Wood use for Energy
Experiences and Perspectives

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Pellet Fuels Institute (PFI)

A North American trade association promoting energy independence through the efficient use of clean, renewable, densified biomass fuel.

» Currently 140 member companies

» Fuel Manufacturers

» Equipment Suppliers
Austria – a very small country in Europe

- 8 million inhabitants
- 47% forest cover
- 3.9 mill hectares (1% of US forest cover)
- 61% spruce, 9% beech, 9% pine, 7% larch
- 50% forest owners < 200ha, 22% > 200 ha, 16% national forest
Wood use for energy can become very significant!

13% of Austria’s entire energy demand is covered by wood – approx. 10 Mill. cords annually

20% of all new installed residential boilers use wood fuels

Austrian pellet production capacity 1.1 million tons
### The Austrian experience with wood energy

- Wood use for energy can become very significant!
- 13% of Austria’s entire energy demand is covered by wood – approx. 10 Mill. cords annually
- 20% of all new installed residential boilers use wood fuels
- Austrian pellet production capacity 1.1 million tons
More than 1000 community heating plants and 300 MW of combined heat and power plants use wood fuel.
Cumulated number of residential pellet boilers in Austria

Source: Haneder, LKNÖ, April 2010
North American Pellet Industry

- In 2008, total North American installed capacity was 4.2 million metric tons, up from 1.1 million in 2003.
- Over 80% of U.S. pellets in 2008 were shipped to in-country destinations.
- Most of the rest was exported to Europe, a growing trend boosted further by the handful of large plants geared to exports.
- By contrast, almost 90% of Canadian shipments were exported, mainly to Europe.
- Reflecting this difference in markets, most U.S. pellets were placed in 40-pound sacks, whereas over 80% of Canadian volume was shipped in bulk.
US Biomass Markets for Wood Pellets

- Residential
- Commercial/Industrial Applications
- Co-Firing
- Gasification
The European market is growing more than the US

- Subsidies
- Investment
- Government Assistance/Mandate

European Union target to supply 20% of its energy needs from renewable sources by 2020, an ambitious goal difficult to achieve from indigenous sources alone

All of the above are slow going in the US
How wood use for energy became big in Austria

- Starting point: considerable traditional use of firewood
- 1980: clean air legislation forces wood boiler manufacturers to invest in major R&D efforts
- 1980s: investment subsidies are established to support small forest owners by creating a market for small wood
- 1997: first residential pellet boilers introduced – consumer driven boom
- 2001 feed in tariff law creates boom of biomass power & CHP systems
The transition to modern wood heating: efficiency increase from 50% to >90% - LHV
Emissions from wood boilers – down by a factor of 1000
Logwood gasification boilers

- Efficiency > 90% based on lower heating value (LHV)
- Emissions < 20 mg/m³ CO
- Very reliable
- Up to 200 kW
Wood chip boilers

- Automatic operation
- Efficiency > 90% (LHV)
- Emissions < 10 mg/m³ CO
- Power > 50 kW
- Low fuel costs
- Storage volume large
Pellet boilers

- Suitable for residential and commercial use
- Efficiency > 90%+ (LHV)
- Emissions < 10 mg/m3 CO
- Automatic fuel feeding from bulk storage
- Very low user involvement & high reliability
Biomass district heating for communities
The contribution of different segments to biomass use

- Chipboiler >1000 kW
- Chipboiler 100-1000 kW
- Chipboiler < 100 kW
- Pellets
- Briquetts
- Cordwood

Pro® pellets Austria

Pellet Fuels Institute

Solid cubic meters per year

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Key questions regarding wood energy use

➤ How should we upgrade wood for fuel use?
➤ How do the economics of wood fuels work – how do wood fuels compare to fossil fuels?
➤ How do we deal with smoke from woodfuels?
How do we deal with smoke?

State of the art wood fuel boilers burn wood without any relevant emission of smoke!

Problem is solved with advanced combustion technology – use it!

