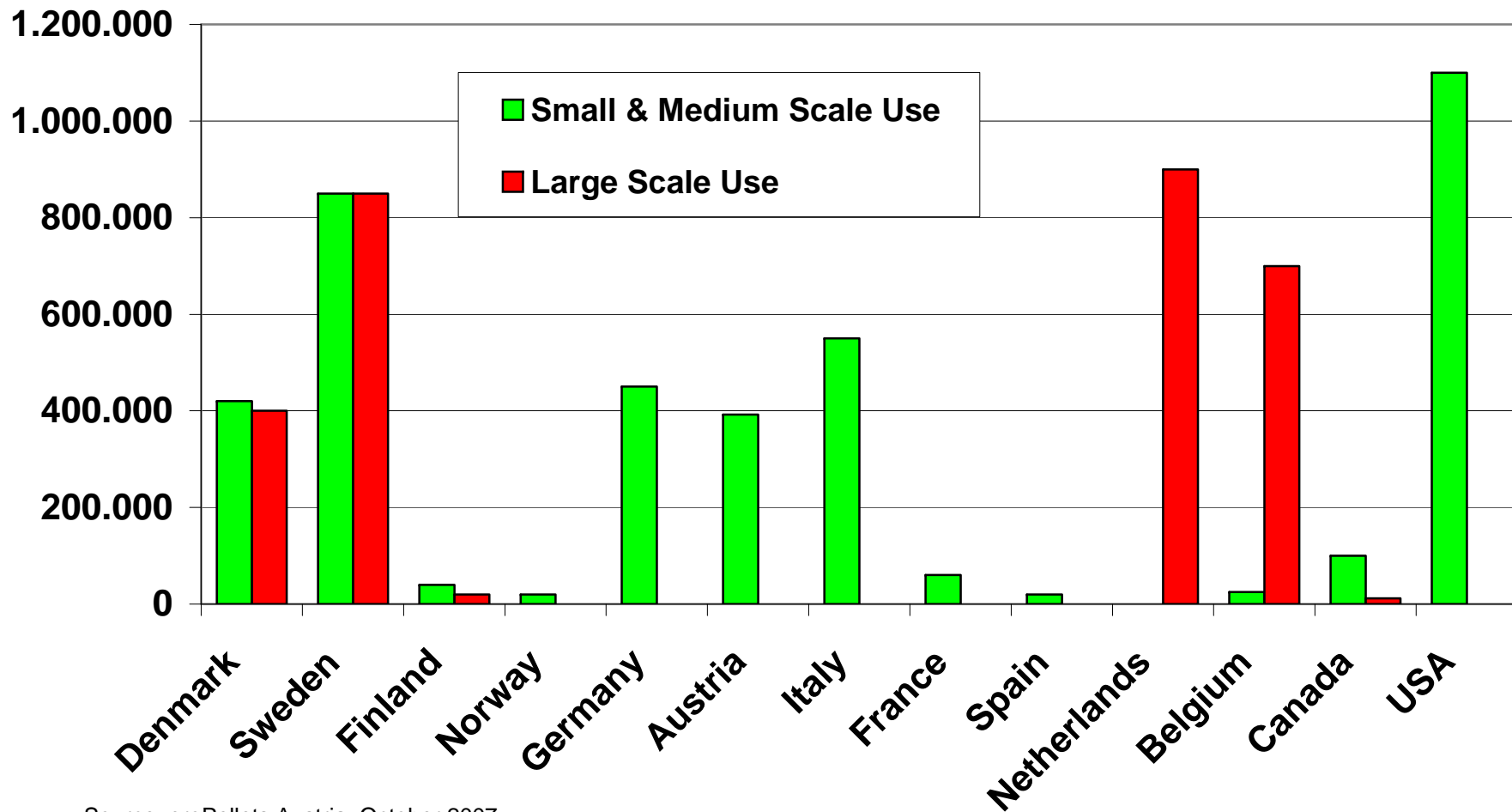


World markets for pellets

Karl Stadlober, Christian Rakos

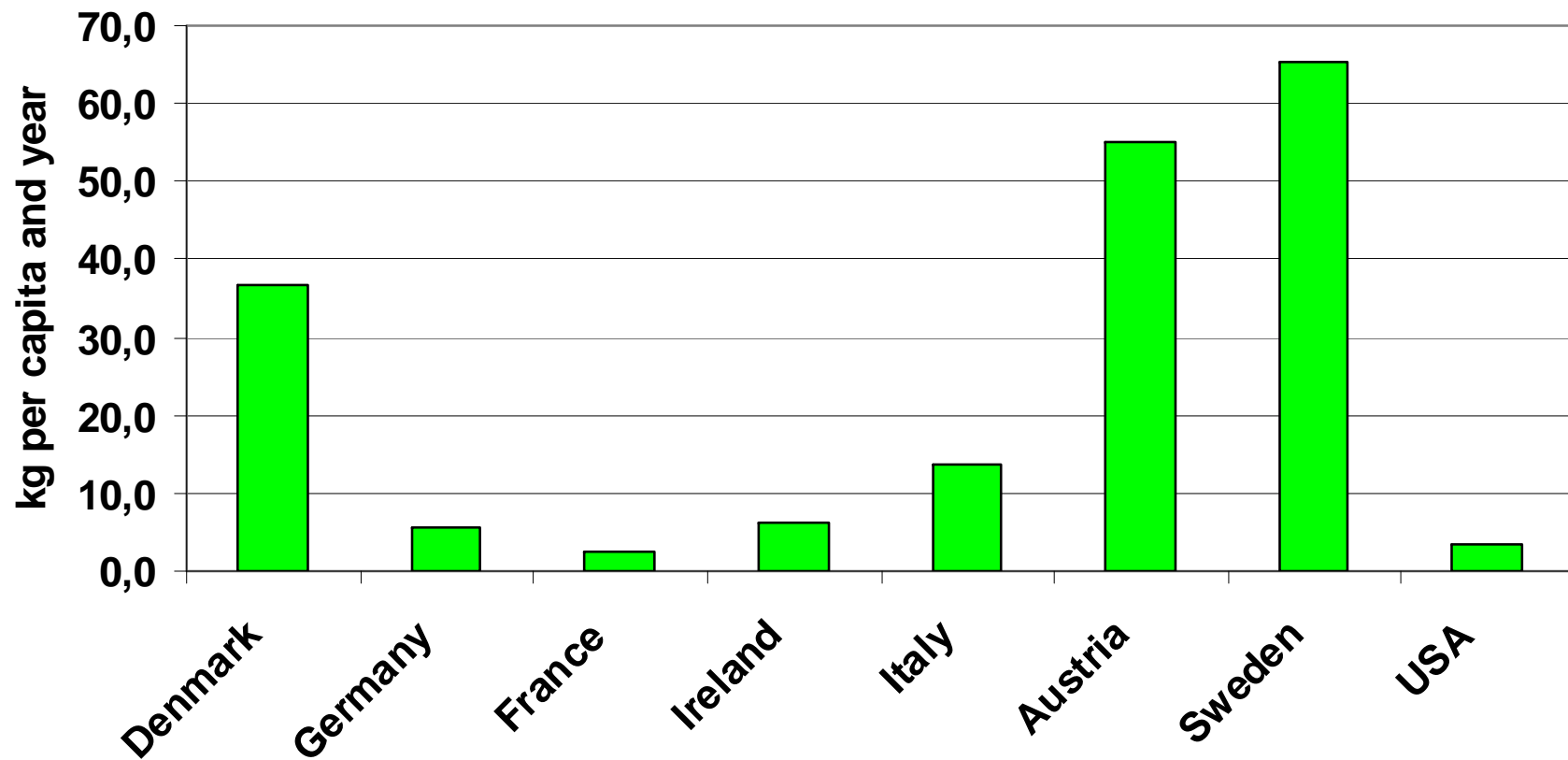
Global use of pellets for residential heating and in power plants – the most important markets at present



