# CCS Commercial and Regulatory Frameworks:

# Lessons Learned from CCS Front-runners in Norway

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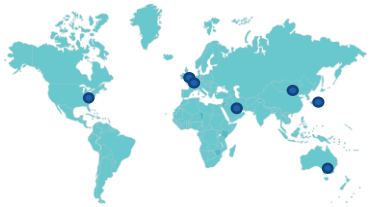
International think tank

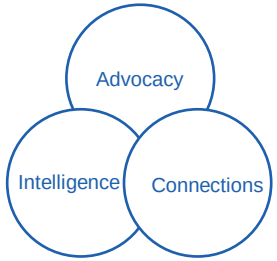
Backed by governments, businesses and NGOs

**Mission**: To accelerate deployment of CCS

**150+** MEMBERS

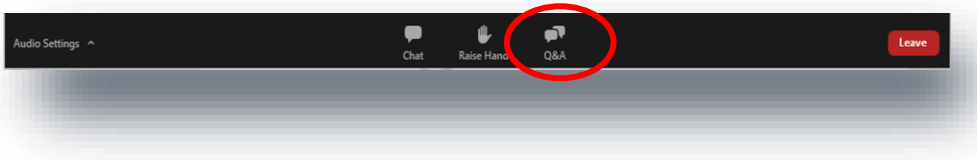
**7 locations**





# BEFORE WE START

- We will collect questions during the presentation.
- Moderator will pose questions to the presenters after the presentation.
- Please submit your questions through Q&A on Zoom control panel:



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# Speakers

Government of Norway – Stig Svenningsen, Deputy Director General, Ministry of Petroleum and Energy

Gassnova – Aslak Viumdal, Senior Advisor

Northern Lights – Børre Jacobsen, Managing Director

Altera Infrastructure – Johanne Koll-Hansen Bø, Vice-President and Head of CCS

Equinor – Dr. Per Sandberg, Senior Advisor - Business Development

Global CCS Institute – Ellina Levina, Senior Finance and European Affairs Manager (Moderator)

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Stig Svenningsen, Deputy Director General

Government of Norway, Ministry of Petroleum and Energy

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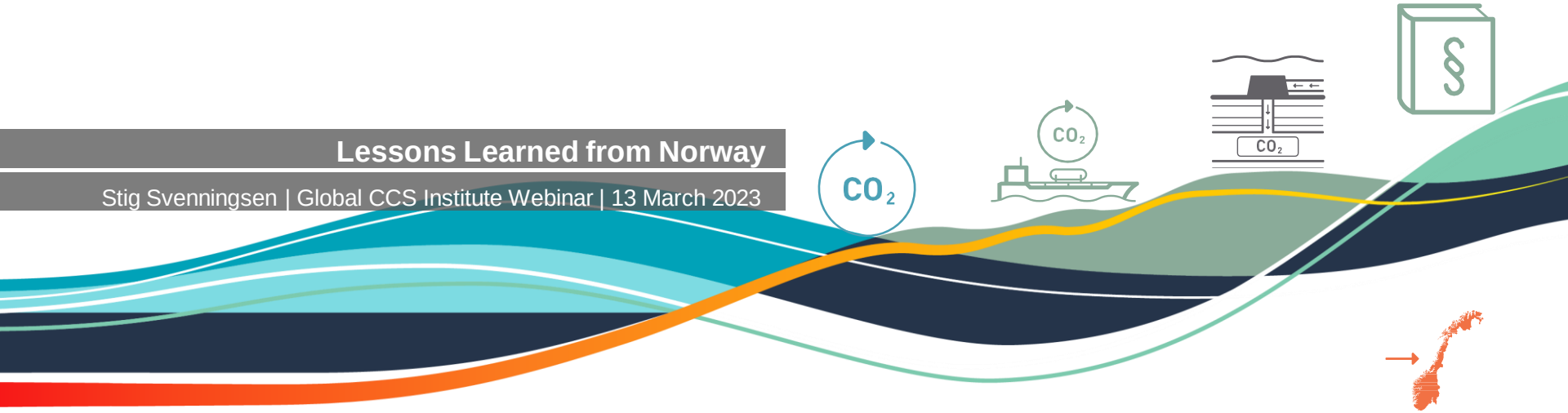
Norwegian Ministry
of Petroleum and Energy

