Johann Heinrich von Thünen-Institut

Biogas in Germany:

Today 1400 MW biogas electricity and future targets

P. Weiland

Johann Heinrich von Thünen-Institut (vTI)

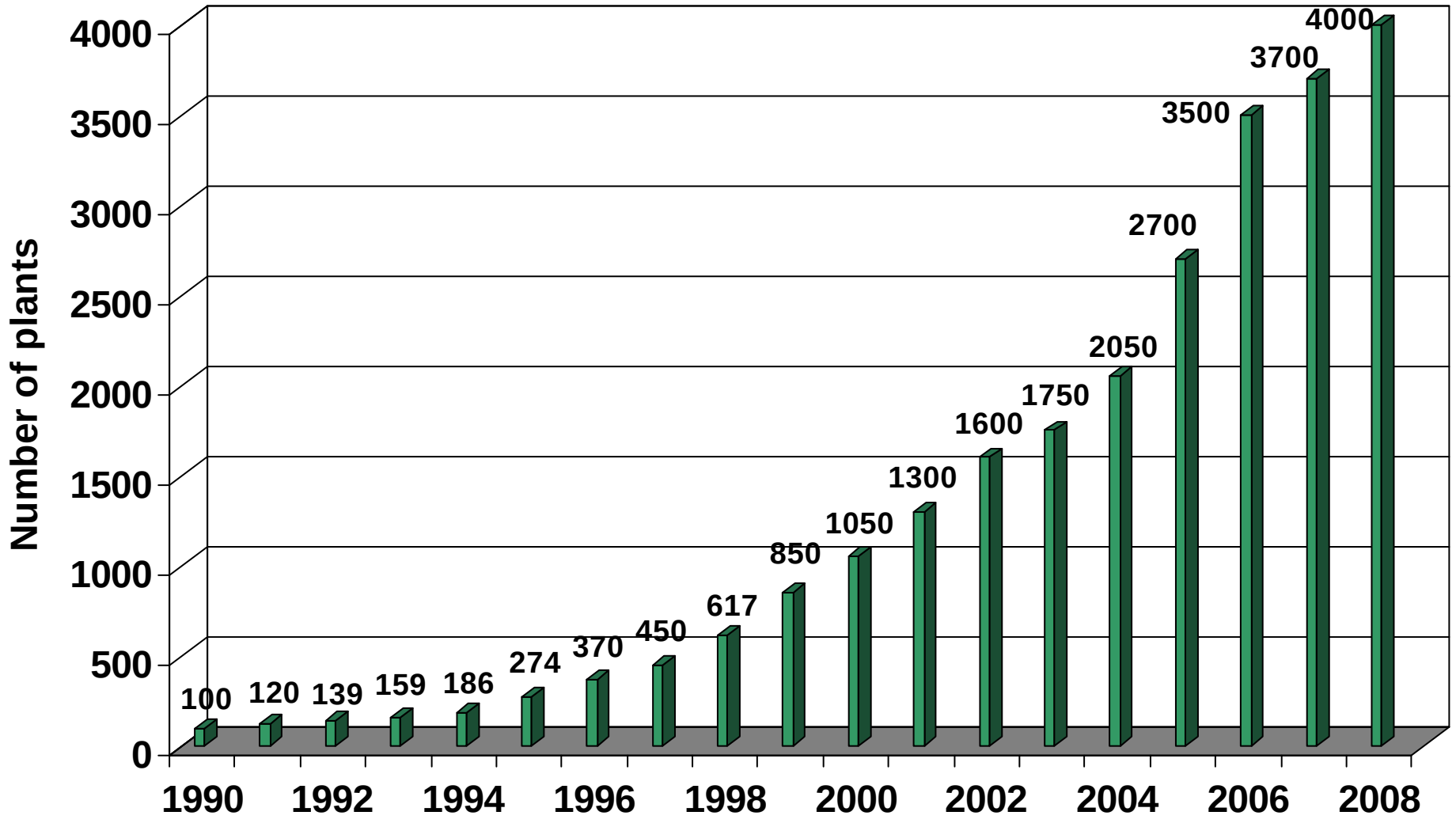
Bundesforschungsinstitut für Ländlichen Raum, Wald und Fischerei

