



CSLF Financing Round Table

Washington DC

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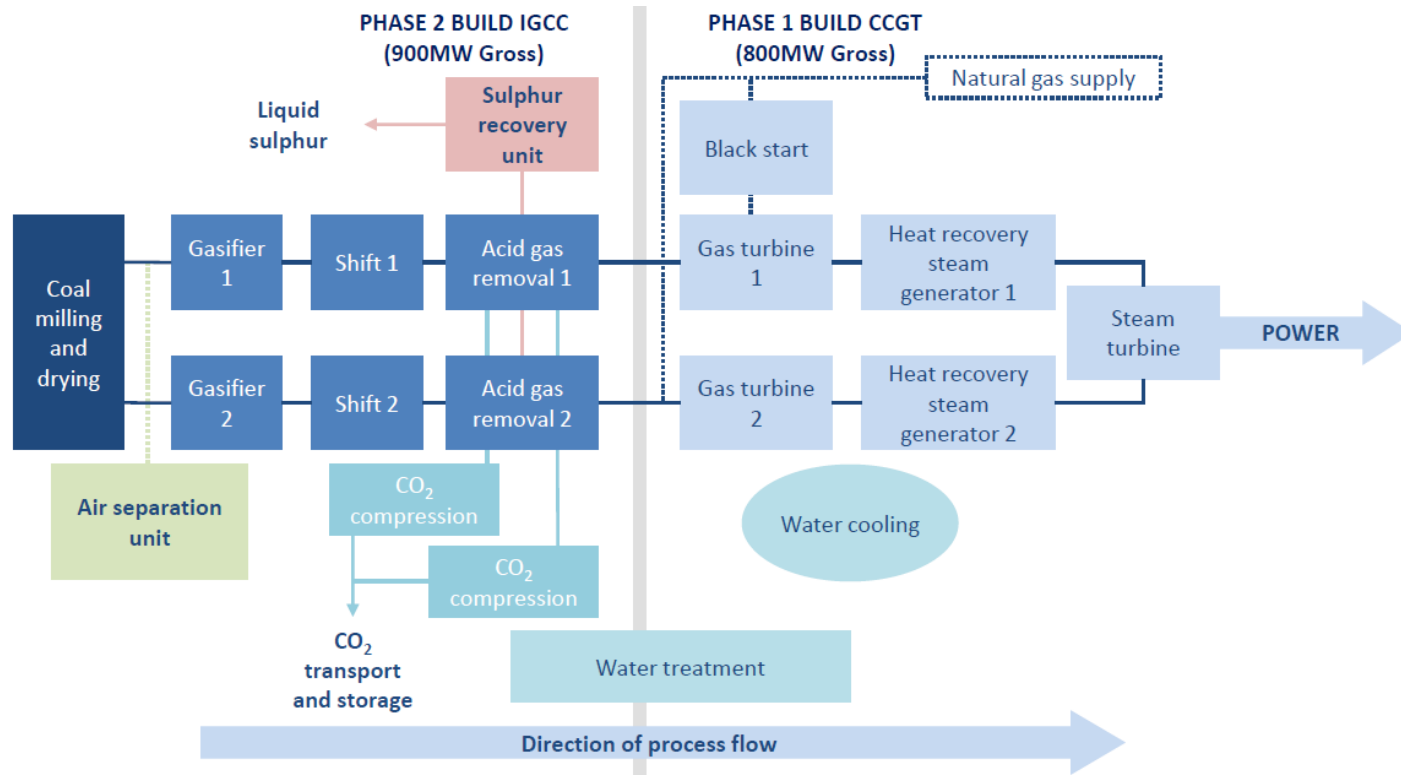
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CCS Case Study #1 – Powerfuel IGCC Power UK