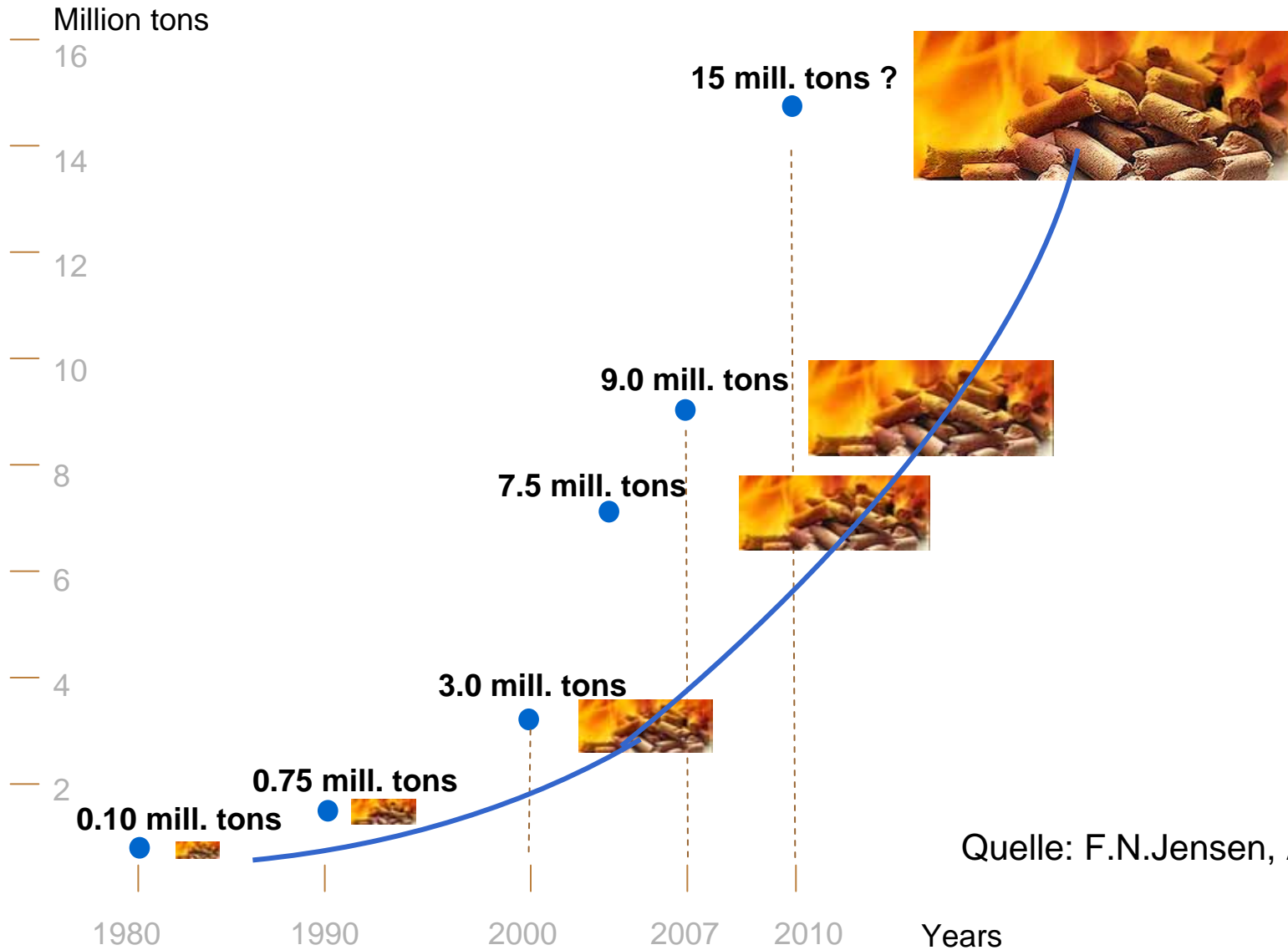
Source: proPellets Austria, October 2007

How intensively are pellets used for heating in different markets?

per capita use of pellets as fuel
for residential heating

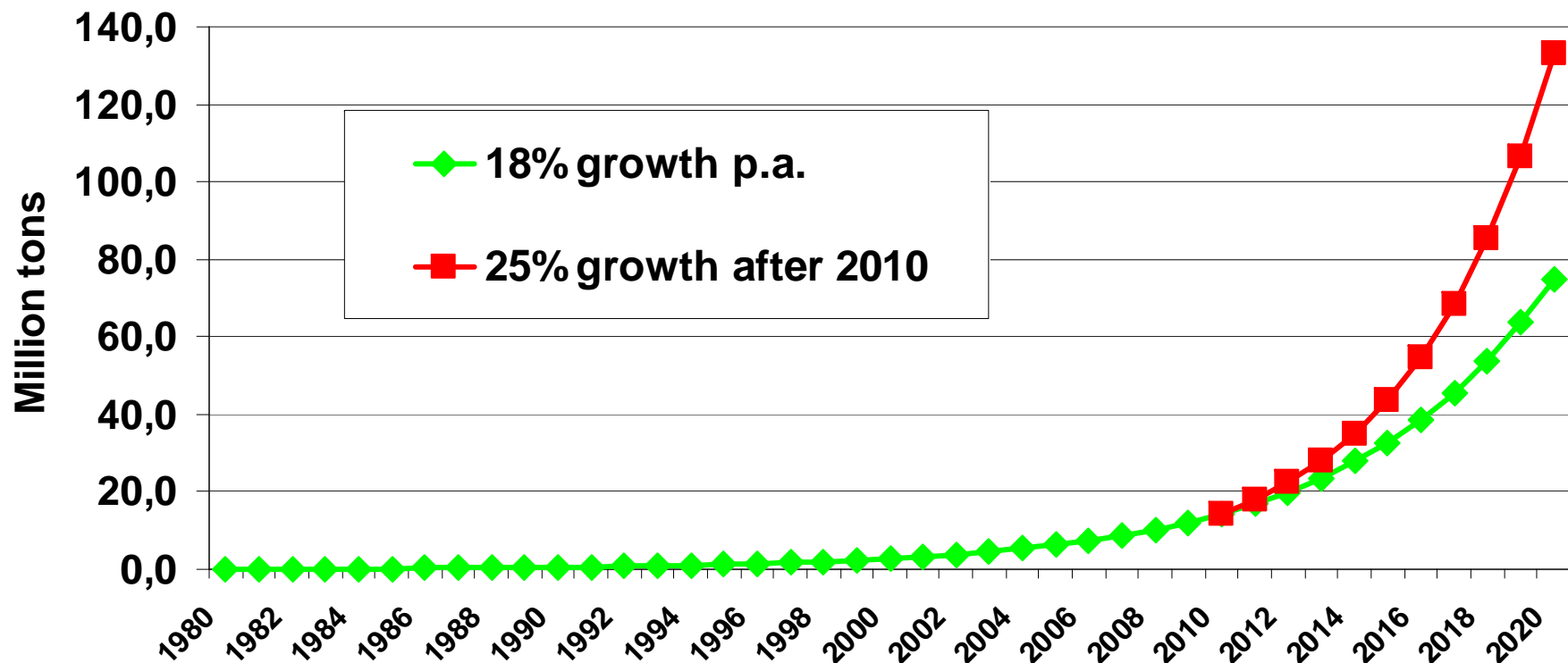


Growth of global pellet production: average 18% p.a.



How could the future look like for global pellet markets?

Szenarios for global pellet production



At present Europe is the centre of international pellet production

» Global pellet-production 2006: 8,3 Mio. t

» European production 2006: 6,3 Mio. Tons



What is the potential for pellet heating in Europe?

- » Current use of heating oil in the EU: 75 Mio t
- » This corresponds roughly to 150 Mio t of pellets
- » IEA sees serious shortages both in oil and natural gas supply ahead
- » All projections expect further rising oil prices
- » **THE DEMAND SIDE POTENTIAL IS VERY LARGE!**

Technologies that are currently
used for pellet heating in Europe

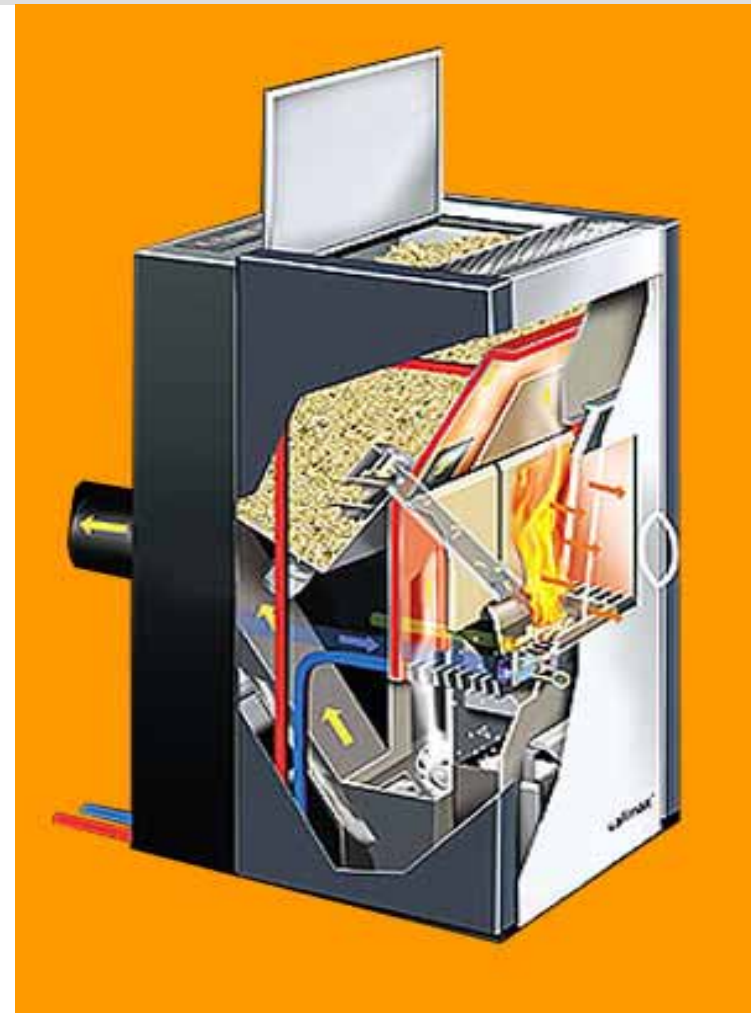
Pellet Stoves

- » filled with bagged pellets
- » Electric ignition
- » fully automatic operation, 90% efficient
- » Ash removal every 2 weeks
- » Costs > 2000€
- » Predominant markets: Italy, USA, countries with mild climate (Mediterranean, Atlantic coast)



Pellet stoves operating as central heating systems

- » Stove for central heating and hot water preparation
- » Power up to 12 kW / 40.000 BTU/h
- » Automatic pellet feeding from bulk storage possible
- » Costs approx. 5.000,- €



Pellet furnaces for domestic heating in single family houses

- » 30.000 – 300.000 BTU/h
- » automatic feeding, ignition and ash removal
- » > 90% efficiency
- » very low emissions
- » Investment: 10.000 – 25.000€
- » Markets: Austria, Germany, Denmark ...



