



Global Centres of Expertise  
**GCE Subsea**

## **Presentation at NICCI Ocean Industries seminar - Bergen 15. March 2018**

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**WORLD-CLASS  
SUBSEA  
SOLUTIONS**  
//// FROM NORWAY



# The Cluster Map

## PARTNERS

Industry



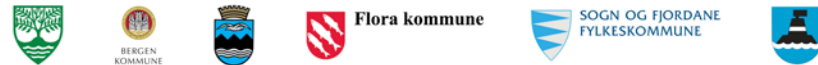
R&D



Higher Education Institutions



Development Contributors



## MEMBERS



Supported by



Cluster Relations



National Relations



International Relations



# Norwegian Innovation Clusters



1. GCE Blue Maritime
2. GCE Subsea
3. GCE Node

**Norwegian Innovation Clusters are aimed at increasing value creation through sustainable innovation.**

The programme is a cooperation between Innovation Norway, SIVA and the Norwegian Research Council, funded by the Ministry of Trade, Industry and Fisheries and Ministry of Local Government and Modernisation.



1. NCE Aquaculture
2. NCE Instrumentation
3. NCE Tourism - Fjord Norway
4. NCE Seafood Innovation Cluster
5. NCE Media
6. NCE Maritime CleanTech
7. NCE Culinary
8. NCE Eyde
9. NCE Micro- and Nanotechnology
10. NCE Systems Engineering Kongsberg
11. NCE Oslo Cancer Cluster
12. NCE Health Technology
13. NCE Raufoss
14. NCE Smart Energy Markets



- |                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Arena Arktisk Vedlikehold</li> <li>2. Arena BioTech North</li> <li>3. Arena Vinteropplevelser</li> <li>4. Arena Innovasjon Torskefisk</li> <li>5. Arktisk Maritim Klynge</li> <li>6. Mineralklynge Nord</li> <li>7. Arena olje og gass Helgeland</li> <li>8. Smart Water Cluster</li> <li>9. Arena NxtMedia</li> <li>10. iKuben</li> <li>11. Legasea</li> </ol> | <ol style="list-style-type: none"> <li>12. Norwegian Rooms</li> <li>13. DesignArena</li> <li>14. Norwegian Smart Care Cluster</li> <li>15. Arena Usus</li> <li>16. Arena Digin</li> <li>17. Electric Mobility Norway</li> <li><b>18. Subsea Valley</b></li> <li>19. Norwegian Fashion Hub</li> <li>20. Oslo Ed Tech Cluster</li> <li>21. i4Plastics</li> <li>22. Arena Heidner</li> </ol> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# GCE Subsea

## // Main goal:

Increase the cluster's competitiveness and global market share, and take a leading position in sustainable utilisation of ocean resources.

## // Main objectives:

- Cost-efficiency: strengthen competitiveness
- Research-based innovation: paradigm-shifting technology
- Ocean Innovation: beyond oil and gas

## // Key global drivers:

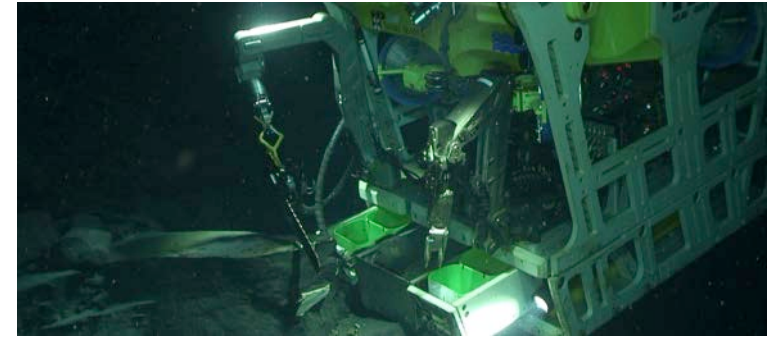
- increased demand for energy and marine resources
- climate and environmental challenges
- stronger global competition



