

Northern Lights

A European CO₂ transport and storage network

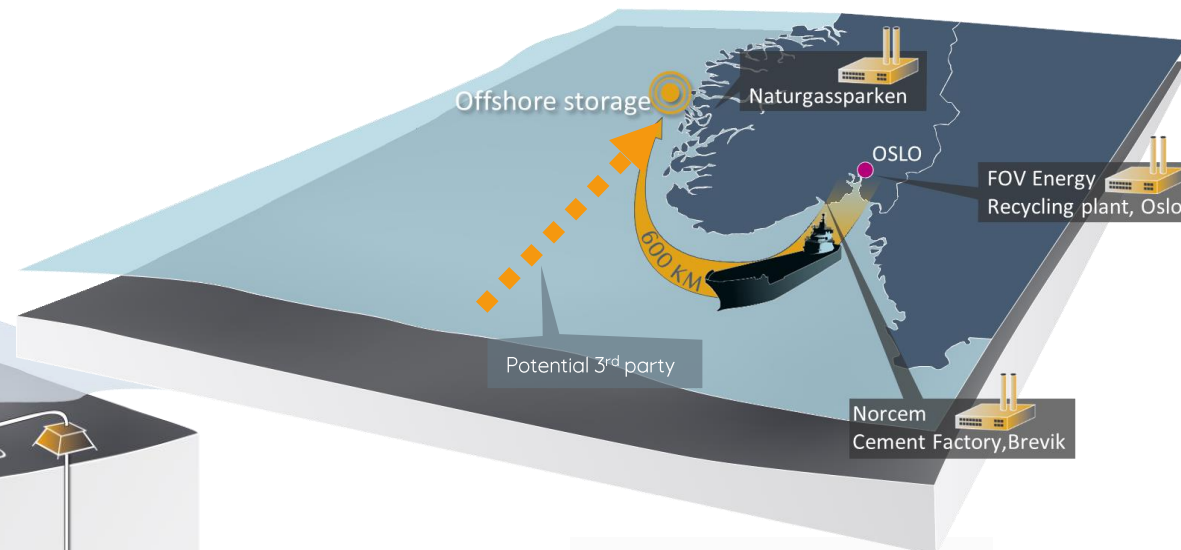
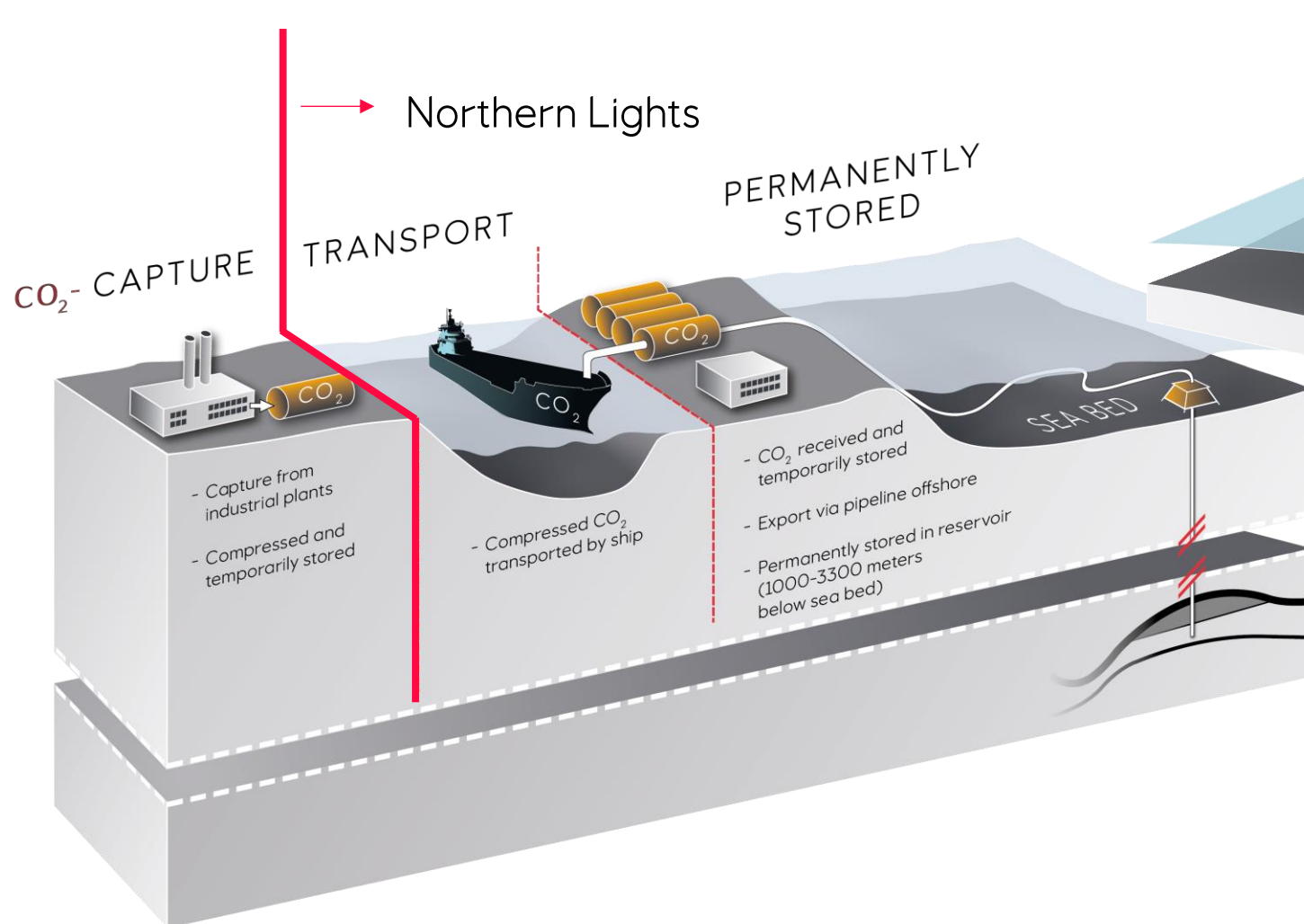
CCS event - Paris 23 May 2019
Cristel Lambton - Equinor