**Pellet boilers work like oil boilers:
automatic fuel feeding from storage**



Pelletburners for replacing existing oil burners



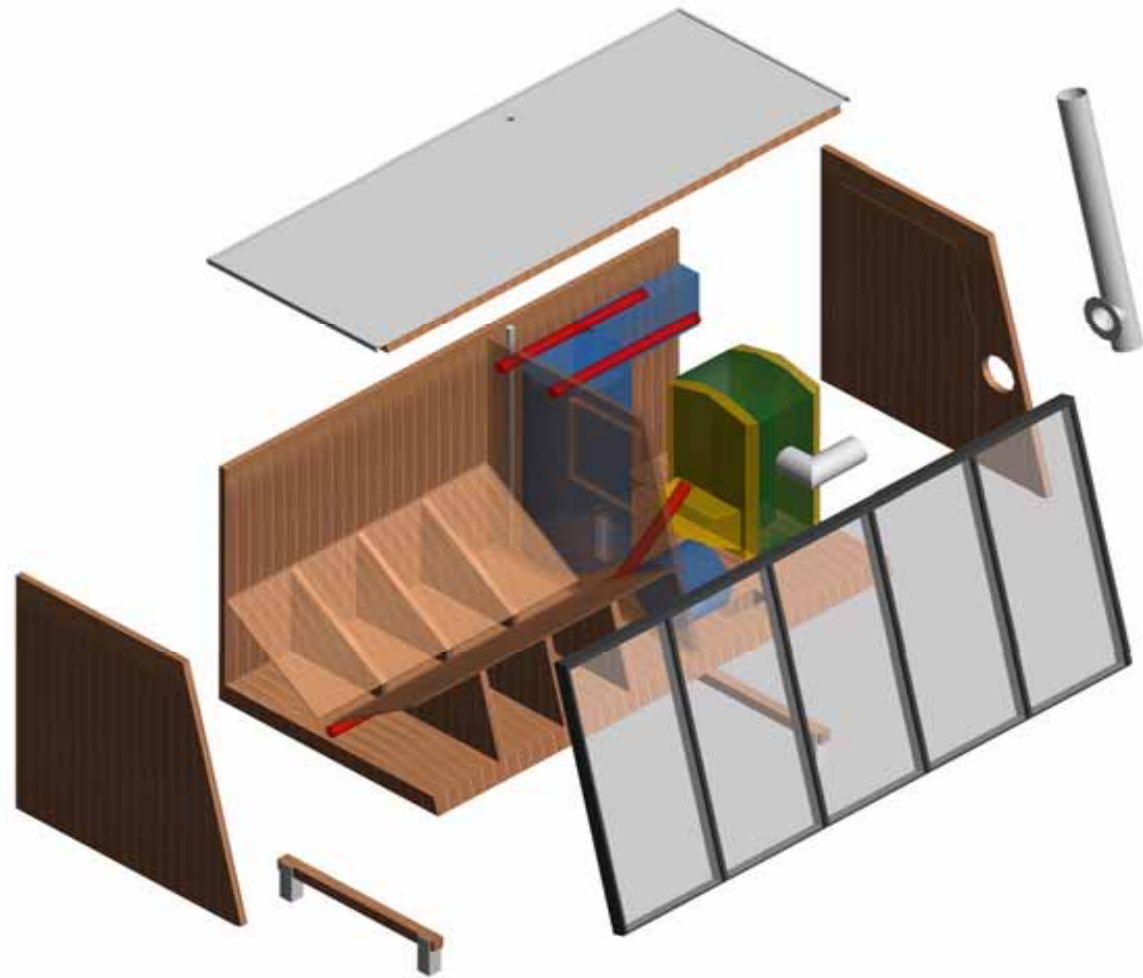
Advantage: low investment, existing boiler can be used approx. 3000 €

Disadvantage: high maintenance effort, lower efficiencies



Integrated renewable energy systems – a container with a pellet boiler plus storage, controls etc.

- » No need to modify existing buildings
- » Precommissioned
- » Load management with buffer tank
- » Remote monitoring and control via internet
- » Solar thermal combined with biomass
- » www.energycabin.com



The use of wood pellets as renewable energy source in Austria

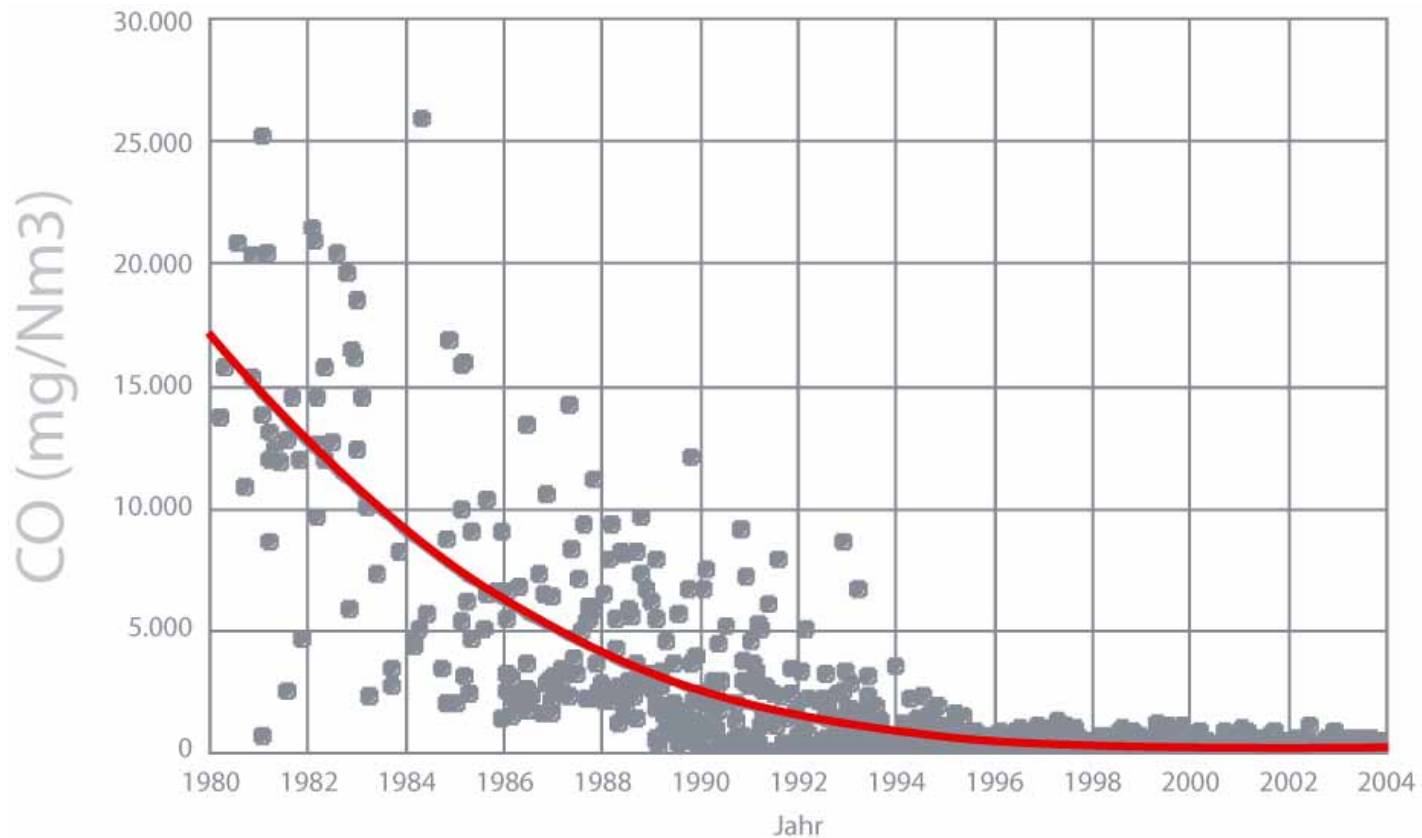
Austria is a leading country in residential use of pellets

- » Most advanced technologies for residential and commercial scale use
- » Market share of pellet boilers 2006: 12,5%
- » Large producer of pellets (approx. 1.000.000t)

Why is Austrian pellet furnace technology leading?

