

# CO<sub>2</sub> and Electricity Generation: the Challenge

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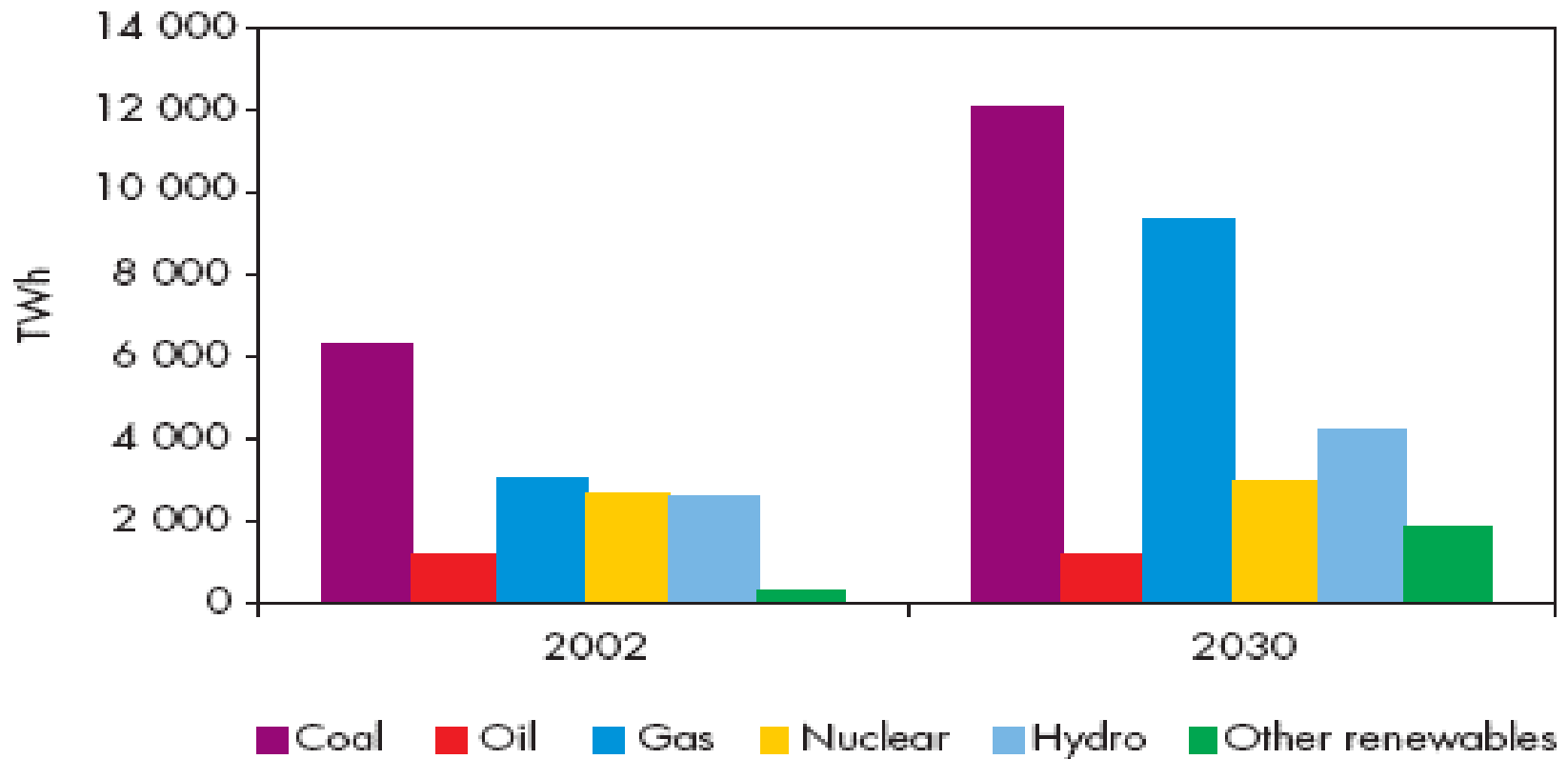
# CO<sub>2</sub> and Electricity: the stakes could not be higher

