Ea 2007

Ea Energy Analyses

Issued by

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Contents

Ea's offices are located on 1st and 2nd floor of the grey building at the corner of Frederiksholms Kanal and Nybrogade (the house to the left of the yellow house). See map on our website.

Who we are

Ea Energy Analyses is a Danish consulting company providing consulting services and performing research in the field of energy and climate change. Ea Energy Analyses operates in Denmark, the Nordic region and abroad with project activities in Europe, North America, Asia and Africa.

Our scope of work comprises analyses of energy systems from a technical, economic and environmental approach as well as analyses of energy and climate policy measures. Our analyses focus on new production technologies as well as savings and adaption of the energy consumption to a more intelligent energy system.

We use complex mathematical models for simulation of electricity and heat systems in a liberalised market, and we use scenario techniques to estimate long-term possibilities of developing sustainable energy systems. Moreover, we help companies in the energy sector to adapt to changing conditions.

In our work, we attach great importance to interdisciplinary integration, to a close dialogue with the customer during the whole process and to presenting the results in an accessible way without compromising professionalism and documentation. We have an ongoing cooperation with universities and other consulting companies.

View from Ea's terrace.

Customers and cooperators

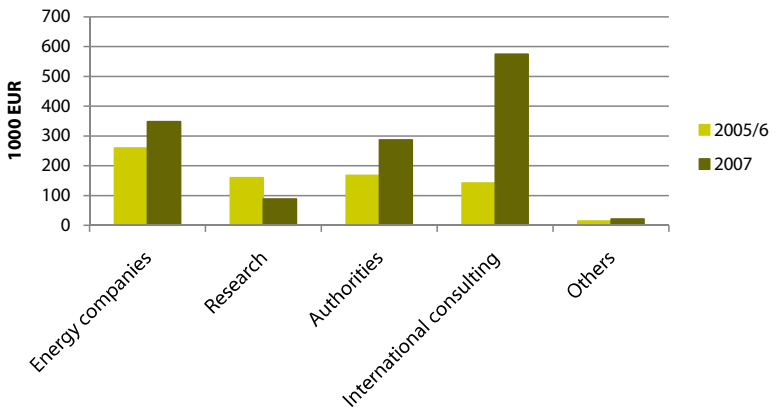
Customers

2007	2005/6	
	x	Amagerforbrænding Waste to Energy Plant
x	x	Copenhagen's energy utility company, KE
x		Danida/City of Cape Town
x	x	Danish Board of Technology
x	x	Danish District Heating Association
x	x	Danish Energy Association
x	x	Danish Energy Authority
x	x	Danish Environmental Protection Agency
x		Danish Oil Industry Association
x		Danish Wind Industry Association
x	x	Danish Wind Turbine Owners' Association
x	x	DONG Energy
	x	Energi E2
x	x	Energinet.dk
x		Energiselskabet Buskerud - the EB Group
x		Environmental Assessment Institute
x	x	EU: Intelligent Energy – Europe (IEE)
x		HNG/Naturgas Midt-Nord
x	x	International Energy Agency, IEA
x	x	Metropolitan Copenhagen Heating Transmission Company
x		New Brunswick System Operator, Canada
x	x	Nordic Council of Ministers
x	x	Nordic Energy Research
x		Office of the Auditor General
x	x	Research/Danish Energy Authority
x	x	Research/Energinet.dk
x		Secretariat of the Economic Councils
x	x	Shell Denmark
x		Svenska Kraftnät
x		UNEP Risø Centre/Government of Mauritius
	x	Vattenfall
x	x	VEKS
	x	World Bank/West Africa
x		Østkraft
x		Århus local authority

Cooperators

BEAMA, British Electrotechnical and Allied Manufacturers' Association, UK
Centre for Electric Technology, Technical University of Denmark
COWI
Danfoss
Danish District Heating Association
Danish Energy Association
Danish Energy Industries Federation
Dansk Energi Analyse
DONG Energy
ECON
EC Power
Hagman Energy, Sweden
Nordic Consulting Group
RAM-løse edb
Risø, Technical University of Denmark
SEAS-NVE
Siemens
Syd Energi
Wazee
ZSW, Centre for Solar Energy and Hydrogen Research, Germany

Revenue by customer group



A few figures

Summary of the annual accounts for 2007

	2007 1000 EUR	**2005/2006** 1000 EUR
Revenue	1,199	760
Direct costs, including salaries invoiced on projects	635	232
Other staff costs	335	201
Other external costs	194	208
Profit before tax	22	115
Tax on the profit for the year	-3	-34
Profit for the year	**19**	**81**
Fixed assets	52	30
Current assets	404	313
Total assets	**456**	**343**
Share capital	67	67
Equity, including profit for the year	167	148
Provisions	37	34
Payables	253	161
Total equities and liabilities	**456**	**343**
	Full-time/stud.	Full-time/stud.
Number of employees at company start 07.09.2005		4/0
Number of employees at end of financial year	12/4	9/3
Efficiency: Share of total hours invoiced on projects	60%	59%

The figures for 2005/2006 cover the period from 7 September 2005 to 31 December 2006.

2007 was characterised by considerable growth. Time was spent on establishing a strong professional environment, and against that background the result of the year is satisfactory.

Detailed annual accounts (in Danish) are available on our website www.eaea.dk.

