partners:**
Zero, Norway
ETC Batteries and Fuel Cells Sweden AB, Sweden
Region Midtjylland, Denmark
H2 Logic, Denmark

**Project Steering Group:**
Ulf Hafseld, StatoilHydro, Norway
Jostein Pettersen, Rogaland Fylkeskommune, Norway
Sven Wolf, Vätgas Sverige, Sweden
Hanna Jönsson, Vätgas Sverige, Sweden
Mikael Sloth, H2 Logic, Denmark
Flemming Wnnike, Region Midtjylland, Denmark

**PhD Candidates:**
None listed

**PhD Degrees:**
None listed

**Post-docs:**
None listed

**Other Participants:** None listed
Combining Flavors in the Market

[Nordic Energy, Environmental Constraints and Integration (NEECI)]

2010

International w/peer review (referee system)

Other international

National
- Baldursson, Fridrik, and Dadi M. Kristofersson (2010): An efficient framework for allocating and leasing energy resources of the Icelandic state, a report for Prime Minister’s committee on allocating and leasing energy resources of the Icelandic state
- Fridolfsson, Sven-Olof Fridolfsson och Thomas Tangerås (2010c): Norge låg bakom vinterns rekordhöga svenska elpriser, Dagens Nyheter, 1 Oktober, 2010
- Hjalmarsson L. Leveranssäkerhet. Report to OED, Oslo, August 2010
- Mortensen, Jørgen Birk og Lars Haagen Pedersen, “Klimapolitik: kortsigtede omkostninger og langsigtede gevinster”, Samfundsøkonomen, Maj 2009, nr. 2
- Tangerås, Thomas (2010d): Nationella beslut kan bidra till att lösa det globala klimatproblemet, IFN Nyhetsbrev #3, 2010
Other (Including papers at seminars)

- Amundsen, Eirik S. “Multiple instruments for energy and climate change policies” (by E.S. Amundsen and T. Bye) at the 11th IAEE European Conference, August 25-28, 2010 Vilnius, Lithuania.
- Baldursson, Fridrik (2010). An efficient framework for allocating and leasing public energy resources, talk at conference organised by the Ministry of Industry.
- Hjalmarsson L. Energi politiken efter valet, Svenska EnergiEkonomiska Föreningen, Stockholm den 30 september 2010
- Tangerås, Thomas (2010g): Incitamenten för att investera i ny produktionskapacitet på den svenska elmarknaden, presentation för Svenskt Näringsliv, Oktober 2010
- von der Fehr, Nils-Henrik M. Information provision in electricity markets - an economic analysis, rapport, Statkraft.
- von der Fehr, Nils-Henrik M.: Incentive-Based Regulation in the Future: So What (Where Do We Go From Here)? FRS Annual Conference, mai.

2009
International w/peer review (referee system)


Other international


• Liski, M and with Reyer Gerlagh (2009b): Incomplete information and resource dependence, HECER-WP.


National

• Andersen, Peder og Amundsen, Eirik S. (2009): Klimapolitik og generationsfordelingsproblemet. *Samfundsøkonomen* 2009 (2) s. 8-10


Other (Including papers at seminars)

• Amundsen, Eirik S.; Sørensen, Peter Birch, Rosholm, Michael; Whitta-Jacobsen, Hans jørgen (2009): Ingen plads til hellige køer i klimapolitiken. *Jord og Viden* 2009 (9)


• Amundsen, Eirik S. (2009a): Climate policy in EU and in Denmark: A critical view. The Danish Economic Councils’ annual conference on environmental economics; 2009-08-31 - 2009-09-01, Skodsborg, Denmark


• Amundsen, Eirik S. and Bye, Torstein (2009): Green and white certificates. NEECI, 2009-12-02 - 2009-12-02, University of Reykjavik, Iceland.


• Bye, T. and Amundsen, Eirik S. “Green and white certificates for energy and climate change policies” at a Nordic Workshop in Reykjavik, December 2009.


• Liski, M. (2009e): Paper presented at: Harvard University, Helsinki School of Economics, MIT, PUC Chile, Stanford University, UC Berkeley, Universidade de Vigo, Universite Catholique of Louvain-CORE, University of CEMA, University of Paris 1 and Yale University.


• Storrøsten (2009b): ECT (energy, climate, technology) 2009, Grieghallen, Bergen, 24 September: “Incentives to invest in abatement technology: A tax versus emissions trading under imperfect competition”.Received “Best student paper award” in competition arranged by the Energiforum for this paper.