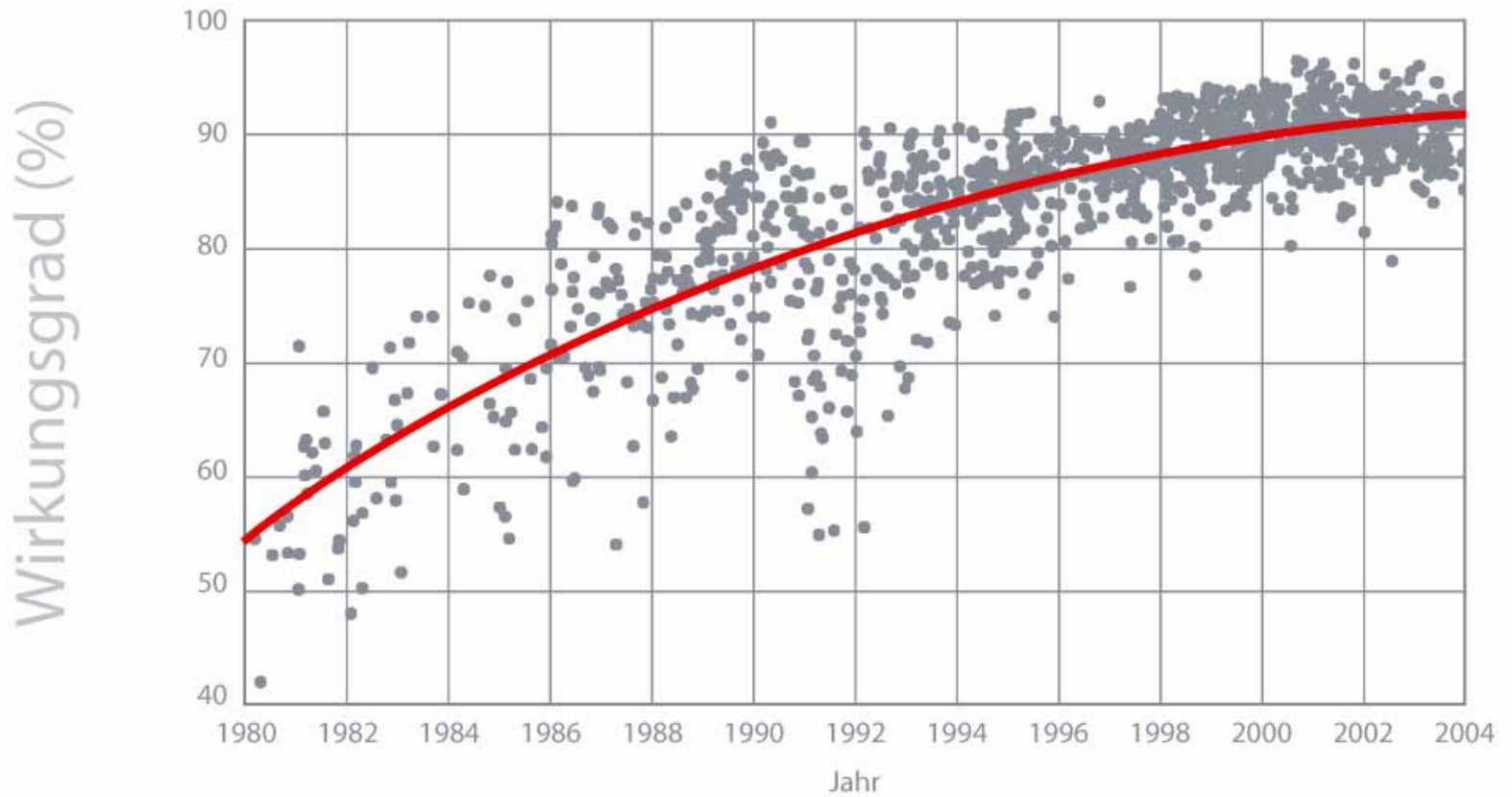
- » Austrian manufacturers have focussed on R&D in wood use for residential heating for 25 years
- » Why? High use of firewood caused significant air pollution problems
- » Strict emission regulations and requirement for certified testing of every new wood fired boiler introduced 1980
- » Heavy pressure on manufacturers to analyse & improve combustion process
- » Close cooperation of academic and industrial research & significant public funding of R&D

The result: emission reduction by a factor of 1000 !



Entwicklung der Emissionen von österreichischen Holzfeuerungen, gemessen an der Bundesanstalt für Landtechnik Wieselburg (BLT), 2005

Average efficiency of wood boilers increased from 50% in 1980 to 93% in 2004



Wirkungsgrad von österreichischen Holzfeuerungen gemessen an der Bundesanstalt für Landtechnik Wieselburg (BLT), 2005

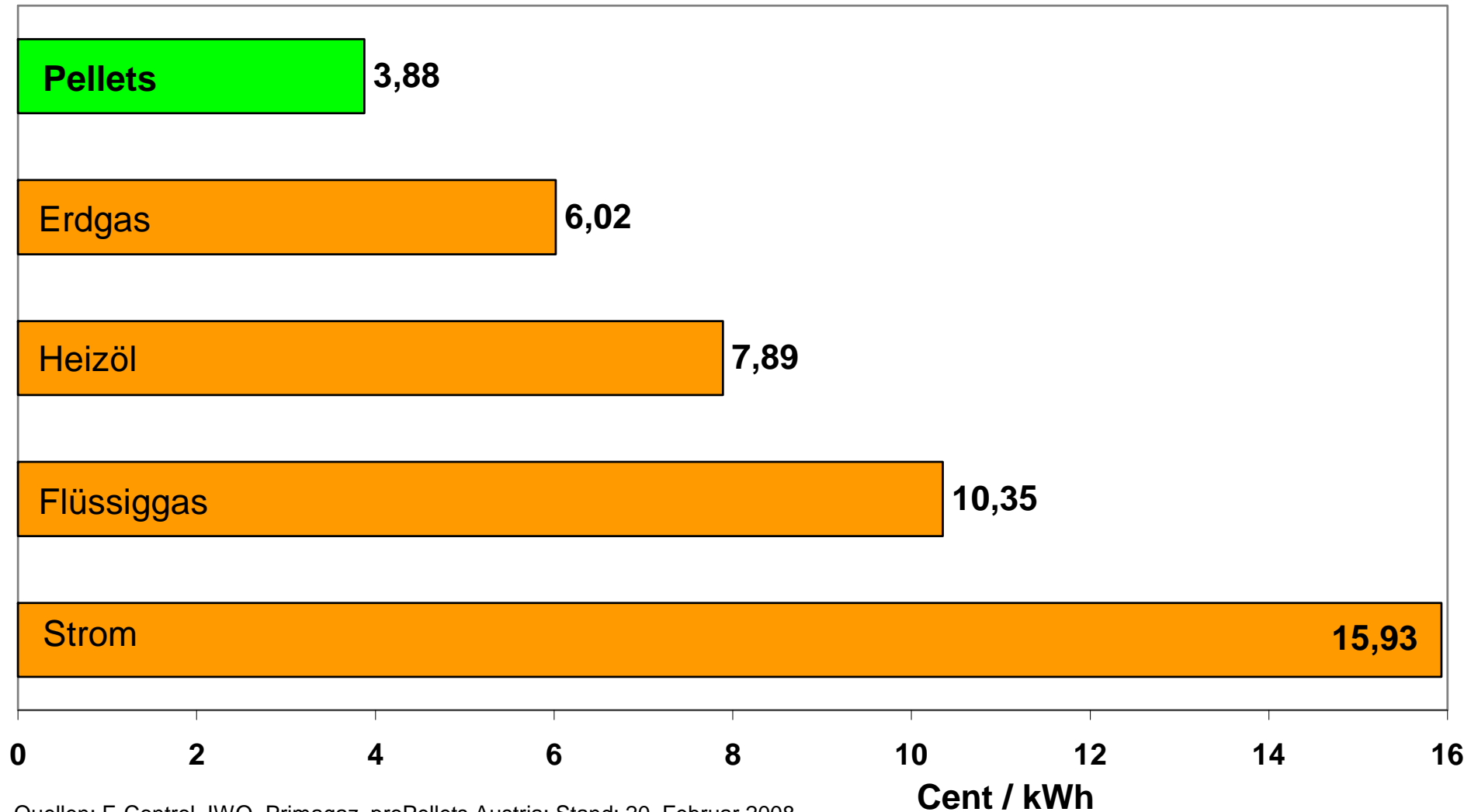
Which technologies were developed?

- »» Advanced logwood combustion
- »» Wood chip combustion
- »» Wood pellet boilers
- »» Wood chip and wood pellet boilers are available
**BOTH FOR RESIDENTIAL & COMMERCIAL
APPLICATIONS**

Why have pellet furnaces been so successful in the Austrian market ?