2007 in Ea Energy Analyses

Ea Energy Analyses is still a new company in the consulting field. However, the first couple of years have given us plenty of work, lots of experience and many new and important relations.

2007 became a year full of activities. Our turnover increased by 78 percent compared to the first financial year. We made projects for returning clients but we also made a number of projects for new clients in Denmark and abroad – including projects in South Africa, Mauritius and Canada.

The issues dealt with in our projects ranged from the CO_2 quota system through combined heat and power, wind power, energy efficiency and white certificates to broad scenario analyses of the Danish and European energy systems. We made presentations in Denmark and abroad, we arranged workshops and we wrote articles on current issues.

Exciting projects in 2008 as well

Our volume of orders at the end of the year shows that 2008 will be a busy year as well with many new projects in the pipeline. These projects will further develop the expertise we have gathered so far, and they require that we maintain a multidisciplined working environment in Ea and continue to collaborate with other consultants.

Valuable experience

We are pleased with and grateful for this development which has given us a valuable range of experience to draw from in the day-to-day work – both professionally and administratively. We have learned a lot in the past year; one important lesson has been that all that glitters is not gold. That is a valuable experience.

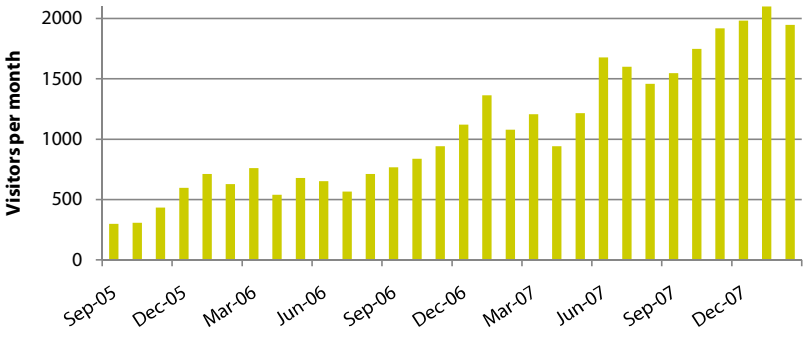
We know that is crucial to have the right people - people who are knowledgeable, possess analytical skills, are committed and not least, who have the ability and the inclination to cooperate with each other and with our clients. Such people work in Ea today and we believe that we will be able to attract the right people in the future as well in line with an increasing level of activities. We started out with four partners – today we are 12 full-time employees and five student assistants. In 2007, we had interns from Cameroon and Romania, who contributed both professionally and socially to the working environment in Ea.

It is also important to point out our excellent cooperation with external consultants, who are working on a number of specific projects. It is a working arrangement that we are very pleased with because the external consultants both reduce our workload and help Ea's employees develop their professional skills. Finally, they play a great part in developing a nice working environment in Ea.

Development of knowledge

One of the risks of being a consultant is that you forget to update your knowledge because of the daily workload, and therefore the continued development of specialist knowledge is a very important issue in Ea. To be a part of generating new knowledge about energy systems, we have

Visits to Ea's website



Both Hans Henrik Lindboe and Mikael Togeby celebrated their fiftieth anniversary in 2007.

chosen to participate in a number of R&D projects. These projects do not contribute significantly to earnings, however, they both maintain and improve our competencies, and they help create important networks nationally and internationally.

We have also learned that stress can occur when the objective is to meet deadlines as well as to ensure high quality work. Therefore, in spring 2007, we set up an internal committee to deal with stress issues such as how the work can be planned in order to minimise the stress level in Ea, though this can be difficult at times. We also know that demands on the IT systems grow more than proportionally with the number of employees and that an efficient IT system reduces the risk of stress. An important task in 2008 is therefore to adapt our IT systems to our way of working.

Visible results

Communication and visible results are important, and our website is one of our key tools for this. We try do update the website both in Danish and in English regularly, and in 2008 it will re-emerge in a new and more user-friendly version. From the visitors statistics of our website we can see that it is used by both our clients and our networks. In 2005/2006, there were 10,542 visitors on the web-site, whereas in 2007 the number had increased to 17,731 visitors. See the figure on the previous page.

During the year, we celebrated that Hans Henrik Lindboe and Mikael Togeby both turned 50, and we held our annual "Energy party" in November with many guests, a lot of talking, live music and even dancing!

This was a lot of words about the life of Ea in 2007. The conclusion is: Ea is alive and well, and is developing as we had hoped for. We are looking forward to the years to come.

Topics

Particularly five central topics characterise Ea's scope of work in 2007: model analyses carried out with the Balmorel modelling tool, scenario analyses, energy efficiency and intelligent energy consumption, district heating and wind power. On the following pages, Ea's tasks within the five topics are described.

