Wood use for Energy
Experiences and Perspectives

Christian Rakos, proPellets Austria

Seth Voyles, Pellet Fuels Institute (PFI)

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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

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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

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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 anually
- 20% of all new installed residential boilers use wood fuels
- Austrian pellet production capacity 1.1 million tons

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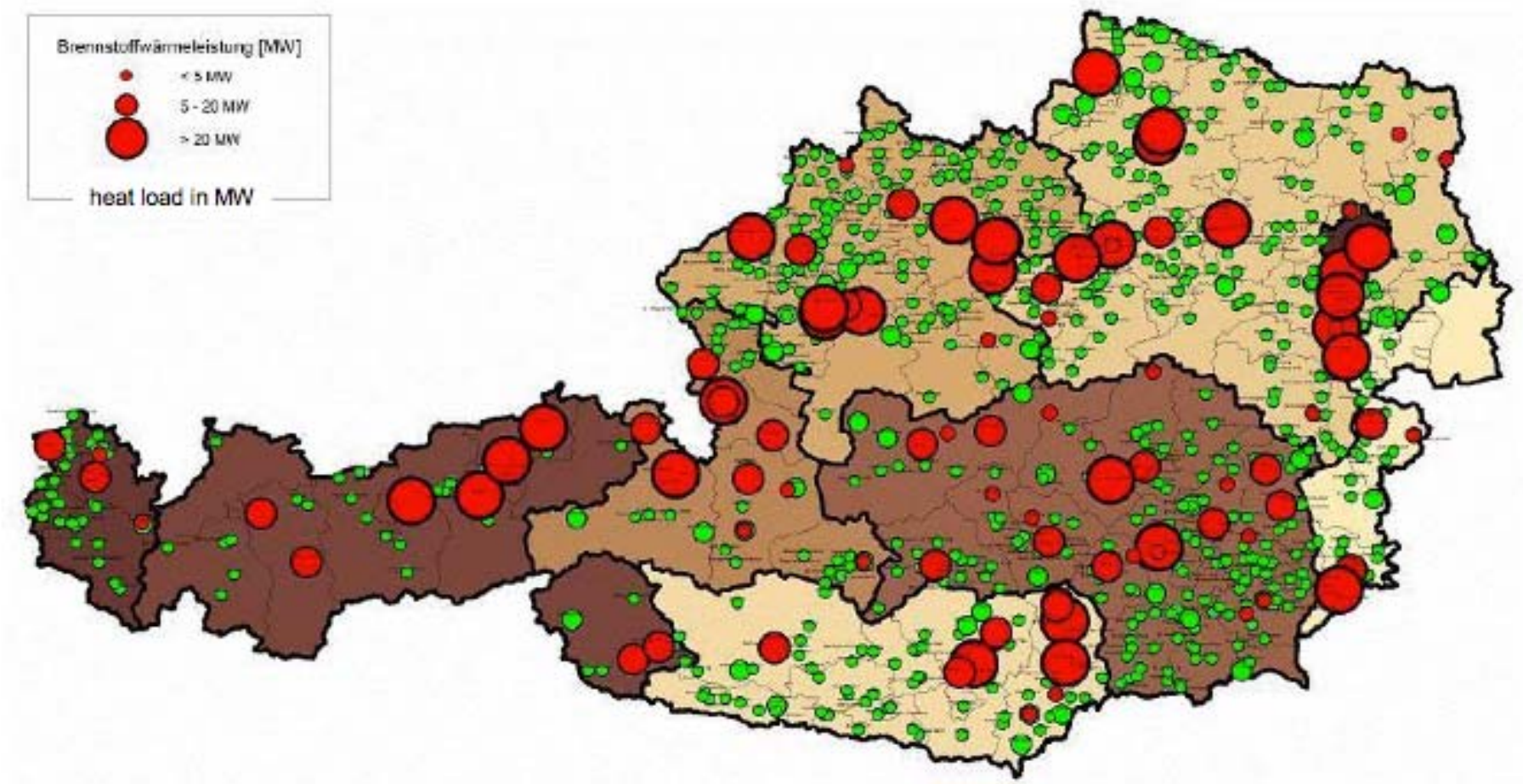
More than 1000 community heating plants and 300 MW of combined heat and power plants use wood fuel



