

A photograph of Earth and the Moon in space against a dark background. The Earth is on the right, showing blue oceans and white clouds. The Moon is on the left, showing a brownish, cratered surface. The text "Mitigation through Renewable Energies" is overlaid in yellow on the bottom half of the image.

# Mitigation through Renewable Energies

Dr. Harry Lehmann  
Federal Environmental Agency of Germany

## Strategy Elements for a sustainable and GHG free Society

1. Efficient energy transformation and end energy use
2. Cover remaining energy services with renewables
3. Behavioural change – energy demand of lifestyles

# Germany

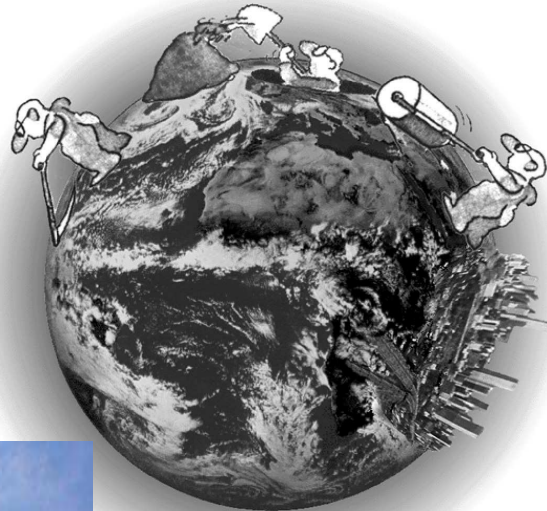
Wind power



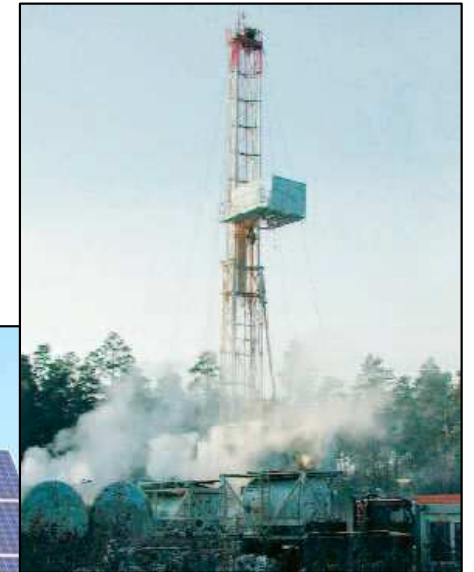
Hydro power



Biomass



Geothermal energy



Solarthermal power



Solar heating/cooling

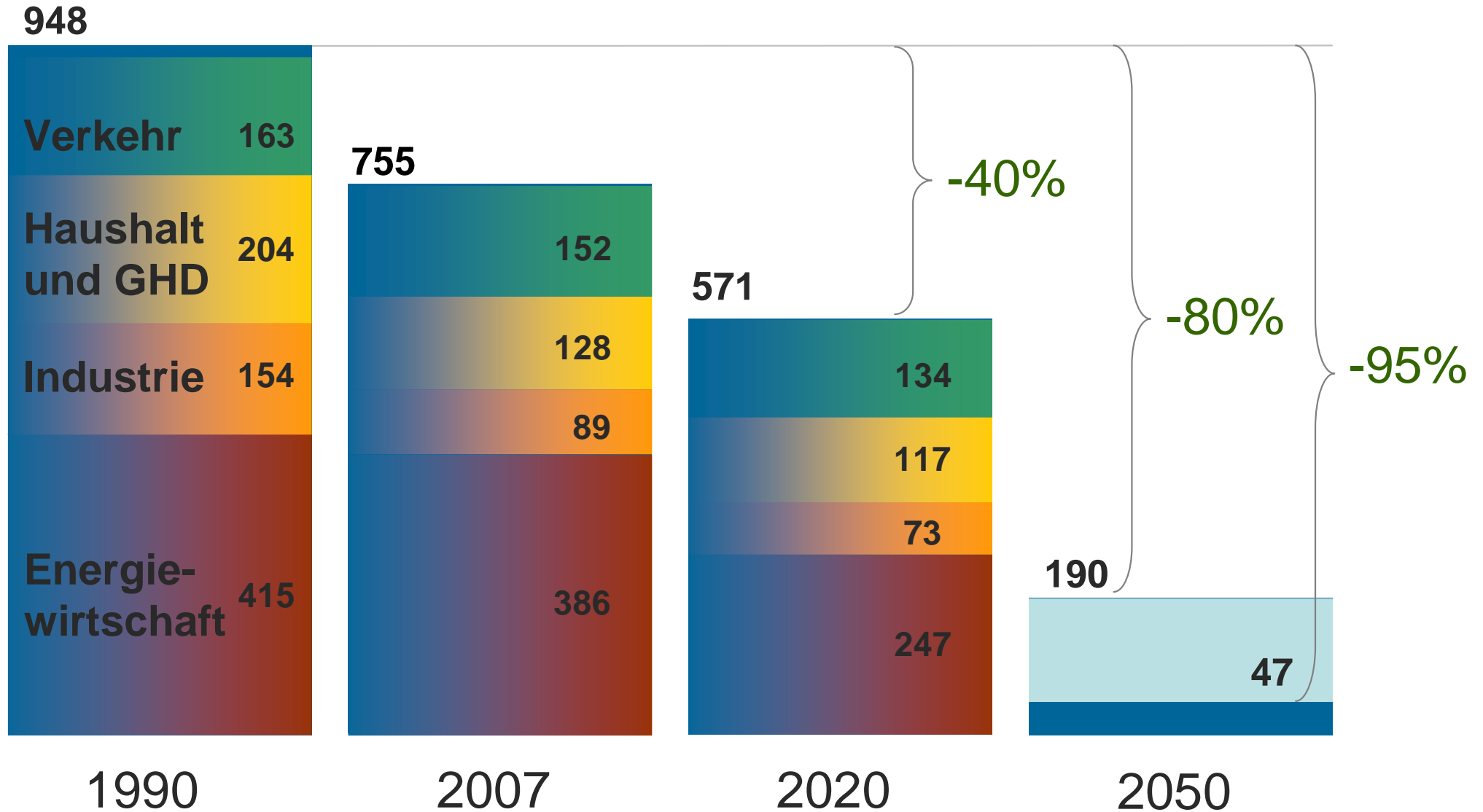


Solar Architecture



Photovoltaic

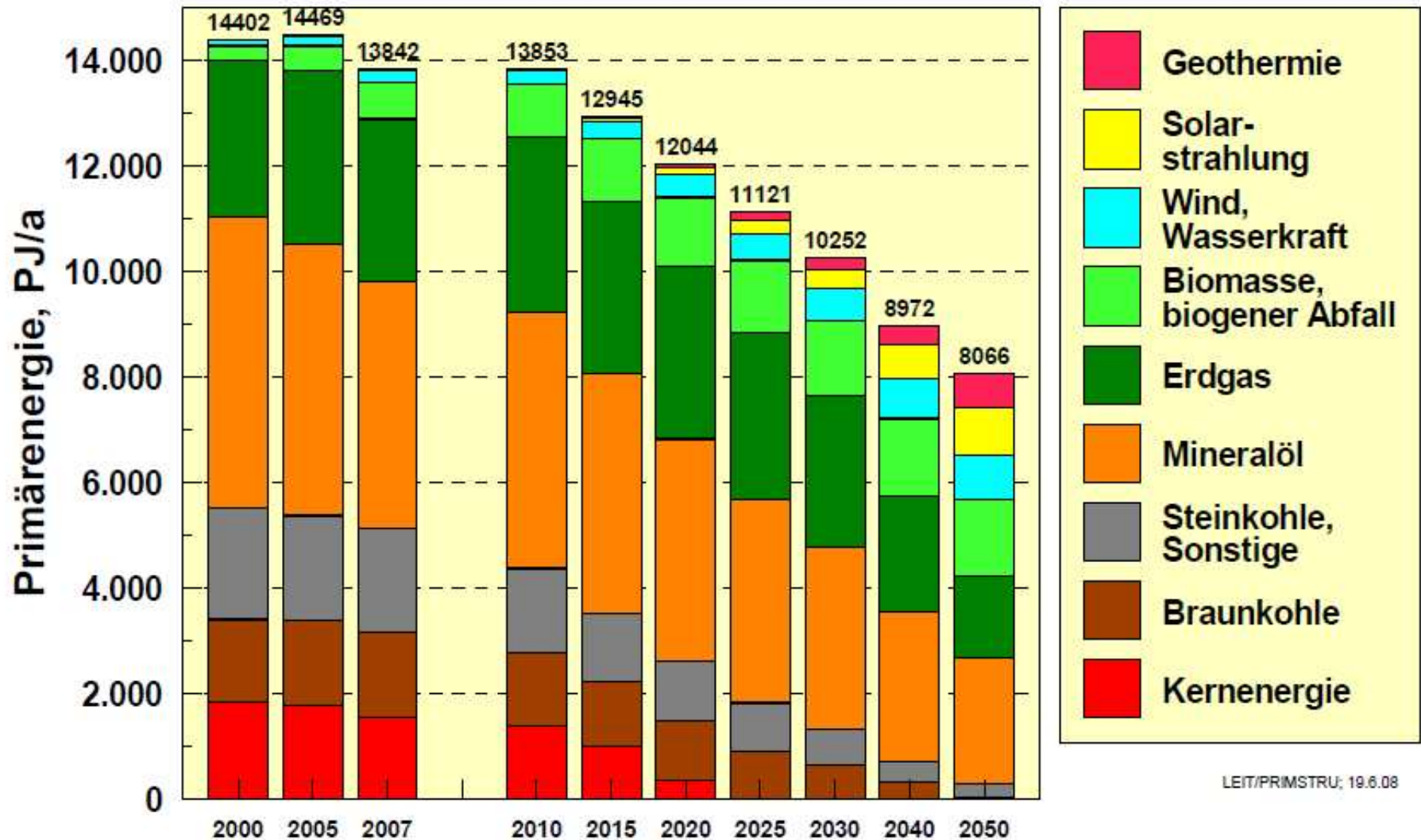
## CO2 Emmissions (Million t) - Energy System



