

# World Oil Market 1999

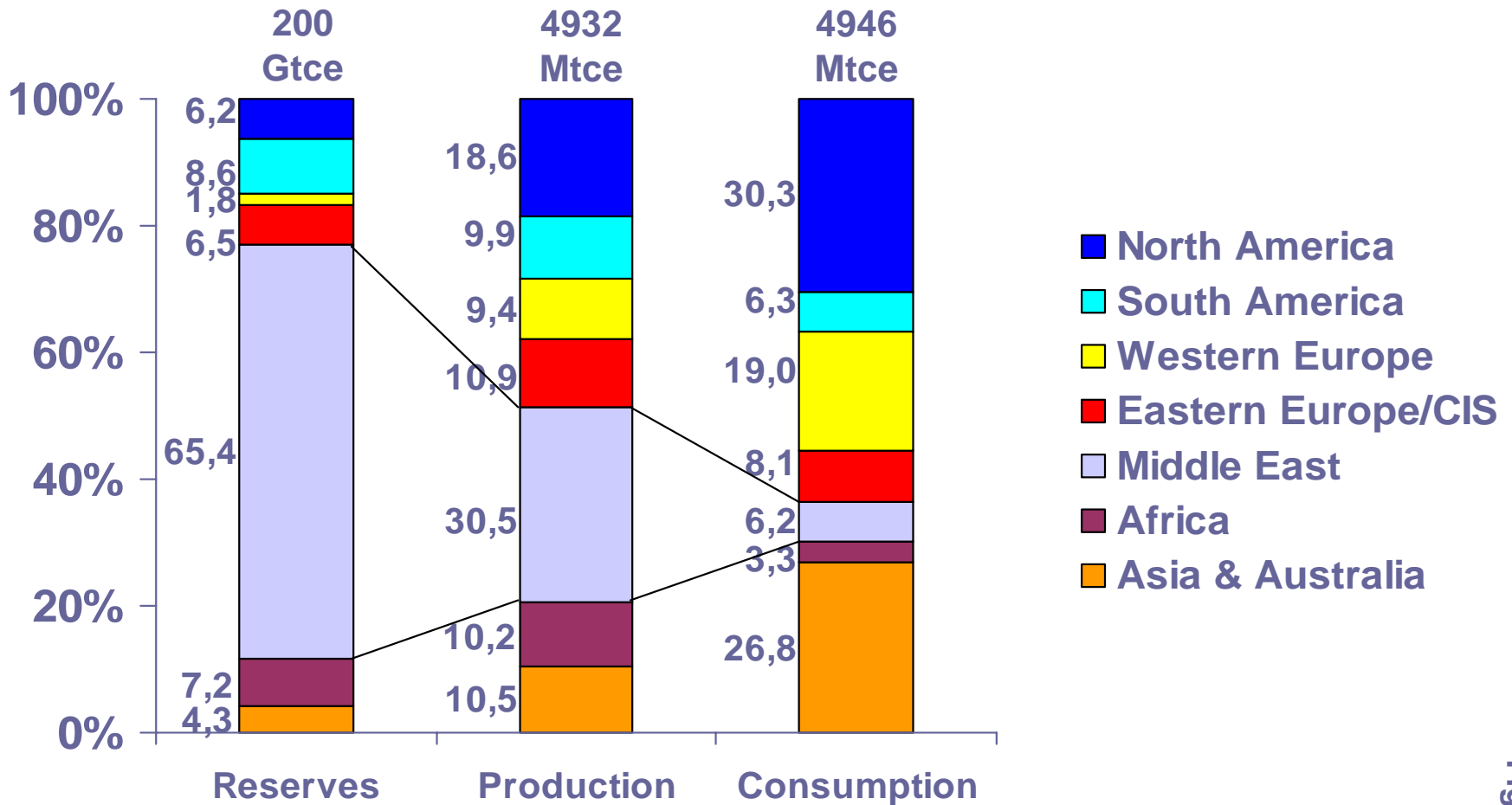
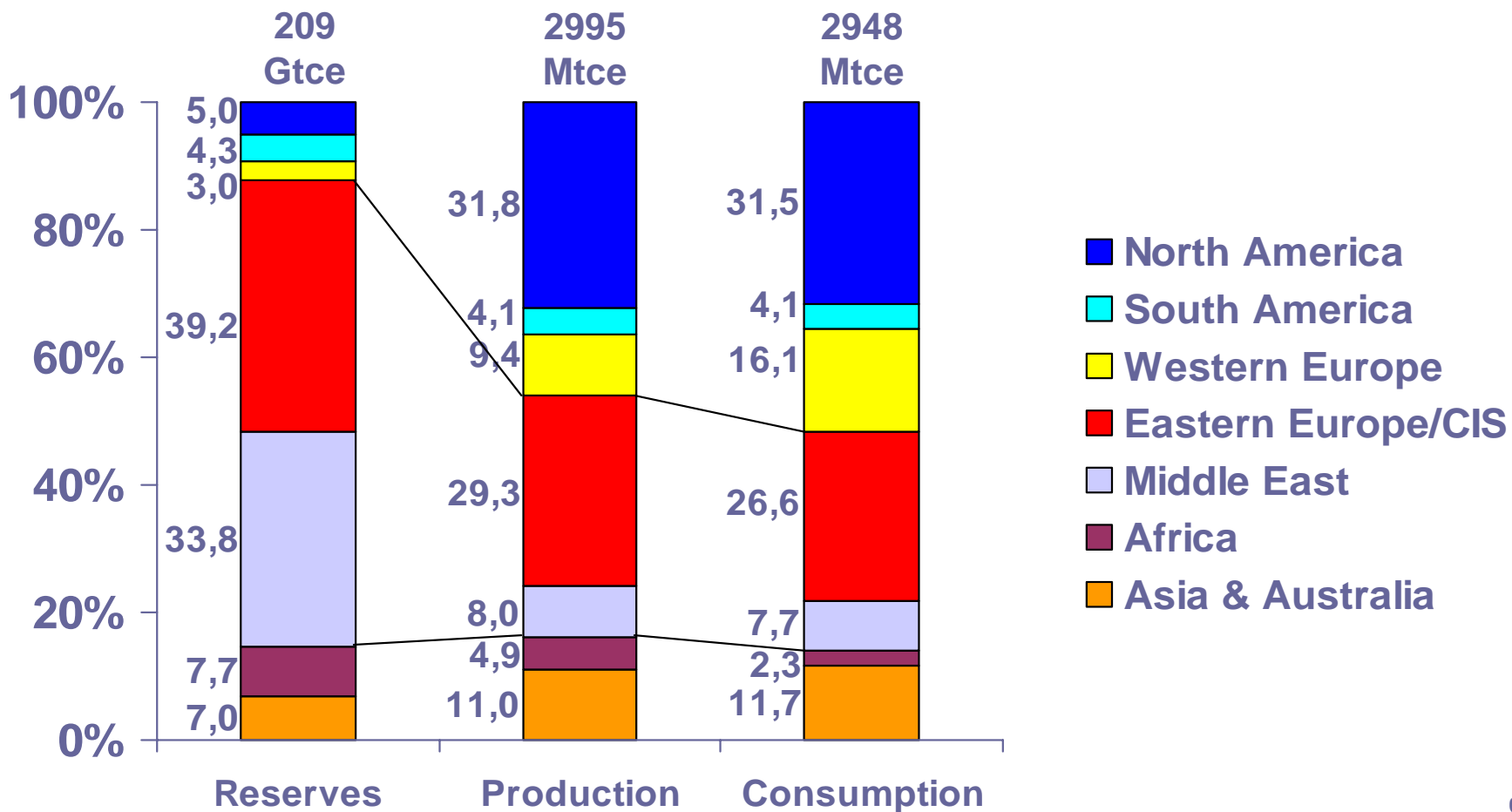


