



**EXPERT EVALUATION NETWORK
DELIVERING POLICY ANALYSIS ON THE
PERFORMANCE OF COHESION POLICY 2007–2013
YEAR 1 – 2011**

**TASK 1: POLICY PAPER ON RENEWABLE ENERGY AND
ENERGY EFFICIENCY OF RESIDENTIAL HOUSING**

DENMARK

VERSION: FINAL

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NEW INSIGHT A/S

**A report to the European Commission
Directorate-General Regional Policy**

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LIST OF ABBREVIATIONS

- DEA – Danish Energy Agency
- DEACA – Danish Enterprise and Construction Agency
- ERDF – European Regional Development Fund
- NSRF – National Strategic Reference Framework
- RE – Renewable energy
- RTD – Research and Technological Development

1. EXECUTIVE SUMMARY

This paper outlines the main features of the national Danish policy on renewable energy and energy efficiency in residential housing and the contribution of the ERDF to these areas.

The Danish Government has recently published a new national strategy on energy that outlines political measures and presents a number of initiatives to ensure that Denmark moves towards being independent of fossil fuels. The main goals are to increase the use of renewable energy to 33% in 2020 and to reduce overall energy consumption by 6% in 2020. To achieve both former a mixture of legislation, grants and subsidies (feed-in premium and feed-in tariffs) are being used.

The ERDF is not specifically directed towards the promotion of renewables and energy efficiency in residential housing and the Danish Enterprise and Construction Agency (DEACA) which is responsible for the overall implementation of the ERDF programme has not categorised any of the projects supported under the FOI codes 39–42 which cover the areas mentioned above. However, a significant proportion of the projects supported contribute to the promotion of renewables and energy efficiency in residential housing.

2. NATIONAL POLICY

This section is primarily based on the strategies and initiatives presented in the Danish Government's "Energy Strategy 2050 – from Coal, Oil and Gas to Green Energy" from 2011. The main objective is to promote renewable energy and energy efficiency. Energy efficiency is not solely restricted to energy efficiency in residential housing, this will be the focus in the paper.

The overall aim of the strategy is to lower the quantity of fossil fuels used in energy production by 33% by 2020 while increasing the share of renewable energy by the same amount. In addition, the aim is to reduce the overall use of energy by 6% in 2020 through a focus on energy efficiency. All targets relate to 2009 levels.

Renewable energy – a mixture of subsidies and legislation

As regards renewable energy, the objective is to promote the use of biological fuels (biomass and biogas) and wind power and to increase research into other sources of renewables. To achieve this goal the government is using a mixture of legislation and subsidies.

To promote the use of biomass in energy production, changes in legislation will make it possible to increase the profits of producers by removing the former rules restricting the price which can be charged. Smaller plants using natural gas will be given freedom to use biomass. In addition, a research project will be undertaken on the structural set-up for the use of biomass aimed at formulating a long-term strategy in this regard.

An increase in the use of biogas in energy production was part of the agreement "Green Growth", between the Government and Danish Folk Party in 2009. The primary initiatives concerned the construction of new plants. The Energy Strategy 2050 includes an increase in the subsidies for the use of biogas for energy production from 2012. In addition, EUR 3.3 million has been set aside for investment in new biogas facilities. This is to counter the possible adverse effect of the fact that operators of small heating plants will no longer be restricted to using biogas but will be free to choose whatever kind of fuel they wish. The extra funding is aimed at supporting the construction of new pipelines to enable the biogas to reach final consumers.

Support is being given to the expansion of off-shore wind power by 1,000 MW through a tendering process, with 600 MW being supplied by one big project on Kriegers Flak in the Baltic Sea and 400 MW by a number of smaller projects. Research to explore the possible placement of new windmills, the demand for them and an evaluation of current subsidies will also be carried out. The government will likewise establish cooperation agreements with Danish municipalities in relation for the construction of new land-based windmills.

