



KEY ROLE OF TECHNOLOGY TO REDUCE GHG EMISSIONS FROM THE NCS

IOR Norway 2020 - Webinar, October 20th
Gunnar H. Lille, MD OG21

THE ENERGY INDUSTRY OF TOMORROW ON THE NORWEGIAN CONTINENTAL SHELF

CLIMATE STRATEGY
TOWARDS
AND

2030 2050



-40%
in 2030

**Near
zero**
in 2050

Oslo Børs stengt Indeks: **879.20** Oljepris: **43.18** -0.37% USD: **9.24** SEK: **104.39** EUR: **10.88** BTC: **10883.90** Mer > DN Investor

DN Dagens Næringsliv Meny D2 Magasinet Dagens avis Kjøp DN Logg inn

Koronaviruset Direktestudio Artikler Markedseffekt Næringslivseffekt Spørsmål og svar Tips oss

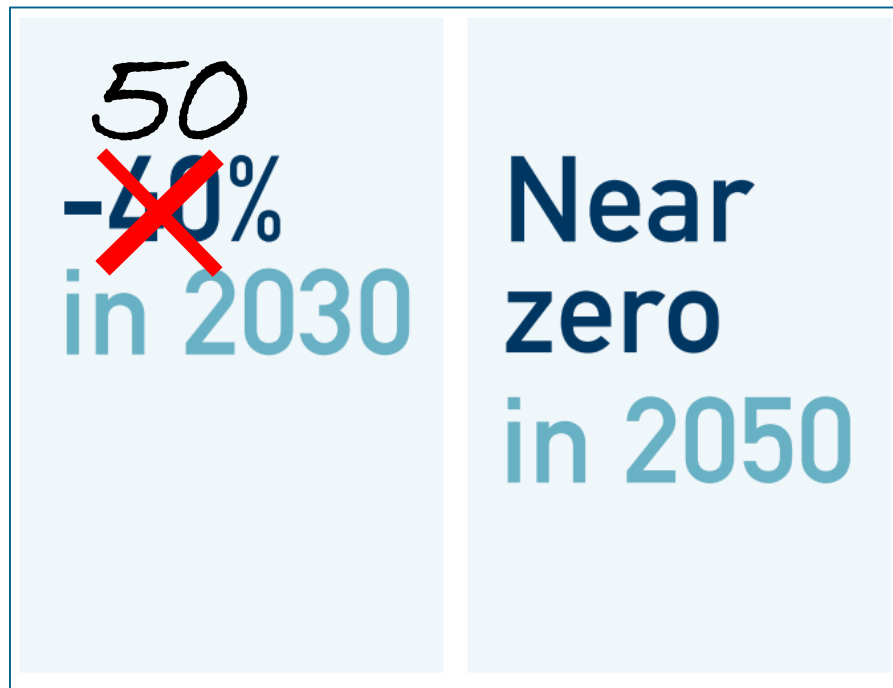
Bred enighet i oljeskattstriden: Slik blir den nye oljeskatten

Partiene på Stortinget er enige om ny oljeskatt. Partiene vil legge bort endringer i selskapsskatten, men øker friinntektene til 24 prosent.

2 min Publisert: 08.06.20 – 13.01 Oppdatert: 4 måneder siden

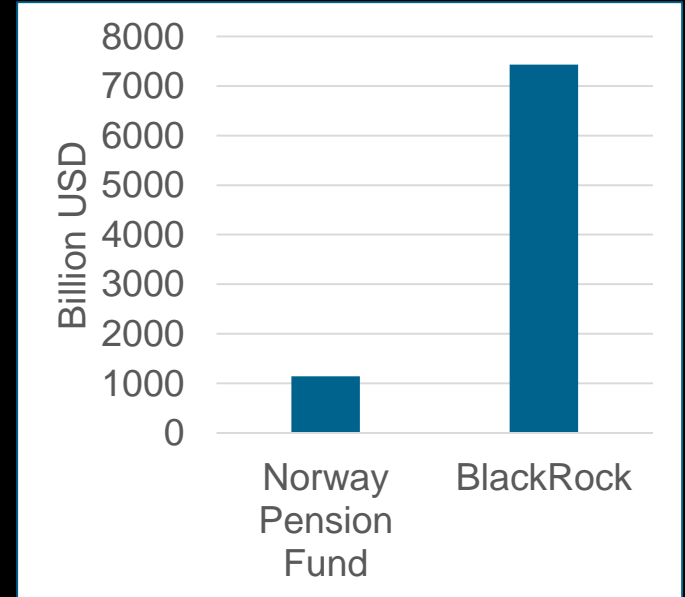


Det er løsning i det betente spørsmålet om oljeskatt på Stortinget. Her er Ap-leder Jonas Gahr Støre (fra venstre), Høyres parlamentariske leder Trond Helleland og Frp-leder Siv Jensen. (Foto: Vidar Ruud/NTB Scanpix)