Fig. 1

Source: BP Amoco, Statistical Review of World Energy, Juni 2000

# World Gas Market 1999

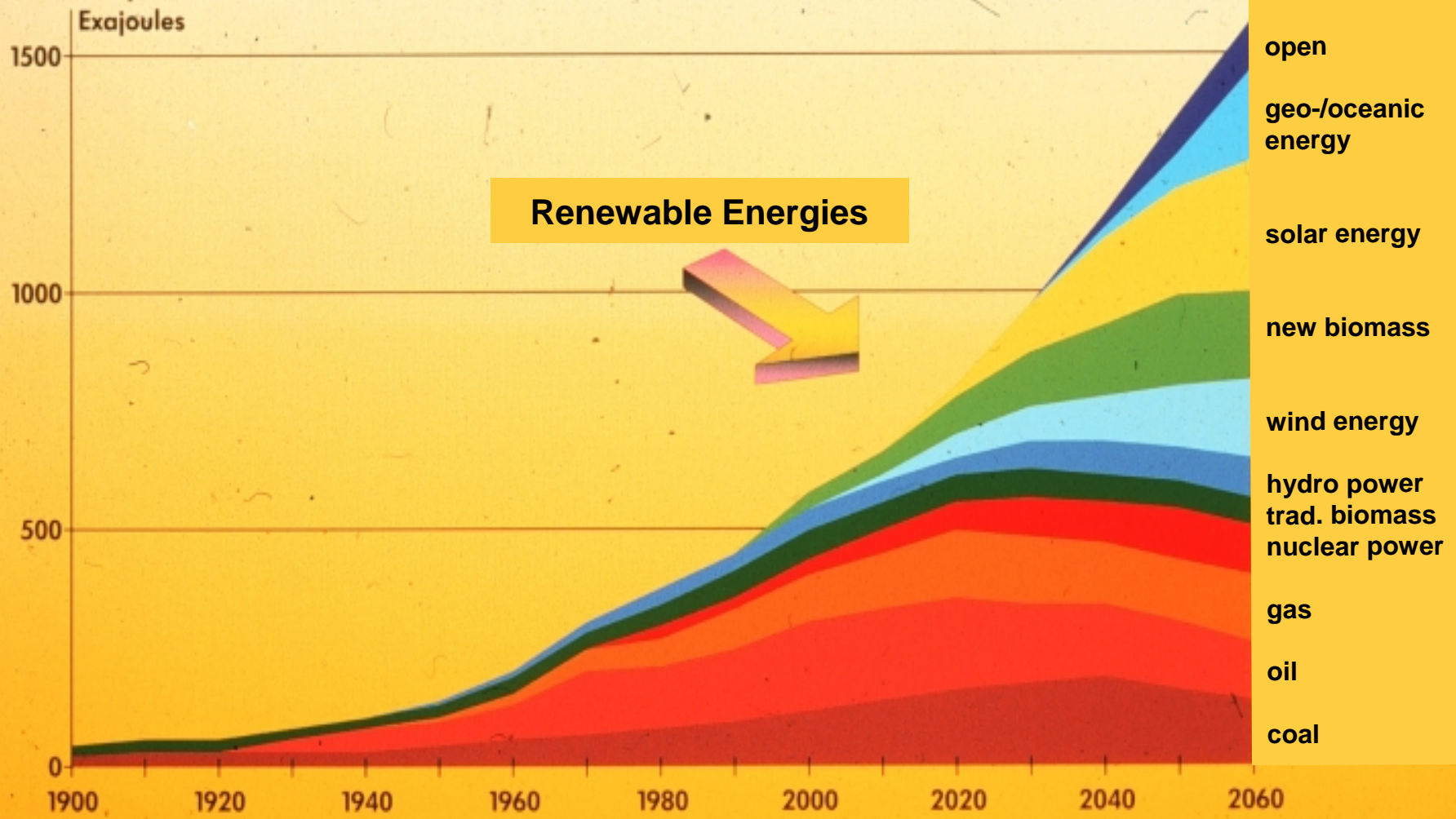


Source: BP Amoco, Statistical Review of World Energy, Juni 2000



# World Energy Demand by 2060

- potential development -



exa = 10<sup>18</sup> 1 Exajoule = 34,12 Mtce

Source: Deutsche Shell AG

Fig. 3

## Coal Production and Imports in Europe 1999

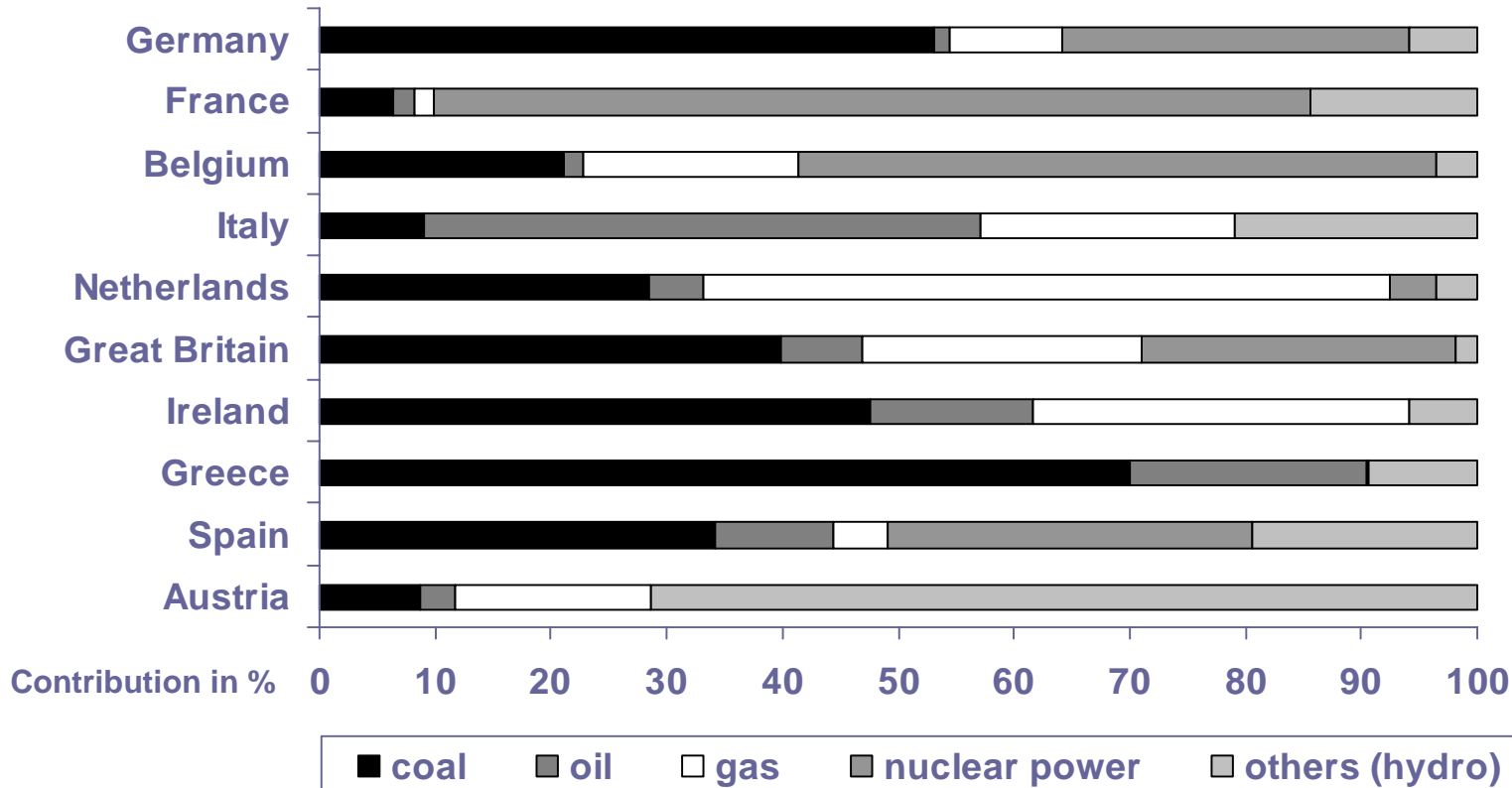
	Lignite- production	Hardcoal- production	Imports 2)
	1 000 t		
Germany	162 242	43 848	23 584
Belgium	-	-	10 848
Danmark	-	-	7 115
France	894	4 033	15 434
Greece	61 469	-	821
Great Britain	-	36 164	20 757
Ireland 1)	2 855	-	2 800
Italy	19	-	17 194
Luxembourg	-	-	151
Netherlands	-	-	19 657
Portugal	-	-	6 042
Austria	1 054	-	3 732
Finland	8 157	-	2 316
Sweden	-	-	2 921
Spain	8 831	15 433	20 081
<b>EU</b>	<b>245 521</b>	<b>99 478</b>	<b>153 453</b>
Albania	179	-	
Bulgaria	24 206	108	
former Czechoslovakia	44 796	18 624	
former Jugoslawia	34 750	70	
Norway	-	300	
Poland	60 840	111 444	
Rumania	19 425	219	
Hungary	13 704	744	
<b>Europe</b>	<b>443 421</b>	<b>230 987</b>	<b>-</b>

1) peat

2) incl. briquettes

Source: Eurostat, IEA

# Structure of Power Generation in selected EU-Countries 1999



Net power generation (without auxiliary power requirements)

