Letter from: Laura Hviid Arildsbo, Energy Attaché, Danish Permanent Representation to the EU

Date: Brussels, 21 October 2011

To: DG ENER

Subject: **Report submitted by Denmark in accordance with Articles 6(3) and 10(2) of Directive 2004/8/EC of the European Parliament and of the Council on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC**

Ref.: 400.K.4-0-1.

Please find enclosed the report submitted by Denmark on the promotion of cogeneration based on a useful heat demand in the internal energy market.

(Complimentary close)

DANISH ENERGY AGENCY

MEMORANDUM

14 October 2011

Ref. 2301/1199-0056

BJK

Report submitted by Denmark in accordance with Articles 6(3) and 10(2) of Directive 2004/8/EC of the European Parliament and of the Council on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC

1. Transposition/implementation of the legal text of Directive 2004/8/EC

Q1 What is the level of transposition of the Directive in your country? What is the timeline for the remaining parts of the transposition of the Directive, if any?

Answer:

The Directive has been transposed into Danish law, as previously notified to the Commission (notification of 31 May 2006) and outlined in the first report, dated 21 February 2007, submitted by Denmark to the Commission.

Q2 What is the timeline for implementing measures based on the Commission Decision of 19 November 2008 establishing detailed guidelines? Please indicate how this has taken place (revision of a general energy law, a specific law, decree, regulation, etc.).

Answer:

The Commission Decision of 19 November 2008 lays down guidelines which clarify the procedures and definitions necessary to calculate the amount of electricity from cogeneration in accordance with the method set out in Annex II to the Directive. The guidelines establish a harmonised method to calculate the amount of electricity from cogeneration.

The Agency has put in place a procedure which uses figures provided by Danish energy producers to gauge on a case-by-case basis whether Danish decentralised cogeneration plants meet the high-

efficiency cogeneration criteria.

Q3 To what extent do you consider your country to have already significantly implemented the Directive?

Answer:

The Directive has already been transposed into Danish law (see answers to Questions 1 and 2).

Q4 Is your country using the alternative calculation method according to Article 12(2)?

Answer:

No.

Q5 Is there any need for your country to review in accordance with Article 13 the threshold values used for calculation of electricity from cogeneration and/or the threshold values used for calculation of efficiency of cogeneration production and primary energy savings?

Answer:

No.

2. National potential to increase the share of high-efficiency cogeneration

Q6 Can your country already show progress in high-efficiency cogeneration since the last report on national potential which can be ascribed to either EU or national legislation and support schemes?

Answer:

Although there has been widespread expansion of cogeneration in Denmark (see answer to Question

7), there is still a certain technical potential for further expansion.

The first progress report, submitted to the Commission in February 2007, estimated the technical potentials over and above the existing cogeneration. The potentials were divided into three categories:

(1): 800 MW (electricity) in the form of decentralised cogeneration. The potential assessment is based on the scope to increase the Cm value (electrical output/thermal output) by establishing new cogeneration plants covering the same heat markets as the current decentralised cogeneration plants;

(2): 1 200 MW industrial cogeneration;

(3): 2 200 MW in the form of micro-cogeneration with an electrical output of less than 50 kW. This potential is likely to be reduced since a large portion of the heat market associated with the potential is expected to convert to heat pumps, district heating, etc.

As the potential assessment submitted by the Agency to the Commission in 2010 found the socioeconomic potential of cogeneration to be limited, measures were not taken to increase the share of high-efficiency cogeneration in Denmark. With regard to current developments, see the answer to Question 7 below.

Q7 What is your evaluation of the progress towards increasing the share of high-efficiency cogeneration in your country? Your assessment should be based on the specific figures to be included in the attached spreadsheet (Excel file) designed to facilitate the submission of your data.

Answer:

Spreadsheet attached.

Cogeneration plays an absolutely crucial role in Danish energy supply, and Denmark is one of the countries with the highest cogeneration cover in the European Union.

District heating, which supplies around 60 per cent of Danish households with heating energy, is the most important basis for cogeneration, and nowadays the majority of district heating is produced at cogeneration plants together with electricity. In addition, there is some industrial cogeneration.