# Overview of CCS evolution in Norway

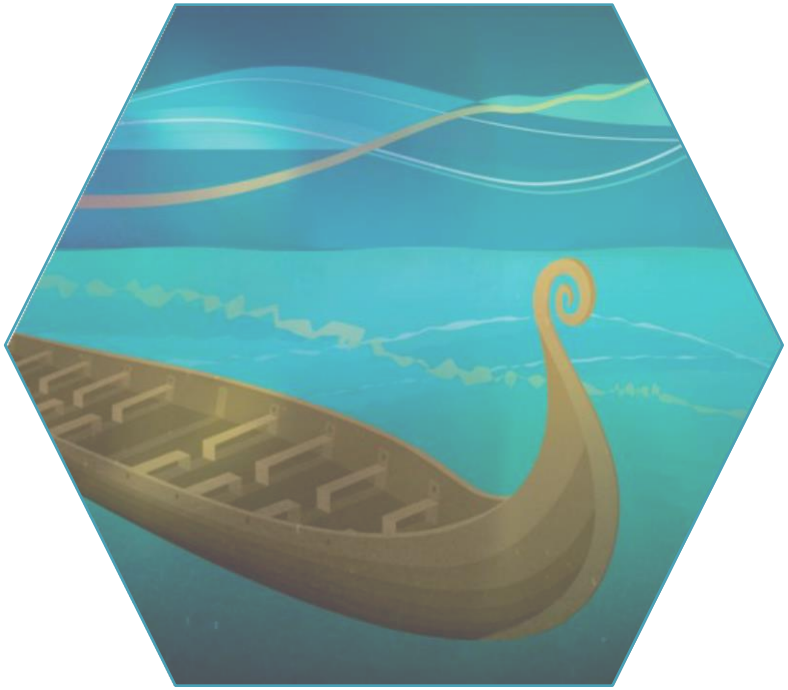
## Lessons Learned from Norway

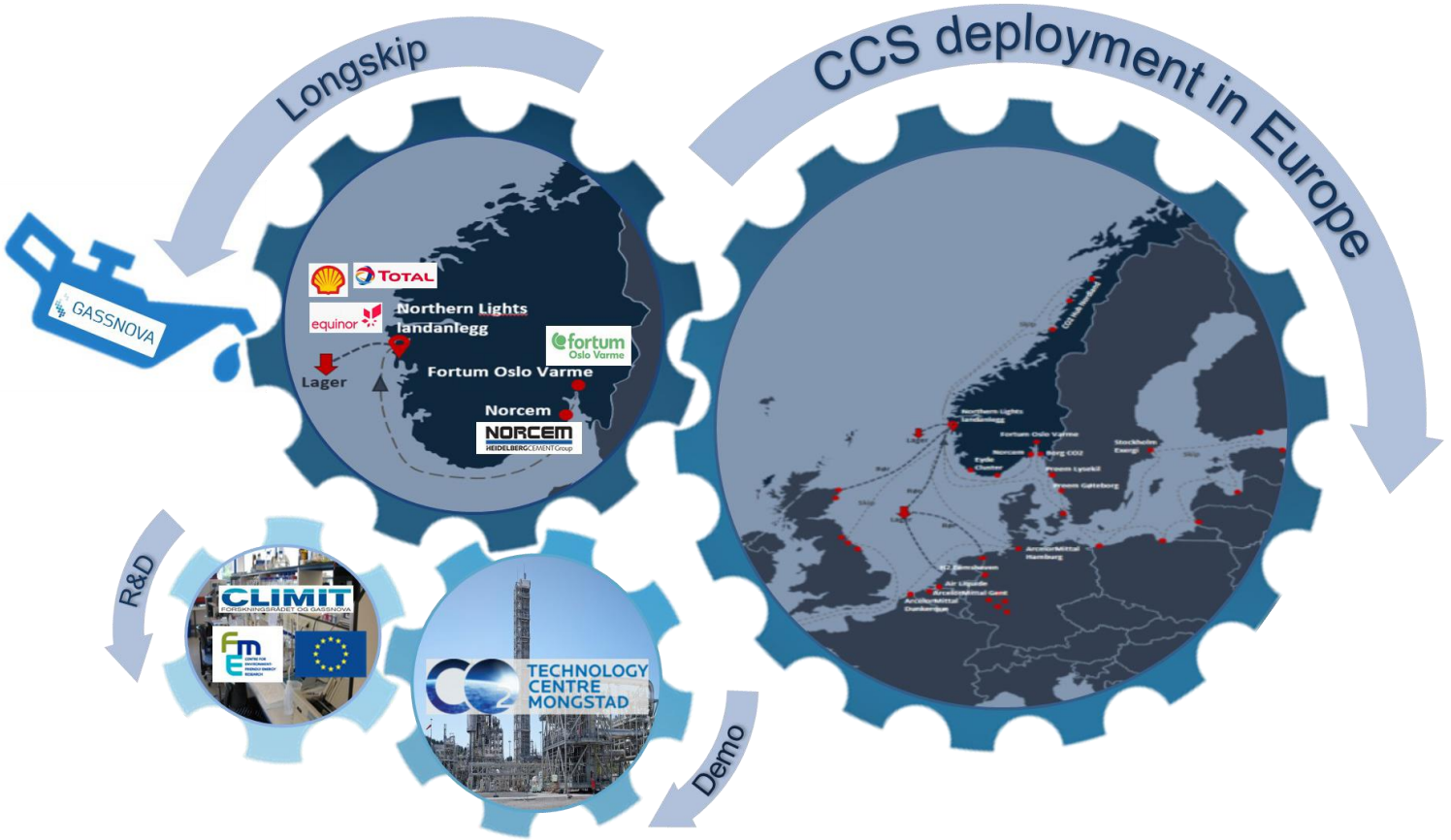
Stig Svenningsen | Global CCS Institute Webinar | 13 March 2023



# The evolution of CCS in Norway

- The Norwegian energy policy
- More than 25 years of experience
  - Sleipner (1996) and Snøhvit (2008)
- Gassnova – state enterprise for CCS (2005)
- Technology Centre Mongstad (2012)
- Norwegian CCS strategy (2014)
- Longship (2020)
- New storage projects and licences for $CO_2$ storage






