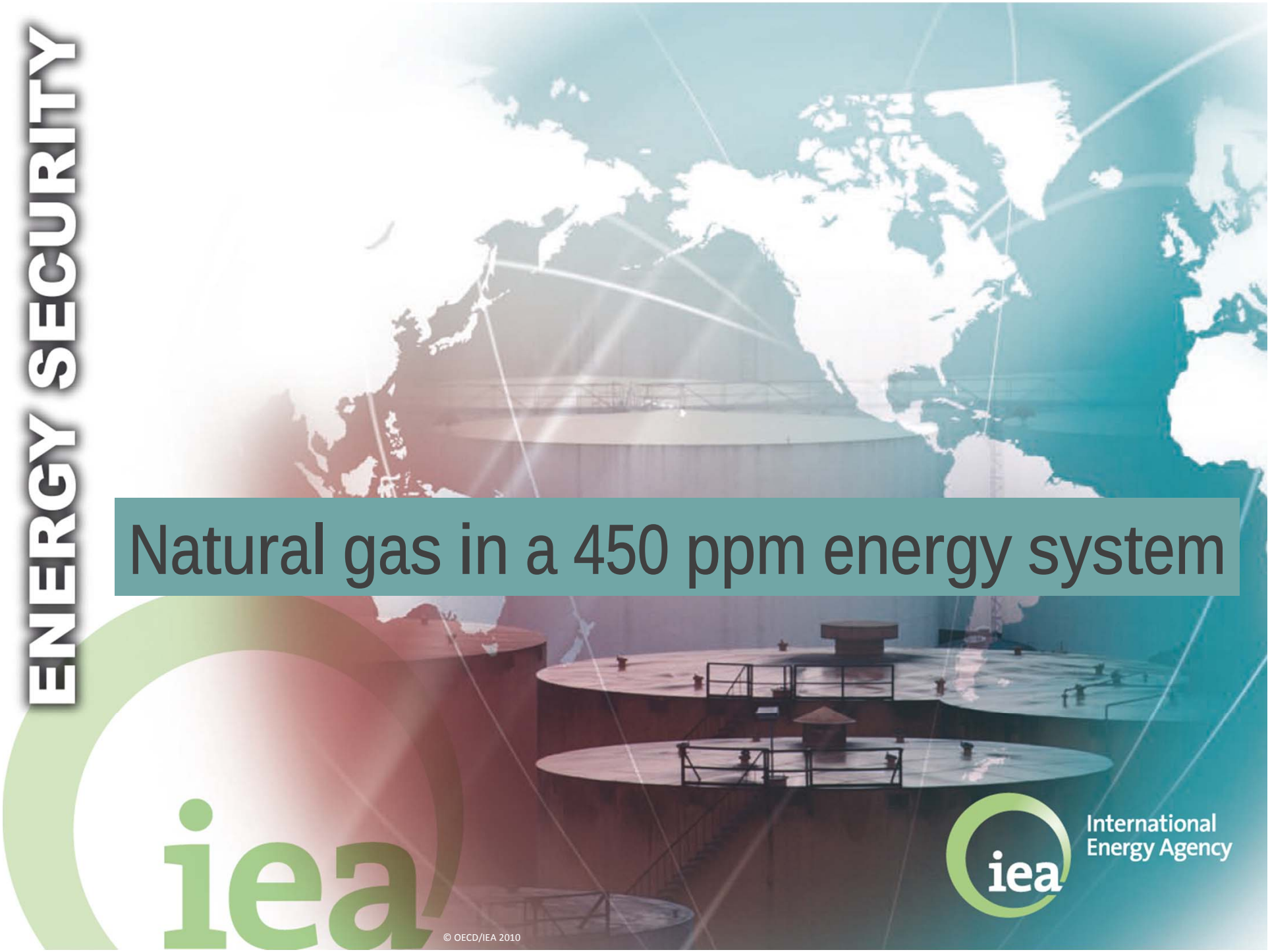
ENERGY SECURITY

Natural gas in a 450 ppm energy system



iea

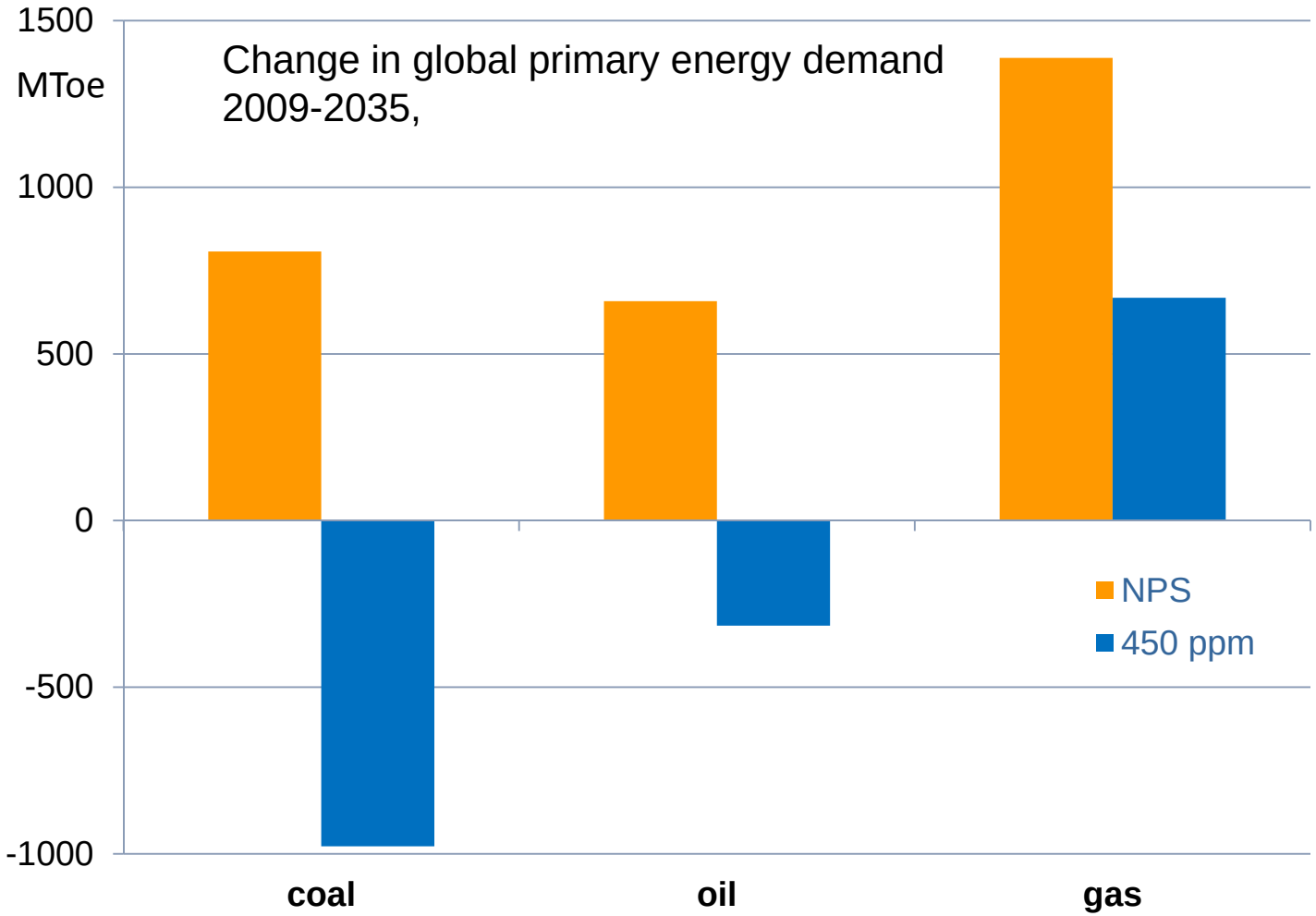
International Energy Agency

Between Scylla and Charybdis

„Natural gas is a fossil fuel, only a bridge, a dash for gas risks locking renewables out”

„Gas is clean, a destination fuel, it should be a backbone of a sustainable energy system”