# Lead Study 2008

## - Primary Energy Consumption -

- LEITSZENARIO 2008 -



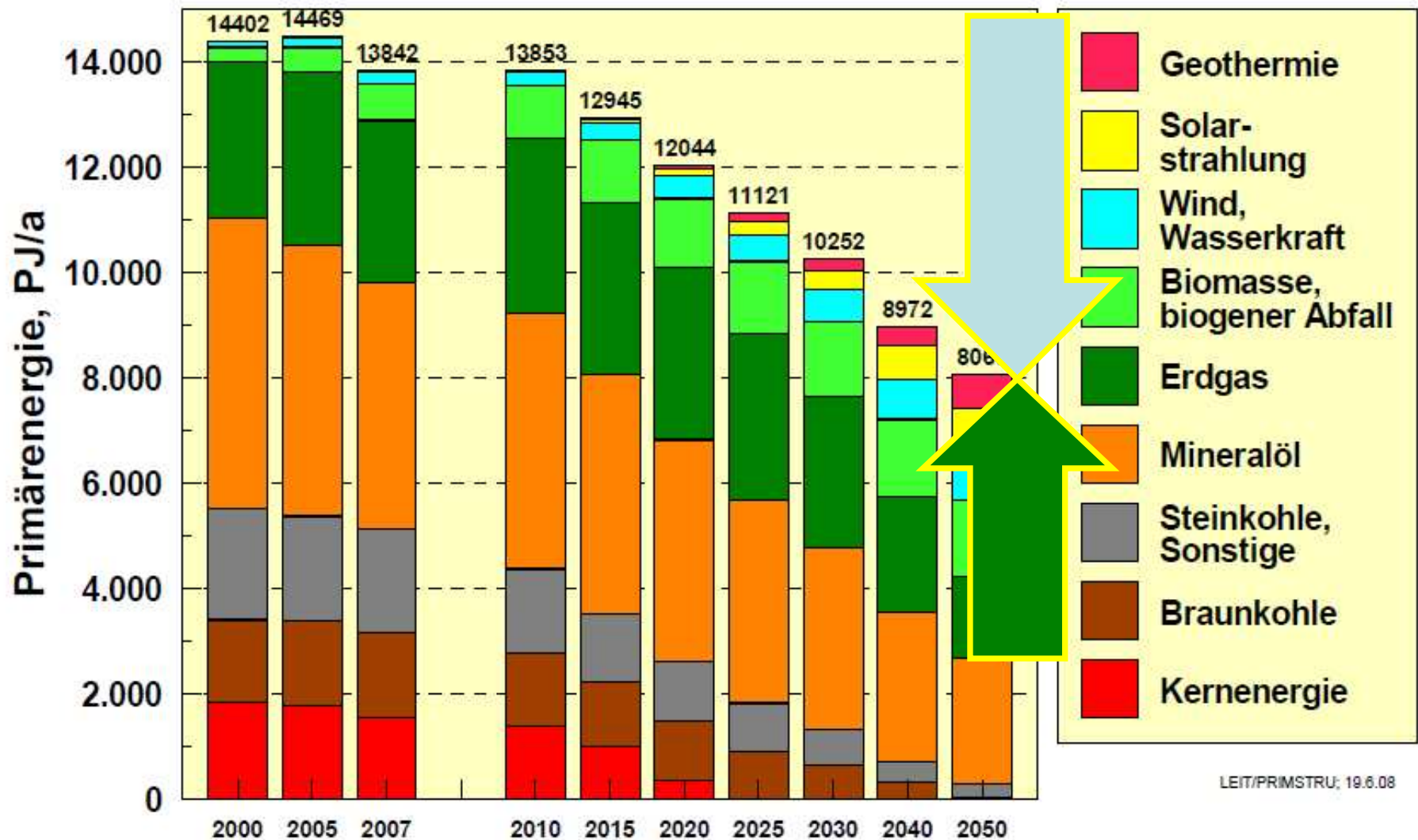
LEIT/PRIMSTRU; 19.6.08

Quelle: Nitsch 2008

# Lead Study 2008

- Primary Energy Consumption -

- LEITSZENARIO 2008 -



LEIT/PRIMSTRU; 19.6.08

Quelle: Nitsch 2008

# Successful deployment of Renewable Energies

## - Important boundary conditions

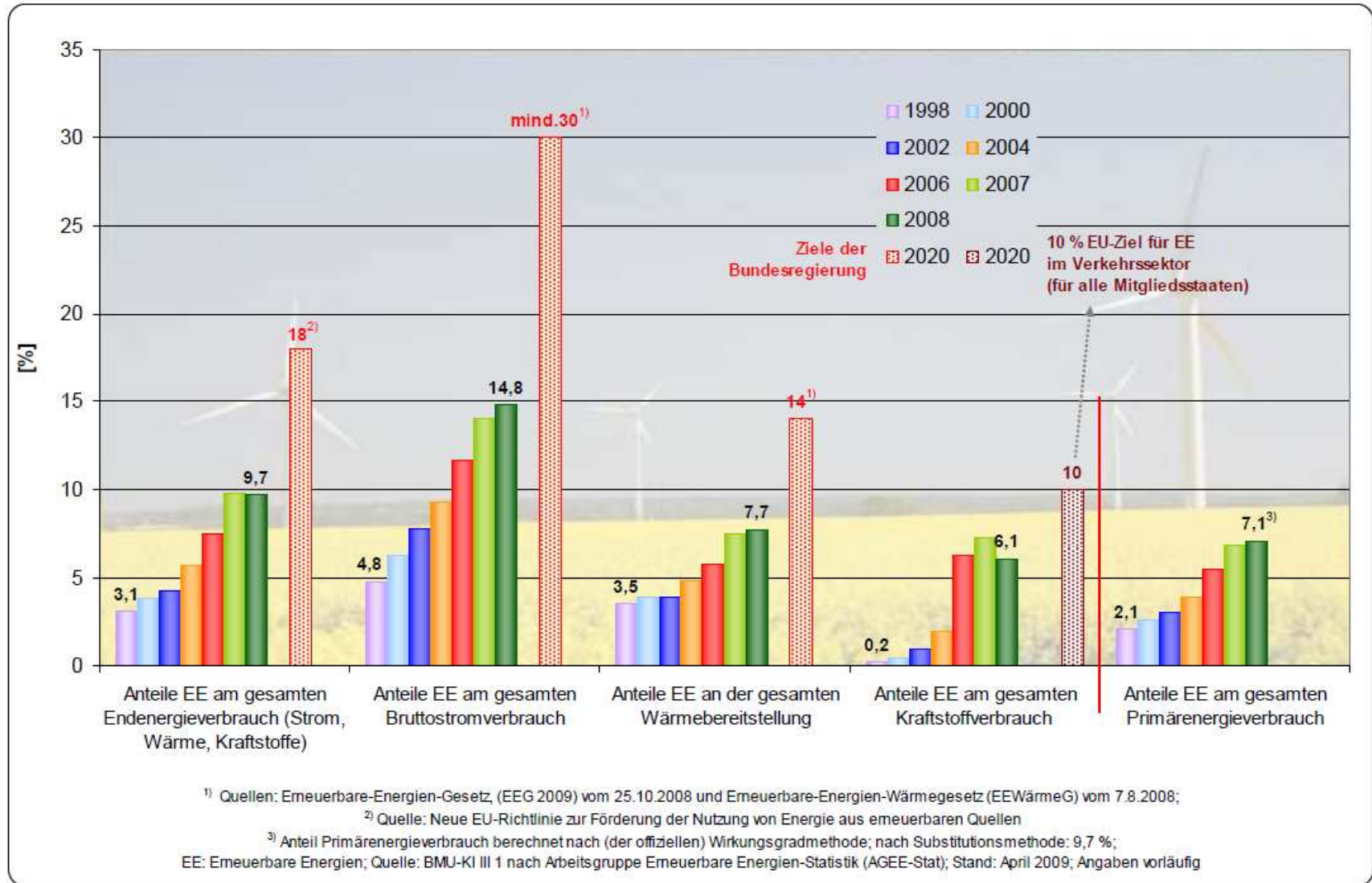
- o Well-established political will
  - long-term and binding development targets
  - respective long-term legislative projects und planning (Germany: IKEP)
- o Grid access conditions
  - Germany's EEG, Energy Economics Act, Federal Net Agency
- o Spatial and community planning processes
  - provision of specific areas and conditions with "national interest"
  - privileged projects in non-constructed community areas
- o Effectiveness of plant authorization
  - one-stop authorization including all partial licenses
  - clear license conditions with limited lead time
- o others
  - sustainability (that's understood !?)
  - public awareness and participation
  - community profit-sharing
  - ...