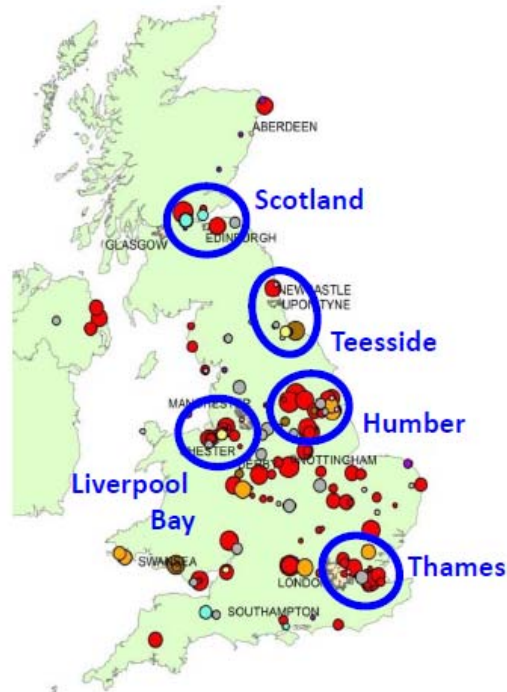


- Two Phase execution of a 900MW IGCC project based on gasification of coal from an adjacent mine
- Phase 1 designed to operate on natural gas, syngas or a blend
- Project consented as a two phase project – requirement to deliver a CO2 transport and storage solution
- Working with NGrid as transport and sequestration partner



CCS Case Study #1 – Powerfuel IGCC Power UK

Sources: IEA Greenhouse Gas Programme and Yorkshire Forward



- **Powerfuel has major advantages, including:**
 - ▶ **Located in Humberside**, one of the “clusters” of CO₂ emissions offering the potential for development of a cost effective Humber –wide CO₂ collection and storage infrastructure
 - ▶ **Fuel supplied from an adjacent mine** leading to economies in fuel transport and security of supply
 - ▶ **Off-shore storage** available in depleted fields in relative proximity to the project
 - ▶ **Fully consented** as a CCS project giving the project the ability to move quickly into execution to meet Government objectives for development of CCS

- **The benefits of Powerfuel have been recognised by the European Union – selected as one of their CCS demonstration plants and benefits from EERP grant funding of €180m**



CCS Case Study #1 – Powerfuel IGCC Power UK

■ **Total Capex estimated at £2.4bn – CCS Power Plant Only**

■ **Financial / Revenue Support anticipated includes:**

▶ **European Union:**

- **EERP Grant:** Already secured €180m funding one of the “clusters” of CO₂ emissions offering the potential for development of a cost effective Humber –wide CO₂ collection and storage infrastructure
- **NER Allocation:** Will apply for a proportion of the EU NER allocation under the ETS – proceeds will be applied to upfront capex

