Financing CCS

Dos, don'ts and other insights

13 October 2022

Introduction

1. ING's approach to Energy Transition and New Energy Technologies
2. Carbon Capture Utilisation & Storage
3. Bankability Considerations

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1. ING's Approach to Energy Transition & NET

Energy Transition is the core of ING's Energy Sector Coverage and Beyond

Leading the Terra approach

Started in late 2017 in collaboration with:

2° Investing Initiative

PARIS2015 COP21·CMP11

… and in late 2018

UN-convened Net-Zero Banking Alliance

ING joined the Net-Zero Banking Alliance and aim to steer our portfolio in line with keeping the rise in global temperatures to 1.5 degrees Celsius, to achieve net zero by 2050

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Supporting our client's transition journey

As a leading global energy bank, ING engages across the value chain

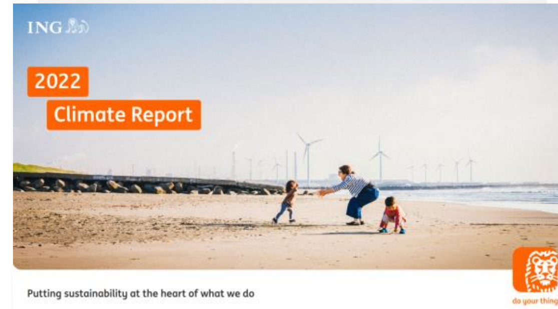
At ING we remain **committed to supporting the Energy Transition**, and to engaging with clients as they build the business models of a net zero economy. We prioritise an **inclusive approach** to ensure that all stakeholders move forward together, thereby creating impact in the real economy.

ING climate action: 5 of 9 sectors are on track with climate alignment pathways

on track	Power generation
on track	Upstream oil & gas
on track	Residential real estate
on track	Automotive
on track	Shipping
close to on track	Commercial real estate
close to on track	Cement
not on track	Steel
not on track	Aviation

Documenting the progress

ING recently published the 2022 integrated climate risk



Grow new financing to renewables by **50%** This includes wind solar, water and geothermal.

Target to reduce funding to upstream oil & gas by **12%** by 2025 from 2019, in line with the IEA-NET-zero 2050 scenario.

Use **100%** renewable electricity in own buildings in 2020, and reduced carbon emissions by 75% since 2014.

Supported **317** sustainable transactions in 2021

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New Energy Technologies – ING is an Early Adopter

Hydrogen

- **20% of global CO_2 emissions** from fossil fuels can be eliminated by using hydrogen
- **US$11trillion of investment required** in production, storage and transport infrastructure
- Expected annual sales of hydrogen of US$700bn by 2050

CCUS

- **18% of global CO_2 emissions** to be eliminated by CCUS
- Capture CO_2, transport and store underground
- **Over 2,000 large scale (>0.4 Mt/year) plants need to be built** by 2050
- IEA estimates investment of ~US$27bn

Energy storage

- 2 emerging solutions: Stationary and EV Batteries
- **Stationary:** ~US$650bn investments needed to grow production (c.US$75m/GWh) by 2030 driven by higher renewables penetration into the grid
- **EV Batteries:** ~US$176bn required to scale manufacturing capacity from 432GWh today to >2TWh in 2030

Germany — Current

German LNG

LNG import terminal with add-on investment to allow H2 imports

Financial Advisor

Energy Project Advisory

The Netherlands — 08/20

Porthos

Financial Adviser on a C02 capture, transport and storage infrastructure system in The Netherlands

Financial Adviser

Energy Project Advisory

Sweden — 08/20

Northvolt Ett AB

USD 1,360m

Multi-ECA covered senior secured term loan

MLA, Documentation Agent, Insurance Bank, Intercreditor Agent, Facilities Agent, FX Coordinator

Energy Renewables & Power

ING wants to be the partner of choice - innovate in the energy transition, retaining relevant knowledge and providing best-in-class solutions

