STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

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The Danish government's long-term vision is that Denmark becomes independent of fossil fuels.

Municipalities have the local knowledge that can ensure political anchoring and commitment from citizens and local businesses to the green transition of the energy system and the economy. In their capacity as local planning and land-use authority, as owner of supply and transport companies, and as a major consumer, the municipalities are in a unique position to facilitate change.

A program with 3.3 mill. EUR was launched in 2014 to support municipal strategic energy planning, providing a 50% grant for the projects.

Strengthening partnerships:

- Vertically – state, region, municipality
- Horizontally – across municipalities
- Locally – businesses, supply companies, municipality
- Internally – municipal administrations
- Democratically – citizens and interest organisations

Cost-effective transition to green growth:

- Mapping energy efficiency and renewable energy resources
- Analysing energy futures and strategic choices
- Setting targets and action plans
- Demonstrating green solutions

In total, 14 partnership projects for strategic energy planning were initiated with each their unique partnership structure and with each their individual energy perspective. The support program aimed at demonstrating different types of partnerships and tackle different aspects of a cost-effective transition to green growth. The 14 projects include 6 regional projects (in the five Danish regions) and 8 projects involving a smaller number of municipalities. In total 96 of Denmark's 98 municipalities have been directly involved while the remaining 2 have provided data to the work. Danish Energy Agency cooperated very closely with Local Government Denmark, the national municipal organisation, on organised networking activities for exchange of experiences among the projects during the project period.

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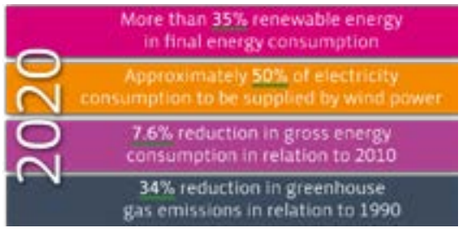
14 CASE EXAMPLES OF STRATEGIC ENERGY PLANNING IN DENMARK

A win-win situation

A broad majority in the Danish Parliament entered an agreement in March 2012 on the 2020 climate strategy and a long-term target to reach 100% renewable energy in the energy system by 2050.



It is necessary that municipalities and regions contribute actively if Denmark is to reach these ambitious targets.

A strategic energy plan is a tool for planning and prioritising different development pathways for local energy demand and supply in order to ensure that the potential for energy savings and conversion to renewable energy are bets exploited.

The long life time of the infrastructure means that investments and decisions made today will have a great impact on the energy and climate situation many years into the future. It is therefore imperative to create an overview of the possible development pathways and critical strategic choices to be made in the medium to long term (2020, 2030/35, 2050) and helps prioritise municipal involvement the coming years. A strategic energy plan typically covers all forms of energy demand and energy supply

Municipalities in Denmark have a number of mandatory duties related to heat planning and physical planning for wind power plants and biogas facilities. Strategic energy planning, however, is voluntary but almost all municipalities have chosen to develop such plans.

Partnership projects

14 partnership projects for strategic energy planning have been carried out in the period 2014-2015. The partnerships have all given a high priority to the co-operation between authorities at municipal and regional level and with local supply companies, industries, universities, and other stakeholders.

The involvement of these stakeholders has been key for achieving a nuanced and in-depth understanding of the energy challenges faced at the local level and to bring into play the relevant competences. Municipalities have a number of measures in their own toolbox but in order to facilitate a comprehensive green transition their visions have to be shared by the most important local stakeholders in the local community such as heat supply companies and public transport companies. All participants emphasize that the work process has greatly increased the understanding of the other involved parties and their interest and competences.

The Danish Energy Agency has published two guidebooks to guide the work process step-by-step; A guidebook on resource mapping and energy data collection and a guidebook containing recommendation and suggestions regarding scenario analyses and inspiration for how to organise the process of developing and implementing a strategic energy plan. The guidebooks also serve as a means to streamline the methods applied in energy planning. In addition, a new data collection tool is underway, which will automatically provide the municipalities with most of the data needed for developing local energy balances.

Most of the projects have carried out scenario analyses of different pathways for the future. The starting point for the local analyses have been the targets at the national levels supplemented by local and regional targets set by local politicians. Each project has also focused on special topics of their choice. These are highlighted in the case examples presented in this publication.

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ENERGETIC NORTHERN JUTLAND

Preserving and expanding North Denmark's valuable nature and countryside areas is crucial to the region's identity in relation to both citizens and visitors.

In 2010, Region Northern Jutland became Denmark's first Climate Region and as a consequence will be actively utilising the position to proactively pursue action within climate protection. The latest initiative, Energetic Northern Jutland, is a regional partnership encompassing the 9 municipalities and the regional administration. It was kick-started in 2014 with support from the Danish Energy Agency.

Characteristic for the energy situation in the region is a high share of district heating, decentralised electricity production, and an efficient integration of wind power in the district heating system. Still large potentials for wind power, biogas, biomass and surplus heat remain untapped.

