



Efficiency first | Compressed Hydrogen

London Road Show
11-13 September 2023



Australia



Norway

www.provaris.energy

ASX:PV1

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Hydrogen development company focused on the simplicity and energy efficiency of compressed hydrogen

Regional supply projects under development

- > Collaborations with local partners for integrated hydrogen supply projects for delivery in 2027-28
- > Focus on supply from Norway provides strategic advantage with proximity to EU market, stable renewable power, satisfies Additionality Rules (EU Delegated Acts)

Aligns with Efficiency First Principle embedded in EU legislation

- > Most energy efficient way to transport volumes at scale over regional distances
- > Reduces the amount of renewable energy required to produce hydrogen for transport
- > Provides low-cost supply and simple delivery of gaseous hydrogen for the H2 backbone

Increasing demand and policy support for hydrogen continues

- > Germany continues to double-down on hydrogen with 50-70% of its hydrogen demand, forecast at 95 to 130 TWh in 2030, required from imports (circa. 3-4 million tonnes)
- > Premium for green hydrogen established with the EU Hydrogen Bank (up to 4.50/kg subsidy)
- > Increasing offtake discussion in 2023, with capital and operating subsidies aligned to green hydrogen to decarbonisation of industries

Proprietary design for storage and transport

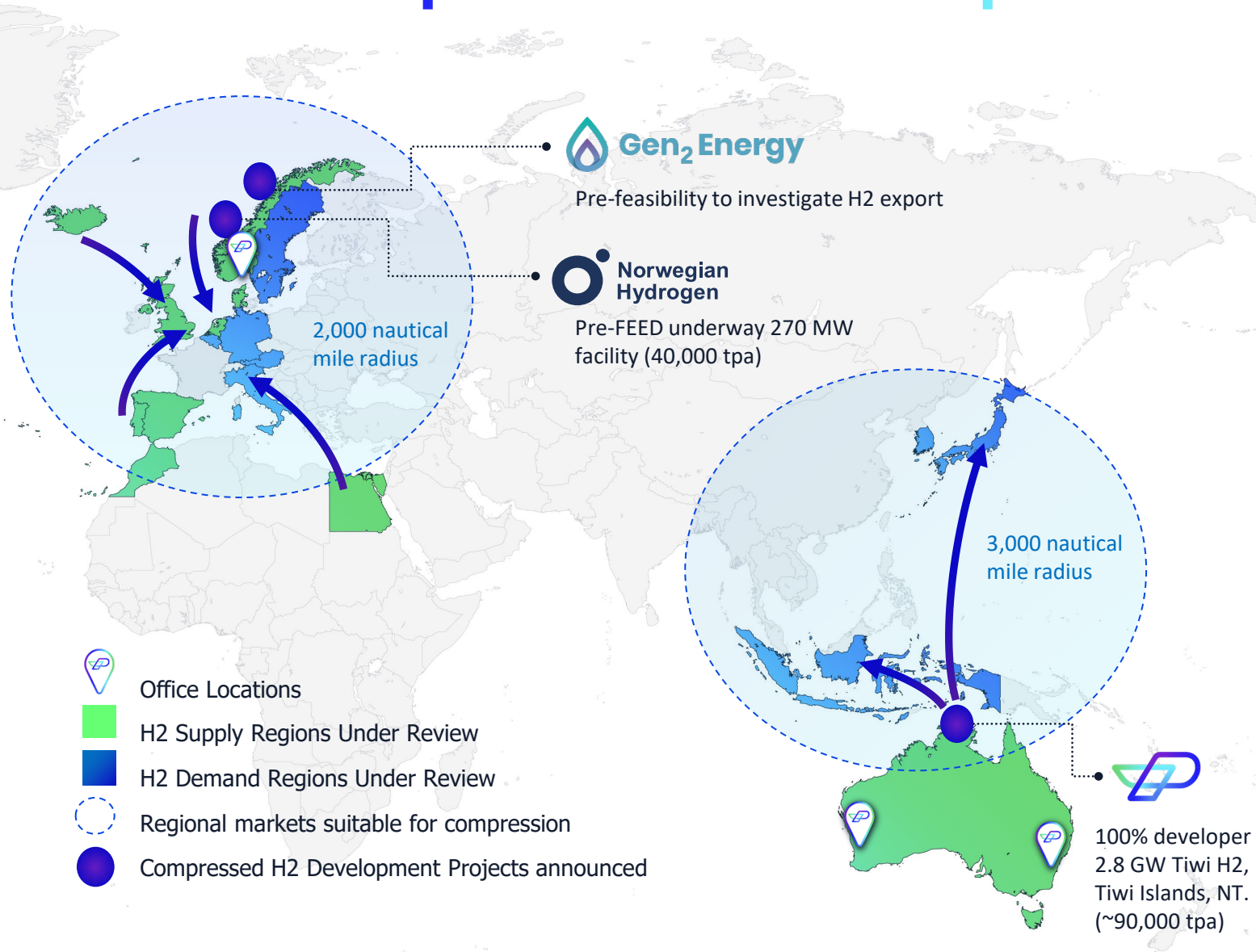
- > Advanced design and approvals for two classes of bulk-scale carriers and marine storage
- > Significant investment over 3 years culminates with Final Class Approval in Q1 2024
- > Developing small-scale storage tanks to transform the cost of onshore storage

Unique IP delivers first mover advantage

- > Unique IP and knowledge on efficient supply projects now being recognised as first to delivery
- > First mover advantage not reflected company valuation



Scaling up hydrogen supply through repeatable projects and collaboration partners across Europe and Asia



- > Established in 2017 (as Global Energy Ventures) to focus on compressed natural gas solutions
- > Pivot to hydrogen in 2020/2021 with the award of AIP on two proprietary compressed hydrogen capacity carriers (H₂Neo & H₂Max)
- > Tiwi H₂ project established in 2021
- > H₂Neo achieved Construction Approval 2022 subject to tank prototype tank test
- > AIP received for barge storage solution 2022 (H₂Leo)
- > Provaris Norway AS established in 2022 with two export projects under collaboration
- > Developing collaboration projects to deliver first exports in 2027
- > Global pipeline of opportunities for compression to make hydrogen transport efficient in regional markets

Seeking to be an integrated developer of the hydrogen value chain

Unique business model to capture multiple revenue streams and drive equity value through project development



Production of Hydrogen

- > **Developer full value-chain for export of hydrogen molecules**
- > NORWAY: Two projects under collaboration for development first export to Europe 2027/28
- > AUSTRALIA: Tiwi H2 project under development for 100ktpa export 2028
- > Equity ownership in long-term take-or-pay contracts



Hydrogen Shipping and Storage

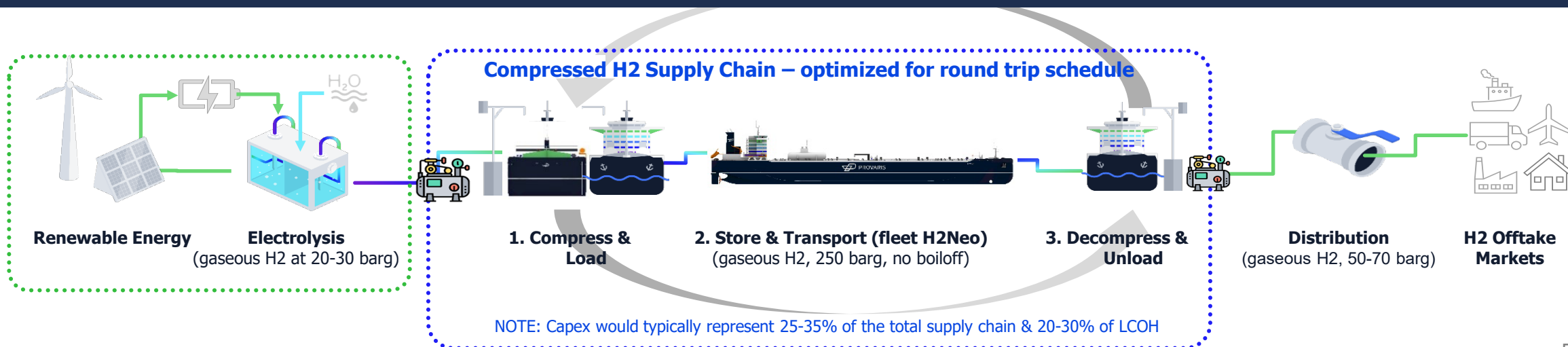
- > **Infrastructure for terminals, storage and shipping of hydrogen**
- > Partner with shipowners and infrastructure funds to own and operate based on long-term charter.