## Renewable Energy Sources Act - EEG

- basic and necessary features

- o priority connection of installations
- o priority purchase and distribution of electricity
- o guaranteed feed-in tariffs
  - extra technology cost + sufficient profit (technology specific)
  - support timeframe long enough to ensure investment security
  - decrease over time (for new installations) enforces cost reduction
- o independence of public budgets low transfer costs
  - nation-wide proportional distribution of electricity purchased and corresponding fees to all electricity customers (“EEG-Quota”)
  - EEG defines a legal relationship between private bodies
- o low transfer costs
- o “Exclusive-use” principle
- o Experience and Impact Report to German Parliament

# Renewable Energy Shares in Germany



Source: BMU:  
Renewable  
energy sources  
in figures –  
April 2009

# Europe

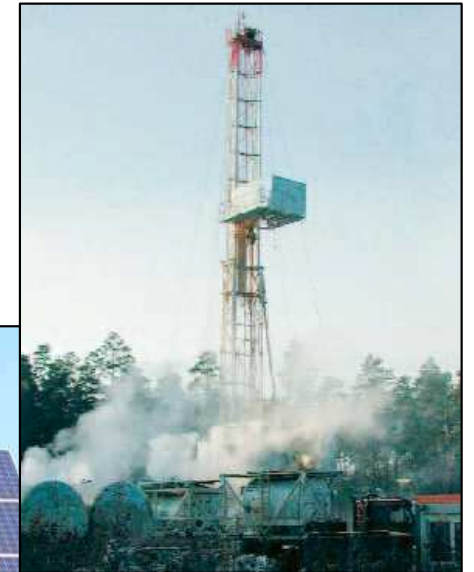
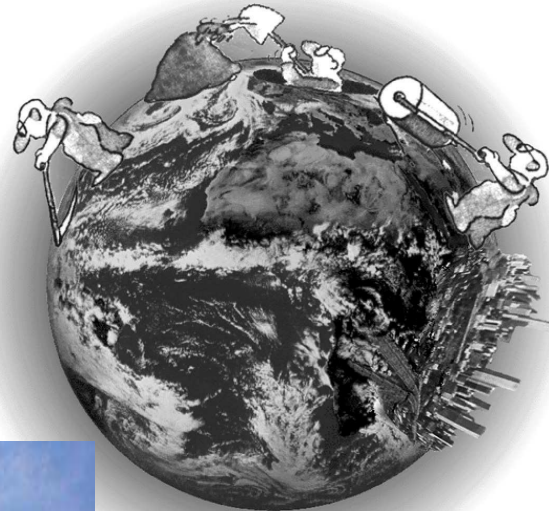
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Biomass