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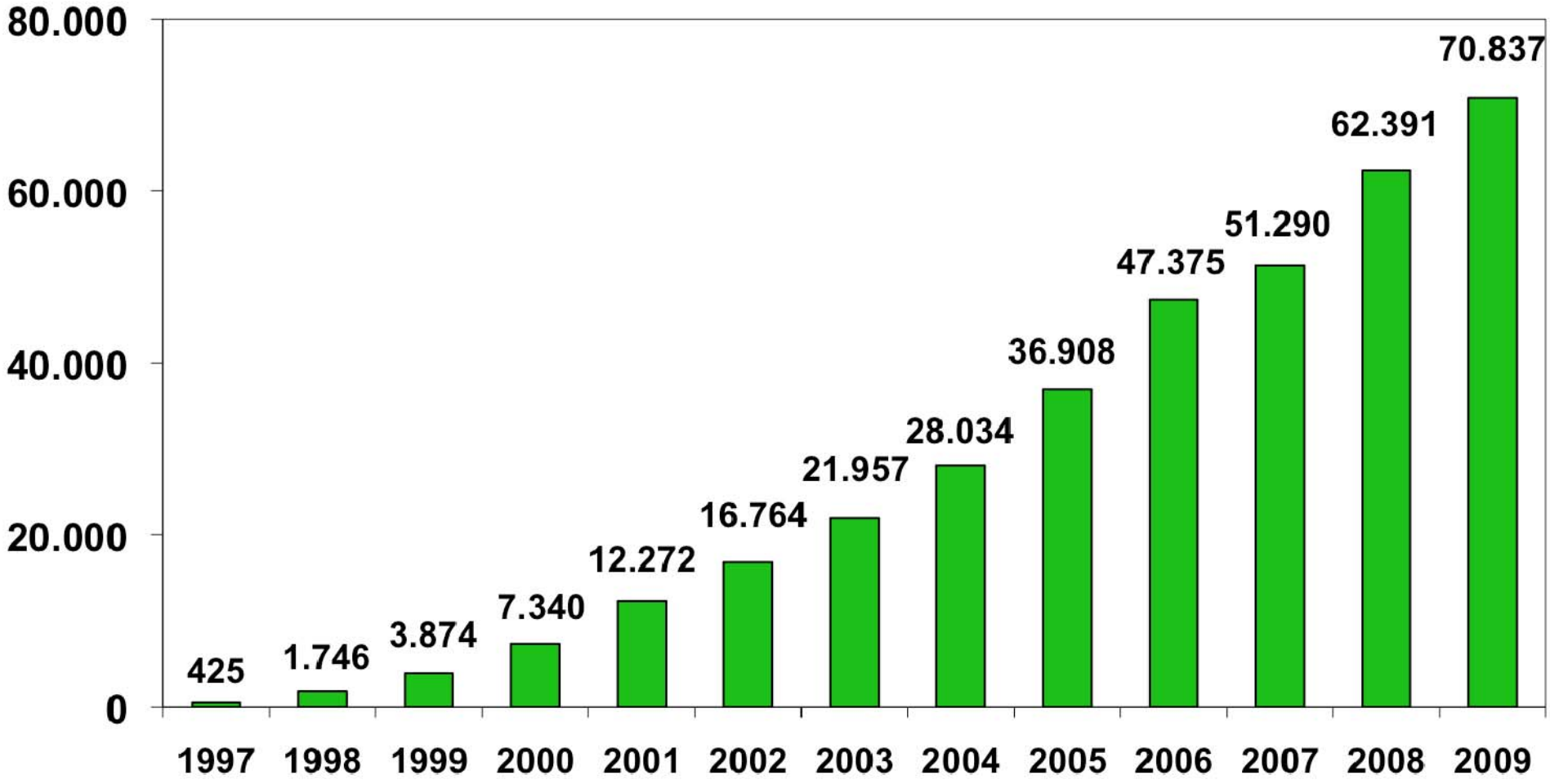
Cumulated number of residential pellet boilers in Austria



Source: Haneder, LKNÖ, April 2010

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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 Eu-rope
- 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

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US Biomass Markets for Wood Pellets

- Residential
- Commercial/Industrial Applications
- Co-Firing
- Gasification

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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 ambi-tious goal difficult to achieve from indigenous sources alone
- ***All of the above are slow going in the US***

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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 tarif law creates boom of biomass power & CHP systems

