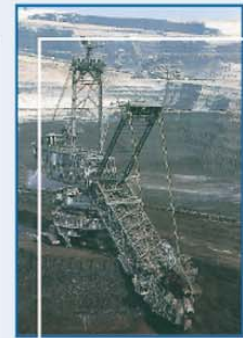


# EURACOAL

European Association  
for Coal and Lignite



## Cleaner Electricity Production – Coal's Contribution

Geneva – 16th November 2009

Dr. Thorsten Diercks, Secretary General

# EURACOAL Members

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- DEBRIV - Deutscher Braunkohlen-Industrie-Verein (GER)
- GVSt - Gesamtverband des deutschen Steinkohlenbergbaus (GER)
- COALPRO - Confederation of the UK Coal Producers (UK)
- ZPWGK - Polish Hard Coal Employer's Association (POL)
- PPWB - Confederation of the Polish Lignite Industry (POL)
- PPC - Public Power Corporation (GR)
- ZSDNP - Czech Confederation of Coal and Oil Producers (CZR)
- CARBUNION - Federation of Spanish Coal Producers (ESP)
- MATRA - Matra Erömu Rt (HUN)
- Mini Maritza Istok AG (BUL)
- PATROMIN - Federation of the Romanian Mining Industry (ROM)
- VDKI - Verein der Kohlenimporteure (GER)
- Coal Importers' Association (UK)
- Swedish Coal Institute (SWE)
- Hornonitrianske Bane Prievidza AG (SVK)
- Premogovnik Velenje (SLO)
- EPS - Electric Power Industry of Serbia (SER)
- ISSeP - Institut Scientifique de Service Public (BEL)
- University of Nottingham (UK)
- IMCL - International Mining Consultants Ltd. (UK)
- Coaltrans Conferences Limited (UK)
- Turkish Coal Enterprises (TUR)
- All-Ukrainian Coal Employers Association (UKR)
- KOMAG (POL)
- Banovici Coal Company (BiH)

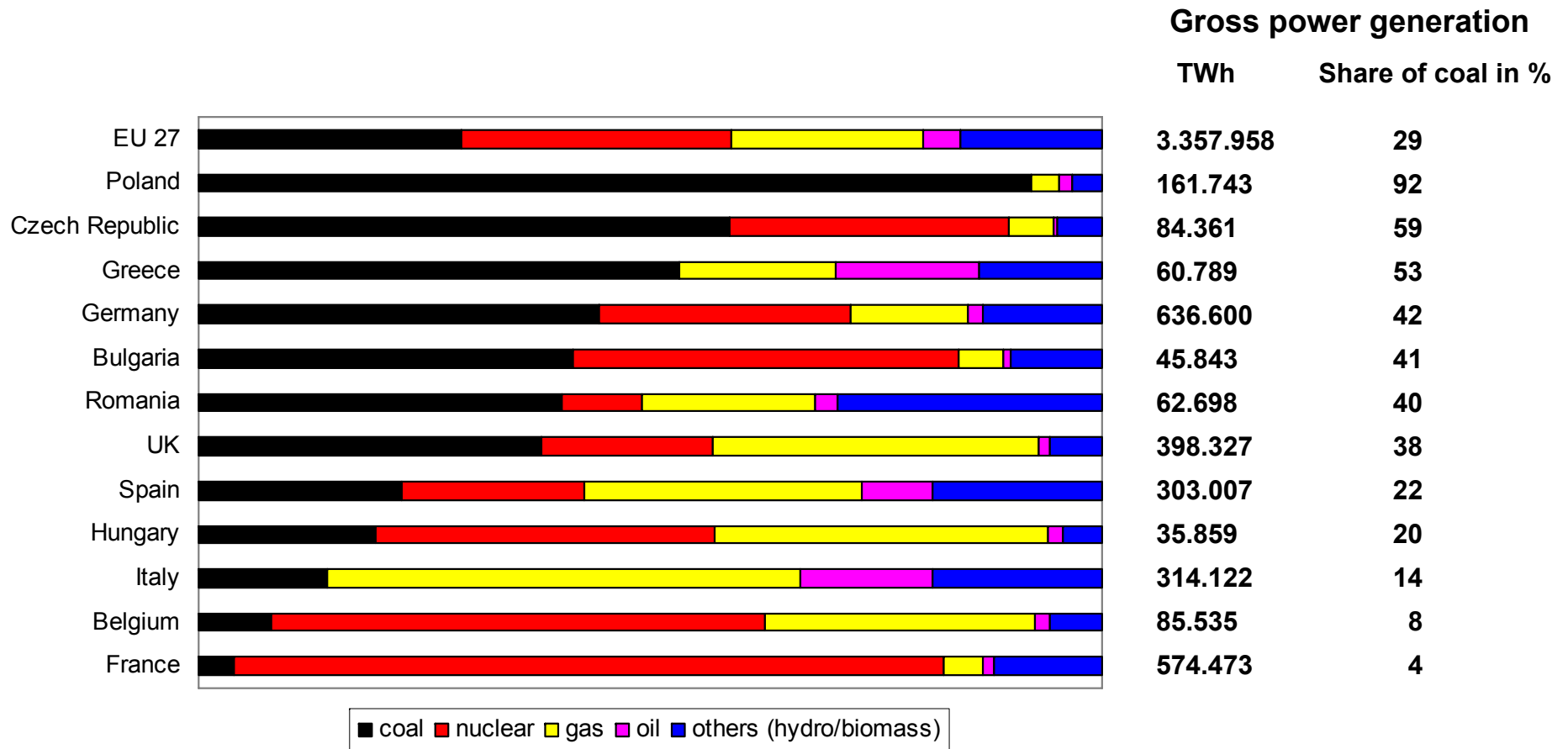
# Cleaner Electricity Production – Coal's Contribution