The promotion of small RE-technologies, e.g. solar power, wave power and biogas production, will be maintained by extending current support by four years with a total of EUR 13.3 million being made available.

The initiatives mentioned above are new initiatives from the Energy Strategy 2050. Apart from these RE-production in Denmark is subject to subsidies through either feed-in tariffs or feed-in premiums, both of which are dependent on the amount of kWh of electricity produced. The table below provides a detailed overview of the support measures.

Table A – Public support to renewable energy

Type of energy	Public Support
Biogas, exclusively	Feed-in premiums 0.1 EUR/kWh
Biogas, combined	Feed-in premiums 0.05 EUR/kWh
Biomass	Feed-in premiums 0.02 EUR/kWh
Biomass in large scale,	Feed-in tariffs 0.05 EUR/kWh/first period of 10 years Feed-in premiums 0.02 EUR/kWh/second period of 10 years
Small RE- plants	<i>Feed-in tariffs</i> 0.08 EUR/kWh/first period of 10 years Feed-in tariffs 0.05 EUR/kWh/second period of 10 years
Private solar power <6 kW	Direct exchange of surplus energy with the general electricity grid
Public solar power <6 kW /100 m ² building	Same as above
Solar power commercial	No tariffs on energy consumption, surplus energy sells at a fixed price
Wind power except large-scale parks	Feed-in premiums 0.01–0.02 øre/kWh or Feed-in tariffs 0.05–0.08 EUR
Offshore wind – large scale parks	Feed-in tariffs according to specific contract

Source: Danish Energy Agency (DEA)

An overview of the total amount of public support in 2009 and 2010 is presented in section 6.

Energy efficiency in residential housing

Policies on energy efficiency are orientated towards replacing heating systems which currently use fossil fuels. Additionally, changes in legislation on the construction of new buildings are being made.

Some EUR 33.3 million was allocated to incentives to replace fossil fuel based heating systems in 2010, specifically to encourage a switch from oil burners to district or solar heating, with both individual house-owners and housing agencies being eligible for support. The funding period extends to end-June 2011 and so far almost 11,000 applicants have received support. From 2012 it will no longer be possible to install oil burners in newly constructed houses and from 2017, the rule will also apply to existing houses. At the same

time, natural gas burners are being phased out, with possible compensation being introduced for gas companies for loss of revenue.

In addition, the Government will apply a new set of regulations on the construction of new houses to promote energy efficiency, new energy efficiency classifications being introduced in 2010 (see Section 6 below). Arrangements to support energy efficient heat pumps and solar power in residential housing are also being prepared.

Changes in national policy since 2007

Denmark has become more ambitious as regards energy objectives during the present programming period. Since 2007 the Government has released four policy papers on energy, with one aimed specifically at energy efficiency. The first (in January 2007) set out a vision for the future; the second (in February 2008) defined objectives and policies agreed with other political parties; the third (in April 2009) presented specific initiatives for improving energy efficiency, while contents of the fourth were set out above. The general tendency is for the policy goals to be set at higher levels. The 2011 paper included the aim of renewable energy supplying 33% of consumption by 2020, as opposed to 30% by 2025 in the 2007 paper, and of reducing energy consumption by 6% by 2020 as against 4% in the 2008 paper.

Energy policy and the economic downturn

During the economic crisis one initiative was directly focused on improving the energy efficiency of residential and commercial buildings. Public funding of EUR 200 million to support renovation in residential housing was introduced in April 2009 and withdrawn in October 2010. It was limited to individual owners and tenants and so excluded housing agencies. The maximum amount of support for an individual applicant was EUR 2,000 to cover fees and EUR 1,300 to cover materials. The aim was partly to reduce unemployment in the construction sector. The scheme was regarded as a great success and all the funds were committed within a short space of time.

3. ERDF AND COHESION FUND SUPPORT AND CONTRIBUTION TO NATIONAL POLICY

This section is based on a literature review of the NSRF, the annual implementation reports for 2008 and 2009, the Energy – green regional growth publication, an interview with the Danish managing authorities DEACA and a screening of the DEACA database which gives provides a qualitative overview of the projects supported.

