Northern Lights

A European CO_2 transport and storage network

Workshop on Hydrogen Production with CCS, Paris, 6.11.19

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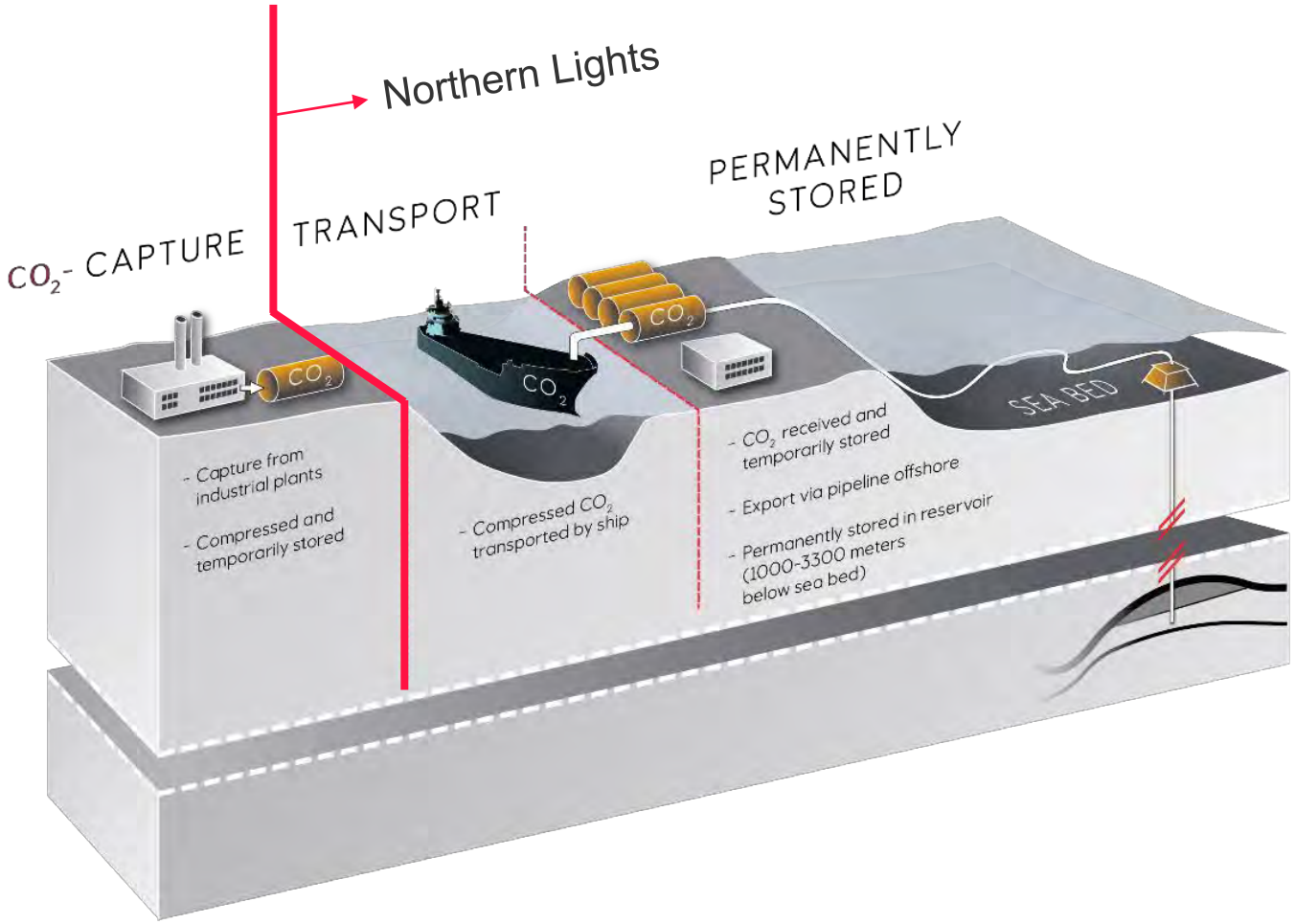
https://northernlightsccs.eu/

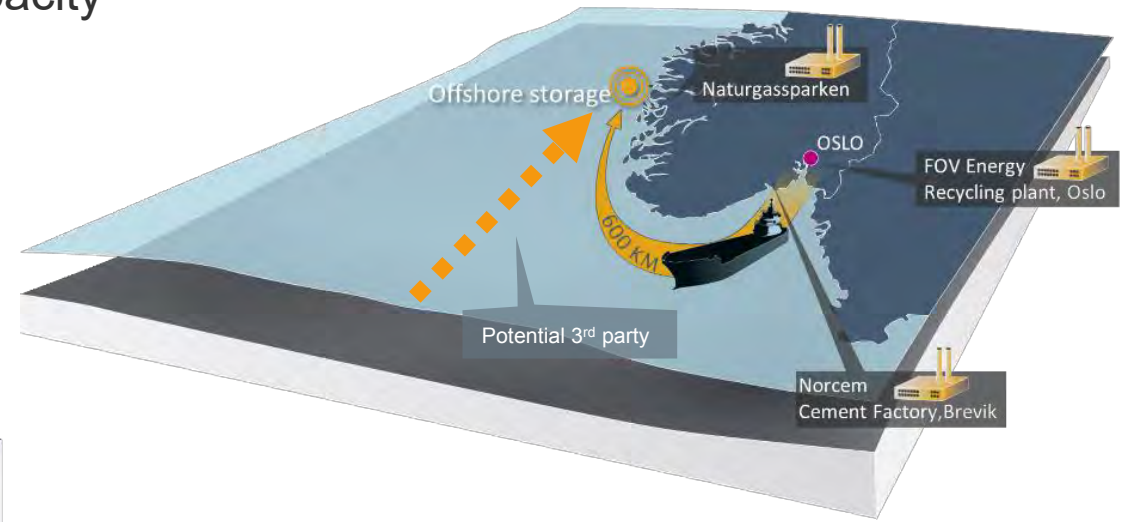
equinor

TOTAL

Northern Lights is part of Norwegian full scale CCS demonstration project

Ship-based transport & storage solution which enables industrial decarbonisation in Europe, first phase with 1.5 MTPA capacity, second phase 5 MTPA capacity