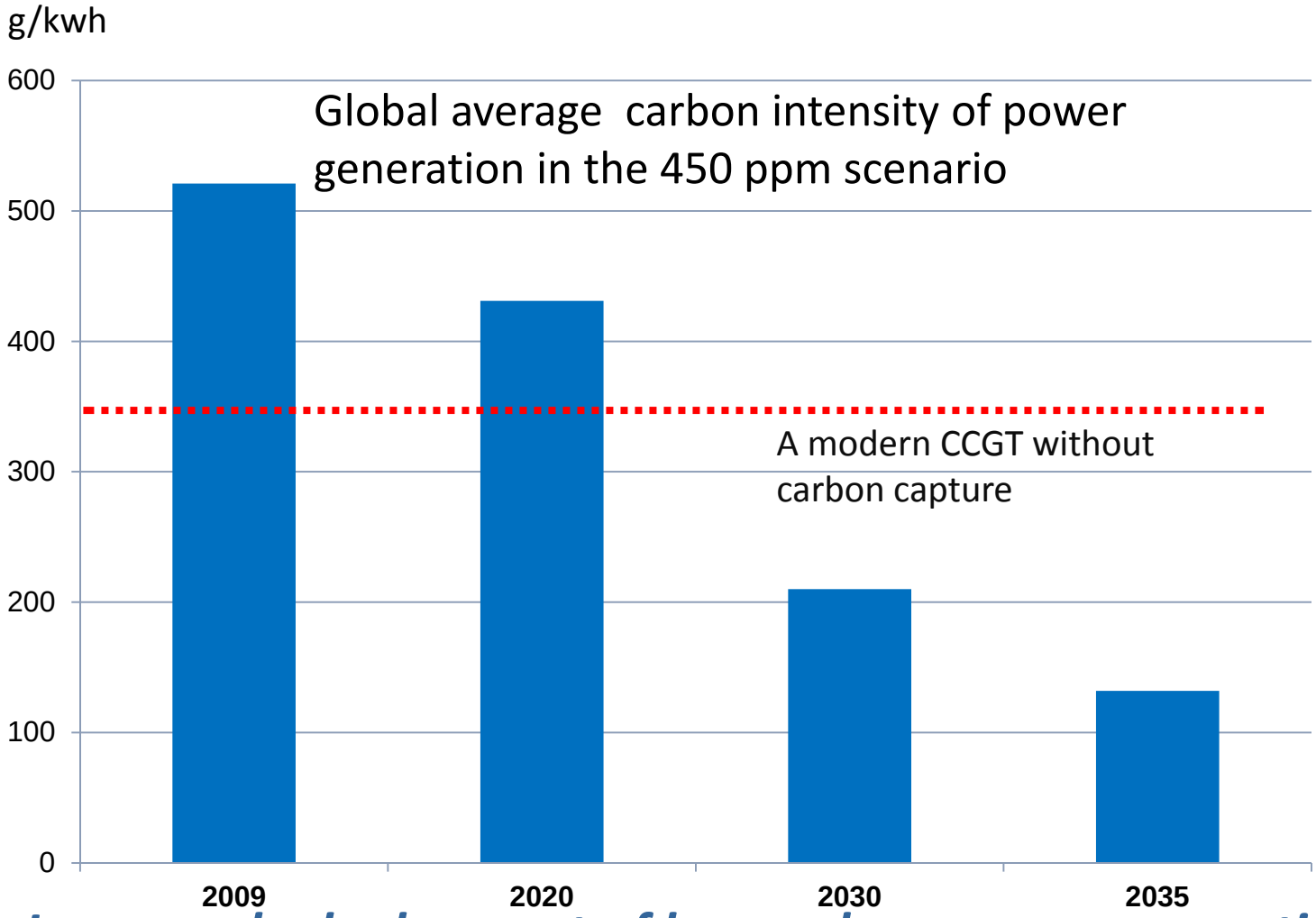
First, the good news: The future of gas is bright in any scenario