The relevant projects concerned are not categorised by under renewable energy and energy efficiency (FOI codes 39–42) but under research and technological development (RTD),

innovation and entrepreneurship, even though they are aimed promoting the development of renewables and improving energy efficiency in residential housing.

DEACA is responsible for the overall implementation of the ERDF programme, whereas the growth forums in the five Danish are responsible for their operational implementation. Each of the five regions has its own strategy, summarised in Annex Table A. All of the regions have singled out development of renewable energy and the application of new technologies to improve energy efficiency as a part of their strategy, and ERDF support is of great importance to the projects carried out at regional level and, accordingly, to the achievement of national aims. It is hard to give an exact assessment of the ERDF contribution to the national achievement within the two areas¹. However the funding from the ERDF seems to complement the national policy in an expedient way, especially regarding national objectives for growth and employment. As an example approx. EUR 2.4 million have been granted for the project “Energy at sea”, which is expected to create significant growth to the Region of Southern Denmark and raise employment by 7,000 people.

The approach followed means that the ERDF is strongly focused on growth², the primary objective of the programme being to ensure that Denmark remains competitive and prosperous³.

The development of renewable energy and improving energy efficiency are considered secondary aims and are not stated as independent objectives in the NSRF or the national Strategic Reports.

Support to renewables and energy efficiency

DEACA data provide an overview of the support to projects relating to the development of renewables and energy efficiency. These are summarised below⁴.

During the present programming period, 31 projects supporting the development of renewable energy have been initiated, all categorised under RTD in the FOI codes. Around EUR 26 million has been committed to these. Annex Table B summarises the details⁵. The

1 A number of other EU programmes promote research and development of new technologies, e.g. Intelligent Energy Europe–programme under DG Energy and Transport.

2 The ERDF programme is carried out to promote innovation, growth in SMEs and the application of ICTs.

3 NSRF 2007–2013.

4 As DEACA is not using the FOI codes 39–42, the national experts have conducted a categorisation of the project based on a manual screening of the descriptions in the DEACA project database.

5 Screening of the project database shows that the majority of the projects are categorised under innovation and just a few of the projects are categorised under entrepreneurship and application of new technology. In the AIR 2009 it is stated that there is an overlap between the growth drivers, meaning that the categorisation does not necessarily reflect the actual content of specific projects.

recipients are very diverse, ranging from small companies developing new technologies for renewable energy to large-scale collaboration between private and public sector companies which aim at the development of clusters and improved the implementation of technologies. As examples, almost EUR 2.4 million from the ERDF has been allocated to the development of offshore wind technology and EUR 840,000 to the development of new solar energy products.

The number of projects aimed at improving energy efficiency in residential housing is relatively small. Only 6 projects have been initiated and around EUR 5 million has been committed within the present programming period. The projects supported focus mainly on collaboration between regional authorities and private energy suppliers (Energy saving cooperation, ESCO) and intelligent regulation of energy consumption in residential housing. In addition, one project is aimed at improving energy efficiency through awareness raising (for details, see Annex Table C).

Implementation and spending is happening according to plan

So far, the programme has been implemented very much according to plan, though in some regions both new and on-going projects have been affected by the financial crisis. In some projects, the composition of the partnership has changed or activities have been slowed down⁶.

4. RATIONALE FOR PUBLIC INTERVENTION

The rationale for public intervention in renewables and energy efficiency is clearly stated in the national “Energy Strategy 2050”. Two main priorities are explicitly stated. First, the aim is to lower energy consumption through a major focus on energy efficiency. Secondly, the aim is transform Denmark into a green sustainable society with a stable energy supply from renewable energy sources⁷. The main underlying reason is to achieve independence from coal, oil and natural gas in order to ensure security of energy supply.

