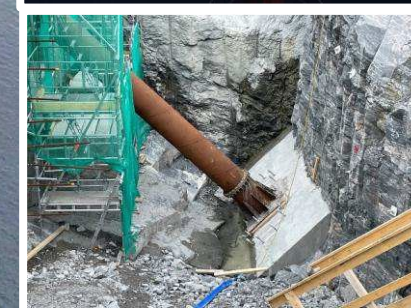


# International Projects Roundup: Northern Lights



Catalina Acuna, Sr. CCS Geophysicist (on behalf of the) Northern Lights JV DA

Presented at the IEAGHG International Workshop on Offshore Geologic CO<sub>2</sub> Storage – Aberdeen 2023





# Northern Lights JV: First open-source CO<sub>2</sub> transport and storage company



## LONGSHIP

### CO<sub>2</sub> capture

Capture from industrial plants.  
Liquefaction and temporary storage.



## NORTHERN LIGHTS SCOPE

### Transport

Liquid CO<sub>2</sub>  
transported by ship.



### Receiving terminal

Intermediate onshore storage.  
Pipeline transport to offshore storage location.



### Permanent storage

CO<sub>2</sub> is injected into a saline aquifer.

100 km

2 600 m

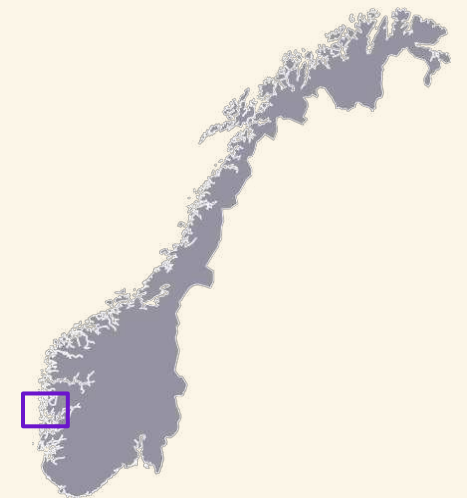
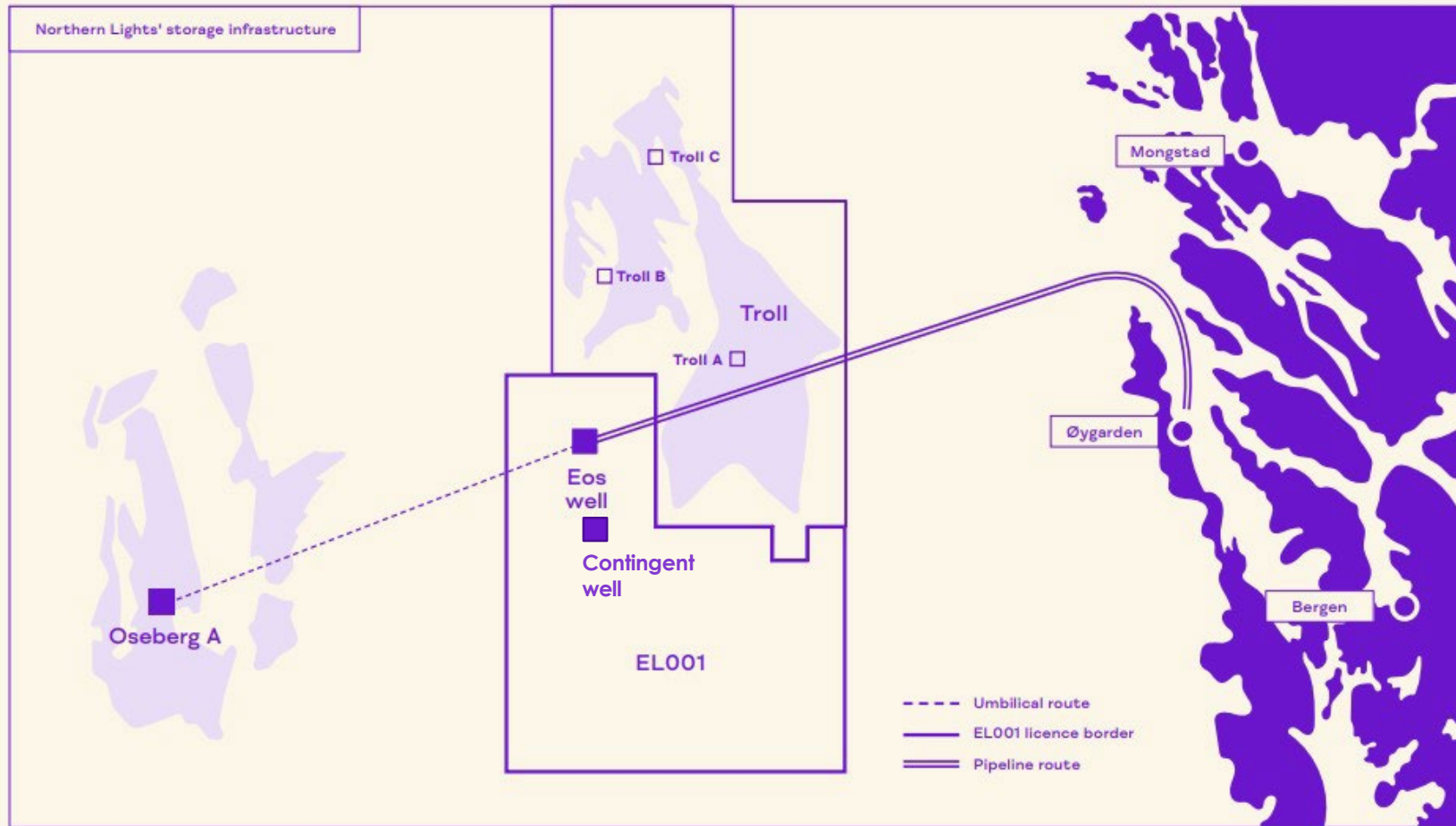