Geothermal energy



Solarthermal power



Solar heating/cooling



Solar Architecture

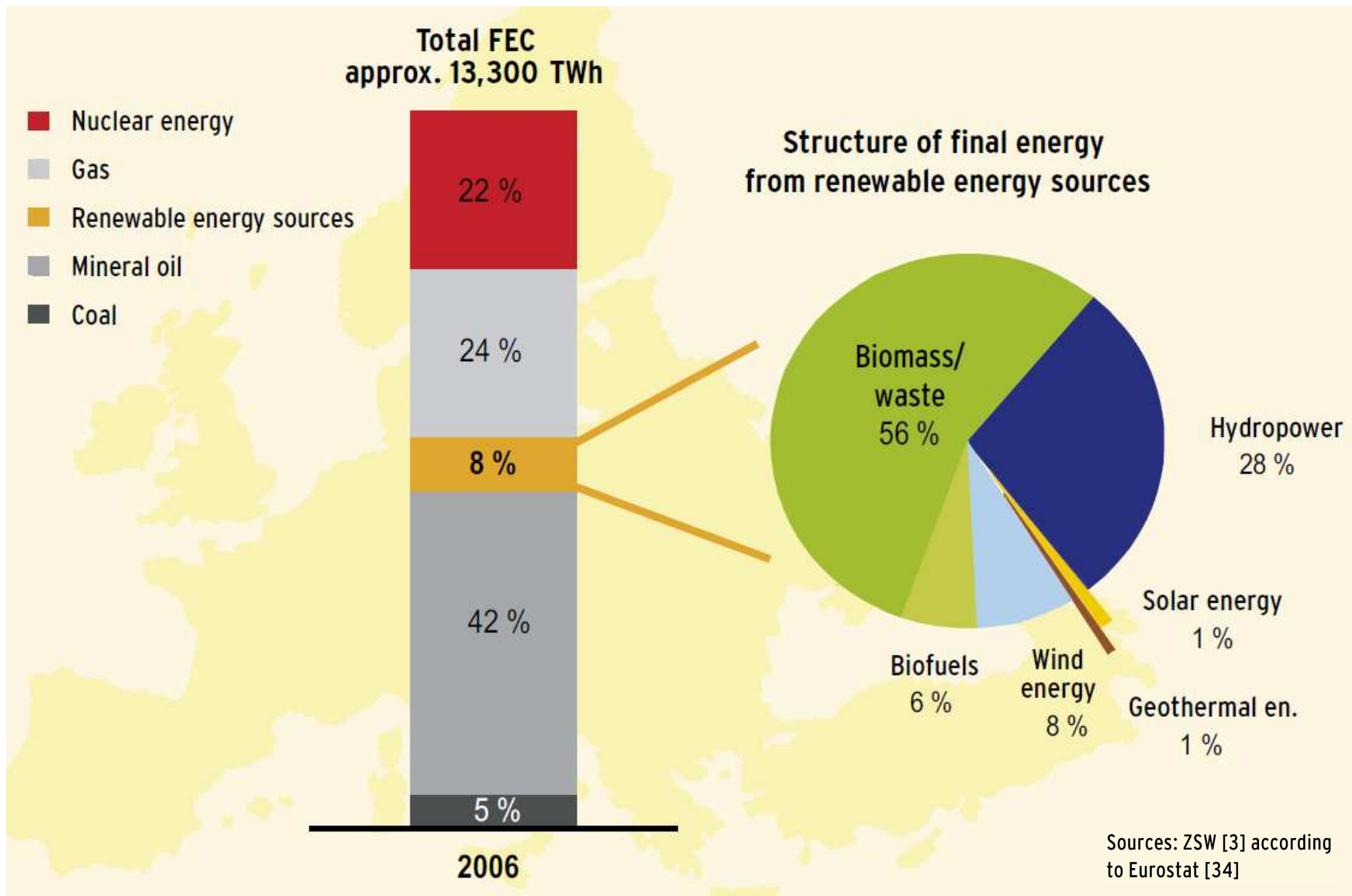


Photovoltaic

## EU-directive for renewable energy deployment

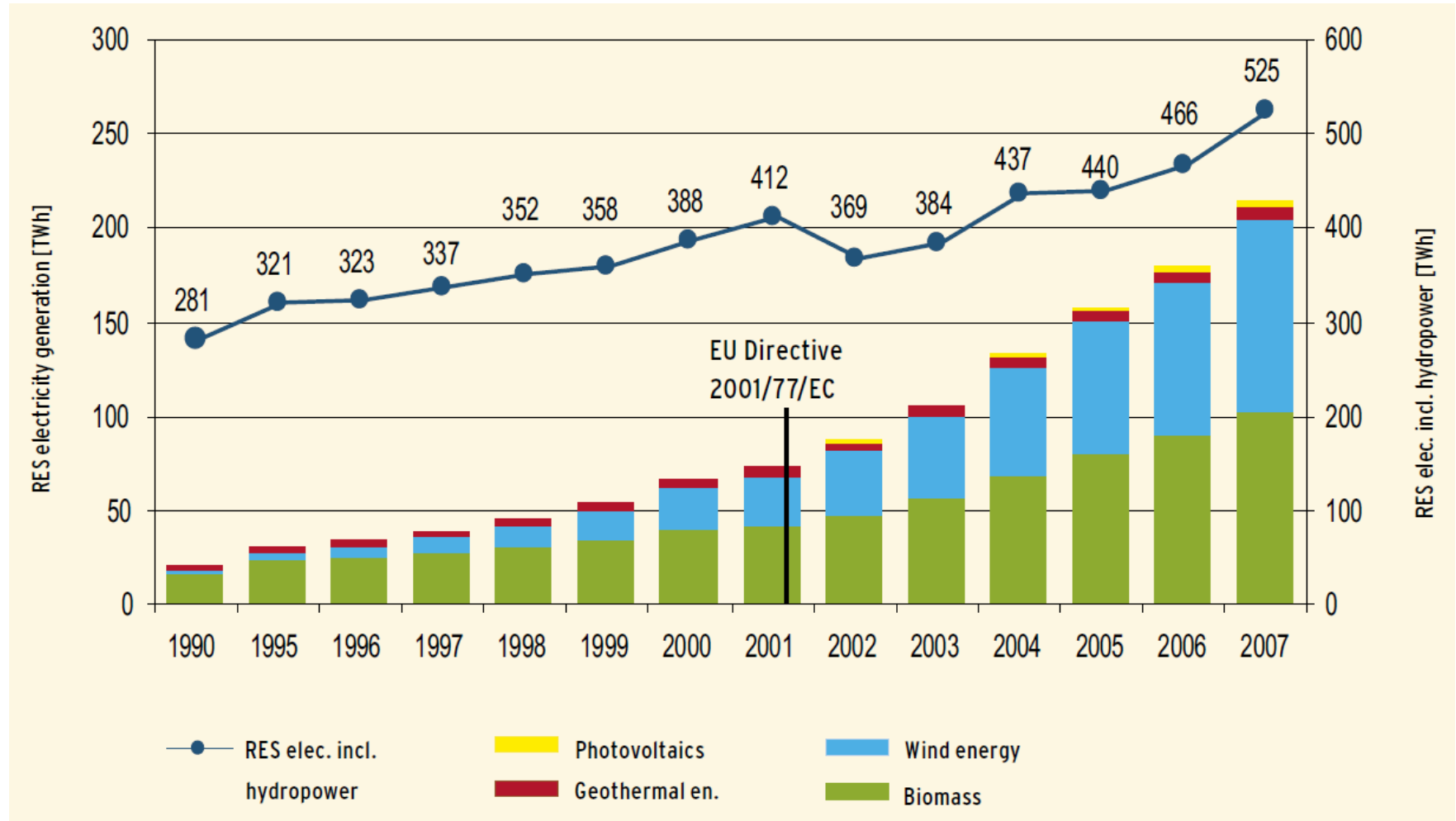
- o European and national targets for renewable energy deployment
- o National action plan for renewable deployment
  - Main policy instruments
  - Yearly targets till 2020
  - All relevant technologies
- o Biennial monitoring report to Commission
  - Detailed documentation of RES sources and development
  - Action taken to comply with Nation Action Plan
- o Common measures between member states
  - Common power plant construction
  - Exchange of electricity production
  - Common use of instruments
- o Reduction of obstructions
  - Access to power supply system
  - Registration of power plant
  - Information und training
  - Administrative
- o Sustainability criteria for bio fuels
- o Guaranties of origin

## Structure of final energy consumption in the EU



Source: BMU -  
Renewable  
energy sources  
in figures  
– April 2009

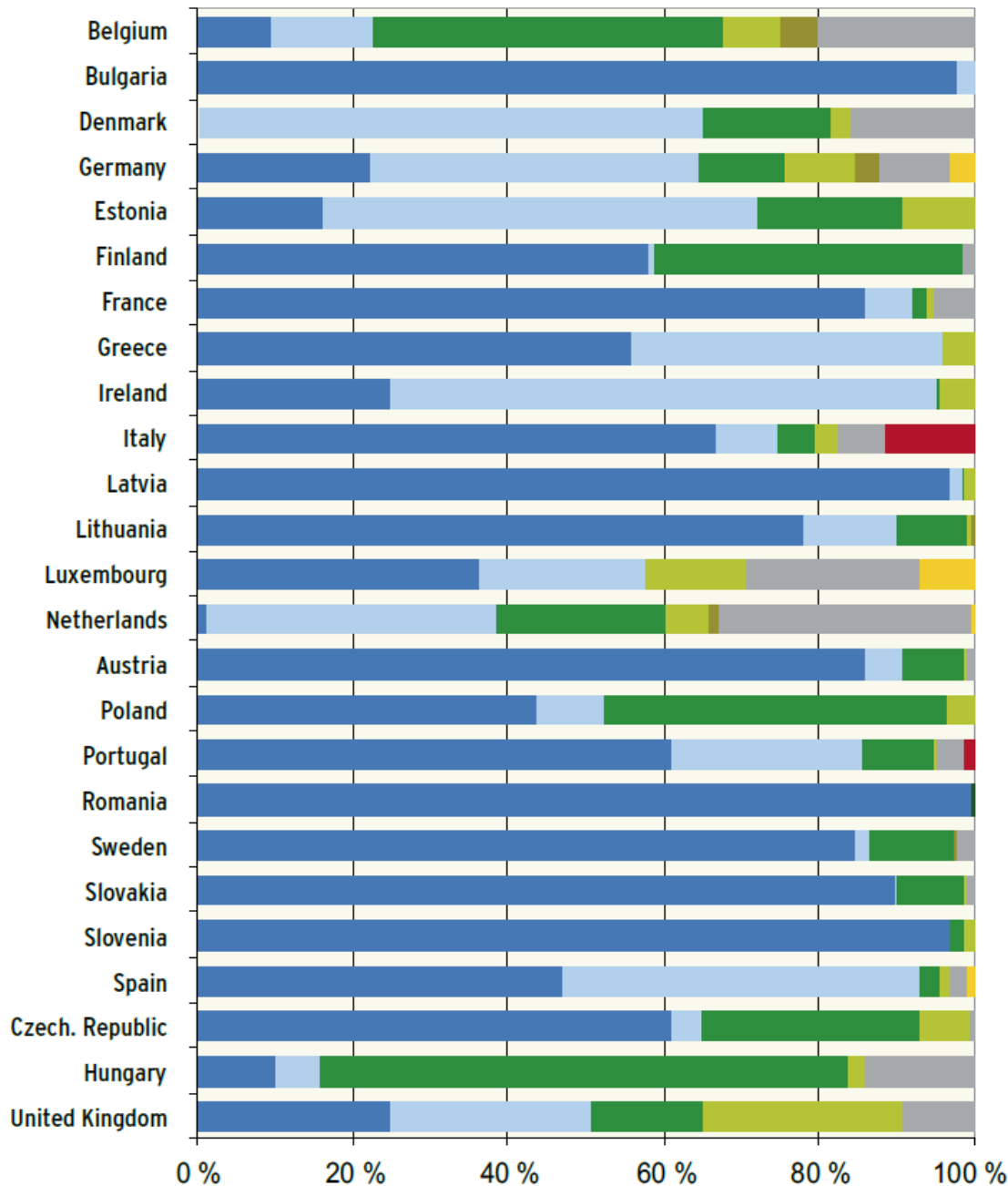
## RES electricity supply in the EU



Source: BMU -  
Renewable  
energy sources  
in figures  
– April 2009

Sources: Eurostat [34];  
Observ'ER [46]; ZSW [3]

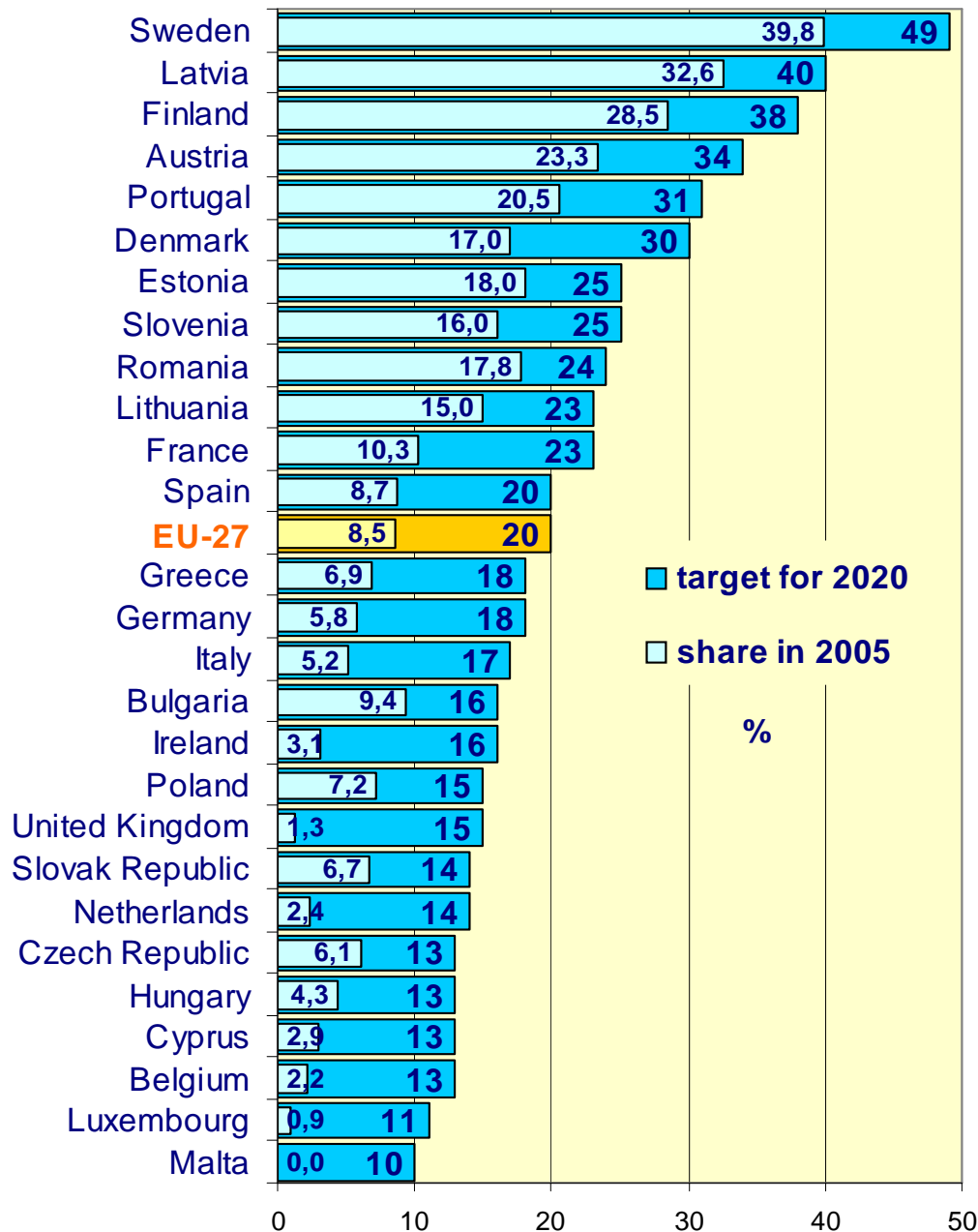
## Structure of RES electricity supply in EU member states in 2007



