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A Systems approach to business models and public-private risk sharing for large scale CCS deployment

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Introduction

- Presentation of findings from ELEGANCY and ALIGN projects on how to develop and structure CCS infrastructure business models by applying systems thinking and public-private collaboration to address investment barriers and delivery of long-term system objectives.
- Addressing historical failures where business model and policy recommendations have been targeted at individual sector or projects.

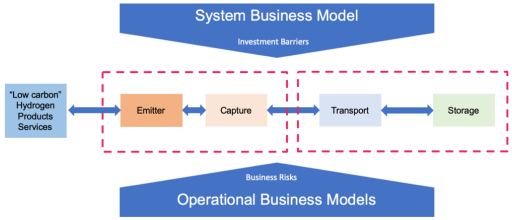

Fig. 1. System and operational business models

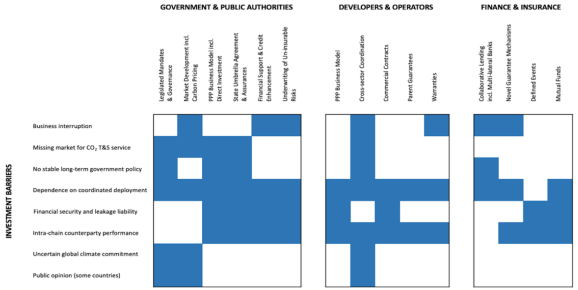

Fig. 2. Example public-private collaboration matrix for the removal of CCS system investment barriers (PPP = public-private partnership)

Defining Business Models

- A Business Model is a way to organize and structure the elements of investment, market development and asset operations to deliver the combined long-term objectives of the public and private sector.
- Need to differentiate between system (macro-economic) business model and business segment (micro-economic) business model.
- System business model is designed 'top-down' to remove investment barriers, facilitate the development of end use markets, and allow businesses to perform in an integrated fashion to deliver the overarching system objectives.

Structured Framework and Methodology

- Flexible business model selection to guide development of system business models for a decarbonisation objective and business context.
- Guided by traditional business models without being constrained by them.

Critical Steps:

- Understanding the specific business context, investability, risk and risk mitigation and institutional capability for business model selection.
- Assessing critical business model drivers to determine preferences for public/private investment structures at system and business level.
- Addressing investment barriers and risks collaboratively. Investment barriers are detrimental to any form of investment and impact multiple segment of the business chain. They require a 'system view' and multi-party approach to mitigation often in collaboration with the government.
- Determining the extent of collaboration and selecting a business model structure through a specific allocation of risk and responsibility between the public and private sector by using four main components of transfer of responsibility.

	Conceptual System Business Model	Asset & Rights Ownership	Capital Sourcing	Market Development		Physical Delivery	
				Responsibility	Remuneration	Responsibility	Business Structure
H_2 INFRASTRUCTURE	H_2 Production with Integrated CO_2 Capture	PRIVATE	PRIVATE	PUBLIC	Targeted Revenue Support	PRIVATE	Free Market Enterprise
	H_2 Transmission	PRIVATE	PRIVATE	PUBLIC	Price Regulated Revenue + Construction Support	PRIVATE	Regulated Asset Base (New)
	H_2 Distribution	PRIVATE	PRIVATE	PUBLIC	Price Regulated Revenue	PRIVATE	Regulated Asset Base (Existing)
	H_2 Storage	PUBLIC	PRIVATE	PUBLIC	Performance Based Revenue	PRIVATE	Public Concession (Design-Build-Finance-Operate)
CO_2 INFRASTRUCTURE	CO_2 Transmission	JOINT	JOINT	PUBLIC	Price Regulated Revenue	PRIVATE	Joint Venture
	CO_2 Storage	JOINT	JOINT	PUBLIC	Price Regulated Revenue	PRIVATE	Joint Venture
H_2 END USE MARKETS	Industry	PRIVATE	PRIVATE	PUBLIC	Targeted Revenue Support	PRIVATE	Free Market Enterprise
	Centralised Heat & Power	PRIVATE	PRIVATE	JOINT	Targeted Revenue Support	PRIVATE	Free Market Enterprise

Fig. 3 Example of H_2-CCS system business model for the UK with component segment business models

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Conclusions

- Applying systems thinking to the development of business models in a structured framework and methodology provides insights into the selection of sector- or project-specific business models that are otherwise not transparent or obvious.
- Designing a system business model must, at minimum, address the following:
  - System-level strategic rationale and objectives;
  - Cross-sectoral synergies and sector coupling;
  - Development of 'low carbon' markets;
  - Enduring system governance and oversight until markets are self-sustaining;
  - Public-private risk sharing reflecting system characteristics/properties;
  - Public-private collaboration and capacity/capability building;
  - Societal and social acceptance; and
  - Development of real options for low regrets transition pathways.
  - System-level strategic rationale

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