

The Challenge of
Building New Clean Coal Plants in the EU

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World Coal Institute Roundtable
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- **Use of Energy**
 - Consumer behaviour
 - Efficient appliances and buildings
 - Energy management / Smart Grid
- **Technology Mix**
 - Nuclear
 - Renewables
- **Production Efficiency**
 - Fuel Preparation/Retrofit
 - New generation plants
- **Carbon Capture and Storage**

Alstom involvement

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The Technology is Working

Operating/Commissioning



We Energies Pleasant Prairie
USA - 5 MWth
Chilled Ammonia - Coal



Vattenfall Schwarze Pumpe
Germany - 30 MWth
Oxy - Lignite



AEP Mountaineer
USA - 30 MWth
Chilled Ammonia - Coal



EoN Karlshamn
Sweden - 5 MWth
Chilled Ammonia - Fuel/Gas



Total Lacq
France - 30 MWth
Oxy - Gas/Fuel



Dow Chemical Co.
USA, West Virginia
Advanced Amines

Study / Engineering



PGE Belchatow
Poland - 260 MWe
Adv. Amines - Lignite



Vattenfall Jämschalde
Germany - 250 MWe
Oxy - Lignite



Statoil Mongstad
Norway - 40 MWth
Chilled Ammonia - Gas



Short-listed for European Energy Programme for Recovery funding

Main Partnerships & Projects Portfolio



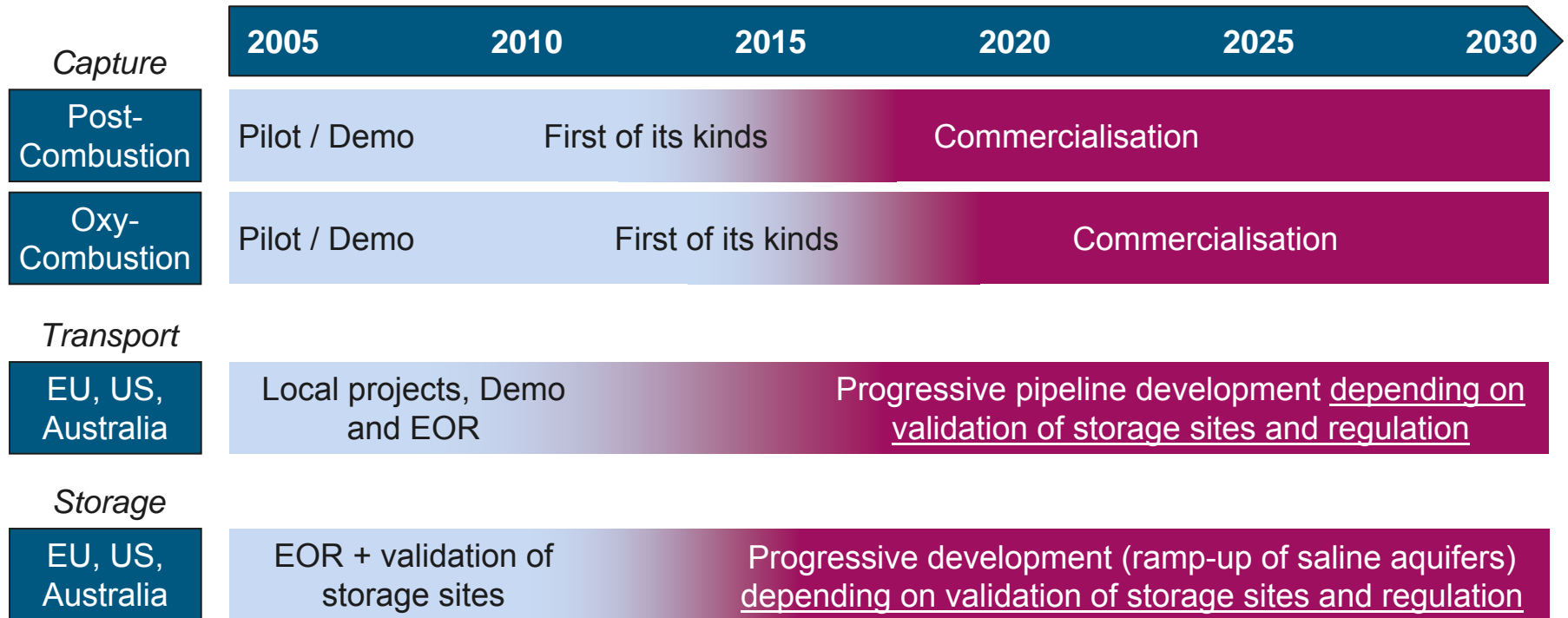
ADVANCED AMINES	Joint Development Partnership			ALSTOM
	Belchatow (Poland) - Coal	30 MWth >150 MWe		ALSTOM
CHILLED AMMONIA	Pleasant Prairie (US) - Coal	5 MWth	 	ALSTOM
	Mountaineer (US) - Coal Northeastern (US) - Coal	30 MWth >200 MWe		ALSTOM
	Transalta (Canada) - Coal	200 MWe		ALSTOM
	Karlshamn (Sweden) - Gas	5 MWth		ALSTOM
	Mongstad (Norway) - Gas	40 MWth		ALSTOM
	Schwarze Pumpe (Germany) - Coal	30 MWth		ALSTOM
OXY COMB	Jänschwalde (Germany)	250 MWe Feasibility Study		ALSTOM
	Lacq (France) - Gas	30 MWt		ALSTOM