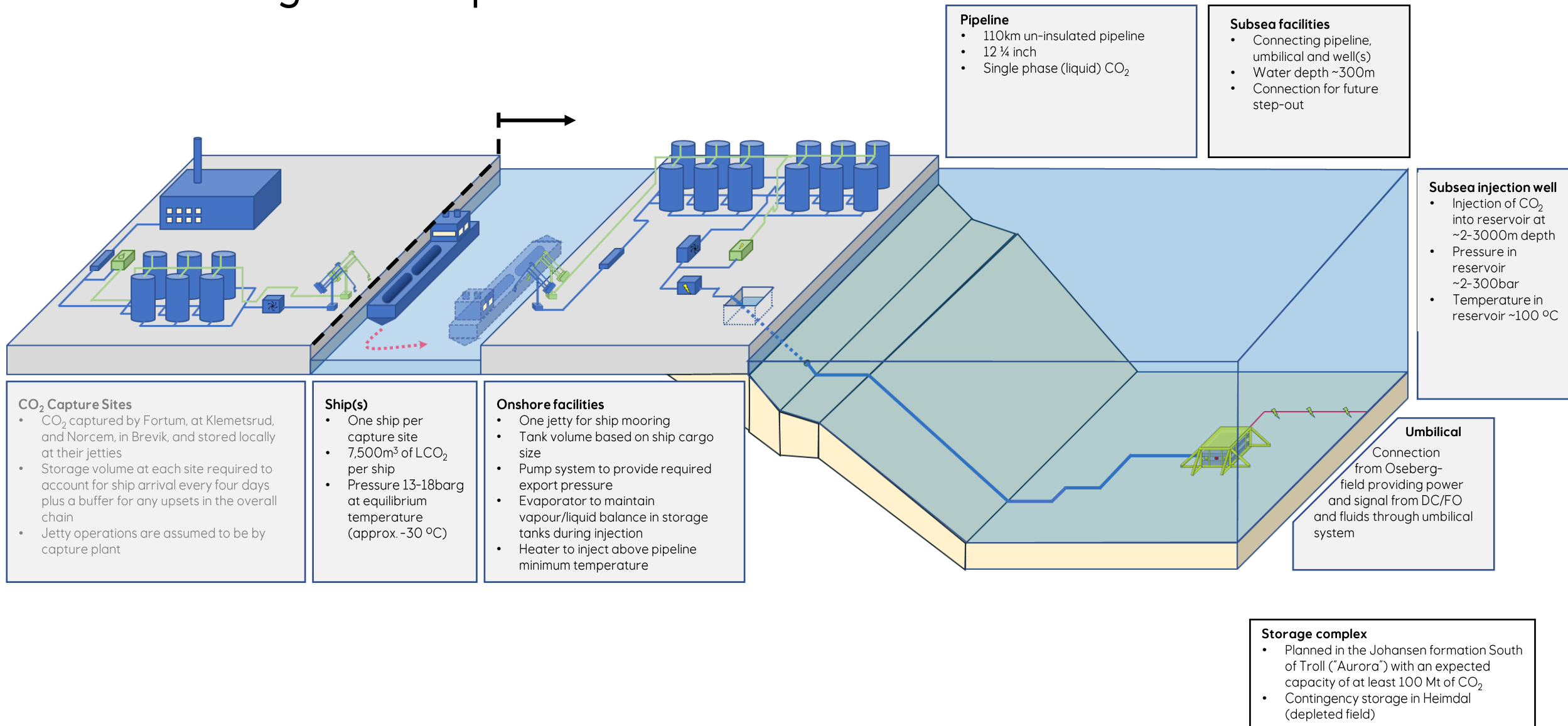
TOTAL

Norwegian full scale CCS demonstration project

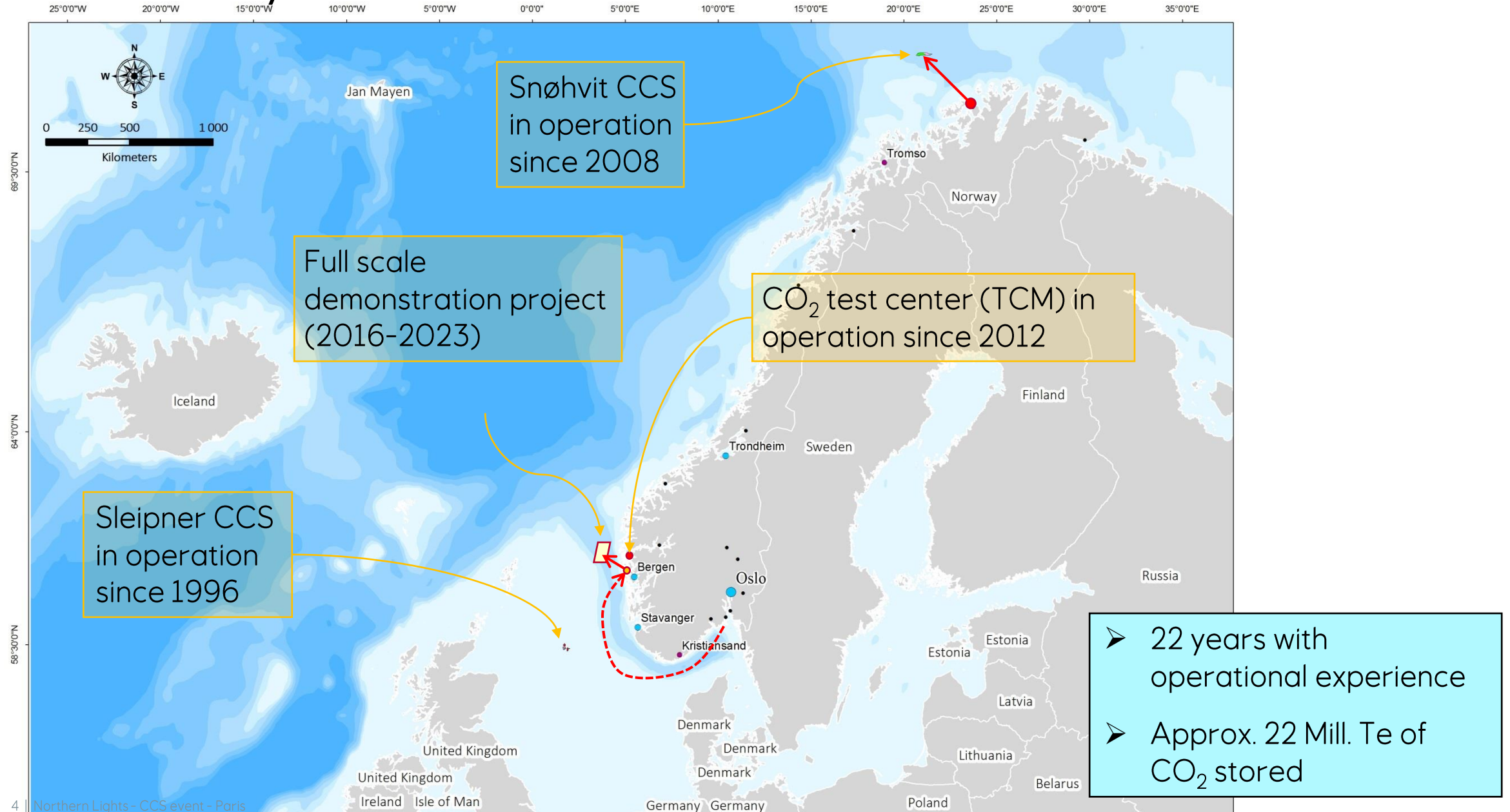
- Enabling industrial decarbonisation -



Northern Lights concept overview



CCS in Norway



We have confidence in CCS and CO₂ storage

The operational experience argument

"We know from 22 years of operations that CCS works"

The geophysical monitoring argument

"We can see where the CO₂ is and show it is safely stored"

The regulatory compliance argument

"We can demonstrate regulatory conformance"

The underlying physics of CO₂ storage in rock pores

"CO₂ is trapped in microscopic rock pores by the same process that has trapped natural gas for millions of years"

Scaling up CO₂ storage



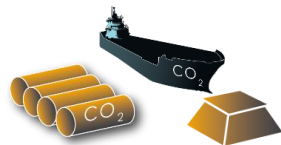
Project phase 1
Volume_{CO₂} < 1.5MT/y
1 well
12" pipeline
12 storage tanks
1 ship per capture site
tank volume based on ship cargo size

Project phase 2
Volume_{CO₂} < 5MT/y
2 or more wells
12" pipeline
36 storage tanks
more ships

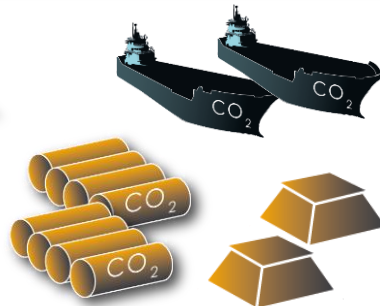
Project phase 3
Volume_{CO₂} > 5MT/y
more wells
additional pipeline
more storage tanks
more ships - bigger ships

