4biomass

Transnational Action Plan for Central Europe

Recommendations for policy makers and implementing authorities towards sustainable bioenergy development by a joint and consistent policy approach

CENTRAL EUROPE
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Introduction

Today's fossil-based economy is no longer sustainable. It is clear that this model threatens climate stability and consequently the health and prosperity of future generations. Hence, a global "Great Transformation" aiming at climate and energy compatibility is necessary, and therefore structural changes are required immediately (WBGU 2011). Additionally, fossil fuel costs continue to rise and prices are highly volatile.

Citizens across several societies have realised the urgency of phasing out fossil fuels by de-carbonising human activities. The nuclear incident in Fukushima revealed a disastrous inability to cope with the enormous damages that threaten the population. Because this event occurred in a highly industrialised country, politicians, environmental actors and the media in several countries have begun to rethink and discuss the risks and threats of nuclear power. Thus, renewable energy production sources have a more realistic chance of implementation as an effective option to produce and use clean energy, while harmful and risky energy sources are phased out. Worldwide cooperation for the "Great Transformation" is needed to tackle climate change now and achieve the 2degree Celsius climate protection goal that was agreed upon at the 2010 Cancun Summit.

Many countries, particularly those in Europe, are striving for a resource efficient and low carbon economy. "Greening the economy", "green growth" of gross domestic product, and new welfare indicators that measure the state of societies extensively and not just its economic performance, are common phrases in statements and documents. "Sustainability", meaning to ensure an environmentally-friendly, economically sound, and socially responsible approach to all activities in all dimensions of society, is a common motto in theoretical and practical political guidance papers. The European Union commits that "the overriding objectives of European energy policy have to be sustainability, competitiveness, and security of supply, necessitating a coherent and consistent set of policies and measures to achieve them" (EU COM 2011). Thus, there is strong support for projects aiming to promote the sustainable use of renewable resources in the EU Member States.

The 4Biomass project, which is financed by the EU INTERREG IVB Programme for Central Europe and the European Regional Development Fund, was developed with the vision to promote an integrated, sustainable and efficient bioenergy policy in Central Europe (CE). The objective is to support the efforts of the CE countries to implement bioenergy policies that follow specifications of their National Renewable Energy Action Plans. Project partners from Austria (AT), the Czech Republic (CZ), Germany (DE), Hungary (HU), Italy (IT), Poland (PL), and Slovenia (SI) established comprehensive studies on political framework, available domestic biomass potential, and trade within the countries and beyond. The findings were subsumed in synthesis reports.

The "Stakeholder Dialogue", a survey among bioenergy actors, resulted in a clear vote for local and regional use of biomass that is preferably for heating. This utilisation path lowers greenhouse gas emissions, reduces energy costs, and provides long-term job opportunities.

The data base of demo projects and the "Joint Management Tool" facilitate planning and implementation of new bioenergy projects all over Central Europe. Furthermore, several Central European Bioenergy Centres (CEBC) were nominated during the Transnational Forum conference in April 2011 in Warsaw. These centres disseminate information on bioenergy issues, and they facilitate a regional, national and international network that connects actors and actor groups that seek advice (www.4biomass.eu/).

Lessons learnt from the 4Biomass Project

Project partner country studies reveal that the Central European Region possesses a considerable amount of biomass resources. This potential is already at present available as a regional resource delivering energy at lower investment costs compared to wind, solar and geothermal energy. In most partner countries, biomass is currently the largest expandable and most widely used renewable energy source. However, installation of off-shore wind power plants will rapidly increase, the construction of such plants was already started in Germany[1] and is planned in Italy and Poland. They are expected to deliver high amounts of electricity in the near future. Hence, biomass can be used in de-centralised small- and medium-scale heating and cooling or co-generation systems. This has great potential in rural areas where resources are readily available in the surrounding area.

1 Presently 118 MW being in operation, 400 MW in construction, 8.435 MW approved.

The perception of bioenergy as an easily available renewable energy source that can quickly replace fossil fuels is not equally developed among actors in partner countries, thus the role of biomass in the energy mix varies. To spread information on sound and sustainable solutions to support the increase of biomass production and deployment in the region, the responsible Committee has nominated the first Central European Bioenergy Centres (CEBCs). These Centres are tasked with disseminating bioenergy concepts and best practice examples to politicians and stakeholders, providing training courses for investors and plant operators, and enhancing consumer acceptance.

Promoting biomass to accelerate the transition process

Legal and financial promotional instruments exist in all 4Biomass countries in different combinations and numbers (feed-in tariffs, quotas, green and white certificates, priority access to grids, fiscal incentives, financial support programmes), but their effectiveness differs. All Partner Countries announced in their National Renewable Energy Action Plans (NREAPs) that they can achieve the EU 2020 targets relying on their own resources. Some countries expect to go beyond their national targets.

Clearly, countries that are still striving to make their transition process as economically and socially compatible as possible will proceed at a slower pace than countries that have a relatively long tradition of energy source diversification. Regardless, the transition phase should be as short as possible to reduce environmentally harmful emissions. Furthermore, coal prices are expected to increase and biomass will become competitive as an equally reliable domestic resource in the near future.

Stakeholders advocate for biomass as a primary heating source

The stakeholder dialogue distributed a questionnaire to participants from industry, companies, biomass organisations, government and political entities, service/consulting groups, the science/research sector, and environmental/social NGOs in all partner countries. The resulting 1.221 responses provided an important indication of what these stakeholders see as the most urgent fields of action. A significant majority advocates for stronger support for solid biomass usage for heat. There is high public acceptance, as 69 per cent of stakeholders see biomass for heat as most favourable usage type. 60 per cent argue that bioenergy heat will need more support for market introduction. In addition, energy users want financial support for bioenergy heating systems. This implies that consumers are ready to buy biomass boilers and stoves if they are provided support.

The questioned stakeholders give biomass district heating the highest ranking for achieving the EU 2020 targets. Small-scale biomass heating and biomass cogeneration are ranked second. Stakeholders view biogas significantly less important, second generation transport fuels and electricity have rather low acceptance, and first generation transport fuels are negatively perceived.

Survey respondents advocated for sustainability standards for solid bioenergy resources and certification schemes to verify standards, similar to the procedure already mandatory for liquid biofuels in EU Member States (www.4biomass.eu/publications/).

The market for refined biomass is rapidly increasing in CE and beyond

Trade studies conducted in the 4Biomass partner countries showed that there is significant biomass trading within Central Europe and its neighbouring states. Imports and exports of biomass within Central Europe are steadily increasing, both in the internal market and in trade to Scandinavian and Baltic countries, to the Ukraine, Russia, Italy and Switzerland. Transnationally traded biomass goods are primarily refined biomass products such as wood pellets, wood briquettes, wood chips, and biofuels for transport, which are predominantly biodiesel. The trade of bioethanol is relatively new. Imports of such goods to Central European countries on an international or global scale are currently very small, but are predicted to greatly increase in the near future.

In their National Renewable Energy Action Plans (NREAPs) all CE countries announced to increase their present bio-

mass usage. However, some partner countries appear to export biomass goods to a considerable extent instead of support the development of the domestic market. For example, the Czech Republic exports refined products and raw material, mainly to Germany and Austria, the domestic market not being developed so far. Also Poland exports a much greater amount of biomass products than is being traded within the country presently.

Increasing biomass transports cause negative environmental impacts that include greenhouse gases (GHG) and noise emissions. In CE region and neighbouring countries biomass freights are at present mainly transported by trucks, a rather short amount by railway. Aside from increasing GHG emissions, this creates considerable road damages and noise pollution. Thus, railways and waterways should be used for medium and long distance transports wherever conditions allow. The EU Commission suggests establishing a European mobility network, a "Single European Transport Area" that is aimed at reducing GHG emissions by at least 60 per cent by 2050 compared to 1990 (EU COM(2011)144 final White Paper). In addition, the EU Commission mandates the fast development of improved international transport and logistics systems (all trade studies under http://www.4biomass.eu/en/publications).

Coordination of policies by cooperation of political actors in CE

These challenges require conscious and responsible political decisions. To ensure a consistent and coherent policy design for bioenergy development in Central Europe, regular and reliable communication and cooperation among policy makers is necessary. Several countries have already taken preliminary steps for cross-border coordination. For example, there are bilateral and trilateral agreements (Czech Republic and Germany, Austria and Slovakia, Hungary and Slovakia, Germany, Poland and the Czech Republic). Transnational cooperation like the Visegrád connection (Czech Republic, Hungary, Poland, Slovakia) for pellets marketing exists as well. The EU Commission has initiated the Danube Strategy in 2009 with the goal of connecting trade routes in the Danube Region (Germany, Austria, Slovakia, Czech Republic, Hungary, Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Bulgaria, Republic of Moldova, Ukraine and Romania) and facilitating the establishment of a common market in the countries situated in the Danube basin. This seeks to establish transnational cooperation and a continuous policy dialogue.

Transnational Action Plan – Recommendations for Integrated Bioenergy Policy

Based on the results of the project, the 4Biomass partners support bioenergy development and deployment in the CE region as a complementary renewable source to wind, solar and hydro power. Sustainability should be guaranteed for the whole life cycle to avoid negative impacts for nature protection and biodiversity.

The Transnational Action Plan (TAP) gives suggestions to address the most important and urgent activities for reconstruction of national energy systems. These suggestions build towards an independent, reliable, socially and environmentally responsible energy supply in Central European countries, and try to avoid or at least reduce greenhouse gas emissions. The recommendations are based on the individual proposals of the 4Biomass Partners [2]. These proposals advocate for immediate bioenergy policy action in their countries and are based on project results that include country studies, trade studies and the stakeholder dialogue, individual research and experience, and numerous discussions among the project partners at the meetings.

The TAP addresses policy makers who develop programmes and strategies for sustainable and efficient biomass/bioenergy politics in Central Europe. Because the 4Biomass partner countries are very different in size, geographic conditions, number of inhabitants, economic conditions, natural resources etc., not all recommendations will be suitable or even necessary for all countries. Thus, policy makers choose the suggestions that are appropriate and helpful for their country's specific conditions and needs, and design individual road maps that are most favourable for a competitive, sustainable and secure energy supply.

2 See Documentation of individual 4Biomass Partner's proposals in chapter 4: Annex, pages 18–36.

1 General recommendations

1.1 All Renewable Energy Sources

Ambitiously convert the national energy system from fossil fuels to available domestic renewable sources ensuring that they are socially acceptable – step by step

Climate change and loss of biodiversity are among the central environmental problems in the 21. century (i.a. WBGU 2010). Thus, hard coal, lignite, oil and nuclear utilisation should be phased out. Evaluation of the different energy production and utilisation paths on the basis of greenhouse gas emission balances is indispensable. Climate-relevant emissions caused by diverse cultivation processes and possible land use changes must be incorporated into an environmental energy balance.

