BIOMASS INNOVATION ALONG THE VALUE CHAIN

Christiane Egger
Christine Öhlinger
O.Ö. Energiesparverband
A-4020 Linz, Landstraße 45

ABSTRACT: In Upper Austria, renewable energy sources (RES) provide over 30% of the primary energy consumption (of which 14% is biomass) and the share of renewable heating is 45%. The regional government has already adopted the target to reach 100% RES heat by 2030. To achieve this ambitious goal a regional biomass action plan is carried out which among others supports innovation along the whole value chain. The O.Ö. Energiesparverband, the energy agency of Upper Austria, is mainly responsible for the implementation of the measures included in the action plan.
Keywords: wood chips, wood pellets, training, promotion, policies

1 THE ENERGY STRATEGY OF UPPER AUSTRIA

Upper Austria is one of the nine Austrian regions, located in the Northern part of the country with 1.4 million inhabitants. The region is highly industrialised, with significant heavy industry (steel, machinery) and a well developed service sector.

According to the Austrian constitution, many energy and environment related tasks fall into the responsibility of the regions ("Länder"), especially where the building and the heating sector is concerned.

Already since the early nineties, Upper Austria has put a political priority on energy efficiency and renewable energy sources, with renewable heating always playing a key role. The first energy strategy and action plan was passed in 1994, leading to an increase in the share of RES from 25 to 32% in the year 2007, of which 14 % is hydro, 14 % biomass and 2 % solar energy and other RES.

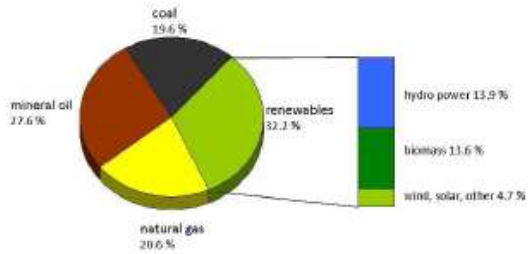

Figure 1: Structure Gross Energy Consumption Upper Austria 2007

Currently, the energy strategy 2000-2010 is being implemented which again sets ambitious targets, for example doubling biomass heating and solar thermal installations.

Within the frame of the energy strategy process "Energy Future 2030", four different scenarios were developed and consumption, trends and potentials analysed. In October 2007, the regional government adopted the most ambitious scenario, the "turning point scenario" as its officials targets for 2030 which include:

- 100 % space heating from renewable energy sources
- 39 % less heat demand
- 100 % electricity from renewable energy sources
- 41% less fossil transport fuels
- minus 65% CO_2

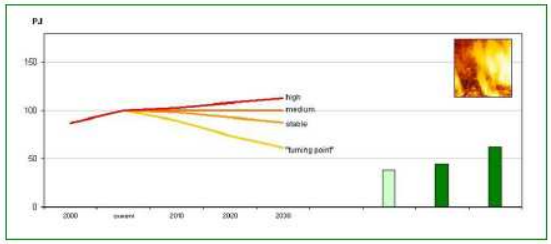

Figure 2: Development of consumption, scenarios and potentials, heating, Upper Austria 2000 – 2030, in PJ

To achieve these ambitious targets, policy packages are applied for the different target groups and technologies, consisting of grants, promotional activities (energy advice, information campaigns), training as well as product and company development. Attention is paid to continuously adapting these programmes to the market needs and including innovative elements along the whole market chain.

2 BIOMASS IN UPPER AUSTRIA

Renewable energy sources and energy efficiency are cornerstones of the Upper Austrian energy policy since many years.

The most important ways to heat with biomass are:

- Automatic wood pellet heating systems, mostly in single-family homes
- Automatic wood chip heating systems for homes, commercial and public buildings
- Biomass district heating installations
- District heating from biomass CHP plants

Additionally, wood stoves and automatic logwood boilers are also frequently used.

Comprehensive action plans and an annual monitoring and reporting system allowed for good progress towards the policy goals. As the graph below shows, the biomass target was already during 2007. The oil price hikes in the past few years clearly accelerated the development.

