The E-ROV System

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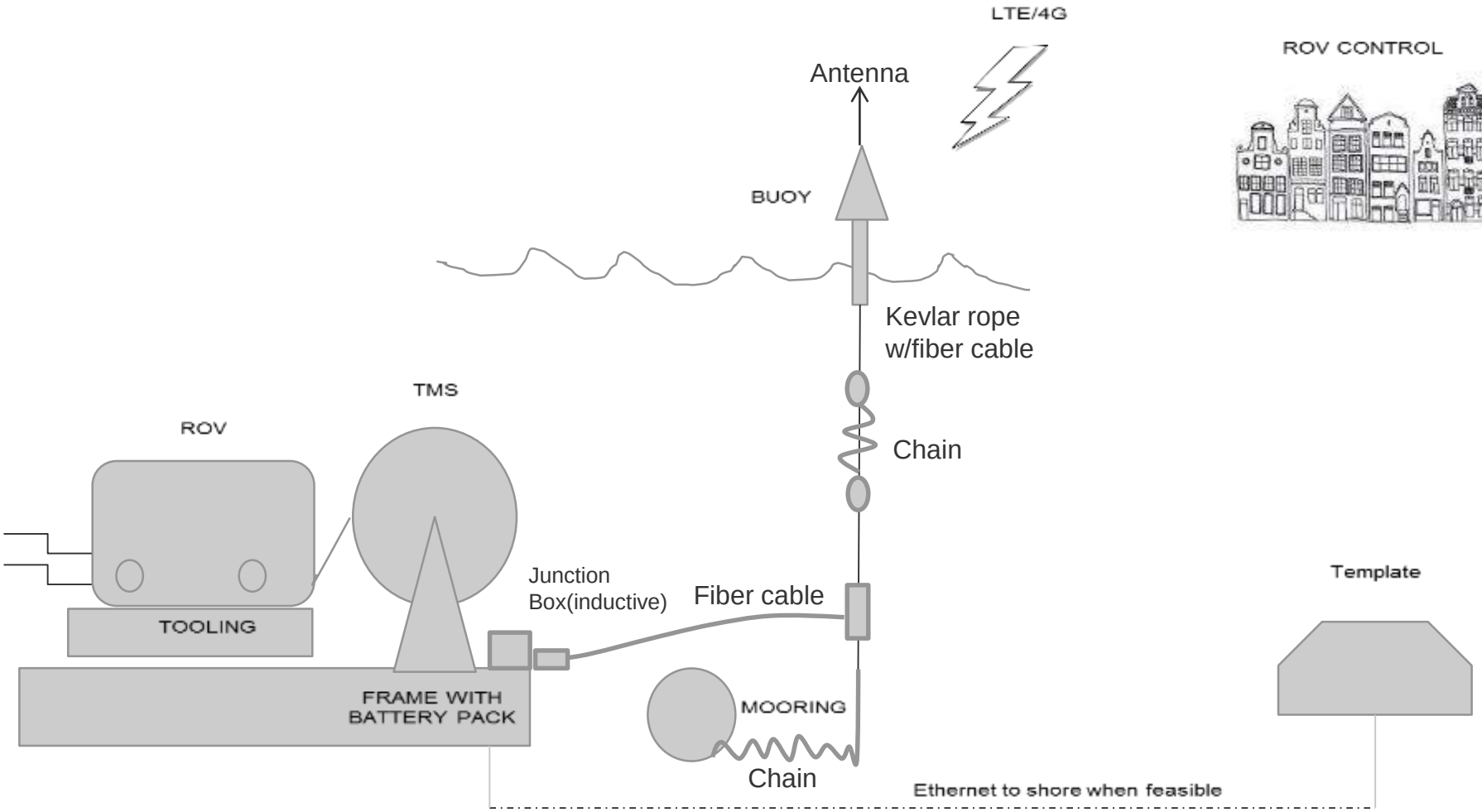
What is the 𝔼-ROV?

