



PROVARIS ENERGY

Compressed Hydrogen

First Mover for regional storage and transport

Corporate Presentation

August 2023



Australia

Norway

www.provaris.energy

ASX:PV1

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This presentation was authorised by the CEO for release on 4 August 2023

\$ refers to Australian Dollars unless otherwise indicated.

Provaris is a developer of low-cost, simple, energy-efficient hydrogen supply chains for regional markets

Accelerating innovation to bridge the gap with safe, simple, efficient and economic solutions

Energy Efficiency First Principle

- > Shapes energy policy and investment decisions.
- > Embedded in EU regulation.
 - Energy Union and Climate Action
 - Energy Efficiency Directive
- > Reduce dependence on fossil fuels and security of supply and the use of renewable energy.



Why Compression?

- > **Efficient** regional production & delivery to minimise losses.
- > **Flexible** to 'load follow' variability & volatility in renewable energy.
- > **Simple** process enables low capex design, build and repeat.
- > Delivers gaseous H2 required for decarbonisation of industries.
- > First mover advantage.

Why Provaris?

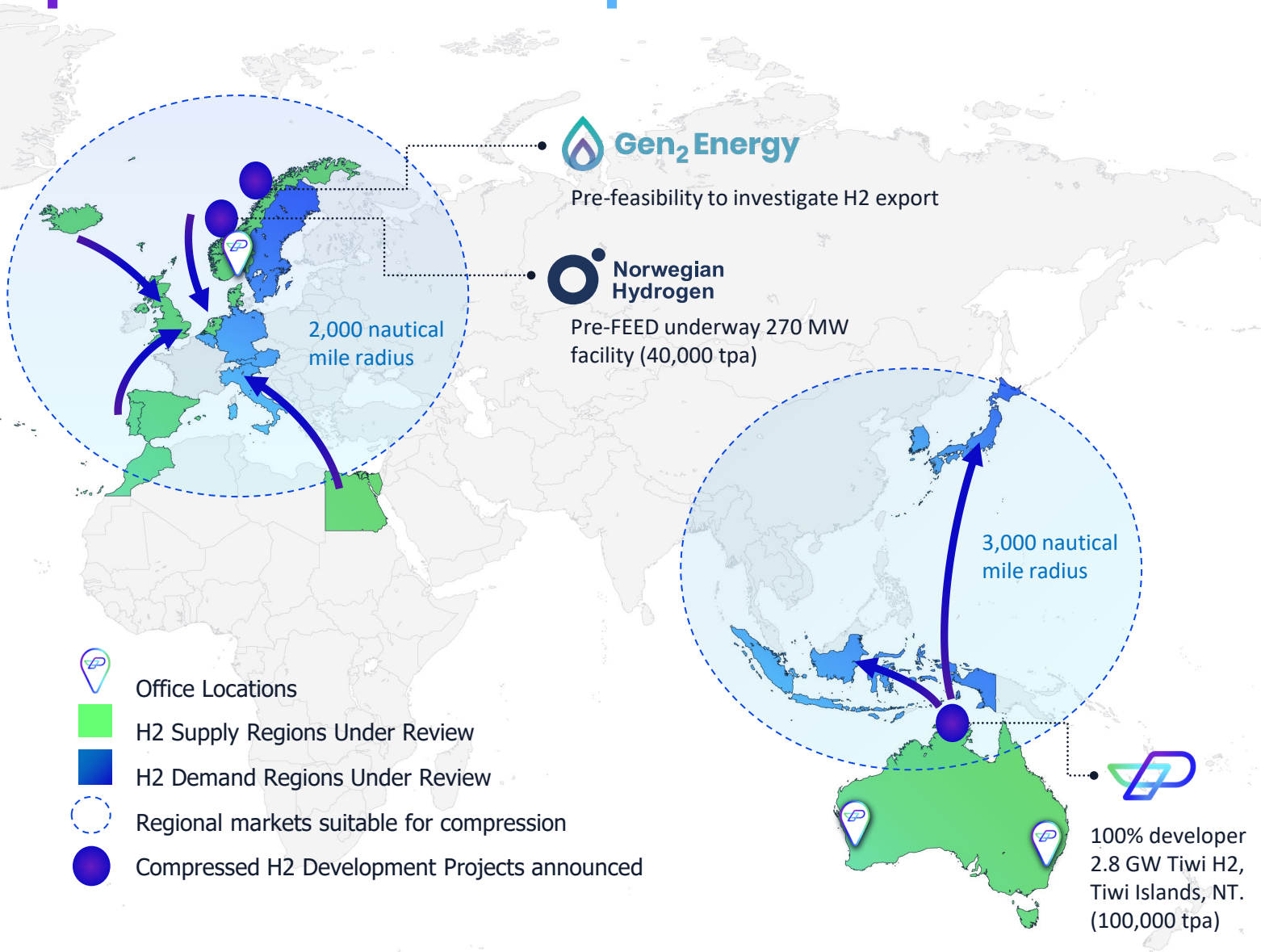
- > Ambition to deliver 1Mtpa.
- > Unique approach to developing integrated supply chain.
- > Advanced IP development of storage and shipping.
- > Advancing production & export supply projects in Australia and Norway.
- > Understand complexity of hydrogen through collaboration, studies and research.

