



**ENERGY for the FUTURE**

***Northern Lights –  
Whole Value Chain CO<sub>2</sub> Storage on NCS***

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**4<sup>th</sup> Biennial CO<sub>2</sub> for EOR as CCUS Conference, Rice University, TX, USA, Sept. 25-27<sup>th</sup>, 2019**

# Norway's Sovereign Wealth Fund Hits \$1 Trillion

Largest sovereign wealth funds by assets under management in 2017\*



@StatistaCharts

\* As of September 19, 2017

Source: The Sovereign Wealth Fund Institute



Norwegian Ministry  
of Petroleum and Energy

# MOU US – NORWAY

## Status on the Norwegian demonstration project

William Christensen

Pittsburgh, 30 August



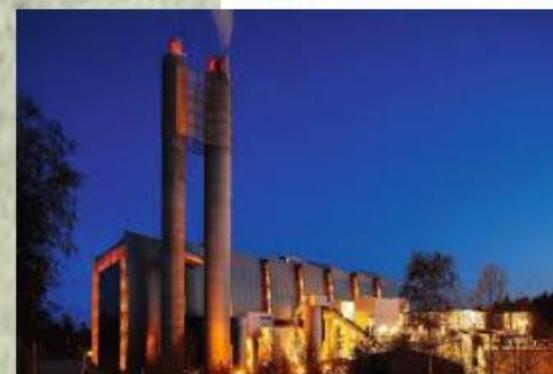
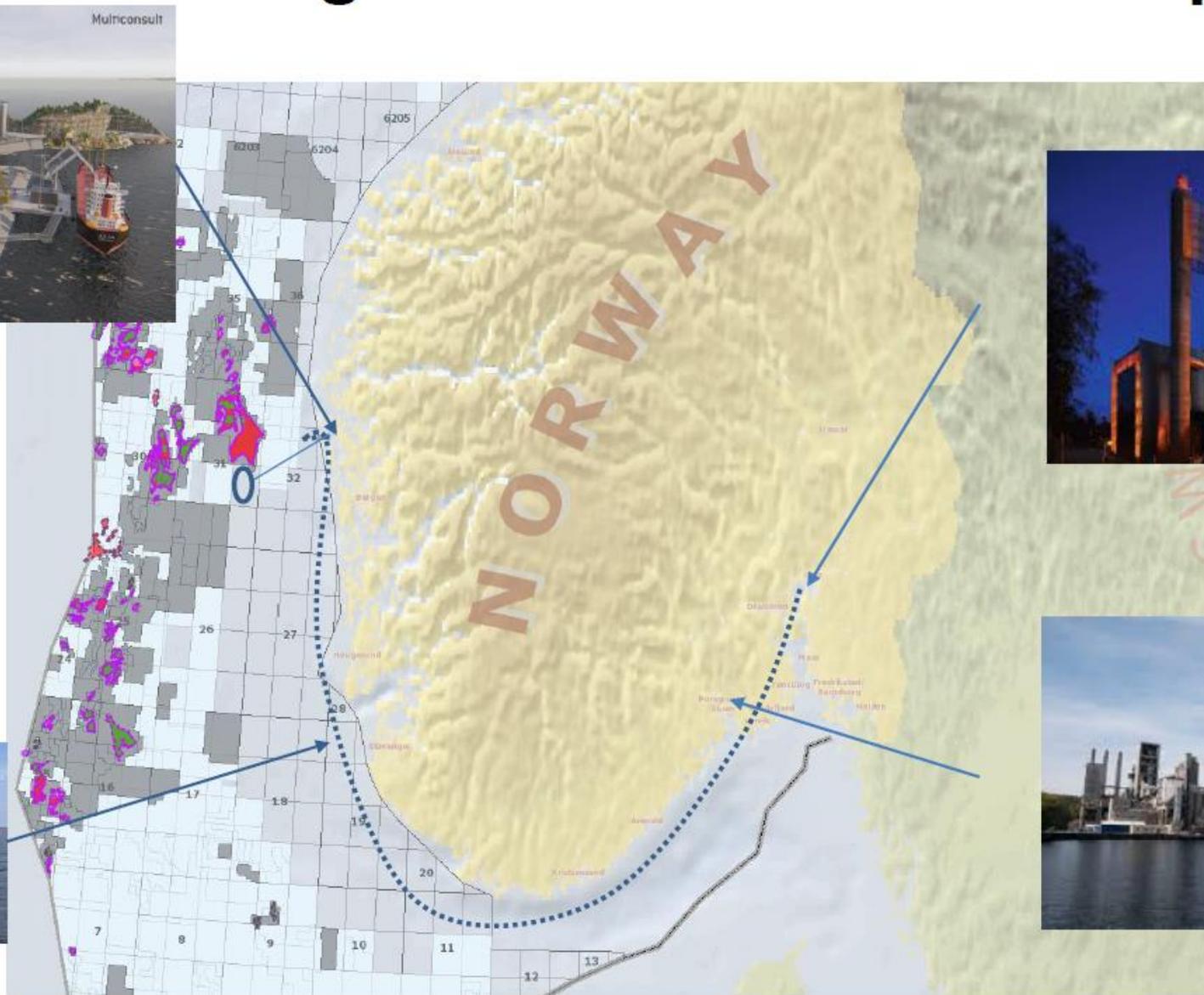
# The Norwegian CCS demonstration project