Norwegian Ministry
of Petroleum and Energy

# CCS Regulation in Norway

**2008**

- EU Commission proposal for the CCS Directive 2009/31/EC
- Public consultation in Norway

**2009**

- CCS Directive adopted in the EU

**2011**

- Deadline for national implementation of the CCS Directive in the EU

**2013**

- Entry into force in the EEA/EFTA States / Norway
- EEA Joint Committee Decision

**2014**

- Proposal for a new Regulation on $CO_2$ storage, including amendments to relevant Regulations on public consultation
- Implementation through a new $CO_2$ Storage Regulation
- Implementation through the Pollution Control Regulations – new chapter
- Implementation through the Petroleum Regulations – new chapter

**2020**

- The $CO_2$ Safety Regulation

# Bilateral cooperation on CCS

## The London Protocol

- Bilateral «*agreement or arrangement*» required
- Ratification and provisional application of the 2009 amendment (art. 6.2)

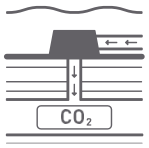
**Norway needs a legally binding bilateral agreement** in order to import $CO_2$ for permanent geological storage on NCS

**Norway is negotiating bilateral agreements** with several interested countries

- Already have existing MoUs on CCS cooperation

## Important matters to consider

➔ The London Protocol (+ OSPAR Convention)
➔ International climate change regime
➔ Relevant EU legislation
➔ Bilateral matters





Norwegian Ministry
of Petroleum and Energy

Aslak Viumdal

Senior Advisor, Gassnova

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GCCSI webinar | 13.03.2023

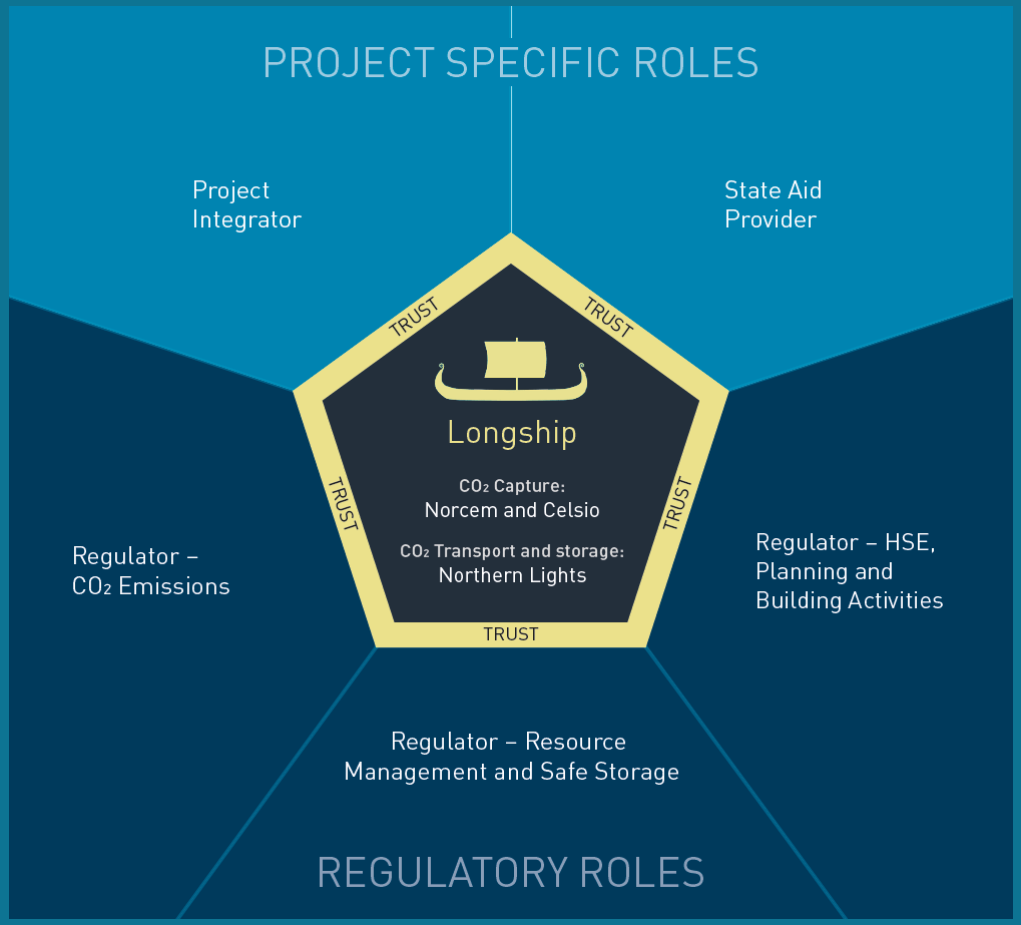
# Regulatory lessons learned from Longship

**Aslak Viumdal**
*Senior Advisor, Gassnova*

# Longship is a first-of-a-kind CCS project. Construction started in 2021

- Demonstration of a full-scale CCS chain, based on hard-to-abate industries
- Application of EU - and Norwegian regulations on industrial scale CCS projects
- Including both biogenic– and fossil-based $CO_2$
- Establishing flexible transport (ship based) and an open-source infrastructure
- Aimed at catalyzing CCS market development in Europe, including cross-border CCS chains