More projects

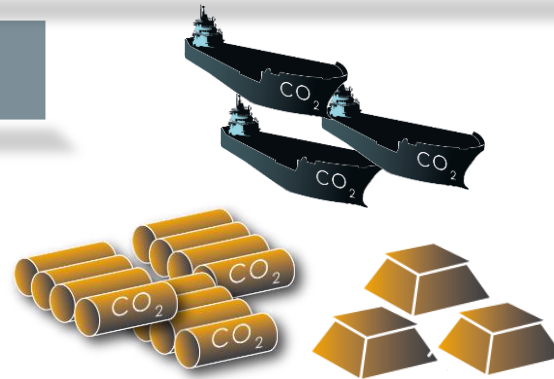
Step 1



Step 2



Step 3



Step 4

The European potential – understanding the scale

Europe

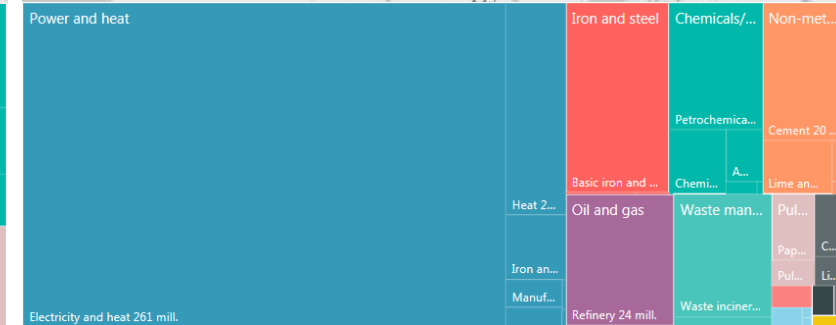
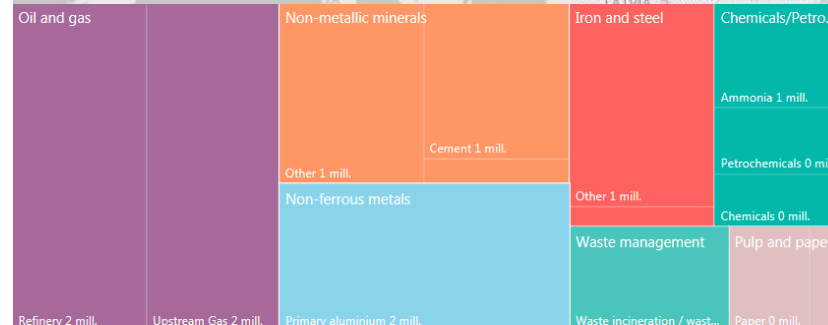
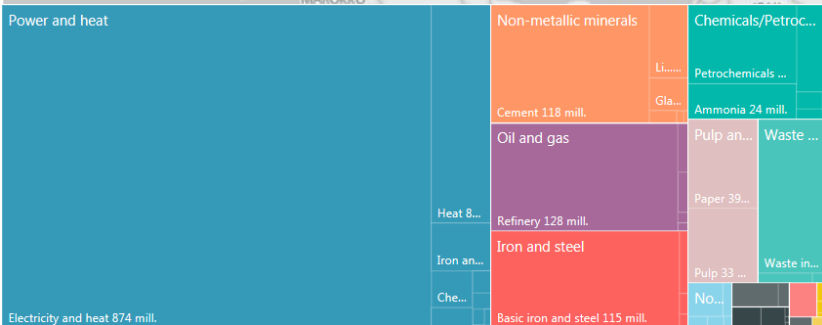
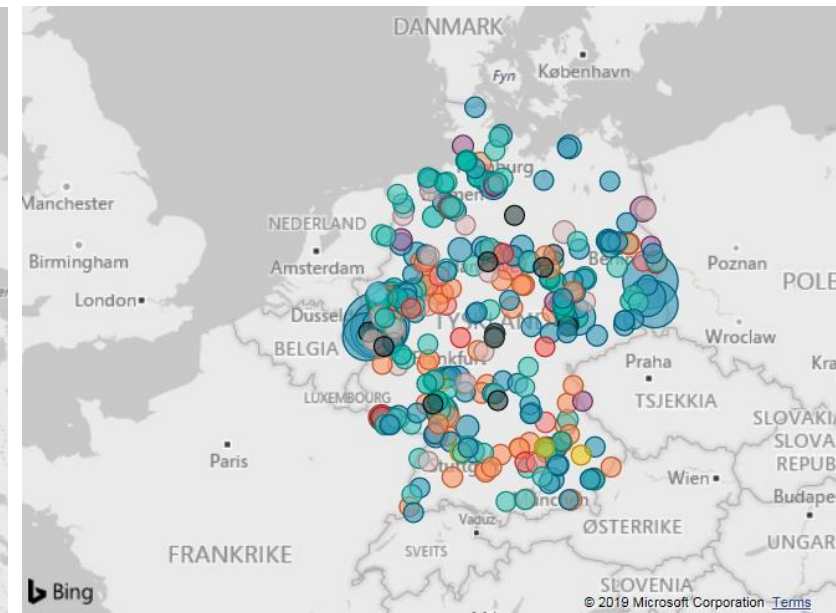
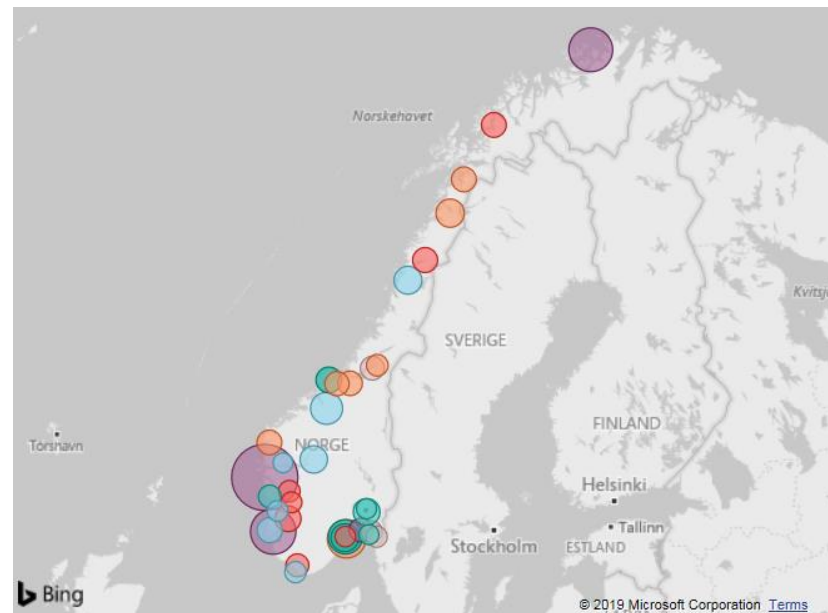
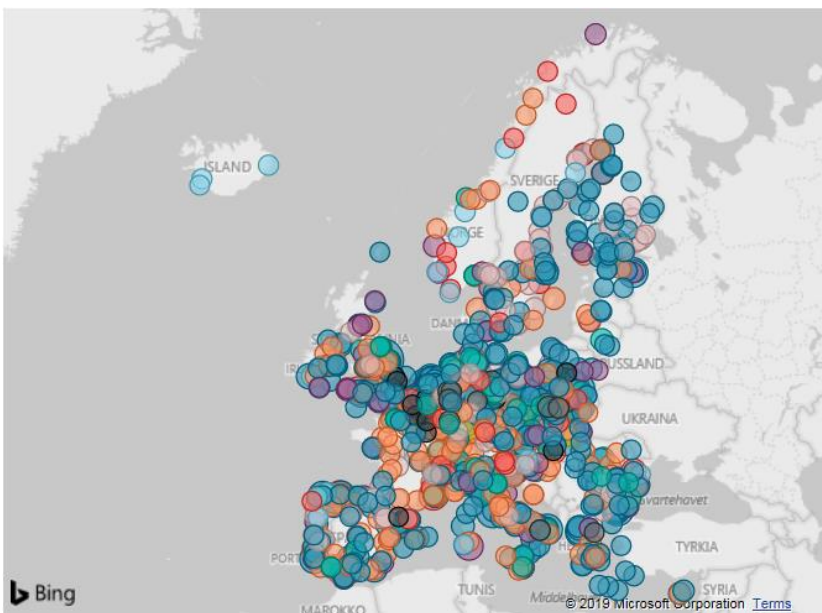
1994 facilities
1680 million tons of CO₂

