Biomass and Bioenergy report

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EUSTAFOR
president's statement

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EUSTAFOR, represents 28 European state forest organisations coming from 21 countries. Altogether EUSTAFOR members manage as far as 30% of the EU forest area and harvest annually 110-115 million m³ of wood.

EUSTAFOR members believe that the use of biomass and wood energy should and can be developed rapidly. As managers of State forests we think that this development of biomass should not be opposed to the use of wood as raw material for timber or paper: both are possible at the same time and needed in order to tackle the challenge of mitigating climate change. We therefore share the ambitious target decided by the European Council last december in the *Climate Plan* package concerning the sharp increase of renewable energy production – reaching 20% by 2020. We believe that biomass, and wood in particular, has a crucial role to play in this regard.

EUSTAFOR members want therefore to develop solutions for a better and higher wood mobilisation both for timber, paper and for energy. State forest organisations have a long tradition of sustainable forest management and we consider that it is our mission to propose original and operational solutions responding this kind of need from the public and from society.

The aim of this booklet is to present and illustrate the practical issues we are dealing with, when developing biomass and bioenergy supply, coming from our forests. I hope it will provide ideas for further reflexion to all the actors involved in this process.

EU's political framework for bioenergy production and forest biomass mobilization

Martin Lindell

The EU is at a cross-road in respect to the future of energy. This is of relevance to the forestry sector.The new EU climate and energy policy presents several new challenges to the forestry sector. The EU Renewable Energy Roadmap aims to increase the security of energy supply and to reduce greenhouse gas emissions. This should lead to wider use of forest biomass for energy production, bearing in mind that wood biomass accounts for approximately 80% of the total use of biomass for energy in the EU. Inevitably the growing demand for renewable energy continues to increase competition for wood, especially in the wood panel and pulp sector. In this light the State Forest Management Organisations, currently responsible for the management of 30% of forest land in Europe, will face pressure to balance new expectations of different customers and policies.

This article gives an overview of the EU level political framework which is designed to secure the forecast growth of renewable energy production and as a consequence create better conditions for the forestry sector. The documents are reviewed from the perspective of forest owners.

1. Renewable Energy Road Map

Responding to the call made by the European Council, March 2006, the Commission presented its Strategic European Energy Review, January 2007. As part of the review, the Renewable Energy Road Map (COM(2006)848) set out a **long term vision**. It proposed that the EU establish a binding target of 20% for renewable energy's share of energy consumption by 2020, and binding 10% target for the share of renewable energy in transport petrol and diesel. The European Parliament, in its Road Map resolution, called on the Commission to draft a proposal for a renewable energy legislative framework. In particular, it recognised the importance of setting targets at EU and Member States level.

2. Proposal for a directive on the promotion of the use of energy from renewable sources

The proposal for directive (COM(2008)19) was made by the Commission, January 2008. It proposed **mandatory targets** against the EU's energy consumption in 2020, of 20% power (heat and electricity) from renewable energy and 10% of transport fuels from renewable energy. To ensure that targets are achieved, Member States should establish a **national action plan** including sectoral targets. Plans must recognise that there are different uses of biomass and therefore it is essential to mobilise new biomass resources. It was proposed that action plans should be sent to the Commission by March 2010.

In achieving the targets only biofuels which meet the following **sustainability criteria** are eligible:

1) the greenhouse gas emission saving shall be at least 35%,
2) biofuel shall not be made from raw material obtained from natural native forests or areas designated for nature protection, unless evidence is provided that the production did not interfere with those objectives,
3) biofuel shall not made from raw material obtained from area previously continuously forested and which was converted to another form of land use after January 2008.

The European Parliament's ITRE committee analysed the proposal and submitted its amendments in September 2008. The members of the committee voted in favour of the 20% target by 2020 and for having **mandatory interim targets**. It was proposed that sustainability criteria should be adopted for all biomass. Raw material shall not be obtained from land recognised as being of high biodiversity value, unless evidence is provided that production will not interfere with the primary objective. Areas of high biodiversity potential shall include areas designated by law, or by the relevant competent authorities for nature protection purpose, including those designated for the protection of threatened ecosystems, or species.

It is expected that the Commission, European Parliament and Council will agree the final text of the directive, early in 2009. After adoption it will be the responsibility of Member States to implement it through appropriate legal, financial and technical measures.

It is also worthy of note that the proposal is consistent with the **European Strategic Energy Technology Plan** (COM(2007)723), which emphasises the need to develop the market competitiveness of the next generation of renewable energy technologies.

3. Biomass Action Plan

In December 2005, the Commission adopted a Biomass Action Plan (COM (2005)628) designed to

1) increase the use of energy from forestry and agriculture by creating market-based incentives for its use, and
2) to remove barriers to market development.

In recognition that the key problems lie in market confidence and attitudes, rather than costs, the Commission proposed to review existing legislation and, to take a different approach from earlier directives. In order to secure a sufficient supply of biomass support initiatives are proposed for

1) setting up supply chains linked to existing plants,
2) organising logistics systems,
3) developing co-operation between forest owners and
4) launching **National Biomass Action Plans**.

These plans are designed to reduce investors' uncertainty by assessing the physical and economic availability of different kinds of biomass, including wood and wood residues, as well as wastes and agricultural crops. Action Plans should **identify priorities for the types of biomass to be used and measures that will be taken** at national level to promote this.

It is stated in the Biomass Action Plan that the Commission will finance a campaign to inform forest owners about energy crops and the opportunities they offer. A review of the impact on forest based industries of the use of wood and wood residues for energy will also be undertaken. Consideration will also be given as to how to develop a European spot market in pellets and chips. The Commission will continue to encourage the development of the **Biofuel Technology Platform** and research into the "bio-refinery" concept and second-generation biofuels will be given a high priority.

4. EU Forest Action Plan 2007-2011

EU Forest Action Plan (COM(2006)302) provides a framework for forestry-related actions at EC and Member States level and serves as a co-ordination instrument between EC actions and the forest policies of the Member States. The Action Plan has four main objectives:

1) improving long-term competitiveness,
2) improving and protecting the environment,
3) contributing to the quality of life and
4) fostering co-ordination and communication.

There are 18 key actions which the Commission implements jointly with the Member States. **Key action 4 addresses the promotion of the use of forest biomass for energy generation.** The Standing Forestry Committee will support the implementation of the Biomass Action Plan, in particular, the development of markets for pellets and chips and the provision of information to forest owners about the opportunities of energy feedstock production. According to the Plan the Commission should facilitate investigations of experience on wood mobilisation and **Member States should assess the availability of wood and wood residues** and the feasibility of using them for energy production at national and regional level. The Commission will continue to support **R&D of technologies** for the production of heat, cooling, electricity and fuels from forest resources.

Key Action 5 places a responsibility on Member States to support the **development of advisory services** for forest owners and their associations and to encourage co-operation between forest owners, industry and third parties in the **development of technologies and efficient markets**.

5. Standing Forestry Committee's report on mobilization and efficient use of wood and wood residues for energy generation

The Standing Forestry Committee ad hoc working-group on wood mobilisation was launched in July 2007 as part of implementation of EU Forest Action Plan's key action 4. A year later the working-group published its report addressing the issues of wood availability, factors affecting demand and supply and challenges to the mobilisation of wood. The report's recommendations focus on the need to improve wood mobilisation in eight key areas, resulting in synergies both for the forest-based industries and energy producers. These areas are:

1) to improve data on supply and use of wood,
2) **to develop national /regional wood mobilisation strategies**,
3) **to increase the potential of wood for energy and material use**,
4) to ensure sustainable provision of forest biomass,
5) **to develop and maintain efficient wood supply chains and markets**,
6) to strengthen efforts to increase forest owner motivation, organisation and awareness,
7) **to enhance support mechanisms, incentives and co-ordination efforts for wood mobilisation** and
8) to promote research and technological development in

the field of forest production, harvesting technologies and wood utilisation.

The report states that the conditions for wood mobilisation vary considerably from region to region and for example in new member States and Eastern European countries, where state forests often dominate, emphasis is required to promote the use of forest residues and low value timber and related markets.

From the point of view of state forest managers the following actions should be considered as **high priority**:

1) to establish task forces to develop **national wood mobilisation strategies**,
2) to disseminate knowledge re the **silvicultural potential** to increase wood supply from coppice management systems, providing guidance re optimal rotation periods and harvesting techniques,
3) to support **forest infrastructure** developments by using Rural Development measures,
4) to explore the **options to improve road transport, including weight and dimension limits** as well as diversification of transport means (railway, water transport),
5) to encourage **partnership between private and public players**, namely state and municipal forest enterprises for wood mobilisation throughout the whole supply chain.