Contents

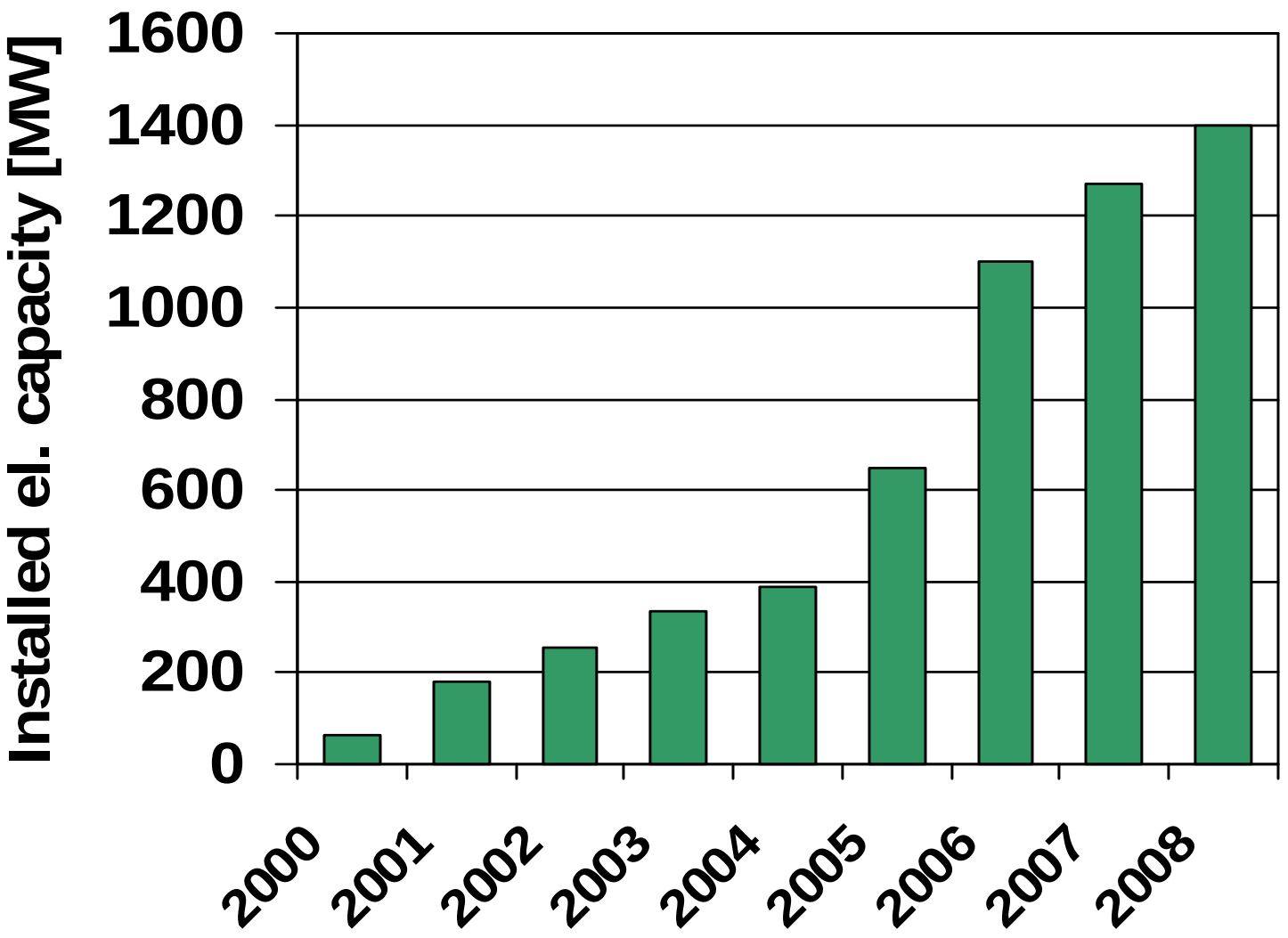
Johann Heinrich von Thünen-Institut

- Current state of biogas in Germany
- Driving force for biogas production
- Legislation
- Future targets for biogas production and utilization
- Conclusions

