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Report on the Austrian study tour (English version)

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Colophon

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In the frame of the UNDP/GEF project Biomass Energy for Heating and Hot Water Supply in Belarus a one-week study tour to Austria for eleven Belarusian high-level decision makers and technical specialists was organised between 3 and 10 October 2004. The goal of the study tour was to present an overview of wood harvesting methods used in Austria in daily practice. In addition to wood chip production equipment, practical examples of bio-energy technologies (biomass heating, biomass cogeneration and anaerobic digestion) were also shown.

In order to present a comprehensive overview of the situation in Austria, an intensive programme was put together (see Table 1.1 on the next page). Many showcase examples and flagship projects were presented in a short time. LEV wishes to stress that the study tour has merely offered the participants a “snapshot picture” of a long development. To fully understand the Austrian biomass energy situation a more carefully analysis is required.

On behalf of LEV the study tour was organised by Mr. Peter Schuster and Mrs. Andrea Klammer.

Table 1.1: Organisations visited

Organisation name	Main activity	Subject of the tour/presentation
Stift Klosterneuburg	Forest enterprise	Tour of forest operations, sawmill and boiler house (heating and ORC plant)
Fürstenbergische Forstverwaltung	Forest enterprise	Tour of forest operations
Fa. Öko-Recycling	Wood waste processing	Company presentation at hotel
Stift Heiligenkreuz	Forest enterprise	Tour of forest operations, sawmill and boiler house (heating only)
Fa. Krenn	Wood chipping equipment	Demonstration of chipping equipment
Fa. Langegger	Wood fuel trade and logistics	Demonstration of container trucks and wood chipping equipment
Biomass CHP Kufstein	Energy supply	Tour of biomass plant (heating and steam turbine)
Biomass CHP Theurl	Energy supply	Tour of biomass plant (heating & ORC)
Biomass CHP Lienz	Energy supply	Tour of biomass plant (heating & ORC)
Forstverwaltung Lichtenstein	Forest enterprise	Tour of sawmill, biomass heat plant and forest operations
Fa. Terra-Mix	Soil stabilisation	Field demonstration at highway site
Fa. Robert Klug		Demonstration of wood chipping, tour of sawmill and biomass heat plant
Fa. LIV	Hydraulic cranes	Company presentation at hotel
Fa. Terra-Mix	Soil stabilisation	Company presentation at hotel
LEV Workshop in Graz	Knowledge transfer	Lecture-room presentations
Fa. Nahwaerme.at	Energy contracting	Tour of biomass heating plant at a apartment building for the elderly
Fa. Nahwaerme.at	Energy contracting	Company presentation at hotel
Fa. Solid	Energy contracting	Company presentation at hotel
Biogas plant Polz	Energy supply	Tour of biogas co-digestion plant
Fa. Peter Schuster	Wood chips supply	Field demonstration of wood chipping

Stiftplatz 1

A 3400 Klosterneuburg

<http://www.stift-klosterneuburg.at/>

Contact person: Hubertus Fladl Tel. 02243 / 411 220 forst@stift-klosterneuburg.at

Introduction

For almost 900 years the Augustinian Canons of Klosterneuburg Monastery have been fulfilling pastoral, economic, social and cultural responsibilities. Amongst its economic activities are the exploitation of 8,000 ha of forest land in ten forest districts (on the Danube, in Waldviertel, in Weinviertel, in Wienerwald and in the Central Alps). The commercial exploitation of the forests has to comply with social and moral guidelines that constantly affect all of the Monastery's economic activities.

Forestry exploitation in practice

Wood harvesting operations are restricted to the September-March period when there is little foliage and vegetation. Plots of 0.5 ha each that are selected for harvesting are drawn out by the Monastery's own foresters. Wood harvesting is carried out by trusted sub-contractors. (Austrian companies employing predominantly forestry workers from Poland). A wood harvesting team of two persons can harvest 330 m³ of wood per week: 100 m³ of poplar, 30 m³ of Acacia, 50 m³ of fibre wood and 150 m³ of logging residues (used for wood chip production).

