



Solutions for biomass fuel market barriers and raw material availability - IEE/07/777/SI2.499477

## **Summary of the legal and technical requirements of biomass and bioenergy in 18 EU-countries– D4.2.1**

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## Preface

This publication is part of the EUBIONET III Project (Solutions for biomass fuel market barriers and raw material availability - IEE/07/777/SI2.499477, www.eubionet.net) funded by the European Union's Intelligent Energy Programme. EUBIONETII is coordinated by VTT and other partners are Danish Technological Institute, DTI (Denmark), Energy Centre Bratislava, ECB (Slovakia), Ekodoma (Latvia), Fachagentur Nachwachsende Rohstoffe e.V., FNR (Germany), Swedish University of Agricultural Sciences, SLU (Sweden), Brno University of Technology, UPEI VUT (Czech), Norwegian University of Life Sciences, UMB (Norway), Centre wallon de Recherches agronomiques, CRA-W (Belgium), BLT-HBLuFA Francisco Josephinum, FJ-BLT (Austria), European Biomass Association, AEBIOM (Belgium), Centre for Renewable Energy Sources, CRES (Greece), Utrecht University, UU (Netherlands), University of Florence, UNIFI (Italy), Lithuanian Energy Institute, LEI (Lithuania), Imperial College of Science, Imperial (UK), Centro da Biomassa para a Energia, CBE (Portugal), Energy Restructuring Agency, ApE (Slovenia), Andalusian Energy Agency, AAE (Spain). EUBIONET III project will run 2008 – 2011.

The main objective of the project is to increase the use of biomass based fuels in the EU by finding ways to overcome the market barriers. The purpose is to promote international trade of biomass fuels to help demand and supply meet each other, while at the same time the availability of industrial raw material is to be secured at reasonable price. The EUBIONET III project will in the long run boost sustainable, transparent international biomass fuel trade, secure the most cost efficient and value-adding use of biomass for energy and industry, boost the investments on best practice technologies and new services on biomass heat sector and enhance sustainable and fair international trade of biomass fuels.

The overall aim of the work package "Legal and technical frameworks & sustainability of biomass fuels" is to improve the legal and technical framework for solid, liquid and gaseous biofuels from biomass and thereby to eliminate market barriers for biofuels. To reach the overall target, a study was carried out to look at legal incentives and other policy regulations and guidelines for bioenergy, which were force in beginning of 2010.

A short country report was prepared for each participating country. The results of the country reports are summarized in this report "Summary of the legal and technical requirements of biomass and bioenergy in 18 EU countries – D4.2.1". The country reports can be found on the project web page.

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# 1 Introduction

In the directive 2009/28/EC the European Union has set an overall target of 20 % share of energy from renewable sources in the gross final energy consumption in 2020. For each country there are individual binding targets depending on the renewable energy potential and energy mix of the country. The countries use different methods and instruments to meet the targets defined in the Directive and to increase the use of bioenergy and other renewable energy sources.

The aim of this study was to look *legal incentives and other policy regulations and guidelines for bioenergy, which were force in beginning of 2010*. A broad variety of policy instruments are set to support the use of bioenergy and other renewable energies. This report is based on country reports written by project partners on legal incentives to promote the use of bioenergy and renewable energy sources.

The Steering Committee proposed that information on the National Renewable Energy Action Plans (NREAP) could be included into the summary report. A questionnaire on the NREAPs was filled by the partners in October 2010. The country reports and the NREAP questionnaire can be downloaded from the web page [www.eubionet.net](http://www.eubionet.net) and are summarized in this report.

In the country reports the legal incentives were divided into the following categories.

1. Support for research, development and demonstrations
2. Energy taxation (e.g. CO<sub>2</sub> taxes for fossil fuels)
3. Investment support (separate harvesting machinery and heat and power production)
4. Feed-in-tariffs and other support for heat and power production
5. Support for wood fuel and round wood supply (e.g. in Finland support for harvesting energy wood from young stands, chipping support)
6. Other (e.g. support of agrobiomass or production of biomass for energy generation)

In the Table 1 the different legal incentives in the project countries are summarized. The instruments are described closer in the next chapters.

Table 1. Summary of different legal incentives to promote use of bioenergy and renewable energy sources in EUBIONET III partner countries.

Country	R&D support*	Investment aid	Energy/CO <sub>2</sub> taxation	Electricity production**	Other
Austria	(X)	(X)	(X)	FIT	Forestry subsidy programme, Klima:aktiv Programme
Belgium				X	
Denmark	X		X	(O)	
Czech Republic	X	X		O	Support for short rotation coppice
Finland	X	X	X	FIT, O	Support for the forestry and agricultural sector (young stands, chipping support)
Germany	X	X	(X)	FIT	Obligation to use a certain share of RES in heating of new buildings
Greece	(X)	X	X	FIT	Process for the concession of exploitation and improvement of forests
Italy	X	(X)		GC, FIT	Rural Development Programmes
Latvia	(X)		X	FIT, O	
Lithuania	X	X	(X)	FIT	
The Netherlands	X	X	X	FIT	Program Sustainable Biomass Import
Norway	X	X	X	(GC)	Subsidy for forest biomass for energy purposes
Portugal	X			FIT	Permanent Forest Fund, Rural Development Programme
Slovakia	(X)	X	(X)	FIT	
Slovenia	(X)	X	X	FIT	
Spain					
Sweden	X	(X)	X	GC	
UK	X	X		GC, FIT	support for energy crops growing; Forestry Commission's Wood fuel Strategy; Renewable Heat Incentive

\* part of national energy strategy  
\*\* feed-in-tariff, FIT / green certificates, GC / other, O

## 2 Support for Research & Development & Demonstrations

In Europe methods to promote innovation and research are an important part of the energy strategies of the European Union and the countries. The EU emphasises that to be able to achieve the climate action targets it is essential to mobilise new biomass resources and it gives high priority to biomass research. Research and development have a major role in developing efficient energy technologies. The

level of public and private spending on research and development in energy technology innovation should be on high level.

In all analysed countries research and development are supported by the national governments with funding, in many countries there are even several programmes established to fund research activities.

As an example, in *Finland* research and innovation activities will have a pivotal role for achieving the targets of the new Climate and Energy Strategy and the public resources for basic research and the development, introduction and commercialisation of new technologies and innovations should be doubled from the current level by the year 2020. Also in *Lithuania* the necessity to support research, development and demonstration is defined in the National Energy Strategy from 2007 and one of the priority areas are technologies for use of indigenous and renewable energy sources. In *Germany* and in the *UK* there are several funding programmes for research and demonstrations projects in the field of bioenergy.

The main incentives to support bioenergy research and demonstration activities in the EUBIONET III partner countries are listed in the Table 2, further information on the single support programmes can be found in the country reports.

*Table 2. Summary of different legal incentives to support bioenergy and renewable energy R&D&D in EUBIONET III partner countries*

Country	R&D support
Austria	The Climate and Energy Fund (2007 – 2010) supported the implementation of the Climate Strategy through research, targeting sustainable energy technologies, increased energy efficiency and CO <sub>2</sub> reduction in transport, and promoting deployment and diffusion of technology in the marketplace.
Belgium	<p><i>Federal level:</i> «La science pour un développement durable» („Science for a sustainable development“) is linked to a cooperation agreement between federal level and regions. Across program, BELSPO provides funds to lead research en Science for a sustainable development e.g. This program targets research in energy but also in transport and mobility, food, health and environment, climate, biodiversity, atmosphere and ecosystems.</p> <p><i>Wallonia:</i> The Walloon region provides to society and small business located in Wallonia a financial help as an advance to allow them the starting of applied research projects and technology developments (50-70% of project costs)</p>
Denmark	<p>A European Energy Technology Development and Demonstration Programme (EUDP) has been established, aimed at the development, demonstration and market introduction of new energy.</p> <p>EUDP must</p> <ul style="list-style-type: none"> <li>• subsidize primary development and demonstration</li> <li>• actively promote cooperation between public and private actors and</li> <li>• strengthen interaction with international activities and programs related to energy technology.</li> </ul>
Czech Republic	<p>The departmental programme of applied research and experimental development (TIP) aims (among other things) to new materials and products – sustainability and economization of sources, respect to ecological, energetical and social factors.</p> <p>The support of applied research and experimental development (ALFA) has a special subprogram for energy sources and environment protection and creation, aiming at e.g. enhancement of reliability and safety of energy supply from renewable energy sources.</p>

Country	R&D support
Finland	The competitiveness of renewable energy sources is promoted through investment in long-term technology research and development. Obstacles to getting R&D findings and results onto the market are lowered by supporting projects aimed at the commercialisation of new technologies. According to the new Climate and Energy Strategy, research and innovation activities will be in a pivotal role for achieving the targets of the strategy.
Germany	Several funding programmes for R&D projects in the field of bioenergy.
Greece	National Strategic Reference Framework, Priority Axis 4 "Completion of the country's energy system and reinforcing sustainability" aims at ensuring the country's energy supply and its accession to international energy transport networks, the rational management of natural resources and the promotion of renewable sources of energy
Italy	The renewed 2009 – 2011 three-year plan of the system research in the electricity sector makes about €291 million available for projects by research organisations and companies; part of this is aimed at renewables.
Latvia	The Action Programme "Entrepreneurship and Innovation" supports practical guidance for research projects, which promotes scientific and industrial integration, and results of research implementation according to the priority directions of science in the country.  Energy and Environment (RES extraction and usage technologies, climate change-absorbing technology and biodiversity) is one of the priority directions defined for 2010 – 2013.
Lithuania	National Energy Strategy (2007): state supported measures of assistance and commitments in several priority areas of scientific research, including RES.  "Sustainable energy" Programme 2008 – 2012: increase of indigenous, renewable and waste energy is one of the supported topics of scientific research.  Programme of Industrial Biotechnology Development in Lithuania 2006 – 2010: reduction of Lithuania's dependence on imported non-renewable energy sources as the main goal.
The Netherlands	The Energy Research Subsidy (EOS) programme includes four schemes, covering the whole path from idea to market introduction: new energy research, long term energy research, short term energy research and demonstration.
Norway	Clean Energy for the Future (RENERGI) is the main programme for renewable energy research – including biomass. The budget for 2009 was about NOK 325 mill.  Centres for Environment-friendly Energy Research (CEER) is a sub-program under RENERGI. There are eight centres under this program, one of which is dedicated to bioenergy. The centres were launched in 2009.  Innovation Norway has a support program aimed at stimulating farmers and forest owners to produce, use and deliver bioenergy in the forms of biofuels or heat. The program supports development, competence building and information related activities, as well as investments.  Innovation Norway also has a special support program for chip production from woody biomass. Support is given both to development/competence building and investments.  Enova provides support for demonstration of new energy technologies in Norway under realistic operating conditions. It has two programs that support maturation of new technology: "Innovative energy solutions" and "Introduction of new technology", the former targets mainly developers/suppliers of technology, while the latter targets end users.

Country	R&D support
Portugal	Some types of projects for producing electricity from renewable sources are eligible for the QREN (National Strategic Reference Framework), more specifically for the system of incentives to encourage innovation for technology projects and the system for incentives for research and technological development. These systems for incentives attribute subsidies that range from 35% to 55% of the eligible expenditure. Also Fund to Support Innovation (FAI) promotes research and development in the area of renewable energy.
Slovakia	There aren't any direct programmes for research projects of bioenergy. There are general programmes for R&D, which include some projects for bioenergy.
Slovenia	Rules on (co-)financing basic, applicative and postdoctoral research projects: public tender for (co-)funding of research projects for 2010 had one priority area covering technology for a sustainable economy (energy and environmental technologies, technology for the rational use of energy, the use of new and renewable sources of energy, etc.)
Sweden	The Government's "Research and New Technology for Future Energy Systems" has been approved by Parliament for a long term programme of research, development, demonstration and commercialization activities for the development of technologies and processes aimed at the establishment of a sustainable energy system.  The programme is constructed around six theme areas: Energy system studies, Energy use in the built environment, Transport, Energy-intensive industry, The power system, and Fuel based energy systems.
UK	The UK has different research and demonstrations funding schemes which are related to bioenergy.

### 3 Investment support

Governments give grants to companies to help them to invest in capital assets such as buildings, equipment, or new machinery. The aim is to promote new technologies in the starting phase or to help favorable techniques to become more common.

In 13 countries of this study governments give grants to companies, municipalities or private persons for investments in new technical installations and equipment. The four countries, which didn't report any investment aids, were Denmark, Latvia, Portugal and Spain. Denmark reported that earlier subsidies were given for installation of small scale boilers, but at the moment there are no national schemes for investment support for solid biomass utilization.

