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Intelligent Energy Europe

Evaluation report on the experiences with the pilot application of biomass standards

WP 2.2 report from the CLEAN-E project

A report prepared as part of the EIE project "Clean Energy Network for Europe (CLEAN-E)"

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The project "Clean Energy Network for Europe (CLEAN-E)" is supported by the European Commission through the EIE programme (contract no. EIE/04/136/S07.38593).

The CLEAN-E project consortium:

Öko-Institut (Coordination)

Inter-University Research Centre for Technology, Work and Culture (IFZ)

IT Power Ltd.

Politecnico di Milano, Dipartimento di Energetica (eERG)

WWF European Policy Office (WWF EPO)

WWF/Adena

WWF Italy

Comité de Liaison Energies Renouvelables (CLER)

Swedish Society for Nature Conservation (SSNC)

Österreichisches Ökologie-Institut für angewandte Umweltforschung (ÖÖI)

Ecofys

<u>Subcontractors:</u>

Eidgenössische Anstalt für Wasserversorgung, Abwasserreinigung und Gewässerschutz (EAWAG)

Verein für umweltgerechte Elektrizität (VUE)

The CLEAN-E project

Quality labels which define a minimum standard for green electricity products assist consumers to verify the ecological performance of green products. National labelling programmes which have emerged in some European countries are important and powerful instruments to strengthen consumer confidence in the voluntary green electricity market.

Objectives

The CLEAN-E project will accompany the establishment of new and the improvement of existing green electricity product labels in selected EU Member States. In this regard the CLEAN-E project will support the efforts of the European Green Electricity Network Eugene[1], a non-profit approach which has set up a minimum standard for green electricity labelling schemes. The Eugene standard will serve as the major point of orientation throughout the project.

The establishment of new labels will be accompanied by a wide range of activities. This includes the development of ecological minimum standards for the two key renewable technologies hydropower and biomass. The project also investigates the feasibility of widening the scope of green power labelling towards the integration of energy efficiency as well as renewable heat. CLEAN-E analyses the interface of green power labels with RES related policies on the national and the EU level including the Guarantee of Origin for renewable electricity and Electricity Disclosure. Furthermore, the project will include a wide range of activities aimed at disseminating and sharing best practices for green power procurement.

Expected key results

- New green power labelling schemes in France, Italy and Spain including the establishment of sound labelling structures and the development of label criteria. Existing labels (e.g. in Sweden and Austria) are intended to be improved towards a harmonised European standard.
- Guidelines how to implement ecological minimum standards for hydropower and biomass in the scope of green power labels.
- Procedures and methodologies how to integrate measures in the field of energy efficiency and RES-H into the scope of green power labelling schemes.
- Guidelines how to integrate new policies on the EU and Member States' level (e.g. Guarantee of Origin, Electricity Disclosure) and private sector initiatives (such as RECS) in green power labelling schemes.

[1] Eugene (www.eugenestandard.org) is an independent network bringing together non-profit organisations such as national labelling bodies, experts from environmental and consumers organisations, and research institutes. The Eugene network pursues no commercial interest. Some of the Eugene activities have been partly funded by the EU Commission (DG Environment).

Executive Summary

The report on hand is the successive report to the CLEAN-E "Report on existing biomass standards incl. suggestions for the establishment of a common biomass standard across Europe in the framework of green electricity certification" (Oehme 2006).

Its purpose is

- to evaluate the practicability of the biomass criteria that were proposed in the above mentioned report (Oehme 2006) and
- to further operationalize the biomass criteria of the above mentioned report (Oehme 2006).

With this objective interviews with plant operators (from Austria) and with auditors of an Eugene accredited label (Switzerland) have been conducted. In addition experts from Austria and from Germany have been interviewed.

In two case studies on Austrian biomass plants the set of criteria has been tested. Although the biomass plants neither produce power for a labelled green electricity product nor will participate in a labelling process in the near future, the plant operators were willing to discuss the criteria in an extensive interview.

Case study 1 is a biomass CHP-plant situated in Vienna, Austria. The plant is fired with wood chips from the Austrian Federal Forest AG (the biggest forest owner in Austria). It is equipped with a circulating fluidised bed boiler and a highly efficient steam turbine for the electricity generation. Heat is delivered to the district heating grid of Vienna.

Case study 2 is a biogas CHP-plant in Hartberg, Austria. The feedstock is biodegradable waste that is collected separated in the households of the region. The fermenting effluent is going through a press leaving a dry residual matter that is deposited by farmers; the waste water is clarified in the sewage plant.

Results

Amongst the criteria proposed by Oehme (2006), the following criteria have been identified that might be hard to reach from the viewpoint of the discussion with the experts: The need to buy certified wood (in those countries where FSC is hardly used), the aim to have an overall efficiency of at least 60% (in southern European countries where heat demand only occurs during a comparably short winter season), the calculation of fossil fuel for transport and auxiliary energy and the compliance with the requirement to consume less then 10% of the electricity output of the plant.

In the following the main points of discussion concerning each criteria are listed and the re-formulated criteria presented:

(1) Eligibility of Sources

<u>Discussion:</u>

Problems have been mentioned that might arise at the threshold between waste management and energy production from waste. Sewage gas plants and the use of "used

wood" are eligible under certain preconditions. MSW plants (municipal solid waste incineration plants) are sometimes classified as biomass installations, whereas in the context of the E network and the CLEAN-E project they are excluded. Modern biogas plants try to increase the gas yield by utilisation of waste e.g. with a high fat content (co-fermentation), but no reservation has been suggested in this context.

Re-formulated criteria:

Eligible biomass sources for the production of green electricity are defined as follows:

- Solid biomass according to CEN/TS 14961:2005, comprising
    - Woody biomass (forests and plantation wood; wood processing industry, by-products and residues; used wood, blends and mixtures)
    - Herbaceous biomass (agriculture and horticulture herb including cereal crops, grasses, oil seed crops, root crops, legume crops, flowers and landscape management herbaceous biomass; herb processing industry, by-products and residues; blends and mixtures),
    - Fruit biomass (orchard and horticulture fruit; fruit processing industry, by-products and residues, blends and mixtures),
    - Blends and mixtures.
- Furthermore, the following sources are admissible:
    - Separated biodegradable waste (for biogas only, without limitations for co-fermentation),
    - Animal excrements, e.g. manure or chicken litter etc. (but no animal body or parts of it),
    - Sewage gas is admissible as far as the label organisations applying for the accreditation by Eugene provide a sound argumentation, why and under which conditions sewage gas is eligible.
- Used wood is defined according to national regulations (e.g. in emission regulations).

(2) Wood fuel

Discussion:

The need to buy certified wood is a major problem in those countries where there is hardly any FSC certified wood or where FSC certified wood has long transport distances. There has not been an agreement that FSC certification is the best way to ensure sustainable forest management. Nevertheless it was admitted that it is the most comprehensive certification.

Re-formulated criteria:

As a general principle: All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management.

For wood fuel from plantations and imported wood fuel: sustainable forest management shall be certified according to FSC (Forest Stewardship Council). Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured.

National certification schemes of green electricity in countries with a sufficient area of certified sustainably managed forest, should for all fuel wood demand a third party certification, thereby referring to the FSC label. Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured. The argumentation has to be provided by the national label applying for Eugene accreditation and need to be accepted by the Eugene Board. The availability of certified wood fuel shall be regularly reviewed according to the reviewing period of the national certification scheme of green electricity, however at least every fourth year and third party certification shall be required as soon as there is sufficient supply.

For wood fuel from non certified forest, the criteria as given in criterion (3) shall be applied (not applicable for wood fuel from plantations and imported wood fuel[2], as they need to come from certified forests).

(3) Wood fuel from non certified forest

Discussion:

It is necessary for the implementation of this criterion to develop national guidelines and benchmarks as well as to provide helpful information especially for small forest owners which are usually not certified at all.

Re-formulated criteria:

All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management. In Europe, the principles and measures referred to above shall at least correspond to the definition of Sustainable Forestry Management that was adopted in Resolution 1 of the 2nd Ministerial Conference on the Protection of Forests in Europe (Helsinki, 16-17 June 1993), the Pan-European Operational Level Guidelines for Sustainable Forest Management, as endorsed by the 3rd Ministerial Conference on the Protection of Forests in Europe (Lisbon, 2-4 June 1998) and the Improved Pan-European Indicators for SFM, adopted at the

[2] It should be clarified whether a hidden barrier to free trade in the community's internal market might be found concerning imported wood.

MCPFE Expert Level Meeting of 7-8 October 2002 that were endorsed at 4th Ministerial Conference on the Protection of Forests in Europe (Vienna, 28-30 April 2003).

These requirements can be summarised as follows:

- Wood shall not originate from illegal harvesting.
  - Definition of illegally harvested wood: Wood that is harvested, traded or transported in a way that is in breach with applicable national regulations (such regulations can for example address CITES species, money laundering, corruption and bribery, and other relevant national regulations).
- Wood shall not originate from High Conservation Value Forests.
  - High Conservation Value Forests (HCVF) are forests that possess one or more of the following attributes:
  - forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia)
  - forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
  - forest areas that are in or contain rare, threatened or endangered ecosystems
  - forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)
  - forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health)
  - forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).
- The national label has to adapt suitable benchmarks for wood fuel suppliers:
  - Biomass power suppliers should provide proof that they are not buying illegal fuel wood; for instance the 4 step-system the WWF proposed in “Keep it legal” (Miller 2006) could be used.
  - The forest managers that have a contract with a biomass power supplier should carry out evaluations (or induce the evaluation) of their forest areas to determine whether any of the defined HCVs (high conservation values) is present within their forest management unit. HCV must then be integrated in management planning and activities.

(4) GMO

Discussion:

The criterion was not objected. But there is a growing demand for grain and corn that is used for bio fuels and for biogas. This could create a surge to ramp up crop yields notably by GMO in the future.

Re-formulated criteria:

The use of genetically modified organisms (GMO, agricultural crops as well as trees) for electricity production is not permitted. GMO in separated biodegradable waste should be neglected due to practicability reasons.

(5) Energy crops

Discussion:

The criterion was not objected.

Re-formulated criteria:

Energy crops shall not be produced on arable land which has been gained by conversion of pasture or grassland (since 2003). Documents on the land use in 2003 have to be provided.

(6) Plantations

Discussion:

No objection has been raised up to now, but the situation might change if short rotation tree plantations are gaining increased importance in Europe.

Re-formulated criteria:

Short rotation tree plantations should not be established on forest areas or on arable land which has been gained by conversion of pasture or grassland (conversion has not been after 1994, as required for FSC certification of the SRTP).

(7) Maintenance of soil fertility of forests

Discussion:

On the one hand there is a tendency of forest management to raise its efficiency thus extracting more and more biomass from the forest during harvesting operations. On the other hand the operator of the biomass combustion plant wants to get rid of the ashes in an economic way. National regulations for the recycling of ashes back to the forest were demanded.

Re-formulated criteria:

Soil fertility of forests must not be reduced substantially. This can be attained by

Either: No removal of needles, foliage and roots. Also forest residues, like branches and others shall be left at the site as far as possible to maintain soil fertility and to reduce risk of erosion. Thereby measures have to be adapted to site characteristics.

Or: Ash quality from conversion processes should be monitored and where possible nutrient-rich ash should be recycled back to the land.

For both aspects national guidelines have to be taken into account as far as available. Measures have to be laid down in management plans of all wood fuel suppliers for the national label.

(8) Maintenance of soil fertility of arable land

Discussion:

The criterion was not objected. In Europe agricultural areas are often loaded with too high amounts of fertilisers.

Re-formulated criteria:

The withdrawal of straw or other agricultural residues for energetic use has to be adopted site-related according to the nutrient and humus level in accordance with Good Agricultural Practice to secure soil fertility in a sustainable manner. Soil fertility can also be ensured by returning of fermenting residues from biomass production to the arable land. The farmer either has to sign a voluntary self-commitment with the plant operator or the farmer has a EUREPGAP-certification (see criterion 9 and 10).

(9) Integrated Farming / energy crops

Discussion:

The criterion was not objected.

Re-formulated criteria:

Biomass from dedicated cultivation on arable land need to comply with guidelines for integrated crop protection. This is documented by a EUREPGAP certification in the field of fruits and vegetables (and/or of flowers and ornaments).

(10) Integrated Farming / livestock waste

Discussion:

The criterion was not objected.

Re-formulated criteria:

If livestock waste (manure, chicken litter, etc.) is used for energy production, the conditions under which animals are housed and reared should comply with the principles of

Integrated Farming. This is documented by a EUREPGAP certification on Integrated Farm Assurance.

(11) Biogas plants using manure

Discussion:

The criterion was not objected.

Re-formulated criteria:

Emissions of CH_4, N_2O and NH_3 by usage of manure have to be reduced by covering the storing tank and by applying manure with accurate methods at appropriate time (e.g. trailhose or similar device).

(12) Overall efficiency

Discussion:

Although the number given in the criterion is under certain circumstances hard to reach it was not questioned by any of the interview partners. This is also due to the fact that the Austrian Green electricity act is demanding this overall efficiency, too. In any case the required efficiency can only be reached when a combined heat and power production (CHP) is realised. This might pose a problem in southern European countries where heat demand only occurs during a comparably short winter season.

Re-formulated criteria:

In the annual average the plant needs to meet an overall efficiency of at least 60% based on operational data if available.

(13) Co-Firing

Discussion:

The criterion was not objected.

Re-formulated criteria:

Co-firing of solid biomass according to CEN/TS 14961:2005 in coal-fired power stations is permitted. The generated electricity has to be mathematically allocated according to the caloric value of the biomass. The power plant need to provide an overall efficiency of at least 70 % based on operational data if available.

(14) Transport and auxiliary energy

Discussion:

There are only few studies dealing with the fossil fuel consumption of the pre- and the post-conversion processes of biomass electricity generation. There are indications that the requirement to not exceed 10% of the electricity supplied can be reached. The criterion will not be practical unless a nation-specific calculation method and database is developed.