6. Communication on innovative and sustainable forest-based industries in the EU

In February 2008, in contribution to the EU's Growth and Jobs Strategy the Commission launched EU (COM (2008)113) a communication on innovative and sustainable forest industry. The communication highlights the **challenges for the EU forest industries** as access to raw material, impact of climate change policies, innovation, trade with third countries and communication. It is stated that forest-based industries use large quantities of wood and its availability at a competitive price is a determining factor for their performance. In paper making more than 30% of the total cost of production is wood cost, and in the sawmill industry this increases to 70%. The communication addresses the need to take into account the increasing competition for wood as a raw material in different policy contexts, such as renewable energy, biodiversity, recreation etc. The document describes a set of actions to improve the competitiveness of the EU forest industries. With respect to **access to raw materials** it is proposed:

1) that Member States, industry and forest owners should promote **afforestation and active forest management**;
2) to explore additional solutions for supply besides mobilisation;
3) that the Commission should launch a study identifying solutions to improve collection procedures and stimulating **recovery of wood among consumers and producers**;
4) to establish a Round Table with industries, timber importers and other stakeholders under the Advisory Committee on Forestry and forest- based industries to develop private sector measures to exclude the trade and use of illegally harvested timber and products;
5) to clarify the application of **public procurement** directives for wood;
6) that Member States and the Commission should pay attention to the different uses of biomass when developing the national action plans and in context of general monitoring and reporting on renewable energies.

Conclusions and recommendations

In March 2007, the members of EUSTAFOR adopted their position on renewable energy, stating that they want to be key-enablers in mobilizing wood and to support the implementation of renewable energy policies on their managed forest area. It was stated by EUSTAFOR that:

1) from a mid- and long-term perspective, its members dealing with biomass issues, are ready and willing to establish services and support the logistical and organisational concepts for the sustainable mobilisation of unused potential forest biomass,
2) the members will offer their know-how and experience both to the policy making institutions and the private forest owners and their associations and
3) from a short-term perspective its members will actively participate as stakeholders in establishing the national renewable energy action plans.

In the light of the policy framework and commitments presented above the overall recommendations for the state forest managers are:

1) to initiate/support the establishment of **national task forces** to develop wood mobilisation strategies and provide professional input to the preparation of National Renewable Energy Action Plans,
2) to continue the **exchange of best practice** between themselves and private forest owners re wood mobilisation,
3) to develop **services** for, and **partnership models** with private forest owners' organisations, to engage more woodland owners in active management, to improve forest infrastructure and to enhance the efficiency of supply chains.

Setting the agenda-
the way of Österreichische Bundesforste AG within the biomass and bio energy sector

Roland Kautz

The article describes how Österreichische Bundesforste AG, OBf, as a European State Forest Organization, embeds its business development while participating in the overall process of establishing strategic frameworks within the Renewable Energy Sector Policy Development. Secondly, as a result, the article gives an example of how ÖBf expands and conducts its business in the biomass and bio energy sector.

Participating in the Renewable Energy Sector Policy Development Process

Österreichische Bundesforste AG, OBf, manages 514.500 hectares of forest with an annual harvesting volume of approx. 1.9 M m³. It is responsible for the supply of 1.2 M m³ to Combined Heat and Power Plants in which ÖBf hold a share interest. Recently a business centre for small and medium scaled hydro power plants was established.

As a relevant stakeholder in the policy development process to establish a Renewable Energy Sector (RES) Strategy, ÖBf participated as a project team member in the Ministry's[1] Project "Renewable Energy 2020/Biomass Forests". The objectives of the project were to: (i) assess the potential for additional sources of renewable energy; (ii) identify necessary measures to realise the additional potential; and (iii) to demonstrate possible fields of conflict associated with an increased exploitation of renewable sources of energy. Given ÖBf's knowledge and experience within all three areas it was keen to express its support for the Project from the outset.

The work stream "Potential" assessed the ratio (past/present/future) of wood biomass assortments within the gross domestic timber consumption. Due to different ownership categories further assessments were done on forest area and growing stock development scenarios, thinning yield development, and increment-exploitation ratio. In addition, all data available from previous studies, undertaken by a number of organisations, ranging from NGOs to national and international agencies, were presented and discussed. The impact of cross border energy wood chains was reviewed. Finally strategies to address additional demand by mobilising existing potential domestic sources and / or imports were considered. The overall potential was estimated to 2010 and 2020 respectively.

The work stream "Measures" was tasked to identify key factors necessary to mobilise the identified potential biomass resource. It was shown that in the current system, production of energy wood is a by-product of established forest management practice and its mobilisation is directly correlated to movement in the price of timber. The measures were grouped into four themes. (a) Technology and Logistics. This identified the use of GI-Systems, additional forest road construction (accessibility), and optimising and redesigning existing transport logistic models; (b) Organizational Structure. This recommended improved advice for forest owners, greater co-operation and co-ordination between authorities, professional representatives and forest owners, and the setting up of various demonstration projects to promote an understanding of how to function in the Value Added Timber Chain; (c) Information, Marketing, Awareness raising and Education. This includes numerous initiatives e.g. communication models, adapted information gathering, educational programmes etc. and (d) Services and framework conditions. This includes such measures as establishing local liaison officers enabled to deal with timber mobilisation issues in small-scale forests, reassessing employment opportunities and the provision of public funded data. Finally forestry subsidies have to be reconsidered for measures which result in increased timber production for energy.

As result of the work stream "Possible fields of conflicts" the following factors of interest were discussed in terms of problems/existing requirements/solutions: Nutrient deprivation, Biodiversity, Air quality with respect to biomass combustion (fine particulate matter, nitrogen oxides, heavy metals) and the competition for material between conventional timber users and the energy market.

[1] Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management

Within the project team ÖBf as a stakeholder in both the Austrian Forest and wood mobilisation sector was able to demonstrate that the greatest challenge to increased energy wood production, lay not in supply chain logistics, but rather the organisational issue of how to mobilise resources by balancing economic and ecological concerns and interests. The development of an integrated model was the most crucial step in demonstrating the way forward and securing buy-in within the State Forest Organization. By implementing new policy concepts it has proven possible to service the needs of both the established timber markets and the new and developing energy market. The net result has been to achieve additional value for the Owner of the State Forest Organization-the Republic of Austria.

A show case: From the idea to a running business model: The CHP activities of ÖBf (Vienna Simmering)

In 2002, following the introduction of the Green Electricity Act Obf undertook a strategy review and decided to develop its business in the field of small and medium scaled (2-30 MW)combined heat and power plants (CHPs). Further, in 2004 the municipal energy utility of Vienna (Wien Energie) and the Österreichische Bundesforste AG signed a contract to jointly develop and operate Austria's largest biomass co-generation (combined-heat-and-power production, CHP) plant, to be fired almost exclusively with wood chips from forest residue. The new generating unit, located at an existing thermal power generation site in the city of Vienna, will predominantly be fuelled with wood chips from forest residues available in the locality. The plant will have a total thermal heat capacity of 65.7 MW_{th} and an anticipated investment cost of around € 52 million. It will feature an electrical capacity of 23.5 MW_{el} during summertime, and 15.1 MW_{el} of electrical capacity and 37 MW_{th} of thermal capacity when operated in CHP mode during winter. On average, the energy generated is sufficient to meet the electricity needs of about 48,000 urban households and the heat requirements of nearly 12,000 dwellings. The plant was put into operation by mid-2006 and incorporates state-of-the-art wood-fired CHP combustion and flue gas cleaning technology. It is considered useful for demonstrating Austrian know-how and expertise in the construction and operation of large-scale wood-fuelled energy conversion plants, which could be exported in the future especially to Central and Eastern European (CEE) countries, but also to other countries throughout the world. Given the urban location and significant biomass input requirements, fuel delivery logistics play an important role – not only from an economic point of view, but also in respect of supply security and environmental impacts. It is envisaged that most of the woody biomass required for the operation of the plant (around 600,000 m³ loose p.a.) will be sourced by ÖBf's as roundwood from the surrounding area (< 100 km radius). The roundwood will be delivered to a transhipment centre near the plant, where a stationary chipper produces the wood chips needed. This helps to keep both fuel delivery costs and adverse environmental impacts at a minimum. ÖBf put a lot of emphasis on the main driving forces behind the whole development process. These include, among others, the role of key players involved, as well as favourable buyback rates for renewable electricity fed into the grid provided by the Austrian Green Electricity Act 2002. From a case study we deduced the following important drivers and success factors for the realisation of large bioenergy projects in urban settings: (1) a critical mass of players; (2) political support; (3) a decisive problem solving culture; (4) institutional innovation and changes in the mindset of main decision makers; (5) favourable economic conditions; (6) change agents that are actively engaged from an early stage of development; (7) intra-firm supporters at different hierarchical levels and from different departments; and (8) the conduct of targeted study tours that help to reduce uncertainties, to enable leapfrogging in project planning and design, and to build up confidence in the overall project's feasibility.

The experience of being a player in the developing biomass and bio-energy sector has proven that for State Forest Organisations, innovation, readiness and willingness can offer new opportunities and lead to an active participation in the development of this new sector. As a consequence, the know-how and experience gained out of this process has become a most valuable asset for our organization. We are now able to demonstrate support and expertise within the biomass and energy sectors in terms of politics, strategy, business planning and day-by-day management.

Available sources of forest biomass for energy production

Pavel Hes

One of the bases for planning the utilisation of usable forest biomass for energy production is an estimation of the available sources thereof. However in the calculation, we must consider not only the limitations in terms of the principles of sustainable development, nature conservation and environmental protection, but it is also necessary to include economic parameters as well.

