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Current Bioenergy Policies and Measures in the Nordic Countries

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Current Bioenergy Policies and Measures in the Nordic Countries

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1 Background

This report is part of a collection of smaller reports under the Nordic Bioenergy Project "***Opportunities and Consequences of an Expanding Bioenergy Market in the Nordic Countries***", which aims to provide factual background information on the status of bioenergy in the Nordic countries. These factual reports cover the following themes:

Econ Pöyry-Report no. 2008-057: Status and Potentials of Bioenergy in the Nordic Countries - Summary

Econ Pöyry-Report no. 2008-054: Facts and Figures on the Use of Bioenergy in the Nordic Countries

Econ Pöyry-Report no. 2008-055: Facts and Figures on the Use and Potential of Biomass Resources for Bioenergy in the Nordic Countries

Econ Pöyry-Report no. 2008-052: Current Bioenergy Application and Conversion Technologies in the Nordic Countries

Econ Pöyry-Report no. 2008-0563 Current Bioenergy Policies and Measures in the Nordic Countries

Econ Pöyry-Report no. 2008-056: Global Aspects of Bioenergy Imports

The Nordic Bioenergy Project was launched in May 2007 by the Nordic Council of Ministers with the aim to help coordinate bioenergy activities in the Nordic countries and improve the visibility of existing and future Nordic solutions in the complex field of bioenergy, energy security, competing uses of resources and land, regional development and environmental impacts.

In addition to the collection of smaller background reports, the Nordic Bioenergy Project has prepared the report"***Energy, Economic and Regional Perspectives in an Expanding Bioenergy Market in the Nordic Countries***". This report provides an overview and analysis of the issues at stake for the Nordic countries in terms of the role of bioenergy in meeting various energy, industrial and regional development policy objectives. The report raises a number of questions in this regard and offers a number of perspectives to inspire future Nordic framework conditions.

During the project, two workshops were held on the themes "***Bioenergy in the Nordic Countries: Status, Opportunities and Risks***" and"***Bioenergy in the Nordic Countries: Lessons & Future Framework Conditions".*** Presentations and summaries from the workshops along with the above mentioned reports are published on the following website:

http://www.nordicenergy.net/bioenergy

2 Current Policies and Measures

This report provides an overview of the current main policies and measures related to the development and use of biomass resources and technologies in heating, electricity and transport.

3 Denmark

The main strategy for use of biomass in Denmark is the "Biomass agreement"[1] from 1993. The Biomass agreement meant that Danish use of biomass resources for energy is at present found mainly within the electricity sector (mostly for CHP). However, new biofuel targets from the EU means that biomass resources will also be used in the transport sector in the future.

The biomass agreement aimed to increase the use of straw to 1.2 million tonnes and the use of wood chips to 0.2 million tonnes by 2000. In 1997 the biomass agreement was adapted to increase the flexibility between the use of straw and wood chips.[2]

3.1 Bioenergy for Heating & CHP

As a support to the development programme for renewable energy, a feed-in tariff system exists since 1993. A green certificate system was proposed by the Danish Government in 1999 where a 20per cent purchase obligation for all consumers was planned[3]. The green certificate market was supposed to replace the existing feed-in system from January 2003 onwards, but was postponed indefinitely due to concerns from the renewable energy sector about the uncertainty and risks of a market for green certificates, especially in the European context.

An intermediate scheme was designed for the period until green certificates could be introduced. Until then, a premium of 10 øre/kWh was introduced instead of the green certificate. The support is now generally lower than in previous policy regimes, in line with technological development and cost reduction.

In the 1980'ies the government supported the use of biomass in small district heating plants (greenfield plants). However, the focus is now on combined heat and power (CHP). The present support to use of biomass resources is given by the "Biomass agreement". According to this agreement subsidies were given to

- Existing decentralised CHP plants (DKK 10 øre/kWh)
- New CHP decentralised plants (DKK 10 øre/kWh + DKK 17 øre/kWh)
- Centralised CHP plants (A price supplement that together with the market price gives a maximum income at DKK 40 øre/kWh in a 10 year period) [4]

From 2004, subsidies to electricity based on biomass, are given to[5]

- Existing plants, with a maximum limit of market price + subsidy of DKK 60 øre/kWh during 20 years from grid connection, or at least in 15 years

[1] http://www.ens.dk/graphics/Energipolitik/dansk_energipolitik/politiske_aftaler/biomasseaftale_1993.pdf

[2] http://www.ens.dk/sw13380.asp

[3] http://www.ens.dk/sw13373.asp

[4] http://www.ens.dk/sw15282.asp

[5] http://www.ens.dk/sw15282.asp

- New plants, with a maximum limit of market price + subsidy at DKK 60 øre/kWh during 10 years and then a maximum of DKK 40 øre/kWh during 10 years.