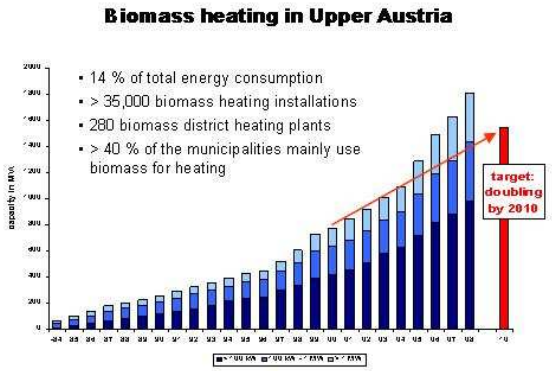

Figure 2: Biomass in Upper Austria, target 2010, in MW

3 THE APPROACH

3.1 Focus on Innovation

Having achieved a high market share of biomass use, it is crucial to use a well targeted approach for further market development. It is necessary to continuously adapt strategies and policy programmes to the market development and to include new and innovative elements to "keep the positive market development going".

3.2 Institution building

Institution building is a key element in these policies: O.Ö. Energiesparverband, the regional energy agency and the Energy Commissioner of Upper Austria support the development, the implementation and the monitoring of the renewable energy and energy efficiency policies.

Upper Austria is home to a number of leading producers of renewable heating equipment (especially small-scale biomass boilers and solar collectors). They are an important factor in market development and the network of the Oekonergie-Cluster supports their market development.

3.3 The O.Oe. Energiesparverband

In 1991, the regional government set up the regional energy agency, O.Oe. Energiesparverband, at that time with the main objective of information provision to private households, especially to set up and manage an energy advice service. Over the years, the target groups for the information provision increased and today cover all energy users and many energy producers in the region. Other tasks were added to the portfolio of the agency, for example, the operation of funding and promotion programmes.

The O.Oe. Energiesparverband holds 15,000 energy advice sessions every year for homeowners, business or public bodies that are considering a building related energy investment. In most advice session, space heating and the use of RES-h are discussed.

3.4 The Oekoenergie-Cluster(OEC)

Many leading producers of biomass boilers and solar thermal collectors are located in Upper Austria and they are growing quickly, making them important players in renewable heating. The companies are organised in the "Oekoenergie-Cluster", the network of green energy companies with more than 4,500 employees and an annual turnover of more than 1.5 billion Euro.

Currently the network has about 150 partners in Upper Austria and about 40 in South Bohemia (the neighbouring region). Renewable heating companies play a very important role in the network, as they include a number of leading European producers of biomass boilers, solar collectors and heat pumps.

The network is managed by the O.Ö. Energiesparverband, on behalf of the regional government.

The main objectives are to support business development of the partners, to foster increased co-operation, to serve as a "Regional Dialogue Platform" and to contribute to the energy and economic policy objectives of the region.

3 INNOVATION ALONG THE VALUE CHAIN

Biomass heating has a long tradition in Upper Austria. The introduction of innovative technologies and business models (e.g. automatic pellet heating systems and biomass district heating operated by farmers cooperatives) allowed for a transition into present times.

Based on market research surveys, the market development approach for biomass puts a strong focus on innovation along the value chain from policies and R&D and innovative products to training and dissemination, comprising the following main instruments:

3.1 Policy development and implementation

One important driver in renewable heating policy is that it is not only seen as energy and environment policy but very much as agricultural (biomass heating), economic (job creation through the production and installation of renewable heating equipment) and social policy (solar thermal). This allows for a wider political support, both inside the government, but also from outside stakeholders (e.g. the farming community) and the availability of higher financial resources (especially from agricultural policies).

Another important aspect of the regional policy are the stable support conditions, it is tried to avoid "stop and go" policies. The financial support for biomass heating installations for example are stable for many years.

3.2 R&D

Among others leading biomass boiler producers are support in their R&D activities by a regional R&D support programme, which is implemented by the O.Oe. Energiesparverband. The regional R&D programme supports research and product development in the fields of energy efficiency and renewable energy sources.

Especially the companies offering RES-heating products and services have profited from this programme in developing a more competitive product portfolio.

