# „CLEAN COAL TECHNOLOGIES“

Geoscience Information for Teachers

„Energy and Sustainable Developement“
Vienna, May 2, 2010

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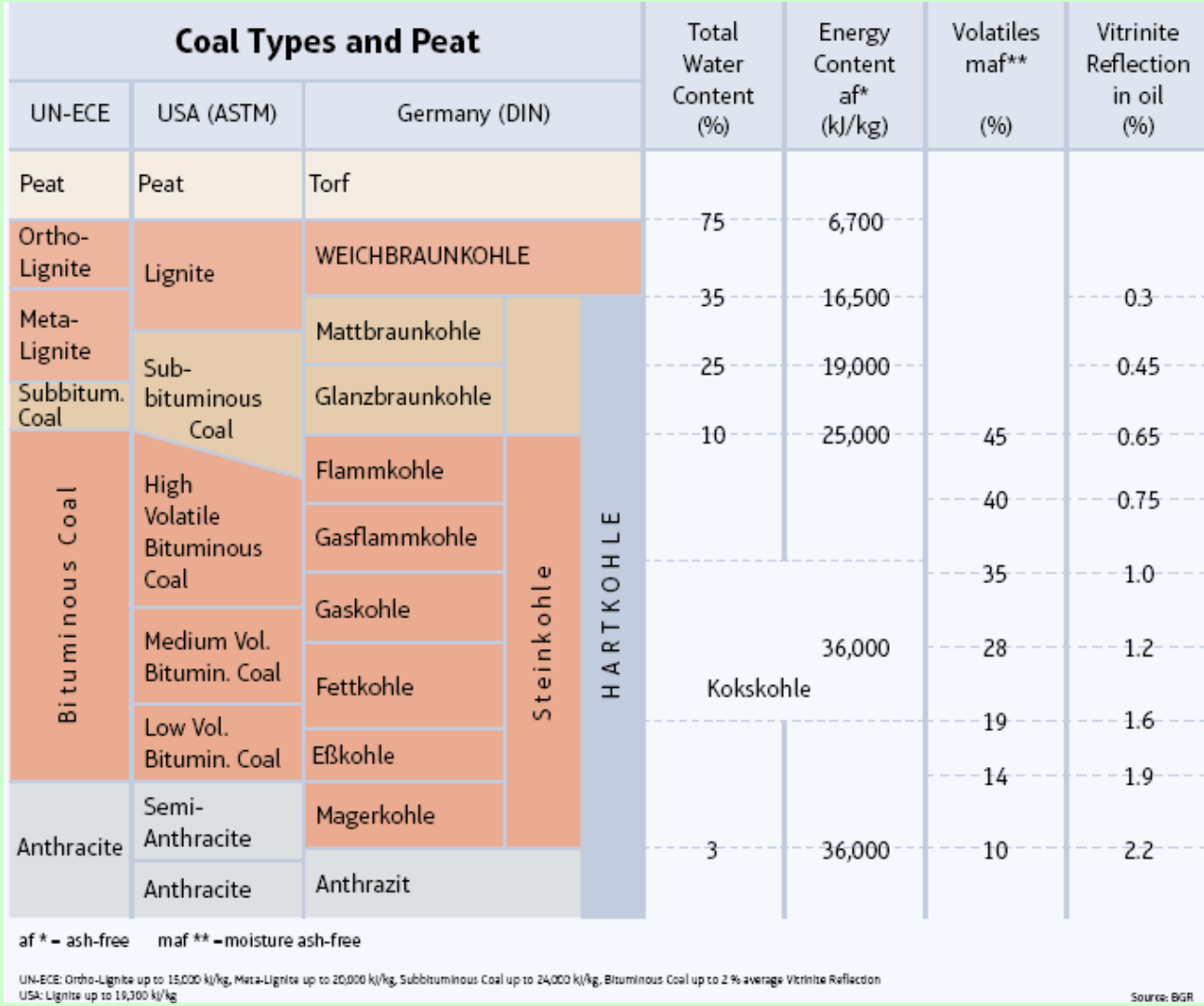
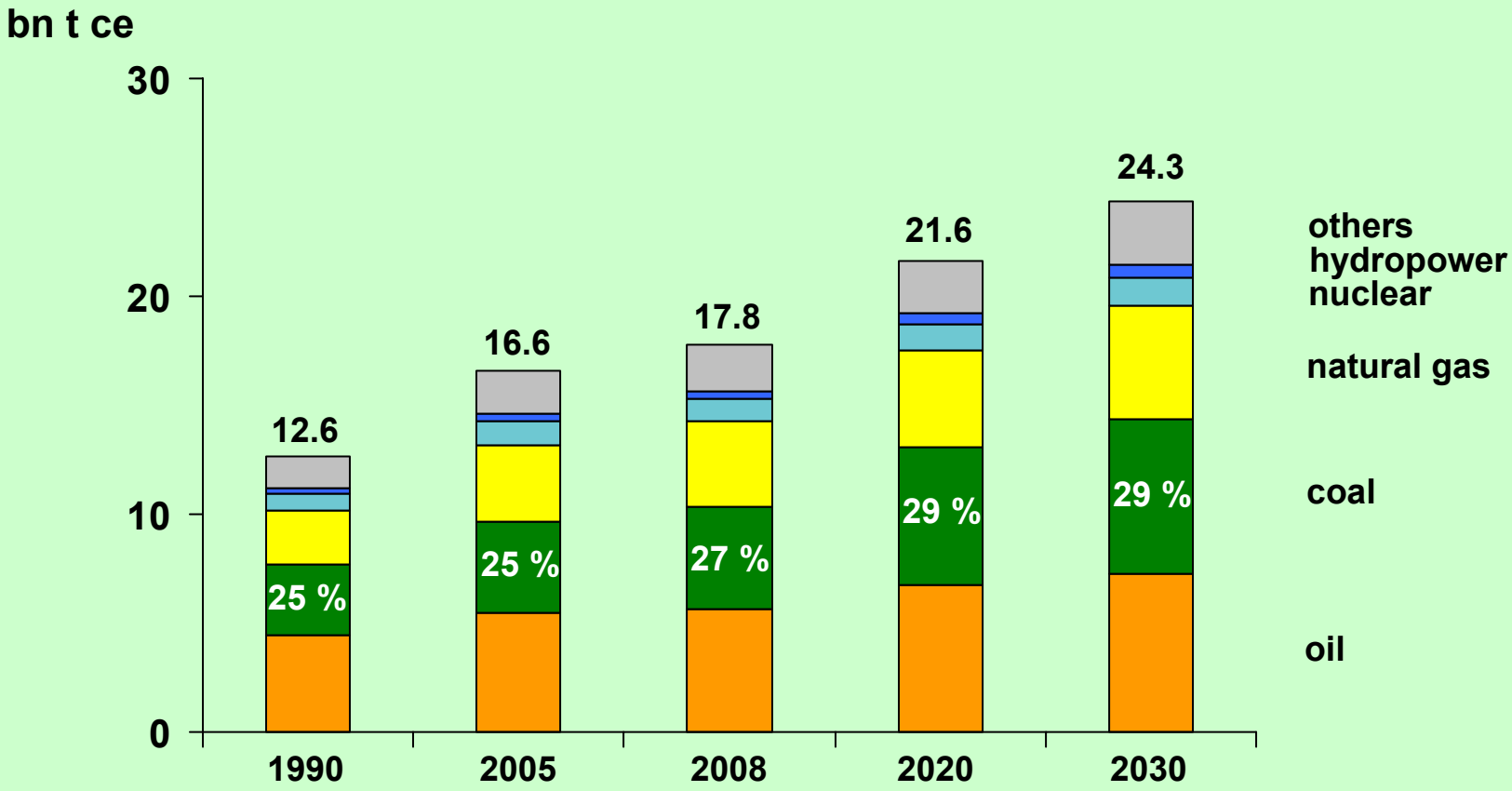
Herne, Germany

# Coal Classifications




EURACOAL; BGR

# World energy consumption




Source: BP Statistical Review of World Energy 2009 / World Energy Outlook 2009, IEA
Forecast: IEA reference scenario based on 2006 data