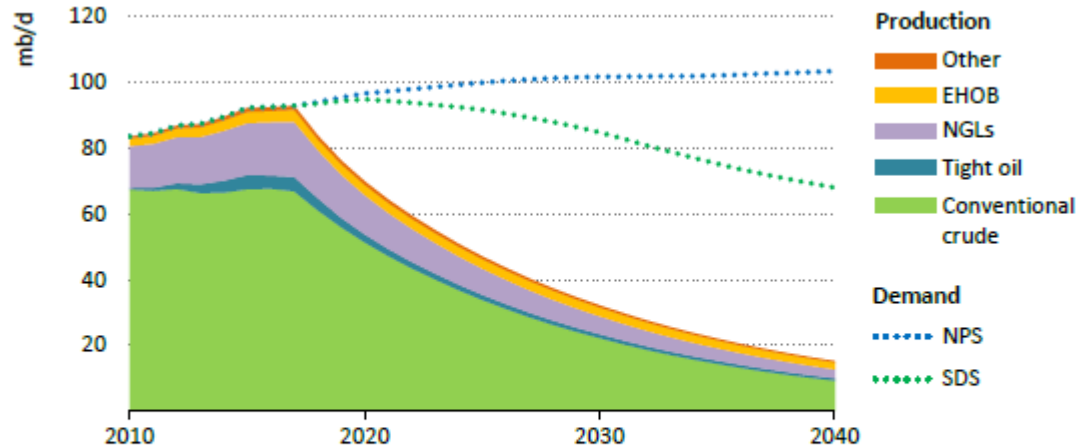


“Climate risk is finance risk”

“In the near future – and sooner than most anticipate – there will be a significant reallocation of capital”



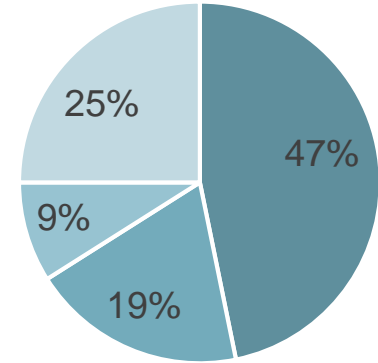
BUT THE WORLD STILL NEEDS PETROLEUM...



*With no new investment, global oil production would halve by 2025:
an average loss of nearly 6 mb/d every year*

Note: EHOB = extra-heavy oil and bitumen; NGLs = natural gas liquids; NPS = New Policies Scenario; SDS = Sustainable Development Scenario.

NCS Total: 15.6 billion Sm³ o.e.



- Produced
- Reserves
- Contingent resources
- Undiscovered resources

FASTER!

CHEAPER!

CLEANER!

CURRENT SITUATION – WE ARE COMPETITIVE

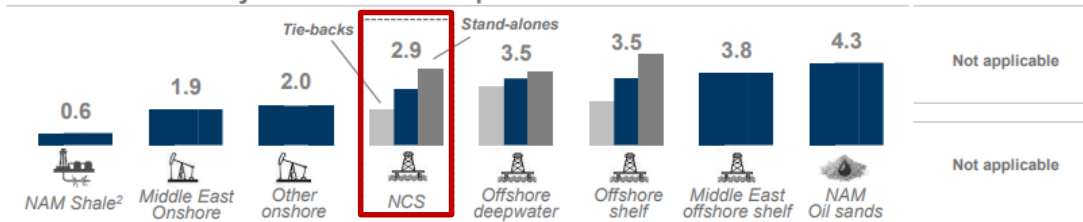
Faster

Lead time from
FID to start up*

Years.

Key indicators for competitiveness in 2018

2014-2018



Cheaper

Cleaner

Sources: Rystad
Energy, OG21

----- Total yearly upstream CO₂ emissions divided according to supply segment production in the same year.

