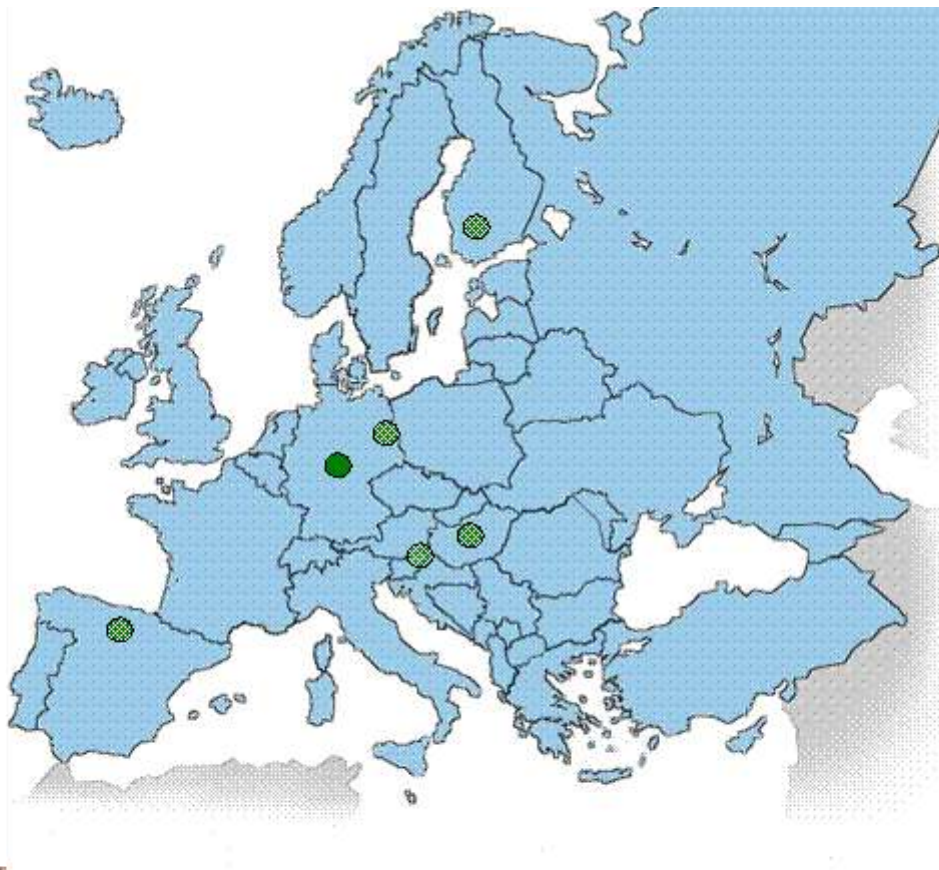


# SUMMARY OF BIOBUSINESS-STUDIES - CONFERENCE PAPER

BURGOS, TAMPERE, POMURJE, CENTRAL HUNGARY,  
NORDTHUERINGEN AND BRANDENGURG REGIONS



Intelligent Energy  Europe

## **About the Project**

BIOBUSINESS is a network project under the EU program **Intelligent Energy Europe (IEE)**. It focuses on the creation and expansion of small and medium-sized companies in the field of biomass. In this way, the basis for an economic growth of the regions involved, especially in the rural areas, is created.

Project partners, regional authorities for industrial development and energy, local government and municipality work side by side with existing small and medium-sized companies that deal with renewable biomass-based energy. The aim is to develop a scenario for the creation of new businesses. In parallel, an inventory of biomass resources, a study of trends in the biomass sector, technology transfer, exploration of market opportunities as well as determining the state of science and technology are carried out.

The result of the project is a good method for founding enterprises with the use of biomass as a key renewable energy sources as well as a design for industrial development trend in this field in other European territories.

To learn more about the project BIOBUSINESS, its project partners and the objectives and results, you can visit the website <http://www.euro-biomass.com/>. For further questions, please contact the project management:



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The BIOBUSINESS partners would like to acknowledge and say a sincere thank you to the European Commission and EACI without whose support none of this work would have been possible.

## Presentation of the partner regions of BIOBUSINESS

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**Burgos in Spain**

*(CEEI-Burgos and AGENBUR)*

**About the region**

Burgos is a province in the Autonomous Community of Castile-Leon (Castilla y Leon) in northern Spain. In the mainly agriculture dominated region live 373,546 inhabitants (2007) on an area of 14,269 km<sup>2</sup>. The capital and largest city of the province is the eponymous city of Burgos with 174,075 inhabitants (2007).



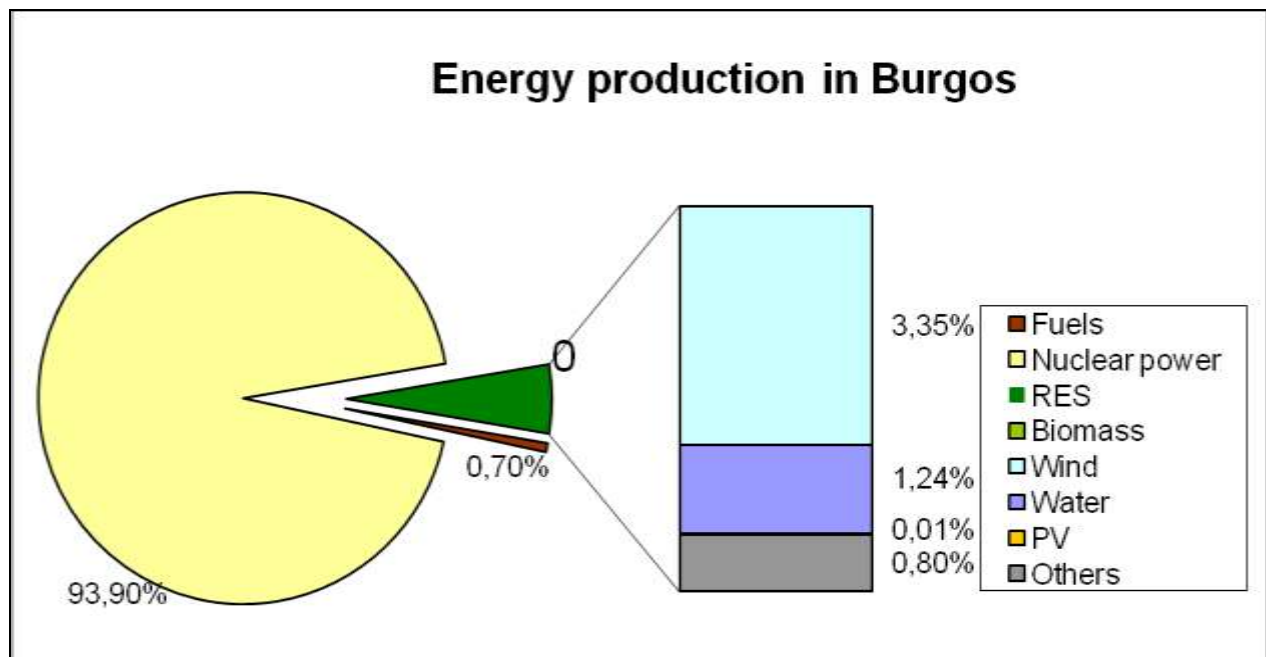
The landscape in Burgos is a mixture of desert, valleys and mountains. The northern zone is shaped from the foothills of the Cantabrian mountain range. Between the Cantabrian Mountains and Duero River in the south is a plateau. In the southeast of Burgos is margined the Sierra de la Demanda of the Iberian mountain range. San Millán, with 2132 meters is the highest mountain in the province.



### **Energy consumption and energy production**

In the province of Burgos in 2003, an energy of 12.53 TWh was consumed. This corresponds to approximately one percent of the total energy consumption in Spain. In recent years, the energy consumption increases continuously.

Annually, in Burgos are generated 12.08 TWh mostly from nuclear power (93.9%). Fuel covers with 0.7% a very small proportion of power generation. The renewable energies are only represented by 5.4% and are divided into 62% wind, 23% hydroelectric and 0.1% Photovoltaic. Wood provides virtually no contribution. The total installed capacity of biomass applications in the heating range is 458.4 kW with a total of 36 plants. Remnants of the agriculture and agri-food industry are not relevant in Burgos, because they are needed for other purposes than the energy.



### Initiatives to promote biomass

Currently in the province of Burgos, only the energy agency Agencia Provincial de la Energía de Burgos (AGENBUR), the service organization CEEI-Burgos (Centro Europeo de Empresas e Innovación de Burgos) of the European Commission and the regional body EREN (Ente Regional de la Energía de Castilla y León) deal with the expansion of the domestic use of biomass. Business incubators, research organizations or technology programs with an emphasis on biomass do not exist.

AGENBUR was founded in 2004 for the purpose to manage energy saving in the region. In this way, the government of the province campaigns for the promotion of renewable energies and for a thrifty use of energy. The agency focuses in particular on the development of solar and biomass energy.

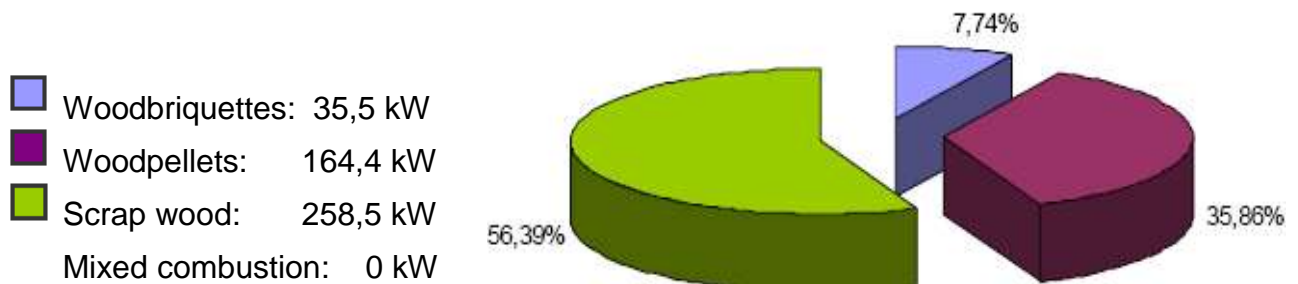
CEEI-Burgos is a charitable society launched in 1994 for encouraging the development of enterprises through appropriate advice and support. The European Center for Enterprise and Innovation offers extensive counseling experience in the field of promotion in the various districts of the provinces, including agriculture, agribusiness, tourism, renewable energy, logistics, transport, mechanical equipment, construction, electronics, environment, engineering services, computer, telecommunications , car parts, etc.