ING's strong in-house capabilities to offer integrated service on NETs

Sector Focus	Coverage Details
Oil & Gas	Upstream, Pipelines, LNG terminals, Refining, Processing and PetChem
Renewables & Power	Gas power plants, Wind, Solar, and other sources of renewable energy
New Energy Technology	Energy Storage, Hydrogen, Carbon Capture (Utilisation) & Storage

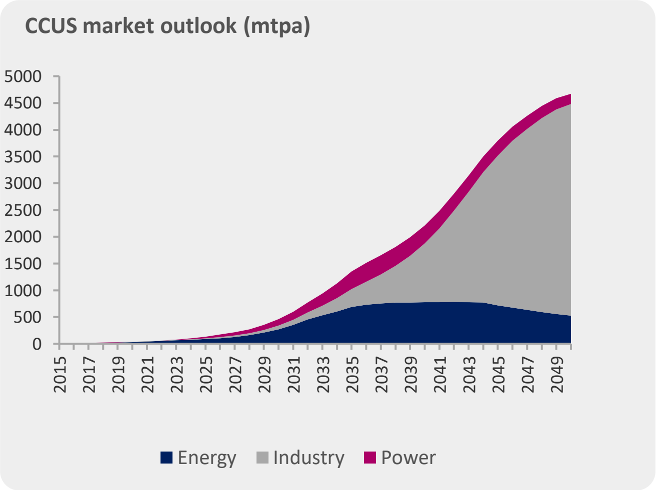
Service Offering

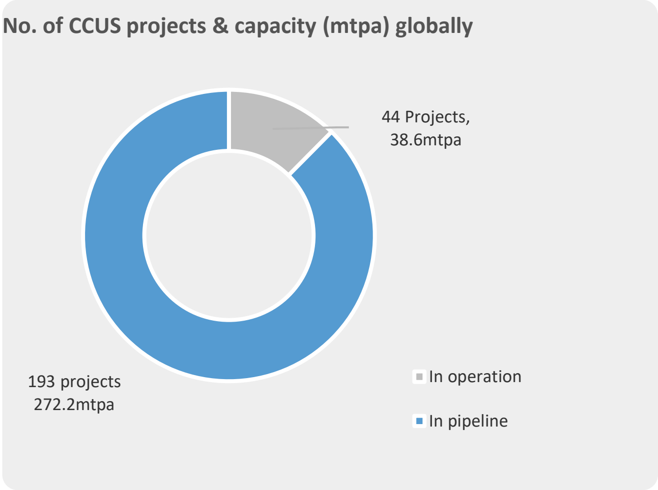
- **Leveraging expertise in Geology, Chemical Engineering and Oil & Gas operations** to facilitate ING's New Energy Technology Initiative.
- **Lead role as Technical Bank** in almost all major O&G upstream financings.
- One of the first banks in Europe to **establish a team of dedicated H2, CCUS and Energy Storage specialists.**
- **One of the largest dedicated debt advisory teams,** working in integrated deal teams with other specialists in the bank.
- Supporting clients in **all stages of the funding process up to financing close.**
- **Identifying the optimum financing structure** to suit the particular stage of the asset's lifecycle.

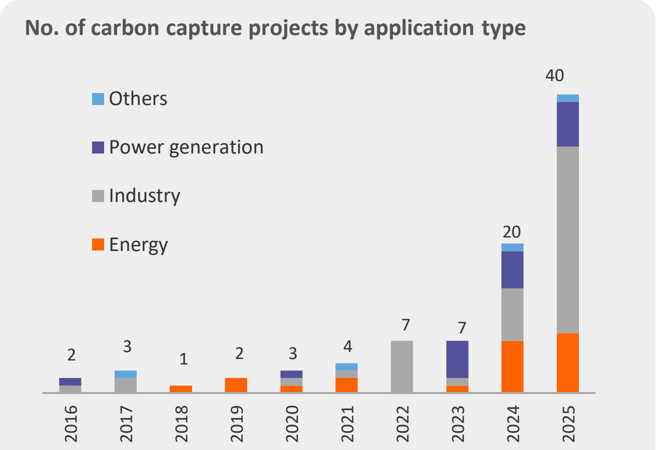
ING combines strong expertise of a market-leading debt advisory team and in-house energy technical team