Ship transport from capture to storage terminal – pipeline to offshore storage complex



Olje- og energidepartementet



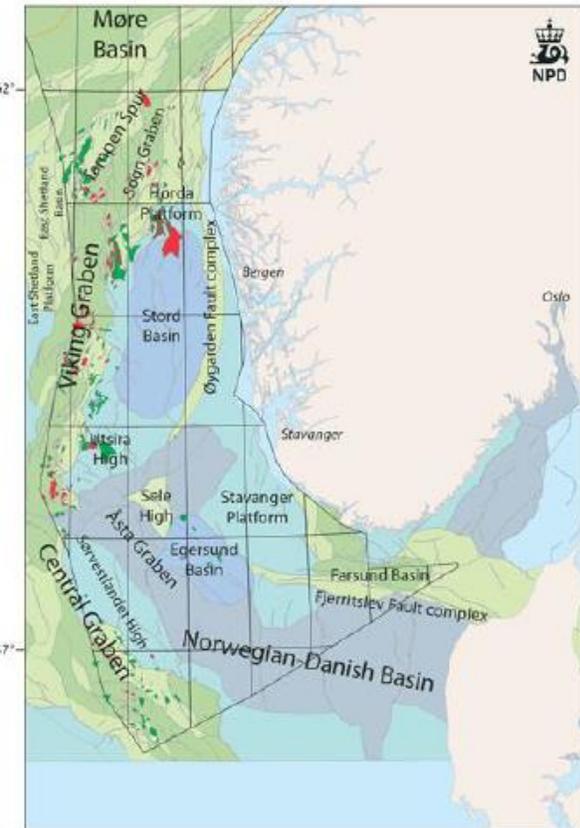
Waste-to-energy  
400 000  
tonnes CO<sub>2</sub>  
per annum



Cement  
production  
400 000  
tonnes CO<sub>2</sub>  
per annum

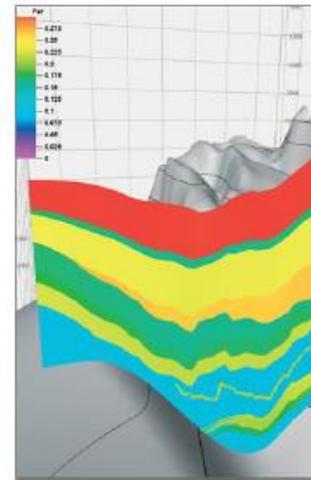
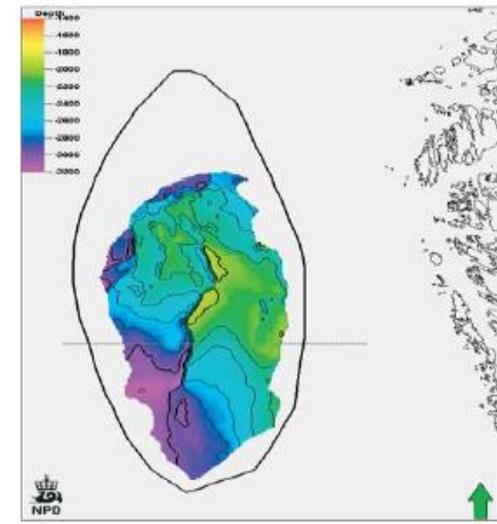
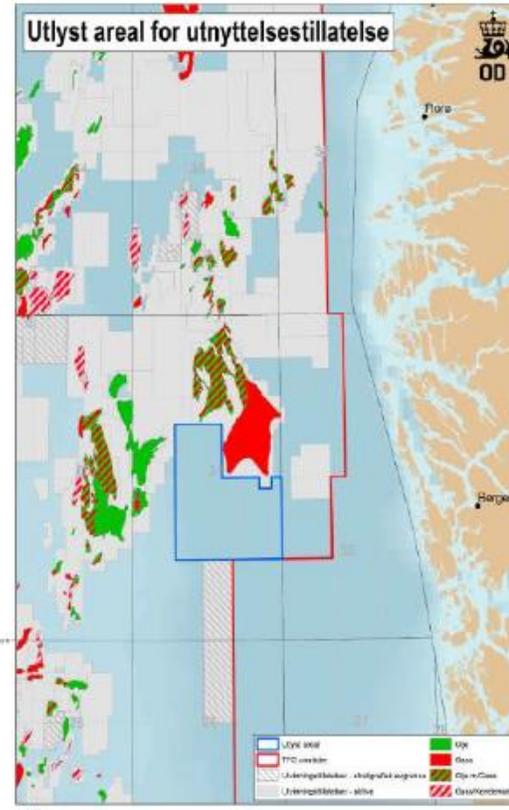
# Johansen Formation aquifer