Relevance to Europe

- > Collaborations with export hydrogen supply projects underway in Norway.
- > Developing supply chain, projects, supported by technology, manufacturing & jobs.
- > **First-mover advantage and regional leadership to unlock early volumes to meet REPowerEU 10Mtpa import requirement.**



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



- ✓ Established in 2017 to focus on compressed natural gas solutions
- ✓ Pivot to hydrogen in 2021 with the award of AIP on two proprietary compressed hydrogen capacity carriers
- ✓ Focus on developing integrated hydrogen projects
- ✓ Two key regional markets strategically positioned based on bulk-scale shipping range (1,000 to 3,000 Nm)
- ✓ Provaris Norway AS established in 2022 with two export projects under collaboration
- ✓ Working with collaboration partners to establish the full value chain
- ✓ Ongoing technical and commercial analysis with broad range of industrial users and energy majors

Seeking to be an integrated developer of the hydrogen value chain

Unique 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**
- > Two projects under development, targeting first export in 2027 in Asia and Europe
- > Tiwi H2 (Australia) Norway projects under development
- > Equity ownership in long-term take-or-pay contracts



Hydrogen Shipping and Storage

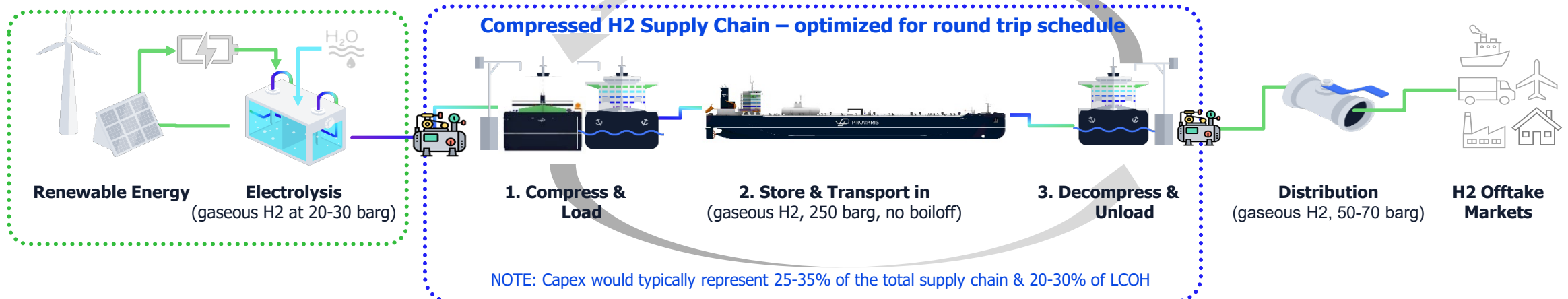
- > **Infrastructure for loading, storage and shipping of hydrogen**
- > Partner with shipowners and infrastructure funds to own and operate based on long-term charter.
- > Knowledge of the challenges and cost profile across regions



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 static storage tanks

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

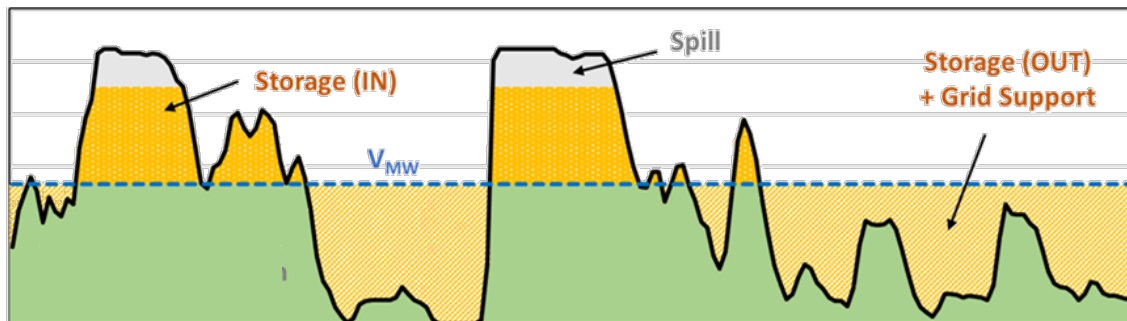


Compression can **100% load-follow** the variable renewable generation profile




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 be evaluated across the full supply chain

