



**WORLD BIOENERGY
ASSOCIATION**

Member of the REN-Alliance



Global Bioenergy Market Developments

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World Bioenergy Association

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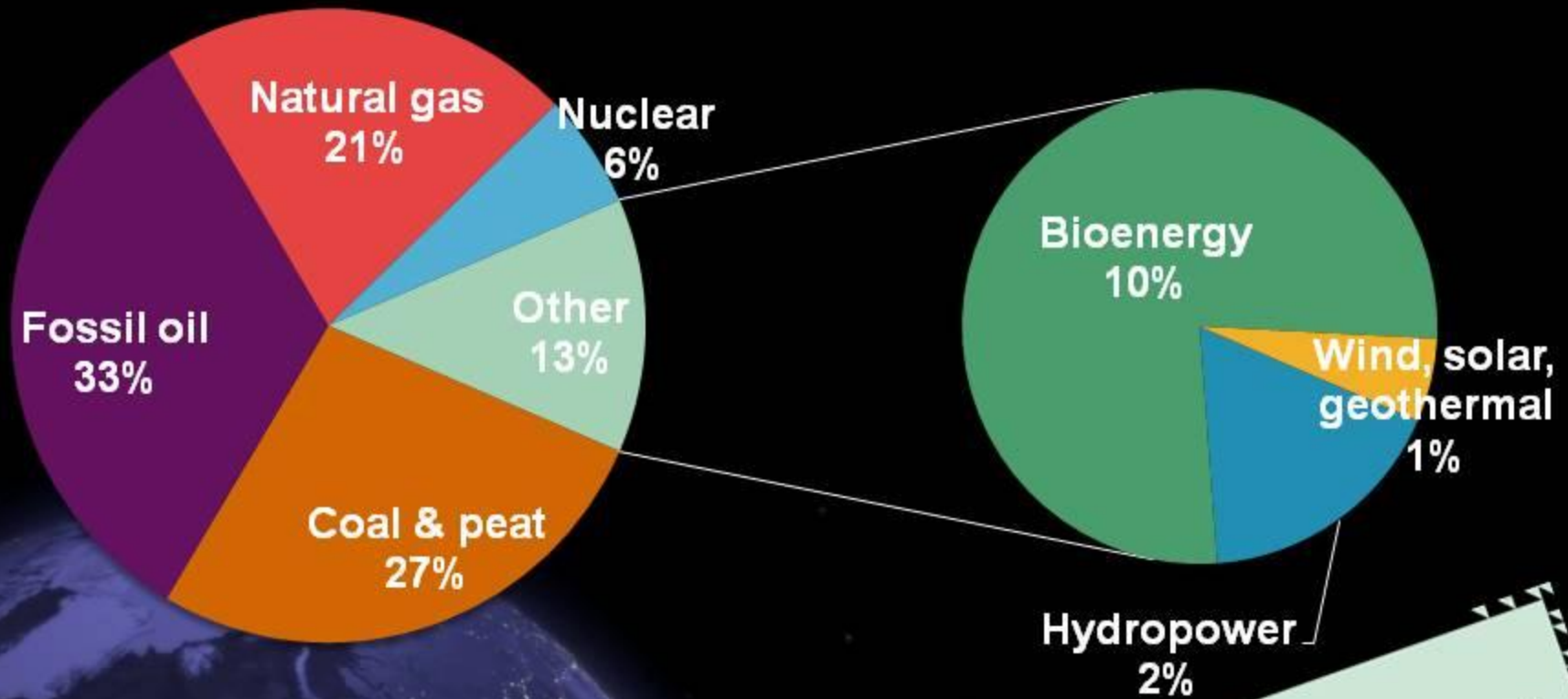
Japan Renewable Energy Foundation - Revision 2012



The importance of biomass

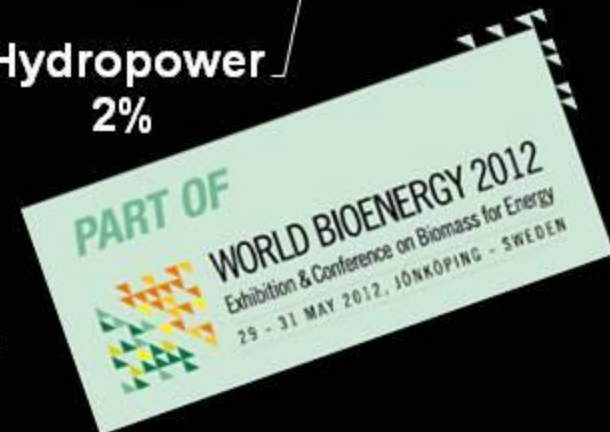
- Biomass is organic matter derived from plants.
- It's contribution to the global energy system: 1238 Mtoe (= 51,83 EJ) that is 75% of all Renewable sources. Biomass delivers heat, electricity and transportation fuels, it is stored solar energy.
- Where does the biomass come from?
 - From forests and the wood industries: wood, chips, pellets, bark, black liquor, saw dust and other by-products
 - From agriculture: crops for biofuels, straw, various byproducts
 - From waste streams

