

IEA WPFF – MOST/Acca21 CCUS Workshop
Raffles Beijing Hotel, 18 – 19 September 2011

Jostein Dahl Karlsen
Chair, IEA Working Party for Fossil Fuels



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WPFF Impact 2001-2005

Programs align with ZETs

ZETs 2001...

2002.....

2003(CSLF)

2005++



WPFFstrategy

“Zero Emissions Technologies for Fossil Fuels”, ZETs



U.S.—FutureGen



Australia—Coal



Germany



United Kingdom—Carbon Abatement Technologies



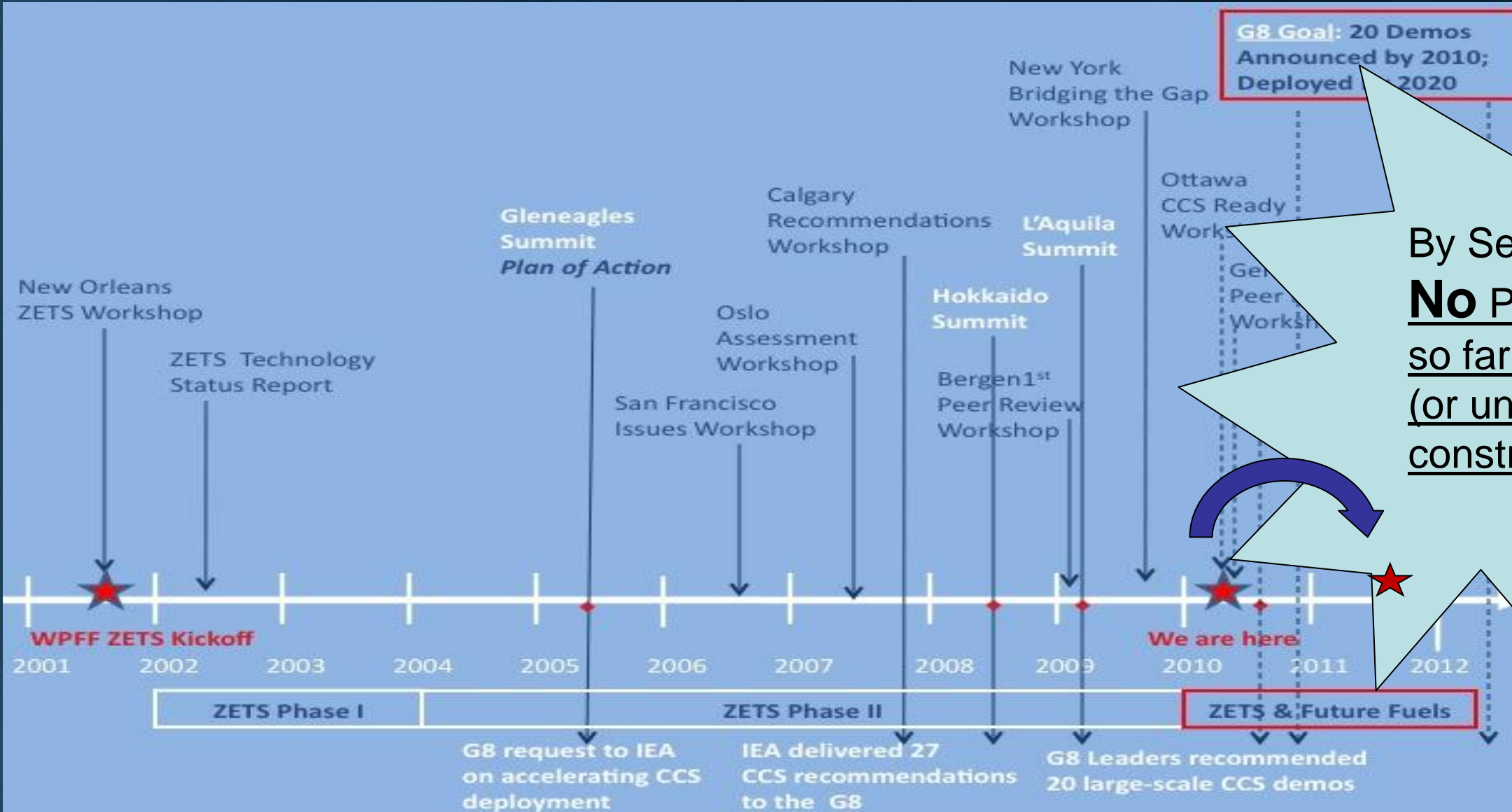
Program



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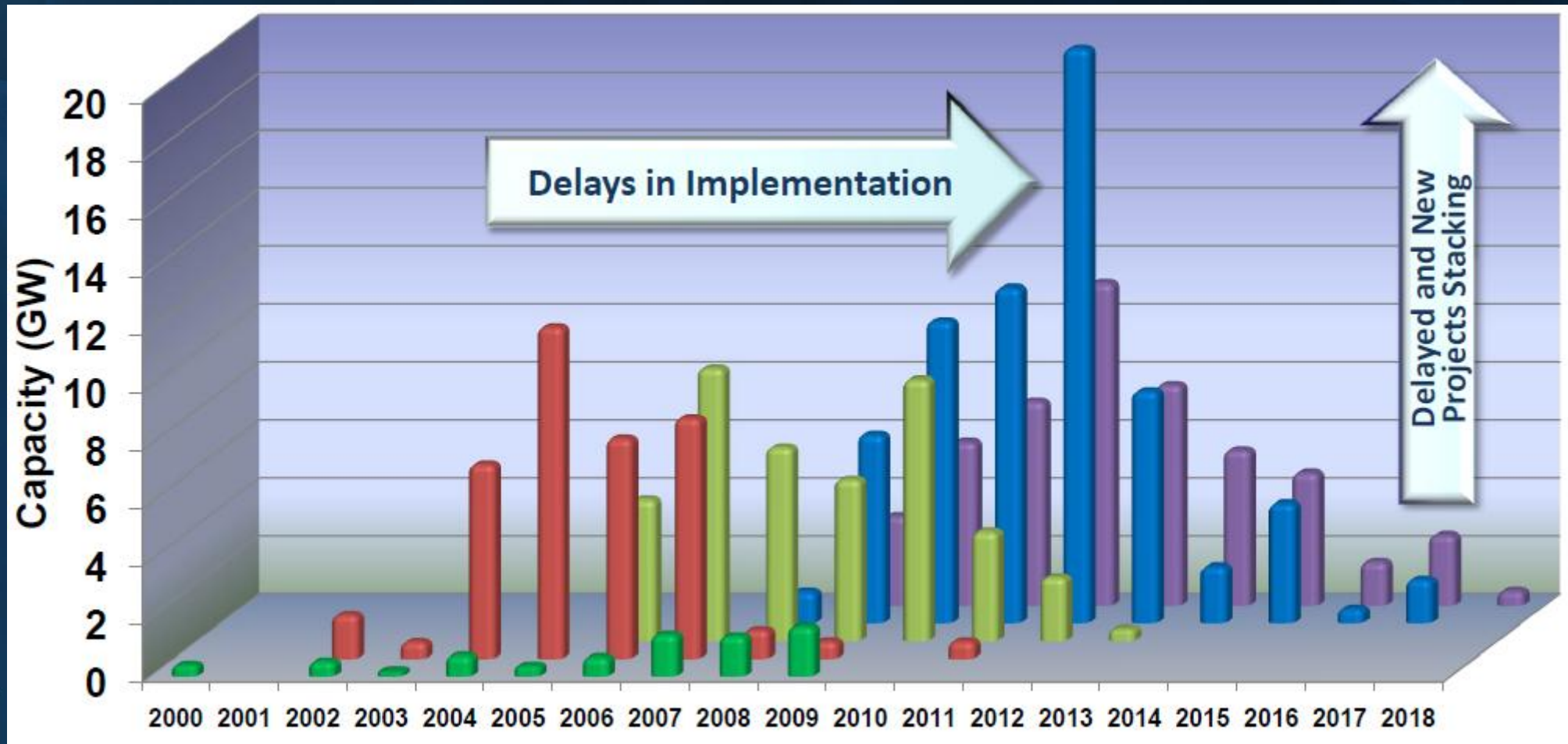
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Working the Global Community on CCS; IEA/CSLF High-level Dialoge



By Sept. 2011:
No Power Plants
so far with CCS
(or under
construction)