In *Austria* new or modernized CHP plants for public district heating can receive investment subsidies, if they result in savings in energy and CO<sub>2</sub> emissions compared with separate production of heat and electricity. New plants can receive investment subsidies up to 10% of the total funds needed. Plants up to 100 MW can receive a subsidy of EUR 100/kW; those between 100 and 400 MW EUR 60/kW; and those above 400 MW up to EUR 40/kW. Existing or modernized plants can receive subsidies in EUR cents/kWh based on several cost parameters, such as fuel costs, operation and maintenance costs, adequate return on employed capital, pension payments, administrative costs and taxes.



The Operational Programme Environment of the *Czech Republic* supports biomass plants for energy production with a maximum of 20% of the costs up to CZK 50 million and the installation of co-generation facilities using solid biomass, biogas or waste and sludge gas with a maximum of 40 % of the costs up to CZK 100 million.

In *Finland* private households can receive subsidies for replacing old oil or electrical heating systems by new renewable energy heating system as the main heating system. The support given is 20% of the eligible material costs. For companies and communities there is the possibility to get subsidies for energy investment studies (grant of 40-50%) and other investments in renewable energy (grant of 40% for conventional technologies and 50% for innovative projects).

*Germany* established the Market Incentive Programme (MAP) in 2009. It focus on investments in buildings to increase the share of renewable energy in overall heat supply and supports installations (primarily promoting the heat generation from biomass, solar power and geothermal energy) by providing investment grants, low-interest loans and repayment grants. The actual funding rates are shown in the Table 3.

Table 3. Funding rates of the German Market Incentive Programme.

Plant type	Support			
	Basis funding)	Combination bonus	Efficiency bonus	Innovation support
Pellet stove (water-based) (5 kW up to 100 kW)	36 €/kW installed, but min. 1000 €	600 € ( if a thermal solar plant, which is eligible for funding under MAP, is installed at the same time)	0.5x basic funding	500 € per measure (e.g. funded are measures for increasing the heat yield through flue gas condensation and/or particle separator)
Pellet stove (5 kW up to 100 kW)	36 €/kW installed, but min. 2000 €			
Pellet boiler plus newly fitted buffer storage with a capacity of at least 30 l/kW (5kW up to 100 kW)	36 €/kW installed, but min. 2500 €			
Wood chip heating system plus newly fitted buffer storage with a capacity of at least 30 l/kW (5kW up to 100 kW)	1,000 € per plant			
Firewood gasifier boiler plus newly fitted buffer storage with a capacity of at least 55 l/kW (5kW up to 100 kW)	1,000 € per plant			

Germany supports investments in supply systems for heat and electricity generated from biomass under legislation of the Joint Task of Improving Agricultural Structures and Coastal Protection, with funding provided under the heading of integrated rural development. The federal government provides 60 % of the funding for GAK measures. GAK also provides for bioenergy advisory services.

*The Netherlands* use a fiscal regulation to promote energy efficiency and the use of sustainable energy. Through the Energy Investment Deduction companies can deduct 44% of the investment costs from the fiscal profit of the company. Companies in greenhouse farming can receive a subsidy of up to 40% of the investment costs when investing in newly to the market introduces energy systems. The investments have to result in energy savings and greenhouse gas reductions. Companies and branch organisations in the transportation sector can apply for a subsidy for investment or adaptation projects that contribute to CO<sub>2</sub> reduction. The project has to be innovative for the Netherlands and score in its CO<sub>2</sub> emission reduction at least 10% better than fossil fuels.

The *Norwegian* government established the Bioenergy programme to stimulate farmers and forest owners to produce and use bioenergy and to deliver it to others. The support is e.g. for heat production up to 35%. A special support programme for chip production from woody biomass funds investments up to 25% of the costs. There are also other funding programmes funding e.g. more efficient energy use or transition to renewable energy sources in district heating systems or single households.

In *Slovakia* the funding from the EU structural Funds is divided in three operational programmes. The scope of the investment support programmes is shown in the table below.

The Slovakian Ministry of Economy supports household in the installation of a biomass boiler in a family house with a funding of 30% of the purchasing price. The maximum amount of support for one boiler is 1,000 €. The total amount of supporting is 8,000,000 € (Table 4).

*Table 4. Investment support operational programmes in Slovakia.*

<b>INVESTMENT SUPPORT – EU FUNDS 2007 - 2013</b>	
<b>Operational Programmes 2007 – 2013</b>	
✓	<b>OP Environment</b> ( Ministry of Environment) (ca. 209 mill. EUR) — electricity generating facilities high-efficiency cogeneration only in combination with changing the fuel base for heat
✓	<b>OP Competitiveness and economy growth</b> ( Ministry of Economy or Ministry of Finance ) (ca. 144 mill. EUR), — new construction, renovation and modernization of electricity generating facilities high-efficiency cogeneration — new construction, renovation and modernization of electricity generating facilities for renewable energy <b>Beneficiaries:</b> private companies <b>Intensity of support:</b> Private sector 40% up to 50% of eligible costs <b>Amount of support:</b> min. 60 000 EUR, max. 6 mill. EUR (State support scheme) <b>Provider:</b> Ministry of Economy of the SR <b>Administrator:</b> Slovak Energy and Inovation Agency <b>Information and application forms:</b> <a href="http://www.siea.gov.sk">www.siea.gov.sk</a>
✓	<b>OP Bratislava</b> (ca. 23.6 mill. EUR) — new construction, renovation and modernization of electricity generating facilities high-efficiency cogeneration — new construction, renovation and modernization of electricity generating facilities for renewable energy

Subsidies or loans with interest-rate subsidies are available. The *Slovenian Environmental Public Fund* promotes sustainable development by financing investment for the prevention, elimination and reduction of environmental pollution with subsidies or loans with subsidized interest-rates. Most of the subsidies cover up to 40 % of the investment cost. Investments in rural areas with no possibility of connection to the electricity network are eligible to apply for an additional 20 % subsidy.

In *Sweden* the owners of properties having direct electric heating can receive a grant for the cost of conversion of such heating systems to district heating, to rock, earth or lake water heat pumps, or to bio fuelled boilers. The purpose of these conversion grants is to reduce the country's dependence on oil, to encourage efficient and environmentally benign use of energy, and to reduce the use of electricity for heating purposes in residential buildings. The grant has been available since the beginning of 2006, and will continue until the end of 2010.

*Table 5. Summary of different legal incentives to provide investment grants for bioenergy and renewable energy projects in EUBIONET III partner countries.*

<b>Country</b>	<b>Investment aid</b>
Austria	<p>The Combined Heat and Power Law promotes CHP through the partial reimbursement of operating expenses for new and modernized CHP plants for public district heating, and promoting investment grants for new CHP plants (except those covered by the Green Electricity Act).</p> <p>New or modernized CHP plants for public district heating can receive investment subsidies, if they result in savings in energy and CO<sub>2</sub> emissions compared with separate production of heat and electricity. An efficiency formula is used to determine whether savings occur.</p>

Country	Investment aid
Belgium	<p><i>Federal level:</i> A scheme of tax reduction has been set up for certain energy-saving investments and production of energy from renewable energy sources. For 2010 incomes, this tax reduction amounts to 40% of the costs up to a maximum amount of EUR 2 770 per year and residence, except for solar energy installations (photovoltaic and solar thermal), for which the ceiling is EUR 3 600. The remainder of the costs can be transferred to the next three fiscal years.</p> <p><i>Flanders: Support for ecological investments (ecologiesteun):</i> Companies can benefit from a premium for investments in the production of energy from renewable energy sources. For small and medium-sized enterprises, the subsidy is at most 40% of the admissible additional costs, and at most 20% for large enterprises. The admissible additional costs vary according to technology:</p> <ul style="list-style-type: none"> <li>- 10% for wind energy (more than 1.5 MW);</li> <li>- 50% for biomass, biogas and CHP generation plants;</li> <li>- 10% for photovoltaic solar panels.</li> </ul> <p><i>Wallonia:</i> The installation in a building located in Wallonia, a biomass furnace with automatic supply is part of subsidized work by the Walloon Region. The premium varies according to the power of the device:</p> <ul style="list-style-type: none"> <li>• When the power is greater than or equal to 50 kW: the amount of the premium is € 1,750 plus € 35 per kW from 50 to 100 kW;</li> <li>• When the power is greater than 100 kW: the amount of the premium is € 3,500 plus € 18 per kW from 100 to 500 kW;</li> <li>• When the power is greater than 500 kW: the amount of the premium is € 10,700 plus € 8 per kW in excess of 500 kW.</li> </ul> <p>The premium is 50% of the invoice amount to a maximum of € 15,000 per installation.</p> <p><i>Wallonia:</i> Companies benefit from a premium for investments in the production of energy from renewable energy sources, the investment allowance is expressed as a percentage (e.g. 40% gross investment by a company in the sustainable use of energy) of the accepted investment programme and may not be exceed.</p>
Czech Republic	<p>The Operational Programme Environment, Priority Axe 3 aims to increase the use of renewable energy sources for generating heat and electric energy, as well as the use of waste heat and funds the construction of new facilities and the modernisation of the existing facilities with the aim to increase the use of renewable energy sources for heat generation, electric energy generation and for CHP.</p> <p>For electric energy generation, the grants may account for 20% of the total eligible expenses (max CZK 50 million), for CHP the grants may be 40% (max CZK 100 million).</p>
Finland	<p>Subsidies granted for energy investments, development projects and energy conservation constitute an important means of implementing the National Climate and Energy Strategy. In 2009, in total € 94.4 million was available for energy supports. The figure includes € 1.3 million in grants from the European Regional Development Fund. The maximum percentage of the support is 40/50% for energy investment studies, and 40% for wind and solar energy investments. For other investments on renewable energy, the support level is 30% for conventional technologies (renovation and modernisation projects) and 40% for innovative projects.</p> <p>For small scale heating systems of residential buildings, the Government provides investment grants of additional € 30 million. Introduction of primary heating system based on renewable energy sources is supported by maximum 20% of eligible investment costs.</p>

Country	Investment aid
Germany	Installations using renewable energies are supported by providing investment grants, low-interest loans and repayment grants. Investment in supply systems for heat and electricity generated from biomass has been promoted with funding provided under the heading of integrated rural development.
Greece	Economic incentives in the form of grants covering a part of investment costs or in the form of subsidy, tax rebate, or cost of creation of new employment. This framework covers mainly RES electricity generation projects, as well as RES heating projects like biomass for generation of heating and cooling (individual central plant and distribution to the surrounding area or district heating and cooling) and biomass for co-generation.
Italy	A Programme Contract is an agreement between the Ministry of Economic Development, acting through Invitalia and the companies involved with a view to implementing industrial projects. Investment programmes falling within the manufacturing, mining and quarrying, power generation are eligible.
Lithuania	Lithuanian Environmental Investment Fund (LEIF) supports investment projects in the form of interest subsidies and loans on soft terms.
The Netherlands	<p>Energy Investment Deduction (EIA) is a fiscal regulation to promote energy efficiency and the use of sustainable energy in the Dutch business community.</p> <p>Via EIA, 44% of the investment costs can be deducted from the fiscal profit of an enterprise. The direct financial advantage is dependent on the tax percentage; it is usually around 11% of the approved investment costs.</p> <p>There is also a market introduction energy innovation subsidy for the agricultural sector. This subsidy is intended for enterprises in greenhouse farming and cooperation initiatives. It is aiming at investments in energy systems which have to result into energy savings and a reduction of CO<sub>2</sub> emissions. The energy system must be in the starting phase of market introduction. Applicants can receive a maximum of 40% subsidy on their investment costs.</p> <p>Companies and branch organisations in the transportation sector can apply for a subsidy for investment or adaptation projects that contribute to CO<sub>2</sub> reduction. The project has to be innovative for the Netherlands and score in its CO<sub>2</sub> emission reduction at least 10% better than fossil fuels.</p>
Norway	<p>Innovation Norway has a support program aimed at stimulate farmers and forest owners to produce, use and deliver to others bioenergy in the form of biofuels or heat: the bioenergy program. Investment support is given for, among others, heat production (up to 35%).</p> <p>In addition, Innovation Norway has a special support program for chip production from woody biomass (forests and cultural landscapes). Support is given for investments (up to 25% of the costs).</p> <p>Enova has a rather large range of investment support programs. As with most other Enova support programs, they are technology neutral. However, it is evident that the support programs aimed at district heating is mainly targeting the use of bioenergy.</p>
Slovakia	<p>EU funded operational programmes 2007 – 2013 (OP Environment, OP Competitiveness and economy growth, OP Bratislava) support also new construction, renovation and modernization of electricity generating for renewable energy.</p> <p>Ministry of Economy, program for higher biomass and solar energy in households: support for the use of biomass for purchasing and installing one boiler of biomass at the family house is 30% of the purchase price of the biomass boiler, the maximum grant is € 1,000.</p>

Country	Investment aid
Slovenia	<p>The Ministry for Environment, Spatial Planning and Energy through its Agency for Efficient Use and Renewable Energy (AURE) supports the investments in RES and cogeneration with subsidies for investment projects. The public tender is issued by AURE once a year or for a two or three year period, depending on the source of finance. In the past this was mainly state budget, in the recent years the program is co-financed through structural funds and Eco fund. For the RES investments producing heat the subsidy is normally up to 30% of the investment.</p> <p>Subsidies or loans with interest-rate subsidies are available for RES-E producers. Most of the subsidies cover up to 40% of the so-called justified investment cost. Investments in rural areas with no possibility of connection to the electricity network are eligible to apply for an additional 20% subsidy.</p>
Sweden	<p>Owners of properties having direct electric heating could receive a grant for the cost of conversion of such heating systems to district heating, to rock, earth or lake water heat pumps, or to bio fuelled boilers. The grant was available since the beginning of 2006, and continued until the end of 2010.</p>
UK	<p>Since 2006 the Bio-energy Capital Grants Scheme for five years (until 2011) will support the installation of biomass-fuelled heat and combined heat and power projects in the industrial, commercial and community sectors.</p>

## 4 Taxation of fossil fuels

Fossil fuel tax or carbon tax are further financial policy instruments to support the use of renewable energies. A fuel tax is imposed on the sale of fuels making fuels more expensive. A tax on CO<sub>2</sub>-emissions increases the price of emitting CO<sub>2</sub>. The higher price causes a decreased demand on fuels and a reduction of CO<sub>2</sub>-emissions.