Information on the potential of forest biomass serves as an initial analysis, not only during the preparation of contractual relations pertaining to particular spatial units of state forests, but also during negotiations with potential consumers in order that there is sufficient raw material for their investment projects. Investments in the utilisation of biomass are long-term, and as such, potential operators turn to large forest owners in an attempt to secure a sufficient amount of raw material. The basis for such negotiations include not only the available current quantity of forest biomass, but also other factors, such as average transport distance, temporal and spatial availability and long-term availability. Nevertheless, potential consumers often demand a contractual undertaking of LČR (*Forests of the Czech Republic, state enterprise*) of an amount we cannot fulfil, either in terms of time, or volume. Often the price offered is unrealistic too.

When determining the forest biomass potential we include all available sources, e.g. harvesting residues, or material left after silvicultural operations such as pruning. The harvesting of forest biomass should be understood as an additional operation to the logging of timber and it is most suited to commercial forests, or tree crops specifically grown for biomass.

Since these are relatively new practices to the Czech Republic, unlike with conventional harvesting, there are no generally recognised business standards, e. g. recommended rules for timber measurement and grading. Energy companies set their purchase prices based on the amount of purchased energy (CZK/GJ). This unit is difficult to apply in forest practise, as many factors are outside the influence of the forest owner e.g. moisture content and the actual quantity of residues harvested. On the contrary, if the calculation of the volume of biomass harvested could be related to the type and yield of the felling operation conducted, which is a quantity easily traceable in forestry records, this would best suit the needs of the forest owner.

When calculating the potential quantity of forest biomass available for energy purposes, the following groups of issues should be addressed:

Selection of suitable forest land and calculation of biomass potential:

- The selection should exclude all forest stands where the soil conditions are not suitable for the mechanised harvesting of residues – e.g. steep slopes, or wet sites. (N.B. even though, for example, during a frost, or long-term drought, it is possible to drive machinery onto gleyed soils, they should be excluded). Also unsuitable are dry skeletal sites where it is advisable to leave the biomass for the mitigation of drying. Similarly sites of low fertility dependent on enrichment with humus and decomposition of biomass should be excluded.
- All forest stands with a high recreation and/or conservation value should be excuded.
- The selection of forest stands should be limited to sites where the collection of logging residues is not sustainable from a nutritional perspective.
- The mechanical harvesting of brushwood and its chipping requires a certain minimum quantity of brushwood in order for the production of chips to be economical. This limits its application to clear cutting operations, to thinning operations carried out by mechanised harvesting , and to salvage logging. Shelterwood systems of management based on natural regeneration are also unsuitable for the mechanised harvesting of brash, both from an economic, and a silvicultural point of view (destruction of undergrowth). Fragmented forest tenure (small forest units in the middle of someone else's property, small forest complexes in the middle of fields etc.) is not suitable for the production of biomass, either.
- The accessibility of stands in terms of transport distance is limited to a defined catchment, beyond which the utilisation of biomass is uneconomical. Accessibility may also be limited by snow cover, which in some locations significantly limits the time frame in which collection and gathering of brushwood can take place (issues include snow covered biomass and / or; waterlogged soils following snow melt).
- When determining suitable areas, the issue of forest certification, or other legislative requirements, that would limit the possible extraction of energy biomass must also be taken into account.

When estimating the potential forest biomass resource it is necessary to include the following in the calculation:

- The conversion coefficient between the volume of utilisable timber harvested in the stand and the volume not utilised further (smallwood, cuttings, breaks, tops, strong branches etc.) This is heavily dependent on tree species, age, previous management (close spaced stands have a higher proportion of smallwood) and the type of felling.
- The maximum practical yield of logging residues is approximately 80% of the potential available volume. Practical availability is limited by micro site conditions, the machinery used, and the dispersed nature of biomass across the area. An effort to achieve higher utilisation of logging residues would result in a decrease in machine productivity, making the whole operation uneconomic and, at the same time, there would be a higher contamination of the biomass by stones, mud etc.. The remaining 20% balance of biomass not harvested does not usually hinder subsequent activities (regeneration of the stands) It also serves in terms of the replenishment of organic matter and nutrients to the soil.

Other important considerations in connection with an estimation of forest biomass potential include:

- The annual delivery schedule / availability must reflect limitations due to seasonal weather conditions e.g. snow.
- In the event that the catchment area is severely hit by a natural disaster (e.g. windblow), the consequence will be major variation to the supply schedule, possibly extending over several years. Initially there will be a glut of material, but then this will be followed by a slump associated with a decrease in the felling volume.
- The demand of local residents for fuel wood, as this may significantly affect the quantity of available biomass.
- Competing market demands between conventional outlets for industrial wood e.g. wood pulp and the energy market.

Preliminary conclusions imply that many studies into biomass potential overestimate availability. This is primarily because they are too theoretical in nature and do not consider the issues discussed in the foregoing. On the basis of such studies, often unrealistic demands are made to the state enterprise regarding a guarantee for deliveries. These do not only request higher volumes than feasible, but also, urealistic even delivery schedules, that do not reflect seasonality. In addition, the purchasers' demands re the technical specification of the biomass fuel in terms, of moisture content and calorific value, are often unrealistic from a supplier's perspective.

An internal directive is currently being prepared which will comprehensively deal with LČR's approach to the sale of energy wood. This will address both contracts and marketing. Information on biomass potential is one of the key foundations to this work.

Forest biomass
supply chain and logistics developments

Ulvar Kaubi

Sources of bioenergy have a pivotal role in increasing the share of energy generated from renewable sources in the European Union. In its Note “Biomass Action Plan”, 2005, the European Commission invited Member States to prepare national biomass action plans. In line with this, the action plan for promoting biomass and bioenergy use has been prepared in Estonia.

One of its goals is to increase the awareness of forest owners and energy producers re the potential use of forest biomass as a diverse and economic renewable resource. In order to promote energy production based on forest biomass and to ensure economic management of forests, it is important to have accurate information both about the existing resource and the energy production enterprises using, or planning to use, these fuels. It is necessary to develop an optimum logistics model. The model would forecast the potential woody biomass in the form of stemwwood, harvesting residues and stumps available from a given area. It would further assess the environmental effect of gathering these resources, and also propose optimum solutions for the logistics of mobilising the resource. Implementation of such a model would support both the forest owners and the energy producers in expanding the use of forest biomass.

One of the priorities is to increase the proportion of energy production generated from renewable energy sources and for it to be economically viable and cost effective. This is possible by employing an efficient logistics model. In the declining market conditions of the current decade, the potetial of using wood as a renewable energy source is far greater than at times when there is high demand for wood. The prices and volumes of raw materials utilised have both fallen due to the reduced capacity of the wood processing industry. As a direct consequence harvesting activity has decreased. In today’s circumstances the energy producition sector offers a real economic alternative to forest owners to sustain forest management activities. Baring this in mind, the resource needs to be mobilised better and supply chains must be implemented that ensure that both the demand and quality of raw material required for energy production are met. On the other hand, the delivery chain of woody biomass for energy production is significantly longer when compared to the delivery chain of the traditional wood industry.

As a general rule,a state forest manager, when compared to a private forest owner, is responsible for a wider forest area and is therefore able to access larger quantities of forest products. In Estonia, the majority of forests are in private ownership. As the average size of a cadastre unit in private ownership is relatively small (only 7.8 ha), there are many forest owners (ca. 60,000), and organising felling in such forests is logistically complicated. RMK as the manager of state forests manages 37% of the total forest area of the country. There is therefore a tension between the relatively low value of the product and the cost of mobilising the resource. This is a logistical challenge for the supplier and the processor and both parties have to work together to find the optimum solution. European countries are using similar technologies for gathering biofuels. Any differences stem from the national regulations, the availability of support measures for using renewable energy sources and the economy-political state of the energy producing sector in the relevant country.

In a narrower sense, our biggest challenge today is finding and implementing suitable technologies for harvesting woody biomass. Harvesting systems must address a number of factors including the road infrastructure, the size and nature of felling locations, the options and requirements for long-term storage of raw materials, and the expense of producing and transporting biofuels. Harvesting systems must be supplemented, or changed, in such a way that the harvesting of energy wood can be integrated into the traditional harvesting of sawlogs and pulpwood.

In the wider sense it is important to ensure that “green energy” production is always prioritised over energy produced from other kinds of fuels (mainly fossil fuels). Today, the supply chain is focussing on stumps as a source of biomass. If the expense of harvesting the resource starts to exceed the potential benefit, then the resource will remain unused. The expense of transporting material out of the forest is high, and in order to ensure cost competitiveness and the continued development of the sector, there is a need to review current legislative limitations to transport. The following limitations for all means of transport have been in force in Estonia since 1996, a maximum truck length of 18.35 m, and a maximum Gross Vehicle Weight, GVW, – 40 tonnes. The forest and wood industry has suffered more than most due to the overall economic crisis and it is important to establish conditions facilitating its development and recovery.

The following steps are necessary to develop the potential of biomass for energy production:

- Developing a logistics model that would help decrease transport costs;
- Facilitating the use of renewable energy resources by establishing relevant legal regulations;
- Notifying consumers about the benefits of domestic renewable resources;
- Implementing support measures for promoting economic forest management, including use of renewable energy sources;
- Increasing the competitiveness by alleviating transport limitations.