The widespread cover through cogeneration is the result of a targeted policy of promoting this form of production – a policy that has laid the foundations for cogeneration to continue to make an important contribution to Danish energy supplies in the future.

Proportion of electricity and district heating produced by cogeneration

Fjernvarme = District heating

El = Electricity

Figure 1. Proportion of electricity and district heating produced by cogeneration 1980-2010

Figure 1 shows the proportion of both electricity and district heating produced by cogeneration. In 2010 60 % of thermal electricity production (i.e. total production excluding wind power and hydropower) was produced together with heat. The proportion of electricity produced by cogeneration has generally risen: in 1990 cogeneration accounted for 37 %, compared to a mere 18 % in 1980. There will be annual variations resulting from cold or warm winters, just as levels of rainfall in the Nordic countries affect the price of electricity and consequently the commercial profitability of cogeneration under market conditions. In other words rainfall affects hydropower generation in the Nordic countries and therefore the amount of electricity that Denmark exports, as electricity for export is mainly produced at separate electricity production plants.

In 2010 a total of approx. 78 % of district heating was produced by cogeneration, compared to 59 % in 1990 and 39 % in 1980. On account of the market conditions, electricity is not produced together with district heating if electricity prices are low. Figure 1 shows the proportion of district heating produced by cogeneration to have decreased slightly as a consequence of liberalisation of the gas and electricity market, so electricity and heat are coproduced only where there is a financial benefit to the cogeneration plants.

High shares of wind power in the electricity system will – all other things being equal – reduce the proportion of district heating produced by cogeneration on account of the resulting reduction in electricity prices.

Electricity production broken down by type of production

Vindmøller og vandkraftanlæg = Wind turbines and hydropower plants

Decentrale kraftvarmeanlæg = Decentralised cogeneration plants

Centrale anlæg, separat produktion = Central plants, separate production

Sekundære producenter = Secondary producers

Centrale kraftvarmeanlæg = Central cogeneration plants

Figure 2. Electricity production broken down by type of production

Figure 2 shows the production of electricity, broken down by type of production. 2010 was a cold year, which meant that more heat was produced at both central and decentralised cogeneration plants and more electricity was therefore also produced at Danish cogeneration plants than in the previous two years.

Electricity production broken down by fuel used

Kul = Coal

Olie = Oil

Naturgas = Natural gas

Vindkraft = Wind power

Anden vedvarende energi m.m. = Other renewable energy, etc.

Figure 3. Electricity production broken down by fuel

Figure 3 shows the corresponding production of electricity, broken down by fuel. The general trend is a fall in electricity production based on coal and natural gas and a slight rise in electricity production based on wind power and biomass. However, the picture is blurred by significant variation in annual production.

District heating production broken down by production plant

Fjernvarmeanlæg = District heating plants

Sekundære producenter, varmeproducerende = Secondary producers, heat-producing

Sekundære producenter, kraftvarmeanlæg = Secondary producers, cogeneration plants

Decentrale kraftvarmeanlæg = Decentralised cogeneration plants

Centrale kraftvarmeanlæg = Central cogeneration plants

Figure 4. District heating production broken down by production plant

Figure 4 shows the production of district heating, broken down by production plant. Cogeneration in Denmark is mainly district heating-based. In 2010 gross production was approx. 150 PJ, nearly half of which was produced at central cogeneration plants, approx. 20 per cent at decentralised cogeneration plants and just over 10 per cent at private cogeneration plants, while approx. 20 per cent came from plants producing only heat.

2010 was a cold year, which meant that more heat was produced at both central and decentralised cogeneration plants.

3. Barriers to high-efficiency cogeneration

Q8 Please give your views on the current barriers to high-efficiency cogeneration in your country:

- barriers in relation to administrative procedures (authorisation, coordination among competent authorities, streamlined simplified procedures, etc);

- barriers in relation to electricity grid system and tariff issues (including specific measures for small scale and micro cogeneration units);

- other barriers (internalisation of external costs, energy prices, financial and technical barriers, etc) in accordance with Articles 9 and 6 of the cogeneration Directive 2004/8/EC.

Indicate the measures to overcome them.