In the country studies eleven of seventeen countries report about implemented fuel or carbon taxation.

*Denmark* was one of the first countries to introduce a carbon dioxide tax in the early 90's. The aim of the carbon and sulphur taxes is to encourage companies and households to save on their energy consumption and reduce environmental manage. The taxes apply to all energy users, but industrial companies can get different conditions for the use f process heat or if they sign a voluntary agreement to enhance the energy efficiency.

In *Finland*, a carbon based environmental tax for fossil fuels has been imposed in 1990. The taxation takes account of the energy content, carbon dioxide emissions, and local/particulate emissions that have adverse health effects. The energy content tax reflects the volumetric energy content of the fuel. The energy tax component is levied on both fossil fuels and biomass fuels, based on the same taxation criteria. The CO<sub>2</sub> tax is based on the CO<sub>2</sub>-emissions of the fuel in question. The weight of levies on carbon dioxide has been raised from their 2010 levels. The evaluation of the CO<sub>2</sub>-content of biofuels is based on their treatment in the RES-directive. A flat rate reduction of 50% is applied to all biofuels which meet the sustainability criteria of the Directive. Second-generation biofuels will be totally

exempted from the CO<sub>2</sub> tax. The tax does not apply to wood and other biomass (sold and gaseous) used in energy production.

Table 6. Energy taxes related to traffic and heating fuels and electricity consumption as of 1st of January 2011 ([www.finlex.fi](http://www.finlex.fi), 1399/2010, 1400/2010)

Product	Unit	Energy tax	CO <sub>2</sub> tax	Security of supply fee	Total
Motor petrol	EUR c/l	50.36	11.66	0.68	62.70
Motor petrol for small engines	EUR c/l	30.36	11.66	0.68	42.70
Bioethanol	EUR c/l	33.05	7.65	0.68	41.38
Bioethanol R	EUR c/l	33.05	3.83	0.68	37.56
Bioethanol T	EUR c/l	33.05	0.00	0.68	33.73
MTBE	EUR c/l	40.91	9.48	0.68	51.07
MTBE R	EUR c/l	40.91	8.43	0.68	50.02
MTBE T	EUR c/l	40.91	7.39	0.68	48.98
TAME	EUR c/l	44.06	10.21	0.68	54.95
TAME R	EUR c/l	44.06	9.29	0.68	54.03
TAME T	EUR c/l	44.06	8.37	0.68	53.11
ETBE	EUR c/l	42.49	9.84	0.68	53.01
ETBE R	EUR c/l	42.49	8.02	0.68	51.19
ETBE T	EUR c/l	42.49	6.20	0.68	49.37
TAEE	EUR c/l	45.64	10.57	0.68	56.89
TAEE R	EUR c/l	45.64	9.04	0.68	55.36
TAEE T	EUR c/l	45.64	7.51	0.68	53.83
Biogasoline	EUR c/l	50.36	11.66	0.68	62.70
Biogasoline R	EUR c/l	50.36	5.83	0.68	56.87
Biogasoline T	EUR c/l	50.36	0.00	0.68	51.04
Diesel oil	EUR c/l	30.70	13.25	0.35	44.30
Diesel oil para	EUR c/l	24.00	12.51	0.35	36.86
Biodiesel	EUR c/l	28.14	12.14	0.35	40.63
Biodiesel R	EUR c/l	28.14	6.07	0.35	34.56
Biodiesel T	EUR c/l	28.14	0.00	0.35	28.49
Biodiesel P	EUR c/l	24.00	12.51	0.35	36.86
Biodiesel P R	EUR c/l	24.00	6.26	0.35	30.61
Biodiesel P T	EUR c/l	24.00	0.00	0.35	24.35
Light fuel oil	EUR c/l	10.35	8.00	0.35	18.70
Light fuel oil, without sulphur	EUR c/l	7.70	8.00	0.35	16.05
Bio oil	EUR c/l	7.70	8.00	0.35	16.05
Bio oil R	EUR c/l	7.70	4.00	0.35	12.05
Bio oil T	EUR c/l	7.70	0.00	0.35	8.05
Heavy fuel oil	EUR c/kg	54.76	12.74	0.35	67.85
Coal	EUR/t	54.54	72.37	1.18	128.09
Natural gas*	EUR MWh	7.70	5.94	0.084	13.724
Electricity, class I	c/kWh	1.69		0.013	1.703
Electricity, class II	c/kWh	0.69		0.013	0.703
Tall oil	c/kg	18.79	-	0	18.79
Fuel peat **	€/MWh		3.90	0	3.90

\* Energy tax is 3.00 €/MWh during 1.1.2011-31.12.2012, 5.50 €/MWh during 1.1.2013-31.12.2014.

\*\* Energy tax for fuel peat is 1.90 €/MWh during 1.1.2011-31.12.2012 and 2.90 €/MWh during 1.1.2013-31.12.2014.

R = product includes renewable raw material according directive 2001/77/EU

T = product includes renewable raw material according directive 2001/77/EU and it produced from waste or residues which are not suitable for food like lignocelluloses material

P= paraffin diesel oil

*Latvia* has exempted energy from renewable resources from the electricity law. In Lithuania there have been discussions if a CO<sub>2</sub>- taxation should be introduced, but at the moment there is no such a tax. Biomass fuels are exempted from pollution (SO<sub>2</sub>, NO<sub>x</sub> etc.) taxes in Lithuania.

*Norway* participates in a greenhouse gas emission allowance trading system which covers now about 40% of the total CO<sub>2</sub> emissions in Norway. For most CO<sub>2</sub> sources that are not covered by the quota system, taxes are levied on the use of fossil fuels. Carbon, e.g. coal, used as reducing agent in the metallurgy industry is neither taxed nor part of the quota system. In addition there are additional taxes on most types of fuels. A CO<sub>2</sub> tax is levied on most fuels, as shown in the next table. Companies who participate in the quota scheme (i.e. large stationary emission sources) do not pay the CO<sub>2</sub> tax.

Table 7. Norwegian CO<sub>2</sub> taxes on fuels

Fuel type	NOK	unit
Gasoline	0.86	liter
Mineral oil	0.58	liter
Mineral oil used in pulp and paper industry	0.30	Liter
Oil used in domestic air traffic	0.68	Liter
Natural gas	0.51	Sm <sup>3</sup>
LPG	0.65	Kg

*Slovenia* has introduced a fee to support the production of electricity from renewable sources. The average monthly contribution fee was in 2010 0.65584 €/kW of calculated power.

In *Sweden* the original objective of energy taxes was to help finance the State's public spending requirements, but in later years the emphasis has increasingly been on the need to control the supply and use of energy in order to achieve various energy and environmental policy objectives. Present energy taxation policy is aimed at improving the efficiency of energy use, encouraging the use of biomass fuels, creating incentives for companies to reduce their environmental impact and creating favorable conditions for indigenous production of electricity. 'Energy tax' is an umbrella name for spot taxes on fuels and electricity. They can be roughly divided up into fiscal taxes and those intended to achieve environmental objectives. This latter group of taxes includes the carbon dioxide and sulphur taxes, while the general energy tax is essentially a fiscal tax.

There are different taxes on electricity and fuels, on carbon dioxide and sulphur emissions, and a levy system on nitrogen oxide emissions. The tax rates can then vary, depending on whether the fuel is being used for heating or as a motor fuel, whether it is being used by industry, domestic consumers or the energy conversion sector and, in the case of electricity, what it is being used for and whether it is being used in northern Sweden or in the rest of the country. Examples of taxation expenditure on the energy tax include energy tax relief for biomass fuels, peat etc., tax reductions for certain environmentally beneficial improvement installations in detached houses, and the reduction of the carbon dioxide tax for industry. Electricity production in Sweden is exempted from energy and carbon dioxide tax, although it is subject to the nitrogen oxide levy and sulphur tax in certain cases. However, the use of electricity is taxed. Heat production attracts energy tax, carbon



dioxide tax and, in certain cases, sulphur tax and the nitrogen oxide levy. The use of heat, however, is not taxed. In principle, biofuels and peat are tax free for all users, although the use of peat attracts sulphur tax.

Many countries, e.g. Germany, Austria and Slovakia have or at least have had reduced tax levels for biofuels and have set quotas for minimum level of biofuels in total road transport fuel consumption.

*Table 8. Summary of energy and CO<sub>2</sub> taxation on the EUBIONET 3 partner countries*

<b>Country</b>	<b>Energy and CO<sub>2</sub> taxation</b>
Denmark	The Law on the carbon dioxide tax on certain energy products introduces CO <sub>2</sub> tax on certain energy products, basically fossil fuels.
Finland	The energy taxation takes account of the energy content, carbon dioxide emissions and local/particle emissions that have adverse health effects. The energy content tax reflects the volumetric energy content of the fuel. The energy tax component is levied on both fossil fuels and biofuels, based on the same taxation criteria. The CO <sub>2</sub> tax is based on the CO <sub>2</sub> emissions of the fuel in question. The weight of levies on carbon dioxide has been raised from their 2010 levels. The evaluation of the CO <sub>2</sub> content of biofuels is based on their treatment in the RES-directive. The CO <sub>2</sub> tax does not apply to wood and other biomass (solid or gaseous) used in energy production. Taxes on natural gas and peat are increased gradually until 2015.
Germany	Reduced tax levels for biodiesel and plant oil if the sustainability requirements are fulfilled. 2 <sup>nd</sup> generation biofuels, fuel with an ethanol share of 70-90% and biogas are exempt from the energy tax.
Greece	Small RES heating systems are eligible for a 20% tax reduction capped at € 700 per system. This applies to co-generation systems using RES for electrical and heating-cooling needs, and replacement of an oil burning boiler with a district heating installation or for new district heating installation.
Latvia	The taxable object is electricity supplied to an end-user, including home consumption. The act does not apply to autonomous producers of electricity produced and consumed by their own use. Electricity obtained from certain resources, including renewable energy sources, are exempt from tax.
Lithuania	Tax is collected for SO <sub>2</sub> , NO <sub>x</sub> , Vanadium pentoxide and solid particles; taxes for CO <sub>2</sub> emissions could be introduced.
The Netherlands	The Regulating Energy Tax is charged per kWh electricity or per m <sup>3</sup> gas. The height of the tax is determined by the amount that is used. The energy taxes are determined for each year. Since January 2010, the energy tax for gas oil, LPG and medium fuel oil is covered under the Law on Excise Duty taxes. Some organizations can apply for a reimbursement of part of the energy taxes, e.g. charitable, religious, cultural and research institutions.
Norway	The "special taxes" are set by the parliament, normally as part of the budget negotiations each year. There are some exemptions of the taxes and/or tax levels, e.g. the electricity tax in most industries is only about 4% of that of households. In addition to energy taxes, there is also a CO <sub>2</sub> tax levied on most fuels. Companies that participate in the emission quota scheme (i.e. large stationary emission sources) do not pay the CO <sub>2</sub> tax.
Slovakia	Support on transport biofuels is in a form of a reduction of excise duty.