There are some initiatives in Burgos which are mostly supported through European projects. Such projects are for example CORE Business (Altener program) for the promotion and provision of renewable energy and RESINBUIL (IEE program) for the expansion of renewable energies in the building sector.

## Biomass Applications

The utilization of biomass in the province of Burgos is currently inadequate and will be further expanded.

Without taking into account the number of separate fire sites, in the province in the year 2004 36 biomass heating systems with a total capacity of 458.4 kW were installed. This corresponds to an average of only 1.3 kW/1000 residents. These fuels are divided by type of used biomass as follows:



2007, about 70 pellet heating systems with a total capacity of 3001.52 kW were registered. These are mostly small plants, only one achieved an output of 582 kW.

In addition, there are numerous fireplaces in family homes, but exact figures are not registered.

In the municipality Briviesca is built currently a biomass power plant with a capacity of 12.5 MW. By the power plant, which will become operational probably in 2009, straw is used as fuel. On the design and development of the plant the government of Castile and Leon with EREN (Ente Regional de la Energía de Castilla y Leon) and the private company ACCIONA participate.

In the province of Burgos, there is only one biogas plant. However, the in the capital built plant is only temporarily in operation. According to a preliminary calculation, the plant can generate 534 m<sup>3</sup> biogas of waste. This corresponds to an annual capacity of 40,000 tonnes of waste, biogas 21,360,000 m<sup>3</sup> and 18,000 MWh of electricity.

## Biomass resources

In the province of Burgos, almost the entire existing biomass potential is not exploited. The region has 7195.67 km<sup>2</sup> of arable land, 113.56 km<sup>2</sup> of grassland and 6737.68 km<sup>2</sup> of forest. For an energy production of 179,198 tons per year are 463,711 hectares of forest managed. The best-developed forests are La Demanda and Merindades where within a radius of 30 km from 30,000 to 70,000 tons of biomass annually will won. In addition, farmers build 5,203 tons (17,344 ha) and 587,364 tons of fuel (468,534 ha) of herbaceous energy crops. 60% of the latter are

cereals. Another potential of biomass of annually 1,563 tons of crude oil units provide 17,344 hectares of fruit trees and vineyards.

### **Supplier of biomass products and related services**

Since the beginning of the establishment of biomass as an energy source, in Burgos several companies have also established which offer biomass products or related technology and act with the appropriate raw materials. Currently, there are 15 companies in the field of active biomass. The majority of them are small and medium-sized enterprises who operate in addition to biomass also in other areas.

In the capital of Burgos, two factories produce pellets. The company with the name Molygrasa is specialized in the production of cattle feed and has some time before expanded their range with straw pellets. Triturados Montero makes chips from biomass. Further projects are under construction. Two more factories for pellets are planned in the municipalities of Quintanar de la Sierra and Huerta del Rey. Annually, 50,000 tonnes of pellets should be produced in these plants.

In Castile-Leon, there are two technology centers, CIDAUT and CARTIF, which develop biogas technology. Nevertheless, the bulk of the biomass technology is imported mainly from Europe. Currently, in Burgos exist first approaches for the development of biomass plants by private companies. Additionally, some companies sell biomass technology. Furthermore, some companies develop and boiler accessories. In the area of agricultural cultivation of biomass, the company CEDER grows very successful and profitable types of wood.

### **Plans for the future use of biomass**

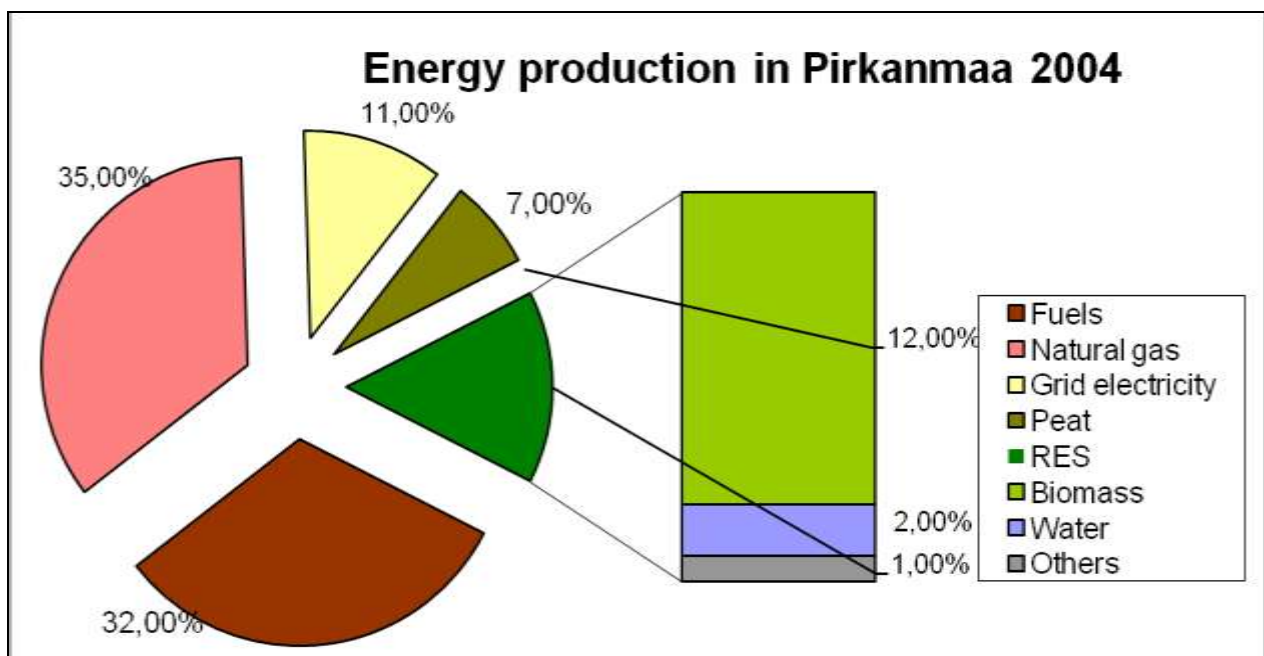
The Spanish Renewable Energy Plan (PER 2005 - 2010) from 2004 provides up to 2010, to apply biomass according to 6 million tonnes of oil for energy use. Of this, 5.1 million tonnes of oil for electrical applications and 0.9 million tons of oil for thermal applications should be used. In line with several studies on the biomass potentials in Spain, the regions Galicia and Castilla-Leon are valid as preferred areas for the implementation of the plan, because a very high percentage of forest cover exists and thus the wood processing industry is very active.



## Energy consumption and production

Finland is world leader in the use of bioenergy as well as the development of technologies for the incineration of biomass and efficient fuel supply chains. The expertise covers the entire value chain starting from the forests to the heating or power plants.

In 2004, Pirkanmaa needed an energy consumption of 23.2 TWh. This represents approximately 5.6% of Finland's total energy consumption. With 35%, natural gas represents the largest share in energy supply. The renewable energies are only represented about 15%. Between 1990 and 2004, the structure of energy consumption is not changed remarkably, but the quantity is evenly increased. The industry has with 44% the highest energy consumption. For applications in the heating area will be approximately 26% needed, in the transport sector there are still needed 21%.



In 2004, in Pirkanmaa a total of 6.4 TWh of electricity was used. In order to meet these needs, there had to be bought 6.8 TWh, 4.2 TWh were generated in the region. Only 6% of the produced electricity and 4% of imported electricity was won from biomass.

Since the introduction of emissions trading, in Finland the use of peat for energy has been reduced, because the dealing with emissions has made the combustion of peat in large installations a lot more expensive. In related investments was replaced therefore the peat in large part by natural gas and wood chips. While in Pirkanmaa in 2002 were obtained 8% (around 1.8 TWh) of total energy by the combustion of peat, the won energy in 2005, were only 1.3 TWh. This represents a decrease of approximately 27%.

## **Initiatives to promote the use of biomass**

The Finnish population is very nature-oriented, and therefore attaches great importance to environmental protection and in particular the preservation of native forests. Consequently, there are throughout the country numerous research institutes, expert organizations and training institutions that deal with topics such as sustainable energy supply, agriculture and forestry as well as technology development. The most important government service provider for technology and innovation is Tekes. In the context of several technology projects Tekes supports innovations in the field of biomass.

Especially in the Pirkanmaa region, the expansion of biomass use by several institutions will be forwarded. For example, Sentre - the network for sustainable energy solutions - links companies and research and training institutions that develop solutions for sustainable energy. The goal is, to link Pirkanmaa with other European and international players, whose skills are geared to biomass.

Two other networks are active in the areas of wood products and forestry sectors. The network for the evaluation of wood products is a service that offers different expertise in the supply chain from forestry and wood processing enterprises. There are offered customized expertise and funding for research and development projects. The Center is also a focal point for players from different regions of Finland. So companies can expand their expertise and can gain skills to open up the regional economy.

The Technology Center Hermia Ltd promotes the start-up of new technology-based firms and the development of competitiveness in the fields of mechanical engineering and automation technology as well as information and communication technology.