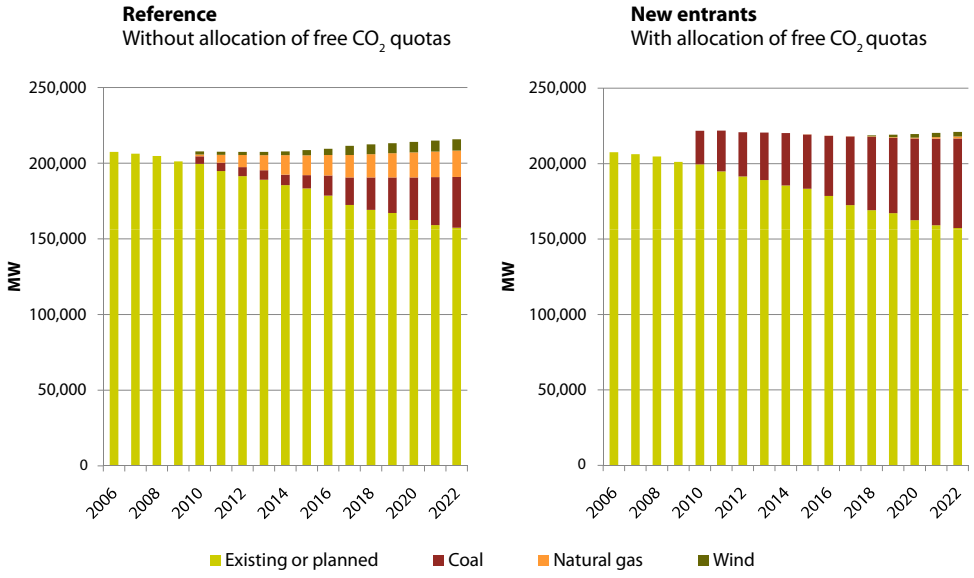
Balmorel – a dynamic tool for model analyses

In 2007, Ea upgraded its competencies within model analyses of the energy system. We hired two new employees specializing in mathematical modelling of energy systems, and we participated in a number of projects in which model analyses are essential.

Particularly the use of the electricity market model Balmorel has played an important role in several of Ea's projects. Experience and a data basis have been built up over a number of years in a model forum comprising Risø DTU, COWI, Ramløse edb and former Elkraft System, and the model has been used and tested in a number of projects. Ea carries out model analyses single-handedly but often also in cooperation with other analysts.

Simulates investments

One example of how Balmorel was used is an analysis of the correlation between investments in the electricity market and the CO_2 quota system, which Ea completed in spring 2007 for the Danish Environmental Protection Agency. The Balmorel model simulated investments in new electricity production capacity in Northern Europe in the coming 20 years based on various assumptions regarding the design of the CO_2 quota system. This enabled us to analyse how the quota system would influence the amount of new plants, their geographical location and the type of plants. The model analyses showed that the existing allocation of free quotas to new plants work as an investment grant to lignite, coal and gas, contrary



The figure shows the results of Balmorel calculations of investment in new power plant capacity in the North European electricity market in the period 2010 – 2022. Without allocation of free CO_2 quotas to new plants (the reference calculation to the left) investments will be made in wind farms, natural gas- and coal-fired plants. With allocation of free CO_2 quotas, only investments in coal-fired plants, primarily in Germany, will be made (the calculation to the right).

to the purpose of the quota system. Ea presented the results of the analyses at a seminar in Brussels in May. There was great interest in the conclusions, which indicate that allocation of free quotas to new plants is inexpedient, distorts the electricity market, generates substantial socio-economic losses and makes it considerably more expensive to reach ambitious objectives for renewable energy and CO_2 reduction. In the beginning of 2008, the EU made a proposal for new rules for the CO_2 quota system after 2012 that pave the way for the scrapping of free quota allocations to new plants.

Rapid adjustments and synergy

We and our customers benefit greatly from a flexible system model such as Balmorel. The advantage of Balmorel is that it can be adjusted to make calculations on new problems as they arise. The model was developed in a so-called high-level modelling language, which makes it easy to adjust and expand this model compared to other similar models. The above-mentioned CO_2 project is a good example, as Balmorel was not originally designed to handle systems such as the allocation of free CO_2 quotas. During 2007 we have also worked on how to integrate new issues into the model, for example renewable energy markets, wind power objectives, various congestion management systems in the electricity market and an increased level of detail in the district heating system.

We create synergy between the projects by continuously developing the model and updating data to new assumptions, projections, plant types etc. We seek to ensure transparency in this connection and share development in the model or in the sets of data with our cooperators whenever possible; and we thank our cooperators for reciprocity in this area.

Projects in which Balmorel was used

- Impact of CO_2 quota allocation to new entrants in the electricity market (the Danish Environmental Protection Agency)
- Steps for improved congestion management and cost allocation for transit (the Nordic Council of Ministers)
- Congestion management in the Nordic electricity market (the Nordic Council of Ministers)
- Energy policy for Mauritius, 2007 – 2025 (UNEP Risø Centre)
- 50 percent wind power in Denmark in 2025 (the Danish Wind Industry Association)
- System costs related to wind power (the Environmental Assessment Institute)
- Efficient district heating in the future energy system (the Energy Research Programme)
- Integration of wind power in New Brunswick, Canada (New Brunswick System Operator, NBSO)
- Analyses of the future load dispatch of district heating in the Greater Copenhagen area (Copenhagen Energy, the Metropolitan Copenhagen Heating Transmission Company (CTR) and VEKS)

See also www.balmorel.dk

Long- and short-term scenario analyses

Scenario analyses played an important part in Ea's work in 2007.

