



E3G

# Delivering a zero emissions EU power sector:

Evidence review on current investment momentum and future scenarios

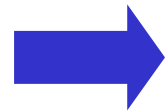
December 2009

Jonathan Gaventa

# Outline of slides



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EU overview

Selected country profiles

UK

Germany

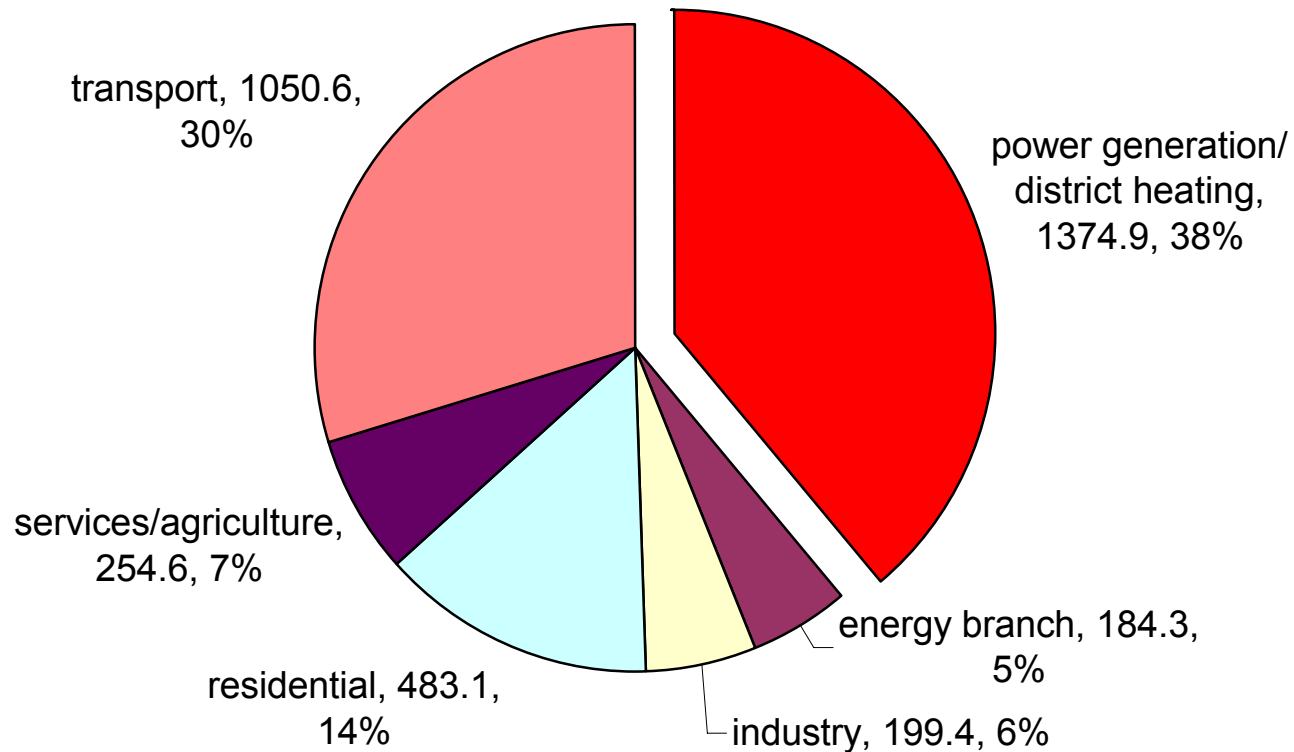
France

Spain

Poland

Conclusions

# Power sector is largest source of CO2 in EU27: 38% of overall CO2 and 28% of GHGs

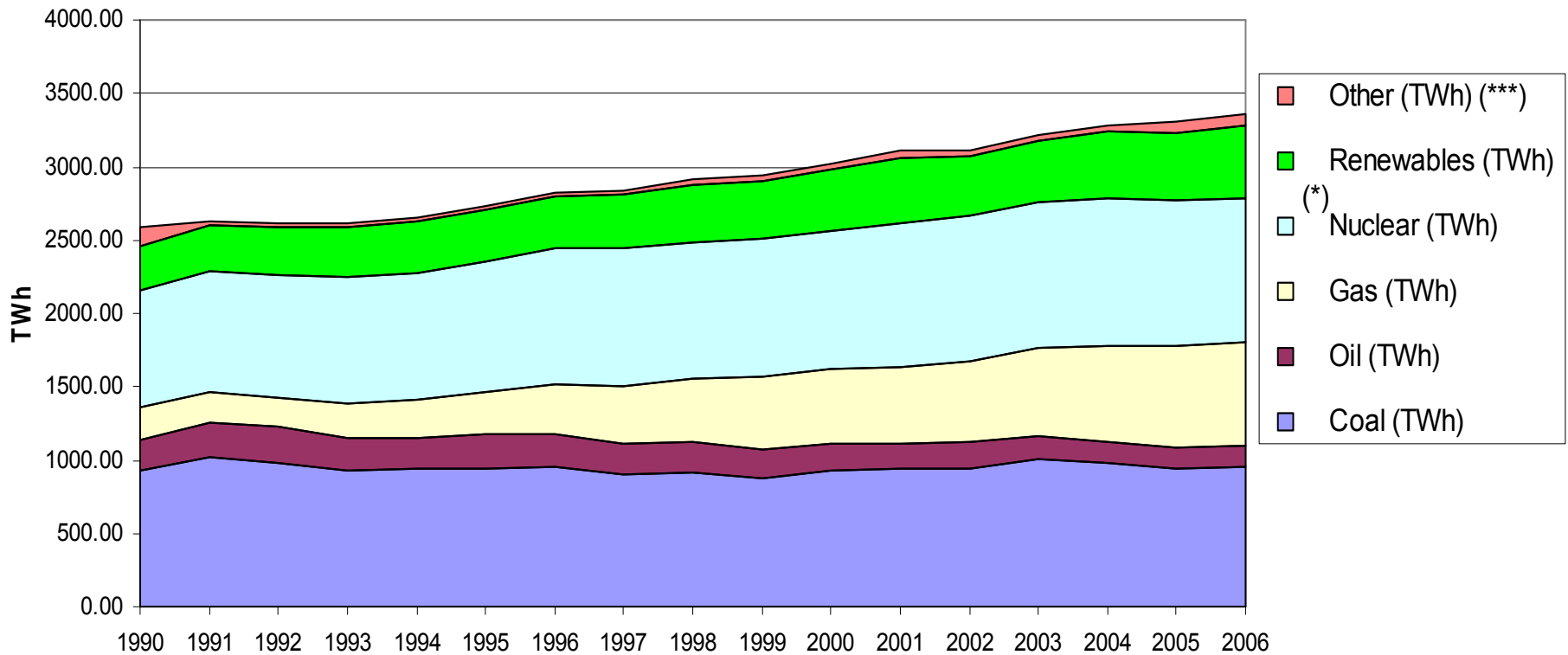


EU CO2 emissions by source, 2005 (MtCO2 and %)

# Most power generation comes from fossil fuels; rising demand has been met by an expansion in gas



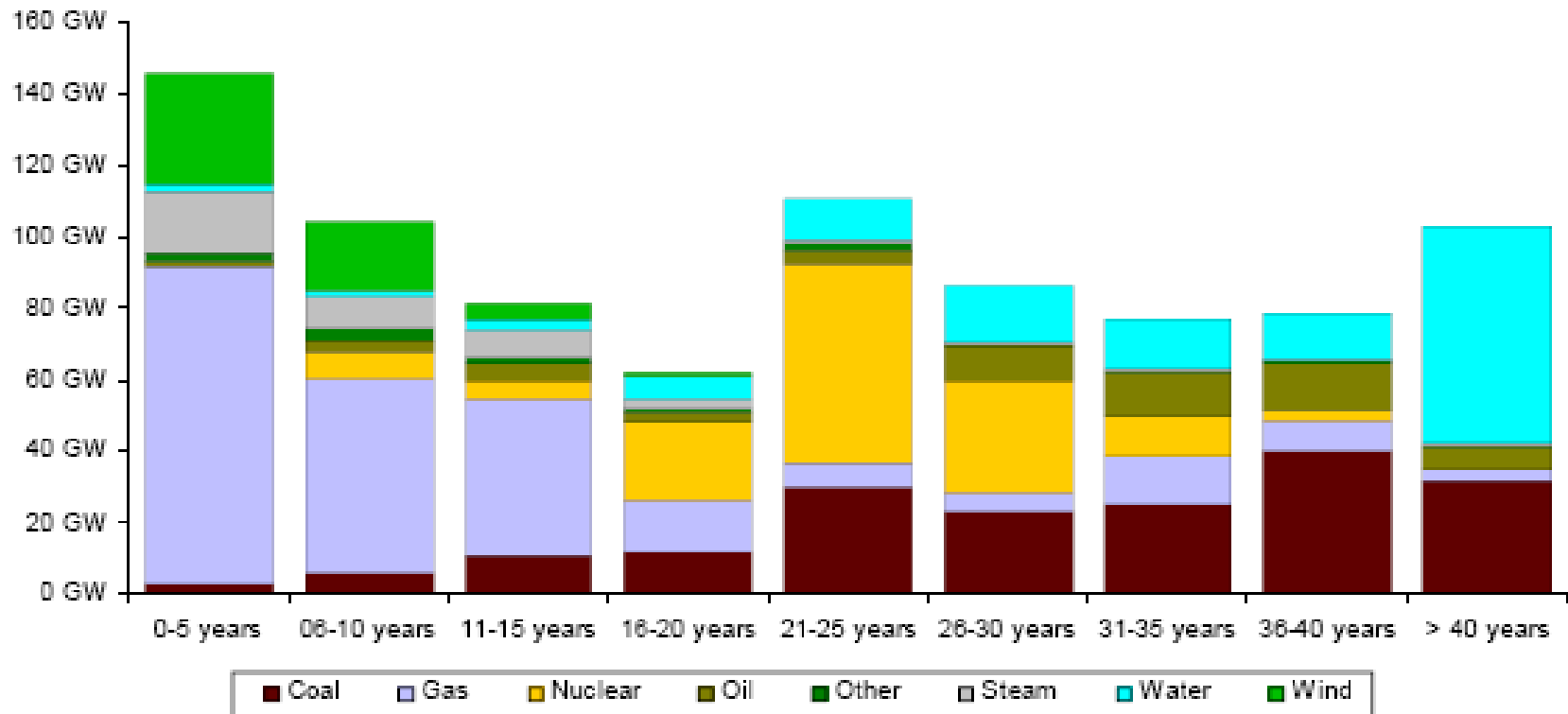
EU-27 Energy consumption 1990-2006



Source: EC DG-TREN 2009a

# Considerable new capacity will be needed as older plants retire

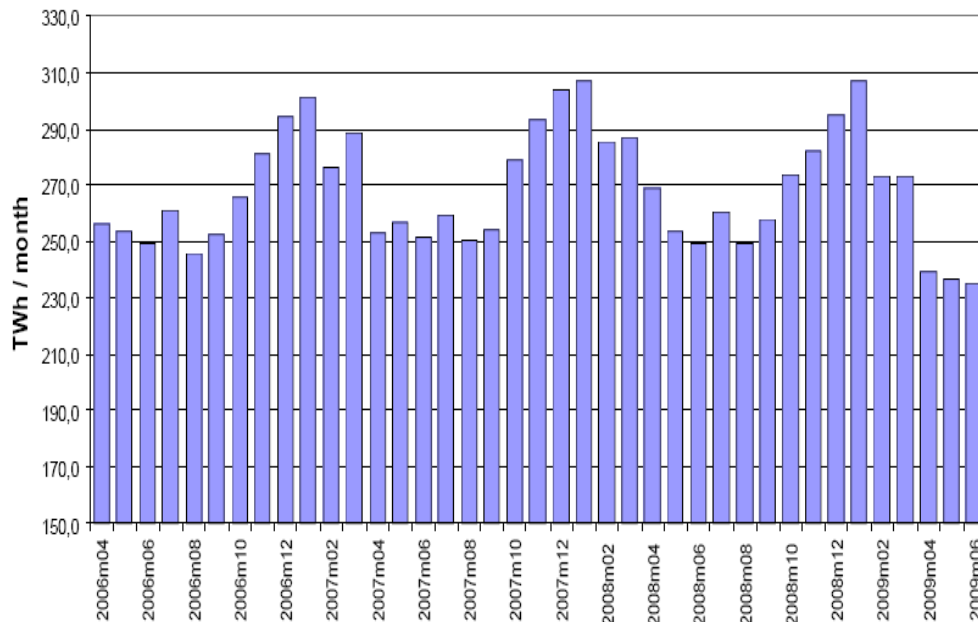
Age of Operational Electricity Generation Capacity in EU27



Source: Platts

# But consumption is falling across the EU as a result of the recession

EU27 monthly electricity consumption



2008: Electricity consumption down 0.1% over 2007; CO2 emissions from thermal combustion down 3.3%

2009: further drop in power consumption over 2008:

- April: -10%
- May: -6%
- June: -5%

# Implications of recession:



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+

CO2 targets easier to achieve  
Lower demand means supply gap less likely  
Falling commodity and construction prices



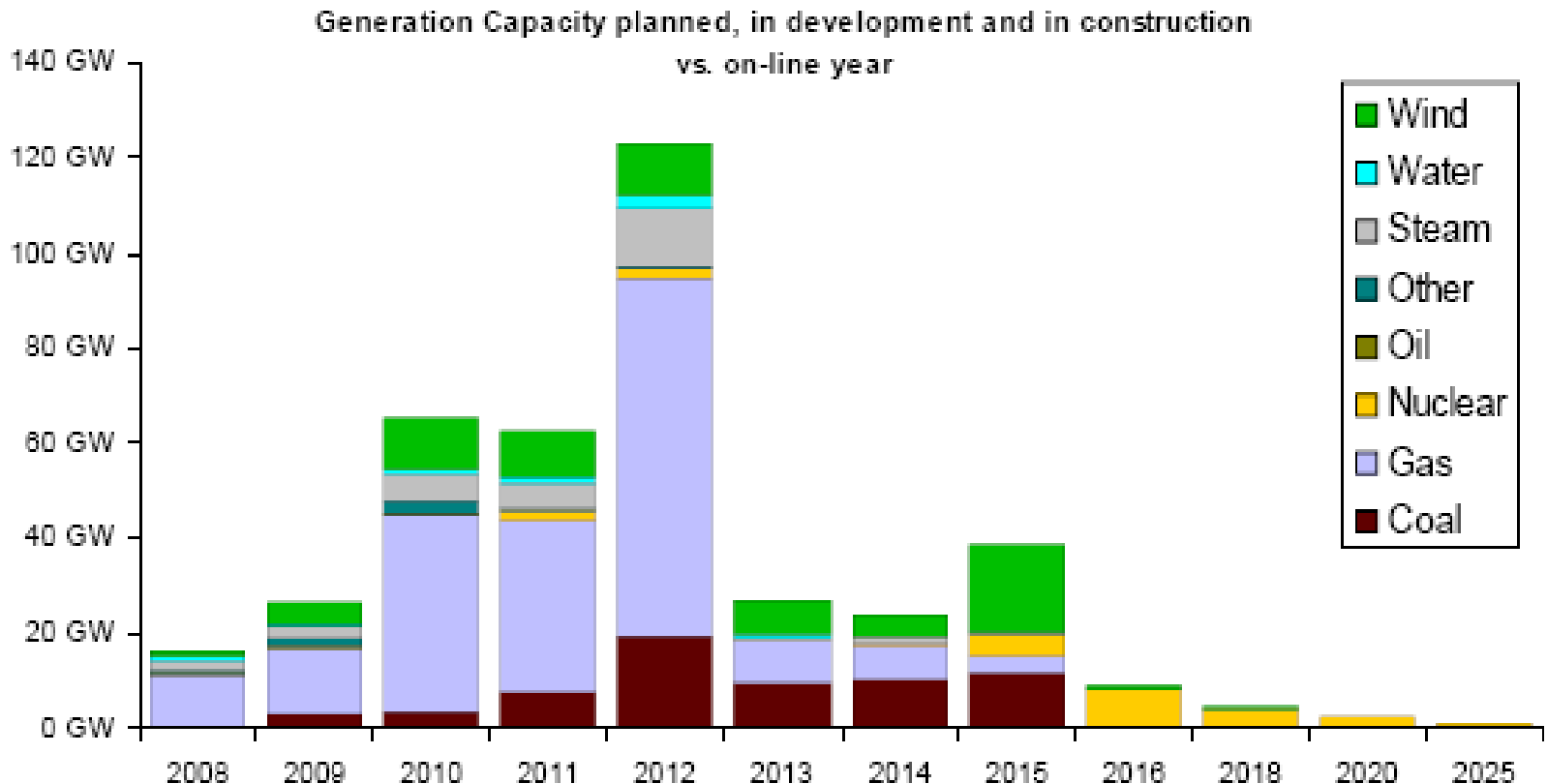
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Planned investments cancelled or delayed  
Falling carbon price and fossil fuel prices  
More difficult to raise investment finance



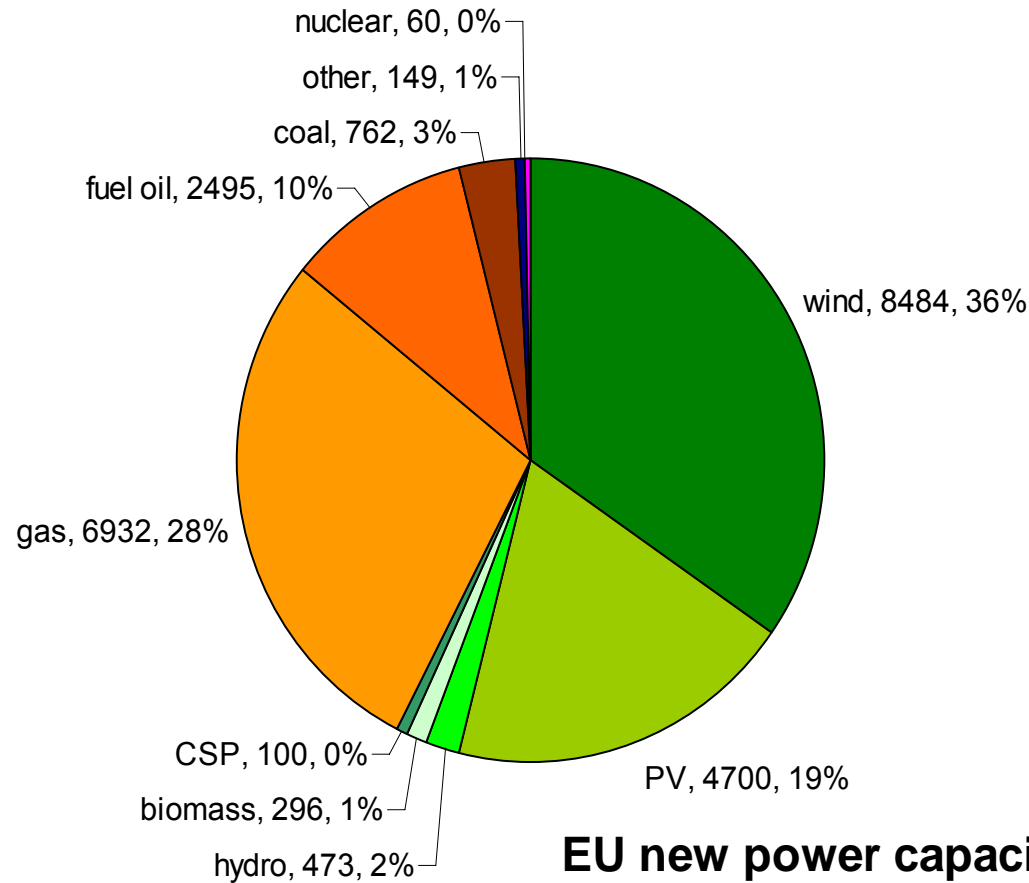
Greater uncertainty in investment momentum