Leveraging unique IP

- > **Proprietary development of bulk-scale shipping and storage solution**
- > US Patent & world-first 'Design Approval' for compressed hydrogen carrier & floating storage
- > Development of automated tank production line for storage tanks (marine and onshore)

Producing H2 at scale with industrial 20-year offtake at agreed prices enables bankable projects



Transport of compressed hydrogen is more than just the energy content of the carrier



Minimise (re)conversion losses and capex required for alternative carriers



Does **not require base-load** renewable energy supply to be efficient

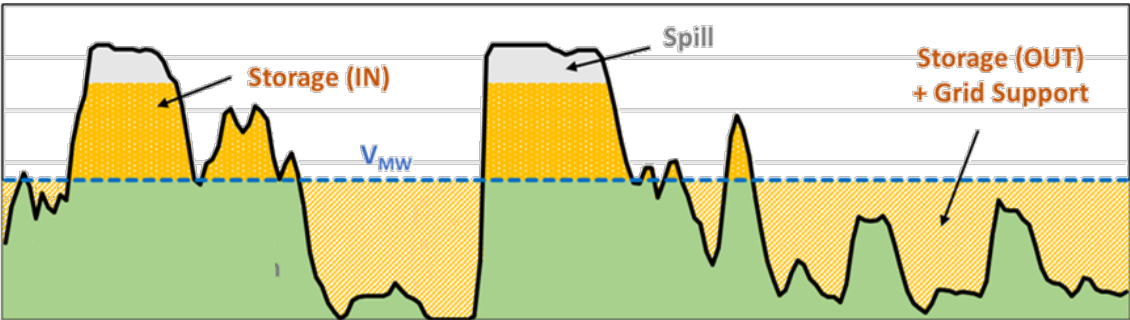


Compression can **100% load-follow** the variable renewable generation profile



Eliminates Batteries, H2 Storage, and/or 'fossil fuel' grid back-up required by other carriers for stable conversion

Avoids the Conversion of a variable wind/solar profile to flat profile



Efficiency and levelised cost needs to evaluate energy efficiency across the full supply chain

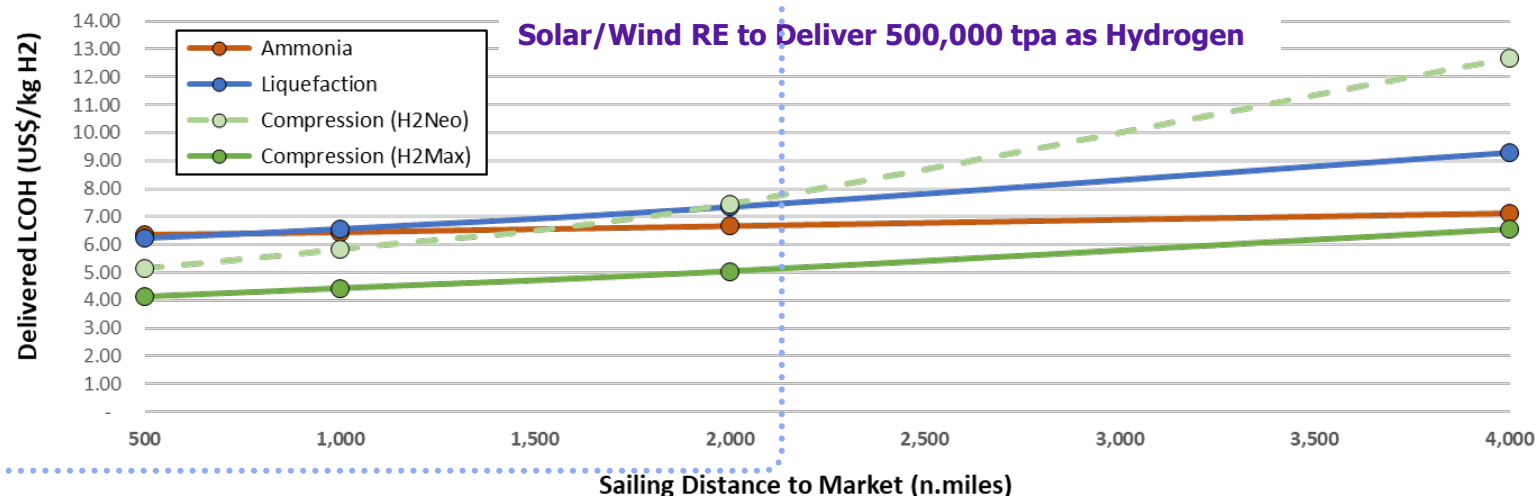
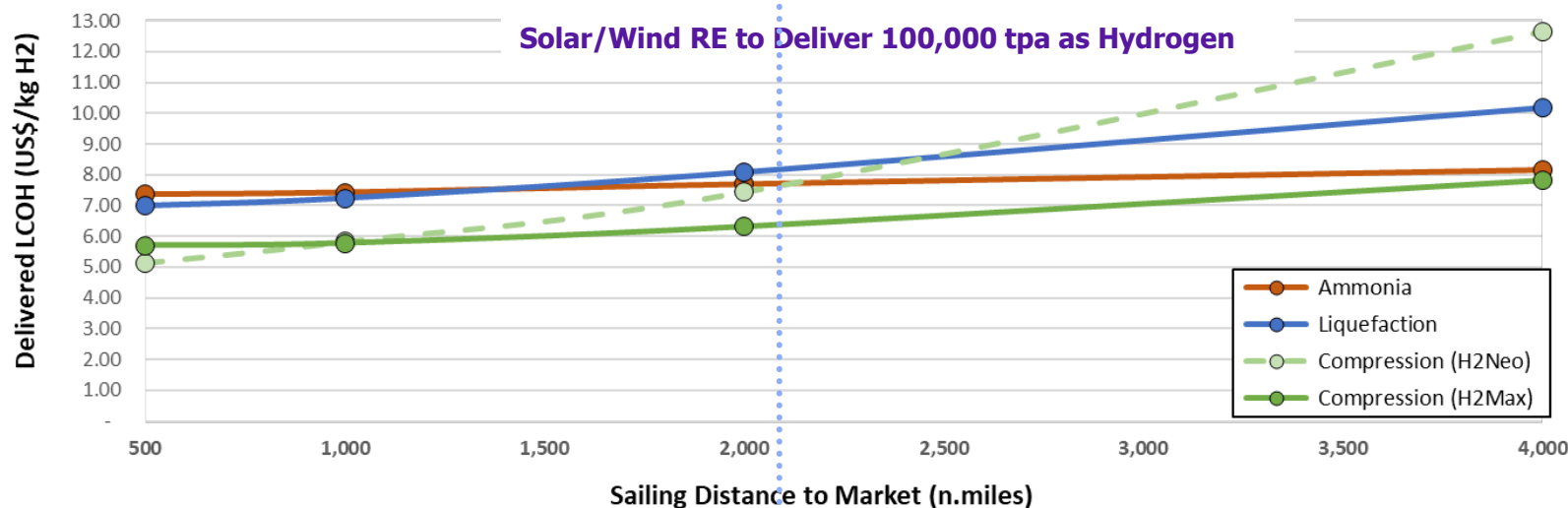
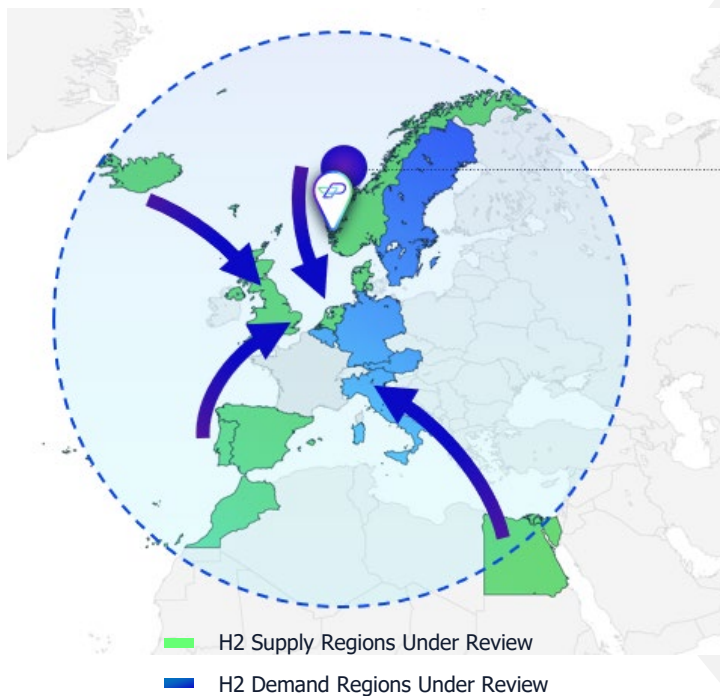
Factors that impact on LCOH of supply chain