- Electricity is central to the climate change challenge, in both short and long term
- Electricity can be part of the problem or part of the solution: the key is investment
- However, at the moment Government policies are failing in relation to electricity, and hence in relation to their climate change targets

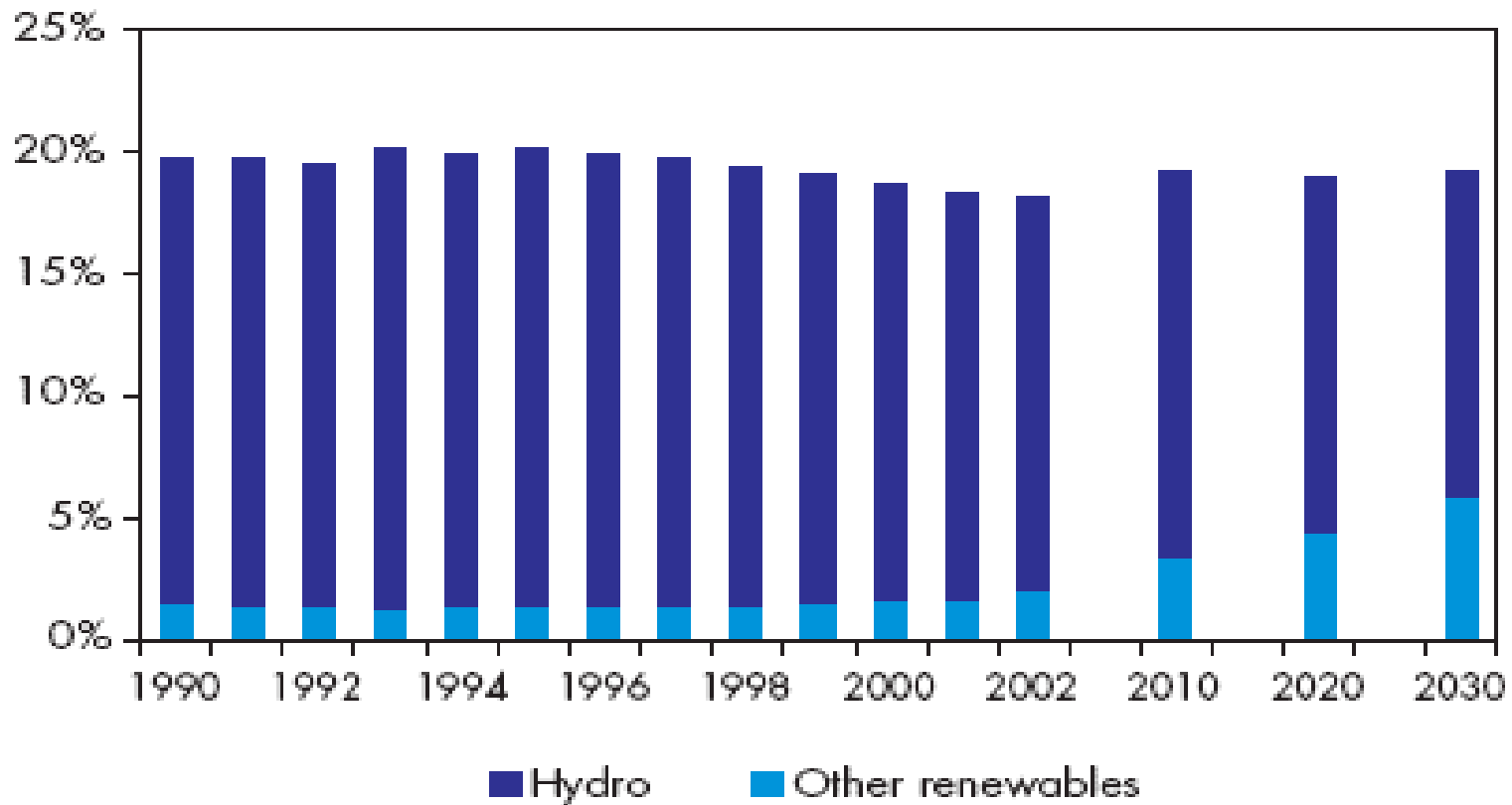
# Electricity as the problem: WEO

- Electricity accounts for 50% of increase in emissions to 2030 (2 x transport)
- Its share of emissions rises from 40 to 44%
- Dependence on fossil fuels is growing
- Most of the increase is in developing countries
- But there is an opportunity – cleaner investment