Pilot Plants in Commissioning / Operation

CCS Deployment Roadmap

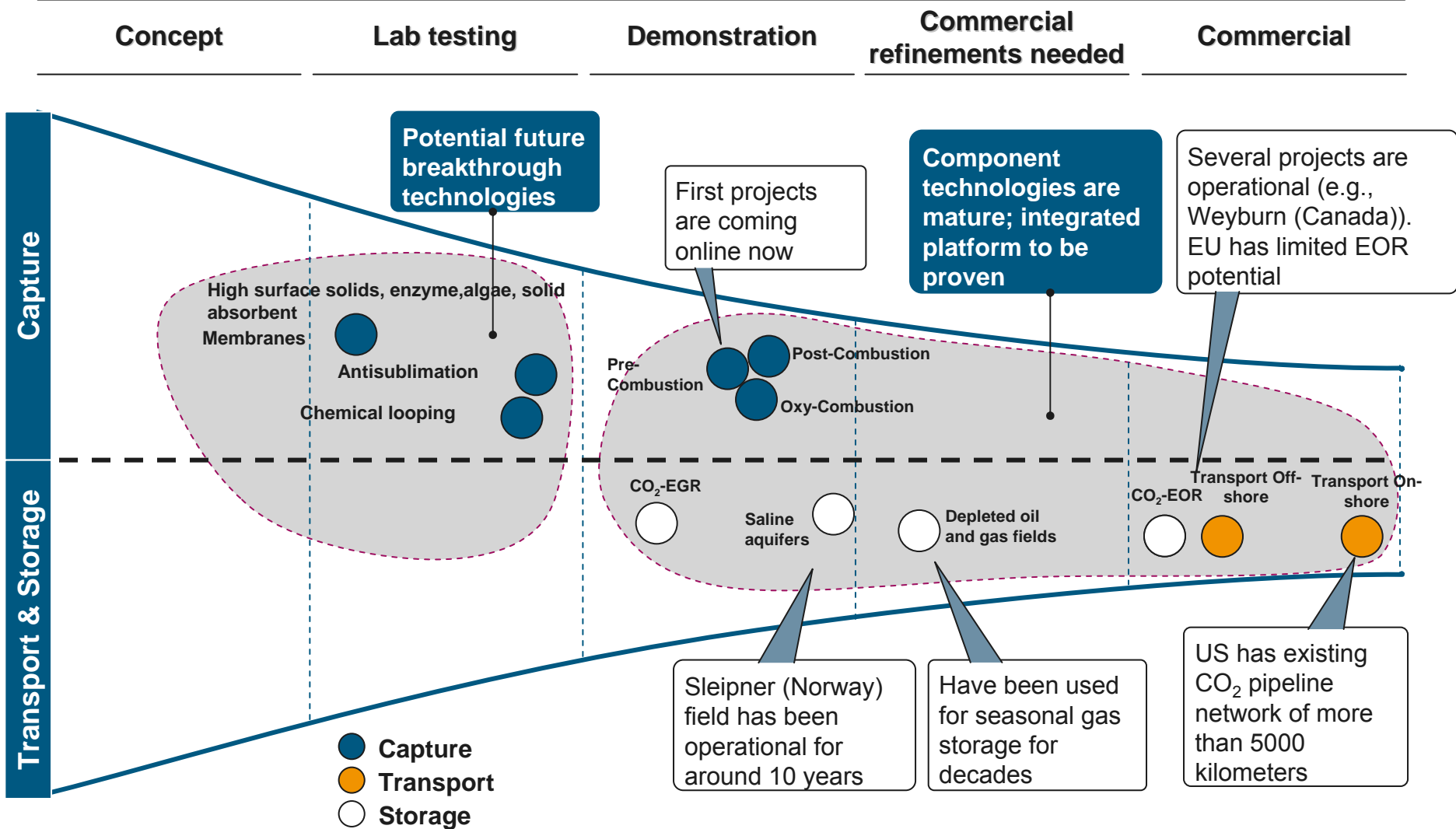


Roadmap

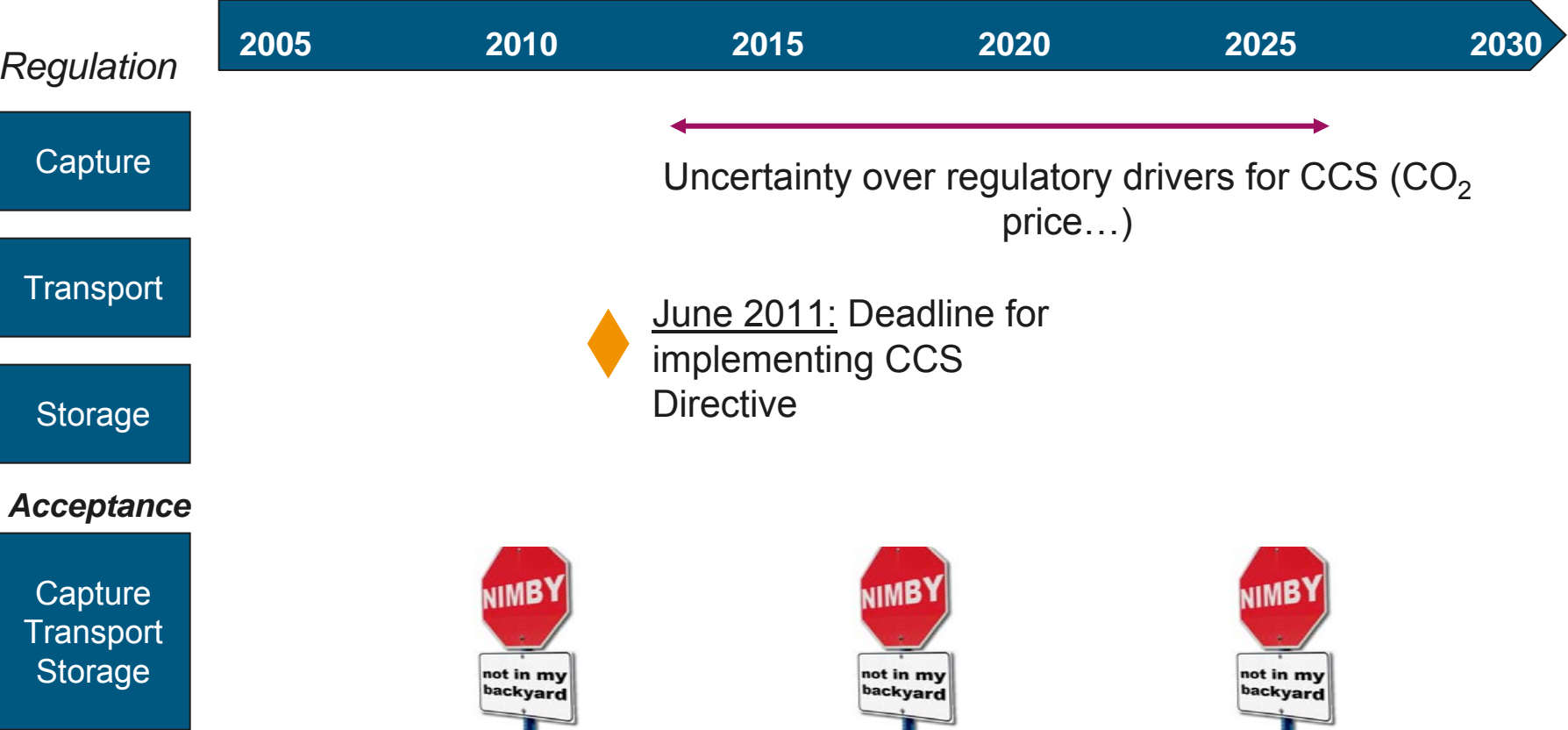