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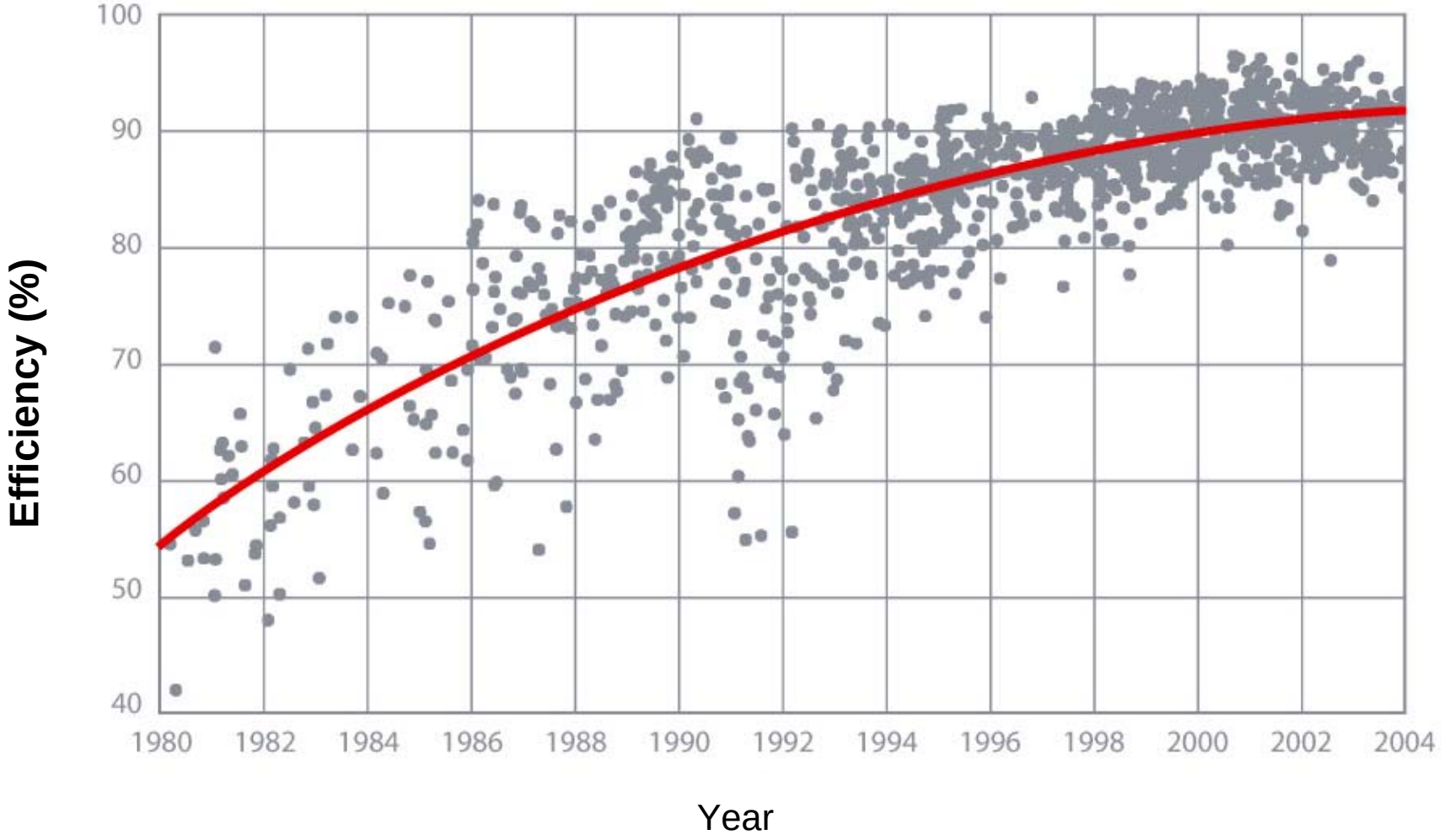
The transition to modern wood heating: efficiency increase from 50% to >90% - LHV



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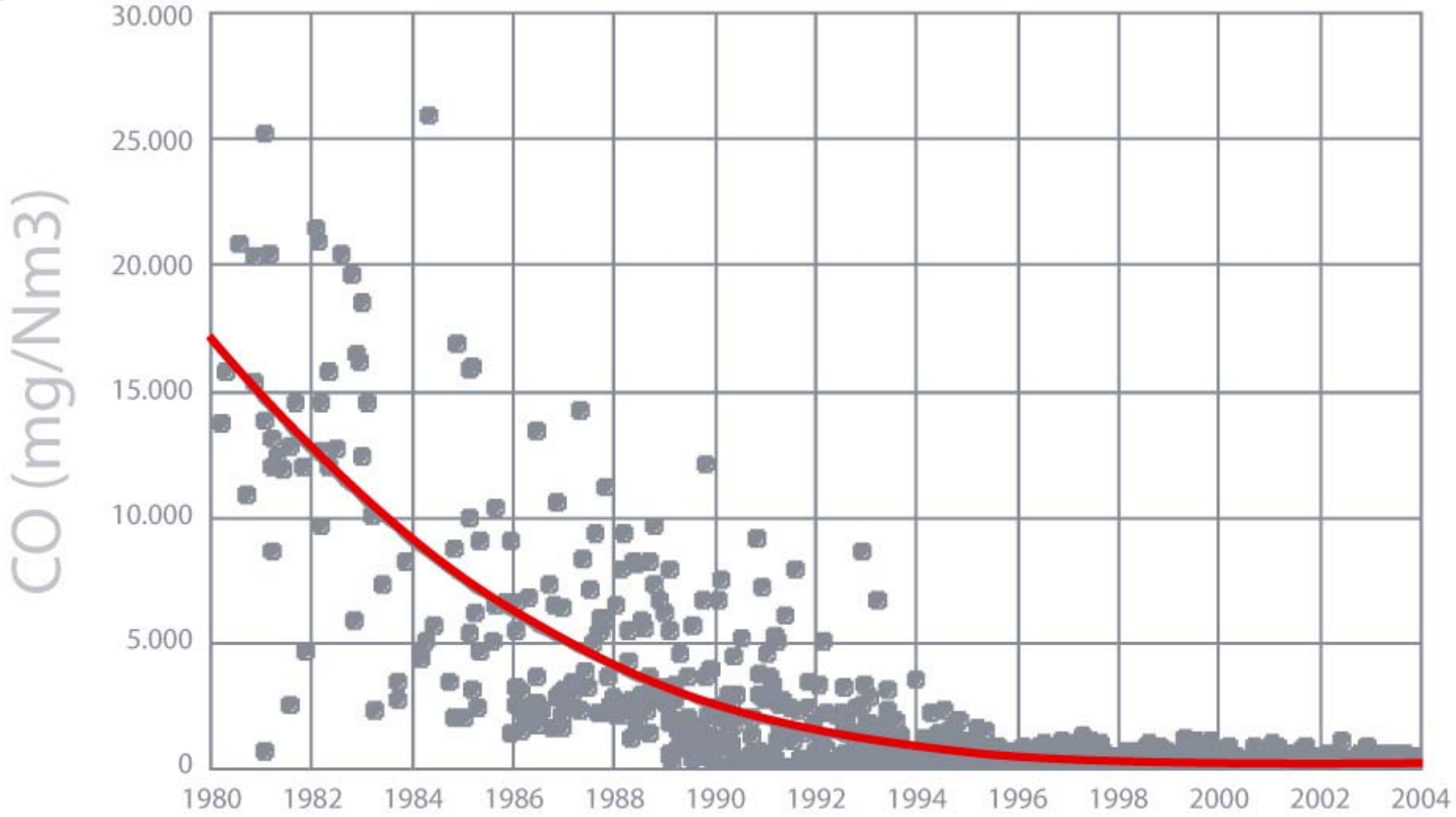
Emissions from wood boilers – down by a factor of 1000