The growth of gas in 450 ppm is more than oil in NPS

Source: World Energy Outlook 2011

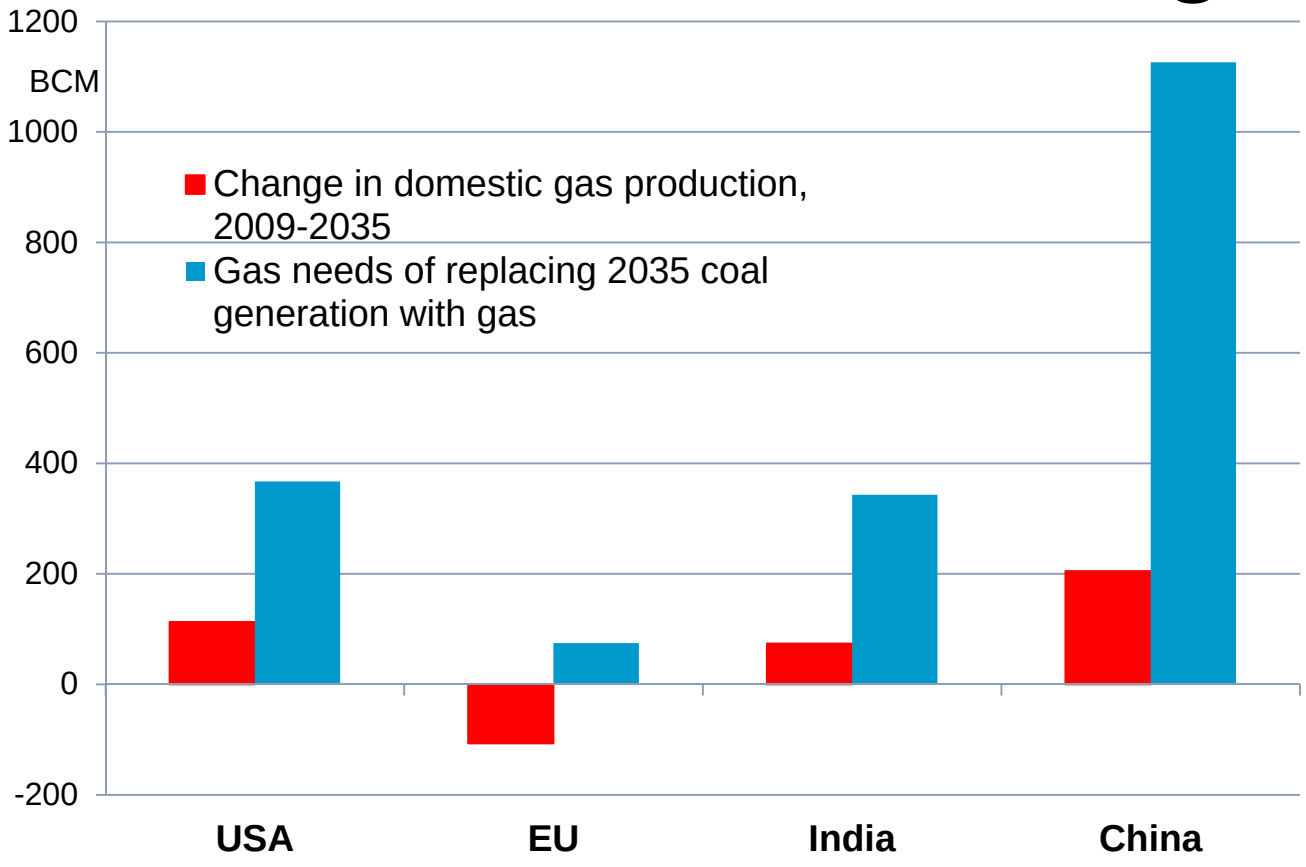
We need a much deeper decarbonization than what could be achieved with gas only



