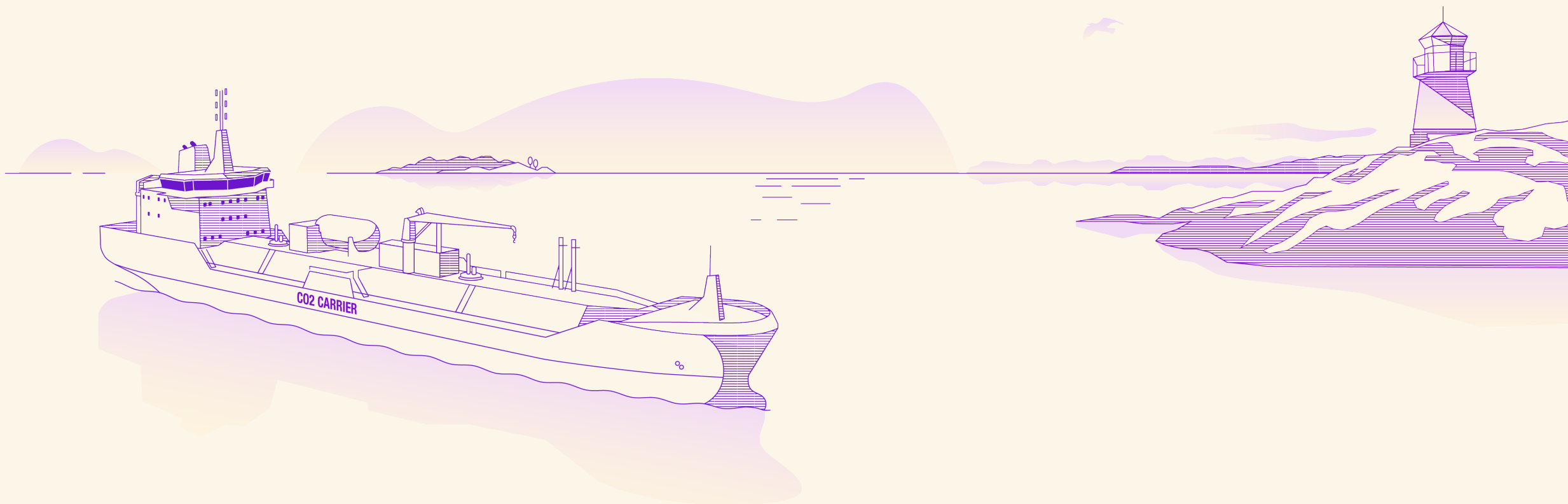


Northern Lights

METI-JOGMEC-IETA joint workshop

Global Carbon Markets and CCS: Towards ASEAN Decarbonization , 26th Jan 2023



Longship value chain

LONGSHIP

CO₂ capture

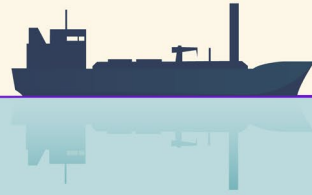
Capture from industrial plants.
Liquefaction and temporary storage.



NORTHERN LIGHTS SCOPE

Transport

Liquid CO₂
transported by ship.



Receiving terminal

Intermediate onshore storage.
Pipeline transport to offshore
storage location.

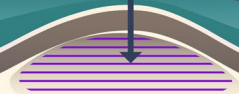


Permanent storage

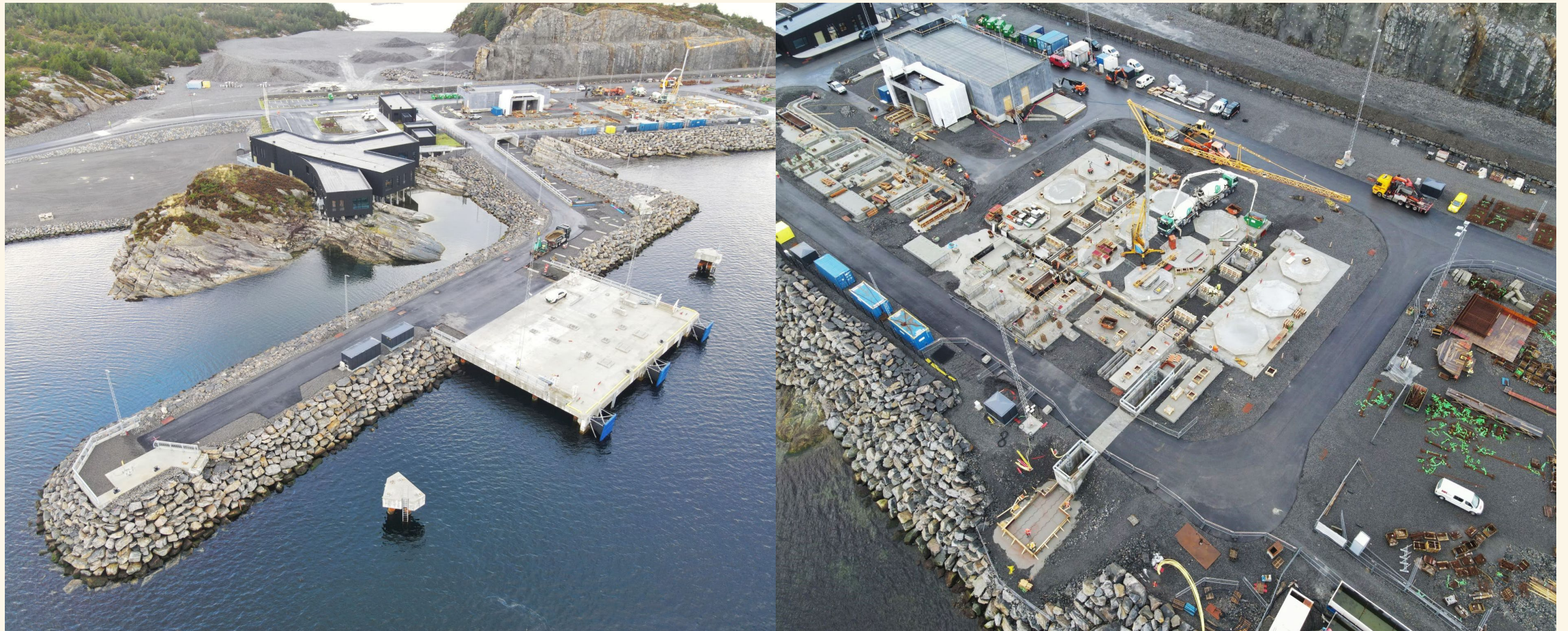
CO₂ is injected into a saline aquifer.