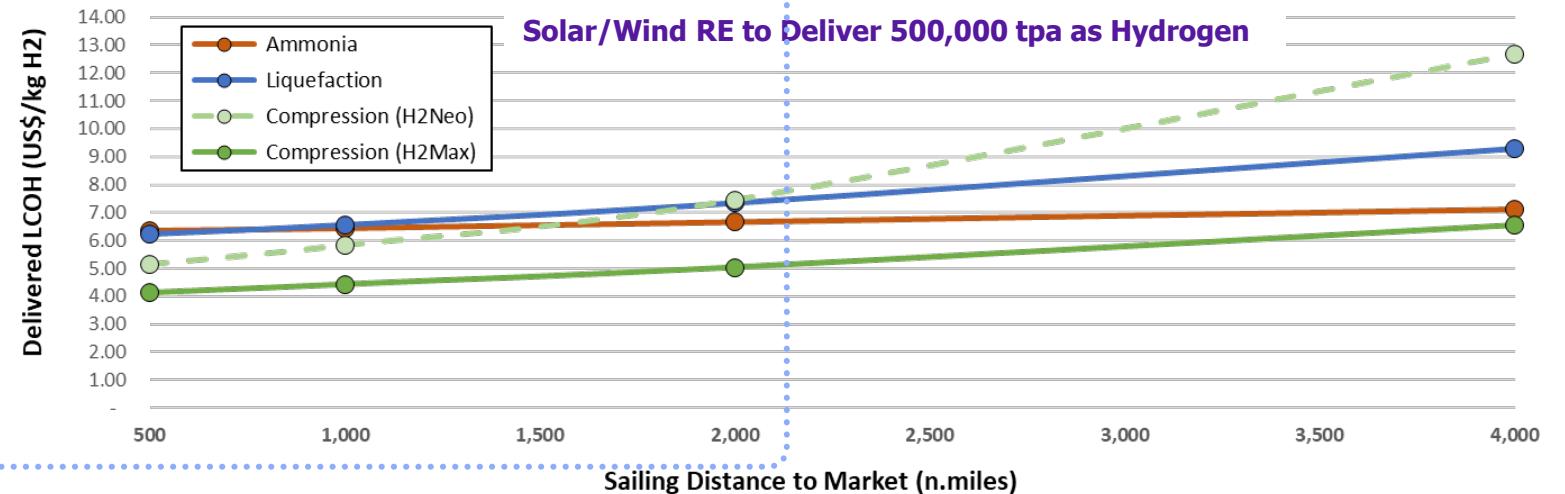
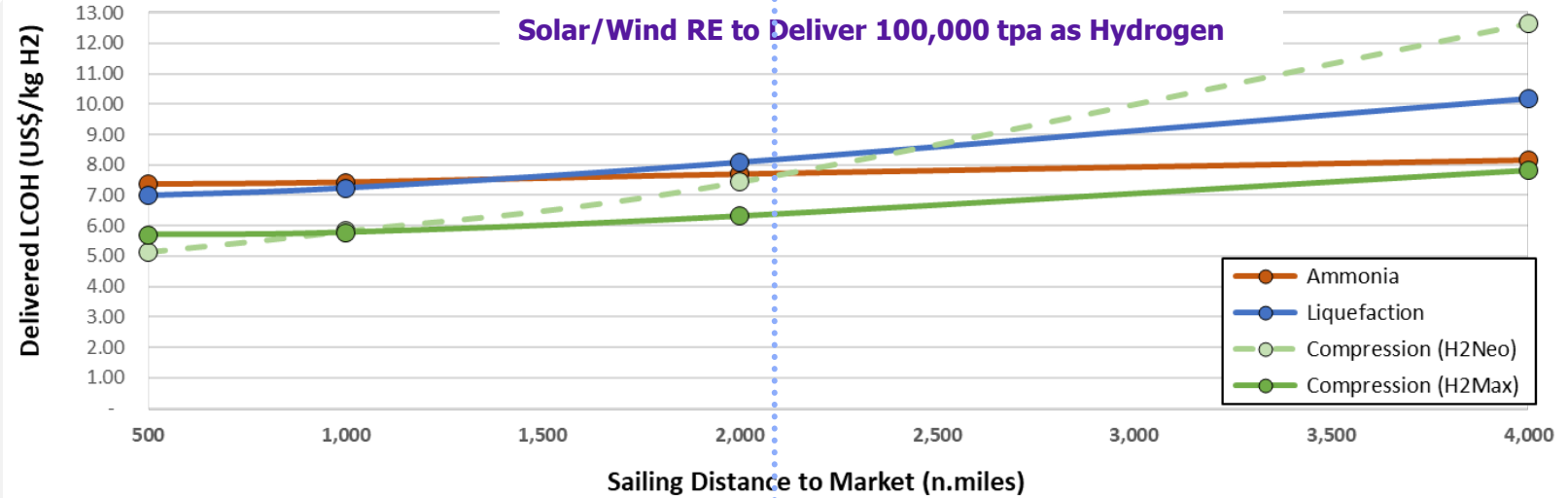
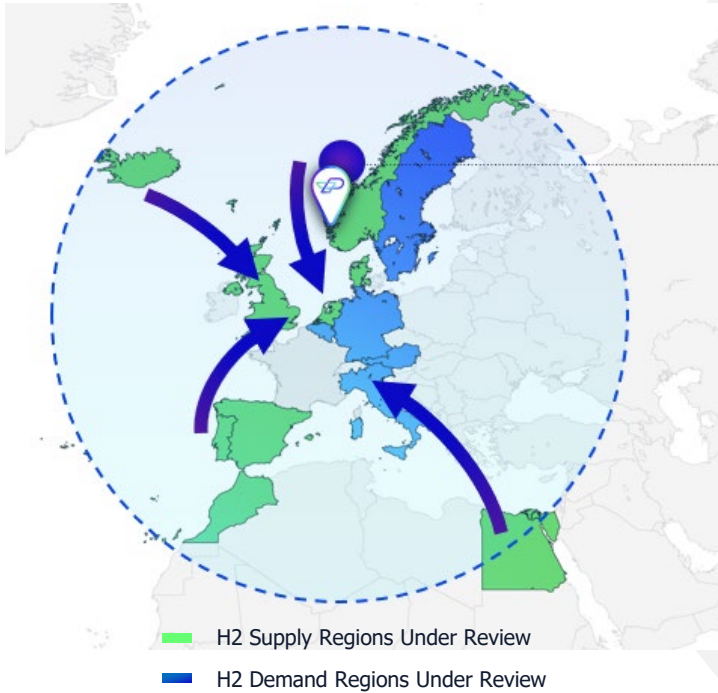
Factors that impact on LCOH of supply chain

	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)

Market Opportunity for Compressed Hydrogen into Europe





World first bulk scale carrier for compressed hydrogen storage and transport

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.