Denmark's future

On 17 September 2007, the project "The future Danish energy system" under the Danish Board of Technology was completed with a conference in the Danish Parliament, in which members of the Danish Energy Policy Committee participated. The purpose of the project, which involved a broad range of stakeholders in the Danish energy sector, was to shed light on different technological pathways enabling a 50-percent reduction of CO_2 emissions and oil consumption in the energy sector by 2025. In the project's recommended "combination scenario", the most important measures are more efficient cars, increased implementation of energy saving measures in households and industry and increased use of renewable energy. At the conference, a number of project "batons" were passed to key players in the energy sector.

As a part of the project, a modelling tool called STREAM was developed in collaboration with Risø DTU, DONG Energy and Energinet.dk. STREAM has since been used in a number of scenario projects and for educational purposes. The tool is capable of modelling all the energy streams in the energy sector, including the interaction between the energy and transport sectors. On www.tekno.dk it is possible to download the final scenario report and other documentation from the project.

...and the European Union's

In cooperation with the Danish Board of Technology and Risø DTU, Ea has studied how the objectives of the EU to improve the security of supply and reduce greenhouse gas emissions can be reached in an economically efficient way. In connection with the project, which was initiated by STOA, the STREAM model has been further developed and now contains publicly available data from all EU countries. The first phase of the project was completed with a conference in the European Parliament on 20 November 2007 at which the project's suggestion for a sustainable energy scenario for Europe in 2030 was presented. In phase two, which runs until autumn 2008, meetings with members of the European Parliament and key stakeholders will be arranged. Their tasks will be to assess measures within different areas such as energy efficiency improvement and savings, transport, electricity supply and energy infrastructure.

Scenarios for 2020 and 2050

Together with Risø DTU, Ea has analysed which combination of technologies may be used in the Danish energy system to reach the future green house gas reduction goals of 30-40 percent in 2020 and 60-80 percent in 2050 in a cost-effective way. The study comprises all greenhouse gases covered by the Kyoto Protocol, including emissions from the agriculture, the transport sector and the oil and gas extraction activities in the North Sea. The analyses are based on the scenarios and scenario tools developed in connection with the project commissioned by the Danish Board of Technology, "The Future Danish Energy System", as well as the assumptions used by the Danish Energy Authority in its projections. The project was carried out for the Danish Environmental Protection Agency/Danish Energy Authority, and the analyses are available on www.ens.dk.

Nordic scenarios

For the Climate Group under the Nordic Council of Ministers, Ea has summed up results and conclusions from a number of recent studies on how the individual Nordic countries and the Nordic countries as a whole can reduce greenhouse gas emissions in the period until 2050. The conclusions are that it is technically possible to reduce emissions significantly (by more than 50 percent) by 2050, that this to a great extent is feasible by using existing technologies and that it can be done at relatively low costs (less than 1 percent of GDP). See www.norden.org.

The effect of climate changes on the electricity sector

The Nordic Council of Ministers has initiated a four-year research project which investigates how climate changes, for instance changed amounts of precipitation or changed wind conditions, may affect the energy sector in the next 20-30 years. Ea's contribution to the project will be to outline scenarios for the future Nordic energy sector and to assess the vulnerability of the electricity sector to climatic changes.

The view from Ea – a hundred years ago

The Storm Bridge 1907: View from the rooftop of the building where Ea's offices are located today.

The photo was taken by Anders Kofoed-Wiuff's great grandfather, Charles Hansen, on the Child Welfare Day in 1907. In the family's photo album, it says that the vehicle at the bottom right of the photo is the "fire engine".

Charles Hansen was a plumber and an inventor. He used all the money from his plumbing career on inventions which, however, never made him rich. His most profitable invention was the so-called "cold gas cooker".

The photo of the Storm Bridge from 1907 shows a townscape where nothing much has changed. Streets and buildings look roughly the same in spite of a hundred years' hectic development. This can remind one of the longevity of a lot of infrastructure. Even though the power plants of today will have been replaced in a hundred years, there will still be many traces of the decisions taken today. It is important that decisions taken within the fields of energy and environment are long-term decisions as the climate change challenge calls for a long-term perspective.

Beer trade at Frederiksholms Kanal 1

In 1880-81, J. Jensen was a beer vendor and a bottler at Frederiksholms Kanal 1. At that time, the beer was delivered in barrels from the breweries, after which the beer vendors bottled the beer and put their own labels on the bottles. J. Jensen's label is an example of such a label. However, several less scrupulous beer vendors were caught in putting a label on the bottle which did not reflect the content of it. A number of such cases back in the 1870's and 1880's led to the breweries introducing licenses and rules stating that the beer vendors had to use the labels of the breweries. Later on, the breweries took over the bottling, and bottling of beer disappeared as a trade.

Beer label from 1880-81 when J. Jensen bottled and sold beer from Frederiksholms Kanal 1. Today it is the address of Ea's offices.

Energy efficiency and intelligent energy consumption

Energy consumption is a key factor in several of the analyses Ea has worked on in 2007.

Simple and very economical

Energy savings are small and often very simple. They are often economical: In return for an extra investment, one gets reliable savings year after year. Well-known technologies, such as low-energy lamps and isolation, will over time be supplemented by new technologies as for instance efficient lighting by means of diods or automation in private homes, which may save energy.

The potential of the energy savings can be seen in, for example, the scenarios drawn up by the Danish Board of Technology. In these scenarios, final energy consumption (without transportation) in 2025 is reduced by 30 percent in spite of expectations of economic growth and increased demand for energy services.