	Compression 	Liquefaction (LH2)	Ammonia (NH3)
'Load Follow' Variable Profile	100%	0%	40-100%
Hourly Change in Process	100%	0%	5%
Conversion Efficiency	1.5 kWh/kg H2	11 kWh/kg H2	9 kWh/kg H2
Boil-off per day	0%	Up to 1%	0%
Reconversion Losses	2.5% (Scavenging)	5% (Regasification)	25-40% (Cracking)
Energy Losses	<20%	+40%	+40%
Purity	✓	✓	?

Compression's ability to load follow increased efficiency and flexibility, resulting in a lower delivered cost of green hydrogen

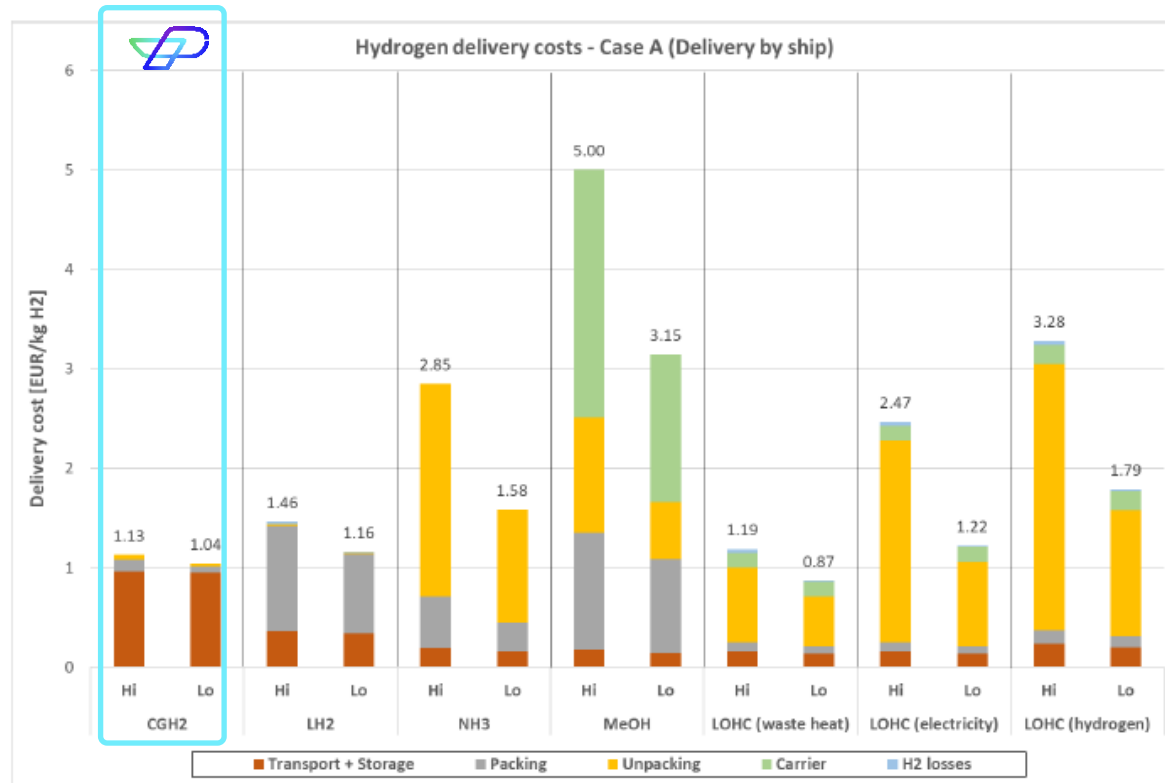
Realistic hydrogen supply chain analysis needs to account for the full value chain: RE curtailment, Vector capital & losses, Shipping, and Conversion back to gaseous hydrogen (**2023 Hydrogen Transport Comparison Report, Energy**)

10Mt Market Opportunity for Compressed Hydrogen into Europe

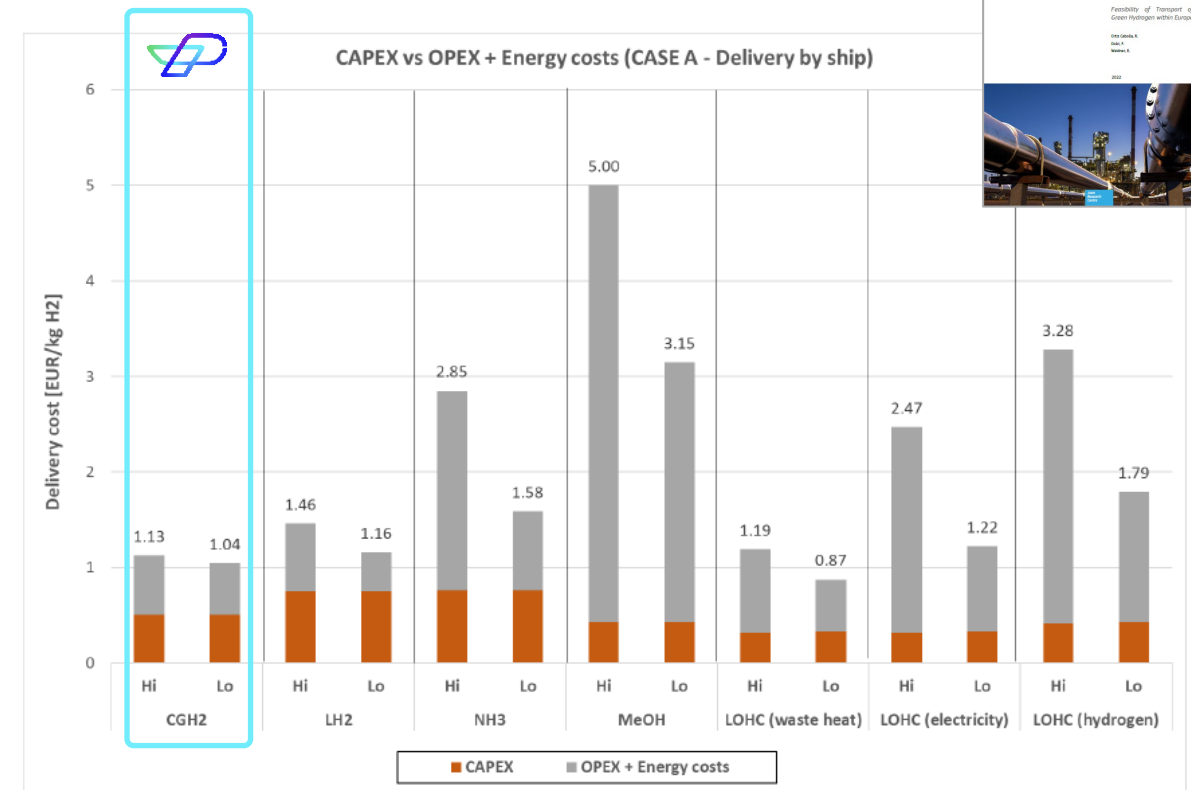


Independent research supports the cost advantage and efficiency of Compressed H2 over regional distances