## **Biomass Applications**

In 2005 in Pirkanmaa were used approximately 915,000 cubic meters of wood in energy production, of which 440,000 m<sup>3</sup> in larger boilers and power plants. Equivalent to heating oil that complies to an energy of roughly 0.9 TWh. 62% of that are waste from the wood processing industry and 32% are wood chips from the precipitation. The remaining 52% (475,000 m<sup>3</sup>) of the used energy wood was used as firewood, mainly in the form of logs, in private households.

In Pirkanmaa, the cultivation of arable crops for producing energy is very low. Cereals (mainly oats), reed canary grass (*Phalaris arundinacea*), and straw are used. The amount of used agricultural biomass for the production of energy is not registered. In 2005, the area planted with reed canary grass was about 150 ha. This corresponds to approximately 2.7 GWh of annual amount of energy. In addition to grain and straw are also burned eliminated partially residues together with wood chips on farms. Estimated that is a total of approximately 200 t.

## **Biomass resources**

Pirkanmaa offers plenty of free potential of biomass. One million hectares of forest are managed by the forest industry. This represents 77% of the regional total area. The economic potential for energy wood is 1,100 GWh per year. Of these, currently only about 480 GWh are used. Studies suggest that a further 350 GWh could be in the form of wood chips are obtained without any additional investments are required.

In Pirkanmaa, there are 5,105 farms and 13% of the total areas are fields and gardens. Compared to today's using stand, theoretical there could be obtained the 140-fold of energy through the cultivation of energy crops, without carrying additional investments in appropriate equipment.

## **Supplier of biomass products and services**

The central forestry sectors in Pirkanmaa act as outlets for all kinds of wooden material. They provide forest, trees, wood chips, etc. for sale. At the same time they act as a network for the sellers of logs.

The HAKE project as part of the network Sentre is a supply network for wood fuels in Pirkanmaa. This network combines both the suppliers of raw materials as well as logistics companies and companies in the areas of forestry machinery, chips and final wood production. Furthermore, in two companies in Pirkanmaa - one in Parkano and one in Juupajoki - annually 28,000 tonnes of wood pellets were produced. This corresponds to an energy of about 132 GWh. Approximately a quarter of it remains as a fuel in the region, approximately 70% of the pellets will be exported.

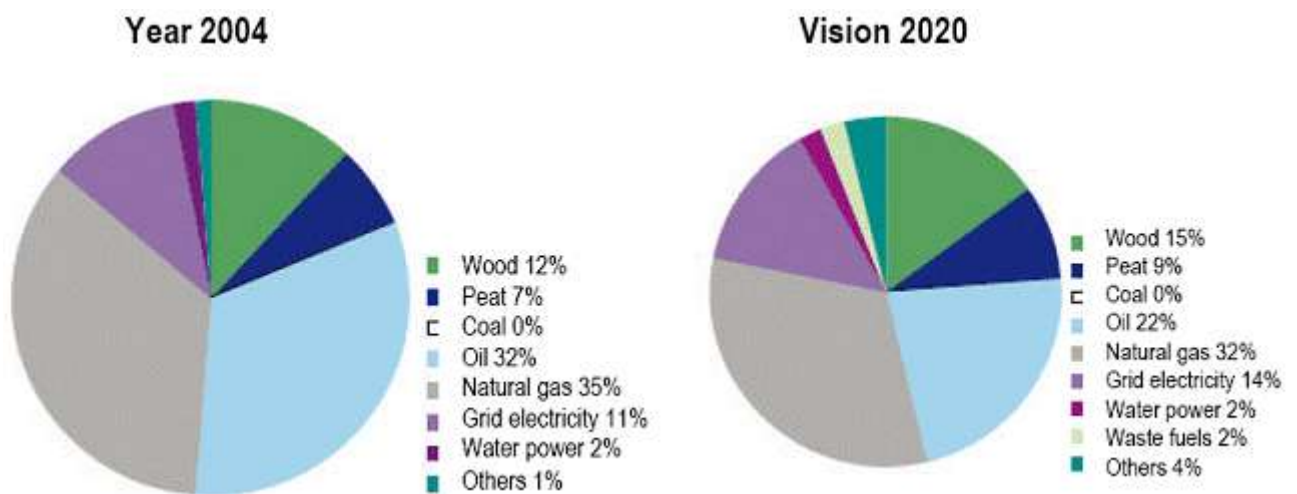
For the biogas production, waste from landfills and farms will be collected. Some companies have contracts with companies that worry about the garbage and buy this raw material. In addition, the farmers in Pirkanmaa cultivate energy plants and sell them.

## **Plans for the future use of biomass**

The municipal council of the Pirkanmaa region has developed, together with local key players in the field of biomass energy strategy, Energy Vision 2020. It is envisaged that the share of renewable energies in overall energy consumption by 2020, annually should be 22%. Peat, although not strictly belonging, is included. In the same period, Pirkanmaas energetic self-sufficiency should be expanded from 18% (2004) to 26%. Furthermore, the Energy Vision 2020 plans that the Energy Efficiency in Pirkanmaa improves by 10% in all sectors of the use of biomass. The use of wood chips should be tripled to 1,000 GWh, energy crops should be cultivated on 20,000 hectares of land area and annually an energy of 600 GWh on the basis of biowaste should be produced. Furthermore it is planned, 10% of fuels in transportation migrate

to bio (17 GWh per year) and natural gas. Therefore, biorefineries make oils from wood and peat.

Estimated, based on the Energy Vision 2020, in the future two to three companies will be founded in the biomass sector annually. New companies for technical support, the sale of biofuels, energy conservation, energy waste recycling as well as for the general advice and services are urgently needed. There is also development in the funding of research and development projects needed. Existing businesses should be modernized to enable them to expand and compete on the world market. By the year 2010, 10, and by 2013 a total of 13 new energy technology companies should be founded in Pirkanmaa. In addition to biogas and biomass combustion technologies, the use of wind and solar and hydrogen technology should be developed.





## Pomurje (Pomurska) in Slovenia

(SINERGIJA)

### About the region

Pomurje, Pomurska in the Slovenian title, is the north-eastern of the 12 statistical regions of Slovenia. The region is divided in 27 administrative units and has no official government, but a regional council for regional development. Local actors are working together to attain unity in the harmonization of development tasks and expectations of the country, regions and administrative units in the areas of economic, social, geographic, environmental and cultural development.

On an area of 1337 kilometers<sup>2</sup> live 121,964 inhabitants (June 2008). Pomurska is one of the least developed regions of Slovenia and is characterized by a large share of intensive agriculture.

The plains merge beyond Hungarian border in the Pannonian plains.



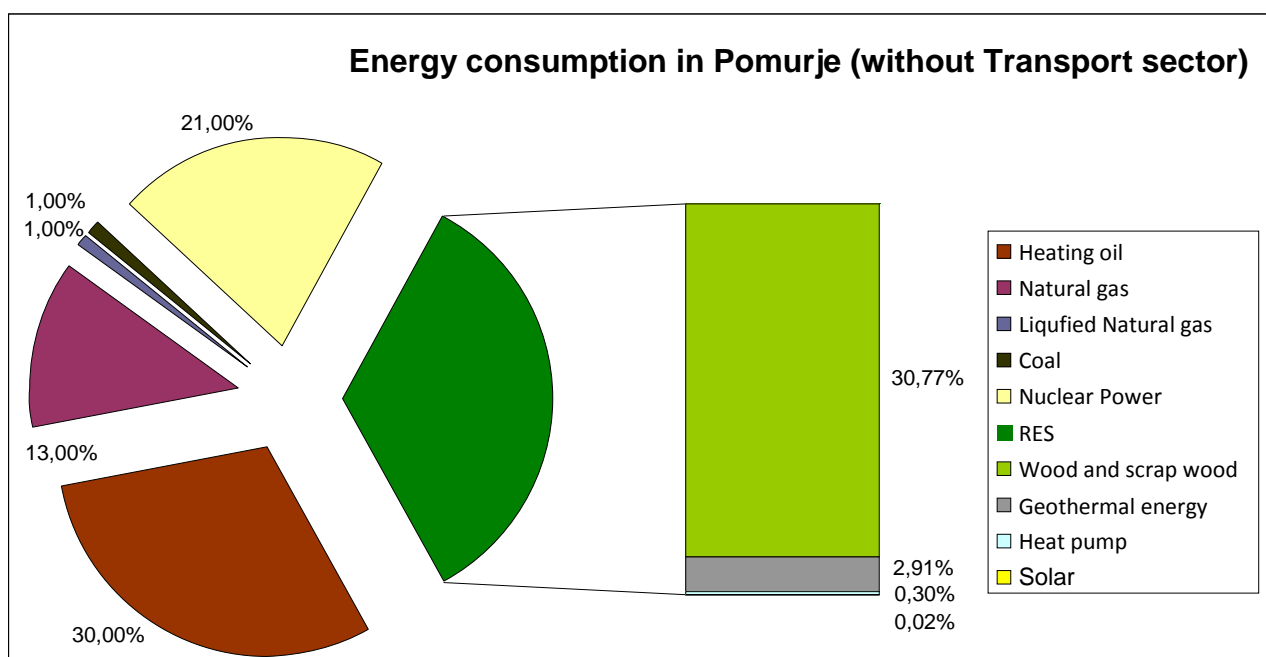
### Energy consumption and production

Excluding the transportation sector, the renewable energies (biomass, geothermal, solar thermal, heat pumps) in Pomurska have a share of 34% of total energy consumption. Biomass can be covered by slightly less than 31%. For technical and

thermal heating in the year 2006 592.062 GWh in houses and 11,806 GWh in private consumption and public buildings were used. The share of renewable energy sources amounted to about 44%. Fire wood and wood waste were participated to 39.8%.

Among the renewable energies dominates with a share of 90.49%, the use of wood and wood waste. Geothermal energy is currently used at 8.57%. Solar energy with 0.07% among the renewable energies hardly play a role.

Due to rising oil prices the use of non-renewable energy sources will reduce. To supply the energy needs of the region, the expansion of renewable energies will be in focus. Primary wood will used contineously for energy production.