# Large generation capacity in development in Europe is dominated by fossil fuels





... but renewables now represent the majority of new capacity actually installed

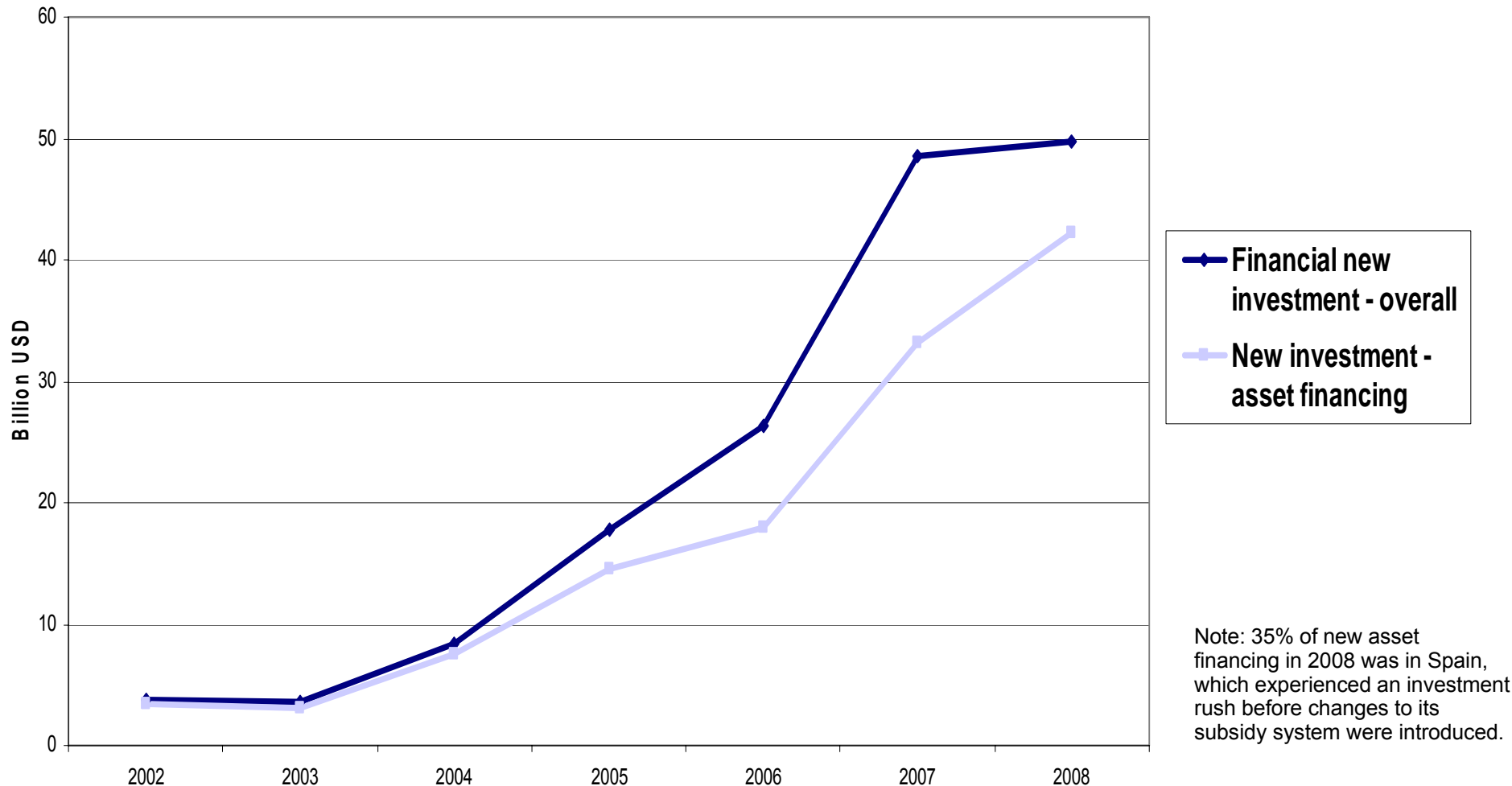


**EU new power capacity 2008 (MW and %)**

# Investment volumes in renewables have increased rapidly since 2003



## New sustainable energy investment in Europe (2002-2008)

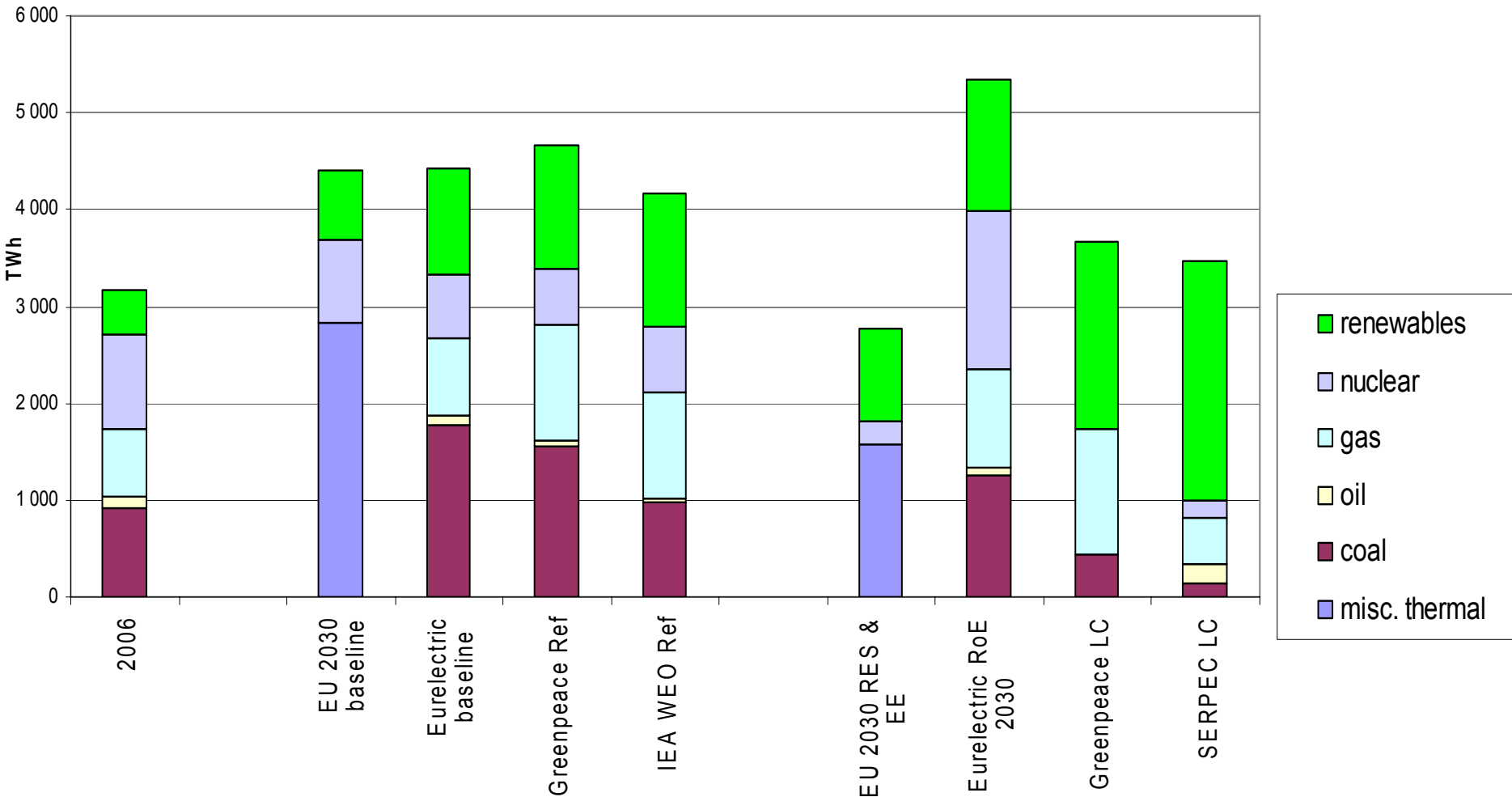


Note: 35% of new asset financing in 2008 was in Spain, which experienced an investment rush before changes to its subsidy system were introduced.

# A number of baseline and alternative scenarios for 2030 have been produced



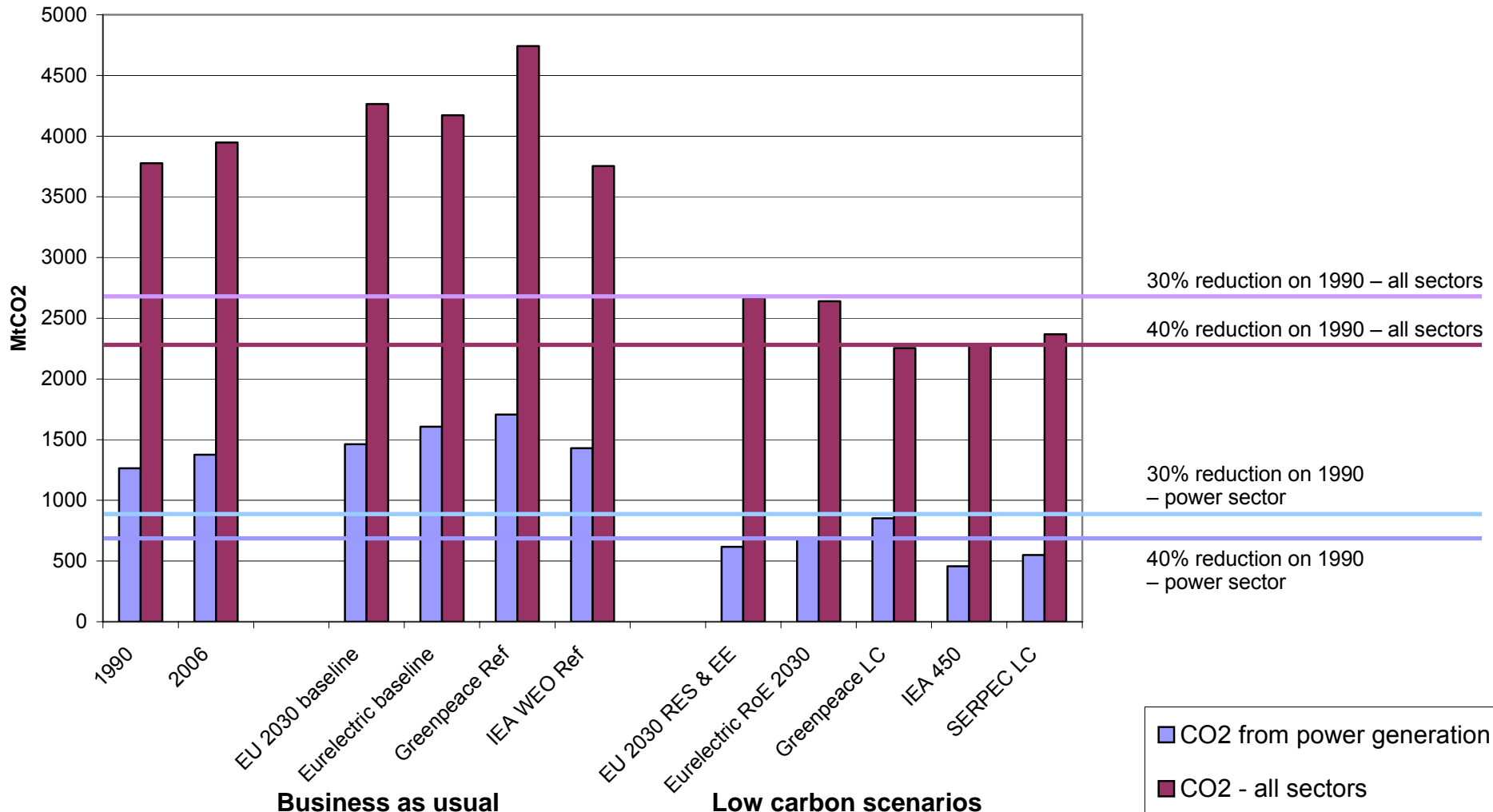
## EU current generation and future scenarios



# 'Business as usual' scenarios massively overshoot carbon reduction targets



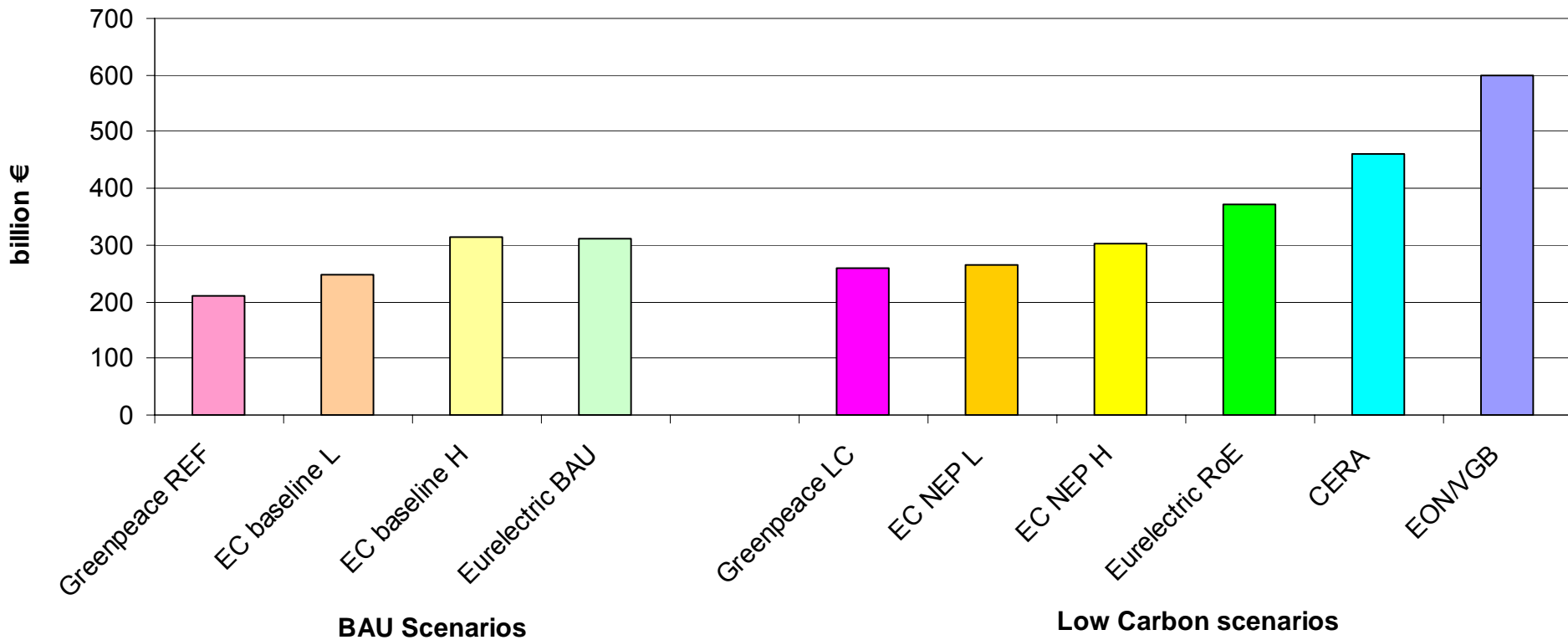
Carbon emissions - current and future scenarios



# Low carbon scenarios require more investment than 'business as usual' – but scale of investment is comparable



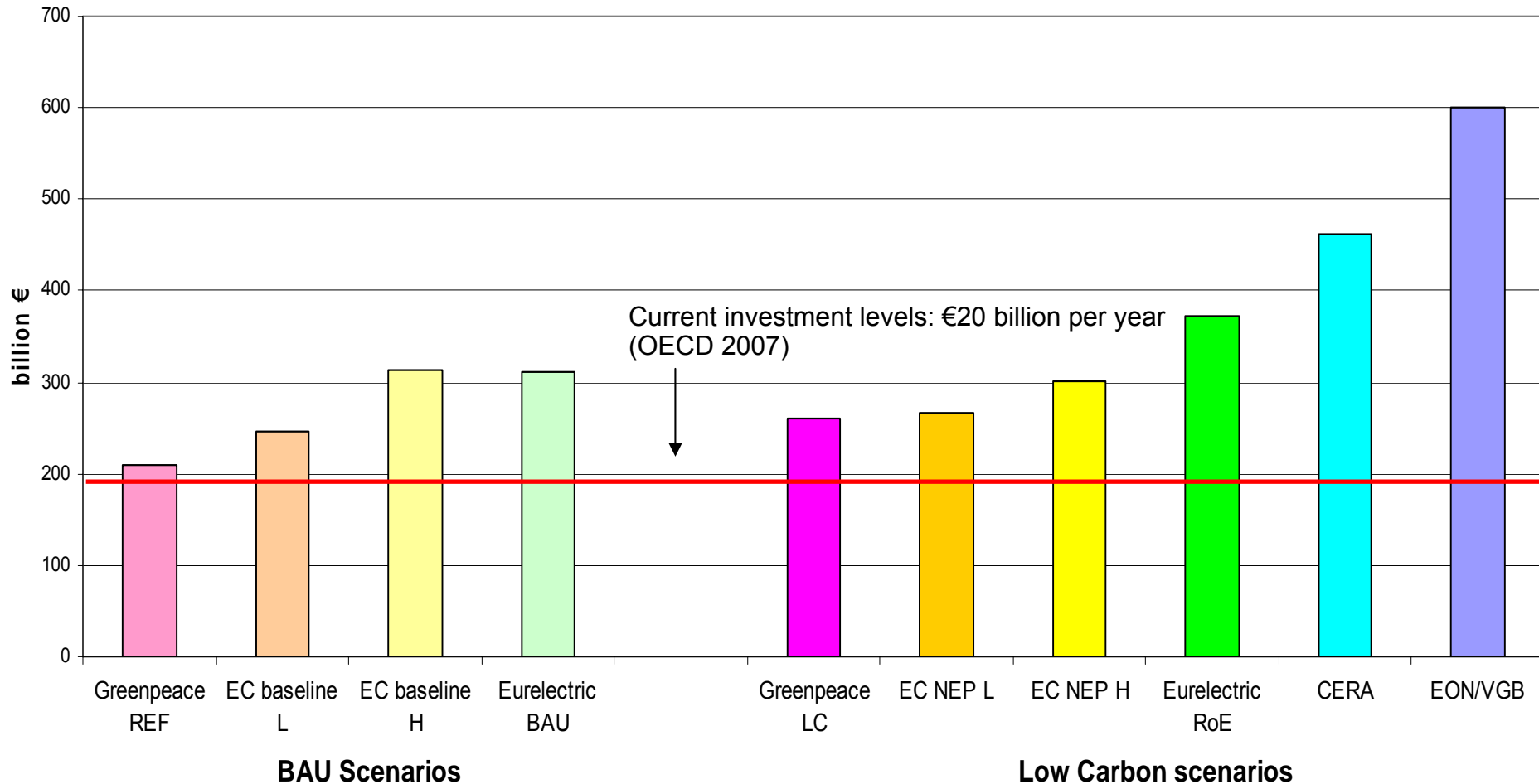
EU power generation investment 2011-2020