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## Agenda

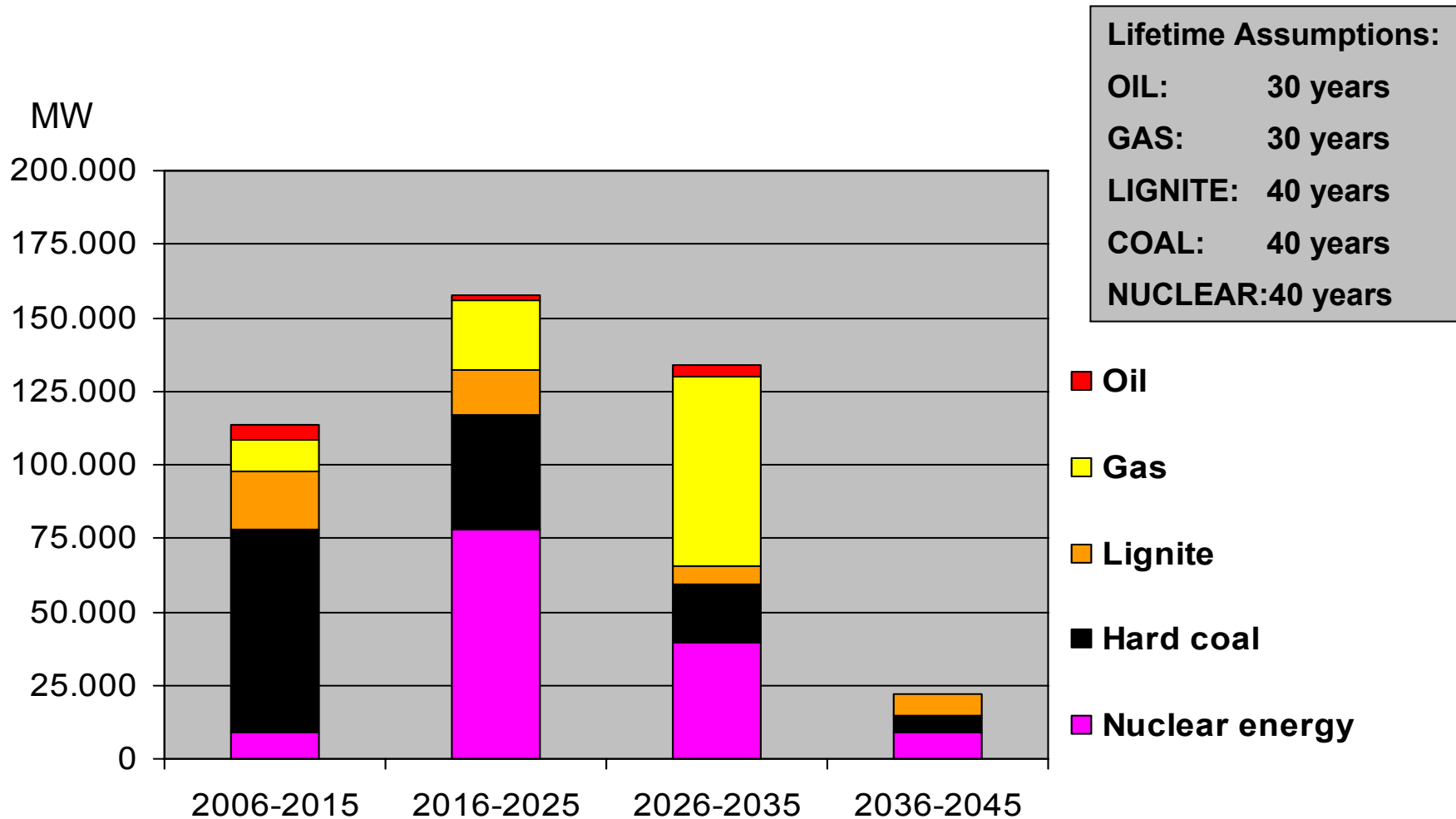
- Electricity Production and Coal Resources in Europe
- Climate Protection Policies
  - Continuous Modernisation
  - Carbon Capture and Storage