- » Committed support by policy makers! Investment subsidies, promotion, information campaigns etc.
- » Significant savings: in April 2008: 58% cheaper than fuel oil
- » High quality products
- » Friendly fuel: not dangerous, not polluting, nice smell, local production, no net greenhouse gas emissions
- » High flexibility: for any amount of heat needed, for any temperature level needed, different storage systems, can be adapted to any kind of building

Current prices of energy sources for heating in Austria



Quellen: E-Control, IWO, Primagaz, proPellets Austria; Stand: 20. Februar 2008

Wood Pellets



Energy	4,9 kwh/kg
Density	1,2 kg/lt
Moisture	< 10 %
Lenght	30 mm
Diameter	6 mm
Ash	< 0,5 %
Softwood	no recycling no bark

1 metric ton = 1,5 m³

Austrian Standards



ÖNORM M 7135
Pellets Quality



ÖNORM M 7136
Logistic

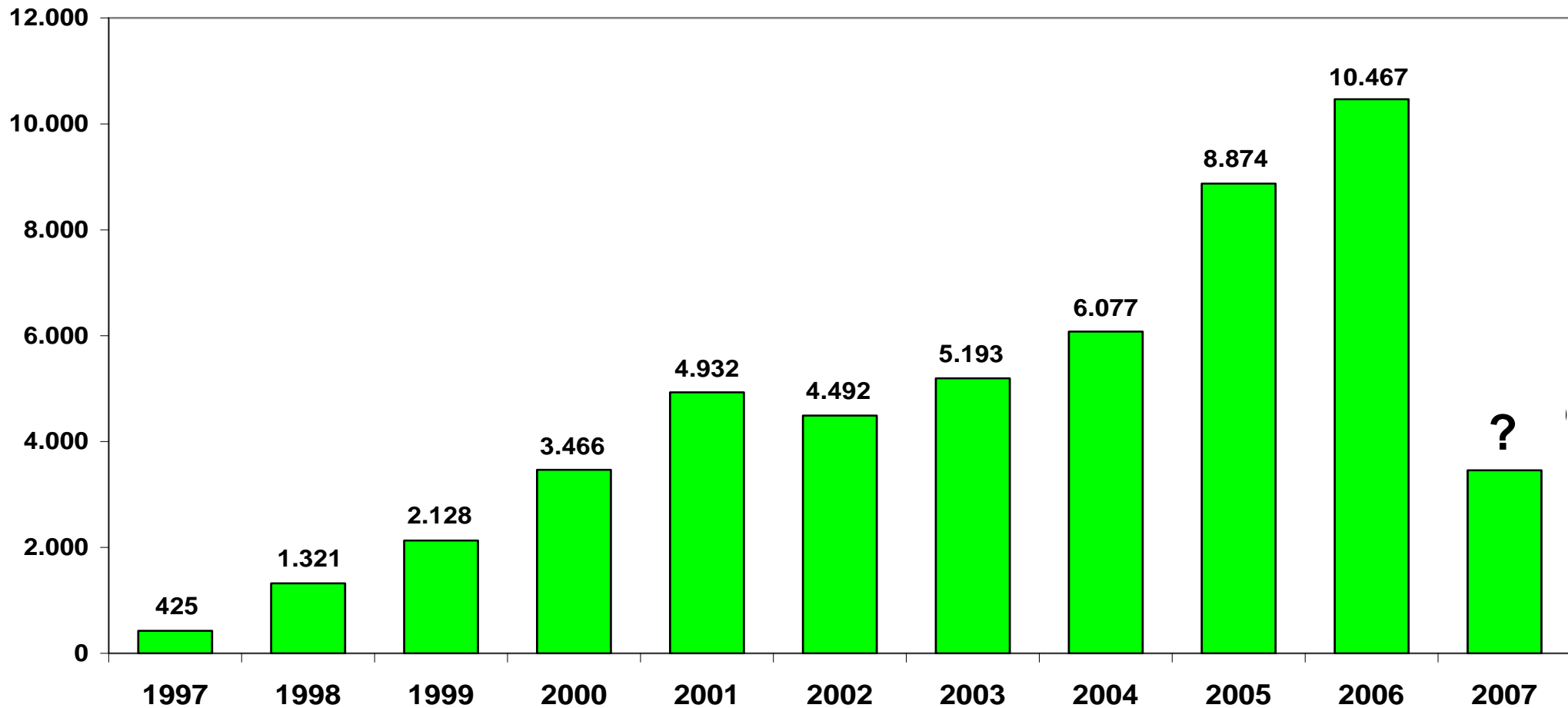


ÖNORM M 7137
Storage

The significance of this development

- » Pellet boiler sales exceeded oil boiler sales in Austria 2005
- » Wood heating systems have a market share of 25% in Austrian heating equipment market
- » Austrian boiler manufacturers have expanded sales into several other EU markets and have a global market share of approx. 80%
- » Key EU heating equipment manufacturers have introduced pellet boilers in close cooperation with Austrian Industries & R&D centres

Annually installed pellet boilers in Austria

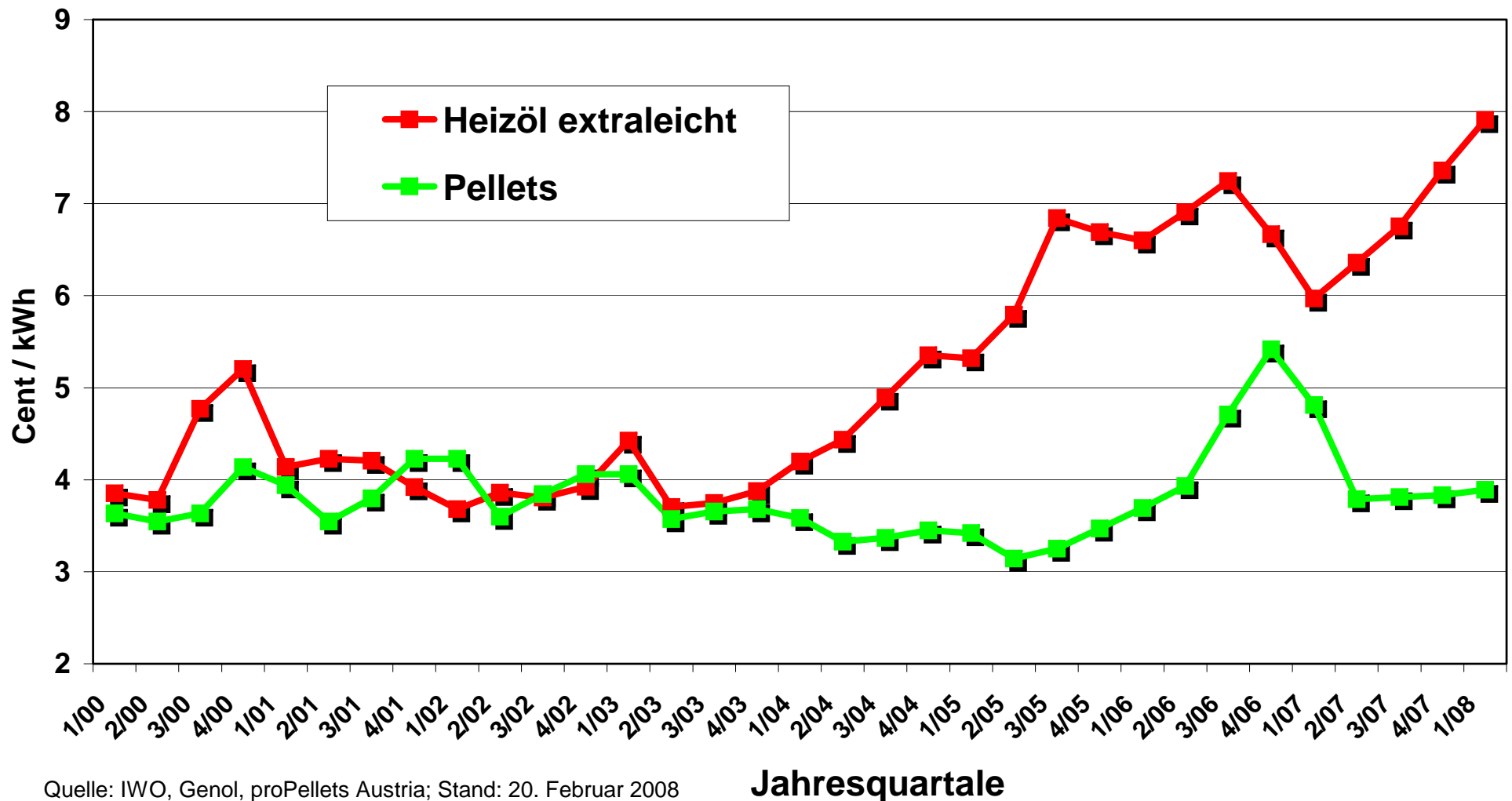


Quelle: proPellets Austria, November 2007

Why did the sales of pellet boilers drop in 2007?

- » Sudden price increase of pellets in 2006
- » This price increase took place all over Europe
- » The effect was that all residential markets declined in 2007
- » 2008: growth is resuming!

Pellet and heating oil prices (cent / kWh) in Austria



Quelle: IWO, Genol, proPellets Austria; Stand: 20. Februar 2008

Bulk delivery of pellets –
a key for successful market development

Bulk delivery with trucks – how does it work?