GASSNOVA

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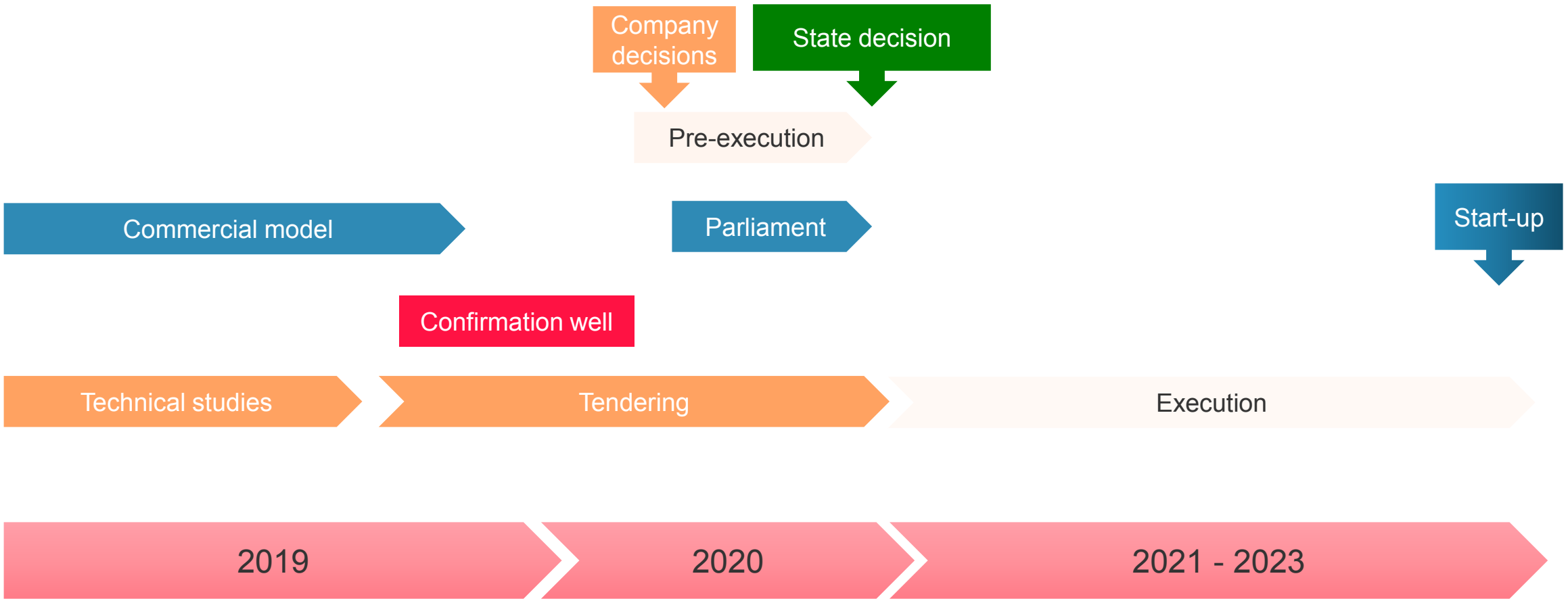
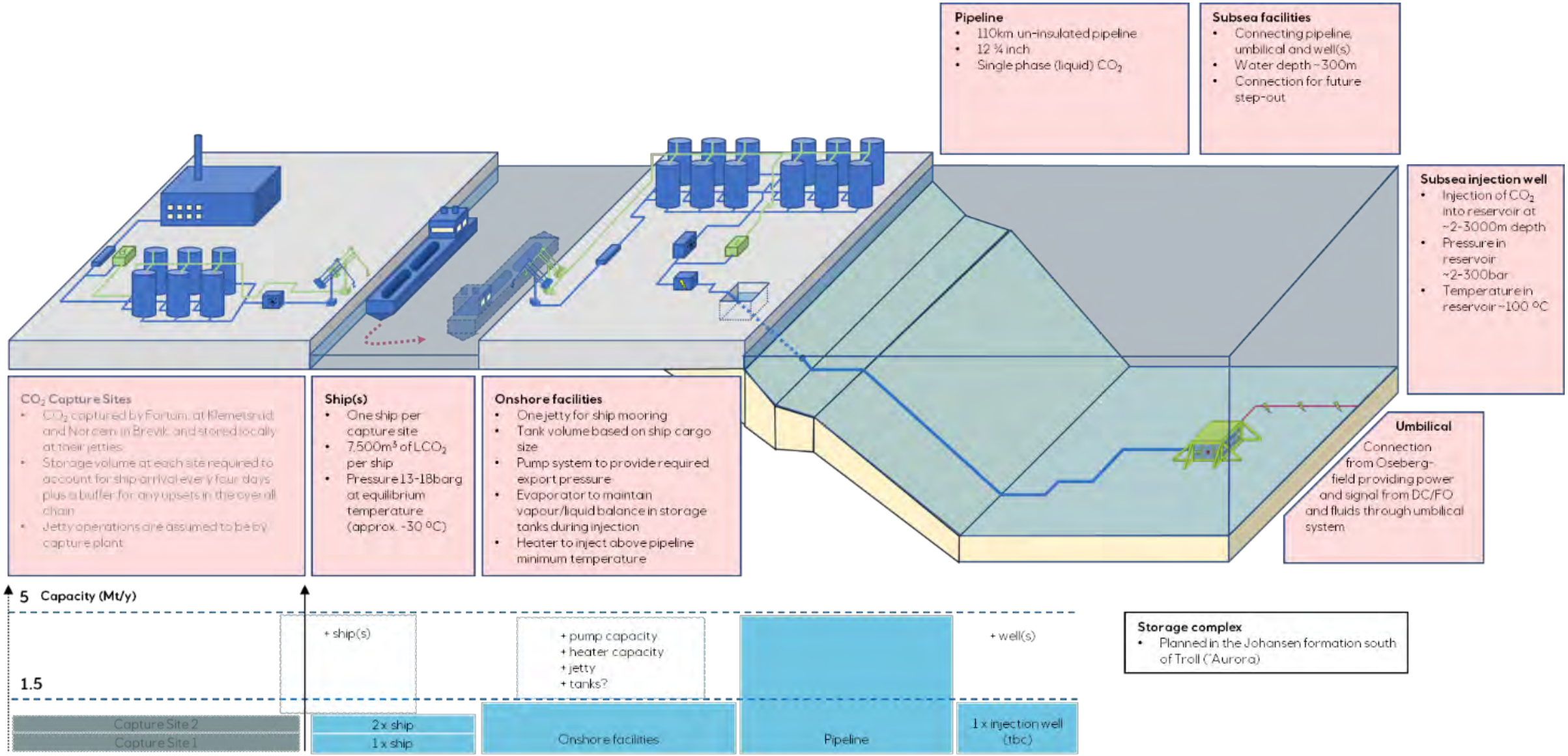
TOTAL