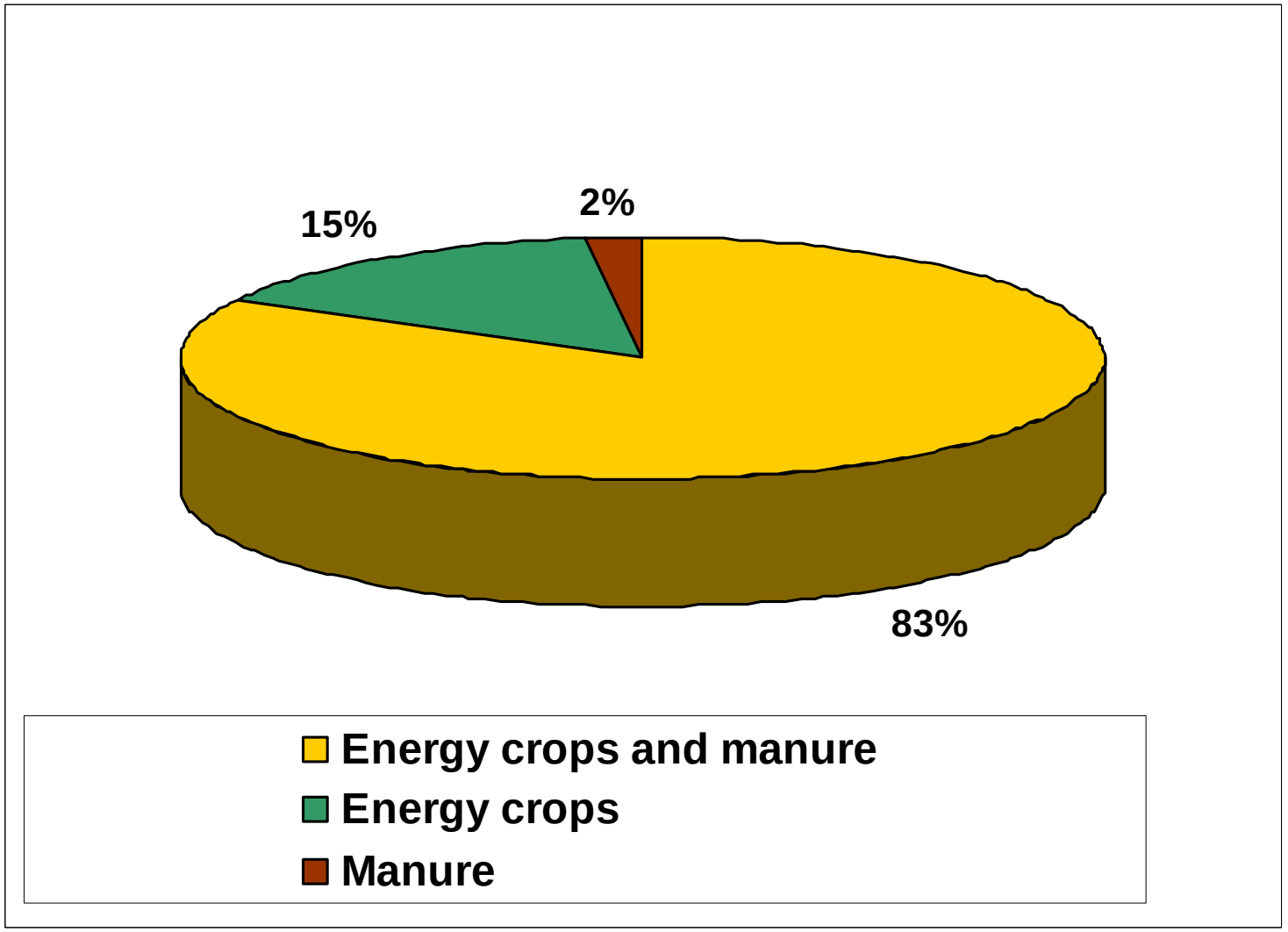
Biogas plants in Germany



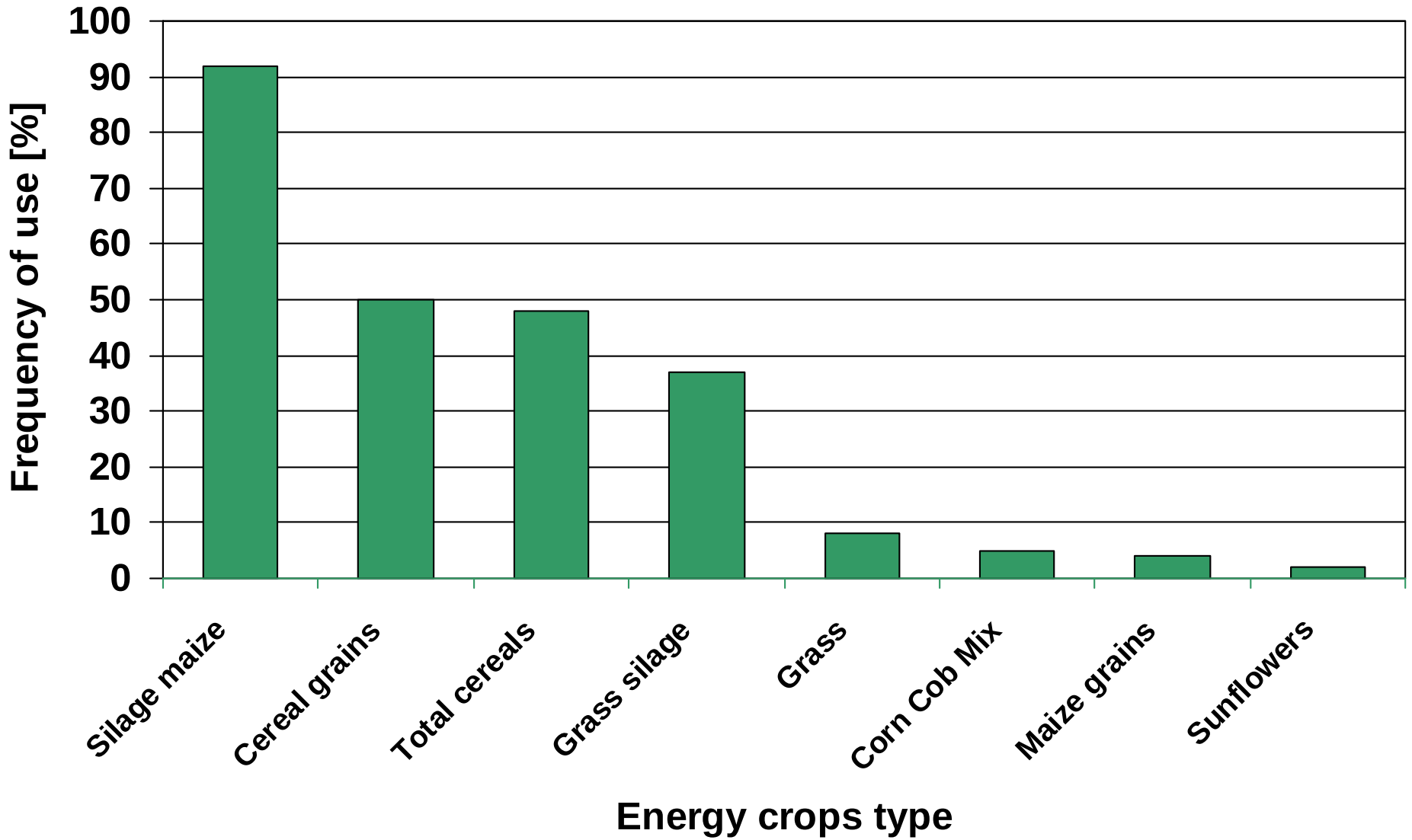
Installed electric capacity of German biogas plants



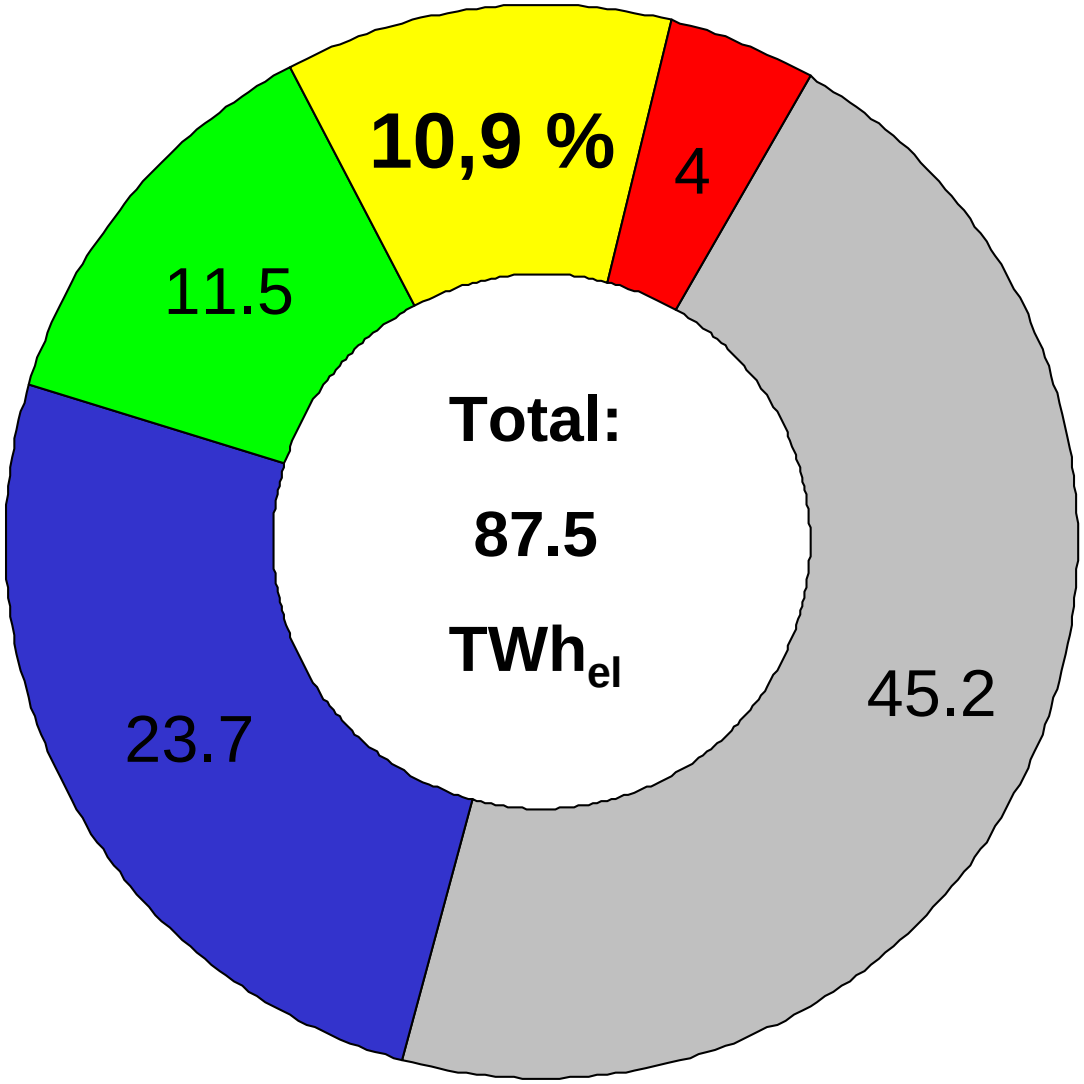
Substrate application in agricultural biogas plants (2005-2007)