World total primary energy supply 2008



Based on: International Energy Agency, Key World Energy Statistics

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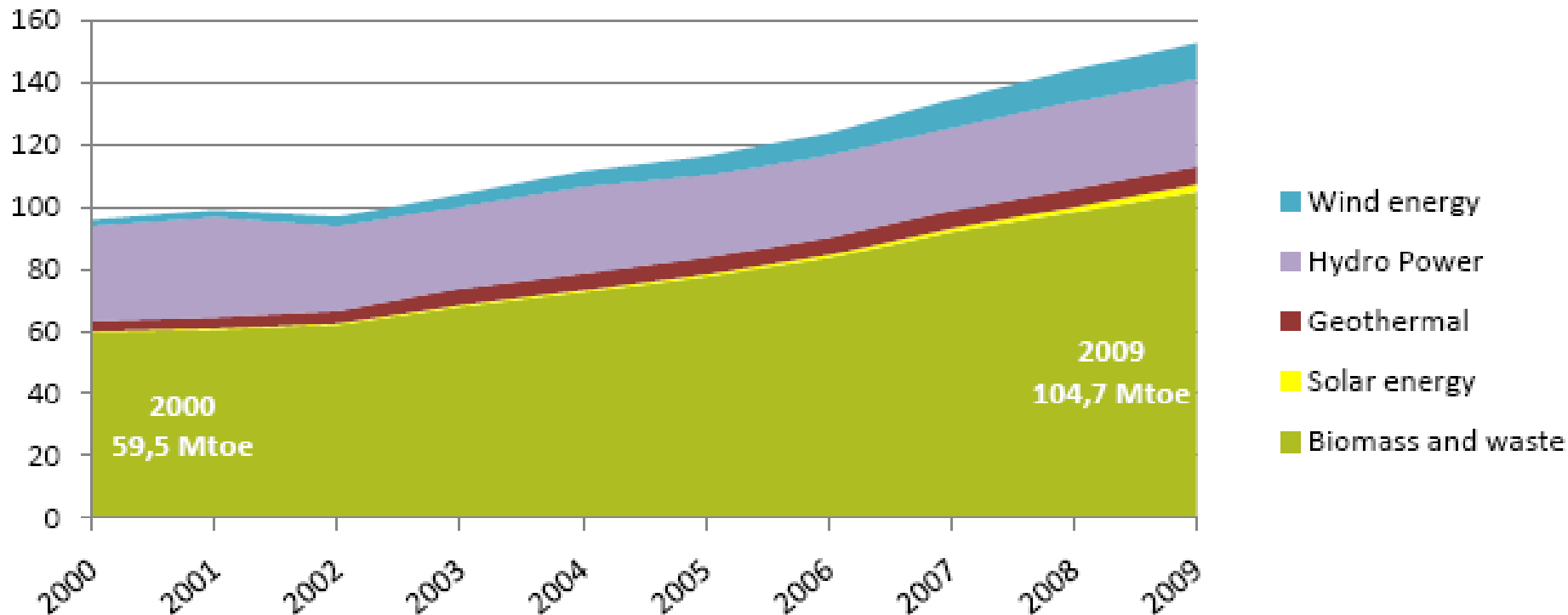




Biomass – a fast growing renewable energy carrier!

The growth of bioenergy in the EU 27 in Mtoe

45,2 Mtoe or 75% within 9 years

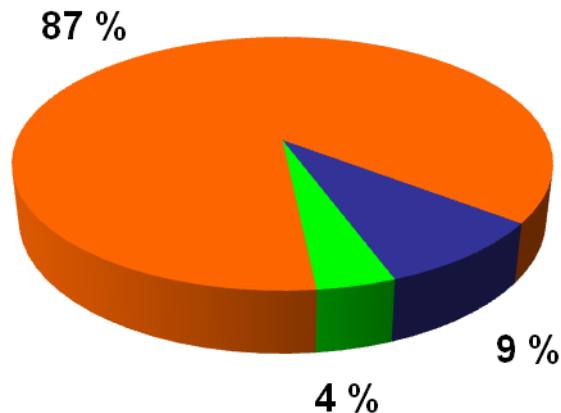


How and what for is biomass used?