RMK as the manager of state forests is interested in multiple use of forest ownership. In addition to utility wood resulting from normal forest management it is also important to develop the market for woody biomass suitable for energy production. The development process must consider the opportunities of both large and small scale forest owners and must keep in mind common interests. Dealing with the above stated problems is important for facilitating the production of renewable energy, and solutions need to be developed at both state and local level respectively.

Stump Harvesting:
Guidance on Site Selection and Good Practice

Mike Perks **Tom Nisbet** **Bruce Nicoll**

"Forest Research (FR) is an agency of the Forestry Commission and is the leading UK organisation engaged in forestry and tree related research. FR provides the science and advice to underpin forestry policy and practice, principally in the UK and on behalf of the Forestry Commission. The Forestry Commission is thus the major customer for FR but in addition, FR has a range of customers from other UK organisations and the Commission of the European Communities (CEC), and our research and development work is often linked with partners and collaborators worldwide. Researchers are experts in forest science and land use and their work focuses on practical solutions to tree, woodland and forest management and sustainability (www.forestresearch.gov.uk)."

Site Selection for Stump Harvesting – Developing a Risk Based Approach Forestry Commission GB

Background

The need to reduce carbon emissions has led to the development of alternative energy sources, including biomass for fossil fuel substitution. Throughout Europe forest harvesting residues are increasingly being used to supply biomass for heat and power generation and attention is now turning to the potential to utilise tree stumps. This is the case in Great Britain, GB.

A protocol has already been provided on site selection for harvesting forest residues, specifically brash (Forestry Commission, 2007). This does not address the issue of stump harvesting and thus there is a requirement for additional guidance to assist the forest industry in identifying where stumps may be harvested sustainably, and on any environmental safeguards that should be applied.

Stump harvesting has the potential to make a positive contribution to economic development and mobilisation of wood fuel, but it also poses a number of potential risks to the forest environment that can threaten sustainable forest management. However, where these risks can be reduced to a low level, the benefits of increasing the use of biomass for energy may outweigh the potential disadvantages.

Introduction

This article outlines the development of a risk-based approach to site selection for stump harvesting, primarily, but not exclusively, on the basis of soil sustainability and water protection. It details the underlining methodology developed by the Forest Research Agency of GB Forestry Commission, which has been used to provide Forest Managers with practical guidance re site selection. An interim guidance note will be available as a download in Spring 2009.

For the purpose of this note, the 'stump' is defined as the basal part of the tree remaining in the ground after felling, with most large woody roots attached. The most widely used stump harvesting system in GB utilises a purpose built stump harvesting head, incorporating hydraulic shears, mounted on a tracked excavator. Stumps are pulled out of the ground, split and shaken in an attempt to remove soil. The processed stumps are temporarily placed in 'wind-rows', and then extracted by forwarder to roadside for storage before being taken by truck to be chipped and burned.

There are four principal risks to soil sustainability that must be considered:

1. Increased soil damage due to compaction, rutting and disturbance leading to erosion and increased turbidity and siltation of local watercourses.
2. Removal of essential major and micronutrients (e.g. nitrogen, phosphorus, potassium and boron), leading to lower soil fertility, and potential loss of tree growth in subsequent rotations.
3. Removal of base cations (calcium, magnesium, sodium and potassium) reducing soil buffering capacity and leading to increased soil and stream water acidification.
4. Increased carbon loss from disturbed soil after stump harvesting leading to reduced soil carbon stock.

A pre-requisite to site selection for managing these risks is a knowledge of soil types across the harvesting coupe. The assessment of site suitability should be based on the main soil types, which are defined as those occupying >20% of the coupe. However harvesting practice needs to reflect smaller areas of more sensitive soils, particularly those at high risk of ground damage and delivering sediment to watercourses. Where it is difficult to distinguish between risk classes, a precautionary approach should be adopted and the higher class selected. Alternatively, advice can be sought from an experienced soil surveyor.

Table 1

Examples of the determination by Soil Group of Combined Risk from the individual relative risks of ground damage, soil carbon loss, soil infertility, and soil acidity from complete stump removal.

Low risk (L); Medium risk (M); High risk (H).

Soil group	Soil type	Ground damage	Soil Carbon loss	Soil fertility	Soil Acidity	Combined Risk
Brown Earth	1, 1d, u	L	L	L	L	L
Podzols	3, 3m	L	L	H	H	H
Unflushed blanket bogs	11 a, b, c, d	H	H	H	H	H
Ground water gleys	5 (excluding 5p phase	M	L	L	L	M

Developing a Risk Based Approach to Site Selection.

A three-stage process has been developed to aid forest managers to select those sites where, subject to the implementation of appropriate safeguards, it is believed that stumps may be harvested sustainably.

The first stage is to consider each of the four factors listed above in turn, and, in respect of each, to categorise soils as **high, medium or low risk**. The next step is to combine the individual assessments to produce an overall rating by soil type as high, medium, or low, risk. The third, and final stage is to provide a summary of recommended best practice measures to control risks in relation to each category. This process is outlined in detail below:

Stage 1 - Assessing Risk

Taking each factor in turn:

1. Ground damage

The main parameters affecting the risk of ground damage are **slope** and **soil type**. Slopes >20^{o} are considered to be vulnerable to soil slumping/slippage and therefore stump harvesting should be avoided on such sites.

Soil types are categorised by risk of ground damage. Soils in the **low risk category** are unlikely to be significantly damaged by stump harvesting, providing that normal good practice is employed. Those in the **medium risk category** require restrictions to the timing of stump lifting and extraction, which should be limited to periods when the soil is relatively dry and better able to support machinery. Additional good practice measures address the design and management of brash mats for ground protection. The **high risk category** comprises soils that are highly likely to be damaged by, and thus are generally unsuitable for, the extraction of tree stumps.

2. Soil infertility

Again the approach is to categorise soils as **low, medium or high risk** in respect of soil infertility.

Soils in the **high risk category** are likely to be damaged by the additional removal of nutrients in stumps or brash, with consequent detrimental effects on site productivity in the medium to long term, while those in the **low risk category** are expected to be relatively unaffected. **Medium risk** soils are those that could sustain an enhanced removal of nutrients but with certain constraints, e.g. stumps should not be removed from these soils where brash (either with or without needles) is also to be harvested, since this would result in an excessive drain on site nutrition.

3. Acidification

The categorisation of soil types for risk of site infertility is broadly applied to the issue of acidification since soil buffering tends to be directly related to soil nutrient availability.

Soils in the **low risk category** are considered able to withstand the additional removal of base cations in stumps without detriment to the soil in terms of acidity and buffering capacity. Those in the **medium risk category** are vulnerable to such losses but this can be countered by only removing stumps, or brash, but not both. Careful management of brash masts is also required to prevent the development of more acidic soil bands. Soils in the **high risk category** are unlikely to be able to sustain the extra drain on base cations from stump harvesting, and therefore this practice should be avoided unless the base cations are replaced by fertiliser, limestone or wood ash applications.

4. Soil Carbon Loss

More carbon is generally stored in soil than in the above-ground parts of forests. This is in the form of litter, soil organic matter (SOM), biomass, and soluble carbon. Stump extraction involves extensive soil disturbance in terms of relative area and depth, with the result that decomposition rates are likely to increase, thereby increasing CO_2 release from the soil.

A lack of empirical evidence makes it difficult to predict the impact of stump removal on the exchange of CO_2 and other greenhouse gases for different soil types. Until such information becomes available, a simple soil classification is adopted based on the expectation that the scale of carbon lost will be directly related to the proportion of SOM. Soils are classified into three risk categories based on the depth of peat layer and thus the amount of soil carbon that could be potentially lost by enhanced decomposition.

Those with a peat depth of >45 cm are categorised as **high risk** and considered to be at greatest risk from disturbance and therefore should be excluded from stump harvesting. The **medium risk** category comprises soils with a shallow peat layer of between 5-45 cm depth. Stump removal may be possible on some of these sites provided care is taken to limit the extent of soil disturbance. The remaining soils with relatively low SOM content are classed as **low risk**.

Stage 2 - Combined Risk Assessment

The categorisation of each soil type for each factor into a risk category (Low, Medium and High) is recorded in a matrix. The individual assessments are then combined on the basis of assigning soil types by their most sensitive classification. In this way a precautionary approach to site selection is ensured. The process is applied to each of the 13 main soil groups and their associated soil types in GB (Table 1).

Stage 3 – Recommended Good Practice

The third and final stage is to provide guidance on managing the risks . The greater the risk, the more operational controls required. This approach recognises that even “low risk” sites can be damaged if good harvesting practice is not observed. Conversely, “high risk” may be harvested where there is an operational imperative, e.g. for habitat restoration.

Increasing precision of guidance

This initial guidance is largely based on expert judgement of the scientific issues informed by practical experience of managing forest soils. Guidance will be regularly reviewed and updated as new research findings become available, with the initial review of the impact of operations and research evidence likely within 12-18 months of publication of the interim guidance on site selection.