### **Initiatives to promote the use of biomass**

The LEA Pomurje is the central, non-governmental Energy Agency of the Pormurske region. Main concern of LEA Pomurje is to support sustainable energy development. Thus, the energy agency is focused on activities to research and development, training, support and advice. The aim is to make the region energetically as independently as possible, to strengthen the prosperity of the local population.

Matters pertaining to the forests of Slovenia are ruled by the state institution, SFS (Slovenian Forest Service). With 14 sub-regional institutions, including the Murska Sobota Pomurje, SFS is mainly operating in the fields of forest management, forestry, protection of forests, forestry technology, wildlife and hunting, promotion and training of forest owners.

In Slovenia, a lot of publicity is done in order to inform both business and private individuals about the opportunities that biomass and other renewable energy sources provide. The regional development agencies, the Institute for Forestry and the

Institute for Agriculture and Forestry bless the biomass sector in the mass media. In local radio and TV stations, various consultations and discussions on these topics were broadcasted. In this way, both, businesses and the general public, will be made aware on this issue and will be informed. The development agency Sinergija has released a series of brochures on renewable energy. It informs also about the economics of biogas plants, boilers and district heating networks based on biomass.

In Martjanci, the pilot "Smart House" runs. Under this project, a building dating from the 18th century in compliance with the renovated and equipped with techniques for the use of renewable energy was equipped. It is heated with wood chips and photovoltaic delivers the required electricity. It is the first house of this kind in Slovenia, and acts as a demonstration object.

### **Biomass Applications**

In Pomurje the biomass of native forests is mainly used by the use of private forest owners. In addition, in sawmills and timber processing plants is so much biomass produced in their daily work, that these companies could defray their own energy needs and offer the remaining stocks on the market.

In 2004, the total energy potential of wood biomass in Pomurje was 308 GWh, or 123,200 m<sup>3</sup>. Since 2006, in 43% of homes heated exclusively with wood. This represents an annual consumption of 171,700 m<sup>3</sup> of wood or an energy of 343.4 GWh. A total of 19,856 biomass combustions were registered. In addition, there four smaller district heating networks in Pomurje, which use wood chips as fuel. Two of these plants were activated in 2004 and two in 2005. One in 2006 built drying chamber for herbs has a 80 kW furnace, which is fired with wood chips.

In Pomurje are currently three biogas plants operating. In June 2008 came into operation a plant at Peti š ovci with a capacity of 4.23 MW is one of the largest biogas plants in Europe. Here are annually 28,760 MWh of electricity and 32,300 MWh of heat produced. In addition, a cleaning plant supplies itself through an integrated biogas plant with electricity and heat.

### **Biomass resources**

In Pomurje, there are 41,021 registered hectares of forest. Indeed, the area with a vegetation of more than 20 years old trees (particularly conifers and beeches), is higher than 30% of the regional total area. The annual increment of wood is 223 m<sup>3</sup> / ha. Of this surplus, 62% may be beaten, although 2004 only 82% of this were actually cut. The reason lies in ownerships justified. 75% of the forest is privately owned and small scattered.

Sawdust and wastes from the woodworking industry and timber construction, and other industrial wastes also provide a significant contribution to the wooden biomass. Overall, the energy potential of wood in Pomurje is 308 GWh. Due to the weak

increase in utilization of wood in the forests this is increasing. Taking into account the untapped possibilities of the forest clearing and with a view to regional development is the energy value of wood in Pomurje estimated at 351.6 GWh. However, the availability is subject of the demand and is therefore governed by the price.

Furthermore, the unregistered stock of trees outside of forests has a rather high purchasing potential in Pomurje. With fruit trees, vines, bushes and shrubs is a yearly average of 26,674 cubic meters of biomass available.

Of the 133,700 hectares of land in Pomurje are 77,000 hectares of fertile soil. 57,622 hectares are land of private farmers. If one assumes that about 6 GWh of energy to an area of 100 hectares can be obtained, the need for a good policy for the prevention of land set aside obvious.

### **Supplier of biomass products and services**

The operators of the three plants for biogas and of the purification systems act as an independent shareholder of arable land and farms. From there, they refer mainly the raw material for biogas production. In addition, contracts with farmers have been completed to ensure a regular supply of biomass.

For the four central heating installations and private consumers in Pomurje, there are numerous possibilities to acquire their biomass fuel. For example, there are 24 sawmills, 94 joiners and numerous smaller private companies, that produce and sell fire-wood or wood chips. In Slovenia and in neighboring countries of Hungary and Bosnia, many suppliers for wood-based fuel have established. The joint-stock Timber and Forest Economy Murska Sobota dd is the largest company in Murgebiet which buys and sell forest resources.

Also in Slovenia, numerous companies are represented, that offers biomass heating systems and related accessories.

### **Plans for the future use of biomass**

The National Energy Program of Slovenia (Official Gazette No 57/2004) sets out the objectives and forms of use and acquisition of energy. Here, the goals in the three pillars of sustainable development - reliable energy supply, competitiveness of energy supply and limited control by the negative impact on the environment – are putted together.

With the National Energy Program, the Slovenian government incentives for the production of electricity and heat from renewable energy sources. On the basis of the EU directive 2001/77/EC, Slovenia has the goal to increase the share of renewable energies in the primary balance of 8.8% (2001) to 12% in 2010. In the basking area should the proportion of 22% (2002) to 25% (2010) increase. Thus, on the one hand biomass district heating networks promoted and expanded and on the other hand

taxes for fossil fuels in the heating area increased. In the electricity sector in 2010, an increase of renewable energies to 33.6% or to 1,600 GWh would reach.

In 2002, the Government Bureau of Pomurje had introduced the Regional Development Program for the period from 2007 to 2013. One content is a high priority to projects on the subject of renewable energies and rational use of energy. The Bureau gave also the requirement, to establish the Local Energy Agency in Pomurje. Their primary tasks are the promotion of energy efficiency and renewable energy sources in Pomurje.



## Central Hungary

(Innóstart)

### About the region

Central Hungary has an area of 6,919 km<sup>2</sup> and has about three million inhabitants. In the Region Budapest (1,702,297 inhabitants, January 2008), the capital of Hungary, and the administrative district of Pest are lying.

The Republic of Hungary is a country in Central Europe, mostly located in the Pannonian Plain. Covering an area of 93,036 km<sup>2</sup> living 10,038,000 inhabitants (March 2008). The capital is Budapest.



Approximately three-quarters of the country's territory are lowlands, one fifth is mountainous with a maximum altitude of 400 m and about 5% of the total territory are mountains whose altitude vary from 400 to 1000 m.

Hungary's economy is heavily dominated by international companies and major local companies are competing in the world market. The small and medium-sized enterprises are the main employers and play an important role in Hungary's economy. This sector employs more than two-thirds of all employees and generates approximately 36.8% of all export revenues. Most companies are in the real estate

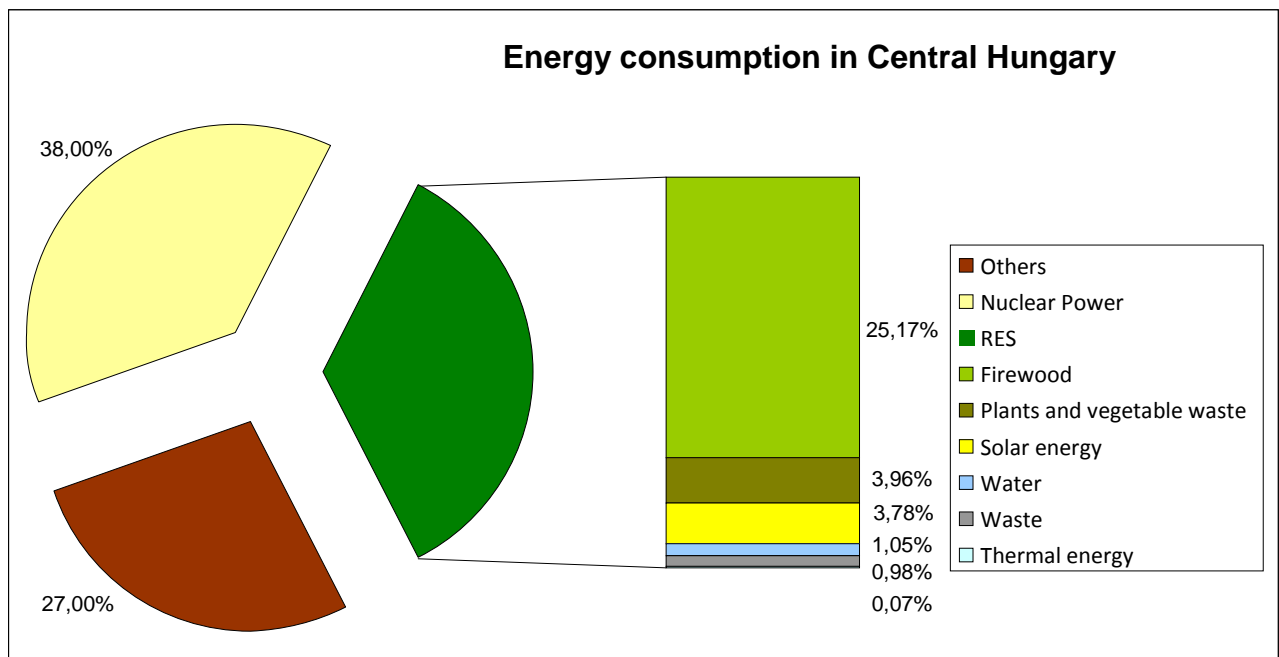
industry, IT, commerce and business-related services. Regional, the majority of companies is located in the centre of the country. It is a concentration of partnership firms in the country's capital Budapest. Approximately 40% of companies have been established there. The proportion of individual enterprises is only 20%.

The nationwide investment in research and development are particularly in the corporate sector far below the EU average. Although Hungary has significant research capacity, these are sometimes not used. Despite a significant growth in the region suffers the country still under a lot of catching up in the establishment of the Information Society.