- Biomass goes either to conversion plants (power-, heat plants) or direct to final use (heat, cooking).

	world	OECD	Non OECD
Primary biomass	1238	242	996
To conversion	158	75	83
To direct use	1080	167	913

In 2009:

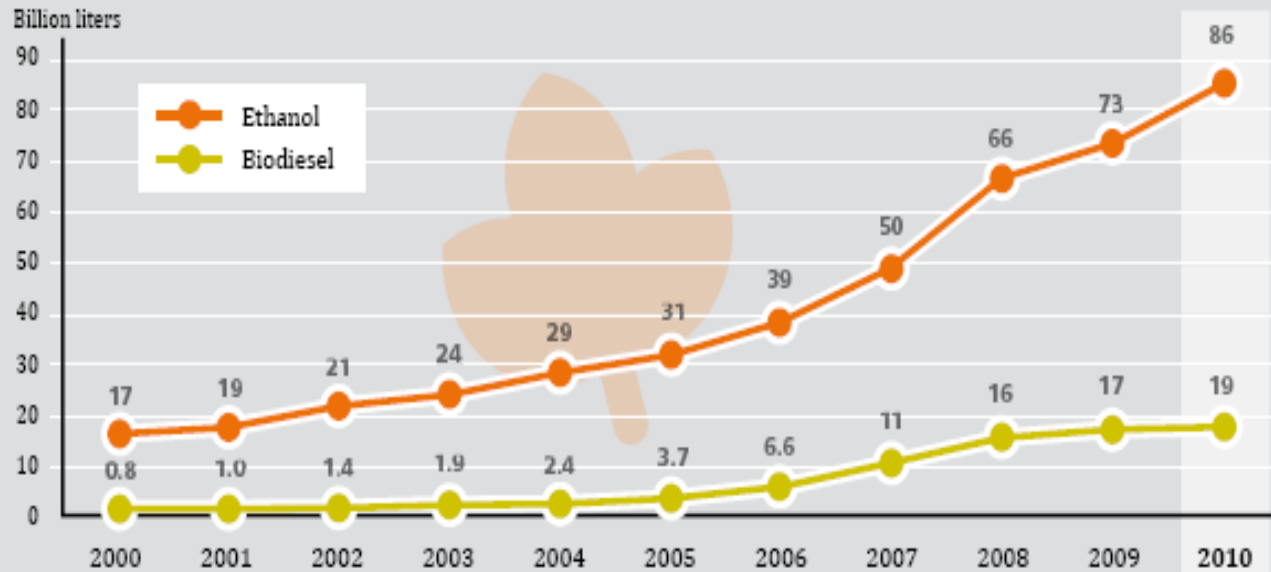


- Biomass to Heat (1080 Mtoe)
- Biomass to Electricity (106 Mtoe)
- Biomass to Fuels (52 Mtoe)



Global Biofuel production
2006: 25 Mtoe; 2008 46 Mtoe, 2010 59 Mtoe

Figure 11. Ethanol and Biodiesel Production, 2000–2010



Source:
F.O. Licht

**Ethanol; 2/3 corn based more than 100Mt,
1/3 sugar based! Biodiesel 50% rape oil.**



Electricity from biomass

- **The raw material: solid biomass (wood chips, bark, straw, bagsdse, pellets) and biogas (from waste, manure, energy crops)**
- 2010: installed capacity: 62 GW, production:372 TWh 1,9% of global production)
- Technology: steam process, ORC, gasification
- Type of plants: CHP (combined heat and power plants), electricity alone plants (efficiency ca 28%), co-firing to coal power plants.
- Trend to big plants not using the heat based partly on pellets,
- Biogas plants smaller in the size between 150kW to 3 MW.
Government policy is important, support by feed in tariffs or green certificates!



**Biomass resources for electricity production in Europe:
almost 40% of bio-electricity (41,4 TWh) comes from biogas and waste**

Table 6.1 Electricity production (TWh) by biomass in 2009 in EU27

	Electricity production (TWh) by biomass
Biomass	109,0
Solid biomass share	63,3
Biogas share	25,5
Liquid biomass share	4,2
Municipal waste share	15,9