Strive to achieve a new energy mix that reduces fossil and nuclear fuels as much as possible. Promote the enhancement of biomass production for energy, and trade and utilise it in a sustainable way, i.e. without endangering food/fodder production and material use

All 4Biomass Countries have a good or even tremendous biomass potential. Particularly Hungary, Poland, the Czech Republic and Italy possess great biomass resources but have used only a limited amount to date. Both Poland and Hungary possess great agricultural areas not needed for food production or material use where energy plants and short rotation coppice could be grown. These could replace or at least reduce coal utilisation in Poland and gas usage in Hungary. The Czech Republic exports considerable amounts of pellets and wood chips, which go mainly to Austria and Germany, but the domestic market is not developed yet. Incentives for market introduction for these products like e.g. support for investments in stoves and boilers should be introduced.

Adjust instruments and measures for promotion of renewable energy to nature protection and biodiversity strategies. All laws and financial incentives should be in accordance with sustainability and biodiversity strategies in each country to prevent further habitats and species losses

Harmonise all laws and ordinances with involved ministries and authorities to avoid unclear and inconsistent legislation and promotion, regularly amend them in defined time intervals on the basis of periodical monitoring. Clearly define and relate legal acts, adjust the often numerous and confusing prescriptions

All 4Biomass countries have enacted National Sustainability Strategies and Biodiversity Strategies to protect biodiversity areas. See the Joint Declaration of EU Environment Ministers on the New EU Biodiversity Strategy. Brussels 03.05.2011[3].

Secure planning reliability and the right of continuance of support measures for an acknowledged time, sudden changes undermine investors' confidence

Support for investments should be granted over a defined period with claim of the right of continuance, frequent changes in preconditions will prevent investments in new technology.

3 Environment ministers from the following 4Biomass countries have signed the declaration: Austria, Germany, Hungary, Italy, Slovenia.

Extend and adapt statistic systems to the changed conditions in the energy market with respect to bioenergy. Collect appropriate data on all stages of the value chain to support bioenergy development

Without appropriate data, the path of development is hardly detectable. The statistical systems of the Member States have not been adjusted to the requirements of the changed energy developments.

Develop extensive land use concepts for multi-functional biomass use, e.g. sustainable agro-forestry systems like e.g. short rotation coppice (SRC) and thereby combine food production, drinking water recovery, husbandry, bioenergy production, nature protection and public recreation in one region

Multi-use concepts seek to find integrative solutions for regional or local spatial planning. The objective is to develop a certain area regarding the cultural landscape, agricultural production (food and fodder, energy plants, short rotation coppice), and the utilisation in facilities embedded in this landscape sensitively. Furthermore, transport routes for delivery of raw material to production facilities, and also from the facilities to the markets should not harass inhabitants living in this region. Protected land should be preserved to not constrain nature and biodiversity.

Initiate integrated spatial planning and energy planning, coordinate them on all administrative levels

Organising national/federal tables e.g. in Germany and national/voivodship tables in Poland, which decide on regional land use planning will enable to find sound solutions i.a. for energy plants locations and necessary transport route configurations. This will avoid or at least minimise pressure on settlements. Deliberate allocation of bioenergy facilities, scaled according to local/regional demand and sited well, will keep value added in the region and secure or create jobs. Furthermore nature and biodiversity rich areas should be saved to conserve habitats and serve as recreational areas(4.6 Recommendations from Poland part F, page 33).

Give subsidies only to environmentally sound proposals with high GHG emission reduction potential and significant energy efficiency and energy conservation rates

Incentives should be given to investments with respect to energy efficiency criteria.

2 Sectoral recommendations

2.1 Biomass Production from Forestry and Agriculture, Biogenic Waste

Encourage legally binding sustainability requirements to include solid and gaseous biomass for the whole supply chain and secure their certification

Since 1 January 2011, the RED2009/28/EC demands the introduction of sustainability standards and certification schemes for biofuels and bioliquids in all Member States. Germany and Austria have already incorporated these EU requirements into their respective national laws. Several national and international certification schemes for compliance are recognised already and in use within and beyond Europe. Only a very low amount of biofuels is imported to EU from overseas countries. All imports have to be certified.

Introduce incentives for environmentally sound cropping systems

Encourage trinomial crop rotation, perennial plants, catch crops, mixed cropping, and two-culture systems, as well as sparse deployment of fertilisers, herbicides and pesticides to reduce soil and water pollution risks.

Abandon conversion of permanent grassland

Strengthening synergies between biomass production and nature protection is indispensable for sustainable production and utilisation of natural resources. Conversion of grass land sets GHG emissions free and should be avoided entirely.

No biomass production on land with high carbon stock, such as primary forests, wetlands, peat land and nature protected areas

Harvesting should be allowed if it complies with sustainability. Direct and indirect land use change should be prevented to not endanger GHG emission reduction (RED2009 17,3).

Increase cultivation of energy plants and short rotation coppice plantations with regard to landscape. This can prevent air, climate and drinking water pollution and soil deterioration

Energy plants such as rapeseed, maize, and sugar beets and also short rotation coppice like poplar, willow, acacia and miscanthus are currently grown in most 4Biomass countries, but awareness for the benefits on stakeholders' and public side is still very low, e.g. in Czech Republic (4.2 Recommendations from Czech Republic, p. 22).

Expansion of energy plant cropping should be accompanied by suitable public relation measures. Energy crops need to be incorporated into the cropping systems to avoid negative side effects.

Promote breeding of new, site-adapted plants for energy use

Biomass raw material should preferably be collected within the region, biomass facilities should be scaled according to local/regional demand (mostly small and medium size). Adapted breeds of plants use the natural resources in an optimal way to reduce competition with food and industrial crops.

Prefer biogenic waste for energy production, use biomass residues from food and fodder production and material use

"Cascading use" of biomass should be stipulated legally, this means food and fodder production should have priority, followed by material use and energetic use.

Mobilise unused and redundant wood and agricultural potential as raw material

Use forest residues (thinnings, dead wood, storm losses), agriculture residues (straw, husks, shells) and cuttings from parks and sports facilities in municipalities, roadside cuttings etc.

Landscape management has high potential for usage even though it is mostly unused in all 4Biomass countries. This is due to lack of technical and organisational coordination as well as an unawareness of this potential [4].

Mobilise new biomass resources, e.g. planting energy crops on degraded land (contaminated by former industrial or military impacts) and set-aside land, for energy plantations

Document these degraded areas in cadastres – they should be compiled in all 4Biomass countries

Degraded land like brownfields can be improved by growing energy plants and short rotation coppice like poplar, willow, miscanthus, and acacia. Certainly, these sorts need favourable conditions like sufficient water resources. Competition with food and fodder production or material use will not occur.

Bioenergy production plants should be properly sited and scaled to avoid unfavourable impacts on citizens and to minimise GHG emissions

For example, biogas plants sited in direct neighbourhood of towns or villages may cause disturbances like odour nuisances (stored biomass, residues, waste, also fertilisers deployed on surrounding fields). Increased truck traffic delivering substrates may release CO_2 emissions and cause noise disturbances.

2.2 Biomass for Heating and Cooling

Biomass is a limited resource that should be used as efficiently and economically as possible. National, regional and local governments should stimulate the heat and cold production from locally available biomass, if possible in cogeneration with electricity based on biomass supplies from areas within a radius not exceeding a stipulated number of kilometres. This can be an alternative to promoting large scale electricity production which requires supplies from remote areas

Local and regional heat and cold use will grant the most cost efficient and sustainable (i.e. GHG saving) deployment. The same amount of wood fuel used for heating contributes three times as much to EU RES targets than used for electricity production due to conversion losses, if the surplus heat is wasted (5.1 Recommendations from Austria, conclusion, p. 20).

In Poland, a significant demand for space heating in rural areas is still met by most farmers by burning coal (mostly low grade coal), often in low efficiency boilers. As coal becomes increasingly expensive while local available biomass is sold to power companies, people turn to burn plastics, old tyres and other highly polluting materials as an alternative (5.6 Recommendations from Poland part E., p. 32). Most 4Biomass countries need to create financial support for modern, efficient biomass boilers for individual farmers and house owners.

4 In many rural regions, like e.g. the Altmark in Germany, one of 25 model regions awarded in a nation-wide competition for the best strategies to become a bioenergy region, financial support is given by the Ministry of Agriculture to develop management plans for to date unused waste material, i.a. residues from landscape or urban parks management (see Identification of Need for Demo Projects in Germany – with special regard to the Bioenergy Region Altmark 2011).

Give heat production the same support as electricity generation. Support should be given to energy production from biomass on the basis of net GHG emission reductions. Introduce feed-in tariffs or green certificates for heat

In all 4Biomass countries there are either low or no subsidies for heat in place. There are feed-in tariffs in all 4Biomass countries except Poland. This instrument is seen as strong and effective, but it currently only addresses the electricity sector. There should be similar support for heat production.

Continuously promote energy efficient bioenergy technologies and require fast socially acceptable and economically viable deployment

Introduce incentives for consumers to replace inefficient technology

Household bioenergy production installations and appliances are usually rather expensive. This includes calorific value boilers and pellet boilers. Thus, these solutions are often not affordable without considerable incentives for individual house owners and residential building cooperatives. However, acceleration of technological innovation and fostering front-runner projects through incentives not only advances ecological modernisation but it also increases economic growth.

Use existing district heating grids for transport of bioheat (and cooling) within local and regional areas

Accelerate construction of new heating and cooling systems in the context of integrated urban planning

In most Central European countries district heating grids are available in many areas, though they have to be modernised to prevent losses. The installation of a biomass boiler in an existing district heating system allows the fuel switch for many households with relative little investment.

Withdraw support for co-firing biomass with fossil fuels

Co-firing of biomass with coal for power generation should be limited to a transition period, and the use of public money for subsidising this practice should be terminated as soon as possible with the aim to achieve singular biomass deployment as fast as possible.

2.3 Biomass for Electricity

Use biomass for electricity production preferably in cogeneration with heat use

Production of electricity without using the waste heat causes losses of 70 % of the primary energy (AEBIOM 2010).

Wind power, biogas, hydropower and photovoltaic should primarily be used to produce electricity.

There should be no support for biomass combustion to produce electricity in big plants because biomass has low energy density and low energy content, and the raw material has to be transported over long distances (4.1 Recommendations from Austria, p. 20).

Use the surplus of produced heat in other industrial processes to save energy and resources

Industrial symbiosis, where large industries use each others' waste or by-products, leads to lower consumption of resources, less environmental damage, and better economic results.

Wood pellets and briquettes should be primarily deployed as fuel in small- and medium-scale units because of their relatively high energy density and favourable storage and transport conditions

For example, Germany's present pellets production capacity of 2.7 million tonnes per year is by far not utilised. The annual production stagnates at 1.7 million tonnes and it exports a certain amount.

Pellets and briquettes are also convenient for space heating in the residential sector but they are still expensive. Their production uses 20 per cent of the processed energy. The most efficient and sustainable use of biomass for heating in small- and medium-sized units is to use it in its primary form.