Use of renewable raw materials



Renewable Energy situation in Germany (2007)



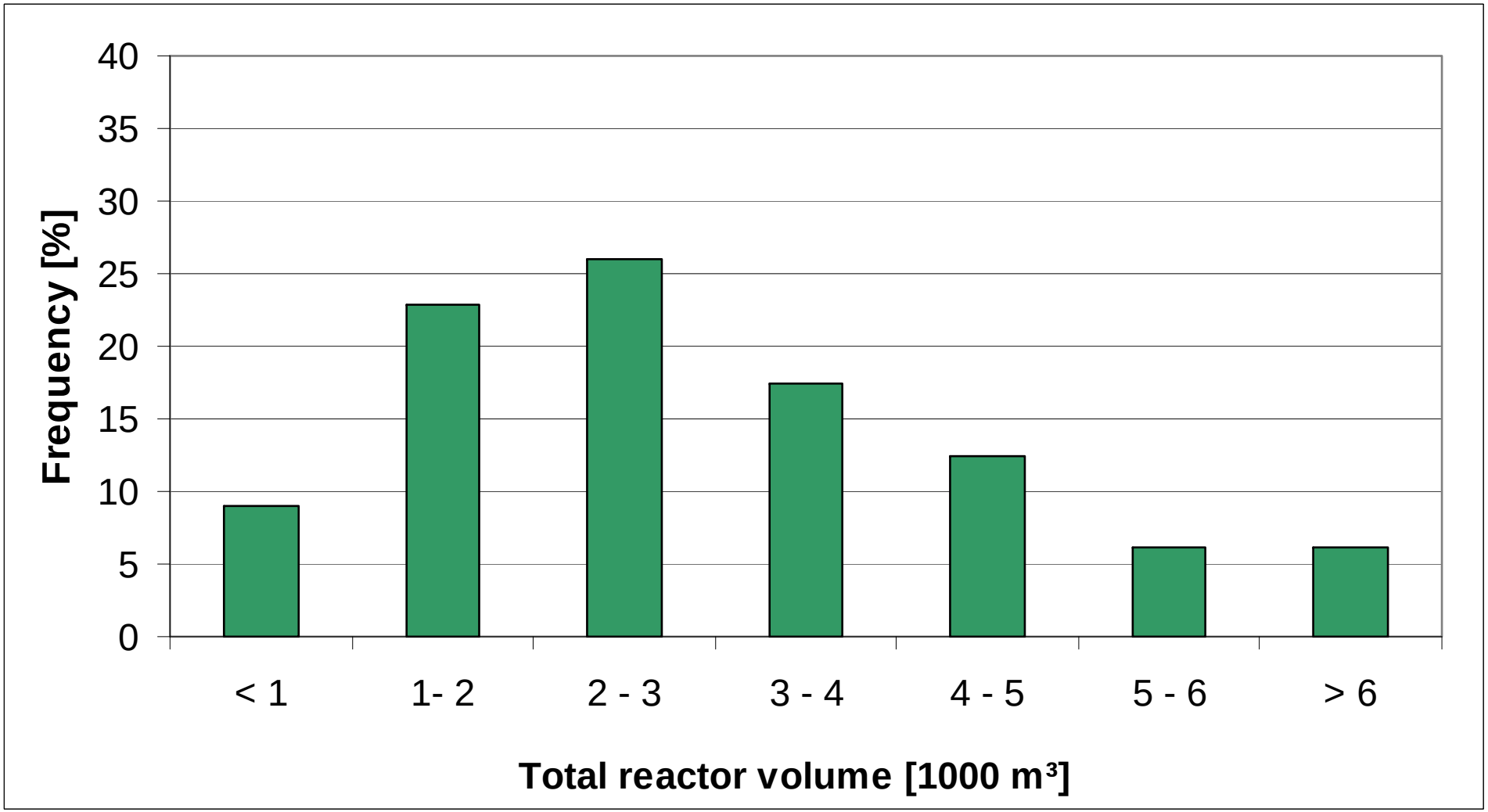
- Wind energy
- Hydro power
- Biomass
- **Biogas**
- Photovoltaic

Share on electricity consumption:

14,2 %

(Biogas: 1,5 %)