As the individual energy savings are so modest, it is however a challenge to design measures where the costs match the realised savings.

Negotiable white certificates

For the Danish Energy Authority, Ea has carried out an analysis of which conditions Denmark should take into account if the government should wish to introduce a system for negotiable white certificates as an efficient measure. The project focussed on practical experience from the UK, Italy and France – and on the possibilities of transposing the experience to Denmark. The positive experience from the three countries include:

- Transportation can be included in such a system (like in France).
- White certificates can be traded at an exchange. This could motivate new players (like in Italy).

Negotiable white certificates are not a miraculous remedy. The investigation points out that it may be difficult to avoid issuing white certificates to savings that would be realised no matter what (so-called free riders). In the three countries, standard schemes are used to a large extent as they reduce administration costs. A standard scheme could for instance be to attribute a certain amount of energy savings to a low-energy refrigerator. The savings are considered as realised regardless of the actual condition. It is easy but not accurate, and it requires regular updating.

Dynamic electricity consumption

On behalf of Energinet.dk, Ea is participating in two research projects on the advantages of dynamic electricity consumption.

One project is carried through together with the Centre for Electric Technology at the Technical University of Denmark and investigates the use of electricity consumption as fast reserves in order to protect the electricity system against large system disturbances. Selected types of electricity consumption may be interrupted within e.g. 0.5 seconds if frequency in the grid is dropping. Very often, the interruption only has to last for a few minutes, and many types of electricity use are suitable for this purpose, for example electric heating, freezers and pumps. Particularly if the number of central power stations decreases in the future, demand response solutions may become more and more attractive. Already today, the economy in using demand response as reserves looks promising. Among the challenges are a new type of monitoring of the reserves and design of an economic model enabling millions of devices to become frequency-controlled.

Spot price-controlled houses

The other project examines the possibility of letting detached houses with electric heating pay their electricity on the basis of a spot price. In the areas of SEAS-NVE and Syd Energi, 250 detached houses are participating in such a pilot project. So far, the experience is that by means of automation it is actually possible to avoid the most expensive hours, without reducing the consumers' comfort. The economic incentive is, however, limited when only the spot price varies. If duties and tariffs were dynamic too, savings could be multiplied.

Whether electricity consumption acts as a reserve or as price-controlled consumption, it will increase the dynamics of the system, which may be an important element in a future electricity system where an increasing share of electricity is produced by wind turbines.

The projects are further described on www.eaea.dk.

District heating in a process of change

District heating plays an important role in the Danish energy supply. After the oil crises in the 1970s, district heating was expanded and a number of small-scale and large combined heat and power plants were built. Through the heat planning, it was ensured that a large number of consumers were connected to the district heating grids. Today, district heating accounts for 60 percent of heating in Danish households. Furthermore, a strong district heating infrastructure has been set up in both small and large cities.

In the EU and in Denmark, the objective is to reduce dependency of fossil fuels and to use energy more efficiently. District heating and combined heat and power may play an important role in the efforts to reach the goal. However, district heating is also facing serious challenges. Heat savings may weaken the financial basis for district heating in some areas. At the same time, large amounts of wind power in the electricity system may reduce operating hours at CHP plants. New technology and changed framework conditions may make individual solutions such as electric heating, heat pumps and micro-CHP more attractive than previously. For these reasons, the competitive conditions between district heating and other types of heating may change in the future. The question is therefore, to which extent district heating will be part of the answer to the future demand for energy efficiency and use of renewable energy.

Ea is participating in several projects on the development of the role of district heating in Denmark. The projects range from the very long-term challenges, which are dealt with in a research project with participants from the District Heating of the Future Committee of the Danish District Heating Association to the more short-term challenges facing the heating companies in the Greater Copenhagen area after Vattenfall took over Amager Power Station and thus created competition in Copenhagen's heat market.

Efficient district heating in the future

Together with representatives from the District Heating of the Future Committee of the Danish District Heating Association, Risø DTU and RAM-løse edb, Ea is participating in a research project supported by the Danish Energy Authority. The aim of this project is to analyse how district heating can develop its role in the future energy system by reducing the energy losses and through dynamic use of both existing and "new" energy technologies such as heat pumps, geothermal power, district cooling and heat storage. Furthermore, the project aims to explain how the interaction between the electricity market and district heating can be made more efficient, and to point out framework conditions of particular importance to the further development and improved efficiency of district heating. The analyses are made using, among other things, the electricity market model Balmorel.

New roles in the Greater Copenhagen area

In the Greater Copenhagen area, Vattenfall has taken over Amager Power Station while DONG Energy still owns Avedøre Power Station, H.C. Ørsted Power Station and Svanemølle Power Station. Energi E2 (today DONG Energy) previously handled the overall optimisation of production at the stations in the Greater Copenhagen area. However, this is no longer possible as Vattenfall has taken over Amager Power Station. In the interest of competition in the electricity market, the two producers are not allowed to exchange all types of information about planned production prior to the day of operation. Therefore neither of the companies is able to draw up an overall plan for operation of all units in the heating system. It has thus been necessary to find a new load dispatch procedure. This new situation implies that the heating companies will have a greater role to play in the daily operations in the future. They have therefore established a whole new unit for this purpose: the load dispatch unit of the heating companies – in Danish VLE.

