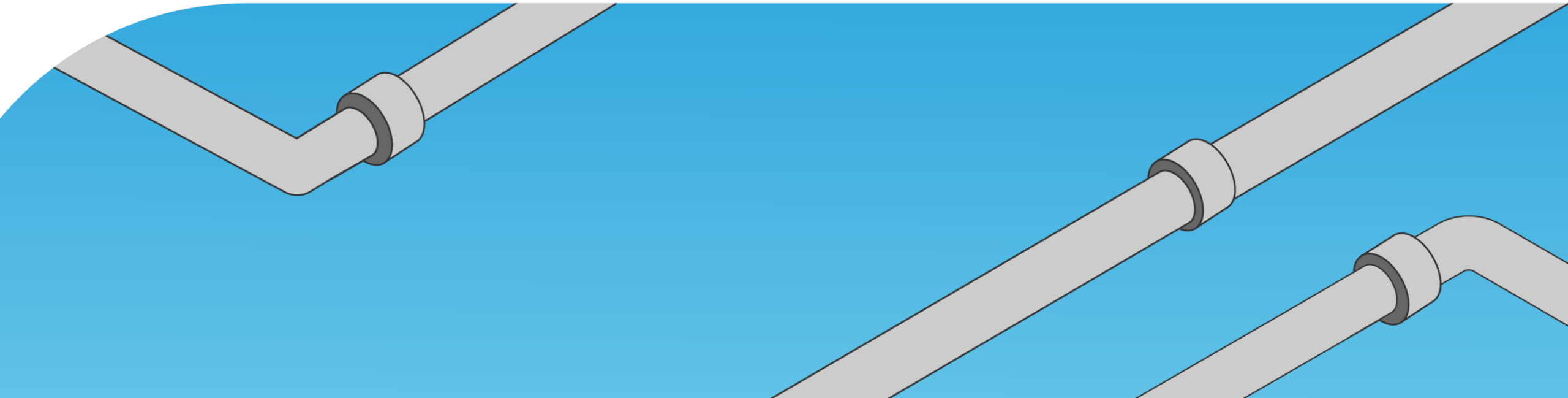


Our journey to efficient international CCS infrastructure

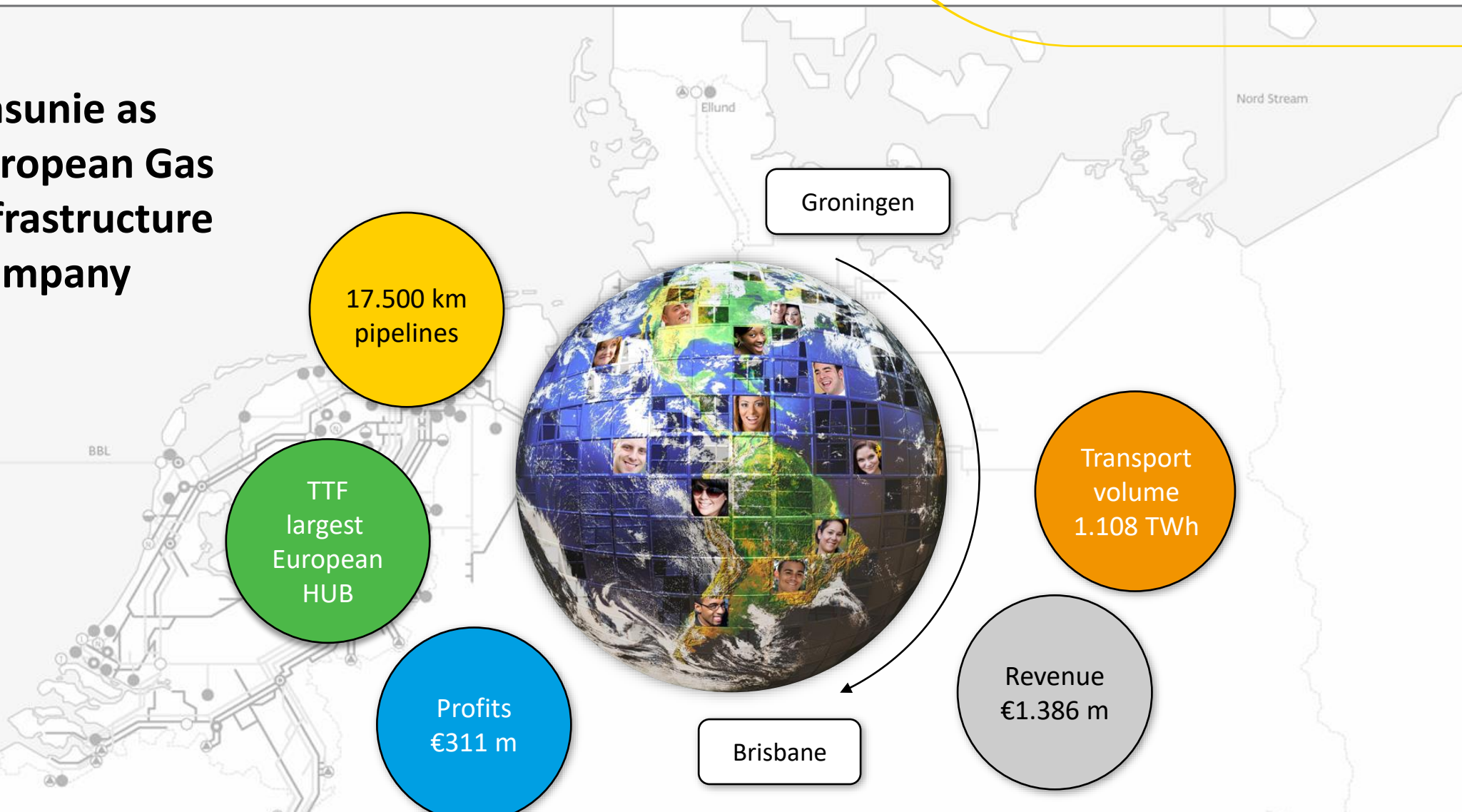
Gareth Noble
Business Development
NV Nederlandse Gasunie



