

# District heating fuelled by Wood Biomass

## Lienz (AT)

### GENERAL ASPECTS

Lienz, the regional capital of East Tyrol, lies at the foot of the Dolomites between the Isel and Drau rivers.

The town's population of 13000 works in local industry dominated by tourism, refrigeration appliance manufacturing and services. The colourful fronts, street cafes and cornershops give a relaxed southern atmosphere.



### BACKGROUND

The environment department of the municipality developed the "Lienz Energy Project" in 1993 in cooperation with a voluntary committee, the Lienz Energy Council. The aim of this project was to reduce air pollution in the Lienz district. Lienz lies in a basin which suffers from temperature inversions in winter, so air quality was poor. Different actions have been undertaken to reduce emissions. The Lienz Energy Plan was prepared based on a survey of 2500 households carried out in 1996 and which led to a 500 roof installation programme and a boiler replacement campaign. A five year solar installation campaign was launched with grants of €73 euro/m<sup>2</sup> plus public awareness raising campaigns. Biomass is the major source of energy in Tyrol, second only to hydro power and it has a major potential for expansion. The Tyrol Land Administration supports the extension of the use of biomass in its development policies. Therefore the policy was continued through the construction of the largest, and most impressive, biomass-fired power plant in Austria.

### ACTION UNDERTAKEN

A sub group in the Energy Council was set up in 1998 to promote the district heating scheme and prepare a call for tenders.



In April 2000 Lienz set up a joint venture company, Stadtwärme Lienz Produktions- und Vertriebs-GmbH, to provide district heating to households and companies in the city in a joint venture with the City (4% share), TIWAG, the regional provider of electricity (48%) and Steirische Gas-Wärme GmbH, the Styrian gas and district heating utility (48%), as partners. Steirische Gas-Wärme, a subsidiary of ESTAG (Energy Styria inc), works in cooperation with Stadtwärme Lienz. It is the biggest provider of heat in Styria (70%) and Slovakia. It also operates in Slovenia, Hungary and the Czech Republic. The companies strategy for many years has been to promote their extensive know-how in the field of biomass.

By using renewable energy sources and the introduction the latest flue gas cleaning technology, it has been possible to reach

the regional objective of a lasting reduction in air pollution and to make a considerable contribution to the overall reduction of emissions.

A considerable public relations programme involving 120 events was undertaken to encourage citizens to connect to the network, and the municipality agreed to connect its 250 dwellings to the network. Construction started once a threshold of 10MW of agreed contracts had been obtained.

About 100 000 m<sup>3</sup> of timber is used each year obtained from sawmill residues, forestry waste and bark with an input of 10 000 m<sup>3</sup> from local farmers. There is a biomass store adjacent to the plant and the sawmills operate just-in-time delivery schedules.

### **The thermal power station**

A search was undertaken for the optimal solution from the technical, economic and environmental point of view. This should provide Lienz with heat and electricity from renewable sources throughout the year. The final design incorporated two biomass boiler systems, an ORC (Organic Rankine Cycle) processor, a solar system, an oil boiler and a flue gas cleaning system with heat recovery. The two biomass heating systems, a high temperature boiler of 7.000 kW and a thermal-oil boiler with 6.000 kW output, are the core of the system. The thermal boiler produces the input for the ORC processor with an electrical output of 1.000 kW of "green electricity" fed into the TIWAG network. The waste heat from the ORC processor is supplied to the district heating. The principle of electricity generation by an ORC-process is similar to the conventional water-steam-process with the important difference that instead of water, an organic carrier with especially chosen properties is used. The ORC processor operates off the thermal oil boiler.

A direct solar thermal system with a collector surface of 640 m<sup>2</sup> provides an additional source to the indirect use of the solar energy stored in the biomass. Because of the high insolation in Lienz, the collectors can feed about 250 MWh/a into the district heating network.

An 11MW oil boiler operating on light heating oil serves to cover the peak load and as a reserve source in case of breakdowns. Overall the oil boiler produces just 4 % of the total thermal energy consumed. Because of this minor input of fossil fuel it is possible to construct a biomass heating plant that is 40 % smaller because it does not have to cover the peak load. In addition a Fuzzy Logic Regulation system is planned in the thermal power station. The advantage of this innovative regulation system is that it improves the utilisation of the system over the year and reduces emissions by providing for steady combustion.