# Power generation structure in selected EU 27 Member States



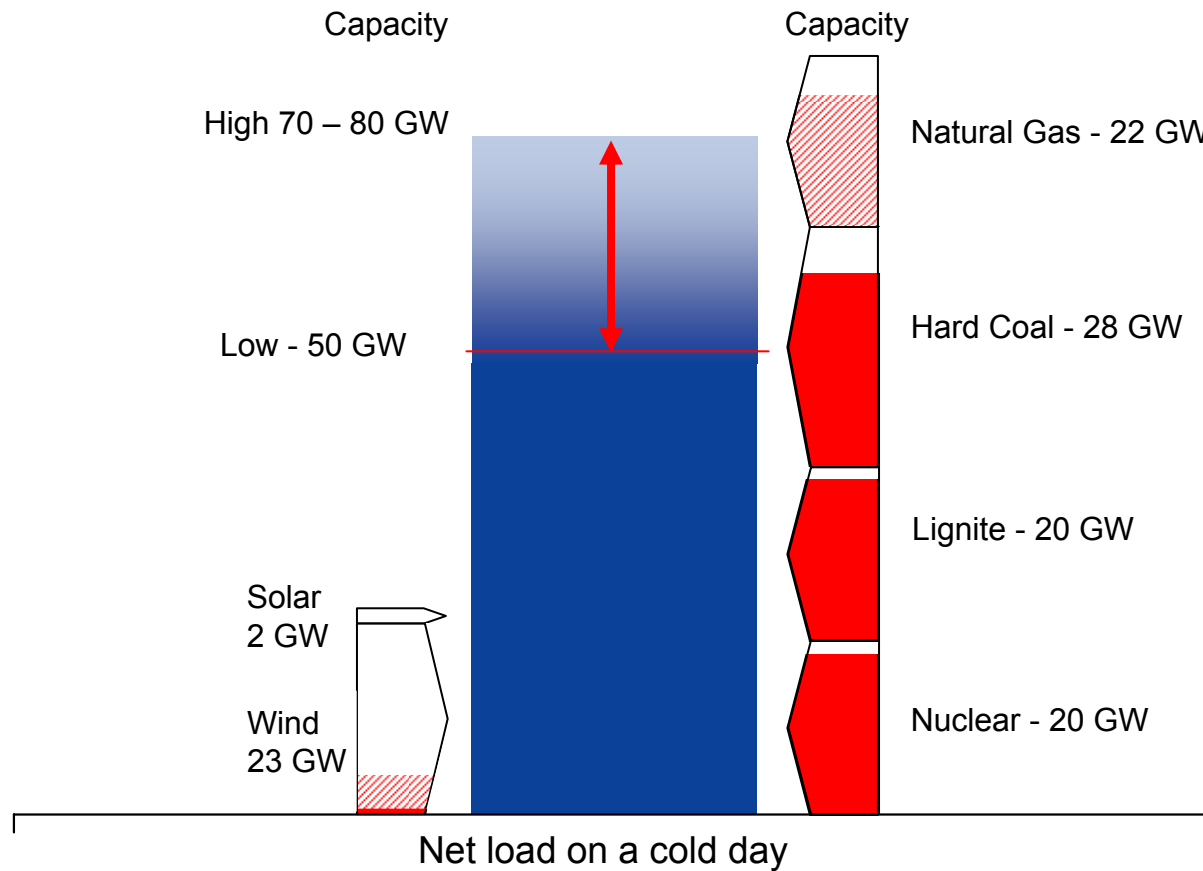
Source: EUROSTAT – Energy / Yearly Statistics 2006  
As at 9/2008

# Electricity generation: Significant capacity needs to be replaced in the short to medium term



Source: Prognos, here: EU-25

# The Gas crisis – Power generation 5th to 11th January 2009 - Example Germany



Coal generation helped in the crisis, renewables did not.



# European Hard Coal Potential (Mt)

Country	Reserves	Resources	Potential
Czech Republic	3,112	21,106	24,219
Germany	118	82,947	83,065
Hungary	276	5,075	5,351
Poland	12,459	167,000	179,459
Romania	14	2,373	2,387
Spain	868	3,363	4,231
United Kingdom	432	186,700	187,132
Other EU	770	7,468	8,231
<b>TOTAL EU</b>	<b>18,049</b>	<b>476,032</b>	<b>494,081</b>
Turkey	413	793	1,206
Ukraine	32,039	49,006	81,045

Source: BGR

# European Lignite Potential (Mt)

Country	Reserves	Resources	Potential
Bulgaria	1,928	4,194	6,122
Czech Republic	185	772	956
Germany	40,818	36,760	77,578
Hungary	2,633	2,704	5,337
Greece	2,876	3,554	6,430
Poland	3,870	41,000	44,870
Romania	408	7,947	8,355
Slovakia	83	525	609
Slovenia	315	341	656
Other EU	359	1,502	1,861
<b>TOTAL EU</b>	<b>53,475</b>	<b>99,299</b>	<b>152,774</b>
Bosnia-Herzegovina	2,369	1,814	4,182
Serbia	7,523	3,750	11,273
Turkey	1,814	7,176	8,990

Source: BGR

# Important Coal and Energy Policy Issues

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## Coal extraction: Access to Resources

- Member States should emphasize that ensuring access to resources is a common task of the EU, Member States and industry in order to secure energy supply
  - No hasty closing down of mines on the basis of short-term considerations
  - The legal system must ensure that access to resources (opencast and underground) remains possible also in practice – this refers mainly to regional planning as well as environmental approval procedures

# The Commission's Strategic Energy Review II – Coal

- “Coal remains an essential component of Europe’s domestic energy supply ... “
- “ ... continued substantial use of coal and lignite in generation in Europe is projected.”
- “ ... in the longer run ... compatible with the climate challenge if highly efficient plants predominate and ... CCS is widely available.”
- “ Obligatory CO<sub>2</sub> emissions standards should be considered only after results of industrial demonstrations have been evaluated ... “