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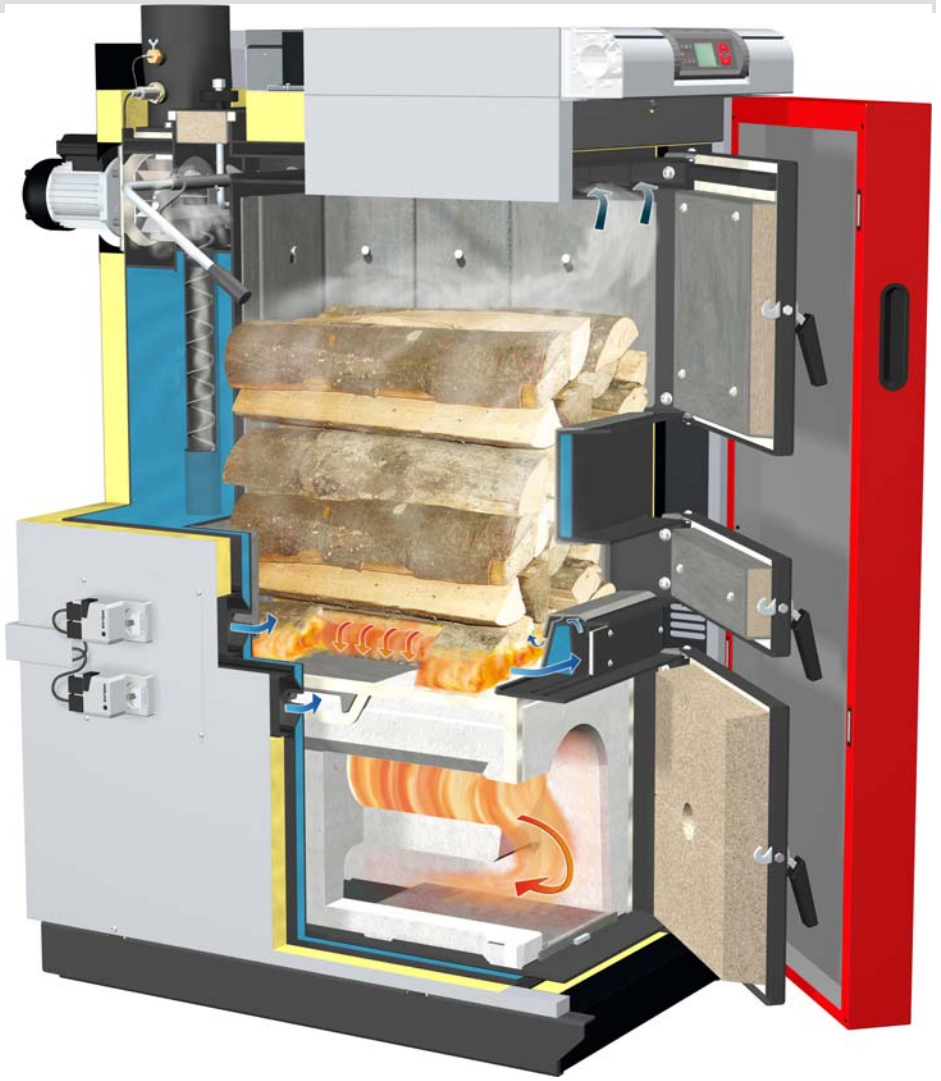
Logwood gasification boilers