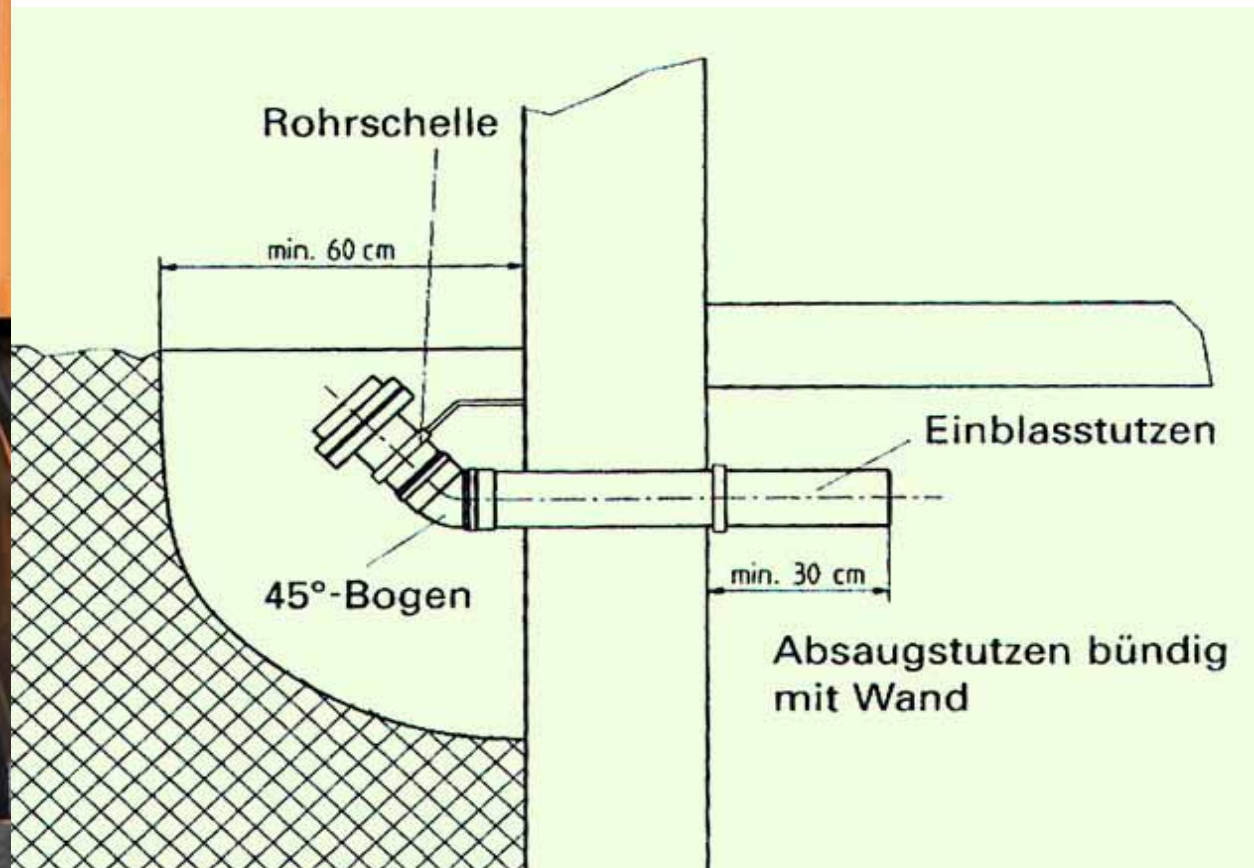


www.stadlober.at

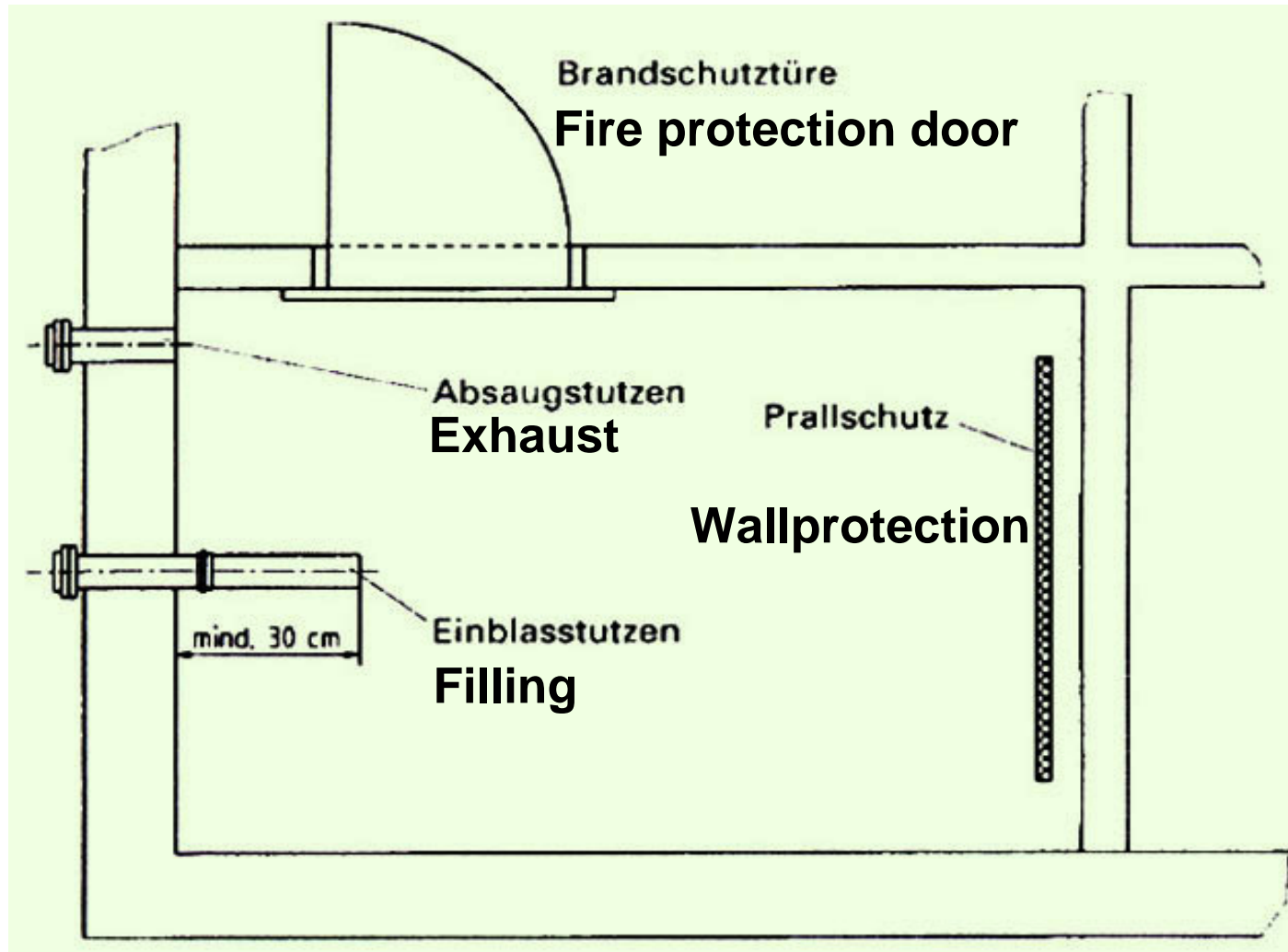
Minimum Outfit for Bulk Delivery

- **Compressor**
 - low pressure, exact adjustable airflow
- **Vacuum Blower**
 - with dust filtration
 - min. flow rate higher than max. flow rate of compressor
- **Hoses and Truck must be electrical grounded**
- **Onboard weighbridge**

