



RENEWABLE ENERGY POLICY REVIEW

DENMARK

Denmark has been self reliant on energy since 1999¹, although oil and gas production from the North Sea peaked about in 2005² and will decrease during the next decade. Denmark will therefore lose its status of net exporter of energy and will become a net importer of oil and gas. The Danish Energy Agency estimates that the country will still have a 12-year-crude oil production and a 12-year-natural gas production at 2007 activity levels. Natural gas and renewable sources (RES) have been gradually replacing solid fuels and oil in primary energy supply, thus contributing to the current 19% decrease in coal consumption compared to 2006 levels. Renewable energy has experienced a significant growth and shares in RES in primary energy and RES electricity in the electricity mix are above EU averages, specially in the case of wind energy, for Denmark has become a global leader of installed wind power per capita and the Danish wind turbine industry exports serves about 1/3 of the world market.

Denmark has the lowest energy consumption per unit of GDP in EU and highest contribution to electricity from new renewable in the EU. Denmark has achieved a de-coupling of economic growth and energy consumption since 1980: GDP grew 78 % in 2007, but the primary energy consumption was only 7.4% higher in 2007 than in 1980 and CO₂ emissions per capita³ have been reduced substantially: 20.5 % lower in 2007 compared to 1980. The de-coupling has been driven by the policies to promote district heating and energy savings as well as renewable energy. Indeed, in Denmark biomass is largely used at power stations and for development of smaller biomass-based cogeneration of heat and electricity. District heating accounts for approximately 50% of Denmark's heat demand. In 2007 district heating registered 3.5% decrease in production compared to the previous year. Nevertheless, the production in the country over the period 1990 -2007 has increased by 40%. Twelve of the 14 largest power stations in Denmark deliver all or part of their surplus heat to a district heating network. Nearly all large-scale power plants are located close to major cities.

KEY FIGURES

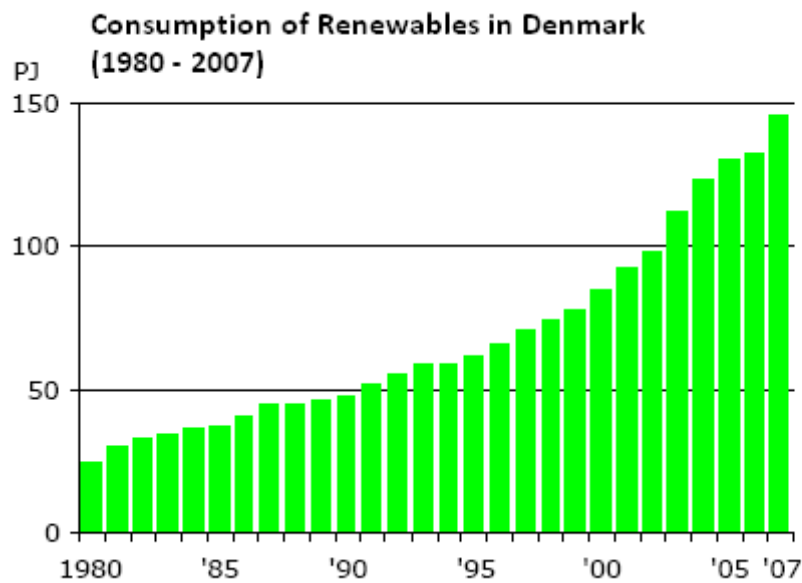
- The **share of RES in total primary energy consumption** was of 11.45% in 2007.