Source: Observ'ER, "Renewable origin electricity production", Edition 2010

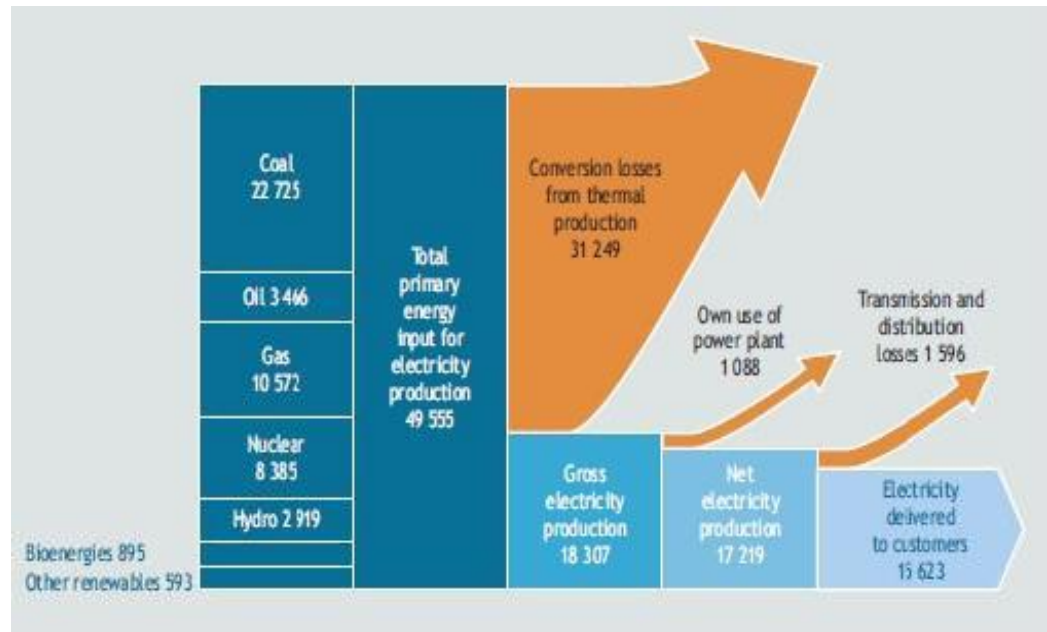


global losses of electricity production due to many electricity alone plants – fossil and also biomass plants!

In TWh, source: InternationalEnergy Agency

Global electricity production:

Primary energy: 4261 Mtoe
 Losses conversion: 2686 Mtoe (63%)
 Losses transmission: 232 Mtoe (5%)
Total losses: 2918 Mtoe
 Electricity received
 By the consumer **1343 Mtoe**
 (32% of input) **(15.623 TWh)**