### **Energy consumption and production**

In Hungary, the energy supply is based mainly on thermal power, which largely from coal and imported oil and natural gas electricity is produced. Hungary covers approximately 38% of its energy needs through nuclear energy with the Paks power plant, which was built 100 km south of Budapest and in 1982 went into operation. Annually there are generated 11,000 to 14,000 GWh of electricity.

Hungary has great potential for the use of renewable energies, particularly in the areas of biomass and geothermal energy. Approximately 30 to 40% of domestic energy demand can be covered through the use of renewable energies. Compared with the potential the country offers, the percentage of use is relatively poor., approximately 405 to 540 PJ of renewable energy are consumed. This represents approximately 15 to 20% of the total potential. Biomass is the dominant energy supplier. Approximately 40% of roundwood production is used for energy purposes. Hungary's energy production based on biomass is at 44 PJ per year, considerably lower than the theoretical potential of 942 PJ, or the technical potential of 297 PJ per year. This information is based on the current technology level. Therefore, the government has decided longer-term commitments to increase the share of alternative energy in coming decades. Strategic considerations in relation to the provision of energy demand to reduce the use of fossil fuels with a view to a secure supply (reduction of import dependency), cost efficiency (replacing the increasingly expensive energy resources), as well as protection of the environment and climate. To achieve this, the energy efficiency should be improved and energy should saved enhancing, as well as the proportion of renewable energy should be increased.



Hungary has a relatively thin crust, and thus excellent geothermal potentials. The major resources are located in the upper Pannonian Basin. Application areas are direct heating, Badtechnologie and horticulture. These three application areas annually consume an energy of 3.6 PJ. In order to permit an application of geothermal energy in the magnitude of power plants in Hungary is currently being intensively researched. In the next ten years could, if the underground hot springs than prove useful, according to the MOL oil company for up to six geothermal power plants in Hungary emerge.

Although Hungary is a Danube riparian State, the country has no hydropower plant. Since the together with Slovakia planned Danube hydropower plant Gabčíkovo-Nagymaros increases on large resistance from the population, were plans for additional hydroelectric power in Hungary discarded. Because Hungary is relatively poor of mountains, there are only two small commercially operated pumped-storage plants with a capacity of about 44 MW. These provide about 200 GWh of electricity annually.

Photovoltaic in Hungary play only a little role. Today there are mostly hotels and resorts that use solar energy, but the demand for photovoltaic and solar thermal collectors is increasing.

### Initiatives to promote the use of biomass

In Hungary, the government is responsible for the energy policy including energy legislation and introduction of measures to promote renewable energies. The Ministry of Economy and Transport create the energy strategy papers. As a national agency for energy efficiency is the so-called energy centre for the practical implementation of the measures responsible. Research and development activities in the field of renewable energies are being coordinated by the Ministry of Education.

Regional energy tactics in Hungary are not created by the state. This task is subject of the municipalities. In the country, several local communities develop local energy concepts on a voluntary basis. The regional energy consulting organizations work together closely with the authorities and companies to, among other things, forward the use of renewable energy.

In addition to this, there are numerous associations, clubs, companies and universities, to develop renewable energies, and are also partly specialized in supporting the use of

Advertising for biomass applications in Hungary only take place in the context of professional events like conferences, trade fairs, information days, workshops, etc. Numerous international conferences and exhibitions that focus on the collection and use of renewable energy - especially biomass – take place mainly in Budapest. These events are either established by intermediary organizations or partners of Hungary who are oriented in international projects. In contrast, regular conferences on biomass with regional focus are normally organized by biomass initiatives. It covers topics such as the local industry situation, application and funding opportunities, legal framework and the national regulatory environment.

Outside of such events, the general public of Hungary is rarely informed about the possibilities of biomass utilization. Actions to promote the biomass have the industry as a target group and thus reach only professional circles. The various relevant institutions remain sidelined.

## **Biomass Applications**

In recent years in Hungary, a continuous increase in biomass use can be reported. While at the beginning for the most part, only wood for heat production was used, is now also electricity is increased in biomass generating plants. In Hungary, there are six biogas plants, five of which were put into operation just last year. To this end, the planting of energy forests in Hungary has already started, as well as the production of energy grass. Materials offer a potential of 500,000 to 700,000 tons.

In 2005, the use of biomass in comparison to the previous year has doubled. Between 1997 and 2004, the average biomass consumption increased by 116% every year. Moreover, in Hungary were reproduced each year about 110 million tons of primary biomass. This allows covering the bulk of the biomass consumption. Approximately 90% of produced renewable energy in Hungary is covered based on biomass. In the country there are more than 10 large biomass plants installed and annually 110 million tons of commodities were produced. Large potentials deliver both solid farming background as well as the effective supply chain. The latter benefited from an especially well-developed transportation network. In the transport sector, in the year 2006 2.2% of total consumption could met with biofuels.

In Central Hungary, on the other hand large-scale biomass installations are rather untypical. Biomass power plants with high performance are missing entirely. For most agricultural enterprises and farms is the energy supply a major problem. The use of

renewable energies such as solar energy and biomass is meaningless. The region is heavily influenced by the capital of the country and is therefore dominated as such by the service sector. In the field of biomass, the proportion of agriculture and forestry is extremely low. Compared with the other partner, the central regions of Hungary take even the weakest position in terms of biomass use. Even biomass for heating is rarely used. However, in the field of small technical use of biomass, a revival can be observed. In the local households, power plants with lower power are starting to establish, but are still rare.

The main reason for the tentative use of biomass in the heating area is the absence of subsidies. Currently, only electricity, not the production of heat and cold, on the basis of renewable energy sources is promoted.

### **Biomass resources**

Hungary's total stock of biomass is approximately 350 to 360 million tonnes. In addition, 110 million are continuously reproduced. The energy content of annually reproduced biomass is 1,185,000 PJ. That is far greater than the total energy consumption of the country.

563,000 hectares of the total 745,000 hectares of Central Hungary could be cultivated. Of these, 54,300 hectares are farmland, the rest are vegetable gardens, orchards, vineyards, meadows and forests. The forests take 27% of the territory. On the fields, mainly wheat (65,000 ha, as of 2006) and maize (57,000 ha), but also sunflower (33,000 ha), potato (5,000 ha) and sugar beet (2,000 hectares) grow. Hungary has no long-term experience with the cultivation and use of energy crops. It is estimated that there may be approximately 150 to 160 mega tonnes of biomass were gained in crop cultivation and the food industry. These quantities could be used realistic for the production of energy and form the basis for the production of 190 PJ of energy.

Overall, Hungary has very good potential for biomass, that are composed of mainly 4 to 4.5 million tonnes of crops, 3-4 million tons of forest wood, from 1.8 to 2.3 million tonnes of livestock, 25 to 30 million tonnes of municipal waste and 150,000 to 200,000 tons of food industry. Despite the existing potential, biomass is currently only very limited used and none of the existing biomass plants is completely utilized. The share of biomass of energy production amounts to only 2.5%, where mainly fire wood is used. A particularly great potential is seen in terms of biogas production. quantity of fermentable raw materials has risen in recent years, so that a large proportion of energy demand could be met. These are mainly animal and municipal wastes. The estimated amount is currently about 8.7 megatons.

## **Supplier of biomass products and services**

In Hungary there are no reliable data available about how many and which companies are working in the biomass sector. It is estimated that approximately 50 to 70 companies and organizations operate in this area. Approximately 15 to 25 are in the capital or in the region of Central Hungary located. Because companies often have no descriptions through reliable sources and no current data exist on this, these figures can diverge also far from the reality.

In addition, numerous suppliers, manufacturers and resellers of biomass technologies are not identifiable, because they often work on this field only additionally to the actual task of the company and it is not mentioned in the profile. Another major problem in the data arises from the lack of internet presency in most Hungarian companies.

The sale of Biomass raw material is mainly linked to the rural areas, where local farmers, producers and sellers promote their products from the nearby areas. However, in the rural areas the number of markets and buying agencies with the necessary infrastructure are very low. Therefore, most products switch their owner in the larger cities and are subsequently returned to rural areas. This results in a significant price increase.

## **Plans for the future use of biomass**

In March 2006, the Ministry of Economy and Transport has developed the new directive for Hungary's energy policy from 2005 to 2030. As a result, since 2007 substantial funds were provided to promote the renewable energy sector under the new National Development Plan (2007 - 2013). In energy production, the share of renewable energies should be increased from 4.3% (2006) to 7.2% in 2010. The share of electricity production increases from 4.6% to more than 5%. In terms of biogas, in the coming years is expected the largest expansion in the renewable energy. Where in 2005 only 10% of the capacity was used, the mass production of primary materials such as manure, sewage sludge and slaughterhouse waste offers excellent opportunities for further development.

After the development of a national biofuel strategy, the harmonization of national laws under EU directive and the revision of the excise tax brackets are now paved the way for the production and sale of biofuels made in Hungary. 2006, only 0.4% of all vehicles were driven with bio-fuels. Until 2010, 4% biofuels should be used.

Within the Kyoto protocol Hungary has agreed to reduce its annual CO<sub>2</sub> emissions from 2008 to 2012 by 6% compared to the years 1985 to 1987. The new National Allocation Plan for 2008 to 2012 sets the average CO<sub>2</sub> emissions to 30.8 million tonnes for the period 2008 to 2012.



## Northern Thuringia in Germany

(BIC Nordthüringen)

The northern region of Thuringia is divided into the two neighboring counties Nordhausen and Kyffhaeuser. The Kyffhaeuser district covers an area of 1035.1 km<sup>2</sup> with 87,058 inhabitants (2006). The district of Nordhausen, situated in the north of Kyffhaeuser region, has an area of 710.9 km<sup>2</sup> and 92,630 inhabitants (2006).