Country	Energy and CO <sub>2</sub> taxation
Slovenia	<p>Regulation on defining and accounting of fee to assure support to production of electricity from cogeneration with high efficiency and from renewable sources.</p> <p>Consumer prices charged to end customers consist of the price for electricity, the use-of-network price, two contributions (supporting security of supply from domestic sources and electricity from high-efficiency cogeneration and RES), the excise duty and the value-added tax.</p> <p>The average monthly contribution to support the implementation of electricity production from cogeneration with high efficiency and from RES in 2010 to the kW of calculated power was 0.65584 €/kW.</p> <p>Feed-in-tariffs are financed from this source.</p>
Sweden	<p>There are different taxes on electricity and fuels, on carbon dioxide and sulphur emissions, and a levy system on nitrogen oxide emissions. The tax rates can then vary, depending on whether the fuel is being used for heating or as motor fuel, whether it is being used by industry, domestic consumers or the energy conversion sector and, in the case of electricity, what it is being used for and whether it is being used in northern Sweden or in the rest of the country.</p>

## 5 Production subsidies for electricity

There are several different incentives to promote green electricity; especially two of them are used often to promote the production of renewable electricity. Green certificates are tradable quota proving that the certain electricity is produced by renewable energy sources. The certificates can be traded separately from the electricity produced. The benefits of the green certificates are said to be that the support system is closer to a market economy than more bureaucratic (e.g. feed-in) systems. A feed-in-tariff system is a policy mechanism guarantying a fixed price for each kilowatthour for a longer period. It offers price stability and long-term contracts which help to get a financing for renewable energy projects.

*Austria* has since 2002 a feed-in-tariff which was amended several times. It supports the production of electricity from photovoltaic, wind power, geothermic, solid and liquid biomass, biogas and landfill gas. It includes fixed feed-in-tariffs for all these renewable energy sources. In the Tables 9 - 11 the Austrian Feed-in-tariffs for bioenergy are listed.

*Table 9. Austrian Feed-in-tariff for energy from solid biomass and wastes with high content of biogenic portion.*

maximum capacity up to 500 kW	14.98 Cent/kWh
maximum capacity from 500 kW to 1 MW	13.54 Cent/kWh
maximum capacity from 1 MW to 1.5 MW	13.10 Cent/kWh
maximum capacity from 1.5 MW to 2 MW	12.97 Cent/kWh
maximum capacity from 2 MW to 5 MW	12.26 Cent/kWh
maximum capacity from 5 MW to 10 MW	12.06 Cent/kWh
maximum capacity more than 10 MW	10 Cent/kWh

If the contract is closed since 19.10.2009 and the capacity of the plant is exactly or more than 100 MW, the feed-in-tariff is fixed with 11.5 Cent/kWh.

*Table 10. Austrian feed-in-tariff for energy from solid biomass and wastes with high content of biogenic portion.*

5.8 Cent/kWh
There is an increase of 2.0 Cent/kWh for combined heat and power plants operated with liquid biomass according to Combined Heat and Power Law (CHP Law - KWK Gesetz) § 8 Abs. 2 KWK-Gesetz, BGBl. I Nr. 111/2008

*Table 11. Austrian feed-in-tariff for energy from biogas plants*

maximum capacity up to 250 kW	18.5 Cent/kWh
maximum capacity from 250 to 500 kW	16.5 Cent/kWh
maximum capacity more than 500 kW	13.0 Cent/kWh.
There is an increase of 2.0 Cent/kWh for combined heat and power biogas plants operated according to Combined Heat and Power Law (CHP Law - KWK Gesetz) § 8 Abs. 2 KWK-Gesetz, BGBl. I Nr. 111/2008	

These fixed tariffs refer only to plants, which use minimum 30% of liquid manure in the substrate. The plant operator has to provide evidence about the input material in the plant substrate.

*Table 12. Austrian feed-in tariff for energy from landfill and sewage gas*

From landfill gas	6 Cent/kWh
From sewage gas	5 Cent/kWh

The feed-in-tariff for green energy made from solid and liquid biomass and biogas is guaranteed for 15 years from the time bringing into service.

Also *Germany* has a feed-in-tariff law (EEG) since 2000. The EEG supports the production of electricity from wind and water power, solar radiation, biomass, sewage and landfill gas and geothermic energy. The EEG guarantees each plant operator free access to the grid and a fixed feed-in-tariff for electricity generated from renewable energy sources. The tariff depends on the type and capacity of installation and on the year of its commissioning. For electricity generated from biomass in an installation commissioned in 2009 the tariff is 7.79-11.67 c/kWh, depending on the capacity. The tariff is paid for a period of 20 years and is increased

- with a technology bonus of two cents per kilowatt-hour if innovative technologies (e.g. thermochemical gasification, organic Rankine cycles) are used
- with a bonus of 6 cents per kWh for the first 500 kW of the output if the electricity is generated from energy crops, and 4 cents for further output between 500 kW and 5 MW (with the exception of electricity from biogas, for which the summed bonuses are between 4 and 13 cent per kWh)
- with a bonus of 3 cents per kilowatt-hour if the electricity is from combined heat and power generation (CHP bonus)
- by 1 cent per kilowatt-hour for electricity from installations which utilise biogas and are a subject to licensing in accordance with the Federal

Immission Control Act and comply with formaldehyde values set out in the Technical Instructions on Air Quality

The tariffs and bonuses for new installations are lowered every year by a fixed percentage (degression rate) and this tariff is valid for the installation for the entire period of 20 years. For electricity generated from biomass the degression rate is 1.0 percent.

Table 13. German payments for installations generating electricity from biomass

Year of commissioning	Up to 150 kW <sub>el</sub> in ct/kWh	150-500 kW <sub>el</sub> in ct/kWh	500 kW <sub>el</sub> -5MW <sub>el</sub> in ct/kWh	5MW <sub>el</sub> -20MW <sub>el</sub> in ct/kWh
2009	11.67	9.18	8.25	7.79
2010	11.55	9.08	8.17	7.71
2011	11.44	9.00	8.09	7.63
2012	11.32	8.91	8.00	7.56
2013	11.21	8.82	7.92	7.48
2014	11.10	8.73	7.85	7.41
2015	10.99	8.64	7.77	7.33
2016	10.88	8.56	7.96	7.26
2017	10.77	8.47	7.61	7.19
2018	10.66	8.39	7.54	7.12

The Czech Republic has set redemption prices for electricity from renewable energy sources as minimal values in a price degree of the Energy Regulatory Office.

Table 14. Czech redemption prices for electricity from biomass.

Fuel	Plant (type, date of commissioning)	Redemption price Kč/MWh	Green bonuses Kč/MWh
clean biomass O1	1.1.2008 - 31.12.2010	4580	3610
clean biomass O2	1.1.2008 - 31.12.2011	3530	2560
clean biomass O3	1.1.2008 - 31.12.2012	2630	1660
clean biomass O1	before 1.1.2008	3900	2930
clean biomass O2	before 1.1.2009	3200	2230
clean biomass O3	before 1.1.2010	2530	1560
clean biomass O1	current plants	2830	1860
clean biomass O2	current plants	2130	1160
clean biomass O3	current plants	1460	490
biomass S1 + fossil	co-combustion	-	1370
biomass S2 + fossil	co-combustion	-	700
biomass S3 + fossil	co-combustion	-	50
biomass P1 + fossil	parallel combustion	-	1640
482/2005 Sb.: O – biomass combustion S – biomass co-combustion P – biomass parallel combustion 1 – phytomass and wood biomass for energy purposes 2 – waste biomass, not applicable for material purposes 3 – biomass applicable for material purposes			

In *Denmark* the production of electricity from renewable sources is supported by PSO (Public Service Obligation) payments by electricity consumers. The rates depend on the technology of electricity generated.

In *Finland* a feed-in-tariff was introduced for wind energy, biogas and wood fuel at the beginning of 2011. Through the feed-in tariff scheme, electricity producers would receive support for a period of twelve years to cover the difference between the actual production costs of electricity and the market price of the energy source in question, or the costs of alternative fuel if plant is accepted in the system. Feed-in tariff is granted for wind power plants (up to total 2500 MVA), power plants fuelled by forest chips, power plants fuelled by wood fuels; forest chips, industrial wood residues (until 50 plants and 150 MVA) and biogas plants (up to 19 MVA). The target price would be €83.5 per MWh for wind power, biogas and wood fuel plants. The level of the feed-in tariff for forest chips plant is based on the market price of emission allowance and maximum is €18 per MWh. If market price of electricity is less than 30 €/MWh, feed-in-tariff is calculated as follows: target price – 30 €/MWh. In forest chips plant the feed-in-tariff will be 18 €/MWh, if the 3 months average emission allowance price is maximum 10 €. The level of the feed-in tariff is based on the market price of emission allowance using the formula  $18 - 18/13 * (P_e - 10)$ , in which  $P_e$  is three-months average price of emission allowance. No feed-in-price will be paid if the average price of emission allowance is 23 €.

Premium price for useful heat production is paid for biogas 50 €/MWh and for forest chips plants 20 €/MWh.

*Latvia's* main support instrument in the renewable electricity sector in Latvia is feed-in tariff system. The following abbreviations were chosen for the formulas in the following two tables for calculating the feed in tariffs:

C – Purchase price of RES-E without VAT

e – exchange rate of Latvian Lats (LVL) and Euro on the date of electricity bill

T<sub>g</sub> – end user natural gas price approved by the Regulatory Authority (without VAT)

k – certain coefficient depending on the installed capacity

Table 15. Calculation of the coefficient *k*

Installed capacity		K factor
From including [MW]	To excluding [MW]	
0.00	0.08	1.240
0.08	0.15	1.231
0.15	0.20	1.202
0.20	0.40	1.131
0.40	0.60	1.086
0.60	0.80	1.072
0.80	1.00	1.055
1.00	1.50	1.035
1.50	2.00	1.008
2.00	2.50	0.992
2.50	3.00	0.982
3.00	3.50	0.974
3.50	10.00	0.965
10.00	20.00	0.950
20.00	40.00	0.920
40.00	60.00	0.890
60.00	80.00	0.860
80.00	100.00	0.830
100.00	-	0.800

Table 16. Latvian Feed-In-Tariffs.

Technology	Capacity restriction	Support level 1 (First 10 years)		Support level 2 (Following 10 years)	
		Formula	Price range (€/MWh)	Formula	Price range (€/MWh)
Wind	< 0,25 MW	$C=147*e*k$	117-128	$C=147*e*k*0,6$	70-77
	Other	$C=120*e*k$	67-95	$C=120*e*k*0,6$	40-57
Biomass, biogas	Biomass < 4 MW	$C = \frac{T_g * k}{9,3} * 4,5$	61-78 <sup>a</sup>	$C = \frac{T_g * k}{9,3} * 3,4$	46-59 <sup>a</sup>
	Biogas > 2 MW		107-138 <sup>b</sup>		81-104 <sup>b</sup>
			50-62 <sup>a</sup>		38-47 <sup>a</sup>
			89-110 <sup>b</sup>		67-83 <sup>b</sup>
Biomass	> 4 MW	$C = \frac{T_g * k}{9,3} * 3,6$	40-49 <sup>a</sup> 71-86 <sup>b</sup>	$C = \frac{T_g * k}{9,3} * 3,0$	34-40 <sup>a</sup> 59-72 <sup>b</sup>
Biogas	< 2 MW	$C=188*e*k$	133-164	$C=188*e*k*0,8$	107-131
Hydro	< 5 MW	$C=159*e*k$	108-139	$C=159*e*k*0,8$	86-111
Solar	-	$C=427*e$	330	$C=427*e$	330
If the information in the annual report on electricity production from renewable resources does not match the information submitted in the application to the Ministry of Economics on obtaining the right to sell electricity from biomass and biogas.					
Biomass, biogas	Biomass < 4 MW	$C = \frac{T_g * k}{9,3} * 3,6$	40-50 <sup>a</sup>	$C = \frac{T_g * k}{9,3} * 2,72$	37-47 <sup>a</sup>
	Biogas > 2 MW		86-110 <sup>b</sup>		65-83 <sup>b</sup>
			40-50 <sup>a</sup>		30-38 <sup>a</sup>
			71-88 <sup>b</sup>		54-67 <sup>b</sup>
Biomass	> 4 MW	$C = \frac{T_g * k}{9,3} * 2,88$	32-39 <sup>a</sup> 57-69 <sup>b</sup>	$C = \frac{T_g * k}{9,3} * 2,4$	27-32 <sup>a</sup> 47-75 <sup>b</sup>
Biogas	< 2 MW	$C=188*e*k*0,8$	107-131	$C=188*e*k*0,64$	85-105

a: at a price of 130 LVL/1000 Nm<sup>3</sup>

b: at a price of 230 LVL/1000 Nm<sup>3</sup>

The feed-in tariff is capped so that electricity producers have the right to sell their electricity at the above described fixed price until a certain share of RES-E in the total electricity consumption is reached.