# But current levels of investment fall below even baseline scenarios

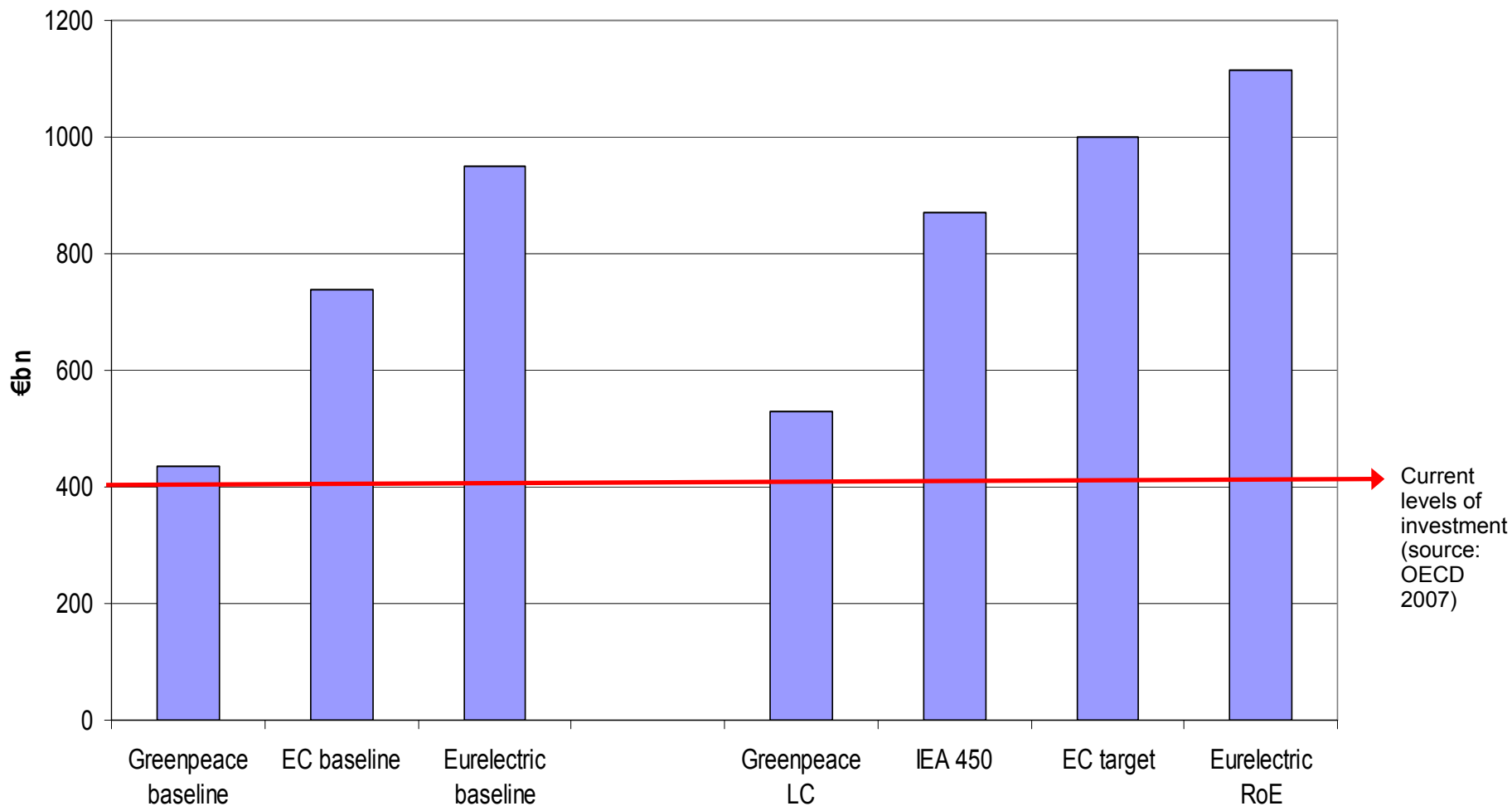


EU power generation investment 2011-2020



# The 'investment gap' is even wider for 2030 scenarios

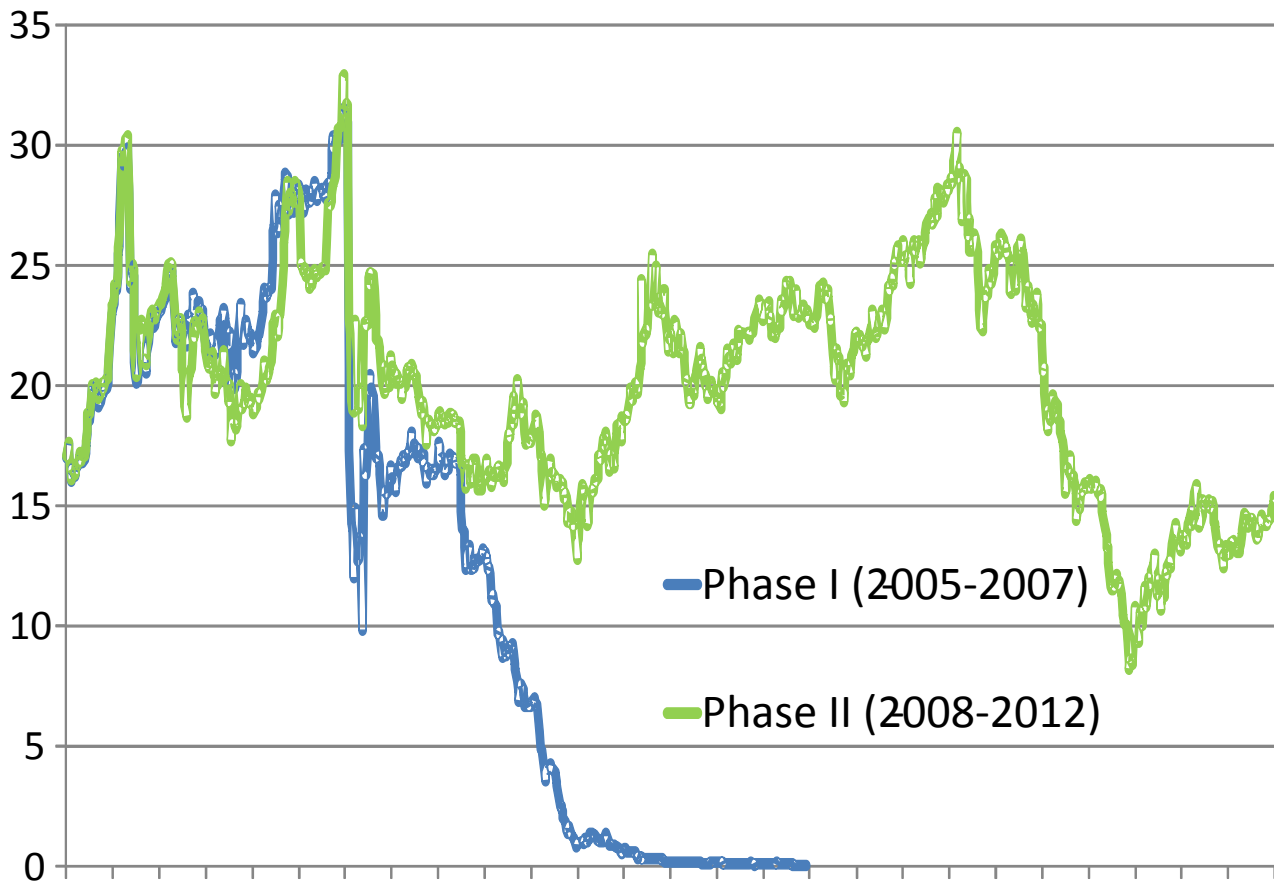
## EU power sector investment to 2030



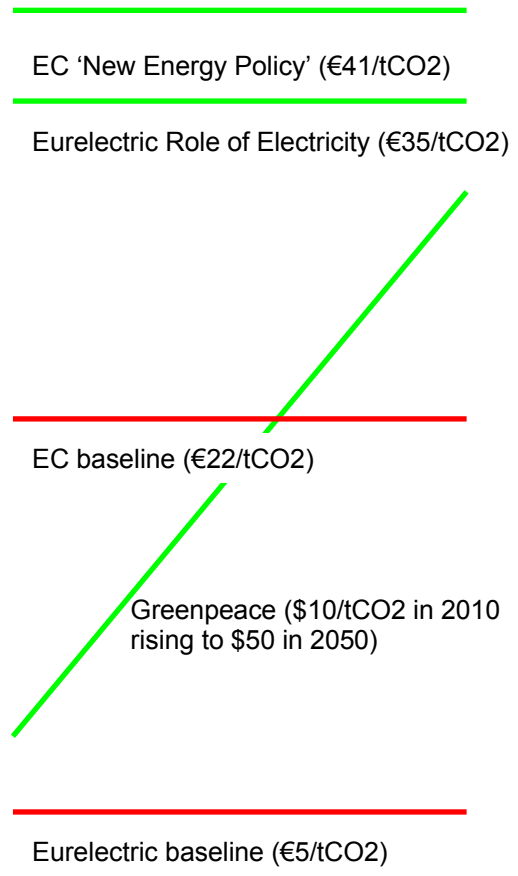
# Carbon price historically volatile and well below most low carbon scenarios