Marketable wood is removed immediately from the forest, whereas the logging residues are piled at a terminal along the roadside where they are left to air-dry until the end of summer for 6-12 months. In autumn the logging residues are comminuted to wood chips (size class G50) using a large chipper. The wood chips that are used as fuel are transported directly to the boiler house using a fleet of 3 container trucks (capacity 35 m³ each), thus minimising the idle time of the expensive wood chipper. At the moment some of the higher quality chips are still sold to the board industry, but within the next few years demand for this application is envisaged to decrease and from then on all logging residues will be converted into fuel.

Wood chip production

The production of wood chips from logging residues was started two years ago, and the Monastery is still gaining experience and optimising wood chip production. One challenge is to reduce the level of dust in the produced wood chips (see Table 2.1).

Table 2.1: Wood chip production costs

Wood fuel supply activity	Cost (€ per m ³)
Harvesting plus transport to road side terminal	€ 7
Chipping	€ 3
Transport from road side terminal to boiler house	€ 2
Gross production costs (excluding the value of the wood)	€ 12

Austrian legislation requires that logging residues are removed from the forest. Uncontrolled open air combustion of logging residues in the forests or elsewhere is strictly forbidden. Therefore the logging residues have to be transported to the roadside terminal anyway, and the costs involved (€ 7/m³) should be carried by the marketable wood. The net production costs of wood chips can thus be calculated at € 5/m³. Ecological and economic considerations determine which wood species are used for reafforestation.

Heating and ORC plant

The Monastery complex is designated a monument and state regulations require that no intrusive infrastructure (e.g. a boiler plant) be visible at the site. Therefore the boiler house was built fully underground. The boiler house includes 3 boilers: two wood boilers of 2.5 MW and 1.2 MW respectively plus a 2.5 MW natural gas boiler. The latter is used to cover peak loads and for back-up operation. Some 0.2 MW of the heat production is used to run an Organic Rankine Cycle (producing electricity), the remainder is used for hot water supply of the Monastery and the district heating network (including a hospital). The boiler consumers approx. 12,000 m³ of wood fuel per season. Some 6,000 m³/year of wood chips are collected from the own forest and some 6,000 m³/year of bark is bought from outside.

Maierhof 73
 A3970 Weitra / NÖ
 fuerstenbergforst@weitranaet.at
 Contact person: DI Rücizka Tel. 02856 / 23 81

Introduction

Weitra is located in Gmünd district, at approx.. 600m altitude and close to the Czech Republic. The forest districts of Fürstenbergische Forst- & Güterdirektion include Schwarza, Rörndlwies, Reinprechts (NW of Weitra), Hausschachen (just south of Weitra), Kienring (NE of Weitra) und Rosenau (in Zwettl district). Forest land covers a total surface area of 3,312 ha: 2,301 ha in the *Oberen Forst* (higher forest districts, above 1000m altitude) and 866 ha in the *Untere Reviere* (lower forest districts, below 1000m altitude).

Wood species

Spruce is the dominant wood species. It covers 90% of the *Oberen Forste* and 70% of the *Untere Reviere*. Other wood species include pine (14% in the lower forest districts) and the exotic larch (7% of total surface area). Red beech is mainly found in older woodlots and covers 6% of the *Oberen Forst* and 5% of the *Untere Reviere*. At soils with little lime in it beech is not a valuable wood, and it is then mainly used as fuelwood. Fir covers just 1%. 150 years ago it still covered 30 %.

Age class distribution (2001)

Age class	Above 1000m alt.		Below 1000m alt.		Total	
	ha	%	ha	%	ha	%
Bl.	15	< 1	4	0	19	< 1
I	151	7	75	9	226	7
II	38	17	128	15	510	16
III	265	12	147	17	412	13
IV	478	21	162	19	640	20
V	404	17	173	20	577	19
VI	606	26	177	20	783	25
Wooded surface areas	2.301	100	866	100	3.167	100

The annual growth is carefully monitored on testing plots and amounts to an average of 10.2 solid m³/ha in the *Oberen Forest* and of 13.4 solid m³/ha in the *Untere Reviere*. The total standing stock is on average 468.6 solid m³/ha in the *Oberen Forest* and 437.3 solid m³/ha in the *Untere Reviere*.