2. Carbon Capture Utilisation & Storage

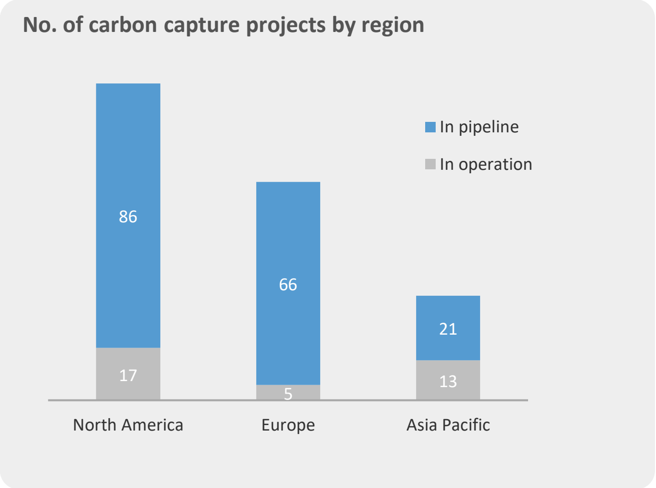
Carbon Capture is an important part of the Energy Transition







Sources: IEA, Rystad Energy

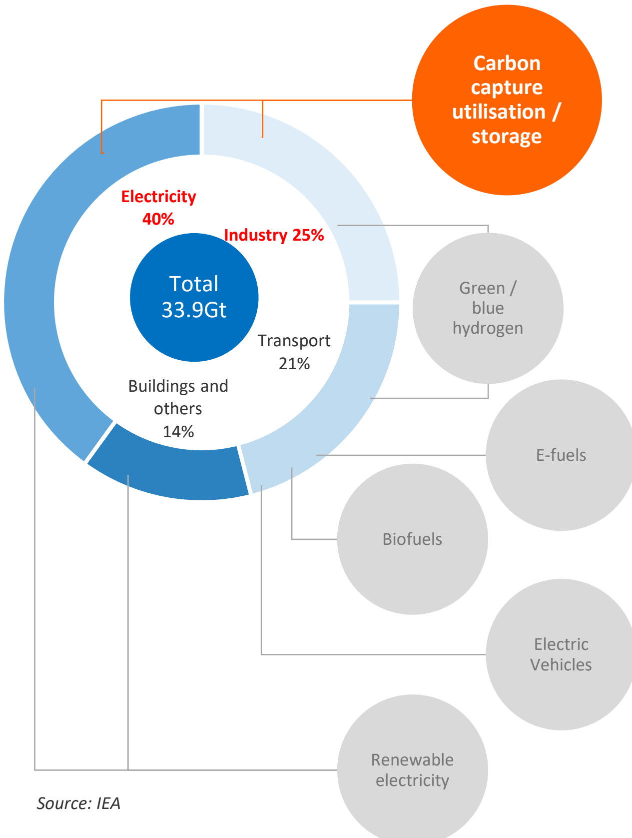


- **CCUS** essential for path to net-zero emissions, Rystad estimate CO2 capture capacity at c. 4,500 mtpa by 2050.
- **18% emissions reduction** to come from CCUS
- 193 projects have been announced globally
- IEA predicts that **CCS will rise to around 350Mt by 2025 in Europe**
- Power generation to be main contributor (42%).
- In North America and Europe, **most of the potential storage sites are close (within 50-100km)** to the emission sources

Key factors needed to further support CCUS development

Cooperation between project sponsors, emitters and government subsidies is key for success

Global CO2 emissions by sector ($GtCO_2$)



Source: IEA

Drivers/Influencers

- **Proven technologies**
- **Technical challenges**
- **Public perception needs improvement**
- **Scalable solution in hard-to-abate application**
- **Robust business case required – financing will be key**
- **Regulation and incentives support CCUS development**
- **Geography constraint**

National and regional factors in Europe are favorable to CCS deployment

CCS readiness

- CO_2 storage **close to emitters**
- **Good infrastructure**
- **Legal and regulatory frameworks**
- **Public acceptance**