## Carbon prices: historic levels and future scenarios

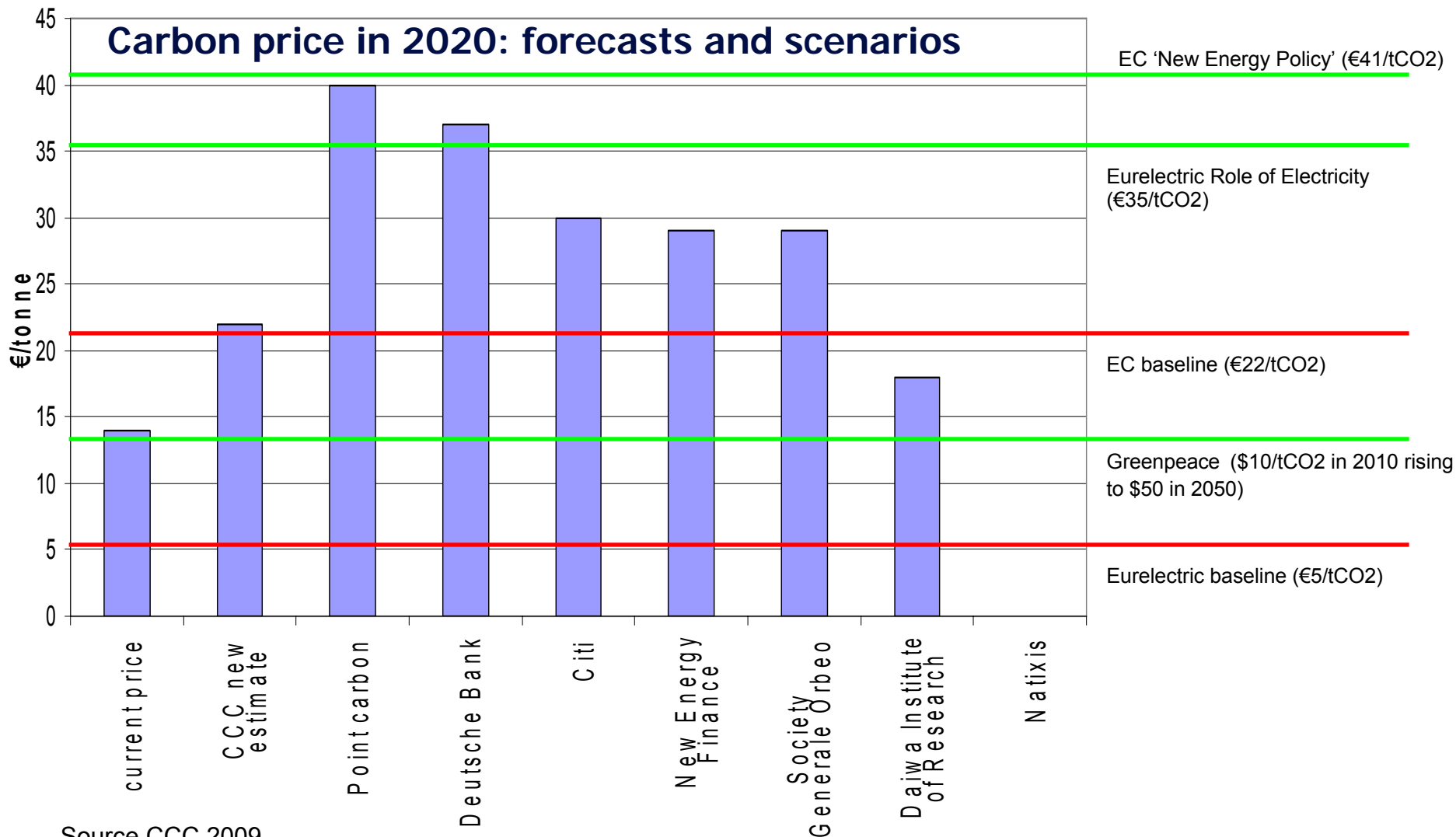


Source: CCC 2009





# Forecasts of future carbon prices varied and mostly below low carbon scenarios

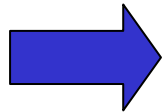


# Outline of slides



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EU overview



Selected country profiles

UK

Germany

France

Spain

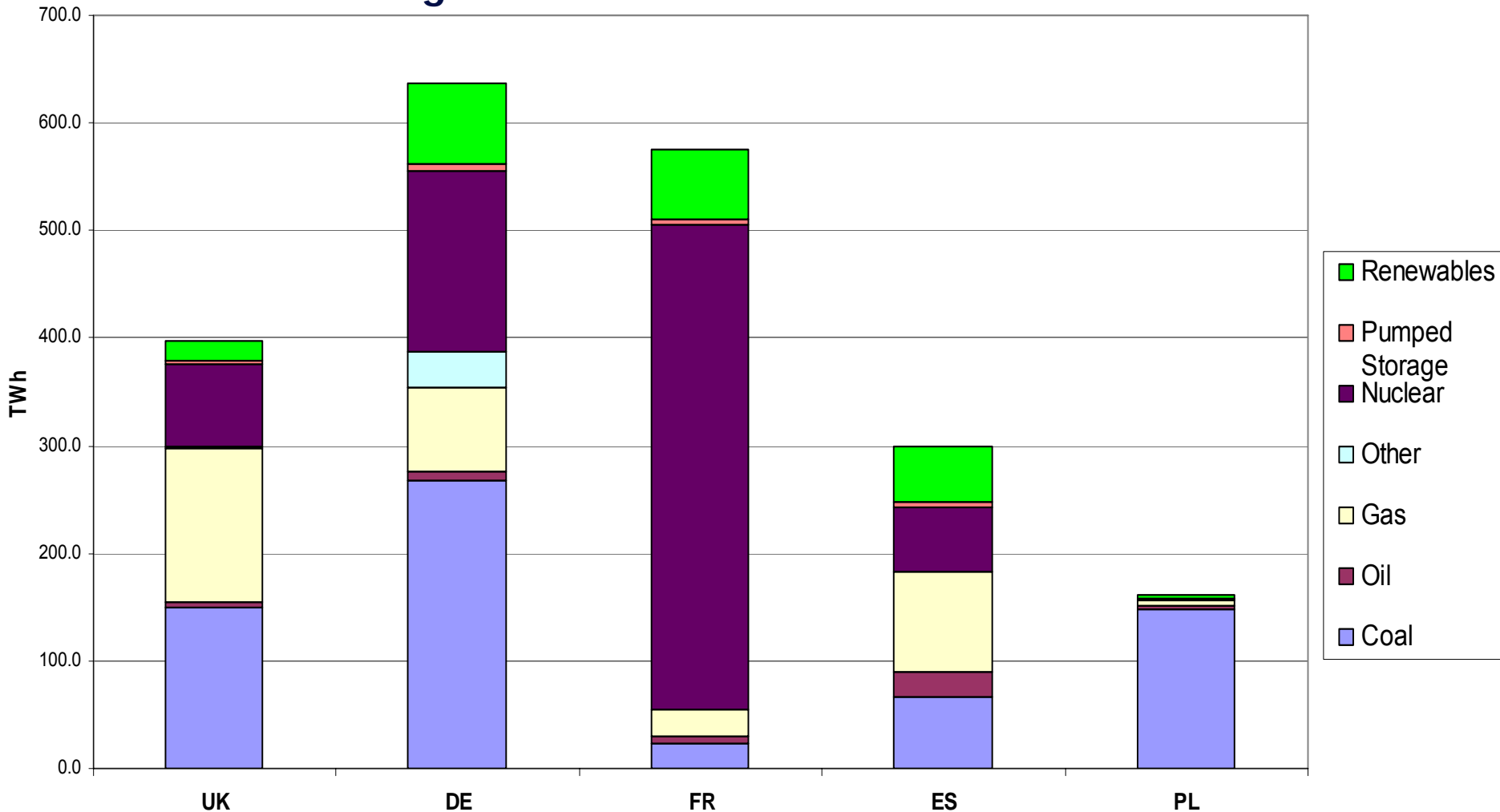
Poland

Conclusions

# Energy profiles vary sharply between European countries ...

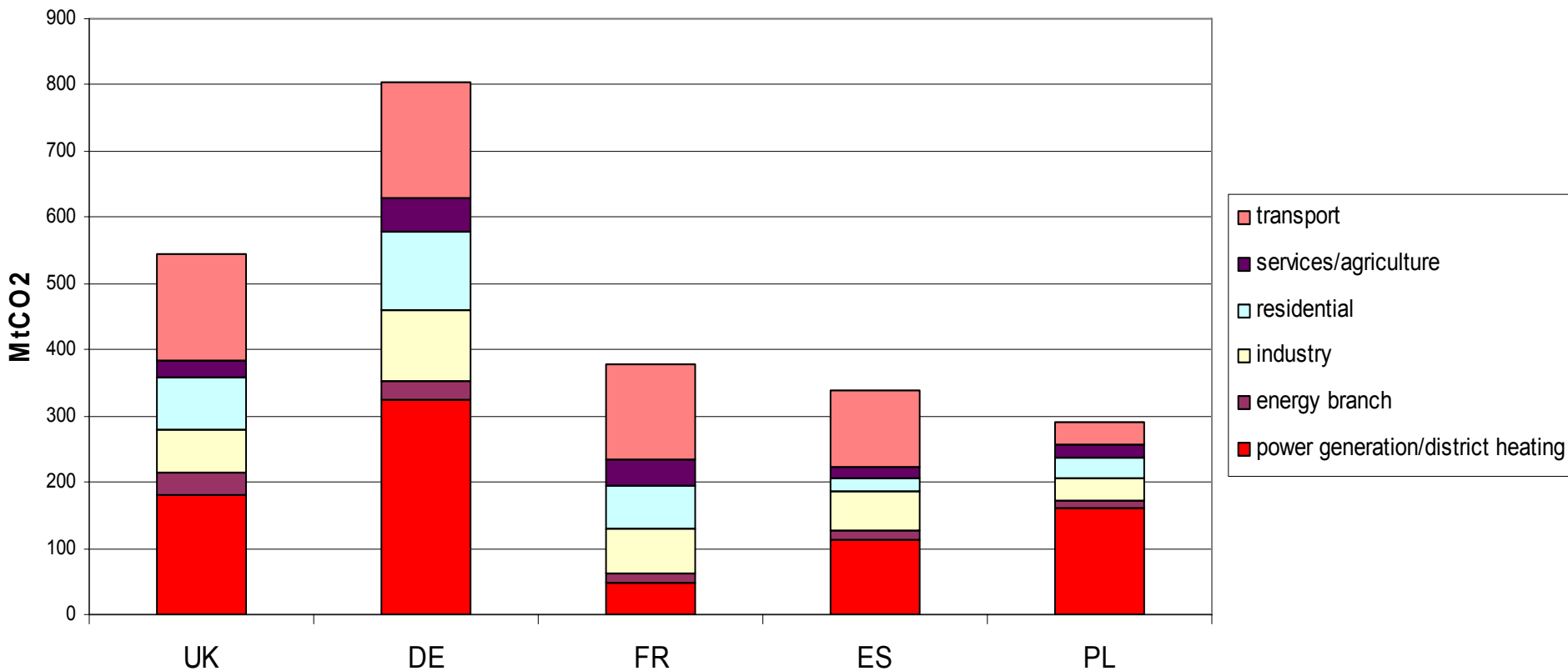


## Power generation: selected EU countries



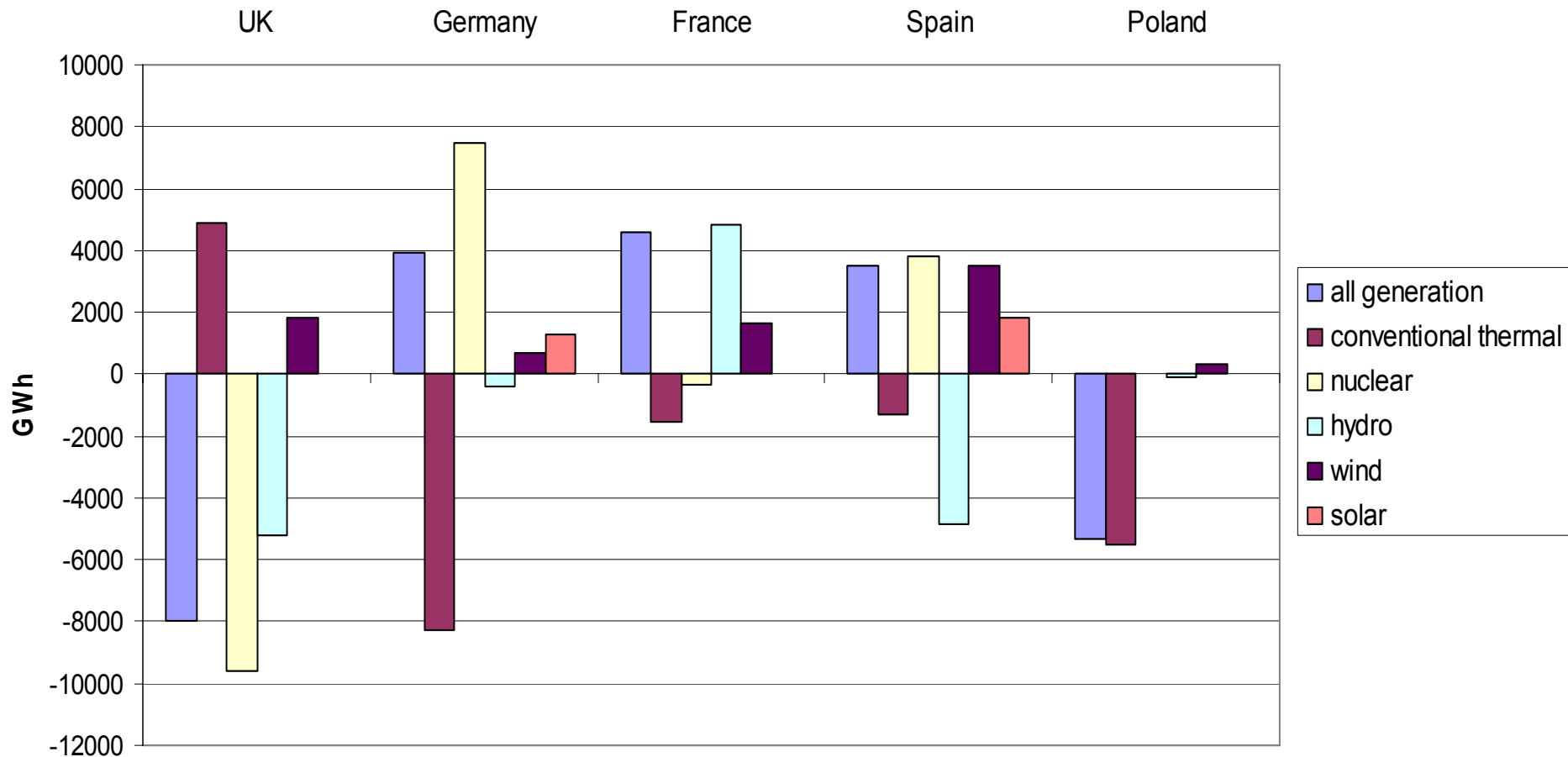
Source: EC DG-TREN 2009a

# ... as do the levels of carbon dioxide emissions from power generation ...



# ... and current momentum in power generation sources

### Change in generation, 2007-8



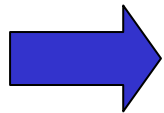
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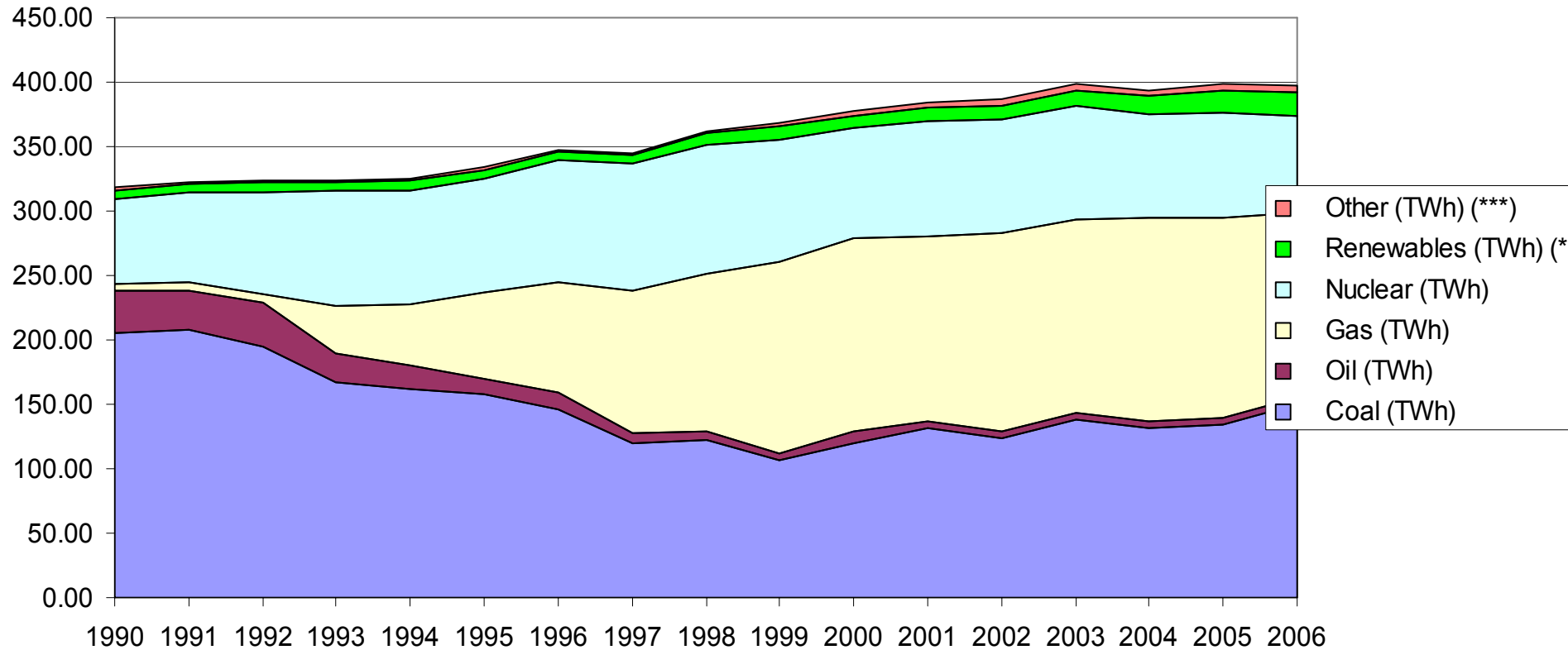
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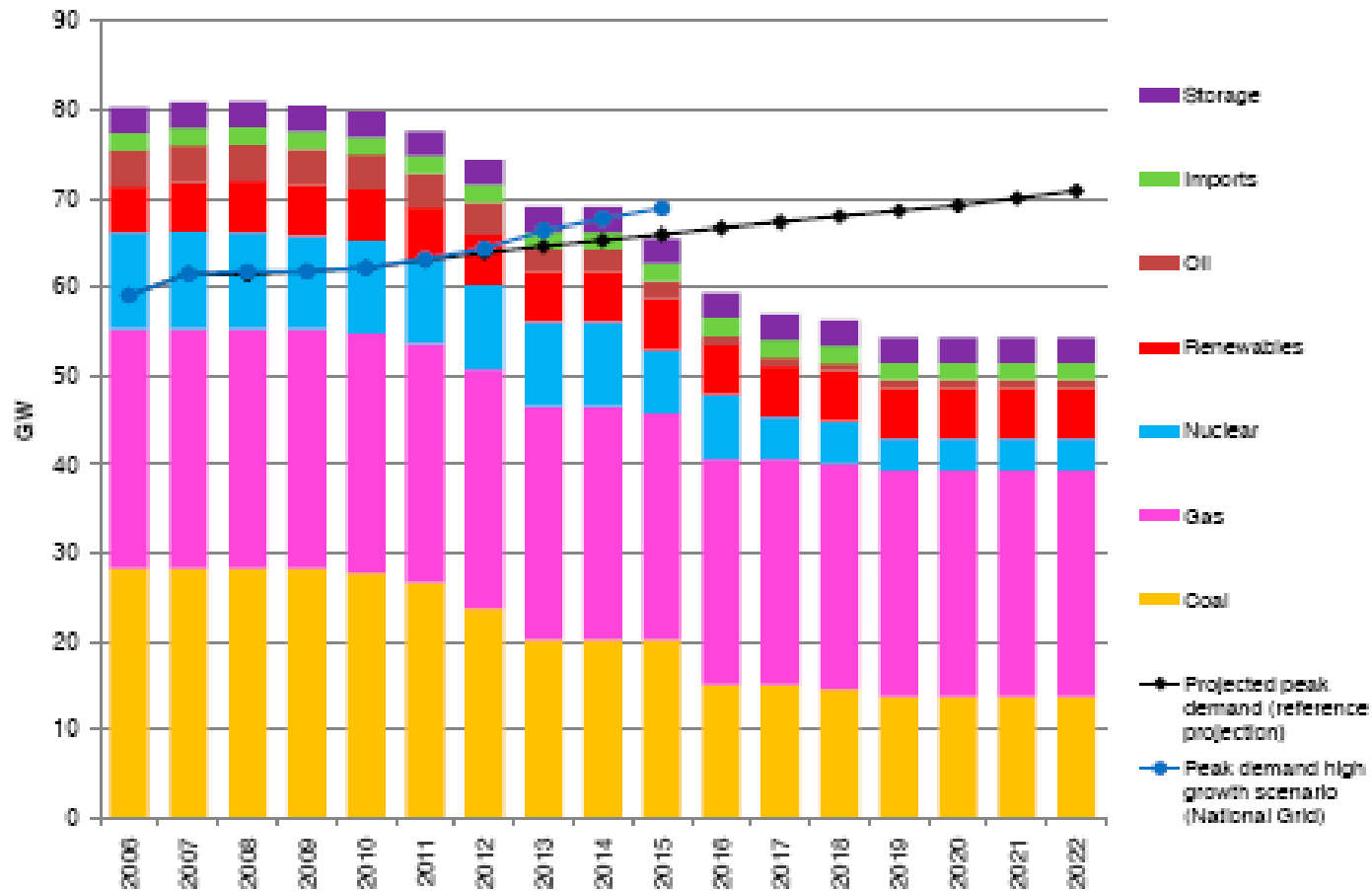
# UK reliant on coal, gas and nuclear – with a very small renewables sector



## UK Electricity consumption by source, 1990-2006



# Forecasts of 'supply gap' by 2016 due to plant decommissioning and rising demand



Source: DECC Energy Model, National Grid (2008) Seven Year Statement.

Note: Assumes peak demand grows in line with demand in our central case reference emission projection.

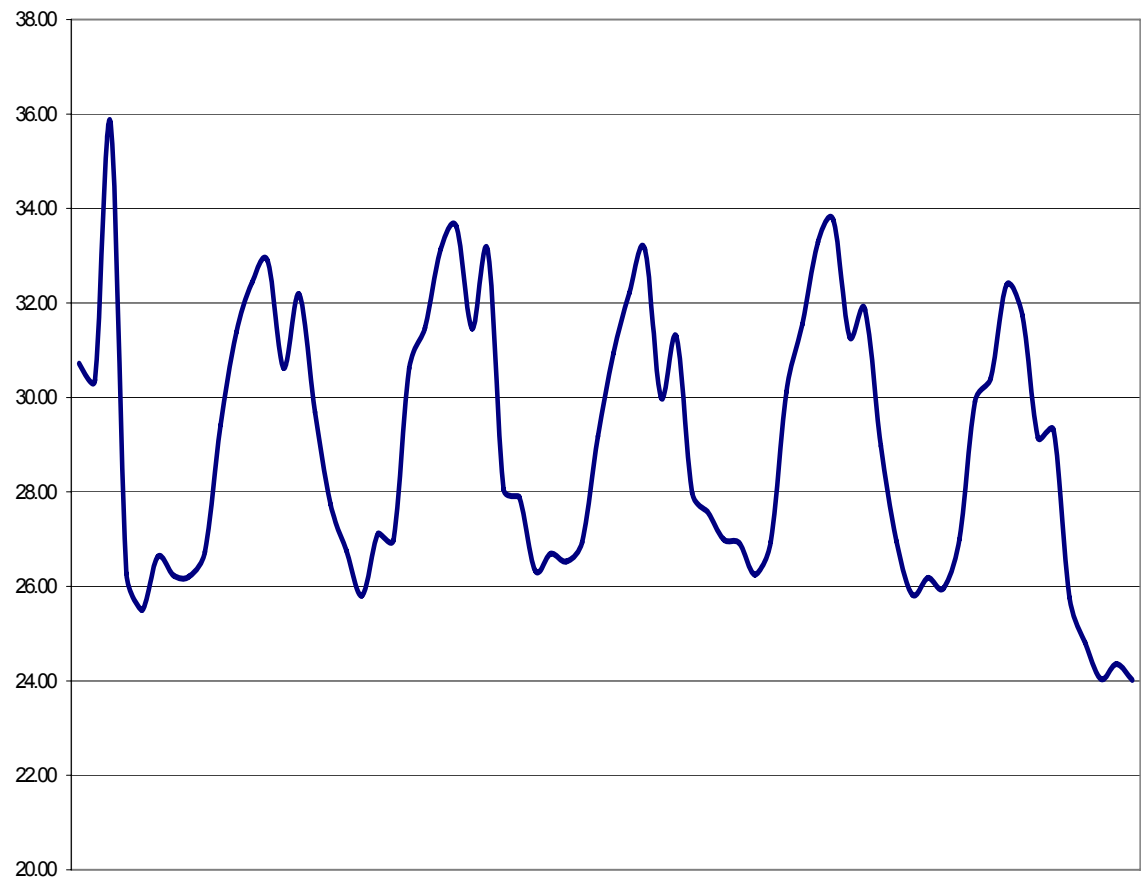


# But recession has halted growth in demand and lowers capital costs



- Electricity demand has fallen for 3 successive years (2006-2008)
- January-August 2009: 7.6% fall in electricity consumption over Jan-Aug 2008

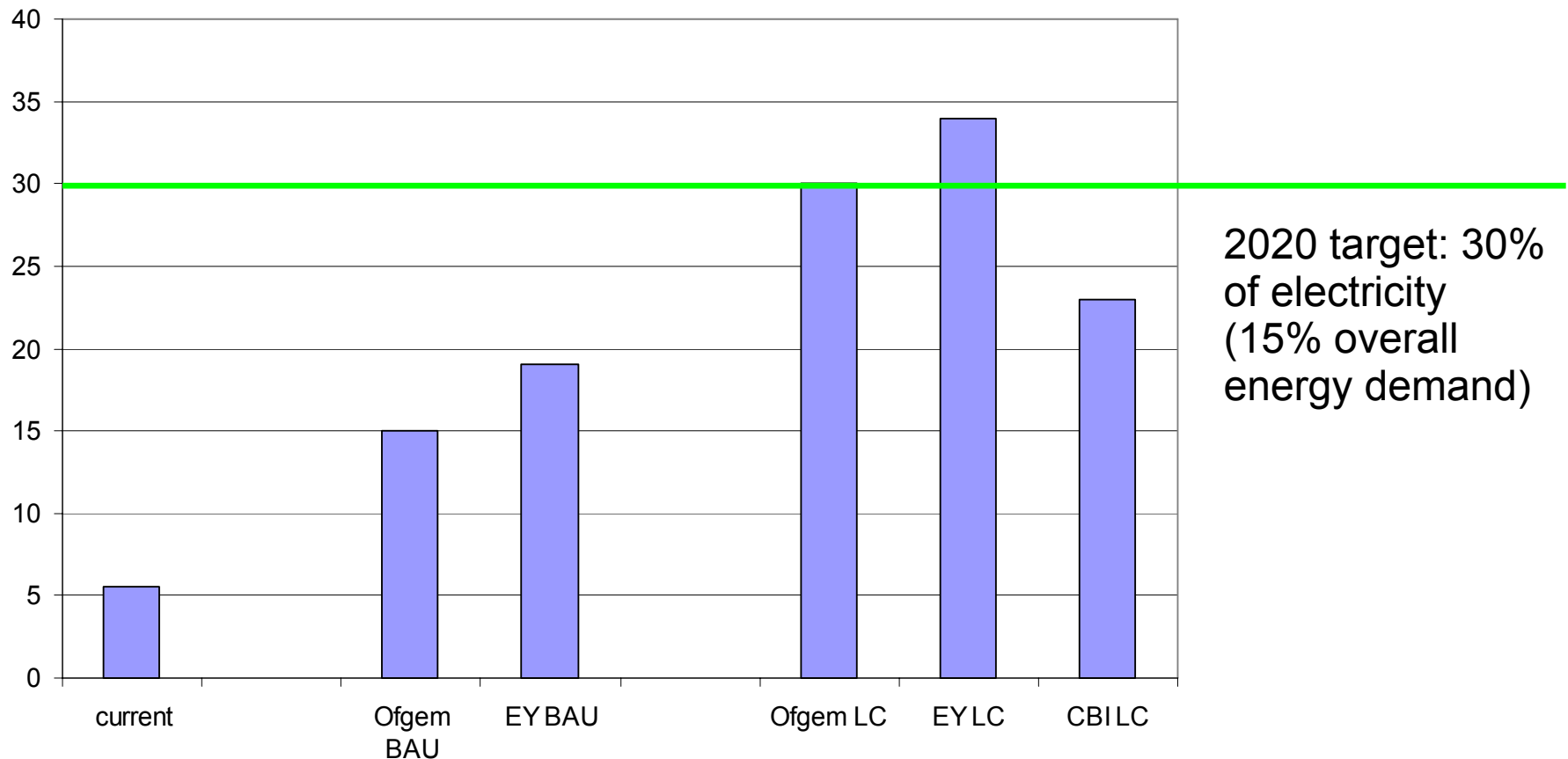
UK monthly energy consumption 2004 – August 2009



# Business as usual scenarios achieve only half of the UK's 2020 renewables target ...

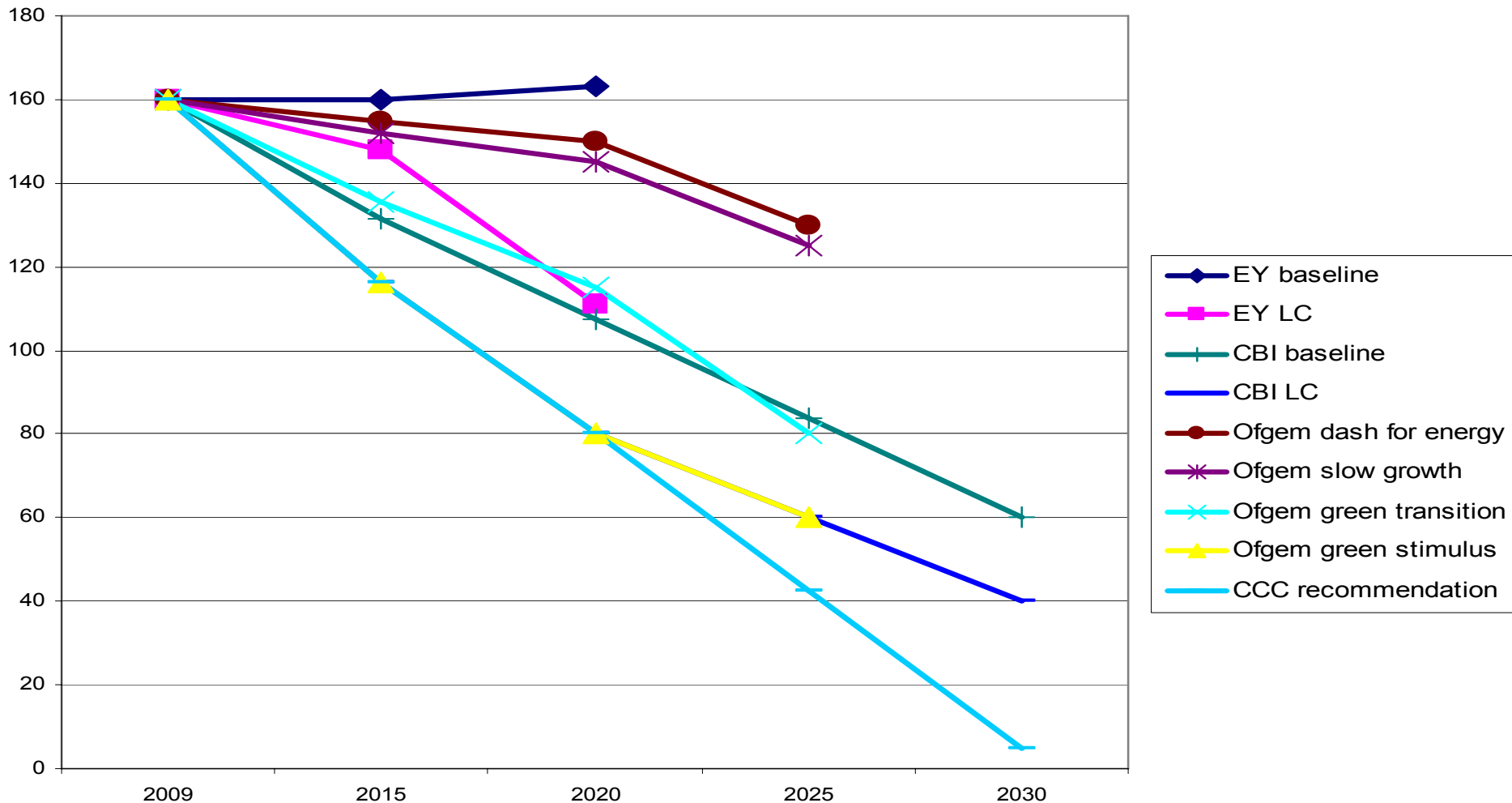


**Renewable electricity % in 2020**



# ... and lead to only small reductions in CO2 from power generation

## CO2 from UK power generation future scenarios

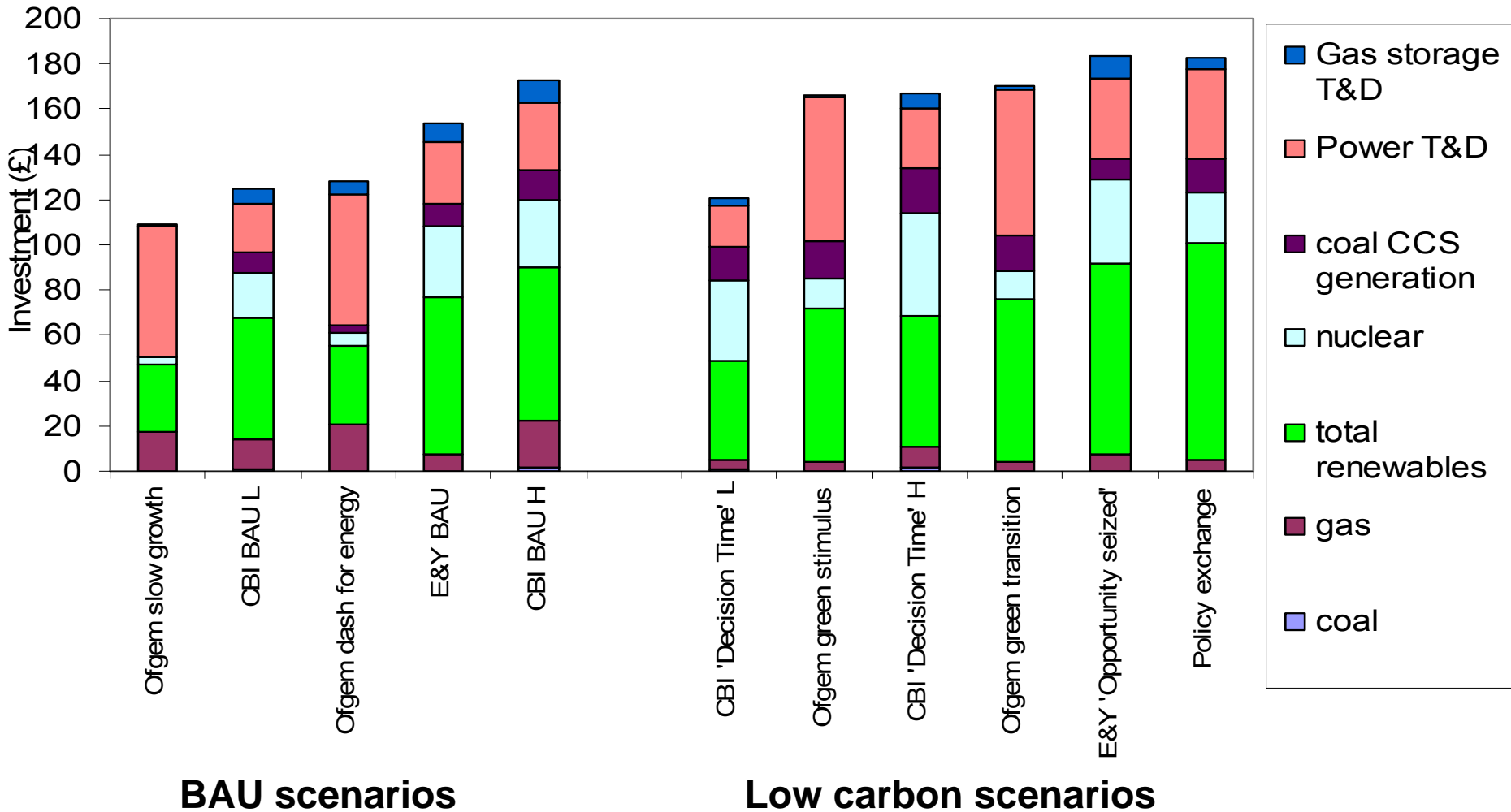


# Considerable investment required under all scenarios; low carbon scenarios only marginally higher than 'business as usual'