In *Lithuania*, the key support instrument for RES-E (electricity) production is a feed-in tariff system with purchase obligation. The National Control Commission for Prices and Energy is controlling that network connection conditions and tariffs for new electricity producers would be objective, transparent and non-discriminatory taking into account all costs and benefit derived from RES. The feed-in tariff is applied since 2002. The level of feed-in tariffs is revised but not periodically. The

implementation of feed-in tariffs system was revised in 2007 and 2009 taking into account the inflation rate changes and other factors.

Energy suppliers are obligated to purchase RES-E from its producers at these guaranteed feed-in tariffs.

Table 17. Feed-in tariff level in Lithuania.

RES technology	Support level					
	2002-2007		2008-2009		Since 2009-01-01	
	LTL/MWh	€/MWh	LTL/MWh	€/MWh	LTL/MWh	€/MWh
Biomass	220	63.7	240	69,5	300	86.9

Lithuania has introduced an annual maximum quota of RES-E to be purchased at the guaranteed feed-in tariffs for period 2004-2010 differentiated according RES technologies based on RES-E target of 7% in the overall electricity production by 2010.

Table 18. A maximum quota of RES-E to be purchased at the feed-in tariffs for 2010

	Installed capacity, MW	A maximum quota, GWh
<b>Biomass</b>	32.8	127.1

The Netherlands launched in 2007 a regulation to stimulate the production of renewable power and the production of renewable gas by a compensation for the uneconomic top. Subcategories included for biomass (year 2010) are:

- Sustainable electricity: waste treatment, (co-)digestion of animal fat, digestion of vegetable, fruit and garden waste, other digestion, thermic conversion of solid and fluid streams to 50 MW, waste water treatment installations, sewage water treatment installations, 'stortgas'
- Renewable gas: (co-digestion) of animal fat, digestion of vegetable, fruit and garden waste, other digestion, thermic conversion of solid and fluid streams to 50 MW, waste water treatment installations, sewage water treatment installations, 'stortgas'

The SDE Subsidy is dependent on the energy price and is calculated by reducing the basic amount from the SDE regulation from the corrective amount. An overview of basic amounts, correction amounts and SDE contributions (not all are shown) is shown in the table below.

Table 19. SDE Subsidies of the Netherlands.

Subcategories (for biomass only)	Basic amount SDE (€/kWh)	(temporarily) correction amount 2010 (€/kWh)	(temporarily) SDE contribution (€/kWh)
Thermic conversion ( $\leq$ 10 MW)	0.151-0.176	0.047	0.104-0.129
Thermic conversion (10-50 MW)	0.114-0.153	0.047	0.067-0.106
GFT-Digestion	0.129-0.149	0.047	0.082-0.102
(Co-)digestion of animal fertilizer and thermic conversion ( $\leq$ 10 MW)	0.165-0.193	0.047	0.118-0.146
Other digestion	0.158	0.047	-

\* Not all categories are shown in the table

Producers of sustainable electricity have to be registered at CertiQ. Renewable energy producers from biomass are obliged to report about the sustainability performance from their biomass feedstock within 3 months after the end of the calendar year.

In *Slovenia* the purchase of the electricity is guaranteed. Pursuant to this support, irrespective of the price of electricity on the market, the Centre for RES/CHP Support buys all the acquired net electricity produced, for which the RES generating plant has received guarantees of origin, at guaranteed prices.

Table 20. Guaranteed Slovenian purchase prices and operating supports for electricity from RES generating plants using wood biomass where wood biomass represents more than 90% of the primary energy fuel input.

Size category of generating plant	Guaranteed purchase price 2009 (EUR/MWh)	Guaranteed purchase price 2010 (EUR/MWh)	Operating support 2009 (EUR/MWh)	Operating support 2010 (EUR/MWh)
Micro (< 50 kW)	<sup>1</sup>	<sup>1</sup>	<sup>1</sup>	<sup>1</sup>
Small (< 1 MW)	224.35	225.74	165.20	177.14
Medium (to 10 MW)	167.43	168.60	107.63	119.46
Large (to 125 MW)	<sup>1</sup>	<sup>1</sup>	<sup>1</sup>	<sup>1</sup>

<sup>1</sup> Shall be determined for each individual case separately.

For electricity generated with cogeneration with high efficiency, the guaranteed purchase prices are shown in the Table 15.



Table 21. Guaranteed Slovenian purchase prices for CHP generating plants using wood biomass annual operating hours up to 4000.

Size category of CHP generating plant	Guaranteed purchase price 2009 (EUR/MWh)	Guaranteed purchase price 2010 (EUR/MWh)	Operating support 2009 (EUR/MWh)	Operating support 2010 (EUR/MWh)
Micro (< 50 kW)	1	1	1	1
Small (< 1 MW)	326.70	327.45	269.50	280.45
Medium – lower (1 MW – 5 MW)	/	/	192.28	203.76
Medium – higher (5 MW – 25 MW)	/	/	126.56	137.95
Large – lower (25 MW – 50 MW)	/	/	93.31	105.07
Large – higher (50 MW – 200 MW)	/	/	1	1

<sup>1</sup> Shall be determined for each individual case separately.

Table 22. Guaranteed Slovenian purchase prices for CHP generating plants using wood biomass – annual operating hours over 4,000.

Size category of CHP generating plant	Guaranteed purchase price 2009 (EUR/MWh)	Guaranteed purchase price 2010 (EUR/MWh)	Operating support 2009 (EUR/MWh)	Operating support 2010 (EUR/MWh)
Micro (< 50 kW)	1	1	1	1
Small (< 1 MW)	220.05	220.80	160.25	171.66
Medium – lower (1 MW – 5 MW)	/	/	111.17	122.76
Medium – higher (5 MW – 25 MW)	/	/	67.99	79.50
Large – lower (25 MW – 50 MW)	/	/	46.46	58.33
Large – higher (50 MW – 200 MW)	/	/	1	1

<sup>1</sup> Shall be determined for each individual case separately.

Only *Sweden* and *Belgium* among the countries participating in this study use Green Certificates as a support instrument for renewable energies. Sweden's Green Electricity certificate system is a market-based support system to assist expansion of production of electricity from renewable sources and from peat in Sweden. Its objective is to increase, by 2016, the production of electricity from such sources on the level of 17 TWh relative to the production level in 2002. It is part of the country's overall objective of moving Sweden towards a more ecologically sustainable energy system. Electricity production that qualified for Green Certificates in 2008 amounted to 15.0 TWh.

Electricity certificates are issued to operators of approved plants producing and metering electricity from renewable energy sources, or from peat, at the rate of one certificate unit per MWh. Electricity produced from the following energy sources qualifies for certificates: wind power, solar energy, wave energy geothermal energy, certain biofuels and certain hydro power. With effect from 1st April 2004, electricity produced from peat in cogeneration plants has also qualified for certificates. New plants receive certificates for 15 years, while those plants started up before 1st May 2003 will be progressively phased out of the scheme, starting from the end of 2012 or 2014.

Demand for certificates is created by the fact that all electricity suppliers, and certain electricity users, are required to buy certificates corresponding to a certain proportion (their quota) of their electricity sales or use. The proportion of certificates thermal energy, certain biomass fuels and certain hydro power. With effect from 1st April 2004, electricity produced from peat in cogeneration plants has also qualified for certificates. New plants receive certificates for 15 years, while those plants started up before 1<sup>st</sup> May 2003 will be progressively phased out of the scheme, starting from the end of 2012 or 2014.

Belgium has three regional green certificate granting systems for electricity; one in each region. Flanders has separate systems for renewable electricity and CHP; Wallonia and Brussels have integrated systems for renewable electricity and CHP.

In Wallonia green certificates are issued to a cogeneration installation or installation using renewable energy sources by the Walloon Commission for Energy (CWAPE). A green certificate market is created by the requirement for each electricity supplier to obtain a quota of "green certificates" in proportion to its own volume of electricity sales. This quota to be met by suppliers is yearly and gradually increasing.

*Table 23. Walloon green certificate system: Quota of green certificates of the electricity sales.*

<b>Year</b>	<b>Quota</b>
2003	3%
2004	4%
2005	5%
2006	6%
2007	7%
2008	8%
2009	9%
from 01/01/2010 to 31/03/2010	10,00%
from 01/04/2010 to 31/12/2010	11,75%
in 2011	13,50%
in 2012	15,75%

Issue of green certificates in proportion to the power generation facility and the rate of CO<sub>2</sub> savings achieved. Currently, a green certificate is issued by 456 kg of non-renewable CO<sub>2</sub> avoided compared to conventional installations.

From 1 December 2009, any prior request for granting the guarantee of origin labels and / or green certificates submitted to the CWAPE for installation of a net developable power less than or equal to 10 kW results in a early grant of green certificates. Only if the plant does not benefit from the grant of the subsidy from the Ministerial Order of 20 December 2007 on detailed rules and procedure for granting bonuses to encourage the rational use of energy and if the producer has formally renounced it.

Green certificates are issued in advance at the time of notification of the CWAPE acceptance of the application, up to the estimated number of green certificates to be received for a production period of five years and subject to a limit of 40 green certificates. The anticipated grant is made on terms established and published by CWAPE on its website.

Table 24. Summary of different legal incentives to promote green electricity in EUBIONET III partner countries.

Country	Electricity production
Austria	<p>The ÖSVO 2010 supports the production of electricity from photovoltaic, wind power, geothermic, solid and liquid biomass, biogas and landfill gas. It includes the fixed feed-in-tariffs for all these renewable energy sources. This regulation refers to new plants, which are licensed by authority after 31.12.2004.</p> <p>The level of the feed-in-tariff depends on the renewable energy source and the capacity of the plant. There are also some requirements regarding the minimum degree of fuel efficiency. The tariffs are revised annually.</p> <p>The feed-in-tariff for green energy made from solid and liquid biomass and biogas is guaranteed for 15 years from the time of bringing into service.</p> <p>In addition, special tariffs are provided for producers of electricity out of all forms of biomass (solid, liquid, gaseous) who received tariffs under a previous regime for 10 to 13 or 15 years. The special tariffs are provided once these periods end, up to the 20<sup>th</sup> year of operation.</p>
Belgium	<p>Green certificate systems in all three regions (Flanders, Wallonia, Brussels)</p> <p><i>Flanders:</i> 2 certificate systems (electricity/CHP)</p> <ul style="list-style-type: none"> <li>-Mandatory system for electricity suppliers to include green power and CHP (annually increasing %)</li> </ul> <p><i>Wallonia:</i> Combined green certificates for electricity and CHP</p> <ul style="list-style-type: none"> <li>-Obligation for electricity supplier (minimum number of certificates)</li> <li>-Basis of green certificates: GHG savings compared to best available technology for electricity and heat production</li> </ul> <p><i>Brussels:</i> The Commission grants a "guarantee label of origin" to the holder of a facility producing electricity from renewable energy sources and / or installation of cogeneration. The guarantee label of origin certifies that the production of electricity can really save CO<sub>2</sub> emissions.</p>
Denmark	<p>The Law on promoting renewable energy aims to promote the production of energy using renewable energy sources in accordance with climatic and environmental and socio-economic reasons in order to reduce dependence on fossil fuels, ensure supply security and reduce emissions of CO<sub>2</sub> and other greenhouse gases.</p> <p>The law should particularly help to ensure compliance with national and international targets to increase the share of energy produced using renewable energy sources.</p>
Czech Republic	<p>Redemption prices of electricity from renewable energy sources are set as minimal values. The redemption prices and green bonuses depend on the fuel and plant type and age.</p>
Finland	<p>The production subsidies for renewable electricity have been subject to revision as a part of introduction of feed-in-tariff for wind power, biogas and wood fuel. The new law entered into force on 1 January 2011.</p> <p>Support for electricity production by renewable energy sources is granted for wind power, hydro power ≤1 MVA, municipal solid waste, biogas and forest chips. As of 1 January 2011 this support is paid only to plants which are not in the new feed-in-tariff system.</p>
Germany	<p>Free access to the grid and a fixed feed-in-tariff for electricity generated from renewable energy sources are guaranteed for plant operators. The tariff depends on the type and capacity of installation and on the year of its commissioning. The tariff is paid for a period of 20 years and is increased with different bonuses if certain prerequisites are met.</p>