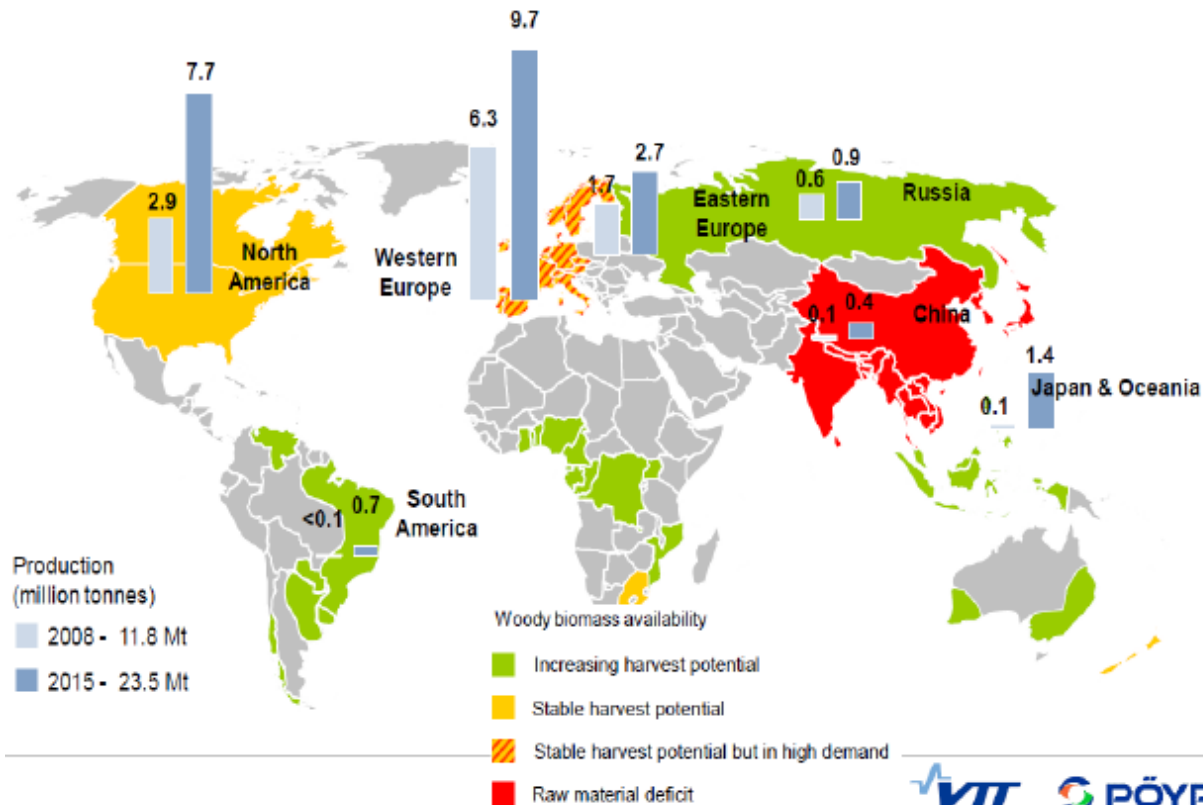




Heat from biomass

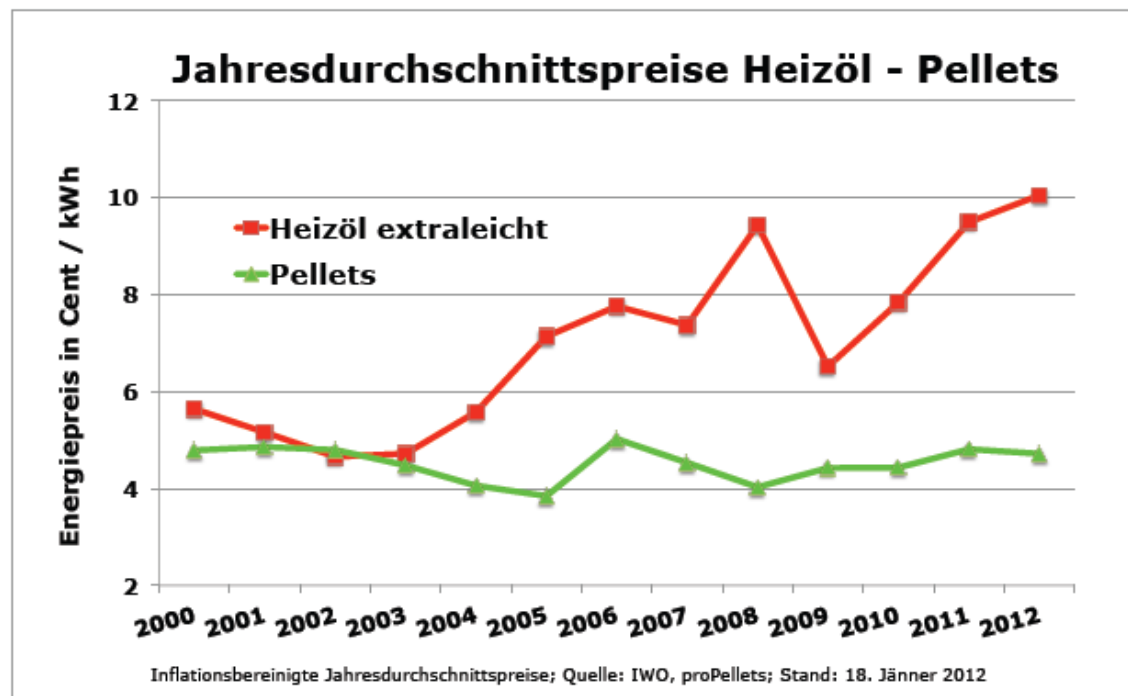
- Traditional biomass heat sector: 90% (972 Mtoe)
- Modern sector 10% (108 Mtoe) growing rapidly based on chips, pellets, by-products (straw, bagasse, etc) in the residential sector, industry and heating plants.
- Main driver: competitiveness. Heat from biomass is 50% cheaper than using heating oil.
- Impressive dynamic of the pellets sector. global capacity 2011 is 30 Mton pellets (12,2 Mtoe, 1% of total biomass) mainly in Europe incl. Russia, North America, China, Korea.