CURRENT SITUATION – WE ARE COMPETITIVE

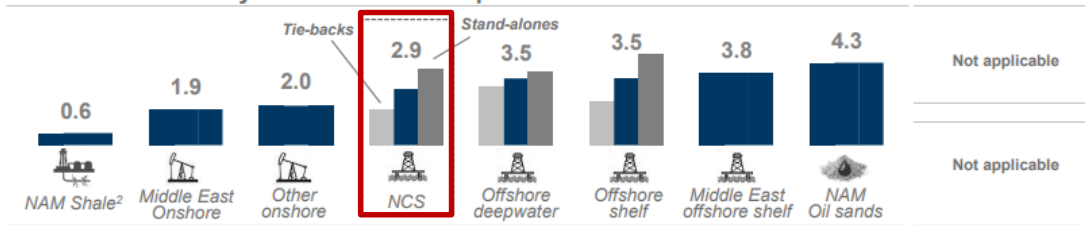
Faster

Lead time from
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Years.

Key indicators for competitiveness in 2018

2014-2018

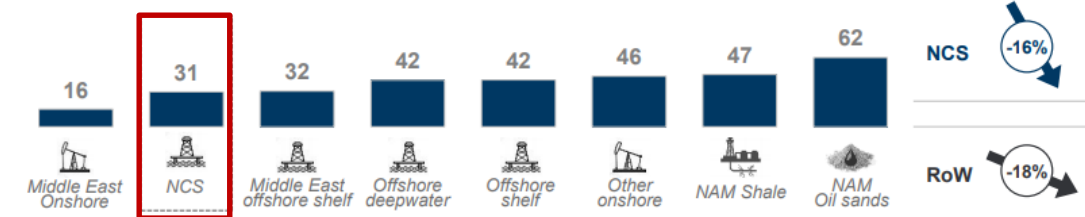


* Average lead time from final investment decision to production start up, in years..

Cheaper

Breakeven oil
price**

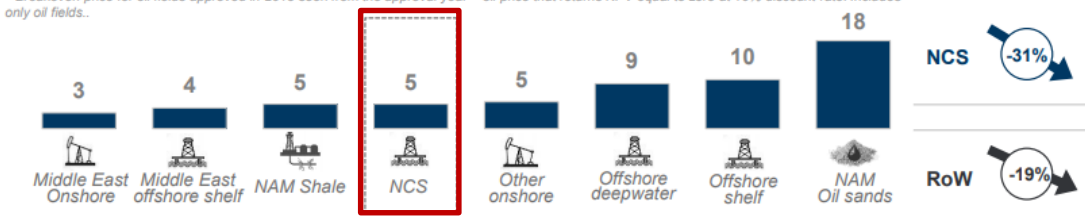
USD per boe.



**Breakeven price for oil fields approved in 2018 seen from the approval year – oil price that returns NPV equal to zero at 10% discount rate. Includes only oil fields..

OPEX per boe.***

USD per boe.



*** Excludes transportation and tax opex. Includes only opex associated with the production of hydrocarbons, in addition to SG&A.

Cleaner

Sources: Rystad
Energy, OG21

****Total yearly upstream CO₂ emissions divided according to supply segment production in the same year.

CURRENT SITUATION – WE ARE COMPETITIVE

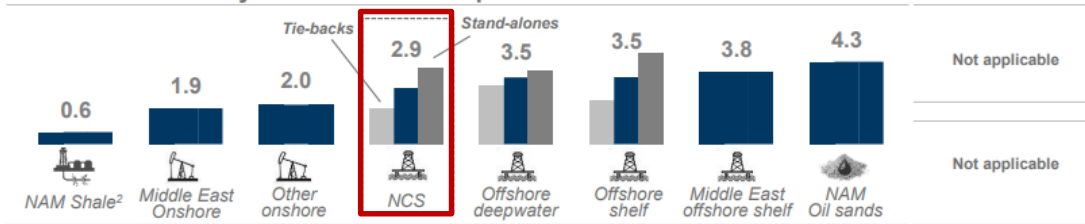
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Lead time from
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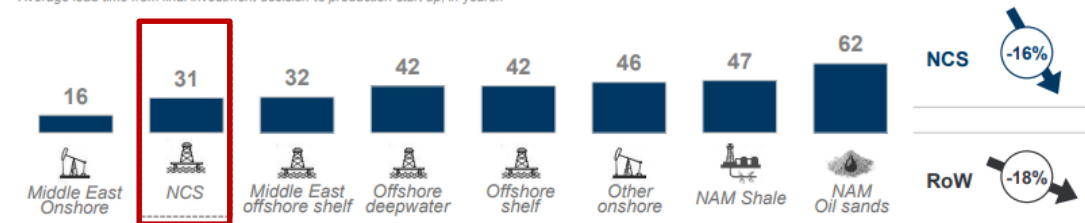
Not applicable

