Horisont Energi - The Greater Perspective

Barents Blue 2024

15-16 April 2024

Bjørgulf Haukelidsæter Eidesen, Co-CEO

Horisont energi

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"Our ambition is to become a leading clean energy company offering cost-effective clean ammonia, with market leading sustainability performance."

BJØRGULF EIDESEN
CO-CEO / Founder

Horisont Energi
Blue Ammonia

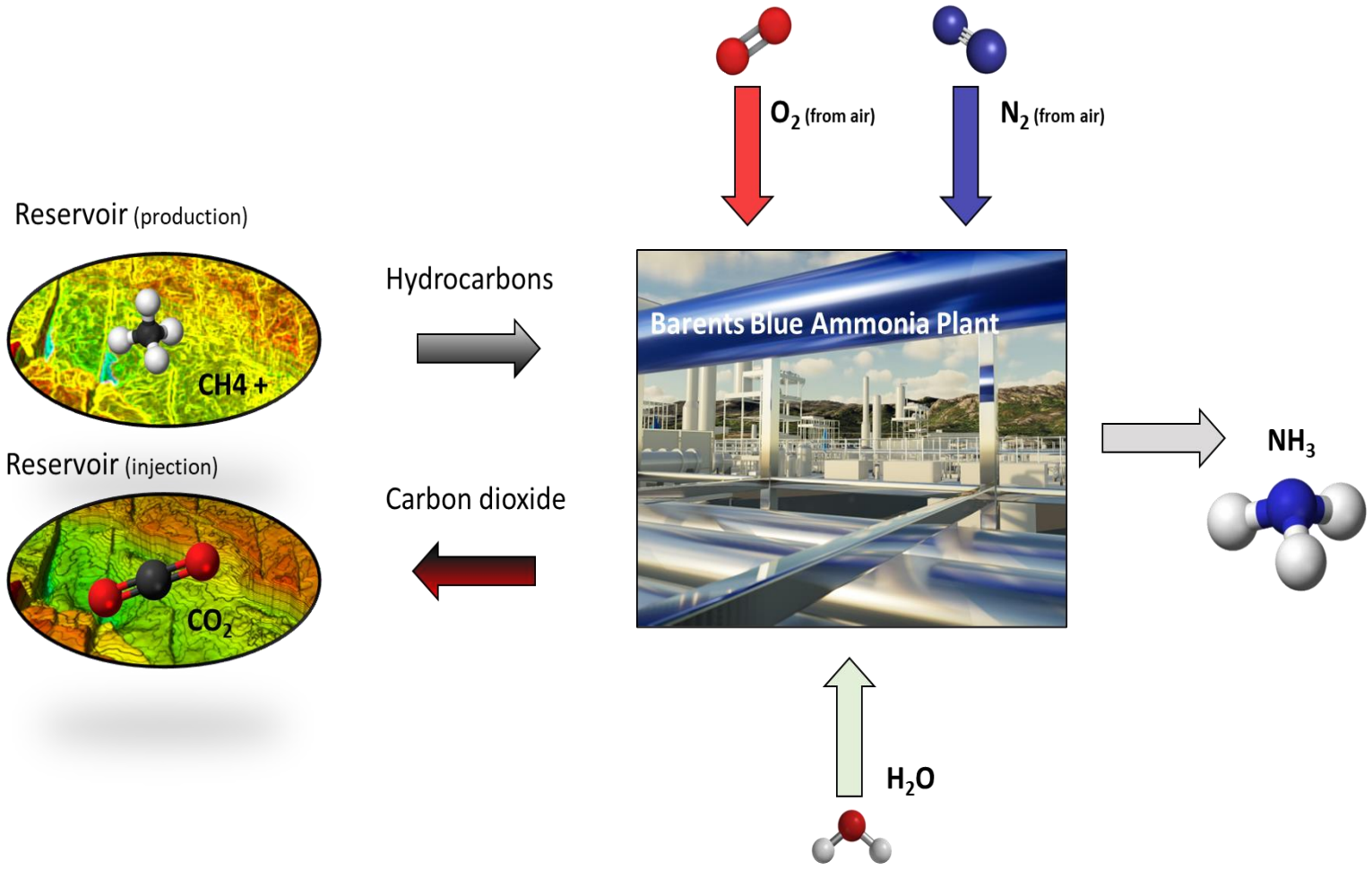
SETTING THE STANDARD
FOR **CLEAN AMMONIA**