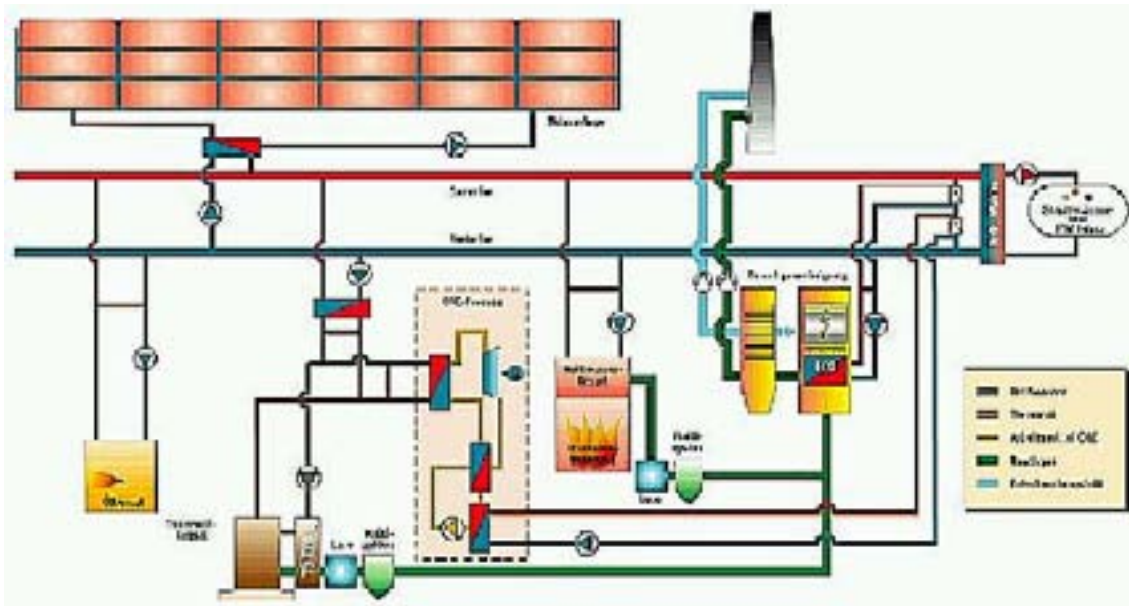
Flue gas purification consists of initial dust extraction, an economiser and wet-electric filtration. The economiser recovers residual heat after which the flue gas cools down to 90 ° C and goes to wet-electric filtration. There it is cleaned to a dust content of 10mg/Nm<sup>3</sup> and is led to the LUVO which dries the flue gas and mixes it with external air, so avoiding a vapour plume down to an outdoor temperature of -5 C.

### **The district heating network**

The district heating network is constructed of prefabricated insulated pipe sections with leak detectors. Online data transfer from the district heating customers to the thermal power station enables settings to be changed at the heat exchanger following the needs of the customer and automatic transfer of energy consumption readings.

The district heating network started operation in November 2001 and the proposed network was completed by Stadtwärme Lienz in 2003 with a total forecast heat output of 60 000 MWh and a CO<sub>2</sub> saving of 25 000 tons per year. The design included three stages: firstly the construction of the three main supply pipes and the thermal power station so that nearly all bulk buyers can be provided with heat, secondly the progressive expansion of the district heating network and thirdly the developing of dense local networks.

Several thermal insulation and demand side improvements were implemented in customers' premises during the installation of the district heating network, so improving comfort and increasing energy saving. Overall a network of about 37,5 km has been laid and about 900 buildings and 3500 customers can be provided with heat from biomass and solar energy throughout the year. About 60 GWh of heat is sold annually.



## Funding

The project's total cost was 23.1 M euro and received funding from Tyrol Land, the Austrian Government and the European Union. The project is Austria's largest biomass project and has won many awards, for instance the Energy Globe Austria Award 2002 and the Environment Award 2002 of Tyrol Land.

## LESSONS LEARNED

This demonstrates that with sufficient political will and public support, an innovative investment can be promoted even under a liberalised regime although liberalisation did not directly have an impact on the project. There were other motors helping to develop this project – in particular the major environmental benefits in terms of air pollution. In the context of the new liberalised market there is great interest in utilities in new business directions and when the municipality organised a “competition” for proposals evaluated by members of the University of Graz, many utilities participated.

In liberalised markets the municipalities have more responsibility for regulation and so energy planning and long term strategies become more and more important. The adoption of a private sector mentality – a secondary impact of liberalisation, meant that extensive marketing activities and the co-operation with the inhabitants were promoted and this was one of the main reasons for success.

However it should be noted that here a local utility is carrying out monopoly functions – district heating. There is some advantage in having a “secure” monopoly business in a competitive market and so this must represent a market opportunity for municipalities wishing to promote local energy policies. The electricity output is relatively small and really provides “the icing on the cake” but, due to the feed in tariffs for green electricity, contributes considerably to the economic return.

# IMPLICATIONS FOR PUBLIC POLICY MAKERS

This project received heavy grant aid funding from all levels of government – regional, national and European. The introduction of liberalisation doesn't get round the need to support desirable forms of activity both for energy saving and sustainable supply options. High demand for biomass will eventually produce a price increase in the biomass fuel and if general energy prices fall, this form of financial support may even need to increase. However it is obvious that such options will work better as part of a rational energy policy prepared at municipal level as in this case study. Liberalisation strengthens the case for preparing such policies – one needs a framework against which to regulate.

## FURTHER INFORMATION

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Case study prepared by Graz Energy Agency as part of Task 9 of the International Energy Agency DSM implementing agreement, Municipalities and Energy Efficiency in a Liberalised System. The cooperation of Stadtwärme Lienz is gratefully acknowledged.

