



COAL: The future fuel

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Chief Executive

14th International Gas & Electricity Summit 2009
Paris, October 2009

World Coal Institute

WCI provides
a voice for coal

Coal provides

25% of world
primary energy

40% of world
electricity

66% of world steel

- American Coal Ash Association
- American Coal Council
- Assocarboni (Italy)
- Associacao Brasileira do Carvao Mineral
- Association of UK Coal Importers
- Australian Coal Association
- British Equipment Manufacturers Association
- Camara Asomineros
- Coal Association of Canada
- Coal Association of New Zealand
- Confederation of UK Coal Producers
- German Hard Coal association
- Indonesian Coal Mining Association
- Iranian Mines and Mining Industries
- Japan Coal Energy Center
- National Mining Association (USA)
- Philippine Chamber of Coal Mines
- Shaanxi Coal Industry Bureau
- Svenska Kilinstituten
- UCG Partnership
- PT Adaro Indonesia
- Anglo Coal
- Arch Coal
- BHP Billiton Energy Coal
- BHP Billiton Mitsubishi Alliance
- Carbonnes del Cerrejon Colombia
- Coal India Limited
- Consol Energy
- Glencore International
- Joy Global
- Mitsubishi Development
- Peabody Energy
- Rio Tinto Limited
- Solid Energy NZ
- TOTAL SA
- XSTRATA Coal

