



## **Deliverable 0.2**

### **Final plan for using and disseminating knowledge**

**Author:** Sørensen, Mette Reiche  
**Company:** Aalborg University  
**Address:** Fibigerstraede 13  
9220 Aalborg  
Denmark

**Email:** mettes@plan.aau.dk  
**Date:** 2007-05-31  
**Document Name:** Deliverable 0.2. Final plan for using and disseminating knowledge  
**Belongs to:** Project - WPO  
**Further Authores:** Ebbe Münster (PE), John Sievers (UniK), Carlos Madina (Labein), Anders Andersen (EMD), Peter Ritter (EMD-D), David Toke (UoB), Florian Schlögl (ISET), and Poul Alberg Østergaard (AAU).

**Abstract:** This deliverable provides an overview of the dissemination activities carried out during the project. Furthermore, it provides a complete picture of the knowledge created during the project and presents a plan for the future application and use of the project results. The inputs for the deliverable have been prepared by each work package leader.



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## **Final plan for using and disseminating knowledge**

DESIRE is a dissemination project and during the project, various initiatives have been taken to present the knowledge created to various target groups. The continuous dissemination has been an integrated part of the project work and has been reinforced throughout the project period. This dissemination will continue after the end of the project, as the results will be further used and exploited after the consortium lifetime. The first part of this report describes the use and dissemination of knowledge of each work package (WP) and the plans for future dissemination. In relation to WP8, a complete list of all recorded dissemination activities is presented. In the second part, a table presents a complete overview of the knowledge created in the project and the future application and use of this knowledge.

### **1. Dissemination activities of the WPs**

#### **WP 1: The balancing problem**

The objective of this work package was to identify key operation tasks for medium and small-sized CHP plants in order for them to contribute to the balancing of the electricity production and consumption. Furthermore, we have quantified the problems caused by the rising proportion of renewable energy sources in the European electricity system. The WP has assumed the following sub-tasks:

1. Providing data for existing and future balancing problems.
2. Quantifying the balancing problems that affect the European electricity inter-connector system.
3. EnergyPLAN modelling of balancing problems.
4. Identification of the role of CHP in balancing fluctuations.

#### **a) Dissemination activities undertaken during the project period**

In relation to WP1, a series of dissemination activities has been carried out.

In May 2005, when the project was initiated, the paper “The Benefit of integrated Energy and Transportation CO<sub>2</sub> Emission Control Strategies” was presented at the Energy Conference hosted by Risø National Laboratory in Denmark. Later this paper was published in “Transport Policies”, acknowledging the succeeding research made possible by DESIRE.

In September 2005, Ebbe Münster contributed to an ex-auditorio discussion in the Danish Parliament. With reference to DESIRE, Ebbe Münster explained the low potential of nuclear power for the balancing of fluctuating electricity production and presented other solutions to members of the Parliament.

In January 2006, The Danish Society of Engineers held a conference on “Technological Innovation”. The preliminary results of DESIRE were presented at the conference.

In March 2006, The Danish Society of Engineers headed a meeting on “Energy Trader”. DESIRE was discussed at the meeting. Following this meeting, Ebbe Münster was invited to take part in the writing of a paper to be presented at the Meeting in the Committee of Energy Policy in the Danish Parliament, March 29th, 2006, regarding intelligent electricity meters and DSM.

In May 2006, the DESIRE project was presented to German stakeholders at the DESIRE seminar in Kassel.

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In October 2006, Henrik Lund referred to the results of DESIRE in his presentation of Danish energy policy at the annual conference of the Danish district heating industry. The presentation was followed by media coverage in the trade magazine of the industry.

In November 2006, the Energy Camp organized by the Danish Energy Association was attended by 48 participants from all branches of the Danish energy sector. During 30 hours, the participants discussed and defined six energy concepts which shall contribute to the solution of climate change problems in the world, as well as strengthen the European energy market. The results and techniques of the DESIRE project were also presented and discussed in this forum.

Also in November 2006, the results of DESIRE were presented at a Danish conference on Renewable Energy for power and transport, arranged by the Confederation of Danish Industries and Risø National Laboratory. Furthermore, the results were discussed at a public meeting on wind power at Risø National Laboratory.

In February 2007, another public meeting on wind power was held and the results of DESIRE were discussed in a new forum.

In January 2007, Poul Alberg Østergaard referred to the results of DESIRE in his presentation of co-generation at the POWERGEN Middle East Conference in Bahrain. An article was also included in the conference proceedings.

In May 2007, a seminar on 'Price flexible electricity consumption' arranged by the Danish TSO, Energinet.dk, and the Confederation of Danish Industries was attended. The importance of coordinating the establishment of new communication networks was discussed with representatives of the TSO. These networks should include all decentralised electricity producers and major consumers between the two purposes: a) securing stability and balance in smaller regions of the transmission grid (cells), and b) enabling fast and effective online markets for the balancing of fluctuating electricity producers. Relevant links and documents were exchanged.

Furthermore, the EnergyPLAN computer model for energy systems analysis has been developed and adjusted to the results achieved throughout the project. The model and the results are presented at the web site: [www.energyplan.eu](http://www.energyplan.eu)

#### **b) Dissemination activities to be carried out in the future**

The dissemination of results from WP1 and the project in general will continue. The first chance to present the final project results will be at the Dubrovnik Conference, June 4-8, 2007. A paper based on DESIRE and titled "Comparison of Electricity Balancing for Large-Scale Integration of Renewable Energy in six European Regions" has already been submitted and will be presented at the Conference by WP leader, Ebbe Münster.

An article titled "New CHP Partnerships offering balancing of fluctuating renewable electricity productions" based on the results of DESIRE has been submitted and is published in the Journal of Cleaner Production 15 (2007).

The results from WP1 will also be presented on the home page of the computer model EnergyPLAN, [www.energyplan.eu](http://www.energyplan.eu). The model is used for both research and teaching and a newsletter describing the use of the model and the results of DESIRE will be sent to a large group of users in July 2007. Furthermore, the EnergyPLAN home page will link directly to the home page of DESIRE to invite visitors to review further results achieved through the project.

### **c) Protection and use of the knowledge generated in the WP**

In general, the knowledge created in WP1 does not require protection. The knowledge has been widely used by several of the project partners in research and teaching and other actors can gain access to the same knowledge through our presentations, publications and the home pages of DESIRE and EnergyPLAN, respectively. The EnergyPLAN model can be downloaded for free. However, the EnergyPLAN name and logo is protected through a trademark registration. The knowledge generated will be used and developed on a continuous basis in the work of the companies involved and in the teaching and research activities of the universities involved in WP1.