Other issues

The guidance focuses on soil and water protection, but recognises that stump harvesting presents other issues, including the need to protect wider constraints from disturbance. Important aspects include:

a) Biodiversity

b) The historic environment (both above, and below ground)

c) Restocking / regeneration

d) Riparian buffer zones

e) Roads infrastructure and stacking space

f) Health & Safety

g) Potential Markets & value.

Publication

The interim guidance on site selection and good practice will be published in Spring 2009. It can be downloaded from http://www.forestresearch.gov.uk/woodfuel

Acknowledgements

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Policy
Development Process

Ciaran Black

The Irish Government's energy policy framework for the period up to 2020 sets out a number of ambitious targets specifically in relation to biomass for energy. Two targets in particular are very important for the biomass sector:

- Electricity generation at Ireland's peat stations are to be 30% co-fired with biomass by 2015;
- And Renewables are to hold a 12% share of the heating sector by 2020.

In volume terms, these targets represent a demand for approximately three million tonnes of biomass material per annum by 2020. This is significantly above the current availability of biomass in Ireland and it is clear that in order to move towards meeting these targets considerable work needs to be done to maximise the potential from multiple sources of biomass and to create efficient and economically sustainable supply chains.

Coillte, as a major player in Irish forestry, is committed to developing our biomass resources to meet the challenges of Ireland's renewable energy revolution. Coillte believes that biomass will have a significant role to play as an energy source in Ireland but it will take time to develop and will face many challenges.

Using wood for energy is nothing new, but in recent times its renewable and environmental credentials is driving unprecedented levels of interest. Wood, however, also has an important role to play not only in energy production but also in climate change mitigation through the production of environmentally friendly products and carbon sequestration. Coillte believes that the distinct roles of wood for products and wood for energy must both be recognised and supported. Policy in Ireland needs to be careful not to promote wood for energy to the detriment of the wood processing sector and in turn undermine the climate change benefits of wood products.

Coillte's guiding principle in developing sources of wood biomass is firstly to use wood to create products and then to seek out the remaining material (which is often left in the forest) and direct that into the energy market. To ensure against any counterproductive trade off between the wood processing and wood energy sectors, Government supports and incentives should be directed where they benefit both sectors. In particular, policy should focus on the early stages of the wood supply chain and create supports and incentives to get wood out of the forest and ready for use (e.g. supports for the thinning and harvesting of forests and for haulage). Carbon benefits and climate change mitigation can be the justification for new supports and incentives designed to create major new drivers in the development of both the wood biomass and wood processing sectors. This would have the effect of promoting wood use in general, with all its positive environmental attributes, through more competitive prices of end products.

In the wood processing sector, the functionality of wood should cascade from a primary product, to re-use and recycle and then to energy. To encourage this approach support is required for research into the initial processing of wood and to sorting and cleaning technologies to ensure that wood is more easily reused and recycled and is not treated as waste before its full potential is realised.

Ireland's indigenous biomass resources are limited and relatively small in absolute terms. Biomass, therefore, should be used as efficiently as possible, that is, it should produce the maximum amount of final energy given a specific quantity of biomass. Wood biomass is best used as a heat source and in CHP installations. To this end, decentralised use of wood biomass fits very well with efficiency objectives in terms of keeping plant location close to the source of supply with an appropriate level of volume demanded per installation. It is preferable to have a blend of a few large scale highly efficient plants combined with many smaller decentralised installations.

Also in order to maximise the potential of available wood biomass, policy should support all types biomass material and all sizes of biomass users. In this regard it is important to ensure that the level of processing is appropriate to the end use (in general, the larger the scale of installation the less processed the biomass fuel needs to be). This means ensuring the production of a broad a range of biomass fuels rather than an over-concentration in any one particular fuel grade to the exclusion of others. Furthermore, support should be given to research into the sources of wood biomass and the systems required to bring it to market.

In line with this approach, Coillte has undertaken a series of field trials and research in relation to forest residues (i.e. wood material that is unsuitable for processing into wood products, typically "lop and top", unmerchantable stemwood and potentially even stumps). The focus of this work is on assessing the volumes available and the efficiency of various collection techniques. Initial indications from these studies are that the volume of recoverable material is less than might be expected and that collection techniques are relatively expensive. While it is clear that forest residues are not an abundant and easily collected material, Coillte is committed to maximising the potential of this biomass resource and is confident that the further work already underway will bring more promising results and contribute to meeting the targets of Ireland's renewable energy revolution.

Biomass activities
the Latvian State Forest Sector

Latvia
Ainars Sedlenieks

The joint stock company Latvijas valsts meži

The joint stock company *Latvijas valsts meži (LVM - Latvia's State Forests)* is responsible for managing 1.6 million hectares of Latvia's territory, including 1.4 million hectares of forest. Every year LSF sells an average of 4.6 million cubic metres of wood and wood products

Forests have traditionally played an important role in Latvia's culture and economy. The wood extracted from these forests has always been an integral feature of people's lives, throughout their lifetime, from the cradle to the grave. Over the centuries, both the forest landscapes and the means for using their resources have changed. The active trade of forest products in Latvia goes back at least to the 12th century, when these were exchanged for precious metals, salt, cloth and other goods.

The trade of wood and wood products increased significantly during the 17th century. Special laws regulated the use of mast trees or spars, for this was the most expensive material. The second most valuable product was oak logs, which were used in shipbuilding, while oakwood of secondary quality was used for making barrels. With the advent of the industrial age, wood began to be used increasingly for the construction of railways and correspondingly less in shipbuilding. Sawmills and furniture manufacturers were set up across the country.

Both then and now, Latvians have been making sure that they not only take, but also give back to the forest. Forest management is regulated by a series of laws, and measures are successfully being implemented to increase the area of land covered by forests. Latvia's Forest Days, first launched 80 years ago in 1928, remain a popular tradition. People all across the country plant trees and clean up tracts of forest during this annual event.

At present, forest products account for a significant part of Latvia's exports and national earnings. The proportion of land covered by forests is continuing to grow and now makes up 56% of the country's territory. This is more than twice the amount registered in 1926, when forests covered only 23% of Latvia's territory.

Currently the annual increment in the volume of growing stock has reached 27 million cubic metres, while the average volume of felled trees does not exceed 12 million cubic metres per year in Latvia. Hence, the total volume of growing stock in Latvia's forests is steadily increasing every year. Along with the marketing of traditional wood products, *LVM* has been devoting increased attention over the past few years to the production and sale of wood-based energy products, thus gaining an additional means to earn revenue from the management of Latvia's state forests. Forestry in its classical sense provides a very slow return on investments that is often difficult to predict, which is why investments into this sphere of the economy are not always easy to obtain.

However, the biomass that can be obtained through selective, improvement cutting and through the maintenance of Latvia's forest infrastructure is sure to bring about a rise in capital return indicators. This is one reason why *Latvia's State Forests* is becoming more actively involved in the energy sector, but not the only one. The high world price of oil products has gradually conditioned consumers to pay more for the energy that they use. This has created the preconditions for the use of wood-based energy resources that previously would have been deemed too costly to be considered as viable sources of energy.

The European Union's promotion of the use of renewable energy resources is another factor that is contributing to the use of wood as a source of energy. One aspect of this policy is based on supporting the increased use of biomass.

For the above reasons, the use of wood-based products as energy resources might increase as much as fourfold over the next 50 years. As a result, there may even be a shortage of wood-based biomass used for energy production, together with a corresponding increase in the price of biomass. This trend has been corroborated by the most recent market data. At a time when the price of all types of roundwood is decreasing in Latvia, the price of woodchips as a biomass fuel has experienced a slight increase. In fact, the price of woodchips may rise several fold in the near future. Already at the present time, *LVM* is experiencing no difficulties in selling woodchips, even to such relatively distant locations as Nordic countries.

As a result of the recent global economic downturn, the worldwide demand for sawn timber has decreased in the construction sector, leading to reduced production at many sawmills and to a corresponding shortage of wood and cellulose chips. The lack of this resource has consequently driven up its market price. The time may come when many companies will be able to choose between the production of either pulpwood, other wood products or wood forenergy.

The total annual consumption of primary energy resources in Latvia has been stable since 2001 at between 180 and 200 PJ. The potential annual output of energy that could be obtained in Latvia through wood-based biomass is approximately 30 to 32 PJ (or 8.4 to 9 million MWh). Like other northern countries, Latvia consumes the greater part of its energy resources (more than 60%) for heating purposes.

Most of the centralized heating system infrastructure that was built in Latvia during the Soviet occupation is in poor condition. While firewood remains the traditional source of heating for individual households, the principal fuel for centralized heating systems is natural gas (70%). Nevertheless, nearly one quarter of centralized heating systems (24%) use wood fuel.

Statistics reveal that the average energy efficiency rate of centralized heating systems in Latvia is 68%, with the overall heat loss averaging 17%. In some cases, this heat loss even reaches 20 to 30%. Through reconstruction work and through the implementation of various energy efficiency measures, it is possible to achieve energy savings of up to 40%. If such measures are implemented, then an increase in the consumption of heating energy will be highly improbable, even if manufacturing production rates increase significantly.