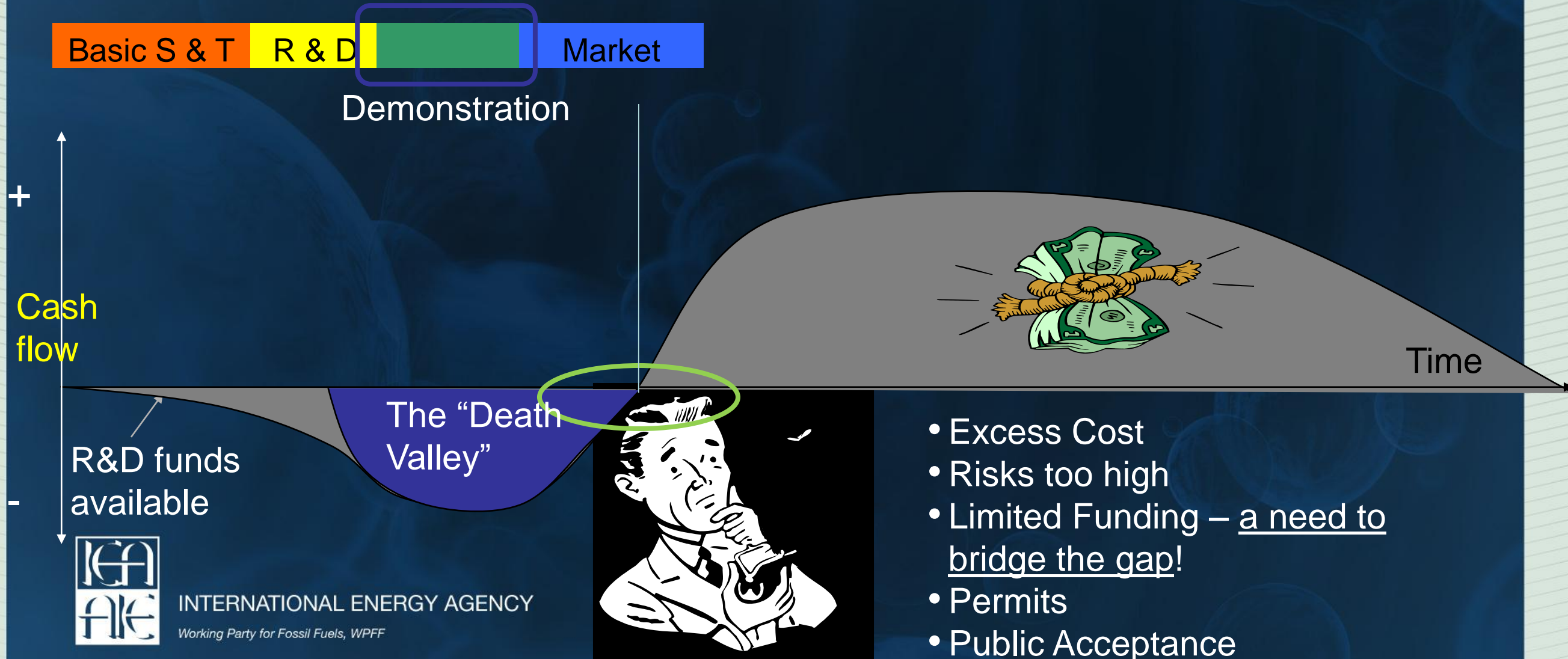
What has been happening?



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“The Death Valley” of Capital Intensive Technologies



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ARE WE ENTERING A GOLDEN AGE OF GAS?

Special Report

WORLD ENERGY OUTLOOK

2
0
1
1



II
W

Historical global electricity consumption



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Key Observation Global CCS

Only Top Down Dialogue **Unrealistic!**



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Observation (2)

Country / country level & regional +
Cross-regional **collaboration** currently undervalued



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WPFF New Bottom-up Approach



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WPFF 2010-2012 Strategy

WPFF Pillars;

“Future Fuels”

Focus: “Next Generation” fossil energy

CCS Implementation

Focus: International projects

Global Outreach

Focus: Dialogue with Major Player NMCies (G8+5/BRICS)

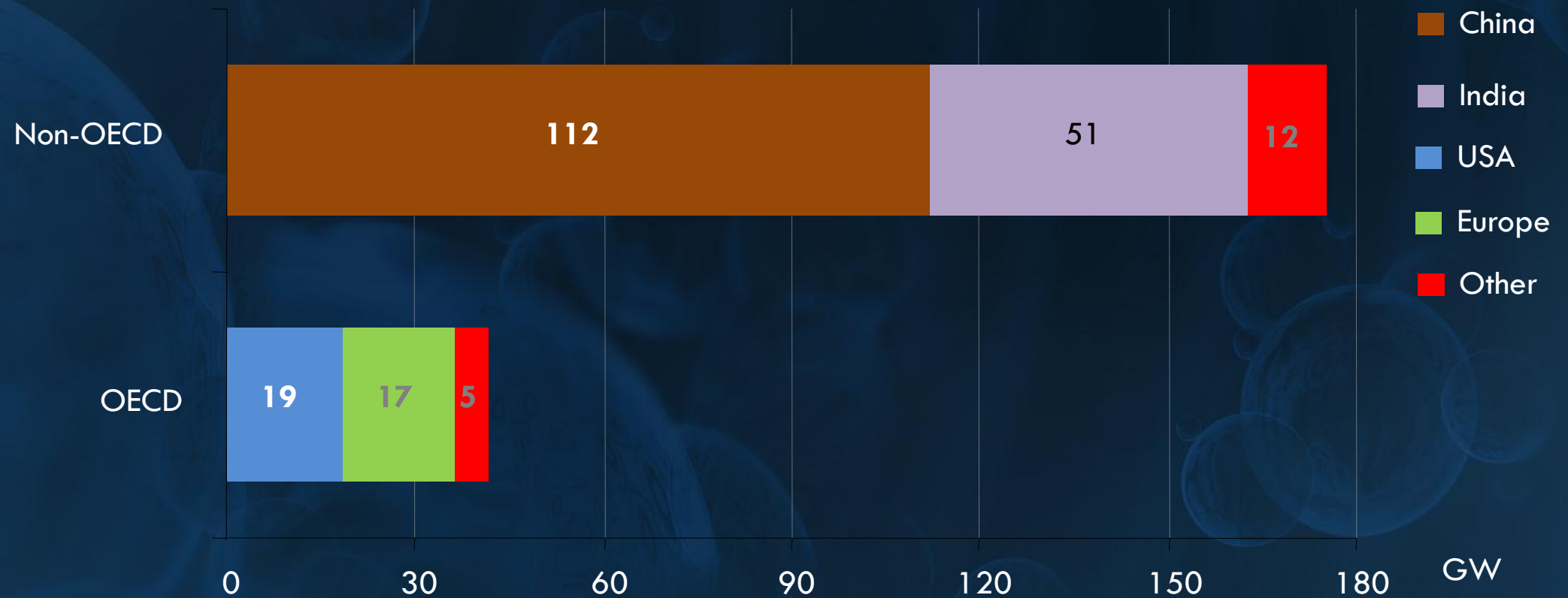
-Beijing, June 2010 → MOST-IEA WPFF Workshop & CSLF Ministerial Beijing Sept ‘11
- Rio de Janeiro, July 2011