- A versatile ROV system
- Deployed by vessel & remotely controlled
- Wireless control linked through a moored buoy
- Powered by a subsea battery pack
- No umbilical from vessel or installation
- 2 main building blocks:
  - Skid w/electrical ROV, TMS and a battery pack
  - Buoy with 4G link, moored to seabed and connected to skid

System overview



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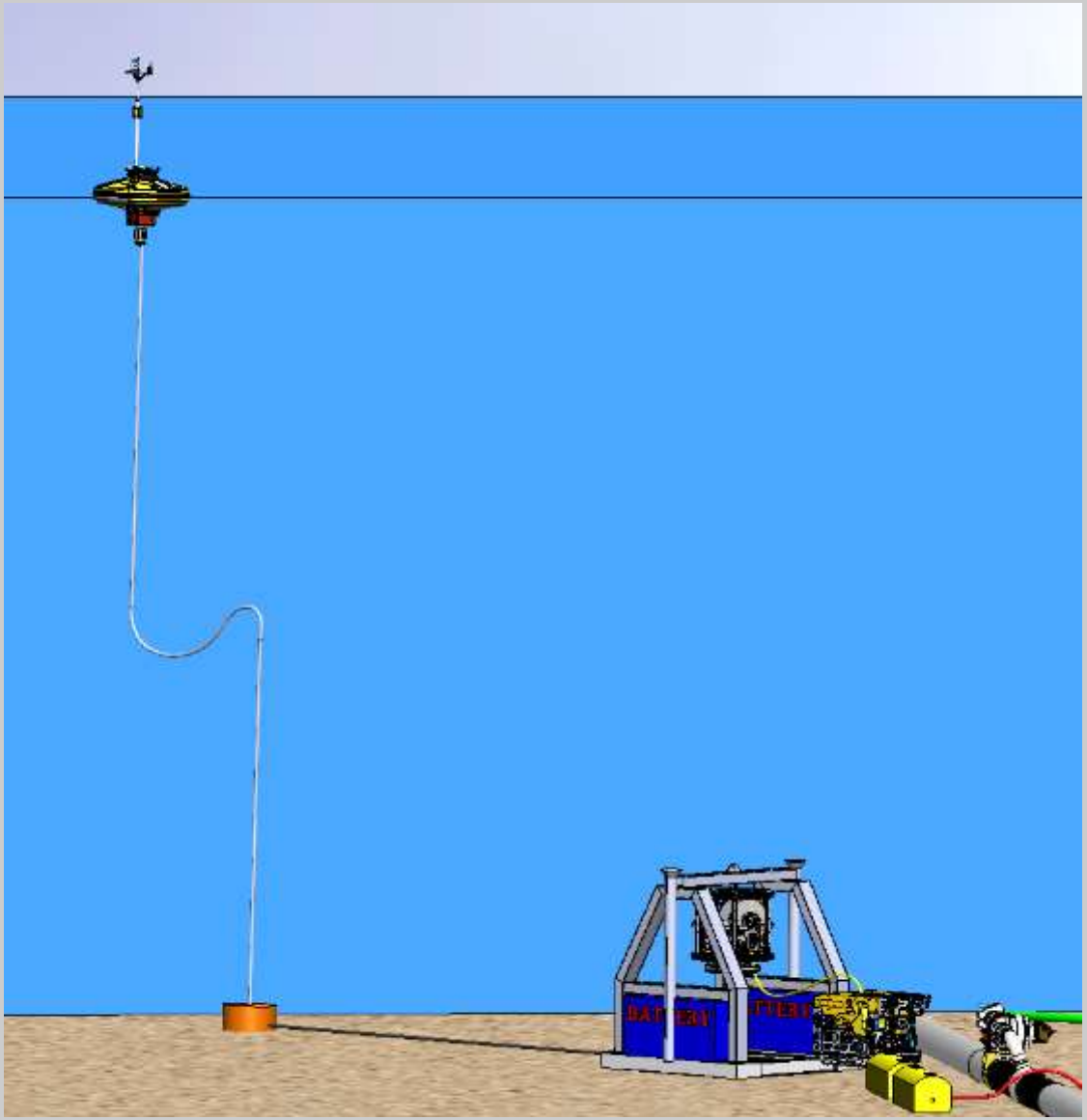