100 km

2 600 m



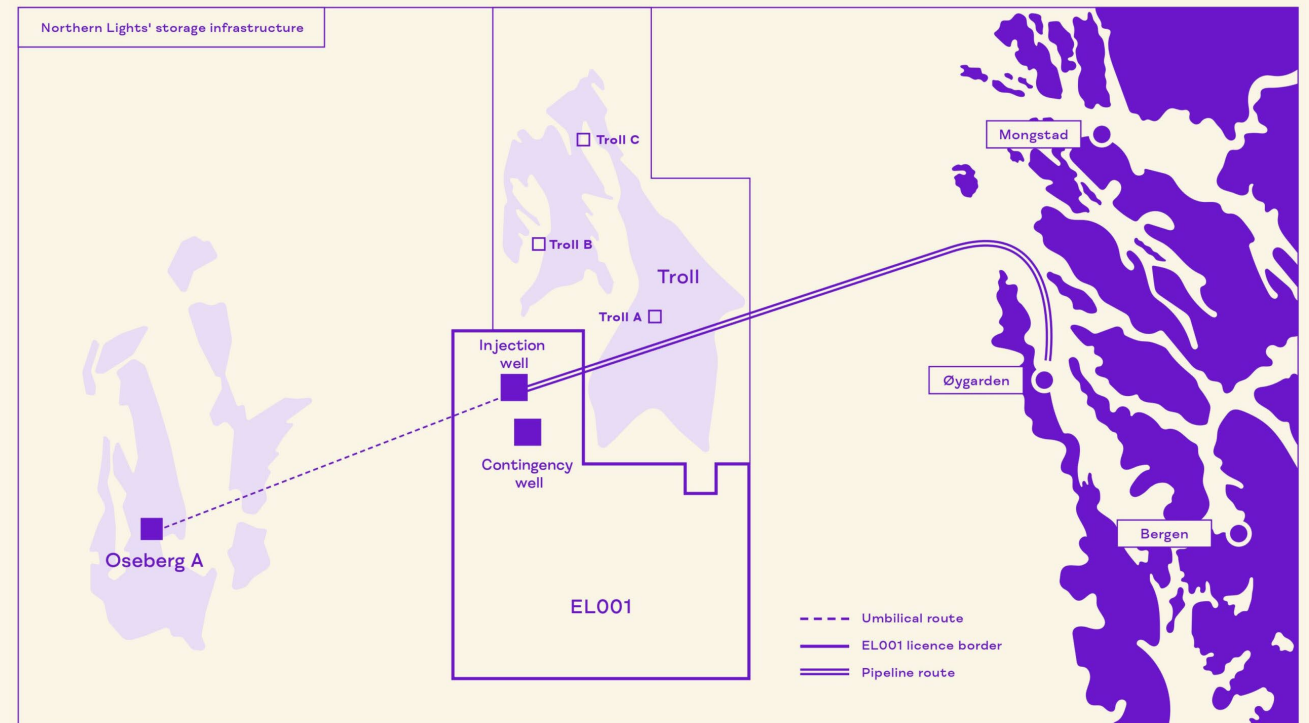
Construction progressing as planned



Completed drilling campaign

→ 2 wells drilled, completed and ready for hook-up

→ Preliminary results confirm the **storage capacity** of at least **5 million tonnes** CO₂ per annum



Building a market for CO2 storage

“Net zero near impossible without CCS” (IEA)

- **Northern Lights is the first** to commercialise CO2 transport and storage as a service
- **Significant interest and demand** for our services
- **First commercial agreement** with Yara in August