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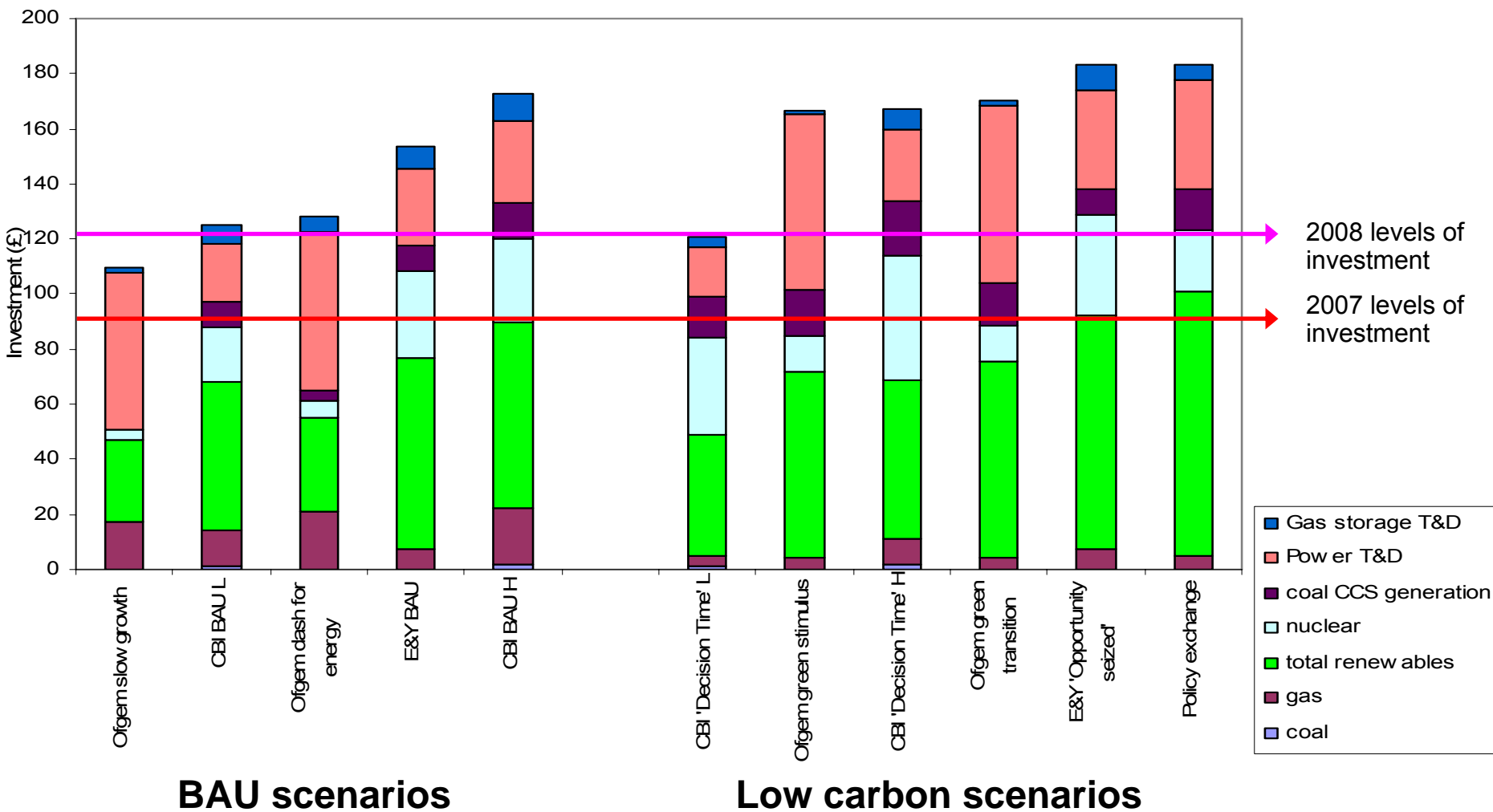
## UK scenarios for investment to 2025



# But current levels of investment insufficient for even some 'business as usual' scenarios



## UK scenarios for investment to 2025



# Outline of slides

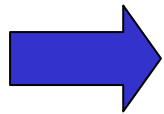


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UK



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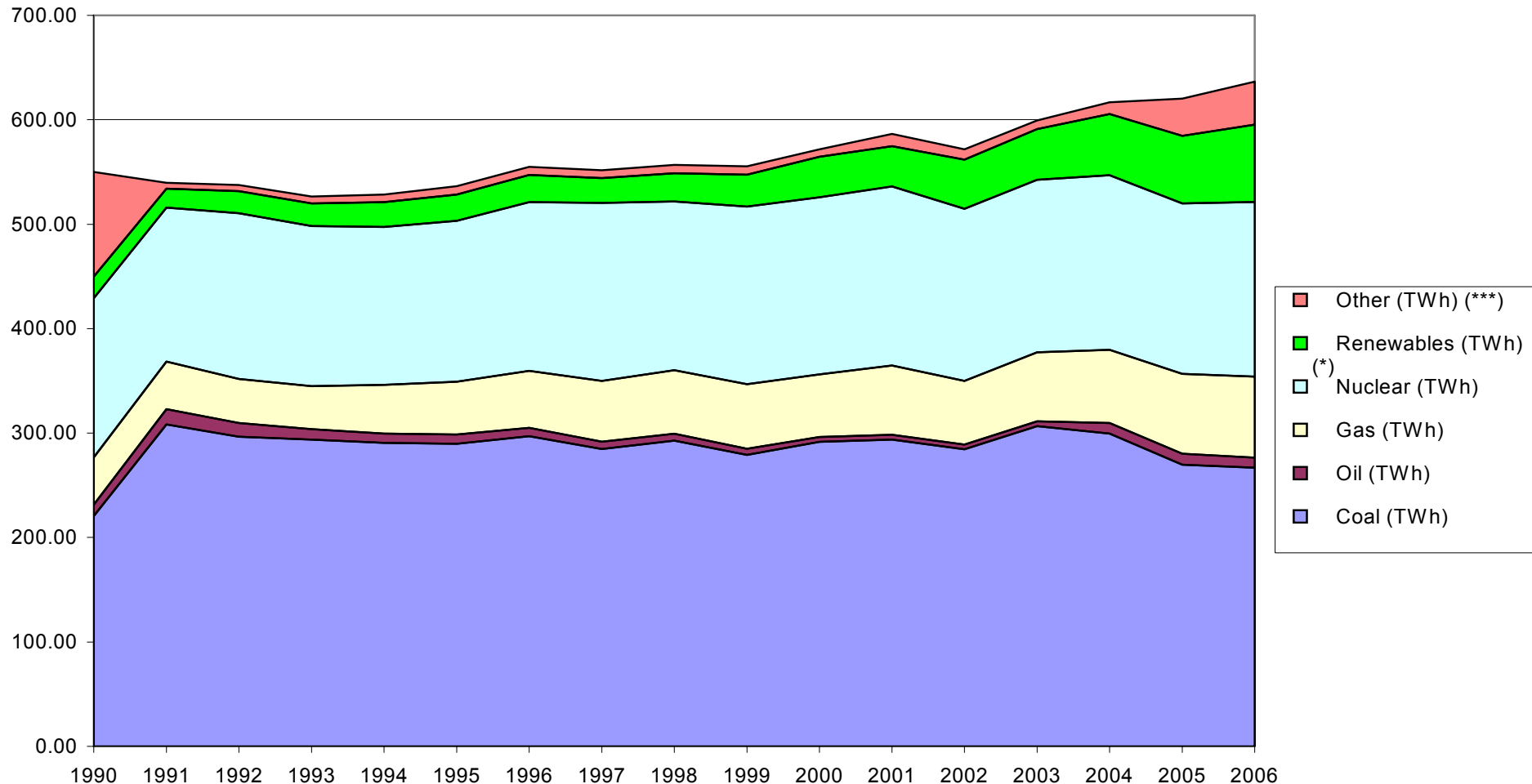
Poland

Conclusions

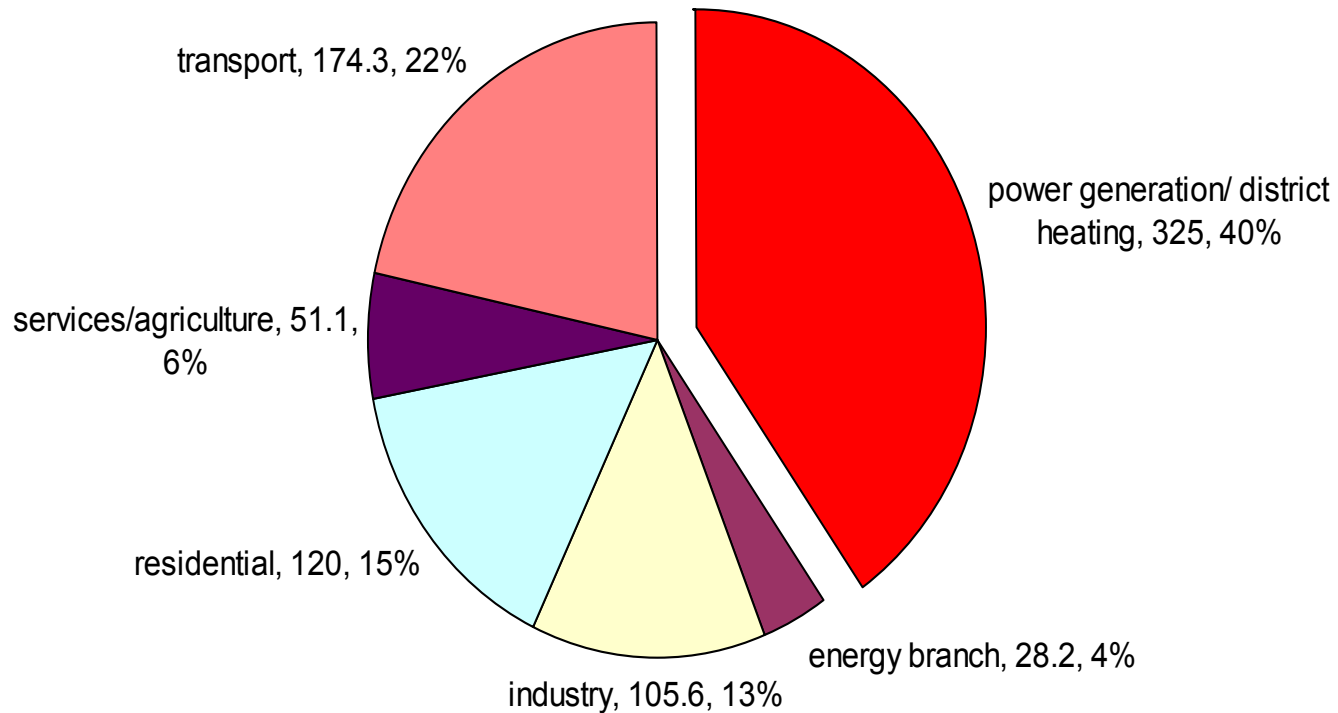
# German power generation mostly coal and nuclear, with increasing renewables



## Germany power generation 1990-2006

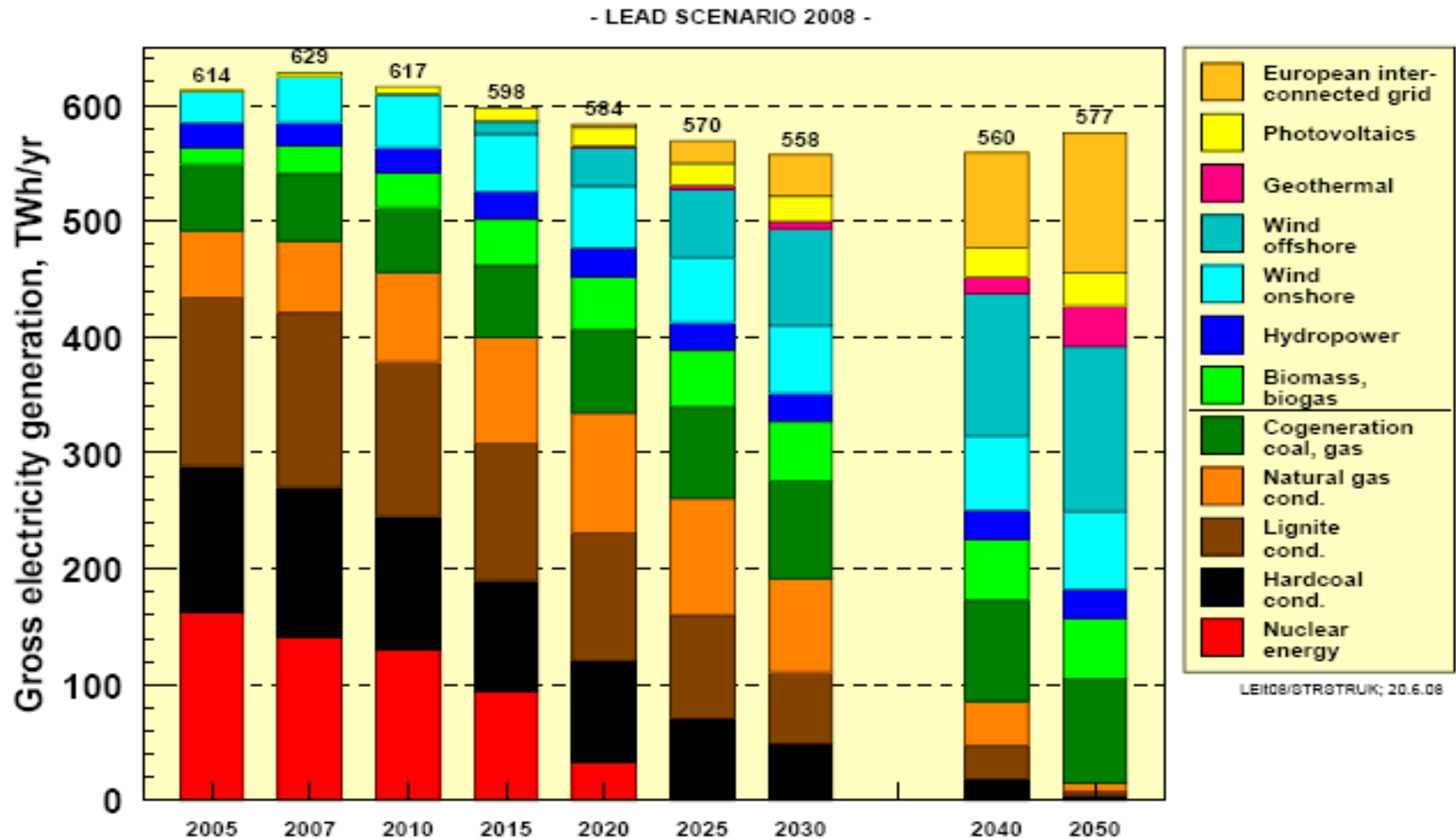


# Power generation accounts for 40% of Germany's CO2 emissions





# Future scenario: more renewables, less nuclear, coal and lignite



excluding hydro pump storage plants

Source: BMU 2008a

# Near-doubling of power sector investment and trebling of emissions-reducing investment is required



## Investment required under the Meseberg Programme

Table 2-4: Emissions-reducing investments, 2005 (in billion euro; figures rounded off)

	Gross investments	Of which, emissions-reducing investments	Additional investments required via Meseberg programme
Buildings	197	40	14
Machinery	121	39	3
Power stations/grids <sup>1</sup>	12	5	10
Vehicles	50	10	2
Remainder	20	1	1
<b>Total</b>	<b>400</b>	<b>95</b>	<b>30</b>
Share of GDP (%)	20	5	1.5

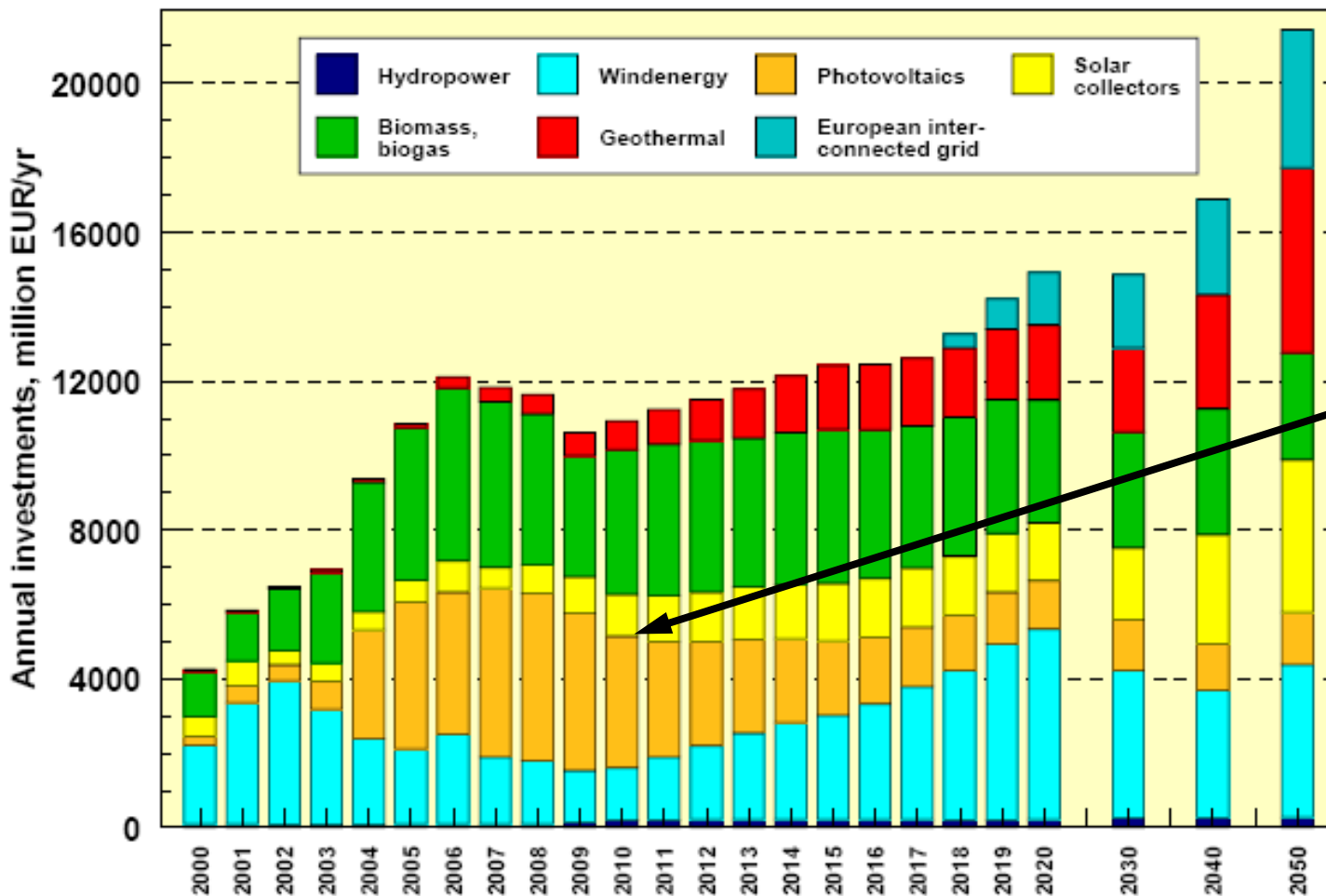
<sup>1</sup> Including renewable energies.

Source: DESTATIS (2008a), BEE (2006), BDEW (2008), Calculations of the PIK and the ECF

# Renewables turnover steady in short term but increase significantly long term

## Germany renewables investment – LEAD scenario

- LEAD SCENARIO 2008 -



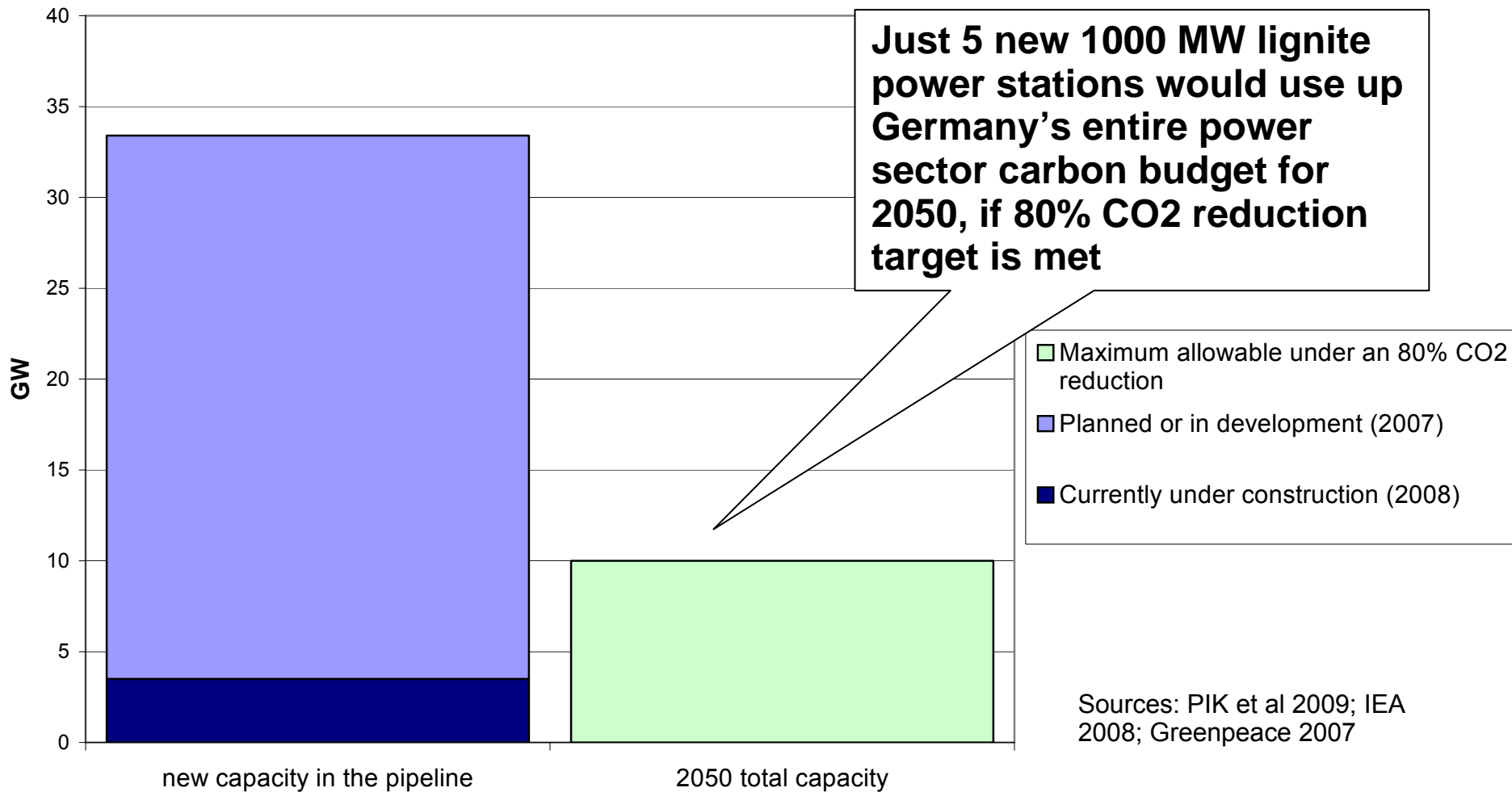
Left-BINW-EE; 25.6.08

Source: BMU 2008a

Reduction in PV subsidies leads to small reduction in overall turnover in near term