Re-formulated criteria:

The non-renewable proportion of the energy that is used for extraction, transportation and processing of biomass fuel, processing energy at the plant, transportation of residual products, and also balancing, should not to be greater than 10 percent of the electricity supplied with the label. A rough calculation model has to be developed by the national label for each country. The model should differentiate between different technologies (combustion, biogas) and between different biomass fuels. It should request at least the following input data: total transportation kilometres by lorries on public roads, fossil fuel consumption for processes conditioning the biomass (chipping, drying, agitation in digester), fossil fuel consumption for the electricity generation process (gas injected to start combustion, ignition diesel for biogas motors). All plants of which the electricity is to be distributed under the national label that wants to be accredited by Eugene have to comply with the criterion. Calculation is on planning data (1st year) resp. on data of the past year.

Contents

List of figures

Abbreviations

BFB	Bubbling fluidized bed boiler
CFB	Circulating fluidized bed boiler
CHP	Combined heat and power
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Eugene	European Green Electricity Network
EUREPGAP	Euro-Retailer Produce Working Group - Good agricultural Practice (www.eurepgap.org)
FLEGT	Action plan on Forest Law Enforcement, Governance and Trade of the European Commission
FSC	Forest Stewardship Council
GMO	Genetically modified organism
HCVF	High Conservation Value Forest
ICP Forest	International cooperative programmes on forests and integrated monitoring of ecosystems
ICP	Integrated crop protection
IFS	Integrated Farming Systems
IUCN	The World Conservation Union
LCA	Life Cycle Assessment
MCPFE	Ministerial Conference on the Protection of Forests in Europe
MSW	Municipal solid waste
PEFC	Programme for the Endorsement of Forest Certification schemes
SFM	Sustainable Forest Management
SRC	Short rotation coppice
SRTP	Short rotation tree plantation
UNECE	United Nations Economic Commission for Europe
VPA	Voluntary Partnership Agreement in FLEGT
WWF	World Wide Fund for Nature
yr	year

1 Introduction

In several European countries biomass plays an important role in national action plans to increase the share of renewable energies for power generation. Thus one objective of the CLEAN-E project was the development of ecological minimum standards for biomass conversion to electricity. Until now there was neither an accepted definition of "green" biomass in this context nor were there guidelines for the processes involved and the technology in use that could be implemented on a broader scale. Within the CLEAN-E project two reports dealing with the further development of biomass criteria and guidelines for green power labels were scheduled.

1.1 Scope of the first CLEAN-E report (Oehme 2006) on biomass criteria

The first report[1] has come up with a number of suggestions in the scope of biomass criteria. As a matter of fact biomass for energy production comes from various sources, it is processed in several steps and it is converted to electricity via diverse technologies. The goal of the first report (Oehme 2006) was to bring forward a set of criteria that should be on the one hand applicable in practice and on the other hand should accord to ambitious ecological requirements. So the main task was to reduce the technical complexity and at the same time to cover the most significant issues of "green" biomass use.

The starting point were the existing Eugene criteria on biomass as well as the definitions and criteria of some other existing green electricity labels. The following labels were analysed and compared: Eugene Standard, Austrian Ecolabel, Bra Miljöval (Sweden), Ecoenergia (Finland), Gruener Strom Label (Germany), Ok-power (Germany), Milieukeur (Netherlands), Naturemade (Switzerland), Green Power (Australia), Green-e (USA), Environmental Choice (Canada). Significant differences were found in the conditions required for certain types of biomass, e.g. criteria for forestry and agriculture, but also according to waste types which are permissible as biomass source and if co-firing of biomass in existing coal-fired power plants is allowed.

A series of interviews with experts and stakeholders in Europe were conducted subsequently to deduce a proposal for a common standard for green electricity from biomass. Since the criteria differ according to the possibilities of their operationalisation, they were divided into two groups: (1) criteria which can be easily operationalised and proven and (2) criteria for which operationalisation and means of proof need to be further elaborated in a second report (practicability report).

1.2 Intention of the second CLEAN-E report on biomass criteria (practicability report)

The second report on hand takes into consideration practical experiences of experts either being interested in achieving a (national) green electricity label or being engaged in

[1] Report on existing biomass standards including suggestions for the establishment of a common biomass standard across Europe in the framework of green electricity certification (Oehme 2006)

auditioning for a (national) green electricity label. By going into details the various aspects of the criteria and possible means of proof were further elaborated and specified.

In the centre of the evaluation is the application of the suggested criteria of the first biomass report (Oehme 2006). Two biomass plants have been chosen to test whether the requirements could be reached and whether the compilation of the required data is possible. Alas, there was no real certification process of a labelled product respectively of its generation site(s). Anyway the practicability could be evaluated on a level of detail that was satisfactory with respect to the development status of the set of criteria.

In principle, two approaches in defining green electricity from biomass were distinguished in the first report (Oehme 2006):

(1) Definition of the allowed feeding material in the first place with additional criteria defining the ecological quality of the biomass and exclusion of certain technologies or types of biomass.

(2) Specification of the technologies (plant types) and assessment of the individual plant, which applies for certification. Criteria regarding the feeding material are additionally applied. Two of the labels (Naturemade and Green power Australia) had been classified to be this type.

In the report on hand this difference does not occur so drastically any more. Prominent is the allowed feeding material with criteria defining the ecological quality of the biomass. Then there are criteria to minimize the impact on the environment and to ensure the well-being of animals. Finally there remain some requirements that have to be proved on the scale of each plant.

Also the concept of recognising two distinct qualities of electric power (a basic “silver” level and a super “gold” level) as shown by the Naturemade label, is not further developed. The preferable strategy is to specify a sole set of criteria that is accepted by relevant stakeholders.

2 Case study 1: Biomass CHP Plant Vienna-Simmering, Austria

The plant has been run during a test phase since spring 2006, commissioning was in autumn 2006. The thermal capacity is 65 MW, the nominal electricity generation is 166 GWh per year. The plant will be supplied with forest biomass (logging residues) by the Austrian Federal Forest AG, which is chipped nearby the plant. About 600.000 m^3 of loose wood chips (corresponding to 245.000 solid-m^3) will be fired per year.

Figure 1 (left): The biomass plant in Vienna-Simmering

Figure 2 (right): The chipping site at Albern Port in Vienna

2.1 Background information

2.1.1 Framework conditions in terms of energy policy and environmental policy

In 2002 the Green electricity act (Ökostromgesetz) has been issued as the implementation of the EU-Renewables Directive. One of the goals was to set up harmonized feed-in tariffs for electricity from renewables, another one was to achieve the targets of generating 9% of electricity demand from small hydropower plants and 4% from so-called "new" renewables (like wind, biomass, solar power, small hydro) by 2008.

The Green electricity act granted a feed-in tariffs of 10,2 cent/kWh for biomass plants with more than 10 MW electrical capacity for 13 years, if wood fuel is used (a reduction by –20% applied for wood chips from bark, sawmill residues etc.). The dead-lines for projects were: the planning and subsequent building permit had to be obtained until end of 2004, the construction and commissioning had to be completed by June 2006.

The favourable feed-in conditions lead to an increase of the share of "other" renewable energies ("new" renewables and waste incineration) by far surpassed the aim. In 2003 1,2% of the electricity that was delivered to consumers originated from renewables, in

2005 it was already 4,2% and the prognosis for 2006 and for 2007 are 6,5% and 8,8% respectively (e-control 2006).

Since a high percentage of Austria’s land area is covered with forests (about 47%) and the share is even rising each year, an essential part of this development was contributed by electricity generation from biomass. The contribution of solid biomass electricity (including municipal waste incineration) in 2003 has been 23% of “new” renewables and will be in 2007 about 42% (e-control 2006). This lead to a significant rise in the demand for wood fuel.

2.1.2 Actors and success factors in the pre-decision period (Madlener 2005)

A political agreement concluded between the social-democrats and the green party of Vienna was a crucial driving force in developing and eventually realising the project. This coalition at some point put together a list of 23 ‘green’ project ideas to be put into practice as part of their political program in 2001 – one of which was the wood-fired cogeneration plant Vienna-Simmering. The ambitious targets for the share of renewable electricity contained in the 2002 Austrian Green Electricity Act (Ökostromgesetz, 2002) was another major driver, which spurred the Vienna electric utility to think about how to increase the share of renewable electricity and to achieve the set targets. Thirdly, it turned out that the Austrian Federal Forest AG, by far the largest forest owner in Austria and thus a prime candidate for becoming a potent wood fuel supplier, showed great interest to develop new business fields as part of a strategic repositioning effort triggered by the companies’ privatisation in 1996. Finally, the Austrian Energy Agency (E.V.A.), a “change agent” (Rogers 1995) par excellence in the field of Austrian energy issues, was actively involved in shaping and promoting the idea of a large biomass energy plant in Vienna right from the beginning of the whole process. (For a more detailed description see Madlener 2005)

2.2 Realisation (Madlener 2005):

2.2.1 Organisation

In spring 2004 the municipal energy utility of Vienna and the Austrian Federal Forest AG signed a contract to jointly develop and operate the biomass CHP Plant Vienna-Simmering. The company “Wien Energie Bundesforste Biomasse Kraftwerk GmbH” was founded. The district heating company of Vienna (Fernwärme Wien GmbH), the electric utility (Wienstrom GmbH), and the ÖBf Beteiligungs GmbH, a subsidiary of the Austrian Federal Forest AG, each hold a third of the registered capital of this company.

The construction of the plant caused investment costs of around 52 Mio Euro. Construction was carried out in 1,5 years.

2.2.2 Location

The plant is situated in the south-eastern part of Vienna (the borough Simmering), where there are already two existing fossil-fuelled thermal power plants (2 × 440 MW) with the possibility to use parts of an old building for the turbine-generator unit, its ancillary equipment, as well as the know-how of the staff. Main advantages of this site are the access to the district heating of Vienna and to the electricity grid as well as to road and rail. The river Danube is nearby (to provide a cooling agent if necessary), and there is also the chipping site that is run by the Austrian Federal Forest AG.

2.2.3 Wood fuel supply

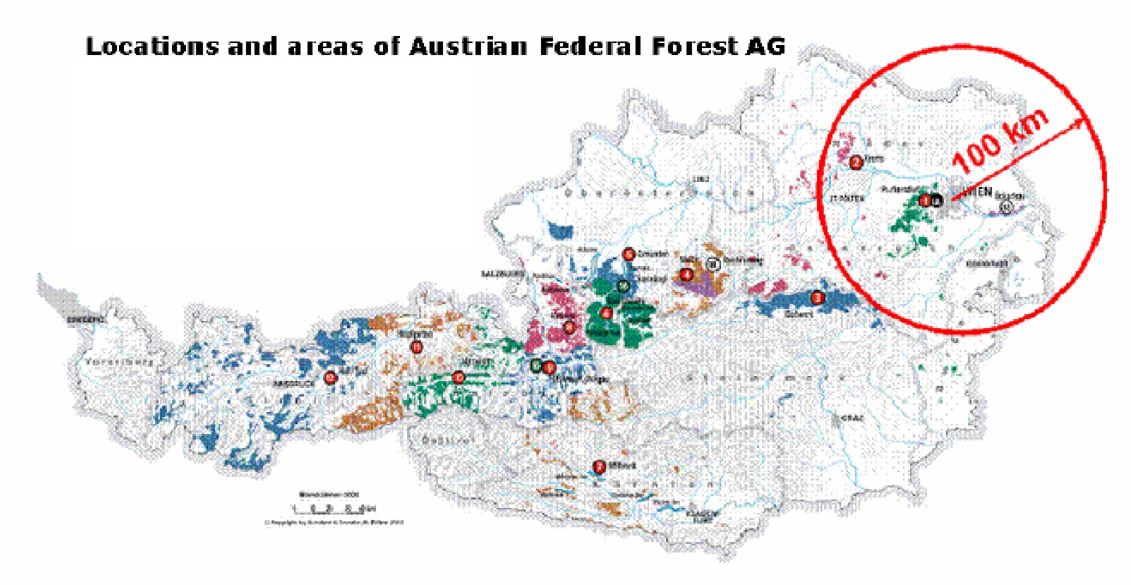
Given the urban location and respectable size of the plant, the latter of which implies significant biomass input requirements, fuel supply logistics play an important role. Short transport distances help to keep both fuel delivery costs and adverse environmental impacts at a minimum.

Austria is one of the most densely forested countries in Europe. Therefore, available forest biomass resources are significant and – due to a lack of profitability of many forest operations – by far not exploited up to limit of sustainable harvesting. Annual growth of the standing stock has been estimated at 36,8 mio m^3, while annual felling amount only to around 22,2 mio m^3, i.e. only about 60% of the annual growth of the stock are currently used. In relation to these figures the wood-fired cogeneration plant in Vienna will use an amount of wood fuel equivalent to only about 0,7% of the total annual net forest growth in Austria.

Figure 3 depicts the business locations and forest and other land areas operated by the Austrian Federal Forest AG. As can be seen the location of Vienna in the far eastern corner of Austria is not optimal from the perspective of domestic supply of wood fuels, as most forest resources under the control of the Austria Federal Forest AG are scattered and quite some distance away from the capital city.

The Austrian Federal Forest AG currently estimates that about 80% of the fuels required could actually be delivered from forests within a distance of less than 100 kilometres from the plant site, and 20% from within a distance of 100–200 km. To reach this target, a contract has been signed with the forest owner cooperation in the province of Lower Austria (Waldverband Niederösterreich). These farmers and forest owners will deliver about 55,000 (solid-)m^3 over a period of 13 years starting in 2006.

Figure 3: Business locations and land areas (drawn in dark colours) operated by the Austrian Federal Forest AG throughout Austria, as of January 2004 (circle: Vienna area/location of the biomass CHP plant, in the very east of the country) (Madlener 2005)



Wood chips from the forest (by mobile chippers) are either delivered directly to the combustion plant, or indirectly via a central transhipment site at Albern Port, Vienna-Simmering. There a large-scale wood chipper produces wood chips that are subsequently transported by low-noise trucks (Euro 4 norm) to the plant.