**EURACOAL welcomes the COM statements on coal in the SER II.**

# EU Council and European Parliament Decisions concerning Climate Protection

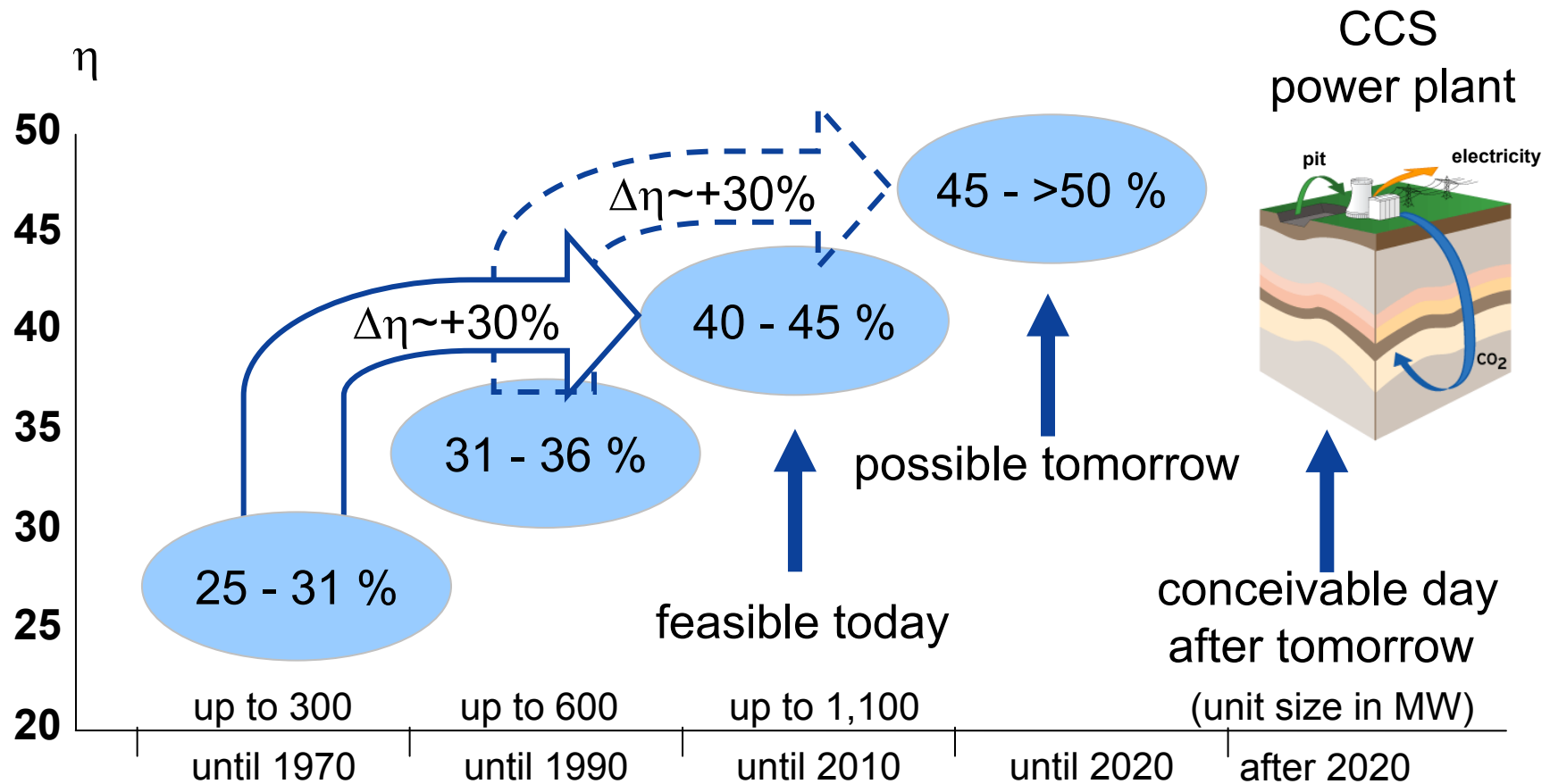
## **Till 2020:**

- 20 % renewables, 20 % energy savings; 20 % less GHG

## **Till 2050:**

- Limit global rise in temperature  $\leq 2^{\circ}\text{C}$ ;  
objective  $\leq 450$  ppm CO<sub>2</sub> in atmosphere
- Worldwide reduction of anthropogenic GHG emissions to 50 % of 1990 level
- Fair burden sharing, i. e. industrialised countries reduce over-proportionally, i. e. 80 – 95 % with 1990 as base year
- Fairness at  $\approx 2$  t GHG emissions per capita per year

# Modernization and increased efficiencies



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

# Continuous modernisation remains important Germany – STEAG AG / EVN AG

## DUISBURG - WALSUM 10



- New 750 MW hard coal-fired power plant
- Efficiency: > 45%
- 2010



Continuous modernization and efficiency increase are a precondition for CCS.