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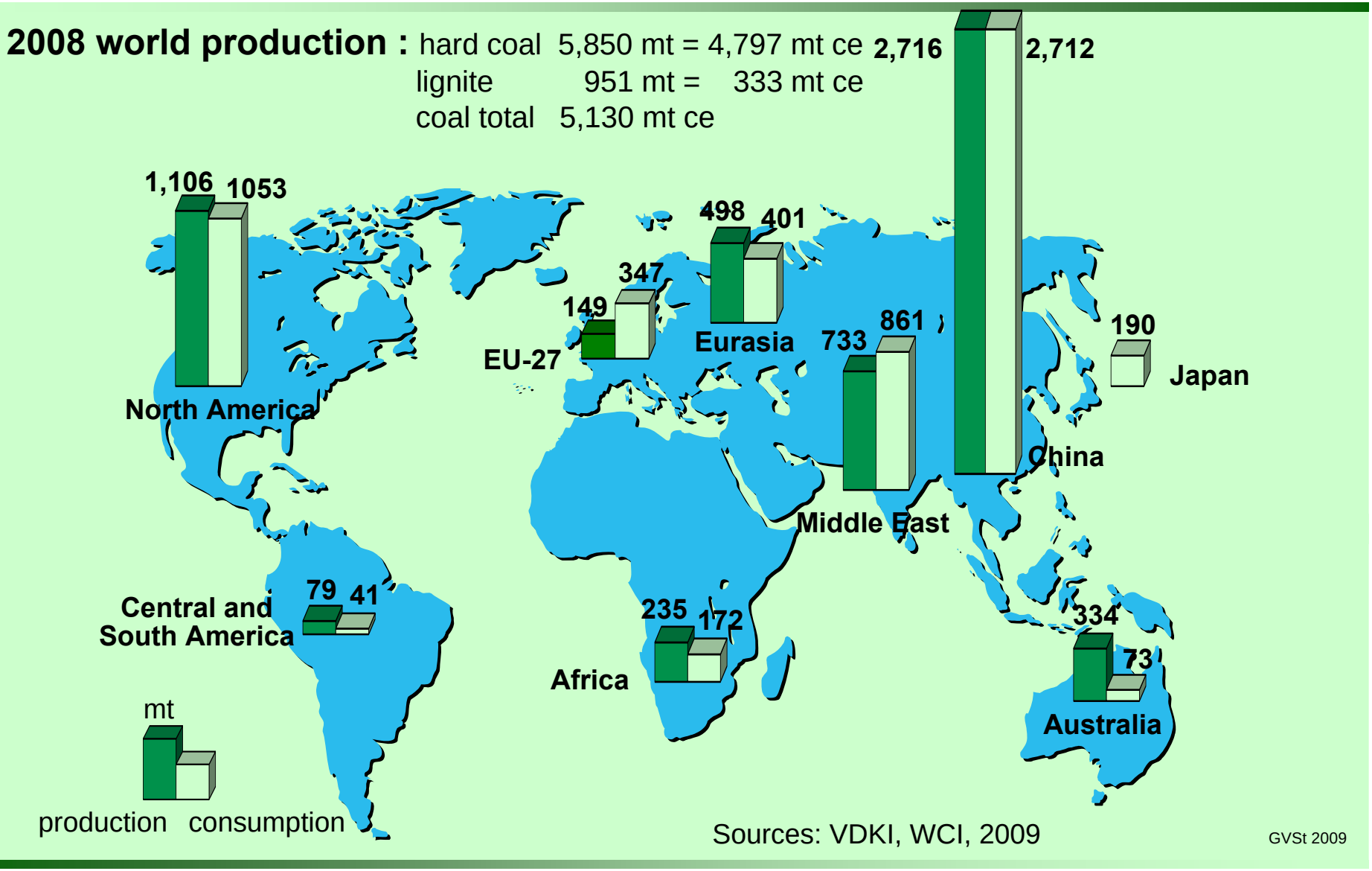
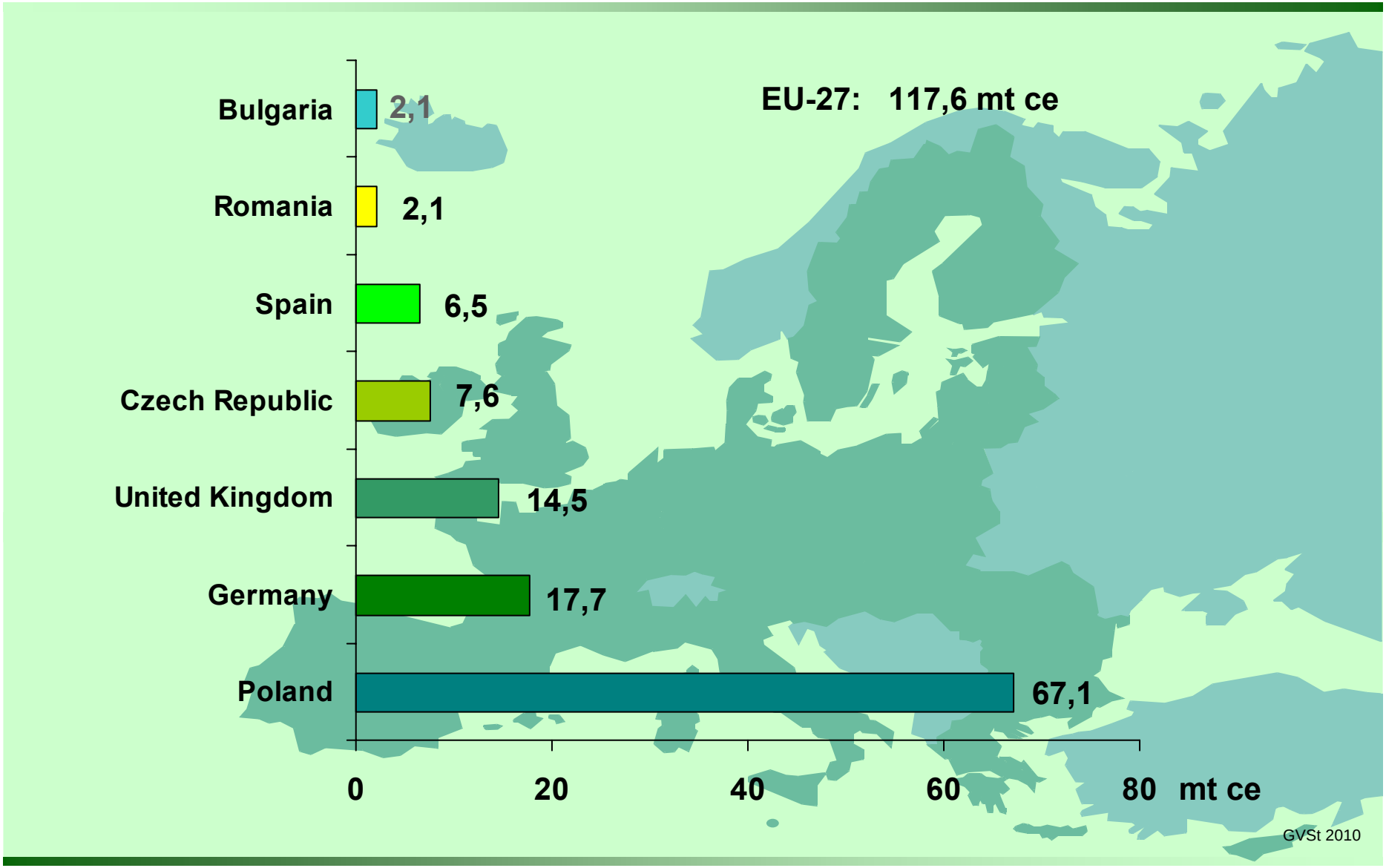
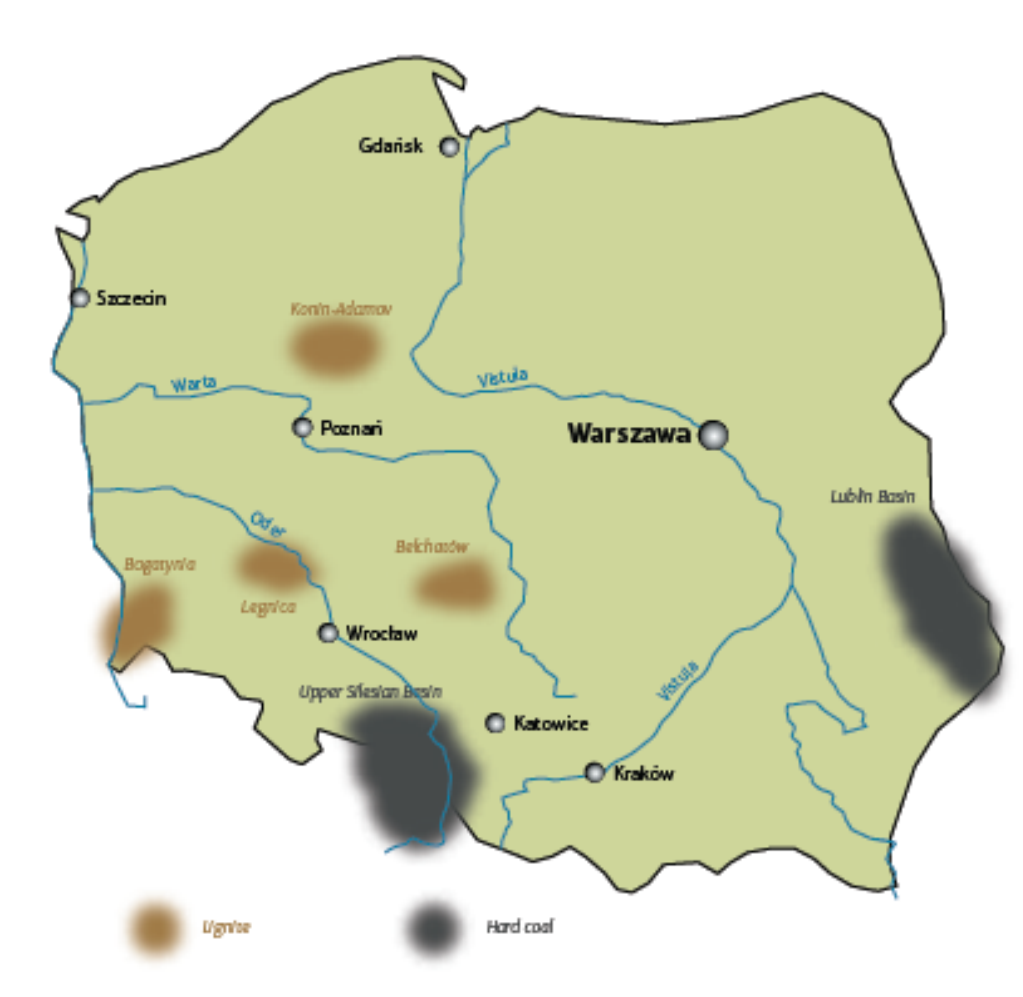
# World coal production and consumption



# Coal production EU-27 in 2008



# Poland




**in 2008:**

| Domestic output | |
|---|---|
| Coal | 67,1 mt ce |
| Lignite | 59,8 mt |
| Coal export | 8,3 mt |

EURACOAL 2008

# Germany


**in 2008:**

**Domestic output**

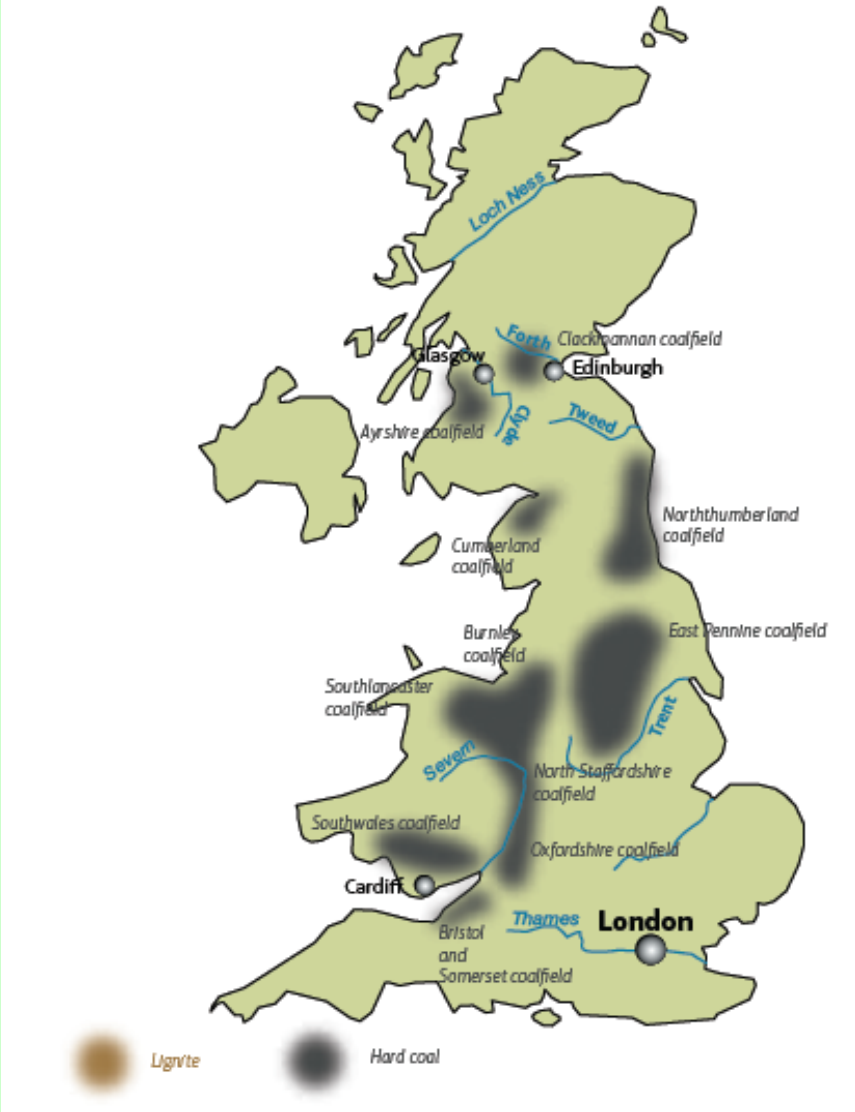
**Coal 17,7 mt ce**
**Lignite 169,9 mt**