# Planned fossil fuel investments could jeopardise Germany's carbon targets

## Germany coal generation capacity



# Outline of slides



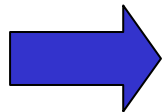
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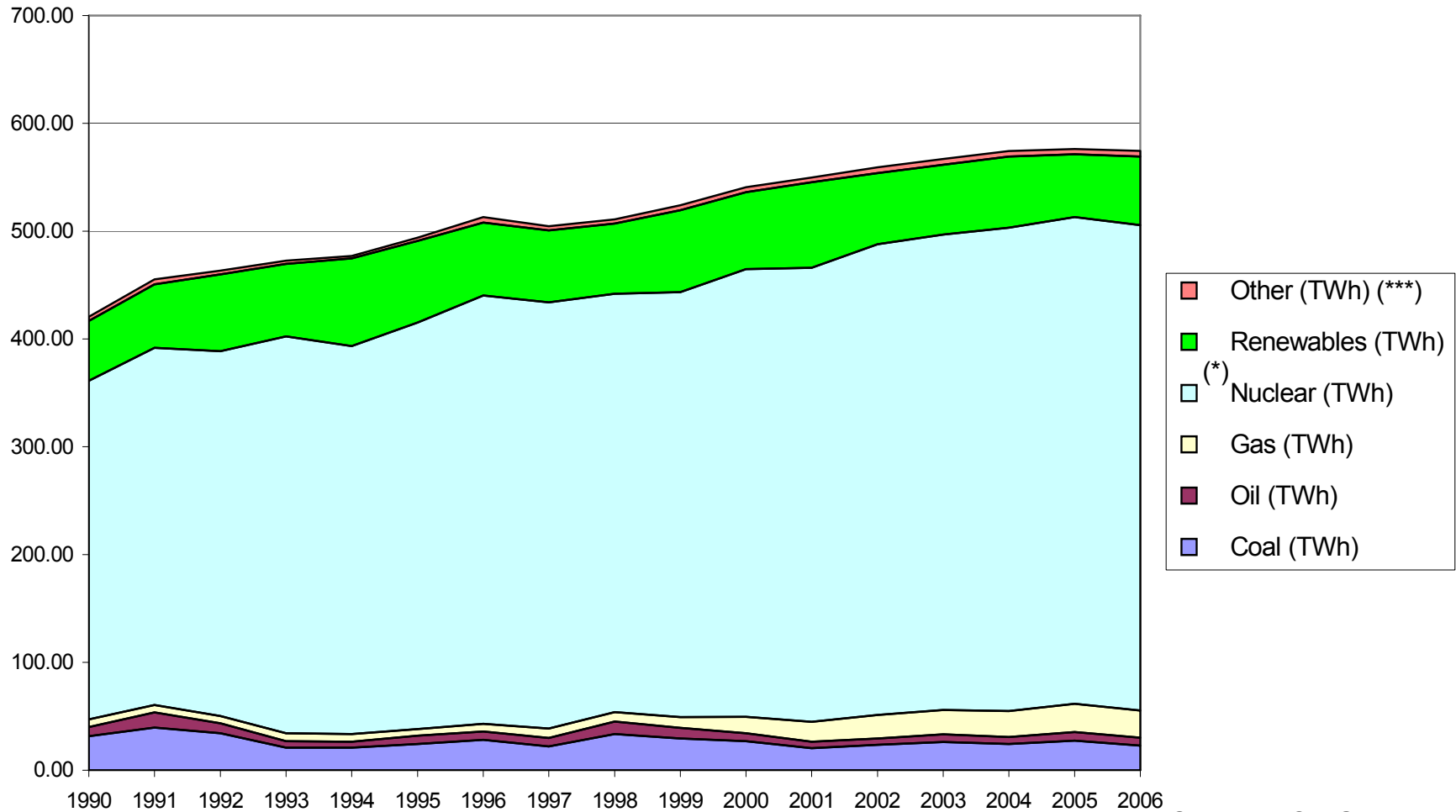
Poland

Conclusions

# France power generation dominated by nuclear



## France power generation 1990-1006

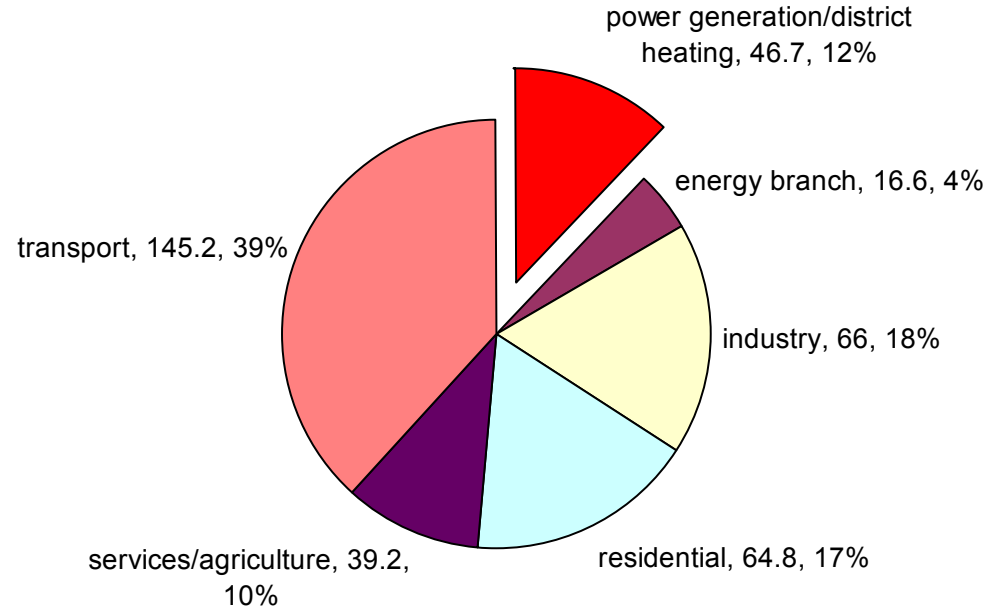


Source: EC DG-TREN 2009a

# Power generation sector in France already fairly low carbon



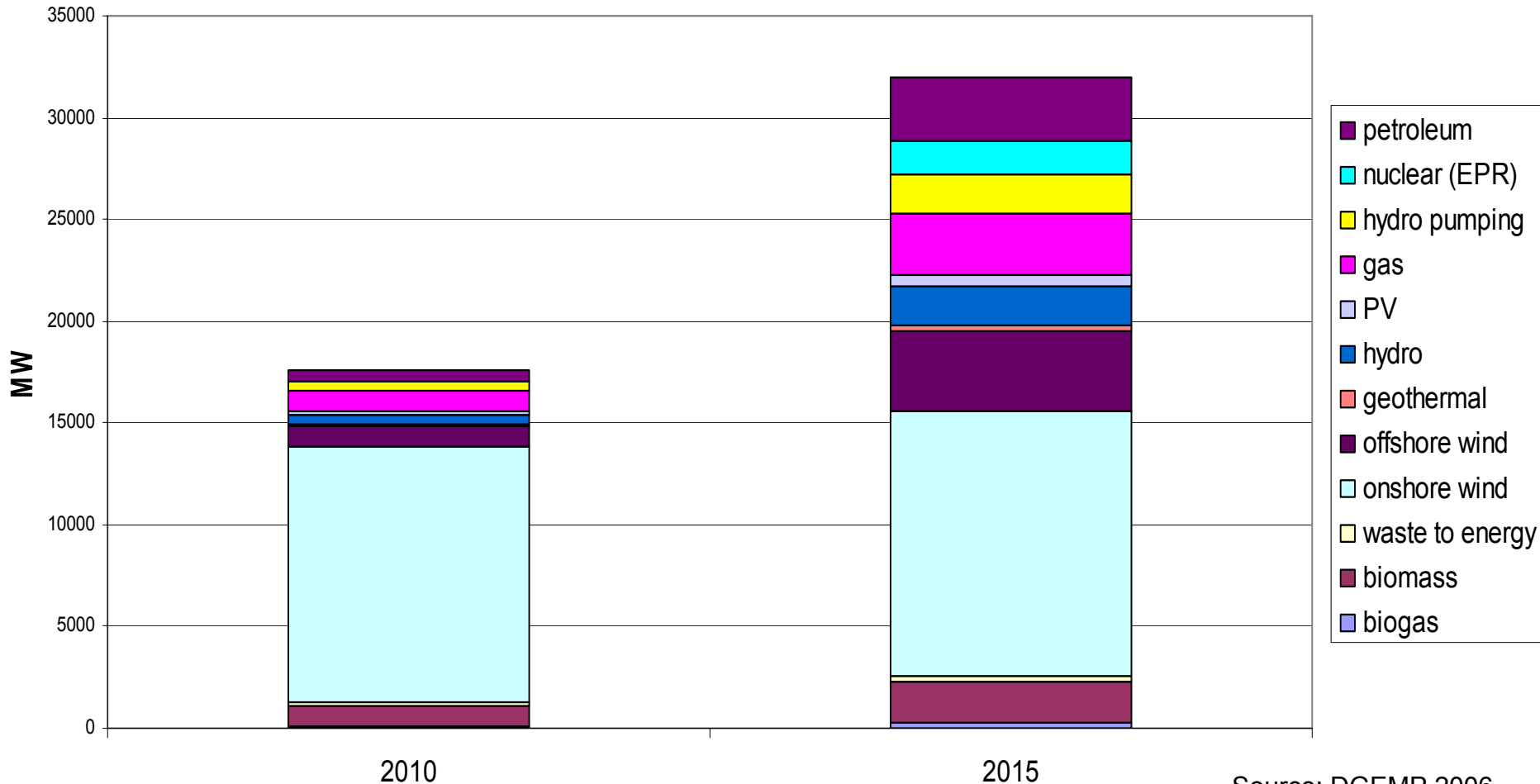
France CO2 emissions by source



# Power investment targets in France are set centrally



PPI investment targets 2006



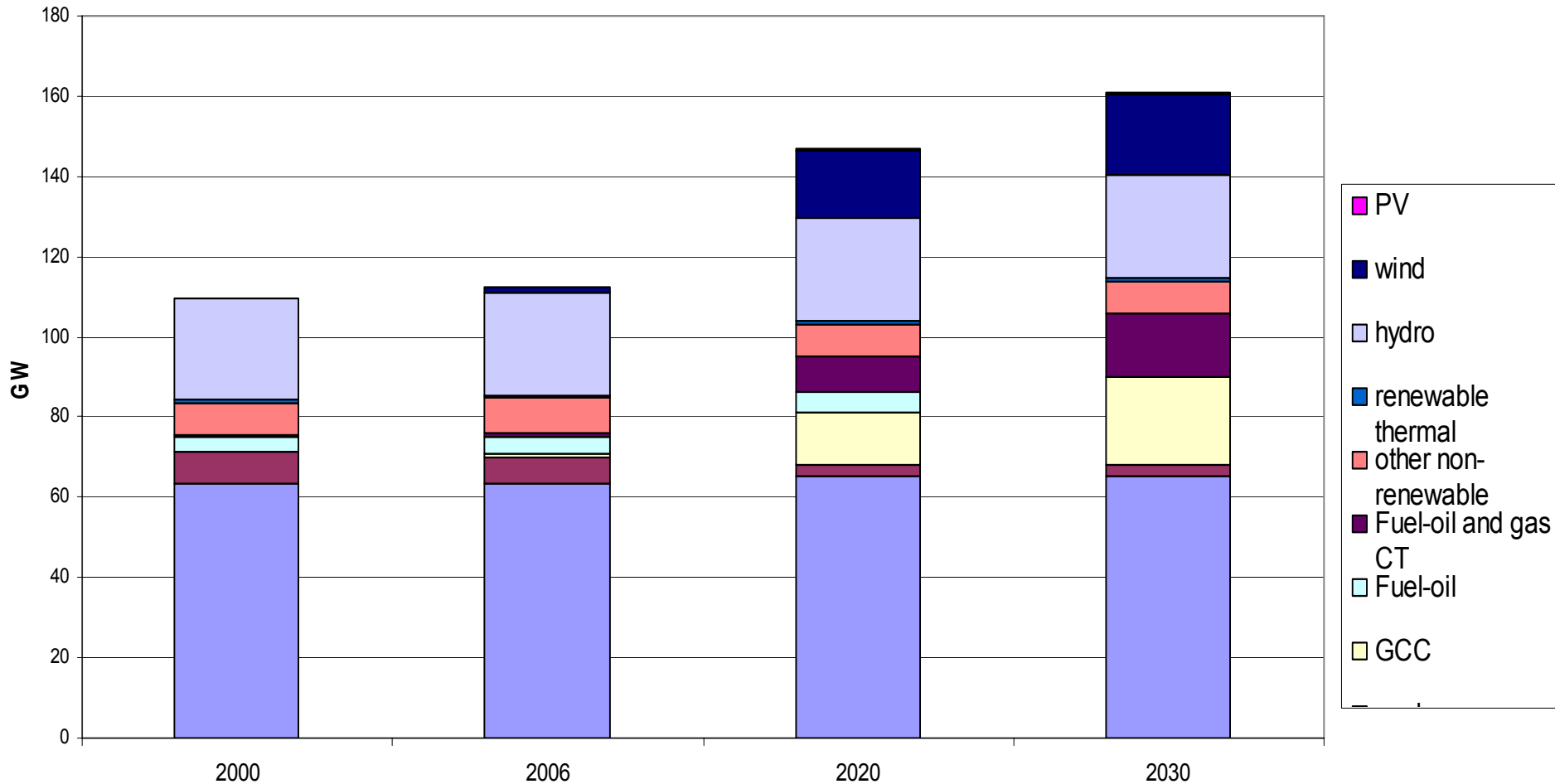
Source: DGEMP 2006



# Baseline scenario includes more renewables and gas ...



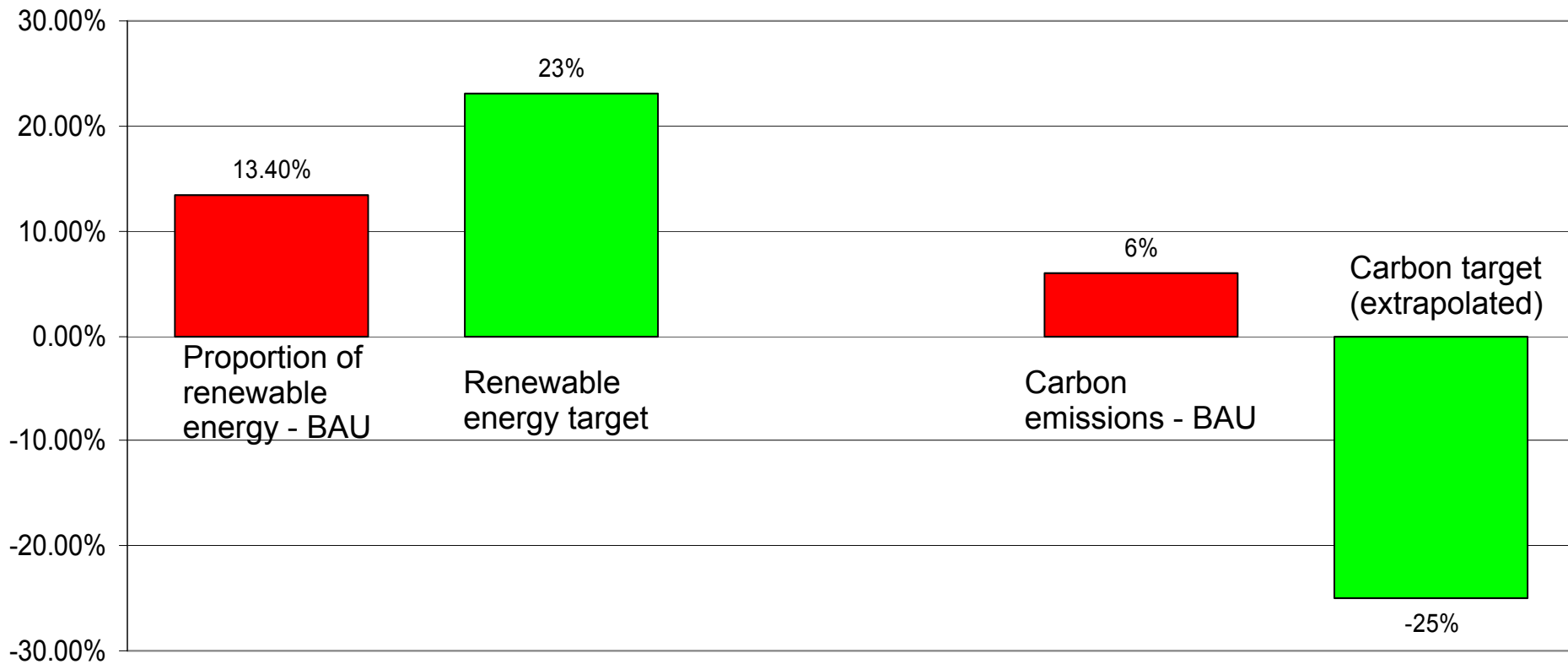
## France baseline scenario



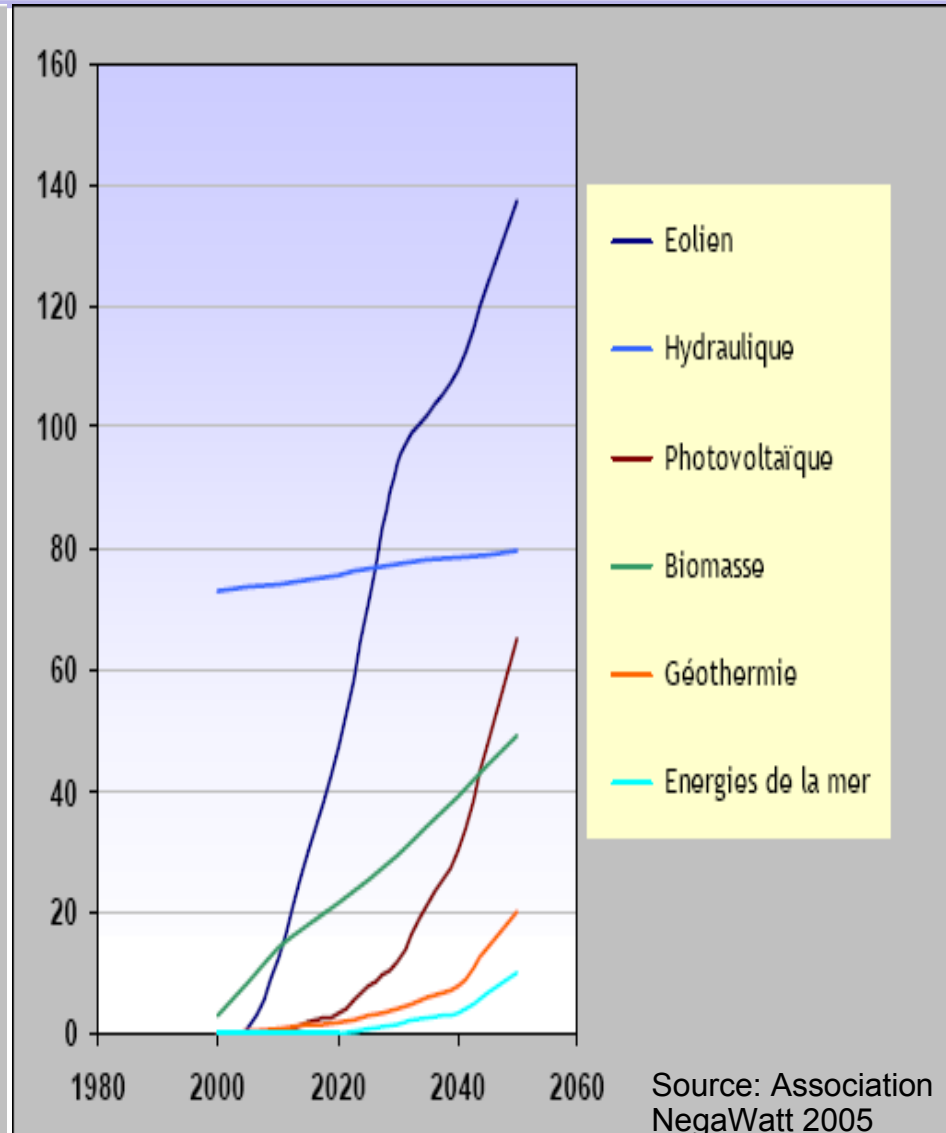
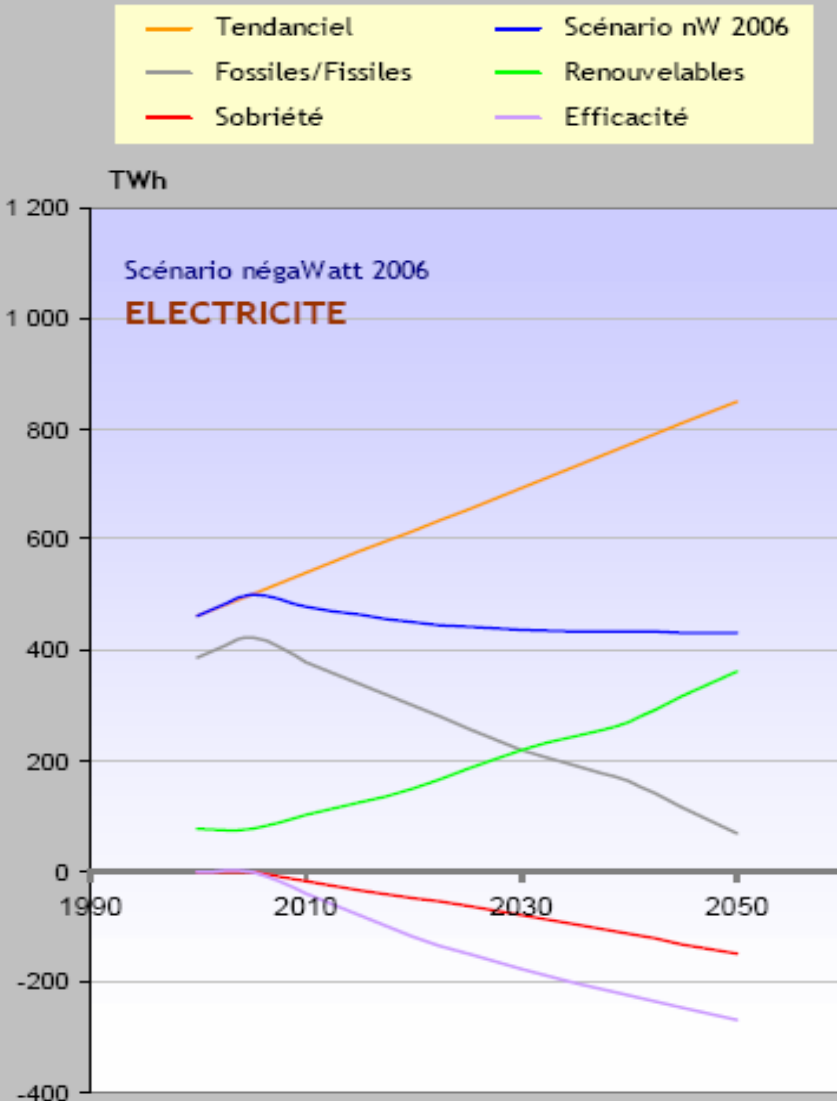
Source: RTE 2009