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2008
International w/peer review

Other international

National
- Bye, Bye og Annegrete Bruvoll (2008a): ØLag på lag i norsk klima- og energipolitikk, Økonomiske analyser nr. 5, 29-37
Essential Fibers

[Basic phenomena in mechanical pulping]

- Hänninen, T., Kontturi, E., Liukkonen, S., Vuorinen, T., “Characterizing mechanical pulp by Raman microscopy”, 6th FMPRS
Food for Thought

[Nordic Graduate School in Biofuel Science and Technology-phase 2]

Refereed articles of students


- Engblom, M., Mueller, C., Brink, A., Hupa, M., Jones, A. Toward predicting the char bed shape in kraft recovery boilers, Tappi J. 7(10), 12-16, 2008


- Filbakk, T., Skjevrak, G., Dibdakov, J., Jirjis, R., Haibo, O. The influence of storage and drying methods for Scots pine raw material on mechanical 26 pellet properties and production parameters, Submitted to Fuel Processing Technology

- Hermansson, S., Thunman, H. Two-dimensional CFD-modeling of multi-particle scale phenomena in fixed bed combustion, To be submitted

- Hermansson, S., Thunman, H. Grate design and operational measures to reduce grate-material wear in fixed-bed combustion, To be submitted

- Hermansson, S., Lind, F., Åmand, L.-E., Thunman, H. On-line monitoring of the fuel moisture-content in biomass-fired furnaces by measuring the relative humidity of the flue gases, To be submitted


- Hjärtstam, S., Normann, F., Andersson, K., Johnsson, F. Performance of global reaction mechanisms in oxy-fuel conditions, To be submitted

- Hjärtstam, S., Johansson, R., Andersson, K., Johnsson, F. Evaluation of gas radiation modeling in oxy-fired furnaces, To be submitted

- Ibrahim, N., Bech, N., Jensen, P., Johnsson, F. Influence of water content on wheat straw pyrolysis, Submitted for publication, 2010


- Lind, F., Seemann, M., Thunman, H. A dual fluidised bed reactor for continuous catalytic tar reforming and catalyst regeneration. To be submitted

- Lindholm, J., Brink, A., Hupa M., Flame retarding effects of some inorganic compounds in polyurethane adhesive, To be submitted

- Lindholm, J., Brink, A., Hupa M., Influence of decreased sample size on cone calorimeter results, Fire and Materials, to be submitted

- Johnsson, F. Lateral solids mixing in a large-scale fluidized bed. To be submitted
Brink, A., Karlström, O., Hupa, M., A simplified model for the behaviour of large biomass particles in the splashing zone of a bubbling bed. 20th International Conference on Fluidized Bed Combustion, Xi’an, China 18-20.5.2009

Claessson, F., Blomqvist, E., Optimera avfyllingshantering i Viareds Företagsförening, Energiteknik, SP Rapport 2009:06, SWE, 2009

Claesson, F., Wikström Blomqvist, E., Johansson, A., Skrifvars, B-J., Andersson, B-Å., Annual Variation In Elemental, Dioxin And PCB Content Within Swedish Waste Fuels – Results From Two Plants, Published in the proceedings and presented at the 12th International Waste Management and Landfill Symposium, Sardinia, Italy, October 5-9, 2009

Claesson, F., Skrifvars, B-J., Elled, A-L., Johansson, A., Chemical characterization of waste fuel for Fluidized bed combustion, Published in the proceedings and presented at the 20th International Conference on Fluidized Bed Combustion, Xi’an, China, May 18-20, 2009

Claesson, F., Johansson, L., Rönnbäck, M., Johansson, M., Tullin, C., Particle emissions from combustion of oat grain with additives, Published in the proceedings and presented at the 4th Biennial Meeting of the Scandinavian-Nordic Section of the Combustion Institute, Åbo/Turku, Finland, November 5-6, 2007

Engblom, M., Brink, A., Mueller, C., Hupa, M., CFD-based modeling of laboratory scale kraft char bed burning, 8th European Conference on Industrial Furnaces and Boilers (INFUB-8), Portugal, 25-28 March, 2008


Engblom, M., Brink, A., Influence of Stefan flow and boundary layer reactions on surface reaction rate. Nordic Section of the Combustion Institute - Biennial Meeting, Åbo, 2007


Non-refereed articles from students


Aubert, M., Lindholm, J., Pawelec, W., Tirri, T., Amiri, R., N., Brink, A., Hupa, M., Wilén C-E., Design of novel non-halogenated flame retardants combustion and polymer scientists join forces, KET/JU Annual Seminar, Helsingfors, Finland, 2010


Hjärtstam, S., Johansson, R., Andersson, K., Johnsson, F. Evaluation of gas radiation modeling in oxy-fired furnaces, Presentation and extended abstract – AIChe, 2010 Annual Meeting, Salt Lake City, UTAH, USA, November 7-12, 2010


Hupa, M., Engblom, M., Brink, A., Mueller, C. How well do we understand recovery furnace processes?, Finnish Recovery Boiler Committee 45th Anniversary International Recovery Boiler Conference, Lahti, Finland, June 3-5, 2009