# Increasing Efficiency

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Mid-term goals:

- 700 °C Power Plant / Materials
- Lignite pre-drying / BoA-Plus-Power Plant
- High efficiency coal gasification / CCGT-Power Plant

Efficiency target: > 50 %, time frame 2020

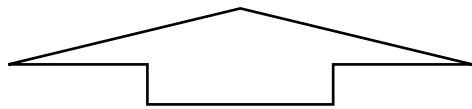
Increase in efficiency must be given a high priority in national and European research programmes

# R&D Timetable for 2 Technology Pathways

Highest efficiency in conventional power plant technology

CO<sub>2</sub> capture and storage

Efficiency increase to > 50 %

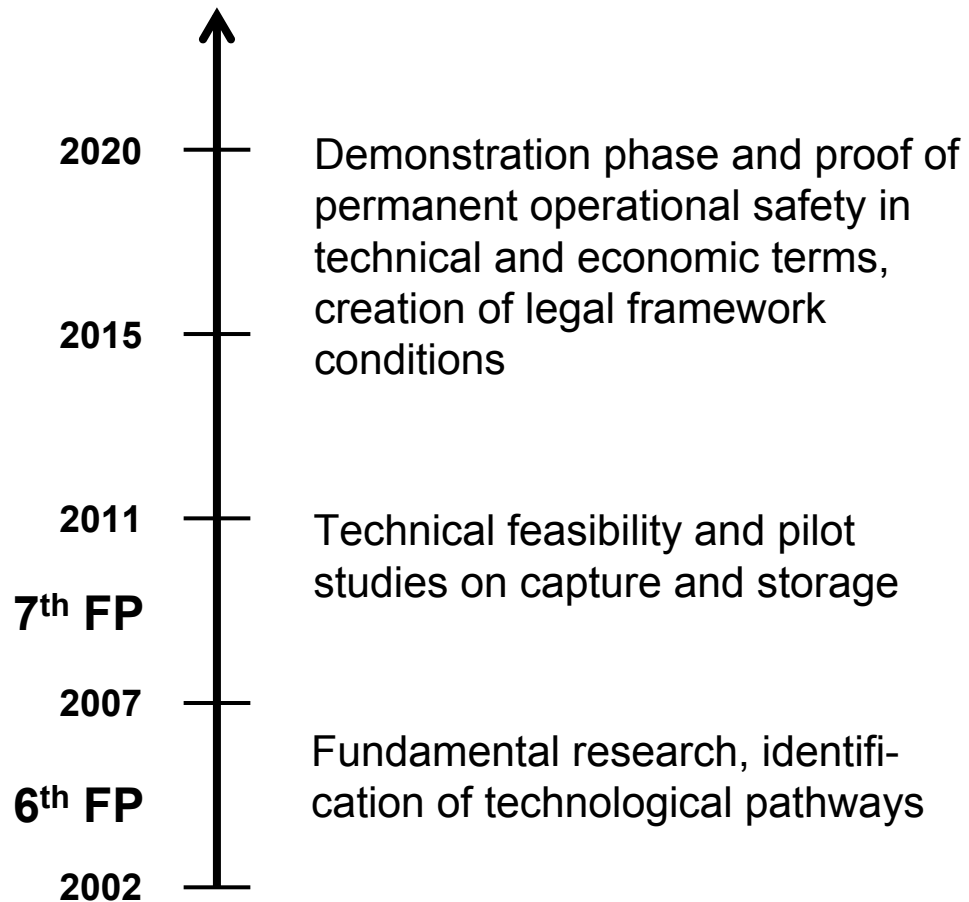


Efficiency potential due to:

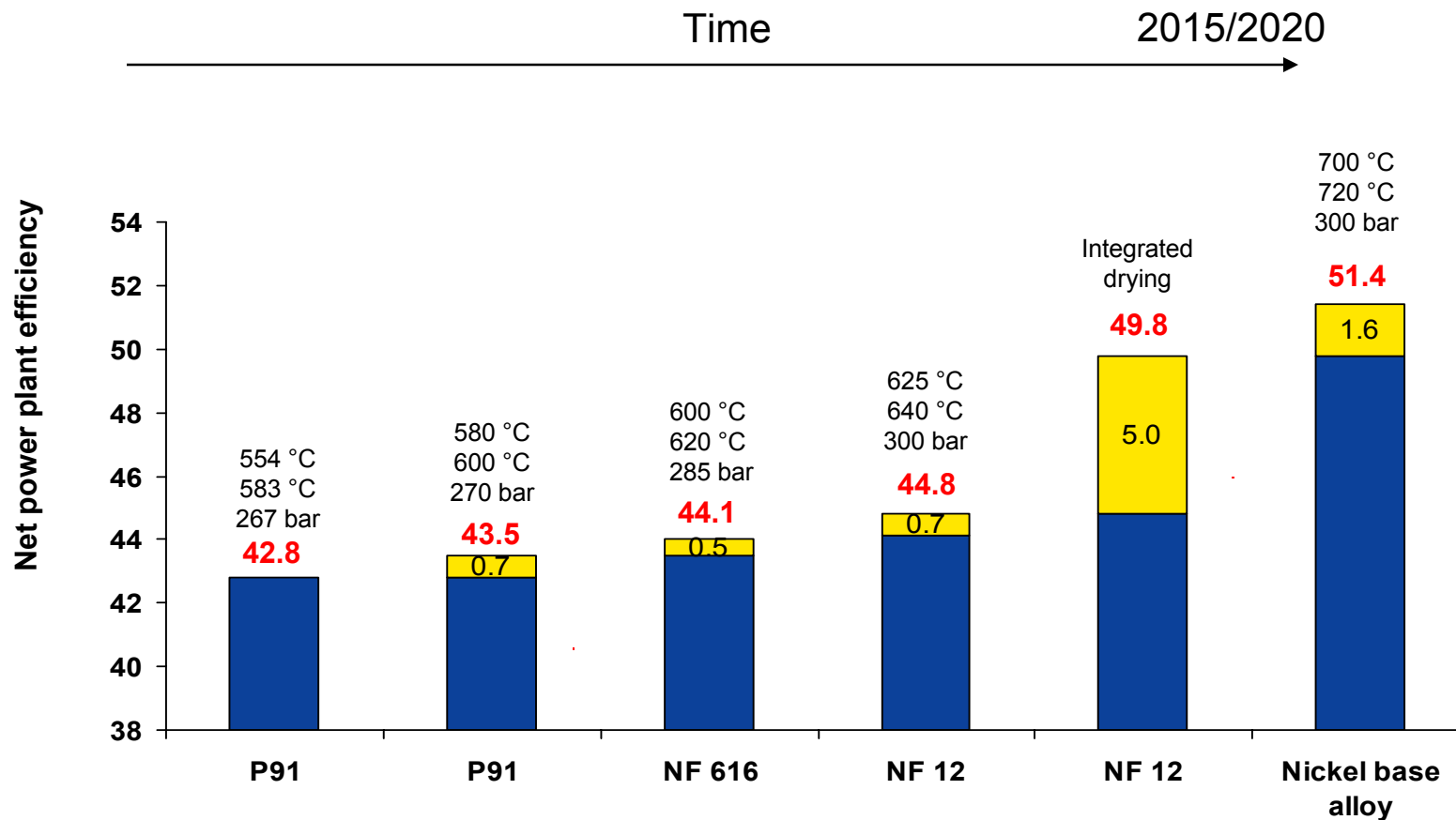
- New materials
- Raised steam parameters
- Pre-drying (lignite)