**Prim. Energy Consumtion**

**Coal 61,4 mt ce**
**Lignite 53,0 mt ce**

EURACOAL 2008

# United Kingdom

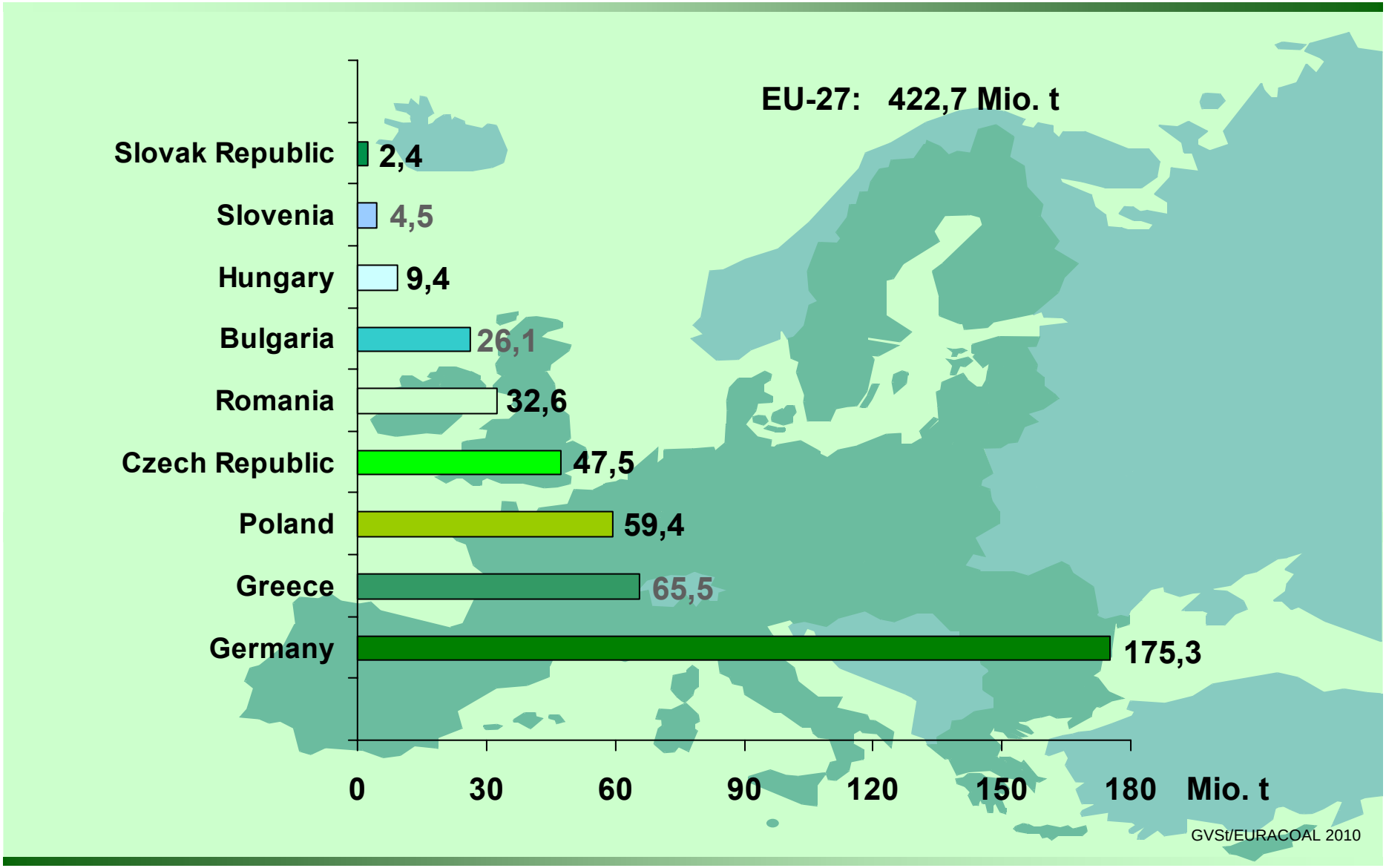



**in 2008:**

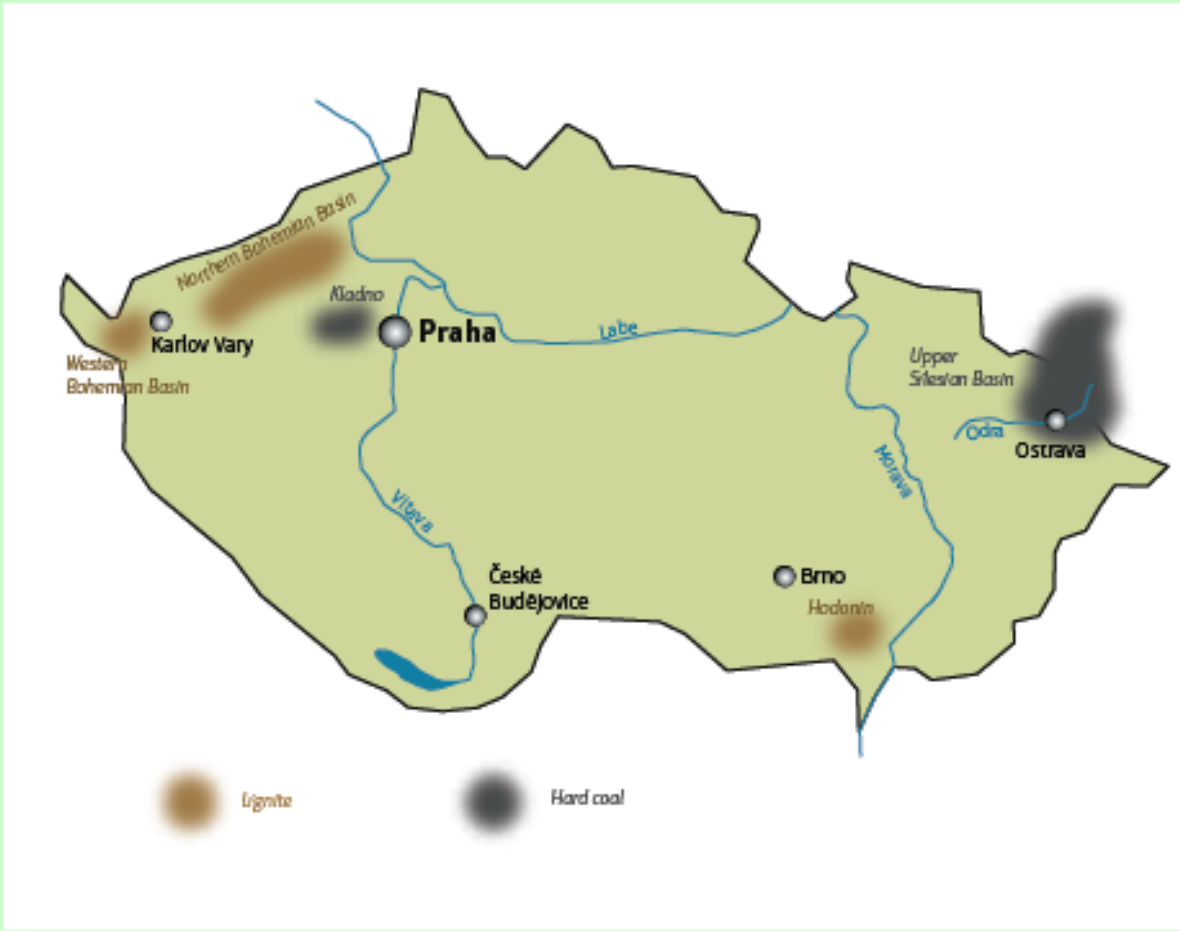
| | |
|---|---|
| **Domestic output** | |
| **Coal** | **14,5 mt ce** |
| **Imports** | **42,8 mt** |