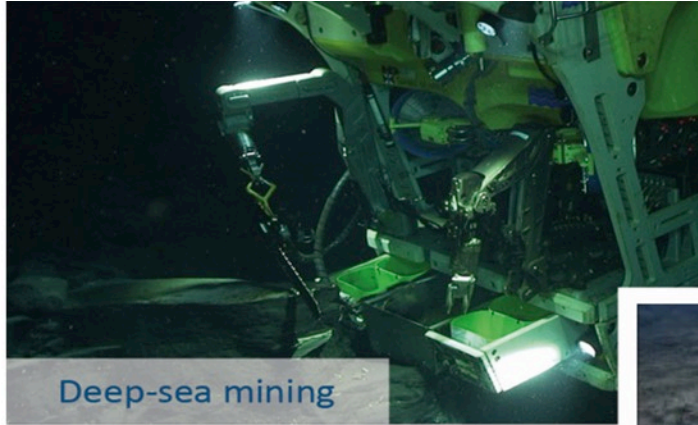
# Ocean Innovation

Collaborate with the strong competence in Norwegian marine and maritime clusters to expand into related industries.

- // **Marine food production:** 35 per cent increase in aquaculture from 2013-2022.
- // **Deep-sea mining:** 10 per cent of minerals will come from the seabed in 2030.
- // **Offshore renewable energy:** The EU has targeted a 20 per cent reduction in greenhouse gas emissions and 20 per cent increase in use of renewable energy by 2020.