Global pellets production and woody biomass availability



Comparison of prices for heating oil and pellets in Euro ct/kWh

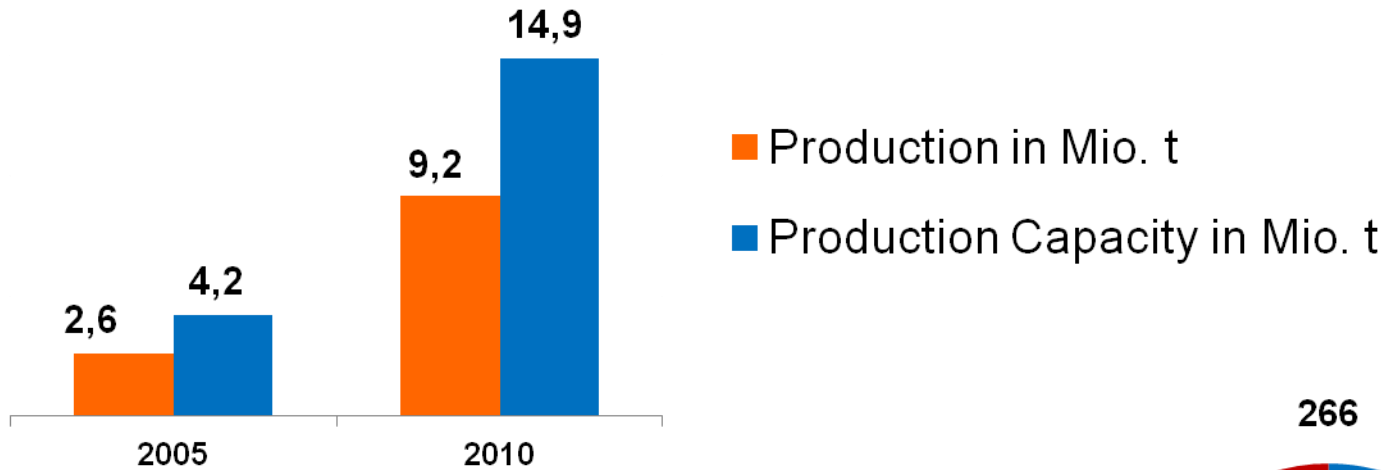
at present: heating with pellets is 50% cheaper than with heating oil.





Pellets – a dynamic biomass market in Europe

- Pellets are becoming the heating oil of the 21th century

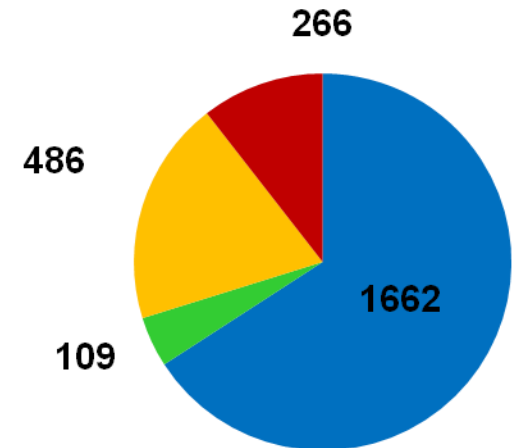


Imports (kt) to the EU 27 in 2010: 2523 kt

Usage in EU 27

- 1/3 small scale heat
- 2/3 power plants

- North America
- AU, NZ, S, Africa
- Russia
- other European countries





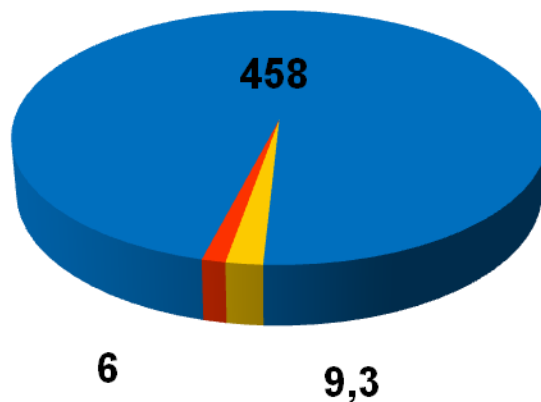
A case study: bioenergy in Japan, Germany and Austria

based on IEA statistics 2009

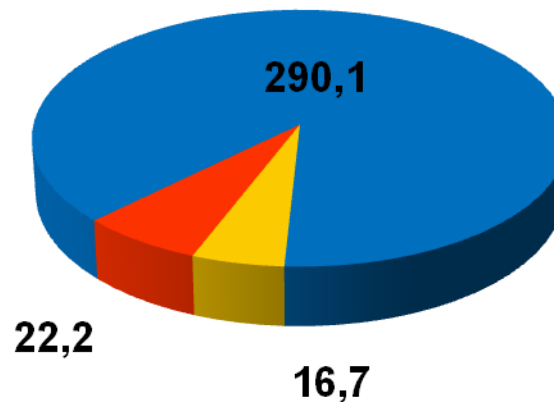
**Total energy supply in Mtoe (share of biomass in %):
Japan 474 (1,6%), Germany 319 (7%), Austria 32 (16,9%)**

- Renewables without Bioenergy [Mtoe]
- Bioenergy [Mtoe]
- Fossil & Nuclear [Mtoe]

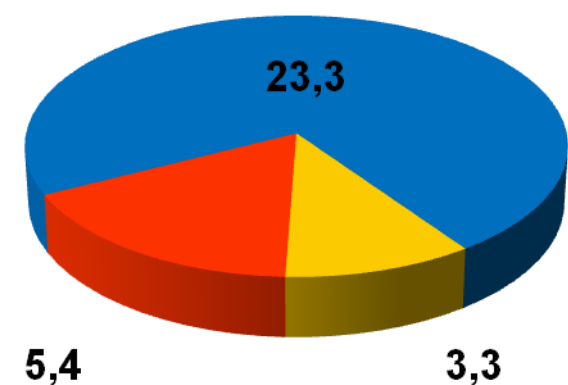
Japan



Germany



Austria





Space heating in %

Source: IEA, 2007
Energy Use in the
New Millennium

Buildings: ca 36% of final energy, mainly heat!