- Hydropower
- Wind energy
- Solid biomass
- Biogas
- Liquid biomass
- Waste
- Geothermal en.
- Photovoltaics

Sources:  
 Biomass: Eurostat [34]  
 Hydropower: Eurostat [34]  
 Wind energy: Observ'ER [46]  
 Geothermal energy: Eurostat [34]  
 Solar thermal energy: Observ'ER [35]  
 Photovoltaics: Observ'ER [82]

Source: BMU -  
Renewable  
energy sources  
in figures  
– April 2009



## Share of RES in gross final energy consumption in the EU

Source:  
EU-directive  
2009/28/EC

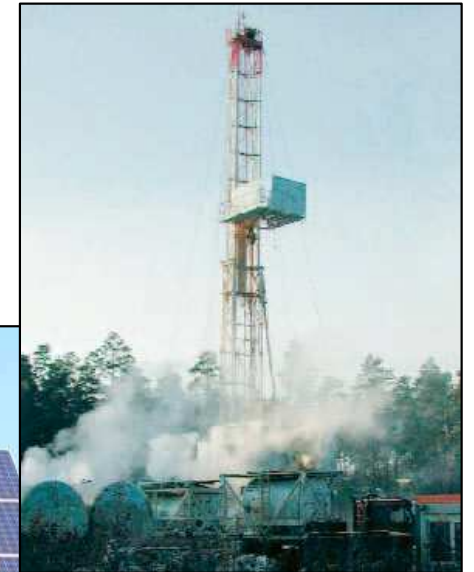
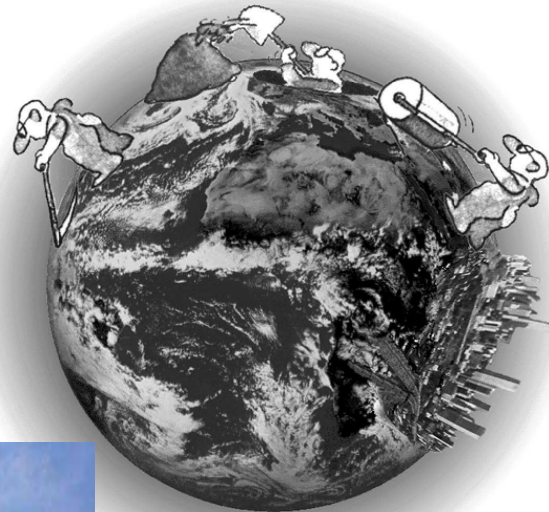
# World