The ambition of the partnership is to explore how strategic energy planning can retain and create jobs in the region, to show that it is possible to create an interconnected flexible energy system based on renewable energy, and to illustrate the impact that the green transition has on the possibilities for business development. An outcome of the project is a series of documents that can inspire and guide the individual municipality in its strategic energy planning.

A focus point has been to identify areas that hold the greatest potential for growth and employment.

Harvesting the benefits locally

The region boasts 793 MW onshore wind turbines larger than 25 kW. The ownership of wind turbines determines whether the profits are retained locally or not. One option is for the municipalities to own the turbines through a limited company or private limited company, as in Morsø municipality. This may have implications for the size of the state block grant given to municipalities but the net benefit can still be positive. Another option is for local actors to form a partnership. This is quite common. A third option is that the owner sets up a fund that supports local activities, as is the case in Hirtshals Harbour. Here earnings from the wind production are channelled in to an expansion of the local harbour.

Building on existing relations

Traditionally, the core task of municipalities towards businesses has been controlling compliance with current legislation. However, many municipalities in the region have experienced a reduction in jobs and relocation of businesses. Therefore, municipalities are gradually focusing on including advice and assistance in order to strengthen local businesses.

This includes supporting local entities already in contact with the local businesses. An example is LandboThy, an agricultural organisation, which offers energy and resource screenings in cooperation with experts in key areas such as ventilation. Typically, the screenings lead to 50-250 MWh annual savings per farm. LandboThy also offers assistance in application for funding – preparing applications on their own can be an unsurmountable challenge to most ordinary businesses.

Another example is NBEN, the network for sustainable business development, which together with the municipalities educates inspectors in sustainable screening for the inspection of facilities.

"With a little help, many businesses can improve operation and increase revenues. The important thing is to start with projects that have a short payback time and visible effect. A good place to start is energy and waste. And this will in turn strengthen the Danish energy technology businesses of which a large part is situated within the region", says Thomas Jensen, Project Manager, Hjørring Municipality.

For more information: www.sepnord.dk.

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

STRATEGIC ENERGY CLUSTERS IN CENTRAL JUTLAND

In the Central Region all municipalities, energy companies, universities and other relevant energy actors have developed a common strategy to reach a target of 50% renewable energy in 2025. The interest in partaking in the work and discussions has been high throughout the project.

The Central Denmark Region shows the way

The municipalities of the Central Region have cooperated for many years within the field of energy. The region is a small scale version of Denmark since the challenges and differences facing Denmark are all averagely represented in the region. Results from the Central Denmark Region can therefore be applied to the rest of the country – as well as inspire other countries.

The common energy strategy, which is now available, shows that implementation of the actions envisioned in the strategy could lead to 70% renewable energy in 2035 – and 90% if you count the wind power exported from the region.

Playing on several strings

The partnership behind the strategy has chosen to focus on the areas where we have the best possibilities for action in the short term, namely:

- Onshore wind power
- Biogas produced from manure
- 2nd generation biomass from agriculture and forestry
- District heat supply for the future
- Energy efficient homes
- Energy efficient industries and agriculture
- Green transport

One of the suggested actions is to replace the existing 1,400 onshore wind turbines with 750 new wind turbines which will lessen the visual impact of the turbines on the landscape.

The emissions from manure will be reduced significantly as a result of using as much as possible of the manure for biogas production. The strategy suggests establishing 10-20 large collective biogas plants or a greater number of decentralised plants.

Daka Biodiesel is an example of an innovative local company, that transforms animal waste into energy.

The energy strategy plan proposes to switch district heat production completely to renewable energy and increase the coverage from 60% to 70% of the heat demand in the region. This will also contribute to reducing consumer heating costs.

An important precondition for reaching the targets set in the strategic plan is that both homes and businesses become much more energy efficient than they are today. This requires a targeted and coordinated counselling effort and that energy planning becomes integral to the municipal planning in both cities and the rural areas. The strategic partnership of the Central Denmark Region will continue the cooperation with key stakeholders to ensure that new knowledge and ideas are brought into play.

Overall, the impact of the strategic energy plan is not limited to independence on fossil fuels and a cleaner environment but also increased employment and strengthening of the export opportunities of Danish businesses.

For more information: http://www.rm.dk/om-os/english/regional-development/energy-hub/

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STRATEGIC ENERGY PLANNING COMMUNICATED

The strategic energy planning project in Southern Denmark was a cooperation between 22 municipalities, 3 energy companies, Clean Energy Cluster, led by the Region of Southern Denmark.

A unique feature of the work was a focus on how to bring about the changes outlined in the strategic energy plans. It is important to consider the social context if the energy solutions of a strategic energy plan are to be successfully implemented. In other words, what drives and motivates consumers to make the energy technology choices that they do?

Applying an anthropological fieldwork method, two types of residential areas were investigated – summer house areas and villages without a collective heat supply system – to reveal the reasons behind choices of energy efficiency improvements and heating solutions.