Timeline for Northern Lights phase 1



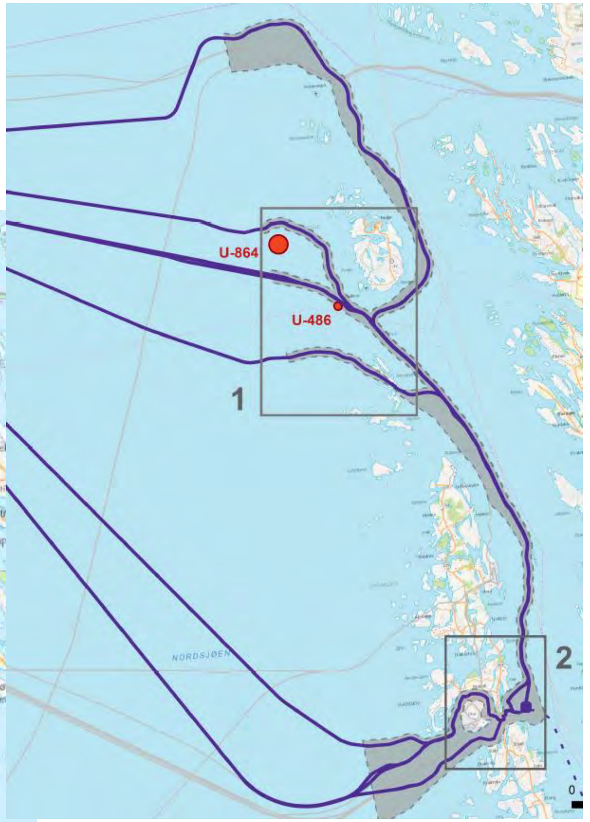
Concept Overview



Visualisation of CO_2 storage hub

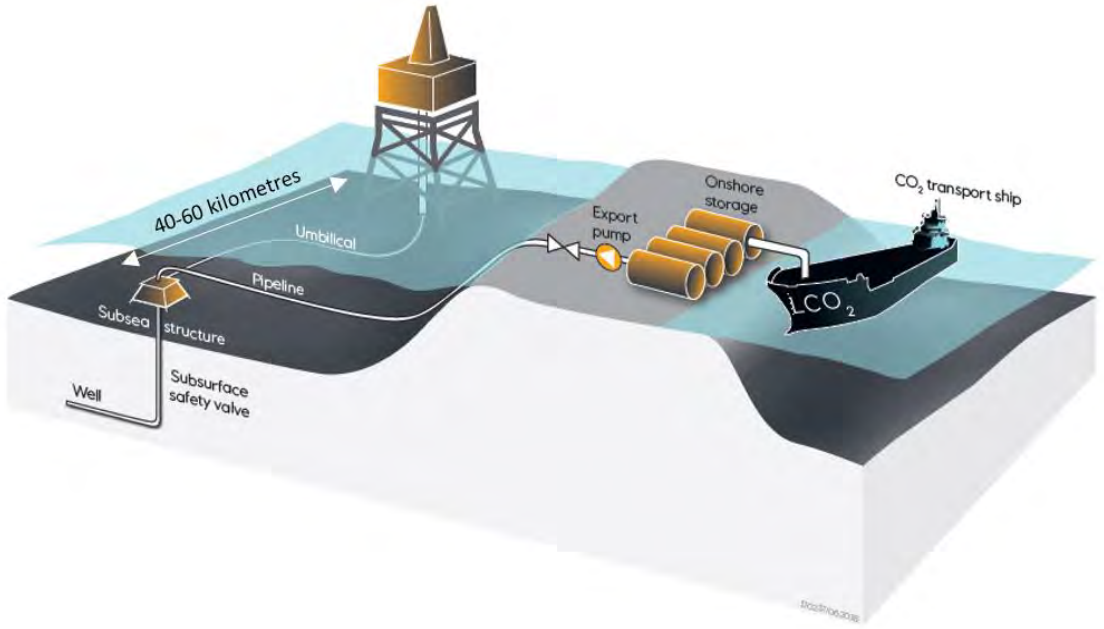
Pipeline

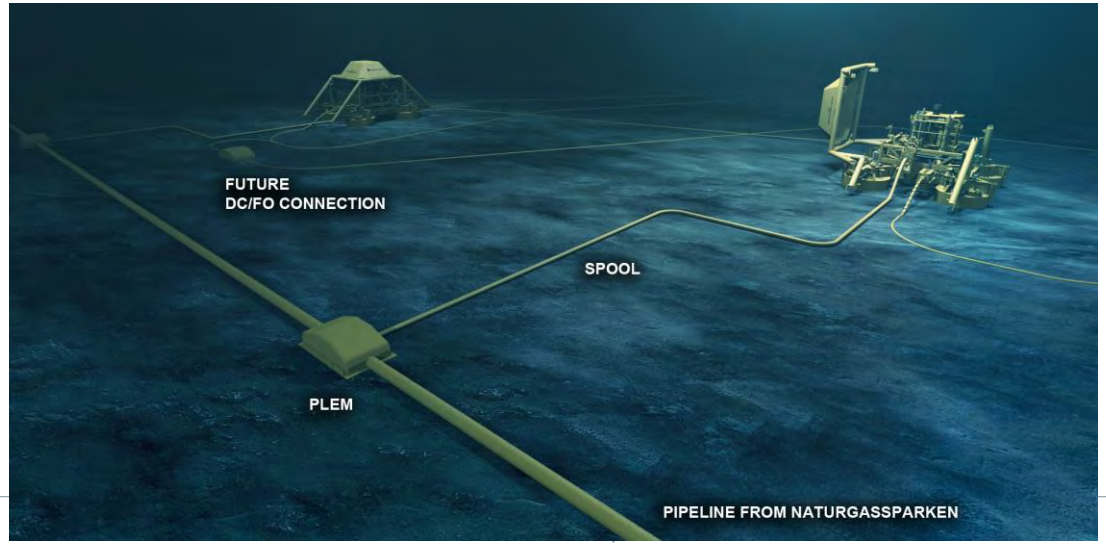

Fedje
1
2
NORDSJØEN
ØYGARDEN
Pipeline Route
Special Caution/Restricted Area
Zoning Plan
Copyright. Equinor ASA - Topographical Background. NMA
0 1,5 3 6 9
Kilometers
N
S
W
E


U-864
U-486
1
2

Subsea

- Early well → Integrated Satellite Structure & Wellhead System
- Tie-in (umbilical) to the Oseberg Field Centre
- Subsea Facility components
  - Subsea structure
  - Wellhead
  - Christmas tree
  - Control module
  - Protection structure
  - Control system
  - Umbilical/power cable (power, hydraulic, chemicals, signal)