In 2007, Ea assisted the unit in analysing various organisational models for the new load dispatch procedure. At the same time, Ea has been a process consultant during the set up of the new unit. Finally, Ea has developed various IT tools for the daily planning of operations.

View over Copenhagen with Middelgrunden Offshore Wind Farm, Amagerforbrænding Waste to Energy Plant and Amager Power Station, which supply Copenhagen with electricity and heat. Photo: Jan Kofod Winther.

Wind power in the future energy system

Wind power has been subject to many debates during 2007. When considering the emissions of CO_2, SO_2 and NO_x from the energy production, wind power has many obvious environmental advantages. However, it is difficult to assess how great the advantages are and what the economy of increasing wind power capacity would be as the production of wind power is integrated into the electricity system and electricity market in a complex way.

These issues formed the basis of a number of analyses which Ea carried through in 2007. In spring 2007, focus was on two extensive analyses of integration of wind power which were made for the Danish Wind Industry Association and the Environmental Assessment Institute. Both analyses are based on mathematical modelling of the North European electricity system and the combined heat and power system, using the Balmorel model (see the article on Balmorel on page 8).

Wind power conditions in Denmark

At a seminar in May 2007, Ea presented the main conclusions from the report "50 percent wind power in Denmark in 2025", which was made for the Danish Wind Industry Association. On the same occasion, Energinet.dk and the Danish Energy Association commented on the results of the analyses. The Environmental Assessment Institute has used our analyses to form part of the basis for the report "The price of wind power", which analyses the socioeconomic costs of further increasing Danish wind power capacity to meet 30, 40 and 50 percent of the electricity consumption in 2025. The report can be found on www.imv.dk (Danish version only).

In addition to this, Ea has assisted the Danish Wind Turbine Owners' Association in producing a number of facts sheets about wind energy. For further information, see www.dkvind.dk.

Nordvind – coordination of wind power in the Nordic countries

Nordvind is a project under the Nordic Council of Ministers' Working Group for Renewable Energy. The Nordvind working group comprises representatives of the authorities in Sweden, Norway, Finland and Denmark, and Ea is the secretariat to the group. Nordvind aims to coordinate wind power expansion in the Nordic countries through exchange of experience and mutual problem solving. The main focus is the authorities' planning and procedures for handling of wind power projects. However, other conditions for integration of wind power are also included in the work.

In 2007, one of the Nordvind activities was a workshop on the Swedish island Gotland where 40 people from the Nordic countries gathered for two days of intensive work with barriers and opportunities for wind power in the Nordic countries. One of the results from this workshop was that key players agreed to cooperate on collecting experience from the Swedish/Danish/German offshore wind farm projects at Kriegers Flak (in the Baltic Sea).

Similarly, a workshop focusing on developing competencies for local wind power planners in the Nordic countries will be arranged in 2008. The work of Nordvind is described in more detail on the website www.nordvind.org.

Integration of wind power in Canada

Ea also works with wind power outside of the Nordic countries. Hence, in autumn 2007, we held a seminar for New Brunswick System Operator, NBSO, which is the system operator for the electricity system in the province New Brunswick in Canada. The purpose of the seminar was to pass on some of the Nordic and European experience in integrating wind power into the electricity system.

On the basis of the seminar, a larger project for NBSO has been launched. The project encompasses an overall system analysis of how wind power can be integrated into the North American electricity markets. It will also include a draft road map for the integration of wind power in New Brunswick in which the local conditions are taken into consideration. The project will be carried out during the first six months of 2008.

Our projects

RECaBS – Renewable Energy Costs and Benefits to Society	The main purpose of the project was to estimate the costs and benefits of electricity from renewable energy sources compared to conventional technologies in a fully documented and transparent way. The economic values of various externalities - air emissions, system integration, security of supply and employment - were included in the analyses. In cooperation with Wazee and Spang Media, we have developed an interactive web-based tool which makes it possible to calculate the advantages and drawbacks of renewable energy technologies compared to conventional electricity technologies. The tool is available on www.recabs.org.	The project was carried through for the International Energy Agency's Implementing Agreement on Renewable Energy Technology Deployment (RETD). The project was launched in November 2006 and completed in January 2008.
Energy poverty alleviation – a catalogue of opportunities for the City of Cape Town	The project involved developing a catalogue on tariff models that can be used to address energy poverty in Cape Town. The catalogue focuses on various tariff models for alleviating energy poverty in urban areas, on the models' efficiency, strengths and weaknesses as well as on the potential costs. The project also investigated the implementation of energy efficiency in low income households. The outcome of the project was a number of recommendations to the City of Cape Town of carrying through information campaigns among low income households about energy savings and about understanding the electricity bill. We also recommended the City of Cape Town to offer micro-financing of compact fluorescent lamps and to change the monthly allowance of free basic electricity for low income households.	The project was carried out for the City of Cape Town under Danida's Urban Environmental Management programme. It was initiated in October 2007 and completed in December 2007. The project report can be found on www.eaea.dk.
Energy policy for Mauritius 2007 – 2025	The project was carried out by a project consortium of international energy experts, and it resulted in an energy strategy and a plan of action for Mauritius until 2025. Ea primarily made analyses of the electricity sector. The task comprised assessment of the existing electricity system, modelling and scenarios for integration of new technologies until 2025. Also recommendations for conditions for new producers, tariff structures etc. were included in the task. The electricity market model Balmorel was used for the modelling.	The project was carried out by UNEP Risø Centre and Ea for the government of Mauritius. It was financed by the EU and the United Nations Development Programme (UNDP) and ran from August 2007 to January 2008.