Domestic energy resources

- Abundant (low-cost) **gas** feedstock for (blue) H2
- Low-cost renewable energy (for BECCS and DAC)

Current and future energy needs

- **Reliance on fossil fuels** in current industrial energy mix
- Strong **growth in electricity demand**
- **Limited availability of alternatives**
- Large role for low-carbon hydrogen in energy system

Government support

- **Ambitious climate targets** for net-zero requiring deep emissions cuts across all sectors
- Comprehensive climate plan and **supportive measures for low-carbon technology**
- **Various EU support schemes available**

Industrial profile/asset base

- **Large cement, steel or chemicals industry**, with limited alternative options to decarbonise
- **Large fleet and low average age** of (gas) power stations and industrial plants

Europe, and in particular the North Sea is an ideal hub for CCS Deployment.

… hence we see a lot of CCUS activities in the North Sea

Projects using North Sea storage | Other CCUS Projects in Europe

CODA Terminal (Iceland)
- Dissolve CO2 into basaltic bedrock

Acorn (Scottish Cluster), UK [Reserve]
- (blue) H2 and CCUS
- Pipeline and shipping (Peterhead Port)
- 5-10mtpa
- COD: 2030

Stella Maris CCS, Norway
- Saline reservoir, involving FPSO and FSRU
- 10mt CO_2
- COD: 2025

Blue ammonia plant, Norway

CinfraCap
- Different industrial facilities Gothenburg (to Northern Lights)
- 2.0mtpa CO_2
- COD: 2026

Northern Lights CCS / Longship, Norway
- Longship project
- 1.5-5mtpa CO_2
- COD: 2024-2028

East Coast Cluster, UK
- BP led Net Zero Teesside and Equinor-led Zero Carbon Humber
- ~6mtpa & ~18mtpa
- COD: 2027

Project Bifrost, Denmark
- Repurpose Harald field for CO_2
- Capacity: 3-16mtpa CO_2
- COD: 2027

Hynet, Uk
- Blue H2 and CCUS
- 4.5-10mtpa
- COD: 2025-2030

Project Greensand, Denmark
- Repurposing existing oil fields under the Danish North Sea for CO_2 injection
- Capacity: 3.5mtpa CO_2
- COD: 2025

Ravenna Hub project, Italy

South Wales Cluster
- (blue) H2 and CCUS
- 9mtpa

CO_2 storage at HC fields, Hungary

CO_2 storage at Prinos oil fields, Greece

V Net Zero, UK
- Immingham cluster
- 8mtpa
- COD: 2026

DelphYnus
- (blue) H2 and CCUS
- 570mt

Dartagnan, France (Sponsors undisclosed)
- Infrastructure, export to NL
- 10mtpa CO_2
- COD: 2025-2026

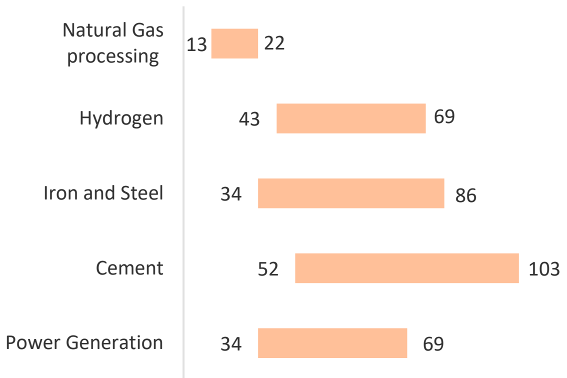
Porthos, the Netherlands
- Offshore pipeline
- 2-5mtpa
- COD: 2024

Aramis, the Netherlands
- Offshore pipeline or vessels to
- Up to 5mtpa
- COD: 2026

Rising carbon prices increase viability of low-carbon technologies impacting carbon capture options for sectors and overall cost