# ... but misses renewables and carbon targets

France 2020 baseline scenario and targets



# Alternative scenarios meet targets through renewables, efficiency and limiting demand



# Outline of slides



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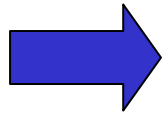
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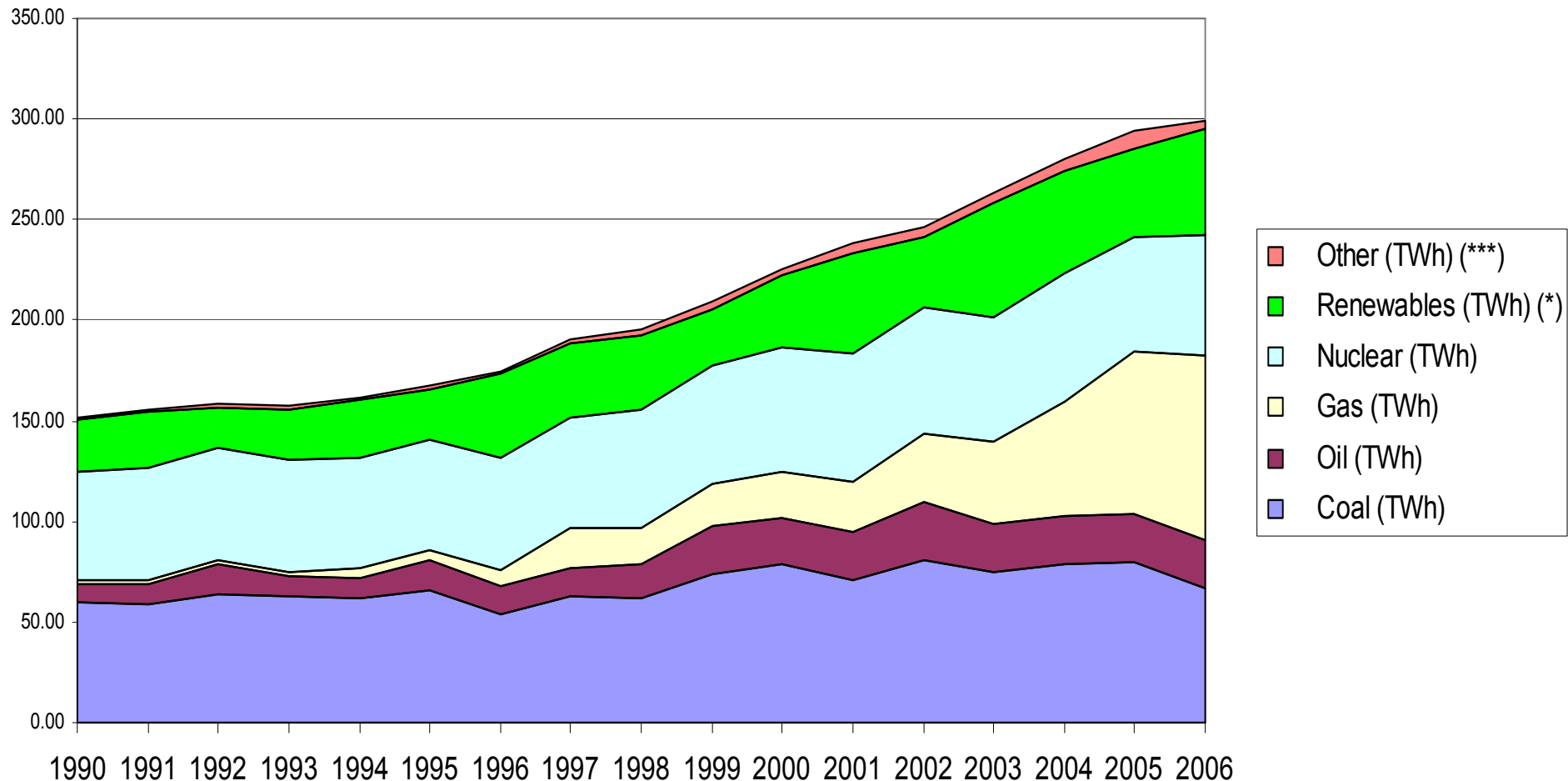
Poland

Conclusions

# Spain has a diverse generation mix, but consumption has doubled in 16 years



## Spain power generation 1990-2006



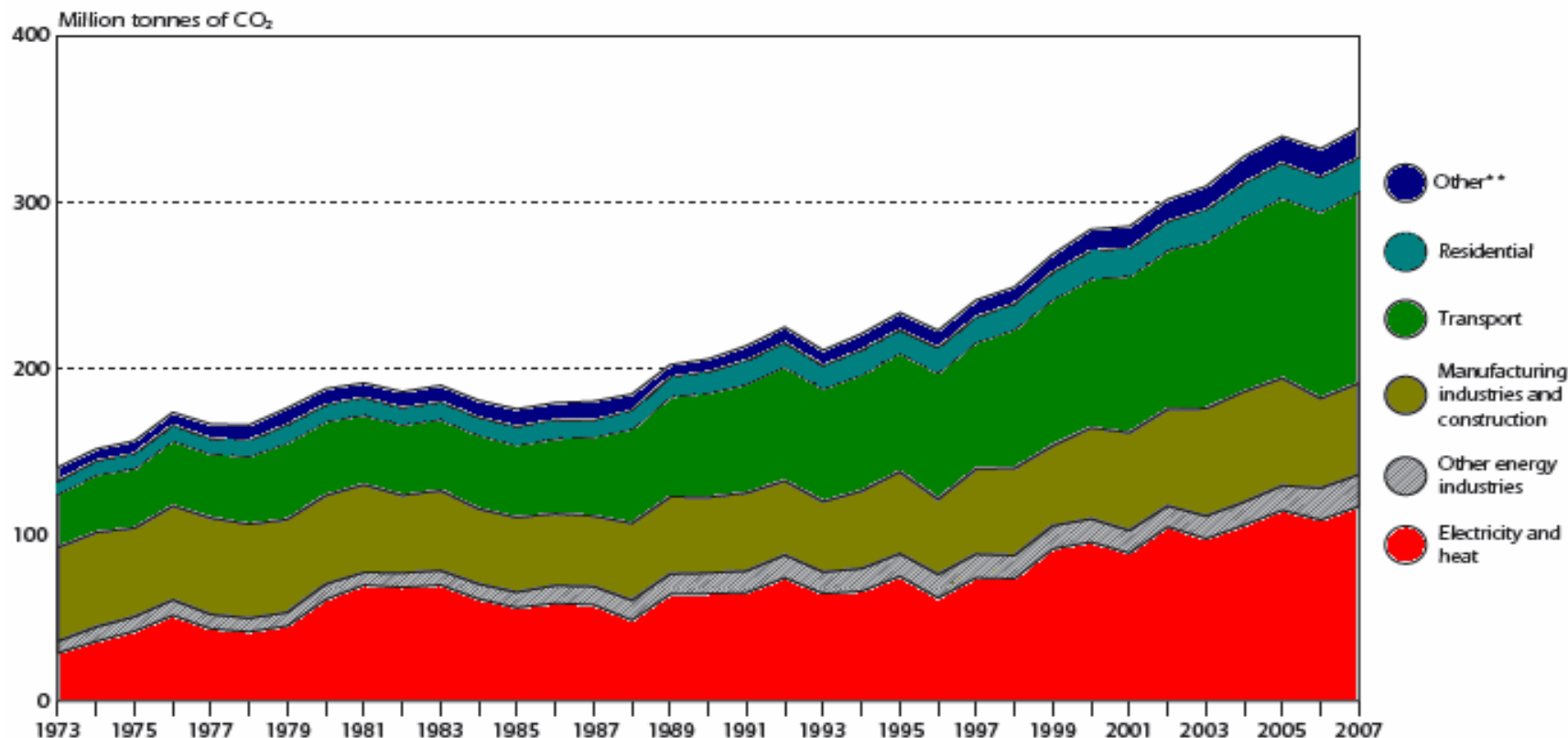
Source: EC DG-TREN 2009a

# Spain's CO<sub>2</sub> emissions in 2007 were 53% higher than 1990 levels, against a Kyoto target of +15%



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CO<sub>2</sub> Emissions by Sector\*, 1973 to 2007



\* estimated using the IPCC Sectoral Approach.

\*\* includes emissions from commercial and public services, agriculture/forestry and fishing.

Source: *CO<sub>2</sub> Emissions from Fuel Combustion*, IEA/OECD Paris, 2009.

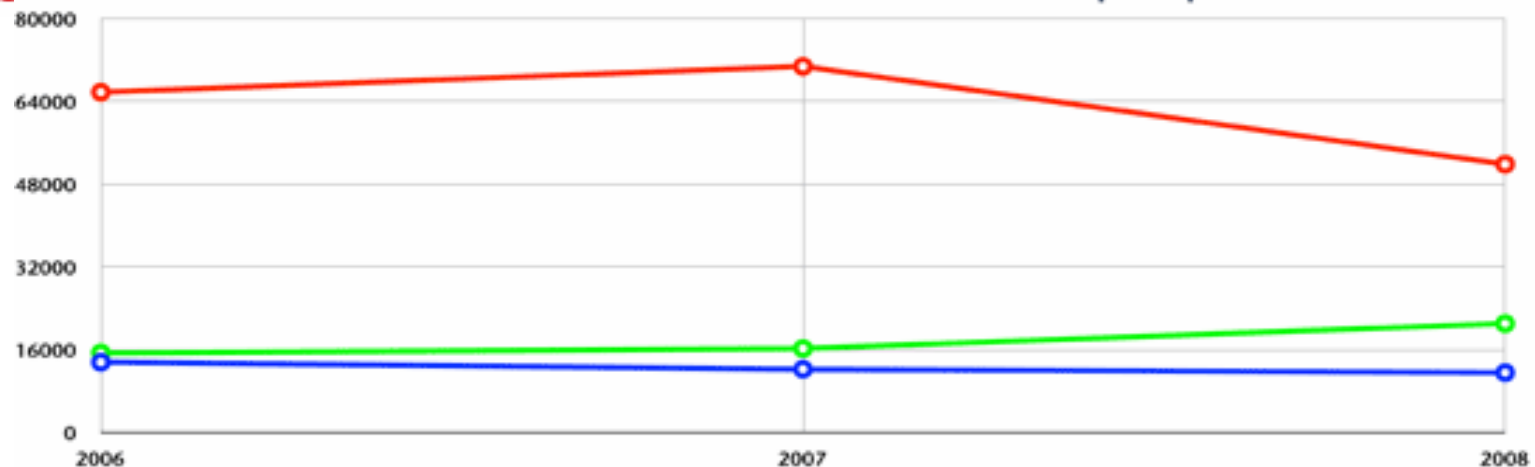
# However CO2 from electricity production fell 15% in 2008, due to less coal



### Emisiones de CO2 del sector eléctrico



### Emisiones de CO2 por tipo de combustible



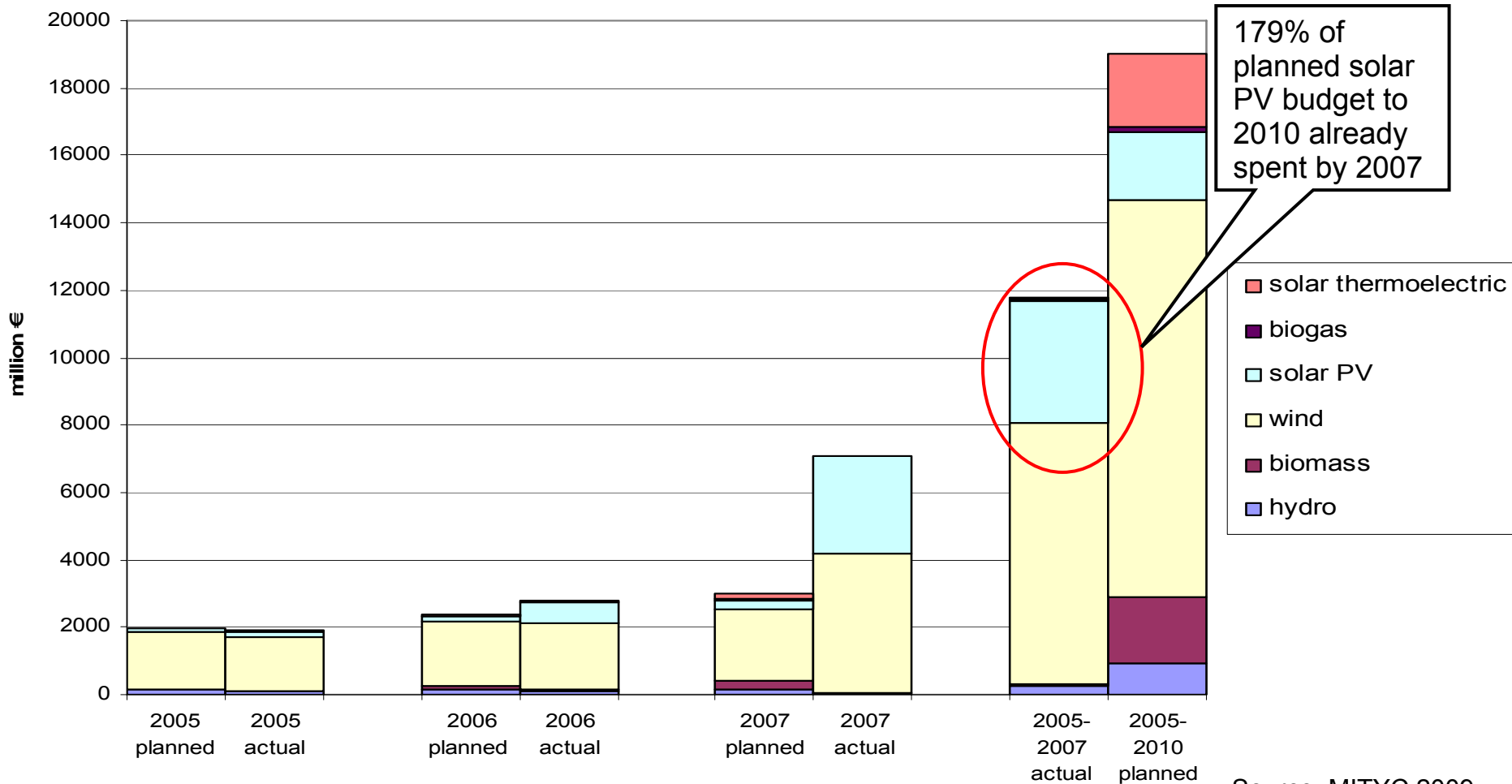
**Gráfico 5** ◆ Combustibles Líquidos (Kt de CO2) ◆ Combustibles Gaseosos (Kt de CO2) ◆ Combustibles Sólidos (Kt de CO2)