Abolish financial support for electricity production from forest wood

Only wood not usable for material use, i.e. residues, waste wood from wood processing and from landscape management should be promoted by financial means.

2.4 Biomass for Transport Fuels

Use agricultural plants like rapeseed for biodiesel, and maize, wheat and beets for bioethanol (so-called first generation fuels) for the production of transport fuels only in amounts which do not cause competition with food and fodder production

Presently, EU sustainability criteria for biofuels and bioliquids have to be incorporated into national law by all Member States (RED2009, Art. 17, 1–6).

Verification by international certification schemes for transport fuels from biomass has to be established throughout EU (RED2009, 18, 1–3).

On 19 July 2011, the European Commission formally recognised seven voluntary schemes that certify the sustainability of biofuels under the Renewable Energy Directive. These schemes apply directly across all 27 EU Member States, the recognition being valid for five years: ISCC (German national and international certification system), Bonsucro (mainly biofuels from sugar cane in Brazil), RTRS EU RED (biofuel from soy, Argentine and Brazil), RSB EU RED (for all sorts of biofuels), 2BSvs (system of French industry for all sorts of biofuels), RSBA (system for supply chain of enterprise Albengoa), Greenernergy (system of enterprise Greenenergy for ethanol from sugar cane) (http://ec.europa.eu/energy/renewables/biofuels/sustainability_schemes_en.htm).

Assess the póssible advantages for development of Biomass-to-Liquid Biofuels (BtL, second generation fuels) for your country

Biofuels made from wood and agriculture residues or from other ligno-cellulosic material are expected to be more efficient. They are presently only in their initial development phase.

Assess the póssible advantages for the development of Waste-to-Liquid Biofuels (WtL, third generation fuels)

Wastes of different biological origin are converted into gases that are subsequently processed into methanol which in the future may be put to use as a fuel for modern electric cars equipped with fuel cells.

They are supposed to be even more promising than other biofuels for transport because CO_2 emissions are four times lower compared e.g. to bioethanol.

Because GHG emission reductions achieved through the use of biofuels for transport are rather modest, other solutions should be considered and their development accelerated to achieve the EU 2020 target of 10 per cent RES share in transport

Development of transport fuels like e-mobility from wind, biogas/biomethane, energy from fuel cells and hydrogen will save natural resources and provide higher efficiency, hence new developments should be promoted.

2.5 Special Case Biogas – for Heating and Cooling, Electricity and Transport Fuels

Mobilise primarily residues and wastes for biogas production

Agricultural residues like straw, husks, shells, animal manure, sludge and other organic wastes should be prioritised and a closed production and generation cycle encouraged. This means that agricultural substrate should be generated in biogas facilities according to the "cradle-to-cradle" procedure and the agricultural by-products should be used as fertilisers for new agricultural production.

Material flows should be canalised by communal and regional actors, land-filling and incineration should be reduced or even avoided, cascading utilisation enables holistic exploitation

First use grass cuttings e.g. for litter in husbandry and reuse it afterwards as substrate in biogas production plants.

Be aware of promoting biogas production from annual agricultural crops

This may lead to overproduction of a certain sort of crops and hence displace other sorts essential for food production. Environmental impacts should be addressed and monitoring systems introduced.

Consider possible negative impacts of biogas plants on the surrounding area and near-by settlements in integrated spatial planning

Ideally, plants should be embedded inconspicuously into the landscape, with sound transport routes not harassing inhabitants of near-by villages and towns.

Incorporate sustainability requirements into permit and authorisation procedures for construction of biogas plants issued by local or regional authorities

EU Environmental Cross Compliance and Good Agricultural Practice should be enforced and improved. Land with rich biodiversity or carbon rich conversion areas and wetlands should not be allowed for biogas production and end use efficiency should be granted.

Support electricity from biogas primarily in combination with heat

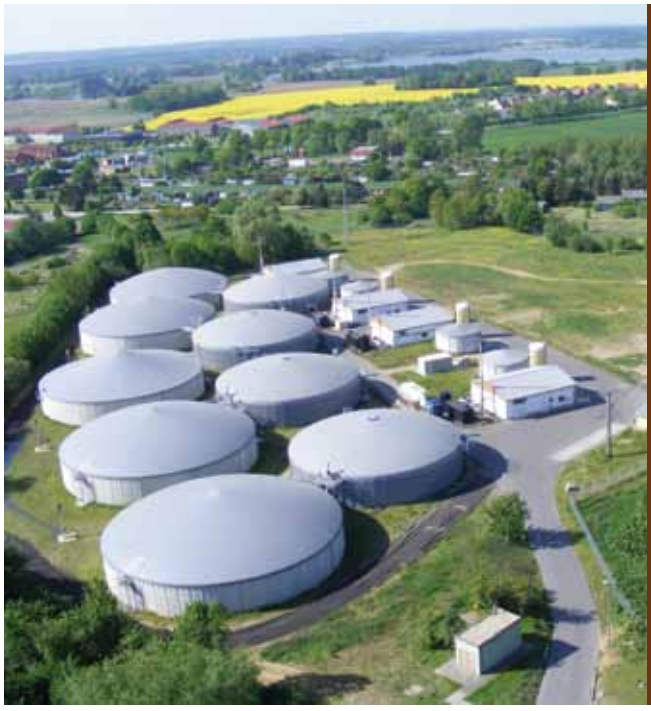
The produced heat can be fed into district heating grids that exist in most CE countries to a considerable extent and the electricity should be integrated into the power network.

Promote upgrading biogas to biomethane and regulate its legal integration into the natural gas grid

Biomethane and biogas allow multi-use: they can be deployed for heating and cooling, electricity and transport fuels.

Use biomethane as storage and as energy reserve for fluctuating renewable energy from wind and solar installations

Biomethane can balance volatile energy supply: Virtual power plants provide reserve energy whenever wind and/or solar energy are not available in sufficient amounts. If the production follows peak power demand, it is possible to increase and decrease it flexibly.



2.6 Transport of Biomass

Optimise biomass logistics to reduce CO_2 emissions

Market activities should not increase the emissions further. A steadily increasing road transport of biomass causes rising emissions.

It would be most favourable to develop a mathematic model for tailor-made solutions for each country and its individual potentials, conditions and needs, granting the most sustainable and efficient use of biomass fractions and providing analytical guidance for politics (see 4.6 Recommendations from Poland, p. 33).

Deploy biomass as far as possible on de-centralised plants which can be provided with input material from the surrounding area

Thus, first satisfy the local needs, particularly for heating purposes in rural areas, and trade only the surplus

Installations requiring large amounts of biomass raw material must be supplied from distant areas by long distance transports causing emissions as well as damages on vehicles and roads. However, the definitely growing biomass market should not endanger the environment (4.6 Recommendations from Poland, part D, p. 32).

If medium and long distance biomass transports cannot be avoided, concentrate on railway networks and waterway transport

3 Overcoming Existing Barriers

Clearly define the domestic biomass/RES potential in all partner countries. Regularly updated inventories on bioenergy potential are needed for all EU Member States

Inquiries on the theoretical, technical and environmentally compatible potential are numerous. However, methodological approaches, assumptions and constraints of these assessments differ from study to study. Reliable and robust statistical data is lacking so far.

Facilitate investments by adjusting (and possibly reducing) unrelated or obsolete legal and technical regulations

These exist more or less in all 4Biomass countries. For example, in Italy over 100 national regulations are in place, not including regional provisions (4.5 Recommendations from Italy, p. 30).

Support investments where it is reasonable and responsible to reduce long return costs

Return on investment takes usually 10 to 25 years for new bioenergy/RES technology, inall 4Biomass countries.

Monitor the effects of subsidies for products and technologies to avoid undesirable developments and adjust support instruments

Overreaching support may lead to unilateral increase of some goods to the disadvantage of others and thus endanger sound and well-balanced production and trade.

Phase out subsidies for fossil fuels and nuclear power because they are a large obstacle to fast biomass/RES production and use

For example, in Germany and Poland there are still subsidies for coal, in Hungary there are subsidies for gas (for the latter see 4.4 Recommendations from Hungary p. 26).

Reduce lead times for licence procedures for investing in bioenergy production by lowering bureaucratic hurdles

Permission granting is split among several authorities in most 4Biomass countries, authorities should be streamlined to reduce lead times to the shortest duration possible (one-stop agency).

Gradually reduce co-firing of coal with biomass with the aim to phase out coal entirely

All partner countries to differing extents (except Italy) still practice co-firing coal with biomass.This practice uses mostly out-dated technology and has usually poor efficiency (only around 33 percent). It hinders accelerated deployment of bioenergy.

Abandon plans for construction of new coal and nuclear plants because their construction will require considerable financial costs that are not available for an increase of bioenergy/RES

Poland is planning both coal and nuclear energy facilities. The Czech Republic and Slovakia plan to extend existing nuclear plants. Germany will build several new coal plants and they will phase out nuclear energy. Slovenia is constructing a 600 MW coal plant for domestic lignite use (4.7 Recommendations from Slovenia, p. 35).

4 Flanking Measures

Make policy planning transparent, consult stakeholders, inform the public early enough, and establish an open dialogue on aims and developments

Information dissemination and raising awareness before introduction of legal regulation are essential for public acceptance. Local authorities and investors should inform the affected inhabitants about possible impacts and benefits of planned bioenergy facilities.

Involvement of local population in renewal processes concerning modernisation of technology or utilisation of new energy sources is not an established procedure in all partner countries. Thus, for example in Italy and Poland the benefits of using biomass as a source of energy have not found much public attention so far[5].

Support research and development of innovative bioenergy technologies

The project financing bodies should coordinate their activities. Political and other supporting bodies should ensure that technical innovations are not promoted by several financers supporting different development teams.

Introduce and support specialised curricula in universities for research on and teaching of bioenergy development and deployment

In Italy, Germany, Poland and Slovenia some universities and universities of applied sciences offer courses on bioenergy issues.

Establish and support agencies and institutes for dissemination of information and knowledge on bioenergy issues

In most Partner Countries a lack of information and knowledge concerning the advantages of a fast development of bioenergy is evident. The economic, social and environmental benefits of new bioenergy technologies should be spread among stakeholders, researchers and the public. The recently created Central European Bioenergy Centres (CEBCs) whose numbers will hopefully increase quickly, are scheduled to submit comprehensive information (www.4biomass.eu/cebs).

Support market introduction of innovative technologies to place innovative products on the market

Incentives should be designed well, granted for a defined time, and reduced or deleted when customers have accepted the product.

Create incentives or require obligations for biomass/RES in newly constructed public buildings as show cases for the public

Ensure public buildings set an example by installing renewable heat systems and energy efficient insulation and equipment. Germany recently introduced this measure through the Renewable Energy Heat Act, which was amended on 1 May 2011.

Support consumer consulting services to enhance consciousness of energy efficiency and energy conservation

Home owners, housing cooperatives and tenants need information on the advantages of energy efficiency and conservation improvements in homes and buildings. If biomass is planned to be used for space heating, an investment in thermal improvement is crucial. Purchasing smaller and more efficient boilers as well as lowering consumption of fuel saves money.