*In the farming sector, b*iomass for individual heating is commonly based on straw or grain builder. *In the household sector,* many households have installed biomass boilers for central heating. However, there is no direct support to the individual use of biomass. The large spread of biomass use to individual heating is caused by the high opportunity cost of fossil fuels. In other words, the high energy taxes on fossil fuels indirectly drive the increased use of biomass for individual heating.

3.2 Bioenergy for Transport

In the Danish energy plan "En visionær dansk energipolitik 2025" (Transport- og Energiministeriet 2007) Denmark has made a target of achieving 10per cent biofuels in the transport sector by 2020. This is a U-turn in the Danish support for biofuels. Until 2006, there was limited political support in Denmark for the production and use of biofuels (bioethanol and biodiesel). However, through the obligation to translate the EU Directive on biofuels into national legislation, Denmark has now accepted a target by 2010 of 5.75per cent.

The Biofuel Directive allows the member states to detax the use of biofuels (Directive 2003/96/EC). There is no detaxation in Denmark.

3.3 Programmes & Grants

The focus has on 2nd generation and it is understood by the Government that the future support to 2nd generation technologies should be in line with the development of technologies. As a consequence, DKK 200 million have been allocated in 2006 as a co-financing of private development programmes and demonstration of 2nd generation biofuels.

The Danish Government has been very modest with support to 1st generation biofuels. A pilot project on the application of Biodiesel in limited vehicle parks receives DKK 60 million during 2007-2009.

As early as in the 1990 "Energy Plan 2000", the Danish Government proposed to increase the use of renewable energy sources by 12-14per cent by 2005 compared to the level in 1988. To reach this goal, "Udviklingsprogrammet for vedvarende energi (UVE)" was introduced. UVE subsidised renewable energy projects by a maximum amount of DKK 1 million. Subsidies were given to

- Solar heat (with a maximum subsidy 30 per cent)
- Heat pumps (with a maximum subsidy 15 per cent)
- Biofuel (with a maximum subsidy 30 per cent)
- Biogas (with a maximum subsidy 30 per cent)

Several RD&D programmes provide funding for Danish energy research and development. None of them are specially directed toward bioenergy. However, bio energy is one of the main focus area for each of the programme:

- EUDP or Programme for Energy Technology Development and Demonstration. This is the successor of the programme Energy Research Programme, ERP, (Energiforskningsprogrammet - EFP). The programme had 186 million Danish kroner for 2007. The EUDP programme is managed by the Danish Energy Agency

- PSO is a program managed by the Danish system operator Energinet.dk. The programme provides funding for energy RD&D projects concerning environmentally friendly production of power. In 2007 130 million DKK is available for project funding. Further information is available on www.energinet.dk

- The Strategic Research Council (Det Strategiske Forskningsråd) provides funding for energy research projects concerning renewable energy technologies and energy conservation. In 2007 approx. 105 million DKK is available. Further information available in Danish on www.fist.dk

- Højteknologifonden (the Danish National Advanced Technology Foundation) in 2005 and 2006 has funded energy technology projects with approx. 50 mio. DKK yearly. Further information on www.hoejteknologifonden.dk

- Dansk Energi - NET (previously named Elfor), an association of electricity distribution companies, provides funding for energy RD&D projects concerning efficient use of electricity. In 2007 25 million DKK is available for project funding. Further information is available on www.danskenergi.dk

3.4 Coming policies

Elements in the draft proposals in the 1st half of the 2007 political discussions in the Danish Parliament about a "Visionary Danish Energy Policy towards 2025" included the following:

- an increase of renewable energy to 30per cent in 2025;

- more biomass to large scale CHP;

- biomass in small CHP plants; and an

- increase of subsidies to biogas to secure 8 PJ

New political discussions on the future framework for renewable energy and bioenergy are planned for fall 2007.

In addition, the Government plans in early 2008 to make a law proposal on biofuel supply obligation for petrol and diesel stations.