### **WP2: Short-term solutions and long-term perspectives**

The objective of this work package was to disseminate knowledge about appropriate technical solutions to overcome the problems that come along with the large-scale integration of renewable energy and CHP. The WP has disseminated knowledge on how CHP designs vary from one country to another and how future CHP plants must be designed to contribute to the balancing of the electricity production and consumption. The WP has assumed the following sub-tasks:

1. Evaluation of CHP and heat accumulator designs for participation in electricity markets.
2. Evaluation of other technologies with perspectives for solving the balancing problem.
3. Development of guidelines.

### **a) Dissemination activities undertaken during the project period**

An important dissemination activity was the DESIRE Seminar at the Kassel meeting in May 2006. The project idea was discussed with external experts from the Stadtwerke Kassel, the most important balancing power provider in Germany (STEAG company) besides the transmission system operators, and with one of the main green electricity market actors, Greenpeace Energy. It was a good opportunity also to inform colleagues from the DESIRE project partner ISET. Helpful for the process was also a guided tour at the hydro power plant of EON hydro power, where the role of wind and hydro power in the power system of today and the future was discussed.

At the meeting in Birmingham in November 2005, the role of cogeneration and demand response for integrating wind energy was presented to British cogeneration experts.

A presentation in Tallinn in Estonia was held for technical experts and decision makers also about the role of cogeneration and demand response in the integration of wind energy. The presentation focussed on the possibility and feasibility of integrating wind by use of cogeneration and thermal stores.

At Kassel University, some project results are already used in lectures in English and a Master's course on renewable energies in German; in common lectures for electrical engineering students; in another postgraduate course on renewable energies as well as in further presentations of our staff. The project results are also used in the work of our colleagues of ISET. Students who work on their diploma thesis are also involved in the new research by also considering e.g. the proposed Danish cogeneration design in their simulations or calculations.

### **b) Dissemination activities to be carried out in the future**

The guidelines which have been prepared (Deliverable 2.4) constitute an optimal possibility to disseminate the knowledge, both in terms of the whole project outcome and certain details. Some of the results shall also be used in the second part of the famous "Dena Sudie" about the

grid integration of wind energy in Germany. It is also planned to make two further publications about the results and to present the results at a conference about renewable energy integration with storages.

Furthermore, an article by John Sievers will be published in *Solarzeitalter* in September 2007 and an article about 50% wind energy integration by cogeneration with large heat stores is also scheduled for publishing both on VDI Nachrichten and Eurosolar/Sonnen seite.

### **c) Protection and use of the knowledge generated in the WP**

The gained knowledge will not be protected, but disseminated as far as it is of interest. Especially the solutions for the conducted simulations may be too detailed to explain to the general public, but this might be done to experts or graduates. It is intended to include the knowledge in further projects like in a project that was applied for at the “FNR”, which decides about proposals that are paid by the “Bundesministerium für Umwelt”. It is also planned to apply part of the knowledge to another EU project and to classes at Kassel University.

### **WP3: Barriers and opportunities for demonstrating projects in participant countries**

The objective of this work package was to identify the regulatory and trading conditions that will affect the implementation of the demonstration and dissemination actions in the different countries. To that end, EU- and country-specific regulations were analysed, as well as local market conditions and the attitudes that the actors participating in those markets have towards the balancing techniques proposed in the project. The WP has assumed the following sub-tasks:

1. Analysis of the nature and potential influence of relevant EU Directives.
2. Analysis of the impact of country-specific public regulations and electricity markets covering CHP and wind power.
3. Definition of potential for access to markets.
4. Identification of attitudes of market actors to the project.

### **a) Dissemination activities undertaken during the project period**

For the definition of market actors’ attitudes, different interviews were held with relevant market actors. These interviews were, thus, the first dissemination activity carried out during the project. Four actors were interviewed, trying to reach the widest scope of dissemination.

First of all, the Basque Energy Agency was contacted. Concerning their role as policy makers, they are in charge of developing energy programmes sponsored by the regional government and they also help the Spanish government when preparing new regulation. Besides, they act as energy producers, both wind power producers and CHP producers. For producing electricity from wind energy, they joined Iberdrola to create the company “Eólicas de Euskadi”, which is the main wind power producer in the Basque country. Regarding CHP production, they joined individual Basque industrial consumers to build up CHP plants in the facilities of those consumers.

Afterwards, Iberdrola was contacted. Iberdrola is the second biggest utility and the main wind power producer in Spain. In WP3, some people from distribution activity were contacted. In further interviews, people from generation and supply activities were also contacted, and they were informed about the project.

Then, Gamesa, the main wind turbine manufacturer in Spain and the second-ranking in the world was interviewed. At that moment, they also acted as a wind power aggregator, but a change in regulation removed the possibility for them to aggregate wind farms.

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The fourth interview for WP3 was with Red Eléctrica de España, the Spanish transmission system operator.

In addition to these interviews, dissemination activities included conference presentations and further interviews.

The first conference presentation was held in Birmingham (UK), during a meeting arranged by the University of Birmingham, following a project meeting. At the meeting, different project partners, including Labein, presented the project, as well as some results, to relevant UK actors.

The second conference presentation was held in Barcelona (Spain), during the conference “Distribution Europe 2006”, where Labein presented the results from WP3. During the conference, other main Spanish utilities were contacted and the project was presented. A general overview of the project was provided to Unión Fenosa (3<sup>rd</sup> Spanish utility) and Viesgo (5<sup>th</sup> Spanish utility) during the conference, and Endesa (the main Spanish utility) received a more detailed description in an interview appointed during the conference.

During the Bilbao project meeting, partners visited the Oiz wind farm, which is owned by “Eólicas de Euskadi”. While preparing the visit, the project was presented in an interview with the relevant staff.

The project has also been presented to Acciona and Gas Natural. Acciona is one of the biggest construction companies in Spain and the most important newcomer in the electricity market in Spain. Gas Natural is the main gas utility in Spain and the fifth biggest electricity producer in Spain (they produce more electricity than the fifth utility, which is Viesgo).

A written article has been sent to DYNA, a Spanish engineering journal, which is being evaluated at the moment of writing this report.

#### **b) Dissemination activities to be carried out in the future**

Future dissemination activities will include further interviews with relevant actors, such as Hidrocantábrico (the only utility not contacted yet) and associations of CHP producers (Cogen Spain, Autogeneradores de Energía Eléctrica – AAEE).