Agenda

1. Background information on Gasunie
2. Gasunie's CCS journey
3. Key lessons learnt so far
4. The CCS system efficiency challenges of the future
5. What is being done and what more can we collectively do?
6. Questions

Gasunie as European Gas Infrastructure Company



17.500 km
pipelines

TTF
largest
European
HUB

Profits
€311 m

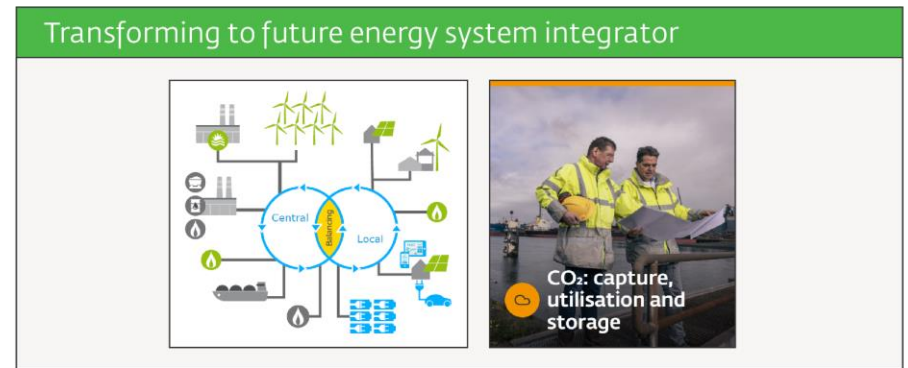
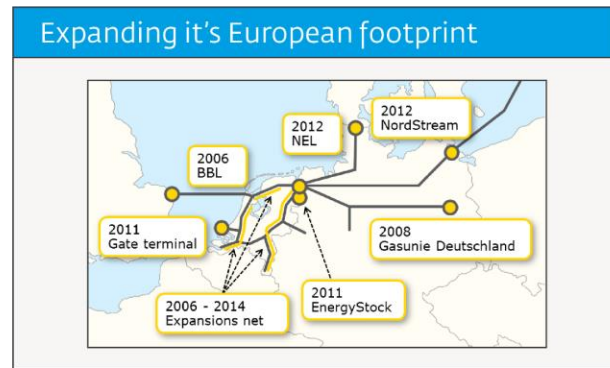
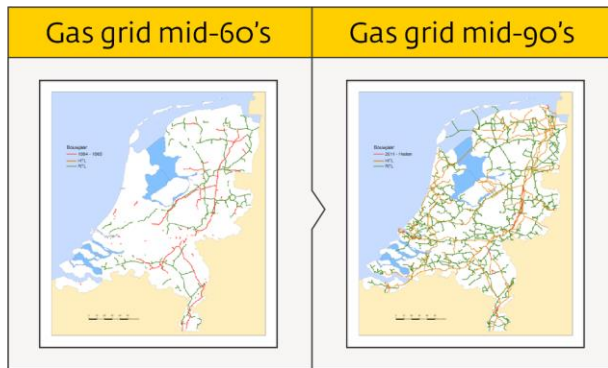
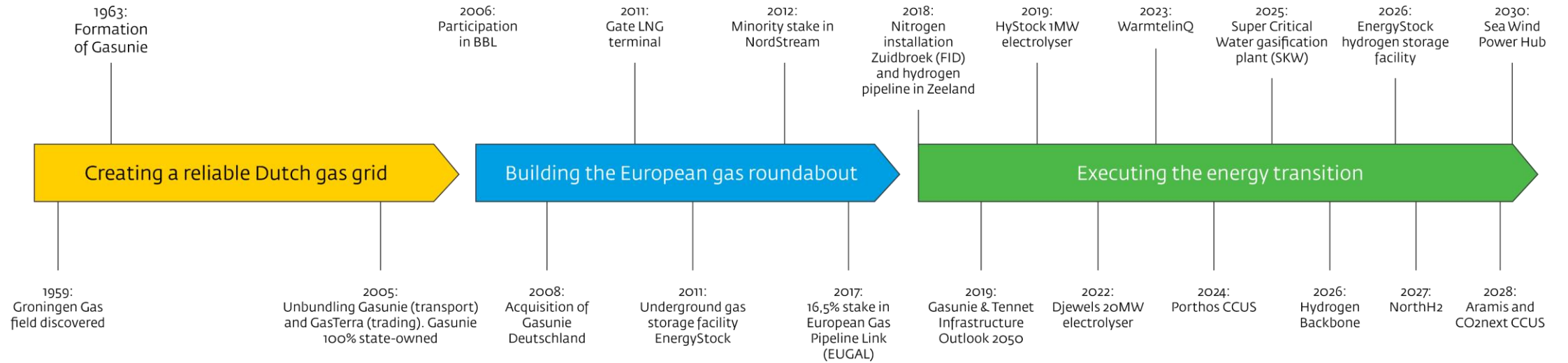
Transport
volume
1.108 TWh