# Growth in generation

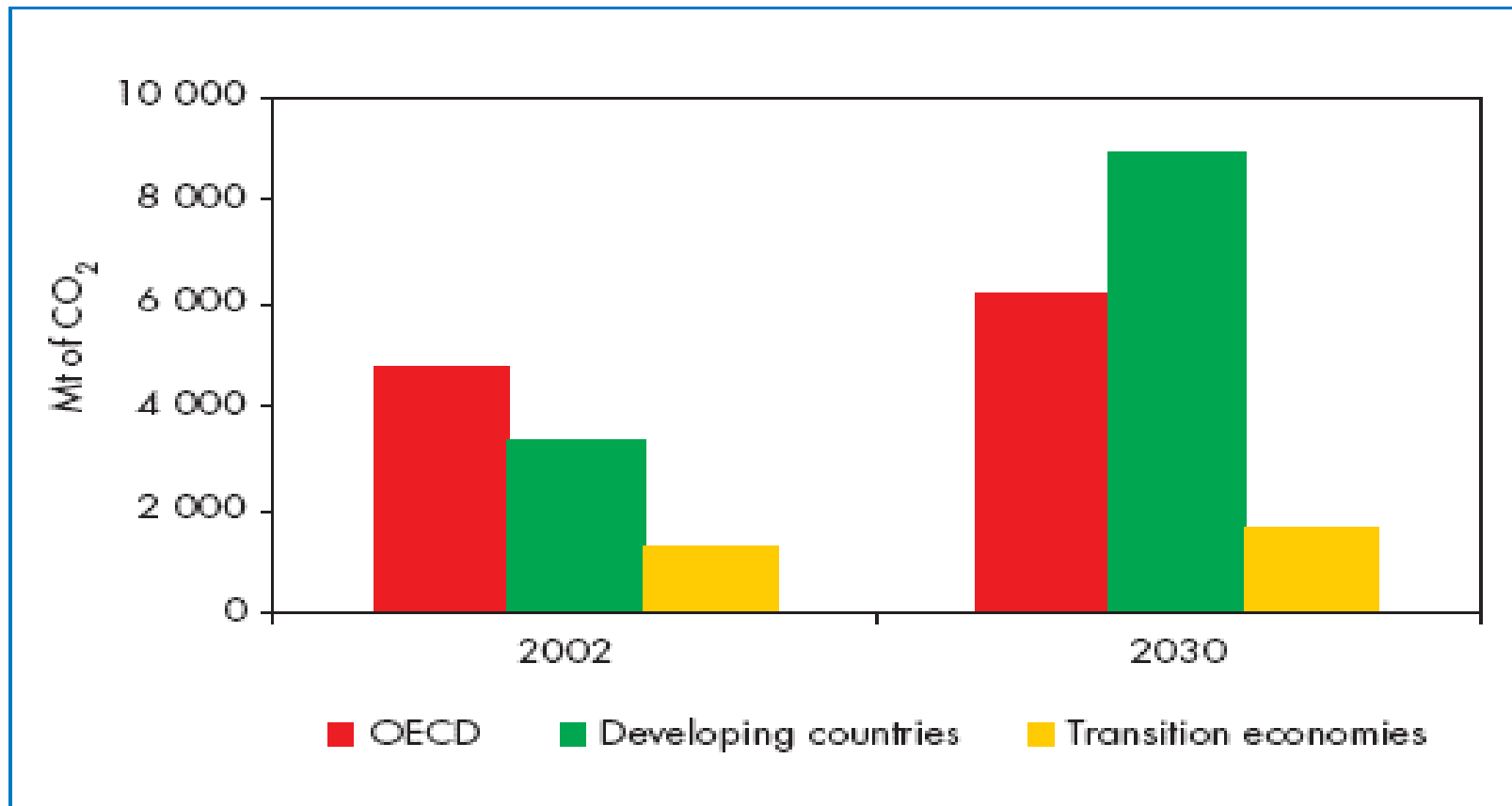


# Renewables share doesn't change



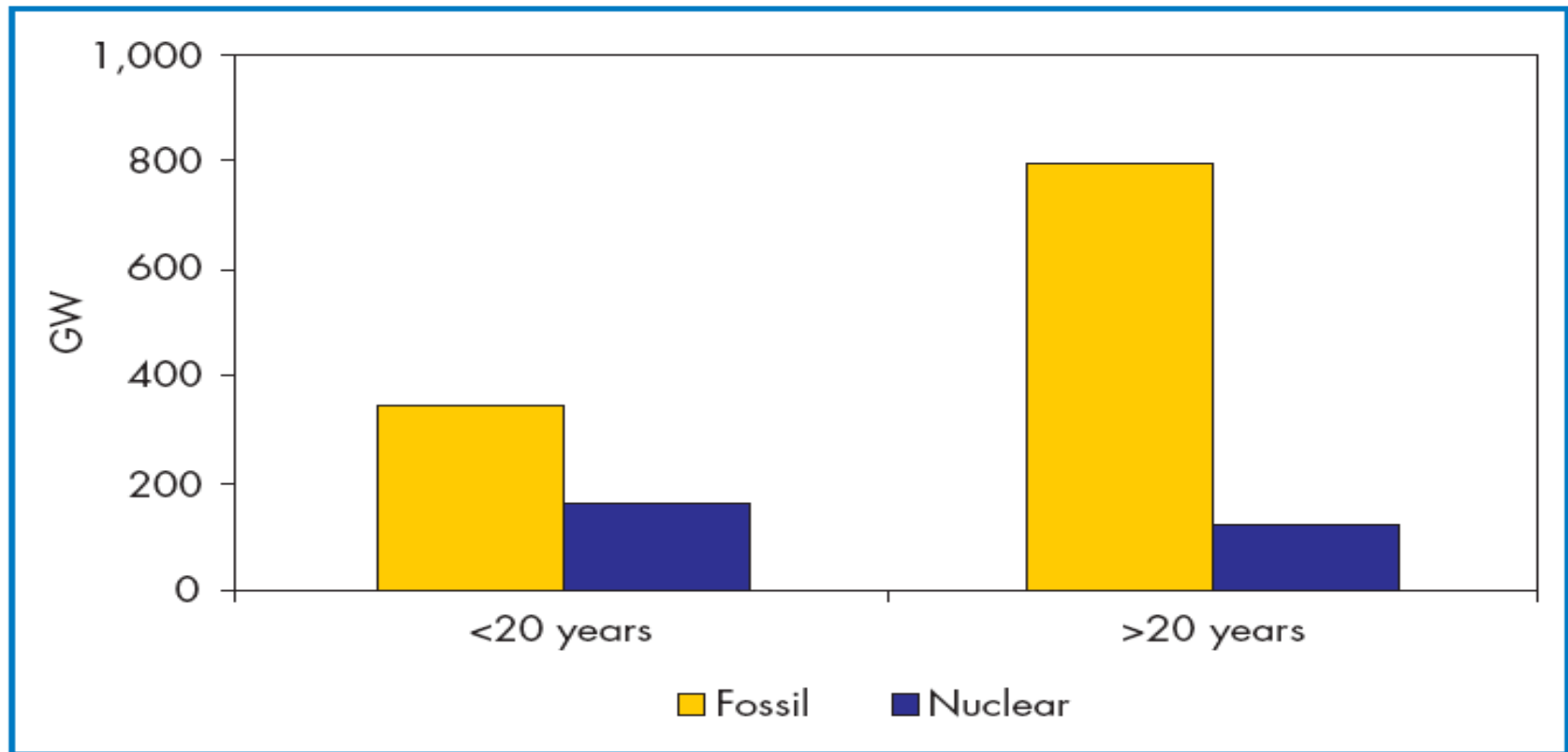
# Regional Emissions

Figure 6.17: Power-Sector CO<sub>2</sub> Emissions by Region



# OECD plant is aging

Figure 7.5: Average Age of Power Plants in the OECD, 2003



Sources: Platts (2001) and IEA analysis.