The logistic concept opted for will allow for just-in-time delivery of wood chips to the plant. In particular, the wood fuel handling site at Albern Port serves as a buffer storage, where up to 30,000 m^3 of solid round wood and up to 10,000 m^3 of loose wood chips can be stored.

2.3 Technical concept:

The plant has been built by Siemens as the general contractor. The boiler, which is a circulating fluidised bed boiler (CFB) is from Foster-Wheeler, the steam turbine (pass out condensation turbine) and the generator were supplied by Siemens.

2.3.1 Nominal and operational technical data

Technology (type of boiler)	CFB boiler
Fuel and annual fuel consumption	600000 m^3 of loose wood chips (corresponding to 190000 t/year or 245.000 m^3 of solid wood
Moisture content of fuel wood	40 – 50% (payment is according to moisture content)
fuel load	65,7 MW

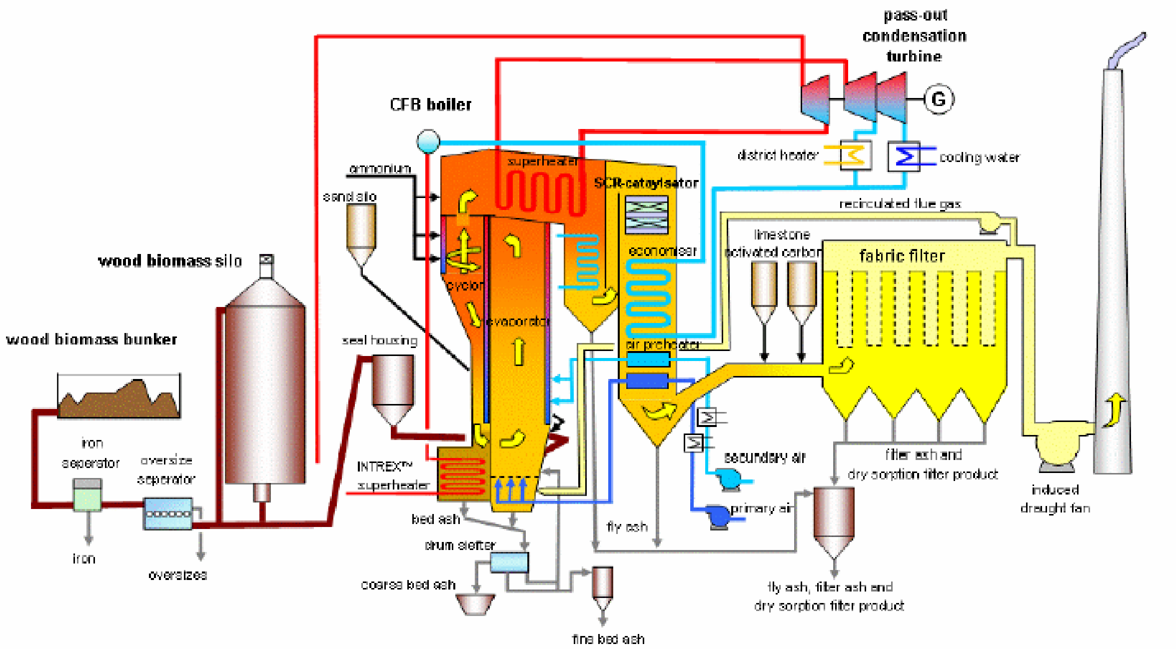
Operation in CHP mode (winter)	15,1 MW_{el} (gross) 37,0 MW_{th}
Operation in condensing mode (summer)	23,5 MW_{el} (gross)
Own power consumption (measured)	1,7 MW (7 – 11% of gross power production depending on operation mode)
Fuel yield	80%
Energy efficiency	Winter: 80% Summer: 36%
Output bed ash and sand	Ca. 290 kg/h
Output filter ash and dry sorption product	Ca. 370 kg/h
Output flue gas	Ca. 105.800 Nm^3f/h

The air pollutant emission limits specified in the plant-specific building/operating permission are markedly below those stipulated in the 1989 Clean Air Ordinance for wood-fired boilers (in its relevant version as of 1997). Some of the limits are even below those of waste incinerators, which are the lowest limits for combustion systems that are imposed in Austria. Under operating conditions, emission levels should be way below the permissible maximum limits, so that the actual environmental impact from the plant is expected to be comparatively minor. This ensures that the new plant's environmental impact is reduced to a minimum.

Operation	Ca. 2.500 h in condensing mode (until Nov. 2006 the heat price had not been agreed on)

The operation time until now is too short to provide operational data like utilisation (produced power divided by full load) or availability (percentage of time when plant is out of operation).

2.3.2 Flow sheet of the plant



SRC = selective catalytic reduction

Figure 4 (left): *The silos on the left and on the right are the two ash silos, in the centre is the small dosing silo where the wood chips are inserted into the boiler.*

Figure 5 (right): *The size of the wood biomass silo at the plant site is 7,500 m^3, sufficient to fuel the plant at full load for about six days.*

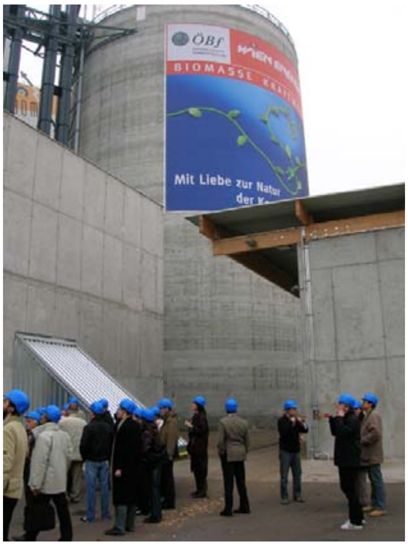
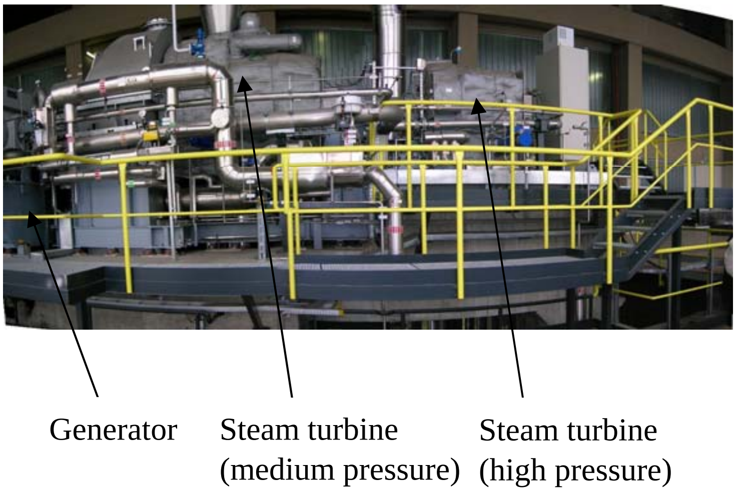


Figure 6 (left): *Turbine and generator*

Figure 7 (right): *Condensor of the turbine. The bulky pipes (dark grey) are cooling water pipes from the river Danube.*



3 Case study 2: Biogas plant, Hartberg-Ökopark/Styria (Austria)

The biodegradable waste of the Styrian town Hartberg is collected separately in so called bio-bins (Bio-waste container). Synergy effects are helping to reduce costs: the waste treatment plant is conditioning alternating either the biodegradable waste or the sewage sludge of the sewerage which is located also at this site. The biodegradable waste is further processed in the biogas plant in the “Eco-Park”, two gas motor/generator units produce electricity and heat that is fed into the district heating grid of Hartberg.

3.1 Background information

3.1.1 Framework conditions in terms of energy policy and environmental policy

The most important incentive for biogas plants in Austria is also the Green electricity act 2002 that determines the feed-in tariffs. Small installations with a maximum of 100 kW_{el} and no co-fermentation are granted 16,5 Cent/kWh, whereas bigger plants and plants with co-fermentation get successively less.

The biogas plant has to organise the application of the fermenting residues, too. The central legal act is the Austrian action plan to implement the Council Directive 91/676 concerning the protection of waters against pollution caused by nitrates from agricultural sources. The action plan sets out maximum levels of nitrogen-containing fertilisers and manures and determines the periods when application is prohibited. Several additional restrictions have to be followed on, e.g. near surface waters.

The fermented residues of a biogas plant that is processing biodegradable waste are monitored (about two times a year) concerning the contents of nitrogen and other minerals as well as of heavy metals and other harmful substances. The arable land as well as the plants that are grown are subjected to strict requirements defined in the regulation on the deposition of sewage sludge (Klärschlammverordnung).

3.1.2 Actors and success factors in the early phase

The director of the municipal utility Hartberg (Stadtwerke Hartberg) was the driving force for the realisation of the biogas plant Hartberg. He had the vision of an “Eco-Park” that was at the same time an industry, an research and an adventure Park reflecting the idea of sustainability: supply and disposal systems should work autonomously and be based on closed cycles. The biogas plant fits perfectly in the concept, providing electricity and heat from digestion of waste.

The design of the biogas plant was implemented by the municipal utility Hartberg together with its subsidiary enterprise, the Oekoplan Hartberg. Scientific assistance was arranged with “reNet”, a competence centre for biomass gasification and biogas. Until now six research projects on the optimisation of the biogas plant were accomplished via “reNet”.

3.2 Realisation

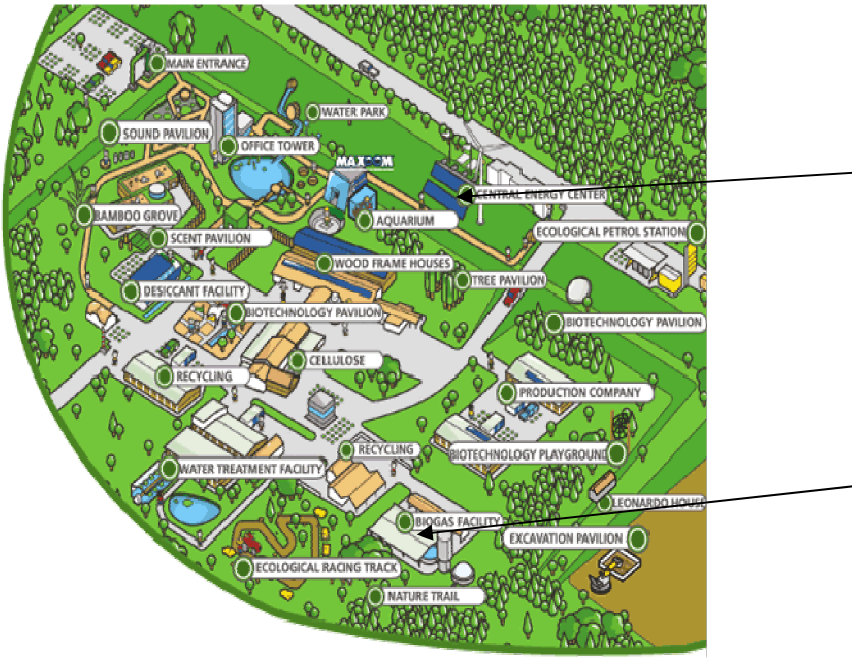
3.2.1 Organisation

The Biokraft Hartberg GesmbH was founded in December 2003 by the municipal utility Hartberg and Oekoplan (together 55%), companies engaged in waste disposal and the Oekostrom AG. The latter being a competent partner in the organisation, distribution and marketing of green electricity is holding a share of 35%. The electricity of the bio-gas plant is labelled as green electricity by the Austrian Eco-Label.

The Biokraft Hartberg operates as well the waste treatment plant and two biogas plants, one for biodegradable waste in the Eco-Park and one for sewage sludge. The investment volume of all facilities was 3,54 Mio Euro.

3.2.2 Location

Figure 8: Map of the Eco-Park Hartberg (model of completed construction – the main part is already realised)



3.2.3 Substrates supply

The biodegradable waste of Hartberg (7 tons per day), left-overs of restaurants (2,5 tons per day) and fat from grease separators (2,5 tons per day) are conditioned in the waste treatment facility which is located next to the sewerage, about 3 kilometres from the biogas plant in the Eco-Park. The substrates are delivered by lorries and fed into the pre-mix tank. Grass and other residues from horticulture may be added also.

Figure 9 (left): *Waste treatment facility with Bio-bins on the right and the clarification basin of the sewerage to the left*

Figure 10 (right): *Pile of the dehydrated digester residues.*

3.3 Technical concept

There are three tubular fermenter (lying) followed by two post-digester tanks (each 1.000 m^3) outside (see figure 12). Their effluents are collected in a storing tank (500 m^3; as well outside). All tanks are closed, thus it is possible to collect most of the biogas that is generated.

In a distance of around 300 meters from the biogas plant the CHP-installation is housed in the so-called energy central. The two gas motors are Otto-type motors from the German company MAN. The heat is transferred by a liquid cooling system to the heat exchanger of the district heating grid.

During summer the heat is used to drive an absorption cooling system for office buildings and for the Maxoom-Cinema located in the Eco-Park.

The effluent from the biogas plant is delivered back to the waste treatment plant and squeezed out. There remains a fertilizer, the liquid is flowing back into the sewerage. Since the dehydrated digester residues of both the sewage biogas plant (2/3) and the Eco-Park biogas plant (1/3) are mixed in one pile, only farmers that have the permission can take these. The heavy metal content is analysed beforehand.