4 Finland

The Finnish targets and support to bioenergy are connected to a number of energy related policy programmes such as the National Climate and Energy Strategy (2001, revised 2005), the National Action Plan for Renewable Energy Sources (1999, revised 2003).

The general target for renewable energy is to increase the use of renewable energy by 25 per cent by 2015 and by 40 per cent by 2025, such that one third of primary energy demand is covered by renewable energy. With this target, the share of renewable energy would increase to one quarter of primary energy consumption. In 2003, the share of renewable energy in primary energy consumption was 23 per cent.

For electricity, a target aims for 31.5 per cent renewable energy of total electricity production by 2010. The National Action Plan for Renewable Energy Sources aims to increase the use of bioenergy energy sources by 30 per cent by 2010 compared to 2001. This has not been broken down into heating, electricity and transport uses.

The energy policy promotes the use of forestry chips, agro-biomass fuels and the small scale use of wood with the aim to increase their use by 65per cent from 2003 to 2015 and by 80per cent by 2025 compared to 2003. Another Finnish target aims to increase the use of solid forest biomass to 5 million m3 by 2010 and at securing the use of peat in CHP.

The revised National Climate and Energy Strategy from 2001 also includes targets to decrease greenhouse gas emissions to 1990 levels by 2008-2012, where bioenergy in electricity, heat and transport play a central role. The strategy focuses on technology and respective financing to attain its objectives.

These abovementioned national targets have recently lost lot of importance as Finland is currently following the new binding targets for renewables set by the European Commission in 2007 (Commission of the European Communities (2007)). A binding target of increasing the level of renewable energy in the EU's overall mix from less than 7per cent today to 20per cent by 2020 is distributed according to the current situation in the member states. For Finland this target was set to 38 per cent by 2020.

In order to get the national energy policy agenda in line with the EU agenda a new national long term climate and energy strategy up to 2020 and 2050 is expected to be published in summer 2008. Bioenergy will have a significant role in the new agenda.

4.1 Bioenergy for Heat & Electricity

CO2 taxes, tax exemptions and tax subsidies on renewable energy and feed-in tariffs are among the policy instruments used in Finland to increase the use of bioenergy in electricity and heat production.

A CO2 tax on fossil fuels was introduced in 1990, indirectly supporting bioenergy in the electricity production. Fuel peat was excluded from this CO2 tax on 1 July 2005. This is linked to the strategy to secure the use of peat in CHP and to the feed-in tariff support for peat between 2007 and 2011 mentioned above.

For *electricity production*, there are two support schemes, one is feed-in tariffs on peat and the other is tax subsidies on renewable energy sources. The electricity sector tax is levied on the electricity generated/consumed and not on the fuel itself. For this reason, there are tax subsidies on renewable energy sources used in the electricity production. This system has been in place since 1997. At present wind power, forest chips, small hydro, biogas and REF receive the tax subsidy. Wood and wood-based fuels (bark, sawdust etc.) was excluded from the subsidy system as of 1st of January 2007.

Feed-in tariffs are in place between 2007 and 2011 to support the electricity production based on peat. Four plants, larger than 120MW, are currently eligible for this support.

Feed-in tariffs are also expected in early 2008 for the use of biogas in electricity production. The biogas producers will be promised a guaranteed price for a certain period of time. The biogas plants are expected to use agro-biomass, slaughter waste, various kinds of livestock manure and community waste. Plants with an output of less than 20 MW will be included in this system.

For *heat generation*, bioenergy fuels are exempt from taxation, including wood fuels, peat, biogas and solid recovered fuels. CHP plants with the combined production of heat and electricity have a two-split tax system in place. Bio-oil used for heating or as fuel for machinery, but excluding transport, is also exempt from taxation.

For the *forest sector*, government grants are available to non-industrial, private forest owner for activities supporting the supply chain of biomass, e.g. tending young stands and harvesting of energy wood. The support encompasses the harvesting costs of thinning from young stands. Since the end of 1999, chipping costs also receive support for chips produced from trees harvested from young stands.

For the *industry sector*, there is financial support available for development projects which promote the use of wood energy, and investment, start-up and development support for enterprises.

4.2 Bioenergy for Transport

In 2004, a national target was set for biofuels to reach 0.1 per cent of total transport fuel in 2005. This target was met. The Finnish Government is implementing the EU Directive on biofuels (Directive 2003/30/EC) by setting an obligation on oil companies to ensure biofuels represent a minimum of 2 per cent in 2008 is 2 per cent, 4 per cent in 2009 and 5.75 per cent in 2010. The system will be applicable from the beginning of 2008. It is up to the individual oil company how to meet the bio-fuel blend obligation.