EURACOAL 2008

# Lignite production EU-27 in 2008



# Czech Republic

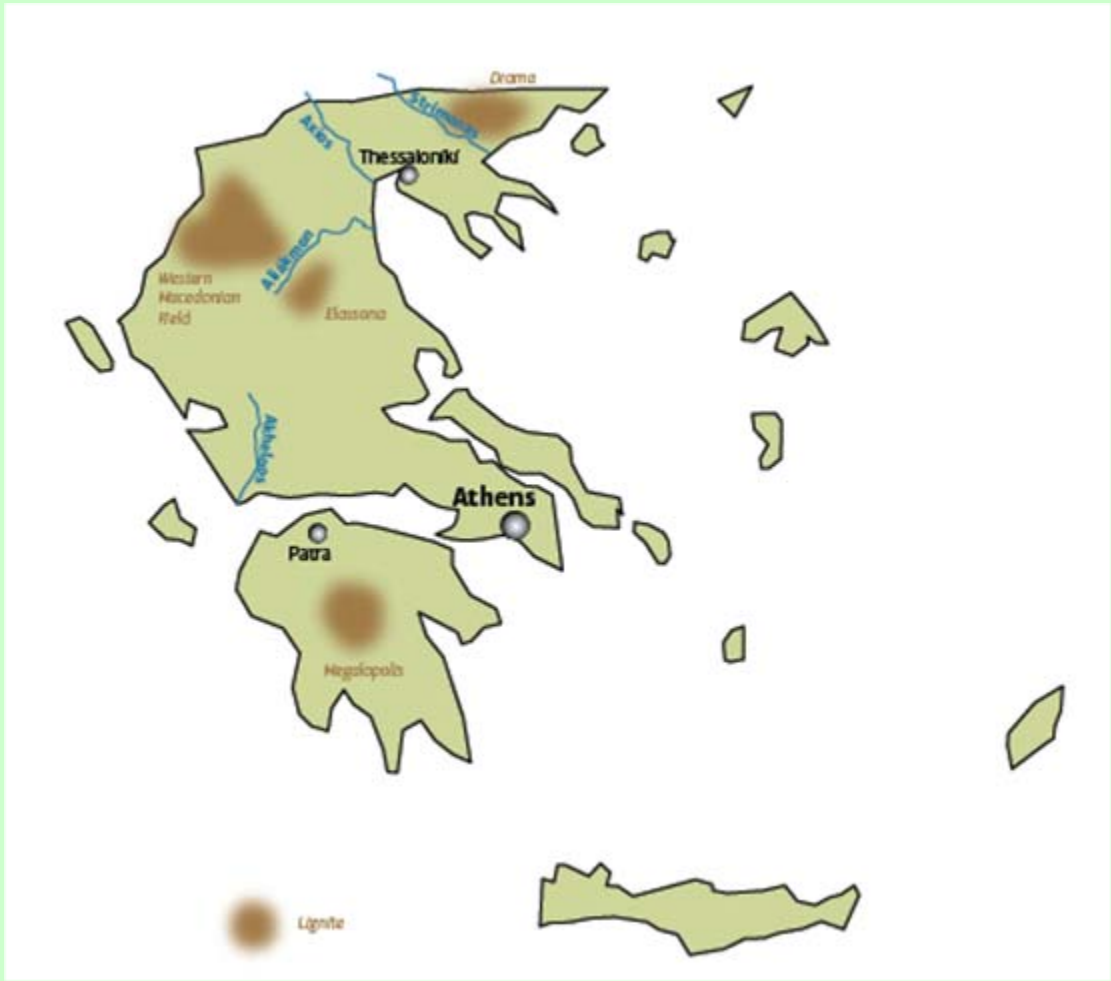



**in 2008:**

| **Domestic output** | |
|---|---|
| **Coal** | **7,6 mt ce** |
| **Lignite** | **47,5 mt** |

EURACOAL 2008

# Greece



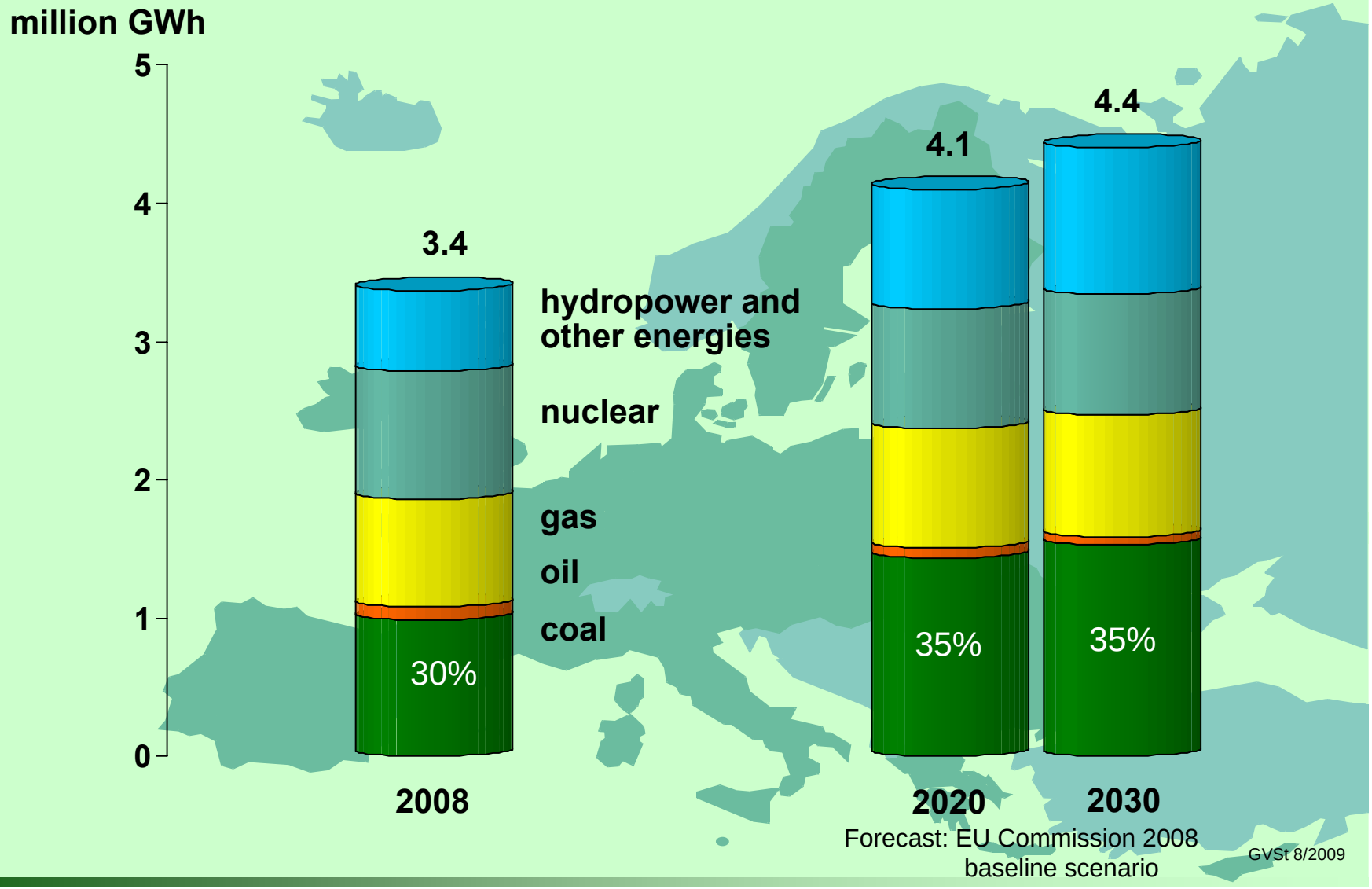

**in 2008:**

**Domestic output**

**Lignite 47,5 mt**

EURACOAL 2008

# Electricity generation in EU-27




Forecast: EU Commission 2008 baseline scenario

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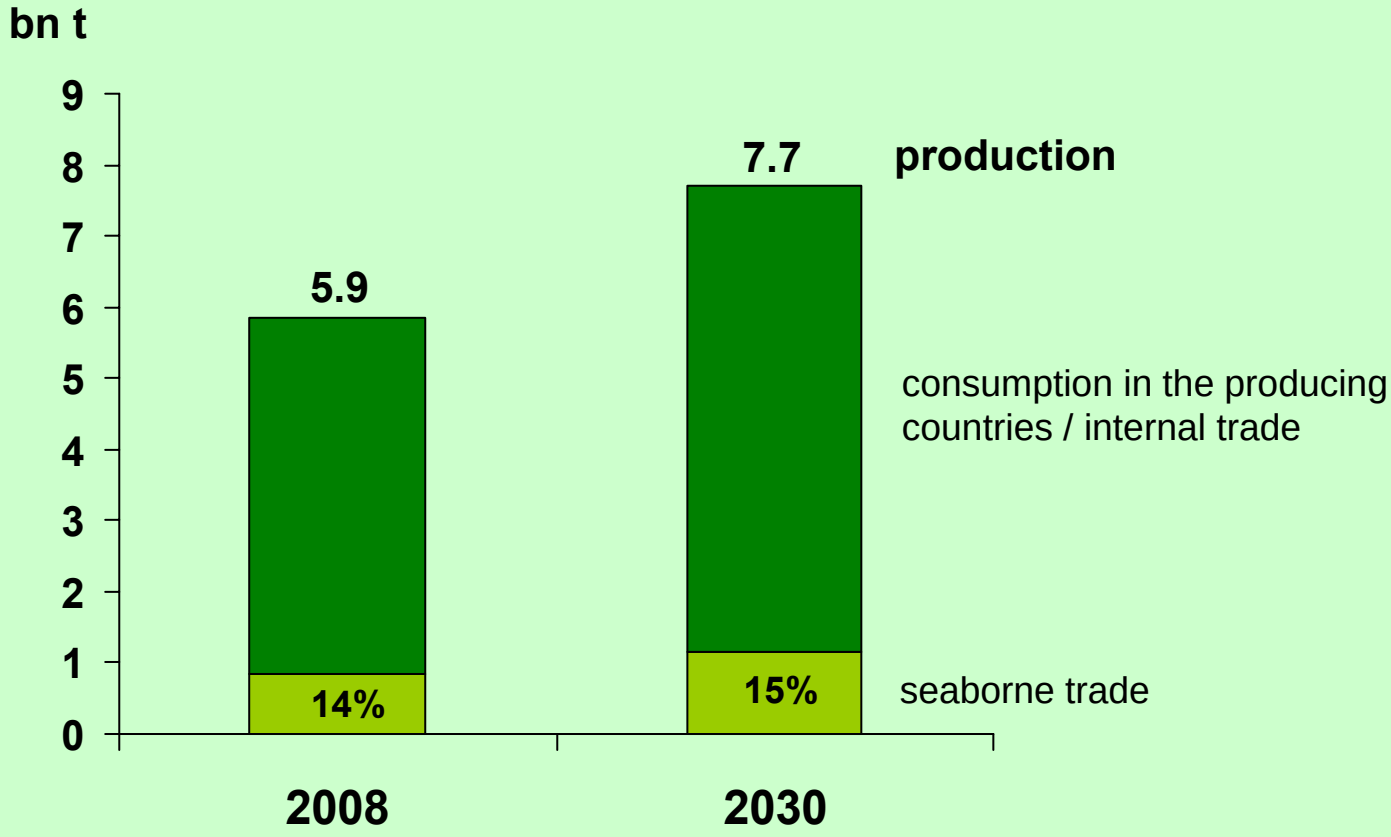
# Intensity of global coal trade