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



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Wood chip boilers

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

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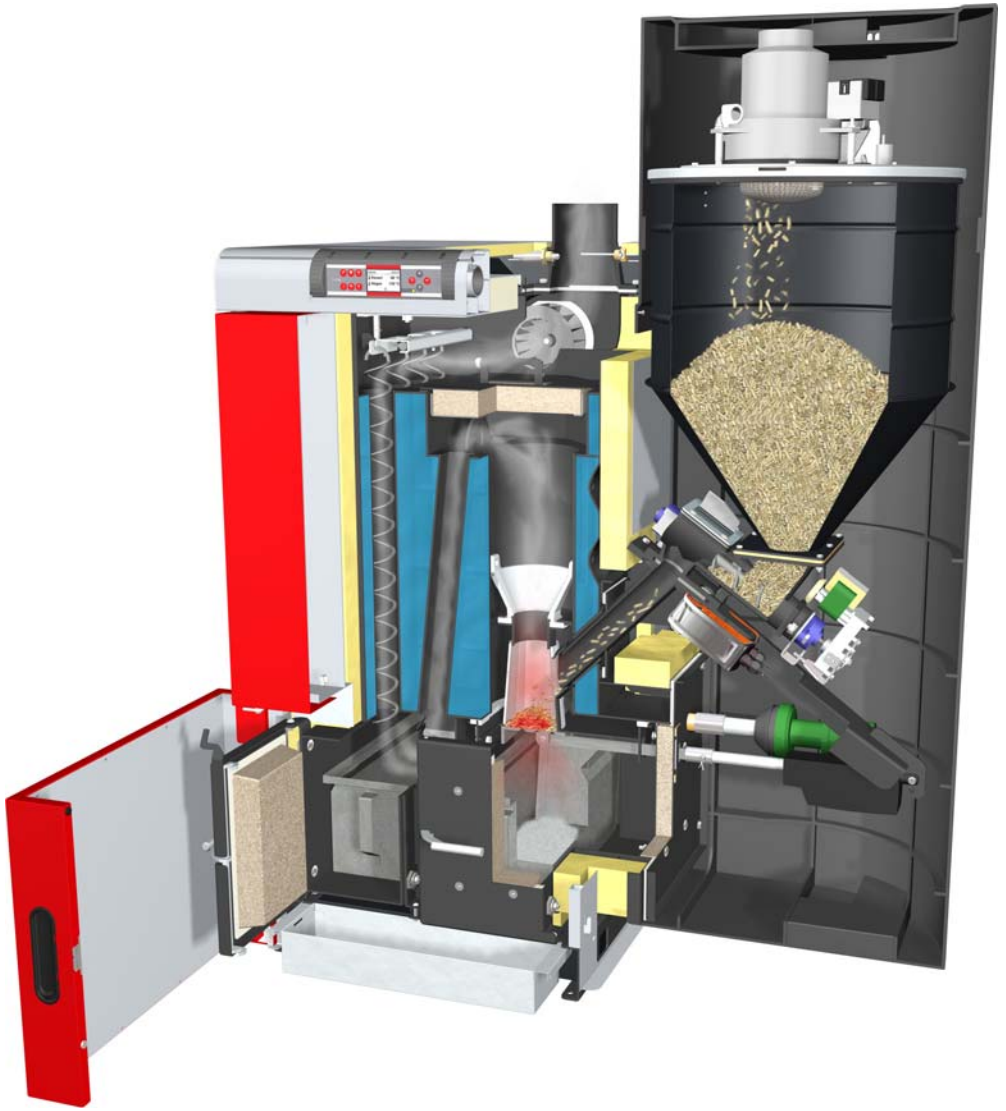
Pellet boilers