Fig. 5

# Primary Energy Consumption and Net Power Generation in the EU 15 1998

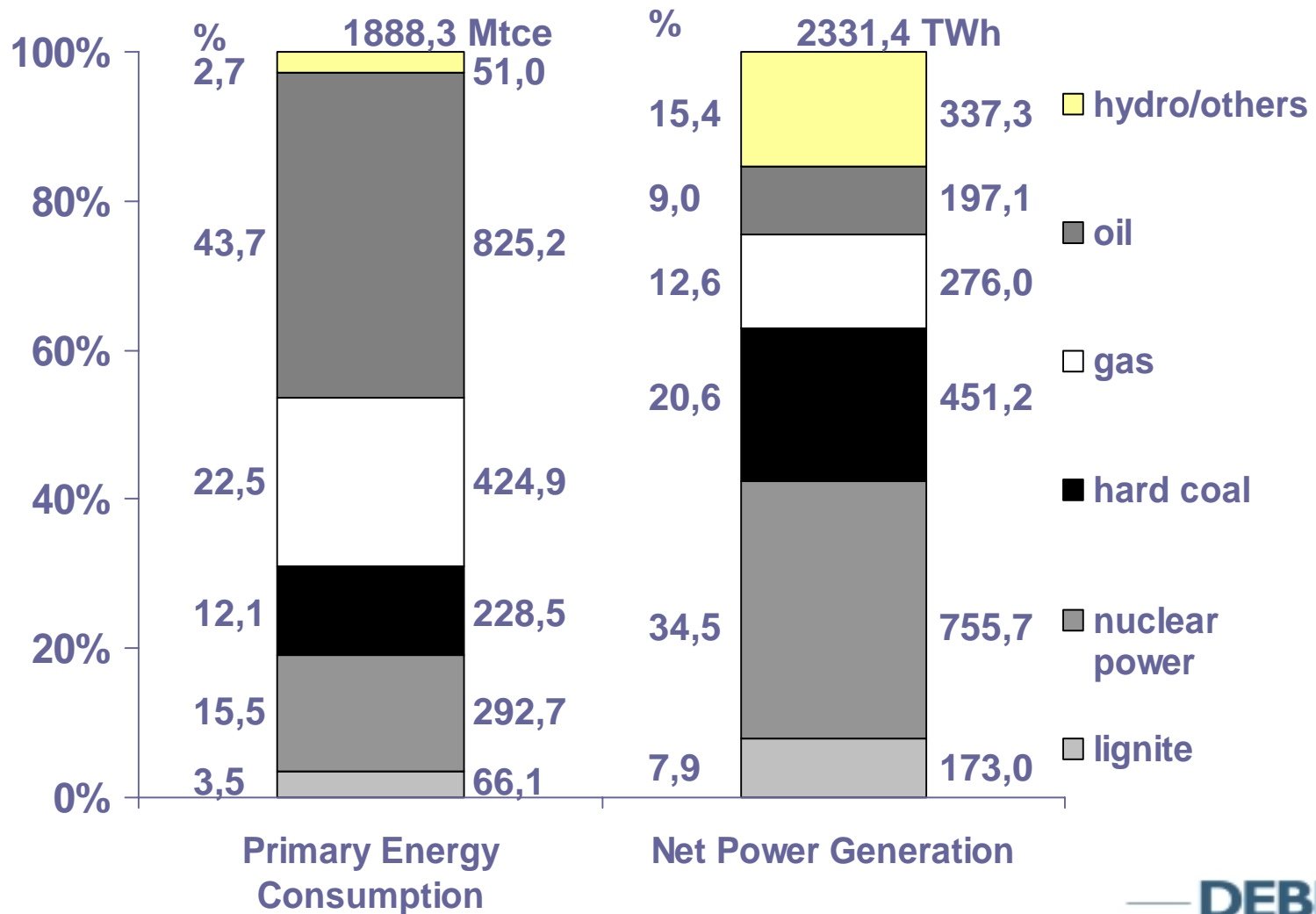


Fig. 6