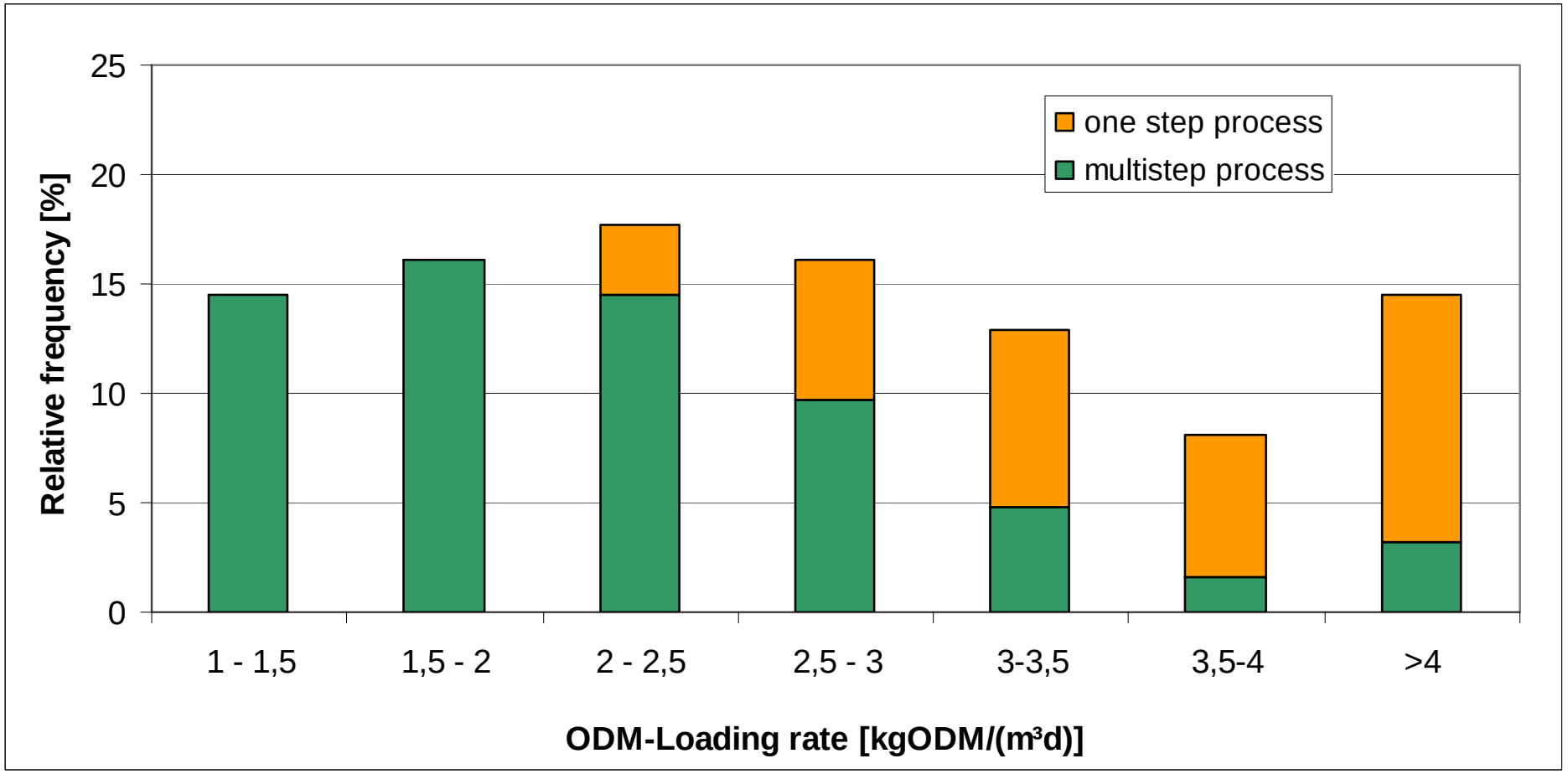
Reactor volume of farm based biogas plants



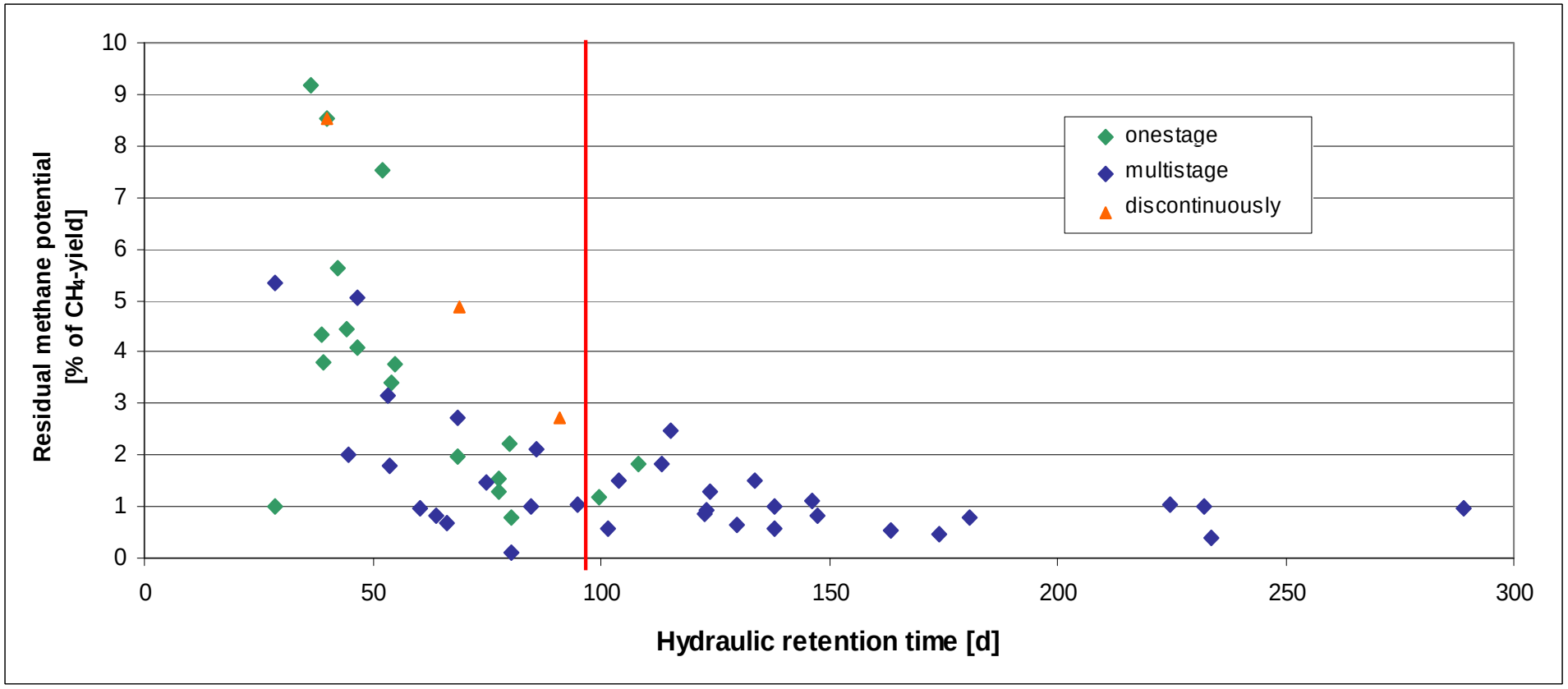
Bioenergy-Park „Penkun“ (NaWaRo AG)