Norway

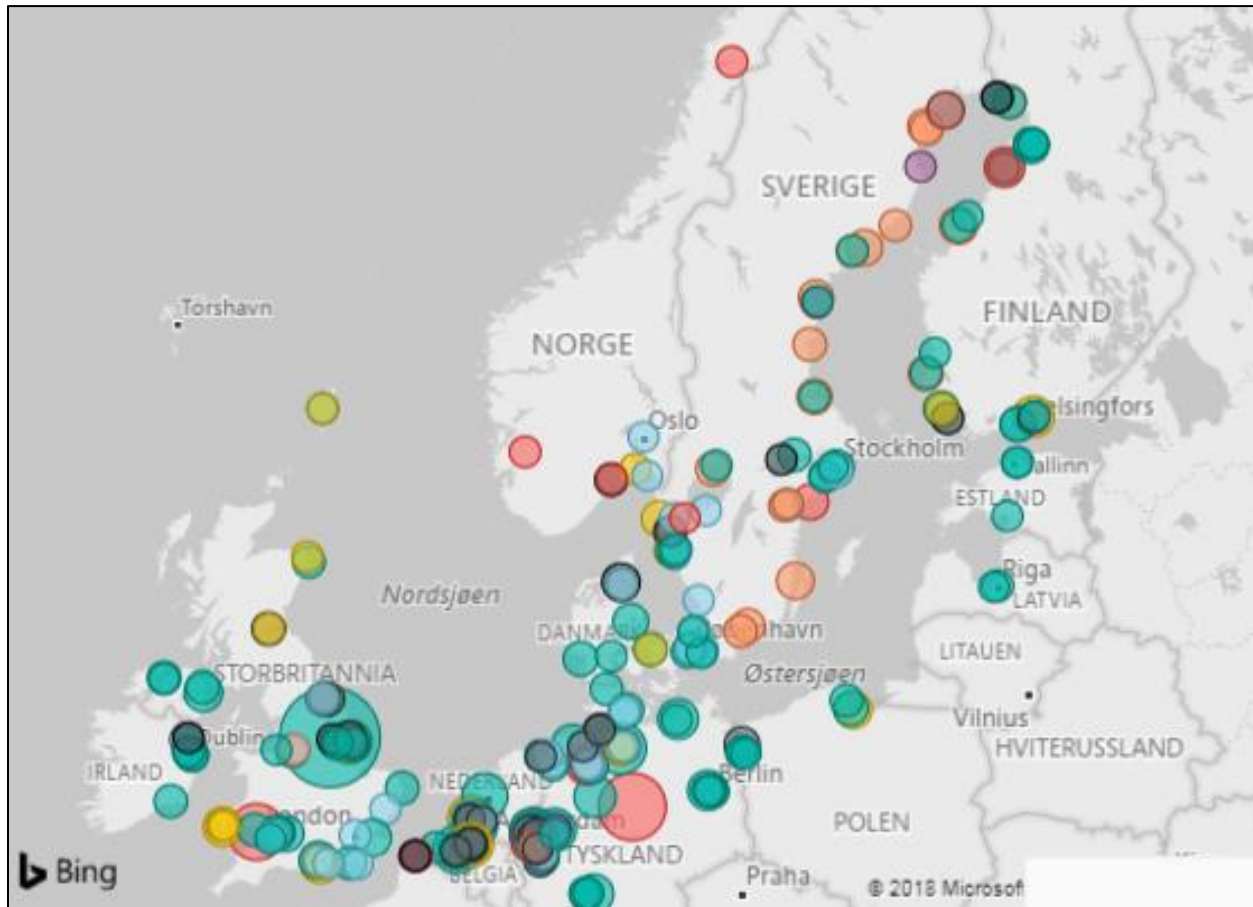
35 facilities
13.6 million tons of CO₂

Germany

406 facilities
447 million tons of CO₂



“Open access” offer for CO₂ sources to establish capture



Sectors with largest potential

- Hydrogen from natural gas
- Waste incineration
- Cement
- Biomass and biofuel
- Steel production
- Refinery

The beginning of a European network for CO₂ removal

EU PCI application with 15 partners submitted 01.03.19

What are Projects of Common Interest (PCIs)?