Sources: BP, VDKI, DOE; 2009

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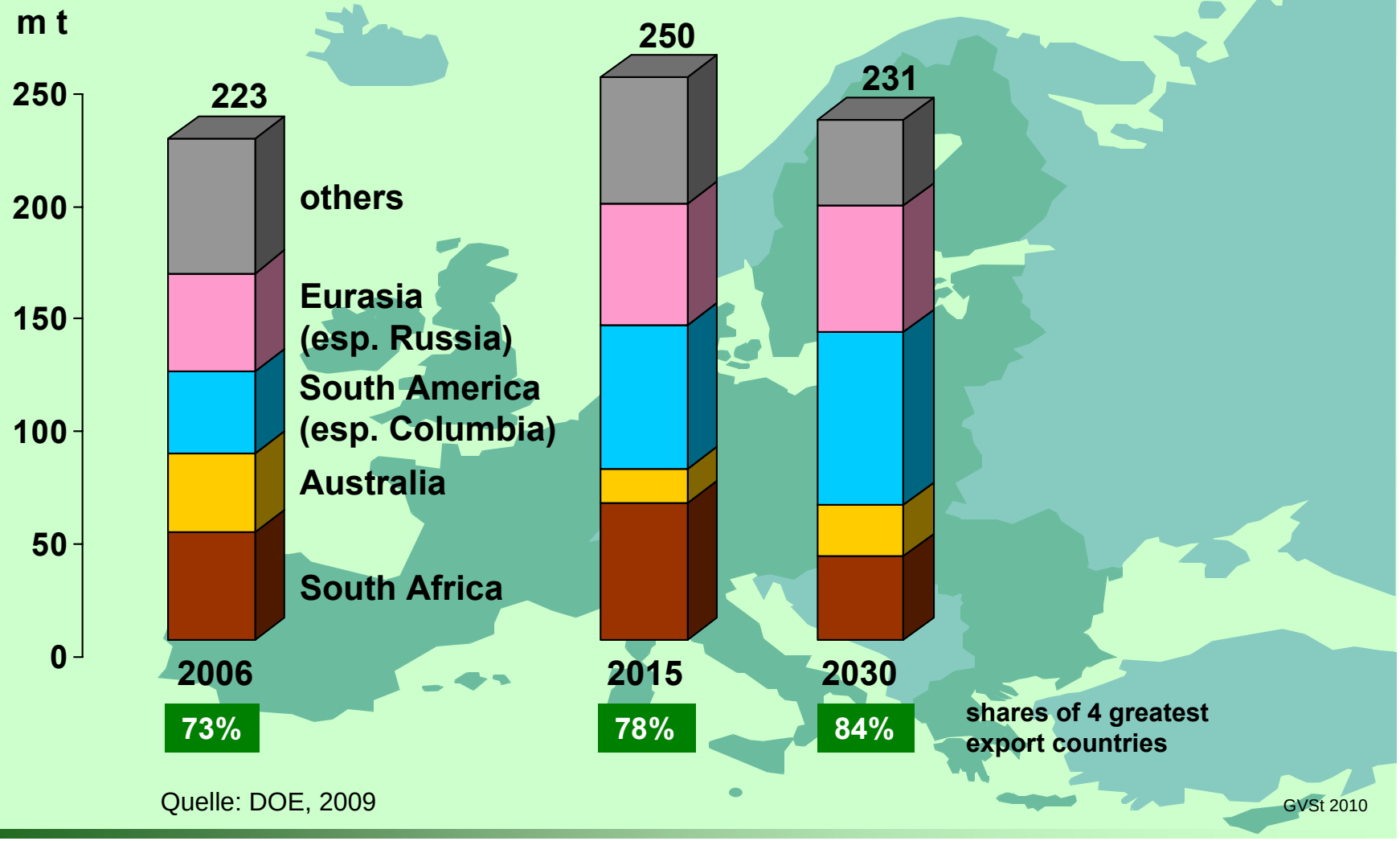
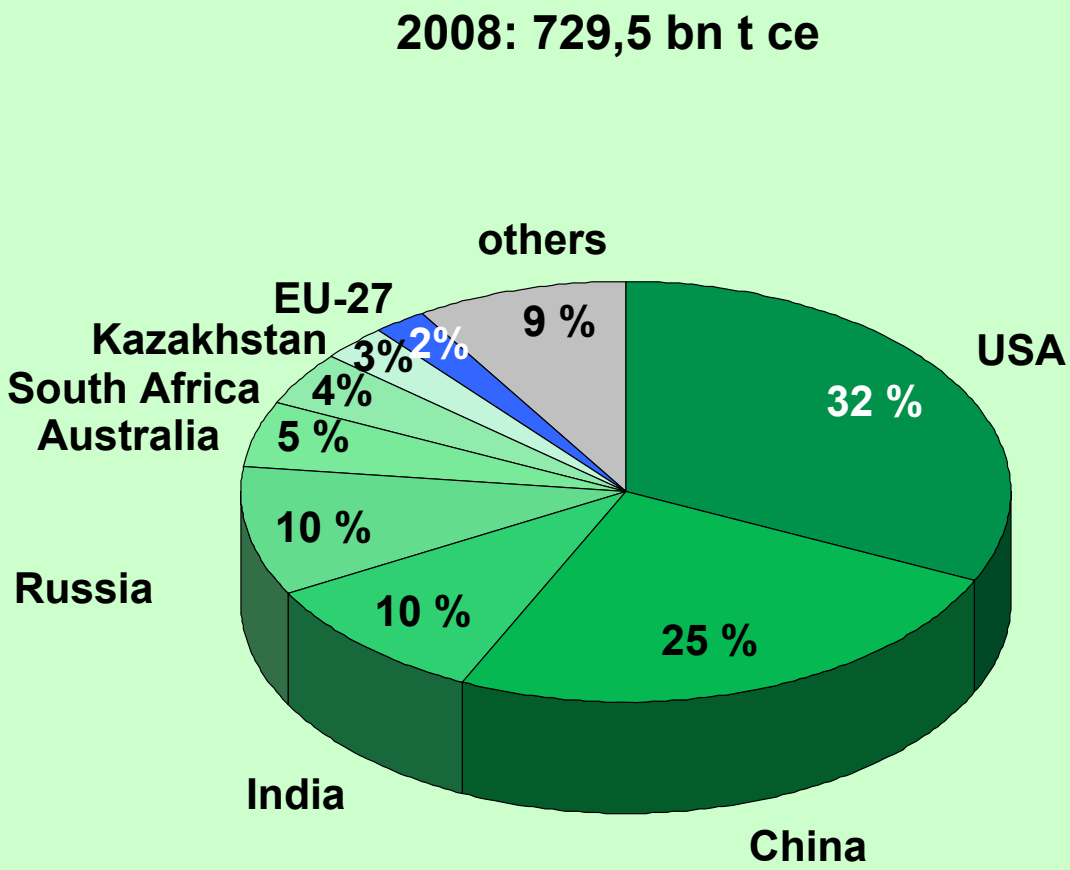
# Coal imports to EU-27




Quelle: DOE, 2009

# World coal reserves




Quelle: BGR, 2009

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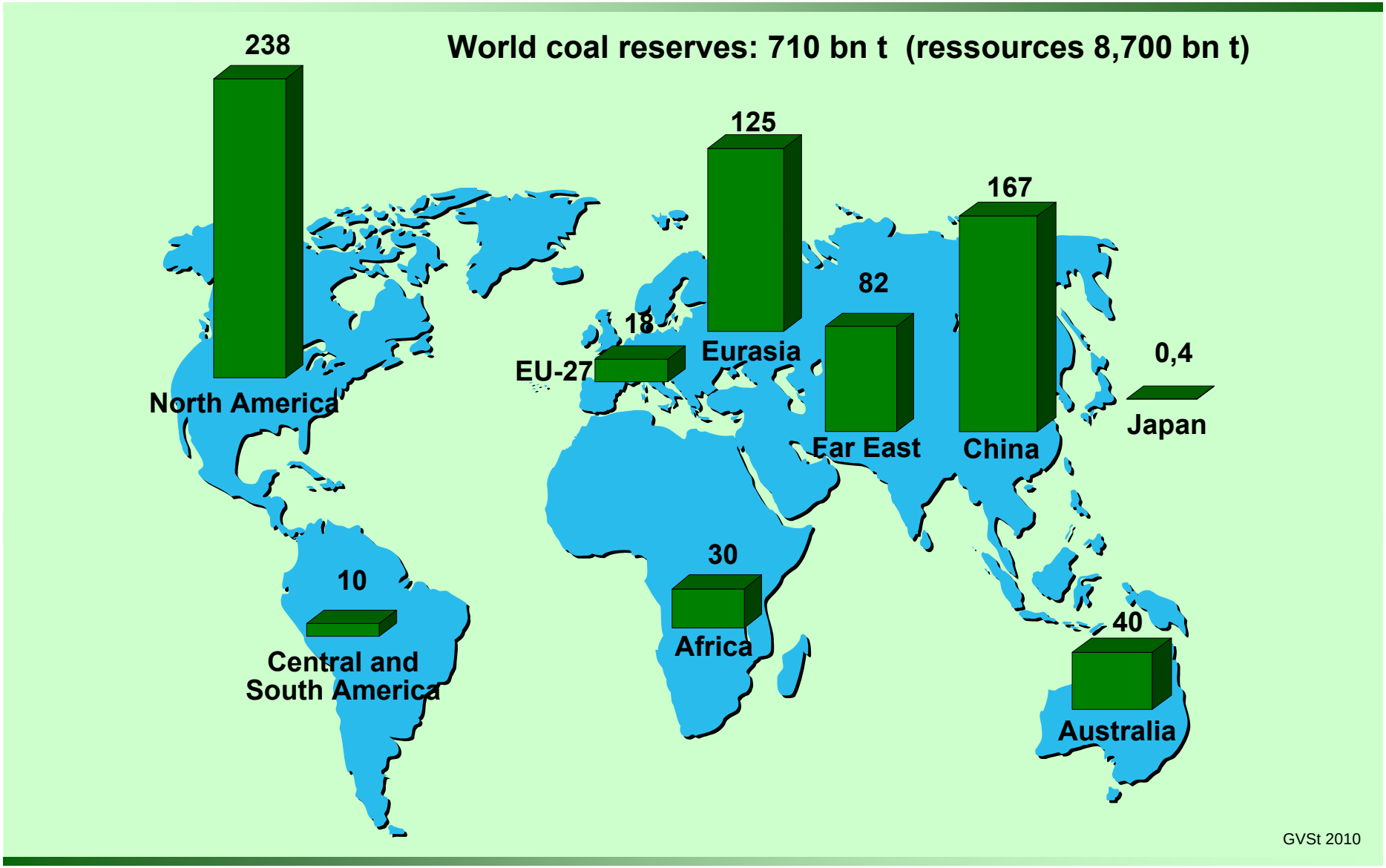
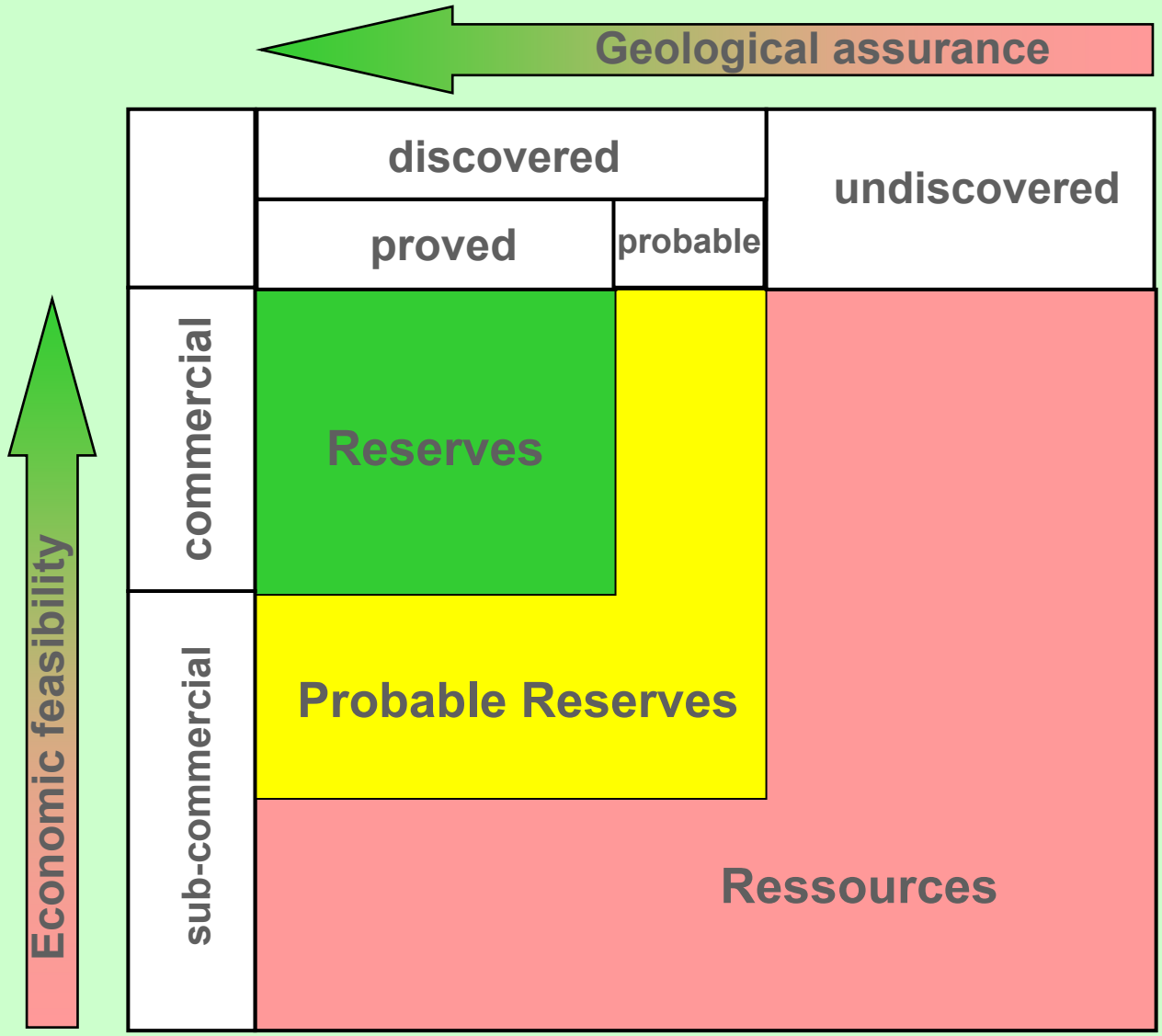
# World coal reserves