# Tendency of Power Generation Cost of newly-built Power Stations

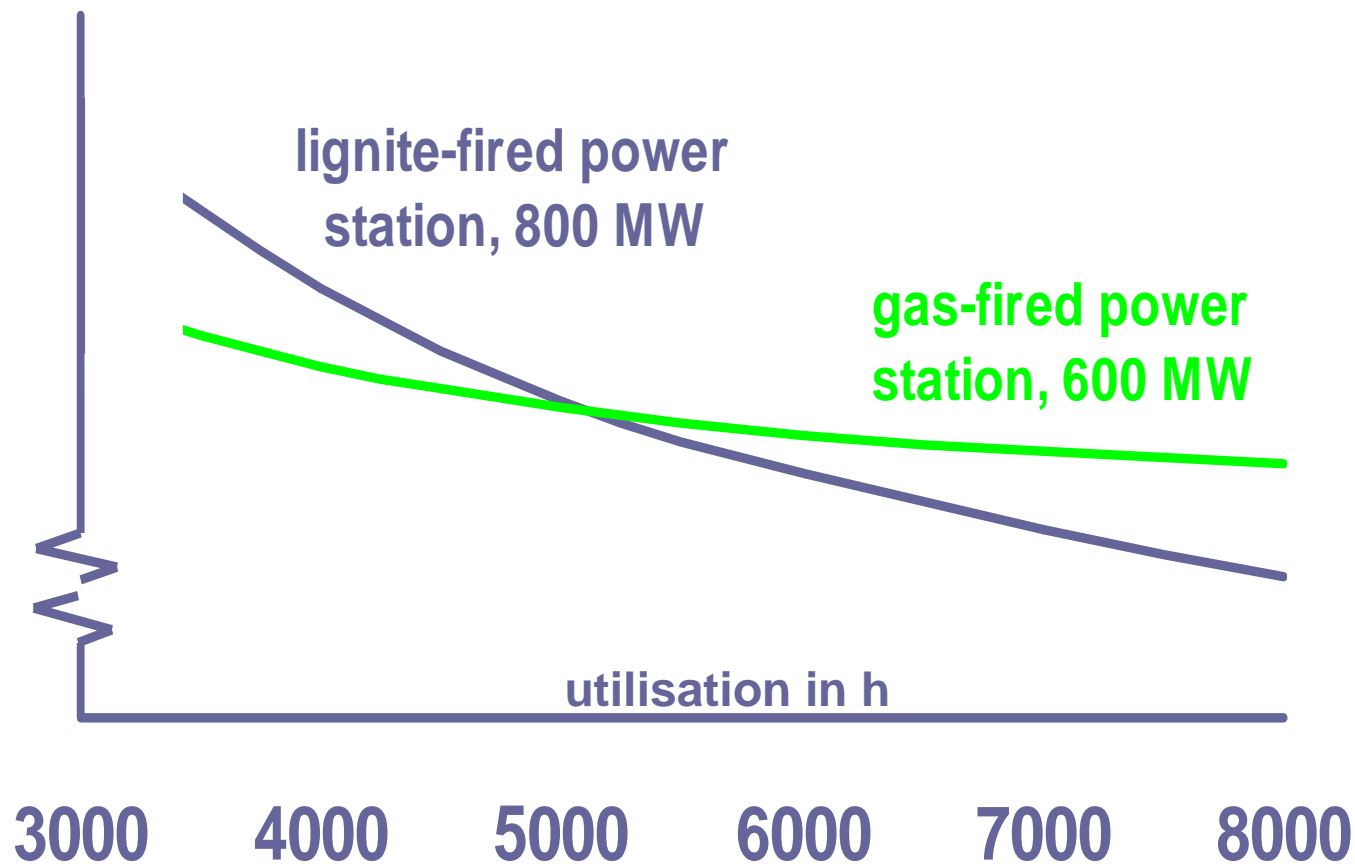
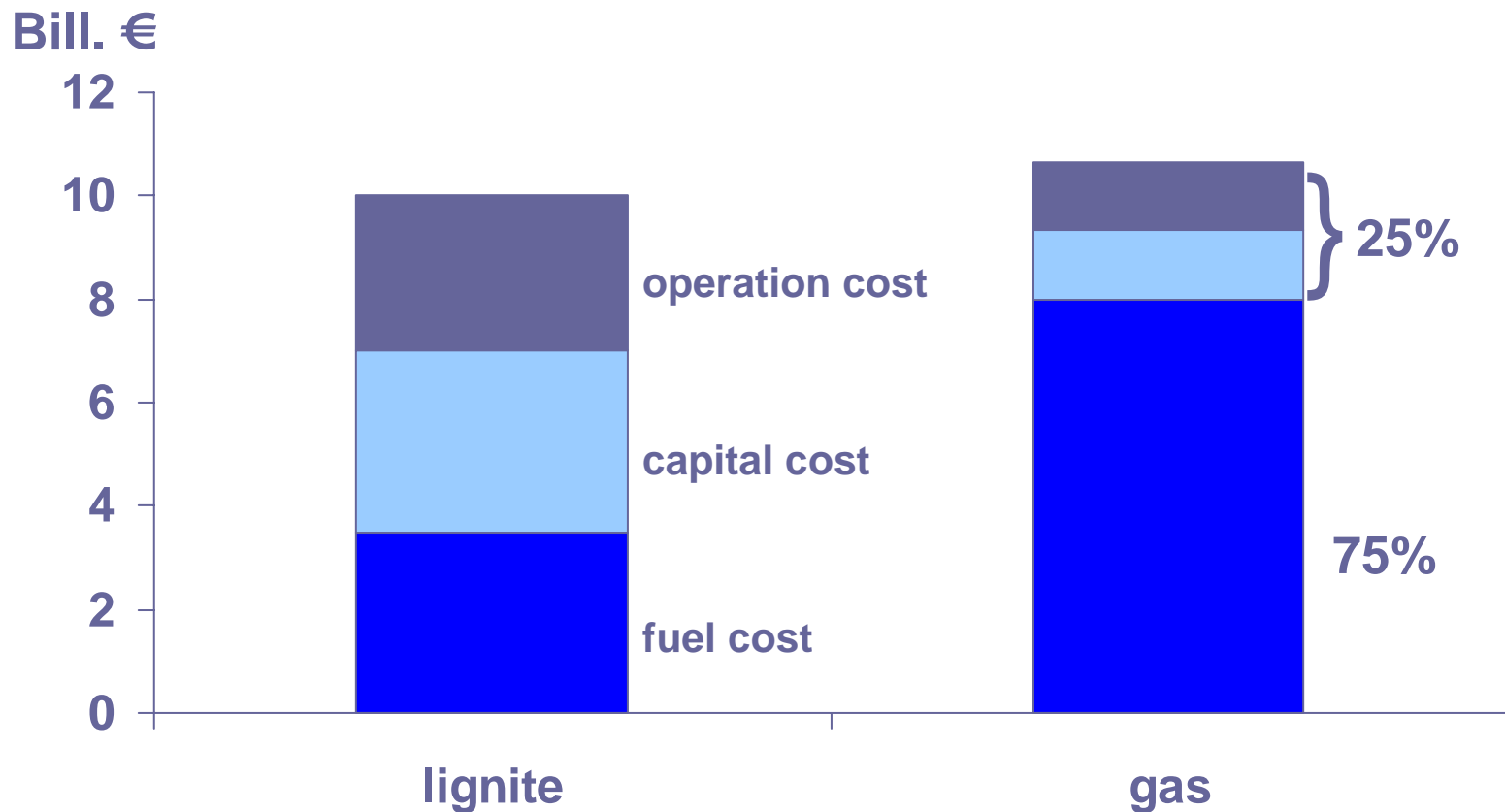