Karlström, O., Brink, A., Hercog, J., Hupa, M., Tognotti, L., Oxidation model for 24 bituminous coal chars: constant of variable activation energy. The 33rd International Symposium on Combustion. Tsinghua University, Beijing, China, August 1-6, 2010

Karlström, O., Brink, A., Hupa, M., Tognotti, L., Modeling the combustion of coal chars in a drop tube using constant activation energy. Joint meeting of the Scandinavian-nordic and French sections of the combustion institute, Snøkkersten (Copenhagen), November 9-10, 2009

Karlström, O., Brink, A., Hupa, M., Tognotti, L., Modeling the combustion of bituminous coal chars in a drop tube using constant activation energy, EDF-IFRF coal characterization workshop, Paris, November 23, 2009

Karlström, O., Brink, A., Hupa, M., Tognotti, L., Kinetic combustion parameters for chars using the IFRF solid fuel database, 16th International International Flame Research Foundation Members Conference, Boston, June 8-10, 2009


Lind, F., Seemann, M., Thunman, H., Evaluation of fluid dynamics in a hot and a cold system of interconnecting fluidised beds, Poster and oral presentation, In International conference on fluidization, Fluidization XIII, Gyeong-ju Korea, May 16 – 21, 2010


Lind, F., Seemann, M., Thunman, H., Evaluation of fluid dynamics in a hot and a cold system of interconnecting fluidised beds, Extended abstract and oral presentation, Joint meeting of the Scandinavian and French Section of the Combustion Institute, Copenhagen, 9 – 10 November, 2009

Lind, F., Seemann, M., Thunman, H., Experiences from recent tests in an interconnecting fluidized bed, Oral presentation at the 60th IEA-FBC Technical Meeting at Chalmers University of Technology Gothenburg May 3 – 4, 2001

Lindholm, J., Brink, A., Hupa M., Aubert, M. C.-E., Wilén, Reproducibility of the UL 94 flammability test of flame retarded polypropylene samples, SNCI, 4th Biennial Meeting, Ábo, Finland, 2007

Technical Meeting at Chalmers University of Technology Gothenburg May 3 –4, 2001

Lindholm, J., Cone Calorimeter - Combustion researcher entering fire research, Åbo Akademi Process Chemistry Centre Annual Meeting, August, 2010

Lindholm, J., Brink, A., Hupa M., Flame retardant research at Åbo Akademi University & Cone Calorimeter – A tool for measuring heat release rate, IFRF Finnish-Swedish Flame Days, Nådendal, Finland, 2009

Lindholm, J., Aubert M., Design of novel non-halogenated flame retardants, KETJU Annual Seminar, Helsingfors, Finland, 2009


Lindholm, J., Aubert M., Design of novel non-halogenated flame retardants, KETJU Annual Seminar, Helsingfors, Finland, 2008

Lindholm, J., Brink, A., Hupa M., Aubert, M. C.-E., Wilén, Reproducibility of the UL 94 flammability test of flame retarded polypropylene samples, SNCI, 4th Biennial Meeting, Åbo, Finland, 2007


Thunman, H., Lind, F., Johnsson, F., Inversioner av framtidens el- och värme- produktionsstekniker, Delrapport Energikombinat, Elforsk 08(79), 2008


Wang, L., Hustad, J.E., Grenli, M., Sintering and Mineral Transformation of Sewage Sludge Ashes, Lapland, Finland, August 29th-September 3rd, 2010

Wang, L., Hustad, J., Alkali chlorides related fouling and corrosion in biomass combustion, 1st NTVA-CAE Joint Seminar on Strategy, Research and Development in Renewable Energy, pp. 225-239, Beijing, China


Refereed articles of Alumni


Lindberg, D., Chartrand, P., Thermodynamic evaluation and optimization of the (Ca + C + O + S) system. [Erratum to document cited in CA152:344853], Journal of Chemical Thermodynamics, 42(11), 1413, 2010

Lindberg, D., Chartrand, P., Thermodynamic evaluation and optimization of the (Ca + C + O + S) system, Journal of Chemical Thermodynamics, 41(10), 1111-1124, 2009


Pedersen, K., Andersen, S.I., Jensen, A., Dam-Johansen, K., Replacement of the foam index test with surface tension measurements, Cement and Concrete Research, 37, 806-1004, 2007

Frozen Fuel Cells

[Development Demonstration of an efficient and cost competitive PEMFC system for cold Nordic climate]


Mixed Green Policies

[Distibuted generation integration in Nordic Energy Market]

- “Status and Scenarios for the Nordic Power Market (2020)” Econ Pöyry
- “Case studies of DG projects throughout the Nordic Region” Sweco

Raw Energy

[Primary energy efficiency (PEE)]