Not applicable

Cheaper

Breakeven oil
price**

USD per boe.



NCS

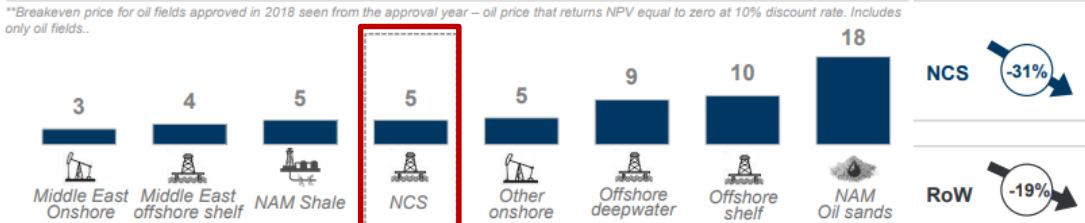


RoW



OPEX per boe.***

USD per boe.



NCS



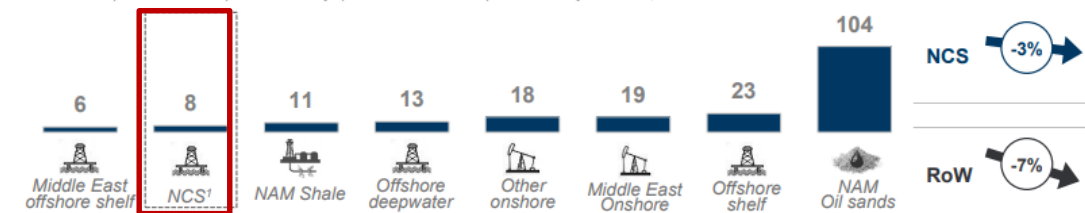
RoW



Cleaner

Upstream CO₂-
intensity****

kg CO₂ per boe.