Provide information and advice for forest and agricultural enterprises on bioenergy production, utilisation and marketing

Bioenergy consultancies, bioenergy agencies and competence centres should be supported to give advice to farmers, forest owners, plant operators, and traders.

5 In Poland, a lack of awareness for the advantages of using wood chips from a willow plantation for heating purposes can be observed in Zielona Góra region. Local residents, plant operators and administration officials have not taken any notice so far. As a result the wood chips are being sold to plants in the region around Berlin which means creating longer transportation routes.

Promoted by the German Agriculture Ministry in a second phase, the project "Regional Bioenergy Consultancy for Agriculture and Forestry, and Public Relation for Energy Plants", provides information all over Germany on bioenergy production and utilisation. It also explains how to increase efficiency and regional value, to agricultural and forestry companies, planners, and potential investors.

Encourage bioenergy partnerships between foresters/forest owners or farmers and communities/public services

Such partnerships not only integrate forestry and agriculture in value chains, but they also increase consumer acceptance of bioenergy deployment. Climate protection goals can be achieved only with the communities.

Communicate the public benefit of the investment to the inhabitants living in the surrounding area and enable local participation

Address "Not in My Backyard" (NIMBY) attitudes of authorities and local residents by creating information campaigns. Facilitate the involvement of communities through ownership models or foundations and cooperatives.

Support innovative social movements for energy self-sufficiency with renewable sources. For example, a number of bioenergy villages and regions and energy cooperatives have de-centralisedtheir energy supply

Grassroots initiatives for 100 % RES energy usage and zero GHG emission goals of villages and regions are very promising strategies. Communities become a motor for creating secure and independent energy supply and generate revenues for the local inhabitants. The increasing development of 100 % RES villages and regions striving for renewable energy self-sufficiency has become a big success story in Austria and Germany. Already in 1990, the Austrian town Güssing in Burgenland decided to strive for a complete abandonment of fossil fuel energy. In 2001, energy self-sufficiency was achieved. Today, they trade a significant surplus of renewable heat, electric power and transport fuels. This region has 27.000 inhabitants and developed from a poor, "dying" area to an area with a high standard of living and excellent quality of life. The European Centre for Renewable Energy (German abbreviation EEE) is an attraction for interested visitors from all over the world (www.eee-info.net).

Annex

Documentation of the 4B Partners' Proposals for Bioenergy Policy in their Respective Countries

1. Austria

Kerstin Schilcher, Johannes Schmidl, AEA

Main Austrian energy targets

Austrian Energy target is the development of a sustainable energy system via a three pillar policy

- Energy efficiency
- Renewable energies
- Energy security

To fulfil EU-directives

- The share of renewables in gross final energy consumption is to be increased to 34 % in 2020 (2005: 23.6 %, 2009: 30.1 % based on calculations by Statistik Austria according to EU definitions), and
- to reduce greenhouse gas emissions by 16 % until 2020, as compared to 2005.

Austrian Energy Strategy 2010

In absolute terms, this means to increase the amount of renewables from 328 PJ in 2008 to 388 PJ in 2020 (+ 60 PJ or + 18 %).

Table 1

	Reference Scenario 2008	Efficiency Scenario 2020
Final energy consumption (PJ)	1,240	1,100
RES production (PJ)	328	388
Share of RES in the gross final energy consumption (%)	25.6	34.2

National Renewable Energy Action Plan

Austria submitted its National Renewable Energy Action Plan (NREAP) to the European Commission in June, 2010[6]. The RES target for Austria according to the RES Directive 2009/28/EC is 34 % of gross final energy consumption by 2020[7]. In 2005, the base year share for setting the RES targets was 24.4 %.

The NREAP was developed within the framework of the Austrian Energy Strategy 2010 as a joint effort between the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMFLUW)[8]. The main objectives of the Energy Strategy 2010 are the development of a sustainable energy system and the achievement of EU targets by 2020. The three main pillars of the Energy Strategy are renewable energy, energy efficiency and security of energy supply.

Table 2 A comparison of the reference and efficiency scenarios for the year 2020 outlined in the Austrian NREAP

	Reference Scenario	Efficiency Scenario
Final energy consumption in 2020 (PJ)	1,240	1,100
Gross final energy consumption in 2020 (PJ)	1,281	1,135
RES production in 2020 (PJ)	388	388
Share of RES in the gross final energy consumption in 2020 (%)	30.3	34.2

6 NREAP, 2010: Nationaler Aktionsplan 2010 für erneuerbare Energie für Österreich (NREAP-AT) gemäß der Richtlinie 2009/28/EG des Europäischen Parlaments und des Rates (National RenewableEnergy Action Plan 2010 for Austria (NREAP-AT).

7 RES Directive, 2009: Directive 2009/28/EC.

8 Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMFLUW), 2010: EnergiestrategieÖsterreich (Austrian Energy Strategy, in German).

Reaching the RES target requires an increase of renewable energy production of 18 % compared to the levels of 2008 (328 PJ), in combination with a 13 % reduction in final energy consumption in an efficiency scenario, as compared to the reference scenario. Thus, Austria will make use of available synergies between renewable energy and energy efficiency in order to reach the RES target.

In 2008, the production of RES, as reported by the Austrian Energy Balance, was 328 PJ. The target value for the year 2020 is 388 PJ, in order to achieve the 34 % target. That is, an increase in RES production of about 60 PJ is required between 2008 and 2020. An indicative distribution of this increase of RES production (60 PJ) in the efficiency scenario is as follows:

Table 3 Indicative distribution of the increase in RES production between 2008 and 2020 in the efficiency scenario

	PJ
Electricity	28
Heating and cooling	24
Biofuels	8
Total	**60**

In order to comply with the 34 % target, Austria aims at stabilising its final energy consumption at 2005 levels by the year 2020. This goal has been made explicit in the Austrian Energy Strategy 2010. This implies a reduction in final energy consumption of 13 % in comparison to a reference scenario with current demand growth trends.

In order to achieve the trajectory of the efficiency scenario outlined in the NREAP and the Austrian Energy Strategy 2010, the following reductions in energy consumption in the three main areas of energy use are expected, as compared to the trends of the reference scenario: 22 % for transport, 12 % for heating and cooling, 5 % for electricity.

That is, Austria will be relying on synergies between energy efficiency and RES energy policies and measures in order to achieve its RES target of 34 % of gross final energy consumption by 2020.

Challenges and chances for bioenergy

Economically feasible production of electricity from biomass depends on both the size of the respective plant (small scale kW range technologies are not yet commercially available) and overall efficiency including heat (at least ca. 75 % of energy output will be heat). Additional good sites with sufficient and big process heat demand, however, are limited, many of them have already been realised.

Electricity from hydro, particularly small hydro, has some additional potential. The same appears for wind energy. Thus, wind, hydro, and PV might meet the demand for additional electricity from renewables more easily than biomass.

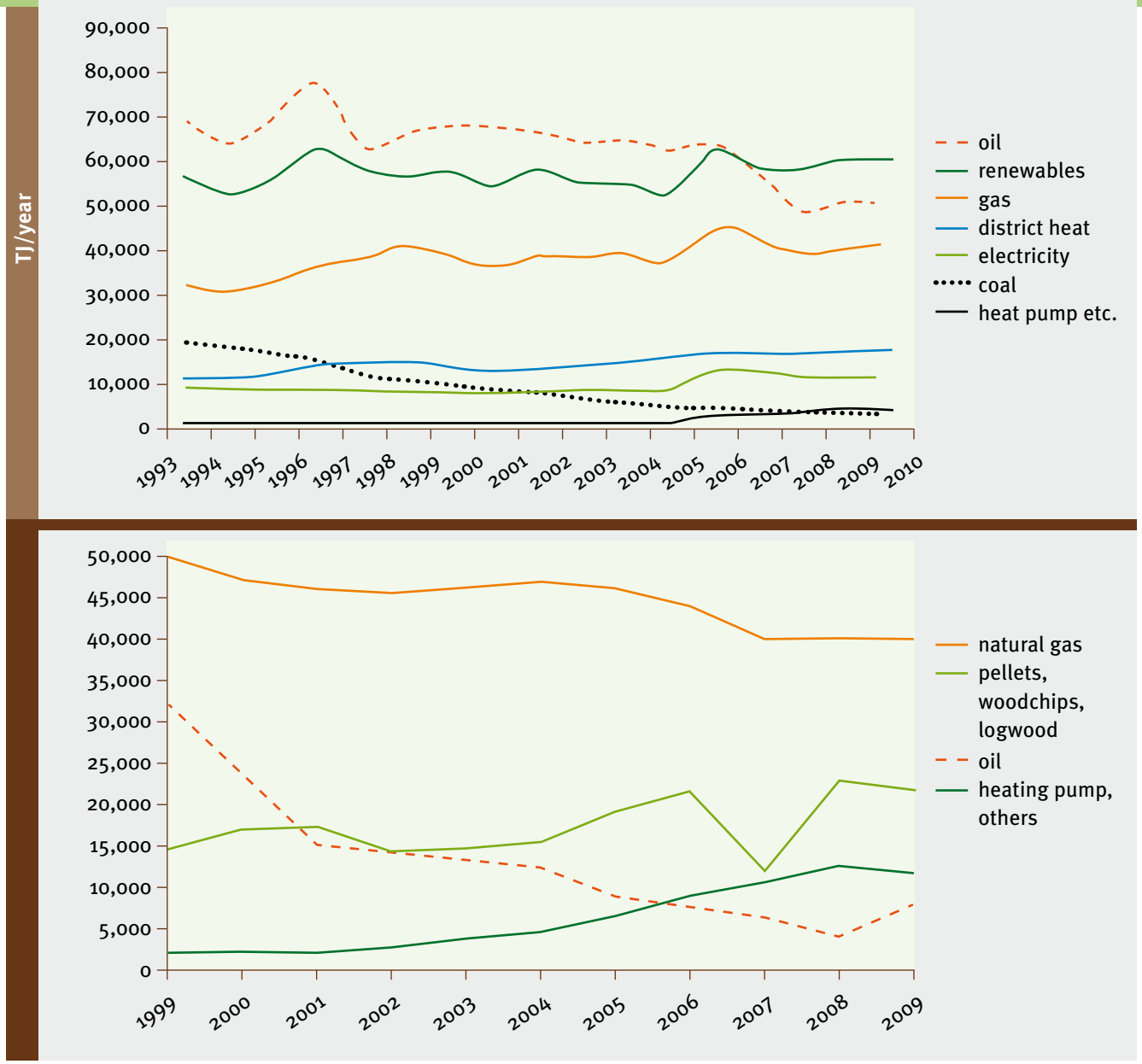
Biofuels face growing resistance due to global sustainability considerations.