Challenges

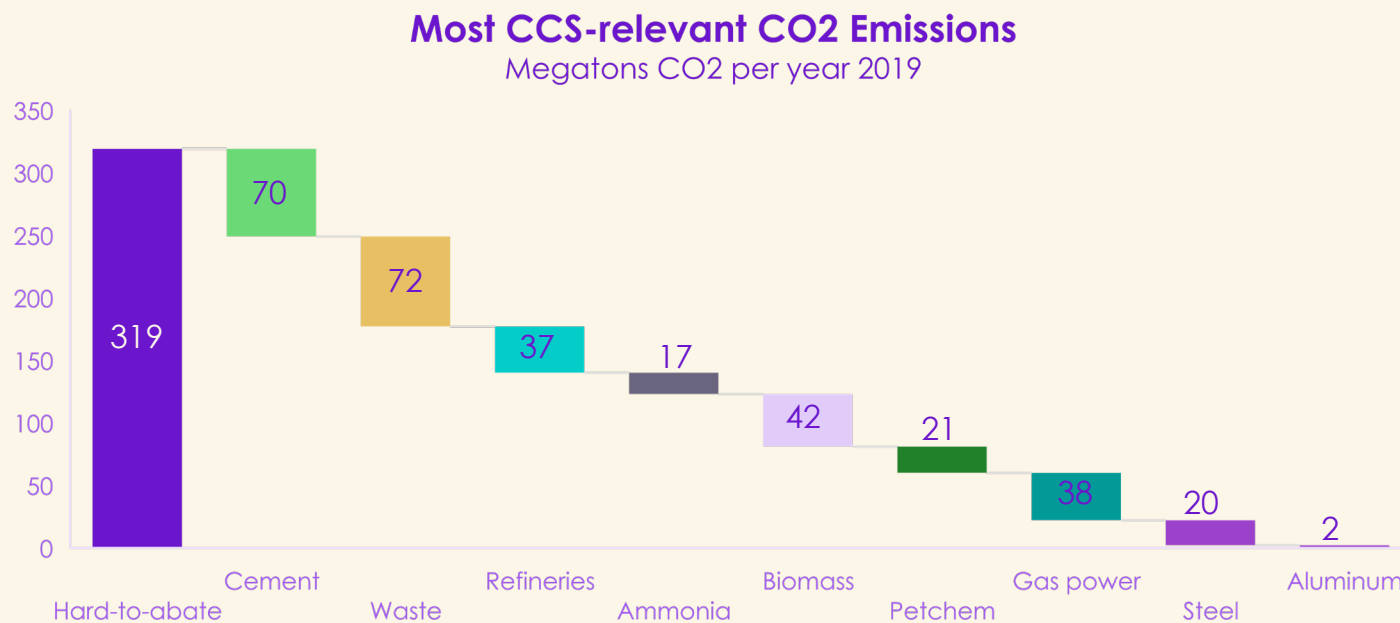
- Establishing **first of its kind contracts** for transport and storage
- Streamlining and adapting **regulatory framework**
- Establishing **bilateral agreements** for cross-border CO2 transport
- Changing geopolitical situation: **security of energy vs. climate targets**



Market potential

→ **Hard-to-abate industries** most relevant for CCS projects

→ **Total CO2 emissions** from these sectors in Europe: **319 MTPA**



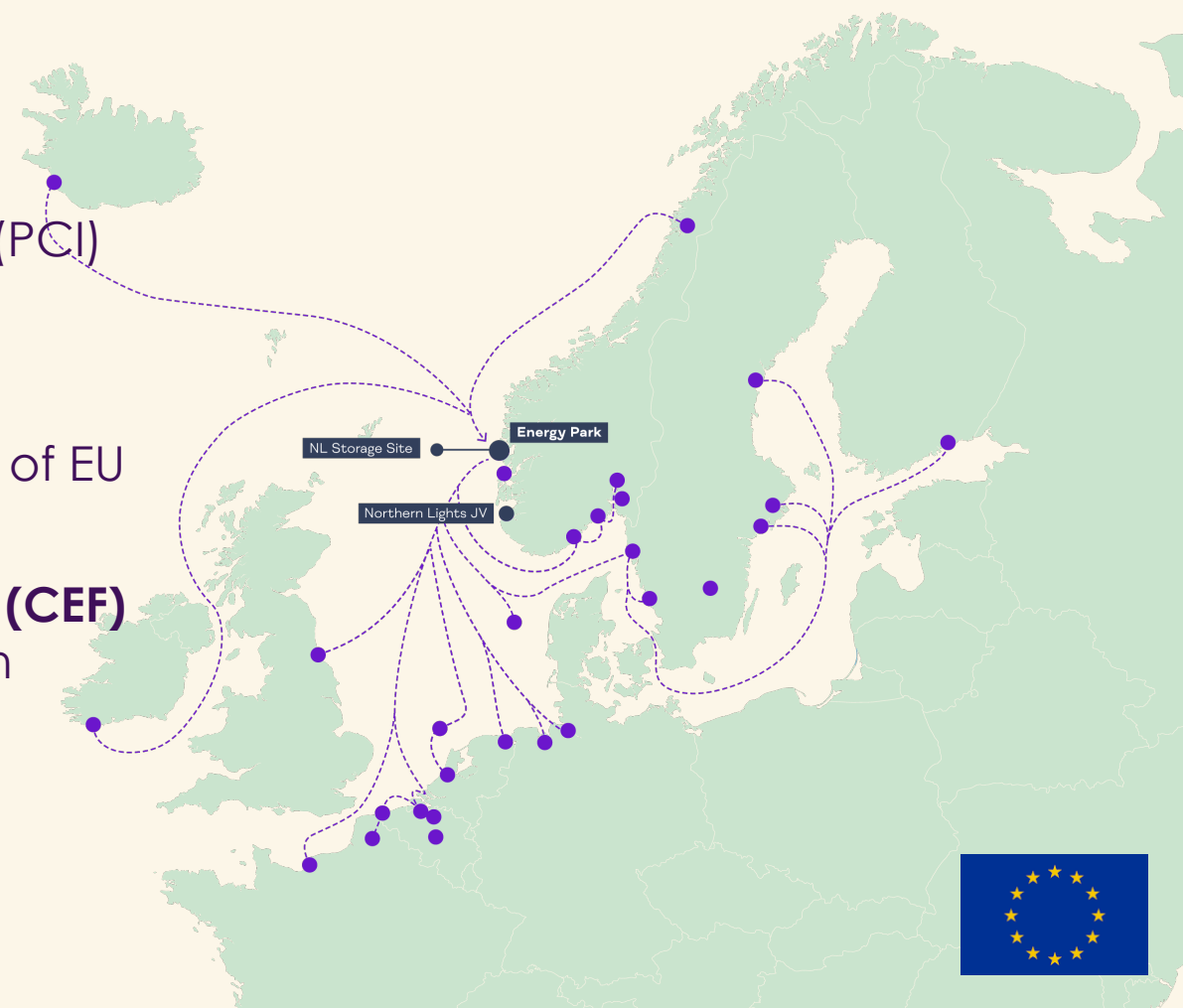
Selected volumes & sectors with strong dependency on CCS to decarbonise

