

Providing minerals for  
the green transition

Energiskiftet 9 mars

# loke

## Investors



Wilhelmsen



NorSeaGroup



TechnipFMC



KISTEFOS

CAMAR

## Industrial Partners



TechnipFMC



KONGSBERG



NorSeaGroup



iSURVEY  
PART OF THE REACH SUBSEA GROUP

REACH  
SUBSEA

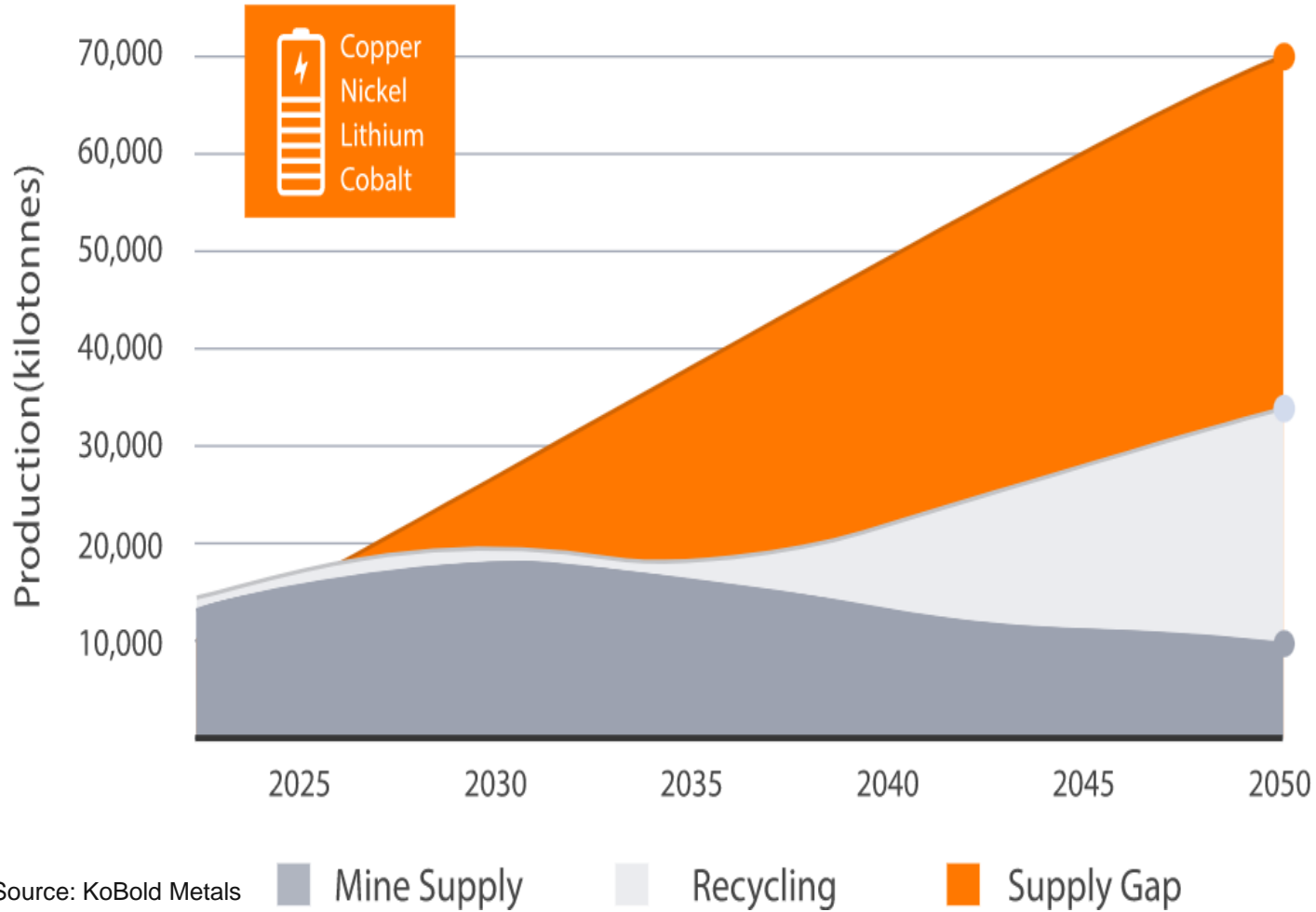


AMC  
consultants

atdepth  
LLC

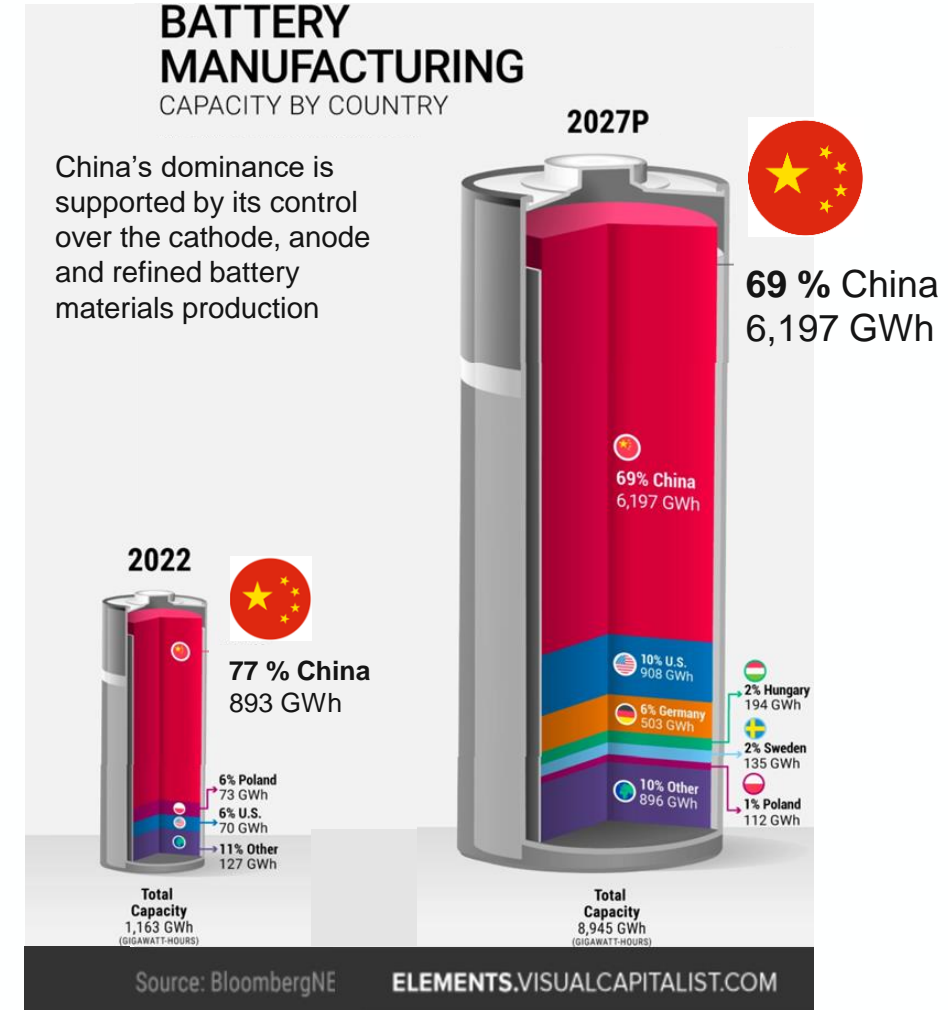
NORCE

# Demand and Supply - Please Mind the Gap



Source: KoBold Metals