¹ In 2007 Denmark registered a 130% self-sufficiency, being the only country in the EU with this status

² Production accounting for 1,315 PJ

³ Adjusted figure

- The **share of RES in the gross final energy consumption** was 17% in 2007⁴.
- The **share of RES in the gross electricity production** was 27.9% in 2007.
- Dependence on external energy supplies is about -30%



Source: Danish Energy Agency

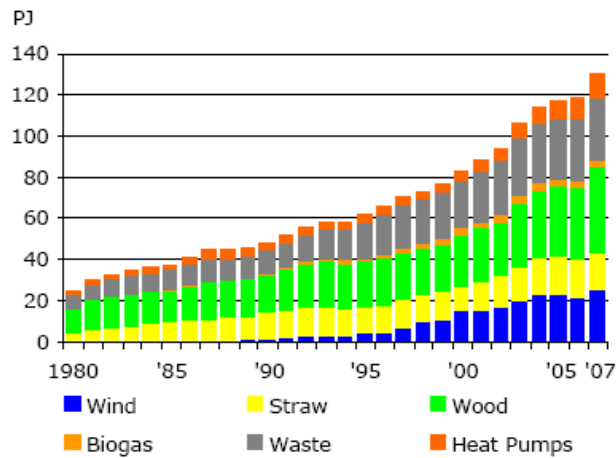
Technology specific figures

- In 2007, **wind energy** in Denmark produced about 7,173 GWh. This corresponded to 19.7% of domestic energy supply or to the consumption of about 2.03 million Danish households. . In 2007, wind power capacity accounted for 3,124 MW (i.e.24.1% the total electricity capacity), 424 MW being offshore wind turbines. This figure represents a 0.4% fall compared to the previous year and is justified by the dismantling of a series of old small plants and a big 4 MW turbine at the trial plant of Høvsøre, which capacity was not totally replaced. Projections by the Danish Wind Industry Association estimate an increase of the yearly instalment of new capacity of about 17% by 2011, reaching more than 200,000 MW. As far as offshore turbines are concerned, 7,600 MW are expected to be installed by the same year.
- **Biomass**⁵ was responsible for 8.4% of total gross electricity production in 2007 and supplied some 32% of total gross production (for district heating).
- **Hydropower** only provides less than 1 % of the electricity production.

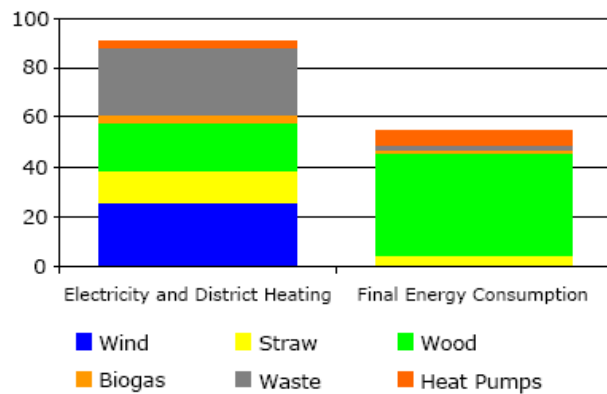
⁴ Adjusted figure

⁵ This figure includes only straw, wood and renewable waste

Production of Renewable Energy by Type in Denmark



Use of Renewable Energy in Denmark (2007)



Source: Danish Energy Agency

RES POLICY

RES TARGETS

Mandatory targets set by the Directive on the Promotion of the use of energy from renewable sources

- 30% share of RES on the final consumption of energy in 2020.
- At least 10% share of renewable energy in final consumption of energy in transport by 2020.

Indicative Target set by the RES- electricity European Directive from 2001⁶

- 29 % share of RES in gross electricity consumption by 2010.

Indicative Target set by the European Biofuels Directive from 2003⁷

- Biofuels consumption of 5.75% of petrol and diesel use for transport in 2010 on energy content.

National Commitments

⁶ Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. Currently in force, sets targets up to 2010.

⁷ Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport. Currently in force, sets targets up to 2010, with indicative targets by 2005.