- 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



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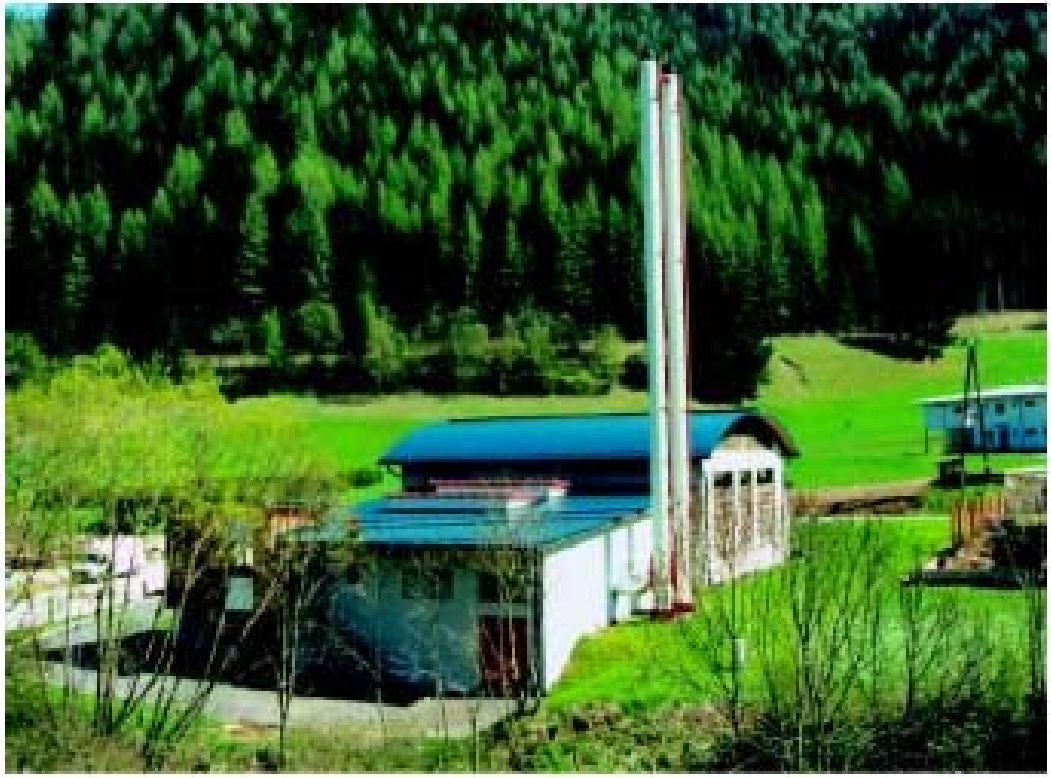
Biomass district heating for communities



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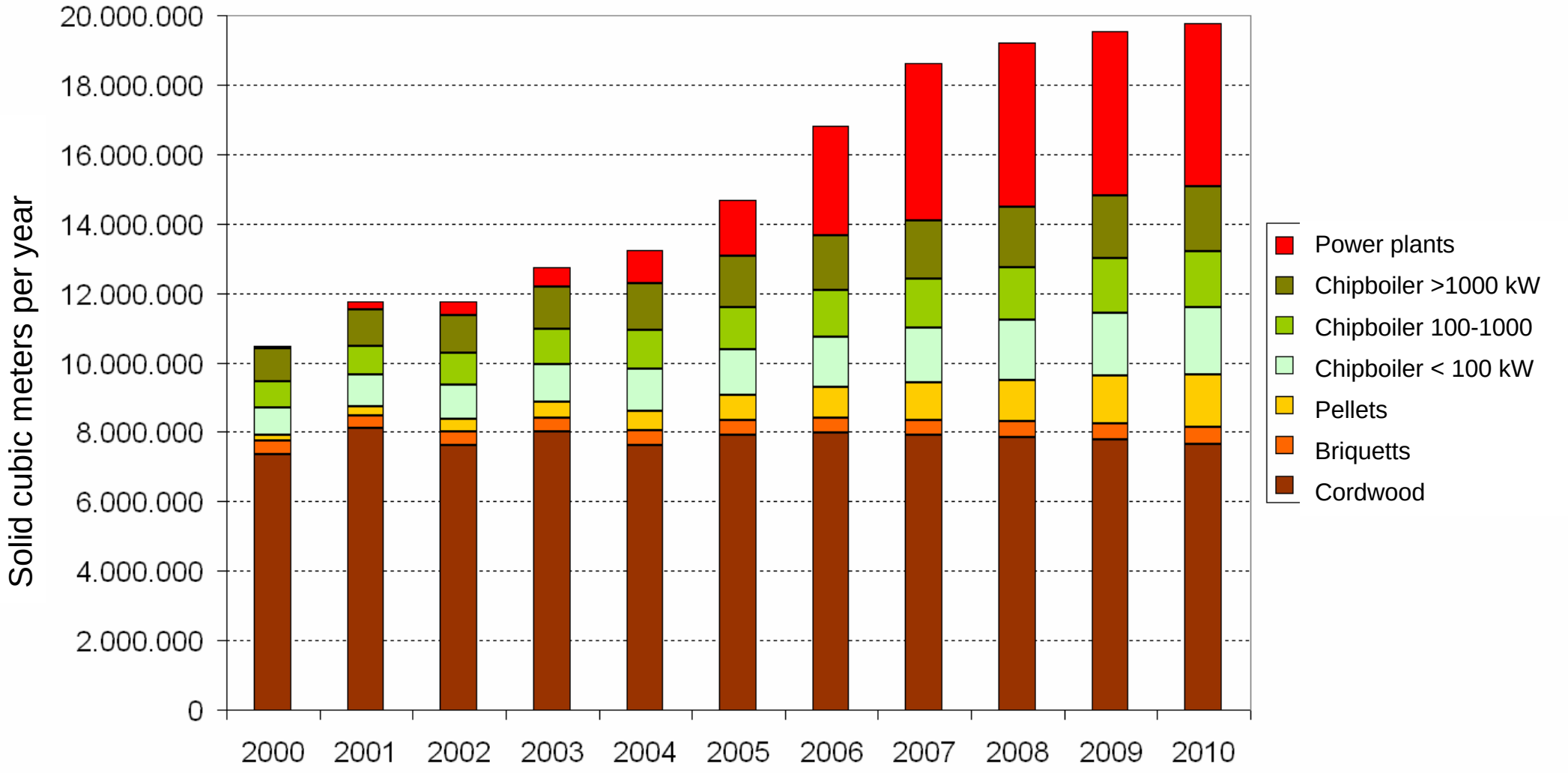
The contribution of different segments to biomass use