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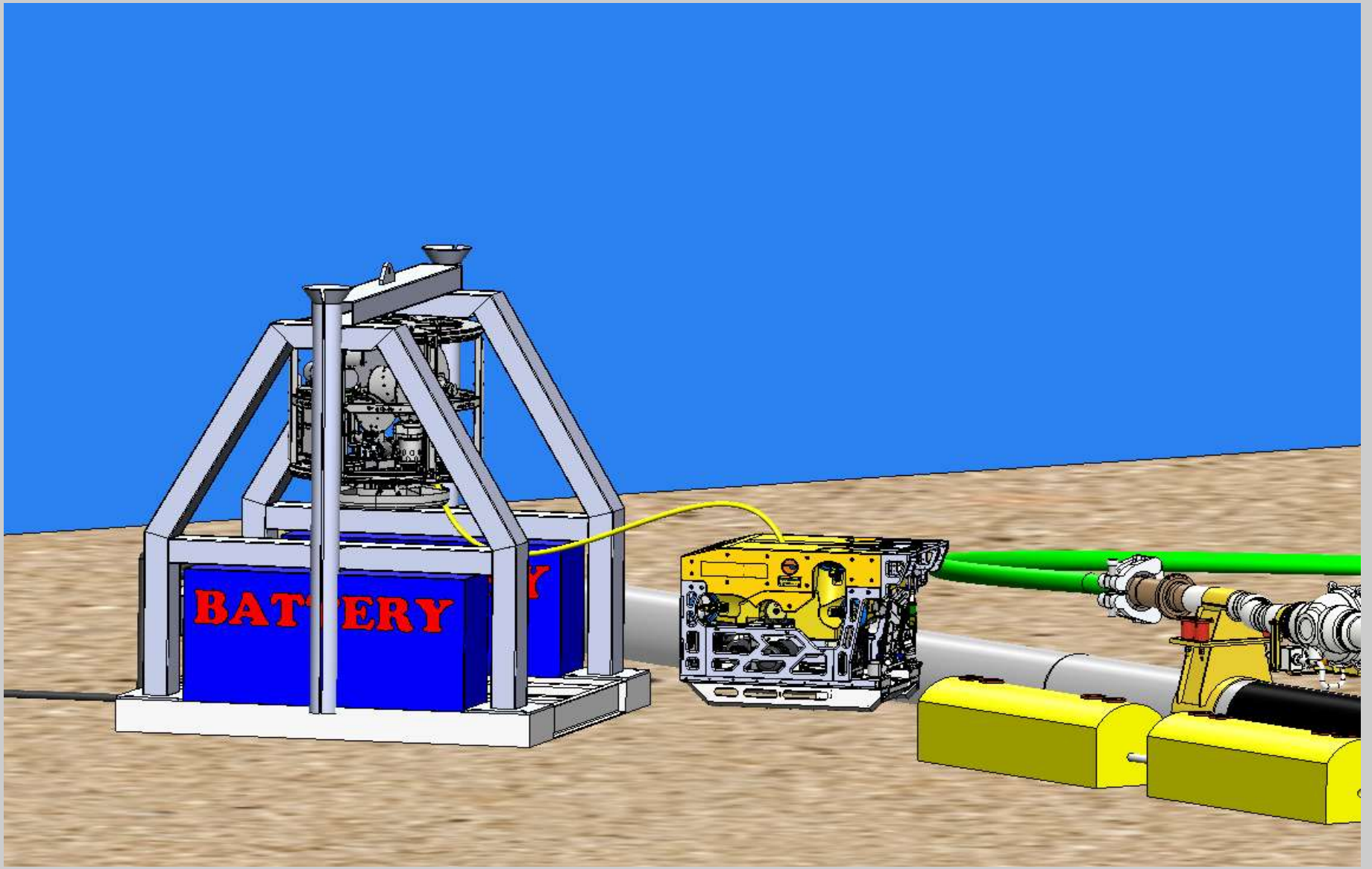