NCS



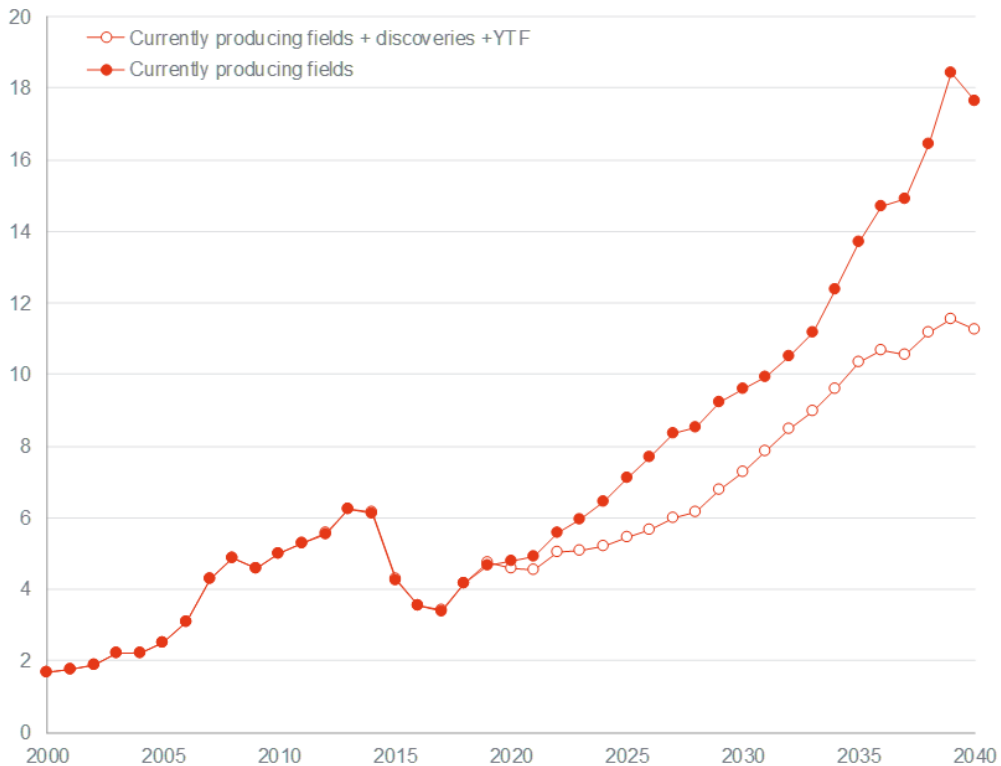
RoW



Sources: Rystad
Energy, OG21

WORKING UPHILL

Average lifting cost for NCS
Opex per boe produced*



OG21

TECHNOLOGIES FOR COST AND ENERGY
EFFICIENCY

Final report
November 4, 2019

Technologies to improve NCS competitiveness

OG21

Final report
08.10.2019

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NO «SILVER BULLET» – LOW EMISSION TECHNOLOGIES COME WITH ADDED COSTS

	Technology area	Target volumes [Billion boe]	Lead time [Years]	Volume effect [Million boe]	Cost effect [Billion USD real 2019]	Emissions effect [Million tn CO ₂]
TTA1 Energy efficiency and environment	Offshore wind for offshore facilities	22 (62%)	3-4 years	Neutral	16.0	-82
	Optimized gas turbines	8.4 (24%)	1-2 years	Neutral	-1.4	-7.6
	Power from shore technologies	10.8 (31%)	2-3 years	Neutral	24.7	-137
	Compact CCS for topsides	7.2 (20%)	2-4 years	Neutral	3.5	-61
TTA2 Exploration and improved recovery	Water diversion	18.5 (52%)	1-2 years	1850	18.6	-11
	CO ₂ for EOR	18.5 (52%)	5-7 years	825	20.0	-330
	Field model optimization	10.4 (29%)	2-4 years	560	-40.8	-2.8
	Big data exploration analytics	9.5 (27%)	7-15 years	1900	-6.0	-0.7
TTA3 Drilling, completion and intervention	Wired pipe technologies	16.1 (45%)	6-12 months	3220	-14.3	-1.1
	Slot recovery technologies	11.5 (32%)	6-12 months	Limited	-5.6	-0.4
	Automated drilling control	16.1 (45%)	6-12 months	Limited	-21.2	-3.1
	Smarter smart wells	11.5 (32%)	6-18 months	580	Neutral	-12
TTA4 Production, processing and transport	Predictive maintenance	35.3 (100%)	1-2 years	1490	-42.9	-1.8
	Unmanned platforms	7.9 (22%)	2-4 years	335	-50.0	-4.7
	Standardized subsea satellites	10.4 (29%)	1 year	1500	-14.0	Neutral
	All electric subsea	10.6 (30%)	2-3 years	450	-12.0	-0.5
	Flow assurance	2.3 (6%)	2-3 years	Neutral	-14.1	Neutral

See appendix of Rystad Energy report for detailed assumptions and technology evaluations

Short term (2020-2025)

Long term (2025-2050)

NO «SILVER BULLET» – MOST COST REDUCING TECHNOLOGIES HAVE MODEST EMISSION EFFECT

	Technology area	Target volumes [Billion boe]	Lead time [Years]	Volume effect [Million boe]	Cost effect [Billion USD real 2019]	Emissions effect [Million tn CO ₂]
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Long term (2025-2050)