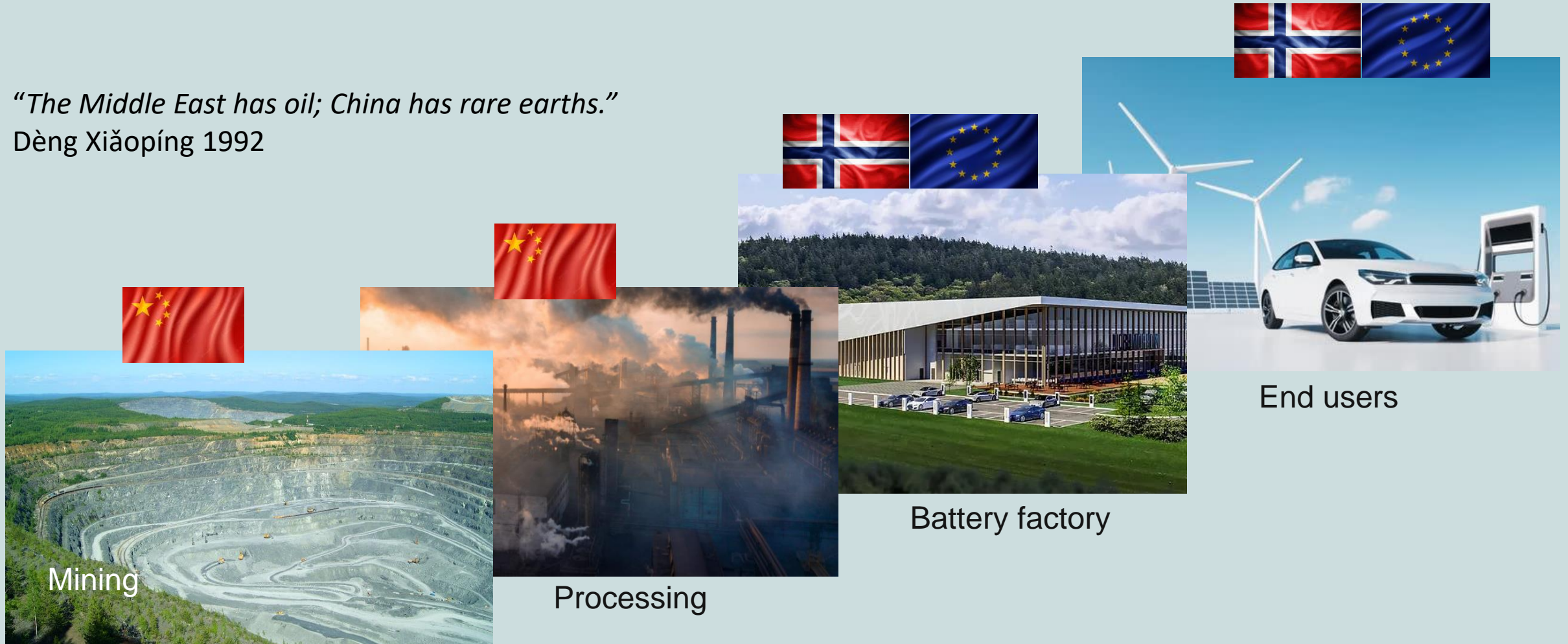
# China dominance will continue



# The Green Energy Transition Paradox

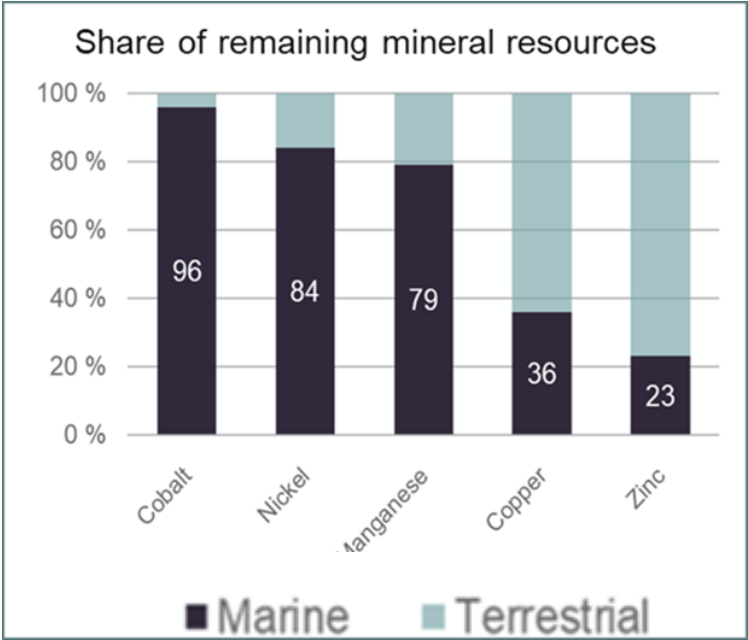
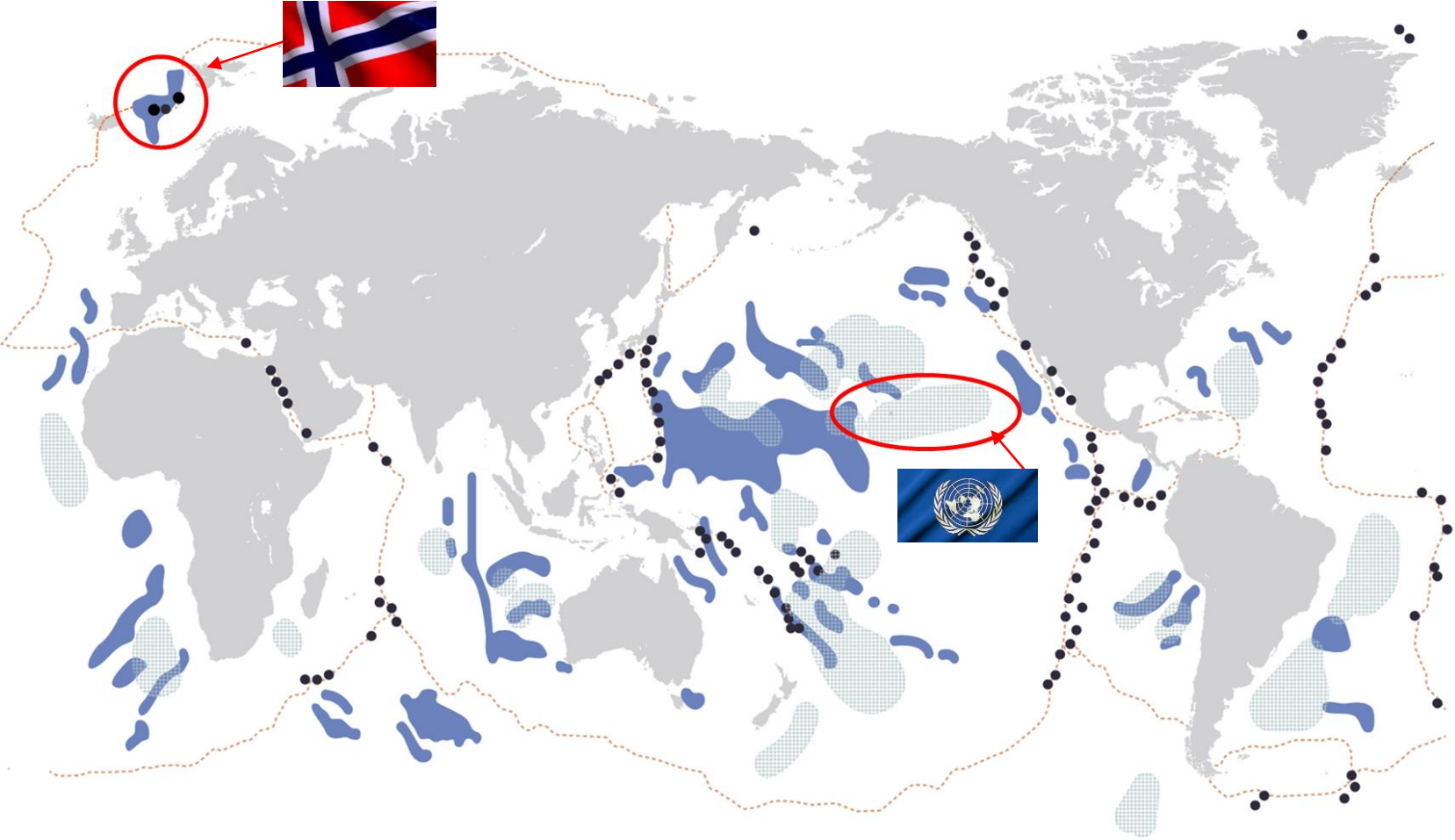
China is doing the dirty laundry for the green energy transition