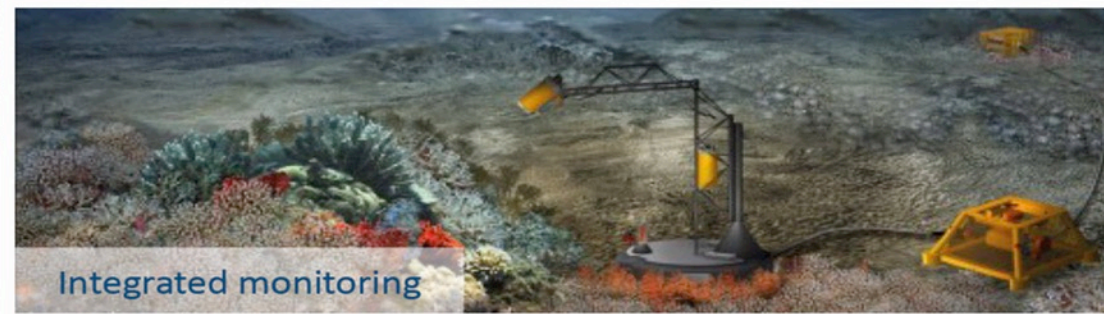
# GCE Subsea - Overview



Deep-sea mining



Marine food production



Integrated monitoring

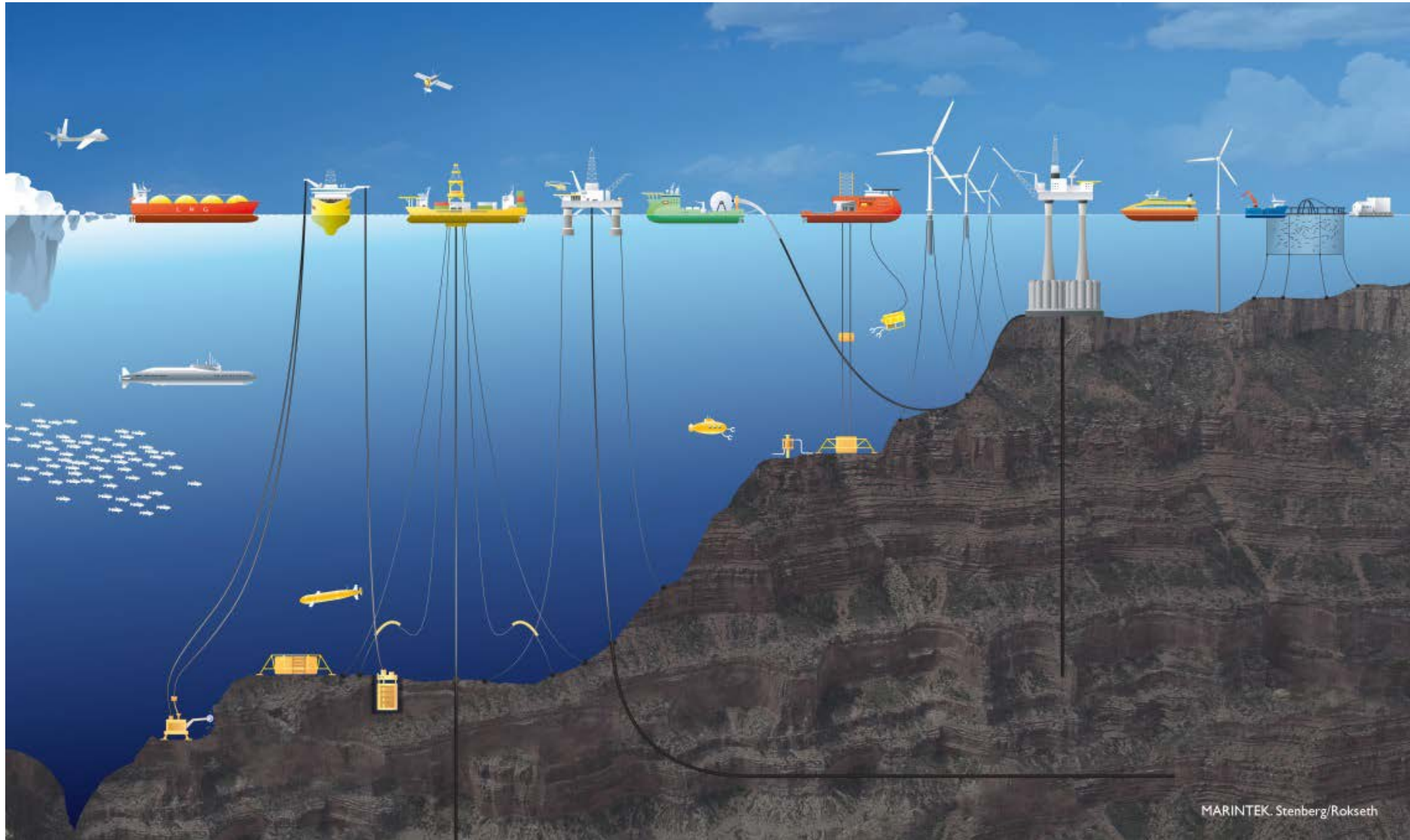


Subsea Factory

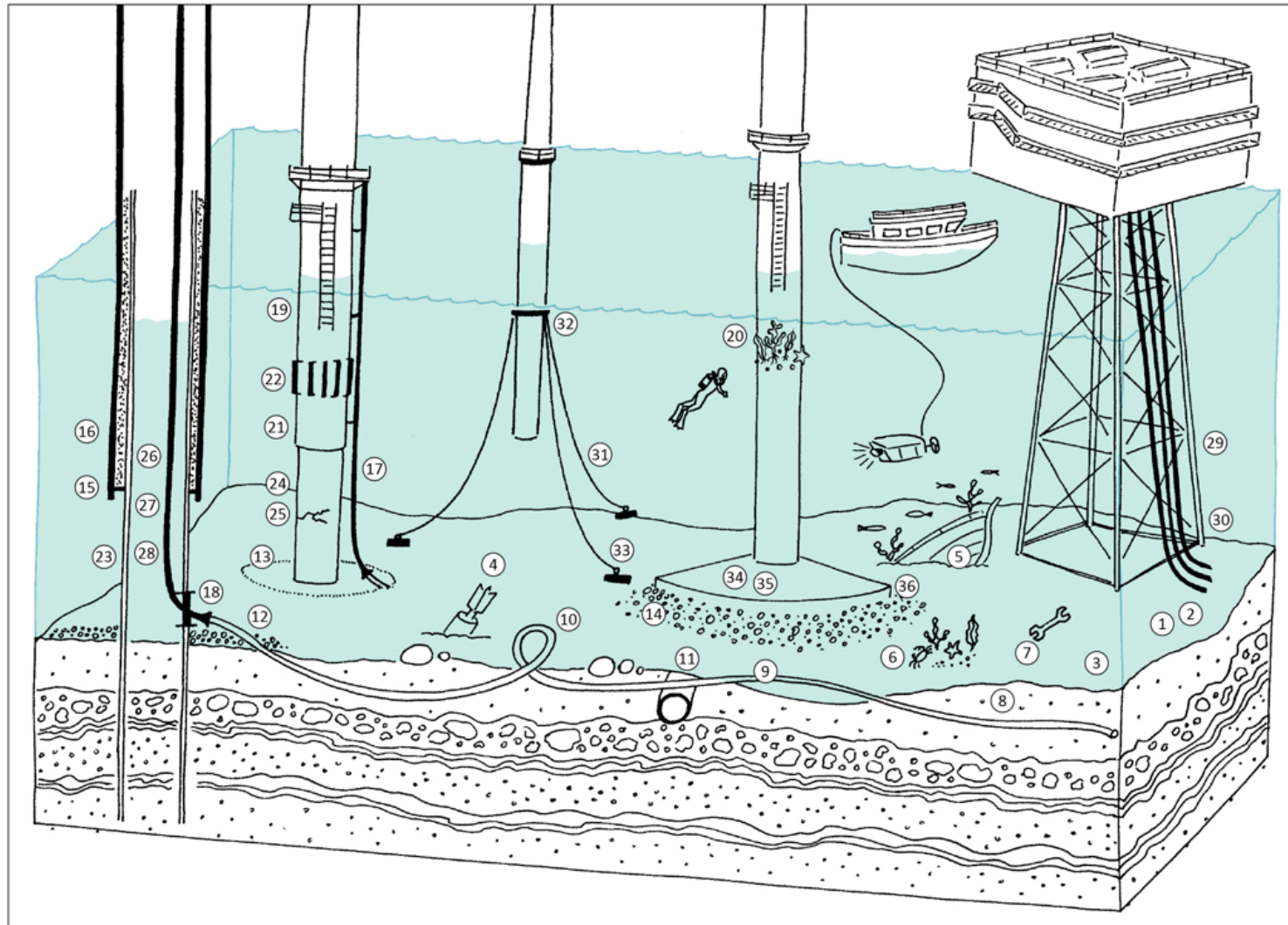


Offshore renewable energy

# Ocean industries – Common denominator – SUBSEA



# Carbon Trust, UK – Offshore Wind Accelerator – 36 Subsea Inspection themes



1. Seabed morphology
2. Seabed mobility
3. Seabed bathymetry
4. Unexploded ordnance
5. Archeology
6. Benthos, flora and fauna
7. Debris and foreign objects
8. Buried cables
9. Free spans
10. Cable loops
11. Cable crossings
12. Cable protection
13. Scour
14. Scour protection
15. Grout seals
16. Grout integrity
17. J-tubes
18. J-tube seals
19. Ladders and boat fenders
20. Marine growth
21. Corrosion
22. Cathodic protection
23. Coatings
24. Welds
25. Cracks and flaws
26. Internal corrosion
27. pH
28. Oxygen levels
29. Flooded members
30. Pile sleeves
31. Tendons
32. Swivels
33. Anchor points
34. Concrete
35. Rebar corrosion
36. Earthing



# Workshop Feb. 3rd. – Theme: Sensors and integrated monitoring

The aquaculture industry has a vision to implement integrated operations based on a large amount of input from subsea sensors – very similar to what the offshore oil & gas industry is doing today.