Figure 11 (left): *(left) The bulky pipes in front of the digester are filled with substrate, the gas pipes have a small diameter.*

Figure 12 (right): *Construction of the post-digester tanks*

Figure 13 (left): *Post-digester tanks and storing tanks are situated beneath the ground, pipes are leading from all of the basins to the gas-bag*

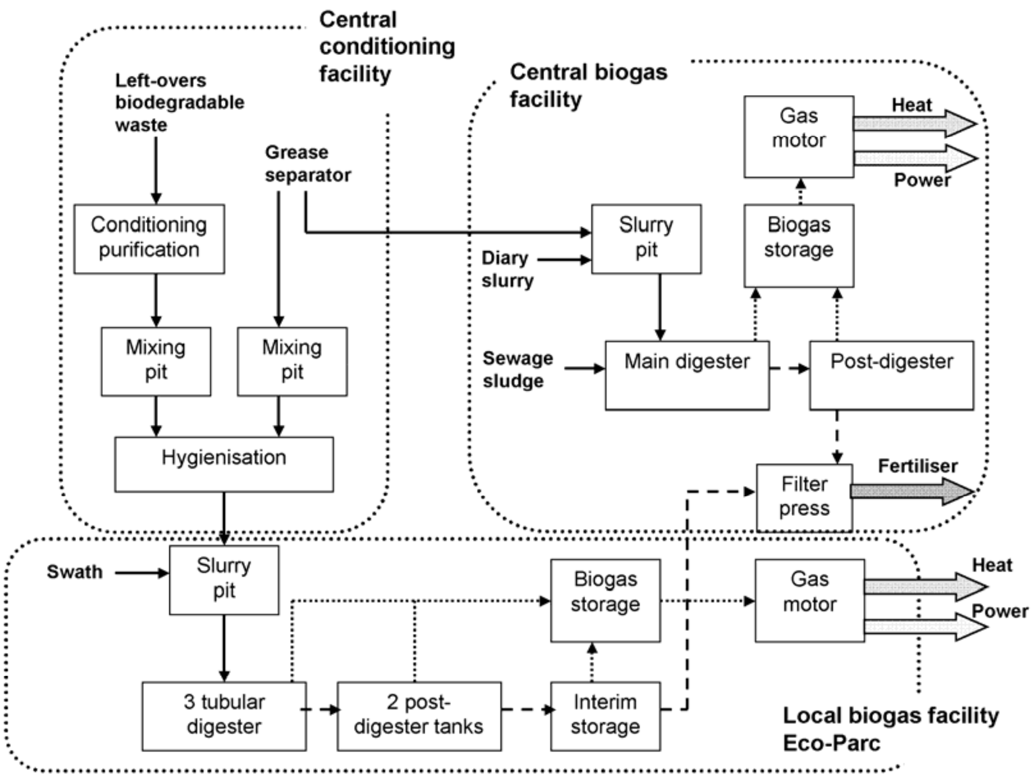
Figure 14 (right): *"Energy center" with PV and wind turbine; the CHP-unit is inside.*

3.3.1 Nominal and operational technical data

Technology (digester)	3 lying tubular fermenter with 160 m^3 volume each
Substrate and substrate trough-put	Biodegradable waste from households (collected in the bio-bin), 6.000 t/yr
Post-digester	2 basins with 1.000 m^3 each, storing tank with 500 m^3
Biogas yield	-
Electricity generation	180 kW + 100 kW
Heating load	587 kW
Overall energy efficiency (electricity + heat)	> 60%
Operation hours	7.600 h/per year

The biogas plant is working in its planned operation since Spring 2006, so there are no complete operational data of the last year.

3.3.2 Flow sheet of the whole facility



Note: The case-study biogas plant is the “Local biogas facility Eco-Parc” in the picture above.

4 Evaluation of the biomass criteria

4.1 Methodology of the evaluation

It is the objective of this report to evaluate the practicability of the proposed criteria of the first report (Oehme 2006). Therefore experts and operators of biomass plants have been interviewed (mostly telephone interviews have been conducted) on the implications of the criteria concerning their plant respectively the plant(s) they have studied. For every criterion that was applicable to each plant the expert was asked to estimate whether it was feasible in practice and whether the needed information to fulfil the criterion was available with a limited effort. The interviews were not restricted to the applicable criteria but also touched all other criteria to get a broader impression of the experts´ opinions and to anticipate any reservations.

The interviewed persons were either representing the operator's viewpoint or the auditor's viewpoint; they were from Austria and from Switzerland. The covered technologies were:

- Biogas / farm scale use
- Biogas / utilisation of biodegradable waste
- Combustion / wood fuel (from non-certified forests)
- Combustion / wood fuel (from FSC-certified forests)

Experts from the EU-Altener project "European Biomass CHP in Practice" (Bio-CHP) were also consulted and asked for their vision and opinion on specific questions and their "best practice experiences" during a workshop of the latter project[2].

Furthermore additional information was compiled by a literature and internet review on formulations that were not precise and on open questions. In specific some inputs of the experts of the first biomass report (Oehme 2006) that have not been utilised in the first report were further exploited.

List of interviewed persons:

Bachhiesl, Mario	Expert for wood fuel logistics, adviser for the design and maintenance of a biomass plant, Austria
Gilomen, Fritz	Auditor for biomass, Switzerland
Hammer, Karl	Engineer in biomass plant, Austria
Kromus, Stefan	Operator of Biogas plant, Austria
Nemesthoty, Kasimir	Expert and researcher on biomass, Austria
Ronchetti, Claudio	Auditor for biogas, Switzerland

[2] The Workshop with a presentation of the project findings took place on the 9th and the 10th of March 2006 in Vienna, Austria.

The input from all interviewed persons is gratefully acknowledged. Since anonymity has been promised no direct quotations are given in the following chapters.

4.2 Discussion and specification of criteria

The criteria that were suggested in the first report (Oehme 2006) and that are detailed in this report should serve the following objectives:

- To provide support for the further development of the biomass criteria applied in the context of the Eugene Standard set up by the European Green Electricity Network Eugene,
- To provide support for the development of biomass criteria in the course of the establishment of new national green electricity labels,
- To provide support for the possible certification of biomass.

The Eugene Standard provides a harmonised standard for existing green energy labels throughout Europe. National labels for renewable and environmentally sound generated electricity can apply for accreditation to the Eugene standard. Although the Eugene standard can serve as a benchmark for energy suppliers their green energy portfolios cannot be “Eugene labelled” directly but they have to apply to accredited national labels.

The following constellations might occur where the suggested biomass criteria have to be specified according to the situation in a certain country and for the validation of a certain green electricity product:

(1) a national label that is governmentally supported or supported by NGO or foundation research programmes and wants to adopt the Eugene Standard as the basis of its national or international green energy markets,

(2) a national label that is e.g. started by an independent organisation like a research institute together with one or multiple energy suppliers,

(3) an energy supplier who wishes to have his product validated and verified to the Eugene Standard and for this purpose calls for an own national label.

With respect to some of the criteria it turned out that for the second and the third constellation it will be quite difficult to reach an accepted result since some criteria need extensive preparatory studies that are far too expensive to be financed by consumers´ higher electricity prices.

It also has to be decided how to proceed when there is a temporarily non-compliance to one or several of the criteria. This is an important issue because of the heterogeneity of biomass sources and technologies. As a general guideline chapter 5.1. of the Eugene standard can be quoted:

“Energy producers and suppliers shall meet the criteria set in this paper on an annual basis. In order to allow necessary flexibility for market operation, suppliers of supply offerings are allowed to rely on balancing power from other than the eligible sources in order to meet their electricity supply commitments. If this option is used, the differences between supply from eligible sources and demand have to be balanced on an annual basis. At the end of each year, a remaining difference between demand and supply of power from eligible sources within the range of +/- 10% of the supplier's green power sales is allowed, but has to be brought forward to the following year.”

It was a distinct experience of the evaluation phase that operators of biomass plants in countries with quite attractive feed-in tariffs did not show much interest in green power labeling as financial interest offered by the feed in tariff is more favorable.

4.2.1 Eligibility of Sources

4.2.1.1 Previous Proposal (Oehme 2006)

Eligible biomass sources for the production of green electricity are defined as follows:

- Solid biomass according to CEN/TS 14961:2005, comprising
  - Woody biomass (forests and plantation wood; wood processing industry, by-products and residues; used wood, blends and mixtures),
  - Herbaceous biomass (agriculture and horticulture herb including cereal crops, grasses, oil seed crops, root crops, legume crops, flowers and landscape management herbaceous biomass; herb processing industry, by-products and residues; blends and mixtures),
  - Fruit biomass (orchard and horticulture fruit; fruit processing industry, by-products and residues, blends and mixtures),
  - Blends and mixtures.
- Furthermore, the following sources are admissible:
  - Separated biodegradable waste (for biogas only),
  - Animal excrements, e.g. manure or chicken litter etc. (but no animal body or parts of it),
  - Sewage gas is admissible as far as the label organisations applying for the accreditation by Eugene provide a sound argumentation, why and under which conditions sewage gas is eligible.

4.2.1.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Eligibility will pose no problem, because only woody biomass is used.

Biogas plant Hartberg: This criterion poses no problem because separated biodegradable waste is eligible as input for biogas plants. No animal body or parts are processed in Hartberg.

4.2.1.3 Further experts´ inputs and in-depth information

In all European countries listings of constituents of biodegradable waste in the context of waste management are available. Some fractions of solid biomass, like residues from forests or from horticulture are also quoted in these listings. But here we mean in specific organic, biodegradable waste of private households, that is collected separately (without plastics). Moreover biodegradable waste may originate from industry and business, comprising e.g. residues from the food industry, leftovers from restaurants and canteens, or waste from manufacturing of products of animal origin (leather, wool, feathers, horn).

The proposal (chapter 4.2.1.1, Oehme 2006) allows biodegradable waste for biogas production only, following the argumentation of Edelmann (2001a). Since the effluents leaving the digester after processing contain similar nutrients to the raw organic waste, they may be used as a fertiliser and as a soil conditioner. Thus it is possible to close the (nutrient) cycle which is preferable to waste incineration, when biodegradable waste is not separated from other organic (synthetic) material.

Digesting of animal slurry adds further advantages in comparison to the application of raw slurry on farmland: nitrogen is concentrated in a more viable form as ammonia ions, odour problems are avoided.

Biogas co-digestion (the use of minor feedstock components together with the major feedstock material whether manure or specifically grown green crops) is not explicitly mentioned in the proposal. As long as eligible sources are used there is no problem. But co-substrates that give a high gas yield are more attractive: glycerine from bio-diesel production, fat from grease separators, animal bodies. In Austria the advantageous feed-in tariffs for biogas electricity are a cut by 25% when the above mentioned co-substrates are used. Nonetheless almost all of the biogas plants in Austria use co-digestion (Resch 2004). In Switzerland the amount of co-substrates is limited to 15%, but will be raised to 50%. The proposal sets no limitations to co-digestion having in mind the professionally operated biogas plants that struggle to optimise their costs rather than farm scale installations that should not be misused for waste disposal.

Animal bodies or parts from animals (abattoir waste, including intestinal contents, etc.) are not permitted. Although these compounds are not excluded in several standards of renewable power, including EU-Directive 2001/77/EC, the proposal is to desist from waste-to-energy conversion as a concession to the public perception of “green biomass”. In some countries nonetheless their processing is promoted as sustainable (Sachsen-Anhalt Ministry of Agriculture and Environment 2003). The regulation (EC) 1774/2002 on health rules concerning animal by-products promotes biogas production as a possibility for the treatment and utilisation of animal bodies etc. under certain preconditions.

Another point to clarify is the term “used wood”. CEN/TS 14588:2003 defines used wood as “wood substances or objects which have performed their intended purpose”. Used wood should not include heavy metals or halogenated organic compounds. Demolition wood (wood arising from demolition of buildings or civil engineering installations) is not classified as biomass by CEN/TS 14588:2003 and is accordingly handled under the waste incineration Directive (EU-Directive 2000/76/EC). Countries can however have their own definitions and/or classification in this subject.

As conflicting points in a general sense that might arise in future there have been mentioned: Ethical reservations rise when corn or grain is used for energy purposes. Competing paths for the biogas might gain increasing ecological importance, e.g. utilisation as a fuel for cars rather than for electricity (The waste water management agency of the region Luzern in Switzerland decided to build a conditioning facility for the sewage gas rather than installing a second gas engine/generator following a study showing that it is ecologically advantageous and economically feasible[3]).

To summarise: Problems could be found mainly in the confines of waste management and energy production from waste. Sewage gas has already been tackled in the first report (Oehme 2006). It is eligible under certain preconditions. Used wood is also eligible under certain preconditions. MSW plants (waste incineration plants) are sometimes classified as biomass installations, whereas in the context of the Eugene network and the CLEAN-E project they are excluded. Modern biogas plants try to increase the gas yield by utilisation of waste e.g. with a high fat content (co-fermentation). No reservation has been suggested in this context.

4.2.1.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

Eligible biomass sources for the production of green electricity are defined as follows:

- Solid biomass according to CEN/TS 14961:2005, comprising
  - Woody biomass (forests and plantation wood; wood processing industry, by-products and residues; used wood, blends and mixtures),
  - Herbaceous biomass (agriculture and horticulture herb including cereal crops, grasses, oil seed crops, root crops, legume crops, flowers and landscape management herbaceous biomass; herb processing industry, by-products and residues; blends and mixtures),
  - Fruit biomass (orchard and horticulture fruit; fruit processing industry, by-products and residues, blends and mixtures),
  - Blends and mixtures.
- Furthermore, the following sources are admissible:
  - Separated biodegradable waste (for biogas only, *without limitations for co-fermentation*),

[3] See www.ara-luzern.ch, press release from 6th of january 2005.

- Animal excrements, e.g. manure or chicken litter etc. (but no animal body or parts of it),
- Sewage gas is admissible as far as the label organisations applying for the accreditation by Eugene provide a sound argumentation, why and under which conditions sewage gas is eligible.

Used wood is defined according to national regulations (e.g. in emission regulations).

4.2.2 Wood fuel

4.2.2.1 Previous Proposal (Oehme 2006)

As a general principle: All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management.

For wood fuel from plantations and imported wood fuel: sustainable forest management shall be certified according to FSC (Forest Stewardship Council). Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured.