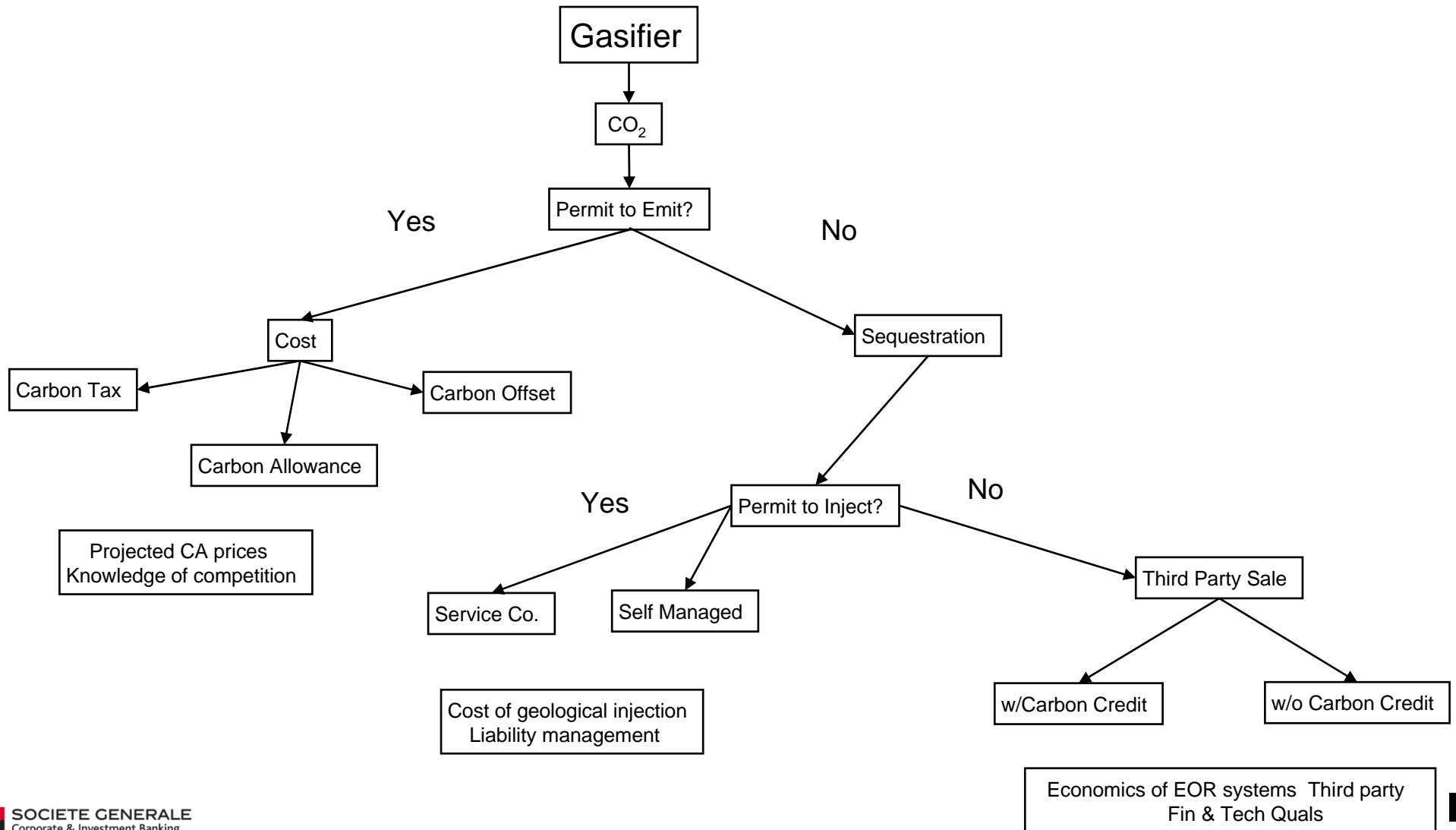
▶ **UK Government**

- **Certificates:** Expect to receive CO₂ certificates from ETS for each tonne of CO₂ sequestered
- **CCS subsidy:** Applying to be one of the 4 UK CCS demonstration projects – subsidy mechanic still to be defined but possibly to be paid in the form of a “contract for difference” against the market price of CO₂

This complex matrix of funding on top of debt and equity may need to compensate the whole CCS chain



Complex Decisions for a Large Scale Gasification Project





Common Problems with Gasification Projects

■ Water Issues

- ▶ Key to conversion for gasification (hydrogen source)
- ▶ Competition from agriculture