It is also Labein’s intention to continue the research in this field, by preparing a project for the National Research Plan, so that the economic and technical feasibility of the proposed techniques can be analysed in more detail.

#### **c) Protection and use of the knowledge generated in the WP**

The knowledge generated in the WP mainly refers to regulation and market conditions for the joint use of wind and flexible CHP. This information is therefore available to everyone and, thus, there is no point in protecting it.

The knowledge generated will help Labein in searching for innovative business ideas in the energy field, as regulation and market conditions set the rules and, hence, barriers and opportunities for stakeholders. Nevertheless, regulation is always changing, so a close look must be kept to regulation, in order to keep the knowledge generated in the project.



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#### **WP4: Developing organisational set-ups, optimising tools and IT for demonstration**

The objectives of this work package were to design and develop the particular organisational set-ups, the optimising tools and the IT needed for the demonstration of the balancing system. The WP has assumed the following sub-tasks:

1. Description of primary markets.
2. Description of conditions for delivering Ancillary Services.
3. Developing organisational set-ups.
4. Developing optimising tools.
5. Developing cost-effective IT solutions.

##### **a) Dissemination activities undertaken during the project period**

The IT needed for the demonstration of the balancing system is tested at two plants and described in a deliverable from WP4.

In the deliverables from WP4, the selected spot markets and balancing markets in Germany, UK and Denmark are further described, and outline descriptions are made of these markets in Estonia, Poland, Germany, Spain, UK and Denmark. The most appropriate types of agreements and sharing out of financial gains that will enable an efficient implementation of our schemes are presented. The optimising tools capable of optimising productions at the case studies in the UK, Germany and Denmark are described in WP4 and demonstrated in WP5. The main dissemination activities of WP4 are linked to the actual demonstrations made in WP5. However, Anders N. Andersen presented the balancing techniques of DESIRE at the DESIRE Seminars in Birmingham in November 2005 and in Kassel in May 2006.

##### **b) Dissemination activities to be carried out in the future**

In WP1, it is demonstrated that when a major proportion of electricity is produced by wind turbines, significant and desirable socio-economic and environmental benefits can be achieved by building flexible CHP plants, matching the wind turbines in capacity. These plants must be equipped with sufficient capacity of CHP, heat pump and thermal store. A typical mix of capacities for a well balanced future system in West Denmark with an increased amount of wind power (5000 MW) is exemplified by the following figures: 1500 MWe of CHP with 350 MWe of heat pumps and 25 GWh of heat stores.

A Danish heat pump demonstration programme is needed. A first step has been made, since Aalborg University, EMD and other Danish partners have received public funding for building heat pumps at two decentralised CHP plants and to demonstrate how these heat pumps will be operated on the spot market and the regulating power market. The optimising tools capable of optimising productions at a decentralised CHP plant with both CHP units and Heat pumps will be developed in this Danish project as an obvious continuation of the techniques developed in this WP4.

##### **c) Protection and use of the knowledge generated in the WP**

In WP4, we have developed the simulation tool energyTRADE, which finds optimal bidding prices by calling the energyPRO calculation engine over and over again, thus estimating the costs of offering e.g. an upward regulation on the Regulating Power Market. This version of energyTRADE does not require protection.

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### **WP5: Demonstration projects**

The objective of this work package was to demonstrate the set-ups, the tools and the information technologies developed and described in WP4. This demonstration has taken place in Germany, Denmark, and the UK in specific case studies. The WP has assumed the following sub-tasks:

1. Describing CHP Plants and RES organised by Stadtwerke Schwäbisch Hall in Germany.
2. Organising CHP plants and wind turbines in Denmark.
3. Operating CHP plants organised by PB Power in the UK.

#### **a) Dissemination activities undertaken during the project period**

In April 2006, the software developed with DESIRE and the objectives of the project were presented at a workshop in Dortmund attended by representatives of the energy sector, industry and NGOs. Some of the WP5 case studies of the DESIRE project were presented and discussed in November 2006 at the yearly congress of the German association for CHP (B.KWK). The head of the subcontractor Stadtwerke Schwäbisch Hall is also in the managing board of the B.KWK. The case studies were also presented and discussed in February 2007 at the conference for Stadtwerke organised by the BHKW-Consult. The B.KWK and BHKW-Consult are the main actors in the CHP activities in Germany. The internet link to the online data in Denmark was presented. The participants in both conferences were representatives from the different CHP operators (industry, small distributors, planning companies and politicians). Additionally, in the newsletter of the BHKW-consult, the issues of DESIRE and balancing techniques were described including the links to the DESIRE web page and dissemination examples. This newsletter will be sent to more than 10,000 recipients, who work in this field of CHP. In June 2007, the results of DESIRE will be published in the magazine "Sonne Wind und Wärme" as well as in the magazine "Energy and Management". Both magazines address main actors on the energy market and in the field of RES.

The German and Danish examples were also discussed with Dr. Hoster from Stadtwerke Kassel, Robert Werner from Greenpeace Energy, Dr. Streese from STEAG (fifth biggest electricity producer in Germany) at the DESIRE hearing in Kassel on 10th May 2006.

A very important dissemination is made by showing the operation of the two Danish CHP plants online. When visiting the DESIRE home page, you can see the immediate productions at the production units. On the online home pages of Hvide Sande and Skagen CHP plants, it is also possible to see plant data, showing typical data for the flexible CHP plants promoted in the DESIRE project. In addition to this, you can see the present content in the thermal store, the heat received from industrial plants and the heat delivered to town, including the temperatures at which the heat is delivered. On the online home page, you can also choose to see historical productions of the plants.