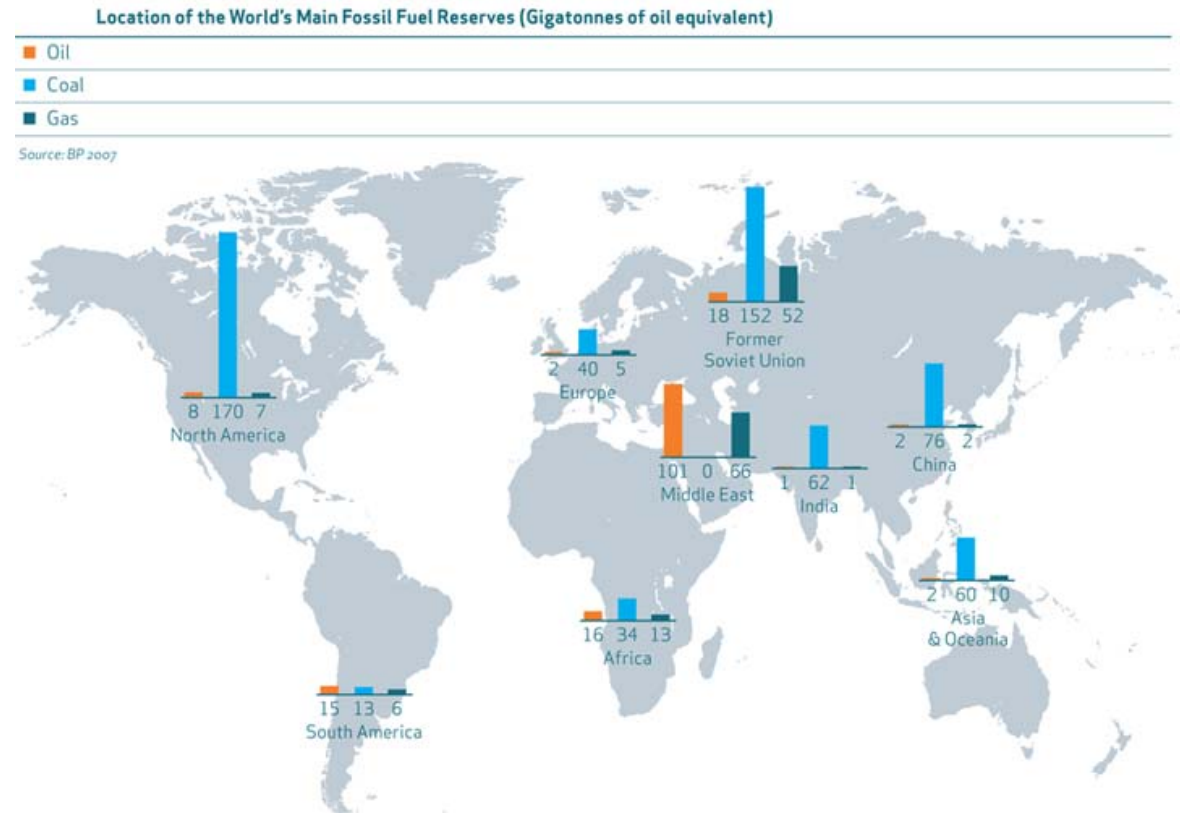
Coal's competitive advantages

COAL LASTS 122 YEARS

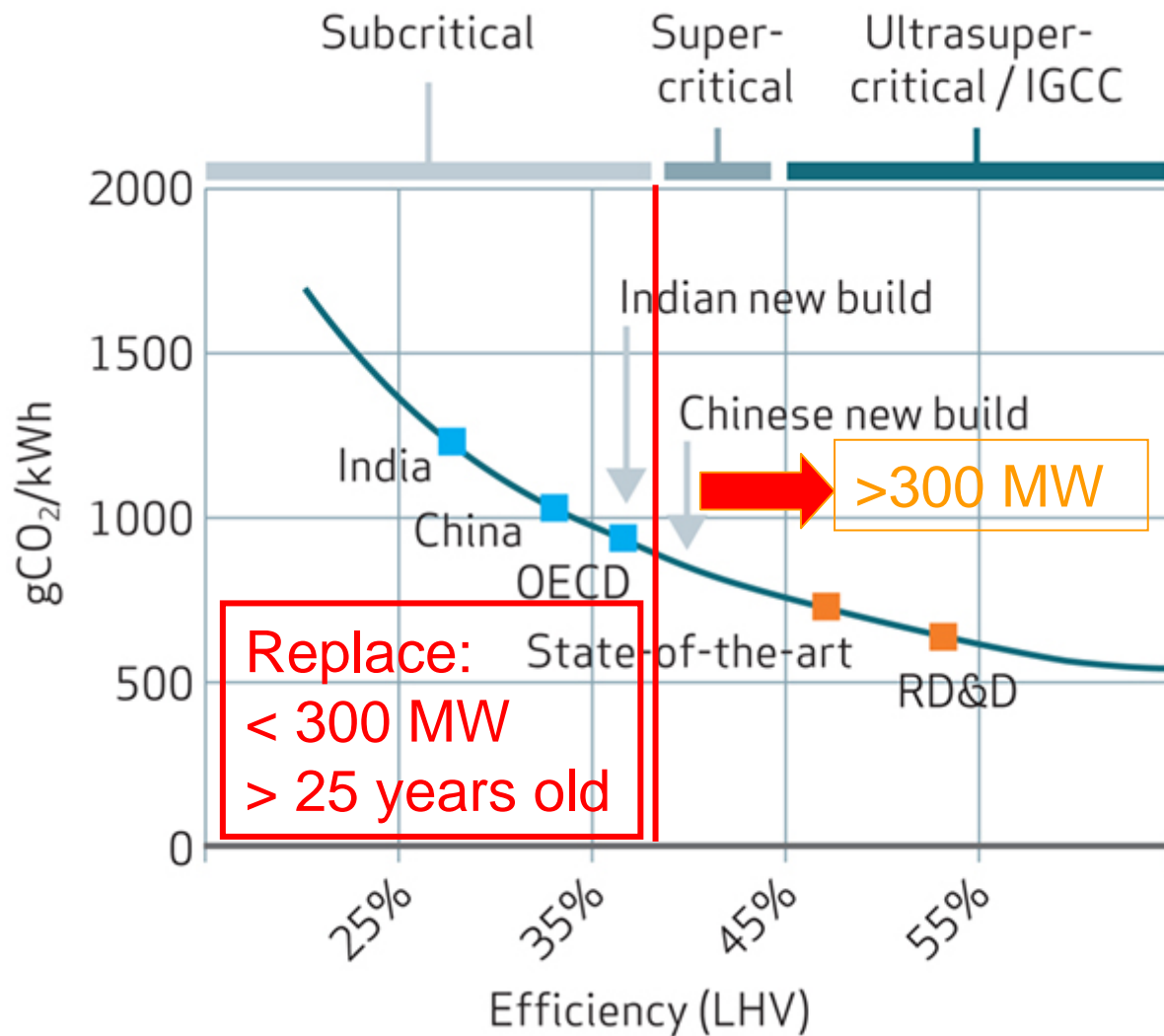
2x as long as gas
(60 years)

3x as long as oil
(42 years)

- Abundant
- Globally distributed
- Affordable & stable in price
- Safe & reliable



Power plant efficiencies



Supply side efficiency is important...