Northern Thuringia is one of the economically weakest regions of Germany. The agricultural and forestry holdings in the rural areas dominated Northern Thuringia region are an important livelihood for the population. In Northern Thuringia, the agricultural used land is currently about 103,000 hectares. Of these, approximately 11,900 hectares are grassland. Northern Thuringia is with a forest area of 44,587 hectares comparatively rich of forest. Small and micro-forest land ownership is widespread, the possession of bigger connected areas are only sporadically.

Due to the agricultural character of the region, the construction of biogas plants started early and there are numerous small and medium sized companies in the Bioenergy sector. The six installed biogas plants have a total electrical capacity of 3.28 MW. In addition, there are four processing plants for oil with a processing capacity of 216,000 tonnes per year. The regional infrastructure for biofuels will increasingly expanded. Meanwhile, nine gas stations offer rapeseed oil methyl ester and one gas station offers of vegetable oil for sale.

The municipal waste of both counties is treated mechanically-biologically on the waste disposal site in Nentzelsrode. In the biogas plant can annually 16,000 tons biowaste be fermented into biogas. Afterwards, the biogas is burned to generate electricity in a thermal power station. In this way, the annual demand of approximately 500 four-person households will be covered.



## Legal and financial frameworks

In Germany, the legal and financial framework for the use of biomass as a renewable energy source due to

- Renewable Energies Law (EEG),
- Biomass Ordinance (BiomasseV)
- Market incentive program of the federal government to develop renewable energies and
- Support programme of KfW Banking Group (Kreditanstalt für Wiederaufbau)

has considerably improved. In addition to these four pillars, numerous other laws and regulations regulate the use of biomass in Germany.

## Renewable Energy Law

The German law for Renewable Energies (EEG) shall forward the expansion of energy-supply systems which are driven, in addition to biomass, from hydropower, landfill, sewage and mine gas, wind and solar energy as regenerative energy sources. It serves primarily to climate protection and shall reduce the dependence of Germany on fossil fuels such as petroleum, natural gas or coal, and also on energy imports from the area outside the EU.

The German Parliament amended a new version of the EEG on 6<sup>th</sup> June 2008 which will come into force on 1<sup>st</sup> January 2009. This establishes the following *minimum compensation rates* for electricity from solid biomass:

- At least 11.67 cents/kWh for installations with a capacity up to and including 150 kW
- At least 9.18 cents/kWh for installations with a capacity up to and including 500 kW
- At least 8.25 cents/kWh for installations with a capacity up to and including 5 MW
- At least 7.79 cents/kWh for installations with a capacity up to and including 20 MW

To these subsidies could be added the following bonuses when appropriate requirements will be observed:

### *Technology Bonus:*

- For gas preparation:
  - 2.0 cents / kWh with a maximum capacity of the gas preparation plant of up to 350 m<sup>3</sup> (iN) reprocessed raw gas per hour
  - 1.0 cents / kWh with a maximum capacity of the gas preparation plant of up to 700 m<sup>3</sup> (iN) reprocessed raw gas per hour
- 2.0 cents / kWh for innovative plant technic

*Bonus for renewable raw materials (NAWARO bonus):*

- General Bonus:
  - 6.0 cents / kWh for installations up to and including a power of 500 kW
  - 4.0 cents / kWh for installations up to and including a power of 5 MW, but 2.5 cents / kWh if the electricity is obtained through the burning of wood, that occurs not from short rotation plantations or comes as part of the landscape conversation
- Bonus for electricity from biogas:
  - 7.0 cents / kWh for installations up to and including a power of 500 kW
  - If the minimum percentage of the manure at any time is at least 30 mass percent (Advice by environmental expert required):
    - (7.0 + 4.0) ct / kWh for installations up to and including a power of 150 kW
    - (7.0 + 1.0) ct / kWh for installations up to and including a power of 500 kW
  - If for power generation mainly plants or plant parts which occurs in the landscape are used (advice needed):
    - (7.0 + 2.0) ct / kWh for installations up to and including a power of 500 kW

*HP-Bonus:*

- 3.0 cents / kWh for installations up to and including a power of 20 MW

*Bonus for plants which need approval after BImSchG, which use biogas produced by anaerobic digestion:*

- 1.0 cents / kWh for installations up to and including a power of 500 kW

These allowances and bonuses are valid for installations which were put into operation before the 1<sup>st</sup> January 2010. After that date, they sink gradually decreased annually by 1.0%, with the results are rounded to two places after the decimal point. The commissioning for the year of the investment rate will be granted across the entire payment period of 20 calendar years plus the start-up year in the same level.

(Source: EEG Act 2009

<http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/eeg2009.pdf>)

## **Biomass Regulation**

The regulation on the production of electricity from biomass by June 21<sup>st</sup>, 2001, as amended by item 1 of the Regulation amending Regulation of biomass August 9<sup>th</sup>, 2005, applies to the scope of the remuneration arrangements of the EEG. It regulates which substances are recognized as biomass, what technical processes for generating electricity may be applied and which environmental requirements are observed.

(Source: Law BiomasseV

<http://www.gesetze-im-internet.de/bundesrecht/biomassev/gesamt.pdf> )

## Market incentive program of the Federation

As part of the market incentive program of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) the Federal Office of Economics and Export Control (BAFA) supports measures for the use of renewable energies. In the year 2008 up to 350 million Euros are available for this program. From 2009, up to 500 million Euros a year are provided for the program.

*At the moment, for biomass plants can be obtained following promotions:*

- *Air guided pellet stoves* from 8 kW to 100 kW or *pellet stoves with water bag* of 5 kW to 100 kW: 36 € / kW (minimum € 1,000)
- *Pellet Boilers:*
  - from 5 kW to 100 kW: 36 € / kW (minimum € 2,000)
  - from 5 kW to 100 kW with a newly constructed storage tank of at least 30 l / kW: 36 € / kW (minimum € 2,500)
- *Bonus promotion for all pellet plants:*
  - Regenerative combination Bonus: 750 €
  - Efficiency Bonus: 18 € / kW or 36 € / kW (including minimum pay rates)
  - Circulating pump: 200 € per heating installation
- *Wood chipping plant* from 5 kW to 100 kW and with a buffer of at least 30 l / kW: € 1,000
- *Firewood gasification boilers* from 15 kW to 50 kW: 1125 €
- *Bonus promotion for wood chipping / firewood gasification plants:*
  - Regenerative combination Bonus: 750 €
  - Efficiency Bonus: 500 € / 1,000 € (wood chips) or 562.50 € / 1125 € (firewood)

The combination of renewable combination bonus with efficiency bonus as well as boiler replacement bonus with efficiency bonus are not allowed. The renewable combination bonus is granted only once. The efficiency boni depend on year of construction of the plant.

(Source: BAFA: „Förderung von Biomasseverfeuerungsanlagen“ BAFA: "Promotion of biomass combustion plants"

[http://www.bafa.de/bafa/de/energie/erneuerbare\\_energien/biomasse/index.html](http://www.bafa.de/bafa/de/energie/erneuerbare_energien/biomasse/index.html))

## Support program of the KfW banking group

The KfW Bank supports the financing of investments in the field of biomass, by providing long-term and low-interest loans for appropriate projects. Diese können jederzeit außerplanmäßig, auch in Teilbeträgen, ohne Kosten getilgt werden. These

impairments may be repaid at any time with no costs, even in installments. In addition to a loan, repayment grant with funds from the federal grants.

On the basis of the BMU guidelines to promote measures for the use of renewable energies in the heating market by December 5, 2007, KfW financed the heat and cooling production from biomass, the treatment of biogas to natural gas quality and heating networks, which will be fed from renewable energy sources.

(Source: BAFA: „Förderung von Biomasseverfeuerungsanlagen“ BAFA: "Promotion of biomass combustion plants"

[http://www.bafa.de/bafa/de/energie/erneuerbare\\_energien/biomasse/index.html](http://www.bafa.de/bafa/de/energie/erneuerbare_energien/biomasse/index.html))

### **Thuringian bioenergy program**

According to a survey by the Thuringian Ministry of Economy, Technology and Work (TMWTA), the technically feasible potential of biomass by 2015 in Thuringia is:

Byproducts / waste materials from industry and agriculture:	13.650 TJ
Plant biomass from agriculture:	21.200 TJ
Forest energy wood (no sawing remainder wood and brushwood):	3.500 TJ

**38.350 TJ  $\triangleq$  16 % of PEV.**

Of these, in 2004 only about **21,400 TJ  $\triangleq$  8,7 % of PEV** (primary energy) is used.

The target of the Thuringian bioenergy program is now, to coverage by 2010 about 10% and by 2020 about 15% of PEV on bioenergy. This assumes that the PEV at the level of 2002 remains.

To achieve this goal, the application areas and fields were identified based on the state of exploitation and the potential of biomass. Based on the proposed, the Thuringian bioenergy program proposes appropriate measures for implementation.

### **Application areas and fields for biomass**

An expansion of biomass use in Thuringia is possible by the production of heat, electricity and fuel, as well as the provision of raw materials.