Wind power



Biomass

Hydro power



Geothermal energy



Solarthermal power



Solar heating/cooling

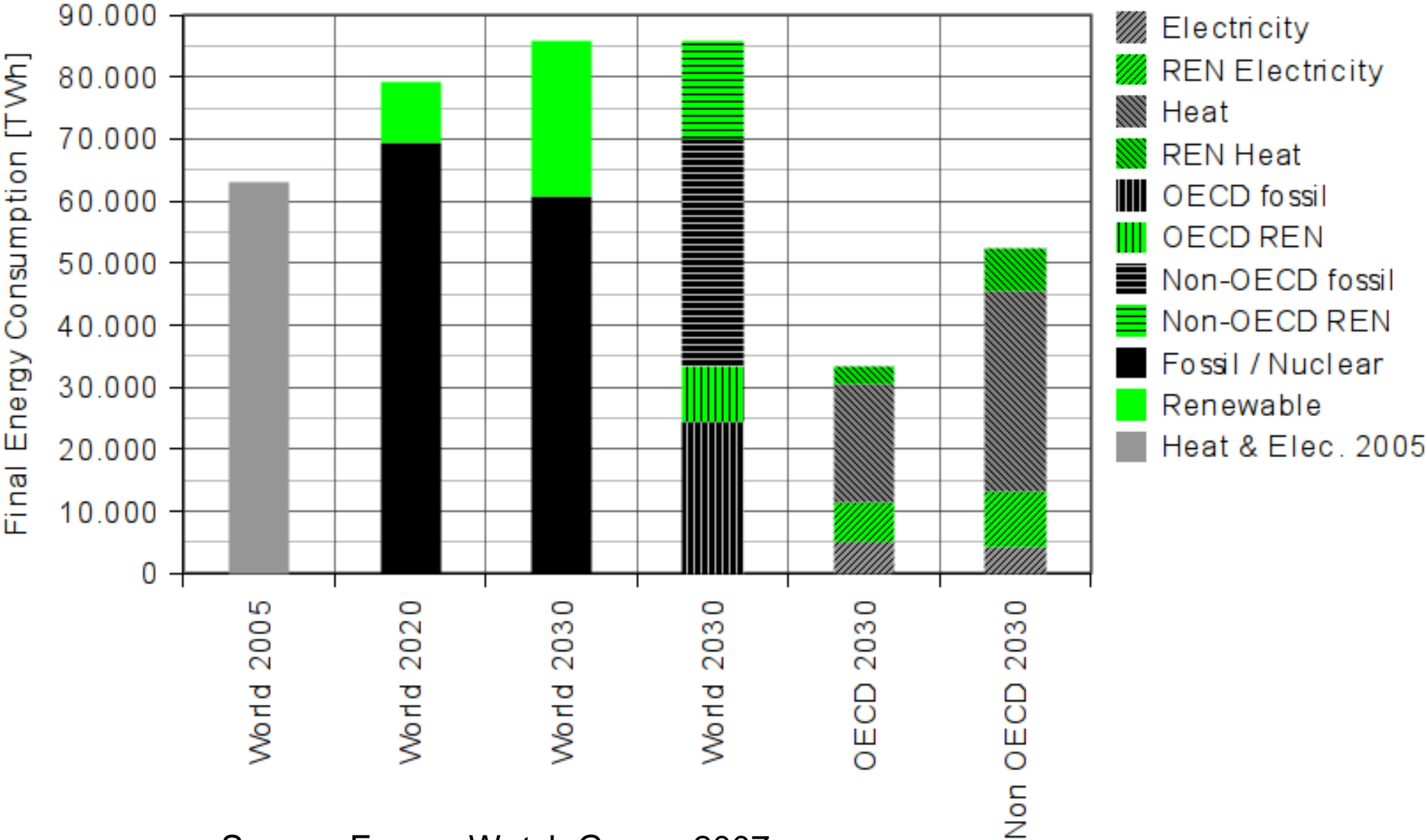


Solar Architecture



Photovoltaic

# REO 2030 - high (heat + elec)



Source: Energy Watch Group, 2007

100%

Wind power



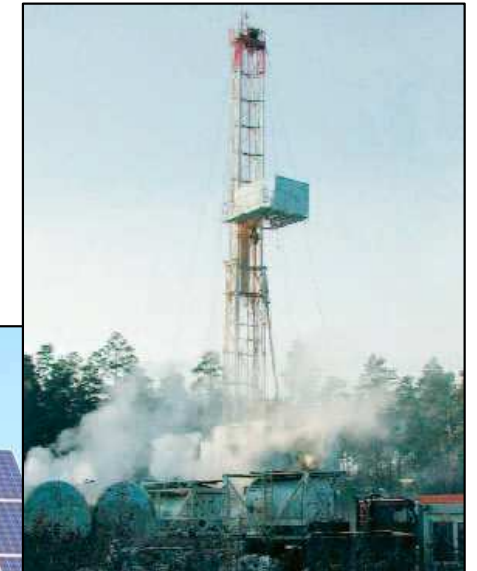
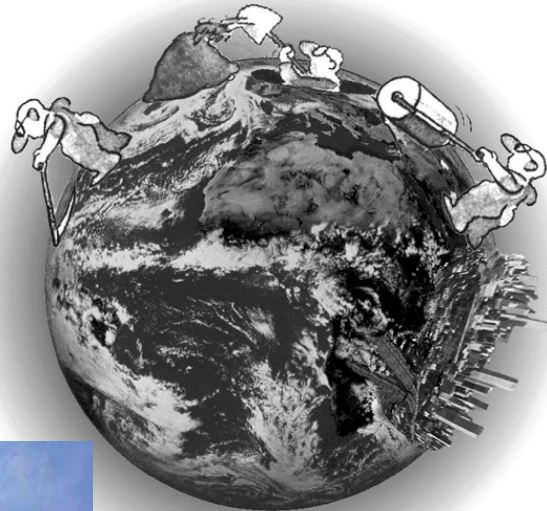
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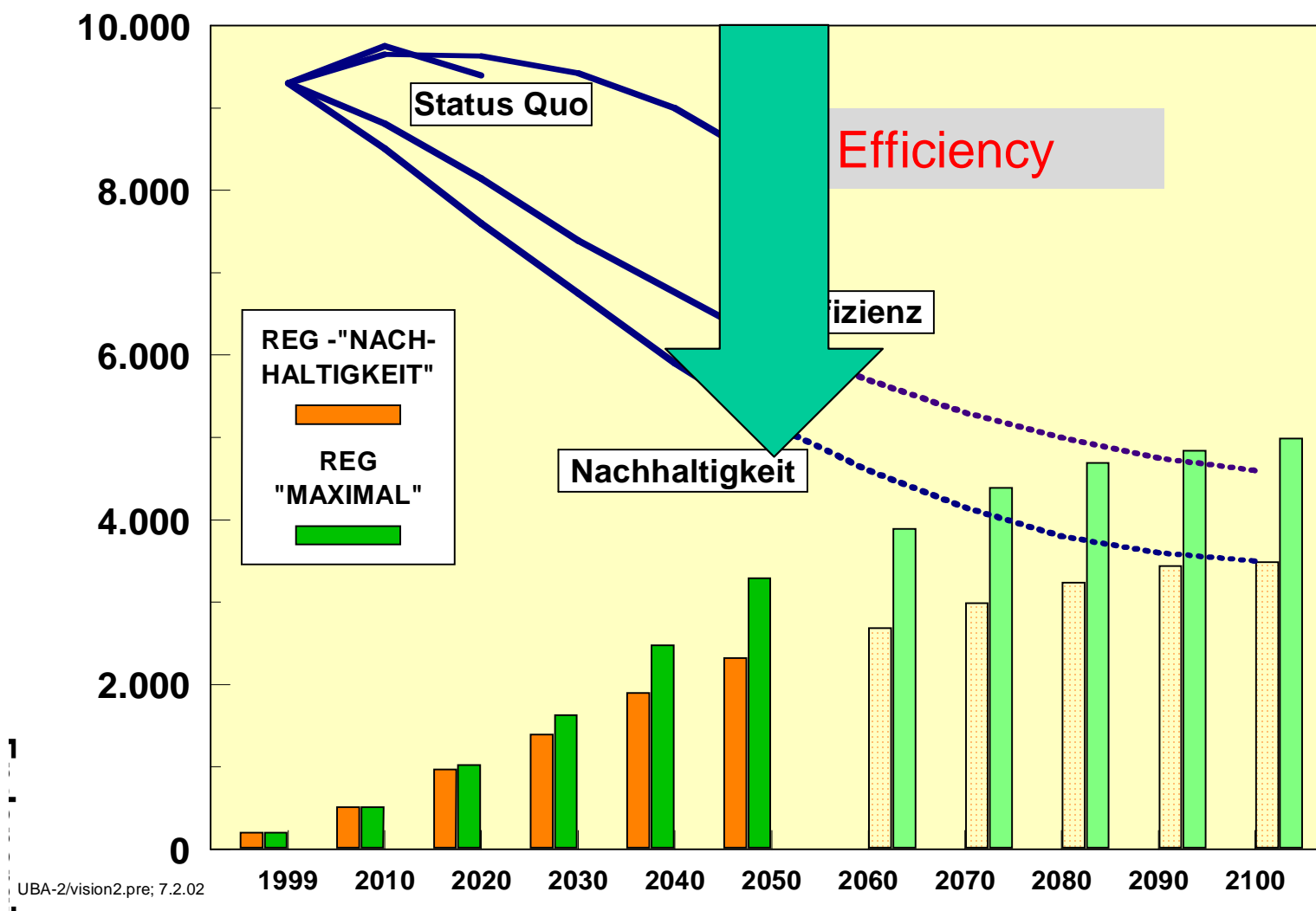