Source: Rystad Energy research and analysis, UNFCCC

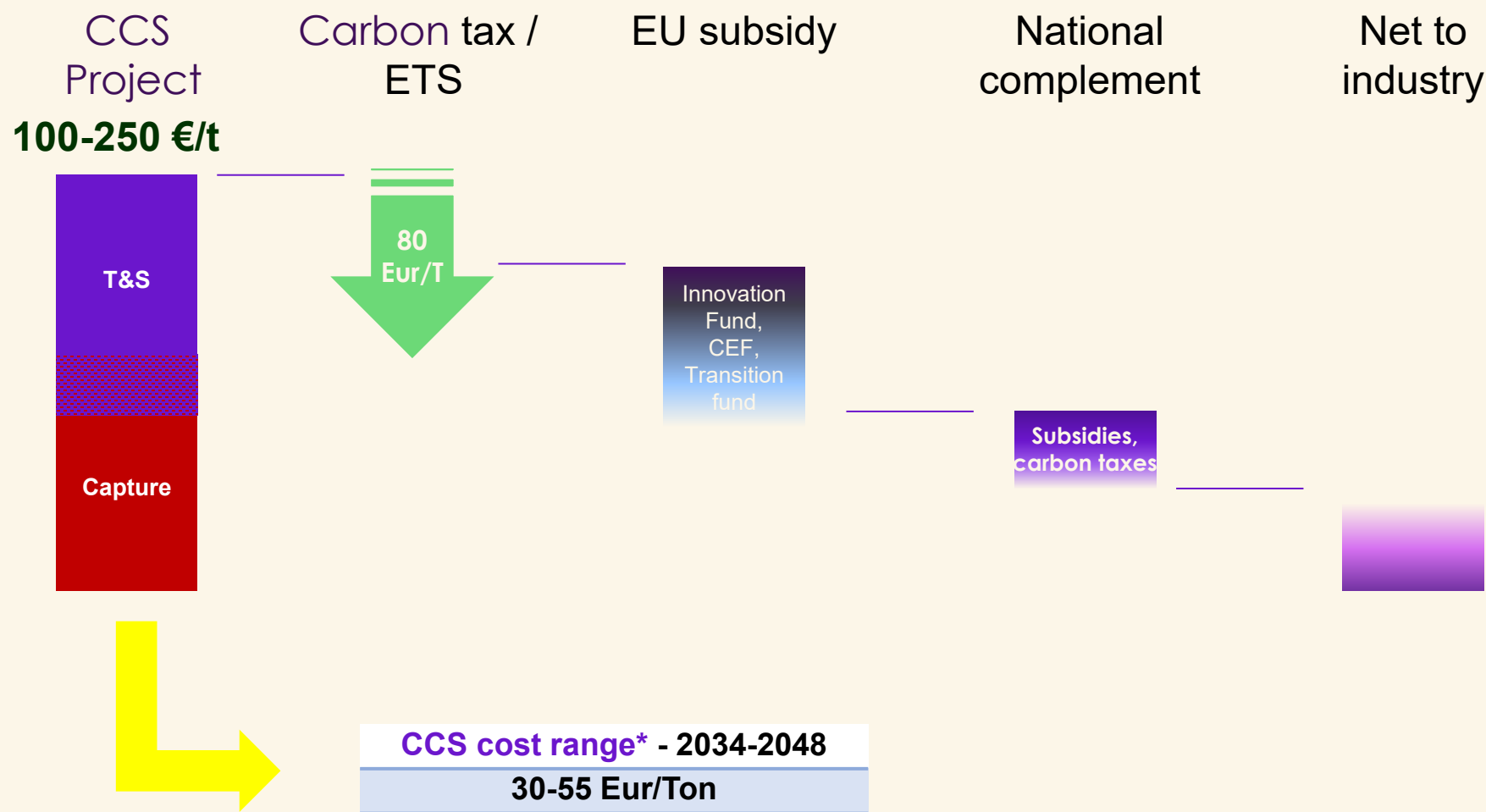
A regional solution

Creating a sustainable CCS market together,
leveraging the strength of all of Europe