Bio fuels are currently not exempt from taxes levied on transport fuel.

Neste Oil has started a large-scale biodiesel production in Porvo 31 Mary 2007 with a capacity around 170.000 tonnes of Biodiesel per year. Plans are underway to open another plant next year (See Econ Pöyry (2008)). According to personal communication with the Ministry of Trade and Industry, a number of smaller ethanol plants are under construction, but in quite a few instances investors have chosen not to go ahead with building the larger plants. It was also reported that the investment costs turned out to be higher than expected.

4.3 Programmes & Grants

The Finnish Funding Agency for Technology and Innovation (Tekes) promoted R&D in renewable energy with more than € 15.5 million in 2004, with bioenergy accounting for approximately € 10.2 million and waste to energy € 2.7 million. In addition, Tekes has € 10 million annually for renewable energy related technology. The public funding for business-driven projects regarding renewable energy and climate change technology is expected to remain at the level of € 60 million according to the report Solid and Liquid Biofuels Markets in Finland.

Finland has a system of grants for energy investments, development projects and energy conservation which aim at promoting the use of renewable resources and reducing the environmental impact from energy generation and consumption. Grant support is given up to 40per cent depending on the type of project. Commercialisation of innovative technology projects is prioritised. Municipalities, joint municipal boards and Regional Councils are eligible to receive an extra 10 per cent when these are in connection to the municipality's tasks. Projects eligible for support can involve issues such as the increased use of bioenergy or the increased production and the processing of domestic fuels. The revised Climate and Energy strategy aims at keeping the support at about € 30 million annually for renewable energy and energy efficiency.

Information, education and motivation represent an important part of the efforts to increase the use of sustainable energy sources. The main part of funds on energy information is channelled through Motiva Oy. Motiva is a state owned company and functions as an affiliated government agency. Motiva promotes efficient energy use and renewable energy. The Finnish Ministry of Trade and Industry began a Climate Change Information Programme in 2002 which has carried out 40 projects. Through Motiva Oy, the Ministry has financed a networking energy agency project which also includes bioenergy. The bioenergy focus has been on chips, heat entrepreneur actions and pellet heating. Forest centres are required to have wood energy advising activities. The Ministry of Education has currently a committee working to integrate renewable energy and energy saving into training and education.

4.4 Coming policies

A number of governmental initiatives announce an increased effort for bioenergy in Finland. Amongst the suggestions are the following:

- Long term climate and energy strategy up to 2020 and 2050, where the Finnish Government is expected to decide on the strategy during early summer 2008 followed by discussions in Parliament.

- Feed-in tariff on biogas plants with an output less than 20MW for a certain period of time.

5 Norway

Increased use of bio energy is an important issue for the Norwegian government, and in the White paper about climate (St. meld. Nr 34, 2006-2007) a strategy for increased use of bioenergy with up to 14 TWh within 2020 is being launched. Below we present the present frame work conditions for bioenergy, and the new coming policies that have been advertised so far.

5.1 Bio energy for heating

The present target for bioenergy is to increase the heat production with 4 TWh from 2001 to 2012, but the government has announced a more ambitious target for 2016 with a total of 30 TWh more renewable energy and energy savings as compared to 2001. So far the overall target of 30 TWh has not been broken further down for heat, renewable electricity and energy savings. The main measures to accomplish the goal are investment subsidies managed by the state company Enova. Enova's programmes are mainly targeted towards professional actors, like district heating producers.

For *district heating* there are two support schemes, one for the heat plant and one for the infrastructure. The present signals are that there will be a larger focus on infrastructure since this has been identified as the main bottleneck for increased use of district heating in Norway. The investment subsidies has no fixed rate, but are designed to give the supported facilities a normal rate of return. Enova also have other support programmes that can promote the use of bioenergy, for instance a programme for the building sector where support can be given for converting from electricity to alternative heating sources, and a programme for introduction of new technology giving support to demonstration facilities.

The Planning and Building Act[6] states that, after a licence for a district heating plant has been given, the municipality can decide that new buildings in the concession area must connect to the district heating system. On the other hand mandatory connected buildings are not forced to use the system, and at least in principle they can chose to use any other heating source, including electricity. The Energy Act[7] states that the charge for district heating shall not exceed the price for electrical heating in the same supply area.