Conditions for sustainable forest management

1. The harvested wood volume shall not exceed the increase in standing stock
2. Forest rejuvenation should be carried out in time - approximately every 30 years
3. Old wood should be cleared once young stands reach 2m length
4. Rotational cycle of at least 120 years (at present > 130 years)
5. With the exception of large calamities no spruces will be (re-)planted
6. Exotic tree species (Douglas fir, American red oak) are permissible on suitable locations.
7. The fir is to be brought in on a large scale on suitable locations again
8. Extremely overused soils must be sanitised on a long-term basis.
9. The game conditions should be adapted to the forestry plan.

Main instruments to achieve sustainable forest management

1. Proper knowledge of the bottom plants and their relevance to the forest
2. Use of tree drills to measure growth
3. Use of soil drills or spades
4. Good knowledge of the forest yields
5. In the case difficult decisions need to be made the federal forestry laboratory and the university for soil culture are asked for assistance

Forest rejuvenation

In fully-grown wood stands with approx. 400 trees and an average stock volume of approx. 470 m³ (solid) one-third of the wood stock is utilised. The forest soil should get sufficient sunlight and heat. During a seed year the young trees are able to grow. When good undergrowth is developed about half of the wood stock is included in a second thinning, depending upon light needs. After further 15 years the final cut is carried out.

Wood harvesting

Work is carried out in accordance with a forestry plan. Six own forest workers harvest wood of high diameters (> 35 cm diameter at breast height). Trusted sub-contractors are used to carry out the remaining harvesting work (cheaper than buying own machinery). Two company forestry rangers show sub-contractors which areas to work on and what type of wood thinning to carry out. No marks are made on individual trees. The sub-contractors know the desired form and dimensions of the wood to be harvested and carry out their activities independently without further instructions or supervision. Marketable wood is brought to the forest road and collected from there. The transfer of the wood takes place at the factory after electronic measurement of the wood volume.

ÖKO-RECYCLING

Gewerbestraße 10
A 3434 Tulbing
<http://www.oeko-recycling.com>

Öko-Recycling in Tulbing (www.oeko-recycling.com) is a company that specialises in equipment for the processing of green wood wastes. (harvesting, composting, sieving and comminution technology). It provides wood chipping services, for which a 70hp Jenz HEM 700 tractor-driven shredder is used. The shredder is capable to comminute branches and bushes of up to 10cm diameter and has a capacity of 8-10 m³/hour.

Since 1987, Öko-Recycling is the Austrian agent for JENZ, a well-reputed German manufacturer of forestry equipment for biomass preparation (www.jenz.de). A brochure of JENZ wood harvesting equipment is enclosed on the CD-ROM.

Heiligenkreuz 1

A 2532 Klosterneuburg

<http://www.stift-heiligenkreuz.at/>

Contact person: FM Ertl Tel. 02258 / 87 06 12

Introduction

Stift Heiligenkreuz in Klosterneuburg in the Wienerwald area is the second oldest Cistercian monastery in the world. One of its economic activities is the commercial exploitation of forest land in seven forest districts. The forest enterprise covers an area of 4,814 ha of which some 95% are marketable forests. The forest enterprise building and the sawmill are located near Baden, south of Vienna. Altitudes range from 270m to 611m. Terrain conditions are flat to moderately steeply, only 20% of the forest surface has a larger inclination than 40%.