Deliberate timing of energy messages

The municipalities of Varde, Sønderborg, and Fanø cooperated in an anthropological study that aimed to find out how to best approach summerhouse areas. Summer house owners were offered free energy checks, and the offer was promoted through the property owner associations.

Analysing three summerhouse areas with different types of property owner associations, the findings show that in these areas the association is not an efficient way to approach the summer house owners. The property owners do not seem to consider the summerhouse area as a community, and the property association is primarily used to dealing with topics relating to common areas such as paths, roads, and waste stations. The property owners are more likely to be influenced by the energy solutions and agendas in their home community, than what is offered when they are on vacation in the summerhouse.

The right solution for the context in question

Another anthropological study in the municipalities of Fredericia, Kolding, Middelfart, and Vejle looked at 20 families in different villages without a collective heating system. The conclusion of the study was that the citizens value their independence and control of the equipment in their homes, partly due to the remoteness of the villages. Unlike city residents, village residents wish to understand the heating technology in their home and how to fix it and also wish to understand the economic aspects of the day-to-day running of the heating system. Therefore, they are not likely to be attracted to energy solutions that are leased or difficult to fix, since these solutions would weaken their independence and control.

Although these case villages were similar in many ways, a clear difference in the choice of heating solutions was observed. The dominant choice of heating solution in some villages were heat pumps, while in other villages the majority of the heating systems was wood pellet fired boilers. The analysis concluded that residents, to a large extent, rely on their community as a source of information and platform for sharing knowledge on energy solutions, and that they overall prefer to follow the recommendations of their neighbours rather than sales offers.

Similarly, a study has been launched to investigate on which terms wind power expansion can regain interest and support among citizens. The study is part of a national research project on local acceptance and development of wind power projects.

For more information: detgodeliv.regionsyddanmark.dk/aktiviteter/strategisk-energiplanlaegning

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

STRATEGIC ENERGY PLAN FUNEN

Funen is characterised by a high share of agriculture, with remarkable biomass resources, and well-developed district heating and gas distribution systems. To ensure the success and stability of future local investments in the energy sector, Funen has developed a political framework for the future energy investments – an energy plan.

The plan was developed in a broad cooperation between 9 municipalities on Funen and Ærø, 5 supply companies, the University of Southern Denmark (SDU), Centrovice (the local agricultural trade organisation), and Udvikling Fyn (a regional trade development company).

Christian Tønnesen, Project manager and Head of the Settlement & Business Department, Faaborg-Midtfyn Municipality, underlines: “The ambition for Funen Energy Plan is to create a platform for the energy stakeholders, so that they, from a common point of view, can approach joint planning of the future energy system with a focus on innovation and optimal solutions”.

Students contributing to real life energy plans

A strong cooperation between university students and the project group was organised through the project for two purposes; To give the students a chance to make educational projects which would contribute to real actionable plans, and to allow local companies and project partners to present potential jobs in the local area that will hopefully help to keep some of the young people in the region.

Peter M.S. Hansen and Julie H. Hansen, master students from SDU, have contributed to the project by making a study comparing heat pumps to wood chip boilers in district heating systems. The study showed that heat pumps were the best long-term investment assuming there are electricity resources available and the spot price does not rise considerably.

Anders N. Andersen, Head of the Energy System Department, EMD International, has been project manager for the district heating analyses and the use of electricity and heat pumps in the district heating system.

From a systemic point of view, he emphasizes that the energy system needs to be redesigned. He finds it important to link large heat pumps to surplus heat from industries so that they will be as cost-effective as possible. Furthermore, he stresses the importance of using heat pumps to harness production of electricity from wind turbines.

In total, 36 students from SDU have conducted their diploma work under the auspices of the energy plan thus creating a win-win situation for students, university, local businesses, and municipalities.

Exporting biomass fuel instead of electricity

The energy plan presents a number of recommenda-tions linked to particularly challenging energy areas, where robust and long-term navigation is crucial.

By upgrading the existing windmills in the area, Funen can double the renewable energy production with half the windmills of today.

By gasifying biomass, there is potential for gas-based transport, but it is important not to build more biogas plants than the area of Funen is able to provide supply for. Christian Tønnesen appreciates the technical aspect highlighted by the engagement of the agricultural sector in the project.

“The agricultural sector on Funen is significant, and the production of biogas has a prominent role in the future energy system. But we are aware of the fact, that we have to develop a solution which ensures that the soil´s natural fertility is preserved in the long run”, he says.

By adhering to the energy plan, Funen expects to be exporting biomass fuels for transport instead of electricity. Several involved energy actors have already started activities that follow the recommendations of the energy plan.

For more information:www.energiplanfyn.dk

DANISH ENERGY AGENCY

ENERGY PLANNING OF THE FUTURE IN THE CAPITAL REGION

The transition to fossil free energy and transport systems faces great challenges but also provides cities with a broad range of possibilities for investing in green growth. The project 'Energi på Tværs' has connected all municipalities and larger utility companies within the Capital Region of Denmark, to develop analysis, visions and strategies to support the transition to a fossil free future and to open up for new cross-sectorial collaboration.