However, one of the principles for transition to independence is to the maintenance of the competitiveness of Danish companies. In this respect, support from the ERDF plays an important role in the country’s attempt to become an international front runner in the development of new sustainable solutions, as the funding allocated by the regional growth forums contributes to innovation, product development and private-public collaborations. The NSRF, the strategic reports and the AIRs do not specifically describe the rationale for

⁶ AIR 2009.

⁷ Energy Strategy 2050 – from coal, oil and gas to green energy.

public intervention on renewables and energy efficiency, but ERDF funding supports the rationale stated in the national and regional strategies.

Furthermore, there is an on-going public debate on climate and energy policy. In the wake of the UN Climate Change Conference in 2009, COP15, there has been increasing public discussion of independence from fossil fuels. The development of renewable energy has been at the centre of the national debate on possibilities for future growth. The agenda on energy and climate policy is among other things about securing of Denmark's leading global position in the development of wind power and biomass as profitable energy sources. Consequently, the debate on energy policy has a strong focus on the profitability of the various energy sources and the economic returns from investment in them.

5. RATE OF SUPPORT AND PROFITABILITY

Renewable Energy

This section outlines the relationship between the rate of support and the level of profitability of different types of energy sources.

Prices for wind power and bio-fuels are based on the market price for energy with the addition of a feed-in premium. Other RE-technologies are subject to a fixed price (a feed-in tariff)⁸, which indicates that they are more vulnerable and need a greater degree of certainty as regards the return on investment. This also applies to large-scale offshore wind farms which are subject to a tendering process to determine the supplier. Land-based wind farms are subject to a special arrangement to support the replacement of old, low capacity windmills.

Residential Housing

In the case of residential housing, support measures are limited to renovation projects and support for the replacement of oil burners, both of which are limited in the period for they are available and, accordingly, are not subject to changes in energy costs. Legislative changes are the other means of encouraging energy efficiency and these too are not affected by changes in energy costs, even though one of the reasons for them has been an increase in the price of fossil fuels.

⁸ Fixed prices make the supplier of energy independent of the movements in the market prices, whereas feed-in premiums are inherently linked to market prices and therefore can result in changes in profitability as the latter move.

6. COSTS, PUBLIC SUPPORT AND PRICES

Support to renewable energy

As described in section 1, the production of renewable energy in Denmark is supported by a wide range of measures. The full amount of support to each type of renewable energy is shown in the Table B.

Table B – Amount of support to production of renewable energy (EUR million)

Type of energy	Support in 2009	Support in 2010
Wind power (including offshore)	200.3	189.7
Biogas (100%)	33.4	32.9
Biomass	29.5	41.3
Special RE-plants	0.6	1.5
Combined plants	6.3	3.1

Source: Energinet.dk

Cost of electricity based on renewable energy

It is complicated to identify the cost of different types of renewable energy. According to the Danish Energy Agency, the cost of production is subject to many factors which differ between different energy sources. The table below presents the estimated prices in EUR per kWh and the variables which affect this.

Table C – Estimated prices and variables renewable energy

Type of energy	Estimated price, EUR per kWh	Variables
Bio gas	0.08	1/ Type of loan 2/ price of input material (mostly animal dung).
Biomass	0–0.26	1/ Size of plant 2/ whether or not combined with fossil fuels 3/ Internal pricing
Wind power	Estimate not available	1/ Location of windmill 2/ Type of windmill 3/ Financing
Solar power	0.33–0.53	1/ Size of initial costs (Construction of solar cells as separate project or combined with renovation or new construction.)

Source: Danish Energy Agency (DEA)

The table indicates that the estimated prices involve significant uncertainty, depending on, for example, on the type of loan, financing arrangements, the size of plant and its location.

Market prices of residential housing and their relationship to energy efficiency⁹

The Danish Association of Chartered Estate Agents¹⁰ concludes from a survey of their members carried out in 2009 that the level of energy efficiency as indicated by the mandatory classification, does not affect the price of houses or at most to a minimal extent.