#### *Heat*

1. Expansion of the wood chipping and pellet heating systems

2. Construction of wood-chip heating systems in individual buildings with high heat requirement
3. Construction of larger straw and wood chips heating systems as a base with district heating network or retrofitting of existing heating plants with biomass
4. Construction of pilot and demonstration projects for the use of straw in rural areas

#### *Stream*

1. Construction of cogeneration plants in the smaller area (<1.5 MW<sub>electric</sub>), (preferred ORC and Stirling technology with a consistent heating and cooling usage)
2. Increased usage of the EEG in the construction of cogeneration plants for forest residues, energy crops and straw
3. Biogas production on the basis of animal excrement and agricultural coenzymes (NAWARO), with intensive use of waste heat
4. Promotion and scientific monitoring of pilot and demonstration projects to Mono Fermentation of NAWARO in the wet and dry method
5. Energetic utilization of biogenic waste materials (sewage and landfill gas)

#### *Fuels*

1. Production and use of rapeseed oil and rapeseed oil methyl ester
2. Optimization of production and supply of grain ethanol
3. Provision of biogenic raw materials for the production of BTL fuels and process optimization of supply (from 2010 on)

#### *Supply of raw material*

1. Optimizing the supply of forest residues
2. Mobilization of raw material reserves in small private woods (strategy development)
3. Energy wood cultivation in landscapes which are characterized by agriculture

## **Measures to implement**

To accelerate the expand of use of bioenergy in the Federal State of Thuringia, the Thuringian bioenergy program proposes following measures:

### *Knowledge transfer and public relations*

The publicity and education lies to the Thuringian Center for Renewable Natural Resources (TZNR) of the Thuringian regional office for agriculture (TLL) in collaboration with the Thuringian Ministry for Agriculture, Nature and Environment (TMLNU) along with the business unit, the chambers and professional bodies of the Thuringian Farmers' Association (TBV) . In addition, the members of the advisory board of Renewable Natural Resources (FbNR) at TMLNU contribute to publicity in the economy over their delegating institutions.

### *Political and legal framework*

As part of its legislative and administrative opportunities as well as influence on the federal legislation, the Land of Thuringia stands up for the following changes to the biomass exploitation:

- Exploitation of scopes of action under § 35 BauGB in the admission of larger biogas plants.
- Simplification of licensing procedures after BImSchG (4. BImSchV) for plants with a thermal power less than 5 MW<sub>th</sub>.
- Equality of the burning straw with wood burning in the Federal Pollution Control Legislation for installations of less than 1 MW<sub>th</sub>.
- Retention of the Excise duty exemption for methyl esters of rapeseed oil and rapeseed oil from German production for the agriculture and forestry.
- Creation of a binding statement of all as a renewable resource measure classified biomass within the meaning of "NAWARO bonus" and host of ancillary products used for the processing of energy plants, such as pulp, rapeseed cakes and bran as well as sawmill wood substances as approved by NAWARO bonus under the amendment of the renewal EEG.

### *Promotion*

The existing funding instruments of the Free State, Federation and the EU should in principle be used. In future, through a special advisory (BIOBETH) will be a greater use of subsidies by the Federal Government and EU possible.

#### 1. Research:

- Greater involvement of the competences of universities and colleges in bioenergy research.

- The technology concept has to be extended more the NAWARO in the continuation and further development. The applied research on cultivation and primary processing is still carried out in Thuringia for bioenergy primarily externally funded through the TLL project "Oil, energy and industrial plants" as well as in the multi-country project "Production of ethanol from corn and feeding of solubles".
- NAWARO have to be integrated into innovation initiatives (eg. the STIFT initiated "biogas network" under the auspices of the University of Applied Sciences Nordhausen). Furthermore, the formation of the networks "Biogenic solid fuels" or "biofuels" with the fields of logistics, business contacts, international experience, knowledge, products and services and the development of clusters has to be accelerated. Funding support through the EU and the federal government have to be exploited.

2. Pilot and demonstration projects to reduce the financial risks involved in introducing new procedures with the following priorities:

- New techniques for heating and emission
- Energy from straw (bales and pellets) and cereals
- Small cogeneration power plants for the recovery of biomass concerning lignocellulose (CARBO-V, ORC, Stirling engines, gasification, etc.)
- Establishment of biomass farms
- Investment of short rotation plantations in conjunction with the agricultural space
- Testing and introduction of new harvest, salvage and transport technology for biomass
- Testing of cultivation systems for biogas production, including the logistics chains
- Optimization of biogas technology (measurement, control, etc.)
- Biogas production through wet and dry fermentation without manure
- Heat recovery options in the summer, including heat storage and cooling
- Distributed generation of bioethanol
- Investigation of sites for large biomass treatment facilities, (BTL, ethanol from lignocellulose)
- Models that participate forest owners as investors in biomass heating plants.

### 3. Investments:

In the field of electricity generation from biomass is a financial promotion only necessary by techniques that are just before the efficiency or that are for the development of a greater potential from agriculture and forestry. But in the case of heat generation and distribution, there is a considerable need for action.

The following application areas must be taken into account:

- Automatically loaded lightening (wood pellet and wood chips) in the private, commercial and municipal sectors (including agriculture):
  - 50 € / kW Installed heating power
  - 40 € / m Lfd heat network,
  - max. 20% of investment costs,
  - max. 2 MW<sub>th</sub>.
- Incineration plant for agricultural crop in agriculture and horticulture farms (or operated from farmers as shareholders with at least 50% shares):
  - 100 € / kW heating power,
  - 40 € / m Lfd heat network,
  - max. 3% of investment costs,
  - Subsidy of 80% of the cost of the licensing procedure for installations of 100 kW to 1 MW<sub>th</sub>,
  - 5 MW plant size.
- Biomass CHP and biogas plants with <500 kW of electric power will receive a grant for the establishment of heating network max. 50% of the investment, if the following parameters are met:
  - Minimum annual energy consumption of 500 MWh,
  - Heat density > 1.5 MW per year and network.
- Promotion of measures to improve and increase the efficiency of the resulting heat by power generation of biogas:
  - Gas or district heating pipes between biogas plants and consumers. Promotion of 49% of the investment,

- Long-term heat storage, absorption cooling systems promotion of 30% of the investment.
- Targeted promotion of decentralized esterification plants in agriculture coupled with existing decentralized oilseed processing plants, 35 to 40% investment.
- Promotion of pilot and demonstration projects with more than 1 MW of thermal power (or 100 kW of electric power for solid, liquid and gaseous fuels) up to 35% of the eligible investment costs. The program is with 3. cumulative.
- For the further development of wood potential has the expansion of funding to promote the marketing and processing of wood and to promote the use of wood for energy recovery to be aspirated.

All programs are linked to the use of natural biomass from agriculture and forestry (no waste). The programs have to be continually evaluated and adapted to the environment.



## **Brandenburg in Germany**

*(BIC Frankfurt (Oder))*

### **About the region**

Brandenburg is a federal state in north-eastern Germany. On an area of 29,478.61 km<sup>2</sup> live along 2,531,700 inhabitants (March 2008). The capital with 150,833 inhabitants (as of December 2007) the city with the largest population is Potsdam. With over 3,000 natural created lakes, numerous artificial ponds, lakes and other waters, and about 33,000 kilometers mostly artificial watercourses, Brandenburg is the federal state with the most lakes in Germany.

In the country there are 15 large protecting areas, including the Lower Oder Valley National Park (106 km<sup>2</sup>), the three Biosphere Reserves of UNESCO Spree Forest (474 km<sup>2</sup>), River Landscape Elbe-Brandenburg (533 km<sup>2</sup>) and Schorfheide-Chorin (1,291 km<sup>2</sup>) and 11 natural parks (in 2002). The large protection areas are around a third of the country's surface area with a total area of 9,987 km<sup>2</sup>.



The Spreewald southeast of Brandenburg is both a vast lowland area as well as a cultural landscape, which was decisively influenced by the Sorbs. In the vast flood plains and moorlands, the natural junction of the river Spree was significantly expanded by creating channels. Because of its biodiversity (around 18,000 species of flora and fauna), the Spreewald has regional importance for nature conservation and is protected since 1991 as a biosphere reserve by UNESCO.

The Oderbruch is an inland delta of the Oder, which is located in the county Maerkisch-Oderland of Brandenburg and in Poland. By straightening the Oder and the dyking and drainage of the wetland in the 18th century, approximately 32,500 hectares of fertile farmland were won.

### **Energy consumption and production**

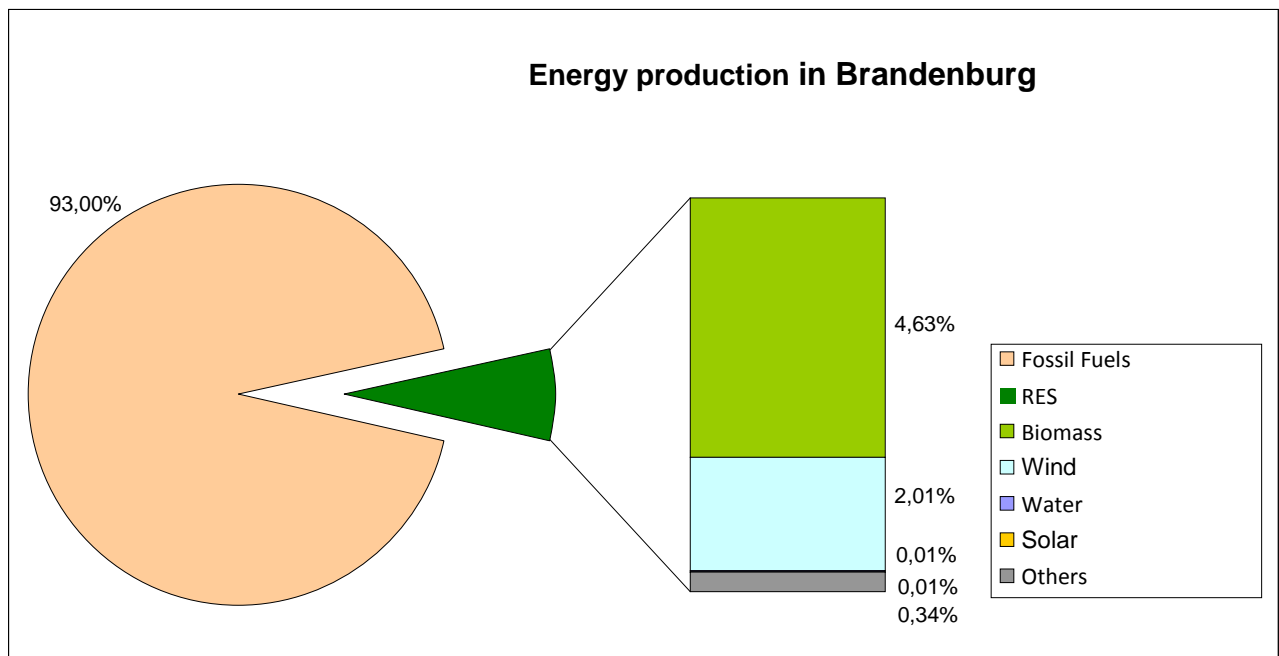
Brandenburg is the federal state in Germany in which the use of renewable energies is best developed. Currently about 7% of regional primary energy consumption can be covered in this way. Biomass provides a contribution of 25,600 TJ, wind 11,100, solar 60 TJ, hydropower 40 TJ and other energy sources such as landfill and

sewage gas, geothermal and heat pumps TJ 1900. In 2004, on the other hand, the share of renewable energies was only 3.94% of energy consumption. This represents an energy quantity of 11,740 TJ.