Heat from biomass, both small scale and district heating, appears to be the most promising option to introduce bioenergy in the market: Technologies are broadly available and competitive, experts (installers, planners) are in place, support schemes have been developed and implemented, and efficiencies of conversion are high (90 %).

Conclusion

Biomass efforts should concentrate on the low temperature heat market. Renewable heating and wood fuel in particular is currently among the most competitive renewable energy technologies. Wood pellets for example, cost half as much as light heating oil. Renewable heat is equal to renewable electricity in terms of gross renewable energy supplied. This means that with the same amount of wood fuel used for heating, a three times higher contribution towards the renewable energy target can be achieved than via electricity production due to the conversion losses, if heat is not utilised. In addition, biomass heat subsidy requirements when compared to electricity from biomass, are about 10 times lower, assuming a feed-in premium of 6 cent/kWhel and investment subsidies for renewable heating devices of approx. 25 % of investment costs (500 € for a pellet stove).

One option could be to convert a significant share of the some 820.000 Austrian oil-heated houses and dwellings to bioenergy (pellets). This would mean more than doubling the number of houses heated by biomass (ca. 750.000 in 2009). This is more than sufficient as a challenge.



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_NREAP Austria under Directive 2009/28/EC of the European Parliament and of the Council). Federal Ministry of Economy, Family and Youth (BMWFJ). Vienna. June, 2010. Submitted to DG for Energy (DG ENER) of the European Commission. http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_austria_de.pdf (in German)
http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_austria_en.pdf (in English)

_RES Directive, 2009: Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Brussels, April, 2009.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF

2. Czech Republic

Petr Tluka, CZBIOM

The Czech Republic has a high potential of biomass, as has been shown in the Trade Study and in the Country Report published within the 4Biomass project. However, the use of this biomass is very limited. There are several reasons why the development of biomass use in the Czech Republic has not reached its potential:

- Political will
- Lack of information
- Trade
- Support of less efficient measures

Political will

The political will for support of RES in the Czech Republic is very limited. Even though there have been policies planned and implemented to reach the goals for the RES use in the Czech Republic, those plans to support the use of RES are only up to the level of reaching the goals. In other words, there is no will for stable development of the RES, but only the will to reach the EU goals.

There are several reasons for this missing political will. Aside from the reasons mentioned, unlike in most of the EU countries, public opinion about RES is rather negative after some past failed steps in supporting RES, which caused a significant increase of electricity prices in the Czech Republic. A closely connected problem is that the conditions for RES use change often, which makes it impossible for any long-term business plans to be established.

Actions to take:

- Set more ambitious and more differentiated goals
- Establish a trustworthy environment
- Develop conditions that are going to be favourable not only for big players

Lack of information

There is still a huge lack of information about RES in Czech society and for stakeholders. This leads to negative opinions about biomass and to slow development of RES use. One example is the use of short rotation coppice. Unlike in Slovakia and Poland, which are comparable countries, the SRC in the Czech Republic is still in an experimental stage and has almost no harvesting area. The reason is that there is no subsidy system that would be favourable for long-term production and there is a lack of information for farmers who might be growing SRC. The same situation exists in other agricultural areasas well.

Actions to take:

- Increase public awareness of RES
- Increase stakeholder awareness of RES

Trade

Biomass potential in the Czech Republic is almost 300 PJ p.a. (results of the Study of Pačes Commission). This potential is however not being fully used in an efficient way for energy production in the Czech Republic. The local biomass use, which should be the primary use of biomass according to the outcomes of the Stakeholder Dialogue, is used only in a few best practice cases. However, because the biomass market is so far not well developed within the Czech Republic, energy producers are forced to secure their fuel supply through transports of biomass from more distant sources or even imports.

Aside from an absent national biomass market another major problem for biomass potential is trade within EU. This is most significant in the trade of wood biomass. For example, there has been 78 thousand tonnes of wood exported to Austria in the year 2007, making the Czech Republic Austria's biggest supplier of wooden biomass. The Czech Republic also exports high amounts of wooden biomass to Germany. During the last couple of years the Czech Republic has dramatically increased its export of wood chips, pellets and briquettes. This is the reason why there should

be a common EU or Central Europe action and goals of biomass use which will make sure that the goals of one country are not achieved only through imports of biomass from other countries since this is not a sustainable way of using biomass.

Actions to take:

- Develop national biomass market
- Support local use of biomass
- Develop pan-EU or CE action for biomass use

Support of less efficient measures

The lobby of big key players on the Czech energy market is very strong. Past efforts resulted in support of solutions that are less efficient, but more beneficial for this small group of stakeholders. Even though there is well documented biomass potential in the Czech Republic proving that biomass can cover a significant share of energy demand in the country, there is no incentive and goal-oriented approach to use it. The potential analysis and actions to take for using biomass are well adapted to the national Biomass Action Plan (BAP), which has been evaluated positively by stakeholders in the 4Biomass stakeholder dialogue. The national BAP and other plans recommend most of the actions mentioned above like local use of biomass, support for heat production over electricity production from biomass, stable legal and financial conditions and an increased public awareness of RES.

Actions to take:

- Follow nBAP recommendations more closely
- Use local biomass
- Support heat production first and foremost and biomass electricity production secondly
- Stabilise legal and financial condition
- Increase public awareness of RES.

3 Germany

Sybille Tempel, FFU

Germany has a relatively long tradition of developing renewable sources for energy production. With the publication of "The Limits to the Growth" by the Club of Rome in 1972 and the 1973 energy price shock, the awareness of the limits of fossil fuels like oil and coal began to grow among several individuals and groups.

Under the first coalition government between Social Democrats and Green Party (1998–2005), fostering the development of Renewable Energy Sources became a declared political aim. Germany has been a front-runner for RES development for several years, with the highest share in the world, particularly with wind and solar energy. Some legislative measures have been adopted by a number of countries, e.g. the Renewable Energy Sources Act (EEG, from 2000, last amended in 2009, next amendment foreseen for 2012). Sustainability standards and certification schemes to verify compliance have already been incorporated into German law and are mandatory for biofuels and bioliquids since 1 January 2011. Nevertheless, there is still quite some work to do.

General Recommendations

The existing national, federal, and local frameworks for policy design should be adjusted in such a way that sustainability and biodiversity issues are considered in all political decisions on bioenergy production and use. Negative impacts to food production and prices as well as to nature and biodiversity must be avoided. The side effects of land use intensification (for food or energy crops) can have significant consequences for ecosystem services, ecosystems and their related biodiversity. Thus, utilisation of biomass from forests and agriculture, including residues and wastes, has to be in congruence with sustainability and biodiversity strategies.

The lower administration levels should strive to integrate energy and transport sectors, and consider impacts to inhabitants of near-by settlements, as well as those in recreation and tourism areas. Integrated multi-use concepts should be developed for landscapes regarding interests and needs of humans, animals, and nature.

Policy planning should be transparent and allow citizens participation by timely information dissemination on planned projects to raise awareness. Classification and terminology in legal acts should be clearly and unmistakably formulated.

Support for circular flow economy and cascading use of biomass should be provided for development and deployment of energy efficient technologies.

Reduction or removal of technical (e.g. poor infrastructure) and procedural (e.g. long lead times) barriers to investments is necessary. In particular, long lead times are well-known among actors in local and regional administration bodies. Hence, numerous municipalities strive to concentrate their licence authorities on "one-stop-shops" to lessen lead-times and facilitate attractive investments.

Providing support for sustainable use of biomass (e.g. taxation, grants, loans, dept guarantees), breeding and site-adapted cultivation of suitable plants among other things should be made accessible to farmers, foresters, and plant operators.

Continuous support should be given to innovative social movements that strive to shift energy supply to renewable sources and achieve independence from fossil fuels and from energy imports. The very successful efforts by German civil initiatives (citizens, mayors of communities, agencies, researchers) to establish self-sufficient bioenergy regions, bioenergy villages, and energy cooperatives (already more than 100 existing presently in Germany) demonstrate how effective and fruitful grassroots initiatives can be for an environmentally friendly, economically advantageous and socially concerned sustainable energy policy. De-centralised biomass utilisation, particularly but not only in rural areas, guarantees a fast and cost-effective energy supply chain, without the pressure to expand electricity networks over several thousand kilometres.

Sectoral Recommendations

Heating and cooling

There is no RES without conflict potential. Thus, stakeholders should carry out expansion considering as many different energy types as possible, and it should be adapted to corresponding conditions.

Agricultural and forest biomass should be exploited under consideration of competition of use, i.e. food and fodder supply first, followed by material use, and finally energy use.

The remarkable potential of residues and wastes like twinnings from forests (crowns, branches, leafs, stumps etc.), and straw, husks, shells etc. from agriculture should be used in a sustainable way. Biogenic waste from households and industry will increase under the amendment of the Act for promoting closed substance cycle waste management and ensuring environmentally compatible waste disposal (Kreislaufwirtschaftsgesetz – KRWG) from 30 March 2011 that regulates collection and utilisation[9]. The introduction of mandatory separate collection will lead to a further increase in recoverable biowaste which will contribute to biogas production. The subsequent residues will be used as fertiliser for surrounding fields[10]. A number of landfills will be able to close, the area can be used for other purposes, and incineration of waste can be reduced.

Management and organisation improvements for unused biomass from landscape management and cuttings from urban parks and roadsides will enhance the amount of suitable material for bioenergy production.

Optimisation of biomass logistics in regard to systems for sorting and marking biomass for adequate deployment, and improved transport solutions for sustainable trading is needed.

Promoting de-central/communal heat supply and local heat grids for villages and municipalities accelerates increasing independence from fossil fuels and energy imports.

Facilitating the increase of bioenergy heat for residential buildings by financial relief for tenants and house owners will attract investments, as well as stronger support for energy efficient reconstruction of buildings – to date this is often not economic and thus not affordable. The recent amendment of the Renewable Energy Sources Heat Act (EEWärmeG) from May 2011 will improve these circumstances.

9 The Cabinet decided the amendment on 30. 03. 2011, the Federal Council has still to approve it.

10 NREAP Germany. Federal Republic of Germany. National Renewable Energy Action Plan in accordance with Directive 2009/28/EC on the promotion of the use of energy from renewable sources. June 2010, p.97.

Electricity

Launch of a support programme to build more combined heat and power plants to replace old big power plants will increase energy efficiency in the production process. It will simultaneously avoid the need for new coal facilities that cause CO_2 emissions increase.

Creating efficient heat utilisation policy for use of waste heat from electricity generation in combined heat and power plants, e.g. for heating near-by villages and towns through local heat grids and district heating grids is needed. Thus, the total efficiency of the installations can be considerably improved.

Expansion of electricity networks (far distance and local/regional) for transport of an increasing amount of electricity derived from renewables should be accelerated and improved access to the grid should be granted. The joint responsibility of the federal and the regional administrative bodies for network planning is favourable for sound solutions.

Biofuels for transport

Production and provision of biomass for transport biofuels production should be adjusted to the region. Introduction of measures for development and market introduction of progressive and innovative biofuels respectively fuels with high renewable share should be promoted (second and third generation types).