■ EPC LSTK

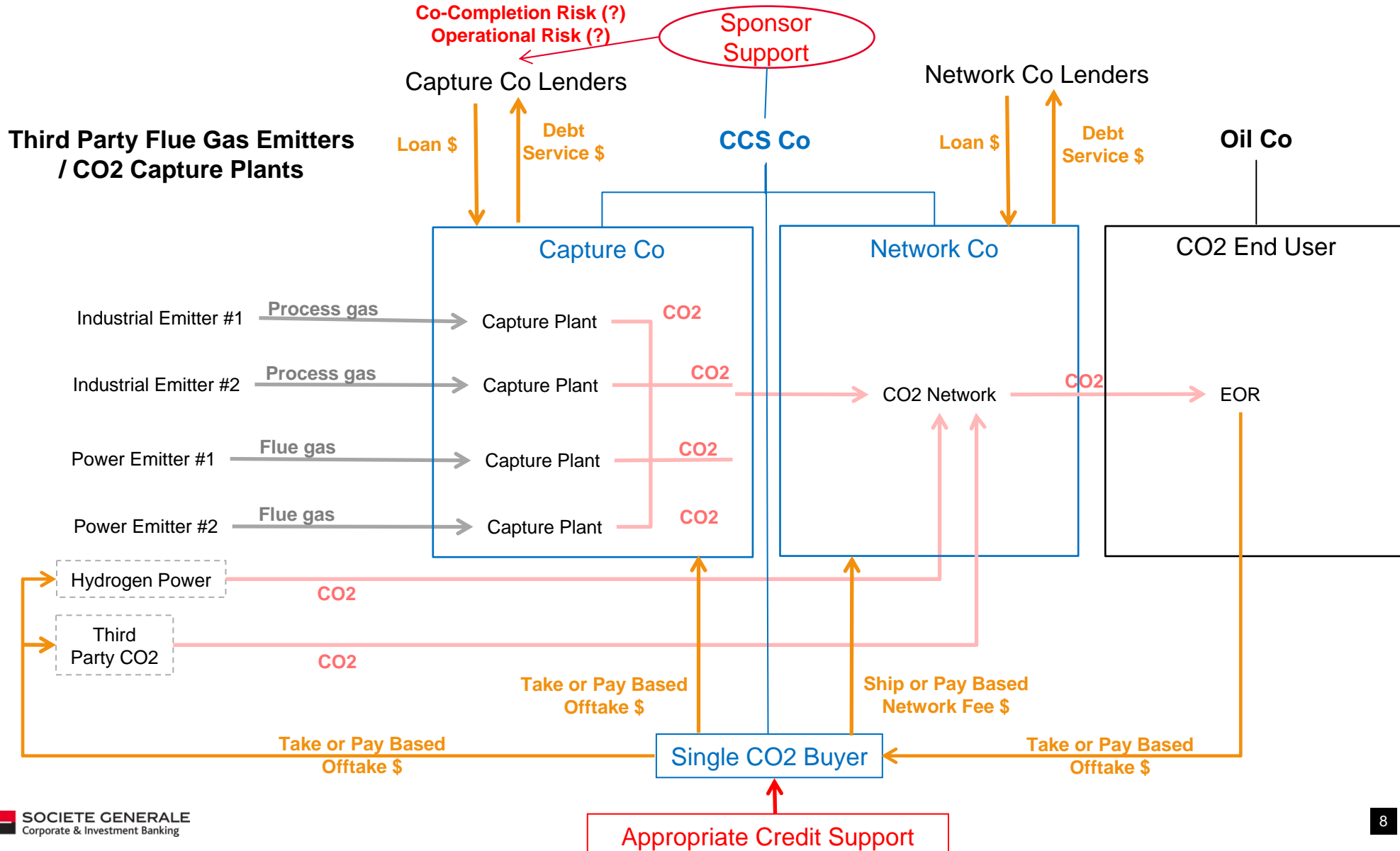
- ▶ Large assumed liability caps (100% MC, 30% SC, 5% FC)
- ▶ Subcontracting required (technical skills, licenses, etc.)

■ Operations

- ▶ GHG – CCS in place
- ▶ Experienced operator (PCB, Syngas, etc.)



Case Study #2 – Full Chain CCS Project: Financing Approach



■ CCS Case Study #2 – Full Chain CCS Project: Financing Issues

Financing Issues:

■ Risk allocation:

- ▶ Emissions risk – Borrower should not be exposed to output variations of emitter but end user wants certainty
- ▶ Ownership of CO₂ along the chain – transfer of liabilities
- ▶ Counterparty credit – the value and (credit worthiness) of the chain lies with the end user but this party will seek to minimise risk and payment to the chain
- ▶ “Black Box” – Government subsidy and support for risks no one else wants ?

■ Regulatory Framework

■ Technology:

- ▶ Post combustion capture – not proven on a large scale
- ▶ Interface risk with emitters existing plant