### Longship objective:

«The Government will contribute to developing technology for carbon capture, transport and storage and facilitate a cost-effective solution for full-scale carbon capture and storage (CCS) in Norway, which will stimulate technological development in an international perspective».

*St. 33 (2019–2020) Report to the Storting (white paper)*

# Northern Lights Location & Timeline



Study agreement  
between Gassnova  
and Equinor

Collaboration  
agreement between  
Equinor, Shell and  
Total

Screening study  
completed  
Decision to  
proceed

Decision to  
drill well

31/5-7 (Eos)  
well spud  
End: 18<sup>th</sup> Jan  
2020

Partners  
FID

State  
FID

NL DA JV  
founded;  
operatorship  
transferred

Phase 1  
drilling  
campaign



Phase 1  
injection  
start

2016

2017

2018

2019

2020

2021

2022

2023

2024



# Onshore facilities



Storage tanks

Future expansion

Workshop

Injection pumps

Pipeline tunnel

Admin/visitor centre

Jetty

→ Construction progressing according to plan, **more than 80% complete**

→ **Ready for operation in 2024**



# Northern Lights JV: Shipping

- Ship building contracts awarded Oct. 2021 (two vessels) & Sep. 2023 (3rd vessel)
- Cargo size: 7,500 m<sup>3</sup> (8,000 tonnes CO<sub>2</sub>)
- Length: 130m
- Medium Pressure cargo containment - Purpose-built
- Primary fuel: LNG
- Wind assisted propulsion system and air lubrication
- Additional vessels needed

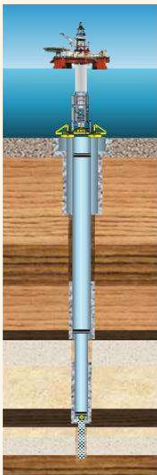




# Wells and underground storage

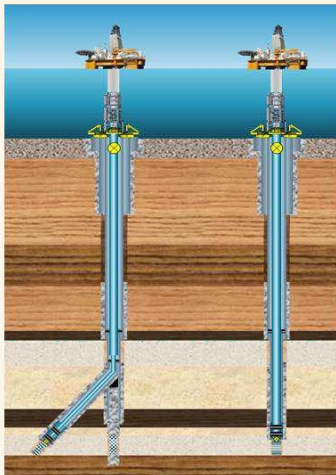
- 2019 – Exploration well drilled (storage confirmed)
- 2022 – Sidetracked exploration well and drilled new contingent well
- 2022 – 4D Seismic Baseline acquired
- 2023 – Injection test to be performed (imminent)
- 2024 – Injection starts (operations)

2019/20



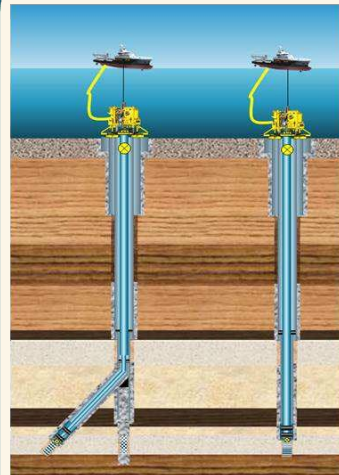
Drilling & test exploration well (Eos)