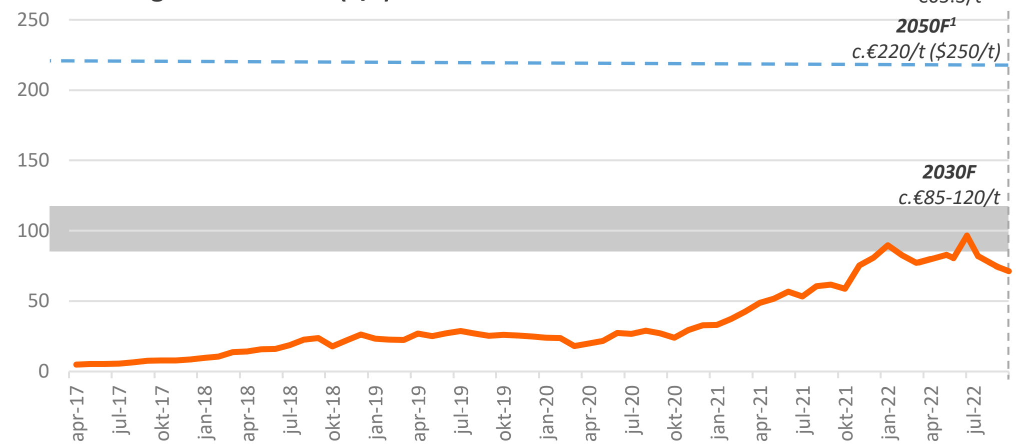
In the near to mid term, government support will remain critical to drive investment in CCUS

Carbon Capture Costs (€/t) – tier 1 technologies



EU ETS Average Carbon Price (€/t)

As of 28 Sep 2022
€65.3/t



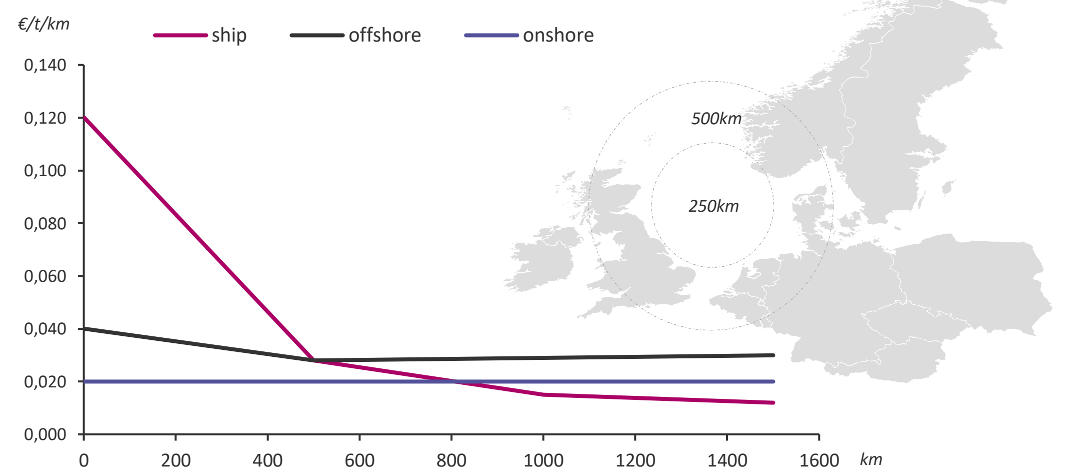
Carbon Price €/t vs CCS Cost w/ 500km offshore pipeline at 50% capacity

Industries	EU Carbon Price (31 Dec 21)	Carbon Capture	Transport & Storage	Full CCS Cost	Subsidy Required
Power Generation		52		78	-14
Cement		77		103	12
Iron and Steel	91	60	26 (+/-20)	86	-5
Hydrogen		56		82	-9
Natural Gas processing		17		43	-48

CCS Cost can vary by up to 20 EUR / t as storage costs and method of transportation can differ