Answer:

As stated in the answer to Question 7, there has been a major expansion of cogeneration in Denmark since 1980. The section of the Heat Supply Act setting out the objectives of the Act states that cogeneration is to be promoted as much as possible, and the legislation has thus paved the way for the expansion described. From this point of view the overall regulatory framework presents no barriers to the expansion of cogeneration. On the contrary, the active promotion of cogeneration has been a matter of policy. See also the answer to Question 10.

Since, as stated above, the potential assessment submitted by the Agency to the Commission in 2010 found the socioeconomic potential of cogeneration over and above the existing capacity to be limited, no further measures were taken to increase the share of high-efficiency cogeneration in Denmark

beyond the existing support schemes described in the answer to Question 10.

4. Guarantees of origin and support schemes

Q9 Article 5 of the Directive requires Member States to ensure that accurate and reliable guarantees of origin are issued according to objective, transparent and non-discriminatory criteria. Please indicate what the situation is concerning the implementation of this measure in your country (information on primary energy savings, type of registration system).

Answer:

In the Order of 16 February 2007 on guarantees of origin for electricity from high-efficiency cogeneration, the Agency put in place a mechanism to issue and verify guarantees of origin in respect of high-efficiency cogeneration. The registration system is administered by energinet.dk.

No applications have so far been submitted for guarantees of origin to be issued in respect of high-efficiency cogeneration in Denmark.

Q10 Does your country have support schemes for cogeneration/CHP based on Directive 2004/8/EC (operational and/or investment aid)? What kind of support is provided (feed-in tariffs, certificates and quota, priority access to the grid, etc.)? Are they designed to provide stable long-term investment conditions? Which sectors will be targeted (agricultural and/or industrial and/or heating cogeneration)?

Answer:

In Denmark electricity produced together with heat is given priority grid access.

The production and expansion of cogeneration are given the financial support required to cover the necessary investment costs without unduly increasing the district heating costs borne by consumers.

Operating aid is also provided for high-efficiency cogeneration. This aid may be classified as follows:

- production-independent subsidies granted to electricity producers, financed as a PSO (Public Service Obligations) contribution through the electricity price charged to consumers;

- production-dependent subsidies (price supplements) granted to electricity producers, financed by

the budget.

Additional operating subsidies for cogeneration are also granted on the basis of renewable energy (biomass and biogas) and financed by electricity consumers as PSO contributions. These subsidies are awarded as price supplements for biomass or as a fixed total price (market price + operating subsidy) for biogas.

Until 2010 operating subsidies were also awarded for cogeneration using domestic waste as a fuel.

The Commission has been regularly updated on the individual support schemes. Please refer to these notifications for a more detailed account of the schemes.

In the case of biomass-based cogeneration, heat production is also exempt from taxation.

Subsidies are granted both for cogeneration geared towards the heat market and for industrial cogeneration.

The high-efficiency cogeneration support schemes are designed to provide stable long-term investment conditions for electricity producers and will run for a period of 20 years from the date of establishment of the plant, and in any case for no less than 15 years from 2004.

Q11 How much money on a yearly basis has been provided in this way in the past years to the promotion of high-efficiency cogeneration in particular? And how much money is expected to be made available on a yearly basis to the promotion of high-efficiency cogeneration in the coming years?

Answer:

The PSO costs of environmentally friendly electricity production in previous years are divided in Table 1 below into wind, biomass, etc., and decentralised cogeneration. In 2010 the PSO costs of high-efficiency decentralised cogeneration were, as may be seen, DKK 573 million.

Table 1 PSO costs of environmentally friendly electricity production (DKK million)

	2005	2006	2007	2008	2009	2010
Wind	1668	1076	1631	667	1242	1069

Biomass, etc.	368	245	419	228	424	461
Decentralised cogeneration	906	401	1179	170	1267	573
Total	2942	1722	3229	1065	2932	2103

In previous years the costs of high-efficiency cogeneration, financed under the Finance Act, were as follows:

Table 2 Decentralised cogeneration costs, financed under the Finance Act (DKK million)

	2005	2006	2007	2008	2009	2010
Natural gas-based cogeneration	127	129	100	129	104	92
Waste-based cogeneration	118	148	79	117	99	0
Total	245	277	179	246	203	92

The plan is to adjust the payments made under the Finance Act to basic amounts financed as PSO contributions.