Fossil free by 2050

The objective was clear: How can the region reach the national target of transforming our current energy and transport systems to 100% renewable energy by 2050? What wasn't as clear, however, was what is needed to make such planning decisions in order to achieve the ambitious targets.

One important deliverable from this project is a regional report, containing aggregated data collected from 29 individual energy balances conducted within all the participating municipalities in the region. The final report enables comparisons between municipalities and provides decision makers with a regional overview. Additionally, scenario analyses have highlighted current plans, existing infrastructure, areas of potential sub-optimisation and risk of overcapacity within different waste facilities that might have to serve new purposes in the future.

Collaboration and political ownership

The various results have emphasised the need for collaboration and political ambitions to be anchored in shared visions and investment plans.

"As politicians we collaborate and coordinate across cities and utilities on a daily basis, and that is why this task also has to be solved collaboratively between all participating cities and utilities", says Thomas Lykke Pedersen, Mayor of the City of Fredensborg and co-chairman of the Climate-Political Forum in the Capital Region.

In April 2015, a grand mayors' meeting took place, which resulted in an agreement that the Capital Region should move forward with the proposed national energy vision for the region. However, the mayors decided to go one step further and strive for 100% renewable energy in the region's energy system as soon as 2035. The target for the transition of the transport system was kept at 2050. This energy vision was politically approved in June 2015.

An energy vision for the Capital Region

"The more ambitious we are, the higher the need for collaboration becomes. There are many existing collaboration initiatives but we are in need of more binding initiatives. Without them we simply will not reach our desired goals", says Kristian Johnsen, Chairman, Energi på Tværs.

The successful agreement on the energy vision has been followed up by a clear political commitment to continue the collaboration to create a shared energy plan for the region, where utility companies can provide their own investment plans for the future and combine these with the overall choice of strategy and energy sources.

The proposals for a new initiative awaits political processing in early 2016. Meanwhile, the project results with regard to green growth have garnered the interest of private actors, eager to be led by political visions and ambitions for stability in their business activities.

For more information: www.energipåtværs.dk.

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

REGION ZEALAND (STEPS)

STEPS: Strategic energy planning across municipalities in Region Zealand

The strategic energy planning project of the Region Zealand is a result of a regional partnership between 16 municipalities in the region, 19 supply companies, Energy Cluster Zealand (a non-profit organisation, established in 2009 with resources from the European Regional Development Fund, owned by the municipalities in the region and Region Zealand), and Roskilde University.

The aim of the plan was to form the basis for policy decisions and ensure cross-municipal cooperation and partnerships on topics of strategic importance for the green transition.

The project has led to three new financed cooperation projects that are likely to impact the individual municipal energy plans: 'Biogas2020', 'Implementation of Bioenergy Zealand', and 'Wind power as a catalyst for local development'.

Bioenergy in accordance with local wishes and needs

The 'Bioenergy Zealand' project aims to give a user-friendly and comprehensive overview of some of the information, that traditionally can be difficult to obtain – including details of the biomass resources available in a particular area, as well as information on new innovative financing models. Bioenergy Zealand has a close cooperation with Roskilde University, which provides mapping data and case studies.

Each case study is prepared in accordance with municipalities, utilities and the specific wishes and needs of the citizens. For example, clarification of where to establish a sufficiently solid basis for ecological biogas plants, a new district heating plant, or a neighbouring heating plant in a village with no access to district heating.

Most of the municipalities in the region are members of the Covenant of Mayors and have voluntarily committed themselves to carbon reduction targets of 20-55% by 2020.

In order to achieve these targets, it is, among others, important for the municipalities to ensure sufficient space and local commitment to new production based on renewable energy and the extension of existing district heating systems.

While the idea of new local sustainable heat supply solutions is good, the recipe is not simple. The initiative can come from different stakeholders but success is best achieved with the aid of strong, broad and respectful cooperation. Irrespectively of whether the initiative is taken by a group of local citizens, the municipality, a farmer or perhaps an established energy supply company, it is a good idea to invite several other stakeholders to take part in the discussions.

"The road towards the target should be characterised by an understanding and acceptance of differing agendas – and plenty of time!", says Lærke Møller Toftlund, Energy Cluster Zealand.

The question is how to set-up a company with the appropriate economic and judicial boundaries. The citizens are not just a target group in this type of project – they are often also project partners or project holders and the role of the municipality and the local energy company is to deliver expertise and advice.

For more information: http://www.energiklyngecenter.dk/en/Project%20Experiences.html

DANISH ENERGY AGENCY

BILLUND LEAST COST ENERGY ACTION PLAN

Symbiotic partnerships

The economy of Billund Municipality with its population of only 26,300 hinges on the presence of a few very large companies such as LEGO, Billund Airport and the associated service businesses, LEGO-Land, and DuPont Nutrition BioSciences. The number of jobs is more than double the population and people commute to Billund on a large scale.

It is therefore quite natural that the strategic energy planning effort of Billund has green industrial symbiosis as a core theme. Green industrial symbiosis explores the potentials for one industrial company's waste becoming a resource for another company.