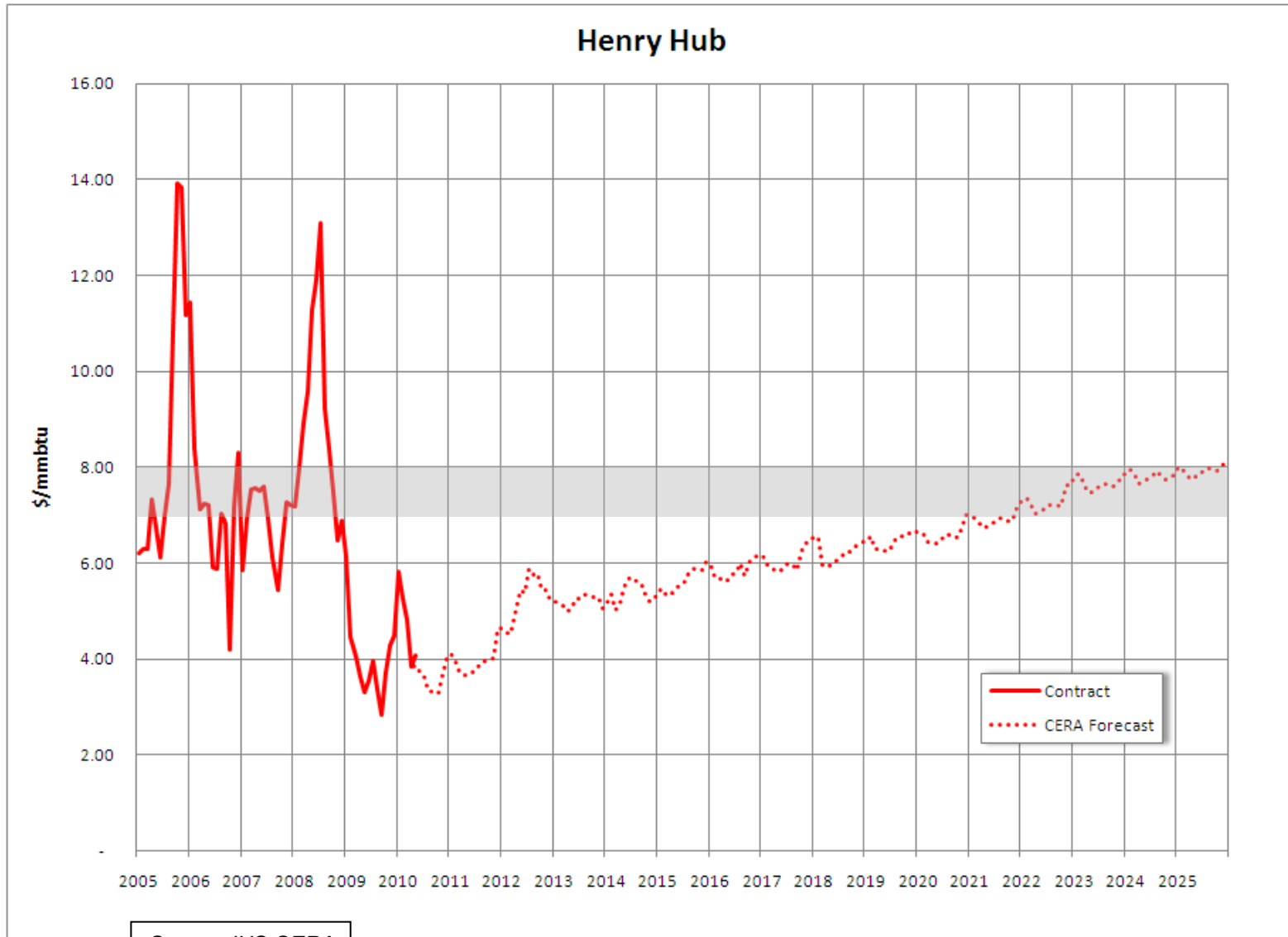
Wider Issues: Prior Government Mandated Programs – Lender Experience

- **Oxygenated Fuels (Clean Air Act of 1990)**
 - ▶ Mandated fuel additives for “non-attainment” areas
 - ▶ MTBE projects financed (four on HSC during early 1990s)

- **Results of MTBE Investments**
 - ▶ Social, environmental and industry resistance
 - ▶ Lenders lost money