# Public sector's involvement in Longship




## Project specific roles

- Ministry of Petroleum and Energy
- Gassnova

## Regulatory roles

- Ministry of Climate and Environment
- Norwegian Environment Agency
- Ministry of Petroleum and Energy
- Norwegian Petroleum Directorate
- Petroleum Safety Authority
- Directorate for Civil Protection and Emergency
- County governor
- Municipality
- And more…

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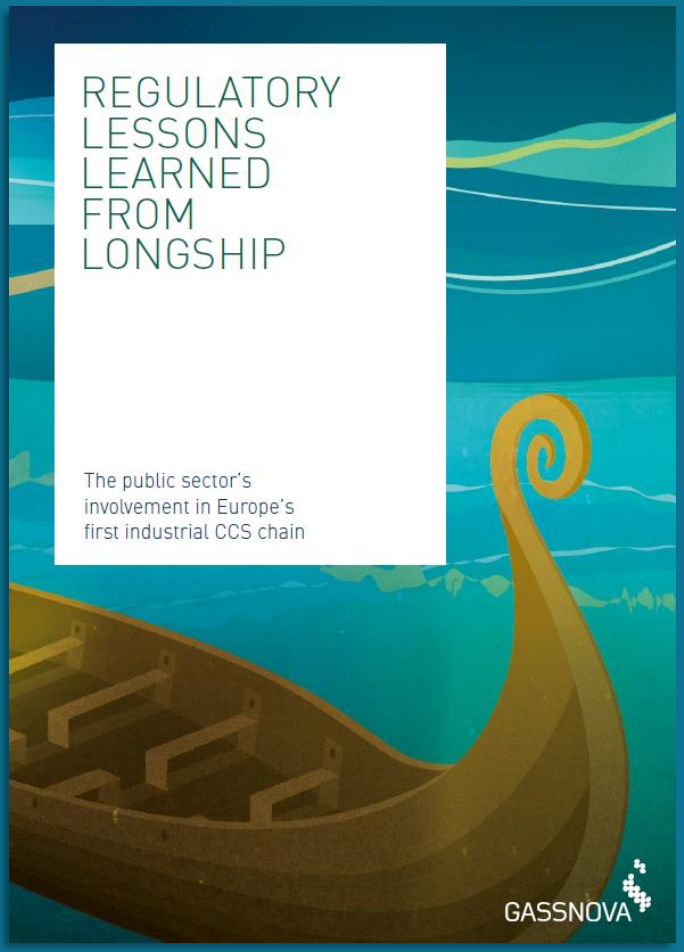
# A few highlights from the report




- Realization of a CCS project contributed to regulatory development (further development needed)
- "The Longship framework" made it possible for industrial investments in CCS activities
- Both biogenic - and fossil CO2 needed to be incentivized for Longships capture projects
- Regulatory regime often based on oil and gas experience. Possibility for better fit with CCS business model and CCS market maturity?

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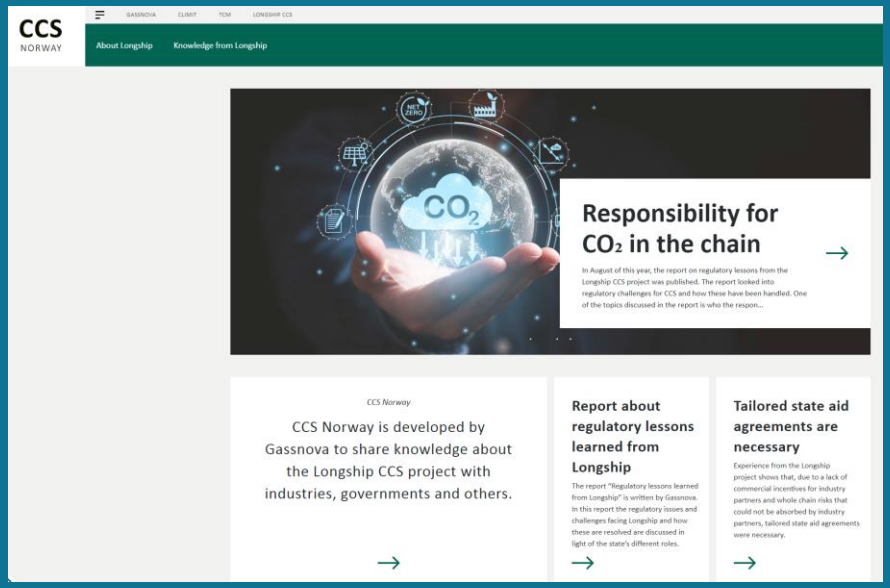
# Website for knowledge sharing from Longship:

## https://ccsnorway.com





- Feed studies and other study documents
- LCA/$CO_2$-footprint analysis
- Cost reduction analysis
- HSE-related studies