- Marta Róis Karlsdóttir, UoI. Energy efficiency consideration of geothermal based power production Conference proceedings, The 11th International Symposium on District Heating and Cooling, August 31-September 2, 2008, Reykjavik, Iceland
- Kohl, T., Järvinen, M., Fogelholm, C.J. Gasification and biorefinery in combined heat and power plants Conference proceedings, The 11th International Symposium on District Heating and Cooling, August 31-September 2, 2008, Reykjavik, Iceland
Marta Rós Karlsdóttir, UoI, Karlsdottir, M. R., Pálsson, Ó. P., Pálsson, H.
Factors for Primary Energy Efficiency and CO2 Emission for the Hellisheiði Geothermal Power Plant, World Geothermal Congress, to be presented in Bali, April 2010


Per-Olof Johansson, LU/LTH, Johansson P-O. Improved temperature performance of radiator heating system connected to district heating by using add-on-fan blowers Proceedings at the 12th International Symposium on District Heating and Cooling, Tallinn, Estonia, September 2010


Softwood Sugar

[New innovative pretreatment of Nordic wood for cost-effective fuel-ethanol production]

Project disseminations
International journals w/peer review


Presentations - international:


Reports:


Presentations - national:


M. Jansson: “Ethanol production from softwood – A general study of the opportunities with the concept integrated with an oil refinery.” Innventia report No. 57, December 2009. (R&D report)


Sunny Side Up Climate

[Climate and energy systems: Risks, Potential and Adaption]

Climate and Modeling Scenarios
International w/peer-review


Peltonen-Sainio, P., Hakala, K., Jauhiainen, L. & Ruosteenoja, K. (2009). Comparing regional risks in producing turnip rape and oilseed rape - Im-


Other international


study conference on BALTEX 2010, 14–16 June 2010. International BALT-
TEX Secretariat Publication No. 46, ISSN 1681-6471, 38–39.

Nikulin, G., Kjellström, E., Hansson, U., Strandberg, G. & Ullerstig, A. (2010b). Nordic weather extremes as simulated by the Rossby Centre Re-


Pryor, S. C., Barthelemie, R. J., Schoof, J. T., Claussen, N.-E., Kjellström, E. & Drews, M. (2010). Intense and extreme wind speeds over the Nordic coun-

Räissänen, J. (2009). Probability distributions of monthly-to-annual mean temperature and precipitation in a changing climate (CES Climate Mod-


Räissänen, J. (2010). Probabilistic projections of temperature and precipita-
tion change for the period 2021–2050. In Proc. of Future climate and renew-
able energy: Impacts, risks and adaptation, Oslo, 31 May – 2 June 2010.

Räissänen, J. & Ruokolainen, L. (2009). Probabilistic forecasts of temperature and precipitation change by combining results from global and re-
f i/~jaraisan/ces.


Rögnvaldsson, Ó. & Ölafsson H. (2008). Dynamical downscaling of precipi-


Shkolnik I.M. (2008). Climate in the late 20th and 21st centuries over the northern Eurasia: RCM and CMIP3 simulations.: Fall AGU meeting, San-


National

Other
- 06.05.2009. “An ensemble of regional climate change simulations.” the 2nd International Lund RCM Workshop. Kjellström, E.
- 14.05.2009. “Ilmastonmuutos ja tuoreet lämpöennätykset: aiemmat havainto antavat harhaisen kuvan nykyisestä ilmastosta (Climate change and new temperature records: past observations give a biased view of the present climate; In Finnish).” Geophysics Days, Helsinki. Räisänen, J.
- 13.06.2009. “På gång inom klimatforskning” (Ongoing activities in climate research, In Swedish). Presentation at a project meeting within a Swedish project on “Spillway design floods in a changing climate – Scenarios in a 50-year perspective.” At SMHI, E. Kjellström.
- 23.9.2009. A presentation in Finnish about the most recent results from climate modeling at the meeting “How will energy be produced in Finland in the future?”, organized by Finnish Energy Industries and participated by energy companies and non-governmental organizations. K. Ruosteenoja.
- Jokinen, P. Several interviews especially related to severe weather, extreme heat and climate change for radio (~10 interviews), TV (one interview) and daily press (dozens) in late July and beginning of August.


National


Energy systems

Other international


• Olsson, J., Yang, W., Graham, L.P., Rosberg, J., & Andreasson, J. (Submitted to Tellus, 2009) Hydrological climate change impacts on inflows to Lake Vänern, Sweden: An ensemble approach.


Other international


• Olsson, J., Yang, W., Graham, L.P., Rosberg, J., & Andreasson, J. (Submitted to Tellus, 2009) Hydrological climate change impacts on inflows to Lake Vänern, Sweden: An ensemble approach.