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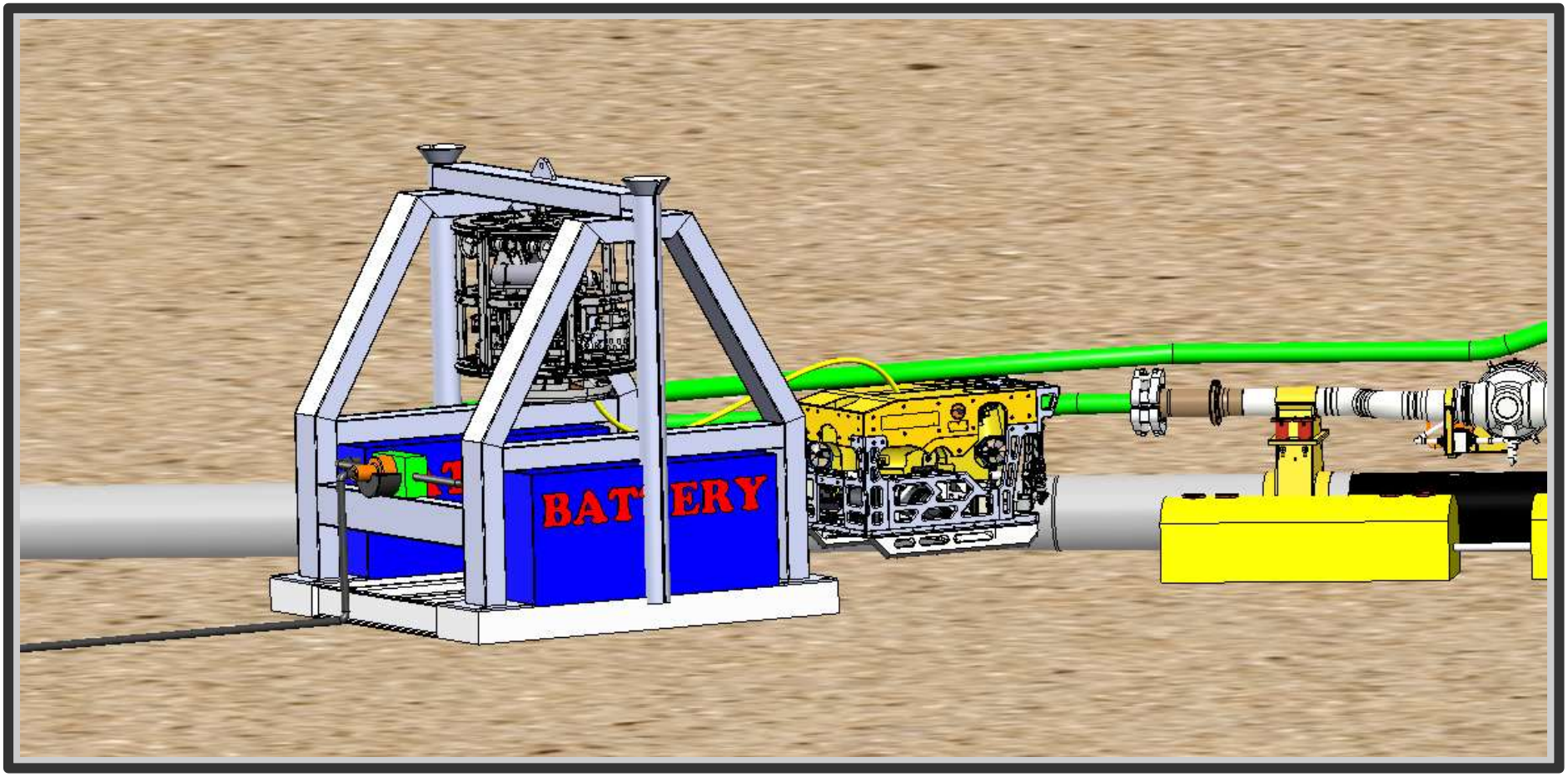