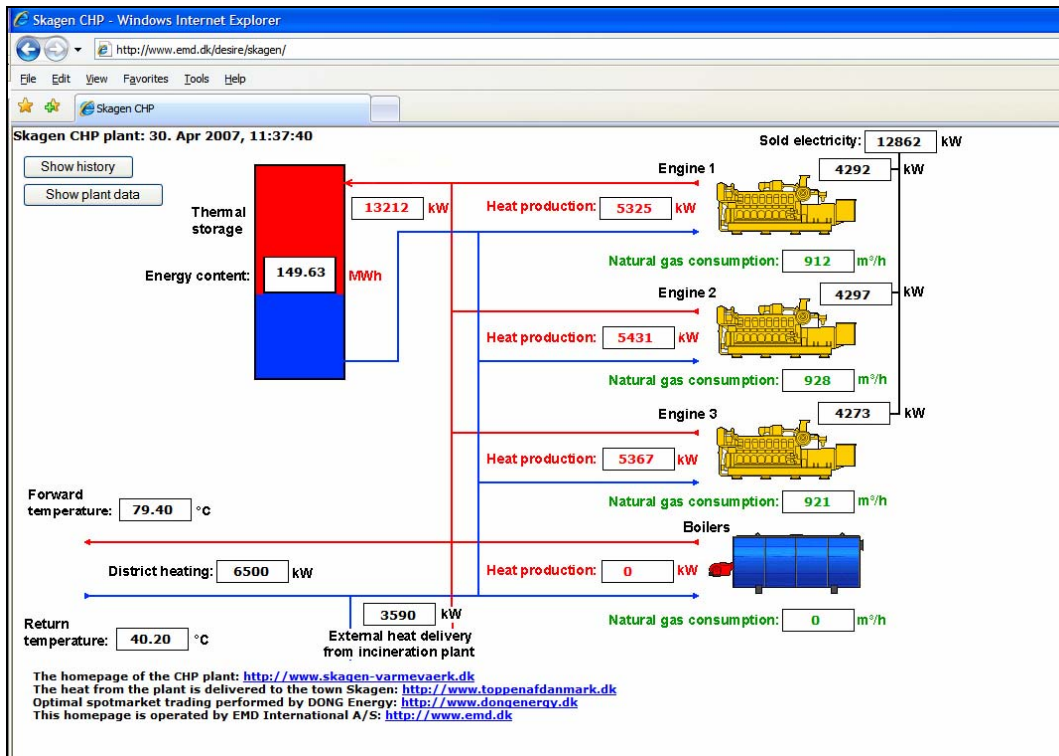


Fig.1: The home page shows the immediate productions of the three CHP engines at Skagen CHP plant, indicating that all of the units have won production on the spot market at this hour.

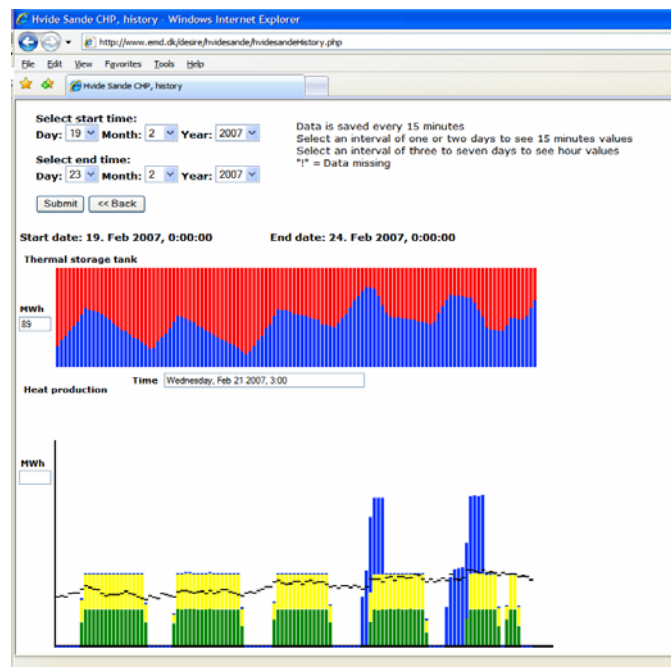


Fig.2: The home page shows the historical productions in 5 days in February 2007 of Hvide Sande CHP plant, being one of the two Danish CHP plants participating in the DESIRE project.

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On 5 February 2007, the Danish District Heating Association ([www.danskfjernvarme.dk](http://www.danskfjernvarme.dk)) held the course “In depth with the electricity market” (Gå i dybden med elmarkedet). Course participants were the managers of CHP plants in Denmark. At the course, EMD presented the results of DESIRE and informed the group about the bidding methods on the spot market and the regulating power market.

On 12 March 2007, The Danish Society of Engineers ([www.ida.dk](http://www.ida.dk)) organized a course on the electricity market for their members. EMD was invited to present the results and methods of the DESIRE project at the course.

The local energy and environmental office in the region of Himmerland ([www.sek.dk](http://www.sek.dk)) held a meeting at a local CHP plant on 26 March 2007. Members of this NGO were invited to visit this plant and EMD presented the results and methods of the DESIRE project to these members.

#### **b) Dissemination activities to be carried out in the future**

The following presentations will promote the DESIRE results:

The articles in the main magazines “Energie und Management” and “Sonne Wind und Wärme” as well as the planned presentation at the 2nd International conference (IRES II), the case of energy autonomy: Storing Renewable Energies will really strengthen the focus on the results of DESIRE. The IRES II Conference takes place in Bonn on 19-21 November 2007 and is organized by EUROSOLAR e.V. and the World Council for Renewable Energy (WCRE). In collaboration with the CHP associations, the politicians will be approached with the needs for flexible CHP plants.

Together with the company BET and EUS GmbH further projects are being discussed to show the profitability and flexibility of CHP with thermal stores. Additionally, a proposal to get subsidies to set up a demonstration case with an economically oversized thermal store is planned.

#### **c) Protection and use of the knowledge generated in the WP**

The examples shown in the WP mainly demonstrate the operation and optimization of the different examples in Denmark, Germany and Great Britain. This knowledge is therefore available to everyone and thus there is no point in protecting it.

The knowledge generated will help EMD International A/S and EMD Germany GbR to show the possibilities of the design and operation software EnergyPro and EnergyTrade. EMD hopes to open up a new market in Germany and UK for their software products. Additionally, the planned development of CHP in Germany will generate new tasks for consulting and engineering companies.

The knowledge generated requires no protection.

#### **WP6: Evaluation and recommendations**

The objectives of this work package were to review the operation of the demonstration part of WP5 and to make recommendations concerning the best way of promoting the balancing techniques. The WP has assumed the following sub-tasks:

1. Analysing the effectiveness of the collaboration between CHP operators and wind power operators and what this experience tells us about the potential penetration of different electricity markets.
2. Promotion of the use of accumulators in the operation of the CHP plant.