- Northern Lights on EU **Project of Common Interest (PCI)**
5th list with 18 promotors and 22 affiliates
- Ongoing process to **apply for 6th PCI** list
- Infrastructure projects that link the energy systems of EU countries
- Eligible for European **Connecting Europe Facilities (CEF) funding**, accelerated permitting and authorisation processes



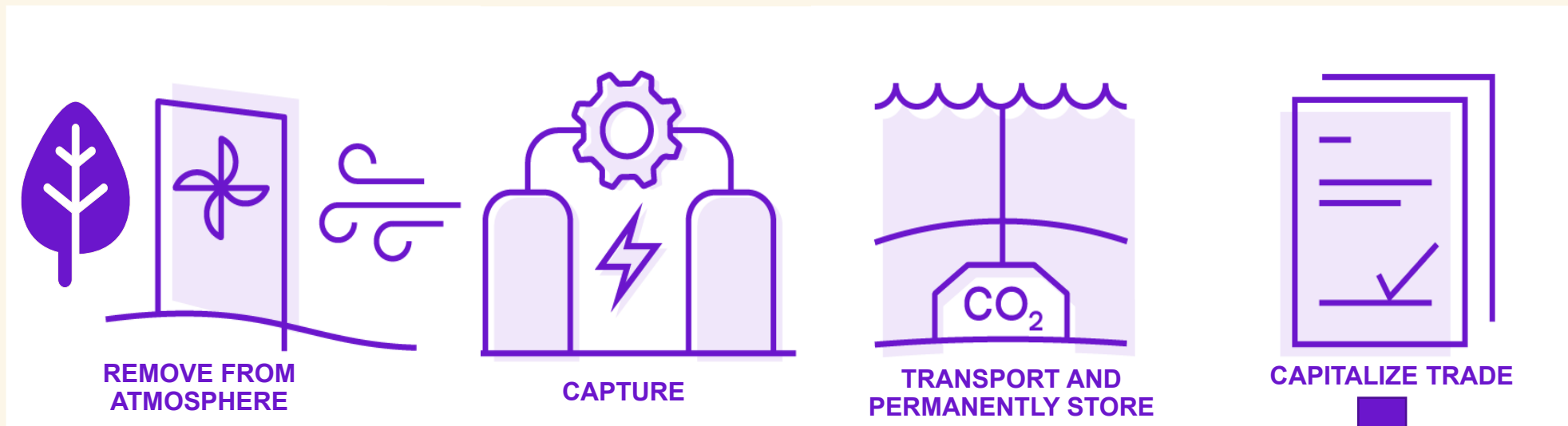
Leverage to sustain CO2 value chain



* IOGP report "The potential for CCS and CCU in Europe"

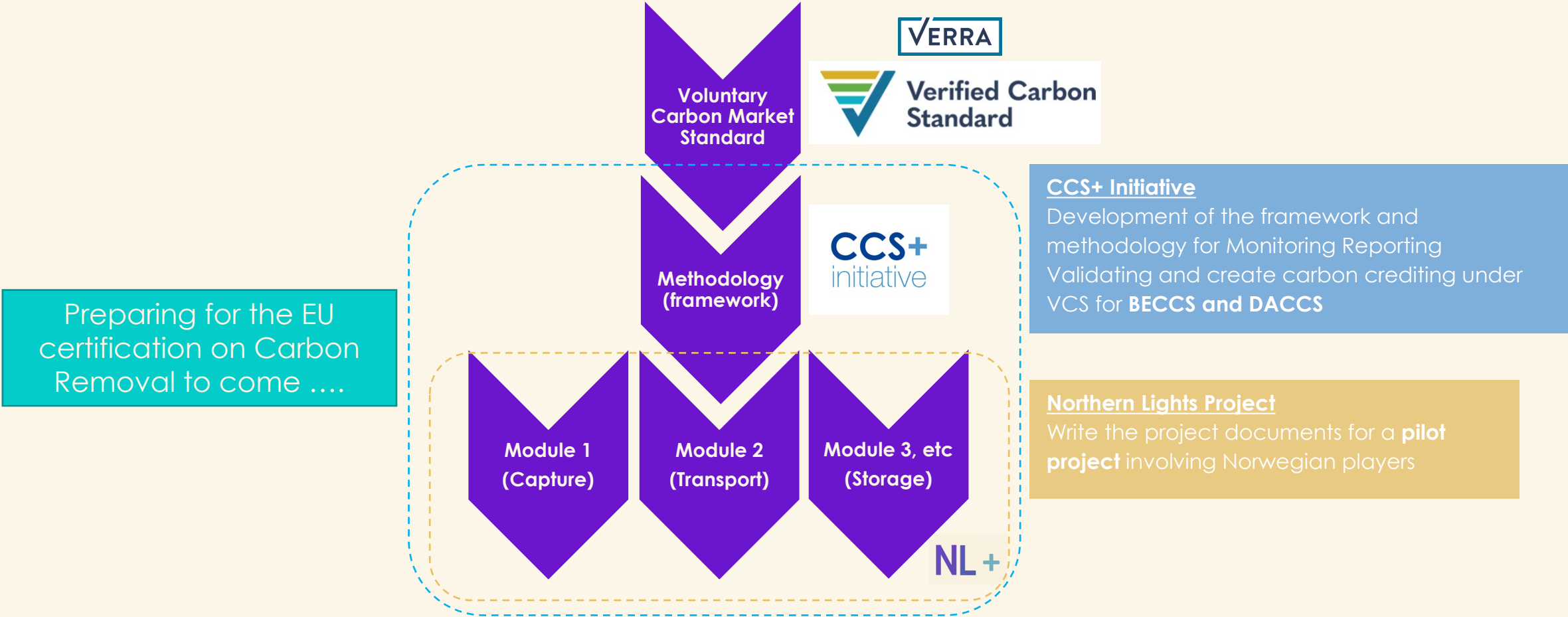
Northern Lights : enabler for negative emissions