1% increase LHV efficiency = 2–3% points decrease in CO_2 emissions

Reduces 1.7 $\text{GtCO}_2 / \text{yr}$

22% ∇ coal emissions

5.5% ∇ global emissions

...and an essential prerequisite for CCS

IPCC Special Report on Carbon Capture & Storage



Carbon capture and storage

CCS could deliver up to 55% of the mitigation effort to 2100

Costs of stabilising CO₂ emissions can be reduced by 30% or more by including CCS in mitigation portfolios

Power plants with CCS could emit 80-90% less CO₂ net

Majority of CCS technologies either “economically feasible under specific conditions” or part of a “mature market” now

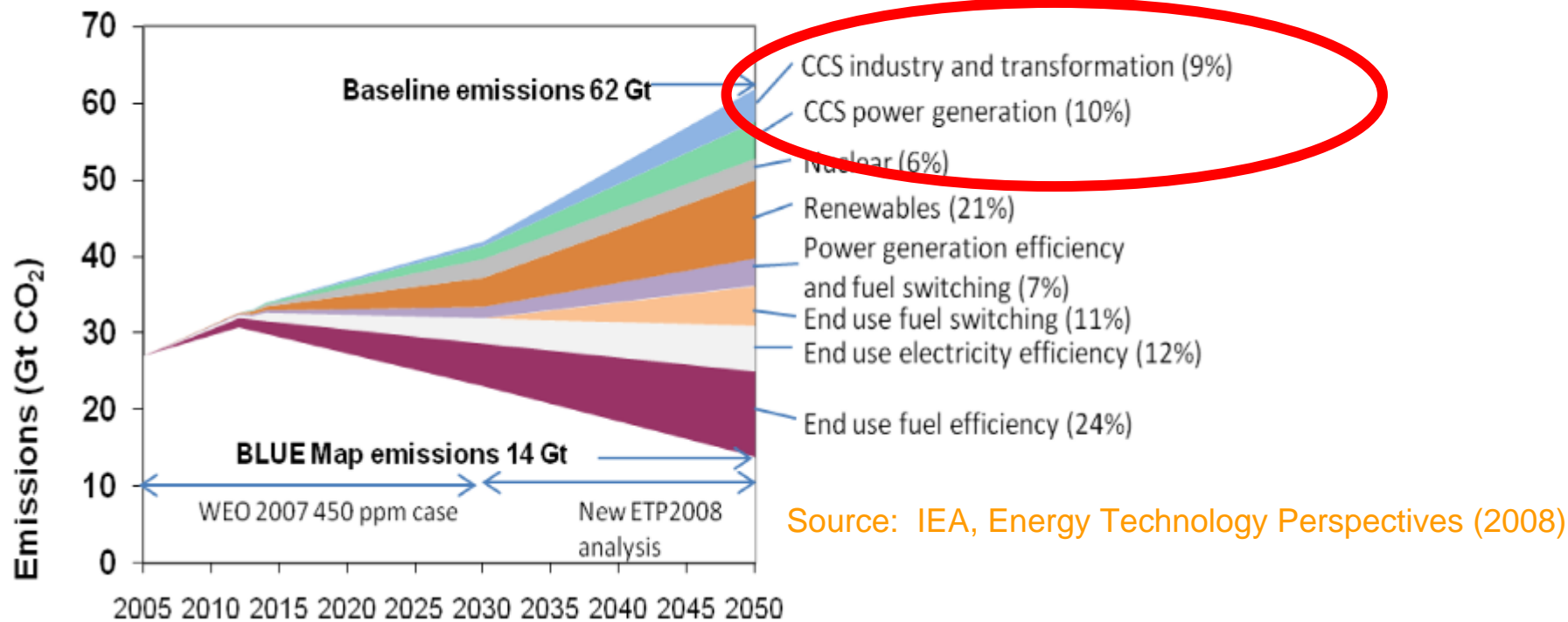
Potential leakage
very likely < 1% over 100 years
likely <1% over 1,000 years

Huge storage capacity for CO₂ in geological formations



Schwarze Pumpe & Sleipner

CCS is *essential* to combating climate change



It is “not possible” to halve CO₂ emissions by 2050 without CCS (p.88)

Climate mitigation costs are 71% greater without coal CCS - i.e. US\$1.28 trillion more p.a. (p.90)

“The deployment of CCS should be a *litmus* test for the seriousness of environmental negotiators dealing with the climate challenge.” Executive Director IEA

Global action on CCS

- \$800m Fund

- 28 potential projects
- ETS Funding

- Stimulus Package incl. \$2.4 – 4.6b on CCS
- 5 CCS power plants

- GreenGen
- NZEC

- GCCSI
- COAL21

Costs and benefits

EUROPE

“Impact Assessment of the Geological Storage of CO₂” (2008)

- 10 x 400 MW coal CCS power plants €9b
- Saves €60b by 2030 in abatement costs

Deutsche Bank AG (2007) estimates 100% Auctioning of EUAs beyond 2013 *for the power sector alone* could raise €24b annually