Country	Electricity production
Greece	<p>Existing feed-in tariff system and the relevant Power Purchase Agreement contract duration have been rationalized further, attempting to promote RES investments for which no significant investment interest has been exhibited so far. It eliminates any pricing differentiation for energy produced in the mainland or in the non-interconnected islands and provides for further increase of the tariffs set, in case the producer does not receive any investment subsidy or tax exemption/reduction/refund. Power Purchase Agreements are valid for 20 years for all RES units.</p>
Italy	<p>Green Certificates are an obligation for producers and importers from non-RES to feed into the grid a percentage of electricity produced from RES via "new" plants; such Green Certificates can be sold or purchased through bilateral agreements or through GME trading platform.</p> <p>The producers of green electricity receive a Green Certificate for each unit of electric energy produced; this certificate can be traded on a Tradable Green Certificate (TGC) market. The TGC system is combined with mandatory targets on the share of renewable energy production, supply or consumption.</p> <p>Qualified RES-E plants receive a number of Green Certificates (each worth 1 MWh) equal to the product between their supportable net electricity generation and the multiplicative factors (differentiated by source).</p> <p>The support is granted through 8, 12 or 15 years, depending on the type and age of the plant, with 4 extra years within certain conditions.</p> <p>Feed-in-tariff is an alternative support instead of Green Certificates. The all inclusive tariff is given for each produced kWh put into the electricity network. The tariff is different depending on the renewable energy source. It is available to the plant for 15 years.</p> <p>The tariff is "all inclusive": it includes the value of the electric energy (selling price) and the support.</p>
Latvia	<p>The main support instrument in the renewable electricity sector is feed-in-tariff system with certain formulas for calculating the feed-in-tariffs.</p> <p>The feed-in-tariff is capped so that electricity producers have the right to sell their electricity at the fixed price until a certain share of RES-E in the total electricity consumption is reached.</p> <p>In addition, the regulations prescribe the criteria for qualification of cogeneration units using RES to acquire the right to sell the produced electricity within the framework of the mandatory procurement or to receive guaranteed payment for the installed electric capacity in a cogeneration unit.</p> <p>The Renewable Energy Law set the state and local government rights and responsibilities of the renewable energy sector, the support instruments (additional payment for electricity production from RES, including promotion of renewable electricity consumption in the household sector) for promotion of renewable energy usage, and transitional provisions.</p>
Lithuania	<p>The key support instrument for RES-E production is a feed-in tariff system with purchase obligation. The level of feed-in tariffs is revised but not periodically. Energy suppliers are obligated to purchase RES-E from its producers at these guaranteed feed-in tariffs (since 1.1.2009 86.9 €/MWh). An annual maximum quota of RES-E to be purchased at the guaranteed feed-in tariffs has been introduced for period 2004 – 2010.</p>

Country	Electricity production
The Netherlands	<p>The regulation to stimulate sustainable energy production (SDE) subsidy is dependent on the energy price and is calculated by reducing the basic amount from the SDE regulation from the corrective amount.</p> <p>Producers of sustainable electricity have to be registered at CertiQ. Renewable energy producers from biomass are obliged to report about the sustainability performance from their feedstock.</p> <p>Feedstock to be used is not only wood, but also other solid biomass streams such as coffee husks, chicken fertilizer, etc.</p> <p>In 2011, a new regulation called SDE+ will succeed the SDE, with some changes in the tendering process and types of installations that can get the subsidy.</p>
Norway	<p>The Government has signed an agreement with Sweden to establish a common market for green certificates. This market will be in place by 2012, and will include all renewable electricity types including hydro power.</p>
Portugal	<p>Producers of electricity based on renewable energy sources are remunerated on the basis of a certain formula.</p> <p>For cogeneration operators, there are two kinds of remuneration regimes: the general regime and the special regime with a renewable energy premium, calculated according to the proportion of renewable fuels consumed. For the plant to be deemed to be renewable cogeneration, at least 50% of the primary energy consumed in the plant must be from renewable sources.</p>
Slovakia	<p>The support of electricity production from RES and high-efficiency cogeneration is ensured by additional payment. The fixed feed-in prices for RES-E depend on the technology used and are guaranteed for 15 years. In cases where EU or state investment support is applied, purchase price is reduced by a certain percentage which depends on the level of investment support.</p>
Slovenia	<p>RES-E producers can choose to receive either fixed feed-in tariffs or premium feed-in tariffs from the network operators. A Purchase Agreement is concluded, valid for 15 years. According to the Law on Energy, the uniform annual prices and premiums are set at least once a year.</p> <p>Support for electricity produced in RES generating plants comprises:</p> <ul style="list-style-type: none"> <li>• Guaranteed purchase of electricity. Pursuant to this support, irrespective of the price of electricity on the market, the Centre for RES/CHP Support buys all the acquired net electricity produced, for which the RES generating plant has received guarantees of origin, at guaranteed prices;</li> <li>• Financial aid for current operations. This support is allocated for net electricity generated for which a guarantee of origin has been received and which RES electricity producers sell themselves on the market or use for their own consumption, provided that the costs of producing this energy are greater than the price that can be obtained for in on the electricity market.</li> </ul> <p>Similar support is available also for electricity from CHP generating plants.</p>
Sweden	<p>Green Electricity certificate system is a market-based support system to assist expansion of production of electricity from renewable sources and from peat.</p> <p>Demand for certificates is created by the fact that all electricity suppliers, and certain electricity users, are required to buy certificates corresponding to a certain proportion (their quota) of their electricity sales or use. Electricity produced from the following energy sources qualifies for certificates: wind, solar, wave, geothermal, certain biofuels and certain hydro power.</p>

Country	Electricity production
UK	<p>The Renewables Obligation (2002 – 2027) makes Licensed Electricity Suppliers source an increasing proportion of their electricity from renewables, or else pay a financial penalty called the buy-out. The Renewable Obligation Certificates (ROCs) are the currency of the Obligation and ROCs are used as proof of compliance.</p> <p>Renewable electricity and heat tariffs are introduced in the UK in 2010 and 2011. The tariffs are intended to support combined heat and power installations as well as pure heat and electricity generation. These feed-in tariffs work alongside the Renewables Obligation, which will remain the primary mechanism to incentivise deployment of large-scale renewable electricity generation.</p>

## 6 Other support, e.g. forestry and agriculture sector

There are several further instruments and measures to support the production and use of bioenergy in the partner countries. Austria has climate programme to advise and promote bioenergy or England's energy crop programme to support the cultivation of energy crops. In the following table the measures which couldn't be categorised in the sections before, are listed.

In the Finnish Act on the Financing of Sustainable Forestry (544/2007) Finland, non-industrial, private forest owners are entitled to seek governmental grants for the afforestation of understocked areas, prescribed burning, the tending of young stands, the harvesting of energy wood, forest recovery, fertilisation, etc. Loans can be granted for joint ventures involving improvement ditching and forest road construction. The Ministry of Agriculture and Forestry pays support in accordance with the law on forestry financing for the harvesting and forestry transport of timber sold for fuel as part of the management of young plantations. The aid for harvesting fuel wood is € 7 per solid cubic meter. Support of € 1.7 per loose m<sup>3</sup> may be obtained for chipping fuel timber. In 2007, a total of € 5.7 million was spent on fuel timber harvesting and chipping support. Also investment aid can be granted for biomass production e.g. supporting investments on chippers.

*Table 25. Summary of different legal incentives to support forestry and agriculture sector in EUBIONET III partner countries.*

Country	Other support for agriculture and forestry
Austria	<p>The integration of forestry subsidisation measures into rural development represents an important method to expand the forest cultivation and to reach national renewable energy targets.</p> <p>State-aided are activities like reforestation. The sum of the aid depends on the composition of the tree species and the habitat. The reforestation has to be geared to the natural tree ecotypes.</p> <p>The opening of forests by building new logging roads and reconstruct or update old forest roads is also included in the forest subsidy program. New and modern logging roads force the use of forests for fuel production and round wood supply. New building activities are financed by 40% of the investment cost, reconstruction activities by 25%.</p> <p>Activities like pest control, the advancement of protection forests and thinning are subsidized and part of the forestal subsidy program.</p> <p>The klima:aktiv programme, running from 2004 to 2012, aims to support energy efficiency and increased use of renewables in all sectors of the economy through direct grant support, information, and advice.</p>

Country	Other support for agriculture and forestry
Belgium	<p>19<sup>th</sup> December 1854 – Forest Code- about a very old right called “droit d’affouage”and means the right for any inhabitant of a village to receive a part of the wood logged in the municipal forests. This wood can be firewood, construction wood or fencing wood.</p> <p>This law is less and less in application because the municipalities also have the right to sell the wood.</p>
Czech Republic	<p>A proposal of financial support for founding and growing of fast-growing wood for energy biomass production is under discussion. It should be realized as part of Agricultural Fund for Rural Development. The produced biomass must not be used within the plant, but it should be possible to sell it to another subject. The support relates to expense of founding and growing of fast-growing wood (between 40% – 60%). The support is still in preparing; program start is supposed in 2011.</p>
Finland	<p>Non-industrial, private forest owners are entitled to seek governmental grants for the afforestation of understocked areas, prescribed burning, tending of young stands, harvesting of energy wood, forest recovery, fertilisation etc. Loans can be granted for joint ventures involving improvement ditching and forest road construction.</p> <p>In December 2010 the Parliament separated the financing of sustainable forestry and energy support for small trees. The support for fuel timber harvesting and chipping will be combined. The Ministry of Agriculture and Forestry will pay support for the harvesting, forestry transport and chipping of timber sold for fuel as part of the management of young plantations.</p>
Greece	<p>Members of forest cooperatives are able to use fuelwood harvested in state forests (or forests owned by public legal entities) located in areas where they live, in order to cover their needs for heating. Fees or taxes for the exploitation of these fuelwood quantities, estimated by the forest management plan, are not required.</p> <p>Farmers of “mountainous” and “other disadvantageous” areas are supported in their activities to cultivate non-food crops (energy crops). The level of the financial support depends on the age of the farmers and the location and type of the area (mountainous/disadvantageous).</p>
Italy	<p>Financial support for the production of woody biomass is available at regional level through the Rural Development Programmes (PSR) the tool of the European Community to reach the targets of the EC Regulation 1698/2005.</p>
The Netherlands	<p>The Program Sustainable Biomass Import is developed to stimulate, support and facilitate the sustainable production, processing, use and import from biomass that is produced outside the Netherlands.</p> <p>The program has to contribute to: i) enhancing sustainable production of biomass; ii) development and adaptation of certification systems for imported biomass; iii) counteracting undesired negative impacts of biomass production.</p>
Norway	<p>Subsidy is given for the following types of harvest/forest activities: pre-commercial thinning, harvest of broadleaves, tending of young stands, harvest residues, tending of the cultural landscape, and clearance along roads.</p>
Portugal	<p>The Permanent Forest Fund (FFP) seeks to support projects aimed at forest planning, management and intervention, forest sustainability and research and technical assistance. The FFP has been indicated to be a financing mechanism to increase the production of forest biomass for energy production.</p> <p>The Rural Development Programme (PRODER) is a strategic and financial instrument for supporting the rural development of mainland Portugal, e.g. to improve the competitiveness of the agricultural and forestry sectors. This includes a financing mechanism to increase the production of forest biomass for energy production.</p>

Country	Other support for agriculture and forestry
UK	<p>In England, the Energy Crops Scheme provides grants for establishing short rotation coppice and miscanthus under the new Rural Development Programme England (RDPE; 2007 – 2013).</p> <p>Farmers can also receive the Single Payment for energy crops grown on set-aside.</p> <p>The Bio-energy Infrastructure Scheme helps develop the supply chains required to harvest, store, process and supply energy crops and wood fuel to energy end-users.</p> <p>The Forestry Commission and other government departments in England, Wales and Scotland have a range of grant schemes to help new suppliers and users with the cost of equipment, and to help woodland owners get started on wood fuel production. Some of these schemes are not specifically directed at wood fuel, but can be applied to it.</p> <p>A key, UK-wide government support scheme due to come into effect in 2011 is the Renewable Heat Incentive (RHI), which will subsidise heat production from renewable sources. This has the potential to transform the finances of the wood fuel industry, and make it a much more attractive business proposition.</p>

## 7 Bioenergy in National Renewable Energy Action Plans (NREAPs)

The Member States of the European Union wrote National Renewable Energy Action Plans in year 2010. These plans, to be prepared in accordance with the template published by the Commission, provide detailed roadmaps of how each Member State expects to reach its legally binding 2020 target for the share of renewable energy in their final energy consumption.

The countries had to estimate the expected final energy consumption and expected bioenergy consumption for electricity, heating and cooling and transport. In the table below the expected relative bioenergy consumption has been calculated.