Congestion management in the Nordic electricity market

The project focusses on the technical and economic consequences of the present congestion management in the Nordic electricity market and the most important alternatives to the present regime. The analyses include efficiency of resource utilisation, market power, incentives for infrastructure investments, security of supply and technical issues. The electricity market model Balmorel is used in the analyses.

The analyses will form the basis of concrete recommendations concerning the future Nordic congestion management and should be seen in context with the previous project "Steps for improved congestion management and cost allocation for transit".

The project was carried out by Hagman Energy, COWI and Ea for the Nordic Electricity Market Group under the Nordic Council of Ministers. It was initiated in December 2007 and is expected to be completed in March 2008.

ESMA – European Smart Meter Alliance

Ea has joined 13 other European organisations to launch the European Smart Metering Alliance (ESMA). The main focus of the project is the possibilities for encouraging energy savings, for instance by giving customers the chance to monitor their own energy consumption. A real-time reading of their energy consumption can help in making costumers aware of the costs of energy.

Some countries, including Norway and the Netherlands, have taken concrete steps towards demanding remote meter reading in all households. In Denmark we seem to be behind in this area.

The project is supported by the Intelligent Energy Europe (IEE) programme and is expected to be completed by 2010. A number of publications are being prepared, including a manual on the use of new electricity meters. For further information, see www.esma-home.eu.

Formulation of Danida's cooperative programme on renewable energy in China 2009 – 2013

The result of the project is expected to be a programme formulation of Danida's support to a renewable energy centre in China. Jørgen Boldt represents Ea in China and works as an international energy sector expert on the project. Ea is to give recommendations to Danida as to which technologies a renewable energy centre in China should focus on, and how synergy between Danish research and knowledge on renewable energy and Chinese needs in this regard can be obtained.

The project is carried out by the Nordic Consulting Group and Ea for Danida, which is funding the project. It was initiated in December 2007 and will be completed in the middle of 2008.

What we talk and write about

Presentations

- **Environmental sustainability.** Presentation by Helge Ørsted Pedersen at a session of the OECD Territorial Review study mission, Copenhagen, 02.04.08
- **Results from demand response demonstration project in households.** Presentation by Mikael Togeby at the conference "Smart Metering Scandinavia 2008", Stockholm, 25-26.02.08
- **Future energy scenarios for Europe.** Presentation by Anders Kofoed-Wiuff at the STOA seminar in the EU Parliament, Brussels, 20.11.07 and to the ITRE Committee (Industry, Transport and Energy) in the EU Parliament, Brussels, 19.12.07
- **White certificates - What can Denmark learn from other countries?** Presentation by Kirsten Dyhr-Mikkelsen at the seminar "Vita certifikat – senaste nytt om marknadsbaserade styrmedel för effektiv energianvändning", Stockholm, 28.11.07
- **Security of supply for Bornholm: Demand-side options for system reserves.** Presentation by Edward James-Smith at PowerEvent Bornholm held at the Centre for Electric Technology, Technical University of Denmark, 22.11.07
- **50% wind power in Denmark and power market integration.** Presentation by Jesper Werling and Lars Bregnbæk at Nordic Wind Power Conference 2007, Risø DTU, 1-2.11.07
- **The Nordic electricity market.** Presentation by Hans Henrik Lindboe at the Workshop on Transmission Access, Investment and Pricing, London, 23.10.07
- **Energy savings in Denmark - lessons learnt.** Presentation by Mikael Togeby at the conference "2007 International Forum on Demand Side Management in China", Beijing, 24.06.07
- **Impact of suboptimal design features in the EU ETS - Allocation in the electricity market.** Presentation by Hans Henrik Lindboe at a meeting in the EU's ECCP working group on emissions trading, Brussels, 22.05.07
- **Innovative electricity markets to incorporate intermittent production.** Presentation by Mikael Togeby at IEA Implementing Agreement on Electricity Networks Analysis, Research & Development (ENARD) Workshop, Wien, 20.03.07
- **The crucial role of demand response.** Presentation by Mikael Togeby at Smart Grids Forum 2007, Amsterdam, 23.01.07

Papers

- **The electricity tariff system, consumption and purchasing patterns and energy efficiency in low-income households in Cape Town.** Paper by Edward James-Smith and Mikael Togeby for the conference "Domestic Use of Energy", Cape Town, 18-20 March 2008
- **50% wind power in Denmark and power market integration.** Paper by Jesper Werling and Lars Bregnbæk at Nordic Wind Power Conference 2007, Risø DTU, 1-2.11.07

Presentations and papers are available on www.eaea.dk.