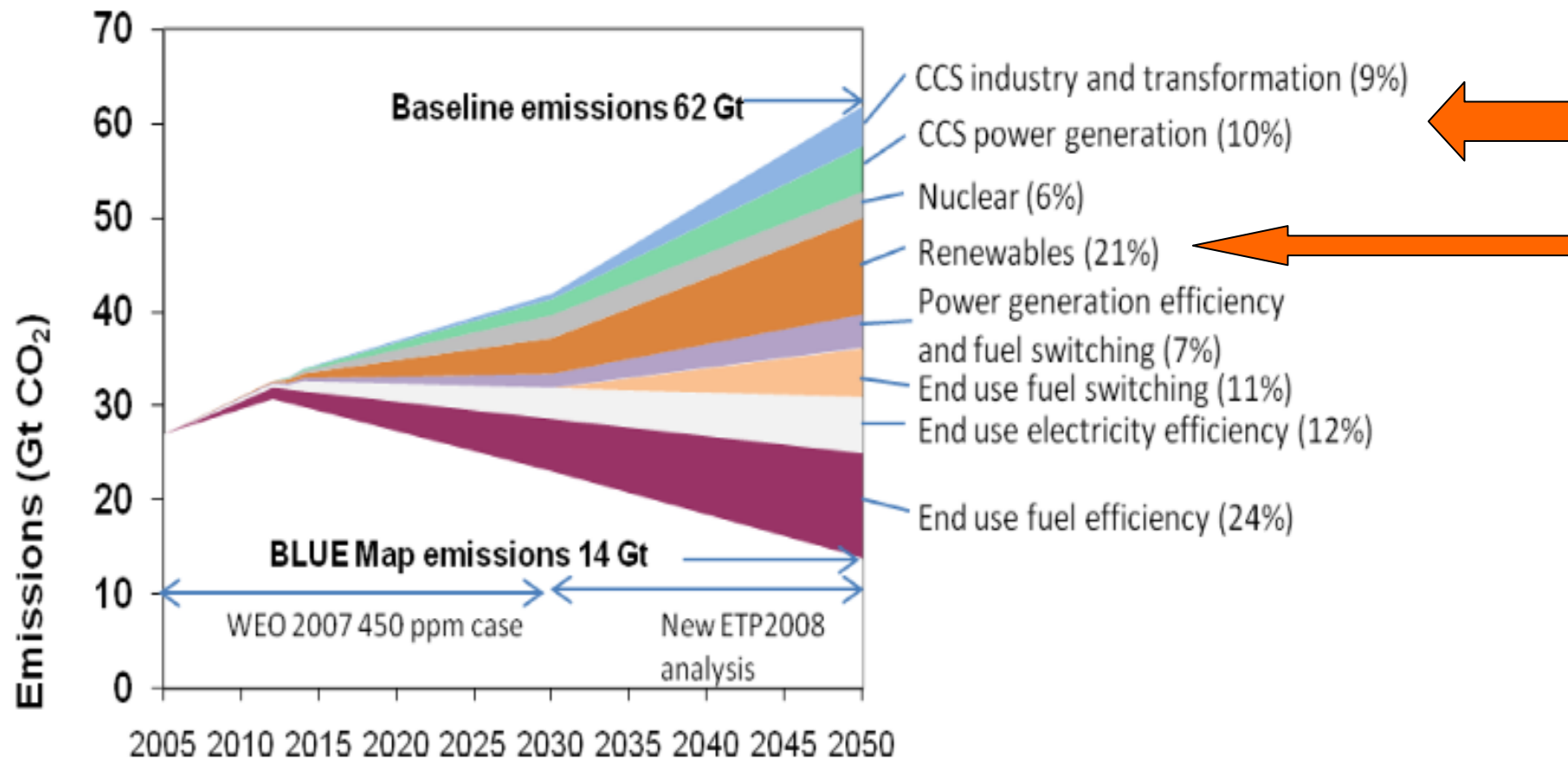
USA

Pew Centre on Global Climate Change (2008)

- 30 x 400 MW coal CCS power plants \$30.1b
- Saves \$80-100b by 2030 in abatement costs

PEW suggests this could be financed through a levy on coal fuelled power stations for 10 years of between \$0.0012 - \$0.0015 kWh

Low carbon technologies: Comparative contribution to mitigation



Source: IEA, Energy Technology Perspectives (2008)

Investments in low carbon technologies

EU LOW CARBON INVESTMENTS

Lifetime cost: €5 -13 billion
to build & operate first 12 commercial scale coal CCS (McKinsey)