Two Carriers under development

H2Neo	H2Max
Cargo carrying capacity: 26,000m ³ (430t)	Cargo carrying capacity: 120,000m ³ (2,000t)
Project export capacity¹: 200,000 tpa	Project export capacity¹: 900,000 tpa
Shipping range: Up to 2,000 Nm	Shipping range: Up to 3,000 Nm
<ul style="list-style-type: none"> ✓ AiP Received: 2021 ✓ FEED Approval: 2022 • Shipbuilding Contract: 2024 • Prototype & Final Approvals: Q1 2024 • First operations: 2027 	<ul style="list-style-type: none"> ✓ AiP Received: 2021 • Final Approval - tbc • Shipbuilding Contract - tbc • First operations: Target ~2030
<p>Assumptions:</p> <ul style="list-style-type: none"> • 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



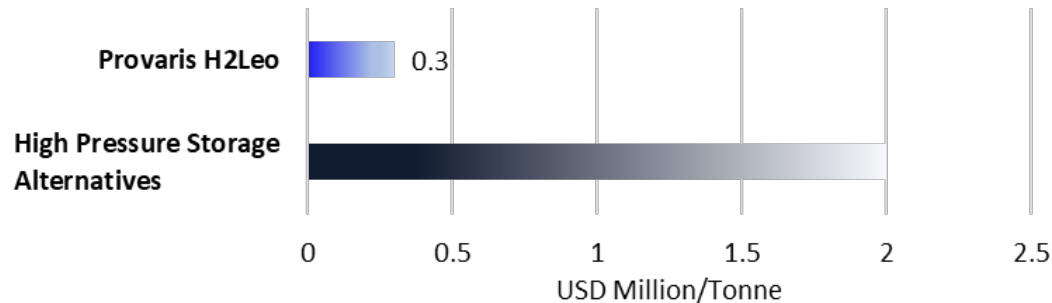
- > **‘Approval in Principle’ received from ABS, April 2023**
- > Approved design capacity range of 300 to 600 tonnes of hydrogen, expandable to up to 2,000 tonnes
- > ‘Buffer storage’ delivers flexibility and optimization of compressed hydrogen supply chain projects = lower delivered cost
- > Target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



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

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

- > Collaboration Agreement with **Prodtex AS** to construct and test a prototype scaled tank, alongside SINTEF, Norway's leading independent research organization
- > Automated tank fabrication line will result in shorter construction period, lower costs, and higher level of quality assurance
- > Joint Venture with Prodtex to develop a full-scale production line in Norway for operations in 2025, delivering a cash flow generating business
- > Expansion into static storage tanks capable of storing single, double and triple digit tonnage volumes extends Provaris' IP beyond shipping.
- > Discussions underway with Innovation Norway for funding
- > Qualifies for Norwegian and EU R&D and Capex subsidy schemes (eg. Green Deal Industrial Plan)

Prodtex's production facility located in Fiskå, Norway



"We have a once in a generation opportunity to show the way with speed, ambition and a sense of purpose to secure the EU's industrial lead in the fast-growing net-zero technology sector. Europe is determined to lead the clean tech revolution. For our companies and people, it means turning skills into quality jobs and innovation into mass production, thanks to a simpler and faster framework. Better access to finance will allow our key clean tech industries to scale up quickly."

Ursula von der Leyen, President of the European Commission

Innovative hydrogen tank prototype supported by best-in-class technical partners in Norway

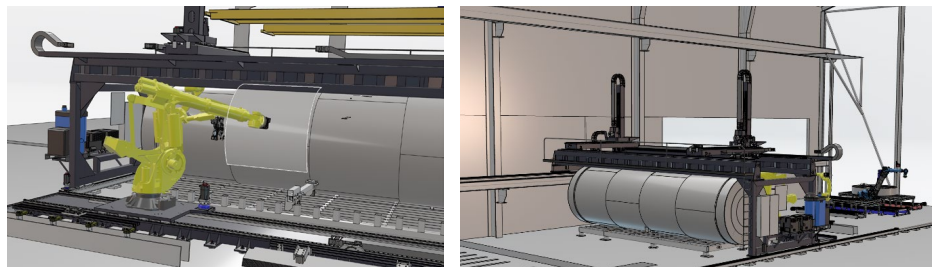
Prodtex AS consists of a very skilled and experienced team, with background in shipbuilding, and a proven track record with fully automated fabrication of complex steel structures

- > Award of a contract to Prodtex AS for the construction and testing of a prototype hydrogen tank at existing facility
- > Encompasses a comprehensive program that includes detailed (production) design, fatigue tests of multilayered welded steel plates, and construction and rigorous testing of the prototype tank, monitored and reviewed by SINTEF
- > Both American Bureau of Shipping (ABS) and Det Norske Veritas (DNV) certification and final Class Approvals for the H2Neo carrier in Q1 2024