→ Negative emissions are not yet part of the EU ETS quotas system

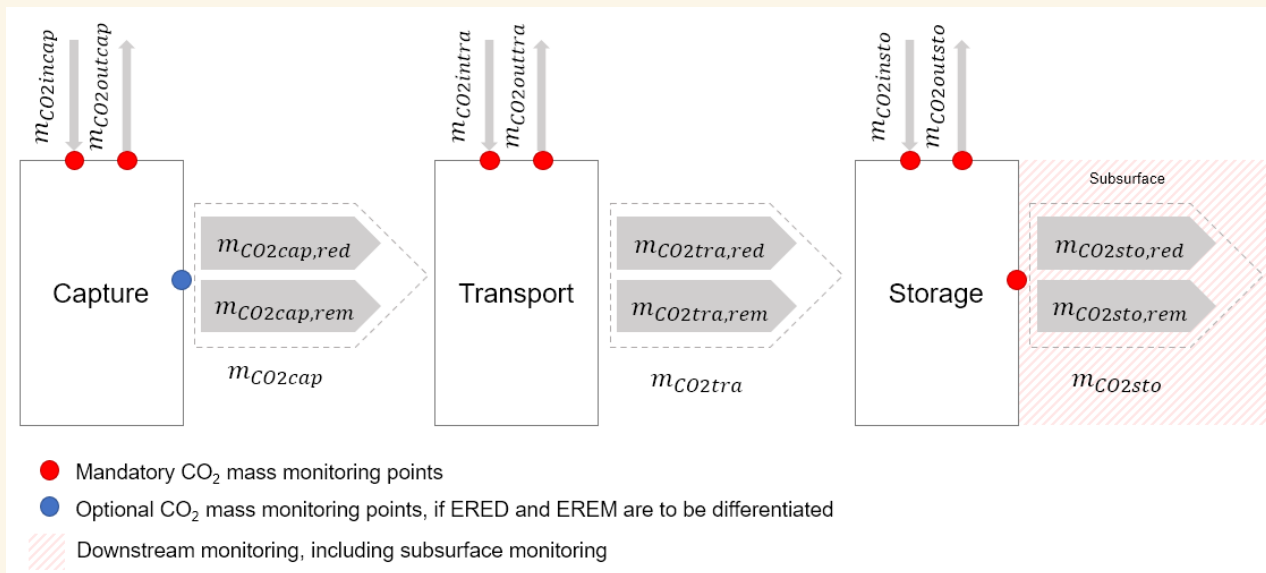


Northern Lights is willing to follow an approved methodology for **certifying** and **verifying** negative emissions. It will provide BECCS/DACCS projects with a **predictable income** stream, and potential buyers with a **transparent** and **reliable carbon offset** scheme