Sources: Global CCS Institute, Rystad Energy

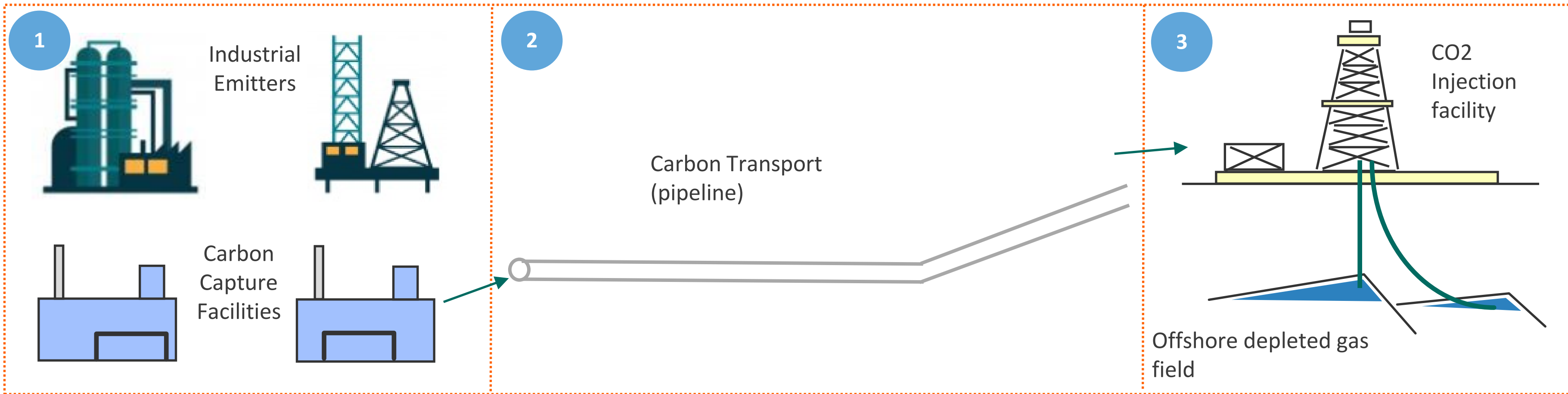
Carbon Transport Costs (€/t/km)



3. Bankability considerations

What are lenders financing and when?

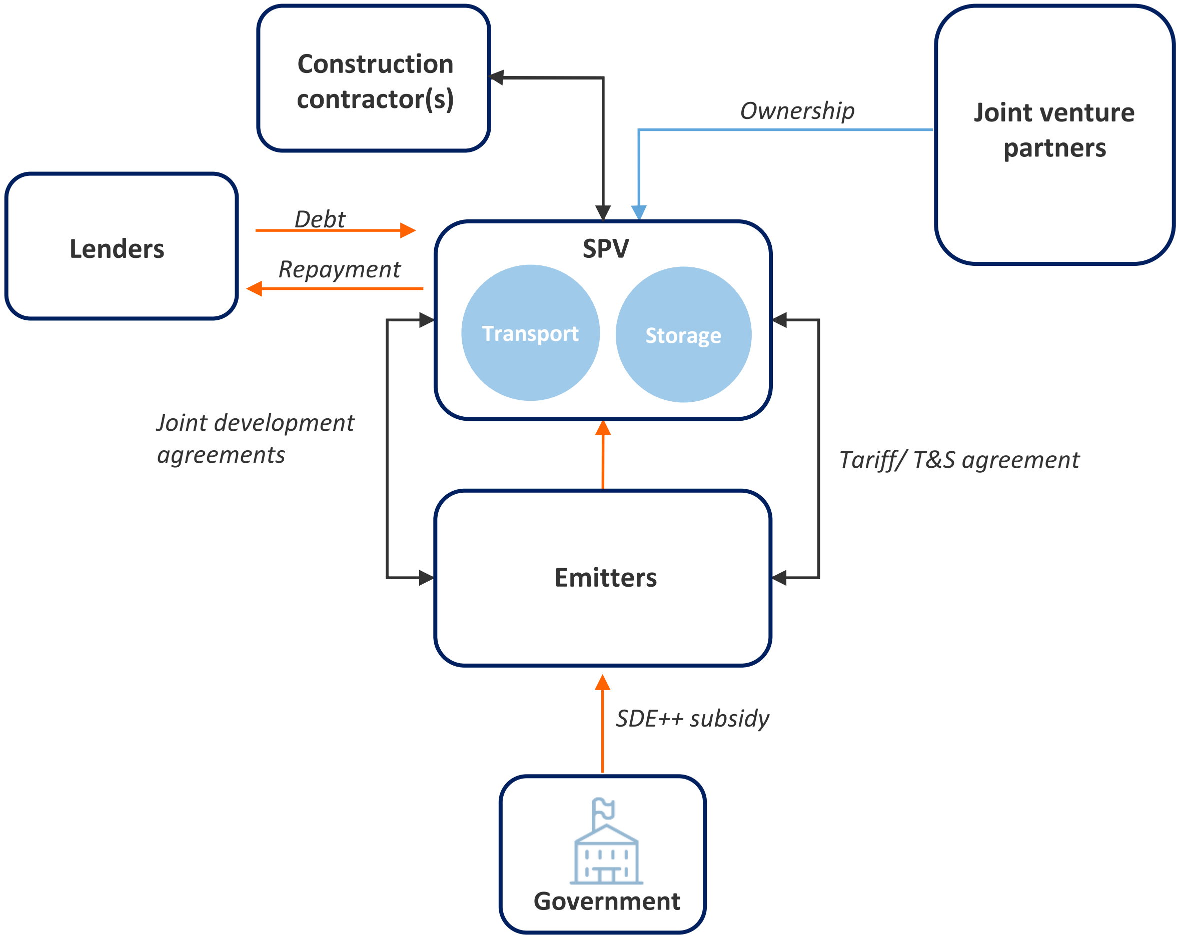
Co2 capture, transport and storage each have distinctive risks