Revenue
€1.386 m

Groningen

Brisbane

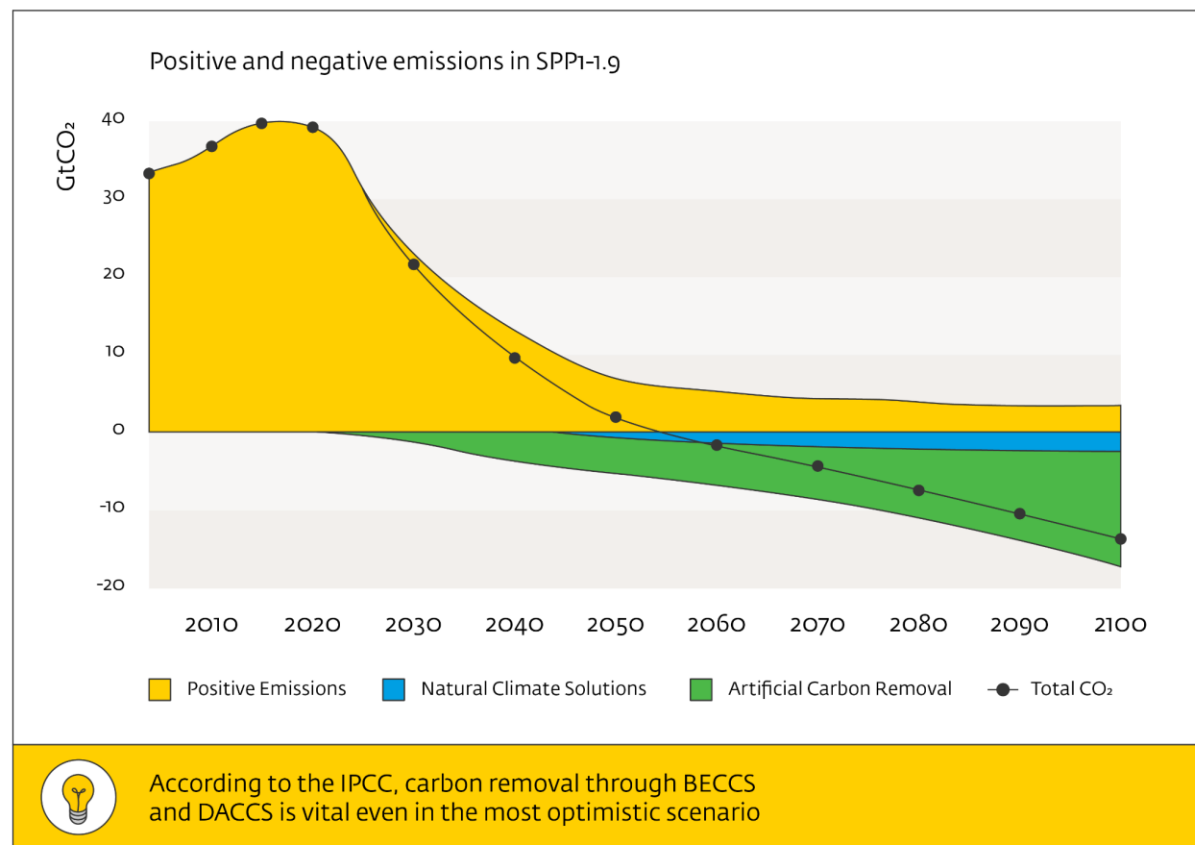
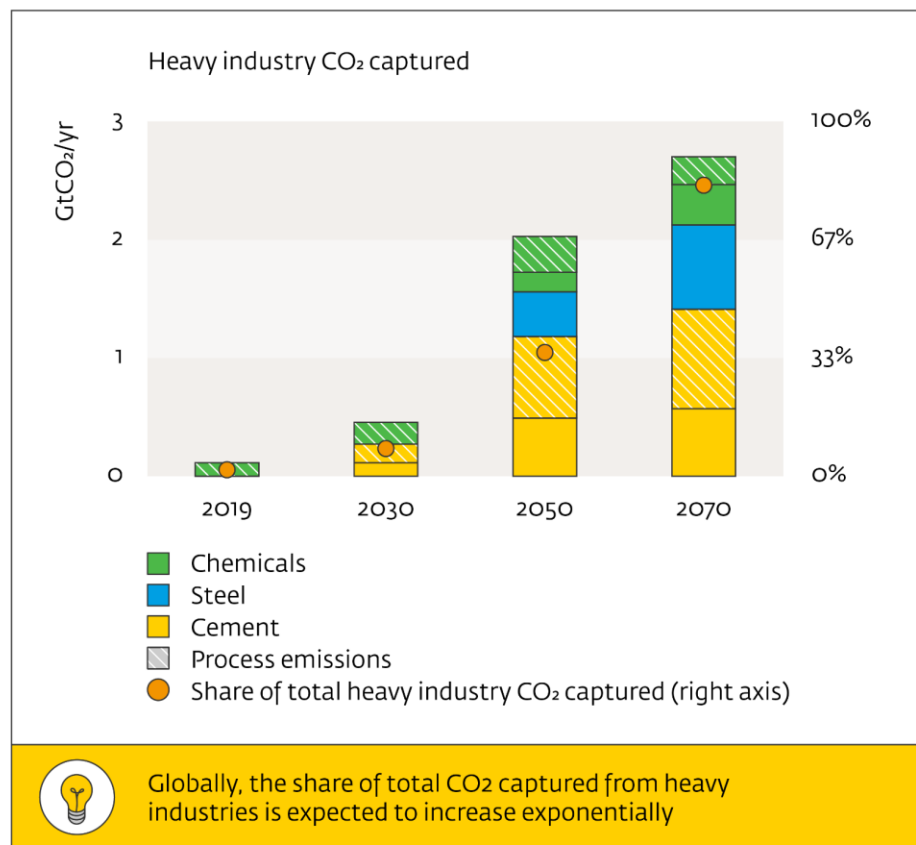
Gasunie has continuously reinvented itself in a changing environment