Create a certified product for Carbon Removal Credit

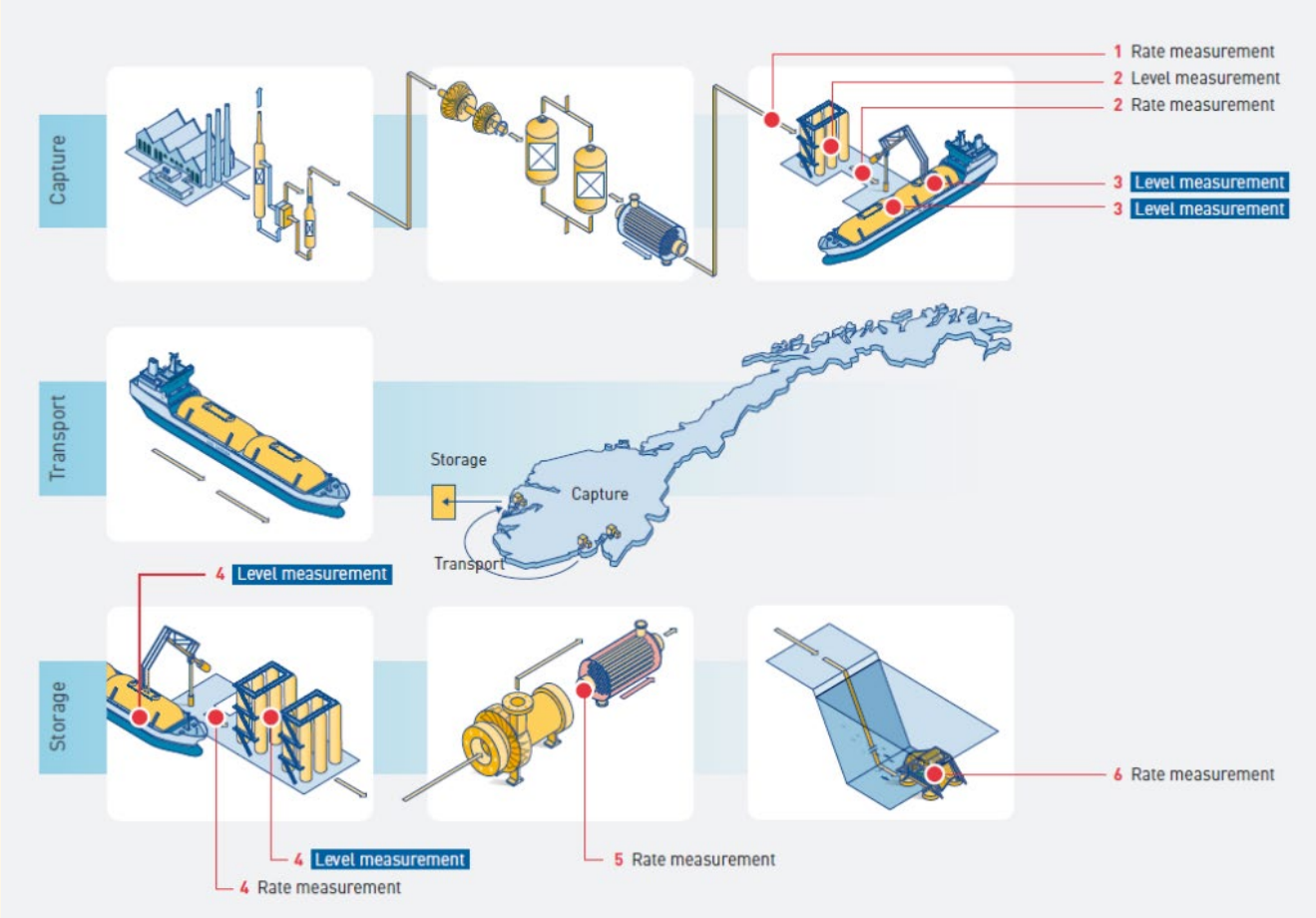


Example of CCS “chain” Carbon Credit CO₂ accounting*



- Same principles as EU ETS and EU CCS Directive requirements
- Differentiation of CO₂ from reduction and removals activities
- Monitoring and reporting from injection point included

Quantity measurement philosophy



→ CO2 volume is almost 100% pure CO2

Source : Regulatory Lessons Learned from Longship – The public sector’s involvement in Europe’s first industrial CCS chain - Fullskala (ccsnorway.com)