*Table 26. Expected share of bioenergy in final energy consumption in the NREAPs*

Country	Final bioenergy consumption 2005	Final bioenergy consumption 2020
Austria	24.4%	34.2%
Belgium	1.6%	9.1%
Czech Republic	4.9%	10.9%
Denmark	17%	28%
Germany	4.5%	10%
Greece	4.4%	10.1%
Italy		
Latvia	26.4%	27.9%
Lithuania	14.1%	20.6%
The Netherlands	2.0%	6.0%
Portugal	13.7%	15.4%
Slovenia	16.3%	25.4%
Slovakia	7.5%	15.3%
Sweden	22.7%	26.3%
UK		



In the following table the chapter 4.6 "Specific measures for the promotion of the use of energy from biomass" of the nREAPS is summarized by the partners. They were asked to summarize the most important and interesting issues from the chapter. Further they were asked how they estimate the balance of resources and bioenergy use in their country. Some experts have argued that for some countries the total use of bioenergy in the NREAP is higher than the net resources (gross resources-export+import).

*Table 27. Short summary of the chapter 4.6 of the NREAP "Specific measures for the promotion of the use of energy from biomass" and an estimation of total biomass resources vs. Total use*

Austria	<p>In addition to wind, solar and water power, various sources of biomass are possible and required to meet the 34 % target for renewable energies in 2020 with a targeted final energy consumption of 1,100 PJ. The exhaustion of available biomass potential is also important to provide energy for heating and cooling and for achieving the 10 % biofuel target.</p> <p>In Austria the production of bioresources for energy extraction and the cultivation of land for food production are not in competition. In 2006 about 3.6 % (50,000 ha) of the arable land (1.37 million ha) in Austria was used for production of renewable raw materials. According to Statistik Austria, there were more than 93200 ha of fallow arable land. Unused raw material potential arises mainly from the use of grassland for the biogas production.</p> <p>A concept to enhance the production of biogas from material like wet manure, catch crops, landscape conservation and other residual products gets currently designed. In future grass and grass waste, high-protein and high-carbon wastewater as well as faeces, sewage sludge, leftovers and fruit and vegetable waste would have a higher priority for biogas production. Beside the production, there are also activities to enhance the applications of biogas. Biogas is currently used to produce green electricity and heat. There are also targets to integrate treated biogas into the natural gas grid as well as filling stations to use biogas as fuel for natural gas powered vehicles.</p> <p>The forest management in Austria is regulated in the Forest Act and takes place under the premise of sustainability with the aim to ensure the multifunctional effects, like use, protection, welfare and recreation. The forest in Austria is mainly structured in small units with numbers of different owners. A significant problem with the raw material supply is the very little average growth usage of 60 % and lower. The efforts to increase the usage meet the problems like inadequate infrastructure, prevailing mentality and great price elasticity.</p> <p>A wood and biomass resource study carried out which amount could be used sustainably in the year 2020 by taking four major scenarios: the theoretical potential, the ecological potential, the economical potential and the potential based on natural conservation laws and factors of Natura 2000. The results in any case are the same: further increase of wood is required. A comprehensive wood flow management for a better coordination of the behavior of all market players, a European wide forest wood cluster and cooperation along the whole value chain are possible measures to improve forest management and increase the wood resources. Depending on the price and usage scenario an annual total usage potential of 23.9 to 31.1 million cubic meters of timber harvested are forecast for 2020. The Forest Dialogue work Program and the Timber Flow Work Program are two measures, which are already implemented to fulfill the targets.</p> <p>In Austria there is sufficient arable land available to cultivate energy crops without any effects on competition for land use. The additional biomass can only be ensured through additional production.</p> <p>Because of increasing demand for biomass, new market opportunities are arising especially for by-products such as wood chips, bark, forest residues. An increased demand for energy wood provides also a variety for recycling purpose, because of enhanced wood harvesting.</p> <p>The biomass net resources of Austria were 4114 ktoe in 2006, according to the Austrian NREAP (Table 7). The final bioenergy consumption in Austria was approximately 3912 ktoe in year 2006 (source EUBIONETIII WP2 country report). Due to this figures the net resources were higher than consumption and the Austrian bioenergy balance was positive</p>
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Belgium	<p>Belgium is a country with a high population density and intense farmland activity. To increase the availability of biomass, the support for renewable energy sources creates new possibilities for using energy crops. Furthermore, there are forestry research and demonstration projects for forestry (short rotation) and other biomass plants under way, which also focus on the phyto-remediation of degraded land. The additional energetic potential of domestic forests is rather limited.</p> <p>Nevertheless additional possibilities remain to implement a more efficient use of wood (residual flows) resulting from the management of road shoulders, nature reserves, parks and gardens. The service entities responsible for forest management stimulate these possibilities by the establishment of forest management plans.</p> <p>The establishment for energy purposes can be reinforced by the improved collection of waste flows and of available residual waste. Furthermore, the improved use of biomass, liquefied by fermentation, in combination with manure and compost processing, offers an interesting perspective. The establishment of biomass for such applications is encouraged by granting support for biomass energy projects for investments and with the help of green certificates. The estimation of primary energy production with inland resources of biomass in 2020 is estimated to 2,434.7 ktoe, coming mainly from agriculture and fisheries.</p>
Czech Republic	<p>There is ca. 977 000 ha of unused arable land as potential for energy production from biomass (regarding the food supply of Czech Republic). The Ministry of Agriculture plans some kind of support of using arable land for energy purposes until 2011.</p> <p>The using of Czech biogas is financially supported as electricity (and heat) production from biogas in terms of the act n. 180/2005 Coll. Primary materials (e.g. animal manure) are used and supported as electricity (and heat) production from biogas.</p> <p>There are planned some measures for maximizing the sustainable harvesting of biomass from Czech forests:</p> <ul style="list-style-type: none"> <li>- improving the efficiency of using of forest biomass,</li> <li>- development of more effective technologies for collecting and transport of forest biomass,</li> <li>- education and more information for the forest owners,</li> <li>- legislative determination of operational support of heat production from renewable sources.</li> </ul> <p>The biomass net resources of Czech Republic were 1 644 ktoe in 2006 (Table 7 of Czech REAP). The final bioenergy consumption in Czech Republic was ca. 1 900 ktoe. The Czech bioenergy balance was negative; the net resources were lower than consumption.</p>
Denmark	<p>There are plans to use up to 50% of the animal manure for energy by 2020. Establishing of perennial energy crops is being promoted. The total biomass net resources in Denmark exceed the use of bioenergy</p>
Finland	<p>On 20 April 2010, the Government's ministerial working group for climate and energy policy agreed on the contents of an extensive package of obligations concerning renewable energy, with the aim of increasing energy production based on renewable forms of energy in 2020. The Government has estimated that final energy consumption in Finland will total 327 TWh in 2020. Of this, if Finland is to meet its obligation to increase the share of renewable energy to 38 per cent of final consumption by 2020, the share of energy based on renewable energy sources must be 124 TWh. This gives an additional requirement for energy produced from renewable sources of 38 terawatt hours.</p> <p>This package will promote the use of forest chips and other wood-based energy in particular, alongside wind power, the use of transport biofuels, and the increasing utilisation of heat pumps. In doing so it will enable Finland to meet its obligations set by the European Union, to increase the share of renewable energy to 38 per cent of final energy consumption in 2020 and decrease of annual greenhouse gas emissions would be 7 million tons of CO<sub>2</sub>.</p> <p>The aim is to increase use of forest chips from 5 million solid m<sup>3</sup> (10 TWh) in 2009 to 13,5 million solid m<sup>3</sup> (25 TWh) in 2020 by granting more support for harvesting and chipping of small-sized trees, variable electricity production support and feed-in-tariff for small-scale CHP plants. The Ministry of Employment and the Economy is proposing to increase support for renewable energy sources to 341 million € in 2020.</p>
Germany	<p>The production of biomass for energy will be in Germany in 2020 app. 1000 PJ. The difference of 400 PJ between consumption (1400 PJ) and production could be covered through imports of biomass, increased yields of energy plants, increased use of forest wood for energy production and landscape conservation material, short rotational plantations and cultivation of energy plants on ecological compensation areas. If biomass is imported, it should be produced using sustainable practices. At the moment the Sustainability Ordinance implements the</p>

	<p>requirements of the Renewable Energy directive of the EU applies for biofuels and –liquids.</p> <p>There is no significant potential on unused arable land in Germany and the potential on degraded potential is small. Incentives to use silage and unused organic waste, including landscape maintenance waste, for energy production have already been implemented.</p> <p>The production and use of biogas is supported with statutory provisions like Renewable Energy Sources Act (EEG), Renewable Energies Heat Act (EEWärmeG), Gas Grid Access Ordinance (GasNZV) and Gas Grid Payment Ordinance (GASNeV), which were all in force in beginning 2010 and are presented in the former document “National incentives and other legal framework promoting the use of bioenergy”.</p> <p>The forestry sector offers a significant potential for bioenergy potential, but it is important to use sustainable management practices to avoid any adverse impacts on society and the environment. For professionalization of forestry management education and training programmes for qualified employees should be offered and the efficient use of wood (cascade utilization) is to be promoted. Soil and nature conservation are to be taken into account.</p>
Greece	<p>Lignocellulosic biomass is already demanded by established markets. Large quantities of wood harvested in forests are used by forest industries, (e.g. saw-mills, particle and fibre board industries) and their residues are directly converted to heat. Imports of solid biofuels are mainly refined wood in the form of pellets for domestic heating.</p> <p>The contribution of forest sector in the Gross National Income is low, ranging around 1.3% due to low land productivity but benefits coming from the management of forests are not classified as income.</p> <p>Agricultural residues (e.g. straw) are used for animal bedding and feeding and remaining quantities are left unexploited on site. Cultivation residues (e.g. olive trees and vineyards pruning) are partly used by the local communities for space heating.</p> <p>The development of technologies for second-generation biofuels could drive on competition for biomass feedstocks after the year 2020 and the increased demand for biofuels could have significant long-term impacts on several markets for agricultural and forest products and responsible policy will be required.</p> <p>The high biomass costs, the limited land and water availability, the competition for food and feed, and the environmental constraints limit the technically available biomass supplies of the country. This may impact the available agricultural residues for energy exploitation.</p> <p>Increased demand of this feedstock in the short and long term could be thus covered by the existing and not exploited biomass –even at low availabilities- without causing significant impact in the energy market.</p> <p>The estimated domestic supply of biomass from agriculture for 2015 and 2020 mainly refers to oil crops and approximately 148,000 tons of biodiesel have to be produced by 2010. To meet future targets, possibly some imports will be needed. The existing biodiesel production (575,000 tons) is four times higher than the required quantities to meet the 5.75% target of 2010. The imported biomass up to 2020 mainly refers to the production of biofuels for transport. Imported oils comprise about 70- 80% of the raw materials used so far by these units and domestically produced oils about 20-30%.</p> <p>Increased demand for biodiesel could have significant impacts on the vegetable oil market, shifting from food to non-food crops which will require careful handling.</p> <p>Bioethanol will be imported in large amounts in order to meet the national RES target.</p> <p>Energy crops being are indirectly included in the measures of the Ministry. The financial support for non-food crops ranges from 100€/ha to 140€/ha.</p> <p>Mobilisation of new biomass sources will be accomplished through a progressive shift from conventional to energy crops rather than utilising degraded lands. There is no land dedicated to short rotation forestry or perennial grasses.</p> <p>The energy use of the available raw materials (e.g. animal manure, agricultural/forest residues) directly depends on the market demand. In Greece, electricity generation via conversion to biogas is the only well developed energy market for this feedstock.</p> <p>Finally, a suitable system for the collection, recording and processing of the data is currently in process to assist the Ministry of Environment, Energy and Climate Change in meeting the following needs:</p> <ul style="list-style-type: none"> <li>• Policy making at different levels (national, local, etc.),</li> <li>• Siting of new installations (granting licenses, location of new plants, etc.).</li> <li>• Informing and providing access to the public to the available statistics.</li> </ul> <p>All biomass products are used for bioenergy purposes. No imports and exports of biomass are included in the survey of biomass supply system. There is no deviation between amount of domestic resources and primary energy production from biomass.</p>