*"The Middle East has oil; China has rare earths."*  
Dèng Xiǎopíng 1992



# Loke's Twin Engine Approach – Crust / Norway and Nodules / Internationally

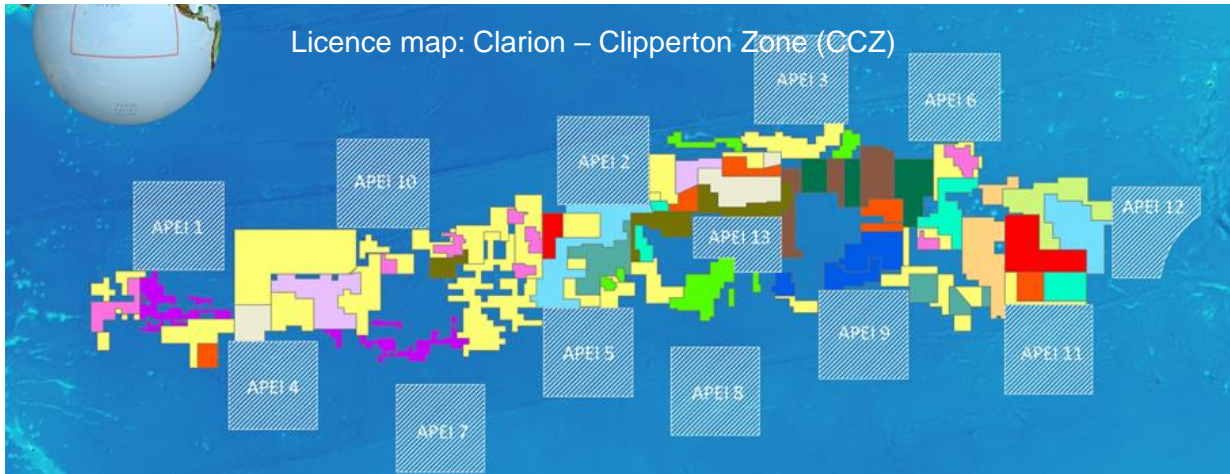
Deep Sea Minerals holds the largest remaining undeveloped resources of several of the critical minerals



- Loke Focus area – Norway / Clarion Clipperton Sonen ISA/FN
- Manganese Nodules
- Manganese Crust
- SMS

# Loke to become a major Manganese Nodule license holder

The Clarion-Clipperton Zone (CCZ) in the Pacific Ocean is the most prospective area in the world for Deep Sea Minerals