Fig. 7

# Accumulated Power Generation Cost of lignite- and gas-fired Power Stations

1 000 MW capacity, 7 000 h utilisation, 40 a lifecycle



Source: DEBRIV

# CO<sub>2</sub>-Reduction Potential of state-of-the-art Power Station Technology

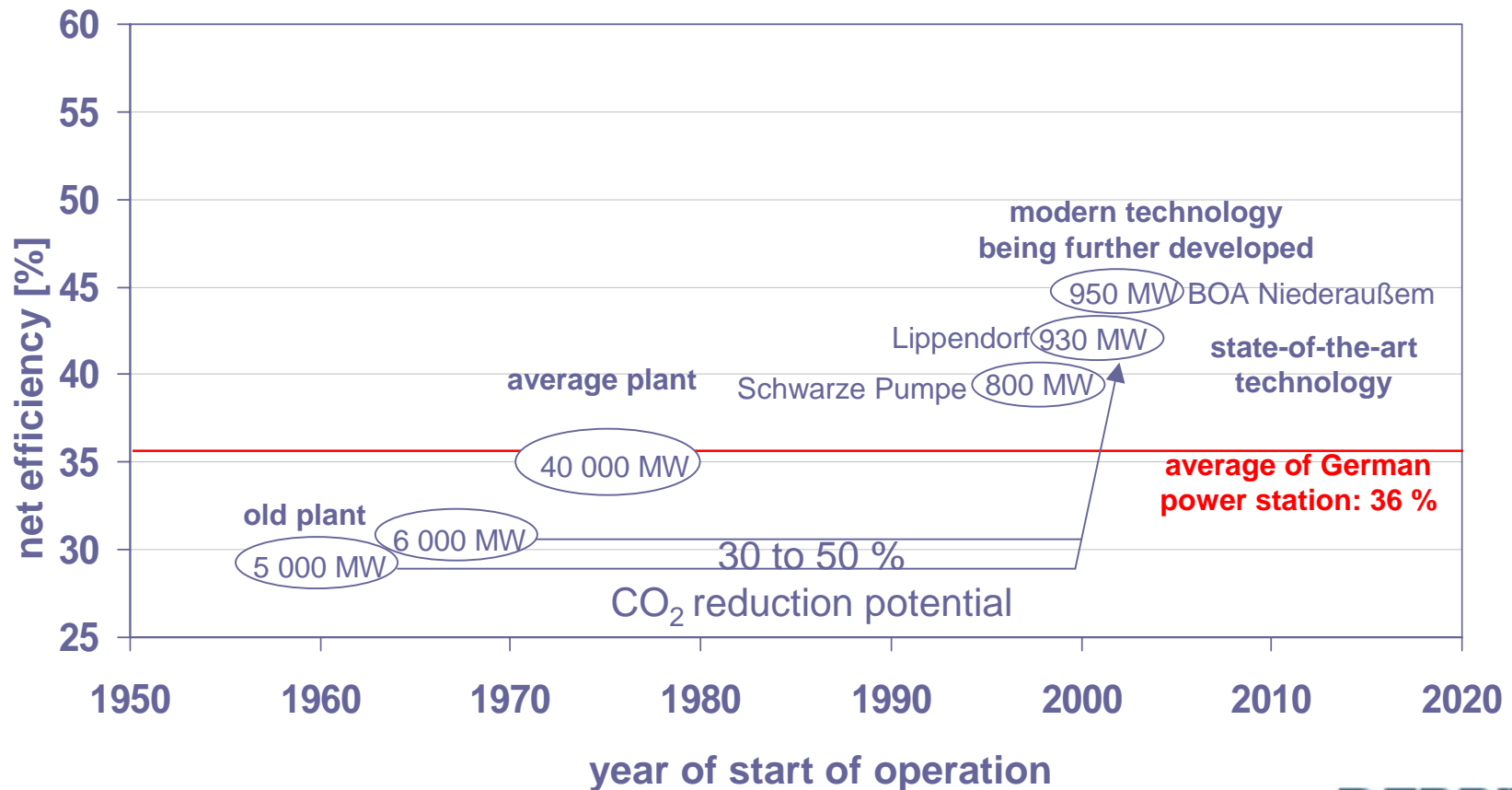
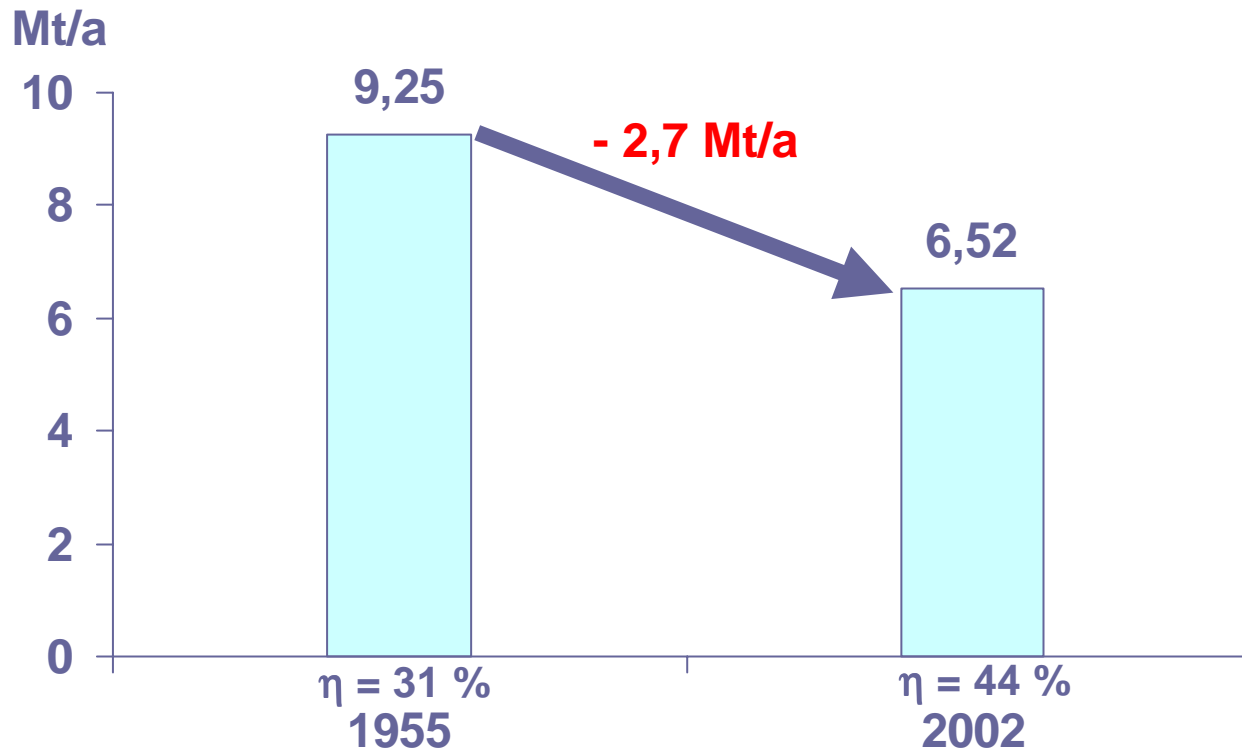