Italy	<p>Action to promote the use of wood and similar energy crops with a particular focus encouraging the spread of small-scale plants and the growth of local entrepreneurship will be outlined, the report says. Attention will be given to criteria for rational use of resources, taking into account the efficiency of supply chains and the sustainable use of solid biomass.</p> <p>The support measures reported are the "all inclusive tariff" and "green certificates" incentives and the Financial support for the production of woody biomass that is available at Regional Level through the Rural Development Programmes (PSR) the tool of the European Community to reach the targets of the EC Regulation 1698/2005.</p> <p>Several studies carried out for the evaluation of the biomass potential for energy use are listed in NREAP Annex 4.6.</p>														
	<table border="1"> <tr> <td data-bbox="424 432 1294 472">Table 7 in NREAP: Biomass supply in 2006</td> <td data-bbox="1294 432 1471 472">ktoe/y</td> </tr> <tr> <td data-bbox="424 472 1294 539">Direct supply of wood biomass from forests and other wooded land for energy generation</td> <td data-bbox="1294 472 1471 539">880</td> </tr> <tr> <td data-bbox="424 539 1294 607">Agricultural crops and fishery products directly provided for energy generation</td> <td data-bbox="1294 539 1471 607">883</td> </tr> <tr> <td data-bbox="424 607 1294 674">Agricultural byproducts/processed residues and fishery by-products for energy generation</td> <td data-bbox="1294 607 1471 674">150</td> </tr> <tr> <td data-bbox="424 674 1294 741">Biodegradable fraction of municipal solid waste including biowaste and landfill gas</td> <td data-bbox="1294 674 1471 741">561</td> </tr> <tr> <td data-bbox="424 741 1294 781">Biodegradable fraction of industrial waste</td> <td data-bbox="1294 741 1471 781">150</td> </tr> <tr> <td data-bbox="424 781 1294 819">Total</td> <td data-bbox="1294 781 1471 819">2 624</td> </tr> </table>	Table 7 in NREAP: Biomass supply in 2006	ktoe/y	Direct supply of wood biomass from forests and other wooded land for energy generation	880	Agricultural crops and fishery products directly provided for energy generation	883	Agricultural byproducts/processed residues and fishery by-products for energy generation	150	Biodegradable fraction of municipal solid waste including biowaste and landfill gas	561	Biodegradable fraction of industrial waste	150	Total	2 624
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Latvia	<p>Information on measures for promotion the use of energy from biomass in Latvia is available for three sectors:</p> <p>Fishery – no measures are planned to be implemented in the future;</p> <p>Agriculture - no measures are planned to be implemented in the future;</p> <p>Forestry - it is not planned to increase the forest exploitation in the future, but the attention will be paid to efficient usage of existing resources.</p> <p>Due to the lack of information and unclear data presentation in the Latvian National Renewable Action Plan, it is not possible to give the description on balance of biomass in Latvia.</p>														
Lithuania	<p>Taking into account the fact that consumption of biomass in electricity, heating and cooling, and transport will be growing in the country, the relation between imported and exported biomass is to tend to unity.</p> <p>Lithuanian soils are not degraded and, under conditions of usual farming, they yield quite bounteous crops. In 2006, the total land area affected by erosion (water, wind, anthropogenic) amounted to 731,900 ha (of which: agricultural land – 609,000 ha; forests and other forested areas – 46,900 ha; scarcely vegetated and non-vegetated open areas – 75,000 ha). Approximately 19 % of the total area of soils of the country are sensitive to deflation (1.8–2.5 t/ha of soil).</p> <p>It is envisaged that pursuant to the special plan for the use of waste suitable for energy production approved by the council of the municipality coordinated with the Special National Plan for the Use of Waste Suitable for Energy Production, municipalities (or groups thereof) will organise, in accordance with the procedure established by legal acts, planning, designing and construction of energy facilities using waste suitable for energy production.</p> <p>The production and processing of agricultural produce as raw materials for biofuel production is promoted. Biofuel production is made equal to development of new, environmentally-friendly technologies with the use of renewable energy sources. The status of a pilot project can be granted to such activities by a resolution of the Government of the Republic of Lithuania.</p> <p>The Plan of Measures for the Implementation of the National Strategy for the Development of Renewable Energy Sources for 2010–2015 envisages the following measure: to prepare forecasts of the use of biomass resources in the country until 2020 taking into account the import, export of biomass and the assessment of the impact of the use of biomass for the production of energy on other sectors (industry, agriculture etc), and to provide proposals regarding the creation of a system for the monitoring of this impact.</p> <p>The biomass net resources of Lithuania were 728 ktoe in 2006 (Table 7 of Lithuanian REAP). The final bioenergy consumption in Lithuania was ca. 559 ktoe. The bioenergy balance was positive; the net resources were higher than consumption.</p>														

<p>The Netherlands</p>	<p>In the Netherlands, biomass for bioenergy purposes is projected to increase from 1815 ktoe in 2005 to 8336 ktoe in 2020. Estimations on biomass available from domestic resources range from 4535 to 5878 ktoe primary energy in 2020, depending on the scenario. The largest contributions are expected from direct and indirect residues from agriculture and fishery sectors. It is however difficult to estimate how much will be used for bioenergy production in the future. Sectors for which large scale imports of biomass is expected include co-firing in coal fired power plants from countries that produce woody biomass (1655 ktoe in 2020) and biofuels (840 ktoe in 2020). For biofuels, biomass can also be imported as semi-finished product or fuels.</p> <p>Netherlands has little degraded and unused agricultural land available and due to the high rental prices for land, it is unlikely that energy crops will be produced domestically. Therefore, no measures are planned to encourage the use of unused and degraded land in the Netherlands.</p> <p>Anaerobic (co-)digestion of manure is financially stimulated via the SDE and the digestate from fermentation might be processed and used as fertilizer under certain preconditions laid down in the fertilizer act. Also the use of biogas has been promoted via the SDE. Ambitious targets for bioenergy are integrated in the program "Schoon en Zuinig" in which the nature, forestry, landscape and wood industry sectors are aiming to mobilize 764 ktoe renewable energy in 2020, e.g. from residues from landscape management.</p> <p>The NREAP of the Netherlands does not make any estimates on imported biomass, but since the Netherlands is not expected to become a producer of dedicated energy crops in the future, it is possible to estimate the required imports of biomass for bioenergy in the Netherlands. Domestic resources of biomass mainly include direct and indirect residues that are estimated to contribute 54 to 70% to the total primary energy demand from biomass resources in 2020. Expected imports, to meet the total demand of biomass feedstocks therefore range from 495 to 3839 ktoe in 2020, but these figures can be higher depending on the price of imported feedstocks.</p>
<p>Portugal</p>	<p>Considering the estimated figure for the potential of the (forestry and other) biomass available in Portugal, it is believed that the conditions necessary to achieve the national target that has been established for producing electricity in dedicated plants have been ensured. The national target has been fixed at 250 MW of installed capacity by 2020.</p> <p>In any case, considering that other uses have been envisaged for biomass, especially the production of pellets for heating, it will be necessary to make efforts to balance public policies and private interests so as to increase and guarantee the availability of the resources. These efforts have been developed by promoting forest cooperatives, measures that compensate for the absenteeism of forest owners, certification for forests and forest products, amongst other solutions, such as, for example, the promotion of energy crops, systems to support forest clearing and new measures to prevent forest fires.</p> <p>Regarding the demand for biomass in different sectors – Electricity, H&amp;C and Transport – it is expected that Portugal will be able to satisfy the majority of its needs by means of domestic supplies of raw materials. The only exception is in the transport sector, particularly the production of biofuels, where imports will account for a relatively significant value. Effectively, it has been estimated that in 2020 imports for this purpose will touch 431 ktoe, representing more than 90% of the raw materials used to produce biofuels. In overall terms, however, imports will not represent much more than 10% of Portugal's biomass needs, and it is estimated that imports will account for 11% in the year 2020.</p>

Slovenia	<p>The biomass net resources of Slovenia were 442 ktoe in 2006 (Table 7 of Slovenian nREAP) and it is expected to be 333 ktoe in year 2020 only from forestry biomass; final bioenergy consumption in 2020 is expected to be 1.354 toe. No specific measure defines from which bioenergy resources the energy deficit will be covered (ca. 1.000 toe).</p> <p>Sustainable forest management has a long tradition in Slovenia, but is also supported by Resolution on the National Forest Programme and the Forest Act. It is estimated that, in light of the criteria to achieve optimal timber stocks in Slovenian forests, the sustainable production of biomass from forests way could increase at least to the extent of the existing quantity of biomass from forests. Barriers to implementing this measure are poor infrastructure, forest roads and disorganized sawing of round wood, including the separation of lower quality wood for the use in the production of renewable energy sources and quality timber, suitable for the manufacture of wood. Improving forest management is a priority action for sustainable economic development. According to the criteria, to achieve optimal timber stocks in Slovenian forests are estimated to increase the maximum annual use of forest biomass to around 3 million t. This indicates a potential that is sufficient for long-term development of wood-processing industry and energy sector, based on the use of renewable energy sources, particularly in the production of liquid biofuels of the second and third generation. Increased use of forest biomass for renewable energy purposes is planned side by side with the increased use of quality wood in the wood-processing industry.</p> <p>The Rural Development Programme 2007-2013 stimulates the use of biogas with the following measures:</p> <p>Action 121 - Modernisation of farming;  Action 123 - Adding value to agricultural and forestry products;  Action 311 - Diversification of farms into non-agricultural activities;  Action 312 - Supporting the creation and development of microenterprises.</p> <p>In Slovenia, the most recent figure shows that there is ca. 21,600 ha of abandoned agricultural land (Source: Records of the actual use of agricultural land, the Ministry of Agriculture, Forestry and Food). Most of the land is pastures, meadows and scattered lands, which do not pose a significant potential for growing crops for energy purposes although no land is so degraded that energy crops could not grow. Reasons for reforestation are mostly of economic-social nature, abandoning of the land is mostly out of adverse natural conditions. Specific measures for the use of unused arable land are not planned. Appropriate use of agricultural land is stimulated in the I. pillar of the CAP in the form of decoupled payments per ha. In the Rural Development Programme, farmers have an additional incentive for considering higher standards of land management and environmental protection.</p>
	<p>The biomass net resources of Slovenia were 442 ktoe in 2006 (Table 7 of Slovenian nREAP). The final bioenergy consumption in Slovenia was ca. 850 ktoe. The Slovenian bio-energy balance was negative; the net resources were lower than consumption.</p>
Slovakia	<p>The energy potential of agricultural biomass in Slovakia is 29 449 GWh or 106 054 TJ which is 13.2% of total energy consumption, which is 800 PJ.</p> <p>The consumption of biomass for energy will be in Slovakia in 2020 app. 43.70 PJ. (Table 10-12)</p> <p>Import of biomass for energy use by 2020 is unlikely.</p> <p>The use of available primary material for biogas plants is supported by Act No. 309/2009 in the Collection of Laws of the Slovak Republic on promotion of RES and high efficiency cogeneration, which promotes production of electricity from biogas and biomethane.</p> <p>Ministry of Agriculture is particularly supportive of agricultural biogas plants, which process waste from primary agricultural production, livestock and agricultural waste.</p>
	<p>The biomass net resources of Slovakia were 625.2 ktoe (26.2 PJ) in 2006 (Table 7 of Slovak NREAP). The final bioenergy consumption in Slovakia was ca. 275.38 ktoe (11.5 PJ). The Slovak bioenergy balance was positive; the net resources were higher than consumption.</p>

Sweden	<p>Biomass from forestry contributes with the largest part of the total use of biomass (both domestic and trade) in Sweden in 2006, 8206 ktoe. Biomass from agriculture and fisheries contributes with 617 ktoe and biomass from waste with 764 ktoe.</p> <p>The estimated biomass amounts for domestic supply in 2020 are 9628 ktoe biomass from forestry, 408 ktoe biomass from agriculture and fisheries and 1202 ktoe biomass from waste.</p> <p>There are measures to encourage unused land to be used for energy purposes. The Swedish Rural Development Programme includes investment aid for energy forests that applies to all arable land. The target as regards multi-annual energy crops is that an area equivalent to 30,000 hectares is to be planted during the period of the programme, 2007-2013. The Swedish Rural Development Programme also includes investment aid for biogas.</p> <p>The extraction of forest residues (branches, tops and stumps) can be increased for a short time as the demand for wood fuels increases. Forestry can also promote generally increased growth through measures including the use of sufficiently dense regenerations, increased land clearance, manuring and by using processed plants that provides improved future deforestation opportunities. The Swedish Energy Agency and the forestry industry are together pushing forward technical development of forest fuel management by the <i>Skogforsk</i> (the Forestry Research Institute of Sweden) programme ESS (More efficient forest fuel techniques). The results of the programme could contribute to increased profitability for the forestry industry and for forest fuel management in particular.</p>
	<p>The biomass net resources of Sweden were corresponding to 9587 ktoe in 2006 (primary energy production, table 7 of Swedish NREAP). According to the Swedish Energy Agency the total bioenergy supply (including peat) in 2006 was 9976 ktoe, while the final use the same year was 5934 ktoe. The Swedish bioenergy balance was hence positive, net resources were higher than consumption.</p>

## References

*D4.2.1 Alakangas, E. & Vesterinen, P., VTT; Martikainen, A., FNR.* The legal and technical requirements of biomass and bioenergy in 18 EU-countries – D4.2.2, August 2011, 192 p. (includes all national reports)