3. Recommendations and promotion for future balancing operations, regulatory changes and new demonstration programmes.

**a) Dissemination activities undertaken during the project period**

Discussions have been held with different officials of the Office of Gas and Electricity Management concerning the advantages of the use of CHP with thermal stores for encouraging decentralised generation and also a flexible means of incorporating fluctuating renewable energy sources into the grid (July 4<sup>th</sup> 2005 and 20<sup>th</sup> March 2007). Meetings and discussions have been held with the British Wind Energy Association (July 12<sup>th</sup> 2005, November 9<sup>th</sup> 2005, 24<sup>th</sup> March 2006) and also the Chair of the Renewable Committee of the Electricity Association (also a wind power developer) on 7<sup>th</sup> July 2006 concerning the benefits of co-production and development of CHP with thermal stores and incentives for CHP and wind power. Discussions have been held with representatives of GridCo about the implications of the DESIRE project (14<sup>th</sup> July 2005).

Discussions have been held with various officials of major electricity companies including RWENpower (18<sup>th</sup> May 2007) and Scottish and Southern Electricity (November 9<sup>th</sup> 2005) concerning their involvement in encouraging CHP with thermal stores. Discussions with Smartest Energy, a leading electricity ‘consolidator’ who deals with small CHP and wind power schemes, have been held (7<sup>th</sup> July 2005, 2nd June 2006). Various discussions with CHP developers and operators and consultants have been held at various conferences and events including meetings with the Combined Heat and Power Association (CHPA) on September 19<sup>th</sup> 2006, and November 16<sup>th</sup> 2006. Discussions have also been held with DEFRA officials, the Energy Saving Trust (November 9<sup>th</sup> 2006) and also Doug Parr from Greenpeace.

A range of stakeholders have been in attendance at specially organised DESIRE conferences held on November 9<sup>th</sup> 2005 and May 18<sup>th</sup> 2007. Around 30 people attended the first event and around 60 people attended the second event held at the University of Birmingham. A coherent strategy emerged at the two conferences aiming to persuade the increasing number of people interested in starting community CHP schemes to investigate the feasibility of including thermal stores in the design of future CHP schemes. The development of a ‘critical mass’ of 50 MWe or so of CHP schemes with thermal stores will allow the ‘aggregation’ technique (see WP6 evaluation, UK section) to be deployed. This will considerably enhance the income from sales of electricity to the grid, allowing access to prices similar to that available to conventional power stations.

Presentations concerning incentives for wind power and CHP were given at the 2006 ENERGEX Conference in Stavanger, 12<sup>th</sup> – 15<sup>th</sup> June 2006; the Open University seminar on ‘Coping with variability; integrating renewables into the electricity system’ on January 24<sup>th</sup> 2006 and also to the two dissemination conferences organised by the University of Birmingham on behalf of the DESIRE project on November 9<sup>th</sup> 2005 and May 18<sup>th</sup> 2007.

In July 2006, Niels I. Meyer presented the results of DESIRE at the GIN Wind Stream Conference in Cardiff, UK. An article was also included in the peer-reviewed journal *European Environment*.

Furthermore, a number of articles have been published and submitted. These have been mainly targeted at an academic audience, although the papers will influence the public policy theory context in which regulators such as OFGEM operate.

1. Toke, D, Fragaki, K., ‘Balancing Act’, *Energy Engineering*, February 2007, pp 30-31

2. Fragaki, A., Andersen, A., Toke, D., Optimal Design of Combined Heat and Power Plants Using Thermal Stores in the UK', submitted to *Energy Conversion and Management*
3. Fragaki, A, Green, R, Toke, D 'Incentives for CHP development in the UK: Analysis and evaluation of their relative importance', *Energy Policy*, 9 November 2005.
4. Fragaki, A, Anderson, A, Toke, D 'Modelling the impact of aggregation of small CHP with thermal stores to sell electricity on UK power markets' (under preparation)
5. Toke, D and Fragaki, A., (2007) 'How to implement Danish decentralised energy systems in the UK', Final Report of British contribution to EU FP6 DESIRE project.

Furthermore, an article summarising the interim research conclusions was sent to stakeholders in the UK in October 2006.

Interventions have also been made in the debate around reform of the Renewable Obligation. Dr Toke has spearheaded a lobby in favour of a feed-in tariff solution to the promotion of renewable energy. He has also engaged in the debate concerning microgeneration, suggesting that in the CHP field, the Danish gas-engine CHP/thermal store solution offers particularly good outcomes for low carbon results.

Generally, a strategy has been developed, and disseminated as the conclusion of the project, that local government planning initiatives favouring low carbon buildings create space for the adoption of gas engine CHP with thermal stores. These can have project-specific advantages. However, the strategic objective to create a 'critical mass' of 50 MWe of CHP with thermal stores which can then trade on electricity markets using a technique that we are calling 'aggregation'. This means that CHP units should be able to considerably increase their income from sales of electricity to the grid because they will have access to the same sort of price levels enjoyed by power stations when selling their electricity to the grid.

In Poland, the project recommendations have been presented at the I International Conference on Solar Energy and Eco-buildings in May 2006 and at the XV National Conference of District Heating in September 2006. Articles were presented in the conference proceedings and in the journal "District Heating, Heating and Ventilation." Furthermore, the project was presented at a Polish-Norwegian Thematic Seminar on "Energy Supply and Mitigation of Environmental Impacts" in October 2006. In Estonia, a public DESIRE seminar was organised in September 2006. Two papers were presented in the journal "Elektriala" in February and September 2006, respectively.

#### **b) Dissemination activities to be carried out in the future**

In the future, we shall be pressing ahead with the strategy described above in collaboration with local authorities and interested consultant companies such as Martin Energy and PB Power. We shall contribute an article in the RENEW magazine. We shall also be intervening in debates about the reform of the Renewables Obligation (RO), working in collaboration with the World Future Council and are soon going to be having discussions with the head of the DTI team responsible for the RO.

#### **c) Protection and use of the knowledge generated in the WP**

None of the knowledge requires protection. The knowledge generated will be used in research and teaching and in the development of the new strategy described above.

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### **WP7: Short-term solutions and long-term perspectives**

The objectives of this work package comprised the design and operation of a running Internet-based project management and information system with access to the project dissemination actions. The key feature was the demonstration of balancing techniques.

#### **a) Dissemination activities undertaken during the project period**

First of all, the internet-based project management and information system is a dissemination activity itself. It has two main functionalities. One is the project management system which has supported the work of the project group which is dispersed over different countries all over Europe. The other functionality is the information system which makes the knowledge and information generated during the project accessible to the public. By the end of the project, the project home page is reduced to the second functionality. Thus, it is optimised in such way that it presents the project information in a simple and demonstrative way.