3.3 Product & company development

Automatic biomass heating systems, using wood pellets, wood chips and log wood have seen a continuous growth over the last 20 years. The market introduction of automatic wood pellet heating systems in 1997 provided a strong boost as consumers responded very well to the new technology.

The business model of biomass district heating systems (operated frequently by farmers cooperatives) also contributed significantly to the market development.

Over the last 10 years, there was a positive interaction between the growth of these companies and regional policy: strong home markets (due to regional support policy) allowed the companies to develop faster and new jobs in these companies increased the confidence of regional politicians in their renewable heating policy.

New innovative biomass technologies recently developed range for example from pellets condensing boilers for agro pellets and stoves for passive houses.

3.4 Third Party Financing

One approach to overcome the challenge of high upfront investments (compared to lower operation costs) of RES-heating installations is the instrument of "contracting". Here an ESCO invests in and operates a RES-heat installation located within the premises of a company or a public body and sells the heat (and possibly also electricity and cooling) to the owners/users of the buildings at an agreed price. One main advantage for biomass contracting is that the ESCO is the specialist in purchasing and handling the biomass fuel and ensuring that the plant is running at optimal efficiency.

Attractive as this in theory, there are not many countries in Europe that have managed to set up a functioning market for "RES-heat contracting". One reason is the "chicken-and-egg" problem: as the instrument is unknown, there is no demand for it from potential customers, and as there is no demand, not many are interested in offering the services, especially as a lot of general promotion of the instrument is required before any business can be done. Also, specific skills and access to capital are necessary for the ESCOs which present another barrier.

That is why the region of Upper Austria set up a specific programme (the so-called "Energie-Contracting-Programm", ECP) which supports the financing of these projects – meaning that a subsidy is granted to cover a part of the costs from financing the investment by the ESCO (in addition to technology specific investment subsidies). The programme covers both energy efficiency investments as well as those in RES-heating and amounts to up to 13.5 % of the investment costs for RES-heat contracting.

Complementary to the funding programme, ESV – which manages the programme on behalf of the regional government – carries out comprehensive information and advice activities, making sure that the instrument is well-known and supporting the quality of the project.

3.5 Training

Fast and sustainable market growth very much depends on the availability of skilled personnel on different qualification levels along the value chain.

Heating installers for example are a group of high importance for the market penetration for biomass heating, especially for homeowners. In Austria, installers are trained as apprentices in a so-called dual training system, which consists of both a practical training in a company (an apprenticeship) as well as attending a vocational school.

In order to respond to the lack of skills in the field of biomass heating, but also to make the profession of a heating installer more attractive to young people, a new professional training "Ökoenergie-Installateur" (renewable energy installer) was created in Upper Austria in 2002. At first, this was a pilot project limited to the vocational school in Linz, meanwhile it has been extended to all other Austrian regions.

Both in the training in school but also in the company where the apprentice is working, a focus is put on biomass heating. The course is also offered as further training to those who have already qualified as installers.

Another important educational initiative was the creation of a new degree course "eco energy engineering" at the University of Applied Science in Wels in 2002. It consists of a 6 semester Bachelor degree programme (Bachelor of Science in Engineering) and a 4 semester Master degree programme (Master of Science in Engineering). The courses cover both technological and economical issues relating to energy efficiency and renewable energy sources and in both the Bachelor and the Master programme, internships of min. 10 weeks in industry or research are required.

Since 1992, O.Ö. Energiesparverband has been running a training programme for energy advisers. This programme consists of a "basic course" (50 hrs) and an "advanced course" (120 hrs + practical project + participation in 10 energy advice sessions). For both courses, an oral exam has to be passed. The courses include the calculation of the building heat demand, building physics and heating technologies as well as economic issues and communication skills. With the completion of the "advanced course", a participant is able to carry out a simple energy advice session for the construction or the renovation of a one-family home.

In addition to these educational programmes, there is a huge need to train professionals in renewable heating and energy efficiency in buildings. That is why the O.Oe. Energiesparverband offers an annual training programme which consists of about 15 different courses. Target groups include heating installers, social housing companies, facility and building managers, employees of municipalities etc.