Description of the forest

The Wienerwald is a paradise within Austria for forestry experts. In addition to more than 20 different domestic tree species it includes exotic tree species such as Douglas fir, giant fir, and yellow pine. At present the hardwood-softwood ratio is 51%:49%. The main tree species are red beech (37% share) which finds ideal growing conditions in Wienerwald. Other important tree species are spruce (20%), white pine (15%) and black pine (9%). The remainder consists of white beech, oak, ash, other hardwoods, larch and fir. Recent trials with Douglas fir showed satisfactorily results on sandstone soils and the introduction of Douglas fir is continued as a substitute for fir (former share 25%, current share 1%). The forest management plan foresees an increase of the hardwood portion to 60% within the next 20 years. For the sustainable management of a forest enterprise a good network of forestry roads is required. The current road density is 401 m/ha, which is considered more or less sufficient.

Annual cut and rotational cycle

The planned annual cut is 30,000 solid m³, including 50% from final cutting and 50% from early thinnings. The actual cut is fully determined by the sales potential and ranges from 25,000 to 40,000 solid m³ per year, with a maximum share of final cutting of 20,000 m³. For softwood a rotational cycle of 70-80 years is maintained, for hardwood the rotational cycle is 100 years.

Sawmill

The sawmill typically processes some 25.000 solid m³ of roundwood per year, classified as follows: some 15,000 solid m³ (60%) white pine, some 5,000 solid m³ (20%) spruce plus some black pine, blue-brown wood and Cx-wood. Most of the wood that is processed originates from the own forest, the remainder is bought. The produced timber is sold to traders and customers in Austria, Italy, Germany and Switzerland.

Wood heating plant

Adjacent to the sawmill is the forest enterprise's own wood heating plant which supplies the Monastery (at 800 m distance), 36 single-family houses and public buildings in

Heiligenkreuz, the forest administration complex and the sawmills' timber drying kilns. Through the district heating network with a 3.6 km pipeline ca. 50,000 MWh of heat is supplied annually. Annual fuel requirements are some 12,000 stacked m³ (equivalent to approx. 8,000 solid m³). Some 7,000 stacked m³ is sourced from the own forest (wood chips from thinnings and logging residues). In addition some 5,000 stacked m³ of bark is used.

Timber marketing

Roundwood from softwoods is processed in the own sawmill or in other Austrian wood processing enterprises. Fibre wood is supplied directly to the fibre processing industry. It is sold by weight which is measured electronically. In the case of hardwood as much as 40% is sold directly as roundwood to foreign customers.

Biomass heating plant Heiligenkreuz

Stift Heiligenkreuz operates the oldest biomass district heating plant in Austria. Following the second oil crisis in the early 1980s the Monastery decided to reduce its fossil fuel dependency and to establish a wood energy plant near its sawmill. Construction of the 1.9 MW biomass boiler started in 1983. Technology was imported from Sweden. In October 1983 the plant was inaugurated. Originally only the Monastery and a few adjacent buildings were supplied with district heating, and only bark was used as fuel. After two years of operation the local municipality expressed the desire that the elementary school, the community centre, the town hall, and the fire station be connected to the district heating plant, which was also accomplished. A year later some private house owners were also connected to the district heating network. To ensure hot water supply in summer time a second boiler with a capacity of 500 kW was installed in 1986. Meanwhile the number of private houses that is supplied has increased to forty.

Within the Monastery complex the heating system was also constantly extended. All business and residential buildings were connected, as well as four timber drying kilns.

Due to the constant increase of the number of heat consumers and thus the heat demand, the original Swedish boiler was exchanged in 1999 by a larger Austrian biomass boiler with a rated capacity output of 3 MW. Fuel used in the new boiler includes ca. 5,000 solid m³ bark, 2,000 solid m³ wood chips and 2,000-4,000 solid m³ sawmill residues per year.

After 21 years of operational experience the Monastery is glad and lucky that in 1983 it has set the right step both economically and ecologically, and that it has drawn a showcase example for other biomass heating plants.

Wood chips production

Large chippers are used for chipping wood residues. The company Krenn (<http://www.hackgut.com/>) provides wood chipping services for many forest enterprises and biomass heating plant operators, and liases in wood chips trade. The Krenn shredder produces approx. 150 loose m³ of wood chunks per hour.