Solar Architecture

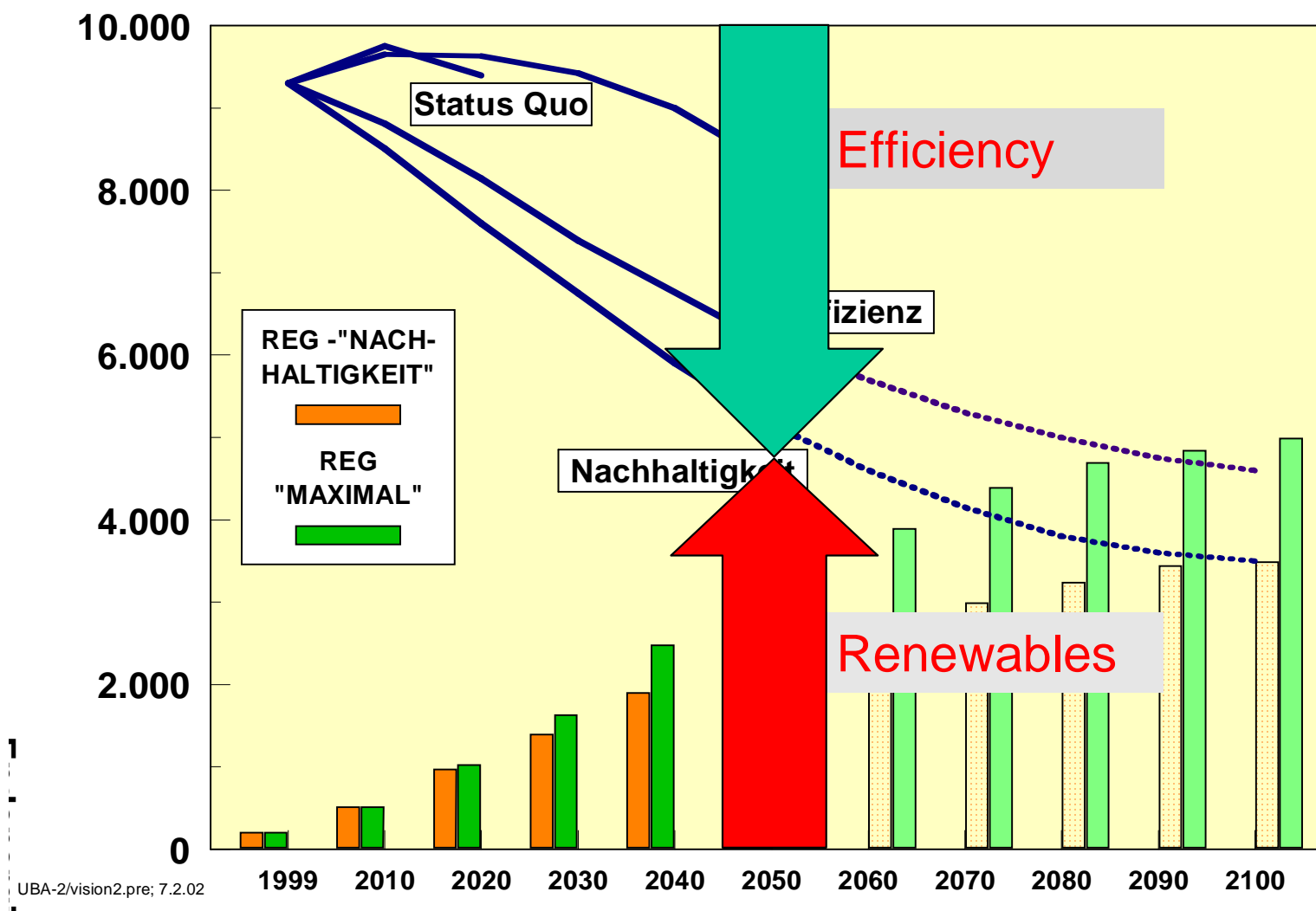


Photovoltaic

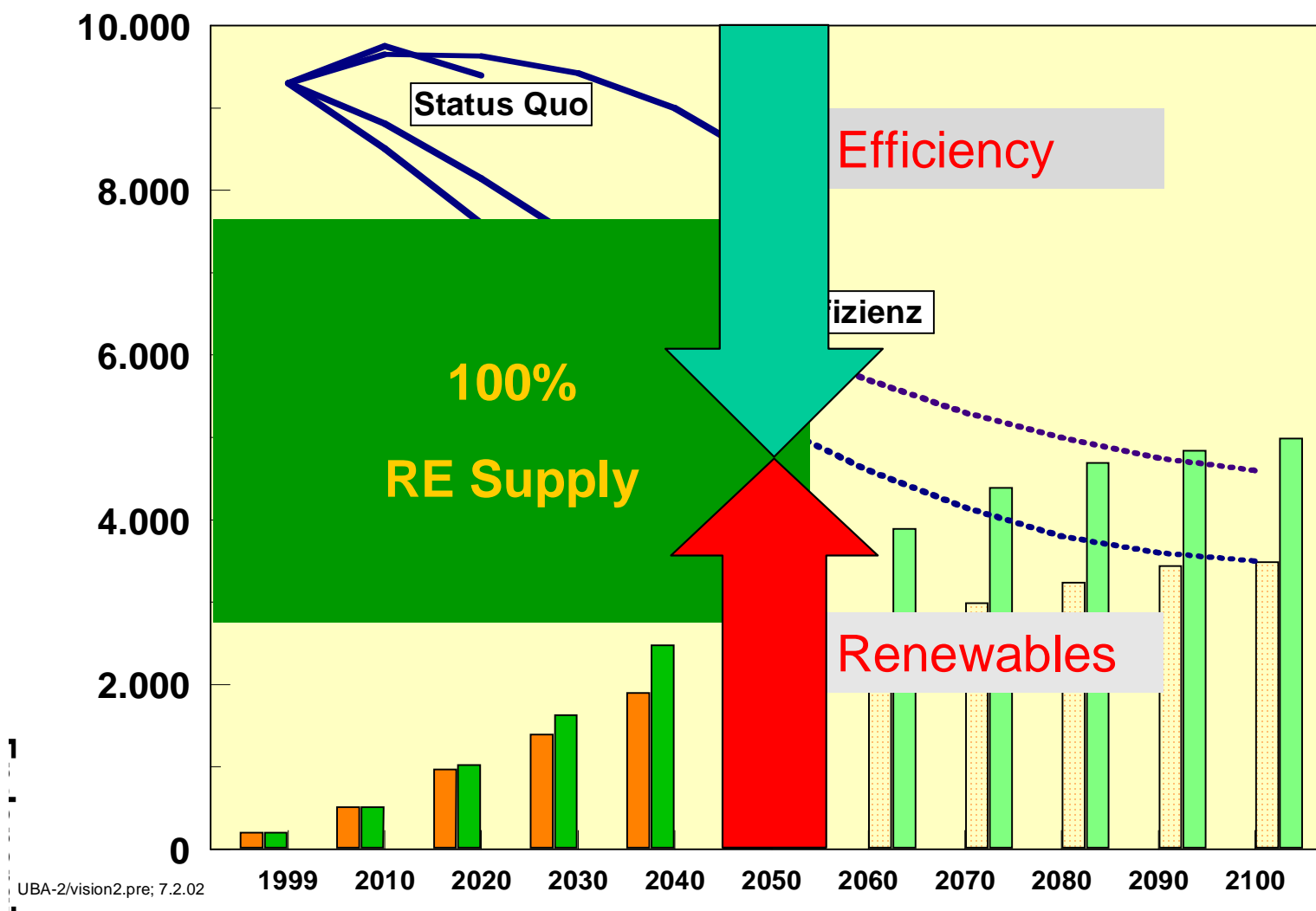
# 100% Scenarios (Germany, Japan, Catalonia etc....)



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# Win Win

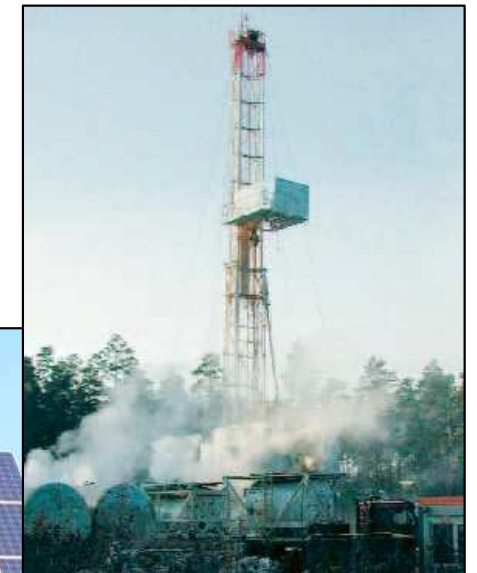
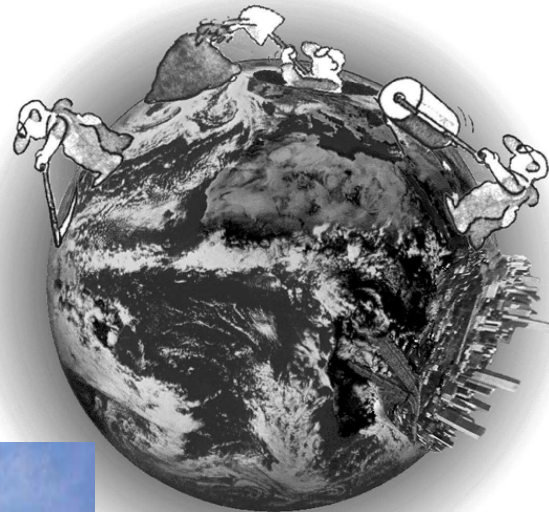
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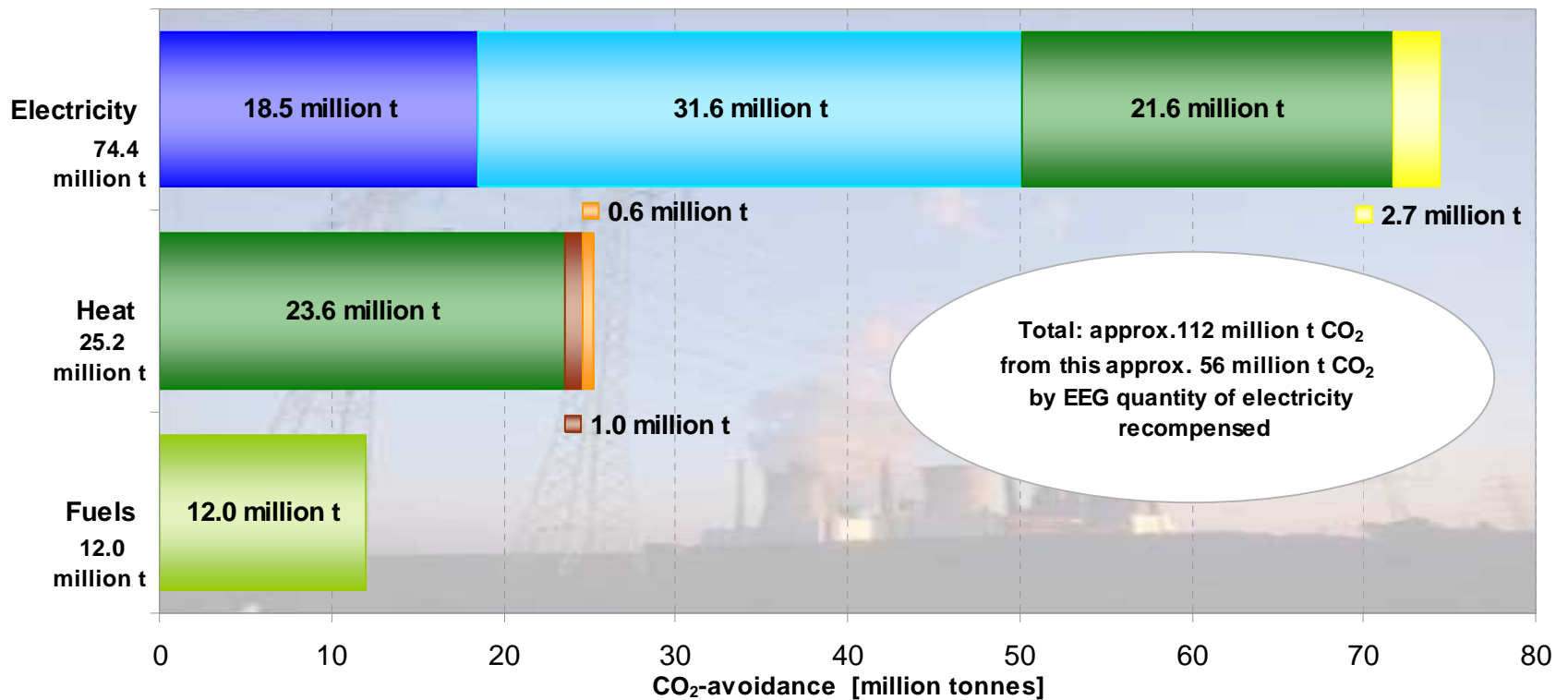
Solar Architecture



Photovoltaic

# CO<sub>2</sub> Reduction Using Renewable Energies

Total CO<sub>2</sub> avoidance via the use of renewable energy sources  
in Germany, 2008