Fig. 9

Source: DEBRIV

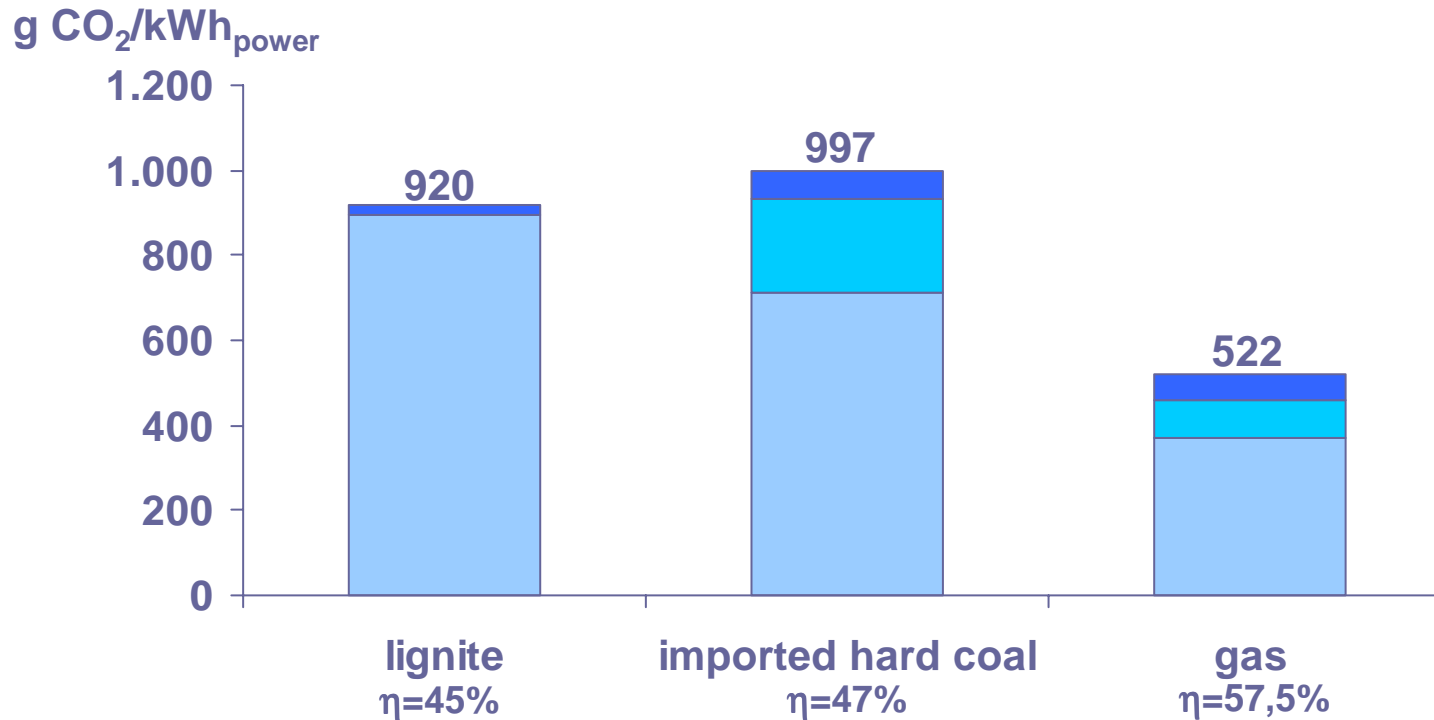
# CO<sub>2</sub>-Reduction by means of Construction of new lignite-fired Power Stations

Mt lignite resp. CO<sub>2</sub> per 1.000 MW



Basis of calculation: 1 000 MW at 7 400 h/a

# CO<sub>2</sub>-Emission Equivalents for Power Generation in modern Power Stations



- CO<sub>2</sub>-emissions from power generation (on site)
- Equivalent CO<sub>2</sub>-emissions from power generation including methane-emissions from production and transportation
- Equivalent CO<sub>2</sub>-emissions from primary energy consumption for production and transportation

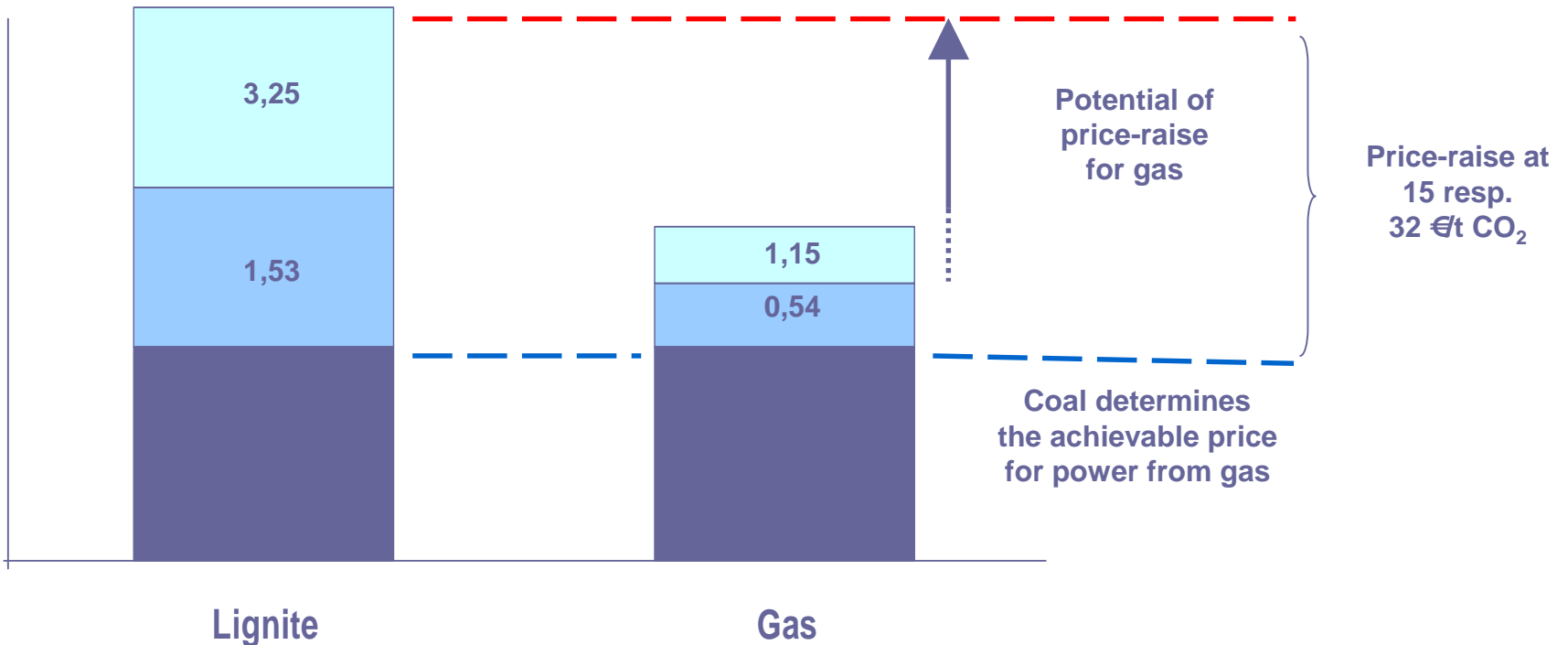
### Fossil Fuels: Reserves according to Countries and Regions 1999