NO «SILVER BULLET» – MOST VOLUME ADDING TECHNOLOGIES HAVE MODEST EMISSION EFFECT

	Technology area	Target volumes [Billion boe]	Lead time [Years]	Volume effect [Million boe]	Cost effect [Billion USD real 2019]	Emissions effect [Million tn CO ₂]
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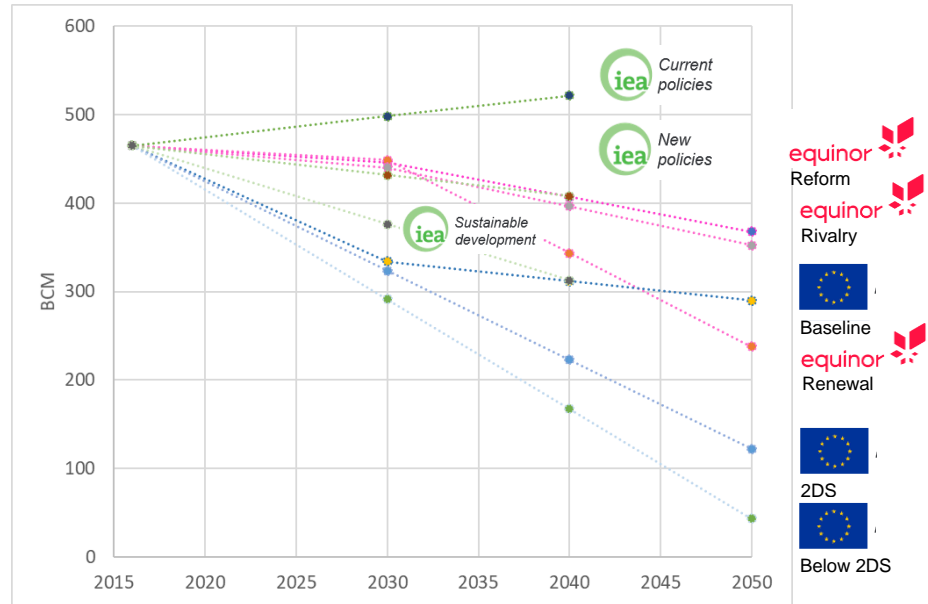
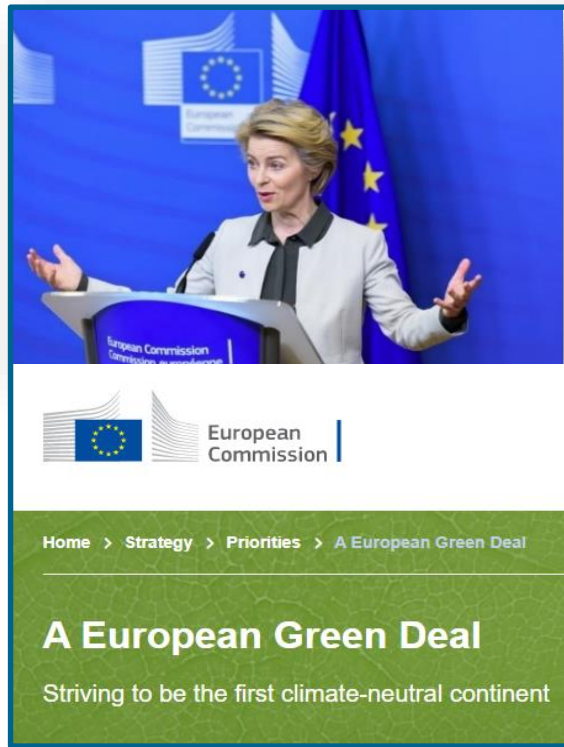
NO «SILVER BULLET» – NEED RANGE OF NEW TECHNOLOGIES

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Short term (2020-2025)

Long term (2025-2050)