Apart from the import dissemination activity of maintaining the project home page, WP7 has undertaken other dissemination tasks during the project. Bernhard Lange gave a presentation at the work shop in Birmingham organised by the University of Birmingham in November 2005, addressing British experts in the field of cogeneration. He also contributed with the chapter "Wind Power Forecasting" of the book "Renewable Electricity and the Grid" by Godfrey Boyle.

Furthermore, other dissemination activities have been undertaken. The DESIRE project and its results have been referred to in related projects, like the German "Netzwerk Energie und Kommunikation" (network energy and communication). Moreover, DESIRE flyers were distributed at the European Wind Energy Conference in Milan (EWEC 2007).

#### **b) Dissemination activities to be carried out in the future**

In the future, the results of DESIRE will be presented internally (within ISET) and in related projects. ISET will also have a booth at the fair at the EWEC 2008 in Brussels where we will refer to the project and distribute DESIRE flyers.

#### **c) Protection and use of the knowledge generated in the WP**

The knowledge generated in WP7 does not require protection. The knowledge gathered while developing and maintaining the project management and information system will be used in future projects where similar systems are employed. The general knowledge generated during the DESIRE project will also be used. For example, the information about other countries' markets can be used for optimising ISET's wind power forecast system for requirements of other countries. This is done in cooperation with partners from industry, e.g. transmission system operators as the clients and providers of energy data management systems as the partners. The knowledge about possibilities of integrating wind power to the energy supply system will be used in future projects addressing wind power integration.

### **WP8: Participation in meetings and conferences**

The objective of this work package was to make sure that a thorough and wide dissemination of the project results has taken place. Therefore, WP8 has played a crucial role to the dissemination of knowledge gathered during the project as well as the documentation of these activities.

#### **a) Dissemination activities undertaken during the project period**

A minimum of 20 dissemination activities must be documented and assessed in WP 8. By the end of the project period, 62 different dissemination activities have been registered. These range from articles in trade magazines to presentations at conferences and seminars. A high fraction of the activities have been targeted towards a broad audience both via well-established conferences

and trade shows but also through trade magazines. In addition to this, a series of DESIRE seminars have been held and the Consortium members have seized every opportunity to communicate the project results to their network and the public in general. The registered dissemination activities are listed tables 1.1 and 1.2.

Apart from the registration of dissemination activities, a DESIRE flyer has also been prepared in WP8. The flyer can be downloaded from the DESIRE home page and is used for distribution at conferences and fairs.

#### **b) Dissemination activities to be carried out in the future**

In the future, WP8 will continue to play a role in the dissemination of results. Each WP will be responsible for the publication and presentation of results. However, WP8 will make sure that a continuous dissemination takes place through the DESIRE home page.

#### **c) Protection and use of the knowledge generated in the WP**

Since the objective of WP8 has been to supervise the dissemination of results from other WPs, no knowledge has been generated directly from this WP. WP8 will continue to stimulate the dissemination of knowledge, but the question of protecting this knowledge is only relevant to the other WPs, not to WP8.

#### **Dissemination Activities: Conferences, seminars and meetings**

<b>Place and time</b>	<b>Type</b>	<b>Author</b>	<b>Title of dissemination</b>	<b>Forum</b>	<b>Size of audience</b>
Kassel, D, 10 May 2006	Presentation at conference	Henrik Lund	The DESIRE project	DESIRE seminar	20
Århus, DK, 26 October 2006	Presentation at conference  Media coverage in trade magazine	Henrik Lund	30 års aktiv energipolitik – og hvad så nu? (30 years of active energy policy – and what now?)	Danish district heating industry	1,500
Cardiff, UK, 3 July 2006	Presentation at conference  Article in peer-reviewed journal	Niels I. Meyer	Learnings from Wind Energy Policy in EU, with Focus on Denmark, Sweden and Spain	GIN Wind Stream Conference	Unknown
Manama, Bahrain, 22 January 2007	Presentation at conference  Article in conference proceedings	Poul Alberg Østergaard	Cogeneration of power & heat and cogeneration of power and desalinated water; modelling for optimal system performance	POWERGEN Middle East	Unknown
Birmingham, 9 November 2005	Presentation at seminar	Anders N. Andersen	How can CHP plants help balancing the system	DESIRE seminar	40



Place and time	Type	Author	Title of dissemination	Forum	Size of audience
Kassel, 10 May 2006	Presentation at seminar	Anders N. Andersen	How CHP plants with big thermal stores can help balancing the system	DESIRE seminar	20
Kolding, DK, 5 February 2007	Course	Anders N. Andersen	Gå i dybden med el-markedet (Into depth with the electricity market)	Course for managers of CHP plants	22
Aalborg, DK, 12 March 2007	Course	Anders N. Andersen	The electricity market	Course for members of the Danish Society of Engineers	11
Roskilde, DK, 23 – 24 May 2005	Presentation at conference	Ebbe Münster	The Benefit of integrated Energy and Transportation CO2 Emission Control Strategies	Risø Energy Conference 2005	Unknown
Copenhagen, DK, 23 September 2005	Ex-auditorio contribution to discussion	Ebbe Münster	Explanation of the low potential for the balancing of fluctuating electricity production which is typical for nuclear power	Members of Danish and EU Parliament	Unknown
Copenhagen, DK, 23 January 2006	Ex-auditorio contribution to discussion	Ebbe Münster	Explanation of the importance of performing dynamic scenario analysis of the electrical distribution	Opening conference for the "Energy Year" of the Danish Society of Engineers	Unknown
Roskilde, DK, 4 November 2006	Ex-auditorio contribution to discussion	Ebbe Münster	Explanation of the core idea of the DESIRE project	Danish Association of Wind Power	200
Copenhagen, DK, 20 November 2006	Ex-auditorio contribution to discussion	Ebbe Münster	Explanation of the possibility for increasing the share of wind power for electricity production in Denmark by use of heat pumps at the decentralised CHP plants	Members of Danish Parliament	Unknown
Aalborg, DK, 5 February 2007	Ex-auditorio contribution to discussion	Ebbe Münster	Explanation of the core idea of the DESIRE project	Danish Association of Wind Power	200