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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?

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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

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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**

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The dilema of building up a wood energy market

- Competitivity 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

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Comparing costs and benefits of power & heat from pellets

125.000 t Pellets p.a. 15 years	Pelletstoves	Powerplant
Number of users	50.000	1
Subsidy	650 $ per stove	feed in premium 7,8 cent/kWh
Total costs of subsidy	32,5 Million $	272 Million $
Savings consumer	292 Million $	0
Renewable energy delievered	9187 GWh	3491 GWh
Ex works price pellets	170 - 240 $/t	110 – 130 $/t

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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

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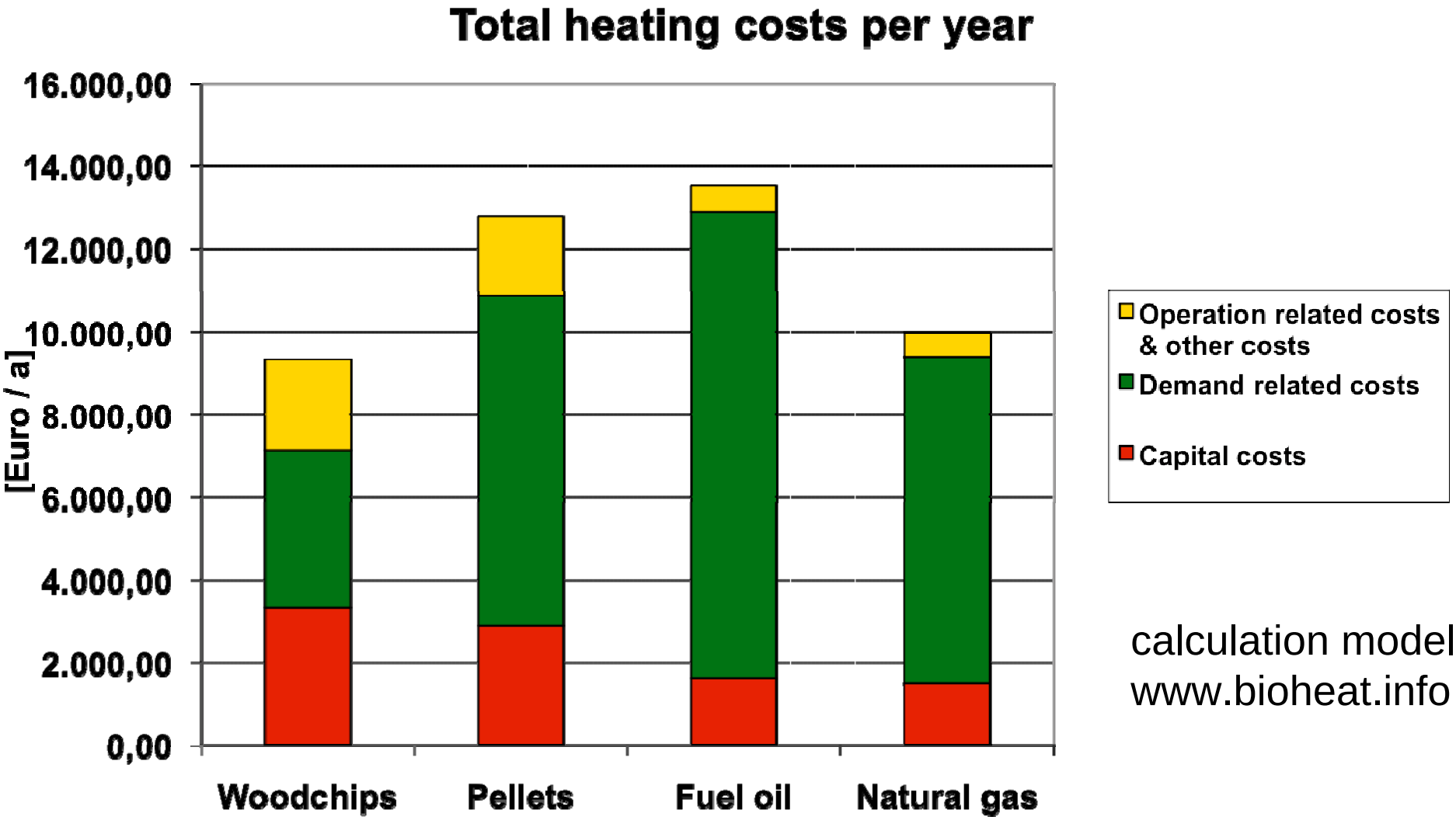
The result:



calculation model:
www.bioheat.info

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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