- On 19 January 2007 the Danish Government presented a comprehensive national energy proposal, "A visionary Danish energy policy", in view of negotiations with political parties. This proposal contains the objective that Denmark reduce its use of fossil fuels by at least 15% by 2025 compared to today, and that total energy consumption be maintained at its current level. The use of renewable energy is to be increased to account for at least 30% of energy consumption by 2025, and the proportion of biofuel for transport is to be increased to 10% by 2020.
- In February 2008, the Danish parliament has agreed on plans for how to boost renewable energy production in the country. The aim is for renewables to cover 20 per cent of Denmark's energy consumption by 2011. The agreement was made by all the parliamentary parties except the far-left Red-Green Alliance.

Progress towards the target

Biofuels for transport represented 0.15% of total sales of petrol and diesel for transport by 31 December 2006 and consequently exceeded Denmark's indicative target of 0.1%.

Denmark is at present close to reaching its RES-E target for 2010.

Support for RES electricity

Fixed feed-in tariffs and premium

The support is given in the form of premium and or as a fixed feed in tariff, so that the combination of market price and supplement ensures a fixed tariff for the producer. All subsidies are passed on to the consumers as an equal Public Service Obligation (PSO) tariff on their total consumptions.

Feed-in Tariff						
Resource	Technology	Support level [€cents/kWh]	Feed-in tariff or premium?	Start year	Duration [years that an investor is entitled to support]	Comments
biomass	solid	8 €cents/ kWh	feed in		20 years	
biomass	biogas	8 €cents/kWh(8€cents/kWh for 10 years and 5€cents/ kWh for the following 10 years.)	feed in		20 years	Biogas plants connected to the grid between 22 April 2004 – 31 December 2008
biomass	electricity generated by central power stations	5€cents/ kWh	feed in	1993	10 years	
PV		8 €cents/ kWh	feed in		20 years	
Geothermal		6,9 €cents/ kWh	feed in		20 years	
wind		1.3 €cents/ kWh	premium	2005	20 years	For wind turbines connected after January 2005

Source: RISOE

For RE plants connected to the grid before 21 April 2004:

- The transmission system operator sells the production on the spot market and the subsidy together with the market price ensures a tariff of 60 øre/kWh (8 €cents/ kWh) for 20 years from the date of grid connection and for at least 15 years as from 1 January 2004.

Special RE plants of major importance and connected to the grid after 21 April 2004:

- Special plants using energy sources or technologies of major importance to future exploitation of RE electricity include wave power, solar energy, fuel cells using renewable energy sources, biomass gasifiers and stiring motors with biomass. Other types of plant can be approved apart from water turbines in rivers and production technologies already in use for biomass incineration.
- The transmission system operator sells the production on the spot market and subsidy together with the market price, ensuring a tariff of 60 øre/kWh for 10 years (8 €cents/ kWh) and 40 øre/kWh (5€cents/ kWh) for the following 10 years.

Other RE plants connected to the grid after 21 April 2004:

- The transmission system operator sells the production on the spot market, and the owner receives the market price and for 20 years a premium of 10 øre/kWh (1.3 €cents/ kWh).

Biogas plants connected to the grid between 22 April 2004 and 31 December 2008:

- The transmission system operator sells the production on the spot market and subsidy together with the market price, ensuring a tariff of 60 øre/kWh (8 €cents/ kWh) for 10 years and 40 øre/kWh (5€cents/ kWh) for the following 10 years.
- The subsidy implies that the total use of biogas not exceed 8 PJ/year.

The biomass agreement of 1993 forced central power stations to use biomass. This element of their production is eligible for a subsidy which when combined with market price ensures a tariff of 40 øre/kWh ((5€cents/ kWh) for a 10-year period.

Wind Turbines connected to the grid from 1 January 2005 are eligible for a premium of 10 øre/kWh ((1.3 €cents/ kWh) until the turbine is 20 years old. Offshore wind parks financed by electricity utilities are or subject to tender are subsidised according to separate rules.

Investment incentives

Subsidies for electricity generated by de-central combined heat and power plants (CHP): in broad terms, subsidies are paid to de-central CHP plants depending on fuel type

Tenders

Tendering procedure for two new large offshore installations. Operators will receive a spot price and initially a settling price as well. Subsequent offshore wind farms are to be developed on market conditions.