State-of-the-art: 40 – 45 %

Power plants in operation:  
30 – 37 %



# Power Plant Efficiency Can Be Increased



Source: Vattenfall Europe, efficiency of lignite fired power plants

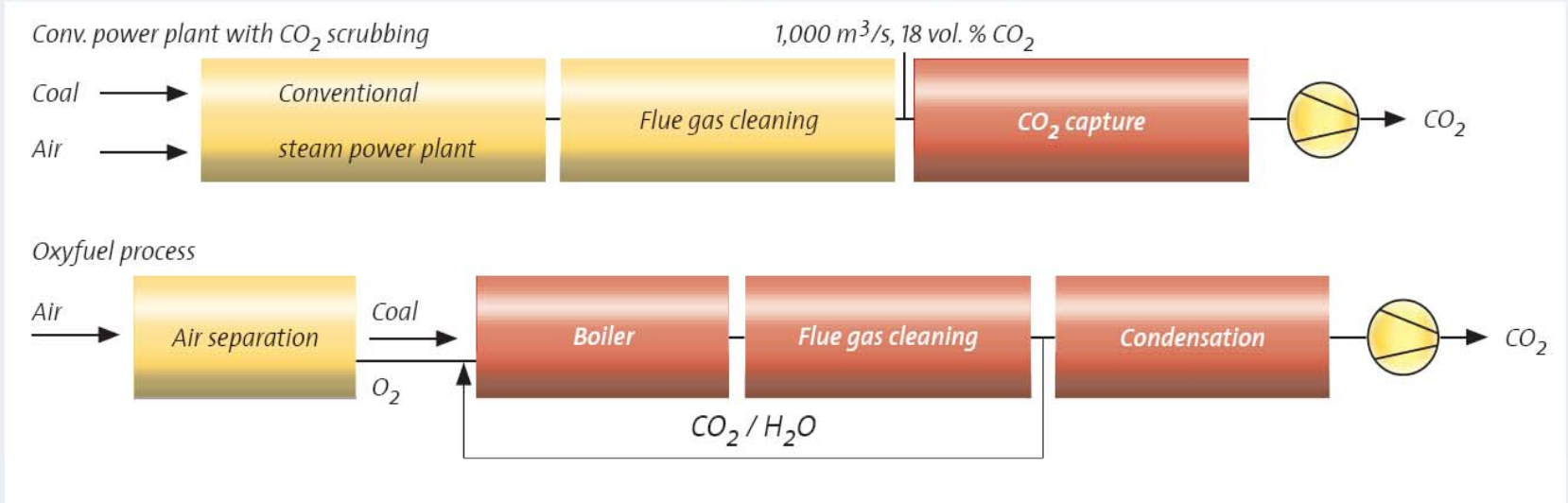
# CCS – EURACOAL's overall position

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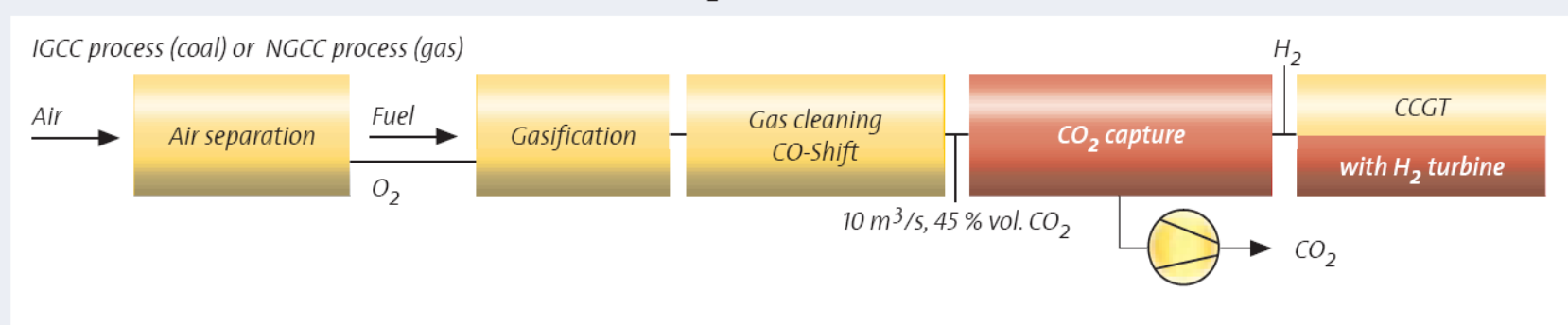
- CCS is a **highly promising technology** within climate protection policies
- The demonstration **project network** proposed by the Commission / the ZEP Technology Platform must be put into practice as soon as possible
  - Project selection - criteria and modalities to be definitely fixed in the Comitology procedure
  - Encourage Member States to co-finance the projects from auctioning revenues
- Decisions on CCS obligations only after results of industrial demonstrations have been evaluated (review in / after 2015)
- Retrofit with CCS after 2020: in some places, top efficiencies may be the best option; any retrofit is subject to proportionality
- Capture-readiness as defined in the CCS Directive is backed

# Potential CO<sub>2</sub> Capture Technologies

## Post-combustion CO<sub>2</sub> capture (steam power plants)



## Pre-combustion CO<sub>2</sub> capture (combined-cycle plants)



■ Novel, modified process steps

# Germany - RWE and Vattenfall

## RWE: CCS DEMONSTRATION PLANT IN HÜRTH



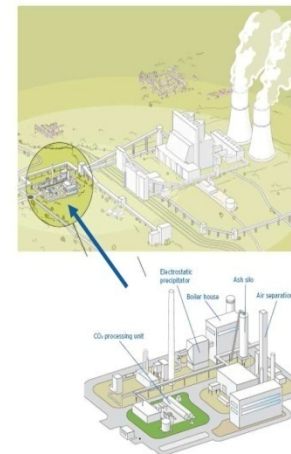
- Basic technology: IGCC (Integrated Gasification Combined Cycle)
- Electr. capacity: 450 MW<sub>gross</sub>
- Capture rate: approx. 90% of CO<sub>2</sub>
- Carbon capture: approx. 2.6 mill. t/a in deep saline formations in north Germany
- Commissioning: End-2014 with optimal underlying conditions

RWE Power has its own power plant and gasification know-how and RWE Dea has the basic know-how required for carbon storage.

## VATTENFALL: OXYFUEL PILOT PLANT SCHWARZE PUMPE

### Vattenfall 30 MW oxyfuel Pilot Plant in Germany

World's first pilot including the whole chain/components:



Air separation  
Boiler 30 MWth  
Ash treatment  
Electrostatic precipitator  
CO<sub>2</sub> processing unit



© Vattenfall AB

10

VATTENFALL

Vattenfall 250 MW oxyfuel and 250 MW post combustion demonstration plant in preparation for 2015.

# United Kingdom – A number of demonstration projects announced

## KINGSNORTH POST-COMBUSTION



- Kingsnorth, e.on, 300 MW new post-combustion, 2014
- Ferrybridge, Scottish and Southern Energy, 500 MW retrofit, 2015+
- Tilbury, RWE nPower, 1600 MW new post-combustion, 2016
- Hatfield, Powerfuel Power, 900 MW new pre-combustion, 2012-14
- Teesside, Centrica etc., 800 MW new pre-combustion, 2013
- Killingholme, e.on, 350 MW new pre-combustion, 2016+

# Czech Republic - ČEZ GROUP

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## NORTH BOHEMIA CLEAN COAL PROJECT



- New power plant
- 660 MWe & supercritical steam parameters
- Lignite
- 2015

## HODONIN CO<sub>2</sub> SEPARATION PROJECT



- Existing power plant
- 105 MWe (2 x FBC, 1996-7)
- Lignite + biomass
- 2015

# Poland – BOT and PKE/ZAK

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## BELCHATOV, PGE



- New 858 MW lignite-based, post-combustion capture, 2015, 1/3 CCS

## KEDZIERZYN, Poludniowy Koncern Energetyczny/Zakłady Azotowe Kedzierzyn

- New 500 MW syngas and 250 MWel, polygeneration, 2014

# Major coal CCS projects in other countries

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## ■ Spain

- La Robla/ León, UNION FENOSA, new 200 MWel (post combustion); Storage connected to the plant (Saline aquifer) – 2016/2017
- ENDESA, 500 MWel oxyfuel (circulating fluidised bed) – 2015; 1 MW plant in operation; intermediate; 20-30 MWt test period in Ciuden

## ■ Bulgaria

- Maritsa, 650 MW new pre-combustion

## ■ Italy

- Brindisi, ENEL CCS 1, 242 MW retrofit, 2014
- Brindisi, ENEL 2, 320 MW oxyfuel, 2016