National certification schemes of green electricity in countries with a sufficient area of certified sustainably managed forest, should for all fuel wood demand a third party certification, thereby referring to the FSC label. Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured. The argumentation has to be provided by the national label applying for Eugene accreditation and need to be accepted by the Eugene Board. The availability of certified wood fuel shall be regularly reviewed according to the reviewing period of the national certification scheme of green electricity, however at least every fourth year and third party certification shall be required as soon as there is sufficient supply.

For wood fuel from non certified forest, the criteria as given in chapter 4.2.3 shall be applied (not applicable for wood fuel from plantations and imported wood fuel, as they need to come from certified forests).

4.2.2.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Almost the whole wood fuel of the plant that originates from Austria is PEFC-certified. In Austria PEFC-labelling will have to be proved to be equivalent to FSC in substantial aspects. The main supplier is the Austrian Federal Forest AG, a minor supplier is the Lower Austria Forest Owner Cooperation.

Some of the wood fuel is imported from the Czech Republic and from Slovakia but within a circumference of 100 km. The (imported) wood fuel is not certified, however the suppliers are well known by the Austrian Federal Forest AG. Since the Austrian Federal Forests AG is bound by a contract to provide enough wood fuel, they attach importance to a reliable sub-supplier. Until now forest certification with a correct chain-of-custody is not as wide spread as necessary to have enough suppliers on the market.

The operator reckons that with the growing importance of certified timber e.g. for garden furniture or for paper production also certification of low value contingents like wood fuel will be promoted within some years.

Biogas plant Hartberg: Not applicable.

4.2.2.3 Further experts´ inputs and in-depth information

Some of the formulations of the proposal are vague at a first glance (sufficient area, sufficient supply). But after all this indicates only that the main addressee of Eugene is the national label that can apply for governmental funding when research or data evaluation is necessary. Interpretation of these can than lead to adequate country-specific numbers. Also equivalence of different certification schemes is best proved by studies that are conducted independently from private financing. It seems very unlikely that a small label could invest the effort and the money to be accredited to Eugene if not substantial parts of the forests in its country are FSC-certified.

In Austria which is a country with almost no FSC-forests the interviewed experts were sceptical: A third-party certification of forests is perceived as being too expensive and not paying off, especially because the wood is not for premier utilisation like furniture or paper (where consumers are already demanding for certified products) but for combustion only.

Since biomass has a comparatively low energy content, large biomass plants also need huge amounts of biomass fuels. Fuel logistics is one of the main tasks of the plant operators. They told that a good strategy in Austria is to have a high percentage of long-term contracts and to use the remaining rest to buy cheap material from wind breakings or bug pests short-dated. The necessity to buy certified timber only would greatly reduce the flexibility of the operator of the plant. Furthermore in Austria an important source of biomass that could be used for energy conversion without any ecological restrictions is from small forests that are owned by private persons (Hirschberger 2006). The growth rate (adding of biomass volume per year) in this section is high and the potential is not exploited by far. But with this criterion it will be even more difficult to get access to this potential because the owner group is not certified at all. Even the proposal for uncertified wood in chapter 4.2.3. will not ease this problem.

Another critique of the interviewed persons in Austria concerned the imposition that imported wood has to be certified and cannot claim the proposal for uncertified wood (chapter 4.2.3.). The opinion was that it is better to draw back on timber from a neighbour country if the distance to the plant is less than to buy domestic wood. The reason are the transport costs: Austria is covered by forests to a large part (over 47%), distances are usually small and preferably passed with lorries. For bigger distances trains are advantageous as transport means but need an additional transportation from the station to the plant. In Austria there are several biomass power plants that would be affected by this criterion.

Moreover it might be argued that it imposes a trade barrier to foreign timber if imported wood fuel has to be certified whereas the domestic timber has not. But to allow criterion 4.2.3. for imported wood fuel also adds considerable confusion to the procurement of the plant operator: According to criterion 4.2.3. the forestry legislation and practice of the importer's country have to be considered when purchasing wood fuel from abroad.

As a summary it can be stated that although this criterion cannot be fulfilled in several countries at the moment it should remain as the aim to be strived for. Experts anticipate that in some years the proportion of certified wood will grow in all or at least most European countries. Sound certification schemes should be supported by sticking to this criterion. National label criteria might be defined with transition periods for this aspects following the further development.

4.2.2.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

As a general principle: All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management.

For wood fuel from plantations and imported wood fuel: sustainable forest management shall be certified according to FSC (Forest Stewardship Council). Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured.

National certification schemes of green electricity in countries with a sufficient area of certified sustainably managed forest, should for all fuel wood demand a third party certification, thereby referring to the FSC label. Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured. The argumentation has to be provided by the national label applying for Eugene accreditation and need to be accepted by the Eugene Board. The availability of certified wood fuel shall be regularly reviewed according to the reviewing period of the national certification scheme of green electricity, however at least every fourth year. Third party certification shall be required as soon as there is sufficient supply.

For wood fuel from non certified forest, the criteria as given in chapter 4.2.3. shall be applied (not applicable for wood fuel from plantations and imported wood fuel[4], as they need to come from certified forests).

4.2.3 Wood fuel from non certified forest

4.2.3.1 Previous Proposal (Oehme 2006)

All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and

[4] *It should be clarified whether a hidden barrier to free trade in the community's internal market might be found concerning imported wood.*

measures aimed at ensuring sustainable forest management. In Europe, the principles and measures referred to above shall at least correspond to the definition of Sustainable Forestry Management that was adopted in Resolution 1 of the 2nd Ministerial Conference on the Protection of Forests in Europe (Helsinki, 16-17 June 1993), the Pan-European Operational Level Guidelines for Sustainable Forest Management, as endorsed by the 3rd Ministerial Conference on the Protection of Forests in Europe (Lisbon, 2-4 June 1998) and the Improved Pan-European Indicators for SFM, adopted at the MCPFE Expert Level Meeting of 7-8 October 2002 that were endorsed at 4th Ministerial Conference on the Protection of Forests in Europe (Vienna, 28-30 April 2003).

- Wood shall not originate from illegal harvesting.
  - Illegally harvested wood: wood that is harvested, traded or transported in a way that is in breach with applicable national regulations (such regulations can for example address CITES species, money laundering, corruption and bribery, and other relevant national regulations).
- Wood shall not originate from High Conservation Value Forests.
  - High Conservation Value Forests (HCVF) are forests that possess one or more of the following attributes:
  - forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia)
  - forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
  - forest areas that are in or contain rare, threatened or endangered ecosystems

    forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)
  - forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health)
  - forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities)

4.2.3.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: See chapter 4.2.2.2

Biogas plant Hartberg: Not applicable.

4.2.3.3 Further experts´ inputs and in-depth information

Awareness is growing in the EU of the increasing dimension of illegal logging and the related trade, and its negative ecological and economic consequences. In May 2003 the European Commission presented an action plan on Forest Law Enforcement, Governance and Trade (FLEGT). The action plan rests primarily on the negotiation of voluntary partnership agreements (VPA) with producer countries. These agreements will put in place in each country a licensing system designed to identify legal products and license them for import in the EU. Unlicensed and therefore possibly illegal products of this country will be denied entry at the EU border. Until now already some countries have negotiated VPAs (www.illegal-logging.info).

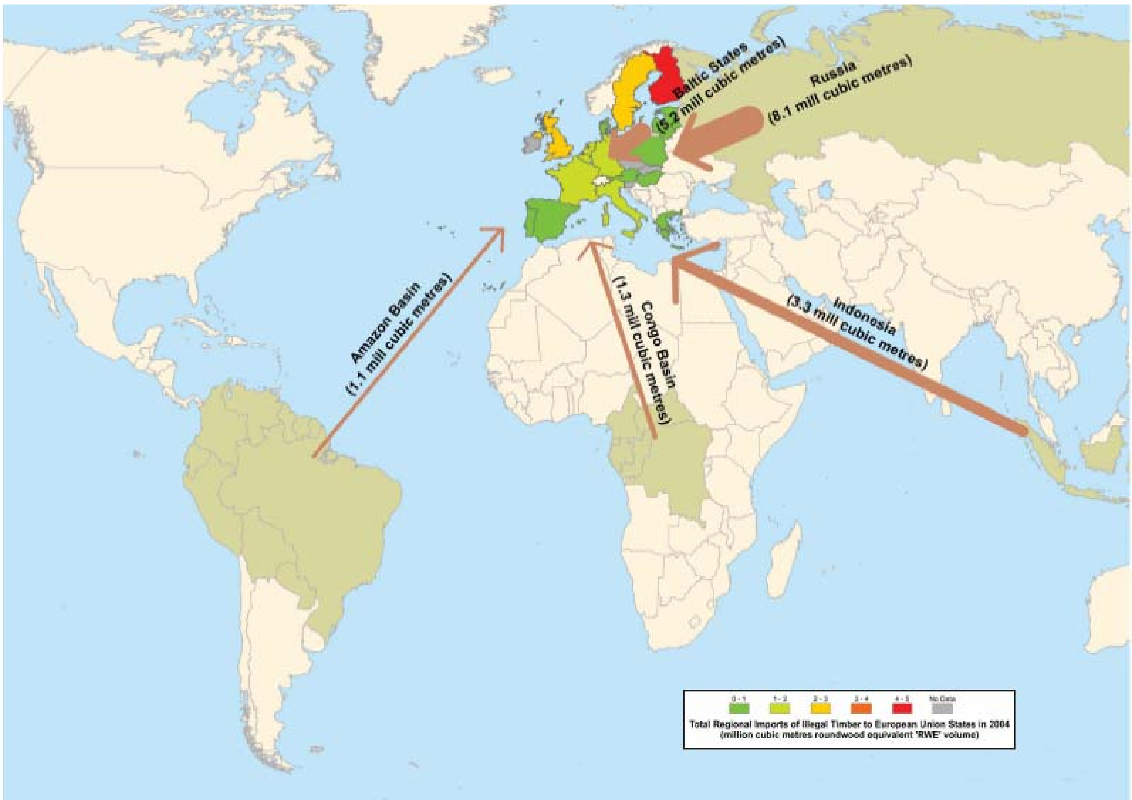
One serious weak spot is the fact that illegal logging would have to be impossible across the entire partner country including all exports (not only to EU) and its domestic timber trade. Furthermore if the country has no national legislation prohibiting the import of illegally logged timber and timber products, timber logged illegally in a non-partner country could enter Europe legally via the partner country (Greenpeace/FERN/Global witness).

But illegal logging is not only a problem in tropical forests. Illegality also occurs in developed countries and economies in transition: in Europe Estonia, Latvia and Russia have been accused or are identified of being a source of illegal harvested timber. A report of WWF, which focuses on the trade between EU countries and the Amazon Basin, the Congo Basin, East Africa, Indonesia, the Baltic States and Russia, found that the EU imports roughly 20 million cubic metres of illegal timber from these regions annually. As a result the report reveals that, of an estimated €10–15 billion per year that the illegal timber trade costs the economies of these countries, the EU is responsible for almost €3 billion, due to its trade with these six regions alone (Hewitt 2005).

Wood fuels that originate from countries with well-functioning regulatory systems have only a low risk of being illegally harvested. Complete sets of documentation papers (permits, etc.) are sufficient to prove this. Also practically all forest certification schemes (FSC, PEFC, CSA, Cerflor, MTCC) require independent verifiers to confirm legal rights to harvest, so risk in trading illegal timber is minimal.

However if the timber is uncertified and the country of origin of the timber is uncertain, e.g. because it was mixed with other sources or the country is known to have a weak regulatory system the risk of illegality is given. Biomass power suppliers should provide further proof that they are not buying illegal fuel wood. WWF supposed a 4 step-system to reduce the risk of using illegal timber (Miller 2006) which could be required to be put into practice by applicants of green electricity suppliers in this case.

Figure 15: Estimated illegal timber trade flows from the six regions investigated in the report into the EU – 2004 (Hewitt 2005)



The second requirement of the proposal on non-certified wood deals with nature conservation. All forests contain environmental and social values, such as wildlife habitat, watershed protection or archaeological sites. Where these values are considered to be of outstanding significance or of critical importance, the forest can be defined as a high conservation value forest (HCVF). This might be the case e.g. only in a small part of a larger forest. The key is the identification of High conservation values, because it is their presence that determines whether a forest is designated a HCVF. It is these values that are important and need to be protected. The forest area where these values are found needs to be appropriately managed in order to maintain or enhance the identified values (www.proforest.net). This does not necessarily preclude management operations such as timber harvesting. However it does mean that management activities must be planned and implemented in a way that protects these values. ProForest has issued a toolkit for defining HCVs and identifying HCVFs both on a national level and on a forest management unit level (Jennings 2003). The toolkit also includes some guidance on designing appropriate management requirements and monitoring measures for each HCV. The HCVF concept was initially developed by the FSC for use in forest certification, providing the generic definition of HCVs as given in the previous proposal (Oehme 2006). But it has already been uptaken in projects of conservation, natural resource planning, landscape mapping etc., too.

The HCVF Toolkit of ProForest is intended to assist anyone who need to interpret the generic definition of HCV of the FSC. If there is a ratified FSC certification standard in a country, this can readily be transferred to a specific forest in this country. Otherwise the implementation of HCVFs can be either defined at a national level with input from a range of different interest groups and science fields. On the other hand there is a methodology aimed at forest managers who need to identify HCVF in the absence of such a national level process.

A large proportion of the effort of identifying HCVs involves using appropriate information. There may be a number of different approaches and analyses of forest resources that are applicable in a specific location. For example, the results of global analyses of those forests that contain the greatest biodiversity, numbers of endemic species and loss of forest area (such as WWF Global 200 Ecoregions, Natura 2000, IUCN protected areas, UNESCO world heritage sites, etc.), the results of monitoring programmes like ICP Forests by UNECE or Forest Focus, and so on. All provide crucial information on the global significance of biodiversity within a region. Likewise, studies of customary land use or maps of indigenous areas might help define HCVF within a particular region. Appropriate management requirements can e.g. be found in the national working plans for forestry management of Natura 2000 regions. The toolkit quotes several sources of information.