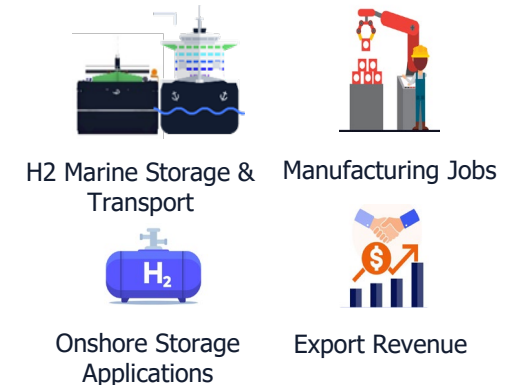
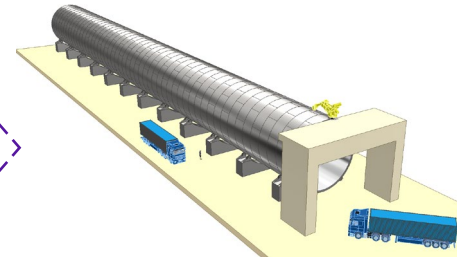
Q1, 2024: Prototype Tank Built in & Fatigue Test



2025: New Large Scale Production Line operational in Møre, Norway, providing tanks for H2Neo & H2Leo



Final Class Approval



Supported by collaboration partners:

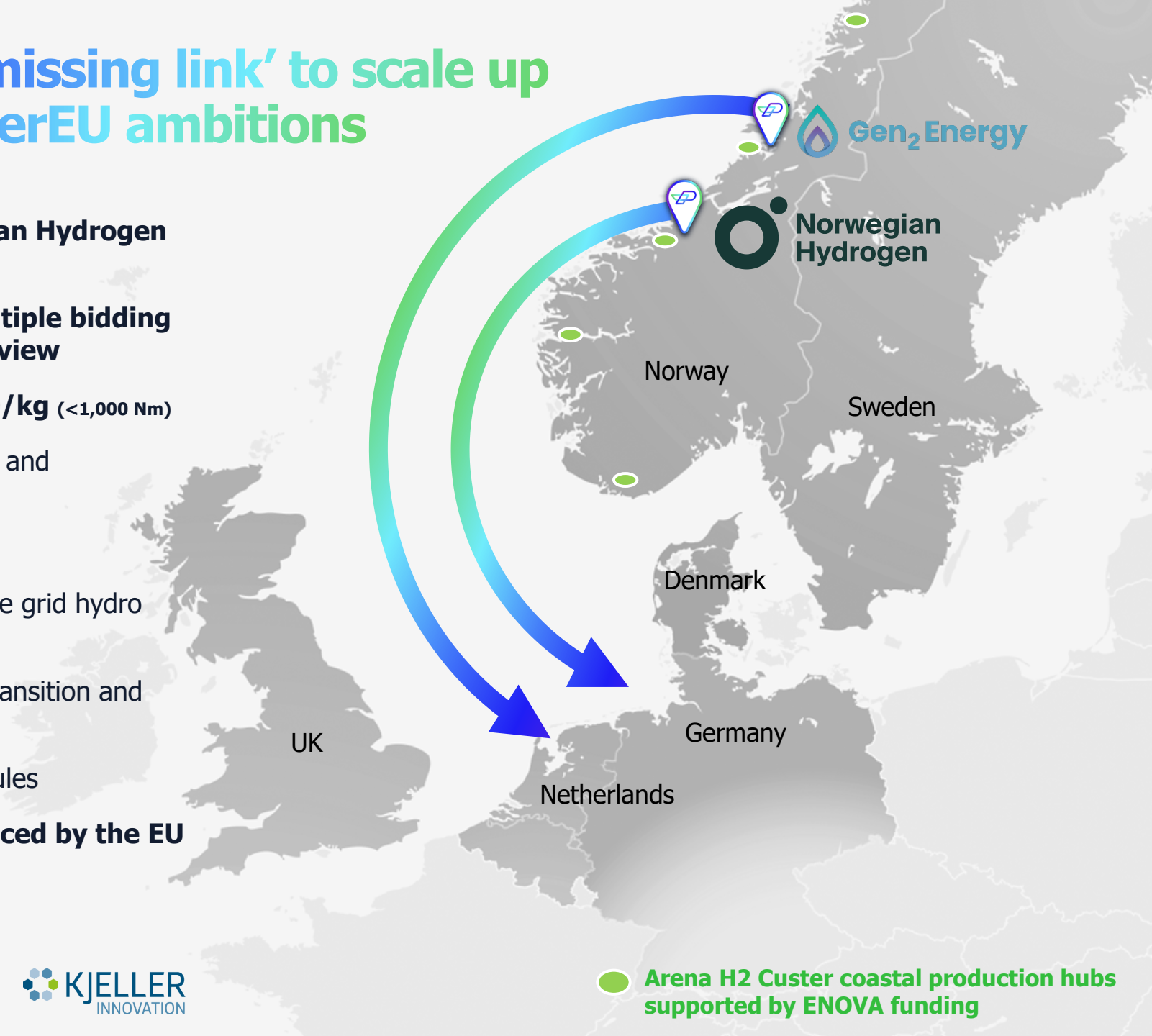




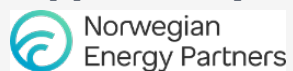
**Establishing a portfolio
of export projects for
supply to Europe**

Provaris identified as the 'missing link' to scale up export and support REPowerEU ambitions