Biogas

Utilising the suitable biomass potential for biogas production should be concentrated in several regions in the area where a variety of biogas substrates is available. Growing high-yield plant species and crop rotation should be preferred, implementation of measures for protection of soil integrity and biodiversity preservation are required.

Regionally/locally adapted installation and utilisation models for biogas production and transportation should be developed. Facilitating the injection of upgraded biogas into the natural gas grid is equally necessary, because this will reduce gas imports.

Legal and financial incentives should immediately adapt to undesirable developments.

Incorporating crop rotation from the Good Agricultural Practice will have an impact on maize productionfor biogas. Maize is an annual plant needing a relatively high amount of fertilisers which put a strain on soil and water quality. Planted in crop rotation with other plants like winter rye or with catch crops lessens negative impacts to biodiversity.

4 Hungary

Peter Ujhelyi, EC Hungary

Biomass use in Hungary has grown rapidly during recent years. This implies that an increasing amount of wood has been used and will continue to grow. This rate of growth is not sustainable. If we take a closer look at the different renewables we see that biomass and wood especially is extremely overrepresented. This is mainly because in recent years the electricity production from biomass output was mainly subsidised, while general biomass use was not. This led to a significantly higher utilisation of wood for power generation even though it has a relatively low efficiency. This is in contrast to heat production that was left unsubsidised and therefore unprofitable. Biomass heat production however could be much more efficient.

Biogas production in Hungary is very underdeveloped; we still have huge growth potential on this field. The legal background needs further simplification and harmonisation. This is because it is very complicated to receive all the permits in time for an investment and there is no consistency in the interpretation of regulations between different authorities. Harmonised and consistent policy development and planning are needed in different sectors to overcome these obstacles. Biogas production is an energy sector problem and it also raises significant agriculture and waste treatment concerns. If we could better coordinate our acts in these fields, we could reach a much higher efficiency, and find solutions to problems like landfills, groundwater pollution, agriculture, rural development and employment.

The best solution for biogas usage would be **feeding biogas into the network**, because there is already an extensive

natural gas pipeline system in place. This would solve unbalanced production and consumption problems. This means that very often there is no heat demand where biogas is produced and therefore heat is unnecessarily lost during power generation. Through the network biogas can be easily transported exactly where heat is needed. The efficiency of the Combined Heat and Power or Organic Rankine Cycle can be improved.

Another problem in Hungary is the traditionally **subsidised gas market**. From year to year billions of Forints are spent on subsidies for residential gas usage. Consequently the real price of gas is not visible and this makes the change to biomass heating less profitable on household level. Biomass should be subsidised instead of gas.

Hungary is an ideal agricultural country because of its geographical situation. However, the share of **biofuels** in biomass is still very low. As mentioned above, with better policy coordination land use planning could be more efficient, and suitable for biofuel crops. The government is determined to promote bioethanol production.

Based on the conclusions of the National Renewable Energy Consumption Action Plan "Hungary fundamentally strives to be self-sufficient in increasing the use of renewable energy sources" except for biofuels (bio ethanol export, biodiesel import).

Transportation of biomass is also a key question. It is important to consider that the CO_2 equivalent is not in line with profitability. In the case of big biomass consumers, e.g. heating or power plants, the criteria and certification system for guarantees of origin for solid biomass should also be established. In this way consumers who utilise significant biomass resources could be obliged to use local sources thus, decreasing the need of transportation.

Besides this, if transportation for longer distances is not avoidable, transportation should be moved from roads to railway and water! Even if it is more complicated, rail and water transportation are more sustainable.

Summarising the findings of 4Biomass project we would like to draw policy makers' attention to the aforementioned problems, and the Energy Centre would like to ask the Ministry of National Development to consider the following recommendations:

- Stricter regulation is needed in type and quality of wood used in biomass fired plants
- Biomass firing should be allowed only in high efficiency boilers
- Heat feed-in tariffs should be considered
- There should be simpler licensing procedures and easily reachable subsidies
- Integrated and harmonised approach to biogas use
- Straight-forward regulation on biogas feed-in.

5 Italy

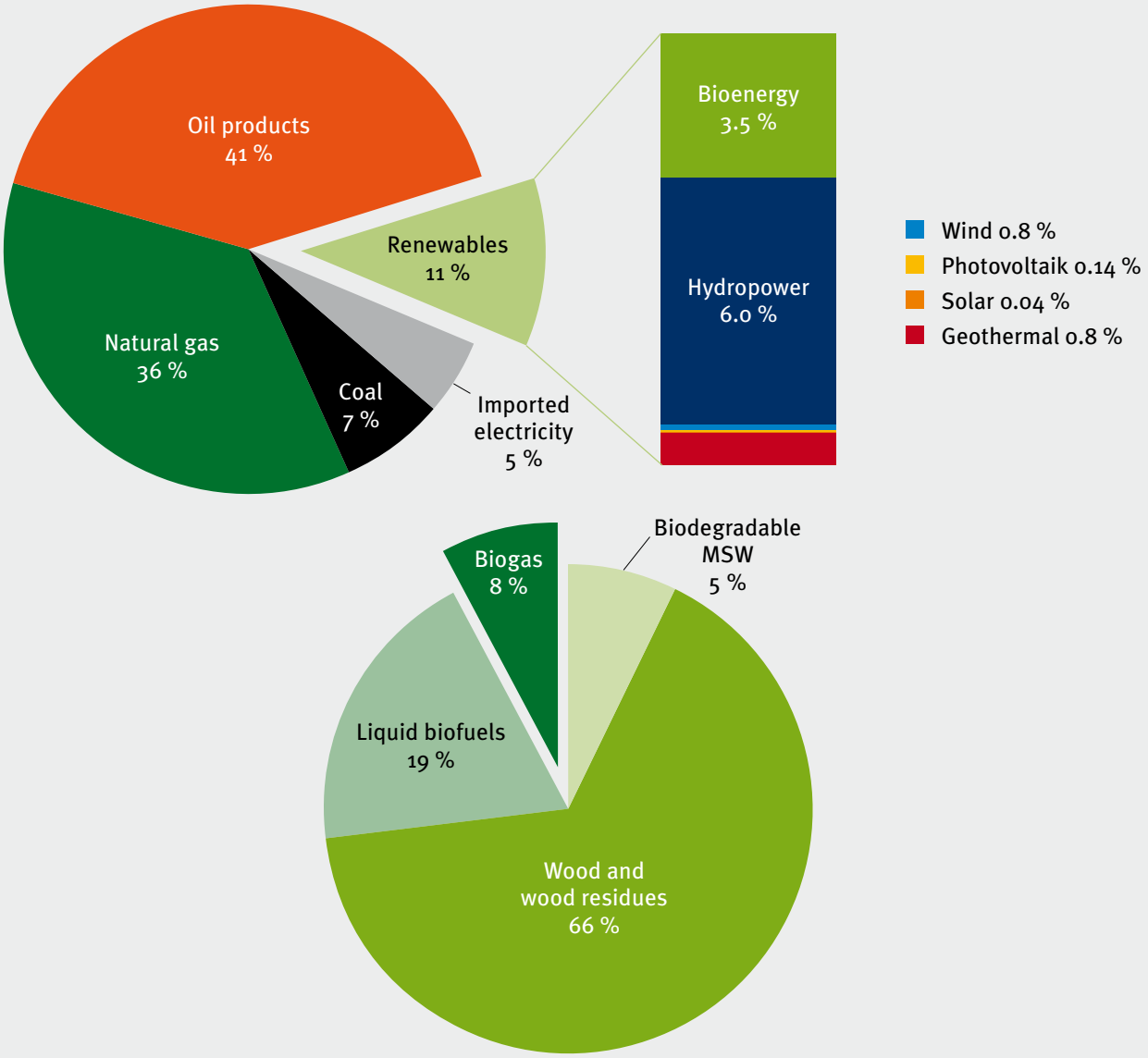
Vito Pignatelli, Vincenzo Alfano, ENEA

Current state of bioenergy in Italy

Italy is largely dependent on foreign energy supplies. This dependence accounts for over 80 % of the total Italian energy demand of 180.2 Mtoe (2009). The contribution of renewable energy sources (including hydroelectric power) to last years' national energy budget amounted to about 9 %, of which 1/3 came from biomass (ENEA, Rapporto Energia e Ambiente 2010).

In 2009 the use of biomass for energy purposes totalled only 3.5 % of the final national energy consumption (180.2 Mtoe). However, with a production equal to about 6,2 Mtoe, bioenergy represent 29.5 % of total energy from renewable sources in Italy (21,1 Mtoe).

Energy use by source and bioenergy contribution in Italy (2009)



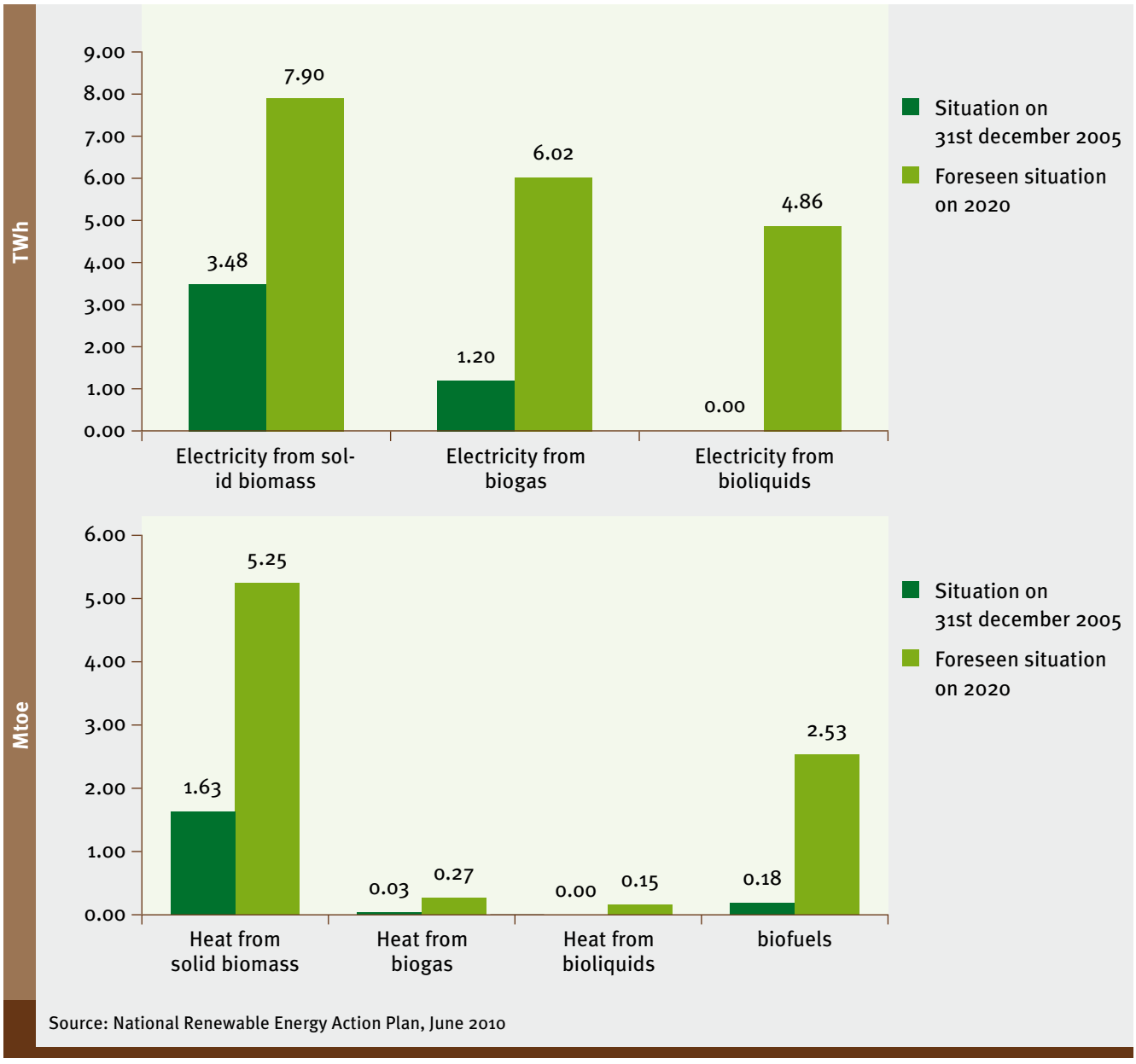
Source: ENEA - Energy and Environment Report 2010