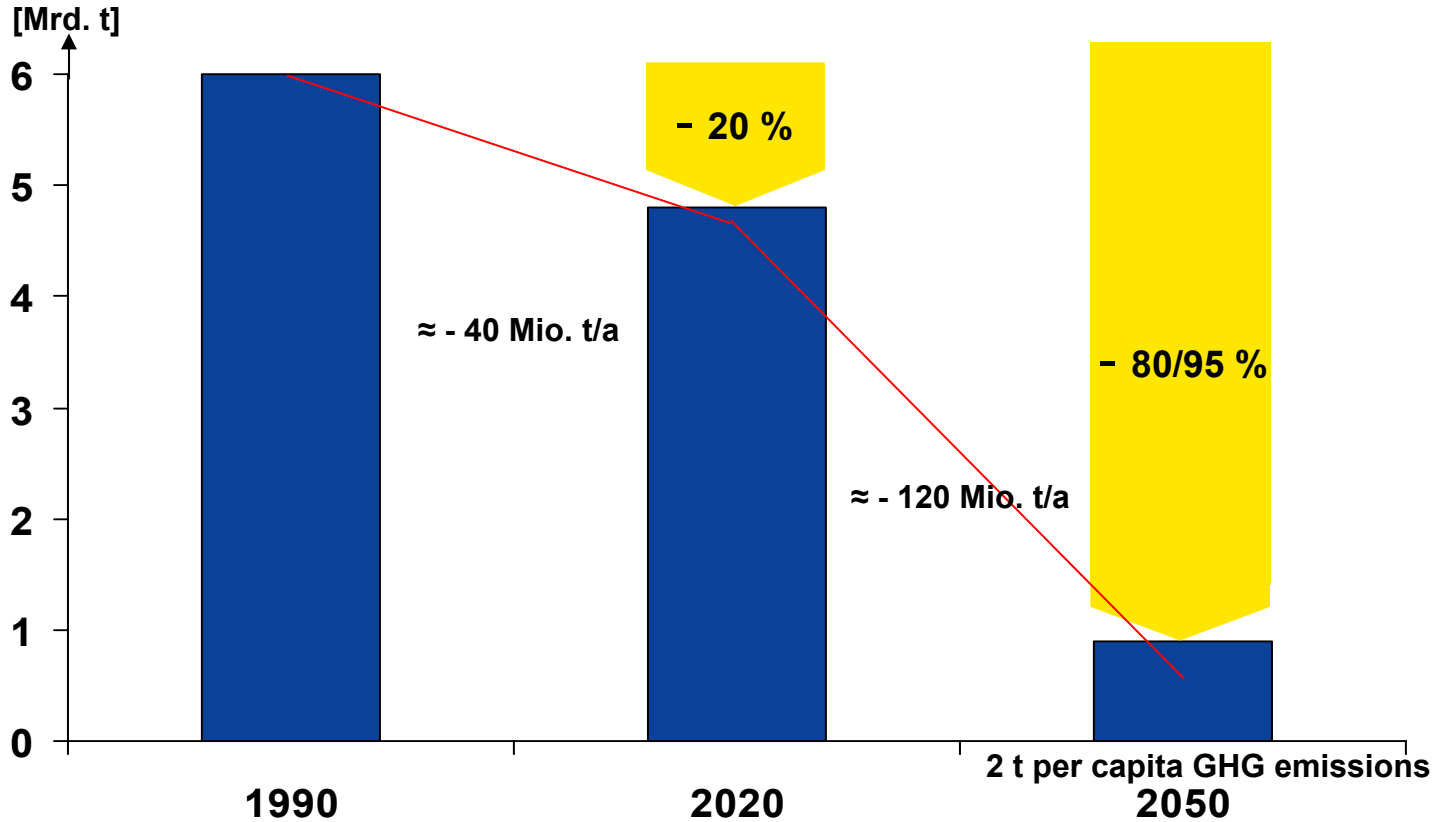
## ■ The Netherlands

- A number of pilot and demo projects to be commissioned as from 2011

# Climate Protection in the EU

## Two phases – two speeds

GHG emissions in the EU



Conclusion: For the EU, this means that GHG emissions of 5,8 billion t/a in 1990 must be limited to ca. 4,6 billion t in 2020 and ca. 1 billion t/a in 2050.

# The minus 80-95% CO<sub>2</sub> - case

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- All fossil fuels to be used in industrial installations with CCS only; CCS becomes a general obligation for industry in Europe
- Operators of installations must pay for capture, transport and storage, independent of the fossil fuel type used
- The CCS infrastructure (transport and storage) is needed at around 2020 and becomes an issue of secure energy later
  - It creates planning security
  - It secures industrial activity in Europe and may become a production factor for Europe
  - Its construction is therefore of general interest; a single user cannot afford it; a common effort is needed

# Conclusions

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- Security of energy supply remains important
- Hard coal and lignite represent 80 % of the EU-27 domestic fossil fuel resources
- In the decades to come, access to coal resources and continuous modernisation of coal-fired power plants remain essential for a secure, competitive and sustainable energy supply.
- Industry, policy makers and administrations must develop a CCS demonstration network in order to potentially have the technology by 2020, incl. infrastructure and financing issues.

**Coal will remain a part of the solution to Europe's energy supply.**

# EURACOAL

European Association  
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**Thank you for your  
attention!**

Photos courtesy of:

- CEZ
- Vattenfall
- RWE
- E.ON
- STEAG
- PPWB

Brussels - 24<sup>th</sup> September 2009