Gasunie's focus on CCS

because it is an indispensable abatement option for hard to abate industries through to 2050

Excerpts from IEA and IPCC reports indicating the need for CCS

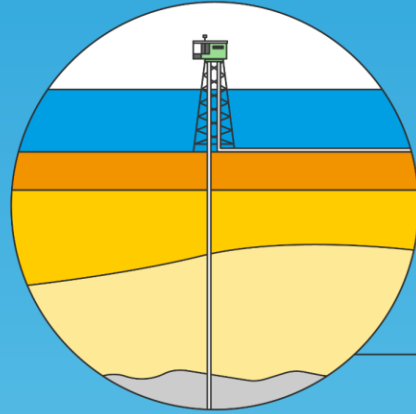


Gasunie's CCS Journey Phase 1: Porthos



Local scale:

A single LP collection system (10 MTPA) and single storage (2.5 MTPA). **Ready for FID**



PORTHOS

- CO₂ pipeline
- CO₂ by ship
- CO₂-storage (onshore)
- Compressor station
- CO₂-storage (offshore)
- Plant
- PORTHOS
- Potential shipping route

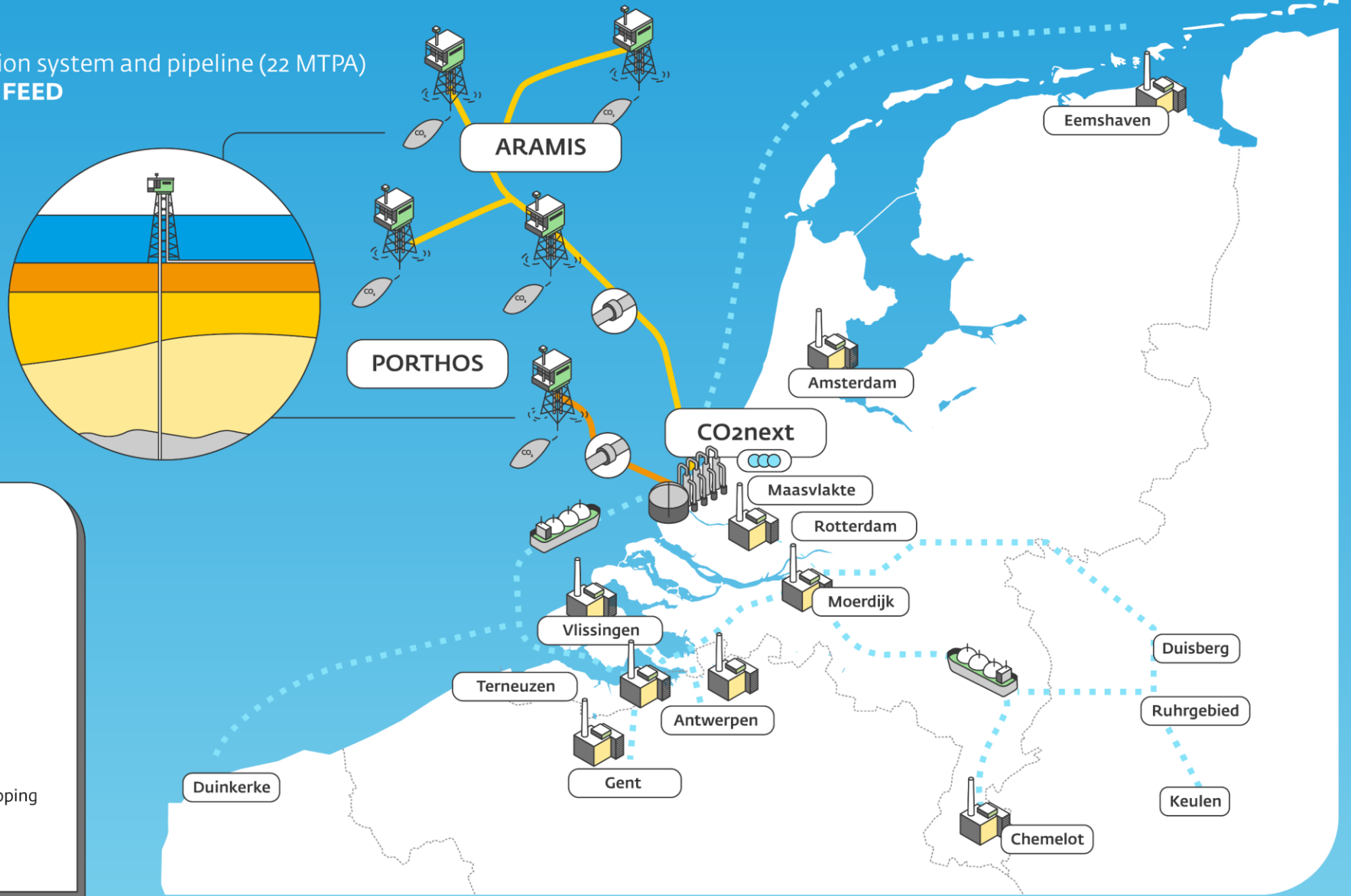


Gasunie's CCS Journey Phase 2: CO2next & Aramis



National scale:

Liquid receiving terminal (7 MTPA), compression system and pipeline (22 MTPA) and multiple connected storages. **Ready for FEED**



	CO ₂ pipeline		Plant
	CO ₂ by ship		PORTHOS
	CO ₂ -storage (onshore)		ARAMIS
	Compressor station		CO ₂ next
	CO ₂ -storage (offshore)		Potential shipping route

Gasunie's CCS Journey Phase 3: International Connected Projects

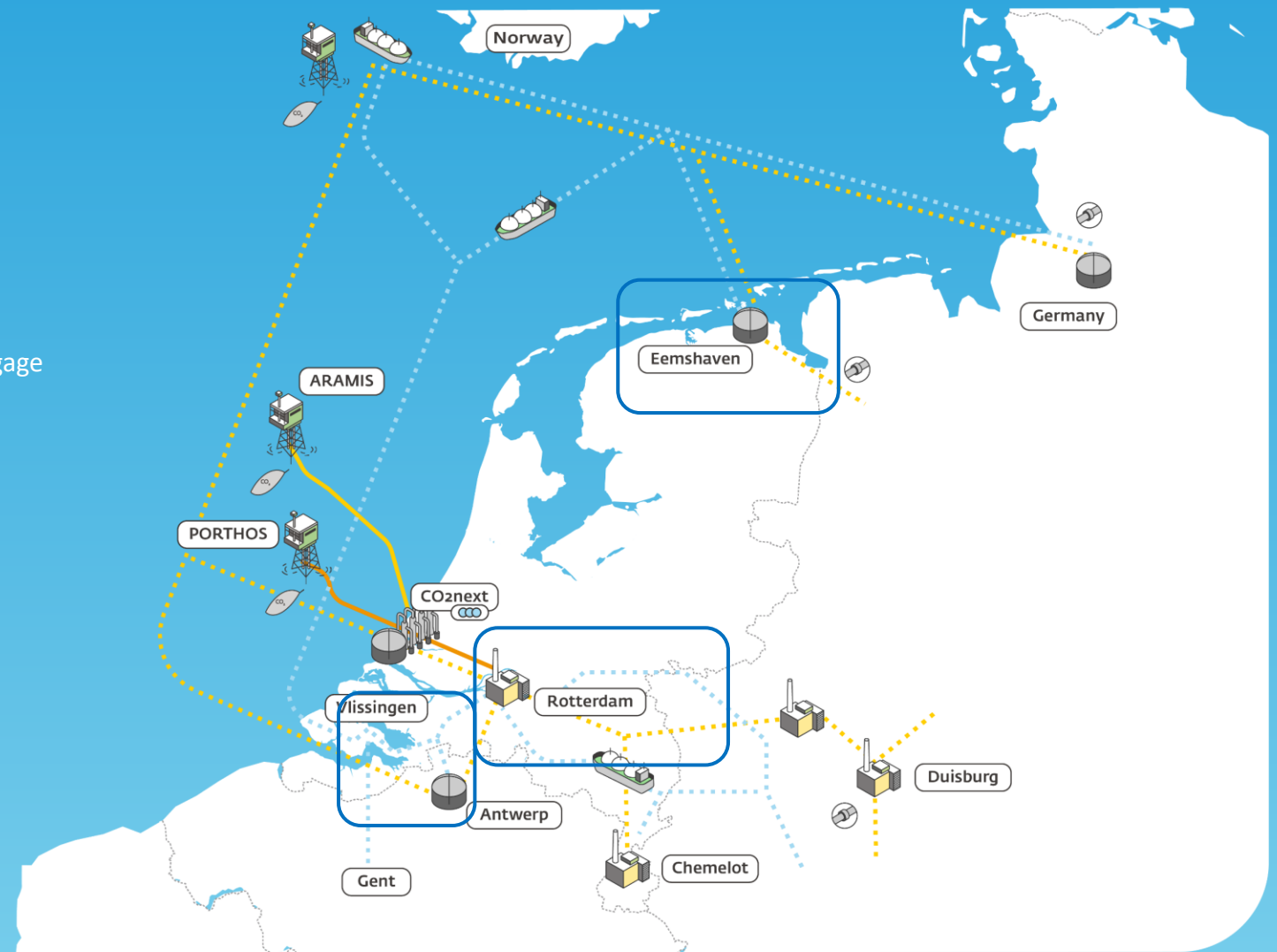
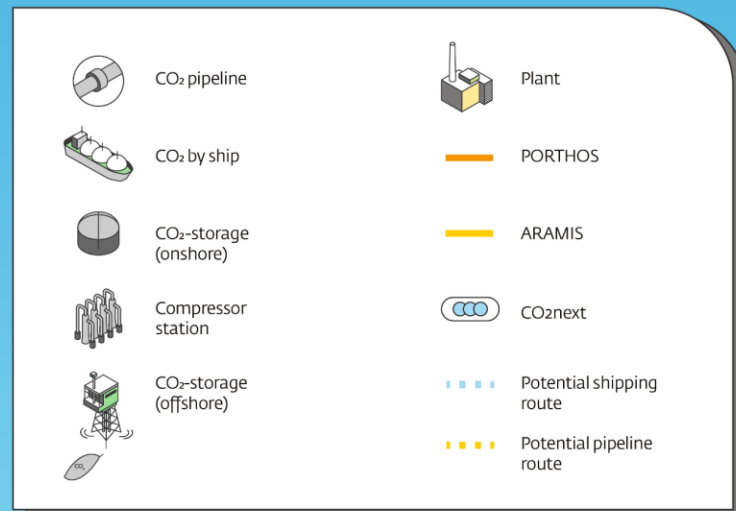


International scale:

linked multi-input, multi-output systems, Total Capacity 42 MTPA.