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Coal Power Currently under Construction



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Source: World Energy Outlook 2009

WPFF – MOST Large Scale CCS Knowledge Exchange Network

	Pilot-scale projects					Commercial-scale demo projects					
	ENEL	AEP	TCM	Shenhua Phase 1	GreenGen Phase 2	ENEL	AEP	Mongstad Phase 2	FutureGen	Shenhua Phase 2-3	GreenGen Phase 3
Location	Brindisi	New Haven	Mongstad	Ordos	Tianjin	Porto Tolle	Mountaineer	Mongstad	Illinois	Ordos	Tianjin
Operation	2010	2009	2012	2011	2014	2015	on hold	FID: 2016	2016	?	2016
Capture rate	20 kt/a @ 90%	100 kt/a @ >85%	100 kt/a @ 90%	100 kt/a @ 90%	100 kt/a @ 90%	1 Mt/a @ 90%	1.5 Mt/a @ 90%	1 Mt/a @ 90%	1.3 Mt/a @ 90%	>1 Mt/a @ 90%	>1 Mt/a @ 90%
Type of capture	Post-comb.: amines	Post-comb.: NH ₃	Post-comb.: amines & NH ₃	Pre-comb.: (CTL)	Pre-combustion	Post-comb.: amines	Post-comb.: NH ₃	Post-combust.	Oxy-combustion	Pre-comb. (CTL)	Pre-combustion
Retrofit	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Repowering	No	No
Baseline plant	PC slipstream	20 MW PC slipstream	Oil & Cracker slipstream	1 Mt crude oil CTL	IGCC slipstream	264 MW PC slipstream	235 MW PC slipstream	CHP	139 MW PC	2 Mt crude oil CTL	400 MW IGCC
CO ₂ transport		Local injection	(release)		17 km by truck (liq.)	Pipeline	Local injection	Pipeline	Pipeline		
CO ₂ storage	(release)	Deep saline aquifer (Rose Run Sandstone)	(release)	Deep saline aquifer / EOR	Deep saline aquifer / EOR	Deep saline aquifer in North Adriatic Sea	Deep saline aquifer (Rose Run Sandstone)	tbd	Deep saline aquifer	tbd, Saline aquifer / EOR	tbd
Budget or funding						EEPR: 100 M€ applied for NER300	668 MIL. USD, 50% DOE share		1.3 BILL. USD (77 % DOE) CCS: 42%		

Notes: FID = Final Investment Decision; NH₃ = Chilled ammonia; CTL = Coal-to-liquid plant; PC = Fossilized coal power plant; IGCC = Integrated Combined Cycle

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INTER
Working

CCS Knowledge Exchange



Lessons Learned
Experience Transfer



Non-Technical	Permitting	Applications, regulations, acceptance requirements		
	Liabilities		CO ₂ Storage Liabilities	CO ₂ Storage Liabilities
	Financing		Electricity premium	
Technical	Methodology & HSE	Design specs, capture rates definitions		HSE/Environmental impact assessment
	Operational Experience	General operation; measurement & instrumentation	Plant integration & reliability	
	Storage			Storage capacity & plume dynamics