2022



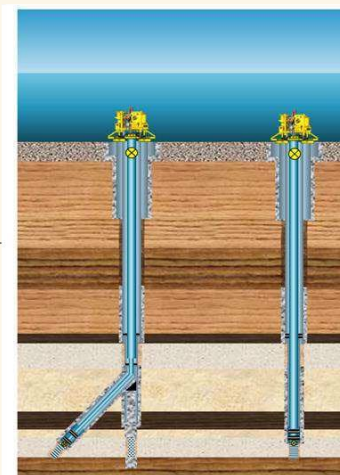
A-7 AH: PP&A of mother bore, drill sidetrack & completion  
C-1 H: Drill & complete

2023

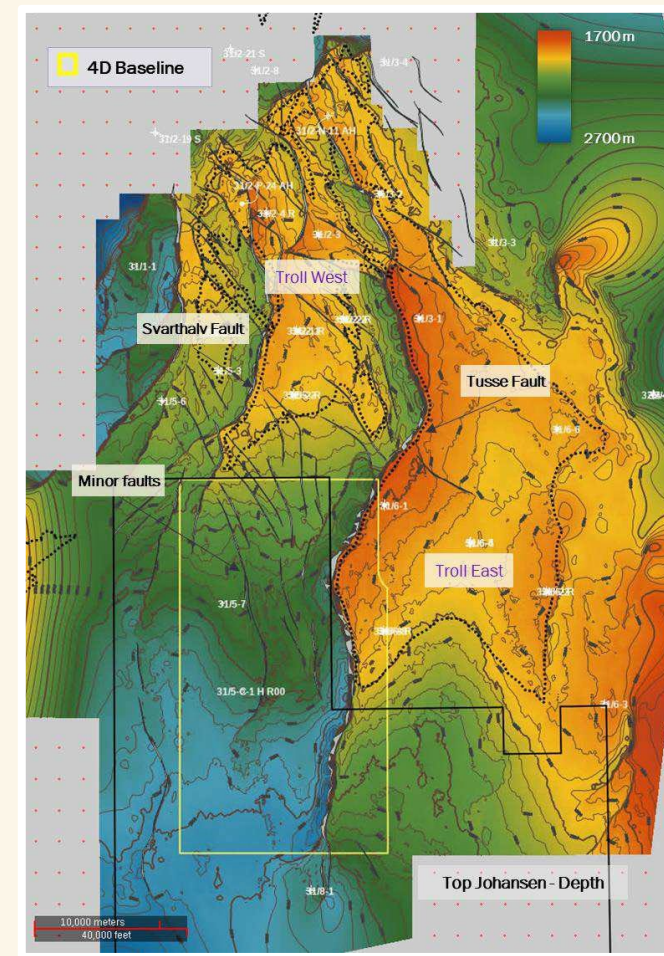


Q1: VXT installation on both wells  
Q2: Injectivity test on both wells

2024 -2049



CO2 injection



Top of storage complex with Baseline outline



Subsea well head installations



# Northern Lights Storage Resources

**SPE SRMS**

Each owner company has its own interpretation of this

TOTAL STORAGE RESOURCES	DISCOVERED STORAGE RESOURCES	STORED		Project Maturity Sub-classes	
		COMMERCIAL	CAPACITY	On injection	
				Approved for Development	
				Justified for Development	
		SUB-COMMERCIAL	CONTINGENT STORAGE RESOURCES	Development Pending	
				Development On Hold	
	Development Not Viable				
	Development Unclassified				
			UNEXPLOITABLE STORAGE RESOURCES		
	UNDISCOVERED STORAGE RESOURCES	PROSPECTIVE STORAGE RESOURCES	Prospect		
Lead					
Play					
		UNEXPLOITABLE STORAGE RESOURCES			



- No steer from Norwegian authorities as of today
- The NL JV subsurface team chooses to use SRMS

**Phase 1**

37.5 Mt Commercial Capacity  
1.5 Mt/y Injection Capacity  
One main injector, one contingent

**Phase 2**

>100 Mt Contingent Resources/Storage Capacity  
Up to 5 injectors

**Phase 3**

(non-disclosable)  
Prospective/Contingent Resources  
Injection Capacity TBD



- Commercial Storage Capacity (SPE) must further satisfy:**
- The target geologic formation must be discovered and characterized (including containment)
  - It must be possible to inject at the required rates
  - The development project must be commercial

**Storage Capacity (SPE)** Those quantities of Total Storage Resources anticipated to be commercially accessible in the characterized geologic formation.