Commercialisation by 2015 is achievable

Status of CCS development

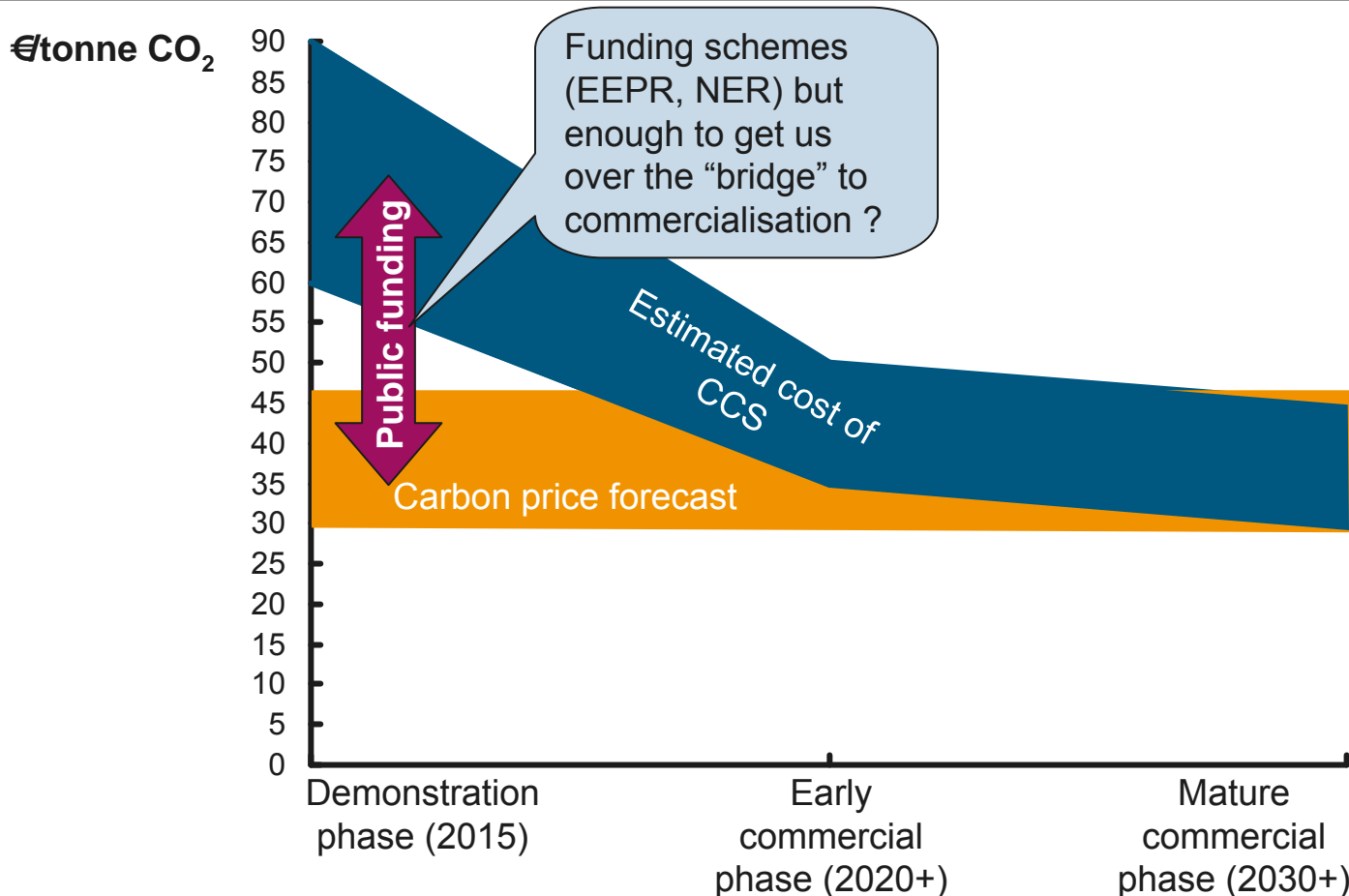


Regulatory and Acceptance Challenges