So for wood fuel from non-certified forests the forest manager should carry out evaluations (or induce the evaluation) of their forest areas to determine whether any of the defined HCVs is present within his FMU. HCV must then be integrated in management planning and activities. To ensure that each identified HCV is maintained and enhanced monitoring is essential. The toolkit outlines basic processes needed to develop robust monitoring protocols. The monitoring results have to be submitted to the labelling organisation regularly.

4.2.3.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management. In Europe, the principles and measures referred to above shall at least correspond to the definition of Sustainable Forestry Management that was adopted in Resolution 1 of the 2nd Ministerial Conference on the Protection of Forests in Europe (Helsinki, 16-17 June 1993), the Pan-European Operational Level Guidelines for Sustainable Forest Management, as endorsed by the 3rd Ministerial Conference on the Protection of Forests in Europe (Lisbon, 2-4 June 1998) and the Improved Pan-European Indicators for SFM, adopted at the MCPFE Expert Level Meeting of 7-8 October 2002 that were endorsed at 4th Ministerial Conference on the Protection of Forests in Europe (Vienna, 28-30 April 2003).

The requirements can be summarised as follows:

- Wood shall not originate from illegal harvesting.

  - Definition of illegally harvested wood: Wood that is harvested, traded or transported in a way that is in breach with applicable national regulations (such regulations can for example address CITES species, money laundering, corruption and bribery, and other relevant national regulations).

- Wood shall not originate from High Conservation Value Forests.
  - High Conservation Value Forests (HCVF) are forests that possess one or more of the following attributes:
  - forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia)
  - forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
  - forest areas that are in or contain rare, threatened or endangered ecosystems
  - forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)
  - forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health)
  - forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

- *The national label has to adapt suitable benchmarks for wood fuel suppliers:*
  - *Biomass power suppliers should provide proof that they are not buying illegal fuel wood; for instance the 4 step-system the WWF proposed in “Keep it legal” (Miller 2006) could be used.*
  - *The forest managers that have a contract with a biomass power supplier should carry out evaluations (or induce the evaluation) of their forest areas to determine whether any of the defined HCVs is present within their FMU. HCV must then be integrated in management planning and activities.*

4.2.4 GMO

4.2.4.1 Previous Proposal (Oehme 2006)

The use of genetically modified organisms (GMO, agricultural crops as well as trees) for electricity production is not permitted.

4.2.4.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Wood fuel is from semi-natural forests with no GMO.

Biogas plant Hartberg: Nobody could tell whether the leftovers of kitchen contains any GMO.

4.2.4.3 Further experts´ inputs and in-depth information

Several cultivation experiments have been conducted on energy crops as well as on Short rotation coppice to improve the yields per area or to improve the biogas yield of the crops (Spök 2003). In the EU the use of genetics is subjected to strict permissions by the EU-Directive 2001/18/EC on the deliberate release into the environment of genetically modified organisms.

The consulted Austrian plant operators are not in favour of GMO, they do not know any concrete or promising applications nor do they express any reservation to this proposal.

The recent rise in US-corn prizes – almost 70% in the last six month of 2006 – has mainly been driven by the demand for corn for ethanol bio fuel in the US. According to the US Department of Agriculture, in 2007 the country will use 20% of its total corn crop for the production of ethanol, and by next year that will jump to 25%. In 2006, 61 percent of corn planted in the United States was genetically modified, compared to 52 percent in 2005 and 46 percent in 2004, according to U.S. Department of Agriculture statistics. Corn is also favoured for biogas electricity production.

Dupont´s vice president for genetics research and development said the firm´s new research was focused on boosting yields by making plants more weather, bug and weed resistant, as well as creating corn types more suitable to ethanol production. He also said farmers planting to meet ethanol demand were more willing to use GMO.[5] This should raise concerns about future scenarios for Europe as well.

4.2.4.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

The use of genetically modified organisms (GMO, agricultural crops as well as trees) for electricity production is not permitted. *GMO in separated biodegradable waste should be neglected due to practicability reasons.*

4.2.5 Energy crops

4.2.5.1 Previous Proposal (Oehme 2006)

Energy crops shall not be produced on arable land which has been gained by conversion of pasture or grassland.

4.2.5.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: No energy crops are used.

Biogas plant Hartberg: Not applicable.

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[5] See http://www.genet-info.org - Newsletter, 13th of february,.2007: Dupont sees key GMO role in ethanol corn challenge

4.2.5.3 Further experts´ inputs and in-depth information

As was already stated in the first biomass CLEAN-E report (Oehme 2006) the European Council Regulation EC 1782/2003 puts special emphasis on the conservation of permanent pasture and grassland. The area of pasture and grassland is monitored by each EU member state regularly as a consequence and according to its cross compliance requirements. If the total area decreases to a certain extent in a time period (detailed numbers are given in the Council Regulation) measures have to be taken. Nevertheless it is not prevented that farmers who possess any of these areas convert them to arable land to grow energy crops. With the rising number of biomass plants either for thermochemical conversion (combustion, gasification, pyrolysis) or biochemical conversion the market of energy crops is getting dynamic. Temporarily even shortages occur, resulting in increasing prices (Jensen 2006). So a new pressure to make profit by using formerly not intensely managed areas is created. This criterion explicitly is directed to farmers supplying power plants with energy crops. Usually the plant operator is tied to his suppliers with long-term contracts, often the plant has been set up in order to make use of regionally available arable areas and to provide a source of income for farmers. Therefore there might be a dependence on his suppliers. Anyway, if the electricity is to be sold as certified „green“, suppliers have to be informed and have to comply with the requirements for the green certification. It is not clear for how many years back this criterion should be applied. Since the Council Regulation refers to the status in 2003, this could be used as key-date for settling the criterion, too.

4.2.5.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

Energy crops shall not be produced on arable land which has been gained by conversion of pasture or grassland *(since 2003). Documents on the land use in 2003 have to be provided.*

4.2.6 Plantations

4.2.6.1 Previous Proposal (Oehme 2006)

Short rotation tree plantations (SRTP) should not be established on forest areas or on arable land which has been gained by conversion of pasture or grassland.

4.2.6.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Until now no fuel from plantations is used. In Austria anyway there are only a few areas with SRTP cultivated by agricultural institutions for research. The criterion might become relevant in some years; the plant operator will then evaluate the economic attractiveness.

Biogas plant Hartberg: Not applicable.

4.2.6.3 Further experts´ inputs and in-depth information

The legal situation as well as the market indications as given for energy crops (chapter 4.2.5) is also true for SRTP. Since SRTP that are used for green electricity production always have to be FSC-certified (criterion 4.2.2), they have to comply to a similar criterion even further back in time: FSC requires that conversion from forest area to SRTP area has not been after 1994. Plantation principles are at the moment being reviewed by FSC. Until now this date has not been either changed nor replaced by another requirement. This will be one of the discussion points of the technical (second) phase of the review process.

4.2.6.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

Short rotation tree plantations should not be established on forest areas or on arable land which has been gained by conversion of pasture or grassland *(conversion has not been after 1994), as required for FSC certification of the SRTP.*

4.2.7 Maintenance of soil fertility of forests

4.2.7.1 Previous Proposal (Oehme 2006)

Either: No removal of needles, foliage and roots. Also forest residues, like branches and others shall be left at the site as far as possible to maintain soil fertility and to reduce risk of erosion. Thereby measures have to be adapted to site characteristics.

Or: Ash quality from conversion processes should be monitored and where possible nutrient-rich ash should be recycled back to the land.

For both aspects national guidelines have to be taken into account as far as available.

4.2.7.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Combustion of foliage etc. is possible in the plant. But at present needles, foliage and roots are not used and therefore remain at the forest sites. This is due to the fact that these parts of forest biomass are both comparably light ("transportation of air") and have a high moisture content. Thus the cost-benefit ratio is bad. Bark is per contract limited to 10%.
Ash is handed over to a waste deposit company. Analyses have shown that the ash is quite pure, so a recycling back would be desirable from an ecological viewpoint. Furthermore the Austrian legislation promotes the recycling of ashes. But the operator fears that residents may voice concern or even file a claim for damages.

Biogas plant Hartberg: Not applicable.

4.2.7.3 Further experts´ inputs and in-depth information

Discussions whether an increased and more efficient forest harvesting for bioenergy purposes is in contradiction with nature conservation issues, are gaining ever broader attention (Wittkopf 2003, Richardson 2005, Hirschberger 2006). It is a fact that the increasing number of plants calling for a sufficient and cheap supply with biomass have raised the interest in extracting also forest fuel assortments that previously have remained in the forest. These logging residues normally have a low density (and a low value). Furthermore needles and foliage are not ideal for combustion because they cause technical problems. On the other hand their nutrient level and their value for reducing erosion is high. As a minimum requirement the logging residues should be seasoned, i.e. the branches and slash remain in the forest until needles and foliage falls off.

This criterion is surely a key requirement for sustainable forest management, but it is not explicitly formulated in the generic FSC Principles. However it might be part of the national FSC-standards, like it is of the German standard.

In Northern Countries the recycling of the combustion ash back to the forests is a quite common practice. It has the additional advantage that deposition costs are saved. This is also mentioned by the interview partners, who would like to introduce this practice as well. The criterion could stimulate the development of a comprehensive national guideline on a sustainable practice of returning the ash to the forest. Until now there is no special guideline or regulation on ash deposition in several European countries, like e.g. Austria.

4.2.7.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

Soil fertility of forests must not be reduced substantially. This can be attained by

Either: No removal of needles, foliage and roots. Also forest residues, like branches and others shall be left at the site as far as possible to maintain soil fertility and to reduce risk of erosion. Thereby measures have to be adapted to site characteristics.

Or: Ash quality from conversion processes should be monitored and where possible nutrient-rich ash should be recycled back to the land.

For both aspects national guidelines have to be taken into account as far as available. *Measures have to be laid down in management plans of all wood fuel suppliers for the national label.*

4.2.8 Maintenance of soil fertility of arable land

4.2.8.1 Previous Proposal (Oehme 2006)

The withdrawal of straw or other agricultural residues for energetic use has to be adopted site-related according to the nutrient and humus level in accordance with Good Agricultural Practice to secure soil fertility in a sustainable manner. Soil fertility can also be ensured by returning of fermenting residues from biomass production to the arable land.

4.2.8.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Not applicable.

Biogas plant Hartberg: Not applicable.

4.2.8.3 Further experts´ inputs and in-depth information

When this criterion was presented to the interviewees, they immediately opposed it because of the well-known problem that agricultural areas are often loaded with too high amounts of fertilisers. Therefore already in 1991 the Council Directive 91/676 concerning the protection of waters against pollution caused by nitrates from agricultural sources set out maximum levels of nitrogen-containing fertilisers and manures on arable land. The Directive had been issued because excessive use of fertilisers led to a pollution of ground water and of fresh water (“eutrophication”).

On the other hand a minimum level of fertilising is necessary also, if the soil is used for agriculture. Beneficiary effects emanate from compost or from fermenting residues on the soil quality. To provide these substances is a vital interest of the farmer because it affects the harvested quantity.

Concerning the returning of fermenting residues the already mentioned practices and guidelines (see chapter 2.2.6.) have to be followed on. Codes of good agricultural practice with the objective of reducing pollution risks by nitrates are listed in the EU-directive and are further elaborated by the Member States in their national legislation. The observance is one of the cross compliance subjects in the Council Regulation 1782/2003, too (since 2005). Furthermore also soil protection of erosion and maintenance of organic matter in the soil are required (see Annex IV). If a farmer offends against these regulations he can be excluded from the direct payments under the various income support schemes in the framework of the common agricultural policy of the EC.

4.2.8.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

The withdrawal of straw or other agricultural residues for energetic use has to be adopted site-related according to the nutrient and humus level in accordance with Good Agricultural Practice to secure soil fertility in a sustainable manner. Soil fertility can also be ensured by returning of fermenting residues from biomass production to the arable land. *The farmer either has to sign a voluntary self-commitment with the plant operator or the farmer has a EUREPGAP-certification (see chapters 4.2.9 and 4.2.10).*

4.2.9 Integrated Farming / energy crops

4.2.9.1 Previous Proposal (Oehme 2006)

Biomass from dedicated cultivation on arable land needs to comply with guidelines for integrated crop protection.

4.2.9.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Not applicable.

Biogas plant Hartberg: Not applicable.

4.2.9.3 Further experts´ inputs and in-depth information

The Council regulation 1782/2003 demands that a farmer receiving direct payments from the EU has to respect statutory management requirements ("cross compliance"). National authorities have to provide the farmers with adequate information. Member states shall set up a farm advisory system (until January 2007) and an administration and control system.

Other measures and programmes that are funded within the Common agricultural policy, are detailed in corresponding national programmes which have to be approved by the EU. There also requirements on the good agricultural practice are formulated.

Going beyond the scope of cross compliance and other agricultural funding programmes on the one hand and providing a detailed system of requirements on the other hand is the EUREPGAP. EUREPGAP is the most widespread scheme of Integrated crop protection (ICP)/Integrated farming systems (IFS) that was included in the report about the status of Integrated crop management systems in the EU (Bradley 2002). It started as an initiative of retailers (Euro-Retailer Produce Working Group EUREP) and raised standards for the production of fresh fruits and vegetables. Standards on flowers and ornamentals, green coffee, integrated farm assurance (IFA) and integrated aquaculture assurance followed.

Either individual farmers or national certification systems representing a number of farmers can gain EUREPGAP certification. Since EUREPGAP certification is a well defined process with distinct actors and concrete requirements (not nation specific) it could be used as a guideline system in the scope of the criterion. In addition EUREPGAP certification is not so expensive. There are no EUREPGAP requirements for energy crops in specific. But the requirements for fruits and vegetables are adequate for the time being. They cover the subjects: Varieties and rootstocks, site history and site management, soil and substrate management, fertiliser use, irrigation/fertigation, crop protection, harvesting, waste and pollution management, recycling and re-use, worker health, safety and welfare, etc. The regulations for flowers and ornamentals contain similar criteria that could be used instead.