<b>Cook Johansen aquifer</b>			
Storage system	half open		
Rock volume		590 Gm <sup>3</sup>	
Pore volume		90 Gm <sup>3</sup>	
Average depth		1700 m	
Average permeability		400 mD	
Storage efficiency		3 %	
Storage capacity aquifer		2 Gt	
Storage capacity prospectivity		150 Mt	
Reservoir quality			
Seal quality			
capacity		3	
injectivity		2	
seal		3	
fractured seal		3	
wells		3	
Data quality			
Maturation			



AGE	Formations & Groups	Evaluated Aquifers
Neogene	Pliocene: Fosså, Jæren, Lingsås, Lingsås, Lingsås	Utsira Fm.
	Miocene: Ve Mh.	Utsira and Skade Formations
	Skade Fm.	
Paleogene	Oligocene: Chalk	
	Eocene: E. Sanden, Fosså, Skade, Lingsås	Gild Fm.
	Eocene: Lingsås	
	Paleocene: Edda, Skade, Lingsås, Lingsås	Frigg field Abandoned Gas field
	Paleocene: Skade, Lingsås, Lingsås	Reisbank Fm.
Cretaceous	Late: Skade, Lingsås, Lingsås	Hod Fm.
	Early: Skade, Lingsås, Lingsås	
Jurassic	Late: Skade, Lingsås, Lingsås	Stord Basin Anoxic Model, Stord Basin Mounds *
	Late: Skade, Lingsås, Lingsås	Sognefjord Delta East, Hugin East
	Late: Skade, Lingsås, Lingsås	Bryne / Sandnes Formations South *, Bryne / Sandnes Formations Farsund Basin
	Late: Skade, Lingsås, Lingsås	Johansen and Cook Formations *
	Late: Skade, Lingsås, Lingsås	
Triassic	Late: Skade, Lingsås, Lingsås	Nansen, Ellikson, Taude, Gassam Fm.
	Late: Skade, Lingsås, Lingsås	
	Late: Skade, Lingsås, Lingsås	Formations not evaluated

\* Evaluated prospects



The license area was defined:

- based on expected sand distribution
- limited by other licensed area (petroleum licences)

Top of the aquifer in the Troll area and the outline of the total Johansen formation.

Cross section of the petroleum model of the Sognefjord. The Johansen and Cook Formations are the two main aquifers.

# Large scale CCS in Norway

"...realise a **cost-effective** solution for full-scale CCS in Norway, provided that this incite **technology development in an international perspective**".

**Solberg Government's Political Platform**

Our aim for a CCS project in Norway:

- Demonstrate a full chain of capture, transport and storage of CO<sub>2</sub>
- Demonstrate CO<sub>2</sub> capture in existing industry
- Establish a flexible storage solution with excess capacity
- Provide cost and risk reductions for subsequent CCS projects



# The way forward



Start FEED -  
summer2018

Investment decision  
2020/2021

Operation -  
2023/2024



QA - prepare  
investment decision -  
2019/2020

Development  
2020/2021 →