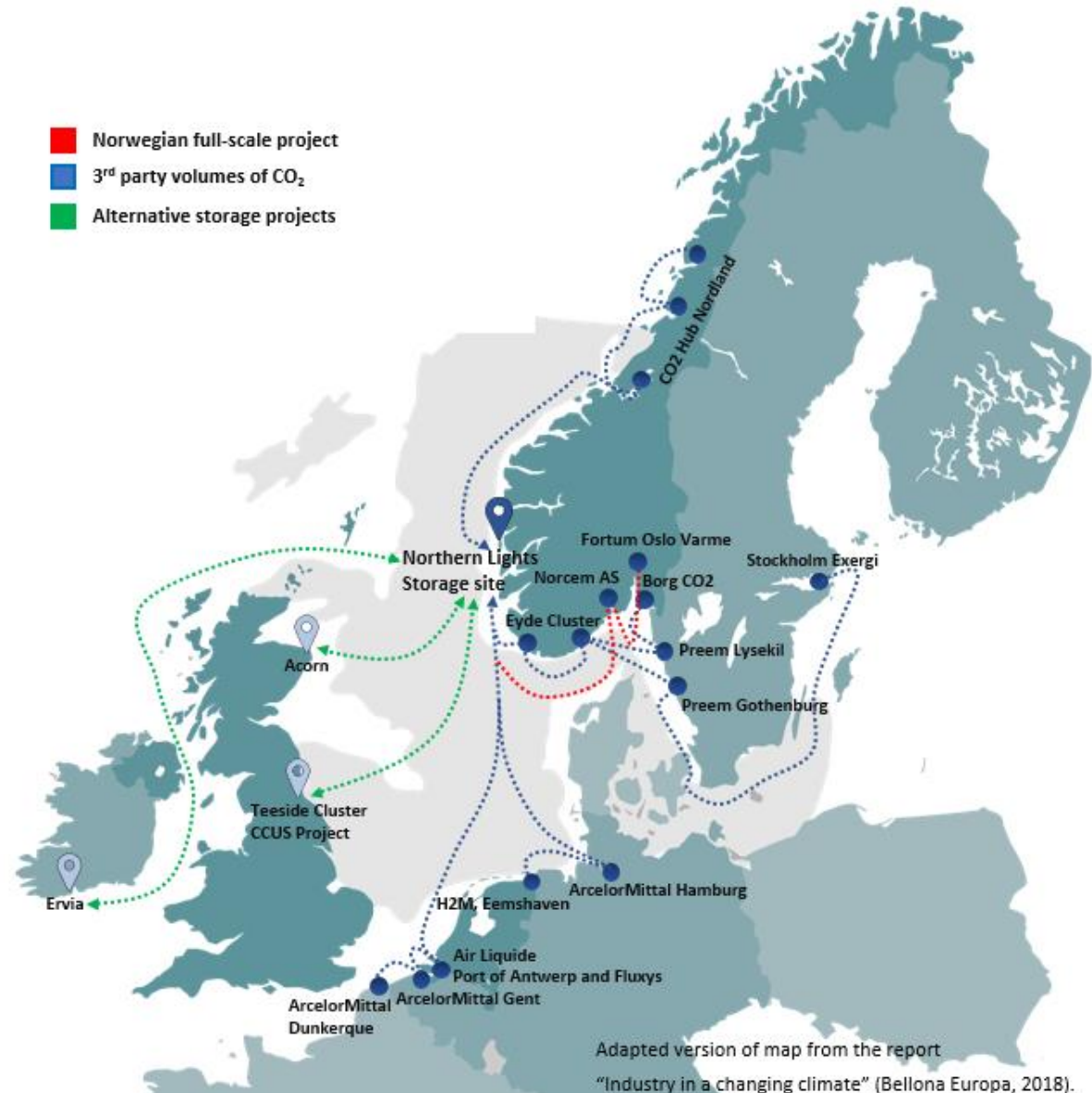
PCIs are infrastructure project that link the energy systems of EU countries.

Why are they important?

To have PCI status is the first important milestone for a Project to be eligible for funding from the EU.

The Northern Lights PCI

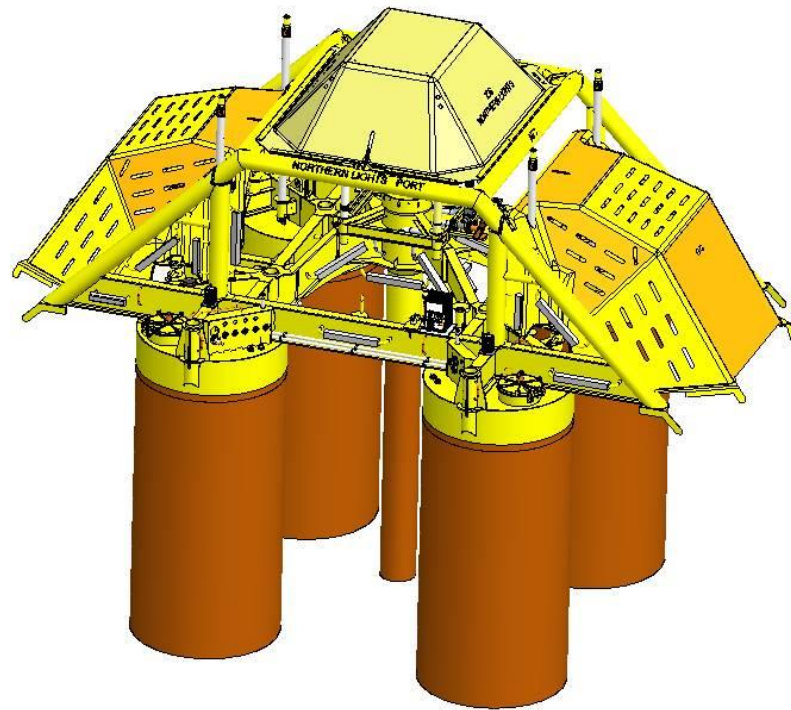
- 15 partners
- 7 countries
- 3 reciprocal alternative storage sites



Visualisation of land facilities (Naturgassparken in Øygarden)