Source:  
FEDEA  
2009

# Generous feed-in tariff led to solar PV and wind investment boom (until rules changed)



## Planned vs actual renewables investment in Spain

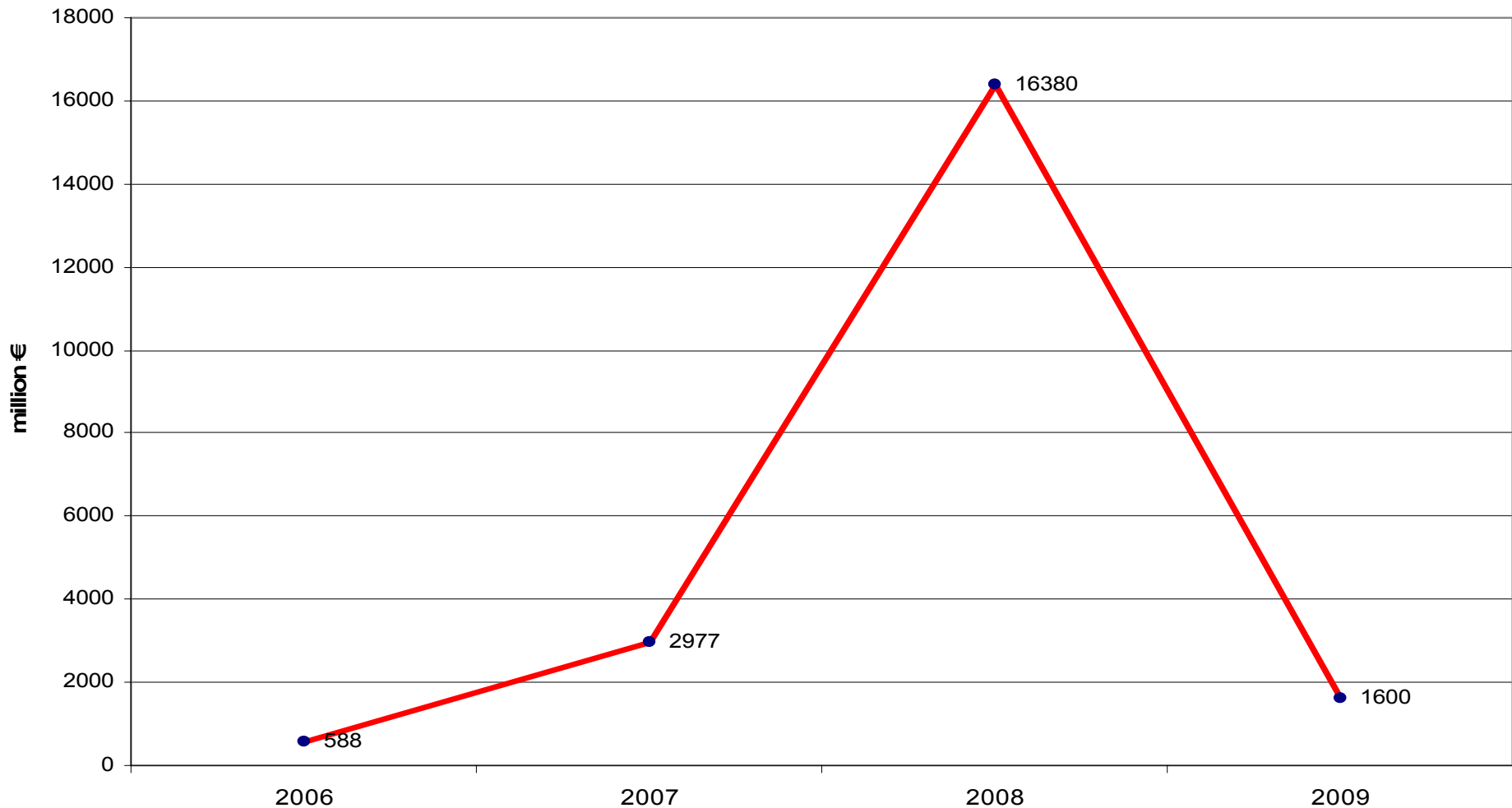




# Industry bodies claim termination of PV support led to collapse of sector and loss of 20,000 jobs



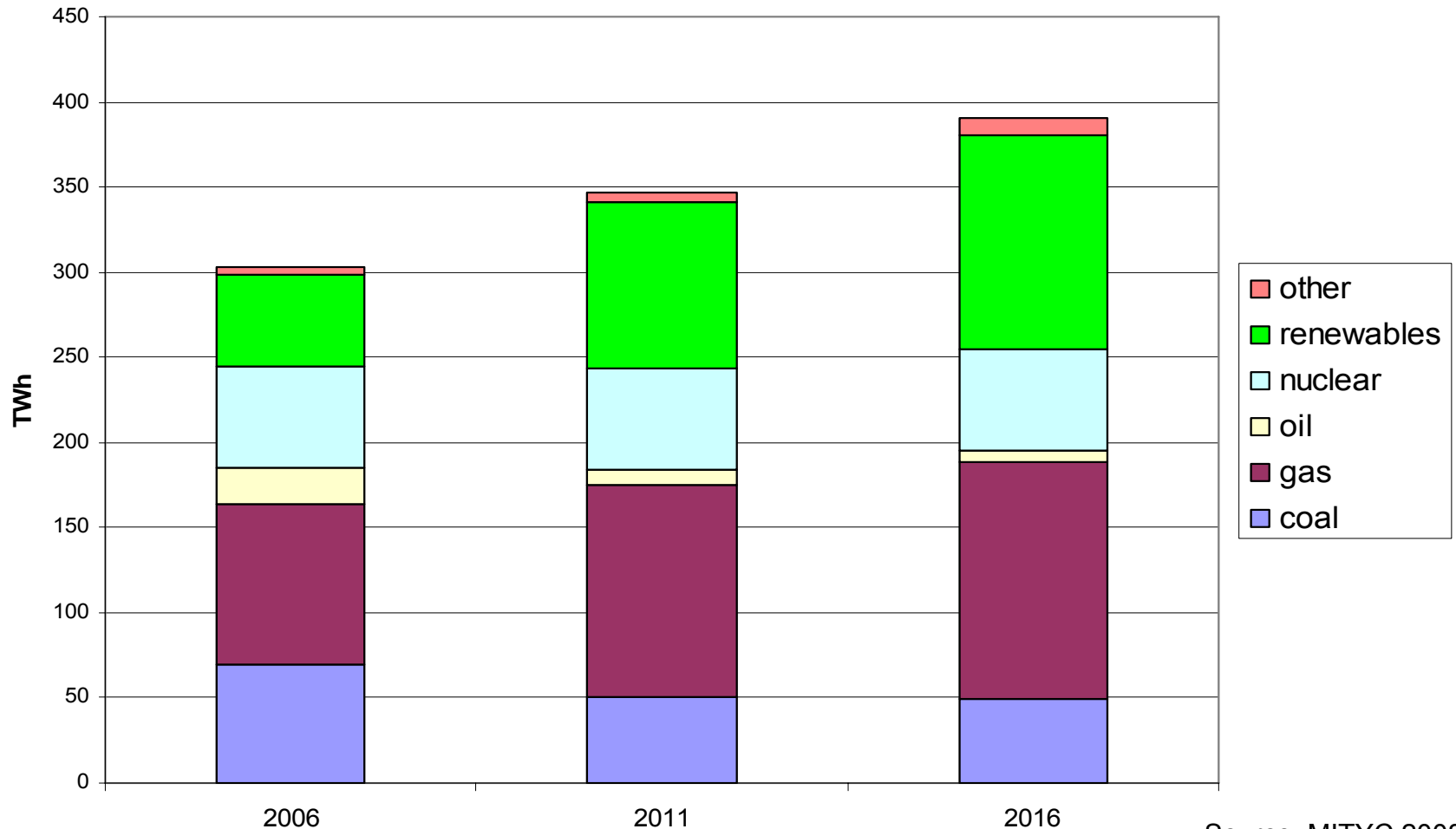
Market value of PV sector in Spain



# Baseline projection for 2016 shows fall in coal, rise in renewables and gas ...

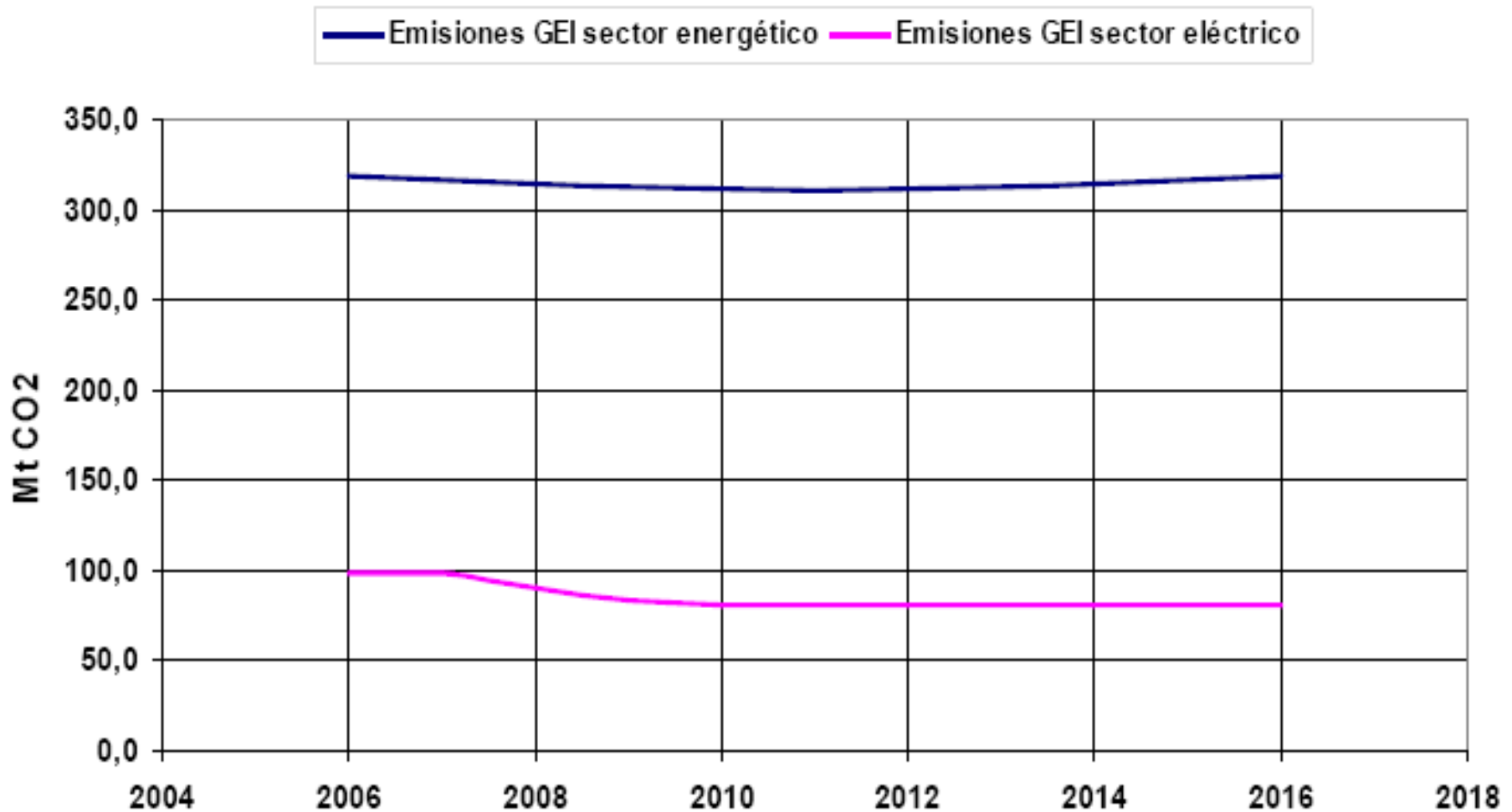


## Spain electricity generation to 2016

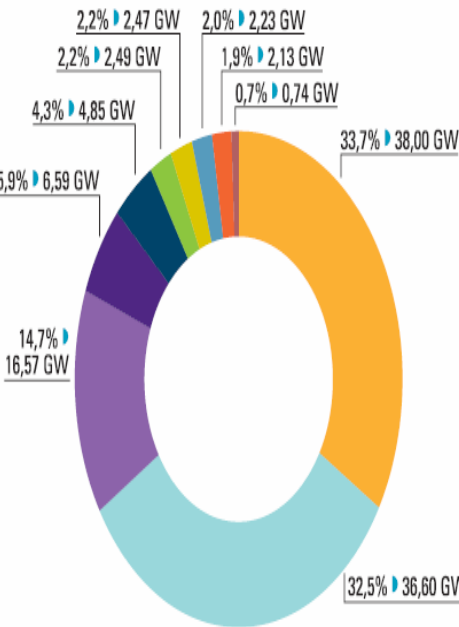


Source: MITYC 2008

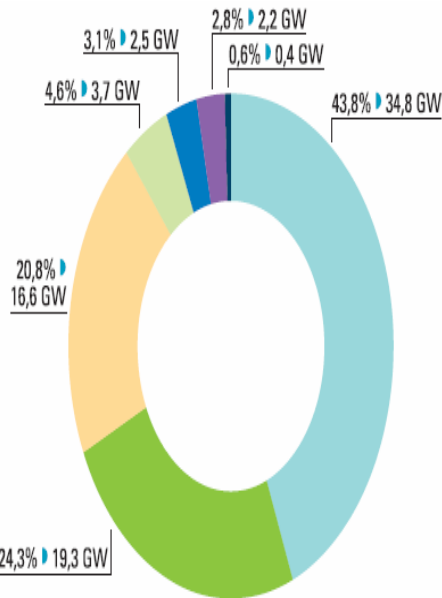
# ... and very little difference in overall carbon emissions



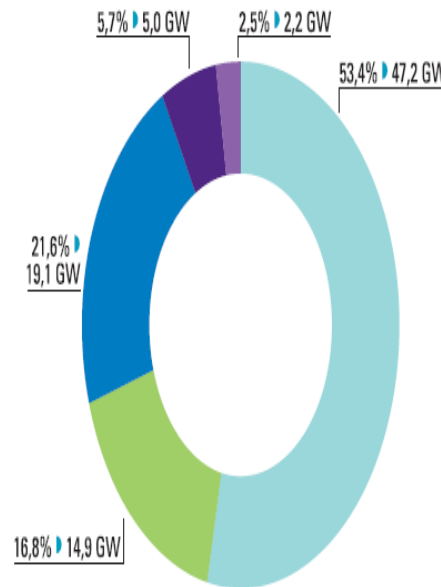
# Low carbon scenarios show a move to 100% renewable generation by 2050



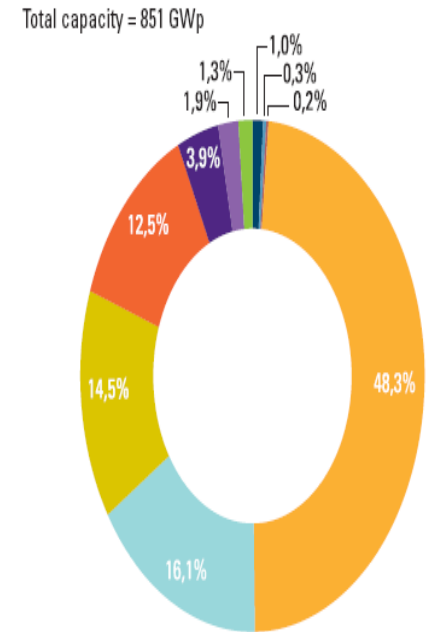
**Technological diversity**



**Economic optimisation**



**Demand reduction**



**Meet all energy demand**



## Four Greenpeace scenarios for 100% renewable power generation in Spain by 2050

# Outline of slides



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EU overview

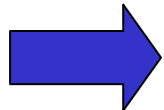
Selected country profiles

UK

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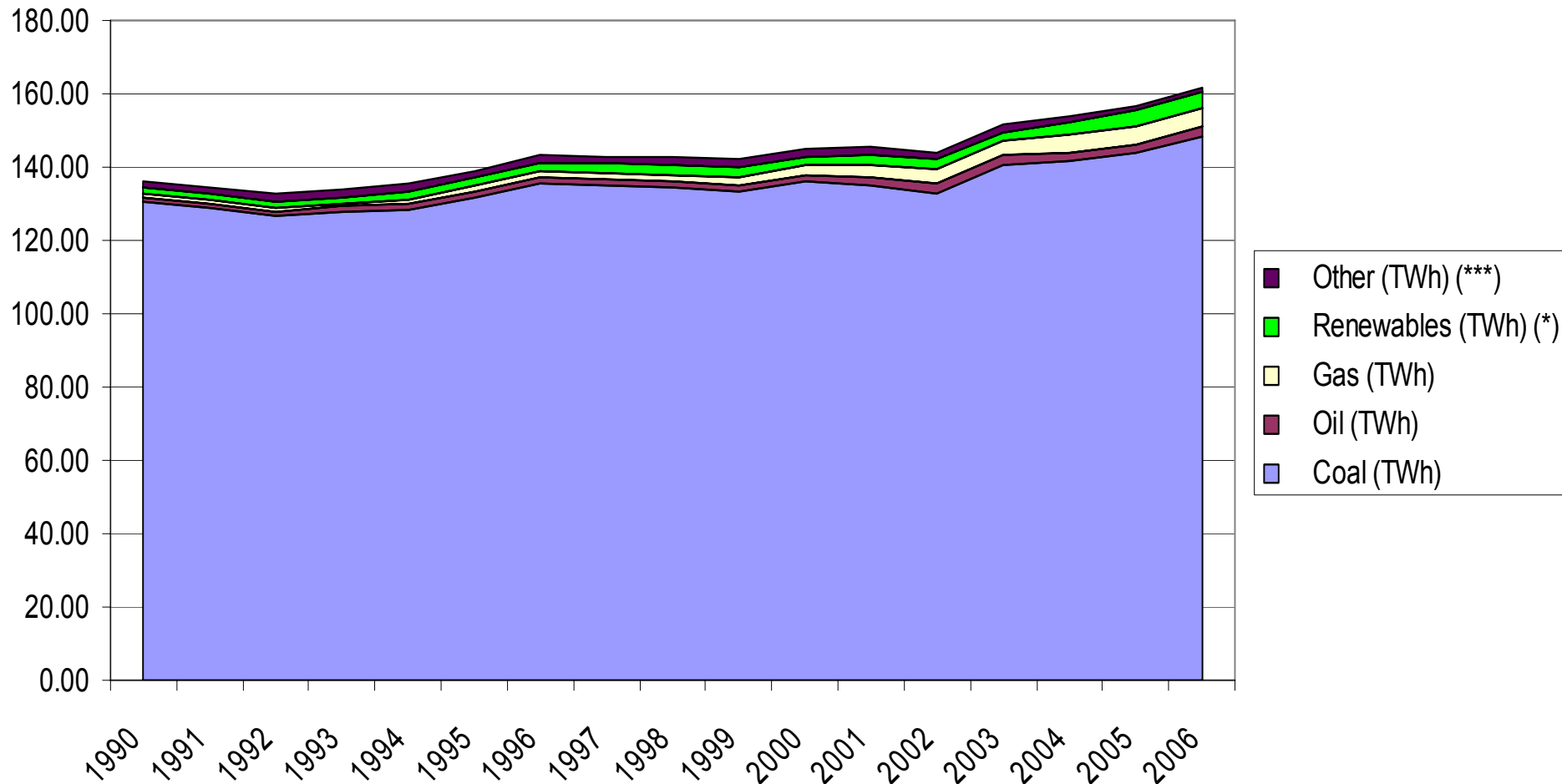
Poland

Conclusions

# Poland power generation almost exclusively coal



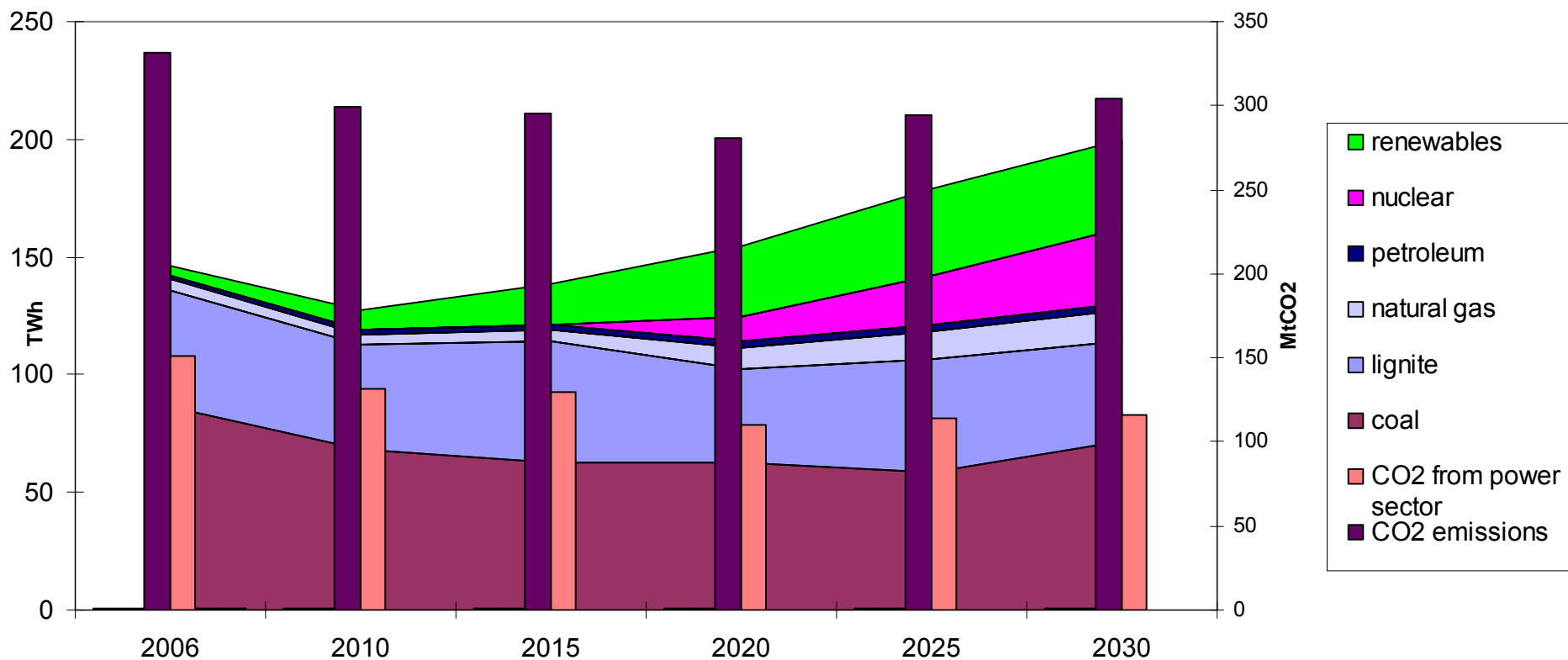
Poland power generation 1990-2006



# Baseline scenario = rising energy use and only minor reductions in carbon emissions



## Power generation and emissions in Poland to 2030

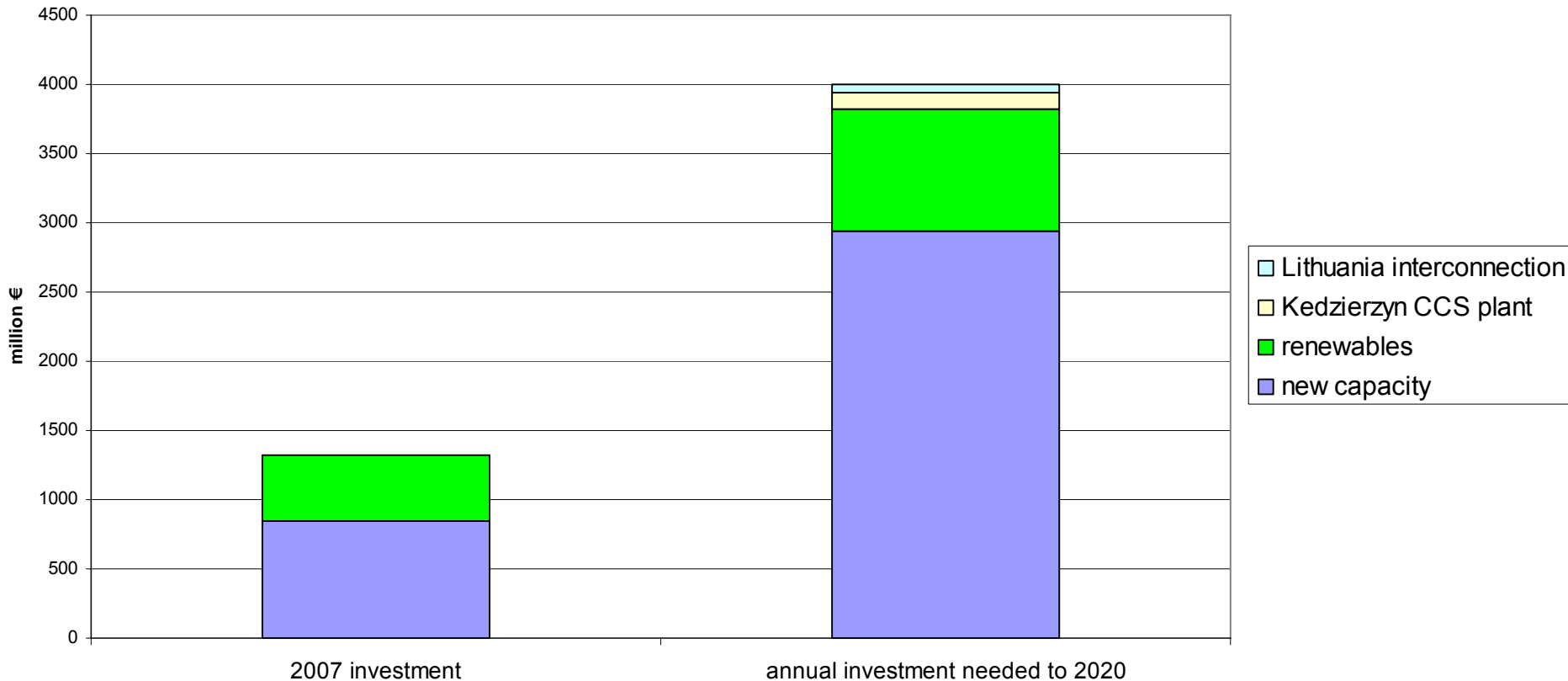


# Investment volumes need to increase threefold to replace decommissioned plants and meet renewables targets



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### Poland power sector investment





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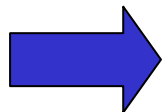
UK

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Poland



Conclusions

# Conclusions (1):



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Large investments will be needed in the European power sector in coming years:

- €200-300 billion over 10 years in “business as usual scenarios”
- €260 to €600 billion in low carbon scenarios

This compares to a current annual average investment of €20 billion.

## Conclusions (2):



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EU investment momentum showing beginnings of a shift towards low carbon power – **but**:

- Significant unabated fossil generation still in the development pipeline
- Current investments are insufficient to achieve a low carbon power system
- Carbon price is too variable and too low to support low carbon scenarios

## Conclusions (3):



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Despite very different starting points and different investment frameworks, “business as usual” approaches in the UK, Germany, France, Spain and Poland will not produce carbon reductions on the scale required - unless additional policy interventions are introduced

# References (1)



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