Case Study: 1Mtpa continuous delivery over a 2,500km shipping



Source: JRC analysis

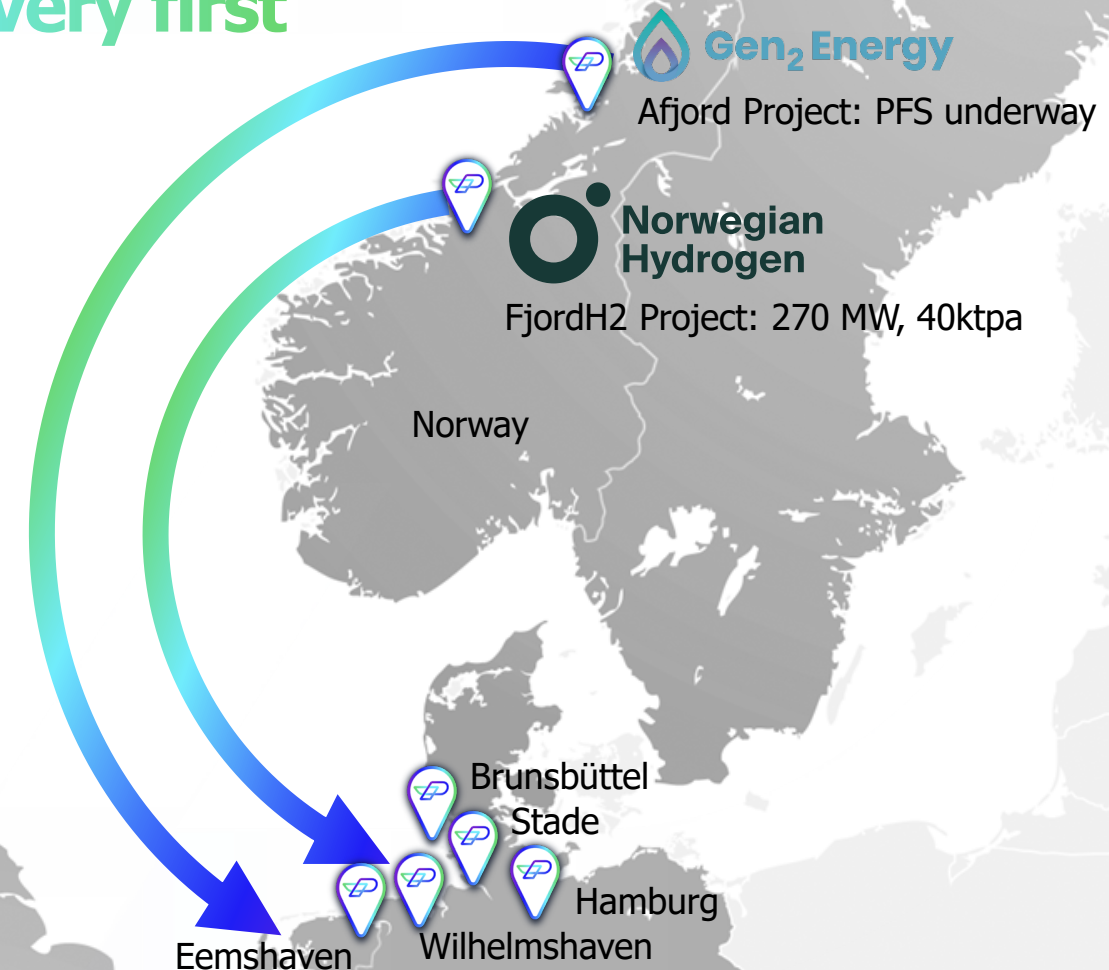


Source: JRC analysis

"In the case of compressed hydrogen delivered by ship, it can be seen that the final cost is dominated by the transport costs. Due to its lower density, transport of compressed hydrogen requires a bigger and more expensive fleet than any other packaging mode. However, the packing and unpacking costs (i.e. compression costs) are low enough to compensate for the higher transport costs. **This makes compressed hydrogen by ship an attractive option, for Case A, with a delivery distance of 2,500 km**" Source: JRC, 2022

Collaboration projects in Norway to delivery first green hydrogen molecules to Europe

- > Norway offers a stable green grid for the supply of renewable power to generate economic hydrogen volumes for export
- > Power availability and pricing varies by regional location
- > Norway understand compression has a key role for the supply and distribution of hydrogen to decarbonise local industry
- > Two collaboration projects under development in 2023 with the ability to delivery to Europe 2027
- > **Provaris now seen as the first to deliver a gaseous solution for pipeline ready green hydrogen supply**
- > Increasing dialogues for long-term offtake with major utilities, steel, chemical or refuelling sectors.
- > H2-ready ports and the H2 backbone grid supported by Government funding



Provaris solution now viewed as “a dynamic element in the supply chain which can provide green H₂ for customers, assist with balancing power, and grid operations”

Our sights are set on the European Hydrogen Backbone for distribution of bulk-scale volumes to industrial customers

- Open access large-scale hydrogen networks in the Netherlands and Germany
- Establishing direct connections to large industrial consumers (steel works, chemical, refineries, mobility)
- **FEED level solution with undertaken to integrate with hydrogen backbone network and supply gas for cavern storage**

Example of a Receiving Terminal Plot Layout



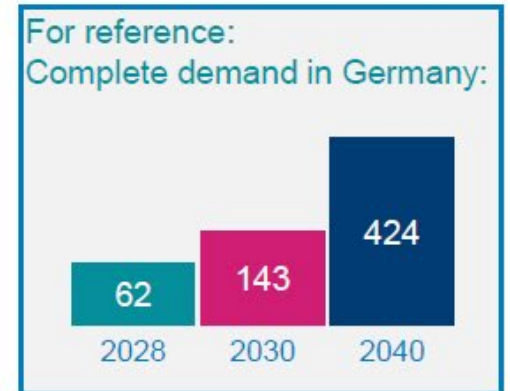
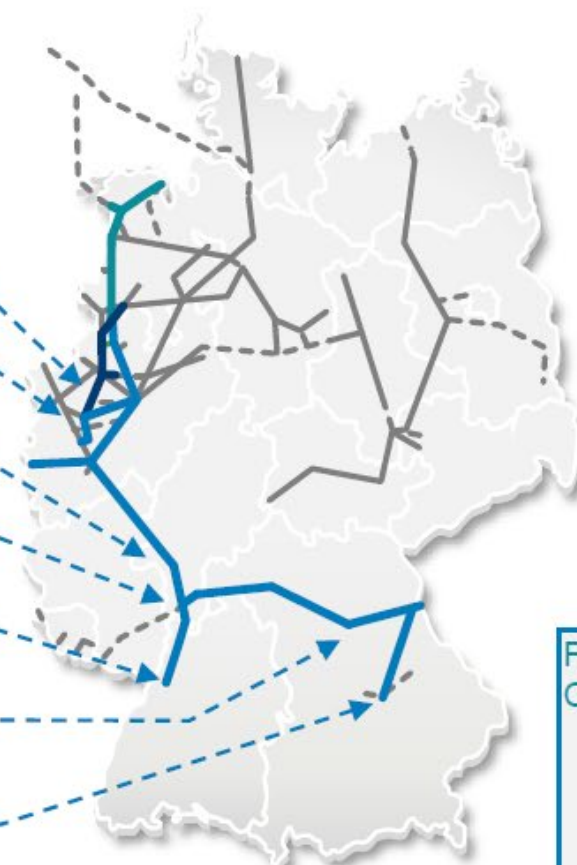
Project HyPerLink project will result in a large-scale hydrogen network (up to 7.2 GW) with a total length of ~610 km