Other international


• Olsson, J., Yang, W., Graham, L.P., Rosberg, J., & Andreasson, J. (Submitted to Tellus, 2009) Hydrological climate change impacts on inflows to Lake Vänern, Sweden: An ensemble approach.


National


Other, Talks


Andréasson, J & Bergström, S. Customer meeting with the Swedish hydropower industry at SMHI. November 25, 2009.

Veijalainen, N: Climate change impacts on floods in Finland. Tulva- ja pata-päivät [Flood and dam day] October 13, 2009, Helsinki.


Other, Dissertations


Bio Energy International w/peer-review


Other international


Hydropower – Glacier, Snow and Ice International w/peer-review


- Guðmundsson, S., Björnsson, H., Magnússon, E., Berthier, E., Pálsson, F., Guðmundsson, M.T., Högnadóttir Þ. & Dall J. Response of Eyjafjallajökull, Torfajökull and Tindfjallajökull ice caps in Iceland to regional warming, deduced by remote sensing. Manuscript accepted in Polar Research in 2010.


Other international


- Hock, R., Flowers, G. & Jóhannesson, T. (eds.) (2008). Glaciers in Watershed and Global Hydrology. Special Issue of Hydrological Processes, 22(19), 3887-4021. [This issue contains papers from a workshop about glacier mass balance and glacier hydrology in Obergurgl, Austria, August 2007, that grew partly out of the CE/CES glaciers/snow and ice collaboration. Short reports about the workshop have been published in ICE (the bulletin of the Int. Glaciological Society) and in the IAHS Newsletter.]


• Nawri, N., & Björnsson, H. (2010). Surface air temperature and precipitation trends for Iceland in the 21st century. Icelandic Meteorological Office, report 2010-005. [This report is mainly a deliverable from the Climate Scenario Group but as it was developed in close collaboration with the Glacier, Snow and Ice Group it is also listed here as a deliverable.]

• Jóhannesson, T. (2009). A simple (simplistic) method to include glaciated areas with a limited ice volume in the WaSIM and HBV models. Icelandic Meteorological Office, memo TóJ-2009/01.

• Jóhannesson, T. (2010). Sviðsmynd um loftslagsbreytningar á Íslandi—Skýrsla vísindanefndar um loftslagsbreytningar (Global climate change and their effect on Iceland—A report of an expert committee on climate change). Reykjavik, The Ministry for the Environment. [This report is not a deliverable of the CES-project, but it is partly based on work that was carried out within the CE and CES-projects, in particular the work of the glaciers/snow and ice groups.]


• Ahlstrøm, A.P., Mottram, R.H., Nielsen, C., Reeh, N., Andersen, S.B., Kristensen, S.S., Christensen, E.L., Stenseng L & Forsberg, R. (2008). Estimating the future ice sheet hydropower potential in Paakitoq, Ilulissat, West Greenland. A technical report from GEUS and a presentation at the American Geophysical Union, Fall Meeting 2008 [The report is not a deliverable of the CES-project but it is related to CES research and modelling of the same watershed/outlet glacier.]


• Nawri, N., & Björnsson, H. (2010). Surface air temperature and precipitation trends for Iceland in the 21st century. Icelandic Meteorological Office, report 2010-005. [This report is mainly a deliverable from the Climate Scenario Group but as it was developed in close collaboration with the Glacier, Snow and Ice Group it is also listed here as a deliverable.]
stracts (page numbers refer to the abstract volume edited by Heidi H. Pikkarainen published by NVE and available on the CES project web):

Risk assessments

Other international

Statistical analysis

International w/peer-review

Venäläinen, A., Jylhä, K., Kiipläinen, T., Saku, S., Tuomenvirta, H., Vajda, A. & Ruosteenoja, K. Recurrence of heavy precipitation, dry spells and deep snow cover in Finland based on observations. Boreal Environment Research (Submitted).

Other international


National

Statistical Analysis –, M.Sc. and Ph.D theses


Wind energy
International w/peer-review

Other International
Information Management

Other, Conference Proceedings.


National


Superior Algae

[Nordic BioH2; Renewable production of H2 using biological system]


Ho, F., Havelius K.G.V., Sjöholm, J., and Styring, S., Investigation and characterization of the EPR split signals in the native S2 state of photosystem II. Submitted.

Holmqvist, M., Stensjö, K., Oliveira, P., Lindberg, P. and LINDBLAD, P. Characterization of the hupSL promoter activity in Nostoc punctiforme ATCC 29133. BMC Microbiology (submitted)


Koskinen PEP, Beck SR, Örlygsson J & Puhakka JA. Hydrogen and ethanol production by of two thermophilic, anaerobic bacteria isolated from Icelandic geothermal areas. Submitted to Biotechnology & Bioengineering.


Nissilä M.E., Karadag D., Puhakka J.A. Fermentative hydrogen production with sequential electricity of methane production. (Submitted to Biotechnology and Bioengineering.)