TCM

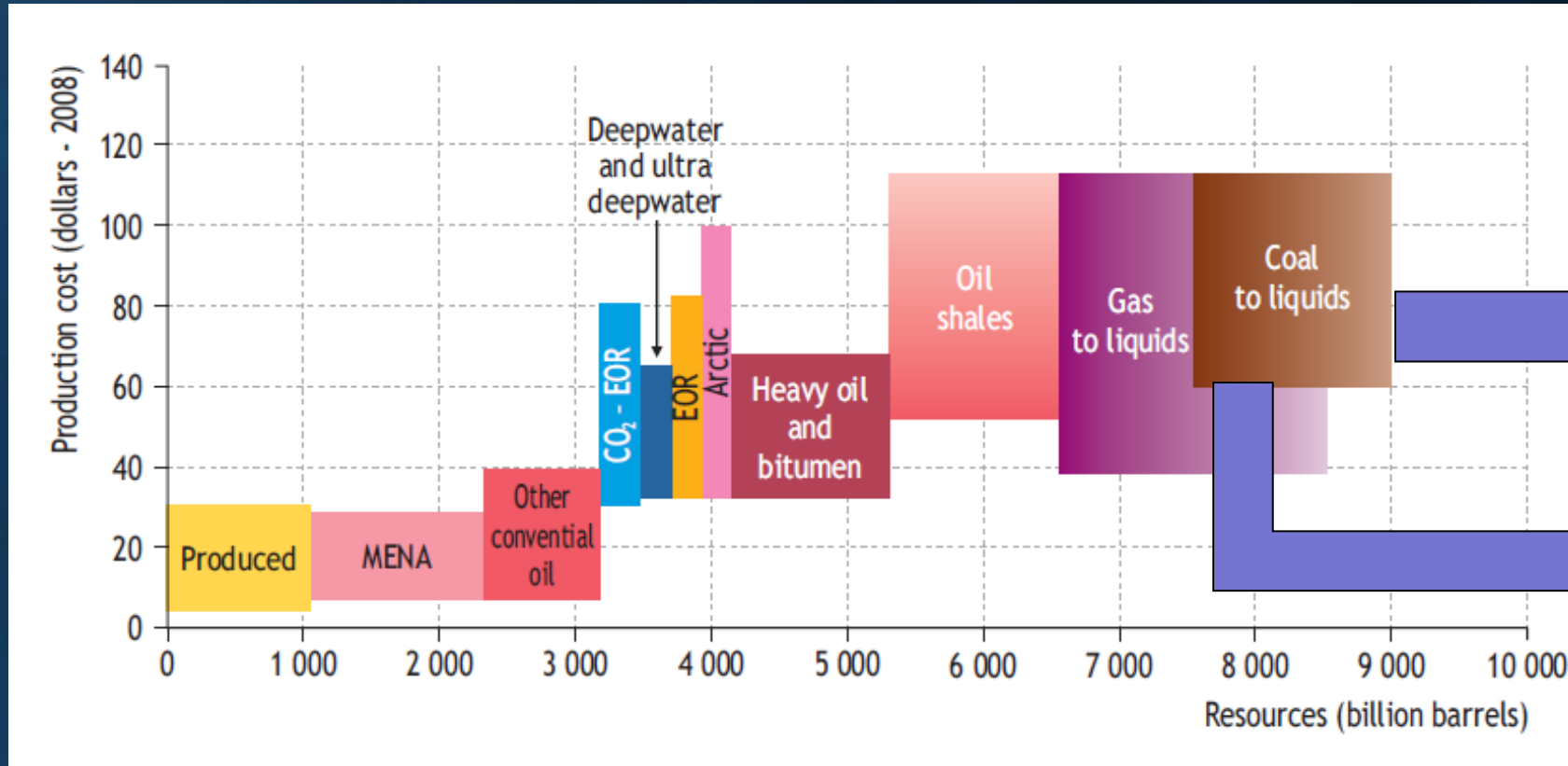
FutureGen

Porte Tolle



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Oil, Gas and Coal Resources for the Next Centuries