# Methods of reserve and ressource classification




McKelvey Diagramm
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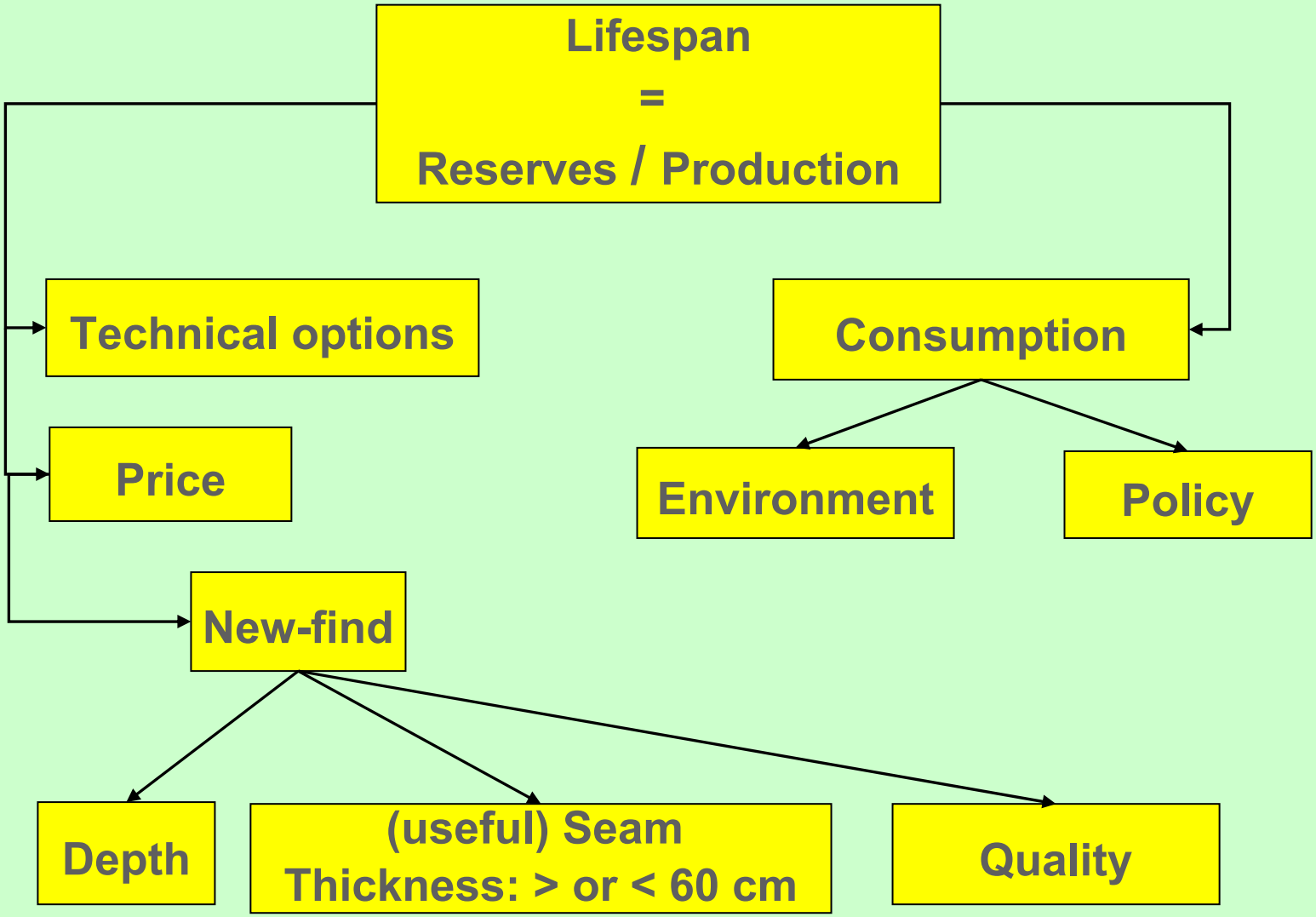
# Lifespan of reserves



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## Three stages of Clean Coal:

### Clean Coal I

Retrofit and new-build in line with
state-of-the-art technology,
increase in efficiency,
reduction of $SO_2$, $NO_x$ and dust

### Clean Coal II

$CO_2$ Capture
and Storage (CCS)

### Clean Coal III

Research and development
to increase efficiency to > 50 %

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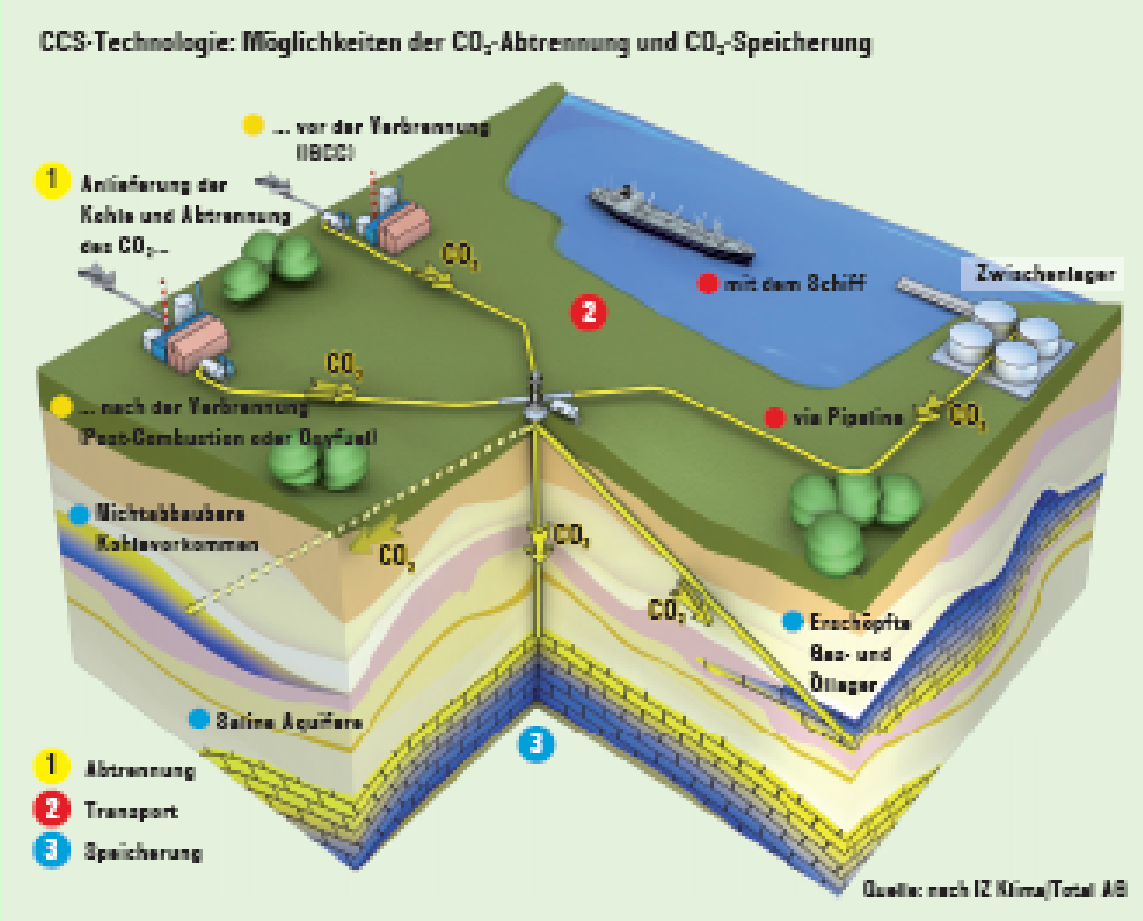
# Capture and storage of $CO_2$

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# $CO_2$ capture technologies