The Energy Act instructs the holder of the so called area licence to take part in energy planning, and to present and discuss the plans with the municipalities in the area. The purpose of these plans is to make sure that the energy supply in the area is being addressed in a larger setting and that alternatives to electricity is being properly accounted for. In the work with a new Planning and building act the issue of transfer this obligation to municipalities has been discussed. Already there are several municipalities with energy plans, and the adaptation of alternative energy, like bio energy, is partly due to whether such plans exist for the municipality.

[6] http://www.regjeringen.no/nb/dep/krd/dok/lover_regler/reglement/2005/The-Planning-and-Building-Act.html?id=420607

[7] http://www.nve.no/admin/FileArchive/379/Theper cent20Energyper cent20Act.pdf

For the *farming and forest sector* Innovation Norway (a state company promoting innovation) offers an investment subsidy for small heating plants and for fuel production. Forest owners are obliged to reserve a certain part of the sale of timber and bio fuels in to a so called forest fund. The forest owner does not freely dispose these funds, but has to use them for certain investement. From 2007 production plants for heat deliveries are included in the allowed investments.

For the *household sector* there has been two time limited programmes giving support to heat pumps, pellet stoves and control systems, one in the winter 2003 and the other in the autumn 2006. The programmes where being administrated by Enova, but financed through a special grant. The grant for the 2006 programme has not been fully allocated, and hence it is still (autumn 2007) possible to apply for support. Otherwise Enova offers information to households on issues like converting from electricity to alternative heat sources and energy saving. For the household sector some municipalities offers a grant for installation of water based heating systems or alike.

All electricity use, except in the industry and the northern parts of Norway, pays an electricity charge of 0.1023 NOK/kWh. For fossil fuels for heating purposes there is a so called "base charge", a CO_2 and a SO_2 charge.

5.2 Bio energy for transport

Bio fuels are exempted from several of the taxes levied on ordinary fuels, like:

- Low mix of bio ethanol in petrol are being exempted from the CO_2 charge
- Low mix of bio diesel in diesel are being exempted from the auto diesel charge and the CO_2 charge
- When bio fuels make up the largest part of the fuel it is being exempted from the petrol charge, the auto diesel charge and the CO_2 charge.

From 1st of July 2007 ethanol or mixed fuel cars (that is E85 cars) are allowed a reduction in the Vehicle Import Duty, equalling NOK 10 000.

5.3 Programmes and Grants

The present programmes promoting bio energy relates to heat purposes, and as mentioned before the main programmes are:

- Investment support for district heating, both production and infrastructure, through Enova
- Investment support for production of bio fuels for heating purposes, through Enova and Innovation Norway
- A temporary support programme for the household sector managed by Enova.

In addition there are some other programmes within the Enova system that can be of relevance for bio energy:

- *Energy Use – buildings* and *Energy Use – Industry* where professional actors can receive investment support for converting from electrical heating to other heating sources, including bio energy.
- *Municipal energy- and climate planning* where municipalities can receive a grant of maximum 50 per cent of total costs for the preparation of a municipal energy- and climate plan.

As mentioned Enova also has several information activities both targeted towards professional actors (both producers and large users) and the households.

5.4 Coming policies

There are several governmental papers that announce an increased effort for bio energy in Norway. Amongst the suggestions are:

- A strategy in order to increase the use of bio fuels, partly driven by the EU bio fuel directive (EU directive 2003/30/EU). As from 2008 at least two per cent of yearly traded volume of road transport fuel should consist of bio fuels, increasing to five per cent in 2009.
- Establishment of a new subsidy for converting oil boilers to renewable heat.
- Prohibition of oil boilers in new buildings from 2009.
- A possible prohibition of replacing old oil boilers with new in existing buildings.

As form 1st of January 2008 there will be a feed-in tariff for renewable electricity production, including bio energy. For bio sources there will be a fixed add-on of 0,10 NOK/kWh.

6 Sweden

A number of measures are being implemented to increase the use of renewable energy and bioenergy in Sweden as part of the work creating a more sustainable society. The measures have included the areas of energy supply, energy savings, energy efficiency, renewable energy and efficient energy technology. Swedish energy policy has in general aimed at remaining neutral with regard to the choice of technology. Two examples are the tax on CO_2 introduced in the 90s and the more recent introduction of green certificates.