Source: Gasunie www.gasunie.de/en/the-company/gasunie-deutschland/project-hyperlink

OGE connecting all major demand centers by 2030

H₂-Demand in the vicinity of „H2ercules“ [TWh¹]



Quelle: Results of the market survey "Wasserstoff Bedarf und Erzeugung" (WEB) of FNB | ¹ TWh = Terrawatt hour



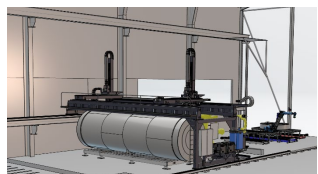
**Innovative tank design, final class approvals
and collaboration projects to unlock pathway to
commercialisation**

Development pipeline for Shipping and Compressed Hydrogen projects to unlock multiple milestones, revenue pathways and liquidity events

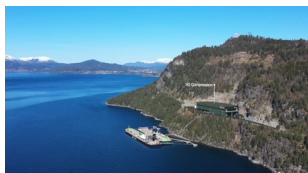
Provaris Norway AS (100% subsidiary of Provaris Energy) established as the holding company for future operating assets

Multiple pathways for commercialisation

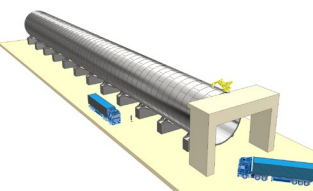
Final Class Approvals



Collaboration Projects



Storage Tank Production



Equity ownership and flexibility to finance at project or asset

Equity ownership of individual export hydrogen project SPVs

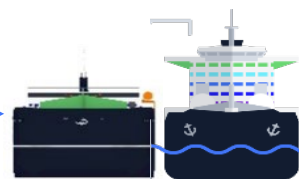
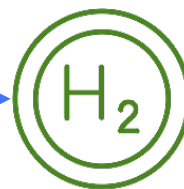
20yr Hydrogen offtake contracts
EU & Norway Capex schemes
Project financing at SPV

License fees to shipyards for integrated ship/tank design (ie. GTT LNG tank model)

Project SPV is the long-term charterer of vessels
Option to hold equity stake in vessels
Option for ship management co.

JV (60%) in robotic tank production facility in Norway (supported by Innovation Norway)

Sale of large-scale tanks for H2Neo and H2Leo carriers (230 tonne)
Sale of tanks for onshore storage (1-50 tonne capacity)
Sale of future robotic production lines to Asia yards



Development of 270 MW green hydrogen plant, Ålesund, Norway

Collaboration with Norwegian Hydrogen AS, located at Ørskog in Ålesund municipality



- › **Pre-feasibility completed March 2023 for 270 MW production capacity with export volume 40,000 tpa**
- › Competitive delivered cost based on 2022 volatile electricity price range of EUR 35-45 MWh
- › ~650 Nm sailing distance to Germany
- › **Provaris marine transport cost range of EUR 1.00-1.50/kg (compression, 1 barge, 2 carriers decompression)**
- › 20 MW power capacity granted + 250MW power reservation request
- › Compression enables plant design with high degree of flexibility to assist with balancing the power grid in periods of high demand
- › Reduces CO2 emissions by 500,000 tonnes annually
- › Supportive local community with significant regional value created with +50 jobs and district supply of heat and oxygen
- › **Target first export late-2027**



Development of a large-scale European hydrogen supply chain, Åfjord Norway

Collaboration with **Gen2 Energy AS**, located Trøndelag region



- › **Collaboration Agreement signed June 2023**
- › Collaboration will benefit from the synergies of Provaris and Gen2 Energy's approach to using compression as an energy efficient carrier for green hydrogen
- › **Prefeasibility study commenced in August 2023** to include detailed feasibility of a large-scale export supply chain from Norway to Europe based on the use of Provaris compressed hydrogen supply chain.
- › ~760 Nm sailing distance to Germany
- › **Prefeasibility Report finalized early 2024**

Åfjord project in Trøndelag region, Norway



World first Design Approval for bulk hydrogen carrier

Low emission shipping through green fuels for power generation, including Fuel Cell and Hybrid integration



- > **Standard MR tanker** with two integrated tanks to store hydrogen at 250 bar pressure. **US Patent filed** on tank design.
- > **Critical safety studies**, process and risk analyses carried out.
- > **'Design Approval' from ABS** based on FEED-level package sufficient for shipyards to quote with confidence
- > **Prototype tank test** to be undertaken in Norway, Q1 2024.
- > Integration with flexible jetty solutions and offshore loading delivers a package to third party feasibility studies.



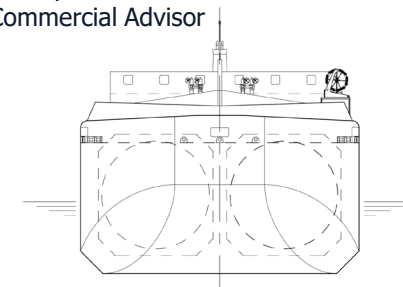
Marine Classification



Ship Broker &
Commercial Advisor



Technical Partner



Two Carriers under development

H2Neo

Cargo carrying capacity: 26,000m³ (430t)

Project export capacity¹: 200,000 tpa

Shipping range: Up to 2,000 Nm

✓ **AiP Received: 2021**

✓ **FEED Approval: 2022**

• Shipbuilding Contract: 2024

• Prototype & Final Approvals: Q1 2024

• **First operations: 2027**

H2Max

Cargo carrying capacity: 120,000m³ (2,000t)

Project export capacity¹: 900,000 tpa

Shipping range: Up to 3,000 Nm

✓ **AiP Received: 2021**

• Final Approval - tbc

• Shipbuilding Contract - tbc

• **First operations: Target ~2030**

Assumptions:

• Unloading in 18 hours

• Fleet Ships is based on project production rates and distance to market

• Actual importation volumes can be multiples of the above "fleet" production facility capacities.

Note: Illustrations are concept designs for unloading at Jurong Island, Singapore

Launch of bulk-scale compressed hydrogen floating storage

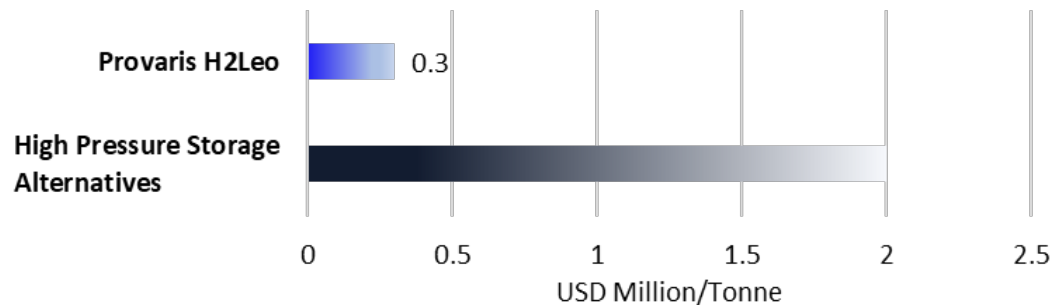
"H2Leo" provides the hydrogen industry with an energy efficient and cost-effective storage solution