- > **Two Collaboration Agreements with Norwegian Hydrogen AS and Gen2 Energy AS**
- > **Collective project scale +100 ktpa across multiple bidding zones, with additional opportunities under review**
- > **Marine transport cost range of EUR 1.00-1.50/kg (<1,000 Nm)**
- > First mover advantage utilizing Provaris' shipping IP and development expertise
- > Target first export of hydrogen within 2027
- > Hydrogen production costs competitive using reliable grid hydro power and efficient utilization of electrolyzers
- > EU & Norway "Green Alliance" to focus on energy transition and hydrogen supply
- > Compliance with Delegated Acts and Additionality rules
- > **Green Hydrogen Premium likely to be introduced by the EU**



Supported by:



 **Arena H2 Custer coastal production hubs supported by ENOVA funding**

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 LCOH based on current electricity prices
- › **Marine transport cost range of EUR 1.00-1.50/kg**
- › 20 MW capacity already granted for regional supply to industry
- › Integration with Provaris solution for storage and marine transport to Europe (~600 Nm sailing distance to e.g. Wilhelmshaven)
- › Compression enables plant design with high degree of flexibility for usage of the power grid to balance against high demand periods
- › Reduces CO2 emissions by 500,000 tonnes annually
- › Significant regional value created with +50 jobs and district supply of heat and oxygen
- › **Target FID late-2024 and First Export late-2027**



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

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



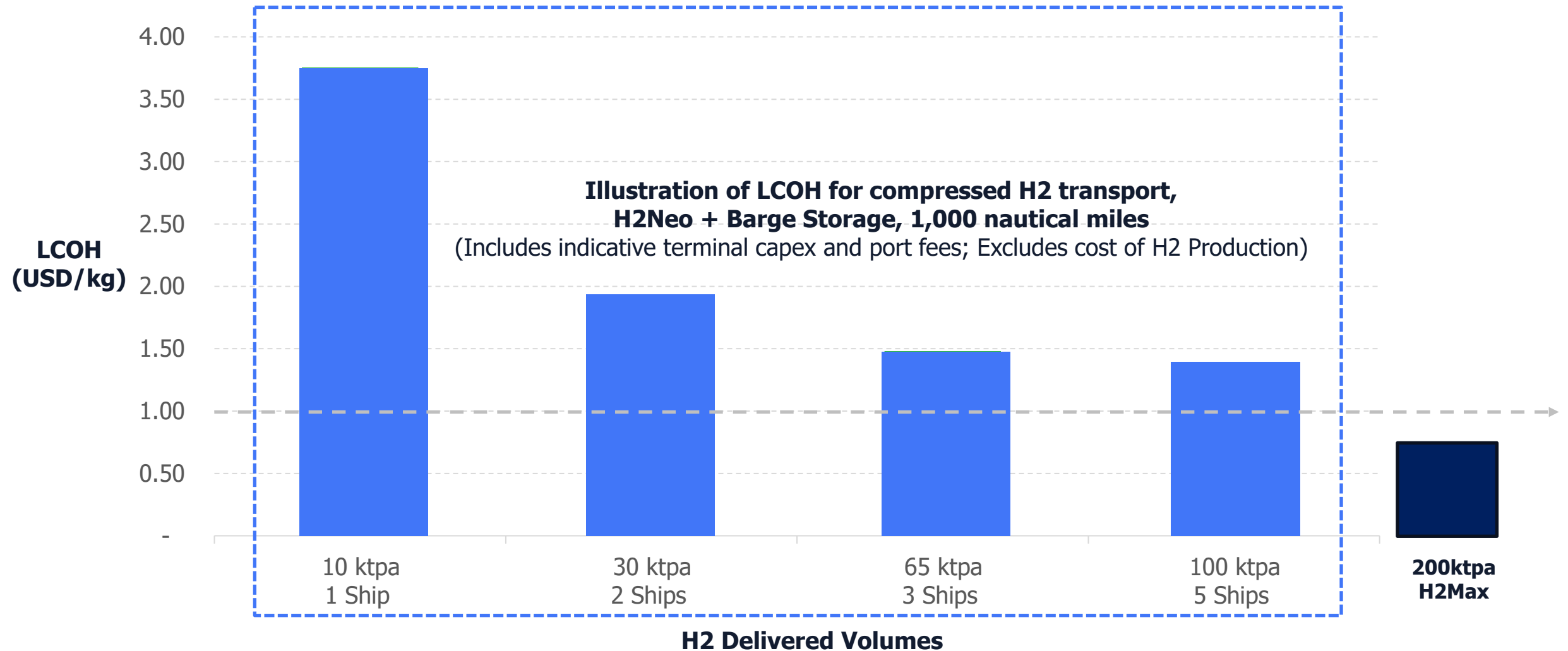
- > **Collaboration Agreement signed June 2024**
- > Collaboration will benefit from the synergies of Provaris and Gen2 Energy's approach to using compression as an energy efficient carrier for green hydrogen
- > **Prefeasibility study to commence in August 2023** to include detailed feasibility of a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

Åfjord project in Trøndelag region, Norway



Export volume ambitions rewarded through reduction unit economics for compressed H2 marine transport

Scale benefits on utilization across the compressed H2 supply chain can achieve sub-USD 1.00/kg transport costs



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)
- **Discussions with multiple ports: Rotterdam, Eemshaven, Wilhelmshaven, Brunsbüttel, Hamburg**
- **Advanced solution with port operator to integrate with hydrogen pipeline (backbone) network.**
- **Traction with German Federal Government Departments requested Norwegian Government support to further consider opportunities for compressed green H2 from Norway**