- Lessons learned reports
- And more…

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Børre Jacobsen

Managing Director, Northern Lights

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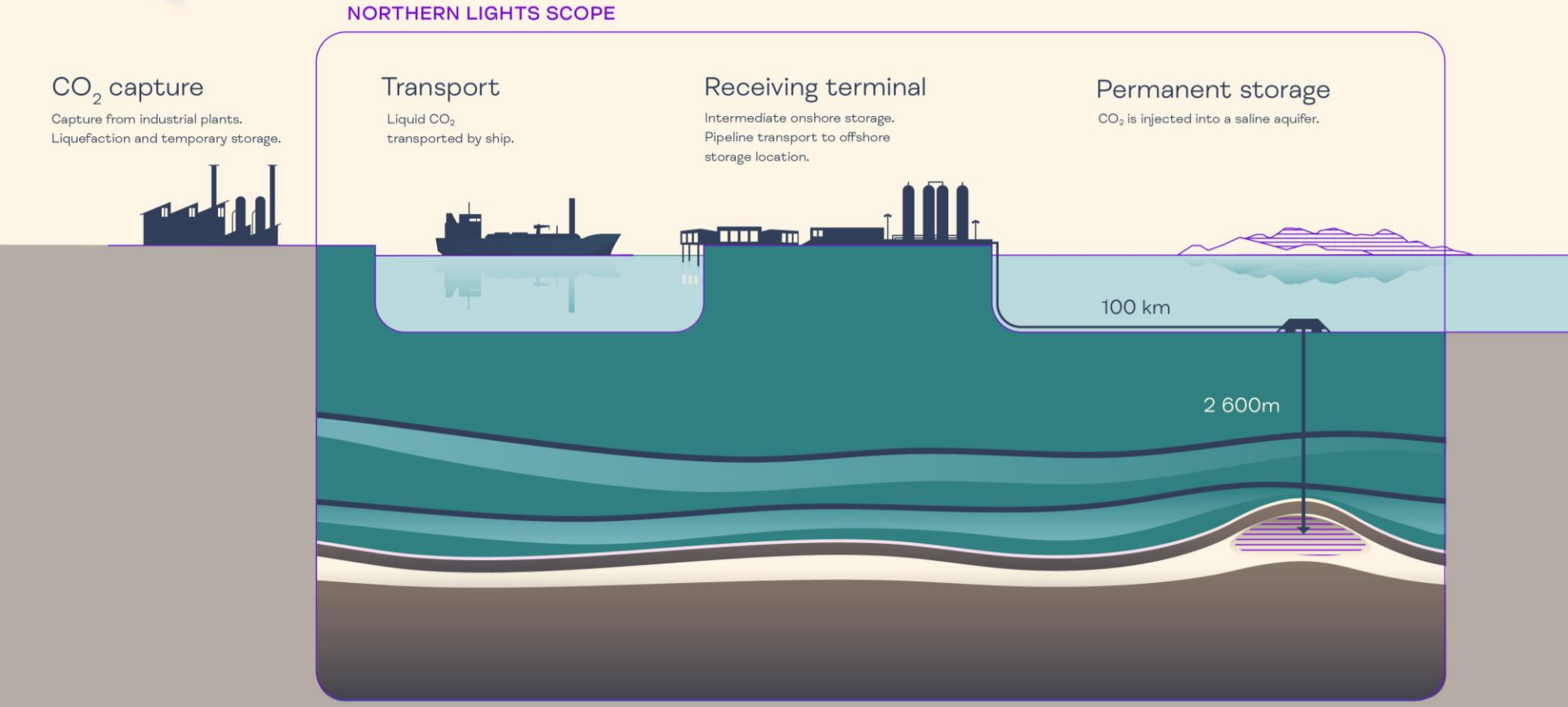
# Global CCS Institute webinar