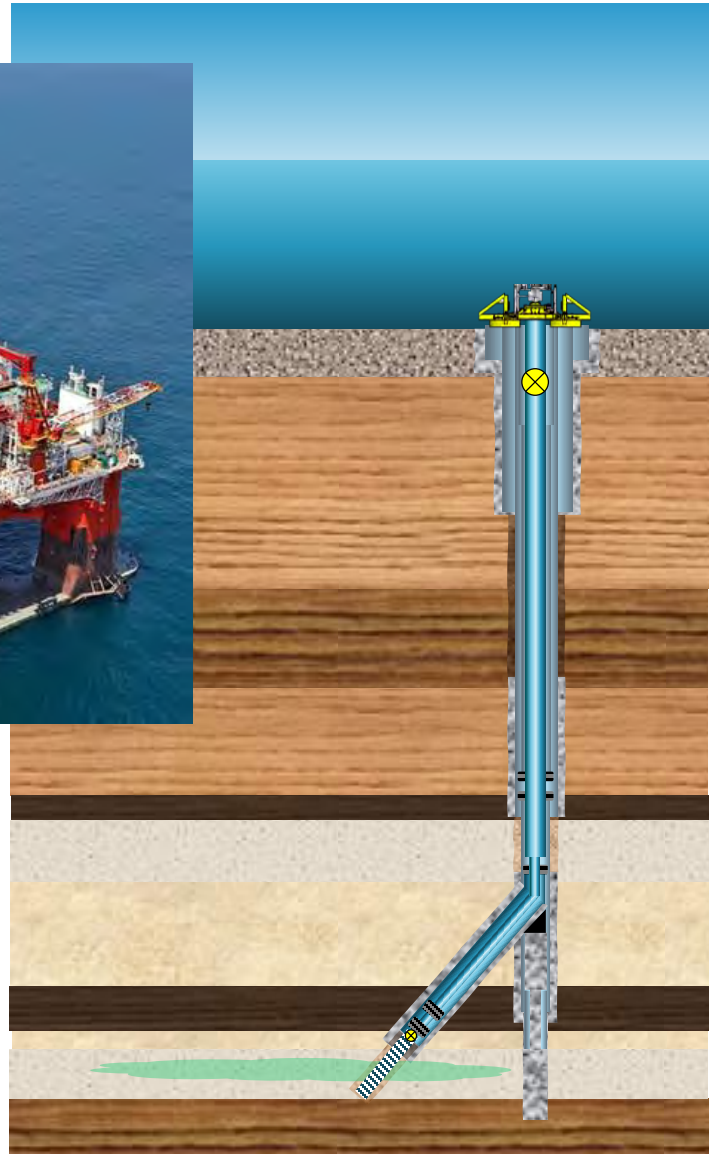




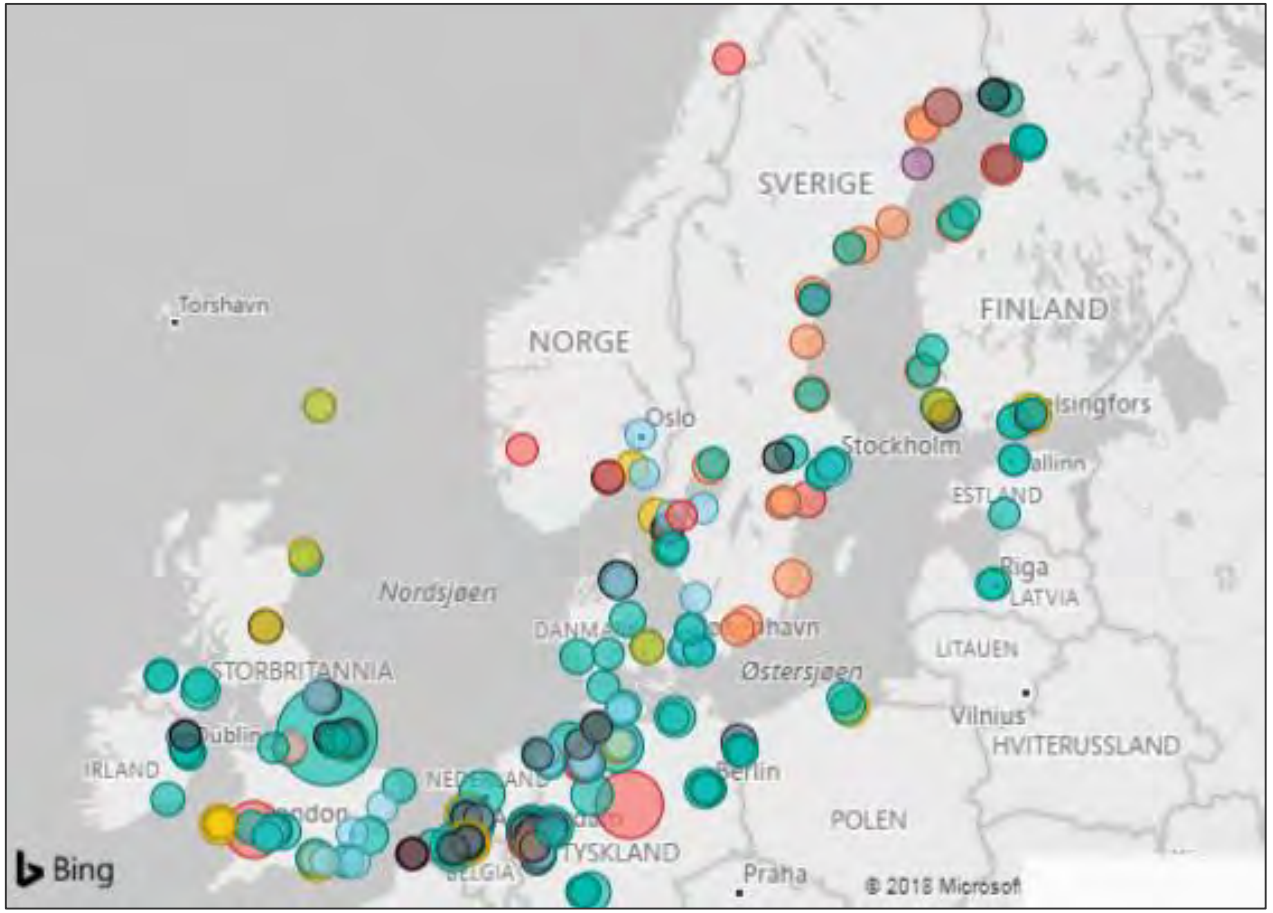

11.10.2019 10:00:39 E:524312.33 N:6715847.38 H:300.30 D:304.03 A:5.39 CON05

Drilling and Well

- Data acquisition – Eos well
  - Coring
  - Logging
  - Stress testing
  - Well test
- Keeper well
  - Temporary plug and abandon well in 2020
  - Re-entry, sidetrack and completion in 2022 or 2023



Enables ”open source” offer for CO_2 emitters to establish capture



Large potential with long-life sectors:

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

- *Northern Lights is relevant and within reach for about 350 facilities and 300 MTPA of these ”most attractive candidates”*

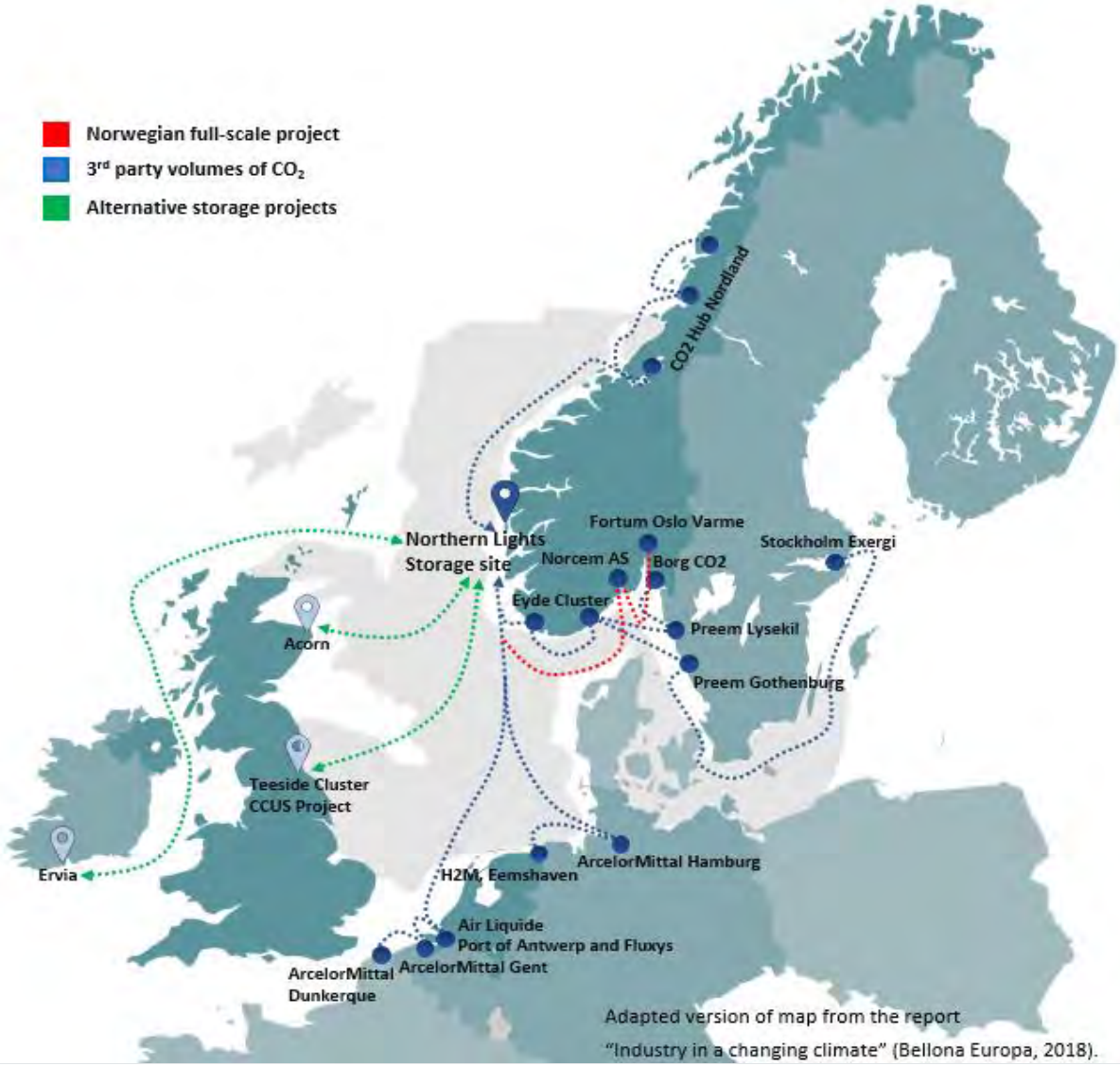
Northern Lights PCI application is the beginning of our contribution to a European network for CO_2 removal