In combination with exploitation of surplus heat from industrial processes it can significantly defer the need for energy company investments in new heat capacity.

One option explored in the energy action plan analysis is a conversion of the coal fired boiler at DuPont Nutrition BioSciences to a wood chip fired plant that, in addition to covering the company's own heat demand, can deliver electricity and heat to a local energy company.

"As part of an international concern DuPont Grindsted has a constant focus on reducing costs including reducing our energy expenditure. Through the partnership project with the municipalities and energy supply companies, we were able to identify energy saving projects together with the energy supply companies", says Martin Kirstein Madsen, DuPont Grindsted.

Green transition on track?

Another solution analysed in the strategic energy plan is extension of the national railroad system to allow visitors and commuters to switch from cars to rail. Establishing a connection from Vejle city which is about 30 km east of Billund city is estimated to potentially move 1.2 million travellers and reduce carbon emissions by 980 tonnes per year.

From waste to biogas

Local industries and several other businesses produce a significant amount of waste with a high energy content that can be exploited for biogas production.

Billund Vand, the municipally owned water, waste and sewage company, has, since 1997, operated a biogas plant based on sewage sludge (63%), industrial waste (33%), and organic household waste (4%) and successfully achieved a sufficiently high purity of the collected organic household waste to avoid mechanical sorting.

The achievements of Billund Vand were acknowledged with the EU Environmental Award 1997 for its well-functioning exploitation of source-sorted household waste.

Furthermore, Billund Vand has even greener ambitions: "Through the establishment of the state-of-the-art Billund Bio-Refinery we aim to extract and exploit all the energy contained in sewage water, food waste, and other organic waste production from the local businesses. Participation in the preparation of the energy action plan for Billund Municipality has therefore been a high priority for us", says Jørgen Krab Jørgensen, Chairman of the Board, Billund Vand.

In 2014, Billund Vand received the Global Water Award within the category Water Reuse Project of the Year, for establishing a completely new type of company which will use sewage and household waste for producing clean water, energy and organic fertilizer.

For more information: http://www.billundbiorefinery.dk/en/

DANISH ENERGY AGENCY

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

GRENAA CITY ENERGY SUPPLY STRATEGY

About 40% of the population in Norddjurs municipality lives in the city of Grenaa.

A local window of opportunity

Grenaa Heating Company currently receives a majority of its heat supply from Grenaa Waste Incineration and Grenaa Combined Heat and Power Plant. However, the supply contracts expire in 2015 and 2017, respectively. Grenaa Heating Company therefore has a window of opportunity for reassessing the long term supply options in the context of a green transition. Lallemand, a local yeast industry will also be looking for a new process steam supply contract as of 2017.

Djurs Bioenergi has for number of years been working to establish a biogas production facility near Grenaa and the private company DBH technology has aims to create the first bio-refinery in Denmark in Grenaa harbour and has formed a company to this end. Reno Djurs, the household waste company, and Aqua Djurs, the sewage water treatment company are both potential suppliers of organic matter

Norddjurs Municipality seized this opportunity to form a partnership with these actors to analyse the options for development.

As a result of the work related to the Grenaa energy supply strategy 2014, agreements have been negotiated with several of the actors. Concrete results include, amongst others, the following:

- A new wood chip fired heat plant will be erected in Grenaa City before 2018
- A biogas plant near the city will be established as soon as possible – a specific area has already been allocated to the project
- The straw and coal fired combined heat and power plant will be closed ultimo 2017
- Surplus heat from the cooling facility of the yeast factory will be used for district heating purposes
- The energy actors will continue to meet at regular intervals to discuss progress and strategies

The expected impact of these changes will be a higher share of renewable energy in the supply.

Furthermore, a heat cost reduction is expected. Lower energy prices will benefit local heat consumers and increased income can be used for expansion and new jobs.

Jens Meilvang, Chairman of the Environment and Technology Committee, Norddjurs Municipality: "For us as municipality the gain has in particular been the recognition of the advantage of using dialogue as a driver for change and exchange of ideas. We will use the experiences gained in the organisation of the strategic energy planning for the entire municipality and the cooperation with district heating companies in the neighbouring municipalities".

Wider application of experiences

"Businesses and citizens need unbiased guidance in the transition to a green economy. And this project shows that municipalities can offer a neutral space for discussion of the strategic energy planning without interference from business tactical manoeuvring. Thereafter, the energy actors are able to negotiate solutions that are not only profitable from a business perspective but also from a socio-economic perspective and an advantage to the local society", says Carsten Thorup Willadsen, Planning Engineer, Norddjurs Municipality.

For more information: www.norddjurs.dk

DANISH ENERGY AGENCY

BORNHOLM – BRIGHT GREEN ISLAND

Even though Bornholm is a small rural island in the middle of the Baltic Sea, or perhaps because of this, Bornholm is the centre of developing and testing the energy solutions of tomorrow.