Potential hydrogen markets



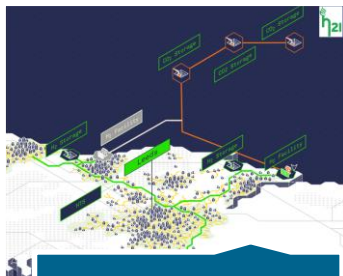
Maritime transport



Power generation



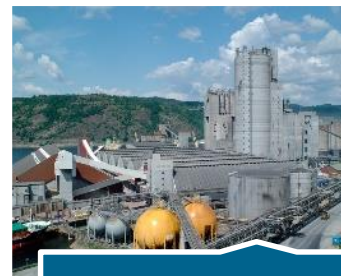
Road transport



Heat in buildings

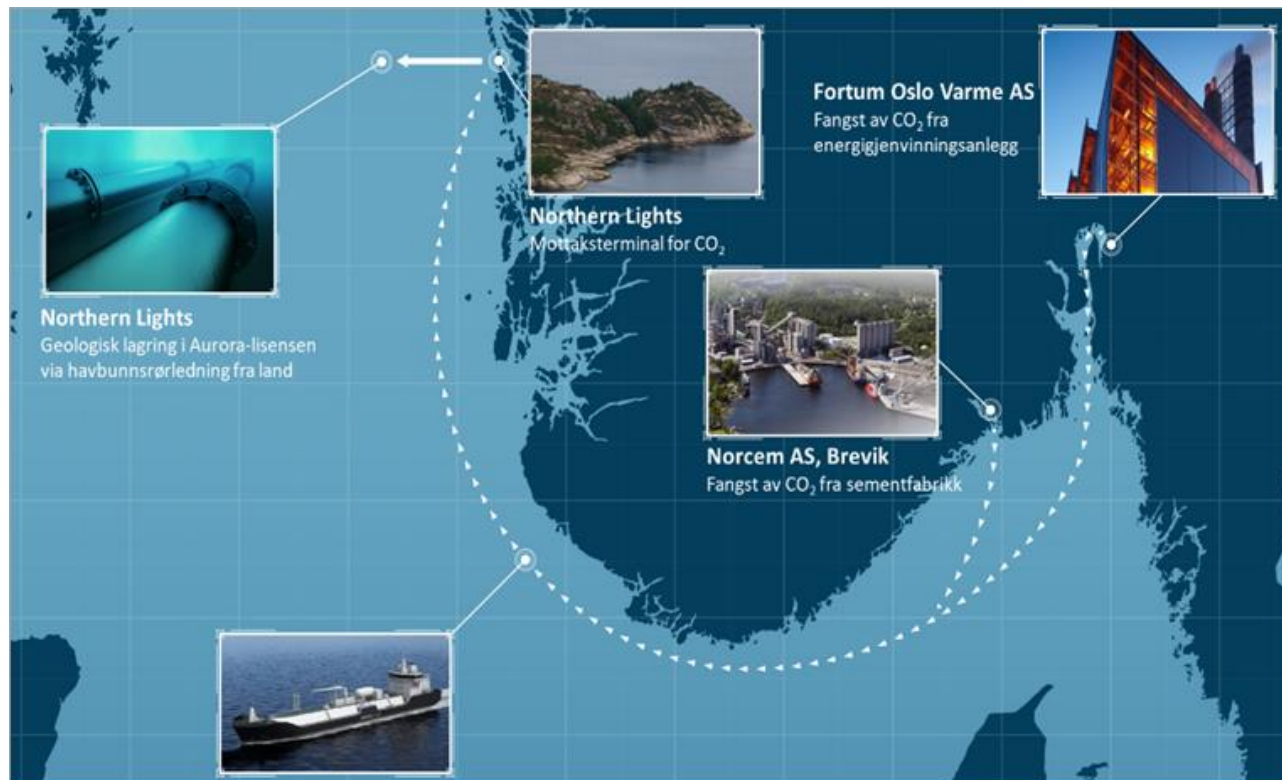


Steel production



Industry

“Longship” – Full scale CCS project



EXCITING TIMES AHEAD – NEED VARIETY OF NEW TECHNOLOGIES TO MAKE US FASTER, CHEAPER AND CLEANER



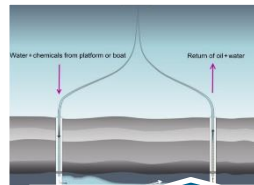
Optimized gas turbines



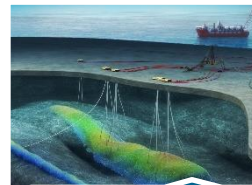
Power from shore



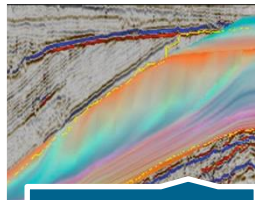
CCUS



Water diversion



Field model optimization



Big data analytics



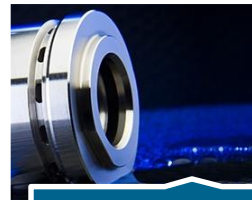
Wired pipe



Slot recovery



Drilling automation



Smart wells



Predictive maintenance



Standardized subsea satellites



Unmanned platforms



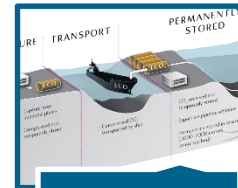
All-electric subsea



Flow assurance long distances



Hydrogen



Full scale CCS

OG21-FORUM

Digital konferanse, 11.november 2020

Teknologispranget
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