Johann Heinrich
von Thünen-Institut

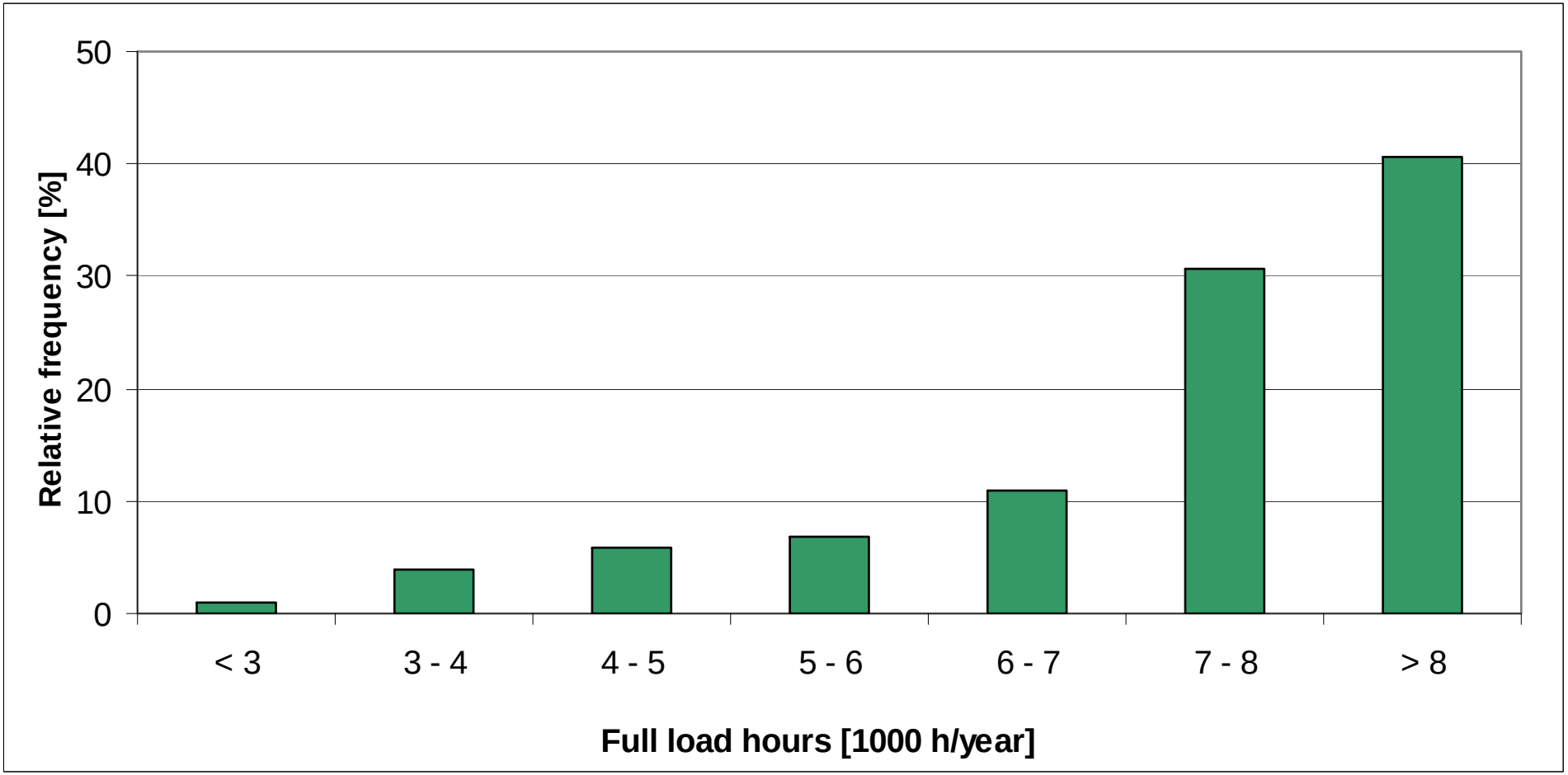
Loading rate of biogas plants



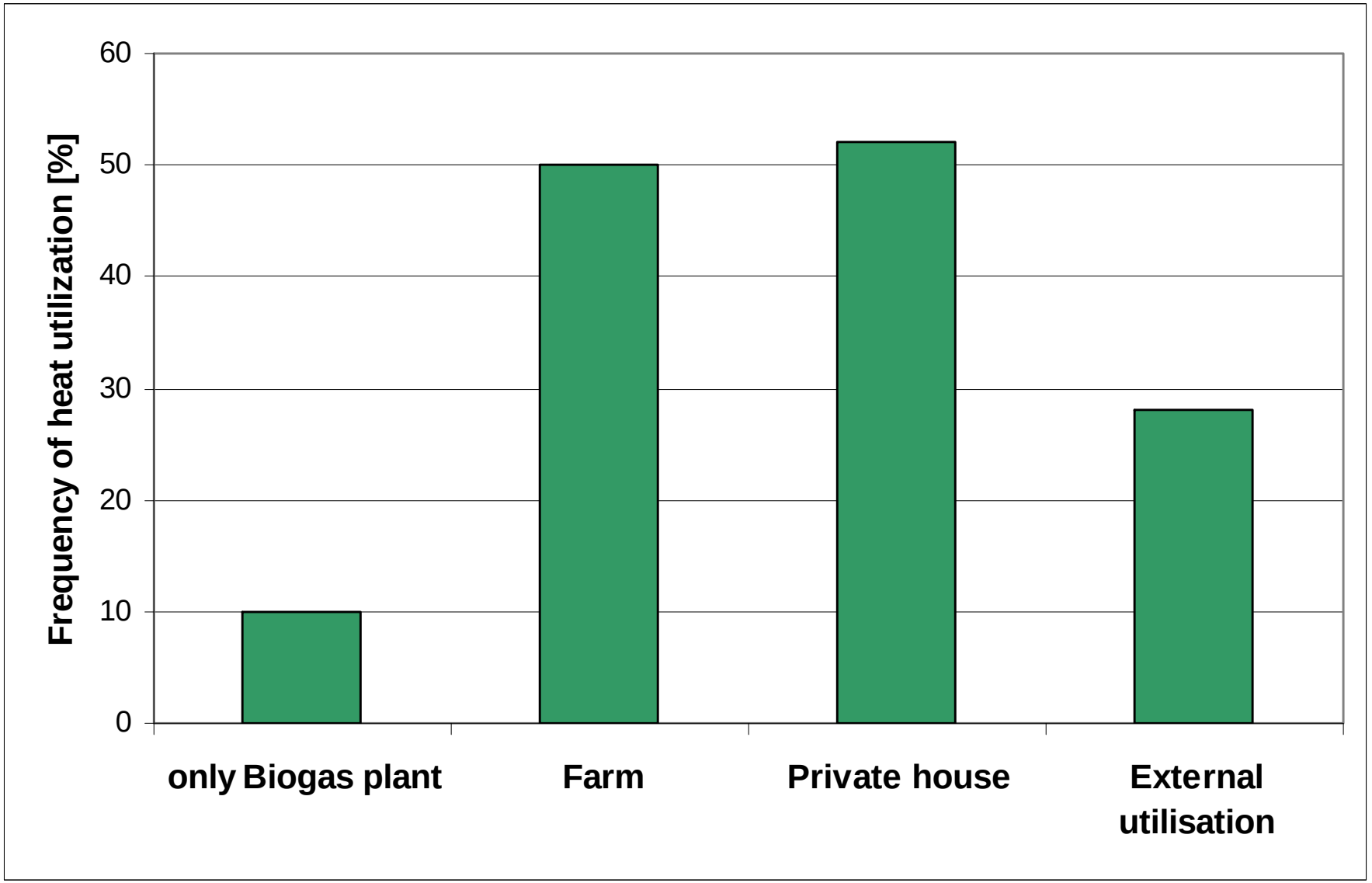
Residual methane potential of digestate at 20 °C