Countries	Geological resources		Economically Mineable Reserves				
	Hard Coal Mt	Lignite Mt	Hard Coal Mt	Lignite Mt	Total Coal Mtce	Oil Mt	Gas Mm <sup>3</sup>
Germany	230 000	78 000	23 000	43 000	35 900	49	339
France	793	289	95	21	111	15	14
Great Britain	-	-	1 000	500	1 165	691	755
Netherlands	4 156	-	497	-	497	16	1 771
Spain	4 700	2 120	200	460	532	2	2
Others	4	805	17	2 967	1 019	243	371
EU	239 653	81 214	24 809	46 948	39 224	1 016	3 252
Bulgaria	-	-	13	2 698	1 362	2	6
former Czechoslovakia	6 401	2 894	2 613	3 736	4 854	4	19
former Jugoslawia	-	479	70	16 500	8 740	12	48
Norway	-	64	-	6	5	1 389	1 172
Poland	60 185	11 184	12 113	2 196	12 838	16	145
Hungary	2 109	13 595	596	3 865	2 313	14	81
Others	250	10 137	450	4 236	2 195	229	643
Europe	308 598	119 567	40 664	80 185	71 531	2 682	5 366

Source: German Mining Yearbook 2001

# Distortion of Competition and Boosting of Power Prices by CO<sub>2</sub>-Certificates / -Taxes

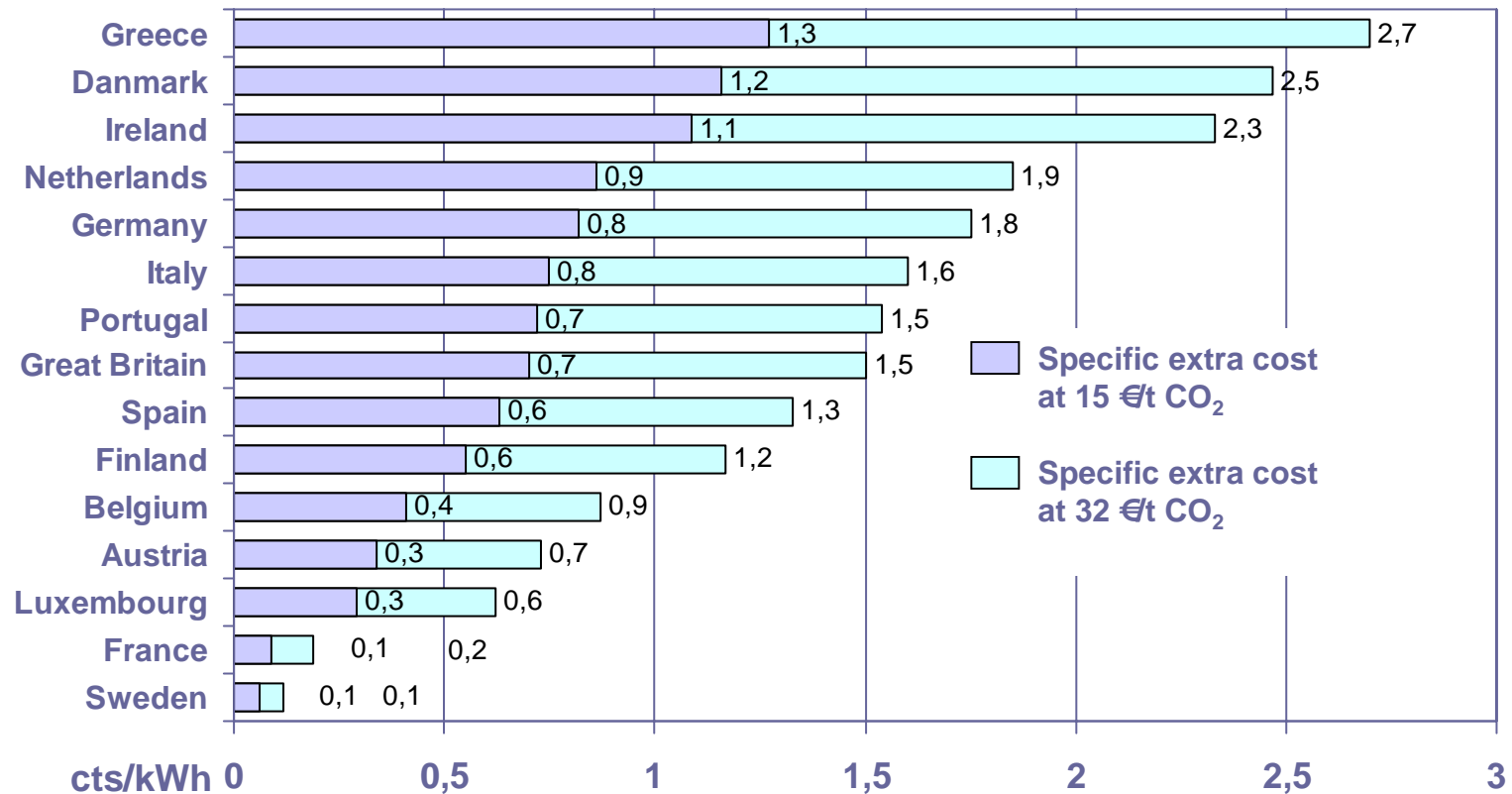
cts/kWh



- Conclusion:**
- Achievable prices for gas producers raise
  - Coal is displaced by gas or nuclear power in the energymix
  - Power generation migrates to more favorable locations