Initiation stage

- We have screened some 50 NW European opportunities and infrastructure needs
- Our focus will be on systems connected or connectable to the Netherlands but as a good neighbor serving international clients
- We are initiating/conducting feasibility assessments as a basis to engage the market



What have we learned from the journey so far?



Experience is key

Our learning journey helps to accelerate projects. We have fewer wheels to invent. This acceleration is proving essential to meet the challenges for phase 3.



Open access

There is trepidation from potential clients when faced with a system managed by parties who have competing commercial interests. Ultimately the system operator should be independent of emitters and stores.



Cost and risk sharing

Achieving agreement, not only on the sharing of costs/revenues but also on the sharing of risks along the value chain is key to being able to develop a chain that is attractive.

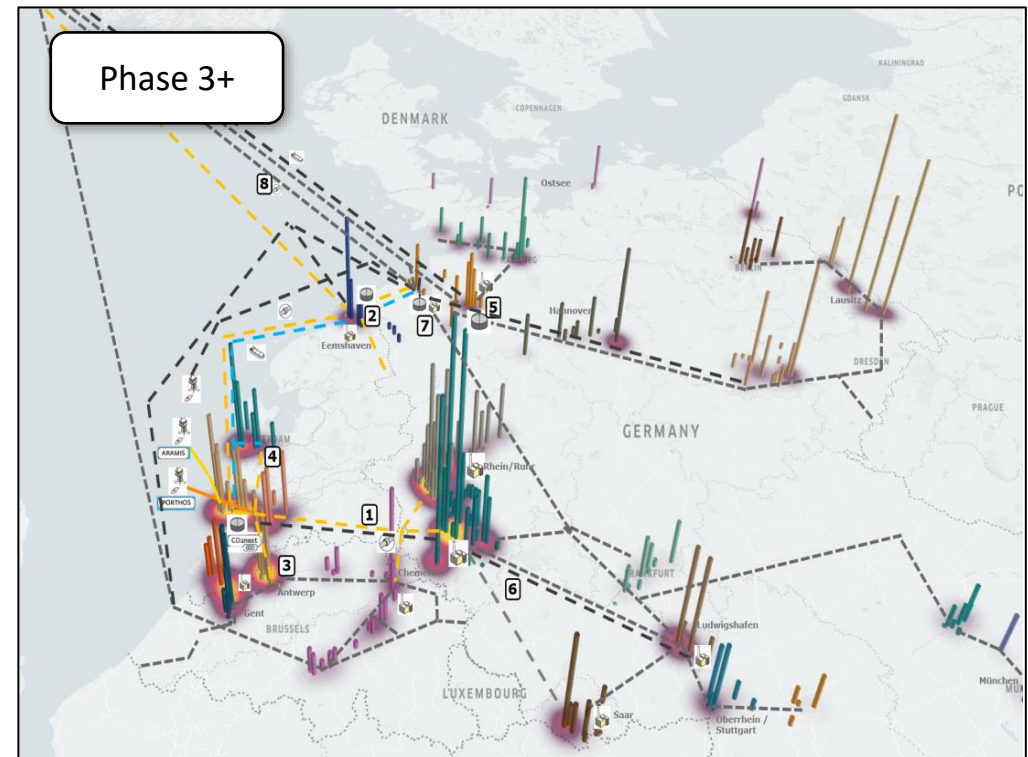
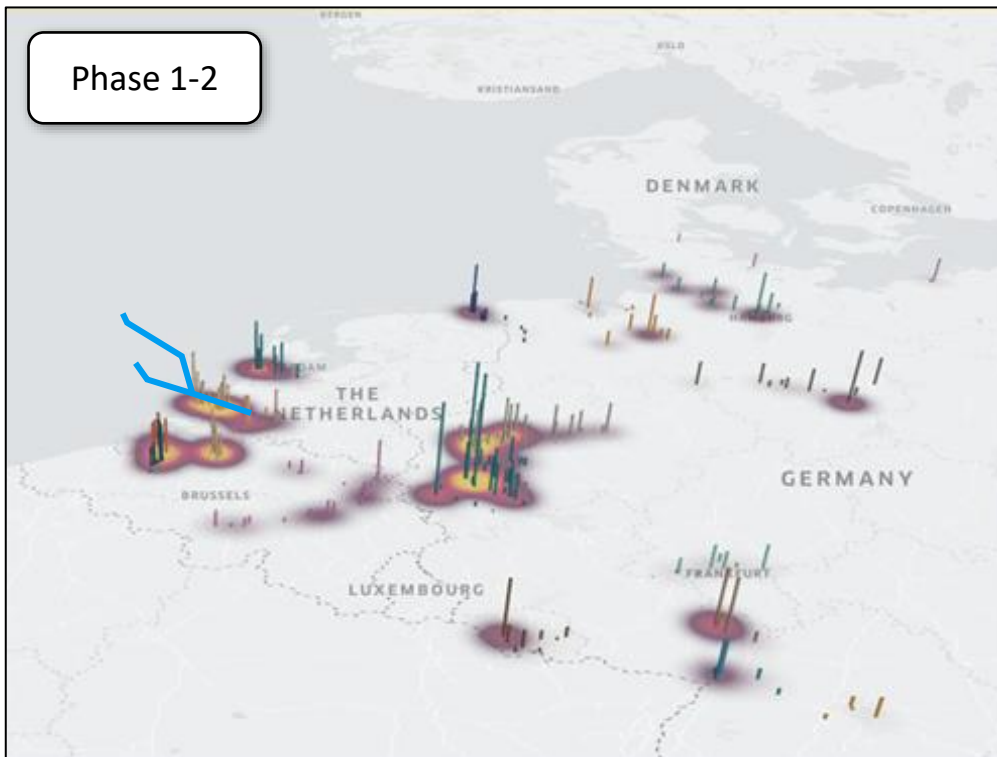