With approx. 40,000 inhabitants Bornholm is a full scale community, with hospital, court house, schools, industry, ferries and airport. Bornholm has an operating energy system integrating electricity production, wind turbines, biogas, waste, solar panels, solar cells, heat pumps and district heating.

Turning obstacles into opportunities

“Bornholm’s remote location in the Baltic Sea and fragile connection to the Nordic power market has proven a godsend to developing Bornholm as a test-community for renewable energy solutions”, says Winni Grosbøll, Mayor,

“Together with the zest and cooperation of the citizens of Bornholm this means that we can test energy solutions on a community scale. One example is the EU ECOgrid projects where as much as 2,000 households test the architecture of the intelligent power system of tomorrow – a demand-response system with dynamic pricing and consumption”.

“This combined with the efforts and cooperation of the local utility companies associated with Energy Innovation Bornholm gives Bornholm a very real possibility of making our vision of Bornholm as a carbon neutral community in 2025 a reality”.

Testing the solutions of tomorrow. Today

How do we make the right decisions, at the right time and in the right order so that we can become a carbon neutral society by 2025? How do we make the most of the investments to be made socioeconomically? Answering these questions is the task of the project to demonstrate strategic energy planning on the island of Bornholm.

The energy strategy is based on a unique, locally developed simulation model containing data from a complete mapping of the energy consumption for heat, electricity and land based transport. With the model it is possible to analyse the consequences of any change in the entire energy system of Bornholm and, for example, assess security of supply at any time. Bornholm is connected to the Nordic power market by a single sea cable, making security of supply a high priority.

The model – named NRGYSIM – provides a realistic fact based foundation for decision-making for politicians, supply companies, public administration, and investors. The model is available to interested municipalities and regions.

Within transport the strategy points to energy saving measures like optimisation and coordination of transport and smarter access via electronic solutions as a first step and a gradual transition to carbon neutral technologies, such as electric vehicles.

With regard to public transportation on Bornholm, this approach has already proven itself: “We deliver the highest number of km per citizen in Denmark at the lowest cost, and at the same time we have saved 10% on fuel”.

The sunshine island of Bright Solutions

Bornholm is the first place in Denmark that experiences the sunrise – this head-start symbolises the core idea of the vision of the island.

In 2007, a widely representative group of 48 people from the Bornholm community joined together to develop a development strategy for the island, referred to as ‘Bright Green Island’. In 2008, the Municipality of Bornholm decided on a vision that Bornholm should become a carbon neutral community in 2025.

For more information: www.brightgreenisland.dk/co2neutral (Danish)
Summary of strategic plan (English, 32p, pdf): www.kortlink.dk/hq9s
Short video (English): www.kortlink.dk/hq9p

DANISH ENERGY AGENCY

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

STEPS BUSINESS

Municipalities are in a unique position to promote and improve local development and business interests with national energy and climate targets and policies.

Municipalities as drivers for a green transformation of businesses

In STEPS Business, 8 municipalities in Region Zealand, joined forces in mapping local businesses with energy efficiency potential and the opportunities for creating a win-win situation between the strategic energy targets and local businesses. The project was headed by Energy Cluster Zealand, a non-profit organisation, established in 2009 with the purpose of coordinating strategic energy efforts within Region Zealand.

The ambition of STEPS Business was to identify and develop municipal efforts to improve energy potential which are profitable for the businesses, and at the same time contributing to carbon reduction and integrate companies’ energy consumption better in the future Danish energy system.

Systematic mapping supports identification of opportunities for exploitation (e.g. process heat) to the benefit of both energy companies and businesses. The municipality can play a key role in providing an overview of the potentials while the energy companies can provide insights in the socio-economic benefits of new solutions compared to existing supply options.

Another way to operationalise the energy ambitions of the municipal plans is to ensure that environmental permitting and inspections are used as an opportunity to require a certain level of energy efficiency and to discuss possibilities for conversion from fossil fuel to renewable energy.

A survey with answers from approximately 140 local businesses formed the basis for developing a support package targeting private businesses consisting of guides, templates, calculators, management tools and real life inspirational case examples. These are now accessible through ‘erhvervsenergi.dk’ – a dedicated website.

For example, a closer look at the national funding program for replacing fossil fuels in industrial processes with renewable energy, in place since 2013, revealed that only very few businesses have applied. This has led to a strategy to raise awareness of the opportunities and a guide for interested businesses as well as municipalities.

Effortless mind-set change through games

The project also explored new ways to improve knowledge and awareness concerning energy efficiency in businesses and investigated the potential for using apps for motivation.

“It is a well-known fact that hands-on exercises and play increases retention and learning”, says Tomas Sander Poulsen, Energy Cluster Zealand. Based on a mock-up and initial interviews among 10 companies, an app based game was developed. The app allows the user to play the role of decision-maker and the object of the game is to make the best energy investment decisions.

The 8 municipalities involved in the project will be using this app-based game as part of their dialogue with businesses for increasing awareness and motivation. The app targets all businesses but in particular offices, storage facilities, retail, supermarkets, auto repair shops, and metal workshops.