In 2009, for example, the following courses relating to renewable heating are carried out:

- Innovative biomass heating for dwellings (1 day)
- Pellet heating for larger buildings (2 days)
- Energy in municipalities (1 day)
- Biomass in municipalities (1 day)
- Decreasing energy costs in companies (1 day)
- Innovative technologies for dwellings (2 days)

Responding to policy changes and technology innovation, new courses are regularly developed and existing ones adapted.

3.6 Promotion & dissemination

Successful promotion is characterised by a smart and effective mix of communication instruments - if professionally done, it can be a very cost-efficient approach to meet policy targets. Certainly, it will not happen on its own but it is necessary to assign this task to relevant organisations and actors.

From the very early phase of renewable energy policy, a strong focus was put on active promotional activities, including energy advice, events and publications, competitions, networking of actors and comprehensive topical information campaigns. The creation and continued funding of the regional energy agency O.Oe. Energiesparverband as the focal point of the information and promotional activities as well as

training was a central part of this policy.

Information provision for energy users - be they homeowners, companies, housing associations, municipalities - is oriented towards two fundamentally different situations of energy users which require other tools and approaches:

- One is that a specific investment is being considered - here usually, very specific information is needed within a usually short period of time. Most important instruments for this situation include energy advice, targeted events, publications and website with specific technical and economic contents and stands at specialised trade shows.
- The other is to draw their attention to an aspect of their energy consumption which they may have previously not considered and/or to introduce a technology or service. Important instruments are media campaigns, direct mailings, short information folders, stands at general trade shows or other highly frequented venues.

In order to reach different target groups, strategic partnerships with other organisations, networks and companies are essential which have access to these groups. Examples are professional associations, public bodies (e.g. the municipalities) and banks.

It is very important, however, not to rely on any other organisation and company alone that they will actively disseminate information relevant to their members or clients. One successful approach is to prepare complete information packages (printed or electronically) which only need to be sent out by the partner organisations and companies.

An important element in the information activities is the "reaching out" approach, meaning a continuous process of trying to reach out to new target groups both by setting up new information channels and by developing new topics to be communicated.

In 2008, the promotional and awareness raising activities carried out by the O.Oe. Energiesparverband included, among others, the following:

- More than 15,000 face-to-face energy advice sessions for private households, companies and public bodies;
- Organisation of about 40 events with a total of 3,300 participants, including 22 training course;
- More than 40 targeted publications, nearly 1.5 million visitors on its websites, monthly eMail newsletter;
- 3 comprehensive information and media campaigns and 3 competitions;
- About 300 press articles/radio/TV programmes.

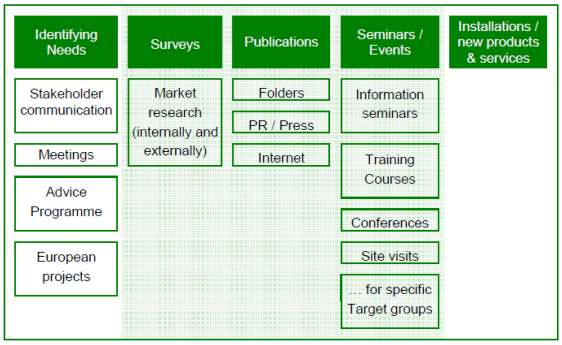

Figure 3: Communication and market development

4 RESULTS & CONCLUSIONS

In 2008, the following renewable heating installations were in place in Upper Austria:

- 1,000,000 m² solar thermal collectors
- 35,000 automatic biomass heating installations in private homes, public bodies, businesses, including
- 16,000 are pellet heating installations
- 270 biomass district heating systems
- 30,000 heat pumps for space heating and domestic hot water

In total, around 1,180,000 tons of solid biomass (including saw residues) are used annually for biomass heating in automatic heating systems, producing 3,510,000 MWh.

This results in a emission reduction of 1,050,000 tons of CO_2 per year.

Additionally, about 500,000 tons of biomass are used in biomass CHP plants (for electricity and heat production).

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