- > **'Approval in Principle' received from ABS, April 2023**
- > Approved design capacity range of 300 to 600 tonnes of hydrogen, expandable to up to 2,000 tonnes
- > 'Buffer storage' delivers flexibility and optimization of compressed hydrogen supply chain projects = lower delivered cost
- > Target for first production unit 2025

Industry-wide applications:

- > Bunkering for the maritime sector
- > Storage of gaseous hydrogen supply required for NH₃/LH₂ process during periods of no, or low, renewable energy generation
- > Long-duration storage for excess renewable energy

Onshore static storage cost-prohibitive for large-scale hydrogen derivative projects



ABS
Marine Classification



Innovative hydrogen tank prototype and automated production line for tank construction in Norway

Use of 'robotics' to 'crack the code' on efficient and cost-effective storage and shipping

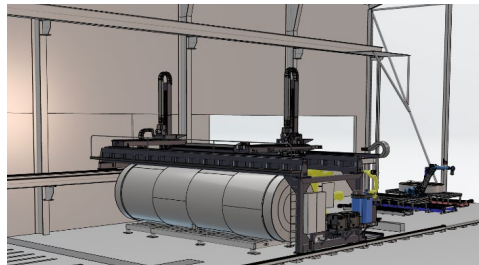
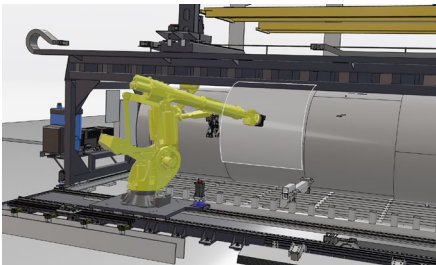
- > **Prodtex AS** to construct and test a prototype scaled tank, alongside SINTEF, DNV and ABS for fatigue testing
- > Completion of testing and Final Class Approval target for Q1 2024
- > Demonstrate automated tank fabrication line results in shorter construction period, lower costs, and higher level of quality assurance
- > Extension of IP and business case for significant market requirement for small-scale storage tanks (1 to tonnes).



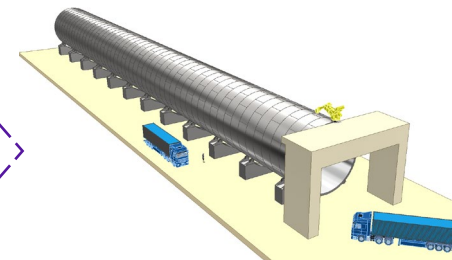
Q1, 2024: Prototype Tank construction & Fatigue Test complete & final class approval



2025: New Large Scale Production Line operational in Norway, providing tanks for shipping and storage



Final Class Approval



Supported by collaboration partners:



Prodtex
Production / Technology / Excellence



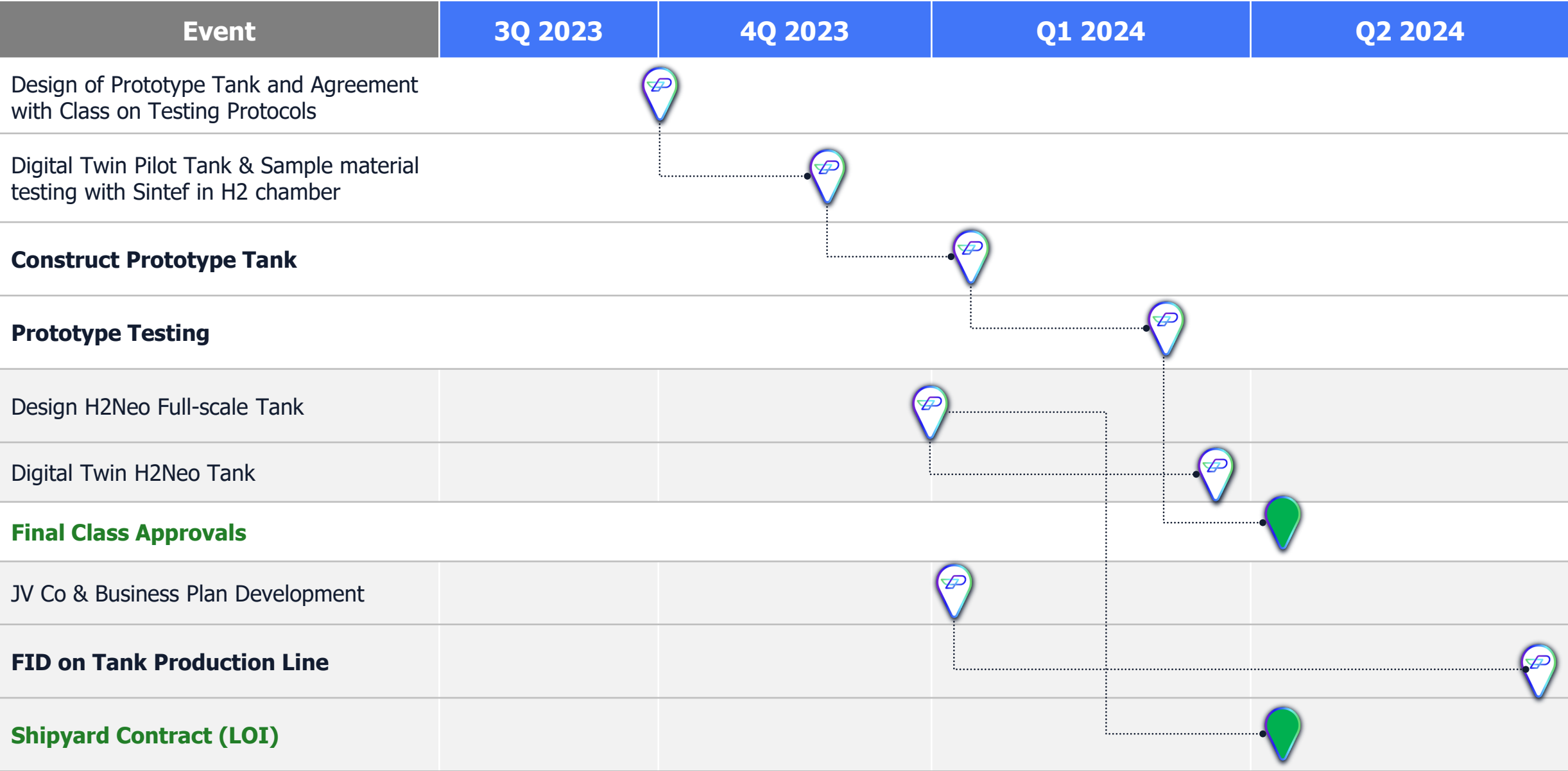
Opportunity to develop low-cost storage solutions required for onshore or maritime hydrogen distribution networks to scale

Fully robotic tank production cell offers significant cost advantages over existing composite solutions in the market. Updates in the December 2023 quarter on the development of tank design and can range from 1 to 10 tonnes for use in buffer or small-scale storage applications such as marine bunkering.