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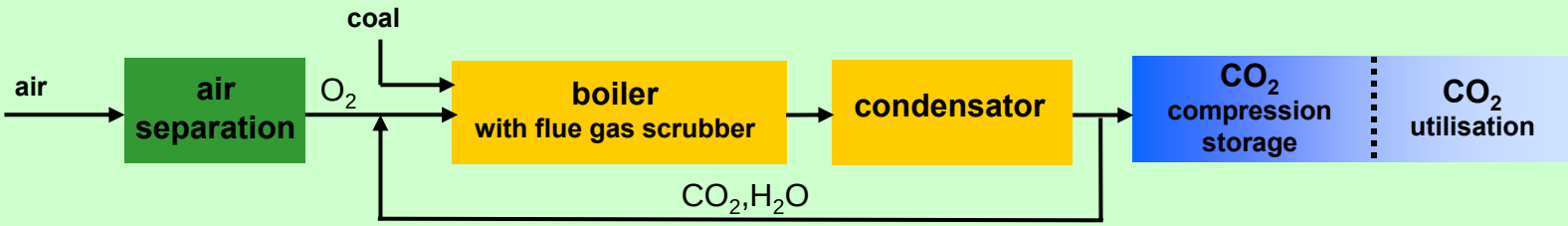
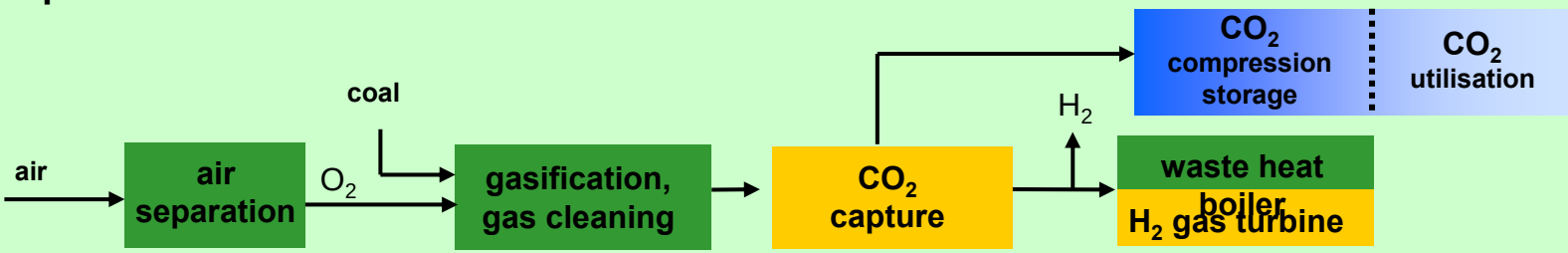
**conventional power plant with "end-of-pipe“ technology:**