EU PCI application submitted 1.3.19

PCI is Project of Common Interest

15 partners from 7 countries

Included on fourth PCI list by EU Commissin, October ’19, together with 4 other CCS projects:



Seven MoU's signed at CCS Conference 5.9.19

COMPANIES

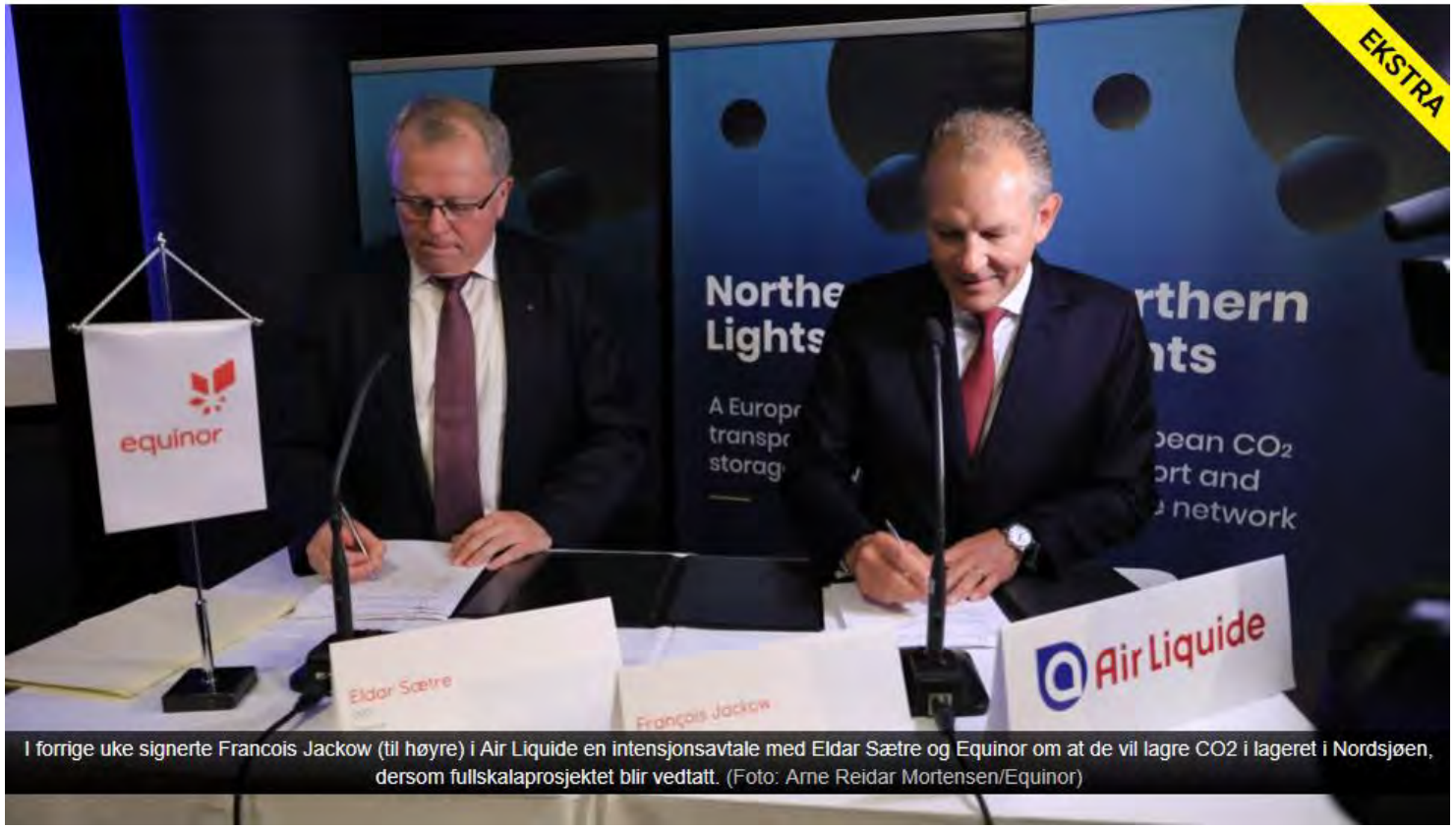
- Fortum Group; Finland
- Ervia, Ireland
- Air Liquide, Belgium
- Stockholm Exergi, Sweden
- ArcelorMittal, Luxembourg
- Preem, Sweden
- Heidelberg Group, Germany

TYPICAL CONTENT

- Logistics studies
- CO_2 specifications optimized across value chain
- Roadmap towards potential start of operations
- Joint advocacy for CCS and its importance for decarbonization of European industry
- Initiate dialogue with National and Norwegian Governments

Air Liquide: – Vi kan bidra med flere millioner tonn CO2 i året i et lager i Nordsjøen

Skal blant annet lage hydrogen fra naturgass – og fange CO2-en.



I forrige uke signerte Francois Jackow (til høyre) i Air Liquide en intensjonsavtale med Eldar Sætre og Equinor om at de vil lagre CO2 i lageret i Nordsjøen, dersom fullskalaprosjektet blir vedtatt. (Foto: Arne Reidar Mortensen/Equinor)

Some regulatory amendments needed to make ship-based CCS happen

- ~~**London Protocol** – to allow for cross-border transport of CO2~~ FIXED 11.10 by collaboration with Governments!
- **CCS Directive** – to include ships in definition of CO2 transport network
- **EU ETS Directive** – to include ships in definition of CO2 transport network
- **TEN- E (CEF) Regulation** – to make ships eligible for funding