The CCZ is estimated to contain 21 billion dry tons Nodules (USGS):  
Corresponding to :

- Nickel: 250 M tons or 45 X 2030 global demand
- Cobalt: 40 M tons or 150 x 2030 global demand

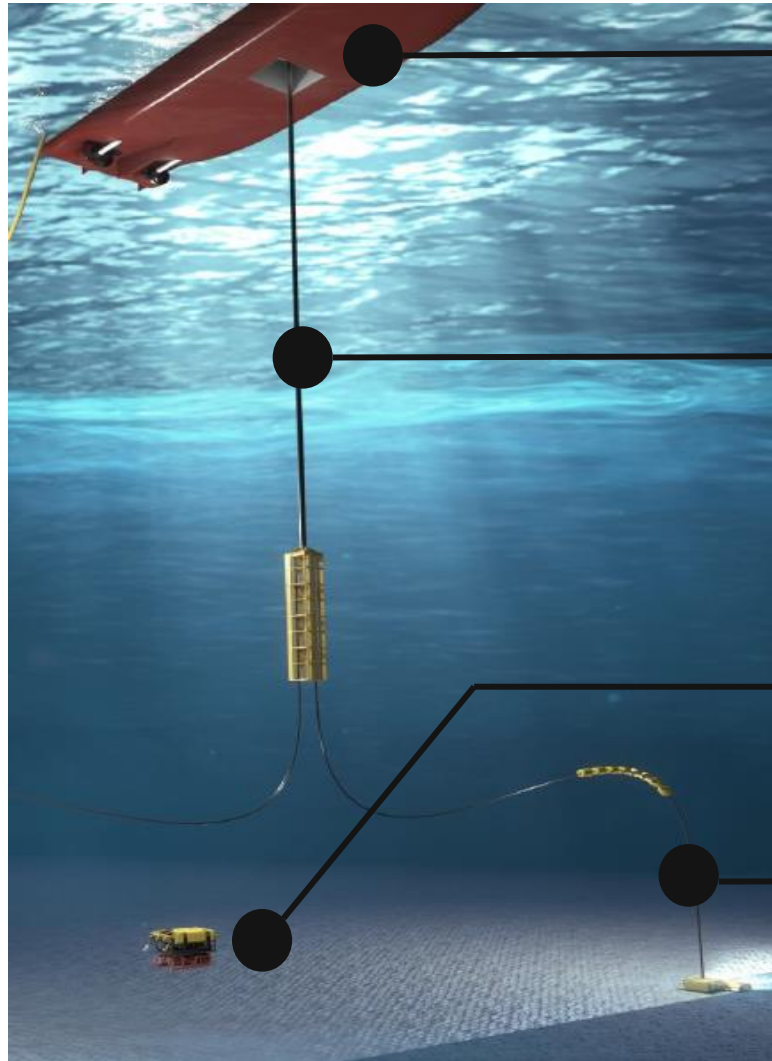


- 700+** Resources Million tons nodules
- 2030** Target production start, deliver FID in 2027
- 3+** Billion dollars NPV of single development  
The acreage has the resource potential to support 20 years of production for 15+ vessels
- 30+** Billion dollars NPV of Loke full scale plan

**& No – Toxic Waste**

# Developing and qualifying enabling technology

Leverage Cornerstone Investors know how from Subsea Oil & Gas



Production Vessel

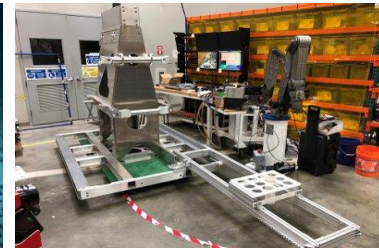
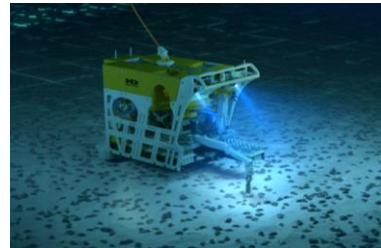


Main focus areas

Vessel capacity, handling system, de-watering system and bulk transfer systems together with ESG efficiency