The interviewed persons were complaining about the increasing burden of bureaucracy for farmers. So it is important to use a standard that is trying to reduce duplication of audits at farm level and that has the potential to become the preferred global reference standard for farm assurance systems and as a common buyer standard by working on a mutual recognition of other quality assurance systems. EUREPGAP fulfils these requirements.

4.2.9.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

Biomass from dedicated cultivation on arable land needs to comply with guidelines for integrated crop protection. *This is documented by a EUREPGAP certification in the field of fruits and vegetables (and/or of flowers and ornaments).*

4.2.10 Integrated Farming / livestock waste

4.2.10.1 Previous Proposal (Oehme 2006)

If livestock waste (manure, chicken litter, etc.) is used for energy production, the conditions under which animals are housed and reared should comply with the principles of Integrated Farming.

4.2.10.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Not applicable.

Biogas plant Hartberg: Not applicable.

4.2.10.3 Further experts´ inputs and in-depth information

As EUREPGAP has also detailed requirements concerning animals within the Integrated Farm Assurance these should be used. As an example the criteria raised for poultry are grouped around the following subjects: sourcing, breeding, hatchery, feed and water, strict conditions for housed and less strict for outdoor poultry, health, hygiene and pest control, handling, residue monitoring, emergency procedures, inspection, workers responsible for the poultry, humane slaughter, despatch and transportation.

4.2.10.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

If livestock waste (manure, chicken litter, etc.) is used for energy production, the conditions under which animals are housed and reared should comply with the principles of Integrated Farming. *This is documented by a EUREPGAP certification on Integrated Farm Assurance.*

4.2.11 Biogas plants using manure

4.2.11.1 Previous Proposal (Oehme 2006)

Emissions of CH_4, N_2O and NH_3 by usage of manure have to be reduced by covering the storing tank and by applying manure with accurate methods at appropriate time (e.g. trailhose or similar device).

4.2.11.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Not applicable.

Biogas plant Hartberg: Not applicable.

4.2.11.3 Further experts´ inputs and in-depth information

Biogas plants that use manure or slurry as feedstock material are often located on a farm and operated by the farmer himself. Bigger biogas plants that process energy crops or biodegradable waste anyway optimise gas yield by covering all storing tanks. Moreover the effluent is dehydrated, composted for some weeks and sold or distributed afterwards with no special requirements regarding its application (Edelmann 2001a, b).

The farm biogas is converted to electricity and heat in a small CHP-gas engine. For years heat and electricity were not sold but used on the farm only. As the energy output was generally well above their own individual needs, there was no point in gaining a higher biogas output or a better electricity efficiency. In the majority of cases the biogas volume was not even measured. But better feed-in tariffs and the possibility to sell “green power” have changed this situation and new and upgraded biogas installations on farms are more sophisticated and better equipped with measurement devices. In Austria practically all new (approximately since 2000, following an EU-Altener-project on standardization of biogas installations (Jüngling 1999)) biogas plants are equipped with a covered storing tank (Braun 2004, Veigl 2005). Also it is well known that the digested manure has to be accurately applied (Pfundtner 2001).

The interviewed experts saw no problem neither in the criterion itself nor in its verification, because the plant building and the equipment of the farmer that is applying the effluent can be checked easily either by an auditor or by building documents and invoices.

4.2.11.4 (Re)formulation of the criterion

Emissions of CH_4, N_2O and NH_3 by usage of manure have to be reduced by covering the storing tank and by applying manure with accurate methods at appropriate time (e.g. trailhose or similar device).

4.2.12 Overall efficiency

4.2.12.1 Previous Proposal (Oehme 2006)

In the annual average the plant needs to meet an overall efficiency of at least 60%.

4.2.12.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: The efficiency in winter is above 80%, the efficiency in summer is about 36%. An overall efficiency of a 60% average per year will be feasible. This is also a requirement of the green electricity act in Austria. The operational data that are available until now do not diverge much from the planning data.

Biogas plant Hartberg: The biogas plant is working with a high efficiency because there is a heat demand all the year round. In summer the heat (10 hours /day, 85 degree C) is used in an absorption cooling system for the office buildings in the Eco-parc.

4.2.12.3 Further experts´ inputs and in-depth information

This requirement can only be fulfilled if the biomass plant is producing heat and power, at least for more than half of the year. Even innovative biomass power production technology reaches an electric efficiency of less than 40%. New plants operating in CHP-mode have a total efficiency (electricity and heat) up to over 80%. This allows the operator of a new plant to run it in condensing mode (when only electricity is produced) for a certain time period too, for instance in summer if there is no or reduced heat demand. Small heat plants that have been installed for supplying heat to a local district heating system, sometimes have been upgraded in the last years with a CHP process if the investment was calculated to be economic. In this case the criterion is always fulfilled, at least if the plant is working as intended (mainly heat production).

As can be imagined this criterion is in specific hard to reach in South European countries. In Spain which is a country that puts a special emphasis on building up biomass energy capacity only one CHP biomass power plant has been found. Other plants that generate power from biomass sources, like e.g. the straw fired plant “Planta de Biomasa Sanguesa” (in operation since 2004, 27,5 MW), a modern and highly efficient installation (fuel yield =31%) will not fulfil this requirement, neither do any of the planned plants or plants in construction (like Badajoz, 27 MW) that are indispensable for Spain to reach its goal in building up renewable energy capacity until 2010.

As has been shown by performance reports of Biomass CHP plants (Anders 2006) the nominal and the operational data differ widely. Often biomass plants encounter severe technical problems resulting in a substantial drop in performance, in other cases not all of the produced heat is utilized or could be sold. The EU Bio-CHP Project (Anders 2006) found for 13 investigated wood fired steam boilers (with one or more steam turbines) the efficiency data given in figure 16. Generally larger plants as well as modern plants operate at higher temperate and pressure in the steam cycle and this results in a better efficiency. Also full load operation performs better than operation in part load. As can be also seen in this figure, the nominal values are not reached for the majority of the plants.

In a cross technology comparison different CHP technologies show quite a difference in their operational efficiency (see figure 17 , Anders 2006). But for all technologies the average lies above 60%.

Figure 16: Nominal and operational efficiencies for 13 grate fired biomass CHP systems (average values for 24 months).

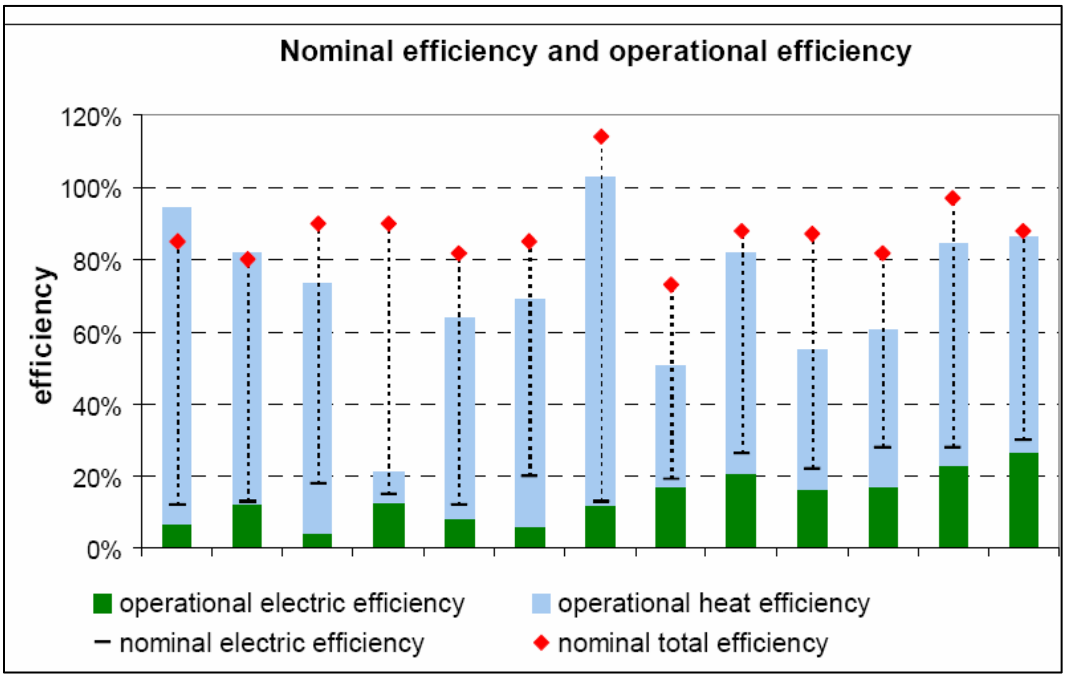
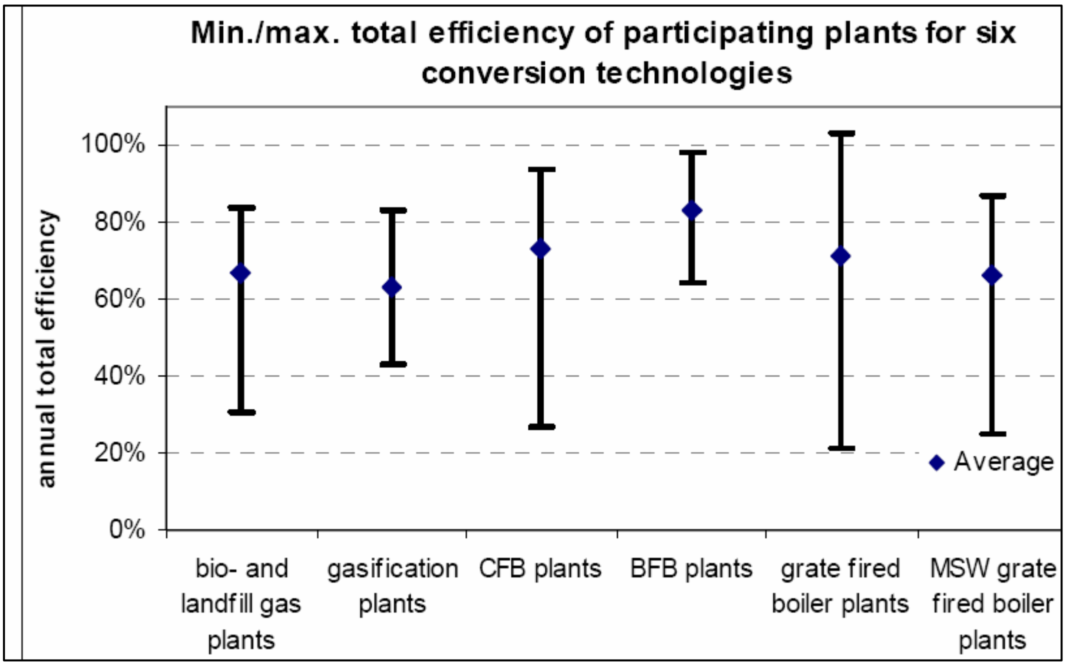


Figure 17: Comparison of the total of electric and heat efficiencies for different technologies based on operational data for 24 month from more than 60 plants.



Some European countries refund electricity from biogas with a premium price regardless what is done with the heat, other countries (like Austria) demand a total efficiency of at least 60%. So several farm biogas installations even do not measure their heat output. The interviewed persons did not restrict their perception of efficiency to the biogas-engine/generator unit (which is mostly a CHP unit). Efficiency concepts can be applied to the digester and its gas output, to the gathering of the gas (including gathering in storing tanks), and so on. But for the purpose of a certification the efficiency of the cogeneration unit is appropriate.

A substantial amount of the heat is used for the fermenting process, other parts are used if input substrates have to be sanitized, for the plant building or the farm buildings including stables. Since it is very unlikely that farm biogas plants also maintain a district heating - by the way: there is no demand for the heat in summer either – the total efficiency is low in summer, but the digestion process has to continue nevertheless. Interviewed auditors did not act very strict and counted all these heat flows where heat is used in favour of the biogas installation.

4.2.12.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

In the annual average the plant needs to meet an overall efficiency of at least 60% *based on operational data if available.*

4.2.13 Co-Firing

4.2.13.1 Previous Proposal (Oehme 2006)

Co-firing of solid biomass according to CEN/TS 14961:2005 in coal-fired power stations is permitted. The generated electricity has to be mathematically allocated according to the caloric value of the biomass. The power plant need to provide an overall efficiency of at least 70 %.

4.2.13.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: Not applicable.

Biogas plant Hartberg: Not applicable.

4.2.13.3 Further experts´ inputs and in-depth information

In Northern countries, especially in Finland, a preferred co-firing material is peat. Peat is not an eligible biomass source in the context of Eugene certification (chapter 4.2.1.).

4.2.13.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

Co-firing of solid biomass according to CEN/TS 14961:2005 in coal-fired power stations is permitted. The generated electricity has to be mathematically allocated according to the caloric value of the biomass. The power plant need to provide an overall efficiency of at least 70 % *based on operational data if available*.

4.2.14 Transport and auxiliary energy

4.2.14.1 Previous Proposal (Oehme 2006)

The non-renewable proportion of the energy that is used for extraction, transportation and processing of biomass fuel, processing energy at the plant, transportation of residual products, and also balancing, is not permitted to be greater than 10 percent of the electricity supplied with the label.

4.2.14.2 Application of the criterion to the two case studies

CHP plant Vienna Simmering: In terms of energy requirements for different fuel supply options it has been estimated by the logistics experts of Austrian Federal Forest AG that up to an average transport distance of wood chips of 70 kilometres energy consumption for fuel supply logistics would be 25% lower if only trucks were used for the delivery of the wood chips to the plant, compared to combined truck-rail-truck delivery. At a distance of 96 km the two options break even in terms of their auxiliary energy requirements, and beyond that distance the modal split solution (partly by truck, rail and ship) is preferable. In terms of cost effectiveness the estimates revealed that up to 70 km the truck-only solution would be 50% less costly than combined transport, and that break even occurs at around 250 km. Energy consumption of the modal split fuel supply also includes energy consumption of handling the wood fuel at the loading and unloading site.