Each of us

Helge Ørsted Pedersen
MSc Economics, Partner
- Energy planning and climate policies
- Long-term scenarios
- Cross-sectoral analyses
- Strategies for research, development and demonstration
- Development of various types of cooperation in the energy sector

Co-founder of Ea, September 2005

Hans Henrik Lindboe
MSc Engineering, Partner
- System analyses and scenarios
- Handling of security of supply in a liberalised electricity market
- Renewable energy technologies
- CO_2 abatement measures and measures to promote renewable energy
- Development of the heating sector to meet future requirements

Co-founder of Ea, September 2005

Kaare Sandholt
MSc Energy Planning, Master of Management Development, Partner
- Integration of renewable energy into the energy systems
- Development of the transmission system operator role in a liberalised electricity market
- International projects on energy
- Emergency preparedness in the electricity sector
- Organisational development, communication and coaching

Co-founder of Ea, September 2005

Mikael Togeby
MSc Engineering, PhD, Partner
- Demand response, energy efficiency and electricity market analyses
- Electricity consumption forecasts and analyses, statistical analyses
- Long-term analyses of technologies and the energy system
- Evaluation of measures
- Research, development and demonstration

Co-founder of Ea, September 2005

Jesper Werling
MSc Energy Technology
- Analyses and planning of integrated energy systems, including analyses of electricity markets and district heating systems
- Development and application of mathematical energy systems models
- Combustion and gasification technologies
- Planning in the district heating sector

Employed October 2005

Anders Kofoed-Wiuff
MSc Technological and Socio-Economic Planning
- Analyses of energy systems
- Environmental costs and CO_2 reduction regulation
- Long-term energy and climate scenarios
- Development and application of energy system models
- Cooperation between authorities and energy companies

Employed December 2005

Camilla Hay
MSc Technological and Socio-Economic Planning
- Planning and analyses of wind power
- Integration of renewable energy into the electricity system
- Planning of energy systems
- Evaluation of research projects
- Emergency preparedness in the electricity sector

Employed October 2006

Edward James-Smith
MSc Technological and Socio-Economic Planning,
BSc Biochemistry
- Energy efficiency
- Energy sector regulation and policies
- Demand response
- Energy economics in developing countries and economies in transition
- Energy system planning

Employed January 2007

Lars Bregnbæk
MSc Engineering, Applied Mathematics
- Modelling of energy systems
- Economic equilibrium modelling
- Mathematical programming
- Operations research

Employed March 2007

Nina Marie Holmboe
MSc Environment
- Analyses of CO_2 quota and CO_2 credit markets
- CO_2 reduction legislation
- CDM and JI projects – investments, evaluation of risks, management etc.
- Economic optimisation in the district heating sector

Employed November 2007

Kirsten Dyhr-Mikkelsen
MSc Energy Planning and International Technology Transfer
- Energy efficiency services and regulation
- Evaluation theory and evaluation in practice
- Energy planning/integrated resource planning
- International technology transfer

Employed January 2007

Jørgen Boldt
MSc Energy Engineering, PhD Energy Engineering
Owner of Wazee
- Project management, primarily for international projects
- Energy sector policies and planning, in Denmark and abroad
- Climate change, including JI and CDM
- Electricity and heat generation technologies
- Renewable energy, particularly biomass technologies

Consultant for Ea

Majken Grünewaldt
Maîtrise in Applied Foreign Languages (English, German and French)
- Internal and external communication
- Webmaster
- Translation and proofreading
- Administrative tasks, including invoicing

Employed May 2006

Sheila Maria Kitching
BA.ling.merc., English and European Studies
- Translation and proofreading
- Updating of website
- Administrative tasks, including bookkeeping

Employed January 2007

Mikkel Haugaard Windolf
Student Assistant
- Is studying for an MSc in Energy Engineering at the Technical University of Denmark
- At Ea, Mikkel works with analyses of the electricity system and production plant, handling of data and models

Employed December 2006

Walter J. Sanchez
BSc Technological-Sociological Planning
Student Assistant
- Is studying for an MSc in Technological-Sociological Planning and Philosophy and History of Science at Roskilde University
- At Ea, Walter works with energy planning and strategies as well as energy economics in developing countries and economies in transition

Employed August 2007

Rasmus Sandbech Clausen
Student Assistant
- Is studying for an MSc in Engineering Design and Applied Mechanics at the Technical University of Denmark
- At Ea, Rasmus works with district heating and data handling

Employed August 2007

Katja Frederik Buhrkal
BScE Mathematics and Technology
Student Assistant
- Is studying for an MSc in Applied Mathematics at the Technical University of Denmark
- At Ea, Katja works with analyses of the electricity system and production plant, data handling and mathematical modelling

Employed September 2007

Kim Frithjof Mygind
BScE Mechanical Engineering
Student Assistant
- Is studying for an MSc in Engineering Design and Applied Mechanics at the Technical University of Denmark
- At Ea, Kim works with data handling, modelling and analyses of electricity and heat systems, industrial production systems and traffic systems

Employed January 2008

Alexandros Filippidis
BSc Computer Engineering
Intern
- Is studying for an MSc in Sustainable Energy Planning and Management at Aalborg University
- At Ea, Alexandros works mainly on energy scenarios and data analyses

Started as an intern in January 2008

In 2007, Troels Hartung was employed with Ea. Cecilie T. Holst, Catarina Marcus-Møller and Casper F. Thorhauge worked as student assistants, and Elena Custura (Romania) and Divine Ngwana Che (Cameroon) were interns with Ea.

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