Clean Coal deployment needs regulatory certainty and public acceptance as soon as possible

Financial challenge: Economics of CCS



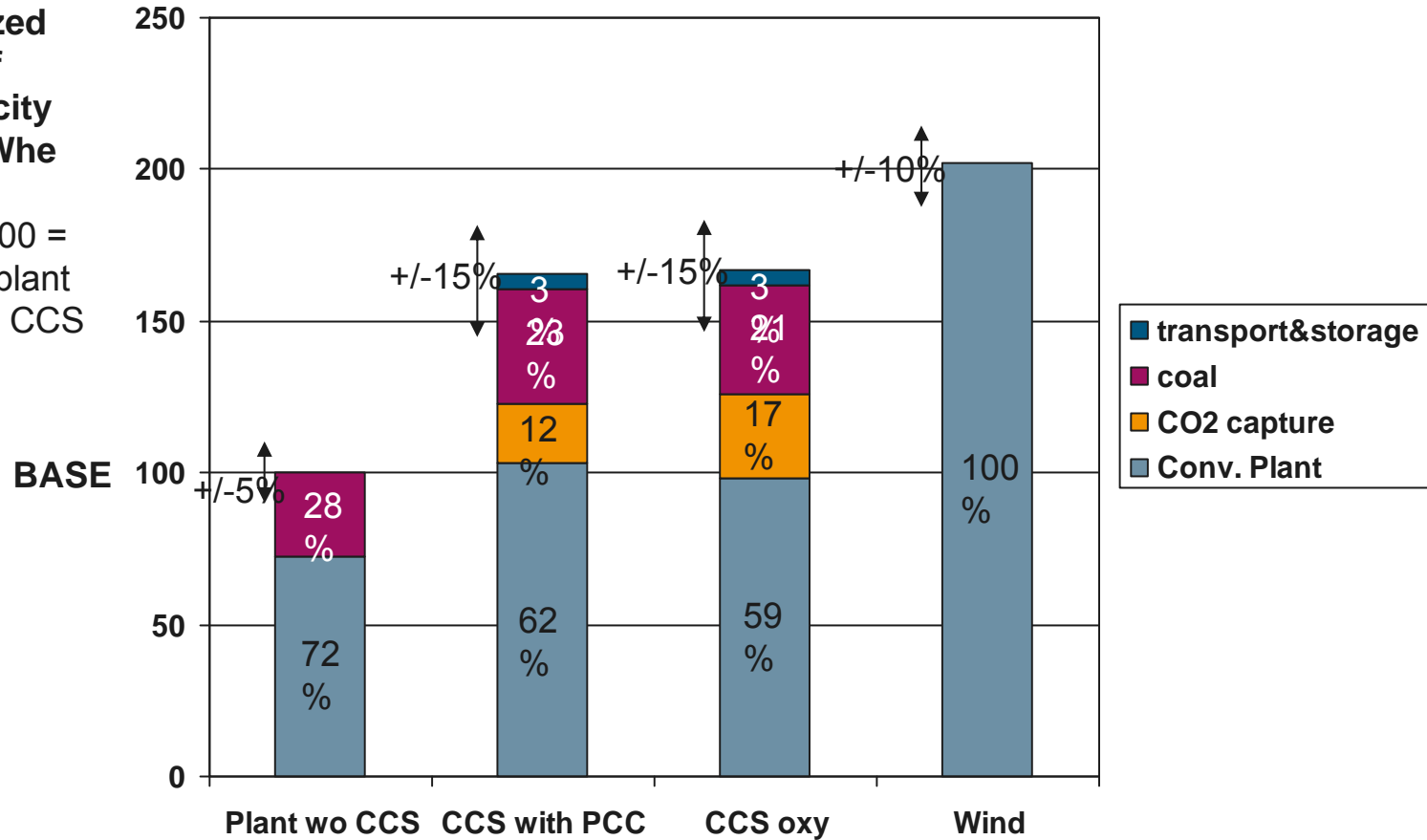
Source: McKinsey & Company “CCS – assessing the economics” for the cost numbers; policy implications drawn by ZEP