Untertauern 94

A 5561 Untertauern

<http://www.langegger.com/>

Contact person: Bernhard Langegger Tel. 06455 / 20 380 0

Introduction

The company Langegger has specialised in the trade and logistics of wood fuel supply. It operates in this field of business since 1994. Langegger links biomass feedstock suppliers/producers (farmers, forest owners) with biomass feedstock customers (both heat-only and combined heat and power plans). By using efficient logistics Langegger aims to open new sources of wood energy supply.

Wood chip supply

Langegger operates specialised container trucks with a smart hydraulic loading and unloading system. With the truck, forestry residues (branches, thinnings, splintered wood etc.) are collected and transported to a suitable storage or directly to the biomass plant for pre-treatment.

On-site comminution

- Roundwood up to 70cm diameter
- Can handle a wide range of harvesting residues (branches, thinnings, splintered wood, etc.), off-cuts, bark, bushes, waste wood, pallets, roots,
- Machine can also be rented by the hour, inclusive of trained personnel.
- Feeding with conveyor belt or crane.

Characteristics

- Long conveyor belt, suitable for feeding from a truck
- Opening size 700 mm x 1500 mm
- Range of sieving baskets
- Self-propelled
- Single person operation (by radio from the crane)
- Feeding with conveyor belt or crane.
- Strong magnet with catch container

7.1 Biomass CHP plant Kufstein

Fischergries 2
A 6332 Kufstein
www.bioenergie-kufstein.at/

Since late 2003 BioEnergie Kufstein GmbH operates a biomass co-generation plant using a steam turbine process. Heat supply started in October 2003 and electricity supply to the local grid in December 2003. District heat is supplied to some four thousand customers. Feedstock used includes bark, forest wood chips, industrial wood chips, and shavings. Annual fuel demand is approx. 300,000 loose m³. The plant uses mostly (1) wood chips with 35% moisture content (2) bark and (3) sawdust and other sawmill residues with a 50% moisture content.

Table 7.1: Technical data Kufstein CHP plant

Investment	€ 25.000.000,--
Steam boiler	24,2 MW _{th}
Steam conditions	30 t/h, 450°C, 66 bar
Thermal capacity	18.0 kW _{th}
Economiser:	0.8 MW _{th}
Turbine generator:	6.5 MW _{el}
Thermal energy supply	67.3 GWh/yr, max. 432 MWh/d
Electrical energy supply	37.9 GWh/yr max. 156 MWh/d
In-house use of electricity	5.0 GWh/a
Flue gas cleaning	Two-stage (multi-cyclone plus elektrofilter)
DeNO _x	Selective non-catalytic reduction (SNCR)

Flue gas cleaning

After the removal of large fly ash particles by means of a multi-cyclone the flue gas of the biomass boiler arrives in the flue gas cleaning plant, composed mainly of an economiser, a wet electrostatic precipitator, and an air pre-heater. The residual heat is recovered in the economiser, whereby the flue gas is cooled down to 90°C, which flows through the wet electrostatic precipitator. The wet electrostatic precipitator cleans the flue gas to a level of particle content of about 10 mg/Nm³. Afterwards the flue gas is led to the air pre-heater where the heat exchange between flue gas and outer air occurs. Hereby the flue gas is dehumidified and the outer air is pre heated. Both gas streams are mixed within the chimney, to avoid the development of plume till an outer temperature of minus 10°C

7.2 Biomass CHP plant at Sägewerk Theurl GmbH

Since May 2004 the Theurl Brothers operate a biomass co-generation plant in Assling (East Tyrol) that is based on the Organic Rankine Cycle (ORC). An ORC uses an organic working fluid instead of water. Residues generated at the sawmill (bark, wood chips, and shavings) are used as feedstock for the biomass CHP plant. Annual fuel demand is approx. 65,000 m³ loose m³.

7.3 Stadtwärme Lienz (Lienz, Osttirol, Austria)

Stadtwärme Lienz operates in Lienz (East Tyrol) a biomass co-generation (CHP) plant. Heat production at the CHP plant started in spring 2001. By the end of 2003 the CHP plant supplied heat to 70% of all objects in its supply area. Customers (both (industrial and private) previously used individual heating systems that were mainly oil fired.