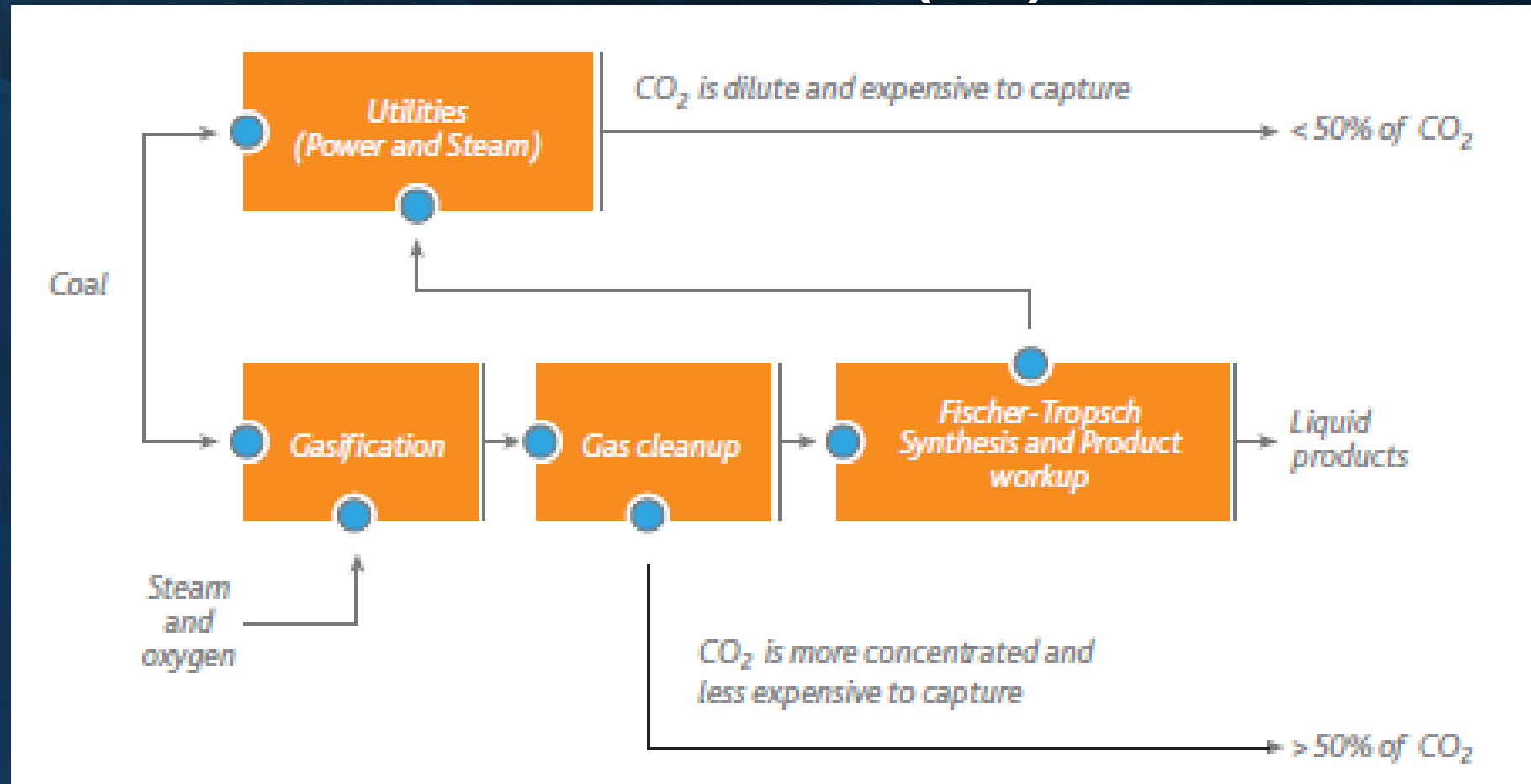
New WFFF
Focus area:
Alternative
Liquid Fuels



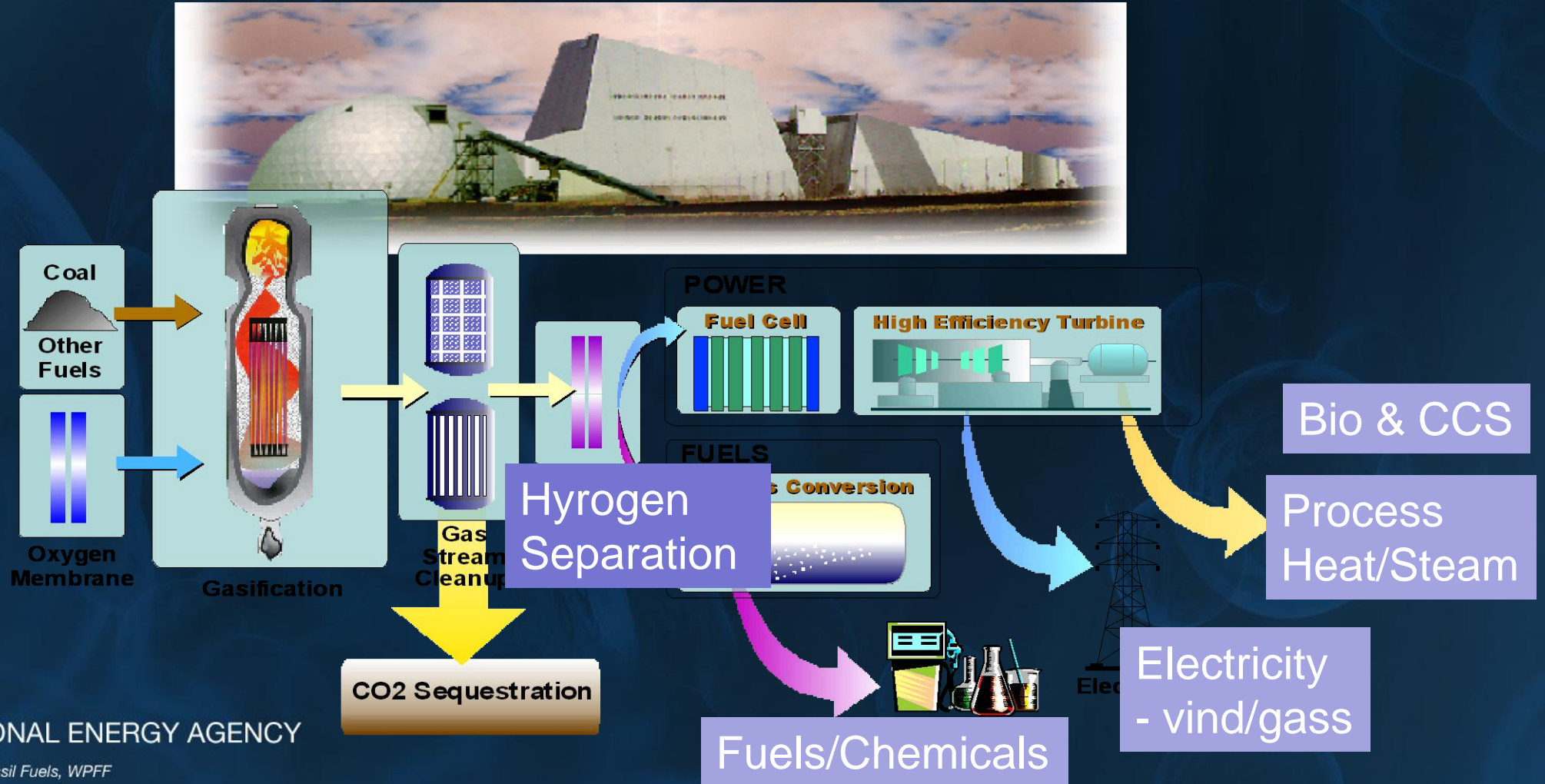
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Emerging Early Opportunities CCSU (C)