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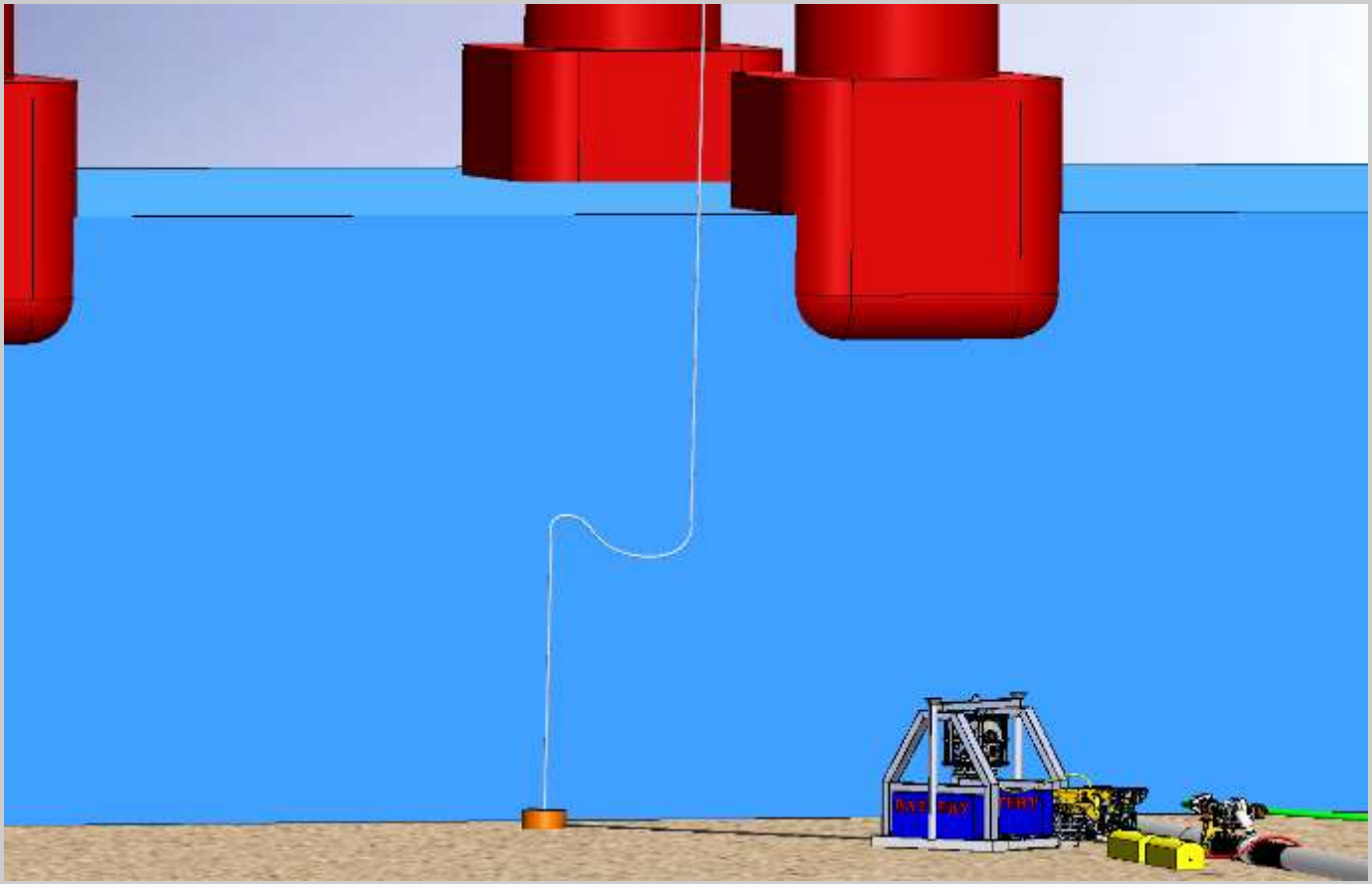
Also possible to connect directly to a rig/install.



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ROV skid

- Consist of a steel frame, battery pack (sides), ROV and TMS
- Fits vessel skidding system
- Easy deployable through the vessel moonpool

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Battery pack

- A marinised ‘Tesla’ battery pack
- Battery pack is scalable.