District heat and biomass:

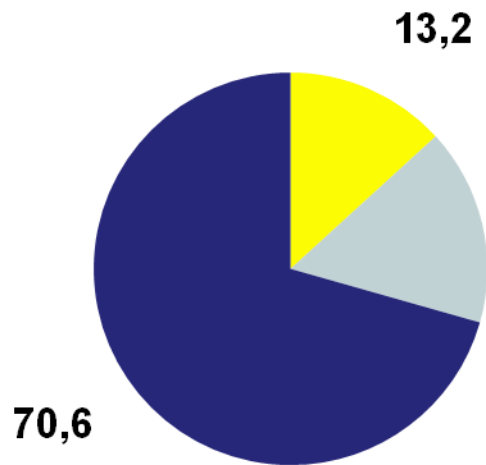
Japan: 0 %

Germany: 20,6%

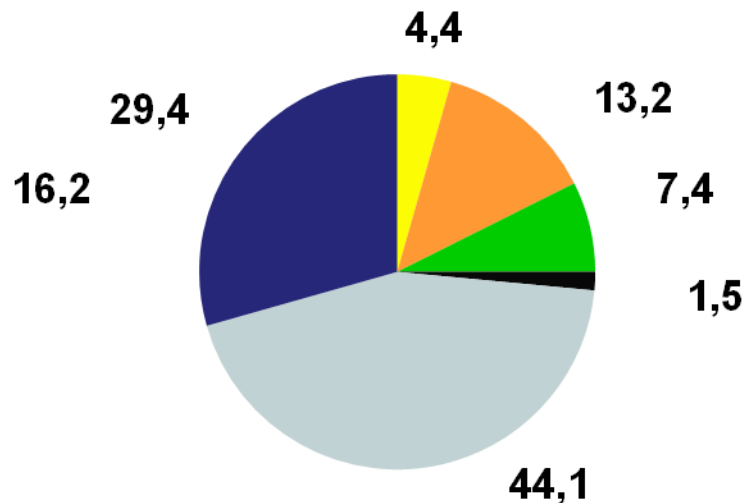
Austria: 36,8%

- Electricity
- District heat
- Renewables
- Coal
- Gas
- Oil

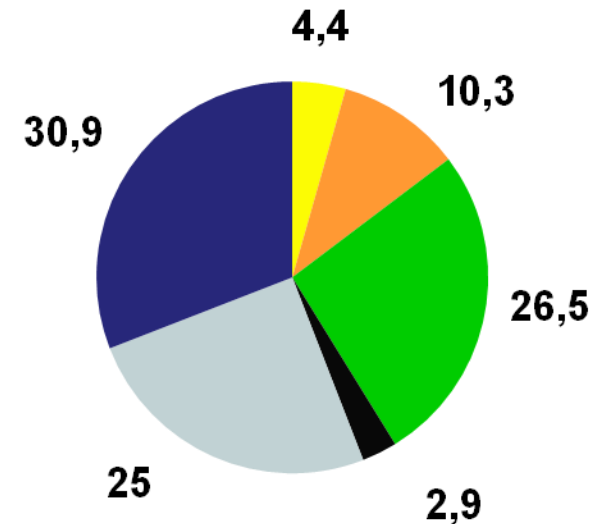
Japan



Germany



Austria





Future opportunities and milestones for biomass use

- **Biomass supply in 2008: 1240 Mtoe (52 EJ)**
- **Sustainable biomass potential in 2050: 4800 – 12000Mtoe (200 – 500EJ)**
- **Requires:**
 - improved agric. Productivity – energy crops, land use
 - use of forest surplus production, planting of new forests!
 - better use of agric. and forest residues, more trade!
 - use of biogas potential (20 – 25% of total bioenergy)
 - high efficiency in the conversion of biomass to final energy
- **Some non optimal developments:**
 - Biomass to electricity without use of the heat
 - Ignoring the importance of the residential heat market
 - Problems with sustainability in global trade and carbon neutrality