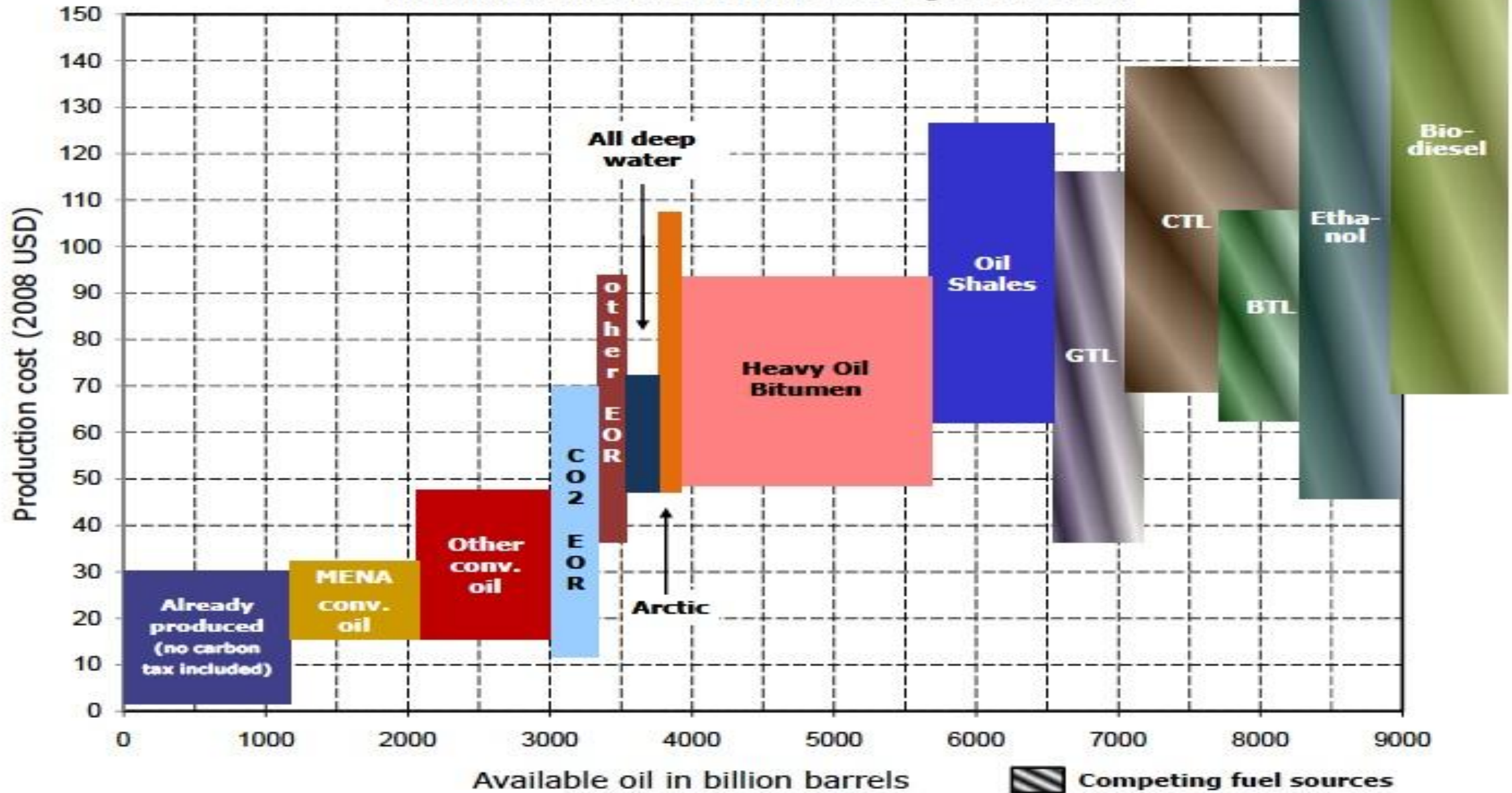


Next Generation Energy



Resources to Reserves – Production Cost Curve

(including a carbon tax of \$50 per tonne CO₂-eq. emissions)