Nodule Vertical Transportation System and Power

Vertical Transportation system performance and reliability



Minimize plume, noise and vibration to ensure deliver most ambitious ESG goals

Nodule Sampler

Accelerate transit time between sampling locations



Collection efficiency and minimum seabed disturbance

Reliability of collection system to maximize operational uptime

Nodule Collector

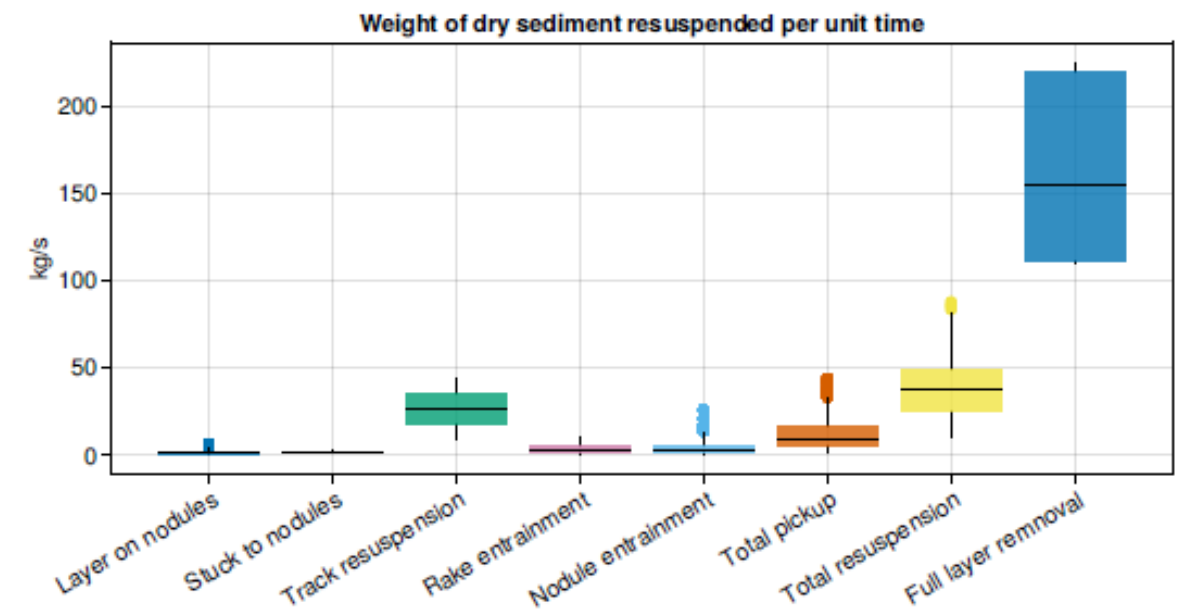
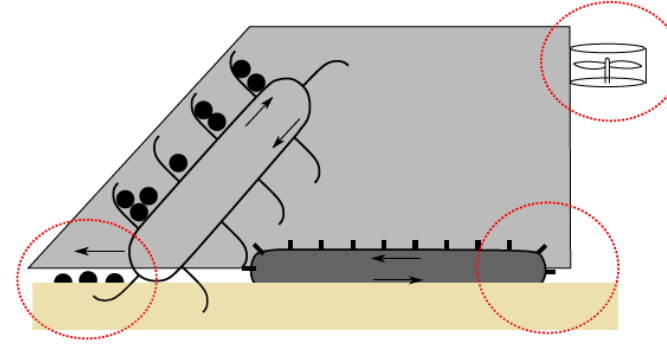
Deliver total system capacity to drive revenue and margin

Manganese Nodules

# Minimum Plume Collection System

Collector System design analyzed by Atdepth LLC (MIT):

- The Loke Collector design has been modelled and analyzed by Atdepth LLC to quantify main plume contributions
- Loke concept design presents **significant** potential for plume reduction over full-layer hydraulic removal systems
- Plume reduction of over 90% can be achieved
- Roadmap for further reduction potential developed by Atdepth