Filling system



Storageroom



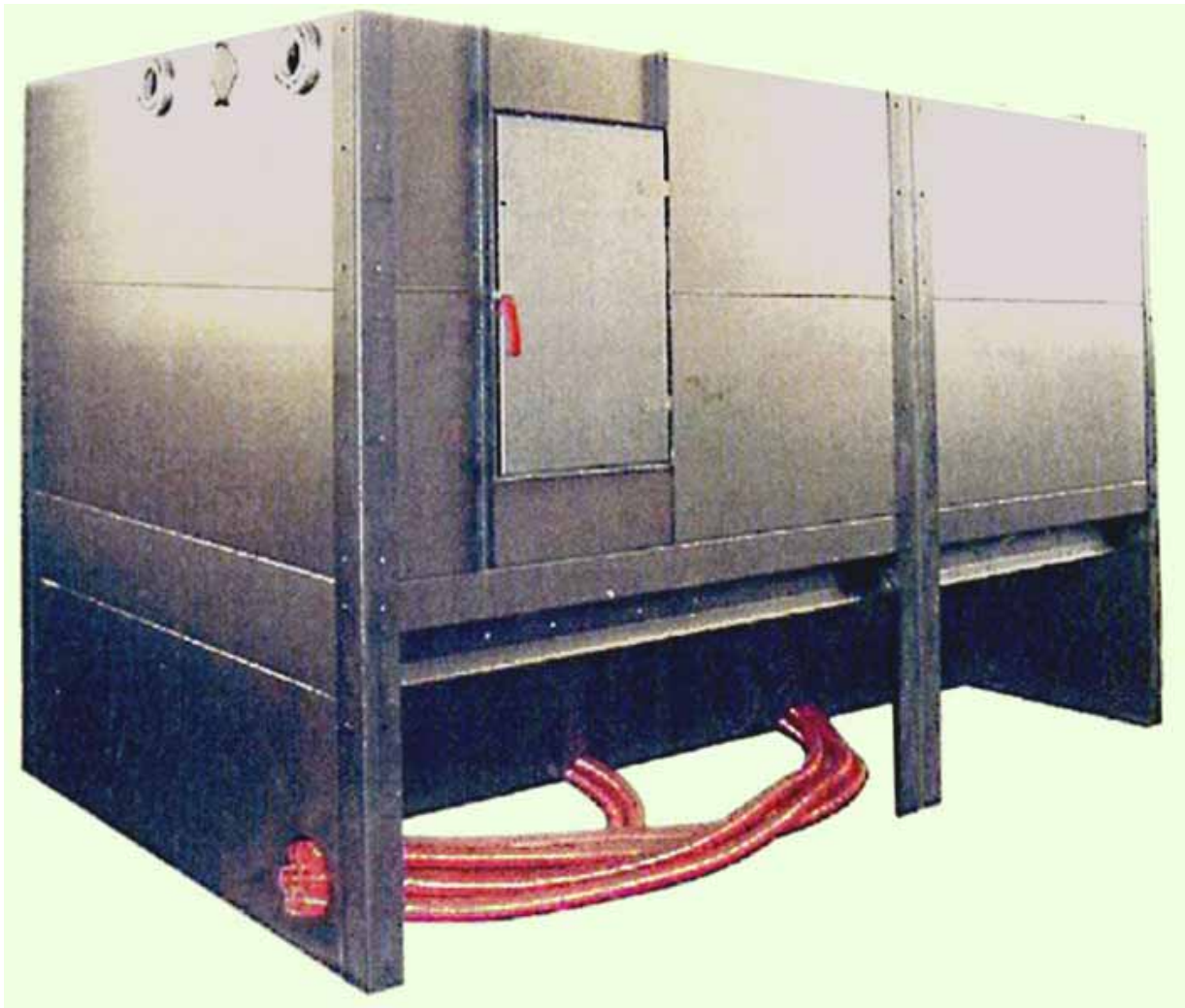
pro»pellets Austria



www.stadlober.at



Steel Storage tank



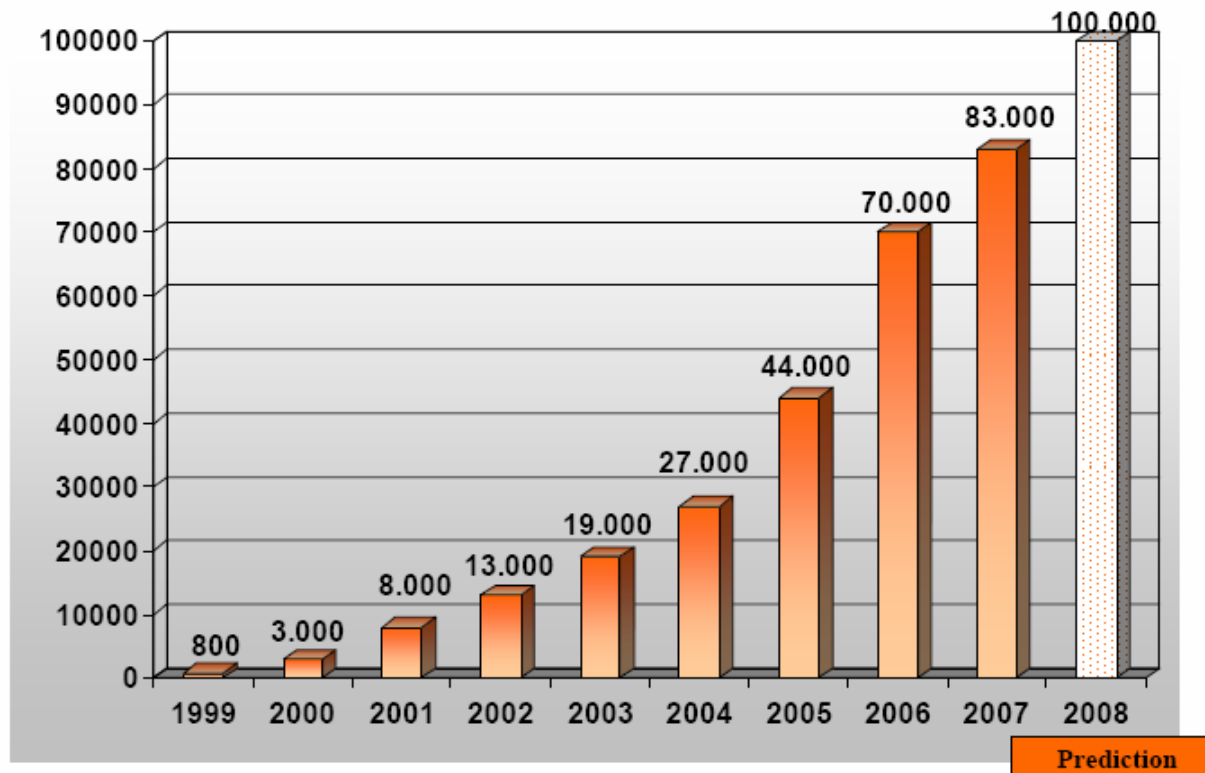
Advantages of bulk delivery

- » Lower costs
- » More convenient for the customer
- » Precondition for use in commercial applications
- »

Recent developments in EU pellet markets

Germany: the largest market for residential pellet furnaces

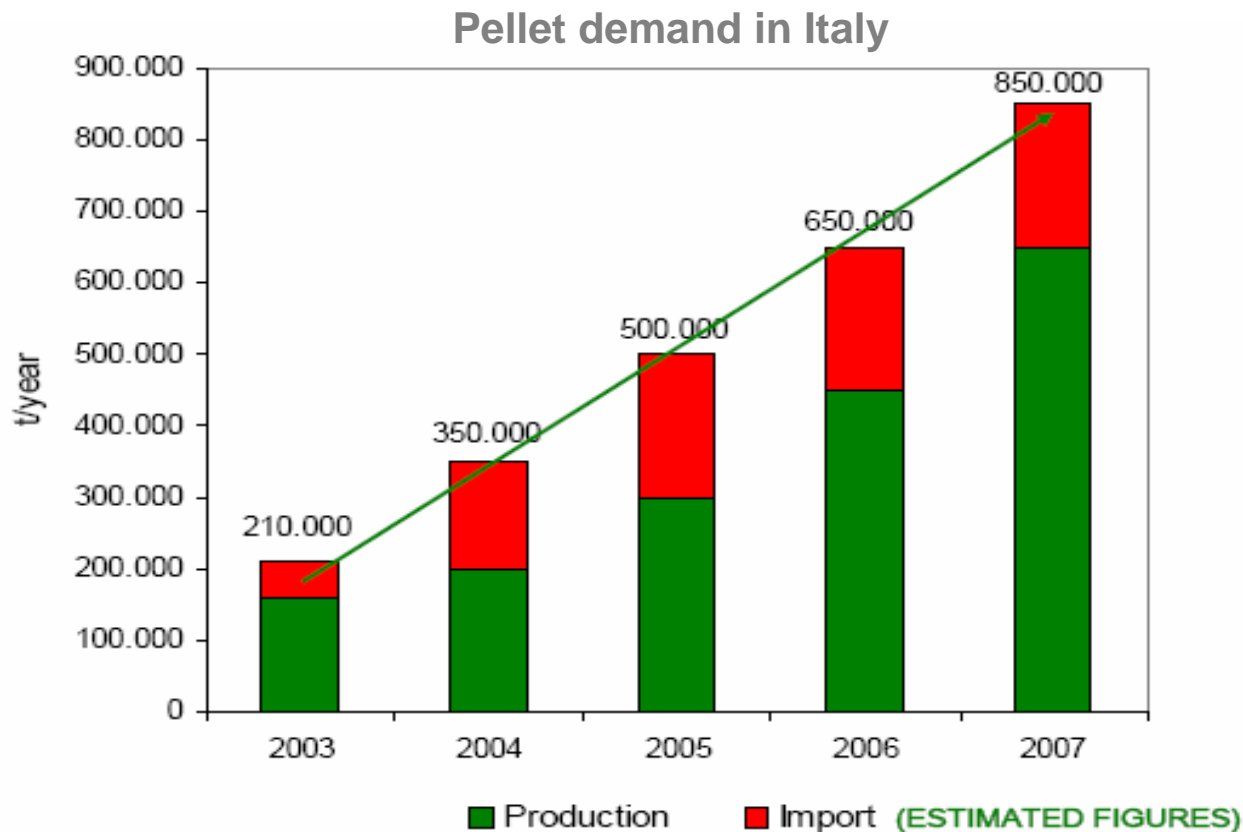
Total stock of pellet heating systems in Germany



Political incentives in Germany

- »» Law for renewable heat will be passed
- »» Increases investment subsidies for renewable heating devices to 500Mio €/year
- »» Legal obligation for all new buildings to supply 15% of energy demand with renewable energy