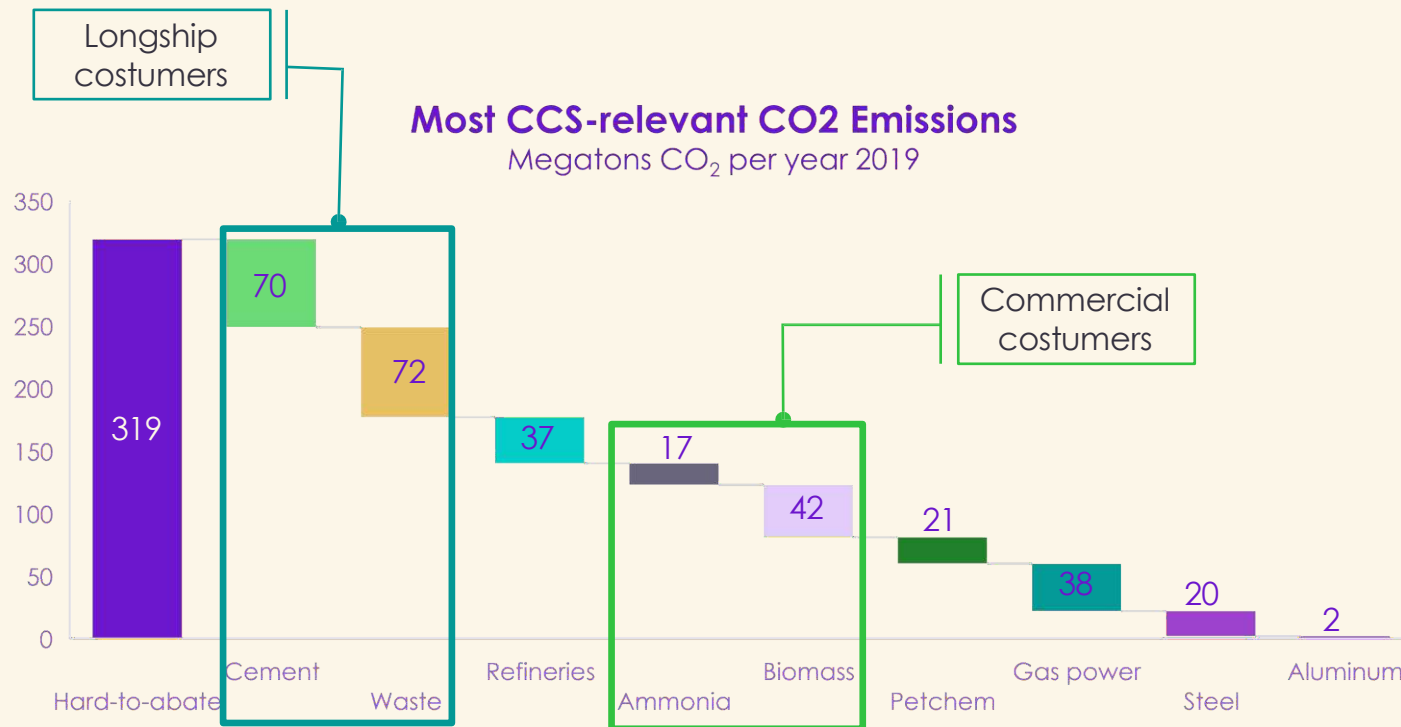
**Contingent Storage Resources** Those quantities of Total Storage Resources estimated, as of a given date, to be potentially accessible in known geologic formations, but the applied project(s) are not yet considered mature enough for commercial development

**Prospective Storage Resources** Those undiscovered storable quantities of pore volume in a geological formation that are estimated, as of a given date, to be potentially accessible

# Northern Lights Business Model



- Deliver CO<sub>2</sub> storage as a service
- Focus on hard-to-abate industries in Norway and Europe
- Flexibility and scalability: shipping solution to service industrial emitters across Europe



Source: Rystad Energy research and analysis, UNFCCC



<https://tradingeconomics.com/commodity/carbon>

Selected volumes & sectors with strong dependency on CCS to decarbonise





# Northern Lights