Fiscal incentives

Small solar cell systems connected via consumption installation:

Solar cell systems with an effect of less than 6 kW connected via consumption installations in households and that are exempt from electricity levies are not eligible for a subsidy.

Next steps

In February 2008, the Danish parliament has agreed to sharply increase subsidies for onshore wind turbines, biomass and biogas. It also agreed that a further 400 MW of offshore windmills would come online in 2012. Onshore, the plan is to build 75 new MW of windpower in both 2010 and 2011. The agreement also means that compensation will be awarded to people living in the vicinity of windmills.

Furthermore, the country's CO₂ tax will be increased to the level of the expected price of carbon, which for 2008-12 is estimated at DKK 150/tonne (approx. EUR 20). A new NO_x tax of DKK 5/kg will be introduced from 1 January 2010.

The Danes will also be earmarking DKK 25m in the next four years for pilot projects within solar and wave energy, among other things. A total of DKK 750m in 2009 and 1 billion in 2010 will be put towards research and development of energy technology.

A new bill on renewable energy is being drawn up and is expected to become law from 1 January 2009.

A spot price, an environmental premium (EUR 13/MWh) and an additional compensation for balancing costs (EUR 3/MWh) for 20 years is available for new onshore wind farms.

Connection to the grid

The Act on Electricity Supply foresees that every plant operator whose plant complies with the technical requirements and who pays the charges for connection to the grid can connect a plant generating renewable-energy-sourced electricity to the grid by the grid operator. Plants shall be connected according to the principle of non-discrimination and connection costs are borne by the plant operator.

As for the usage of the grid, renewable energy has priority i.e. if there is a capacity shortage, he shall be given priority over the producers of electricity from conventional energy in use of the grids. The latter are obliged to reduce their feed-ins if necessary. This principle of priority may only be violated for reasons of network security, i.e. to guarantee the technical quality and balance the grids.

The grid operator is statutorily obliged to expand the grids, if the expansion is necessary to guarantee the efficient transmission of electricity. The target of increasing use of renewable energy sources is given special attention whenever possible.

Support for RES heating and Cooling

The generation of RES-H is supported by means of tax exemptions.

Resource	Support level [Unit or %]
Solar heating	Exemption from CO2 and energy tax
Biomass	Exempt from CO2 tax

Support for biofuels

Biofuel quota obligations

Resource	Quota in % (per year)	Year	Comments
Biofuels	5.75% (energy)	2010	Compulsory

Tax exemption

Since January 2005, the Danish Government exempts biofuels from the CO2 tax imposed on the use of ordinary petrol and diesel for transport.

Investments in Second- generation biofuels

The government decided in 2006 to significantly boost efforts to promote the use of second-generation biofuel technologies by allocating an additional DKK 200 million for the co-financing of

large-scale private development programmes. Altogether, these additional private and public development interventions are expected to total significantly more than DKK 200 million.

At the start of 2008 applications were invited for 2008 grants for EDDP, which amount to DKK 222 Million in order to further enhance this effort. The invitation comprises two parts. One part is addressed to second generation bio-ethanol technologies. The purpose of this initiative is to establish large scale research and demonstration plant for second generation biofuels in Denmark before 2010. The rest of the 2008 grant may be applied for broadly.

Sources:

European Commission Factsheets by Country

http://ec.europa.eu/energy/energy_policy/facts_en.htm

Member States Reports in the framework of the Directive 2001/77/EC on renewable electricity

http://ec.europa.eu/energy/res/legislation/electricity_member_states_en.htm

Member States Reports in the framework of the Directive 2003/30/EC on biofuels

http://ec.europa.eu/energy/res/legislation/biofuels_members_states_en.htm

Danish Energy Agency

<http://www.ens.dk/>

RISOE

<http://www.risoe.dk/>

EurObserv'er Barometer

<http://www.energies-renouvelables.org/observ-er/sig/eufores/sig.asp>



In the framework of the EU co –funded project: RES 2020: Monitoring and Evaluation of the RES Directives implementation in EU27 and policy recommendations to 2020.