# Electricity as the solution: 1

- Electricity can be made from any energy source (often only effective route for, eg renewables, nuclear)
- Electricity can substitute for any energy source (in the long run, even personal transport)
- Emissions free electricity does not require major behavioural change



# Electricity as the solution: 2

## The problem is manageable

Process	Number of sources	Emissions (MtCO <sub>2</sub> yr <sup>-1</sup> )
Fossil fuels		
Power	4,942	10,539
Cement production	1,175	932
Refineries	638	798
Iron and steel industry	269	646
Petrochemical industry	470	379
Oil and gas processing	Not available	50
Other sources	90	33
Biomass		
Bioethanol and bioenergy	303	91

# Electricity as the solution: 3

- Short term and long term solution
- Route to low emissions combines
  - low emission electricity
  - high electricity intensity
- This route has been demonstrated in practice

# Emissions reduction from electricity: low hanging fruit

- 1990 – 1995: UK – down c 35 MtCO<sub>2</sub>  
(6% of UK total)
- 1979 – 1987: France – down c 100 MtCO<sub>2</sub>  
(20% of French total)
- 1979 – 1983: Sweden – down c 20 Mt CO<sub>2</sub>  
(25% of Swedish total)

Only comparable reductions due to industrial collapse – eg FSU – or war.

# Emissions reduction: low emissions economies

Country	tCO <sub>2</sub> /head	Electricity tCO <sub>2</sub> /head	Transport tCO <sub>2</sub> /head	kWh/head
Denmark	9.5	4.3*	2.3	6506
France	6.2	0.6	2.3	7366
Germany	10.2	3.7	2.0	6742
Netherlands	11.1	3.1	2.1	6696
Sweden	5.6	0.8	2.5	15665
UK	8.9	2.7	2.2	6158

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US	19.7	7.9	6.1	13228

# What could be done – contract and converge on France!

- US electricity at French levels: 2.1 GtCO<sub>2</sub>  
(c 9% of world total)
- Chinese electricity at French levels: 0.75 GtCO<sub>2</sub>  
(c 3% of world total)
- World electricity at French levels: 6.0 GtCO<sub>2</sub>  
(c 25% of world total)

# Sustainable change requires investment

- UK: Carbon intensity of generation to halve 1990 – 2010. Investment in gas (and renewables).
- France, Sweden: Carbon intensity of generation less than one quarter OECD average. Investment in nuclear and hydro.
- Estonia (10.5t/head; 7.6 from electricity) vs Lithuania(3.5t/head; 1 from electricity)

# Do we have the policies for liberalised markets?

- In principle, liberalised markets determine investment
- New investment is generally good for the environment (eg CCGTs in UK, Italy, Spain)
- But policy uncertainty delays investment
- Government intervention inhibits investment
- A supposedly liberalised market subject to policy uncertainty and intervention will under-deliver



# Policy uncertainty and government intervention

- Governments are promoting renewables and CHP, by non-market means (>50% of planned investment in Europe)
- Nuclear uncertainties: Governments may (or may not) support. Either way it can discourage investment
- ETS creates new uncertainties – what will the carbon price be in 2020? But not just a European problem – cf US.

# Policy making for liberalised markets

- Interventions affect market dynamics
- Impact on investment likely to be the biggest CO<sub>2</sub> effect: works on whole system, not a subset, as do most Government policies
- Governments do not consider, measure or understand this impact
- Their policies aren't working – only two EU countries on track. Canada and Japan in worse position.

# A Parting Thought

Many European countries had a good track record on energy-related CO<sub>2</sub> – pre-UNFCCC

1980-1995 France -36%

UK -7%

Germany -23%

OECD Europe - 7%

Since 1995 and the introduction of Climate Change Measures +5%!

# Conclusions

- Investment in electricity generation is the key to reducing CO<sub>2</sub> emissions
- But governments have not worked out how to adapt their policies to liberalised markets and encourage investment successfully
- This is the key challenge in combating climate change