Stakeholders

It is essential to invest time to be able to understand the needs of local, national and international stakeholders. Wise investment early on in this area yields time saving later and yields a better result.

Key challenges of the future – ever increasing complexity

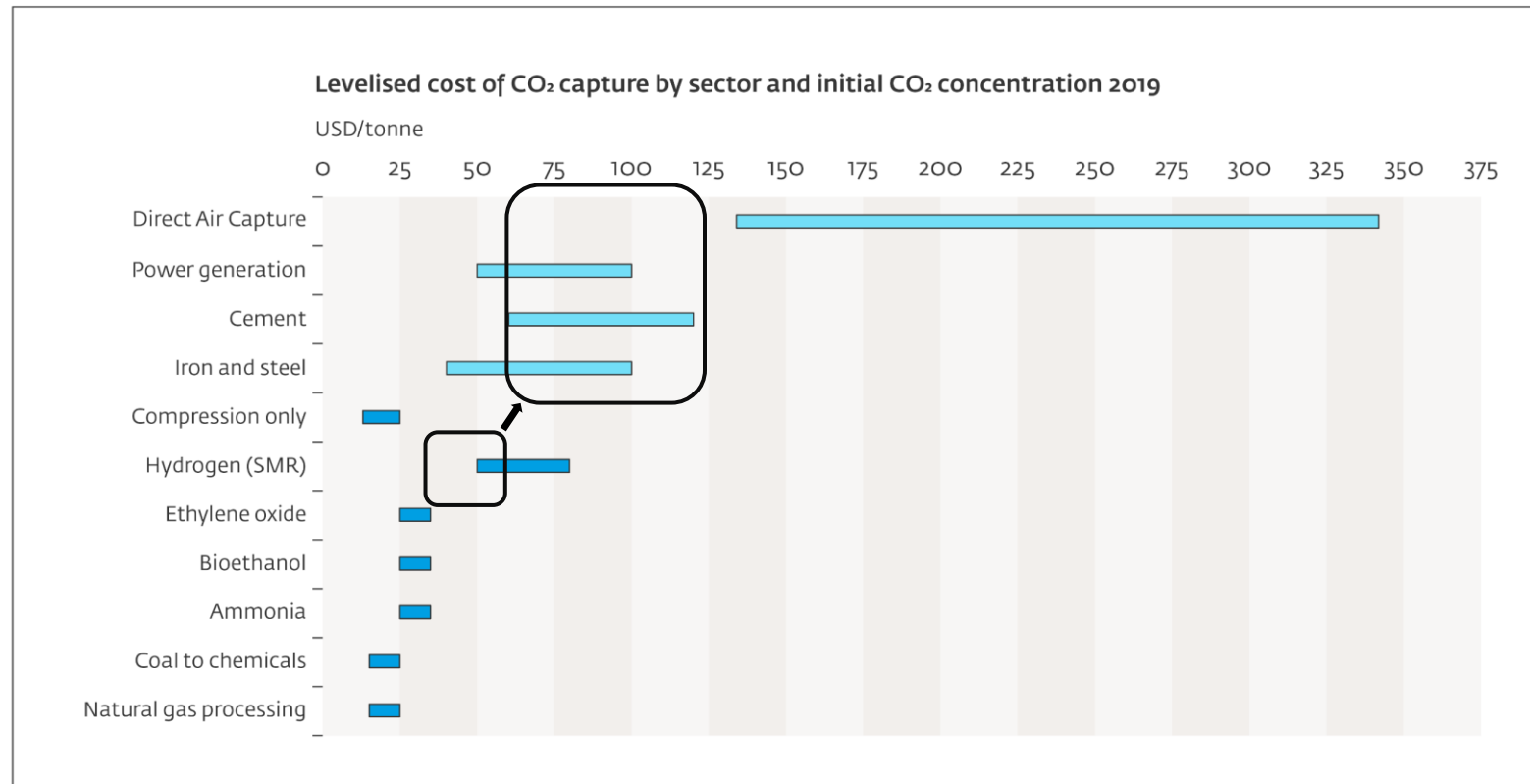
The complexity of projects will continue to increase so requiring treaties, international chain cooperation, commonality of specifications & local public support required for international projects