Børre Jacobsen, Managing Director, Northern Lights JV

Northern Lights

Northern Lights

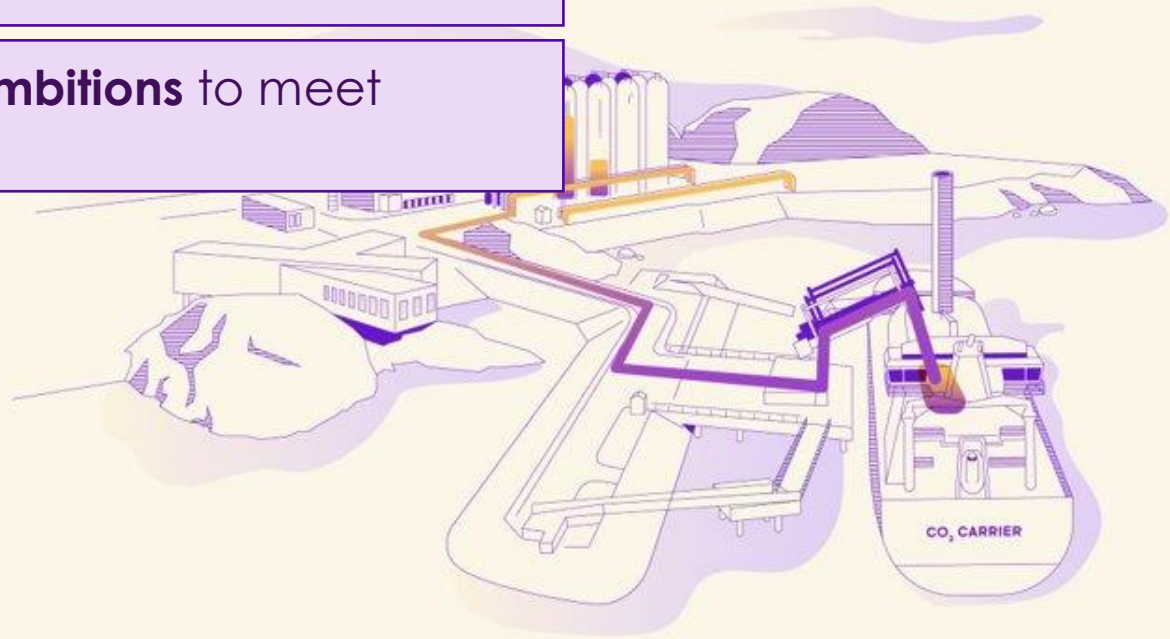
# $CO_2$ transport & storage at scale



Northern Lights

# **FOCUS:** Delivering on commitments

| | |
|---|---|
| 1 | **Deliver Phase 1** - operational in 2024 |
| 2 | Develop **commercial expansion** (**Phase 2**) |
| 3 | Deliver on **growth ambitions** to meet market demand |



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# Learnings

## CCS business is not a hydrocarbon business

- → **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**
- → Changing geopolitical situation: **security of energy vs. climate targets**

Northern Lights

norlights.com

Johanne Koll-Hansen Bø

Vice President and Head of CCS, Altera Infrastructure

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Stella Maris CCS
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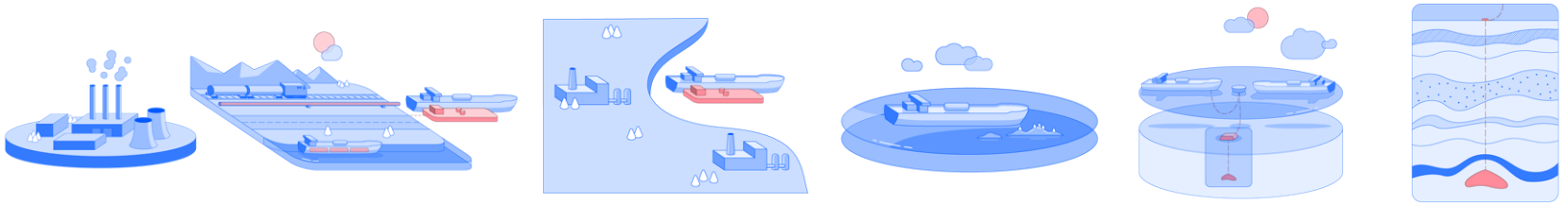
# Large-scale integrated value chain for CO2 infrastructure - One-stop-shop from collection to storage

Stella Maris CCS



**Capturing Technology**

**Transport $CO_2$ from Emitter to $CO_2$ Terminal**

**Collection**
$CO_2$ Terminal

**Transportation**
$CO_2$-shuttle carriers

**Injection of $CO_2$**
Floating Injection Unit

**Offshore Storage Reservoir**

- Flexible and scalable maritime solution with direct injection solution
- «Open access» and non-discriminating CO2 infrastructure
- Minimizes cross value chain risk – coping with the chicken and egg situation

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# CCS development – increasing number of capture and infrastructure projects, but CO2 storage is a short-term constraint

Stella Maris CCS

- Norway has taken a leading role within CCS development in Europe. First Longship – now focusing on providing offshore storage
- There is currently no developed commercial market for CO2 storage in Europe
- CO2 storage will be a short-term constraint in the European market the coming years – huge mismatch between supply and demand
- Limitation of CO2 storage – the biggest near-term threat to CCS development?
- Time is of the essence – it takes three to four years to develop an offshore storage reservoir
- Ensure that this new CCS industry is not only being managed by oil and gas companies – we need industry diversity within all the components of the value chain – including storage
- The importance of stimulating the industry to develop *new* commercial and technical solutions that fit a low-margin business like CCS

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# The future of CCS – an open and functional market

Stella Maris CCS

- An open and non-discriminating CO2 infrastructure network allowing large and small emitters and clusters to connect – sharing risks and costs
- ~ €100/t for the complete value chain from source to sink
- A holistic and well integrated regulatory framework – regulations designed for CCS as a new industry
- A competitive and diversified market with multiple storage operators, shipping companies, capture technology providers and other suppliers in the value chain
- Regulatory predictability – makes CCS investible
- Long-term reservoir liability – the importance of a balanced and manageble set of requirements
- Industrial development – how we are working:
  - Promoting open access CO2 infrastructure
  - Industry-wide insurance scheme
  - Fund structure for long-term CO2 liability?