Taxation has been used to create incentives for moving towards a greener society. In 2000 the Swedish Parliament decided that SEK 30 billion in tax burden should be transferred from taxes on work to taxes on energy use and emissions by 2010, the so called green tax reform. The emphasis was on higher taxes on electricity and heating fuels and later also on the transport sector. The Swedish Budget Bill for 2007 proposed that the green tax switch should be interrupted.

The Swedish Commission on Oil Independence delivered their report *Making Sweden an OIL-FREE society* [8]in June 2006. Their task was to develop a concrete strategy for breaking Sweden's dependency on oil by 2020. The targets suggested by the Commission were to reduce the use of oil in the transport sector by 40 - 50 per cent and in industry by 25 - 40 per cent compared to today. Housing and other premises should not be heated by oil. Energy efficiency measures should amount to 20 per cent.[9]

6.1 Bioenergy for heating/electricity

Main instruments in Sweden to increase the production and use of bioenergy include taxes, green certificates for the production of electricity with renewable energy and rural programmes to support the production of domestic bioenergy. Sweden has a target of 17 TWh new renewable electricity by 2016 compared to 2002

The CO_2 tax was introduced in the 1990s exempting bioenergy, including peat and the green certificate system was introduced in 2003.

The production of heat is generally charged with an energy tax, CO_2 tax and sometimes sulphur tax. However, bioenergy and peat is exempt from these energy tax and CO_2 taxes, but peat is charged with a sulphur tax since 1991.

In the *production of CHP*, the energy tax does not apply and the CO_2 tax is reduced by 79 per cent for the part of the fuel that is equivalent to the production of heat. Peat is exempt from CO_2 tax.[10] In January 2004 CHP came under the same tax relief rules as manufacturing industry. The manufacturing industry does not pay the energy tax on fossil fuels and it only pays 21per cent of the CO_2 tax.

[8] Commission on Oil Independence (2006): Making Sweden an OIL-FREE Society.

[9] The Swedish Energy Agency Energiläget 2006

[10] The Swedish Budget bill for 2008.

District heating CHP plants fuelled by bioenergy are favoured by the green certificates while CHP plants in district heating networks fuelled by fossil fuels are favoured by the taxation of CHP. It is difficult to assess which energy sources benefit the most from these tax rules. However, due to the initially high ETS allowance price, the fossil fuel price became more expensive for both electricity and heat producers. In addition, the price of the green certificates has been comparatively high and fossil fuels have also become more expensive. This situation has benefited bioenergy (Energimyndigheten, 2007).

For households there is a subsidy for switching from direct electrical heating to e.g. district heating or a bioenergy furnace. This subsidy is also available for apartment blocks. There is also a subsidy available for installing bioenergy based heating when building new one-family houses. A subsidy supporting the switch away from oil based heating to e.g. district heating or a bioenergy furnace used up the allotted funds before the end of the financial year 2007

In *electricity production*, there is a target to obtain 17TWh renewable energy by 2017, which is expected to come mainly from wind power and bioenergy. Electricity based on bioenergy accounted for approximately 7.7per cent per cent of the electricity used in 2006.

Biofuels are exempt from the energy and CO_2 tax, but may be subject to a NOx levy and a sulphur tax. The NOx levy is applicable for plants of more than 25GWh annually. The tax is recycled back to plant operators in proportion to their energy production. Only those with above average levels of emissions for produced utilized energy are net payers.

The green certificates were introduced on 1 May 2003 and the system was extended to include peat in electricity production on 1 April 2004. Bioenergy and peat play a dominant role in the green certificate system. In 2006, electricity produced from biofuel and peat constituted 75 per cent of the electricity entitled to green certificates. It amounted to 9 149 GWh which meant an increase of 590 GWh from the previous year, constituting close to 70 per cent of the increase for 2006. The green certificates are based on a quota system where companies selling electricity and certain users of electricity are obliged to buy green certificates in proportion to the total amount of energy they sell/use.

For *the forest and agriculture sector,* there are support programmes within EU CAP and a specific Swedish programme. The latter is an investment support given for planting energy forest. It is possible to get support for 50per cent of the costs that are eligible for the support, with a maximum of SEK 5000/hectare. The investment support is part of a broader support system for rural development and is administered by the Swedish Board of Agriculture.