Whether the CLEAN-E proposed criterion (The fossil fuel input for all processes should be not more than 10% of the electricity generated) is met could only be decided either on the basis of a detailed study or with a national calculation method and database that has to be developed.

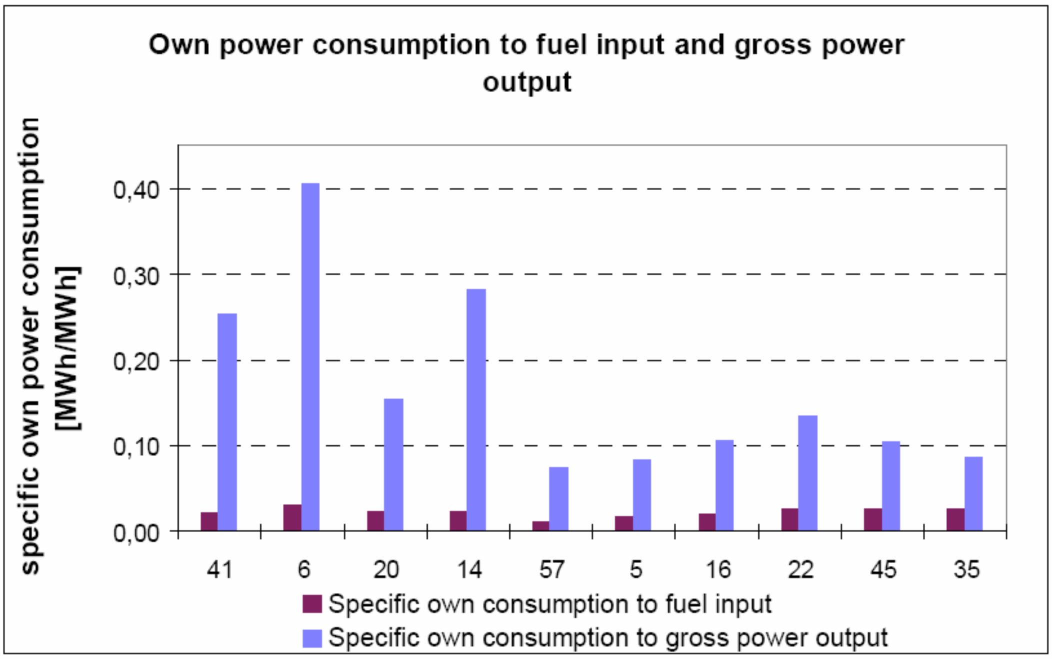
Biogas plant Hartberg: Fossil fuel is consumed by lorries during the collecting of the bio-bins and for the transport of the conditioned substrate from the waste treatment site to Eco-Park. The conditioning (grinding, mixing, magnetic metal remover) is done with electricity generated by the biogas plant at the site (124 kW) that is fed by sewage sludge, so no fossil fuel is consumed. The digester and the ancillary equipment (pumps, agitation, etc.) is connected to the green electricity of the Eco-Park CHP-unit. The effluent is again transported by lorries back to the waste treatment site. The press also is provided with biogas electricity there. The waste water is led into the sewerage, that is owned and operated by the Reinhalteverband Hartberg (Purification Association Hartberg). Its auxiliary energy (Pumps, etc.) are supplied by the municipal utility Hartberg that has only a minor part fossil power generation.

4.2.14.3 Further experts´ inputs and in-depth information

Transport and auxiliary energy are factors, which greatly influence the economic and ecological performance of a plant. A wide range of technologies with specific machines and processes are available when the biomass resource is harvested, transported and prepared for use as biomass fuel. There are several analyses of woodfuel production in the context of economics (logistics and costs) or computer models for the calculation of costs and time for harvesting options. But only few studies show the fossil fuel consumption as an extra result. In Austria the amount of timber that is harvested has to be reported, as well as the technology that is employed for extraction. The vast majority is still the manual felling of trees with a chain saw, only 16% is with modern forest harvesting equipment like forwarder. Hence the fuel consumption is rather small, only about 1% of the energy content of the wood fuel (own calculation based on data from Pröll 2005). A calculation for three different, mechanized types of harvesting and transportation (Chipper, forwarder, trucks) for Japan gave on average as a result 4% of the energy content of the wood fuel (Yoshioka 2006). In the power plant only a fraction (according to the efficiency) of the energy content of the input is converted to electricity, so that compliance to the criterion might just be reached. The fact should be stressed, that no fossil fuel consumption is allocated to the heat production.

The own power consumption in the plant (for pumps, for ventilation, for control, in biogas plants also for the digestion process) is significant, especially if the plant is older and cheaper equipment has been used. For 10 grate fired boilers the data given in figure 4 have been collected (Anders 2006). Other technologies (CFB circulating fluidized bed boiler, BFB bubbling fluidized bed boiler) show also numbers between 10 to 25%. The own power production cannot be sold as green electricity. It has to be decided whether power consumption by the heating system (district heating pumps, etc.) has to be included in the own power consumption and thus is covered by "green electricity".

Figure 18: Own power consumption for 10 grate fired biomass CHP plants (average of 24 months)



Generally the system boundaries are not very well defined in this criterion. Proper allocation of the fossil fuel consumption to various elements of a complex, integrated process is sophisticated. E.g. should transport costs of biodegradable waste from the dwellings to the waste conditioning be a task of waste management that is performed anyway or should it be part of the fuel supply? The 10%-limit is also not clearly defined: It could refer to the biomass share of particular individual electricity products which are labelled or be the maximum that is allowed for each single plant or for each supplier (average of his generation capacity), and so on. But it is reasonable to refer to a single plant.

An extensive discussion of this criterion is beyond the scope of the practicability report. In fact detailed studies are necessary to develop calculation sheets like the key-parameter models of Naturemade (Switzerland) that are based on life cycle assessment data.

4.2.14.4 (Re)formulation of the criterion

(Note: Amendments or changes to the previous proposal (Oehme 2006) are written in italic.)

The non-renewable proportion of the energy that is used for extraction, transportation and processing of fuel, processing energy at the plant, transportation of residual products, and also balancing, should not to be greater than 10 percent of the electricity supplied with the label. *A rough calculation model has to be developed by the national label for each country. The model should differentiate between different technologies (combustion, biogas) and between different biomass fuels. It should request at least the following input data: total transportation kilometres by lorries on public roads, fossil fuel consumption for processes conditioning the biomass (chipping, drying, agitation in digester), fossil fuel consumption for the electricity generation process (gas injected to start combustion, ignition diesel for biogas motors). All plants of which the electricity is to be distributed under the national label that wants to be accredited by Eugene have to comply with the criterion. Calculation is on planning data (1st year) resp. on data of the past year.*

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Annex:
Compilation of the biomass criteria (WP 2.2 from the CLEAN-E-project)

(1) Eligibility of Sources

Eligible biomass sources for the production of green electricity are defined as follows:

- Solid biomass according to CEN/TS 14961:2005, comprising
  - Woody biomass (forests and plantation wood; wood processing industry, by-products and residues; used wood, blends and mixtures),
  - Herbaceous biomass (agriculture and horticulture herb including cereal crops, grasses, oil seed crops, root crops, legume crops, flowers and landscape management herbaceous biomass; herb processing industry, by-products and residues; blends and mixtures),
  - Fruit biomass (orchard and horticulture fruit; fruit processing industry, by-products and residues, blends and mixtures),
  - Blends and mixtures.
- Furthermore, the following sources are admissible:
  - Separated biodegradable waste (for biogas only, without limitations for co-fermentation),
  - Animal excrements, e.g. manure or chicken litter etc. (but no animal body or parts of it),
  - Sewage gas is admissible as far as the label organisations applying for the accreditation by Eugene provide a sound argumentation, why and under which conditions sewage gas is eligible.
- Used wood is defined according to national regulations (e.g. in emission regulations).

(2) Wood fuel

As a general principle: All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management.

For wood fuel from plantations and imported wood fuel: sustainable forest management shall be certified according to FSC (Forest Stewardship Council). Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured.

National certification schemes of green electricity in countries with a sufficient area of certified sustainably managed forest, should for all fuel wood demand a third party certification, thereby referring to the FSC label. Other certificates or standards should be accepted, as far as it can be proven that an equivalent quality is secured. The argumentation has to be provided by the national label applying for Eugene accreditation and need to be accepted by the Eugene Board. The availability of certified wood fuel shall be regularly reviewed according to the reviewing period of the national certification scheme of green electricity, however at least every fourth year. Third party certification shall be required as soon as there is sufficient supply.

For wood fuel from non certified forest, the criteria as given in criterion (3) shall be applied (not applicable for wood fuel from plantations and imported wood fuel*, as they need to come from certified forests).

(3) Wood fuel from non certified forest

All wood fuel including wood fuel from thinning and residues from harvesting operations shall originate from forests that are managed so as to implement the principles and measures aimed at ensuring sustainable forest management. In Europe, the principles and measures referred to above shall at least correspond to the definition of Sustainable Forestry Management that was adopted in Resolution 1 of the 2nd Ministerial Conference on the Protection of Forests in Europe (Helsinki, 16-17 June 1993), the Pan-European Operational Level Guidelines for Sustainable Forest Management, as endorsed by the 3rd Ministerial Conference on the Protection of Forests in Europe (Lisbon, 2-4 June 1998) and the Improved Pan-European Indicators for SFM, adopted at the MCPFE Expert Level Meeting of 7-8 October 2002 that were endorsed at 4th Ministerial Conference on the Protection of Forests in Europe (Vienna, 28-30 April 2003).

These requirements can be summarised as follows:

- Wood shall not originate from illegal harvesting.
  - Definition of illegally harvested wood: wood that is harvested, traded or transported in a way that is in breach with applicable national regulations (such regulations can for example address CITES species, money laundering, corruption and bribery, and other relevant national regulations).
- Wood shall not originate from High Conservation Value Forests.
  - High Conservation Value Forests (HCVF) are forests that possess one or more of the following attributes:
  - forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia)
  - forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where

* It should be clarified whether a hidden barrier to free trade in the community's internal market might be found concerning imported wood.

viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance

- forest areas that are in or contain rare, threatened or endangered ecosystems
- forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)
- forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health)
- forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

- The national label has to adapt suitable benchmarks for wood fuel suppliers:
  - Biomass power suppliers should provide proof that they are not buying illegal fuel wood; for instance the 4 step-system the WWF proposed in “Keep it legal” (Miller 2006) could be used.
  - The forest managers that have a contract with a biomass power supplier should carry out evaluations (or induce the evaluation) of their forest areas to determine whether any of the defined HCVs (high conservation values) is present within their forest management unit. HCV must then be integrated in management planning and activities.

(4) GMO

The use of genetically modified organisms (GMO, agricultural crops as well as trees) for electricity production is not permitted. GMO in separated biodegradable waste should be neglected due to practicability reasons.

(5) Energy crops

Energy crops shall not be produced on arable land which has been gained by conversion of pasture or grassland (since 2003). Documents on the land use in 2003 have to be provided.

(6) Plantations

Short rotation tree plantations should not be established on forest areas or on arable land which has been gained by conversion of pasture or grassland (conversion has not been after 1994, as required for FSC certification of the SRTP).

(7) Maintenance of soil fertility of forests

Soil fertility of forests must not be reduced substantially. This can be attained by

Either: No removal of needles, foliage and roots. Also forest residues, like branches and others shall be left at the site as far as possible to maintain soil fertility and to reduce risk of erosion. Thereby measures have to be adapted to site characteristics.

Or: Ash quality from conversion processes should be monitored and where possible nutrient-rich ash should be recycled back to the land.

For both aspects national guidelines have to be taken into account as far as available. Measures have to be laid down in management plans of all wood fuel suppliers for the national label.

(8) Maintenance of soil fertility of arable land

The withdrawal of straw or other agricultural residues for energetic use has to be adopted site-related according to the nutrient and humus level in accordance with Good Agricultural Practice to secure soil fertility in a sustainable manner. Soil fertility can also be ensured by returning of fermenting residues from biomass production to the arable land. The farmer either has to sign a voluntary self-commitment or the farmer has a EUREPGAP-certification (see criteria 9 und 10).

(9) Integrated Farming / energy crops

Biomass from dedicated cultivation on arable land need to comply with guidelines for integrated crop protection. This is documented by a EUREPGAP certification in the field of fruits and vegetables (and/or of flowers and ornaments).

(10) Integrated Farming / livestock waste

If livestock waste (manure, chicken litter, etc.) is used for energy production, the conditions under which animals are housed and reared should comply with the principles of Integrated Farming. This is documented by a EUREPGAP certification on Integrated Farm Assurance.

(11) Biogas plants using manure

Emissions of CH_4, N_2O and NH_3 by usage of manure have to be reduced by covering the storing tank and by applying manure with accurate methods at appropriate time (e.g. trailhose or similar device).

(12) Overall efficiency

In the annual average the plant needs to meet an overall efficiency of at least 60% based on operational data if available.

(13) Co-Firing

Co-firing of solid biomass according to CEN/TS 14961:2005 in coal-fired power stations is permitted. The generated electricity has to be mathematically allocated according to the caloric value of the biomass. The power plant need to provide an overall efficiency of at least 70 % based on operational data if available.

(14) Transport and auxiliary energy

The non-renewable proportion of the energy that is used for extraction, transportation and processing of biomass fuel, processing energy at the plant, transportation of residual products, and also balancing, should not to be greater than 10 percent of the electricity supplied with the label. A rough calculation model has to be developed by the national label for each country. The model should differentiate between different technologies (combustion, biogas) and between different biomass fuels. It should request at least the following input data: total transportation kilometres by lorries on public roads, fossil fuel consumption for processes conditioning the biomass (chipping, drying, agitation in digester), fossil fuel consumption for the electricity generation process (gas injected to start combustion, ignition diesel for biogas motors). All plants of which the electricity is to be distributed under the national label that wants to be accredited by Eugene have to comply with the criterion. Calculation is on planning data (1st year) resp. on data of the past year.