What remains is the problem of communication!

Serious efforts are needed to inform local residents, the media, and policy makers.
How should we upgrade wood for energy use?

» By natural drying

» By chipping AFTER drying

» By pelletizing: drying, grinding & densification if fuels needs to be transported over larger distance or used for domestic heating

» **NOT** by trying to turn it into a liquid fuel or into electricity – very high losses!

» One way of upgrading is to produce heat and sell the heat instead of the fuel
The dilemma of building up a wood energy market

- Competitiveness and efficiency of wood fuel use is highest in the heat sector.
- BUT it is a slow and complex process to develop this market that needs public support programs.
- Use of wood fuels in power plants can create very large demand quickly – large volumes but low prices for wood.
- The benefit of power plants: supply chains for wood fuels are developed that can serve heat markets later.
### Comparing costs and benefits of power & heat from pellets

<table>
<thead>
<tr>
<th>125.000 t Pellets p.a. 15 years</th>
<th>Pelletstoves</th>
<th>Powerplant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of users</strong></td>
<td>50.000</td>
<td>1</td>
</tr>
<tr>
<td><strong>Subsidy</strong></td>
<td>650 $ per stove</td>
<td>feed in premium 7,8 cent/kWh</td>
</tr>
<tr>
<td><strong>Total costs of subsidy</strong></td>
<td>32,5 Million $</td>
<td>272 Million $</td>
</tr>
<tr>
<td><strong>Savings consumer</strong></td>
<td>292 Million $</td>
<td>0</td>
</tr>
<tr>
<td><strong>Renewable energy delievered</strong></td>
<td>9187 GWh</td>
<td>3491 GWh</td>
</tr>
<tr>
<td><strong>Ex works price pellets</strong></td>
<td>170 - 240 $/t</td>
<td>110 – 130 $/t</td>
</tr>
</tbody>
</table>
Conversion of wood fuel prices and fossil fuel prices
Figures based on lower heating value (LHV)

- 1 cord = 15.8 GJ = 4400 kWh = 15.02 Mbtu (20% water content)
- 1 mt pellets = 16.9 GJ = 4700 kWh = 16.04 Mbtu
- 1 gallon fuel oil = 0.133 GJ = 37.1 kWh = 0.126 Mbtu
- 1 ft³ natural gas = 0.098 GJ = 0.27 kWh = 930 btu
The result:

Total heating costs per year

- Woodchips
- Pellets
- Fuel oil
- Natural gas

[Operation related costs & other costs]
[Demand related costs]
[Capital costs]

calculation model: www.bioheat.info
Conclusions for different options for biomass heating

Best economic choice: use of wood fuels in individual large buildings or “Micro grids“ – heating of several large buildings

Good chances: residential use of wood fuels, particularly pellets in pellet stoves, pellet central heating stoves and pellet boilers

More difficult: District heating networks
How will the framework conditions for wood energy develop?

- Factor with highest single impact: oil price
- International energy agency sees major problems with oil supply ahead
Discoveries of new oil fields have been declining since 1965

Quelle: The world oil Supply 1930-2050, Petroconsultants
Conclusions

» Wood fuels will become very valuable sources of energy as fossil fuel supply declines and prices fluctuate.

» The energy value of wood will be several times higher than today's value of wood – it will change the economics of forestry completely.
Conclusions II

» The use of wood for energy cannot happen from one day to another because it requires concludes education
  
  • Efficient fuel production & logistics
  
  • Technical implementation: proper planning, installation, operation & maintenance of systems
  
  • Supportive policy framework

» Learning by doing is the only way to get prepared!

» Start to realize projects based on excellent equipment, single buildings with high heat demand and offer heat service contracts (maybe with suitable partners)
We are happy to share our experiences!

www.bioheat.info

www.propellets.at

www.pelletheat.org

Come over and look how wood energy use has developed in Austria!

proPellets will gladly be your host!
Thank you for your attention! Questions?