It is estimated that if just 20 businesses take on board the recommendations of the app or some of the other tools developed in the project, then this is likely to result in savings equivalent to €16,000-27,000 per year and a 24-40 tonne carbon reduction.

For more information: www.energiklyngecenter.dk

DANISH ENERGY AGENCY

STRATEGIC ENERGY PLANNING IN REMOTE AREAS

The national energy strategy calls for a phase out of individual oil boilers by 2016. The municipalities can play a key role in communicating unbiased advice to their local citizens and make them aware of the possibilities for financial support.

“When discussing strategic energy planning one often tends to focus on large structures and the densely populated areas. In this initiative we have chosen to address areas without access to collective heat supply and the older generation”, says Majken Hentze, Randers Municipality.

The smaller communities

The 60+ segment has reached a stage in their life where they have to decide whether to move to a more manageable home or improve their existing home. Many wish to remain in the neighbourhood that they are familiar with and near neighbours that they have built a relationship with for as long as possible.

Through a strategic partnership, the municipalities Randers, Favrskov, Syddjurs and Samsø have reached out with assistance to the 60+ citizens. The aim is to educate these citizens on how to increase the comfort level and energy efficiency of their homes. It is perhaps a small segment, but a significant challenge.

In this work, the municipalities have joined forces with the Energy Service (EnergiTjenesten), which is an independent NGO energy consultancy service. The key ingredients are time and proximity.

It starts with a cup of coffee

The developed concept consists of a small gathering of 5-15 local residents for afternoon tea in the home of one of the residents. Here the Energy Service explains the different options that are available to improve homes and reduce the energy bill. The energy advisor then proceeds to make a detailed energy assessment of the home of the host and, at a leisurely pace, highlights elements that typically hold a potential for improvement. The participants are encouraged to ask questions during the assessment. The opportunity to pose questions often spurs on new questions and reflections.

In some cases, the hosts have already carried out energy efficiency improvements and can share their first hand experiences with the visitors. The philosophy behind this approach is that seeing is believing and we place a great deal of trust in the advice and experiences given to us by our trusted neighbours.

The next step is a brief energy check of each of the participants’ homes but this time focused on a topic of their individual choice.

“It is our experience that the biggest barrier for the home owners actually implementing improvements on their home is that they need help to prioritise between the many options for improvement”, says Carsten Vejborg, EnergiTjenesten.

For more information: www.energitjenesten.dk

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

INCREASED FLEXIBILITY IN LOCAL ENERGY SYSTEMS

Hjørring Municipality and Ringkøbing-Skjern Municipality belong to different regions of Denmark but have, in spite of the distance and the structural separation, decided to cooperate on strategic energy planning.

“Our municipalities are quite similar and we face the same challenges. We share an ambition to increase the flexibility of the district heating systems in order to allow for an even higher share of renewable energy and in particular a higher exploitation of the local wind production in the local heating systems.” Says Henning Donslund, Ringkøbing-Skjern Municipality.

”Furthermore, we both wanted to test how we can ensure a higher buy-in from the energy companies in the overall energy strategy for the municipality before focusing on implementing technological solutions. Joining efforts and using each other as sparring partners therefore made good sense“, continues Henning Donslund.

Singing the same tune

Hjørring Municipality had already prepared an energy plan in 2009 and wanted to work more targeted at engaging the district heating companies and their boards in developing their individual action plans.

“Our approach to the dialogue with the heating companies was to kick-start discussions using a set of cards, randomly placed on the meeting table, containing energy buzz words and let each participant reflect on the importance and relevance of the topic as well as their company interest in the topic”, says Martin Berg Nielsen, Hjørring Municipality.

The responses were then summarised graphically and three topics selected for cooperation, namely ‘Involving private plants and meters’, ‘Solar heating panels and heat pumps’, and ‘Transmission cables and surplus heat’.

This simple approach provided, among others, a reality check of what can actually be initiated with the support of the local energy companies while at the same time creating a common platform for cooperation on specific projects. One crucial outcome of the cooperation is a well-functioning network among the district heating companies as well as with the municipality, formalised through regular meetings.

Communication via memorable images

In Ringkjøbing-Skjern, the chosen themes for cooperation were local sustainable energy resources, heat supply, and energy consumption. GIS- mapping is a valuable tool in communicating complex technical topics.

The energy scenario analyses carried out for Ringkøbing-Skjern showed that the agreed development path towards a sustainable energy system in 2035 can lead to savings of approximately €30 million per year for Ringkøbing-Skjern and €54-80 million per year for Denmark.

For more information:http://www.hjoerring.dk/Borger/Baeredygtig-Udvikling/Projekt-Varmeforsyningers-handleplaner.aspx

DANISH ENERGY AGENCY

ÆRØ SMART ENERGY ISLAND

Ærø with a population of 6,200 has since the 1980s embarked on sustainable transition. The energy vision is to become carbon neutral and self-sufficient with renewable energy by 2025.