	Hexagon Purus: www.hexagonpurus.com	Umoe: www.uac.no	Provaris JV (Prodtex)
Type	Composite – carbon fibre Container	Composite - Glass fibre Container	Carbon Steel Tank
Storage Capacity	1,029 kg 500 bar pressure	850 kg 350 bar pressure	1 to 50 tonne 250 bar pressure
Cost	USD 750,000	USD 350,000 (targett)	1 tonne: ~200,000 USD 10 tonne: ~2,500,000 USD
Cost / kg H2	730 USD	400 USD (target)	Target below 200 USD
Market Applications	Mobility, refuelling, remote sites	Mobility, refuelling, remote sites	Static solutions (e.g. marine, shore based, buffer, distribution)



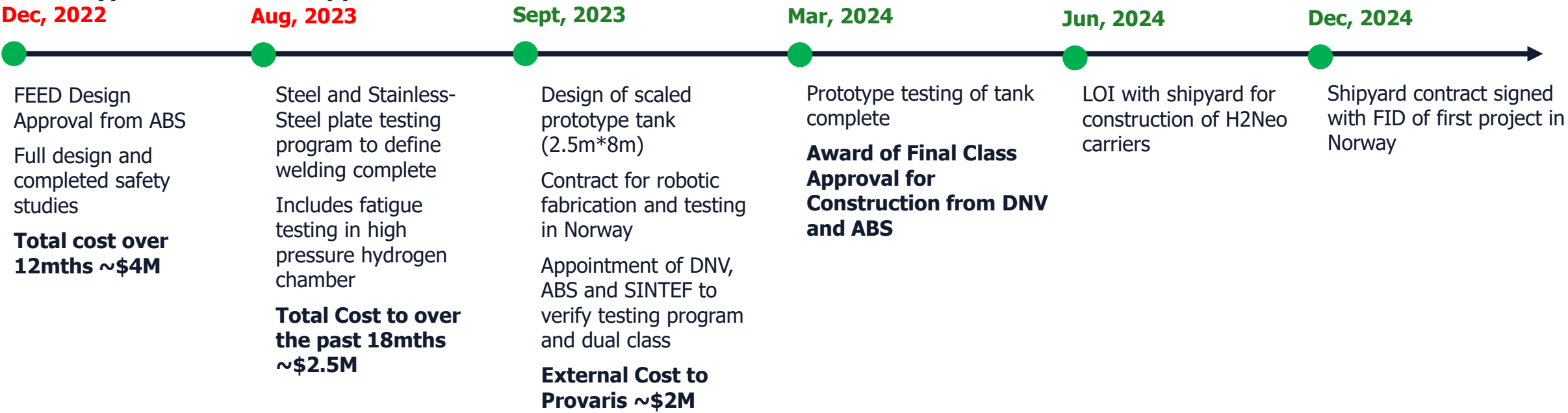
Near term milestones for prototype test and final class approval for H2Neo aligned with commercialization in Norway



Ship development capital and pathway to final Class approvals, shipyard contract & financing

H2Neo program to undertake prototype test in Q1 2024 to achieve final class approval from DNV and ABS

Prototype Tank & Class Approvals



JV Tank Production Facility (all internal costs excluding legal advisors)





Tiwi H₂ the only gaseous green hydrogen
export project for Australia



Tiwi H2 Project demonstrates scale for a compressed hydrogen supply chain in proximity to key markets

Strategic decision to develop both upstream hydrogen molecules and integrate with compressed hydrogen supply chain

2.6 GW
Solar Generation

2028
Target for first export

~90,000 tpa
Green Hydrogen

~500 construction
and up to **~100**
operational jobs



Strategic Location to Markets



Existing Port Infrastructure



Solar Intensity & Water Access



Traditional Land Ownership



Low Environmental Impact



Landowner & Government Support

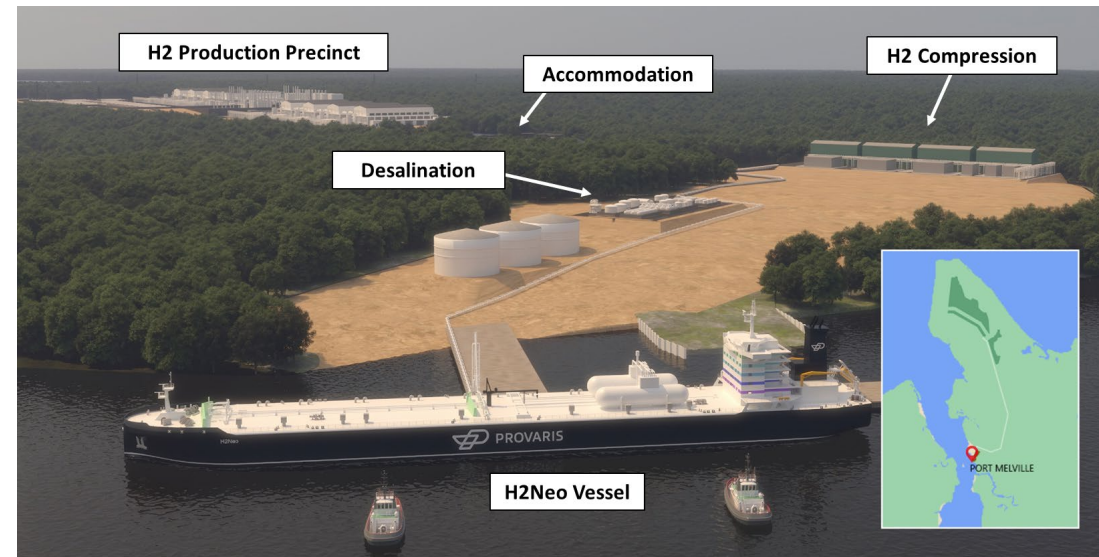
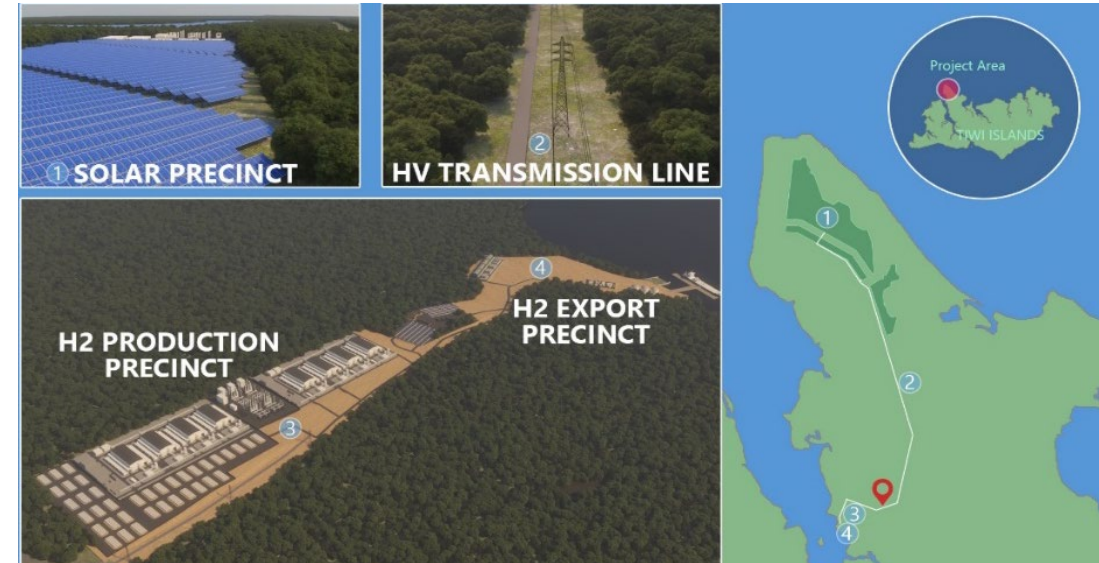
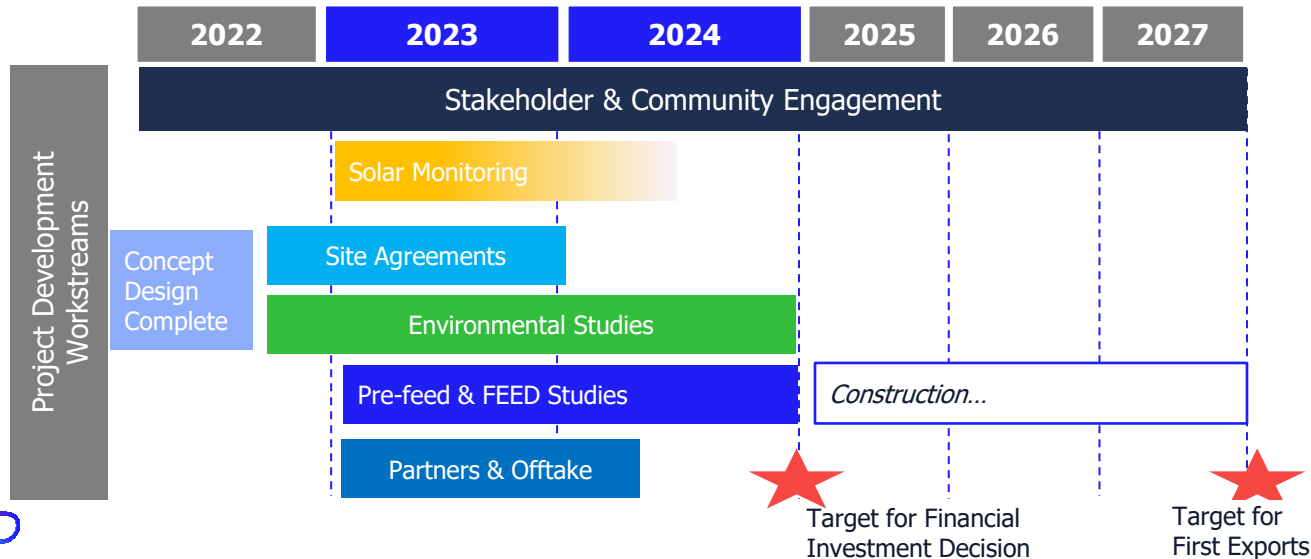