Basically the plant is composed of two biomass boilers (thermo-organic oil boiler and hot water boiler), a CHP-module based on ORC-Process, a solar thermal plant, and an oil boiler with a multi-stage flue gas cleaning with integrated heat recuperation.

The system includes the following components:

- A 7.0 MW_{th} biomass-fired hot water boiler
- A 6.0 MW_{th} biomass-fired thermo-organic oil boiler
- A 2.0 MW_{th} Heat recollection system
- A 1.0 MW_e Organic Rankine Cycle
- 630 m² of roof mounted solar collectors, generating a maximum of 0.35 MW_{th}
- A 11 MW extra light heating oil fired boiler to cover peak loads and as back-up
- A flue gas cleaning section similar to the one used in Kufstein (see above).

Liechtensteinstraße 15

A 8530 Deutschlandsberg

<http://www.holztreff.at/>

Contact person: Prince DI Alfred Lichtenstein Tel.: 03462 / 2222 info@holztreff.at

Introduction

Holztreff Liechtenstein is an integrated forest enterprise that covers the complete supply chain for marketable wood “from tree to household”. It is specialised in supplying special assortments of high quality construction wood (lengths of 4-11 m). Ninety percent of the wood that is processed originates from own forests. Construction wood is only harvested in the winter season. Annual cut amounts to some 15,000 solid m³.

Forest enterprise

The forest enterprise covers approx. 8,000 ha of forest. The forests districts lie between 350 and 1800 m altitude. Final harvesting of marketable wood is accomplished with company workers. For thinning operations trusted sub-contractors are hired. They get paid approx. € 26 per solid m³. When thinning large wood stands harvesters can be used. However, usually trees are felled and delimbed with manually-operated chainsaws after which tractors pull the trees to the forestry road. To minimise soil damage a lot of attention is paid to using tractors with sufficiently broad tyres that cause minimal pressure on the ground, thus preventing root damage.

Wood waste use

Wood residues generated at the sawmill are sold for three different purposes:

- Bark: mainly used for gardening and as fuel
- Bark-free wood chips are sold to the paper, pulp and particle board industry
- Wood shavings are sold to the agricultural sector

Liechtenstein at present already supplies some enterprises (e.g. the Burg) that operate a biomass fired heating plant. It plans to construct a biomass cogeneration plant (2 MW_e plus 4 MW_{th}) that will supply heat to the existing district heating network of the town of Deutschlandsberg.

Pörbach 11

A 8551 Wernersdorf

www.terra-mix.com/

Contact person: Johannes Fürpass Tel. 03466 / 42 74 611 mail@terra-mix.com

The company Terra-Mix was established in 2001. It specialises in soil stabilisation. This involves the on-site intermixing of soil with binding materials followed by soil compacting. As a result the soil is able to carry much more load.

The Terra-Mix method is used for a range of purposes, including the construction of motorways and forestry roads. The method is cheaper and faster than the conventional method of road construction. Further details are presented in the brochure on the CD-ROM.

Rosenkogel 48
A 8510 Stainz
Tel. 03463 / 20 17

Robert Klug is a farmer who owns 75 ha of woodland at 1200m altitude. His main economic activities are forestry-based and include the harvesting of wood, the operation of a small sawmill, and the marketing of construction timber. Making economic use of forests leads to forest rejuvenation.

Robert Klug harvests wood with a tractor equipped with a hydraulic harvesting crane and a trailer. Using this harvesting technique requires a well developed network of forestry roads. Trees are felled aimed towards the roadside. Branches are removed using a portable chainsaw. The hydraulic tractor crane elevates the trunk to the roadside where it is cut into standard lengths, delimbed and loaded directly onto the trailer. For this harvesting method the ideal crew size is three persons: one crane operator and two forest workers with chainsaws. The resulting wood waste lies within elevating distance of the hydraulic crane and can be collected during a second work course.