Approximately two thirds of renewable energy in Brandenburg will be used to generate electricity. Mainly hydropower, wind power, photovoltaics and a considerable proportion of biomass find use. 2003, the share of renewable energies in gross electricity is 9.4% and 28.7% on power consumption. 2005, 6.32% of the heat energy consumption are covered from renewable energy sources. The net electricity generation was in 2006 even 12.53%.

With the introduction of a higher buyback price for energy from biomass by the amended EEG from the year 2004, in Brandenburg - as everywhere in Germany - the installation of biogas applications increase significantly. The peak of this boom was reached 2006 until the beginning of 2007. In the second half of 2007, in the installations stagnated due to rising prices for agricultural raw materials.

The largest part of the in the biogas plants produced gas is burned in combined heat and power plants to generate electricity that feeds the local power grid. The waste heat which is produced in this process can be used only rarely. Due to the lack of rural structures and the missing industry, there are rarely opportunities to use the waste heat for heating. This has a negative impact on the economy and the energy balance of these plants.



### **Initiatives to promote the use of biomass**

The model region Barnim-Uckermark in Brandenburg is one of 18 regions in Germany, that are involved in the pilot and demonstration project "ACTIVE REGIONS - country shapes the future". Its main objectives are the strengthening of rural areas and creating additional sources of income as well as a natural and environmentally sound land management. This model will later serve as an example

for an integrated rural development and a functioning city-village linkage. The farmer is increasingly becoming an important energy supplier to offer both raw materials and energy, to maintain a closed circuit.

Furthermore, in the region Barnim-Uckermark a "biogas cluster" structure is established, in which companies develop intelligent strategies for efficient utilization and marketing of biogas, especially in the field of dry fermentation. The span of the project extends from biomass farm to technology transfer.

The Baltic Biomass Network (BBN) project explores the specific ways of mobilizing set-aside entitlements and the production of Refuse Derived Fuel (RDF, secondary fuel from waste), especially with the background of the future demand for biomass BtL production. BBN operates in the form of local planning groups, which involve the provincial authorities, building planning authorities, bioenergy investors and plant operators, biomass manufacturers and associated experts. Currently there are six groups active in planning BBN model regions. In the model region Brandenburg, the activists are included in a regional planning group. The leadership is in the responsibility of the Brandenburg Energy Technology Initiative (ETI).

In Brandenburg, there are numerous research institutes which are active in the field of biomass. The main representatives are the Leibniz Institute for Agricultural Technology Bornim ATB researches, the Centre for Energy Technologies Brandenburg CeBra of the University of Cottbus and the University of Applied Sciences Eberswalde.

## **Biomass Applications**

In the field of energy production from biomass, Brandenburg is one of the leading regions of Germany. The federal state is one of the largest forest owners. For the planting of biomass in the year 2005 91.111 hectares were used. This corresponds to a share of 8.8% of agricultural land. The apparent increase in contrast to previous years has been reached by using an energy plant subsidy and thanks to a considerable expansion of cultivated plant varieties. 16,887 hectares of biomass were cultivated on set-aside land and 74,224 hectares of arable land. The further development of bioenergy led to the increase of the acreage of energy plants from a total of 32,057 hectares to 59,579 hectares in 2005. So the state of Brandenburg got a leading role in Germany. 00-rapeseed and rye dominate in this planting area.

In September 2007, in Brandenburg were installed 80 biogas plants with a capacity of 55 MW. 14 of these installed plants have more than 1 MW capacity. More plants are under construction or in planning. By the end of the year 2010, more than 100 biogas plants should be installed. Currently, about 8% of in Germany from biogas derived electricity is produced in Brandenburg.

In 850 local heating systems with a capacity below 1 MW, forest wood is burned for energy production. 14 larger biomass heating plants with an average power of 20 MW burn waste from the wood processing. Overall, in Brandenburg annually more than one megaton energy is consumed.

Furthermore, in Brandenburg in the last 6 years more than 800 million Euro were invested in the bioenergy sector. With an annual production capacity of more than 250,000 tonnes of biodiesel, Brandenburg is one of Europe's leading production regions in this industry. Annually, 180,000 tonnes of bioethanol are produced.

## **Biomass resources**

Large forest reserves and efficient agricultural structures, as well as state and federal state funding for the development of bioenergy offer optimal conditions for strong growth in the field of biomass. The fast-growing market for bioenergy in Brandenburg altered the traditional agricultural and forestry production system. Farmers are offered a new market for products and forest biofuels. The increasing competition for resources becomes a key point in the planning of local investments.

In the year 2007, in Brandenburg on 200,000 hectares of arable land energy crops were cultivated. This represents 19% of the arable land in the federal state. This is the full physical potential for crops. A further growth can only be achieved by higher yields. To this end, short-rotation crops and fast-growing plantations with Canadian poplars, willows and Rubini were investigated. 2007, mainly rye and rape were cultivated. Maize, with an area of approximately 10,700 hectares, is of a lower priority. Approximately 10% of the energy crop is aside 19,700 hectares of land set.

Despite an intensive use of biomass, the federal state still have some reserves in the use of solid biomass. According to estimates, the Brandenburg biomass potential in terms of energy production is up to 130 PJ per annum. Currently, of which approximately 1.3 PJ, or 16% are exhausted.

## **Supplier of biomass products and services**

As previously mentioned, Brandenburg plays a leading role under all federal state in the use of biomass for energy production. Accordingly good expanded are the commercial biomass structures in the region. There are many companies that distribute the right technology and offer their services.

For biomass raw materials exist in Brandenburg no specific outlets. Manure and manure biogas operators relate mainly from their own livestock. Even cereals, corn and energy crops are mostly grown on their own fields. Some plant owners have contracts with farmers from the region and buy raw materials.

The global trade of biomass is coordinated in Germany on the Stock Exchange BIOMATRA<sup>®</sup>. It is an electronic trading platform, where both individuals and companies, for example, solid biomass, biofuels or biogas can buy and sell. For logs, wood briquettes, wood chips and pellets are other smaller outlets additionally to BIOMATRA<sup>®</sup>. Some of them are directly specialized to biomass products, others sell it as a sideline. Logs and wood chips can also be purchased by sawmills.

## **Plans for the future use of biomass**

The energy policy framework of the State of Brandenburg until 2010 is defined by the government in the so-called energy strategy 2010. The Energy Strategy 2010 is the basis for the use of biomass for the production of electrical energy. In this context, actions will be taken to both future-oriented jobs to create and maintain, as well as through the securing of resources and efficient energy production and energy use contribute to climate protection. Thus, the proportion of renewable energy in Brandenburg should be increased of 21.3 PJ (2004) to approximately 35 PJ in 2010. This represents an annual increase of 18%. Within 15 years, thus would use twelve times of renewable energy. A great potential offers the use of biomass. It aims by 2010 accounted for approximately 5% of the total primary energy consumption of Brandenburg.

The Energy Strategy 2010 defines the tasks on the basis of extensive analysis and forecast for the agriculture and forestry and identifies development trends for the use of biological energy. Particular development trends will be the use of biogas for generating electricity and heat, the cultivation and processing of energy crops for producing biofuels and the use of solid biomass in combined heat and power plants for electricity and heating production.

### Comparative overview of the data of the partner regions

	Burgos	Tampere	Pomurje	Hungary	Nordthuringen	Brandenburg
Population	352 273	469 000	123 280	10 198 315	92 899	2 567 220
Area km <sup>2</sup>	14 300	14 658	1 337	93 030	710,91	29 476
Energy usage	12,53/ 12.531GWh	23,2 / 23 155GWh	1.535 GWh	n.a.	n.a.	16,246 TWh
Proportion of biomass	n.a.	4366 GWh	603,9 GWh	44 PJ/year	n.a.	5,4 %
Proportion of RES	5,4%	n.a.	666,6 GWh	n.a.	n.a.	9,3 %
Forest biomass potential GWh/m <sup>3</sup>	954 /annually	1 091, 524 /552 278	308 / 123 200	4 000 000-4 500 000 m <sup>3</sup> /year	480.000 m <sup>3</sup> / annually	970.000 m <sup>2</sup> /annually
Forest biomass usage GWh/ m <sup>3</sup>	n.a.	1 973 GWh	603,9 GWh / 241.547 m <sup>3</sup>	n.a.	n.a.	n.a.
Agricultural biomass potential	2524,7	n.a.	254,3 ha	14-18 Mt/year/16 0-190 PJ	n.a.	n.a.
Agricultural biomass usage	n.a.	2,7 GWh 150 ha	48,8 GWh *	n.a.	n.a.	382,9 MW el. 4.554,9 GWh
Agricultural waste potential GWh	2531 /annually	600	61,8	75 – 80 PJ	n.a.	n.a.
Agricultural waste usage	n.a.	350 GWh	n.a.	n.a.	n.a.	102,7 MW th 596,6 GWh

**Impressions from working on BIOBUSINESS topic in Project Partner Meetings and increasing European experience and additional value**



Project Management Meetings:



Technical visits:



European experience and added value:



## Business opportunities in biomass sector for SMEs

Presentations and events:



Workshops and Biobusiness Forums:



