

BIOMASS - WOOD

FELDKIRCH (Austria)

If the share of renewable energy in Europe is to be increased to 12% by 2010, one has to consider an increase in the use of biomass, both for heat and for electricity production. Wood, wooden waste and straw are anything but rare, but they need rather heavy investments if they are to be fully exploited. That is why the use of wood and straw as a real renewable energy source (keeping the sustainable use and growth in mind!) still is subordinate in comparison to other renewable energy sources. As an example of facilities in Austria, we present the town of Feldkirch, where a wood-chip-fired interconnected heating system was implemented in 1996.

GENERAL ASPECTS

Feldkirch, a town of 26,000 inhabitants located in the Province of Vorarlberg, is characterized by its well-preserved historic old town centre and seven rapidly growing outer districts. Founded in the twelfth century by the Count of Montfort, the town, which is today dominated by the service sector, enjoyed considerable prosperity due to its strategically favourable location for commerce.

Climatic data:

Degree days:	3,324
Average mean temperature:	7,5°C



CONTEXT

The use of renewable sources of energy and their potentials in Feldkirch was already investigated in 1988, as part of a study commissioned by the Feldkirch municipal utility (Stadtwerke), "Public Energy Supply Concept for Feldkirch". In addition to the possible use of solar energy (solar architecture, solar collectors, solar cells), the potentials for water power, wind power, energy from biomass, firewood, agricultural wastes, other wastes and garbage, and geothermal energy were studied. The study suggests locations for decentralized combined-heat-and-power generation, as well as measures to reduce consumption in existing and new buildings, and of air-pollution emissions, among other things.

The implementation of this concept and its expansion into a climate-protection concept is being done in close co-operation between the local authority and the municipal utility. The municipal utility is a business without separate legal personality, but with its own entry in the Commercial Register. The Town of Feldkirch can influence the municipal utility, and thus also include it in a municipal climate-protection programme, directly via the political decision-making bodies and via the by-laws. The Town and the municipal utility have made a name for themselves throughout Austria by their commitment to climate protection.

EXPERIENCE OF FELDKIRCH

Nofels Town Farm district-heating system

Eight years passed from the development of the energy concept until a major wood-chip-fired facility went into operation. When the Nofels old people's home was being re-planned, an existing small-scale district heating network (covering the old people's home, the fire brigade building, and the town parks and gardens department) was expanded in 1996, and



the obsolete heating system was converted to burning biomass (wood chips). Today, this district-heating scheme covers the Nofels Town Farm (a municipally-owned agricultural estate) with its associated housing, the town plant nursery, a fire-brigade equipment building, an office of weights and measures, further housing, and the old and new Nofels Old People's and Nursing Home. During planning, the financial viability and environmental compatibility of a wide range of variants for the heating system were examined. These include different combinations of gas heating, a packaged combined-heat-and-power plant, wood-chip firing, solar-energy facilities, and utilization of biogas (from a biogas plant in the Town Farm for this purpose).



For reasons of climate protection in particular, the Town of Feldkirch chose the climate-neutral wood-chip heating system (although this was not the most cost-efficient variant); as a pilot plant, this is to provide the town with its own experience to decide whether biomass heating can be a genuine alternative for the town's future decisions on energy policy.

Technical specifications of the Nofels district-heating system:

Capacity of the wood-chip-fired heating boiler:	300 kW
Annual thermal energy demand:	ca. 1,500 MWh
Base-load heating from wood-chip plant:	ca. 1,100 MWh
Peak-load coverage by old oil furnaces:	ca. 400 MWh

The equipment of the plant also includes a buffer store (6 m³) and a wood-chip fuel bunker (150 cubic metres of piled material). A supply contract has been signed with the town forest authority for the wood chips. In the initial phase, public invitations to tender for the amount of

wood needed were issued, but the price of the fuel was found to fluctuate widely, and the quality of the wood chips often proved unsatisfactory (too much moisture). The ashes generated are given out to the farmers resident on the Town Farm.

The plant was built and is operated by the Town of Feldkirch, and maintenance work is done by municipal public-works staff. The capital costs, including all incidental expenses (expansion of the district-heating network, wood-fuel bunker, etc.), amounted to almost 400,000 Eur; the Province of Vorarlberg provided 50% of the finances. Based on a depreciation period of forty years for the buildings and twenty years for the machinery, a heat price ex boiler of about 50 Eur per MWh (including maintenance and taking the subsidy into account) is obtained. After initial problems with the quality of the wood chips, the plant is now functioning to the complete satisfaction of the operator.

Biomass Working Group

In preparation for planning the Nofels plant, a Biomass Working Group (town government and forest authority, users) was set up, which concerns itself with the utilization of biomass – mainly in the form of wood chips – generated in Town of Feldkirch's facilities.



Thus there is an as yet unused annual potential of an estimated 2,000 m³ of piled wood chips, with an energy content of about 840 kWh/m³, from the forestry work of the town forest authority, due in particular to numerous blowdowns. In addition, there is an unused potential from waste disposal of tree prunings, which are currently made into compost; but medium-term plans are to incorporate them in wood-chip utilization. So there is an overall unused annual potential of 2,200 m³ of wood chips at present.

Since a continual supply of wood chips of appropriate quality to biomass plants involved difficulties, in Feldkirch's experience, the municipal forest authority has adapted to being a producer and supplier of wood chips – for its own existing wood-chip facilities and the Nofels district-heating scheme, for the municipal biomass plants to be built, and in future possibly for external plants, as well. At present, the working group is devoting itself to the detailed planning of a shed for interim storage of wood chips at the municipal forest authority, as part of the "Wood Chip Utilization" project. The construction of this shed is intended to make it possible to exploit the biomass potential mentioned above, and even to expand it in future.

Public relations

The implementation of the energy concept is accompanied by an intensive public-relations effort in Feldkirch; the highlights of this are the annual Feldkirch **Environment Days**. In February 1997, the Town of Feldkirch also participated in the **Biomass Day**, held throughout the Province of Vorarlberg. Interested people in Feldkirch were invited by the Town to an information day at the municipal forest authority.

Waldbad-Vorarlberger Milchhof GmbH-Oberau School district-heating system

The Waldbad district-heating scheme is another very interesting project that has been implemented in Feldkirch, although not with biomass. In connection with the renovation and

redesign of the Waldbad (the municipal swimming pool), the utilization of waste heat from the cooling system of the adjacent Vorarlberger Milchhof GmbH (a large dairy plant) has been put into practice. The dairy uses 350 cubic metres of ground water at a temperature of 8°C per day to cool its process equipment. It then emits the same quantity again at a temperature of 26°C for free – an energy potential that can be exploited for the swimming pool. The warm water is pumped to the heating plant of the near-by primary school through a district-heating pipeline. There, the process water can be heated to 60°C by a newly installed heat-pump unit, and used to supply hot water and heating to the school. The process water, now cooled again by this use, is then returned to the dairy for cooling the process equipment again, or to be returned to the ground water.

This system ensures that the process heat can also be utilized outside the bathing season; a potential for energy usage of 830 MWh for the school centre, and of about 300 MWh for the swimming-pool facilities.

EVALUATION AND PERSPECTIVES

The usage of renewable sources of energy has formed a focal point of energy policy in the town of Feldkirch over the past five years. This includes these subsidy programmes:

- Solar service-water heating plants and partial solar space heating in private facilities. The Town of Feldkirch subsidizes the erection of a solar-heating unit for hot-water heating in the amount of 25% of the Vorarlberg Provincial subsidy.
- Active support for solar-energy do-it-yourself groups, by purchasing the necessary tools and providing assembly spaces (Feldkirch municipal utility).
- A subsidy for the erection of a photovoltaic unit (output: 2,000 watts) at a vocational school in Feldkirch-Altenstadt from the Feldkirch municipal utility. This unit serves teaching and learning purposes, and to log readings used for Feldkirch's energy-supply concept.

FOR FURTHER INFORMATION

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