Buoy system

- Surface buoy with antenna and tranceiver (Fugro Oceanor/MCP)
- Kevlar mooring line with fiber cable and chain/buoyancy elements to reduce wave influence
- Inductive connector to the junction box on the ROV skid

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Advantages:

- Significant cost reducing impact when operationalised
- Utilise proven technology
- Utilise vessels on hire as «mother» vessels (charging & maintenance)
- Take advantage of the LTE/4G system
- Take advantage of rapid battery improvements for industrial purposes(scalable)
- Flexible – always an option – a very powerful tool
- Minimal interfacing with rigs & plattforms
- Keep in-house control of the operations
- Service is scalable to any extent – world wide
- Ethernet communication
- Environmental friendly – fully electrical system.
- Reduced emissions from ROV vessels

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LTE / 4G

On NCS

Technical requirement

- Capacity and coverage
  - Typical minimum capacities and coverage:
    - 16 Mbit/s for drilling rigs and LWI/IMR vessels
    - 4 Mbit/s for vessels
    - Within a radius of 40 km
  - Up to 5 drilling rigs may operate within a sector.
- IT security - Encryption of data traffic
  - The LTE solution should support encryption, both communication and signaling links remain encrypted across the network without significant performance degradation. The encryption algorithm should be based on industry standards.
  - CPE equipment should support IPSec.
  - For Company internal traffic CPE Contractor shall be independent of Contractor of the base station equipment.

Technical requirement

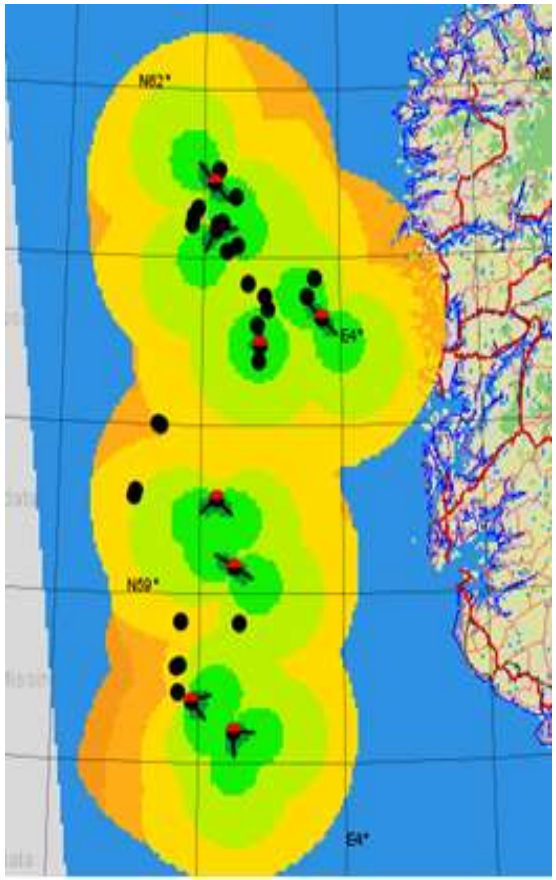
- Interface
  - Company’s data network via an Ethernet interface at the facility where the base station is installed
  - The data network of the individual service companies, vessel operators etc. giving services to Company
  - SOIL (Secure Oil Information Link) – an oil and gas collaboration network.
  - Internet
- Frequency band
  - Company has spectrum licenses in the 900 and 1800 MHz band that can be used for services on the Norwegian continental shelf