Njakou D.S., Blumberga D. Combining the “Well to Gate” and Scenarios Analysis to Assess Hydrogen Transition Pathway in Latvia // Book Climate change in Latvia Latvian University 2007, pp261-268


Oliveira, P and LINDBLAD, P. CyLexA and CyAbrB, cyanobacterial transcription regulators affecting numerous metabolic pathways with focus on the bidirectional Hox-hydrogenase. Journal of Bacteriology (submitted)


Sjöholm, J., Chen, G., Ho, F., Mamedov, F., and Styring, S. Methanol allows the induction of a pH independent split EPR signal at 5 K from the $S_e$ state of the oxygen evolving complex. Submitted.


• Skjånes, K., Lindblad, P., and Muller, J. 2007: BioCO₂ - A multidisciplinary biological approach using solar energy to capture CO₂ while producing H₂ and high value products. Biomolecular Engineering 24: 405-413.


Wind-packed Power Goodness

[Model Development for Power System Analysis with a substantial wind energy capacity installed in the Nordic grid]

International w/peer review


• Reactive power balance in a distribution network with wind farms and CHPS. T. Lund, J. E. Nielsen


• Validation of Full-Converter Wind Power Plant Generic Model Based on Actual Fault Ride-Through Measurements Tšernobrovkin, O.; Perdana, A.; Palu, I.; Kilter, J. Journal of Energy and Power Engineering, 4(4), 54 - 62, 2010

Other international


• Interaction between distributed generation units and distribution systems. T. Lund, A. H. Nielsen,

• P. Sørensen. Nordic Wind Power Conference, Risø National Laboratory, Roskilde, Denmark 1-2 Nov, 2007


• Loss Allocation in a Distribution System with Distributed Generation Units. T. Lund, A. H. Nielsen,


· Measurement based analysis of active and reactive power losses in a distribution network with wind farms and CHPs. T. Lund. European Wind Energy Conference and Exhibition. Milan, Italy 7-10 May, 2007


· Verification of a Wind Farm Aggregated Generic Dynamic Model Based on a Real Fault Ride-Through Test in the Grid. O. Tiernobrovkin, A. Perdana, I. Palu, J. Kilter Nordic Wind Power Conference. Bornholm, Denmark 10-11 September, 2009

· An optimal model for balancing fluctuating power of large wind parks, H. Tammoja, I. Palu, H. Agabus, M. Keel, R. Oidram. 8th International Work-

shop on Large Scale Integration of Wind Power and on Transmission Networks for Offshore Wind Farms. Bremen, Germany: Energynautics GmbH. 6 pp 2009


· Variable Speed Wind Turbines Capability for Temporary Over-Production. G. C. Tarnowski, P. C. Kjær

· P. E. Sørensen, J. Østergaard, 2009 IEEE Power Engineering Society General Meeting, Calgary, Canada July 2009


· Frequency Control in Power Systems with High Wind Power Penetration. G. C. Tarnowski, P. C. Kjær

· J. Østergaard, P. E. Sørensen. 9th International Workshop on Large-Scale Integration of Wind Power into Power Systems, Québec, Canada, October 2010

National Reports


· Power Quality Issues on Wind Power Installations in Denmark. P. Sørensen, N. A. Cutululis, T. Lund,

· D. Hansen, T. Sørensen, J. Hjerrild, M. H. Donovan L. Christensen, H. K. Nielsen, 2007
#1 Cooking up Networks:

[Energy Foresight Forum]

No public available reports. Please contact Nordic Energy Research.

#2 Cooking up Networks:

[Initiation of Nordic Automatic Meter Reading Forum]

Additional documents and results
- Pekka Koponen, VTT et al., Results from work in Expert Group “Functional Requirements” within the Nordic AMR Forum
- The Best national practice: The participant’s Compendium for the Nordic AMR Workshop 2007

- Thermal power plant cooperation with wind turbines, I. Pulu, In Estonian in local journal, 2008
- Models for grid fault studies of wind turbines, Poopak Roshanfekr, Internal report Chalmers University of Technology, 2010
- Analysis of distribution systems with high penetration of distributed generation, Torsten Lund, Technical University of Denmark, Denmark, 2007-11-30
- Large-scale Integration of Wind Energy into the Power System Considering the Uncertainty Information, Hannes Agabus, Tallin University of Technology, Estonia, 2009-09-04
- Impact of Wind Parks on Power System Containing Thermal Power Plants, Ivo Pulu, Tallinn University of Technology, Estonia 2009-07-02
- Power System Integration and Control of Variable Speed Wind Turbines, Jarle Rok, The Norwegian University of Science and Technology, Norway, 2009-12-04
- Coordinated frequency control of wind turbines in power system with high penetration of wind power Germán Tarnowski, DTU, Denmark, planned in 2011
- Influence of Large Scale wind integration to power system stability according to loadflow and dynamic simulations analysis and modelling methodology. Oleg Tsernobrovkin, Tallinn University of Technology, Estonia, planned in 2011.