Place and time	Type	Author	Title of dissemination	Forum	Size of audience
Copenhagen, DK, 16 May 2007	Presentation at seminar	Ebbe Münster	Explanation of the core ideas of the DESIRE project	Seminar on price flexible electricity consumption, organised by the Danish TSO and the Confederation of Danish Industries	Unknown
Birmingham, UK, 9 November 2005	Organization of seminar and presentation	David Toke	Where will DESIRE get us?	DESIRE Public Seminar	30
Milton Keynes, UK, 24 January 2006	Presentation at conference	David Toke	Interactive Load Management	Conference, 'Coping with Variability: Integrating Renewables into the Electricity System'	50
Stavanger, Norway, 12-15 June 2006	Presentation at conference	David Toke	Wind Power Planning and Finance in the United Kingdom – Future Prospects	ENERGEX 2006 Conference	Unknown
Stavanger, Norway, 12-15 June 2006	Presentation at conference	David Toke	Energy Efficiency in the UK	ENERGEX 2006 Conference	Unknown
Birmingham, UK, 18 May 2007	Conference	David Toke and Katerina Fragaki	DESIRE UK	DESIRE Conference	60
Birmingham, UK, 9 November 2005	Presentation at seminar	Bernard Lange	Integration of Wind Power into the Electrical Energy Supply System in Germany	DESIRE Public Seminar	30
Birmingham, UK, 9 November 2005	Presentation at seminar	John Sievers	The economics of heat storage in CHP plants and integration techniques such as use of buildings as 'batteries' and heat pumps	DESIRE Public Seminar	30
Tallinn, EST, 18 September 2006	Presentation at seminar	John Sievers, Heiki Tammoja and Olaf Terno	EU Project DESIRE - The assisting role of co-generation for a power supply with renewable energies	Seminar on the DESIRE project	Unknown

Place and time	Type	Author	Title of dissemination	Forum	Size of audience
Bonn, D, 20 November 2007	Presentation at conference	John Sievers	Speicherung von thermischer Energie zum Ausgleich der Stromerzeugung aus Windenergie	International Conference (has not yet taken place)	Unknown
Dortmund, D, 11 April 2006	Presentation at workshop	Peter Ritter	Software zum Betrieb von Energieerzeugungsanlagen im liberalisierten Strommarkt	Workshop Netzwerk Energie und Kommunikation	30
Berlin, D, 29-30 November 2006	Poster presentation	Peter Ritter	Higher economic benefits for CHP plants with thermal stores	Stadtwerke Konferenz 2007 by B.KWK	50
Berlin, D, 13-14 February 2007	Poster presentation	Peter Ritter	Optimisation of CHP plants for the growth of renewable energies	Conference for municipal utility organised by BHKW Consult	35
Birmingham, UK, 9 November 2005	Presentation at seminar	Carlos Madina	Methods used by Spanish authorities to integrate the rapidly increasing capacity of wind power in Spain into the electricity grid	DESIRE Public Seminar	30
Barcelona, E, 17 May 2006	Presentation at conference	Carlos Madina	Wind – CHP, “Virtual Power Plants” in different European countries	Distribution Europe 2006	60
Madrid, E, 22 June 2005, 7 November 2005, 15 November 2005, 18 April 2006, 20 February 2007	Meetings with stakeholder	Carlos Madina and Miguel Ángel Sanz	Presentation of the DESIRE Project	Meetings with Iberdrola	10
Madrid, E, 27 September 2005, 16 May 2006, 13 March 2007	Meetings with stakeholder	Carlos Madina, Miguel Ángel Sanz, Iñaki Laresgoiti and Ángel Díaz	Presentation of the DESIRE Project	Meetings with Red Eléctrica de España	10

Place and time	Type	Author	Title of dissemination	Forum	Size of audience
Madrid, E, 15 September 2005 3 October 2005	Meetings with stakeholder	Miguel Ángel Sanz	Presentation of the DESIRE Project	Meetings with Gamesa	10
Madrid, E, 30 November 2005 14 February 2006	Meetings with stakeholder	Carlos Madina	Presentation of the DESIRE Project	Meetings with Asociación Empresarial Eólica	10
Paris, F, 30 August 2006	Meeting with stakeholder	Iñaki Laresgoiti	Presentation of the DESIRE Project	Meeting with Gaz de France	10
Madrid, E, 30 September 2006 13 February 2007	Meetings with stakeholder	Miguel Ángel Sanz and Ángel Díaz	Presentation of the DESIRE Project	Meeting with Endesa	10
Barcelona, E, 16 November 2006	Meeting with stakeholder	Miguel Ángel Sanz	Presentation of the DESIRE Project	Meeting with Gas Natural	10
Madrid, E, 6 February 2007, 12 April 2007	Meetings with stakeholder	Carlos Madina and Miguel Ángel Sanz	Presentation of the DESIRE Project	Meeting with Acciona	10
Solina, PL, 17-20 May 2006	Presentation at conference  Article in conference proceedings	Krzysztof Wojdyga, Marcin Lec and Rafal Laskowski	Renewable Energy Production – the comparison of countries of the DESIRE project	I International Conference on Solar Energy and Eco-buildings	Unknown
Solina, PL, 17-20 May 2006	Presentation at conference  Article in conference proceedings	Krzysztof Wojdyga, Marcin Lec and Rafal Laskowski	Dissemination strategy on electricity balancing for large-scale integration of renewable energy	I International Conference on Solar Energy and Eco-buildings	Unknown
Trondheim, Norway, 17-19 October 2006	Presentation at seminar	Krzysztof Wojdyga	CHP and Renewable Energy Sources in Strategy for Developing District Heating Systems in Poland	Polish – Norwegian Thematic Seminar “Energy Supply and Mitigation of Environmental Impacts”	
Tallinn, EST, 19 September 2006	Organisation of public seminar	Heiki Tammoja	DESIRE	DESIRE Public Seminar	

*Table 1.1. Overview of conferences, seminars and meetings attended.*

## Dissemination activities: Publications

Time	Type	Author	Title of dissemination	Forum	Audience addressed
22 May 2006	Article in peer-reviewed journal	Henrik Lund and Ebbe Münster	Integrated transportation and energy sector CO <sub>2</sub> emission control strategies	Transport Policy 13 (2006)	Worldwide
July 2007	Article in peer-reviewed journal (submitted)	Niels I. Meyer	Learnings from Wind Energy Policy in EU, with Focus on Denmark, Sweden and Spain	European Environment	Worldwide
22 January 2007	Article in conference proceedings	Poul Alberg Østergaard	Cogeneration of power & heat and cogeneration of power and desalinated water; modelling for optimal system performance	PowerGEN Middle East	Worldwide
2007	Article in peer-reviewed journal	Anders N. Andersen and Henrik Lund	New CHP Partnerships offering balancing of fluctuating renewable electricity productions	Journal of Cleaner Production, 15 (2007)	Worldwide
29 March 2006	Paper	Ebbe Münster	Energy Trader	Committee of Energy Policy of the Danish Parliament	Denmark
3-8 June 2007	Article for conference	Ebbe Münster	Comparison of Electricity Balancing for Large-scale Integration of Renewable Energy in six European Regions	Dubrovnik Energy Conference 2007	Worldwide
9 November 2005	Article in peer-reviewed journal	Aikaterini Fragaki, David Toke and Anders N. Andersen	Optimal Design of Combined Heat and Power Plants Using Thermal Stores in the UK	Energy Conversion Management	Europe
9 November 2005	Article in peer-reviewed journal	Aikaterini Fragaki, David Toke and Richard Green	Incentives for CHP development in the UK: Analysis and evaluation of their relative importance	Energy Policy	Worldwide