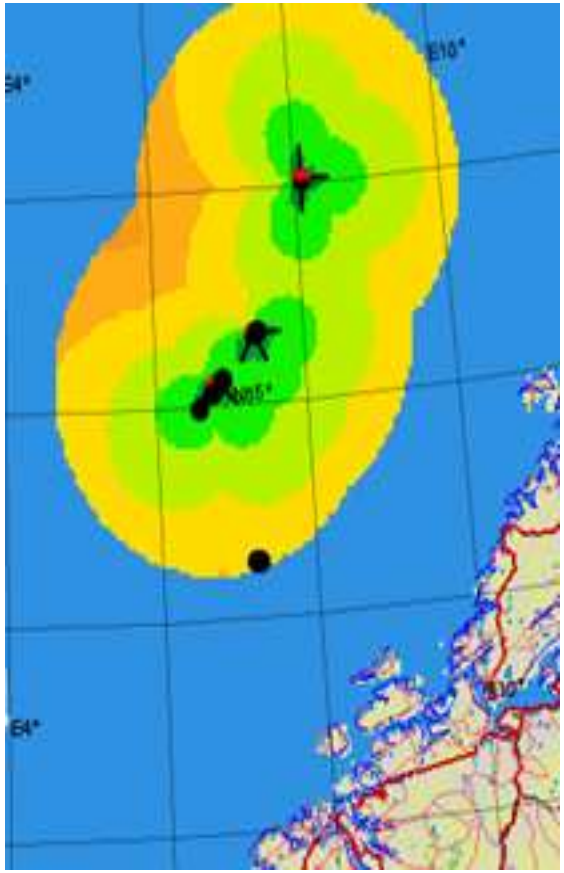
Drilling activity

FIELD	DRILLING ACTIVITY
DRAUPNER	LOW
GRANE	HIGH
GUDRUN	LOW
GULLFAKS	HIGH
HEIDRUN	LOW
HEIMDAL	LOW
KVITEBJØRN /VALEMON	LOW
NJORD	LOW
NORNE FPSO	HIGH
OSEBERG	HIGH
SLEIPNER	HIGH
SNORRE	LOW
STATFJORD	LOW
TROLL	HIGH
VESLEFRIKK / HULDRA	LOW
VISUND	LOW
ÅSGARD / KRISTIN	HIGH

- Drilling activity
  - High means up to 5 drilling rigs can operate on the field or in one sector
  - Low means up to 2 drilling rigs can operate on the field or in one sector

Coverage for Statoil's operations on NCS





Base station on following platforms:

 = in place

- **Åsgard B**
- **Heidrun B** 
- **Norne**
- **Troll A**
- **Snorre A**
- **Sleipner**
- **Draupner**
- **Grane** 
- **Gullfaks A** 
- **Heimdal** 
- **Oseberg A**