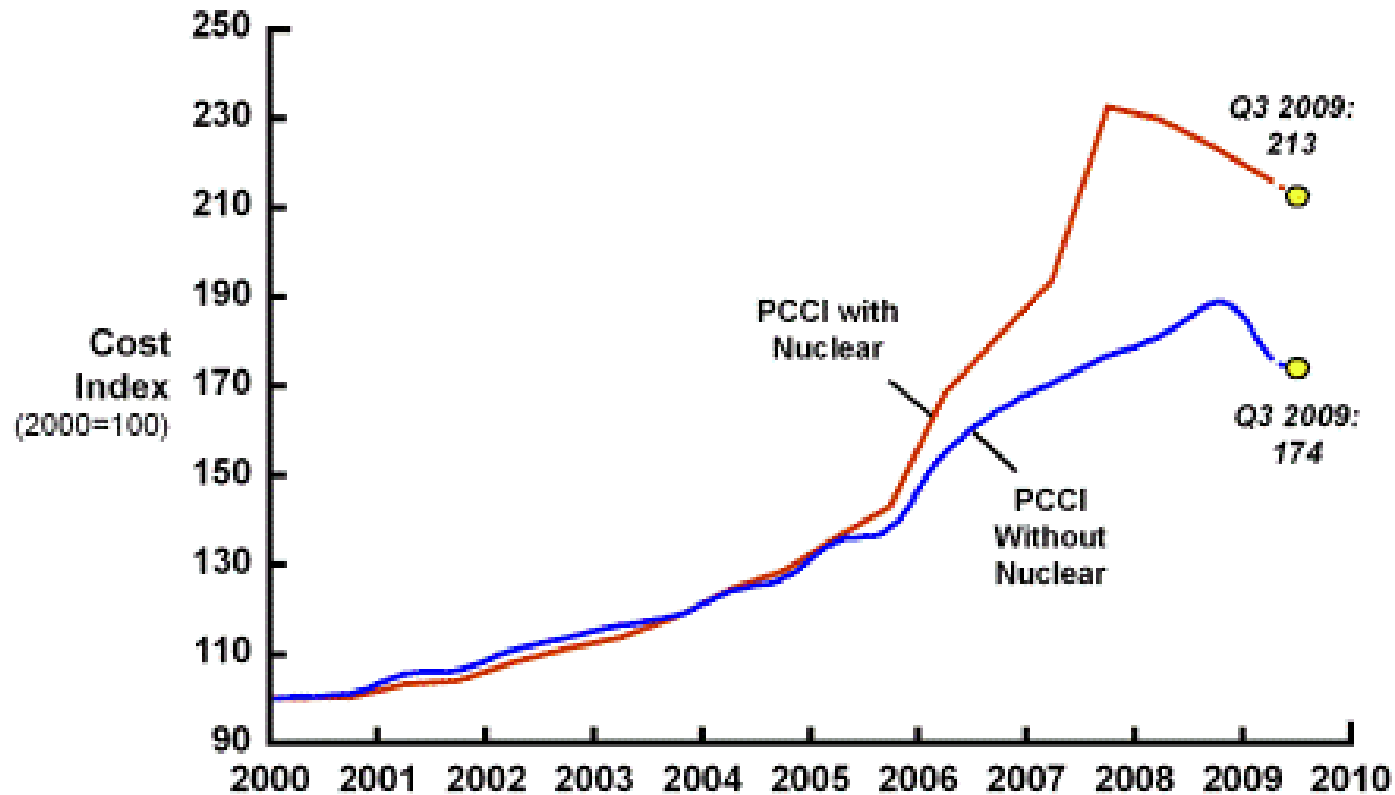
Wider Issues: Interaction with Natural Gas Outlook - Price



Source: IHS CERA

Capital Cost Increases - Power

IHS CERA North American Power Capital Costs Index (PCCI) with and Without Nuclear



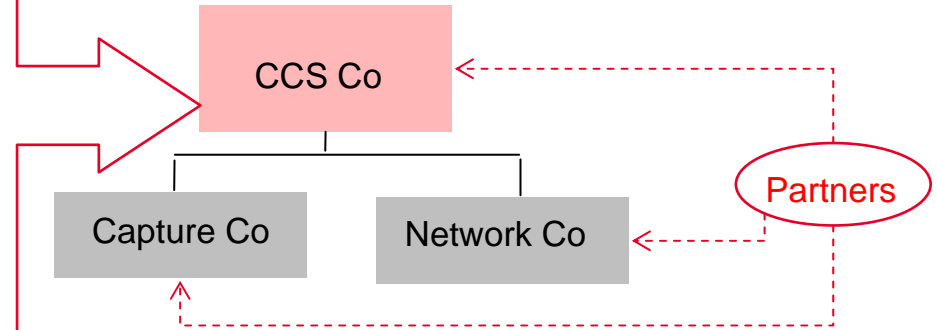
Source: IHS Cambridge Energy Research Associates.
91116-4



Conclusions: Who Should Play in the Business ?