# Manganese nodules Production

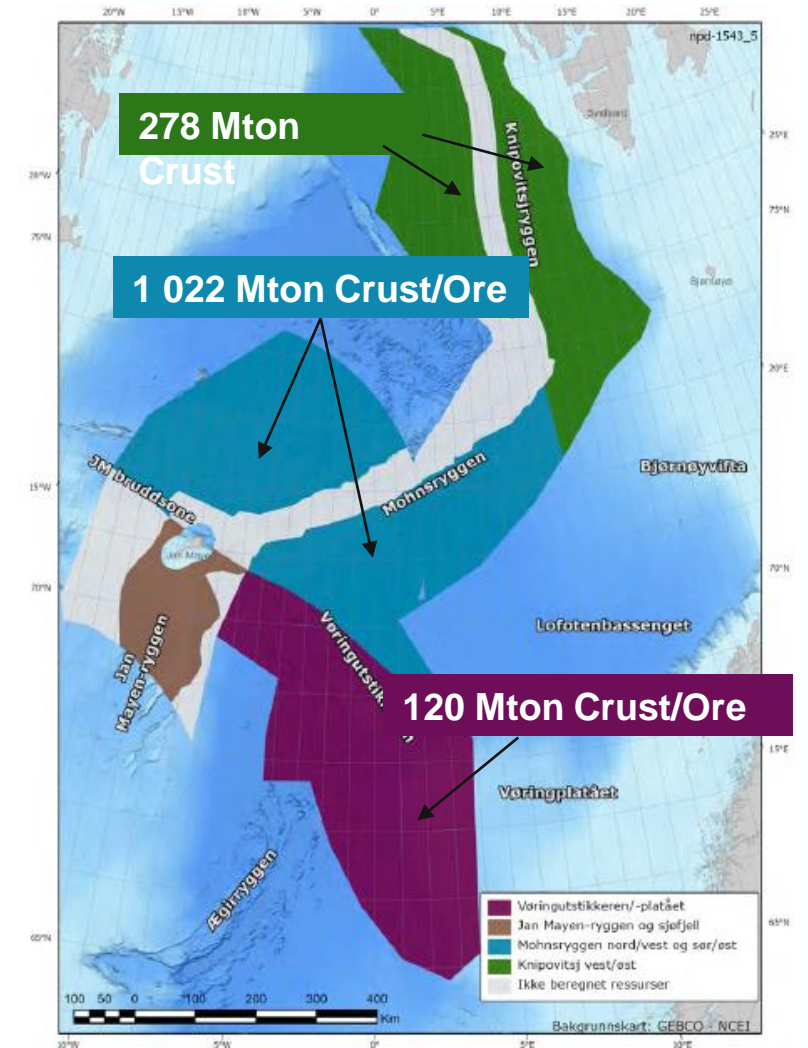
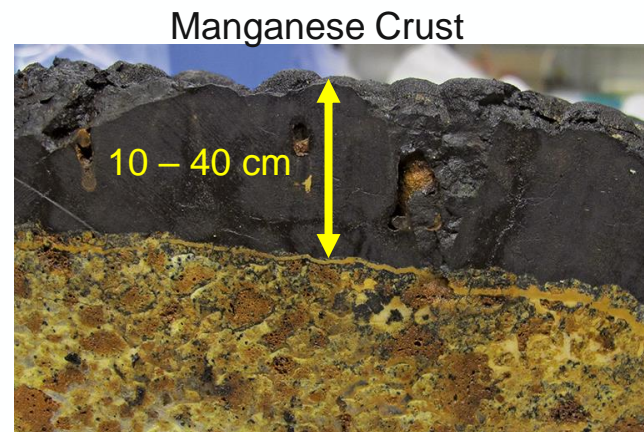
- Mechanical nodule pick-up collection head with minimum seabed disturbance
- No sediments returned from Production Vessel – minimum 90 % plume reduction
- Autonomous Collection Tools – no light pollution
- Free swimming Collection Tools – allowing easy repositioning to protect sensitive habitats
- Digital twin to monitor all aspects of operation
- Production capacity of 10 000 ton nodules per day
- Annual gross revenue above 1 000 MUSD