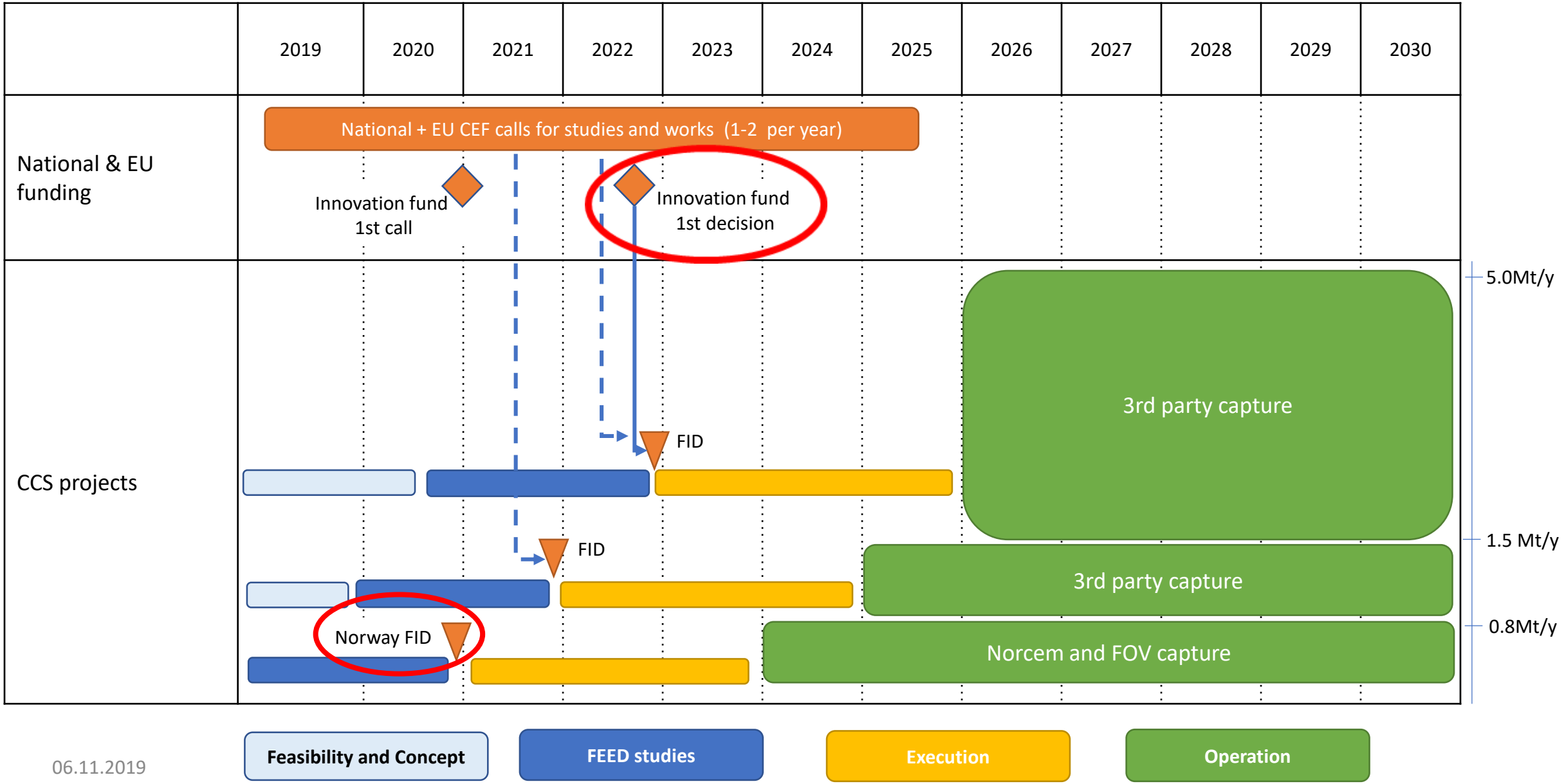
The London Protocol:

Together with the Netherlands, Norway submitted a resolution to the IMO/LP meeting 7-11 October 2019. The Northern Lights project also gave a presentation.

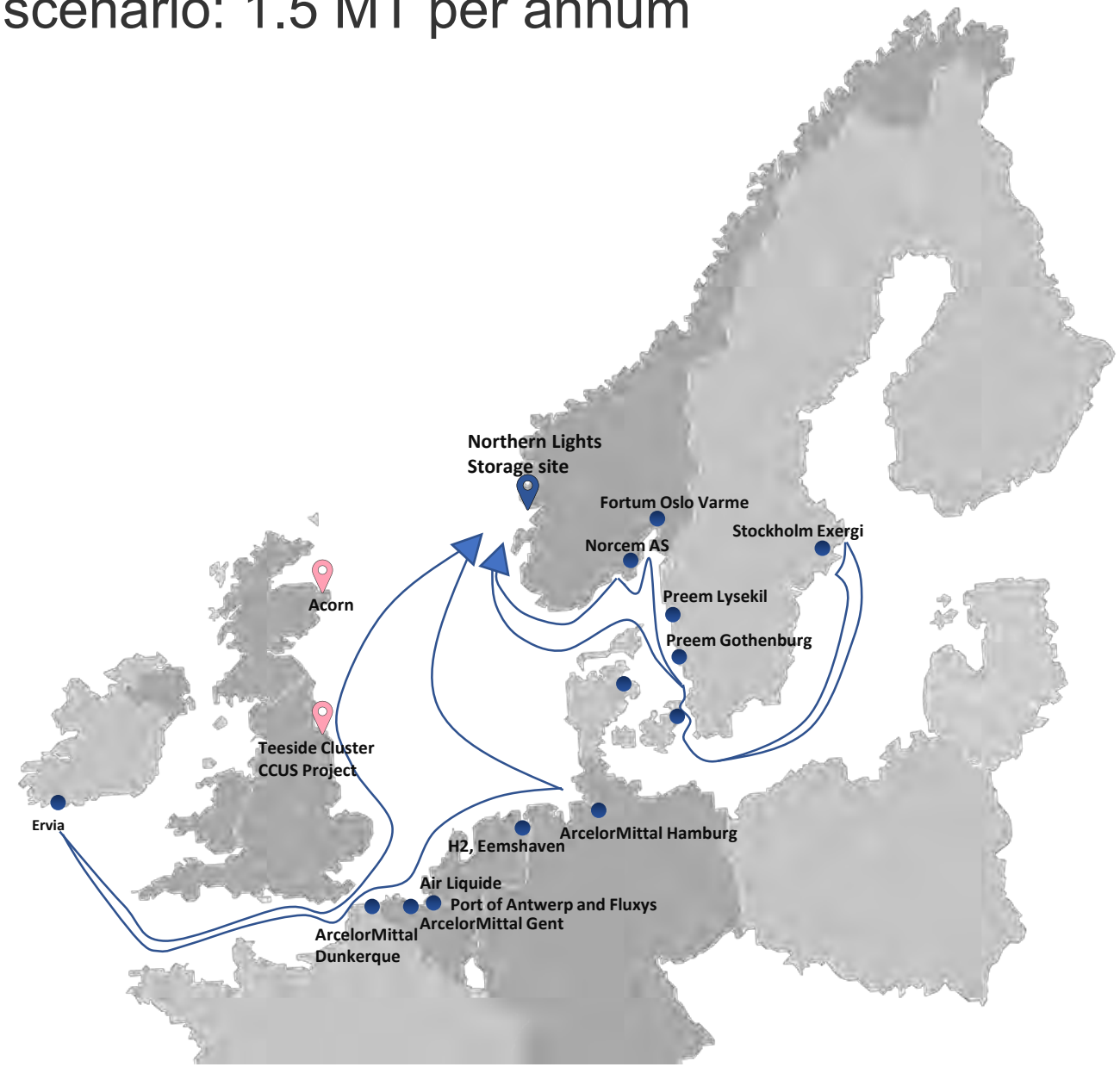
The resolution is based on Article 25 of the Vienna Convention on the Law of Treaties which states that if Parties to a treaty agree on something, they can act upon this agreement immediately pending administrative implementation in the treaty.

The resolution was approved 11.10.19, so ship transport of CO2 between two countries that agree will now be allowed.