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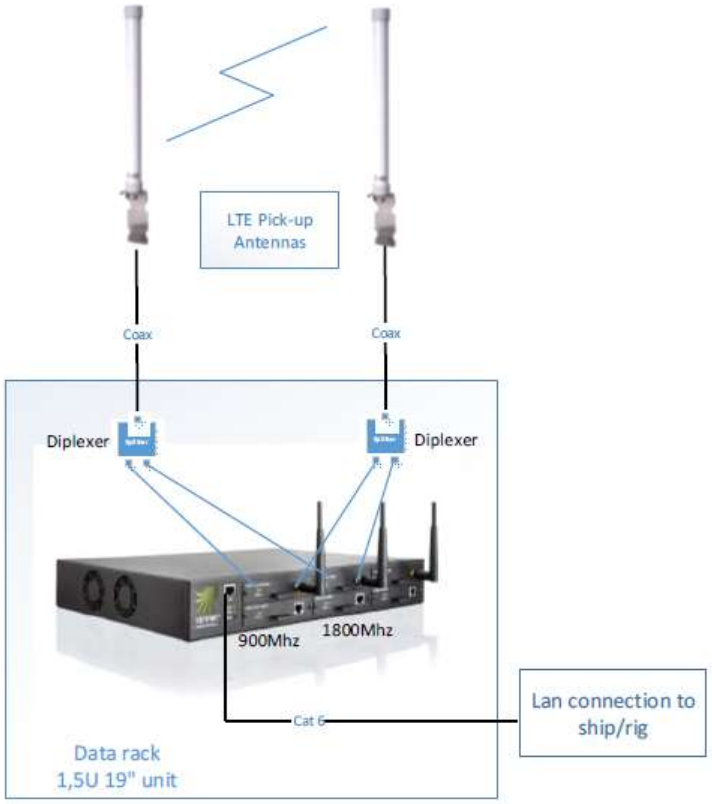
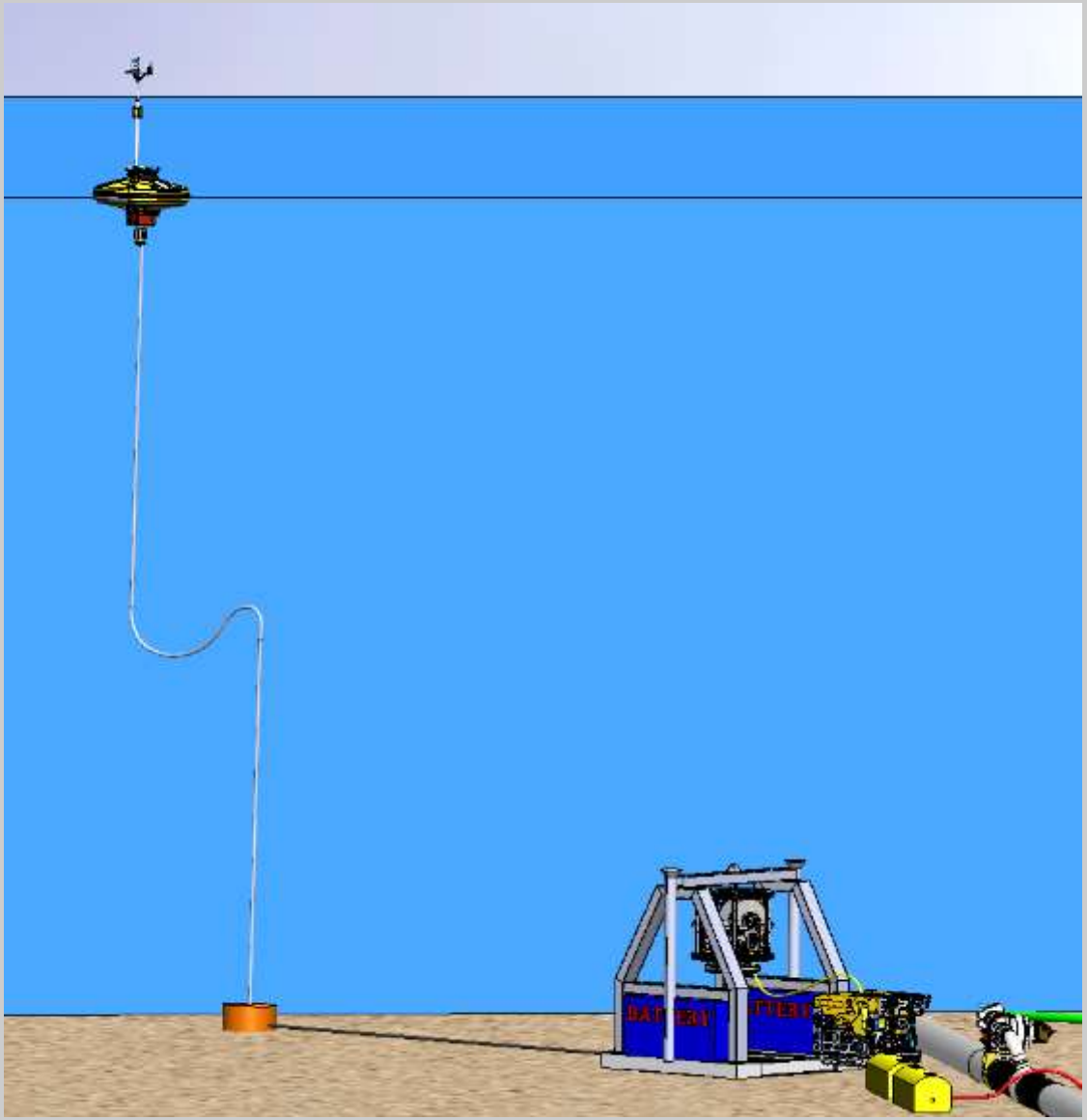
CPE equipment required for Rig installation



Project plan

Technical qualification

- Conduct a test-pilot
- The pilot will include: Small electrical WROV + Battery pack + 4G Buoy + Control Room + ROV pilots
- Deployed from an IMR vessel on a location with 4G coverage
- ROV, Buoy, Control Room, personnel: -> Rental
- Is this a reliable system?
- Give input to a complete E-ROV spec.



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There's never been a better time for good ideas

Kaj-Ove Skartun

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