Source: "Resources to Reserves", IEA
Forthcoming

Tracking Regional & Global Status of CCS;



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Thank you



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Back-up

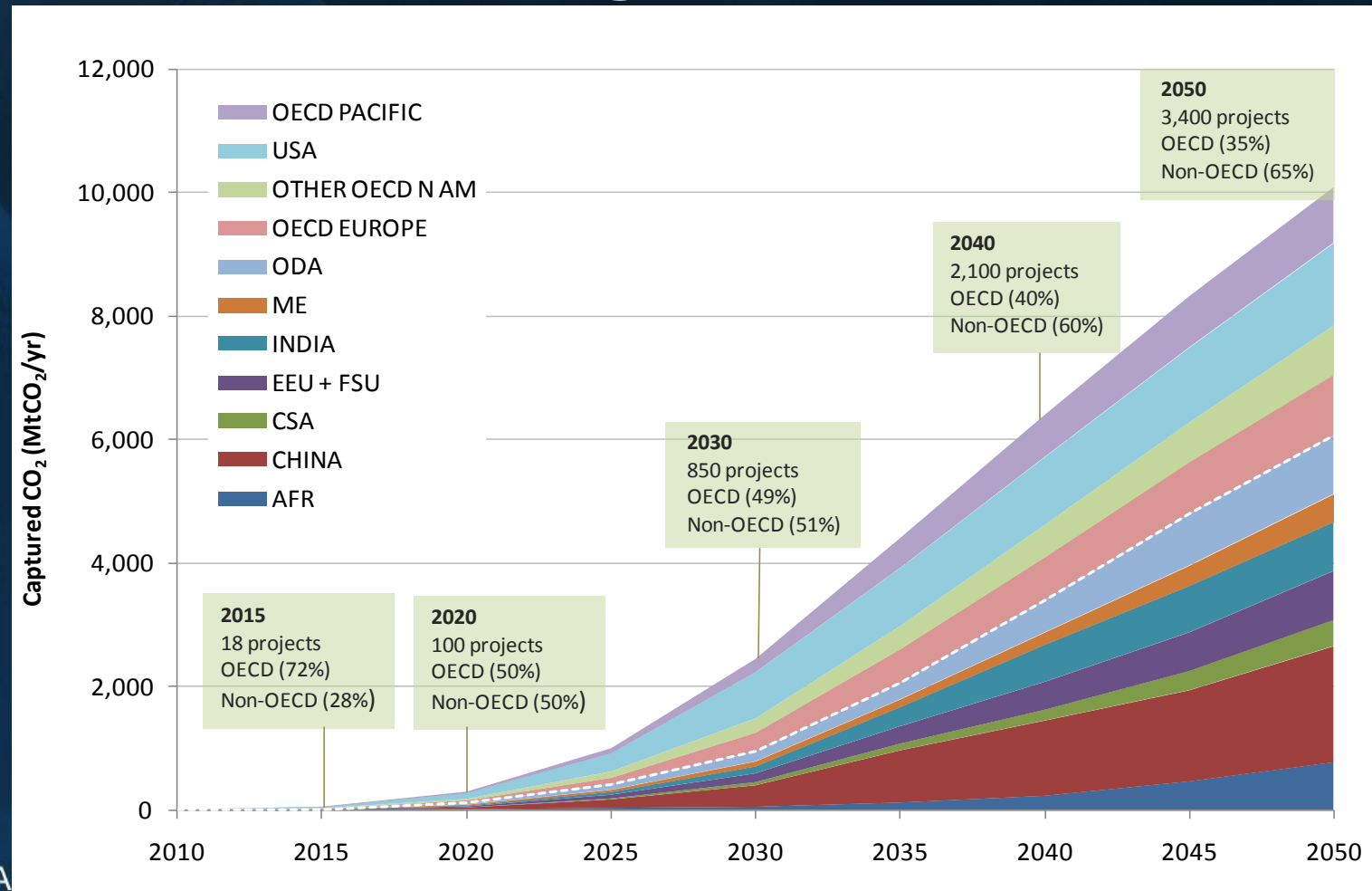


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CCS Implementation

An ambitious global challenge



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Source: IEA, CCS Roadmap (forthcoming 2009).

IN SUMMARY – Backdrop to Event;

Forge Near Term Commitment to Reach Long Term Goals



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