Fig. 13

# Raise of average Power Prices by Cost of Emissions Trading

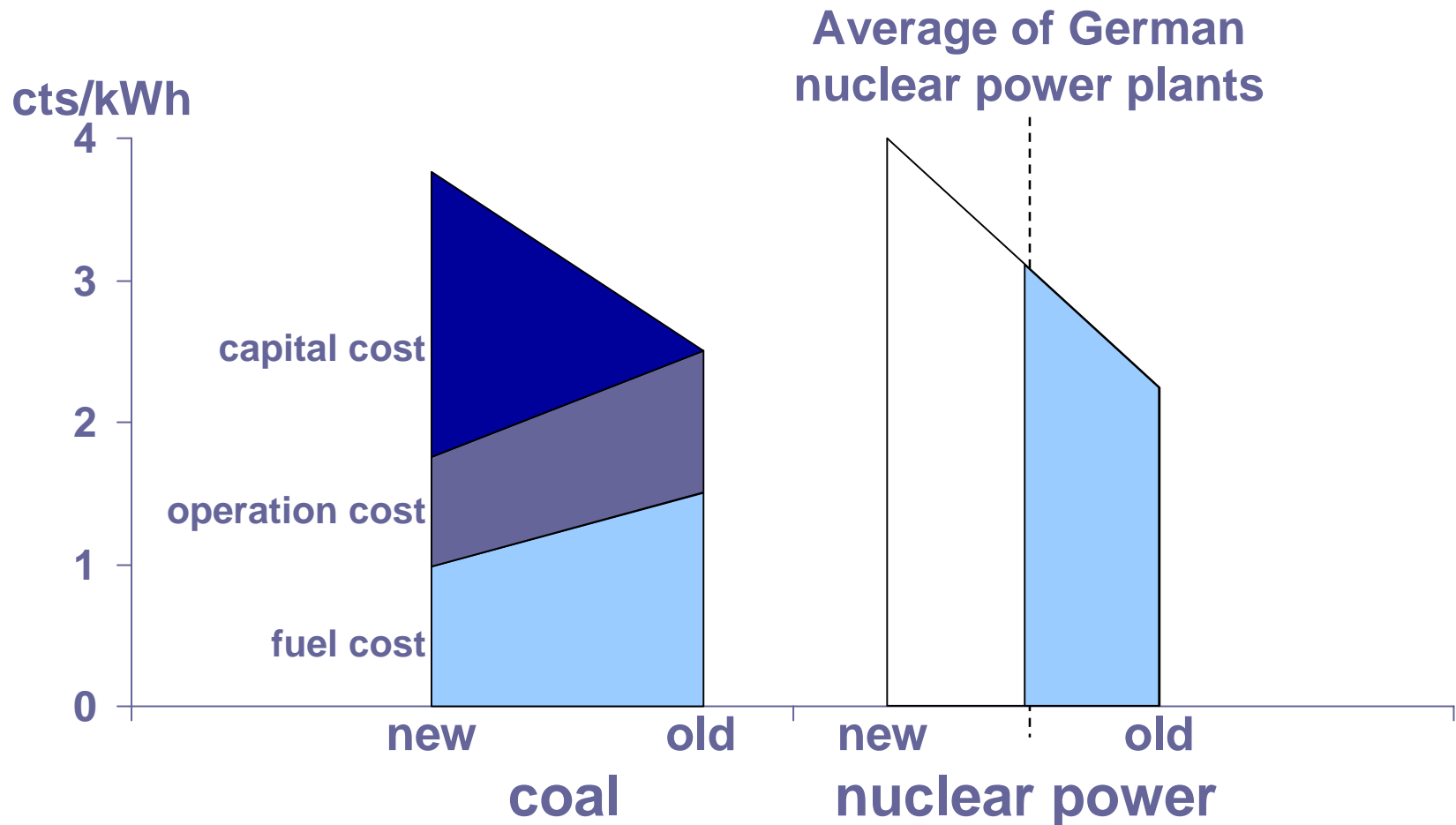


The difference of the extra cost in each country is the result of the specific energy mix for power generation and the individual raise in cost of the respective energy sources.

e.g. lignite-fired power 0.5 cts/kWh and gas-fired power 0,18 cts/kWh at 5 €/t CO<sub>2</sub> emission cost

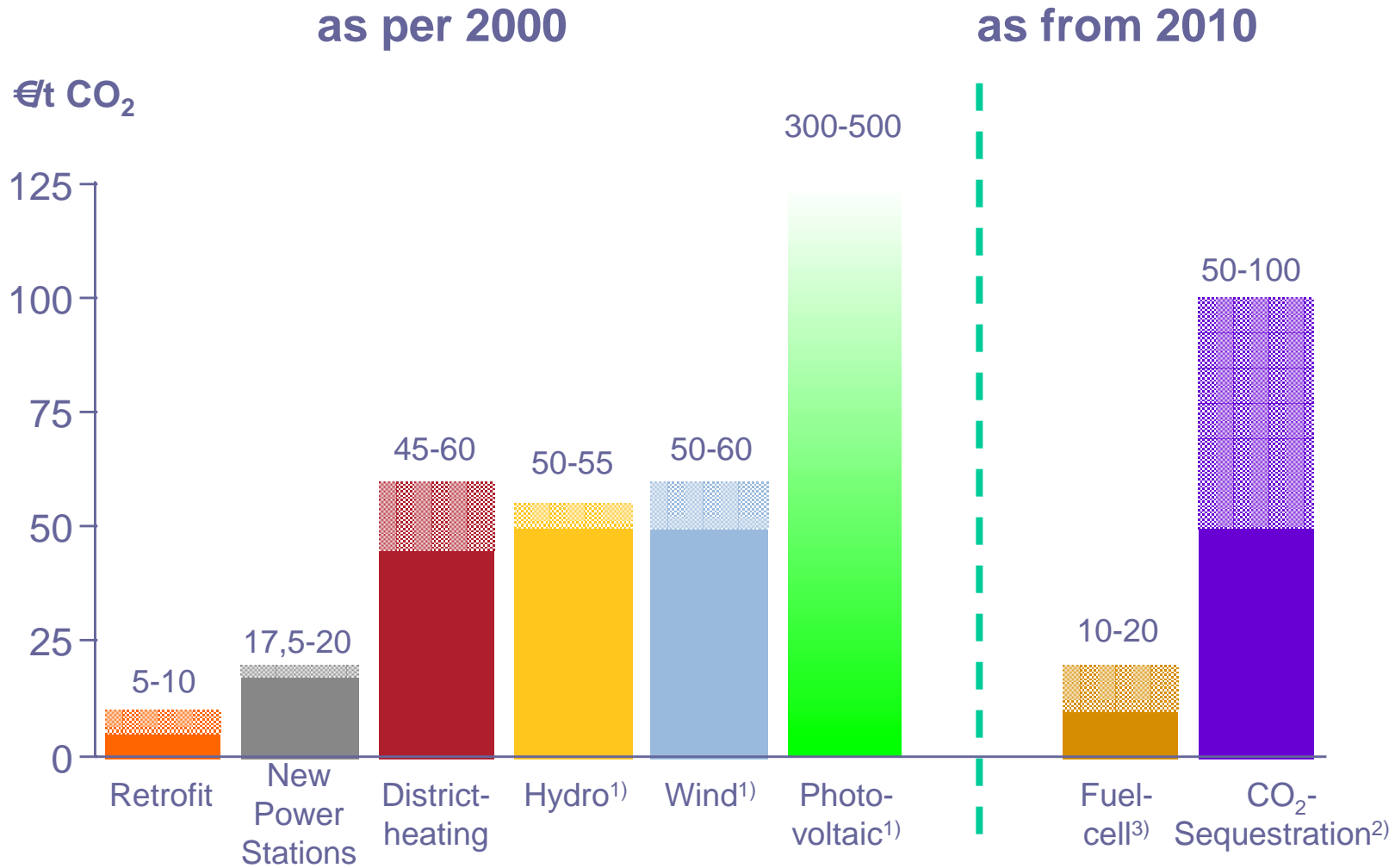
Source: Energy in Europe - 1999 - Annual Energy Review (1997 Data)

# Cost of base-load Power Generation



Basis of calculation: utilization 7 000 to 8 000 h/a  
coal prices  $\cong$  price of imported coal

# Specific CO<sub>2</sub>-Avoidance Cost



1) Source: EEG

2) Source: Vattenfall

3) under certain circumstances