Each phase of the project also has distinctive risks

Permitting & Construction → **Commissioning** → **Commercial Operations**

Typical CCUS project finance structure (highly simplified)

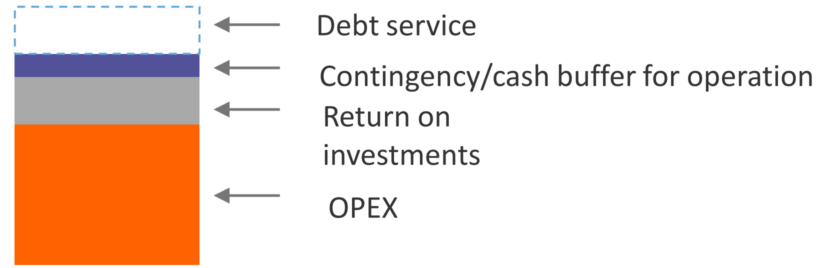


Structuring CCS Transport & Storage (T&S) Tariffs

Rationale in setting the T&S tariff

- The required tariff is typically set to cover the envisaged costs and return on investment.
- A formula based approach is most robust
- Alternatively a fixed tariff can be agreed, as long as the sensitivity analysis demonstrates the robustness of the financing case

Elements which should be covered by the T&S tariff



Business model drivers that impact the level of the required tariff

Drivers	Implications
System availability	• Reduced availability limits revenue generation and increases required tariff
Injection capacity	• Greater injection rates increase the speed at which additional capacity can be added to the system
Storage capacity	• Higher storage capacity increases project lifetime and total revenue, decreasing the required tariff
CAPEX	• Higher CAPEX investments during construction must be compensated by a greater overall return
OPEX	• Higher projected OPEX costs decrease profitability and raise the required tariff
Inflation	• Inflation can raise costs and the tariff may be linked to a an inflation index (e.g. 50% of CPI)

Key financing considerations for CCUS projects

Project agreements need to be bankable from commercial, financing and legal perspective to deliver a successful process

1 Cash Flow Visibility	• Availability based, supply-or-pay contracts. • A group of creditworthy, ‘anchor’ suppliers of CO_2 • Annual tariff to cover all costs (opex/license), debt service and equity returns • Limited termination rights for project as well as emitters.
2 Experienced Partners and Alignment of Interests	• Involvement of oil majors or parties with significant experience. • Alignment of sponsors, emitters and key project parties is critical.
3 Robust Contractual Structure	• Project agreements need to be suitable for Project Finance from the onset. • Interface management between on- and offshore scopes. Clear liabilities allocation
4 Plan for Lenders’ Due Diligence requirements	• Given “novelty” of CCUS projects, lender due diligence is expected to be high • Involvement of lender-suitable consultants is recommended from the onset.
5 Financing Process	• Identifying financing options & a roadmap for financing from an early stage.