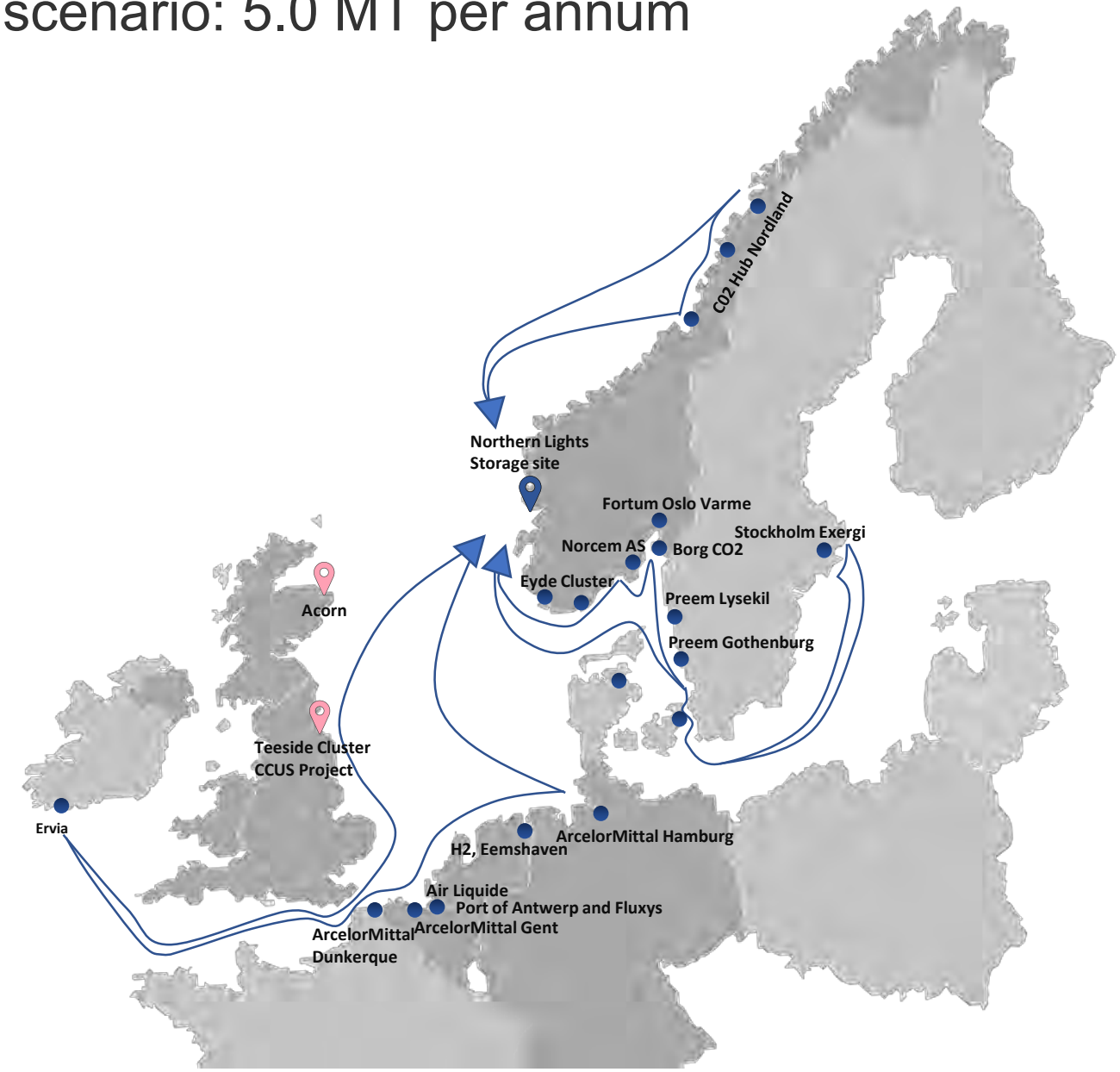
Early Norwegian investment decisions can enable early European capture projects