A different situation has developed in the production of electricity. Every year, Latvia imports about 3 million MWh of electrical energy. With predictions for a continued increase in the country's GDP and in the welfare of its inhabitants, the amount of electricity that is consumed in Latvia is expected to rise significantly. However, by using the wood-based energy resources available already today, and by developing electricity production at cogeneration stations, it would be possible to cover not only Latvia's current power deficit, but also the predicted increase in demand for electrical energy.

Guntis Āboltiņš-Āboliņš, a business development and project manager at the oil and gas company *StatoilHydro*, believes that biomass cogeneration should be developed in a decentralized manner. At the same time, the volume of production and the type of technology employed should be optimized in accordance with the needs of each specific location:

"Theoretically, Latvia could become an energy exporting country, if it exported electrons or high quality biofuels to European consumers in the place of wood, chips and pellets ."

The idea to manufacture woodchips in Latvia arose a few years ago, following a number of exchange trips to similar wood-producing enterprises in other countries. By the year 2005, *Latvia's State Forests* had gained the firm conviction that wood-based energy resources can and should be manufactured in Latvia. Since Latvia's specific conditions would not permit the direct duplication of Nordic manufacturing practices and since further information was required about the situation on the ground, the Latvian State Forest Research Institute *Silava* conducted a detailed study of Latvia's forest resources in 2005. The study concluded that Latvia has tremendous potential for producing wood-based energy resources on a large scale.

The next step for launching the production of woodchip fuel required research about the available manufacturing technologies, as well as an estimation of the probable production costs. In 2006, the Forestry Research Institute of Sweden *Skogforsk* came forth with the results of a study that it had conducted for *LVM* in this regard. Besides establishing the costs for each stage of production, the study also provided recommendations about the most optimal technologies that could be used for processing the wood residue obtained at felling sites in Latvia and for turning this residue into woodchip fuel. Based on the results of this study, *LVM* then began to produce its own woodchip fuel from this residue.

Currently *Latvia's State Forests* produces and sells forest wood chips with an approximate energy yield of 0.16 million MWh. Since the demand for wood-based energy resources is continuing to rise, LSF is seeking to increase its production of these resources through other forest management activities. In this regard, *LVM* is now conducting a study to establish the most optimal technological means for processing such additional

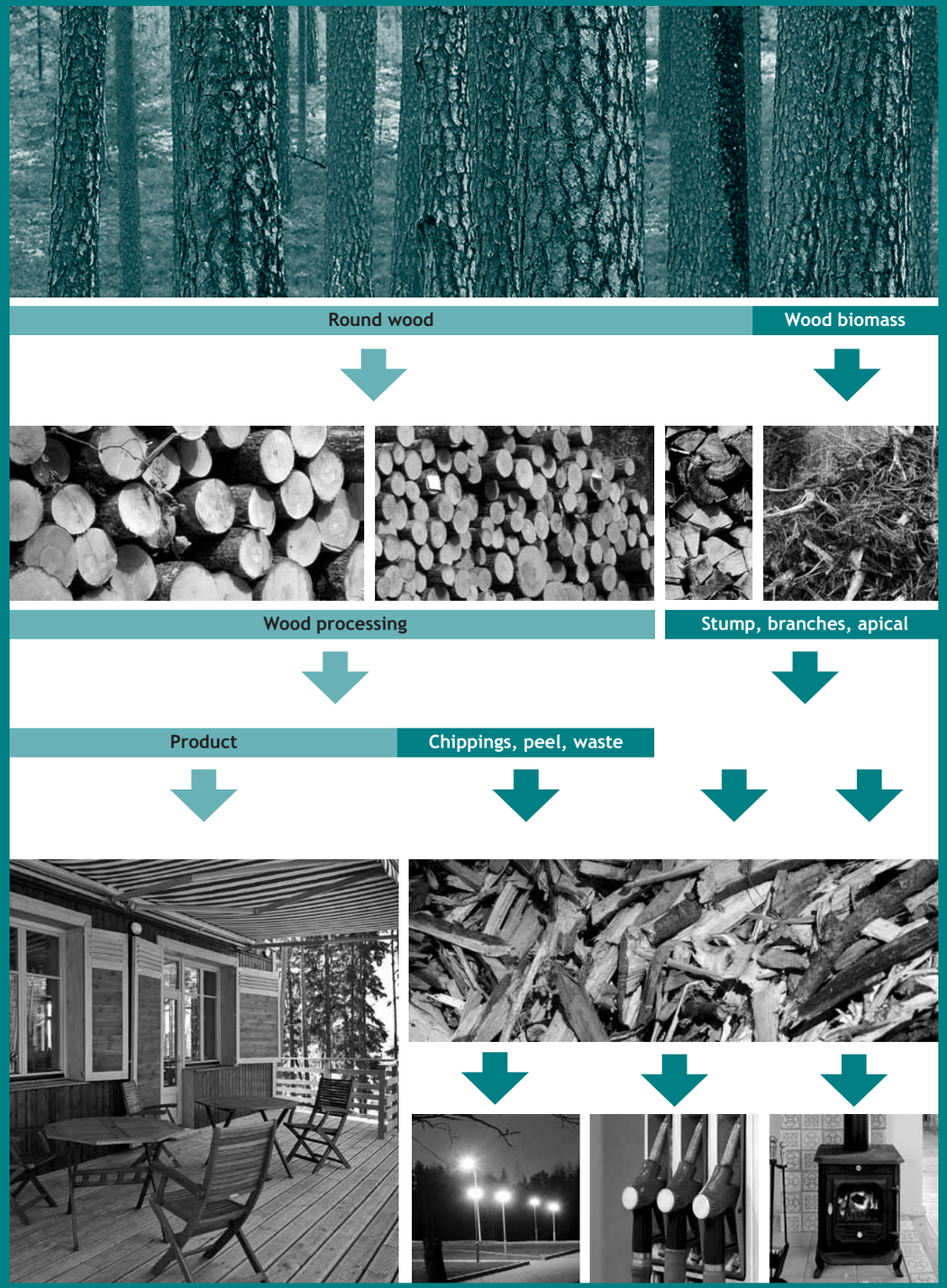
resources as young growth (saplings), roadside and ditchside growth, and tree stumps for the manufacture of wood-based energy resources.

Unfortunately, Latvia's consumers lack information about the economic potential of wood-based energy resources, which is why most of *LVM*'s biomass energy production is exported abroad. This applies to about 90% of the wood pellets and most of the woodchips produced in Latvia. One could say that Latvia's forestry sector is several steps ahead of the potential, domestic biomass consumer in its comprehension of current energy issues.

In order to promote the development of wood biomass-based energy production in Latvia as well, *Latvia's State Forests* is not excluding the possibility of participating in building its own energy production plants, for LSF has access to about half of the wood biomass resources in Latvia.

The wood fuel produced by *Latvia's State Forests* is not the company's only contribution to the energy sector. Currently Latvia obtains far more energy resources from the country's forests in a less direct manner, through the wood processing sector. In the processing of roundwood, a considerable volume of co-products is created (woodchips, bark, cuttings and wood dust), which are subsequently transformed into various other products that can be used for producing energy. Presently such wood processing co-products make up two thirds of the bioenergy produced through Latvia's forestry sector. By promoting the use of wood co-products, *LVM* is also stimulating the demand for forest roundwood. The more raw materials received by the wood processing industry, the more biomass will be available for the energy sector.

Latvia's State Forests primary goals are to ensure the sound and effective management of Latvia's forests, and to obtain the greatest possible yield of wood per hectare, thus increasing revenues for the company and for the country as a whole. Some might see this as going against nature conservation, but that is not the case. Quite the contrary, by intensifying Latvia's forestry activities (including tree planting), LSF is contributing to the capture of carbon dioxide (CO_2) emissions from the atmosphere and to the fight against climate change, as well as to the preservation of the earth's resources for future generations. We feel fortunate to have these valuable forest resources at our disposal. We are committed to continue managing them effectively, for the benefit of all of Latvia's inhabitants.



Biofuels
in the transport system

Norway

Ivar Asbjørn Lervåg

Global warming

The challenge of global warming has to be tackled by a wide range of solutions. In the short to medium time frame biofuels will probably be an important tool to reduce the emission of greenhouse gasses from the transport sector. Based on the commercial technologies that are available today, Norway's natural environment is less suitable for the production of biofuels as compared with many other countries in the world. Investments in developing technologies and products will lead to new kinds of biofuels based on wood as the raw material. Development of second generation biofuels will challenge all the component parts of the value chain, from industrial research to harvesting and transportation of biomass, to production and distribution in the retail market.

Present production and use of biofuels

Norway is currently in an early phase of biofuel production. During the last 5 years biodiesel produced from marine oils has been the dominant process, but there is now a substantial buildup of new production capacity mainly based on imported rapeseed oil.

The use of biofuels has so far barely been visible on the sales statistics, but biodiesel in low blend (B5) is now being phased in by several oil companies. The Norwegian government has announced a new fuel standard requiring 2% volume share of biofuels in 2008 and a 5% share in 2009. There is also a goal to reach a 7% volume share (approximately 5.75% when measured on energy content) in 2010.

Development and new initiatives

There are a huge number of initatives to develop second generation biofules based on wood as the raw material. The key players behind these efforts are public sector, commercial companies, NGOs and research institutions. The competence and resources of SFOs should contribute to different parts of these development programmes. The positioning of the SFOs should underline both the companys' social responsibility and long term commercial goals.