WHAT WE SET OUT **TO DO**

- World-scale clean ammonia plant
- Most carbon and energy efficient blue ammonia plant in the world
- Best-in-class carbon footprint, well within EU taxonomy requirements
- High safety level for personnel and 3rd party obtained by use of barrier management principles

- Focus on minimizing:
  - Need for electricity from the grid
  - Fresh water consumption
  - Noise and light exposure to surroundings
  - Emissions and waste
  - Carbon footprint

Ammonia and what makes it blue



- Ammonia (NH_3) production is the reaction of nitrogen (N_2) with hydrogen (H_2) in a 1:3 ratio

$$N_2 + 3\ H_2 \rightarrow 2\ NH_3$$

- Source of nitrogen: cryogenic separation of air which contains 78% N_2 and 21% O_2
- Source of hydrogen: natural gas reforming (using O_2 from air separation in an autothermal reformer) and water (H_2O)

Why Finnmark?

The best region for production of clean ammonia in Europe

- A **climate optimal for cooling** without affecting seaborne transport
- Among the **lowest power prices in Europe** – with only renewable energy
- **Available gas that can be decarbonised** – a good climate measure, and where most of the gas have a low carbon footprint
- **Good marine conditions** in many areas with a limited need for winterisation and high reliability
- **Short transport route** to the worlds next largest port for marine bunkering - Rotterdam

Barents Blue Ammonia

What does the Barents Blue project do for Finnmark?

- Barents Blue provides infrastructure that builds Finnmark for the future
- Creates above 500 future oriented jobs in Northern Norway
- Transforms Finnmark into a global production region for clean ammonia
- Creates strong synergies with but also depends upon the Snøhvit Future project
- Places Finnmark in a leading role in the energy transition of Norway

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Setting the standard for **CLEAN AMMONIA**

Key design ambitions

Develop the most carbon and energy efficient ammonia plant in the world

- Minimum all emissions & use of clean water
- CO_2 capture rate: > 99 %
- Minimise renewable electricity use, high energy efficiency
- Focus on sustainable solutions and circular practices
- Efficient process utilizing the benefit of the cold climate
- Low noise level and negligible light pollution – minimize effect on surroundings and impact on biodiversity
- Full EU Taxonomy compliance

Multiconsult

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Project facts

Established May 2020 by Horisont Energi
Based upon Topsoe ammonia technology
Design developed together with Saipem
EU IPCEI Hydrogen project

Key Technical Data

Hydrogen technology: Oxyfuel Auto Thermal Reforming (ATR) (SynCOR Ammonia™)