Public funding required at demo phase and early commercial deployment

CCS costs lower than wind

Levelized cost of electricity per MWh net

Base 100 = steam plant without CCS



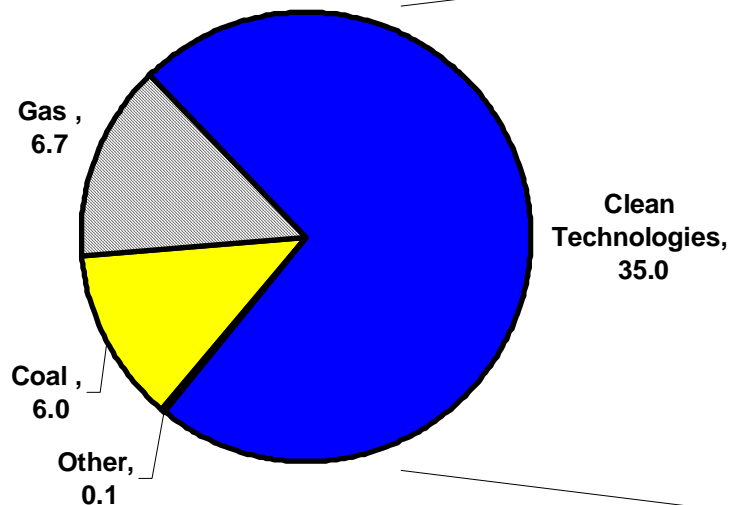
Post-combustion and oxy are nearly equivalent

Incremental BoP and O&M for CCS in CO2 capture portion
 Incremental fuel for CCS in coal portion

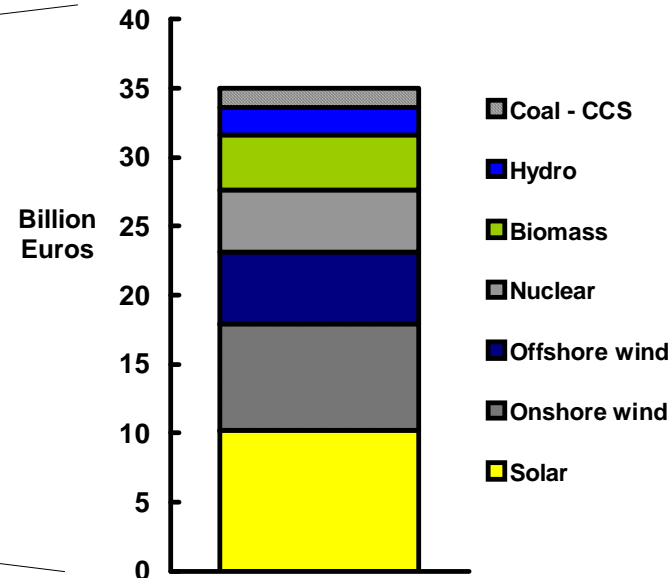
CCCS costs lower than other clean power

Europe needs to invest €35bn a year on clean power plant up to 2020. CCS only €1bn of that.

Average Annual Investment Needs 2009-2020



Clean Technologies breakdown



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