Industrijska c. 2

6230 Postojna

Slovenija

www.liv.si

Contact person: Bogomir Likon, 00-386-5-72 83 700

LIV is a Slovenian Joint Stock Company based in Postonia that consists of four affiliate companies (LIV Plastics, LIV Wheels, LIV Hydraulics and LIV Tools) combined into a single concern. It has 800 employees and an annual turnover of some € 65 million. Export represents more than 80% of total sales. Half of the export is to Western Europe. In total LIV exports to some 50 different countries all over the world.

The product range of LIV HIDRAVLIKA d.o.o includes a wide spectre of hydraulic cranes (for foresters and tractors), grapples and forestry winches. LIV HIDRAVLIKA strives to become one of the leading European suppliers of hydraulic lifts and appliances for cargo manipulation. Further details are presented in the brochure on the CD-ROM.

During the LEV workshop in Graz presentations were given by:

- Eva Brander, (Province of Styria), “RIST”
- Gerhard Ulz (LEV) “Bioenergy Promotion in Styria – Success Stories”
- Wolfgang Jilek (Energy Commissioner for Styria) Ökostrom (“Green Power”)
- Christian Rohrmoser (Federal Foresters Austria) “Raw materials from the forests”

Sheets of the four presentations are included in the CD-ROM.

Eva Brandner of the business department of the Province of Styria gave a presentation on RIST (Regional Internationalisation Strategy of Styria) in Russian. The RIST programme co-ordinates existing and planned internationalisation programmes, projects and activities of Austrian and foreign institutions.

In his presentation LEV Director Gerhard Ulz introduced the various renewable energy technologies that the federal government of Styria is financially supporting (solid biomass, biogas, biodiesel, geothermal, hydro, solar photovoltaic, solar thermal and wind). With charts he illustrated the rapid development of solid biomass, biogas, and biodiesel plants in Styria over the last 2 decades. According to Ulz, key factors to the successful introduction and expansion of bioenergy in Styria include: (a) luck, (b) crazy people, (c) innovative politicians, (d) subsidies, (e) regional energy advisers, and (f) legal support.

The *EU Directive on the promotion of electricity production from RES in the internal electricity market* requires the EU Member States to increase the share of renewable energy in their national energy production. The Renewables Directive sets a target of 22% for the share of renewables in the total EU electricity production in 2010, compared to 13.9% in 1997. For Austria, which already had the highest share of renewable energy production of all EU-15 Member States (70.0%), an indicative national target of 78.1% is set for 2010, a 8.1 percentage-points increase. In his presentation, Wolfgang Jilek showed that Austria aims to reach this target as follows: 62% large hydro, 9% small hydro, 4% financially supported green power systems, 2-3% other green power systems. Jilek also explained the level of the guaranteed feed-in tariffs available for different renewable energy technologies under the Ökostromgesetz BGBl. 149/2002 (law concerning the electricity production on basis of renewable energy).

Christian Rohrmoser of the Federal Foresters Austria presented the findings of a recent study, financially supported by the federal states of Lower Austria and Salzburg, aimed at optimising the harvesting of wood fuel. In the study, detailed assessment was made of the optimal order of wood supply chain unit operations, the specific performance and associated costs of individual unit operations, and the overall wood supply costs for six different locations in Austria. For each of the six supply chain models a SWOT (strengths, weaknesses, opportunities and threats) analysis was made. Finally, the progress made in Austria between 1995 and 2002 tackling barriers to wood energy developments was illustrated.

Mr. Christian Holter gave presentations on the companies Nahwaerme.at and Solid GmbH. His presentation sheets are included in the CD-ROM.

13.1 nahwaerme.at

Energie Contracting GmbH & CoKG
Herrgottwiesgasse 188
A 8055 Graz
<http://www.nahwaerme.at/>

nahwaerme.at, established in 1998, is an energy service company that uses renewable (biomass and solar) energy technologies to generate and sell heat. The philosophy behind nahwaerme.at is the bundling of know-how from several specialist areas (agriculture, forestry, planning, financing, engineering, plant operation, etc.). In this manner a total solution is offered. The various specialists are all partners in the company, which can fall back on more than a decade of relevant experience.