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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

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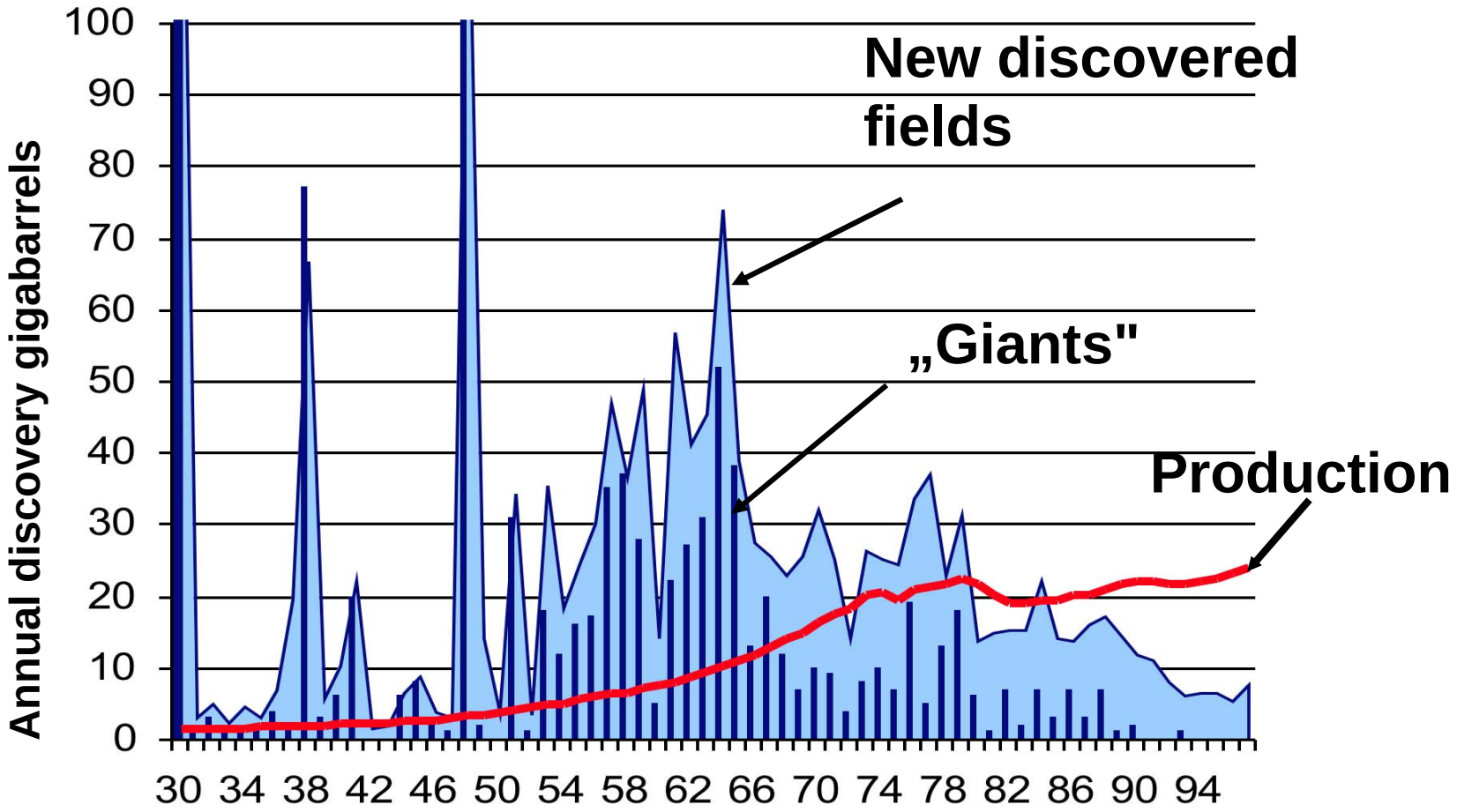
Discoveries of new oil fields have been declining since 1965



Quelle: The world oil Supply 1930-2050, Petroconsultants

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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 todays value of wood – it will change the economics of forestry completely

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Conclusions II

- The use of wood for energy cannot happen from one day to another because it requires continues education
  - Efficient fuel production & logistics
  - Technical implementation: proper planning, installation, operation & maintenance of systems
  - ***<u>Supportive policy framework</u>***
- **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)**

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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!**

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Thank you for your attention!
Questions?