Key Investor Objectives:

- Necessity?
- Profitability?
- Maintain control of key infrastructure?
- Develop technical expertise?
- Financial Investment?
- Form strategic partnerships in the value chain?



Potential Investors	Rationale for the Investors	Contribution	Optimal Timing for Investment
Oil Majors (Exxon Mobil, BP, Conoco Phillips, etc)	Developing large-scale commercial CCS project for EOR purposes and / or control large scale storage sites	Technical expertise / Operating capabilities and EOR experience	Flexible
Industry / Utility Players (E.On, GDF Suez, Gasco, National Grid, etc)	Necessity. Need CCS technologies due to increasing constraining emission reduction regulations	Technical expertise	Flexible
Equipment Suppliers / Operators (MHI, Alstom, GE, Shell, Siemens, etc).	Positioning for demonstrable technology lead. Increase negotiation power on commercial agreements	Technical expertise Synergies in the Project	Before EPC
GOVERNMENT	Ability to facilitate development of CCS: - Need to reduce CO2 - Major contribution to CO2 reduction - Tech jobs from the sector	CLARITY ON LONG TERM POLICY CLEAR INCENTIVE MECHANISM	NOW

Conclusions: Key Financing Challenges to be Addressed

Projects are fundamentally uneconomic	<ul style="list-style-type: none">■ EOR provides the only positive cashflow to the Projects – no alternative market for product■ Where is the value if no EOR?■ How to recover significant investment on the CCS infrastructure – particularly for “multi-user” schemes■ Economic subsidy and/or guarantee will be required for the Project to be bankable
Risk Allocation & Interdependent Infrastructure	<ul style="list-style-type: none">■ Integration of this Project with several independent operating businesses give challenges to risk allocation■ Failure in any part of the chain may have knock on effect to the whole Project■ Emission level of the flue gas / processing gas is outside the control of the Project■ Termination Regime to be considered carefully due to single ender user for the Project
Technology	<ul style="list-style-type: none">■ CCS technology has not been tested for large scale commercial use – Particularly Post Combustion■ Construction and operation experience is limited■ Difficult to find a traditional EPC Wrap with warranty and damages provisions at economic cost■ Lenders likely to require higher performance guarantees on early projects due to uncertainties
Environmental Compliance	<ul style="list-style-type: none">■ CCS technology to be used for enhanced oil recovery could become NGOs’ target■ Questioning of benefits of new coal fired generation even with CCS■ Credible monitoring and certification of sequestration crucial
Un-tested in the Finance Market	<ul style="list-style-type: none">■ Large financing needs call for diverse funding sources to secure largest possible financing component■ Lenders have not been tested on the above risks■ “First of its Kind” risk■ Until there is confidence in Government policy and technology there will be no project finance
Key Message	<ul style="list-style-type: none">■ Currently no comprehensive legal and regulatory framework exists for CCS■ Legal issues (CO2 network and storage liabilities & monitoring are not clear■ Policy and regulatory framework remains unclear■ NO LONG TERM CLARITY = NO PROJECT FINANCE



Conclusions:

What do banks need to Finance CCS and from whom?

Requirement	Provider
Clear long term policy and regulatory framework for the whole CCS chain	Government
Confidence that the policy and framework will not be adversely modified	Government
Strong financial support - CCS is fundamentally un economic without it	Government
Co-Completion – alignment of interests in all areas of the chain	Participants
Capture Technology – Proven technology: not series #1	Participants
Proving storage and capture technology – understanding economics & risks	Participants & Government
Project break-even to other competitive suppliers – focus on natural gas	Participants & Government

- **Certainty and confidence – without this there will be no financing**
- **All stakeholders need to work together to make CCS happen**
- **Government need to provide the platform to encourage investment**



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