CO_2 capture rate: > 99 %

Gas feed: ~2.8 million Sm^3/day

Blue hydrogen capacity: 675 MT/day

Blue ammonia capacity: 3000 MT/day

Annual output NH_3: 1 million MT/year

Renewable electricity: 45 MW

Carbon footprint scope 1-3: 300 g CO_{2e}/kg H_2

Total Module Weight: ~60 000 tons

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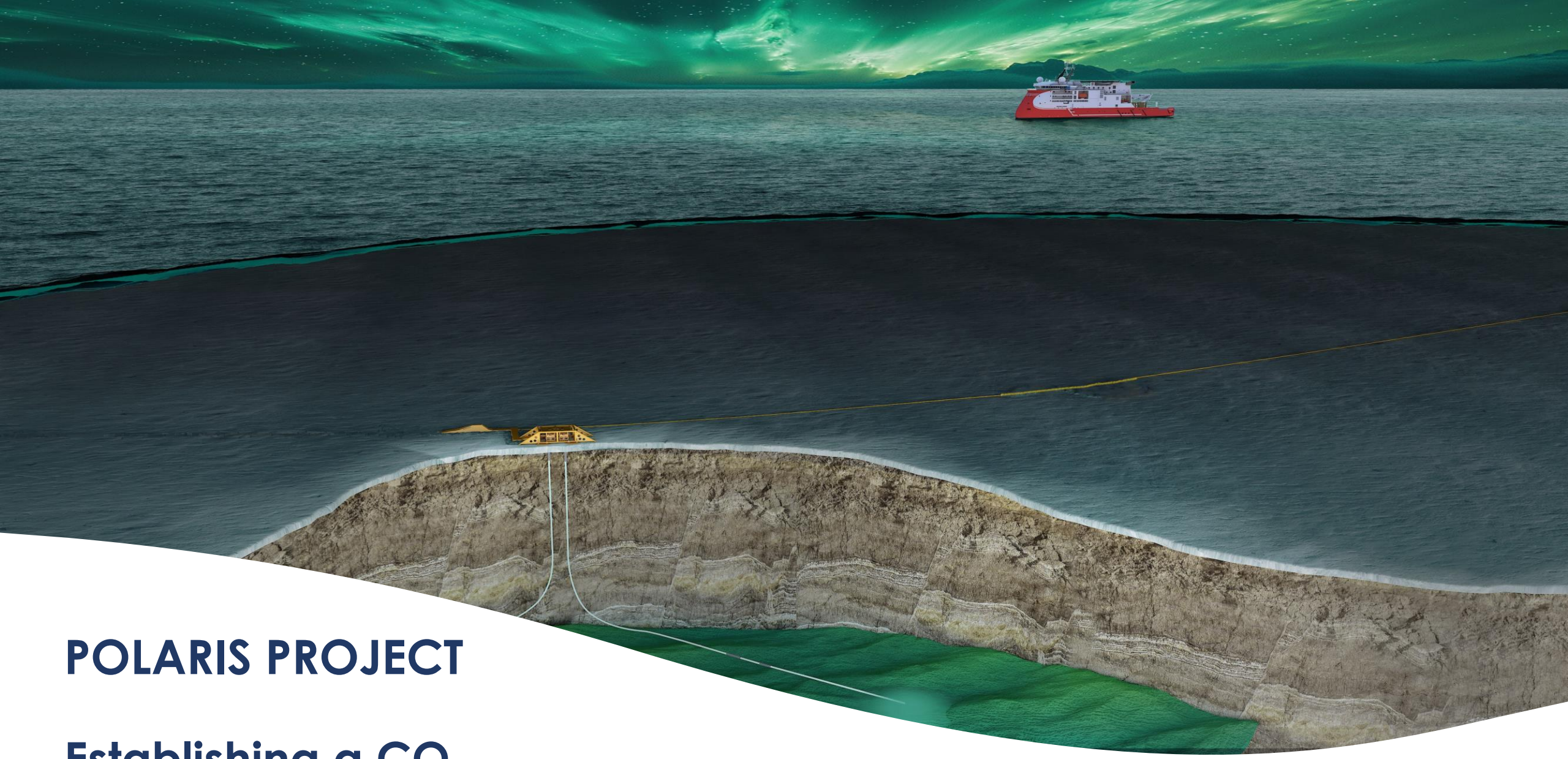
Key schedule figures

2025

Final investment decision

2029

Est. production start



POLARIS PROJECT

Establishing a CO_2 value chain in Northern Norway

PGNiG | UPSTREAM NORWAY
ORLEN GROUP

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The first CO_2 value chain in Northern Norway for third parties

Polaris (EXL003)

One of Norways most mature CO_2 licences

- Operated by PGNiG Upstream Norway (PUN)
- Driven by Barents Blue as anchor customer
- Planned with robust operations and mature technology
- Strong customer base for scaling of the development, term-sheets signed and in development
- Strong support in local community for Northern Norway CCS value chain
- Project lifetime 25+

Key figures

2025
Final investment decision

2029
Est. production start

3-6M tonnes
First phase storage capacity*

Tentative subsea CO_2 storage scope

Developed a standard cost-efficient CO_2 system

Power and communication

- DCFO cable from shore
- Jumpers and flying leads
- Onshore control room
- Reservoir monitoring system

Well design:

- Simplified templates
- Low deviation of well path
- Reduced casing program
- No hydraulic functions in the well, no need for subsea hydraulic

Flexible field architecture

- Subsea pipeline and spool
- Scalable number of wells
- Standard building blocks
- 2 wells on each injection point

All electric Solution

- Simplified and light weight subsea tree and manifold
- Single control module on structures
- Automated well control

Photo: Enova

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"Barents Blue will be a flagship project of great importance for Norway and Europe."

"The project will demonstrate that new, energy-efficient technology for ammonia production including carbon capture can make low-emission ammonia competitive."

NILS KRISTIAN NAKSTAD
CEO Enova

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Our mission

Accelerating the transition to carbon neutrality through pioneering projects

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www.horisontenergi.no