Italy: the largest market for pellet stoves worldwide



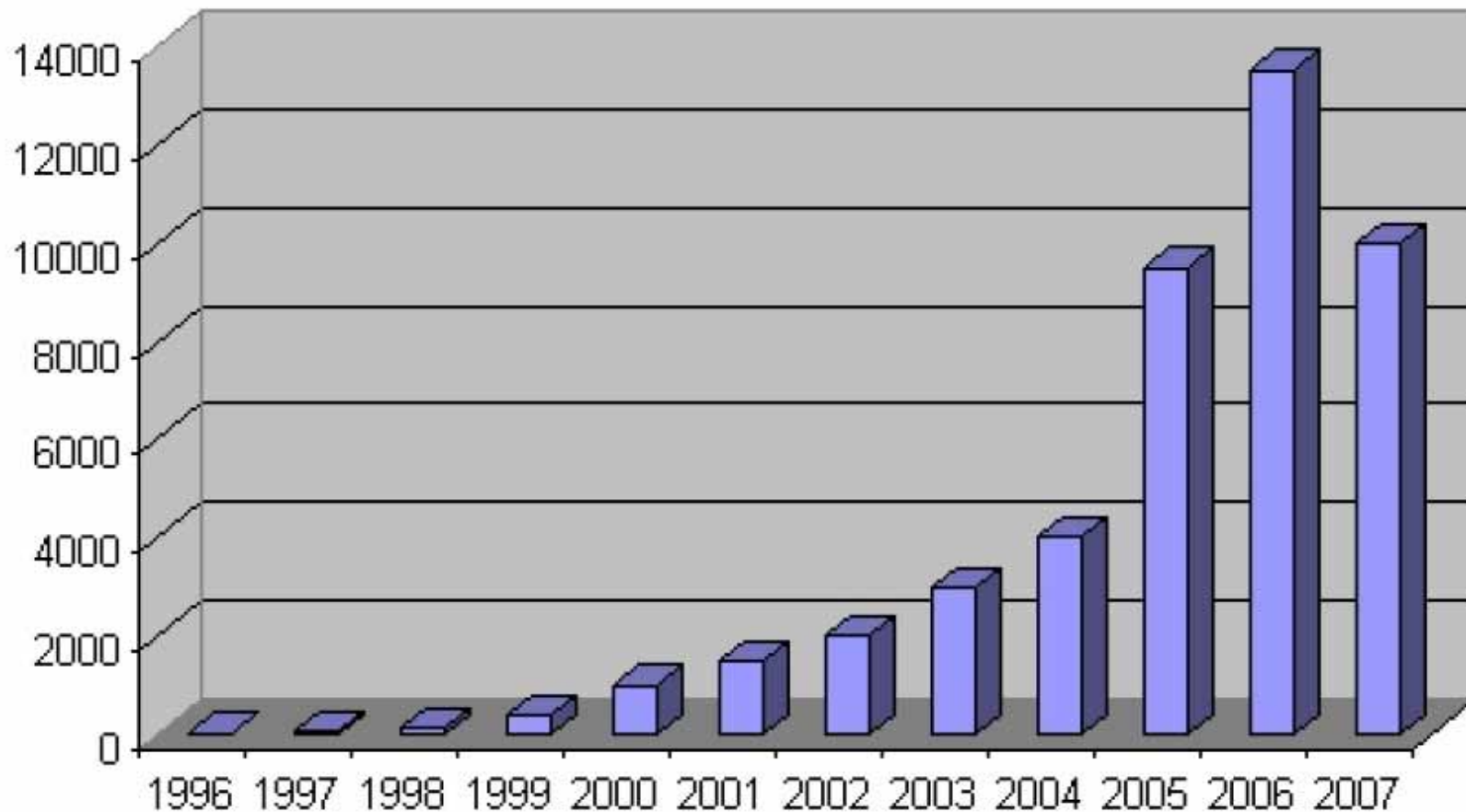
2003 - 2007
INCREASE OVER
300%

Pellet Producers
Rise from 37 to 87
(+ 135%)
heterogeneous for
production and size

Pellet stove sales 2006: 270.000 units !

Development of the French pellet market

Estimation of the sales of pellet stoves in France, ITEBE



Belgium: use of pellets primarily in power plants

Electricity

2 power plants in Belgium : electricity from pellets (*)

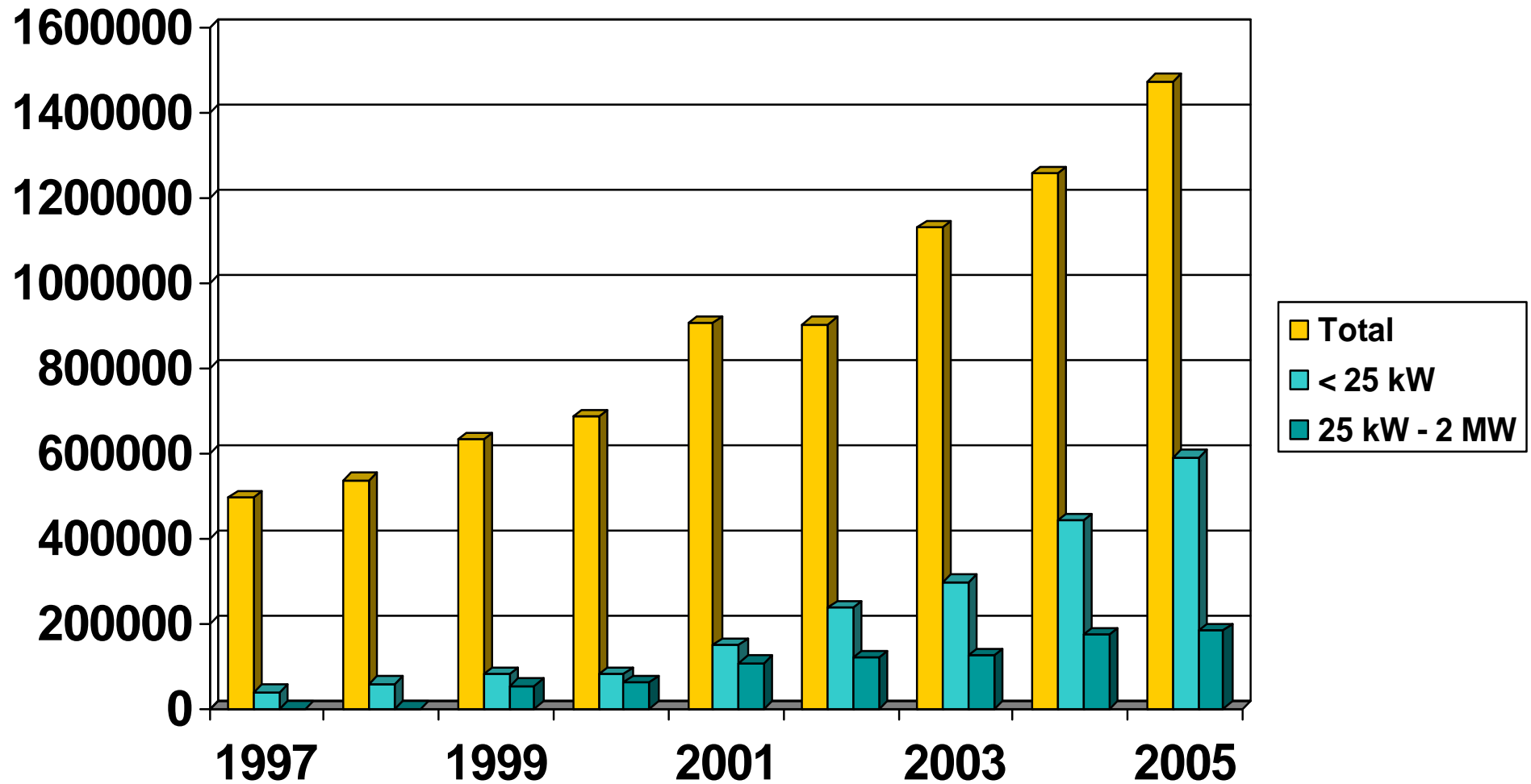
- Les Awirs (80 MWe, 100% pellets) [400 000 tons pellets / year]
- Rodenhuize (68 MWe, 25% pellets, cofiring with hardcoal) [300 000 tons]



(*)The Belgian authorities require a certification for the origin of the imported wood fuel delivered to the power plants from all parts of the world.

Photo : Electrabel

Pellet sales in Sweden (t) to large scale and small scale markets



Conclusions

- » Pellets are well on their way to become a mainstream fuel
- » Markets are growing worldwide – but the focus of development is Europe
- » Dedicated policies have made a few European countries to leaders in the global pellet market development
- » Canada is in a very good position to become an important player in the international pellet market
- » It has very significant opportunities of using pellets as indigenous fuel
- » European businesses are happy to cooperate with you!

www.ebes.at

EBES AG

The staff of EBES has a long term experience in the sector of energy from biomass and in trading biomass fuels.

EBES guarantees professional and reliable performance and provide tailor-made solutions for your specific situation.

You can get detailed information about the european pellet market from <http://www.ebes.at>