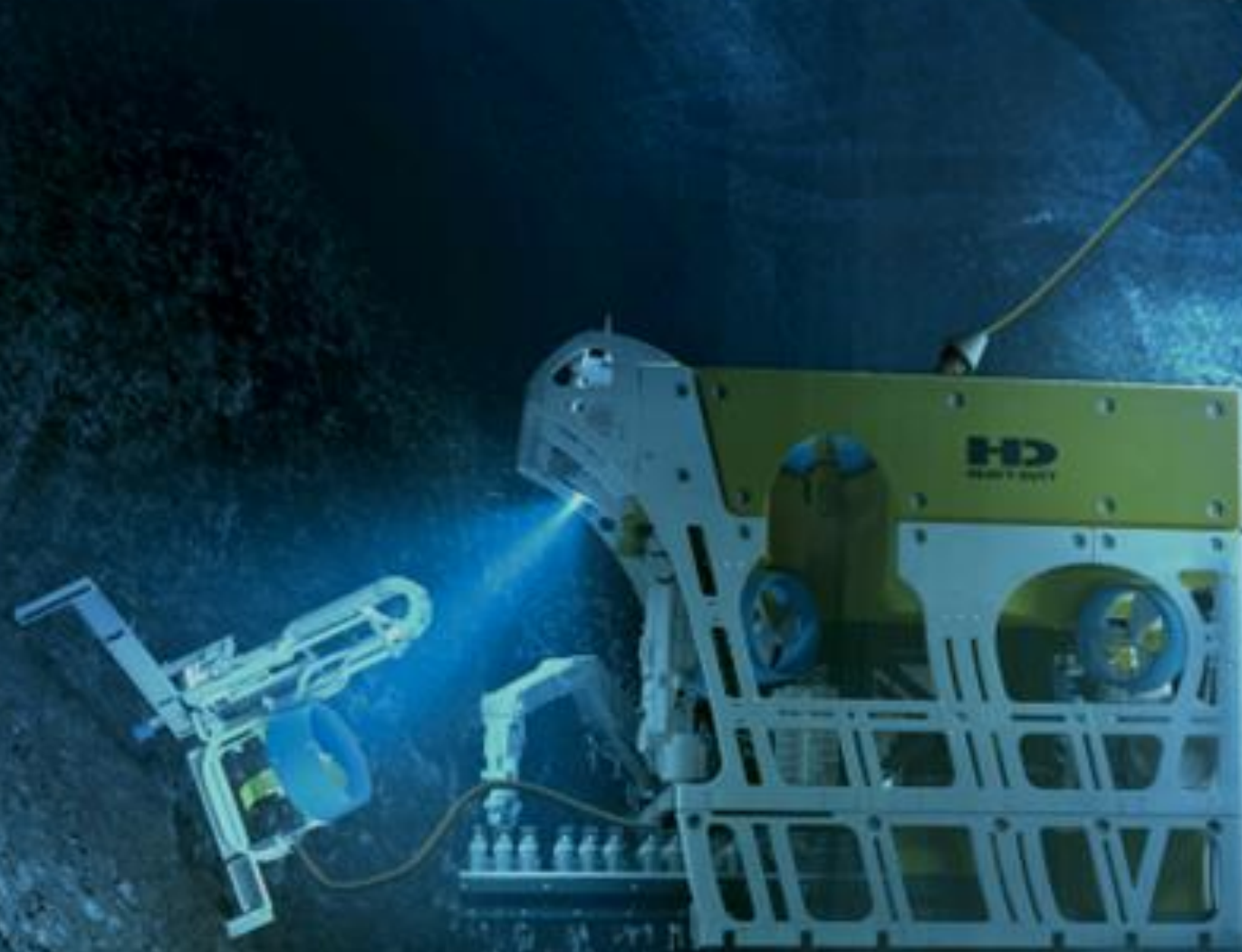


# Norway Opening Process - Public consultation period ended 27<sup>th</sup> of January

Expected Parliament voting spring 2023, followed by first licensing round in 2024?

- Strong support from key Industrial stakeholders – NHO, LO, Offshore Norge ++
- NPD Mineral resource report 2023; “Substantial resources on the Norwegian shelf”
- Manganese crust holds large resources with key minerals as:
  - Cobalt – 3,1 Mt / Gross value: 100 billion USD
  - Vanadium – 1,9 Mt / Gross Value: 75 billion USD
  - Neodymium (REE) - 0,4 Mt / Gross Value: 80 billion USD
- Norwegian recourses can cover several decades of global demand for many critical REE
- Field example from NPD report
  - Inplace crust volume 56 Mt
  - Production period 20 years
  - Gross revenue of 20 billion USD
  - Compared to an oil field (80 USD/bbl)
    - Resources 250 million bbl






## Manganese Crust

### **Exploration:**

ROV based Manganese Crust coring system – successfully tested in 2 500 m water depths October 2022

AUV based “Fly By” thickness measurements by acoustics



## Manganese Crust Production

Several smaller neutrally buoyant cutting & collection tools - Tool width: 2 m Speed: 0,05 m/s

Autonomous operated – linked tracking/ navigation system

Capacity:

Net excavation per tool 900 ton/day@75% uptime

Total daily production – 5 400 t/day with 6 tools

Annual production: 2 million tons

# A new Industry for Norway - from Exploration to Battery Factories

← Loke →

Phase 1 – exploration, technology development & production

Phase 2 – Shipping & logistics

Phase 3 – midstream & downstream mineral off-take

Exploration	Offshore production system	Shipping	Onshore base and processing facility	Energy transition Metals
				
<ul style="list-style-type: none"> <li>• Environmental baseline studies</li> <li>• Remote/autonomous operations</li> <li>• Survey AUV/ROV</li> <li>• Resource/core sampling</li> </ul>	<ul style="list-style-type: none"> <li>• Production vessel</li> <li>• Vertical transportation system</li> <li>• Mineral collectors</li> </ul>	<ul style="list-style-type: none"> <li>• Shipment of ore minerals from production vessel to onshore base</li> <li>• Decarbonized operation and transportation</li> </ul>	<ul style="list-style-type: none"> <li>• Onshore base/terminal for mineral unloading</li> <li>• Processing of critical minerals with highest ESG rating</li> <li>• Nickel, Cobalt, Copper, Manganese and REE</li> </ul>	<ul style="list-style-type: none"> <li>• Energy storage and battery producers</li> <li>• Energy grid infrastructure</li> <li>• Solar and offshore wind component industry</li> </ul>



Seeking New Partners



[www.lokemm.com](http://www.lokemm.com)