Overall support for high-efficiency cogeneration (excluding special subsidies granted for biomass or biogas-based cogeneration) is expected to be at a similar level to 2010, i.e. approx. DKK 700 million per annum.

Sheet No 3 Technologies				TOTAL	CCGT with heat recovery	Steam backpressure turbine	Steam condensing extraction turbine	Gas turbine with heat recovery	Internal combustion engine	Microturbines	Stirling engine	Fuel cells	Steam engine	Organic Rankine cycle	Other*
2000	electricity	capacity	[GW]	6.5	0.51	0.68	4.10	0.27	0.91						
		output	[TWh]	23.0	2.15	2.72	13.15	1.28	3.65						
	heat	capacity	[GW]	9.1	0.55	2.34	4.47	0.50	1.21						
		output	[TWh]	30.8	2.75	9.14	11.51	2.40	4.98						
	fuel	input	[PJ]	245.4	20.24	50.56	123.16	15.86	35.55						
2004	electricity	capacity	[GW]	5.9	1.08	0.70	2.84	0.28	1.00						
		output	[TWh]	25.4	4.66	2.52	12.77	1.38	4.05						
	heat	capacity	[GW]	9.0	1.17	2.29	3.63	0.58	1.33						
		output	[TWh]	30.9	4.93	9.09	9.01	2.48	5.41						
	fuel	input	[PJ]	261.2	42.82	47.81	116.01	16.27	38.26						
2005	electricity	capacity	[GW]	6.8	1.08	0.61	3.85	0.28	1.02						
		output	[TWh]	25.7	4.14	2.75	13.79	1.28	3.72						
	heat	capacity	[GW]	9.2	1.14	1.94	4.21	0.56	1.35						
		output	[TWh]	31.4	4.75	9.26	9.97	2.43	4.97						
	fuel	input	[PJ]	265.2	38.64	49.07	127.02	15.41	35.06						
2006	electricity	capacity	[GW]	6.4	1.08	0.61	3.46	0.29	1.00						
		output	[TWh]	29.8	4.89	2.60	17.69	1.35	3.23						
	heat	capacity	[GW]	8.7	1.14	1.94	3.76	0.57	1.31						
		output	[TWh]	29.5	5.06	8.79	8.88	2.45	4.35						
	fuel	input	[PJ]	294.5	44.55	46.60	157.02	15.73	30.61						
2007	electricity	capacity	[GW]	6.3	1.08	0.84	3.14	0.20	1.02						
		output	[TWh]	23.8	3.85	2.76	13.79	0.74	2.64						
	heat	capacity	[GW]	9.6	1.16	2.78	3.94	0.40	1.33						
		output	[TWh]	28.5	4.53	9.83	9.22	1.36	3.53						
	fuel	input	[PJ]	249.0	36.84	51.75	126.71	8.93	24.74						
2008	electricity	capacity	[GW]	6.2	1.07	0.77	3.14	0.19	1.03						
		output	[TWh]	22.9	3.88	2.78	12.54	0.87	2.70						
	heat	capacity	[GW]	9.3	1.14	2.50	3.94	0.39	1.33						
		output	[TWh]	28.6	4.39	9.81	9.20	1.62	3.57						
	fuel	input	[PJ]	240.6	36.08	51.93	116.76	10.57	25.22						
2009	electricity	capacity	[GW]	5.6	1.05	0.59	2.74	0.24	1.02						
		output	[TWh]	22.2	3.51	2.66	12.95	0.68	2.41						
	heat	capacity	[GW]	8.2	1.07	1.83	3.51	0.41	1.33						
		output	[TWh]	27.0	4.01	9.95	8.62	1.23	3.20						
	fuel	input	[PJ]	231.6	32.32	50.86	117.78	8.14	22.50						
2010	electricity	capacity	[GW]	6.2	1.06	0.58	3.31	0.24	1.04						
		output	[TWh]	25.3	4.35	2.79	14.52	0.74	2.91						
	heat	capacity	[GW]	8.9	1.12	1.79	4.18	0.48	1.34						
		output	[TWh]	32.6	5.09	9.98	12.19	1.45	3.88						
	fuel	input	[PJ]	265.7	40.67	52.38	136.55	9.01	27.05						

*within the scope of Directive 2004/8/EC