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Dr. Per Sandberg

Senior Advisor of Business Development, Equinor

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# Developing geological CO2 storage for Europe: From Sleipner via Northern Lights to Large Scale Solution

GCCSI Webinar 13 March 2023
*CCS Commercial and Regulatory Frameworks: Lessons Learned from CCS Front-runners in Norway*

Dr Per Sandberg, Equinor Low Carbon Solutions
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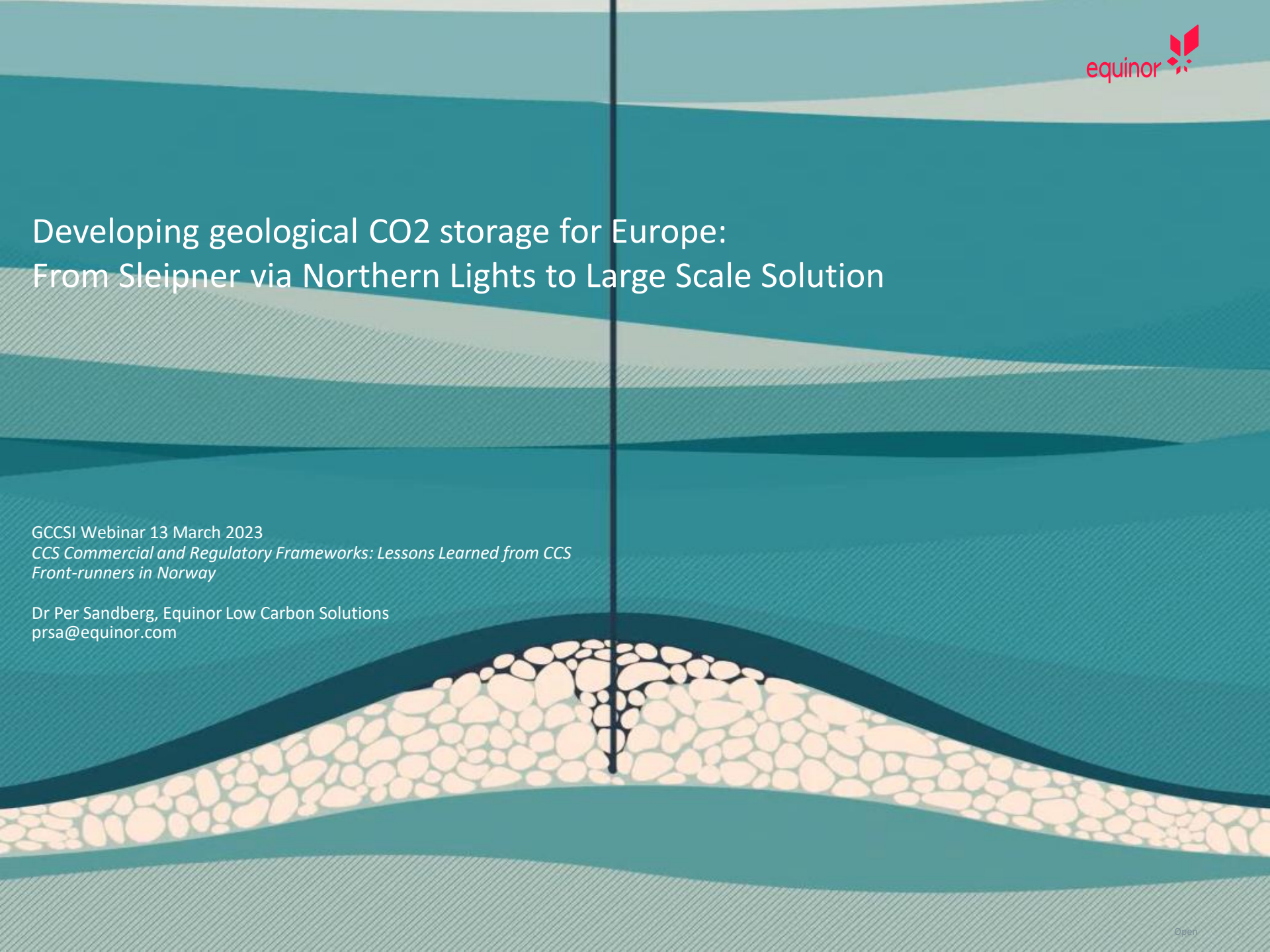