• M. Altosaar, J. Raudoja, K. Timmo, M. Danilson, M. Grossberg, J. Krustok and E. Mellikov, Cu2Zn1-xCdx Sn(Se1-ySy)4 solid solutions as absorber materials for solar cells, Conference on Photonic Materials, Kariega, South Africa, 2-6 May 2007 (avaldamisel Physical Status Solidi, C)


• J. Pettersson, C. Platzer-Björkman, A. Hultqvist, U. Zimmerman and M. Edoff, Measurements of photo-induced changes in the conduction properties of ALD-Zn1-xMgxO thin films, Accepted for publication in Physica Scripta


• Hultqvist, C. Platzer-Björkman, J. Pettersson, T. Törn Dahl and M. Edoff, “CuGaSe2 solar cells using atomic layer deposited Zn(O, S) and (Zn, Mg)
	tsf.2008.10.109

(Presented by A. Hultqvist at the E-MRS Spring Meeting, Strasbourg 2008)

• Gudovskikh AS, Kalyuzhny NA, Lantratov VM , Mintairov SA, Shwarts
	MZ, Andreev VM, “Properties of interfaces in GaInP solar cells”, Semicon-
ductors 43, 10 (2009) 1363-1368

• Gudovskikh AS, Kleider JP, Chouffot R, Kalyuzhny NA, Mintairov SA,
Lantratov VM, “III-phosphides heterojunction solar cell interface properties
from admittance spectroscopy”, Journal of Physics D: Applied Physics,
42, 16, Article Number: 165307 (2009 )

• Chu Y, Mintairov AM, He Y, Merz J, Kalyuzhny NA 3, Lantratov VM,
Mintairov SA, “Lasing of whispering-gallery modes in asymmetric wave-
guide GaInP micro-disks with InP quantum dots” Physics Letters A, 373,
12-13 (2009) 1185-1188

Other international

• J. Gjessing, E.S. Marstein, A. Sudbø, “Modelling of light trapping in thin silici-
on solar cells with back side dielectric diffraction grating,”, presented at
the 24th EU PVSEC, Hamburg, Germany, 21-25 Sept. 2009.

• Asghar, M.I., Miettunen, K., Halme, J., Toivola, M., Aitola, K., Vahermaa, P.,
and Lund, P., Stability issues of improved dye sensitized solar cells, 24th
European Photovoltaic Solar Energy Conference, Proceedings of 24th Eu-

• Toivola, M., Peltola, T., Miettunen, K., Halme, J., Aitola, K., and Lund, P.,
Large Area Optimized Thin Film Nano Solar Cells on Metal Sheet, 12th
NSTI Nanotech Conference, Houston, USA, May 3-7, 2009., Proceedings of

• Altosaar, M., Timmo, K., Danilson, M., Raudola, J., Mellikov, E. Character-
ization of Cu2ZnSnSe4 monograin layer solar cells. In: Proceedings of the
International Conference on Solar Cells: International Conference on Solar
Cells IC-SOLACE 2008, 21-23 January, 2008, Cochin, India., 2008, 103 -
105.

National

• J. Gjessing, E.S. Marstein, A. Sudbø, “Photonic crystals applied for light
trapping in solar cells”, Norwegian Electro-Optics Meeting 26-28 March
2008

2010 International w/peer review

• Aitola, K., Kaskela, A., Halme, J., Ruiz, V., Nasibulin, A.G., Kauppinen, E.I.,
and Lund, P.D., Single-Walled Carbon Nanotube Thin-Film Counter Elec-

trodes for Indium Tin Oxide-Free Plastic Dye Solar Cells, Journal of the

• Asghar, M.I., Miettunen, K., Halme, J., Vahermaa, P., Toivola, M., Aitola, K.,
and Lund, P., Review of stability for advanced dye solar cells, Energy & En-

• K. Aitola, J. Halme, N. Halonen, A. Kaskela, M. Toivola, A. G Nasibulin, K.
Kordás, G. Tóth, E. I. Kauppinen, and P. D. Lund, Comparison of dye solar
cell counter electrodes based on different carbon nanostructures, revised
version submitted to Thin Solid Films on 16.12.2010

• S. G. Hashmi, K. Miettunen, T. Peltola, J. Halme, I. Asghar, K. Aitola, and P.
Lund, Review of materials and manufacturing options for large area flexible
dye-solar cells, submitted to Renewable and Sustainable Energy Reviews on