...with more & more complex interfaces ->cooperation will be key

Key challenges of the future – cost of capture

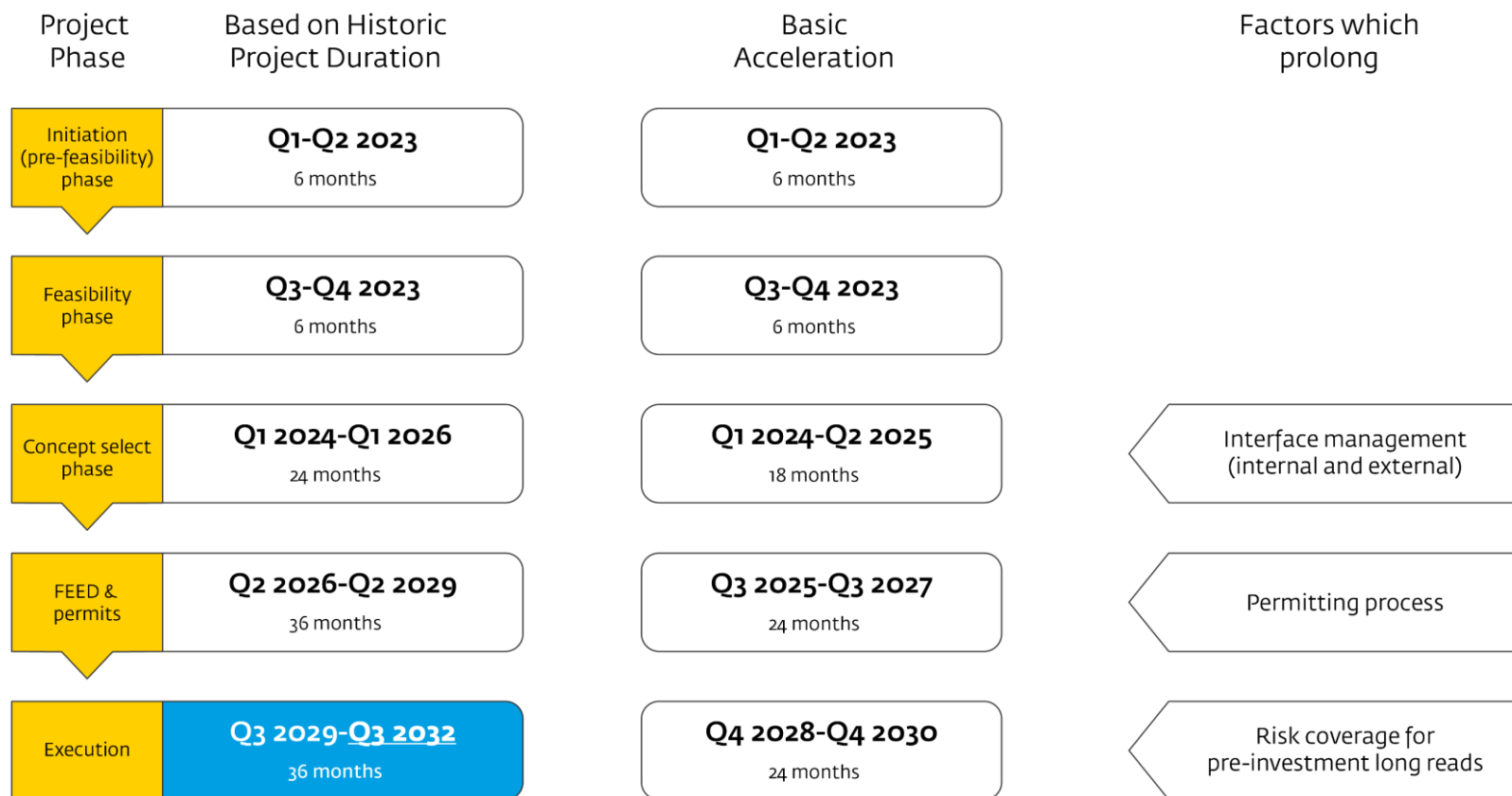
To impact total emissions we have to target client groups with a higher intrinsic cost of capture.



Source: IEA. Licence: CC BY 4.0

The cost of the whole chain must be contained -> we must avoid inefficiency at the interfaces will drive up costs

Key challenges of the future – project duration



Project duration must be reduced -> we must avoid conflicts of interest at the interfaces which cause delays

These challenges and others have been signaled to the EU Commission

CCUS Forum Working Group 1 Infrastructure¹

Challenges identified for resolution:

- Regulatory Framework
- Transparency on risk sharing
- Standard quality specifications
- Open information on storage locations
- Further resolution of legal requirements for cross-border transfer of CO₂
- Efficient permitting processes
- Funding

ENTSOG Principles Paper²

Challenges identified for resolution:

- Regulatory Framework
- Network Planning
- Market
- De-risking
- Technical Aspects and Standards

We seem all to be in agreement ... but given the time challenge we cannot wait. We must connect and cooperate now with the parties who are already active along the whole value chain whilst we support the medium term efforts to resolve the challenges.

Contributing to the fight against climate change, Gasunie will continue our CCS journey.

We welcome opportunities to cooperate along this vital value chain.

G.W.M.Noble@Gasunie.nl

Tel: +31611005974

Crossing borders in energy
Gasunie connects

A stylized illustration of grey pipes with joints, set against a blue background. The pipes are arranged in a network, with some forming right-angle turns and others connecting at various points. The joints are depicted as grey rings with a darker inner seal.