# CCS scale up- building on 26 years of operational experience and Northern Lights

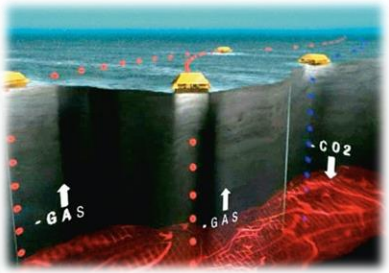
## 15-30 Mtpa

$CO_2$ transport and storage capacity by 2035

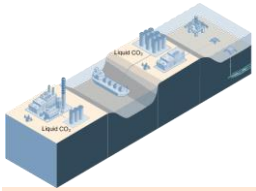
Equinor share

SLEIPNER


SNØHVIT

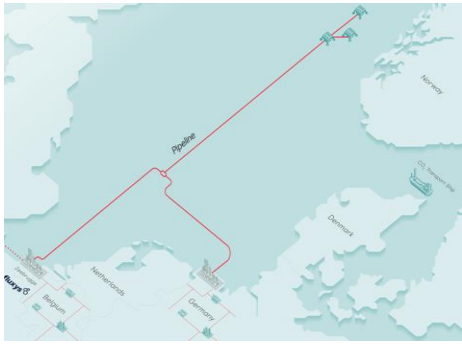



NORTHERN LIGHTS



EAST COAST CLUSTER. UK


SMEAHEIA




**Costing Down by Scaling Up**

**Northern Lights – Market opener**

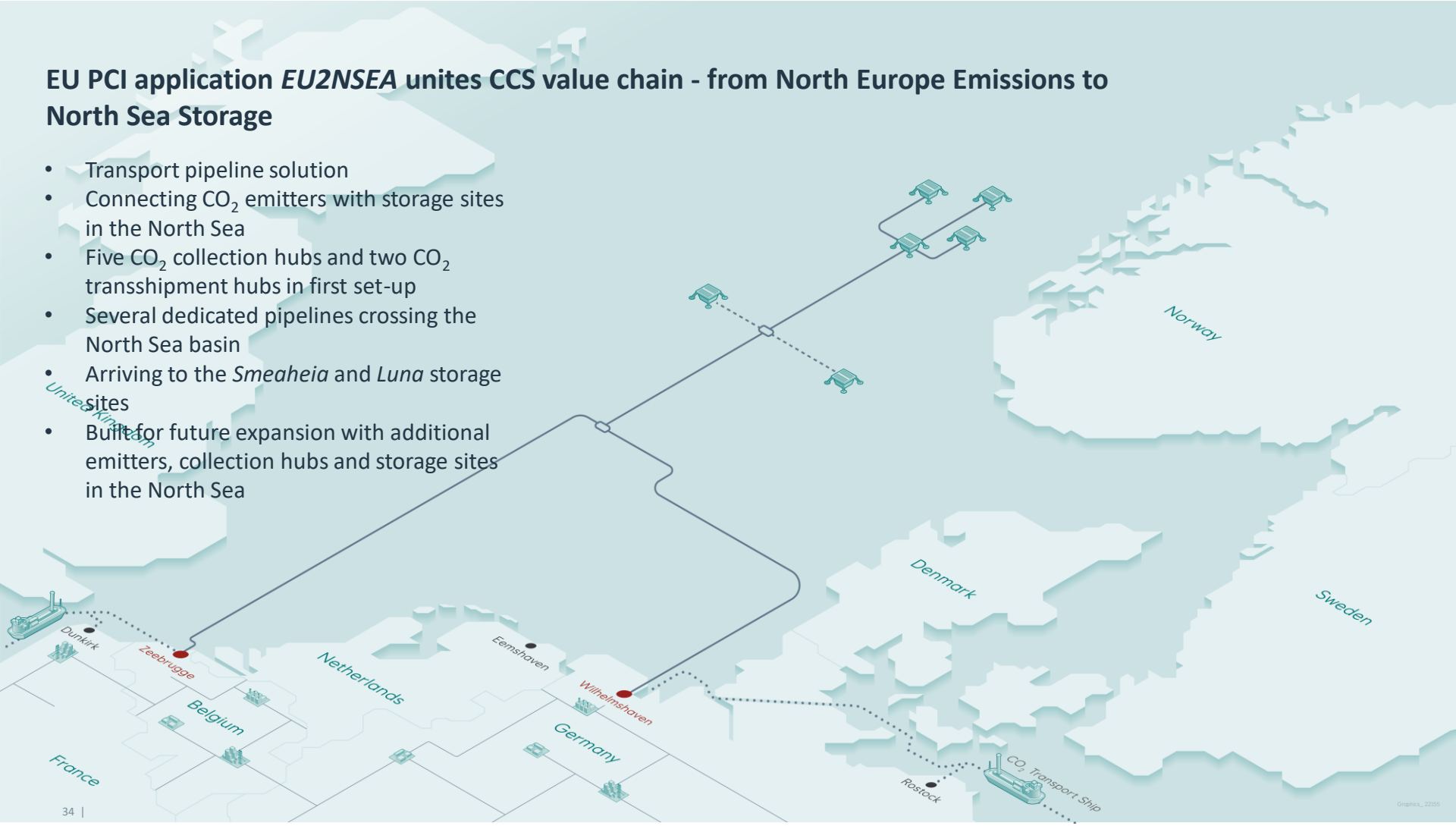
**Operation experience – technology works!**

# Some learnings

- CCS appears similar to oil & gas but is different – business cases must be built, not harvested
- Project developers & customers & authorities must build business cases together
- Business cases are built by always moving forward with project, business and market development
- Braveness and stamina needed !

# EU PCI application *EU2NSEA* unites CCS value chain - from North Europe Emissions to North Sea Storage

- Transport pipeline solution
- Connecting $CO_2$ emitters with storage sites in the North Sea
- Five $CO_2$ collection hubs and two $CO_2$ transshipment hubs in first set-up
- Several dedicated pipelines crossing the North Sea basin
- Arriving to the *Smeaheia* and *Luna* storage sites
- Built for future expansion with additional emitters, collection hubs and storage sites in the North Sea



# Frameworks must be improved – to make CCS the success it needs to become

- CCS is important for Europe's climate ambitions and not a transitional technology - *No CCS, no Green Deal*
- Hubs & clusters, multi-modal transport cross-border from exporting to receiving countries
- Permitting designed for rapid success at scale
- Cost efficiency in monitoring plans, whilst respecting overall rationale of "permanent and safe storage"
- Financial Security (FS) requirements based on CCS being a safe and strongly needed climate measure:
  - Include the probability of the event
  - Built up over time
  - Risk sharing mechanism for long-term liability

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https://status22.globalccsinstitute.com/


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