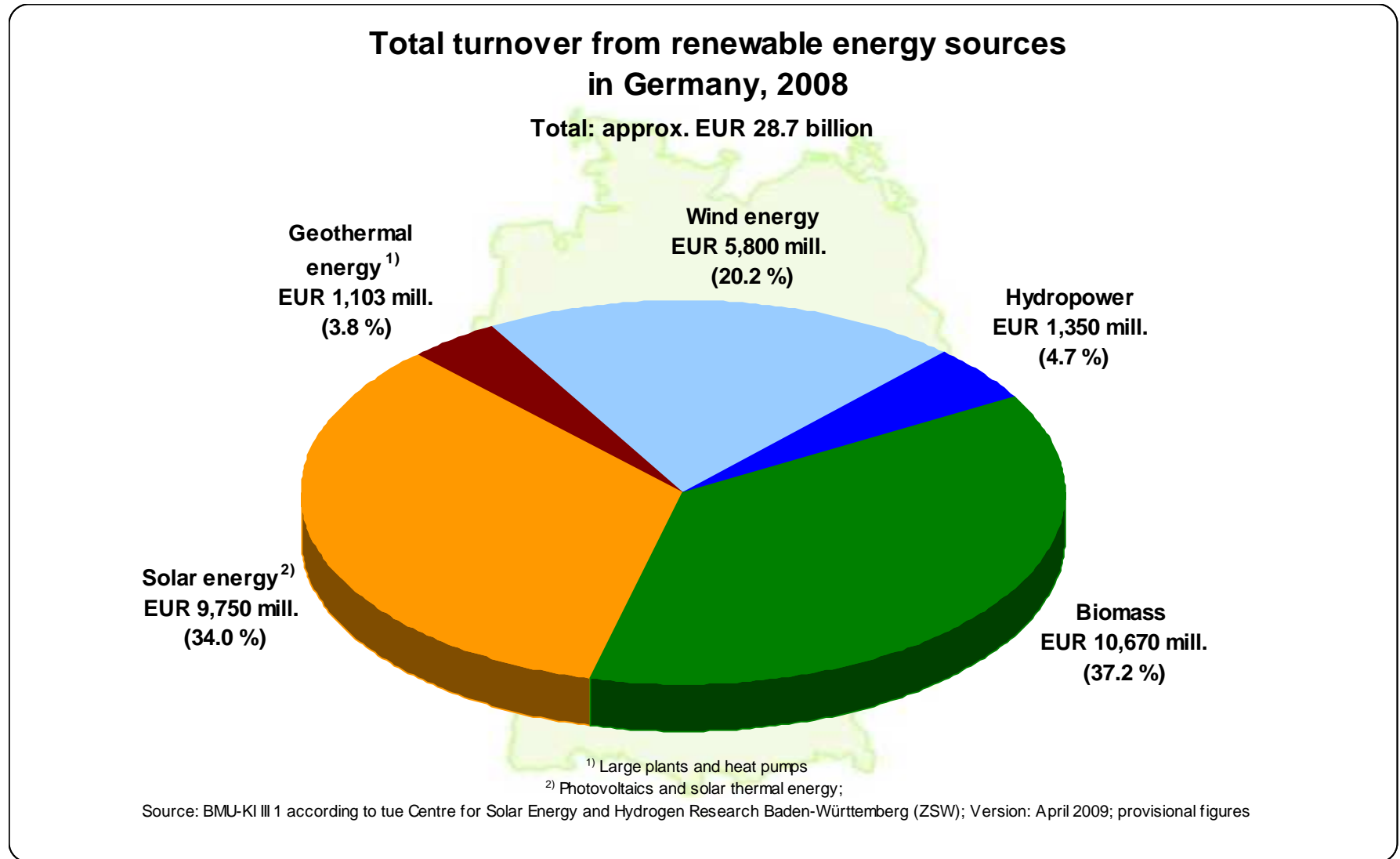


Source: BMU:  
Renewable  
energy sources  
in figures –  
April 2009

Legend: ■ Hydropower ■ Wind energy ■ Biomass ■ Photovoltaics ■ Geothermal energy ■ Solar thermal energy ■ Biofuels

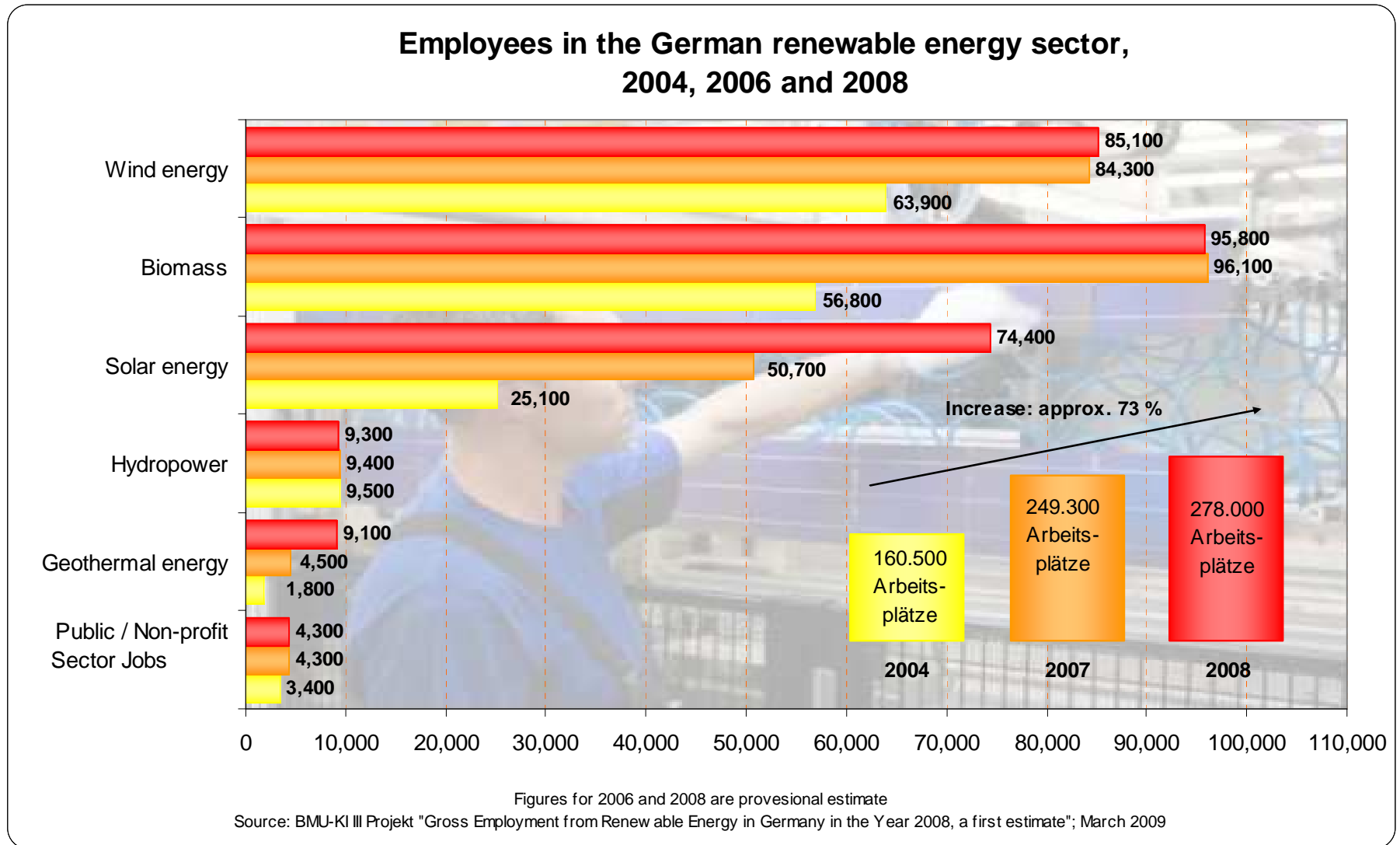
Source: BMU-KI III 1 according to Working Group on Renewable Energies / Statistics (AGEE-Stat); Version: April 2009; all figures provisional

## Total turnover from renewable energy sources



Source: BMU:  
Renewable  
energy sources  
in figures –  
April 2009

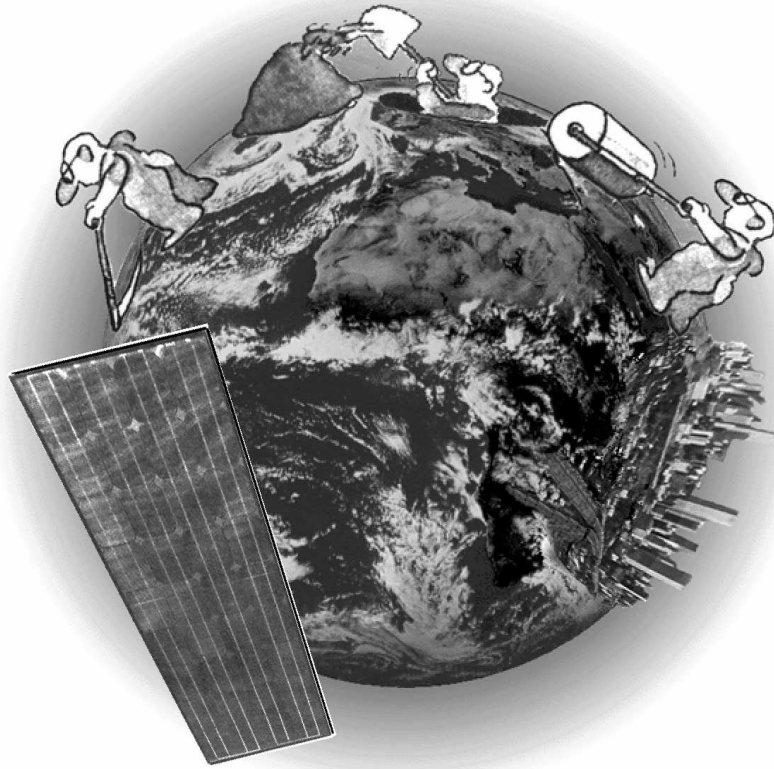
# Employment related to Renewable Energy use



Source: BMU:  
Renewable  
energy sources  
in figures –  
April 2009

# Renewable Energy Supply is possible !

Up to 100%



Lets do it !

Source: Harry Lehmann, 1994

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