<b>Time</b>	<b>Type</b>	<b>Author</b>	<b>Title of dissemination</b>	<b>Forum</b>	<b>Audience addressed</b>
October 2006	Article	David Toke and Aikaterini Fragaki	DESIRE UK – Summary of Interim Research Conclusions	Article to stakeholders	UK
February 2007	Article in trade magazine	Aikaterini Fragaki and David Toke	Balancing Act	Energy Engineering	UK
15 March 2007	Book chapter	Bernard Lange	Wind power forecasting	'Renewable Electricity and the Grid' by Godfrey Boyle	Worldwide
17 September 2007	Article	John Sievers	Speicherung von thermischer Energie zum Ausgleich der Stromerzeugung aus Windenergie	Solarzeitalter	Germany
2007	Article in trade magazine	Peter Ritter	Flexible KWK-Anlagen können den Bedarf an Regelenergie für den weiteren Ausbau der Erneuerbaren Energien mindern	Energie und Management	Germany
2007	Article in trade magazine	Peter Ritter	Flexible KWK-Anlagen können einen Teil der für den weiteren Ausbau der Erneuerbaren Energien erforderlichen Regelenergie abdecken	Sonne Wind und Wärme	Germany
7 May 2007	Article in peer-reviewed journal	Carlos Madina	Central virtual de energía eólica y cogeneración	DYNA	Spain
May 2006	Article in conference proceedings	Krzysztof Wojdyga, Marcin Lec and Rafal Laskowski	Renewable Energy Production – Comparison of Countries of the DESIRE project	I International Conference on Solar Energy and Ecobuildings	Poland
May 2006	Article in conference proceedings	Krzysztof Wojdyga, Marcin Lec and Rafal Laskowski	Dissemination strategy on electricity balancing for large-scale integration of renewable energy	I International Conference on Solar Energy and Ecobuildings	Poland



<b>Time</b>	<b>Type</b>	<b>Author</b>	<b>Title of dissemination</b>	<b>Forum</b>	<b>Audience addressed</b>
September 2006	Article in conference proceedings and journal	Krzysztof Wojdyga and Malgorzata Kwestarz	Energy storage in view of cogeneration systems generating heat and electricity	XV National Conference of District Heating.  Journal: District Heating, Heating and Ventilation	Poland
September 2006	Article in conference proceedings and journal	Krzysztof Wojdyga and Malgorzata Kwestarz	Cooperation of associated systems supplying heat engineering plants containing renewable electricity sources	XV National Conference of District Heating, X Forum of Polish District Heating Engineers  Journal: District Heating, Heating and Ventilation	Poland
20 February 2006	Paper in journal	Heiki Tammoja and Olaf Terno	Cogeneration plants can compensate wind farm power imbalance	Elektriala 8 (2006)	Estonia
20 September 2006	Paper in journal	Heiki Tammoja	Quo vadis, Heat and Power co-generation in Estonia	Elektriala, 8 (2006)	Estonia

*Table 1.2. Overview of publications of DESIRE.*

## 2. Overview of knowledge created and future application and use

Table 2.1 presents a complete overview of the knowledge created in the project and the future application and use of this knowledge.

<b>Exploitable knowledge or products/measures:</b>	<b>Sector(s) of application:</b>	<b>Timetable for commercial use:</b>	<b>Patents or other IPR protection:</b>	<b>Owner and other partners involved:</b>
The improved flexibility implemented in the optimising tool, EnergyTRADE, makes it able to simulate the feasibility of CHP plants in Denmark, Germany, and the UK, selling on the spot and regulating power markets. With this improvement, consultancy companies applying EnergyTRADE will be able to demonstrate to owners of CHP plants how to design optimal CHP plants selling on the spot and the regulating power markets	Consultancy companies	1-2 years	Protected product name	EMD-DK and the rest of the project partners
The improved version of the EnergyPLAN model makes it able to make simulations of electricity productions of various regions with different characteristics than the Danish electricity market	Consultancy companies	1-2 years	Protected product name	AAU and the rest of the project partners
Detailed knowledge of the conditions on the different markets involved in the project for the use of wind or CHP, and the combined use of both: regulatory, market, and technical.	Prospective of future businesses	2-4 years	None	Public knowledge, available to any other part
Knowledge about efficient plant design	Services, consultancy, teaching, lectures and laboratories	1-4 years	None	Public knowledge available to any other part

<b>Exploitable knowledge or products/measures:</b>	<b>Sector(s) of application:</b>	<b>Timetable for commercial use:</b>	<b>Patents or other IPR protection:</b>	<b>Owner and other partners involved:</b>
Method for the comparison of the socio-economic effects of either increasing transmission capacities or increasing the internal flexibility of regional electricity grids	Services, consultancy, Transmission System Operators.	1-2 years	None	Public knowledge available to any other part
Economy of heat store investments for EEX spot market trading with existing depreciated plants	DSO	1-5 years	None	Kassel University and DESIRE partners
Influence of high wind shares, high insulation standard heat demands, Danish CHP design and demand response on the yearly remaining power demand profile in an hourly resolution.	DSO, consultancy, Transmission System Operators	1-5 years	None	Kassel University and DESIRE partners
Demonstration that flexible CHP can be profitable in Spain, under certain demand and price conditions	Consultancy, regulators	1-2 years	None	Public knowledge
Knowledge of different possibilities for integration of wind energy into power markets in different countries makes it possible to optimise wind power forecast systems.	TSO, provider of numerical weather predictions, provider of forecast systems	1-3 years	None	ISET, Public knowledge

*Table 2.1. Overview of knowledge created and future application and use of knowledge.*