Strong ESG credentials for project financing & government funding



Concept Design Study confirms Tiwi H2 can fast-track green hydrogen exports to capitalize on growing demand in Asia

- > **Concept Design Study (August 2022) confirmed feasibility** for compressed hydrogen production for 100,000 tpa export project
- > **Permitting advancing** with Federal and Territory EIS submission scheduled for Q4 2024
- > **Design Feasibility complete** for Solar Farm and transmission pre-FEED and Owners Engineer appointed
- > **Project and land agreements** and benefits package submitted to Tiwi Land Council
- > **JV partner process underway** to 'farm-in' and maximise shareholder value





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Corporate Overview

Capital Structure

Ordinary Shares on Issue (PV1.ASX) 548 Million

Market Capitalisation (at 6.5 c) A\$ 35 Million

Cash (at 30 June 2023) A\$ 5.1 Million

Performance Rights ² 24.0 Million

Unlisted Options ³ 9.0 Million

Shareholding (Undiluted)

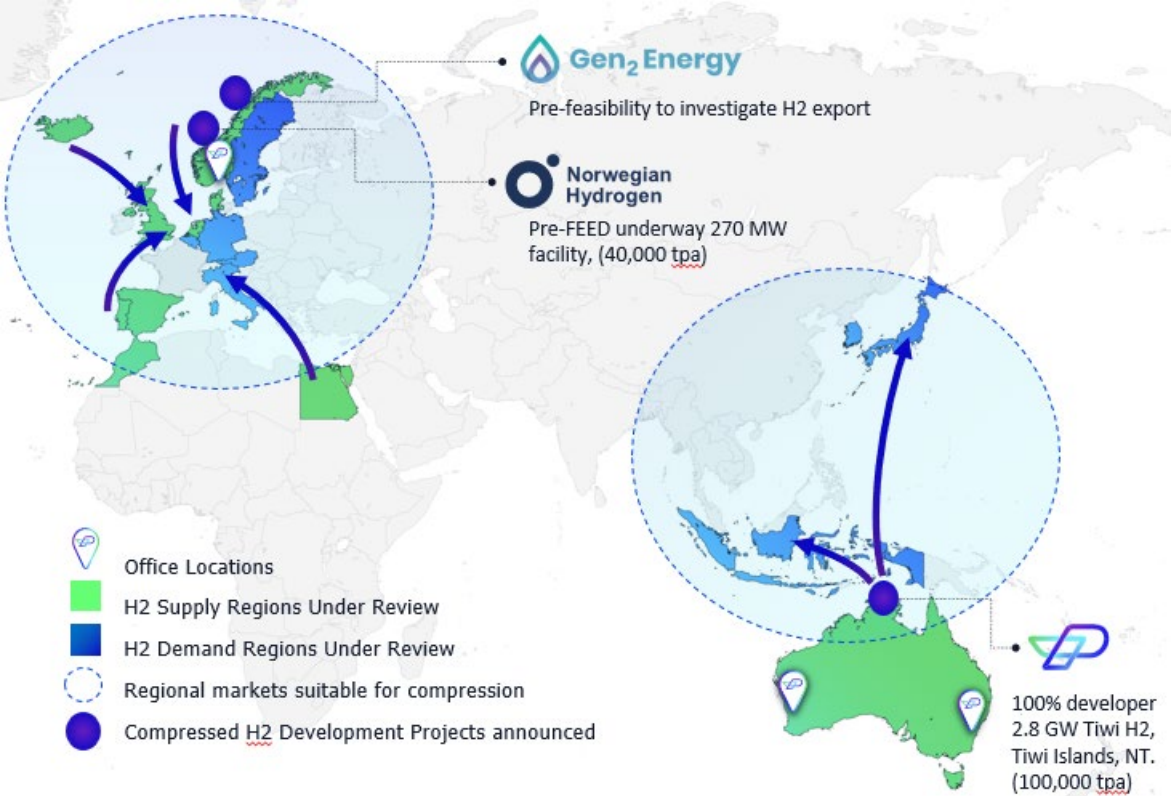
Institutional & HNW 18%

Management 5%

Total top 20 33%

1. Listed Options PV10A, expiry 26 May 2023, exercise \$0.12
2. Performance Rights issued to Management
3. Broker options exercisable at 18.75c, Expiry November 2024

Regional Office Locations Servicing Europe & Asia (Sydney, Perth, Oslo)



Board & Management

Global experience in energy infrastructure, utilities, ship newbuilds, operations, and capital markets



Martin Carolan

Managing Director
& CEO

Commercial
& Capital Markets

SYDNEY



Garry Triglavcanin

Executive Director & Chief
Development Officer

Engineer, LNG, Project Development

PERTH



Greg Martin

Chairman

Business Leader, Energy, Infrastructure,
Governance

SYDNEY



Andrew Pickering

Non-executive
Director

Shipping, Newbuilds,
Tankers, LNG

SYDNEY



David Palmer

Non-executive
Director

Shipping, Commercial, Financing

LONDON



Per Roed

Chief Technical Officer

Newbuilds, Tankers, LNG, Ports,
Operations

OSLO



Mats Fagerberg

Business Development - Europe

Commercial, LNG, Infrastructure,
Shipbroking

LISBON



Norman Marshall

Commercial Manager

Legal, Commercial,
Project Finance

PERTH



John Stevenson

Group Financial Controller

Accounting,
Finance

SYDNEY



Dave Stenning

GH2 Carrier
Development

Class Approvals,
Commercial

CALGARY



John Fitzpatrick

Naval Architect
& Inventor

Ship Design,
Class Approvals

CALGARY

Progressing our commitment to ESG reporting for a fair and sustainable future, connecting the world to a clean energy future

Provaris has adopted the World Economic Forum (WEF) framework to report material and non-material Environmental, Social and Governance (ESG) matters

Our purpose is to produce and develop renewable hydrogen supply chains that are simple & efficient providing energy security and enabling net-zero targets to be achieved



- **ANTI BRIBERY/CORRUPTION**
We maintain the highest standards of integrity and honesty in our business.
- **MODERN SLAVERY ACT**
We adhere to legislative obligations relating to modern slavery and human trafficking.
- **DIVERSITY AND INCLUSION**
We advocate the principles of an inclusive work environment and a diverse workforce.