• J. Pettersson, C. Platzer-Björkman, U. Zimmermann, M. Edoff “Baseline
model of graded-absorber Cu(In, Ga)Se2 solar cells applied to cells with
Zn1-xMgxO buffer layers”, accepted for publication in Thin Solid Films 2010

• C. Platzer-Björkman, P.Zabierowski, J. Pettersson, T. Törndahl and M.
Edoff, “Improved fill factor and open circuit voltage by crystalline selenium
at the Cu(In, Ga)Se2/buffer interface”, Progress in Photovoltaics: Research

• Timmo, K.; Altosaar, M.; Raudoja, J.; Muska, K.; Kauk, M.; Pilvet, M.; Varema,
T; Danilson, M.; Volobujeva, O.; Mellikov, E. Characterization of Cu2ZnSnSe4
monograin powders for solar cells. Solar Energy Materials and Solar Cells,

• Timmo, K.; Altosaar, M.; Raudoja, J.; Muskila, K.; Kauk, M.; Pilvet, M.; Varema,
T; Danilson, M.; Volobujeva, O.; Mellikov, E. (2010). Chemical etching of Cu2ZnSn(S, Se)4 monograin powder. 35th IEEE Photovoltaic Specialists Conference, Honolulu, Hawaii,
Other international


National


(Nordic Center of Excellence in H2 storage)

2007-2008

International w/peer review


M. Salhberg and Y. Andersson “The crystal structures of Sc2MgGa2 and Y2MgGa2” Acta Crystallogr. C accepted for publication.

Wirth, Emmanuel; Milcius, Darius; Filiou, Constantin; Noreus, Dag. Exploring the hydrogen sorption capacity of Mg-Ni powders produced by the vapour deposition technique. International Journal of Hydrogen Energy (2008), 33(12), 3122-3127.


Deledda, S., Hauback, B. C: Formation mechanism and structural characterization of the mixed transition-metal complex hydride Mg2(FeH6)0.5(CoH5)0.5 obtained by reactive milling. In press Nanotechnology (2008).


M. Salhberg and Y. Andersson “The crystal structures of Sc2MgGa2 and Y2MgGa2” Acta Crystallogr. C accepted for publication.

Wirth, Emmanuel; Milcius, Darius; Filiou, Constantin; Noreus, Dag. Exploring the hydrogen sorption capacity of Mg-Ni powders produced by the vapour deposition technique. International Journal of Hydrogen Energy (2008), 33(12), 3122-3127.


Deledda, S., Hauback, B. C: Formation mechanism and structural characterization of the mixed transition-metal complex hydride Mg2(FeH6)0.5(CoH5)0.5 obtained by reactive milling. In press Nanotechnology (2008).


storage in compact metal ammine salts", J. Am. Chem. Soc. 130, 16 (2008)


Other - Book chapter


2009

International w/peer review (referee system)


- P. Vajeeston, P.Ravindran, and H. Fjellvåg, Lattice dynamic study on AlH3 polymorphs - a theoretical study: (submitted for publication in PRB)


- M. Sahlberg, C. Zlotova, M. Latroche, Y. Andersson “Fully reversible hydrogen absorption and desorption reactions with Sc(Al1-xMgx), x= 0.0, 0.15, 0.20.” In manuscript.


Transition from spin-density-wave to layered antiferromagnetic state induced by hydrogen as a test for the origin of spin-density waves in chromium, V.M. Uzdin, H. Zabel, A. Remhof, B. Hjörvarsson, Phys. Rev. B. 80, 174418 2009


Other international

National

„Search for metal – insulator transition in MG2NIH4 films which could be switched by mechanical sensitive stacking faults”, M. Lelis, D. Milcius, E. Wirth, D. Noreus, K. Jansson, U. Haliensius, T. Yokosawa, T. Sato

Other
- M.S thesis, Jön Steinar G. MÝðdal, University of Iceland, ’Theoretical Studies of Aluminum Based Nano Scale Materials for Hydrogen Storage’
- M.S thesis, Pavel Bessarab, Univ. of Iceland, ’The influence of hydrogen on magnetic properties of nanoscale metal clusters’

2010-2011
International w/peer review (referee system)
- P. Vajeeston, P Ravindran, and H Fjellvåg, The crystal structure, physical, dynamic, and mechanical properties of CaB2H2 (2010, submitted for publication in PRB)

Other
- M.S thesis, Jön Steinar G. MÝðdal, University of Iceland, ’Theoretical Studies of Aluminum Based Nano Scale Materials for Hydrogen Storage’
- M.S thesis, Pavel Bessarab, Univ. of Iceland, ’The influence of hydrogen on magnetic properties of nanoscale metal clusters’


#5 Cooking up Networks:
[Nordic Network for sustainable development in isolated. Areas]

No public publications. Please contact Nordic Energy Research.

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[Scandinavian Hydrogen Highway Partnership]

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