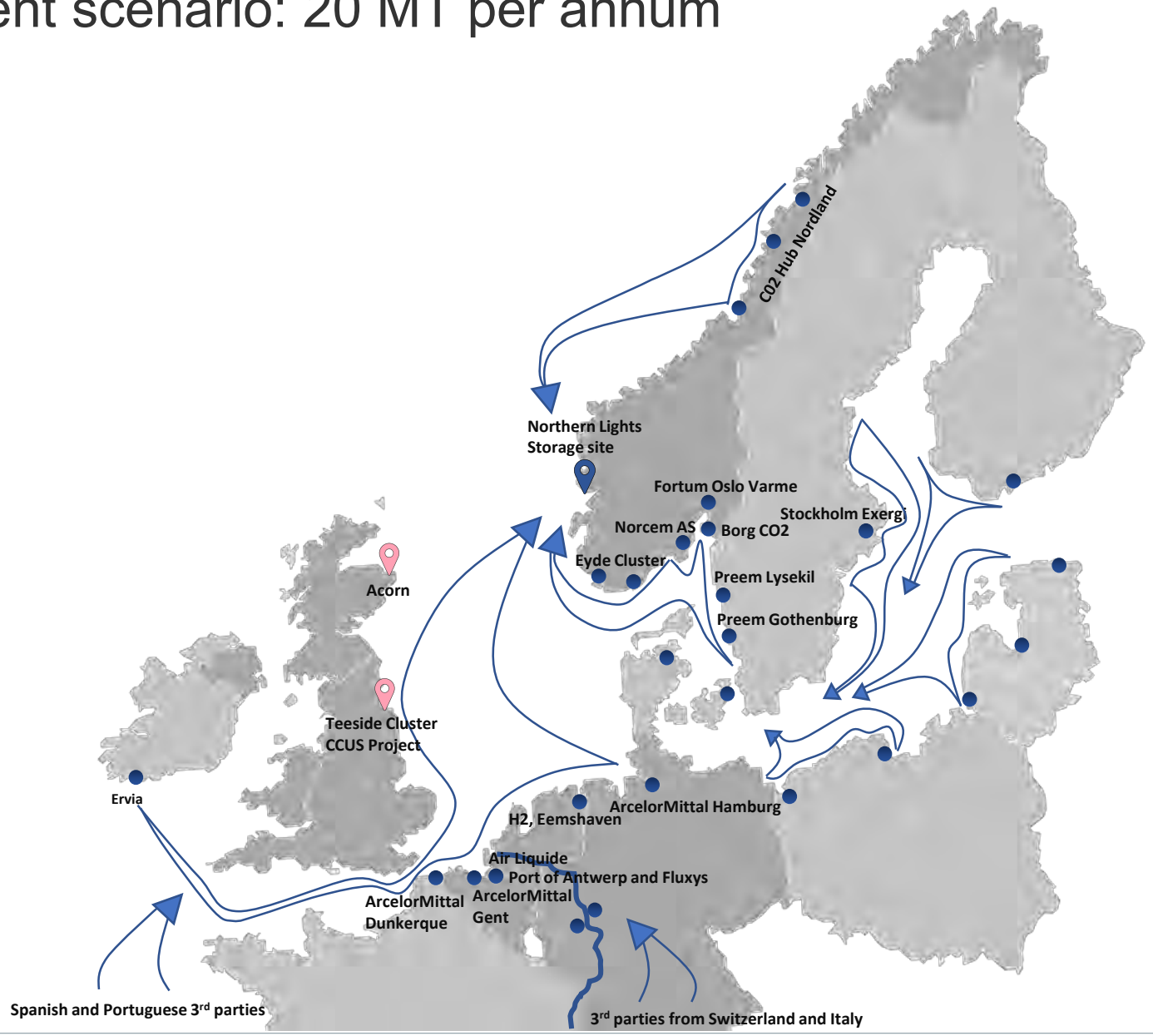
Development scenario: 1.5 MT per annum



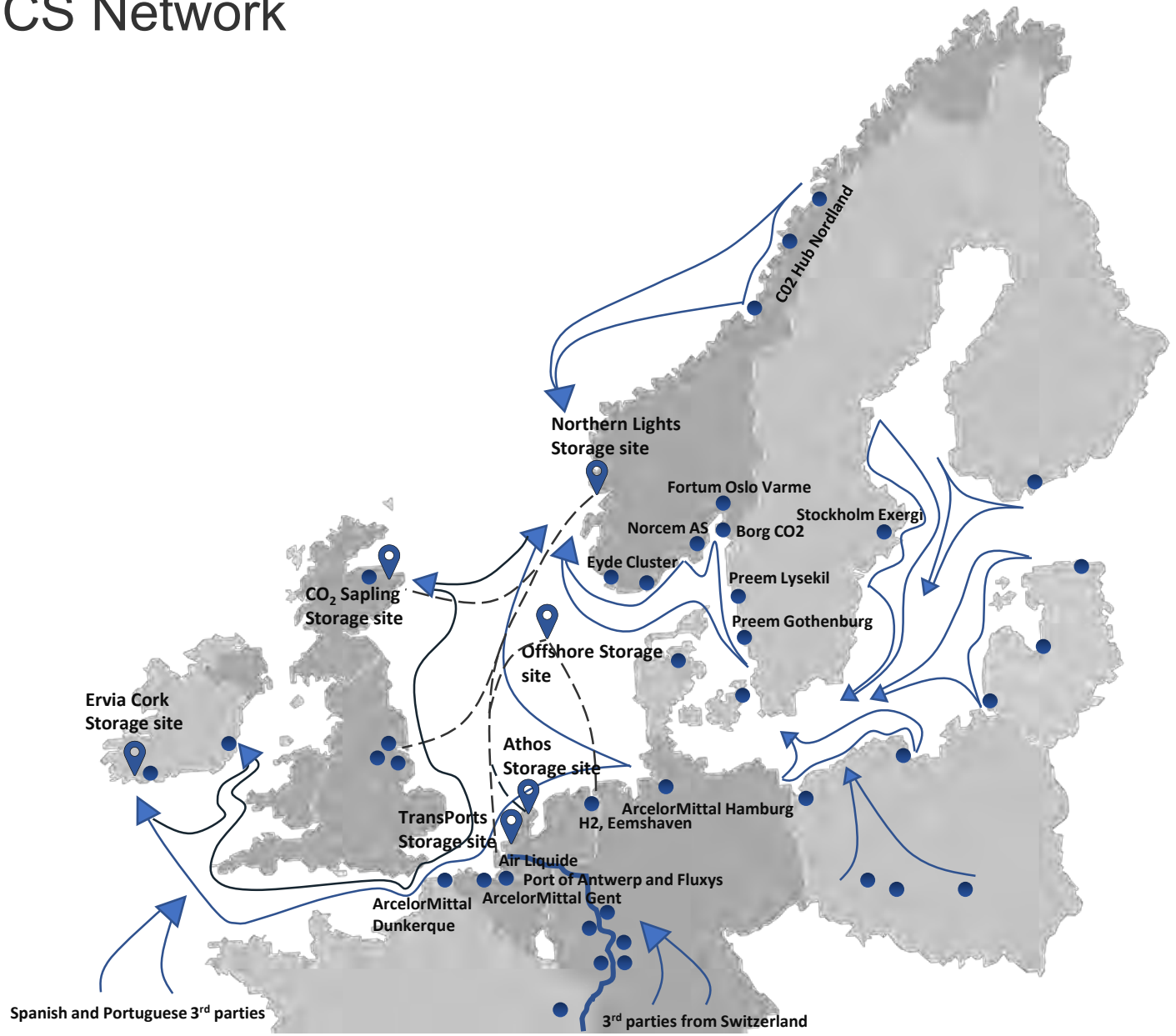
Development scenario: 5.0 MT per annum



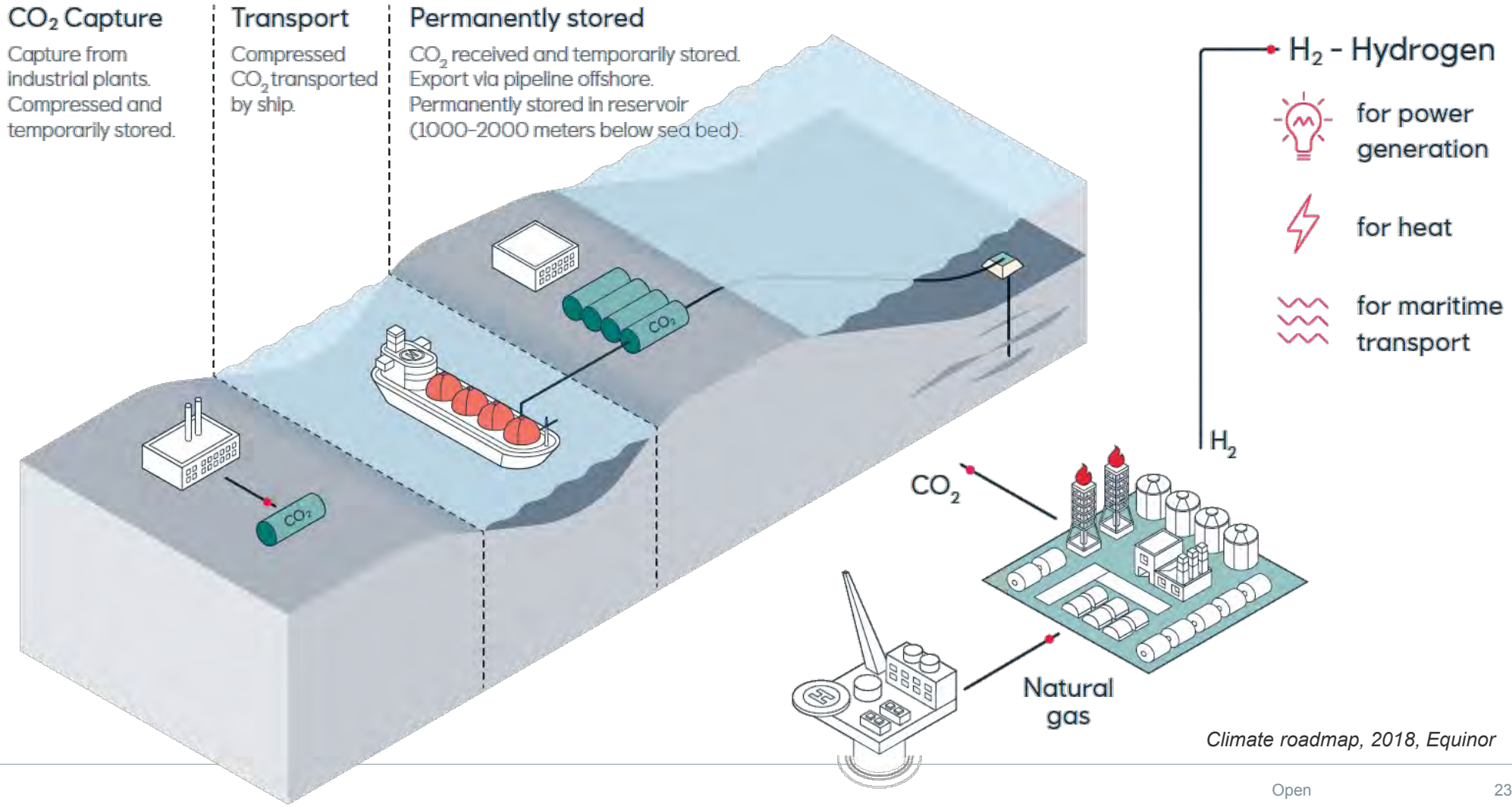
Development scenario: 20 MT per annum



Future Scenario for a European CCS Network



CCS as enabler for hydrogen production



Climate roadmap, 2018, Equinor