New technologies, industrialization and new markets are developed in co-operation between many players. SFOs endeavors in developing second generation biofuels must be in conjunction with official programmes, or initiatives made by other commercial players.

Areas of SFO initiatives

In this early stage of second generation biofuel development there are a number of areas where SFOs could be an important player, namely:

- Research and development – new technology, reducing capital and operational costs in all parts of the value chain
- Establishing pilot plants and industrialization
- Assessment of the available forest resources to support the production of biofuels
- Access to forest resources in an early stage of the industrialization
- Establishing a commercial framework to promote investment decisions

Statskog have joined two programmes in developing the second generation of biofuels:

1. Xynergo – pilot plant of biofuel production

Xynergo's first objective is to build a prototype plant for the production of synthetic diesel based on woody biomass at Follum in Norway. Such diesel will be virtually CO_2 neutral. Moreover, fuel production based on woody biomass means that the raw materials will not compete or conflict with food production.

Xynergo is owned by Norske Skog, Viken Skog, Allskog, Mjøsen Skog and Statskog. The company will develop an integrated management model between industrial production and sustainable forestry.

2."Cost effective production of renewable liquid biofuel and biochemicals from Scandinavian wood materials".

This is a research project with the overall objective of establishing the knowledge platform needed to develop an industrial process for efficient conversion of Scandinavian wood into fuel components.

Subprojects are:

1. Technology for separating carbohydrates, lignin and extractives
2. Technology for producing fuel components from wood lignin - pyrolysis
3. Production of biofuel from wood extractives (fatty acids, resin acids)
4. Potential for a Norwegian ethanol and biofuel plant / biorefinery

In addition to Statskog the industrial and public project partners are:
Statoil/Hydro, Estra, Forest Owners Fed's, North Trøndelag County Council, The Research Council of Noray, and several sawmill companies.

Consequences for the SFOs

Climate Change challenges the SFOs to enter into co-operation with a wide range of players. Adoption of measures to reduce greenhouse gas emissions will present new possibilities to re-position SFOs, both on a long term commercial basis, and as a governmental tool to combat climate change. Increasing focus on climate change issues increases the need for competence and knowledge on forest management, bioenergy potential and biofuel technologies. The SFOs have an opportunity to play an important part in the national development of competence, commercial investments and politics respectively. Opportunities include:

- investments in competence and co-operation with research institutes and authorities. The key to success is to combine existing complementary players to establish a strong and coordinated base for research and development within biofuels.
- maintaining an overview of how SFO activities and production affect CO_2 emissions and carbon sequestration
- optimizing the management of forest resources for carbon capture and establishing bioenergy plantations
- commercial investments in different industrial sectors of the biofuel value chain.

What are the strategic challenges / considerations facing the SFO and the developing biofuel sector?

- To position the SFO as a national/governmental tool in the combat of climate change.
- To consider if EUSTAFOR should enter into european biofuel /bioenergy projects.
- To promote a framework to encourage investments in forest management, development of technology and industrialization.
- To expand the co-operation between players to increase competence and commercial investments in a new market.

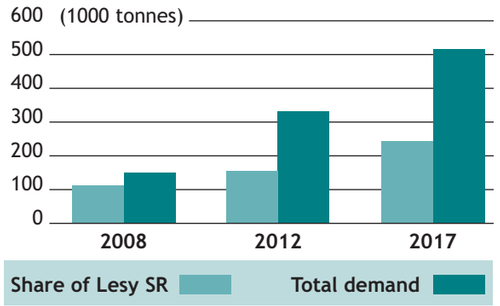
Opportunities
for increasing Biomass resource - A great challenge for Slovak Forestry

Slovak Republic
Ing. Alojz Riško

The state enterprise LESY Slovenskej republiky (LESY SR) is an enterprise of strategic importance in the Slovak Republic managing approx. 969 Tsd. hectares of forests (i.e. 48% of the forest area in Slovakia). The annual harvesting volume is approximately 4.3 Mio. m^3. Climate change and security of energy supply are the principal challenges for scientists, farmers and foresters to achieve. The common target being to replace fossil fuel usage by renewable energy resources. The following article discusses new harvesting opportunities for increasing the biomass resource. In common with other countries the Slovak Republic not only sees this as the way forward, but also a major challenge.

The LESY SR, as Slovak State Forest Organization, launched a Biomass project in 2005. The project objective was to establish a flexible, efficient and profitable business, to service new markets for wood chips harvested from forest biomass. Using modern technology and state of the art chippers, the aim was to develop a highly productive and low-cost production process. The project had 7 teams and deployed over 50 professionals drawn from different disciplines and levels of management. As well as ensuring co-operation within the organization, the other key challenge was seen as national promotion and communication. The success of the newly created Centre of Biomass is largely dependent on the initiative of its enthusiastic employees. In order to ensure the Centre of Biomass performs effectively they need to build a network of regional customers for wood chips, optimize the effective deployment of chippers, and minimise transport costs.

Forecasted volume-development of biomass market in Slovakia



Since starting the project LESY SR has founded seven regional Biomass Centres all over Slovakia and invested 3 million Euros in new technology. The investment in modern technology is key to the efficient and low –cost production of wood chips, which is necessary to achieve a leading market position. LESY SR's most important priority was the establishment of new markets and new power plants located next to our biomass resources.

The pilot programme was able to establish new regional markets for wood chips, supplying 25 – 30 new heating plants (one is as a combined heat and power plant). LESY SR, set up a separate dedicated supply business– Forest Enterprise Biomass, which it is envisaged will supply regional customers all over Slovakia.

The following graph shows the forecasted growth of the Slovak biomass market, both in terms of total demand, and the share of LESY SR's production.

Nowadays LESY SR is the leader of the Slovak biomass market. Up to 90% of deliveries of energy wood chips are based on LESY SR's wood mobilization efforts. On both a provincial and local level there is a great interest in establishing new CHPs. In terms of increasing the biomass resource, it seems feasible to establish energy plantations (short rotation) on forest land. The future

Table: Comparison of black locust production over various rotation periods up to 35 years

Rotation period (years)	Number of cycles	Volume of tree biomass from 1 hectare in m^3 ($m^3.ha^{-1}$)	Production in m^3 under the bark from 1 hectare ($m^3.ha^{-1}$)	Weight of production from tree biomass calculated in dry mas (tonnes.ha^{-1})	Weight of production from brances (smallwood) calculated in dry mass (tonnes.ha^{-1})
8	4,4	111	28	333	249
12	2,9	124	41	245	164
15	2,3	149	54	234	149
20	1,8	176	80	216	118
35	1,0	235	192	160	29

forecast increase in the price of gas will motivate further investments in renewable energy.

To secure the availability of biomass-resources LESY SR has commissioned Research and Development on fast growing species (e.g. willow, poplar, alder and black locust). Fast-growing trees, as compared to normal forest species, have the advantage that the period between planting and harvesting is significantly shorter. Fast-growing trees also produce a larger amount of biomass/annum/hectare. In Slovakia black locust seems to be the most suitable tree species to establish energy plantations. It was imported from the American continent to Europe in 1601 and nowadays it covers 100,000 ha in France, 191,000 ha in Romania and 280,000 ha in Hungary. In Slovakia 33,000 ha are covered by black locust which represents just 2% of Slovak forest's area.

Further advantages of black locust are its wide ecological range, and ease of regeneration. It is very suitable for the reforestation of devastated areas. In addition its wood is of low moisture content as well as being of high caloric value, 8,360 – 16,300 kilojoules per kilogram.

There are 15,000 ha of coppiced stands of black locust established as energy plantations grown on a short rotation period of 6 – 12 years and a medium rotation period of 15 – 20 years.

According to preliminary results of the National Forestry Centre in Zvolen, black locust coppiced on a short rotation of 7 – 8 years produces from 12.4 to 15.4 m^3 of biomass / hectare/ annum; total biomass resource at 8 years is from 112.5 – 121.7 m^3.

Recent R&D studies show that for black locust the ideal model is as short rotation forestry on an 8 year rotation. Over a 35-year period it provides harvesting volume and revenues 4.4 times higher than a single crop rotation of 35 years. Short rotation forestry, compared to the current 35-year rotation period, is able to produce double the quantity of tree biomass. LESY SR expects to gain the highest possible revenue by whole tree harvesting and chipping.

A second project– the Ecological project, focuses on short rotation forestry in close co-operation with the Forest National Centre in Zvolen. The overall objective of the project is to study the option of using wood ash as a mineral fertilizer on forest land to maintain the input/output nutrient balance. Via experiments the project models the direct application of ash on areas of plantation and the use of ash in the forest nursery. These experiments are continually evaluated and results show there is a positive effect of the use of ash as a fertiliser. For practical implementation further research is necessary.

Key challenges and expectations for the future – Support for energy wood production

Investors in CHP plants require a 15 – 20 year long term-guarantee of wood chip supply to secure their return on investment. Therefore within the National Biomass Action Plan of the Slovak government appropriate support measures for biomass are being evaluated as a means to achieve the RES targets. For the purpose of long-term supply guarantee LESY SR wants to stimulate the following incentives for forest owners and farmers:

- Financial support to establish energy plantations with short and medium rotations.
- Financial support of between 50 – 100 Euro per hectare (subject to yield) to stimulate the harvesting of biomass from forests.