6.2 Bio energy for transport

The Swedish Parliament has adopted the European target of 5.75 per cent biofuel in the transport sector by 2010 (EU Directive 2003/30/EC). The use of biofuels in Sweden was approximately 3 per cent in 2006 (Energimyndigheten, 2007), with ethanol accounting for the major share. According to the Swedish Energy Agency Sweden did not reach its own target of 3 per cent renewable fuels for transport in

2005 (Energimyndigheten, 2007). Sweden did however reach the goal of 2 per cent set by the EU for 2005.

The main instrument in force for the promotion of biofuels in Sweden in the transport sector is the tax exemption for biofuels. Biofuels can be granted tax exemptions after having applied for it. In addition, vehicles that are defined as "green" also get other benefits such as free parking etc. (see policies and measures). The tax for E85 was 0,75 SEK in 2005, including a CO_2 and an energy tax. This is much lower than the tax on petrol (2.12 SEK) and diesel (2.61 SEK). The final price to the consumer was at that time 7.83 SEK per litre. Other instruments and regulations in place focus on facilitating the supply chain of car production and fuel outlets.

For outlets, petrol stations above a certain size are obliged by law to sell biofuels for transport. The initial focus has been on installing pumps for ethanol since this has been the cheapest alternative according to the Swedish Energy Agency. The Swedish Environmental Protection Agency administers a grant available for installing pumps for other renewable fuels than ethanol.

For car producers and buyers, there is a number of tax breaks, bonuses and fringe benefits, such as a green car bonus when buying a new green car (10.000SEK), a particle filter rebate for diesel cars with low levels of particles (6.000SEK, which will be discontinued at the end of 2007), and a lower vehicle tax for green cars. In locations such as Stockholm, certain green cars are exempted from congestion fees and eligible for free parking in certain areas. The value of fringe benefits is lower for the taxation assessment for green cars than for traditional cars. Ongoing discussions debating the definition of an environment car in different regulations may however slow the rise in demand for these cars.

A number of grants and supported pilot programmes exist in order to stimulate the development of the transportation sector and non-fossil fuels (See Programmes & Grants below).

International agreements are also used in Sweden in order to increase the use of biofuels and green cars. In June 2007, the Swedish government signed an agreement with the government of the USA regarding cooperation on research in the field of energy with a focus on biofuels and more efficient motors and vehicles.[11] In September 2007, the Swedish government also signed an agreement with Brazil[12], aiming at co-operating in the bioenergy area, for example on research on cellulose based ethanol. Among the issues of common interest for a policy dialogue on energy the agreement e.g. mentions information exchange on sustainable production and use of energy from renewable sources, including biomass, and similar areas of interest. Sweden has also begun to look into the possibilities of assisting developing countries in their work with the biofuels sector, such as in Tanzania.

[11] The Swedish Budget bill for 2008.

[12] Samförståndsavtal mellan Konunagriket Sveriges regering och Förbundsrepubliken Brasiliens regering om bioenergisamarbete inklusive biobränslen

Tax exemptions have been one of the main tools to promote biofuels for transport. However in its report "Styrmedel för att främja användning och produktion av biodrivmedel"[13] the Swedish Energy Agency proposes that an obligation system would be a better measure than tax exemptions.

6.3 Programmes & Grants

The Swedish Energy Agency supports a number of research programmes with the aim to bring new technologies faster to a commercial state. Support can amount to up to 25 per cent for demonstration projects, 50 per cent for research projects and 100 per cent for basic research.

Examples of the programmes include focus on the sustainable supply of biomass and sustainable methods for the conversion of biomass, waste based fuels including biogas or energy systems in road vehicles and development projects in the car industry concerning different kinds of hybrid vehicles. The Energy Agency has formed four competence centres with universities and the industry of which one focuses on hybrid vehicles. The Swedish Energy Agency also offers loan based support to companies which can be used for bioenergy related ideas.

In relation to the transportation sector, the government granted during 2007 and 2008 400 million SEK for R&D in order to stimulate the development of environmentally friendly cars. Six different programmes have been set up together with the car industry, including the green car programmes aimed at developing vehicles and vehicle parts with more environmentally friendly characteristics, and the 'PFF – vehicle research from an environmental standpoint'. In addition, 100 million SEK will be given to R&D during 2007 and 2008 for the development of second generation biofuels. In addition, the Swedish Energy Agency has set up a program (bränsleprogrammet) to support Research, Development and Demonstration. The program started in 2007 and will continue until 2010 with a yearly budget of 40 MSEK. In this programme, all R&D activities regarding input and transformation of biomass for energy use have been grouped. It includes basic research as well as very specific industrially driven development projects.