Full load hours of the CHP



Frequency of heat utilization



Biogas upgrading

- **16 upgrading plants are in operation**
- **PSA is the dominating technology**
- **Pressure water scrubbing is gaining market share**
- **2 Selexol-washing plants are in operation**
- **2 pilot plants use chemical washing by amine, and a first full scale plant is in construction**
- **For achieving the technology bonus the methane losses must be < 0.5 vol.-%.**

Growth drivers for biogas in Germany

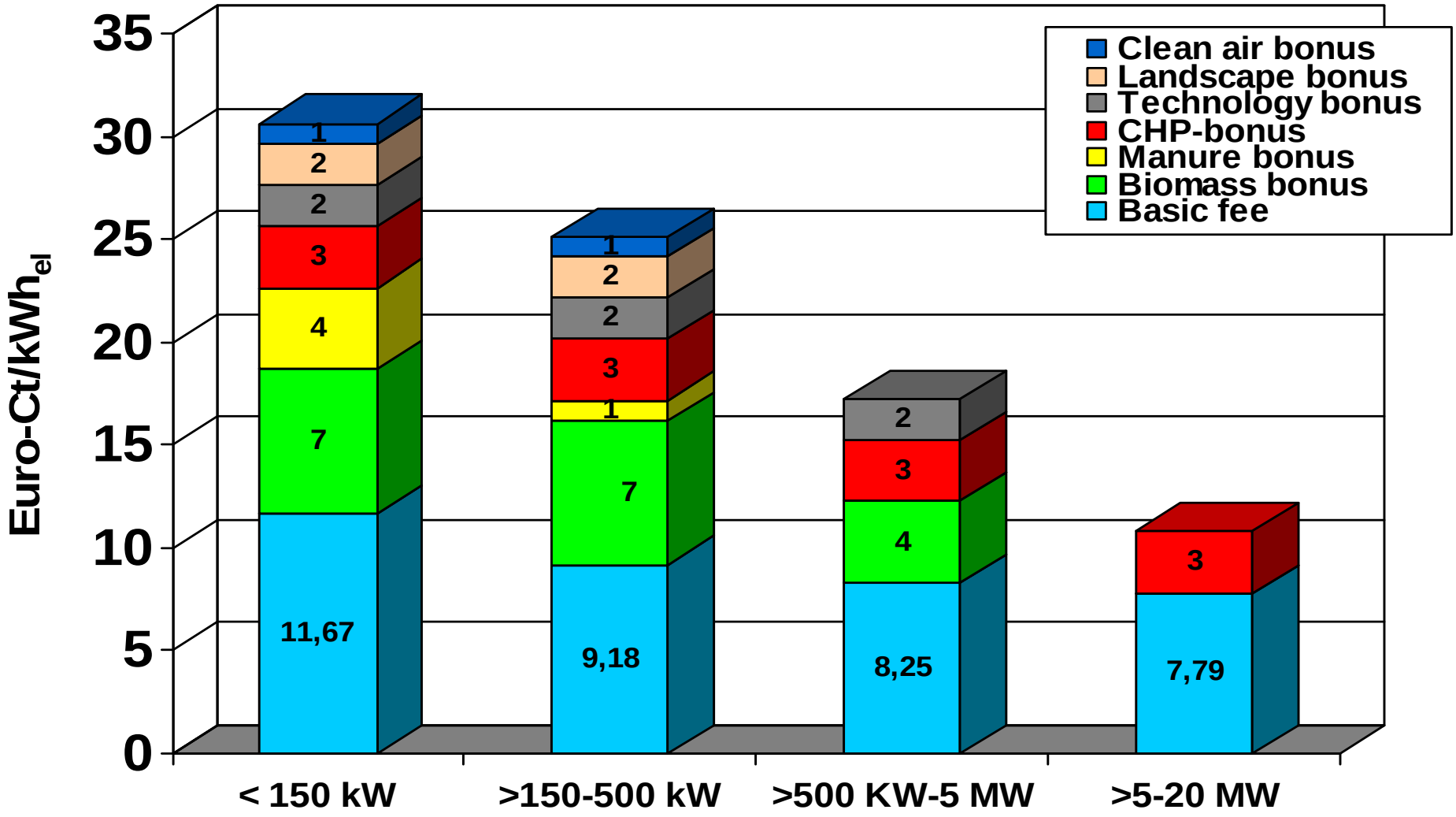
Johann Heinrich von Thünen-Institut

- **The Government has decided to increase the renewable energy electricity production to 30 % and the portion of heat to 14 % by 2020.**
- **40 % reduction of CO_2-emissions by 2020.**
- **High dependency on foreign gas imports. 42 % of the natural gas is imported from Russia with a high risk for gas supply disruptions.**
- **The Government is aiming to improve the share of biogas on the natural gas market to 10 % by 2030.**
- **The most important growth driver is the Renewable Energy Sources Act (EEG).**