The problem is indicated in the Government's "Strategy for a reduction of the use of energy in buildings" from 2009, which states that the energy classifications do not have the intended effect and includes initiatives for making the classification more effective. This has led to new regulations, one being an obligation to print the energy classification on estate agent advertisements. The effect of these, however, is as yet uncertain.

In the 2009 Government strategy, a range of initiatives were focused on the social housing market, among them one to increase the power of social housing committees in relation to energy efficient renovation projects, which might be rejected by the tenants due to the increased rent they are likely to have to pay. For rents more generally, however, there is little evidence of a link to energy efficiency.

7. CONCLUSIONS

As indicated above, Denmark is pursuing an ambitious strategy to develop renewable energy, primarily through supporting the use of wind power, though support for biomass, at present relatively small, is increasing. The national effort has three different objectives, first, to meet the challenge of global warming, second to increase future security of energy supply and, thirdly, to further growth prospects since a strong domestic market is expected to provide Danish companies with a competitive advantage in the global market for renewable energy.

As the funding from the ERDF is only a relatively small part of the Danish effort to promote renewable energy and improve energy efficiency, the impact of the funding is proportionate to the money spent.

There is no evidence that the economic downturn has caused any significant set-backs in the promotion of renewable energy and politically the area continues to have high priority. Indeed, during the economic downturn, efforts to promote energy efficiency in residential housing were intensified. The establishment of a fund for the renovation of residential housing was a significant part of these efforts, and on-going financial support to encourage the replacement of inefficient heating systems continues to be important for achieving the goal of a 6% reduction in energy consumption by 2020.

⁹ Literature: "Strategy for a reduction of the use of energy in buildings", The Government 2009, "Buyers ignores energy classifications" and "Energy classifications – a change is coming" The Danish Association of Chartered Estate Agents 2009.

¹⁰ Professional organisation that covers 94 per cent of all practising Danish estate agencies. www.de.dk

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ANNEX

Annex Table A – Regional strategies of renewable energy and energy efficiency

Regional Growth Forum	Strategy on energy
Growth Forum North Jutland	Wave energy, Hydrogen and fuel cells
Growth Forum Central Denmark	Wind energy and biomass
Growth Forum Southern Denmark	Offshore technology and energy efficiency cluster
Growth Forum Zealand	Green industry and biomass
Growth Forum Capital Region	Cleantech cluster and energy efficiency

Source: New Insight A/S based on “Energy – green regional growth”, Danish Regions

Annex Table B – Categorisation and characteristics of projects promoting renewable energy

Growth driver	Characteristics of the projects	Number of projects in this category
Innovation, knowledge sharing and knowledge development	<ul style="list-style-type: none"> – Collaboration between academic research and product development. – Development of new clusters – Development of demonstration plants 	26
Creation and development of new enterprises (entrepreneurship)	<ul style="list-style-type: none"> – Product development – Development of prototypes 	1
Application of new technologies	<ul style="list-style-type: none"> – Public–private collaboration on implementation – Application of renewables to residential housing – Cross–municipal public cooperation on the application of new technologies 	4

Source: Project database, Danish Enterprise And Construction Agency (DEACA)

Annex Table C – Categorisation and characteristics of projects improving energy efficiency

Growth driver	Characteristics of the projects	Number of projects in this category
Innovation, knowledge sharing and knowledge development	<ul style="list-style-type: none"> – Collaboration between academic research and product development. – Intelligent regulation of residential energy consumption – New forms of organisations, for instance ESCO – Digital regulation of energy expenditure – Cross–municipal public cooperation on the application of new technologies – Renovation of residential housing – Development of new clusters 	6

Growth driver	Characteristics of the projects	Number of projects in this category
Creation and development of new enterprises (entrepreneurship)		0
Application of new technologies		0

Source: Project database, Danish Enterprise And Construction Agency (DEACA)