In the biofuel area there is also research into the possible future use of black liquor and wood chips. Black liquor is a wood based waste product from the forest industry. There is one pilot factory in Örnsköldsvik producing ethanol from wood waste products. The pilot project receives economic support from The Swedish Energy Agency and the European Union. The ethanol produced at the pilot factory is intended for the transport sector only. Other examples are one plant in Piteå developing the gasification technology for black liquor and one plant in Värnamo working with the gasification of biomass. The Swedish Energy Authority is co financing both projects. Chemrec in Piteå has signed a contract with the American paper producer New Page with the intent of implementing the method developed in Piteå in the U.S.

Support for energy investments in premises for public use e.g. conversion from electricity and oil to renewable energy sources also benefit the increased use of bioenergy.

[13] Swedish Energy Agency (2007): Styrmedel för att främja användning och produktion av biodrivmedel

The Swedish 2007 Budget Bill[14] contains a so-called 'climate billion', meaning that SEK one billion will be used to strengthen measures deemed necessary and important up to 2010. Plans are to spend part of the climate billion on projects such as pilot and demonstration projects for second generation biofuels, and sustainable use of biomass from agriculture and silviculture.[15]

Bioenergy related projects can also apply for support from Nutek, the Swedish Agency for Economic and Regional Growth, which administers the EU structural funds where environment is considered a priority.

The Climate Investment Programme (Klimp) in part supports bioenergy related issues involving physical investments over a period of four years. The programme aims to help municipalities, companies and other actors reduce environmental pressure and encourage local commitment and initiatives. The total Programme operates with 390 million SEK in 2007.

6.4 Coming policies

A number of proposals are underway, which relate to bioenergy. Some of these include[16]:

- A general tax exemption for CO_2 neutral biofuels to be included in the Law on Energy Taxes for another five year period starting no later than 1 January 2009 and up to 2013;

- Abolishment of the conditions required to get the tax exemption for ethanol used for low level mixing in petrol by no later than 1 January 2009;

- General overhaul of the energy taxation based on the polluter pays principle.

[14] The Swedish Budget Bill for 2008.

[15] Ministry of Enviroment (2007), Ökad klimatsatsning i budgeten för 2008, Pressrelease 19 September 2007

[16] The Swedish Budget Bill for 2008.

7 Summary

Different targets for renewable energy and bioenergy exist in the Nordic Countries. Not all have a specific target for bioenergy, although the sector in all countries is set to play an important role. Targets in Denmark include an increase in the share of renewable energy to 30 per cent by 2020, where the Biomass Agreement for electricity production plays a significant part. In Finland bioenergy represents 95 per cent of total renewable energy. The increase in the renewable energy targets to 25 per cent in 2015 and 40 per cent by 2025 is primarily referring to further increasing the use of bioenergy. In Norway, increasing the use of bioenergy is high on the political agenda. A proposed target for bioenergy has been set to increase the use of bioenergy by 14 TWh by 2020, which is close to a doubling from current use (16 TWh/year). Sweden has an ambitious strategy to break Sweden's dependency on oil by 2020 through the use of energy efficiency and increased use of renewable energy.

At the EU level, targets have been set for the use of bioethanol and other bio-fuels for transport applications by replacing diesel and petrol to the level of 5.75per cent by 2010 (Directive 2003/30 EC), a 10per cent goal for 2020 (Comm 2007/0001) and an indicative target of 25per cent in 2030 (European Commission, Directorate general for Research (2006)). The Nordic member countries have all implemented the Directive into national legislation.

Framework conditions and support mechanisms differ between the countries as well. A green certificate market since 2003 in Sweden has proven especially beneficial for the expansion of bioenergy in the electricity generation and the tax exemption for biofuels is one of the corner stones in the Swedish efforts to increase the use of biofuels in the transportation sector. Tax exemptions for biofuels and green certificate systems are not currently in place in the other Nordic countries. In Denmark, the biomass agreement from 1993 has been instrumental in introducing straw and wood chips in the electricity generation, while in Finland feed-in tariffs for peat in electricity generation and tax subsidies on renewables support the use of bioenergy. In Norway, focus is on eliminating the main bottleneck for district heating through investment subsidies in the creation of district heating networks. Grants, programmes and R&D are common instruments across the Nordic countries, especially in the area of second generation bio-ethanol, production and processing of domestic fuels, hybrid cars, and biogas.

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