National target for bioenergy in the nREAP

The National Renewable Energy Action Plan (nREAP) sets a 2020 bioenergy target for Italy that is 9,815 ktoe in order to cover 19 % electricity, 54 % heating and cooling and 87 % in transportation fuel on total consumption from renewable sources.

The amount of energy produced in 2009 (6.238 ktoe) was equal to 63.6 % compared to the target set for 2020 by the nREAP. Such a target could seem ambitious, but is considerably smaller than the estimated potential (24–30 Mtoe, ITABIA, 2009) for bioenergy in Italy, able to cover up to 13–17 % of the total energy demand.

Future bioenergy growth in Italy



Source: National Renewable Energy Action Plan, June 2010

Table 4 Bioenergy Potential

Biomass	Mtoe/ year
Residues from agricultural and agro-industrial	5
Residues from forestry and wood industry	4.3
Municipal solid waste	0.3
Livestock manure	10 – 12
Firewood	2 – 4
Energy crop	3 – 5
Total	**24 – 30**

Source: ITABIA 2009

Main Problems and difficulties for bioenergy further development in Italy

Italy's growing interest in the use of biomass as an energy resource and the almost unanimous acknowledgment of the advantages that can be gained from the proliferation of bioenergy in the Italian economy, are strengths that place Italy at the same level as other European and non-European nations.

The ongoing developments, particularly in the use of biomass for heating and electricity, reveal Italy's strong industrial background and great research potential. Nonetheless, bioenergy is not yet used in many market applications and its potential has not yet been fully developed. This is due to a number of factors and obstacles, that still delay its development today. Very briefly, the weaknesses of Italy's biomass system can be summarized as follows:

- Little attention to successful chains (district heating, district cooling, co-combustion, co-generation, biofuels) both in terms of energy conversion efficiency and in terms of social acceptability
- Weak systemic approach of the projects of bioenergy plants (few connections with agriculture and forestry)
- Unreliable basins of biomass production (little attention to the condition of agricultural and forestry soil)
- Difficulty in developing multi-annual supply chain agreements among sector operators (shortage of company consortia or associations encompassing agricultural and industrial producers and companies dealing with supply, first biomass conversion, plant management and maintenance and, finally, distribution of electricity and/or heating produced)
- Existence of numerous and unrelated legal and technical regulations (there are about 100 regulations in Italy without including regional provisions)
- Little involvement of local populations (little perception by the population of direct benefits related to the use of biomass as a source of energy).

Biomass is the only renewable source that needs to be produced before it can be collected and used; its chain stretches from production to final use and needs to be considered as a whole. It should be planned in terms of efficiency and according to size and extension of supply basins, and in a way that is compatible with the local territorial and socio-economic context.

6 Poland

Adam Guła, Paweł Wajss, Tomasz Mirowski, Arkadiusz Figórski, AGH Cracow

A. What is the paradigm: CO_2 emission reduction or market?

The present drive to treat biomass for energy production as a market commodity for making profit is largely stimulated by the EU-funded initiatives. This leads to practices that have one of the following net effects:

- Net increase of CO_2 emissions or
- Largely sub-optimal emissions reduction compared with other possible ways of using the available biomass resource for energy purposes.

Both aforementioned situations are due to the fact that under present regulations free markets ignore life cycle emissions and other negative environmental impacts. There are some advances to address this, but the proposed solutions are highly insufficient and are developing too slowly, not to mention final implementation and enacting issues. The market is definitely prevailing over the environment. A powerful industrial lobbyist opposition has and will invest in recovering their current and future incurred costs. If life cycle emissions criterion rewarded industries through variety of financial instruments (green certificates, preferential taxation etc.), these industry lobbyists could not justify their existence. The problem is that the volume of potential stranded costs grows very quickly. Therefore, revision of the legislation and rules that would stop the

present practice is a very urgent task that must be undertaken as quickly as possible.

Recommendation 1. The paradigm should be the environment rather than the market. Rules to guarantee that must be developed urgently. There is no time to wait. The damage, labelled most often as success, is growing very quickly.

B. Eligibility of avoided CO_2 emissions

There are two specific differences between primary biomass fuel (e.g. wood, straw, etc.) and fossil fuels:

- First, primary biomass fuel has a low energy density, when expressed in terms of energy content per unit volume
- Secondly, the biomass has a low energy density when expressed in terms of GJ per hectare, which is the energy that can be extracted from a given area of land.

Transportation of a given amount of energy derivable from biomass is typically considered more CO_2 emission intensive in terms of CO_2 grams per km driven than transportation of the same amount of energy transported in the form of fossil fuels.

On the other hand, installations requiring large amounts of input energy in the form of biomass have to bring it from sources distant from their location to satisfy their fuel needs. One may assume with high probability that more CO_2 is emitted by bringing a given amount of input energy in the form of biomass than it would be if the same input energy was delivered as a fossil fuel.

Of course, those additional CO_2 emissions are believed to be offset by avoided emissions that would originate from burning the corresponding amount of fossil fuel. However, the existing practice of rewarding producers of "green energy" relies on a simplistic assumption that there are no CO_2 emissions embedded in fuel pre-processing (e.g. making pellets), transportation (most often by trucks) or energy embedded in trucks' production and exploitation, additional road repairs etc.

Conclusion: Each biomass installation should have a maximum radius that "embedded emissions" cannot exceed. This would be equal to the avoided emissions that "green" energy producers receive.

Recommendation 2. Rewarding "green" energy producers must be based on avoided emissions and account for total various origins and life-cycle emissions. Only these avoided emissions should be considered eligible for applying for the bonuses. To achieve that in practice and in a possibly short time, a comprehensive and EU-coordinated set of default values should be determined and a control mechanism quickly established.

C. Large or small scale biomass installations

The previous conclusion implies that smaller installations can satisfy their fuel needs by using supplies from an area of a correspondingly smaller radius. That means that their "embedded" transportation emissions will be smaller and their corrected (eligible) avoided emissions will be higher. In other words, the same amount of biomass will be used more efficiently from the point of view of the environmental impact.

Conclusion: Small is better and more environmentally-friendly.

Recommendation 3. Smaller installations should be favoured when granting investment subsidies. In fact, that should be sufficient, because in the exploitation phase they will be more competitive due to lower CO_2 emission "costs" (cf. Recommendation 2).

D. "First satisfy the local needs, trade only the surplus" principle

It is obvious that the local use of biomass is more efficient than transporting it to remote destinations (both for a final use or reprocessing). However, in some areas, mostly outside the EU, local energy needs can be satisfied with only a fraction of the locally available biomass. That can and even should be exported to destinations where the biomass potential is not sufficient. But, exports of wood from Estonia to Sweden, while Estonians burn low-grade peat, or pellets exported from Poland to Denmark and Germany, while Poles burn environmentally harmful lignite, does not make much sense from a global environmental perspective.

Recommendation 4. The first step would be to pay some respected and non-corruptible NGO(s) to become an international watch-dog to reveal these cases and bring them to the attention of the environmental community and

ultimately make policy makers start thinking about regulatory solutions. A good candidate would be INforSE (The International Network for Sustainable Energy whose headquarters are in Denmark. Funding should also be awarded to research projects that would give some reliable quantitative estimates of the additional avoided CO_2 emissions.

E. Biomass for heat or electricity

The answer to the question posed in the title of this paragraph is country specific. In many European countries, notably in Poland, there is a significant demand for space heating. This demand could be largely satisfied by biomass, primarily in rural areas. However, most farmers buy coal which is burned often in low efficiency boilers. Since coal is becoming increasingly expensive, the practice is often to burn plastics, old tyres and other highly polluting materials. On the Polish market there are good and efficient biomass boilers that are produced in Poland. However, farmers usually do not have enough money to buy and install these boilers (they are mostly sold to Western Europe). There is no financial support scheme that would help them overcome this barrier. At the same time using biomass for power generation is heavily supported by Green Certificates. This support is granted from the money paid by all consumers of electricity in Poland. The estimates show that the support given to power stations using biomass is in the range of 700 million euros annually, which is a staggering amount of money for Poland.

The calculations performed using Invert model, developed in the Altener Programme, have shown that, if only a fraction (ca. 4 %) of this money were transferred to farmers to help them cover 40 % of the investment costs, the market for individual biomass boilers (in the range of 20–50 kW) would grow quickly. Alternatively, the same public money would have an environmental effect that would be 25 times larger. In fact, this effect would be much higher, because this calculation did not take into account the "embedded emissions" described in the previous paragraphs. An optimistic observation is that an increasing number of experts try to exert pressure on the government to change the policy and grant the "Green Heat" the same status as "Green Electricity". Unfortunately, the power of big money still prevails.

Recommendation 5 (tailored to the Polish conditions). Convert part of the funds supporting biomass-derived electricity to support individual farmers so that they can buy and install the modern efficient biomass boilers. For larger installations (orders of up to a few MegaWatts, i.e. typical small district heating companies) issue **Green Heat Certificates**, which would be 3 times more valuable per 1 MW than the Green Electricity ones. The latter follows from the fact that in Poland almost 100 % electricity is produced in thermal power plants with conversion efficiency of about 33 %.

F. Optimisation task

Note: This part of the present contribution applies to a situation which is typical for many EU regions or EU member states as far as the biomass potentials vs. needs are concerned.