Intelligent Energy  **Europe**

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Annex I Danish Key energy data

Gross Energy Consumption by Fuel

	Total	Crude oil/Feedstocks	Oil Products	Natural Gas	Coal and Coke	Waste, Non-renewable	Renewable Energy	Electricity	District Heating	Town Gas
Direct Energy Content [TJ]										
Total Energy Consumption	863 470	330 645	15 647	171 023	195 268	8 670	145 489	-3 420	148	-
- Primary Energy Production	1137 232	652 261	-	346 146	-	8 670	130 156	-	-	-
- Recycling	303	-	303	-	-	-	-	-	-	-
- Imports	595 312	88 308	250 204	-	200 099	-	19 018	37 535	148	-
- Exports	-824 915	-409 164	-196 910	-169 540	-4 661	-	-3 685	-40 955	-	-
- Border Trade	-8 160	-	-8 160	-	-	-	-	-	-	-
- International Marine Bunkers	-46 292	-	-46 292	-	-	-	-	-	-	-
- Stock Changes	4 345	-2 247	13 725	-6 555	- 578	-	-	-	-	-
- Statistical Difference	5 644	1 488	2 776	972	409	-	- 0	-	- 0	-
Energy Sector	-48 528	-330 645	313 699	-28 243	-	-	-	-2 978	- 360	-
- Extraction and Gasification	-28 243	-	-	-28 243	-	-	-	- 0	-	-
- Refinery Production	328 617	-	328 617	-	-	-	-	-	-	-
- Used in Refinery Production	-347 051	-330 645	-14 918	-	-	-	-	-1 127	- 360	-
- Used in Distribution	-1 851	-	-	-	-	-	-	-1 851	-	-
Transformation	-115 372	-	-14 622	-73 020	-184 164	-8 112	-90 480	134 241	120 338	447
- Large-scale Power Units	-92 678	-	-10 639	-27 408	-183 450	-	-15,237	89 601	54 456	-
- Wind Turbines & Hydro Power	-	-	-	-	-	-	-25,924	25 924	-	-
- Small-scale Power Units	-6 756	-	- 92	-31 431	- 527	-2 514	-15,988	17 022	26 774	-
- District Heating Plants	-1 036	-	-1 215	-5 736	- 117	- 110	-11,547	-	17 688	-
- Autoproducers	-7 033	-	-2 666	-7 986	- 70	-5 489	-21,784	8 418	22 545	-
- Gas Works	- 21	-	- 9	- 459	-	-	-	-	-	447
- Own Use in Production	-7 848	-	-	-	-	-	-	-6 723	-1 124	-
Distribution Loss etc.	-30 723	-	-	- 119	-	-	-	-6 490	-24 097	- 18
Final Energy Consumption	-668 846	-	-314 724	-69 641	-11 105	- 558	-55 009	-121 353	-96 028	- 429
- Non-energy Use	-13 235	-	-13 235	-	-	-	-	-	-	-
- Transport	-224 520	-	-222 986	-	-	-	- 252	-1 282	-	-
- Agriculture and Industry	-158 634	-	-53 346	-33 191	-11 096	- 286	-9 101	-43 572	-8 022	- 19
- Trade and Service Sector	-83 421	-	-3 127	-10 188	-	- 272	-2 737	-39 242	-27 822	- 33
- Households	-189 036	-	-22 029	-26 262	- 8	-	-42 918	-37 256	-60 184	- 378

Note. The energy balance provides an overview of supply, transformation, and consumption of energy. A more detailed statement of entries (black figures) and exits (red figures) of individual energy products is available in the table entitled Energy Supply and Consumption 2007.

Source: Danish Energy Agency