Large scale deployment of low carbon power generation is essential

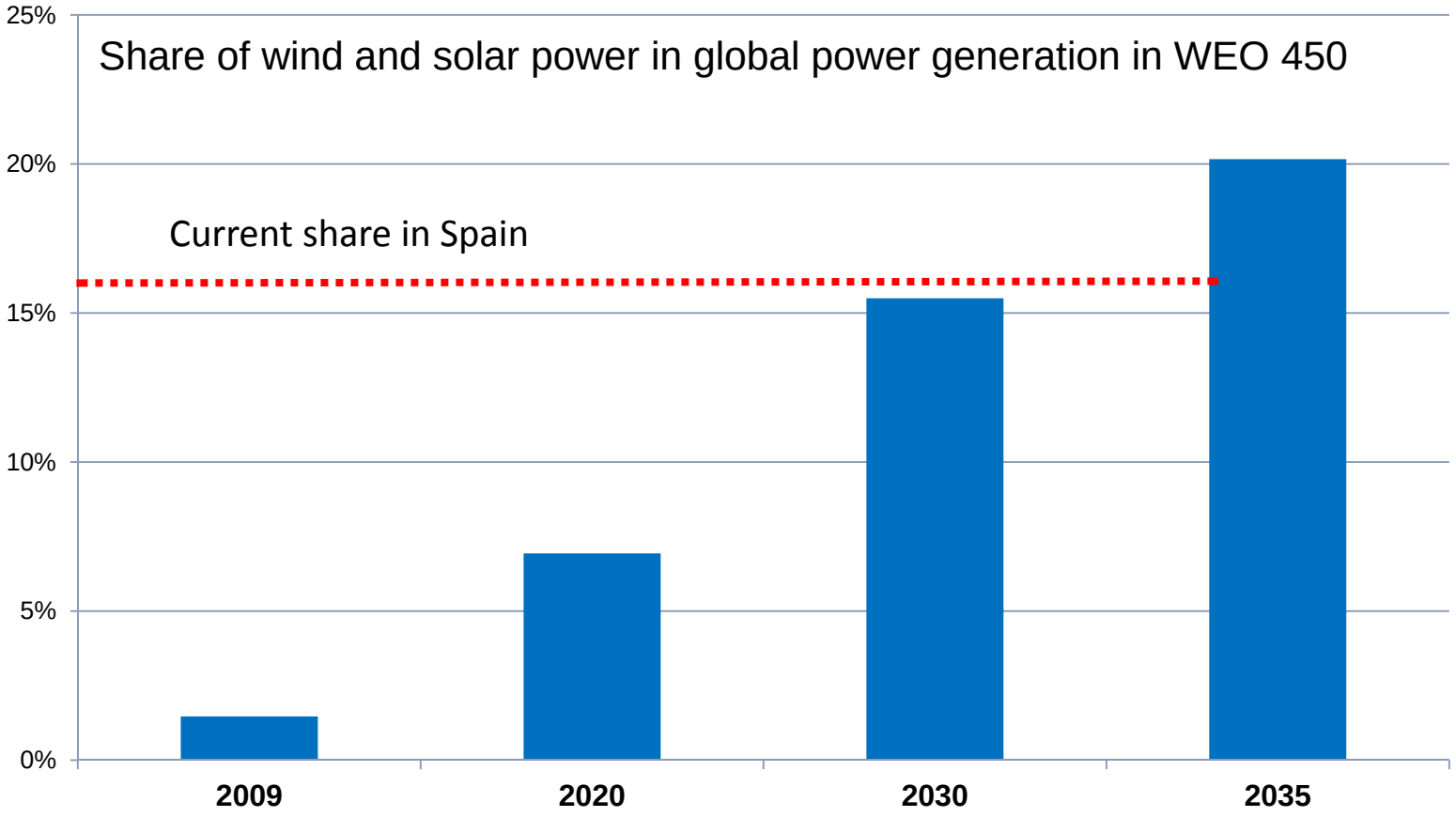
Source: World Energy Outlook 2011

Energy security implications of a wholesale switch from coal to gas



The additional import needs of major consumers would be 4 times the global LNG market today

Variable renewables grow very rapidly in 450 ppm



Flexible gas plants will play a major role in balancing renewables in a sustainable energy system

Source: World Energy Outlook 2011

Gas retains its advantages with CCS

- Gas plants will still have a lower capital cost
- And a higher operational flexibility
- Less CO2 to deal with – limited storage will last longer
- Ease of transport: A major gas pipeline is a freight train of coal every 20 minutes

CCS needs strong policy support

- a sectoral agreement
- measurable carbon prices
- funding for demonstrations etc.

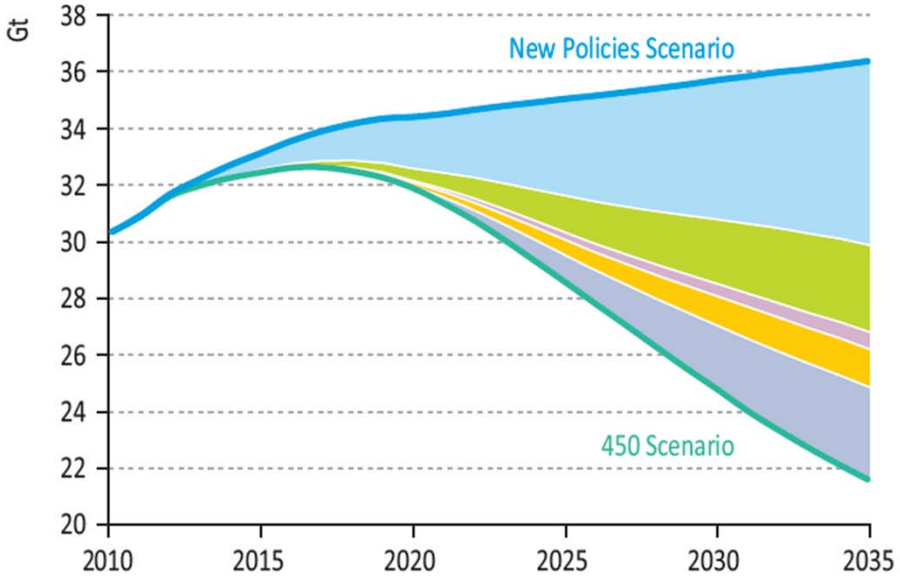
Conclusions

- Gas has a bright future, with strong growth even in the 450 ppm scenario
- Running gas power plants at high load factors instead of coal plants will help cut emissions in the medium term
- Gas plants will be an important source of flexibility for power systems integrating high renewable shares
- Gas alone is not a long-term solution due to the need for deeper decarbonization and energy security concerns
- CCS could help gas maintain its long term role in a sustainable energy system