One specific feature of biomass as a renewable energy resource is that there is a variety of possibilities for how it can be produced and used for energy purposes:

- First, there are a variety of the input biomass materials (wood, straw, dedicated plants, etc.)
- Secondly, there are different energy applications that can be derived from biomass materials (as opposed e.g. to wind or hydro):

Biomass can be converted to gas or liquid fuels or it can be used in the solid form, either directly (e.g. log wood, or straw bales) or as pellets, briquettes, etc. As a converted fuel, biomass can cover a wide spectrum of final energy applications: it can be used as motor biofuel to provide mechanical power and it can be used for electricity generation or for heating.

At the same time, it is obvious that biomass is a limited resource (contrary to what some people seem implicitly to assume). Its potential in a given area is determined by the available land area, soil quality, and climate, among other factors, and financial resources available for investment also determine its potential.

Therefore, it is usually not possible to simultaneously satisfy all energy needs (electricity, heat, transportation) using this resource alone, because we also need biomass for food and fodder or for industrial uses. Additionally, not

all accessible land can be used to cultivate or harvest plants for energy use. We also need land for preserving biodiversity and for recreation.

One has to make the best possible choice given the previously defined criteria. This means that we are facing a typical optimisation problem of finding a minimum (or maximum) of a defined goal function, under the given boundary conditions. To achieve that, an appropriate tool or mathematical model is needed to support the decision-making process. This tool should be sufficiently universal and usable at different decision-making levels, including local ones. That is to say that it should be sufficiently simple and user-friendly.

The goal function(s), i.e. the function that one is looking for an optimum of (maximum or minimum) can obviously be different, depending on the specific interest of the particular decision makers. One can consider finding for which values of the variables under consideration a maximum is reached, for example:

- Reduction of GHG emissions, which is of a global concern,
- Fossil fuel substitution (motor fuels, gas), which typically is of national concern,
- Extracted energy (attempts to achieve energy self-sufficiency of an area, e.g. an island),
- Revenue (cash, tradable certificates, etc.), that would be typical for an individual farmers' interest or concern of a local authority.

Alternatively, one can try to find where the minimum is. This could include the costs of achieving the assumed goals (assumed CO_2 emission reduction) or the minimum number of land requirements for energy plantations.

This model would provide the needed analytical guidance in the decision making process. Otherwise, there is a risk of taking sub-optimal or even clearly wrong decisions, which may be "orthogonal" to the original goals for which the decisions are actually made. Poland has examples of this situation, because biomass is massively used for power generation by co-firing it with coal in pulverised coal boilers.

One should note that there have been attempts to solve this problem. An example is the Invert Model, which was developed within the Altener Programme of the EU by a consortium led by the Technical University of Vienna. This model also took other renewable energy sources and energy efficiency measures into consideration to find the best solution for allocation of public money to support particular categories of climate friendly energy-related investments.

However, with such a wide range of possibilities the task becomes exceedingly complex and the search for an optimum of the goal function has to be performed in a multidimensional space where the number of dimensions is very high. Consequently, answers become highly ambiguous due to complex correlations and inherent uncertainties of the input parameters.

Recommendation 6: What is needed is a simpler model. This can be done by reducing the number of dimensions to the biomass-related variables only. However, even then the task will certainly remain remarkably complex although naturally much simpler. From a technical point of view, it may require searching for the optima in subspaces chosen based on expert intuition and knowledge. The same applies to setting the boundaries of the regions, where the "physical" solutions should be sought for at the start of the runs. The optimisation task can be divided into two interlinked levels.

We still need to develop a model. If we do not develop one, we will continue to take sub-optimal or clearly wrong decisions that can sometimes be driven by EU directives.

7 Slovenia

Matjaž Grmek, ApE

Quote from NREAP:
"In 2005 the share of RES in final overall energy consumption in Slovenia was 16.2 per cent. Slovenia must achieve at least a 25 per cent share in the balance of final energy by 2020. The most important renewable source of energy in the country is wood biomass, followed by hydroenergy, while in recent years development has been most dynamic in exploiting solar energy and biogas. The potentials of these energy sources, plus the potentials of wind and geothermal energy, will contribute to increased consumption of renewable energy sources.

Promoting renewable energy sources and prioritising efficient use and renewable energy sources are components of the Energy Act (hereinafter: EA) defined as energy policy goals. The programming document for Slovenia's energy policy – the Resolution on the National Energy Programme (hereinafter: ReNEP) – which was implemented in 2004, defines the mechanisms for promoting renewable energy sources and sectoral goals for renewables up to 2010. The new National Energy Programme (NEP) [11], which is in the final stage of drafting and should replace the existing ReNEP by the end of 2010, will define the goals of energy policy up to 2030 and the mechanisms for implementing these goals, including the targets Slovenia has set itself in the EU climate and energy package up to 2020 and other international obligations."

End of quote.
(http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_slovenia_en.pdf)

ReNEP clearly failed to meet the set RES targets. Only about 10 % of what was defined was actually achieved mainly because of lack of funds and a lack of commitment from the state and public sector. The situation should change with the new NEP, which has come into public debate in spring 2011 and parliamentary procedures in autumn of the same year. However, from what is already known, RES are still very much seen as something of lower or even negligible impact to the big energy picture.

The situation is best described by a few practical experiences. One of the success stories of the RE sector is/was also biogas in agriculture.

Not only the number of biogas plants increased considerably but also domestic competency was developed that people helped export. The support policy was only partly successful as the feed-in tariffs mainly supported the big power plants (1MW and above). The result was that there is still only one smaller farm application (124 kW). However, after ignoring this issue, the Ministry of Agriculture (MKGP) suddenly realised it should be involved and put a hold on biogas plants that mainly use energy crops as a feedstock (40 % and above). The main reason was a possible competition with food production. The the Ministry of the Economy accepted the suggestion and a new regulation is in place for 2011 that affects also the plants that are already in construction. This was a clear political decision. Biogas producers association protested and the policy is now being revised. In addition to this, MKGP hired an outside group of experts to prepare a strategy for biogas development in agriculture that should be ready by autumn this year. This gives a good perspective to how RE is treated in Slovenia.

Another Slovenian example is wind production. After a multiyear debate on whether to build a wind farm in a preserved area, an investor built a wind turbine after getting the approval of the local community and gathering all the necessary permissions. The result was a modern 2 MW gearless application that was to be erected on karst soil. However, in the middle of construction the building permit was annulled and construction stopped.

A similar procedure has not occurred in the case of the current biggest energy investment in Slovenia, a 600 MW new block of a domestic lignite coal power plant. This 600 MW project is going on despite not having all building permits and despite having a questionable investment plan. Apart from this, retrofitting of the existing power blocks would be in fact a less cost-intensive option.

Furthermore the new NEP would consider both the new coal power plant and as well the second nuclear power plant, but it does not include a green scenario without fossil fuel option.

Quote from NREAP:
"The objectives of Slovenia's energy policy for renewable energy sources are: ensuring a 25 % share of renewable energy sources in final energy consumption and a 10 % share of renewables in transport by 2020, which under current predictions will involve a doubling of energy generated from renewable sources relative to the

- baseline year of 2005,
- halting the growth of final energy consumption,
- implementing efficient energy use and renewable energy sources as economic
- development priorities,,
- in the long term, increasing the share of renewable energy sources in final energy
- consumption up to 2030 and beyond.

Electricity: In the reference year of 2005, a total of **28.48 %** of electricity was generated from RES, and in 2008 the share was 29.5 %. Improvements are tied to increasing the

11 The draft of the new NEP was presented in June 2011 and is currently (September 2011) in phase of public debate

generation of electricity from water energy and wood biomass, and reducing final electricity consumption. At first it appeared that in terms of fulfilling the target of Directive 2001/77/EC Slovenia would not succeed, since generation of electricity from RES was rising too slowly relative to the very rapid growth in electricity consumption, which was partly a consequence of non-implementation of EEU measures. Markedly higher generation of electricity from renewable sources in recent years, tied especially to the more favourable hydrology and greater exploitation of wood biomass, and the economic crisis, which contributed to a turnaround in the trend of electricity consumption, have helped create the conditions where Slovenia is once again well placed to meet the 2010 target.

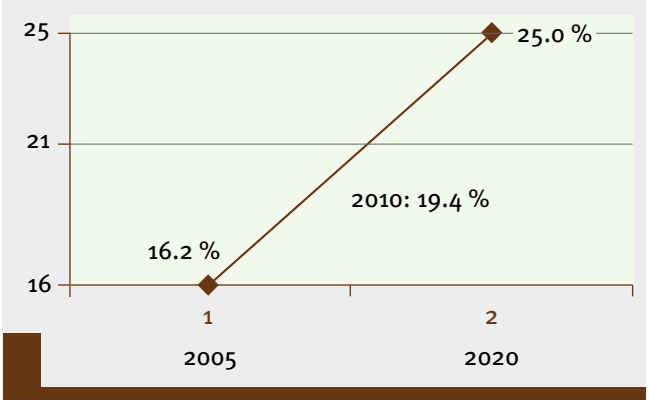
RES in final energy consumption will be set at a level of **39.3 %**, which is exceptionally ambitious and will require both an increase in electricity generation from renewable sources and a reining in of growth in electricity consumption.

In transport, which in 2008 accounted for 39 % of final energy consumption, the share of RES still amounted in the reference year of 2005 to just 0.27 % and in 2008 to just 1.22 %. Alongside the low value in the starting point and the very rapid growth in energy consumption in transport over recent years (18 % growth in consumption in 2008), the target for 2020 is set at the minimal required value of 10 %. There is little scope for obtaining raw materials in Slovenia, pressure on the cost of food production owing to competition for the use of arable land must be prevented, and sustainable criteria for biofuels must be ensured. This sectoral target will be verified once again upon a breakthrough of second-generation biofuels.

Some other considerations (from KGZ presentation):

- Situation

Renewable energy commitment



The relatively good standing during 2010 of 19.4 % (according to Energy Balance of Slovenia for 2010) is a consequence of the economic crisis more than a job well done.

- Directive EU 20/20/20 (SLO 25 %)
- **Target is not met:** reducing CO_2 emissions for about 1 million tons per year
- REAP
  Does not describe the plans of how to mobilise bigger amount of wood, which is the most important RES in Slovenia
- Bioenergy (wood) is seen as the enemy of a wood-based industry sector
- New NEP
  - foresees increase of the energy consumption in industry
  - new coal and nuclear power plant
  - **no scenario with only RES** (in addition)
- Problem with the transport increase and bad railway infrastructure (NREAP 2010: National Renewable Energy Action Plan Slovenia).

References/Abbreviations

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Abbreviations

BAP	Biomass Action Plan
BMU	Federal Ministry for Environment, Nature Conservation and Nuclear Safety
EU COM	European Commission
NEP	National Energy Programme Slovenia
NREAP	National Renewable Energy Action Plan
ReNEP	Resolution on the National Energy Programme Slovenia
RED	Renewable Energy Directive
TAP	Transnational Action Plan