**oxyfuel process:**




**IGCC process*:**



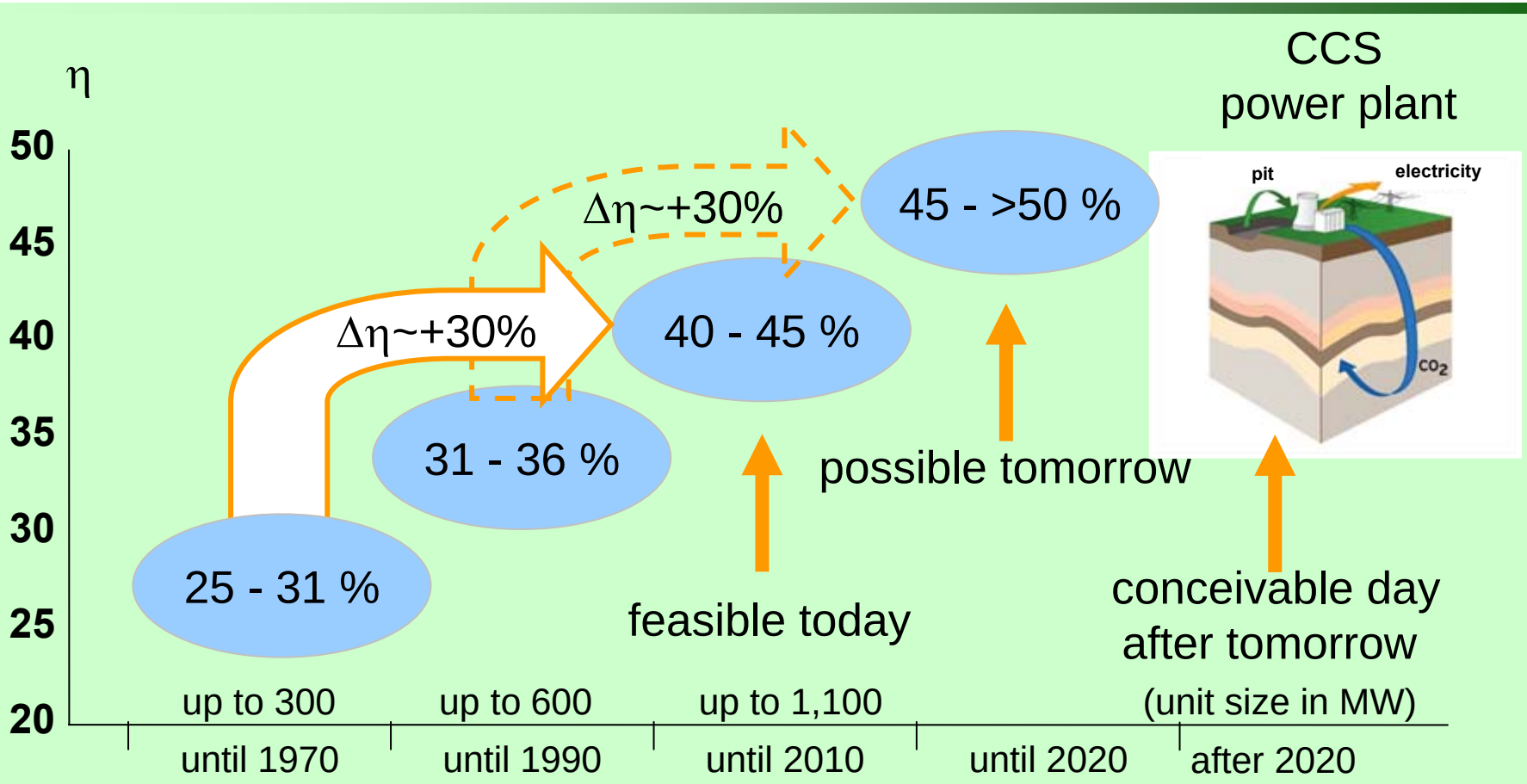

established technology

process stages to be developed

* IGCC: Integrated Coal Gasification Combined Cycle

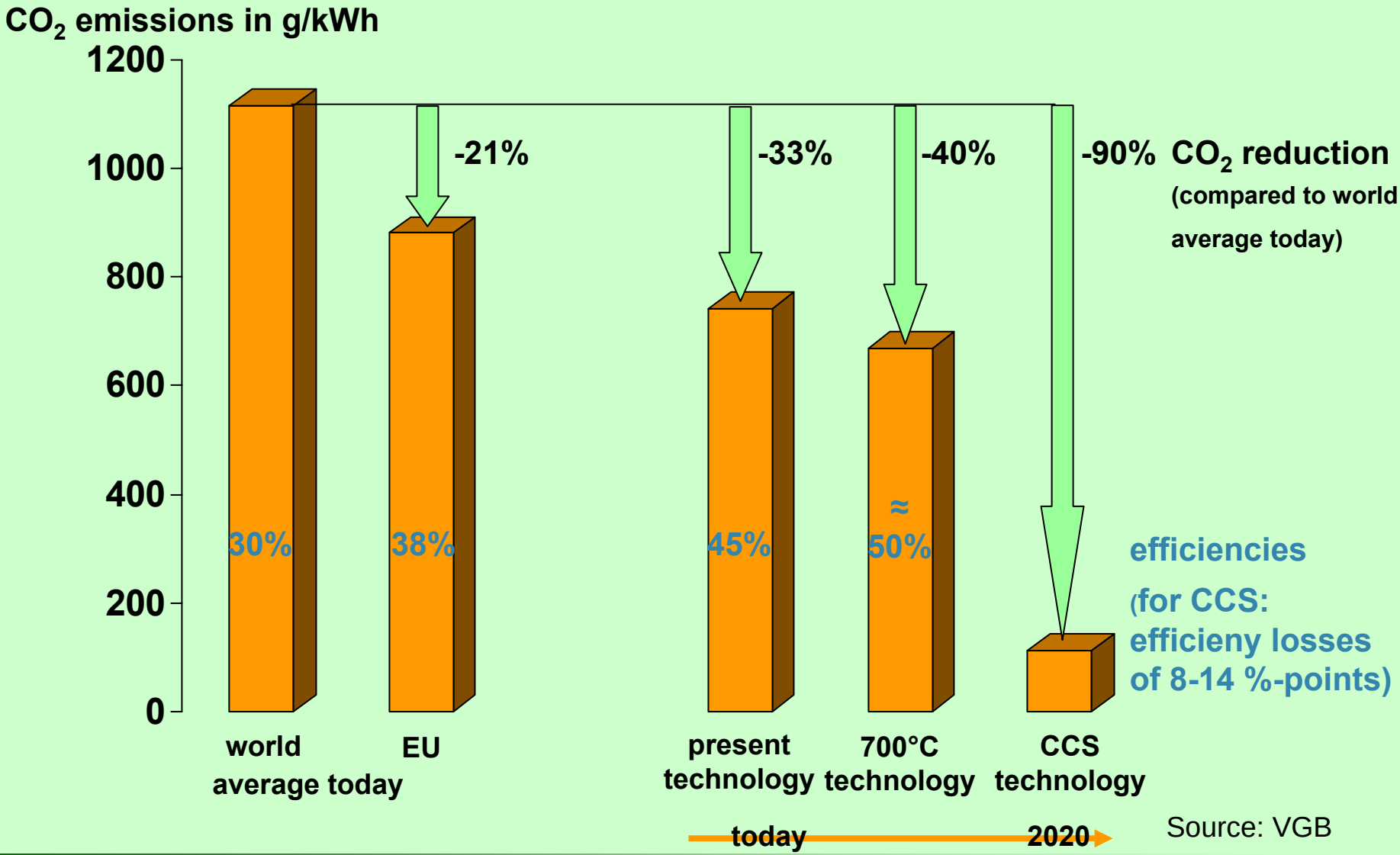
Source: Euracoal

# Modernization and increased efficiencies

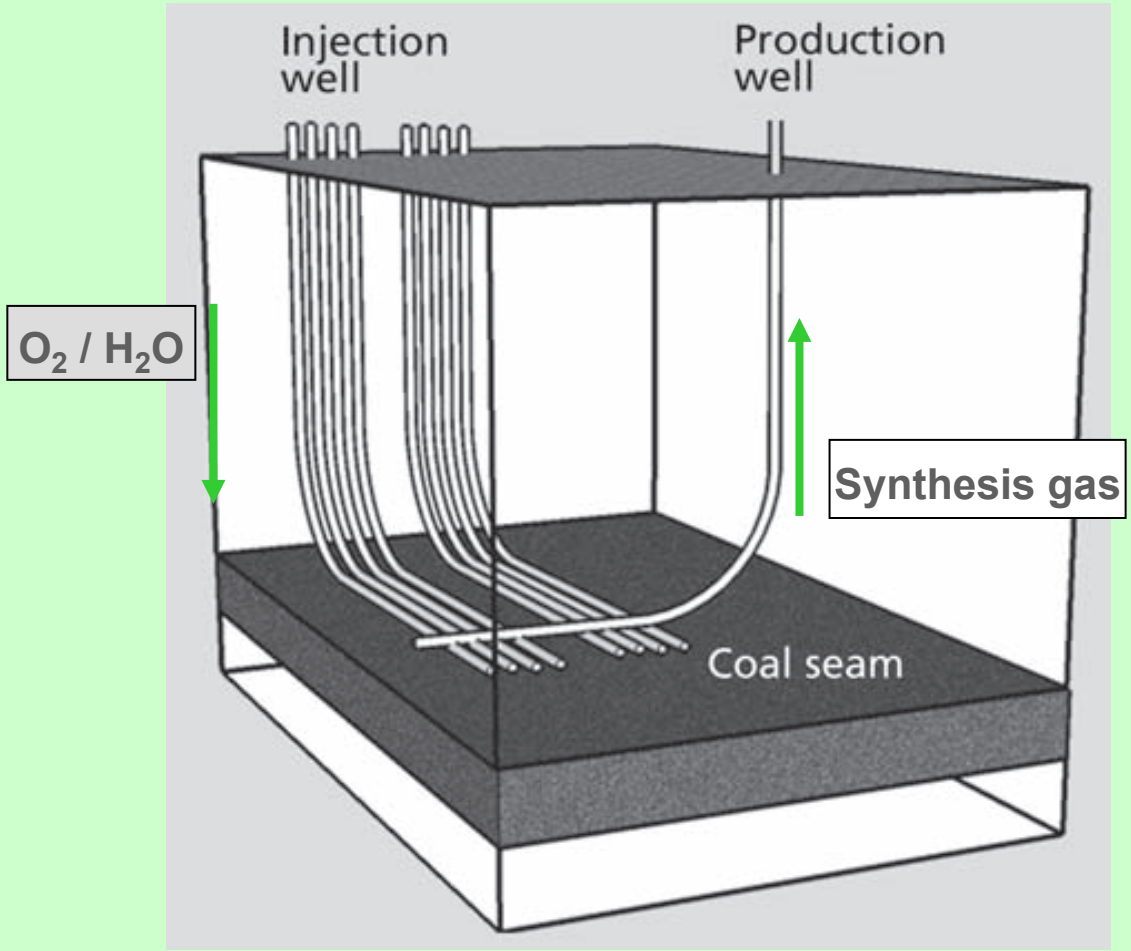



**The right base: continuous power plant modernization/renewal**

# Reducing $CO_2$ emissions of coal-fired power plants: efficiency increases / CCS technology



# Layout of the injection and production wells

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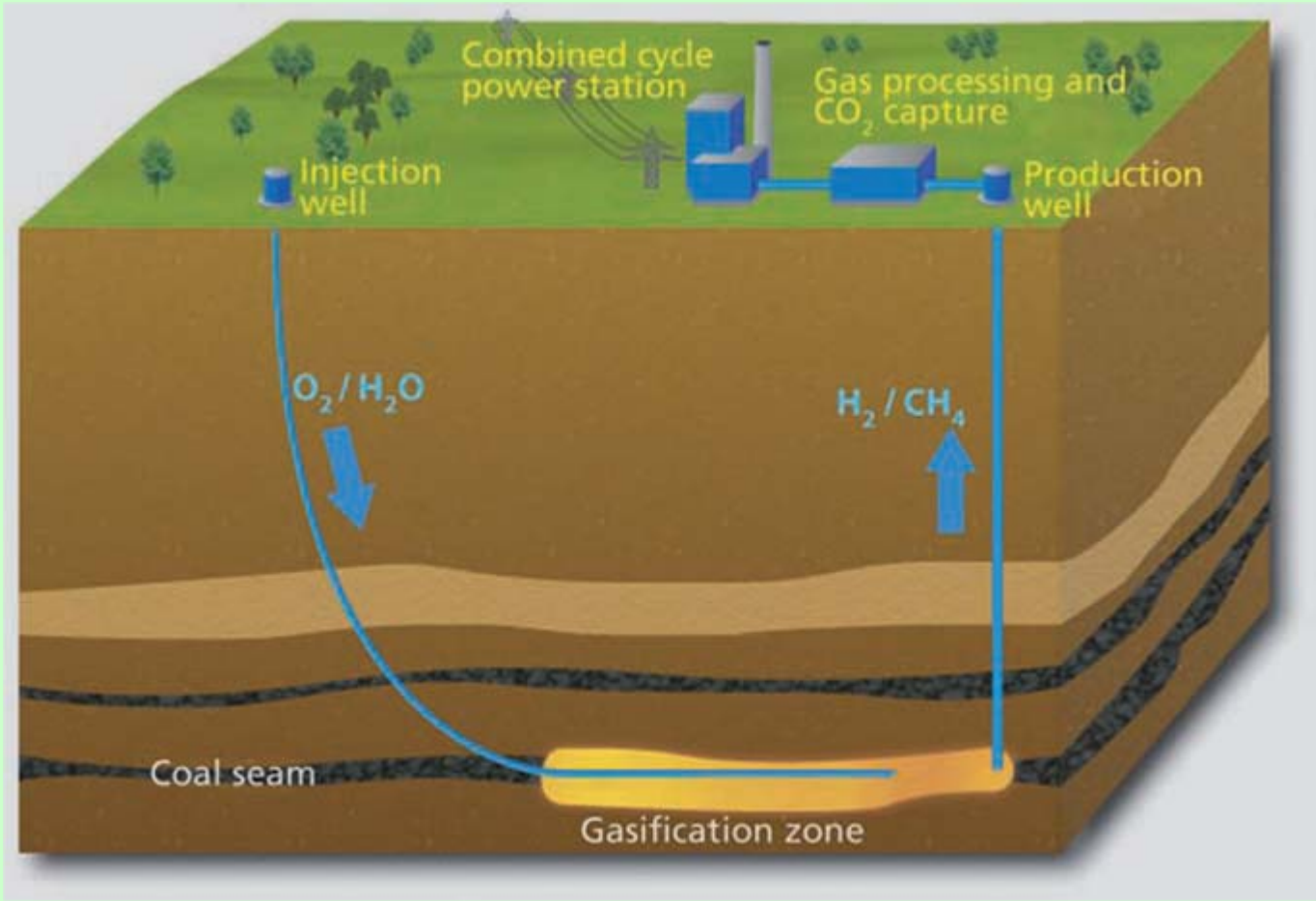
# Principle of in-situ coal gasification

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# UCG-CCS Principle of $CO_2$ storage using post-gasification coal seams

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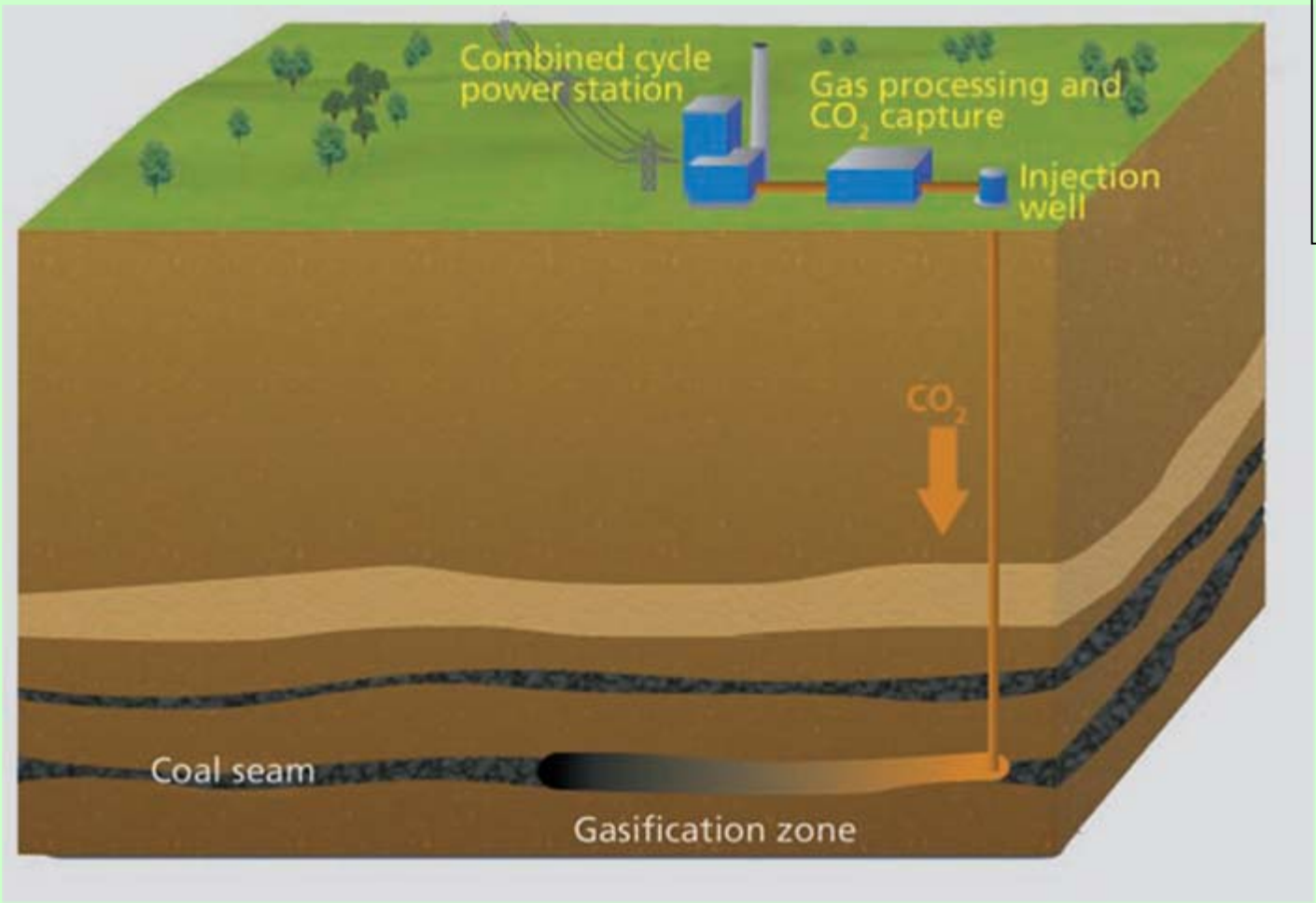


**CO2SINUS-project**

**with including**

**RWTH Aachen**

**DMT Essen**

GFZ/RWTH 2009


Thank you
and
Glückauf !