Conclusion

The Slovak State Forest Organisation is convinced that promotion of sustainable energy solutions, that are both resource and cost efficient, is one of the most appropriate ways to contribute to sustainable development. Renewable energy will play a crucial role in their development. These steps have stimulated the use of bioenergy in commercial terms and will provide the market players with the opportunity to implement new energy solutions in a flexible and cost efficient way.

Biomass
supply chain logistics in Sweden

Anders Jönsson

Background

Growing demand for forest biomass to meet the EU 20% renewable target

The EU target of 20% renewable energy sources in 2020 will put increasing pressure on the forest resources in Europe. Renewable energy sources like hydro, wind and solar energy are all limited by either a fixed supply, or strong negative opinions. Farm land may be used for energy production. However, with a growing World population, a large-scale conversion from food to energy production is potentially not feasible.

In Sweden the level of biomass use is high

A large proportion of the energy produced in Sweden comes from biomass. This is mainly due to its vast forest resource, extensive forest industry and large amount of co-products available for energy production.

Green electricity certificates have supported a conversion from oil and coal in regional heat and power production. The CO2-taxation has also stimulated producers to focus on renewable energy sources.

Problems

Fragmented supply

Sweden has a fragmented supply of biomass. The forest resource is relatively evenly spread over the country, but in some cases the annual forest growth and dominating tree species limit the sustainable available biomass supply. Private family forest owners, who in many cases have limited knowledge and interest in biomass harvesting, own half of the forest resource. To exploit the full biomass potential, the supply controlled by private forest owners has to be mobilised and brought to the market.

High transport/logistics costs

Biomass resources that are easily won , e.g. sawmill co-products, are often fully exploited, which means that more difficult sources like final felling residues have to be used. The logistics for these biomass sources are more complex, the location of harvesting sites are geographically dispersed and dynamic, leading to longer transport distances, there are additional operations such as in-forest storage and chipping, all of which result in higher sourcing costs for the power plants.

Limited biomass knowledge among buyers

Power producers that are changing from oil and coal to biomass as their major source of energy, face problems with the non-transparent nature of biomass trading and price setting. In most cases they are use to trading well-defined products such as oil and coal, but not biomass, which can vary substantially in quality over time or by region. Often the potential efficiency of large scale sourcing is limited due to a lack of market knowledge and an inability to set up logistical solutions.

Biomass demand is connected to large scale operations in population centres

To fully exploit the potential of biomass as a source of energy that can replace fossil fuels, operations have to be large scale and located in population centres. Electricity generation alone will not utilise the full energy content of the biomass, but in combination with district heating, the energy yield can be increased substantially. To achieve viable large-scale operations, raw material sourcing and logistics are key success factors.

Solutions

Demand for logistics service provider

To meet the growing customer demands for a supply chain and logistics service provider, Sveaskog, the Swedish state forest company, has developed its biofuel business. Due to the size of Sveaskog's available biomass supply, that will reach ~2,0 TWh in 2008, large biofuel consumers are turning to Sveaskog in order to develop long-term supply agreements. The major reason for this is the need for a stable raw material base load to their biomass combined heat and power plants.

Example Fortum Brista

The Fortum Brista CHP plant north of Stockholm wanted to expand its local sourcing. Sveaskog held detailed negotiations with Fortum, and in 2008, a three year supply contract was signed with annual biomass volumes reaching 300 GWh in 2011. Sveaskog will employ 2-4 dedicated biomass purchasers, paid by Fortum, who will buy from local forest owners. In addition to this Sveaskog will employ a marketing coordinator, also paid by Fortum, who will facilitate communication with forest owners and work closely together with the communication department at the Brista CHP plant to raise biomass awareness and knowledge among biomass sellers.

Sveaskog is securing a steady flow of biomass to the power plant via in field storage in the surrounding area to the plant. Contractors that run the chipping and crushing equipment at the plant are hired by Sveaskog, which also controls the full supply chain from the forest to the plant.

Example Söder Energi Södertälje

Söder Energi in Södertälje, south of Stockholm, is currently building a large CHP plant that will increase the capacity of its biomass operations. In order to secure its biomass supply, Söder Energi has signed a four-year supply contract with Sveaskog for annual domestic biomass volumes equivalent to 200 GWh. As Söder Energi's plant is located on the coast with a suitable harbour facility, Sveaskog plans to eventually import 200 GWh/year from its operations in Latvia.

Söder Energi, owned by the town of Södertälje, has imposed high standards regarding transport. A large proportion of its supply should be transported by rail. In order to meet this requirement, Sveaskog has developed railway terminals located 200-300 km from the plant. At the terminals, biomass volumes are collected, chipped or crushed and stored before delivery to the customer.

Lessons learned

Common customer needs

Sveaskog's biomass customers are growing fast and their need for large scale suppliers that can offer a full assortment portfolio are increasing. They are also seeking fewer suppliers that can offer both larger volumes and extended services such as logistics, terminal storage, and chipping, or crushing, of the fuels.

Stability

As a large forest owner, Sveaskog can offer supply stability and biofuels from all areas of Sweden. This means that the customers can also source biomass from less competitive areas in periods of weak market activity.

Dialogue

As a large supplier with long-term experience, Sveaskog can in dialogue with the customer set up sourcing solutions that meet complex customer demands. Sveaskog can also facilitate the development of the infrastructure around the power plant.

Issues to be solved as we go forward

Development of a model long-term contract

As the biomass market becomes more competitive Sveaskog is focusing its effort on developing contract models to meet customer demands for longer-term supply contacts. The contract models should address time frame, volume stability and price fluctuation, both for the raw material, and the energy produced.

Efficient material handling

As customers quickly increase their capacity , the raw material volume requirements are getting larger. This is putting pressure on the receiving capacity of the power plant. Bulkier raw materials can quickly fill storage areas and suppliers are in some cases not able to deliver their full volume at all times. The power plants in cooperation with the suppliers need to improve the receiving capacity of the plants and also develop systems for efficient material handling.

Consequences for European State Forest Organisations

There are substantial opportunities for SFOs

The State Forest Organisations, SFOs, have substantial opportunities to build profitable biofuel businesses. SFOs can offer several types of biomass and also in most cases, large volumes. Consequently they can play vital roles in securing not only the raw material supply to individual power plants, but also to national energy security by decreasing the need for imports of fossil fuels.

Logistics capability - key to success

In order to develop a supply chain that can be offered to biomass customers, SFOs need to control the logistics from the forest to the customer. This will not only facilitate sourcing, but also provide opportunities to optimise long-range transport, this in turn will release larger biomass volumes and assist to balance demand.

What is needed to support the state forest organisations in these matters?

Analysis of efforts needed

To facilitate the expansion of the biomass business in Europe, which will be required to meet the EU 2020 targets, analysis of the factors required to develop a profitable biomass business is necessary. Best practices in logistics and supply chain management need to be developed and communicated to stakeholders.

Infrastructure, roads/railroads/terminals

A well developed infrastructure is a foundation for efficient supply chains. Roads, railways and terminals are all needed to secure steady raw material flows. Landowners can offer parts of the infrastructure, but the public sector has to take a large share of the responsibility.

EUSTAFOR
in short

Represents commercially orientated state forest companies, enterprises and agencies which have sustainable wood production as a major concern. It currently has 28 members including 9 non voting associate members (observers).

The members represent one third of EU forest area including large protected areas and most member organisations are certified (FSC, PEFC). Annual harvest is approx. 115 million m^3 and together the organisations employ more than 100 000 persons.

The goal of EUSTAFOR is to promote the common interest of state forests in the EU in the scope of their sustainable development. The association supports and strengthens state forest organisations in Europe to maintain and enhance economically viable, socially beneficial, culturally valuable and ecologically responsible sustainable forest management.

Our mainobjectives are:

- To analyse and investigate the existing framework conditions within EU, in order to create the preconditions for sustainable management of state forests;
- To facilitate and expand an exchange of ideas and contacts between the state forest organisations of Europe;
- To keep its members regularly informed on topics and issues that concern the whole of Europe.

EUSTAFOR uses working groups for different issues to analyse, learn, produce guidelines, benchmark and so on. This is the work done by the working group on Biomass and Bioenergy.

The group was chaired by **Roland Kautz** (Austria) and the other members of the group were **Martin Lindell** (EUSTAFOR) **Premek Stipl** (Czech Republic), **Ulvar Kaubi** (Estonia), **Pasi Korteniemi** (Finland), **Yves-Marie Gardette** (France), **Frank Brodeck** (Germany), **Christoph Baudisch** (Germany), **Uwe Barge** (Germany), **Ciaran Black** (Ireland), **Martins Gaigals** (Latvia), **Ivar Asbjörn Lervåg** (Norway), **Adam Pogorzelski** (Poland), **Mihai Dragos** (Romania), **Frantisek Kral** (Slovak Republic), **Anders Jönsson** (Sweden) and **Mike Green** (United Kingdom).

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