Integrated operations – decision support

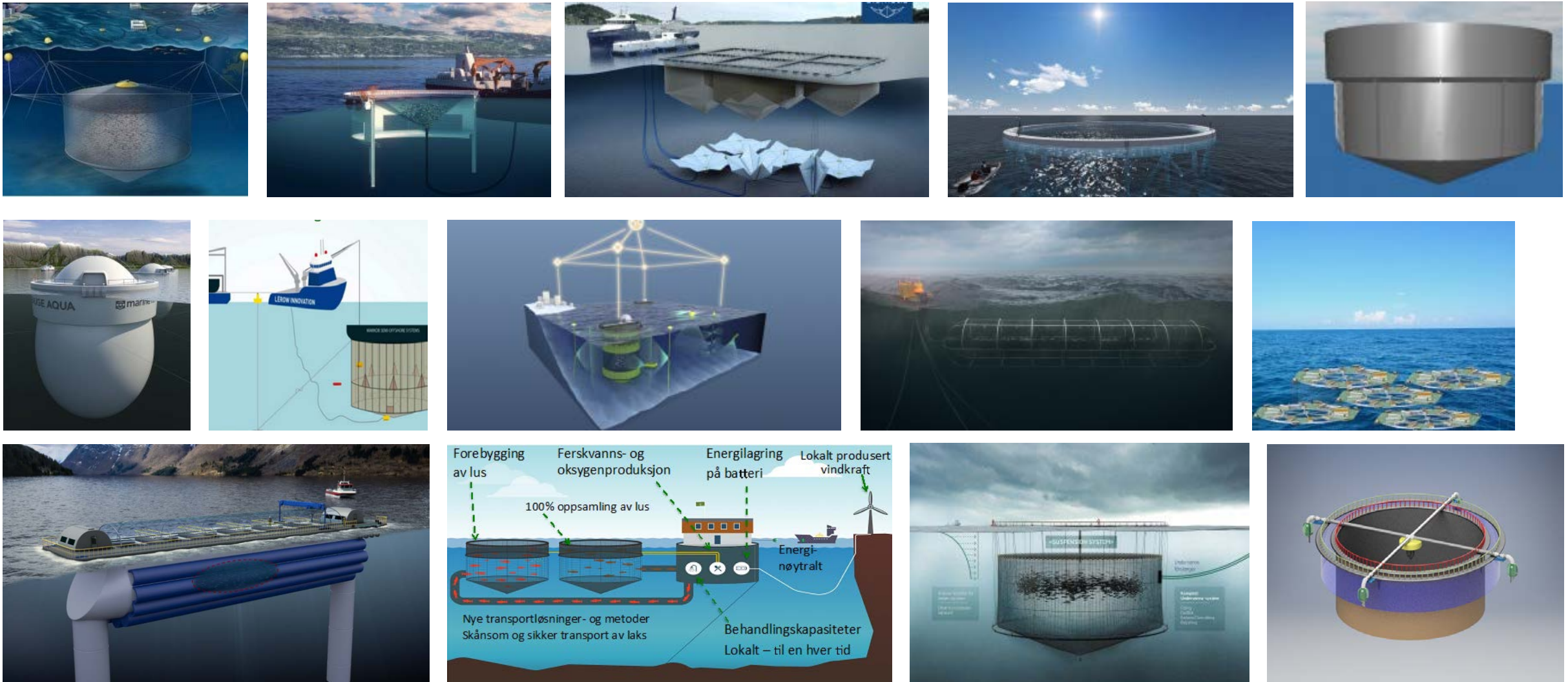


Sensors onboard Fleet	Local sensors	External sensors/sources
Feed status/Feed type	Coastal current/Tidal current	Weather forecast
Feed guns/hoses status	Sea state/Wave height/Length	AIS information/Ship movements
Positioning/Movement	Temperature/Salinity	Public information (Oil spill)
Doors/Hatches/Pumps	Oxygen	Farming info (Disease/Lice/Zones ++)
Water/Damp/Fire/Heat/Smoke	Water samples (Drones)	Algae predictions
Breakage/Leakage/Power/Fuel	Algae indications/Predators	Genetic information
Temperature Indoor/Outdoor	HMS/Safety radio	Other farming companies
HMS/Sabotage	Working boats status	++

Internal sensors Cage (N-RT)	As-Is	To-Be
Temperature	A/M	A
Current strength / direction	M	A
Oxygen	A/M	A
Salinity	M	A
Light (Lumen)	M	A
Individual registration	-	A
Individual weight & quality	-	A
Individual behaviour	-	A
Disease indication	-	A
Dead fish registration	M	A
Dead fish handling	M	A/M
Lice registration	M	A
Lice treatment	M	A/M
Movement v/h	-	A
Cage breakages	-	A
Net breakages	M	A
Anchor stretch / Mooring	-	A
Water samples	M	A
Weight (Icing)	-	A
Power outlets	M	A
Camera/ROV	A/M	A