The advantages of the approach offered by nahwaerme.at include

- Comfort, because nahwaerme.at supplies carefree energy and takes over plant management
- Security, because the biomass fuel comes from nature and is regenerated again and again,
- Price stability, because wood supply is independent from fossil fuel price fluctuations
- Green image, because nahwaerme.at preserves the environment, strengthens the region, creates jobs and protects the climate

The mission of nahwaerme.at is to assure quality heat supply and to promote general well-being.

Energy from today

- Biomass and solar, for many perhaps energy sources of the future, are for us the energy sources of today.
- We preserve the earth's resources and the climate, and use the energy which we get today from the sun
- It is not a question whether, but only when fossil fuel reserves deplete. It is open us to choose anytime the road to a sustainable energy supply. We take that road today and offer our customers comfort and security in harmony with nature.

13.2 Solid GmbH

Energy contractor Solid GmbH is specialised in the conceptualisation, project development, construction, optimisation and operational of large solar thermal systems used for water heating, district heating, cooling, and commercial use.

When used for hot water supply and district heating (micro grids), biomass plants in Austria are often equipped with solar thermal collectors. When solar thermal collectors supply hot water the biomass boiler need not to be used in the summer period. In case the yield of the solar thermal collectors is insufficient the hot water production can be boosted using the back-up boiler. Alternatively the biomass boiler can be used.

There are good technical reasons building hybrid biomass-solar thermal heating plants and running on solar in the summer seasons. Operating the boiler in the summer season means that it has to be operated at small partial loads. Operational losses will be higher when running at small loads and pollutant emissions will be higher when starting up the boiler. Mechanical stress to the system will continue also when the load is small. Temporary taking the system out of operation in the summer period will extend the biomass boiler lifetime.

Energie Contracting GmbH & CoKG

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The biogas plant is owned by Christian Polz and was constructed by the company Oberdorfer (www.oberdorfer.at). The biogas plant has a thermal capacity of 450 kW and an electric capacity of 300 kW (2 identical Swiss-made Liebherr 150 kW_e biogas engines). Construction costs of the biogas plant were close to € 1 million (including the transformer and grid connection).

Feedstock used includes 70 ha. of purposely-grown maize plus manure from 2 pig breeding stations. Incidentally municipal green waste is fed. Digesting maize does not require pre-heating of the feedstock. Residence time of the feedstock is 60 days, spent in a pre-reactor, 3 main biogas reactors and a post-reactor (3500 m³) respectively. The latter is emptied once a year in spring when the digestate is spread over farmland.

The pre-reactor is fed daily by the operator using a shovel. Every two hours the first biogas reactor is fed automatically.

Collected biogas is cooled down in underground piping. This helps to condense the water in the biogas. Adding a small portion of air helps to remove sulphur. The cooled and cleaned biogas is fed to the generator that runs continuously (24 hr/day).

The produced electricity is sold as Ökostrom and yields 14.5 €ct/kWh. Only a small portion of the generated heat (50 kW) is used for space heating of the nearby farmhouse. It was planned to sell excess heat to the sawmill located across the street but this sawmill went bankrupt. Instead, the excess heat is cooled away.

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The 22 ha of woodland that is owned by Peter Schuster is used for testing and developing innovative wood harvesting methods, new combinations of machinery and alternative wood harvesting chains. Different types of fuel harvesting machinery have been developed and improved, including a large-scale wood chipper, a harvesting crane and a trailer that can pump chips pneumatically. The large-scale wood chipper has been in use since 1994 and has been improved time and again ever since. The flexible harvesting crane can be attached to a tractor using a quick coupling and is operated by joystick integrated in a revolving chair. The trailer that can pump chips pneumatically was also designed, constructed, tested and improved here. It enables the dust free pumping of wood chips at fuel storage rooms that are difficult to access.

In addition, extensive tests have been carried out with drying and sieving different assortments of wood chips. Experience gained at Mr. Schuster's testing site is used in practice by the company Nahwärme.at but also in other areas.