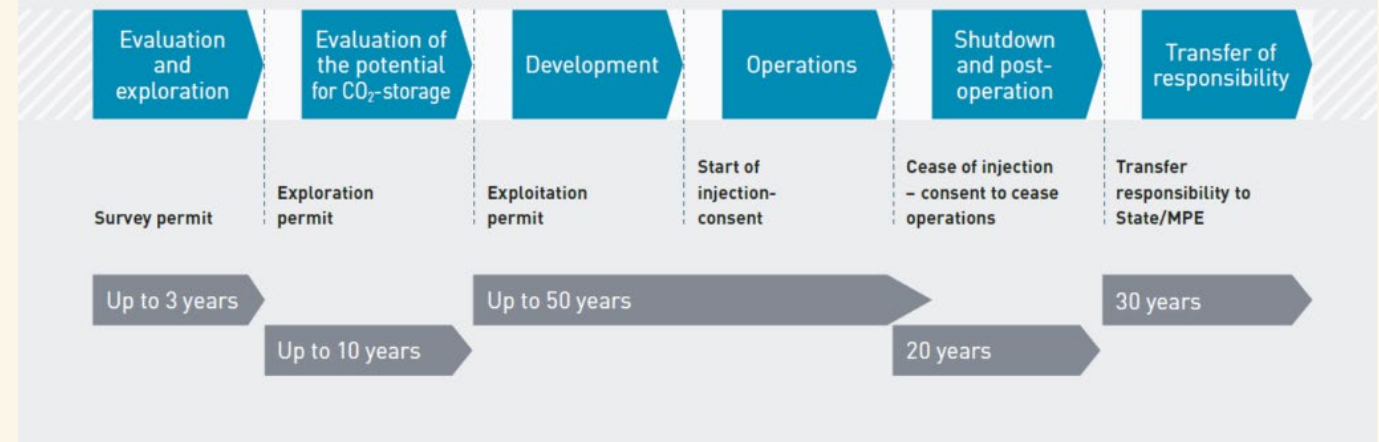
Storage monitoring requirements

5-4 Monitoring

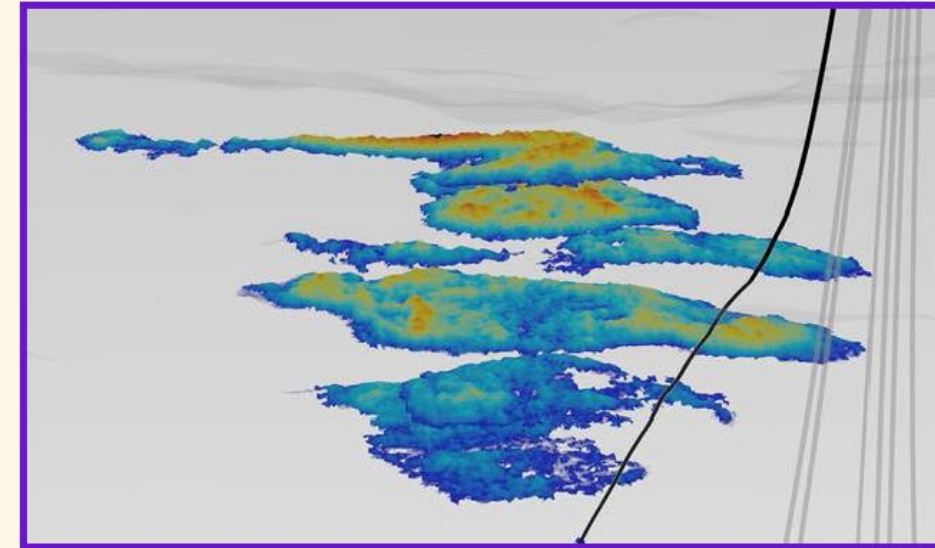
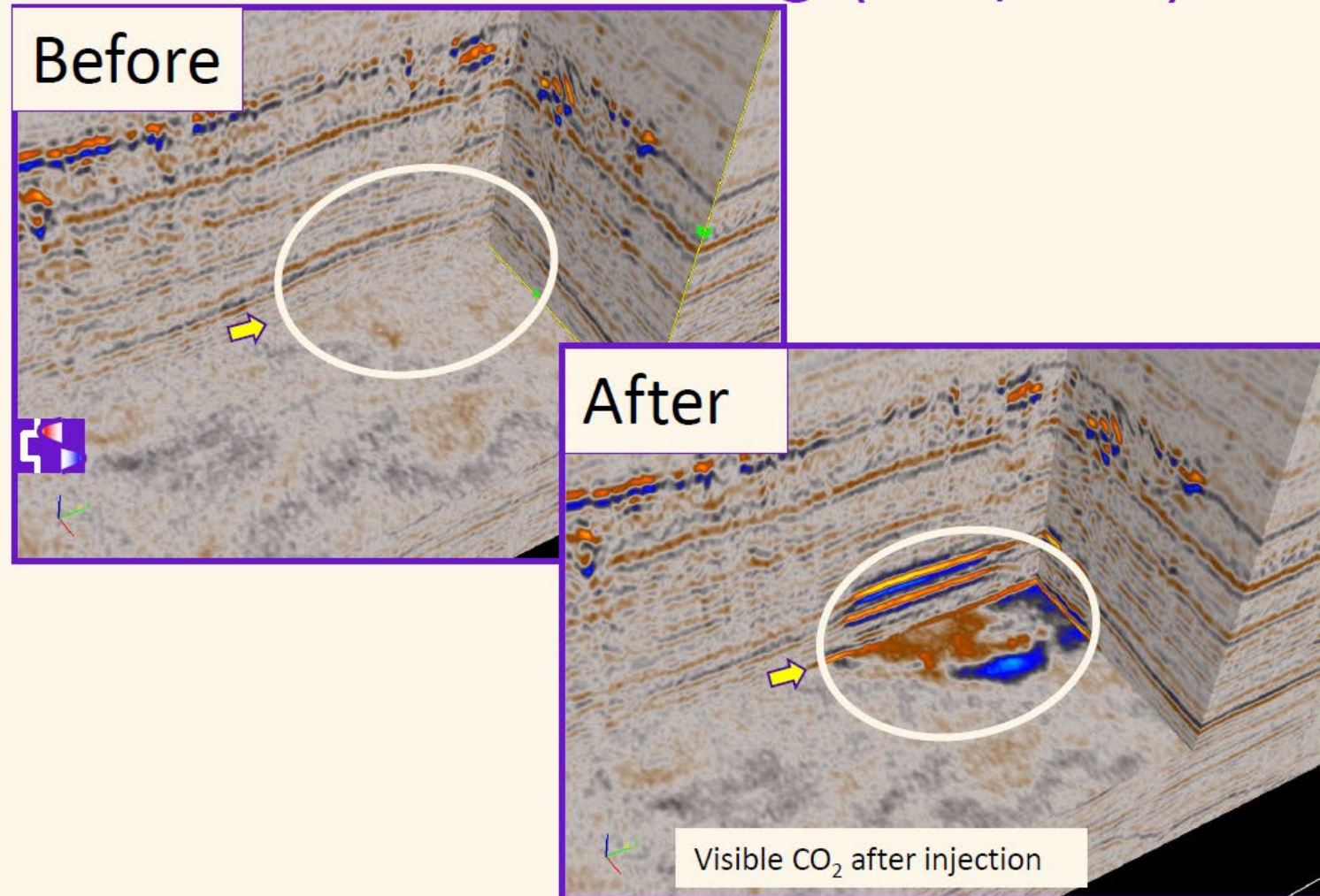
The operator must monitor the injection facilities and the storage complex, including the spread of CO₂, to:

a)	Compare the actual and modelled behaviour of CO ₂ and formation water at the storage location,
b)	Identify significant irregularities,
c)	Track the migration of CO ₂ ,
d)	Detect any leakage of CO ₂ from the storage complex,
e)	Update the assessment of the short and long-term safety and integrity of the storage complex, including whether the stored CO ₂ remains securely contained.

The regulatory framework *(some highlighted issues)*



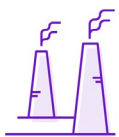
Seismic monitoring (Sleipner)



Accelerating CCS



Temporary government support can overcome the chicken-and-egg challenge



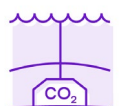
Large-scale development paves way for others



Shipping provides the necessary deployment flexibility



CO₂ storage enabler for a net zero ecosystem



CCS value chain is cost-effective decarbonisation solution



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