Main factors of the Renewable Energy Act

- **A guaranteed fixed fee for the electricity paid by the grid operators for a 20-year period.**
- **Priority for connection to the electric grid.**
- **Priority purchase and transmission of the produced electricity.**
- **Security for long term planning and investment**
- **Calculable costs for the consumers.**
- **Specific fees dependent on plant size, substrate type and technology.**

Compensation for electricity 2009 (EEG)

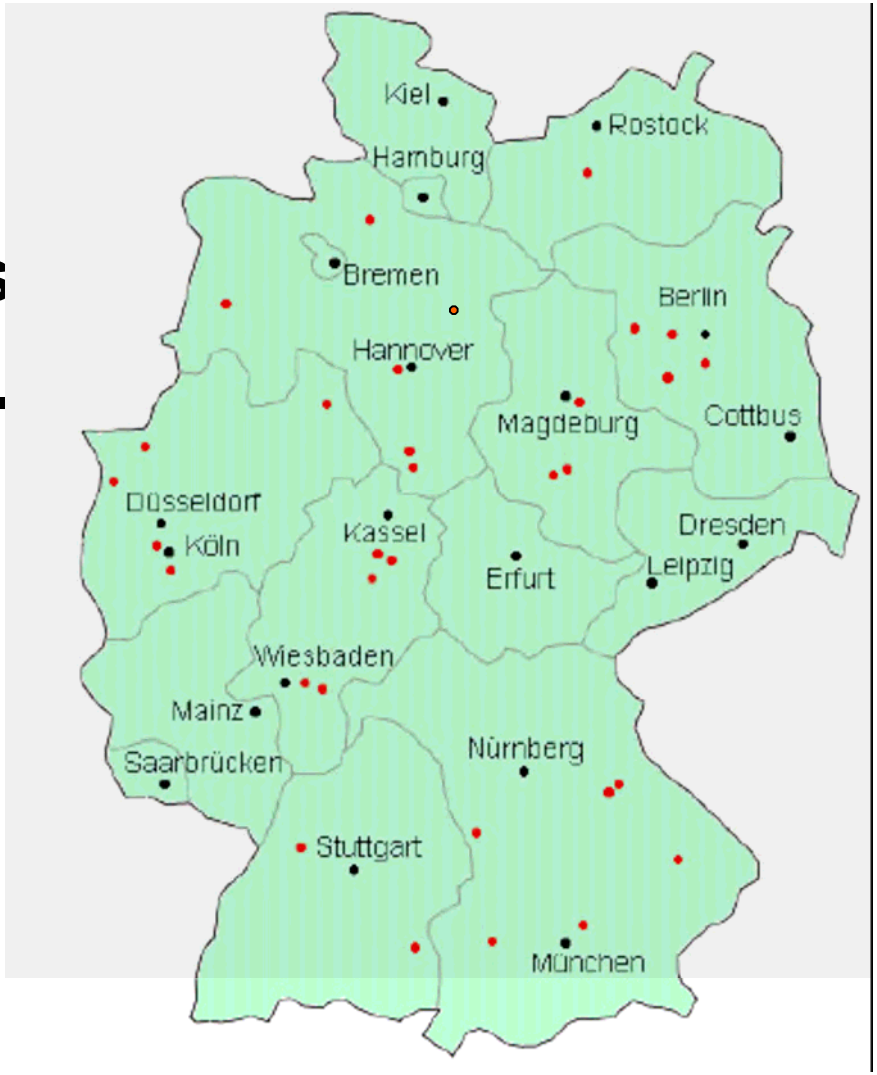


Gas network access ordinance

- **The gas grid operator must connect biogas upgrading plants to the grid.**
- **50 % of the connection costs must be paid by the gas grid operator.**
- **The gas grid operator is responsible for odo-rization, gas quality control and compression.**
- **Biomethane is fed into the grid by traders not by the producer.**

Gas upgrading in Germany

- **16 biogas upgrading plants are in operation.**
- **Only one plant produces biomethane for vehicles.**
- **15 plants are planned.**
- **Up to 2020 yearly 6 bill. m^3 methane should be injected into the grid (2030: 10 bill. m^3)**



Biogas plants tomorrow

Johann Heinrich von Thünen-Institut

- **Strong increase of the gas production capacity.**
- **The number of biogas plants will increase up to 10,000 – 12,000 facilities in 2020.**
- **Within the next 4 years mainly small biogas plants < 200 kW and large biogas plants > 1 MW will be installed.**
- **Small biogas plants will be operated mainly with 30 % manure and more (manure bonus).**
- **Large biogas plants will be used mainly for producing biomethane with gas injection into the grid.**

Substrates tomorrow

Johann Heinrich von Thünen-Institut

- **Renewable energy crops will be the main substrate for biogas production also in future.**
- **New energy crops which are not in competition to food and feed crops becomes more important, e.g. Sudan grass, sorghum, topinambur, silphium and intercrops.**
- **The application of manure will strong increase due to the manure bonus.**
- **Pure plant by-products will be more often applied but wastes will play a minor role in agricultural biogas plants.**

Gas utilization tomorrow

Johann Heinrich von Thünen-Institut

- **Biogas and biomethane will be used mainly in combined heat and power plants.**
- **Most of the produced biomethane will be injected into the grid and the mixture of natural gas and biomethane is used in CHP, as vehicle fuel or for chemical processes.**
- **Micro biogas grids will be more often applied. 30 % of the investment costs are supported by MAP.**
- **Local heat grids find increased application due to the financial support of 60 €/m - 80 €/m.**
- **Bioenergy villages with energy self sufficiency find increased application.**
- **Combined renewable power stations (biogas, wind, photovoltaic) will be applied for stabilizing the electric grid.**

Summary: Biogas today in Germany

Johann Heinrich von Thünen-Institut

Workplaces	**> 10,000**
Turnover (manufacturer, planner)	**650 mill. €**
Turnover electricity	**1,000 mill. €**
Export share	**~ 20 %**
Electricity production 2008	**11 bill. kWh**
CO_2-reduction 2008	**9 mill. t/a**

Source: GBA

Thank you for your attention!