Illustration: Grieg Seafood

# Innovative concepts being developed for the next generation of fish farming.





 HORDALAND  
FYLKESKOMMUNE

 Global Centres of Expertise  
GCE Subsea

 Norwegian Centres of Expertise  
NCE Seafood  
Innovation Cluster

**Deloitte**

 BTO

# Ocean Industries Collaboration



# Ocean Industries Accelerator

- // Incubator for start-up companies from the ocean industries
- // Located in the heart of the innovation community at Marineholmen, Bergen
- // Cooperation between GCE Subsea, NCE Maritime Cleantech, NCE Seafood and Bergen Teknologioverføring (BTO)



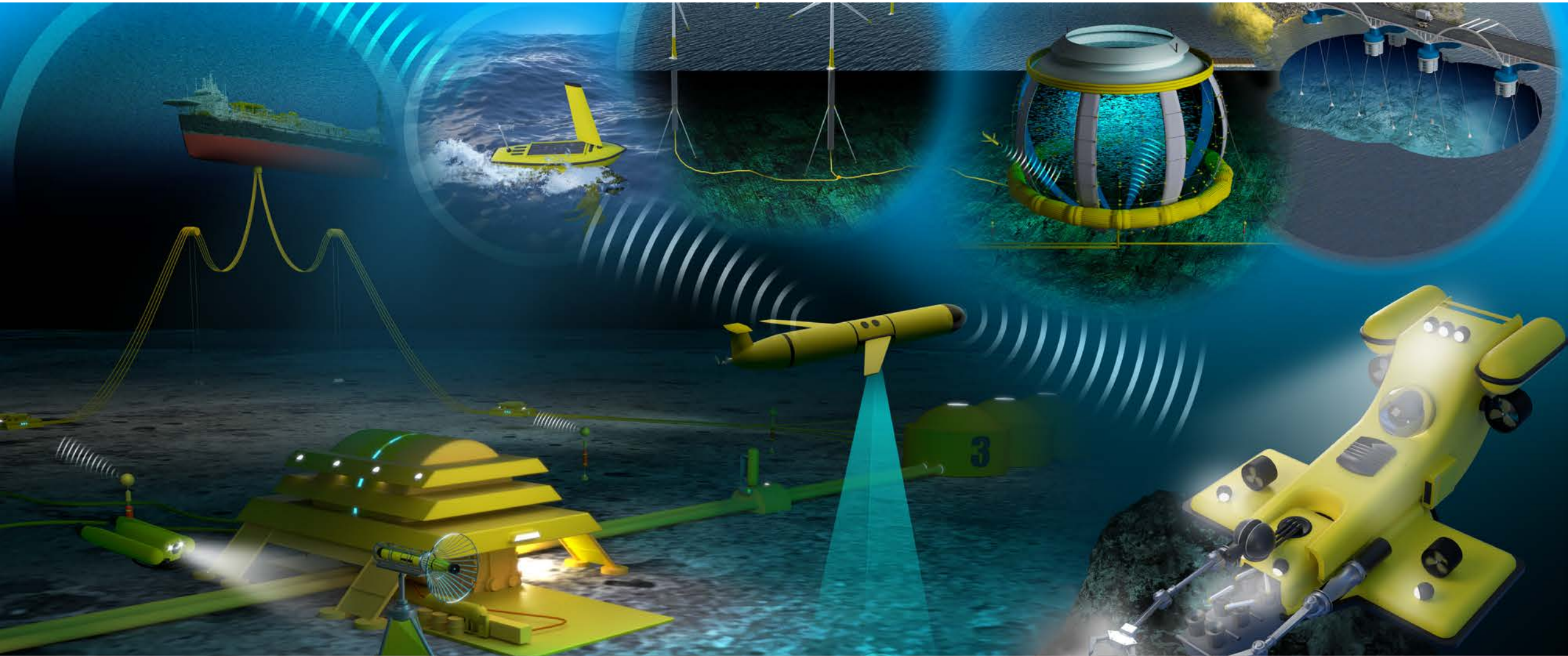
Norwegian Centres of Expertise  
**NCE Seafood**  
Innovation Cluster



Norwegian Centres of Expertise  
**NCE Maritime CleanTech**



# Next step - Ocean Industries Supercluster?



# WORLD-CLASS SUBSEA SOLUTIONS


//// FROM NORWAY



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