Summary:

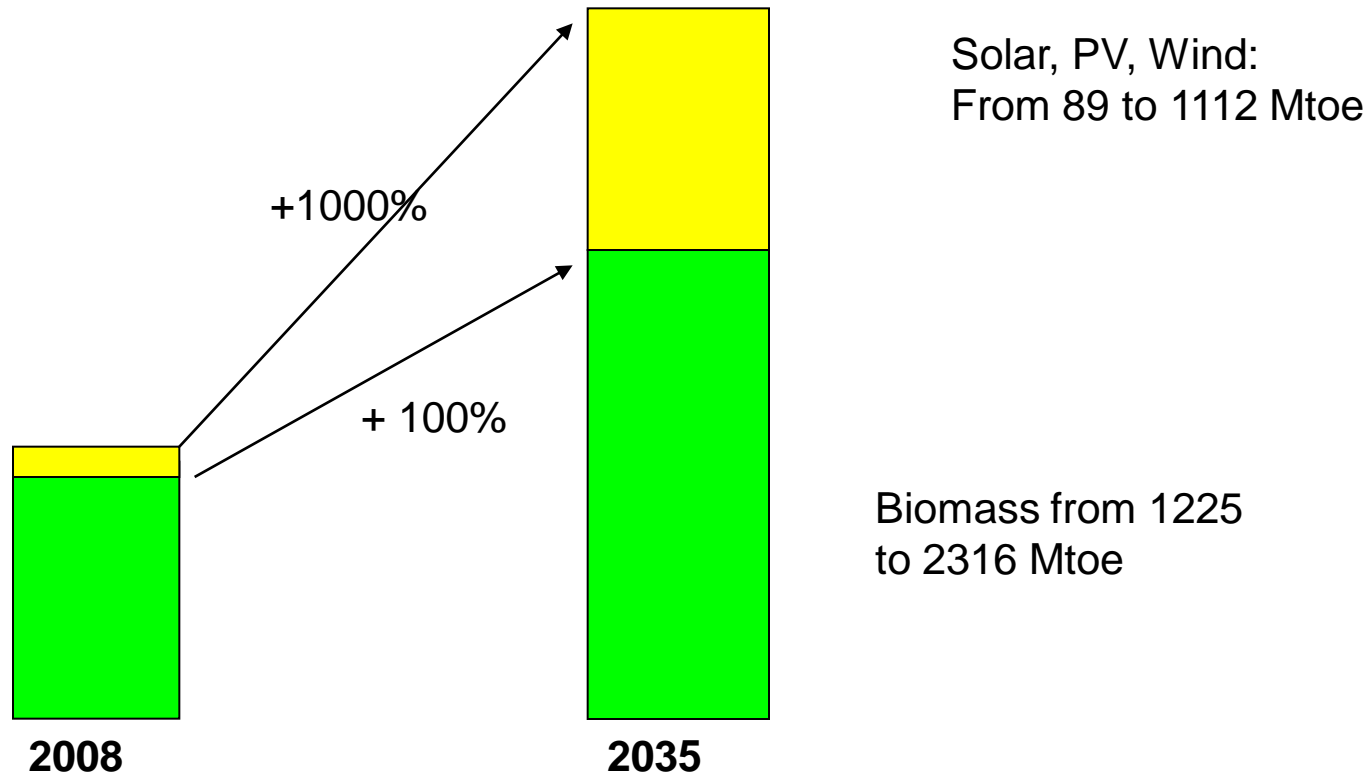
- > a high share of Renewables means a well developed bioenergy sector
- > a well developed bioenergy sector means a high share of biomass in the heating sector!



IEA: World energy outlook and climate policy

450 ppm scenario:

expected annual growth: biomass 40 Mtoe, other RES 38 Mtoe



Solar, PV, Wind:
From 89 to 1112 Mtoe

Biomass from 1225
to 2316 Mtoe

Also IEA sees the necessity for a rapid growth of all Renewables from 1590 Mtoe in 2008 to 3428 Mtoe in 2035!



What can we expect globally

- A modest growth in biofuels of the 1st and 2nd generation
- A stronger growth in electricity, if driven by government policies
- A strong growth in biomass to heat, especially if supported by government policies such as investment grants for the private sector!
- Regional solutions on the one side and an increasing global trade with pellets, ethanol, biodiesel on the other side!; pellets from Canada in the future rather to Asia than to Europe
- More emphasis on efficient production, conversion and final use and the sustainable supply of biomass, more new energy crops on idle land
- More emphasis on the use of biogas and the waste streams for energy purposes.

Biomass can contribute 20 – 35% of the energy supply of a world without nuclear and fossil fuels in the future!