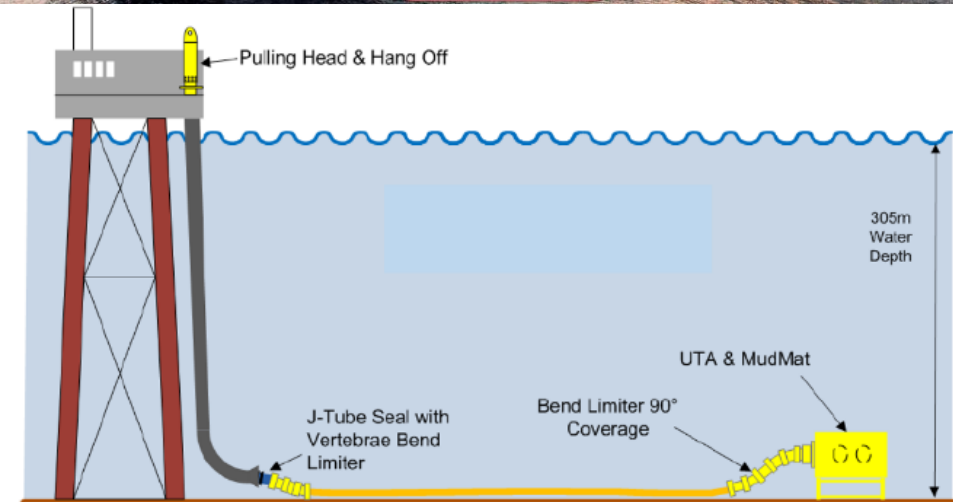
Subsea Facilities



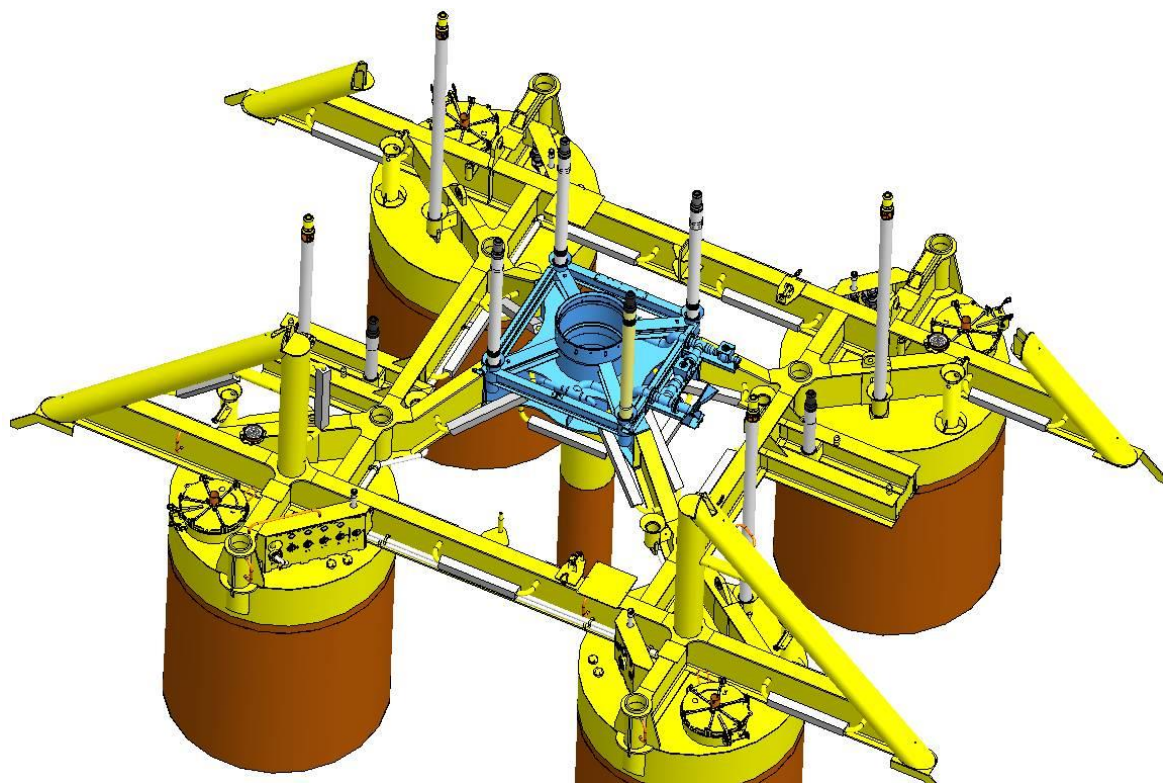
Satellite structure delivery 01.10.2019

Wellhead delivery 01.10.2019

Installation 10.2019

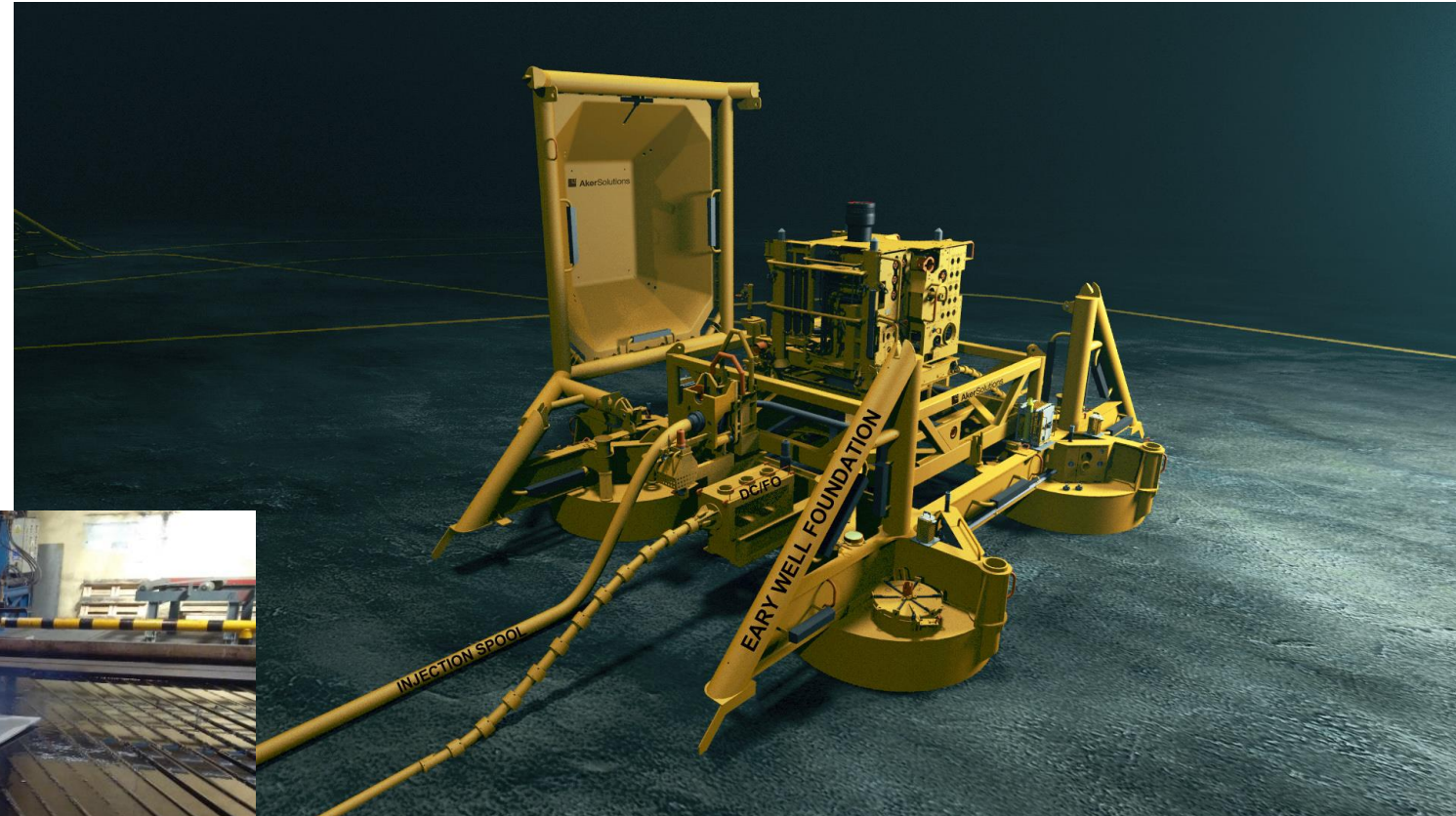


Our first stone...

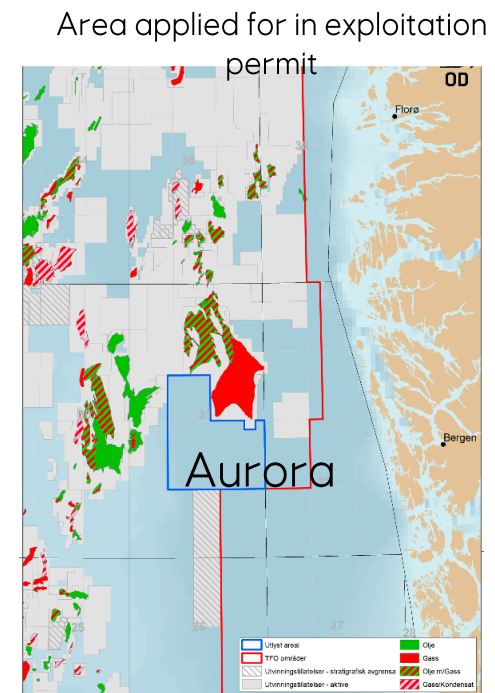
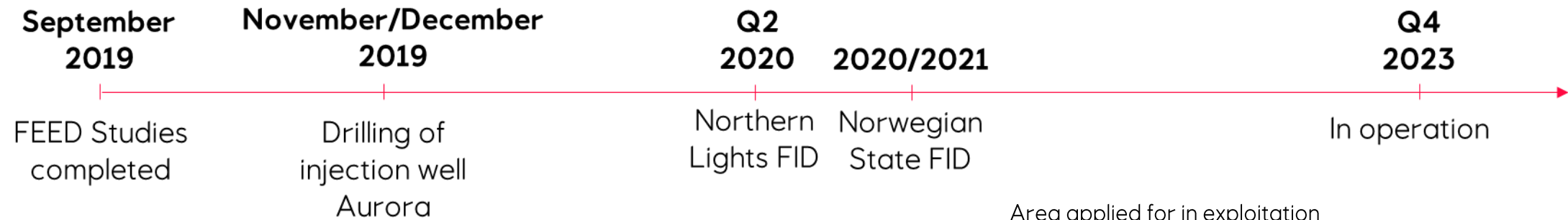


Well Bay Insert: finished fabricated 28.03 at EPG Poland, ready for painting

Latest snapshots



Project status & plan ahead



Northern Lights – CCS event Paris 23.05.19

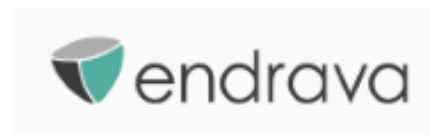
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Screening of 3rd party volumes

- Northern Lights currently screening for potential candidates for 3rd party volumes of CO₂ outside of Norway
- On request from the Norwegian Oil and Gas Association a model has been developed by Endrava (Valentin Vandenbussche) with support from Carbon Limits (Gaëlle Bureau)
- Data from The European Pollutant Release and Transfer Register
- Sites emitting more than 100 ktCO₂/ year in Europe
- Industrials sites producing power and heat, industrial facilities and waste management



CARBON LIMITS

Potential - France

- 209 facilities
- 103,3 MTPA of CO₂
- Estimated 69,2 MTPA of capturable CO₂ (generic)
- Large number of facilities located far from sea/port – however, large volumes in Dunkerque and Le Havre/Rouen