Overview of potential financing options

			Pre completion	Post-completion
Sponsors Corporate Balance Sheet			✓	✓
Debt Capital Markets	Private	EUPP	*Unlikely / not on best terms*	✓
	Public	USPP		✓
		Project Bond		✓
Project Finance	Non- and limited recourse project finance	Commercial lenders	✓	✓
		Institutional lenders	✓	✓
		ECAs	✓	✓
		Multilaterals (e.g. EIB)	✓	✓

Case: Porthos CO_2 transport & storage project in the Netherlands

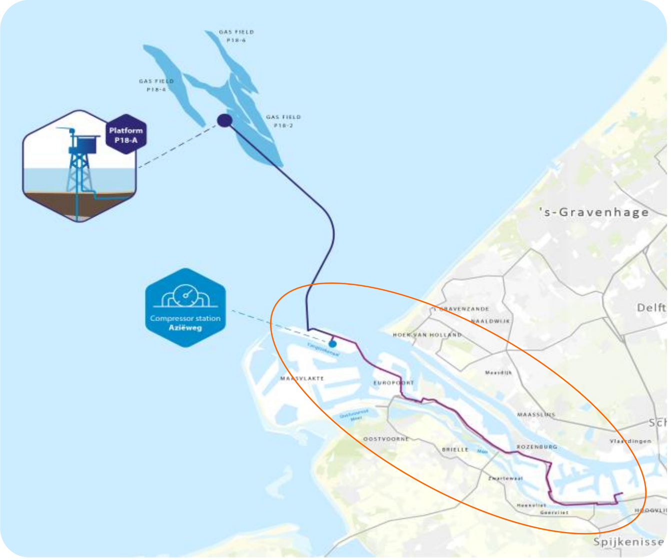
A great example of how emitters, CCS project company and government came together

The Project

- CO_2 infrastructure system near the Port of Rotterdam **to transport and store CO_2 in offshore fields** in the North Sea.
- Porthos is a joint venture between **Port of Rotterdam, Gasunie and EBN**.
- Parties with extensive knowledge on the local situation, gas infrastructure development and expertise in sub-surface gas reservoirs and offshore infrastructure.
- One of the largest **planned CCS projects in the Netherlands.**
- **Four large industrial companies** (Shell, ExxonMobil, Air Products and Air Liquide) signed a joint development agreement with Porthos

Key numbers

- Porthos aims to store an annual amount of 2.5MT of CO2 from 2024 and in **total 37MT in 15 years**
- The Dutch government allocated up to EUR **2 billion of SDE++ subsidies** for the next 15 years to the emitters.
- Final subsidy amount is expected to be considerably lower, depending on the **ETS price**



ING's role

- ING advised Porthos and its sponsors on financing related aspects of the project including:
  - ✓ Bankability
  - ✓ Financing structures
  - ✓ Type of lenders
  - ✓ Risks and mitigants
  - ✓ Key project agreements
  - ✓ Required due diligence
  - ✓ Equity returns for one of the shareholders
- Acting as financial advisor for this project in one of our home markets is an important milestone and commercial achievement in light of ING's New Energy Technology focus.

Key take aways

- CCUS is key for the Energy Transition
- ING embraces the Energy Transition agenda and intends to actively support CCUS project
- Many projects are currently being developed in the North Sea, with different stages of maturity
- Most projects are being developed by strong partners relying on (own) balance sheet financing
- Off balance sheet financing (post construction) is an attractive option, however this requires adequate structuring from the onset with balanced risk mitigation
- ING actively supported the Porthos project parties and is well positioned to help structure other projects
- We are keen to engage with interested parties

do your thing

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