Six large wind turbines supplemented by more than 250 solar panels and 3 district heating plants based on solar heat and biomass ensures a high share of carbon neutral electricity and heat.

Analyses carried out in relation to the project 'Smart Energy Island' investigates how Ærø can become fossil free. Parallel to the analyses, Ærø has initiated two demonstration projects that show-case Ærø as a frontrunner.

Thomas Estrup, Project Coordinator: "It is important for us, in order to successfully achieve our climate goals that we implement the straight forward obvious solutions such as lake-heating as well as tackle the more complex challenges such as ferry transport".

Historical moat with a twist

The manor house Søbygaard dates back to 1580 and the buildings are today used for exhibitions and concerts. The original moat was drained in the 1770's and since used for farming.

As part of the transition to a green island, 7 km piping has been laid down in the moat of Søbygaard and the lake re-established. Modern science now heats the listed buildings of Søbygaard. As a result, the heat expenses have been reduced by 75%.

"Installing a lake-heat system can kill the wildlife in the lake because it takes away heat from the lake. But in our case the situation is the reverse since the lake was dry", says Jess Heinemann, engineer at Ærø Municipality and member of the private foundation Søbygaard.

In many other cases getting the necessary permissions for a lake-heat system is a barrier and can be a showstopper because the modifications will adversely change the living conditions for the wildlife.

A game-changing approach to medium range ferry connections

Together with the Danish Maritime Authority and eight other partners, Ærø Municipality has launched project 'E-ferry'. This aims to apply an extremely energy efficient design concept and demonstrate a 100% electric, medium sized ferry for passengers and cars, trucks and cargo1 in full-scale operation on longer distances than previously seen (> 5 nautical miles) for electric drive train ferries.

The E-ferry project is supported by the EU H2020 Research and Innovation Programme and was initiated in June 2015. The ferry is expected to be in operation by summer 2017.

In addition to the climate benefits there are also more local environmental benefits when employing electric ferries. In spite of sailing at higher speeds the electric ferry will create less noise and waves which is a benefit to the nearby communities and wildlife living in the vicinity of the ferry routes.

"We estimate, that the potential in Europa amounts to about 1,000 ferries", says Henrik Hagbarth-Mikkelsen, associate professor at Marstal Maritime Academy and project coordinator for the feasibility study Green Ferry Vision which preceded the current E-ferry project.

For more information: http://e-ferryproject.eu/

STRATEGIC ENERGY PLANNING IN DENMARK AT MUNICIPAL AND REGIONAL LEVEL

COST-EFFECTIVE ACCELERATED GREEN TRANSITION IN HØJE TAASTRUP

Høje-Taastrup is an average sized Danish municipality aiming to accelerate the green transition within electricity, heat and transport in collaboration with neighbouring municipalities, supply companies, knowledge institutions and private businesses.

The implementation of the previous climate plan demonstrates that a systematic effort can lead to significant reductions in carbon emissions and a more efficient use of energy even when both the population and the number of jobs increase.

In the period 2008-2012 carbon emissions have in total been reduced by approximately 20% and the municipality itself and as consumer reduced its level by 25%.

The good life is becoming greener

The Strategic Energy and Climate Plan 2020, approved by the city council in May 2015, calls for to continued cooperation.

An extension and transformation of the district heating system is key to reducing carbon emissions. Høje-Taastrup Municipality has therefore analysed the options for heat storage, district cooling, and cross-municipal supply. As a result, Høje-Taastrup District Heat Company will be launching Denmark's largest project that combines heating and cooling production – and Copenhagen Markets will be the first company to be connected to the system. Copenhagen Markets with its 67,000 m^2 will be the largest wholesale and distribution centre for fruit and vegetables, flowers and accessories, and other food products in Northern Europe.

Høje-Taastrup District Heating Company has also established a 3,000 m^2 solar heating unit supplying heat to the system. The next step could be to establish a large heat storage system in Kallerup Gravel Pit.

Focus on energy savings in buildings

Efforts within energy efficiency encompass all building categories, including municipal institutions, administration buildings, private detached houses, blocks of flats, and businesses. The activities cover energy renovation of municipal buildings, the establishment of a new Internet portal for energy consumption, energy savings aimed at detached houses and agreements with housing companies and businesses on energy efficiency.

Additional activities include municipal facilitation tasks and network activities as well as a broad communication of the results from the already implemented activities and projects.

Høje-Taastrup is a transport hub – and should continue to be so

As a hub for goods and passenger transport, Høje-Taastrup has invested great effort in mapping the transport patterns and analysing instruments and opportunities in order to target the transport related carbon emissions effectively. The catalogue of efforts within transportation therefore encompasses a broad range of initiatives to encourage green transportation; including strengthened mobility planning which will allow for reduced car commuting within the municipality.

The use of climate friendly fuels for transportation of people and goods will be promoted along with an improvement of the infrastructure by offering more charging stations for electrical cars and general support of the supply for alternative fuels.

For more information: http://www.htk.dk/klima
For building case examples: www.bedrebolig.htk.dk/cases

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