Back-up slides on CCS

Role of CCS in the future (1)

- **Without strong policy, CCS will play a very limited role in the future…**
  - WEO-2011: only 1% of global power production from CCS-coal by 2035 under New Policies Scenario
- **…but it will have a CRITICAL ROLE to play in reaching any ambitious outcome (e.g. a 450-scenario)**
  - CCS could deliver 22%, or 3Gt, of total required abatement by 2035 under WEO-2011 450-scenario

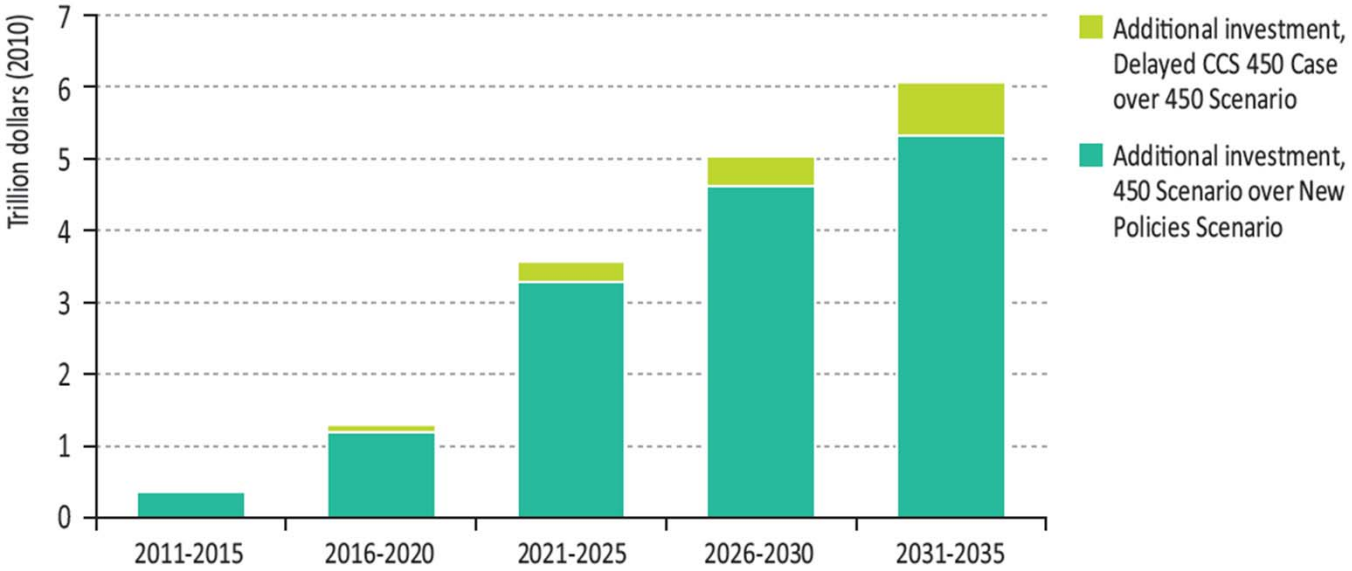


	Abatement 2020	2035
Efficiency	72%	44%
Renewables	17%	21%
Biofuels	2%	4%
Nuclear	5%	9%
CCS	3%	22%
Total (Gt CO_2)	2.5	14.8

Source: "New Policies Scenario", IEA World Energy Outlook 2011

Role of CCS in the future (2)

- **Delaying CCS is a costly option**
  - Delaying deployment of CCS until after 2030 would require over 1,1 trillion USD additional investment between 2011-2035 to reach 450-scenario (WEO-2011)



Source: "New Policies Scenario", IEA World Energy Outlook 2011

- **CCS IS PART OF A LEAST-COST PATHWAY TO REACHING ANY AMBITIOUS CLIMATE GOAL!**