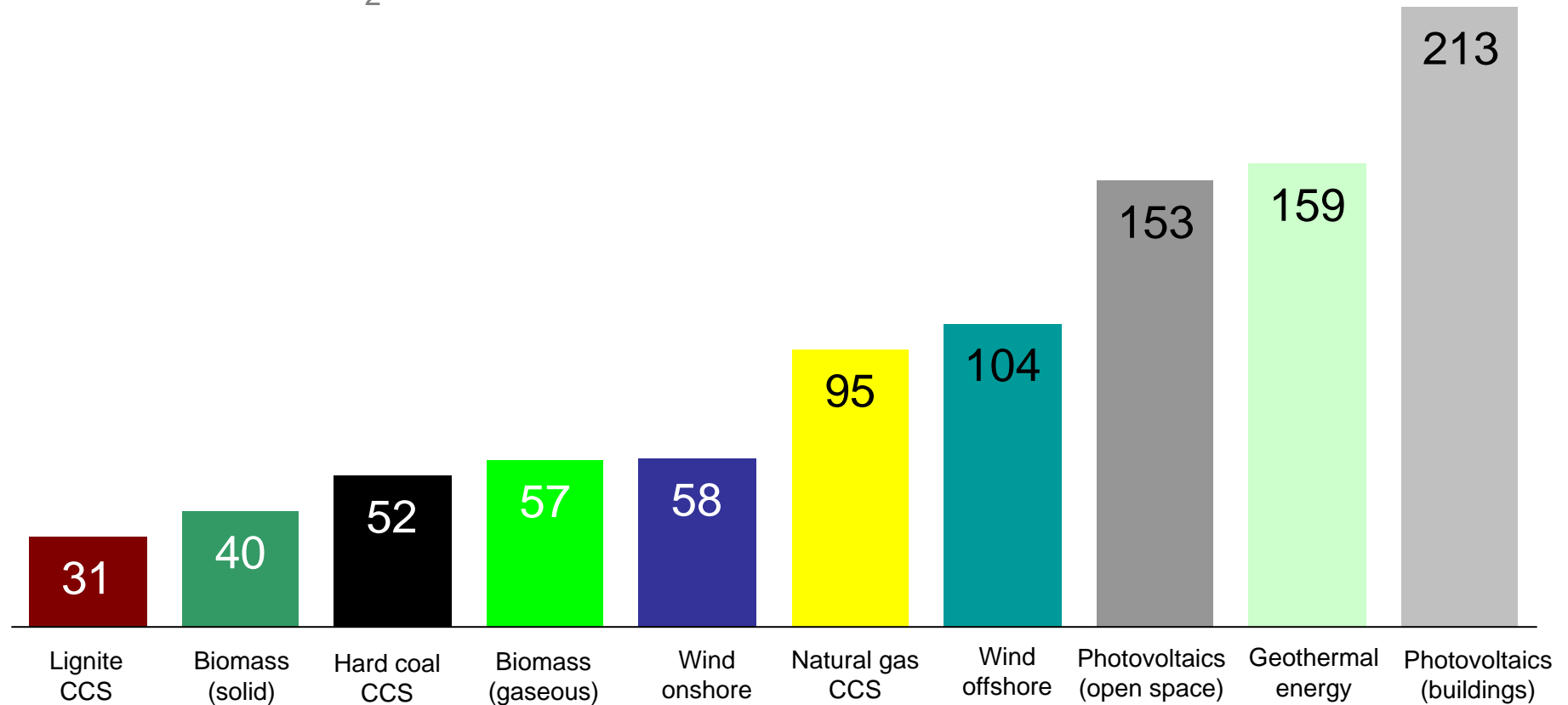
Annual costs: €13 -18 billion p.a.
for EU to meet its renewables energy targets (EC estimates)

UK LOW CARBON INVESTMENTS

Abatement costs in UK through coal CCS
€60 – 90 / tCO₂ for first CCS coal plants to 2015
(From 2020 costs should be €35 - 50 / tCO₂ abated) (McKinsey)

Abatement costs in UK through renewables
€95 - 205 / tCO₂ (Ofgem)

2020 CO₂ avoidance costs for power generation technologies from a macroeconomic perspective in EUR/t of CO₂



Source: McKinsey&Company, Costs and Potentials of Greenhouse Gas Abatement in Germany, energy sector perspective, Berlin in September 2007, pp. 48 and 55

Thank you

It is not possible to halve CO2 emissions by 2050 without coal CCS.

**Mitigation costs are 71% greater without coal CCS
(\$1.28 trillion more per annum)**

**The deployment of CCS should be a *litmus* test for the seriousness
of environmental negotiators dealing with the climate challenge**

International Energy Agency