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



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



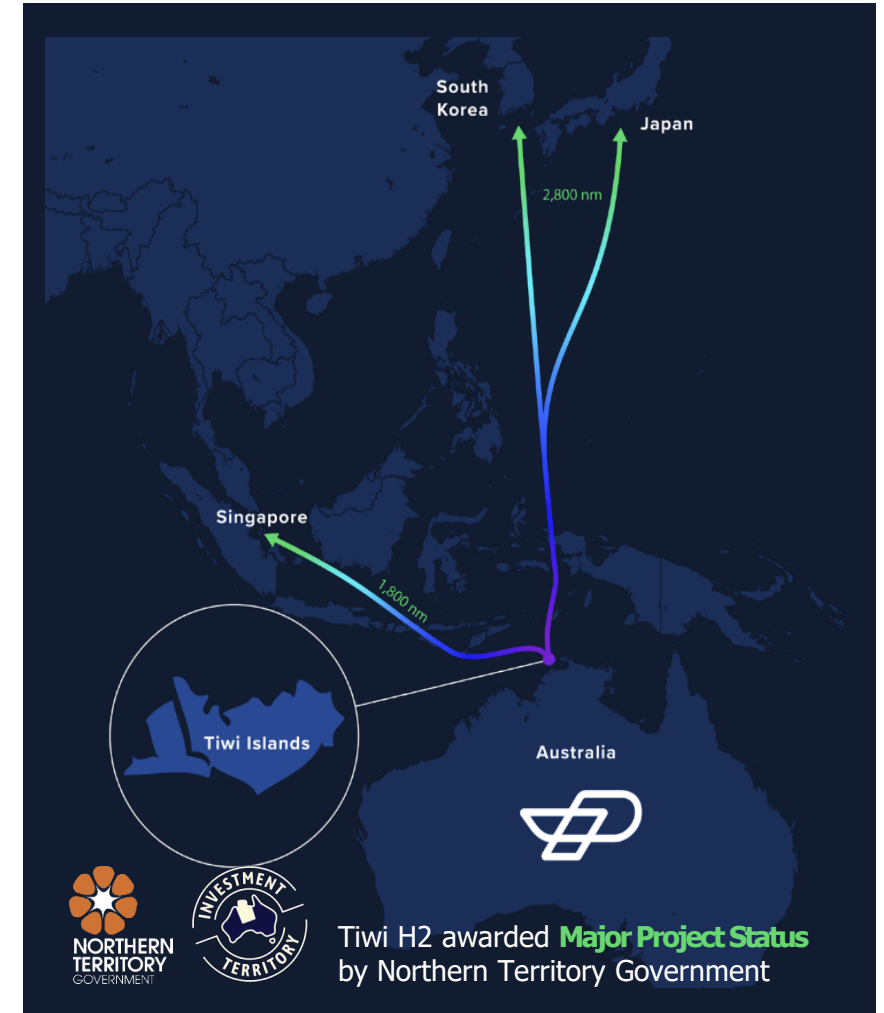
Low Environmental Impact



Landowner & Government Support



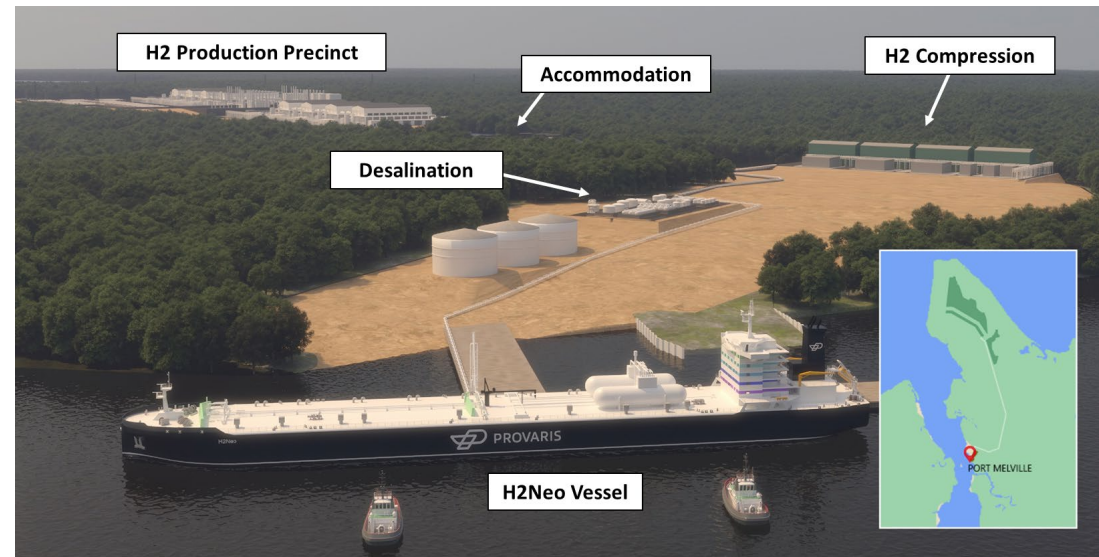
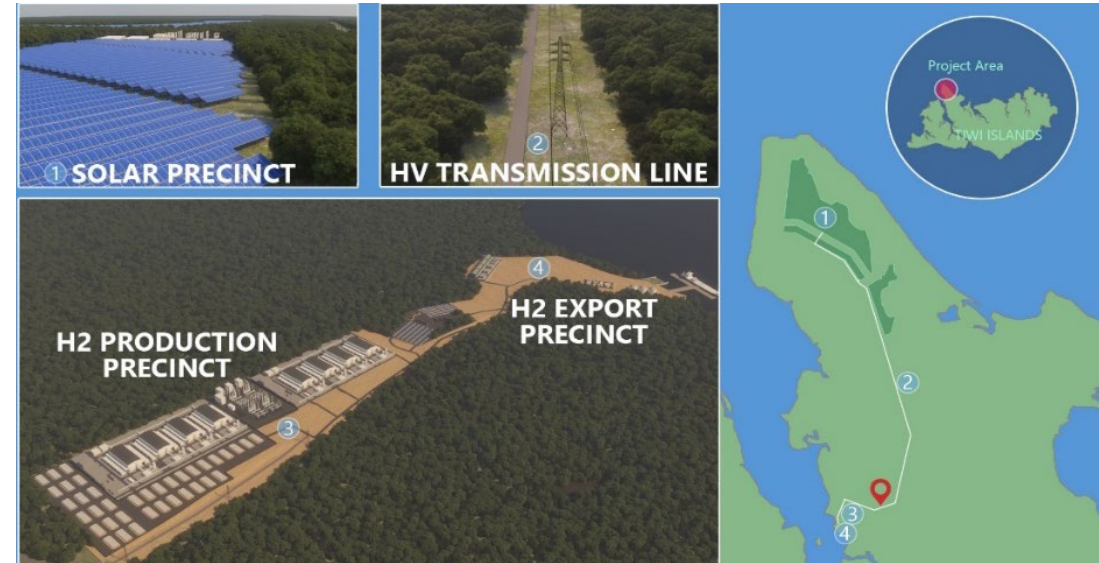
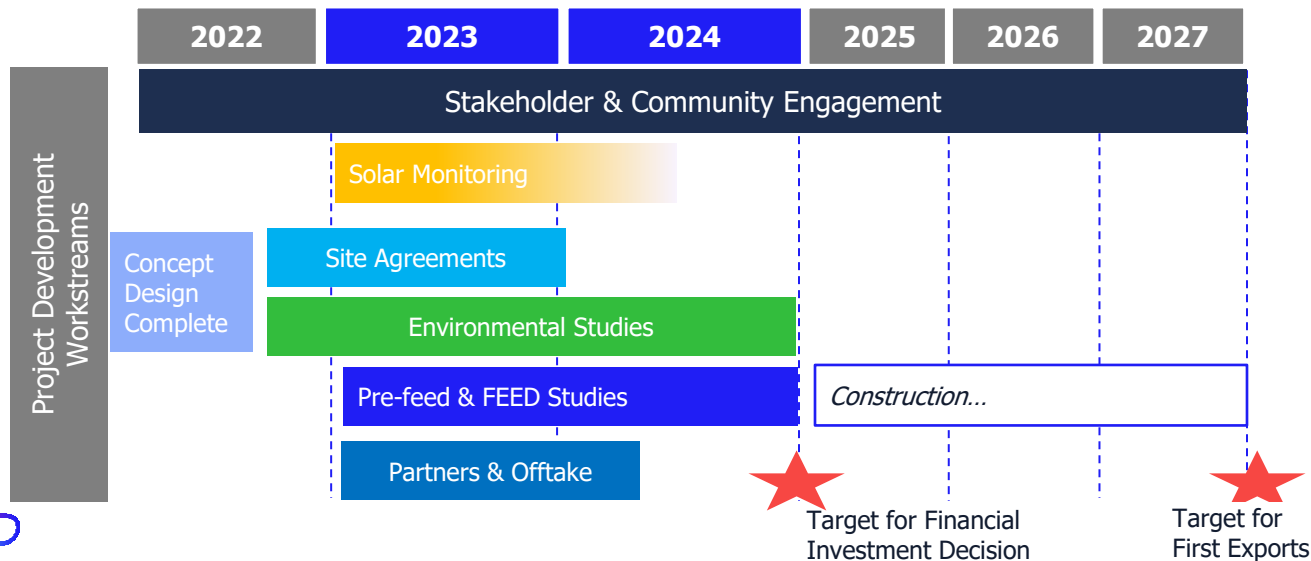
Strong ESG credentials for project financing & government funding



Provaris acknowledges that its proposed Tiwi Islands Green Hydrogen Export Project is located on the traditional lands of the Munupi people. It is a privilege to have the support and such a close working relationship with the Tiwi Land Council and Munupi Landowners.

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 Q1 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





Investment highlights & Key Milestones

Provaris is committed to become a leading developer of integrated green hydrogen projects

INVESTMENT HIGHLIGHTS

- > Compression now considered viable alternative pathway for early export volumes in Europe
- > Demonstrating the simplicity and efficiency of compression can provide lowest-cost for H2 delivery to Europe
- > REPowerEU has established a 10Mtpa import market & Norway to benefit from 'additionality' rules being introduced
- > Multi-project potential in Europe and Asia and other regional supply locations to compete with fossil fuel
- > Global opportunity for compression extends beyond shipping with development of static storage solution
- > Value creation significant through IP and development of first mover advantage, simplicity and low-cost delivery

KEY FOCUS FOR 2023

- > Mature a portfolio of export projects from the Nordic region to confirm additional project
- > Execute JDA and advance FjordH2 project (Norway) to FEED
- > Complete Prefeasibility for Afjord Project (Norway)
- > Secure Industrial Partners: Offtake, Port and Pipeline agreements
- > H2Neo Prototype tank program
- > Tiwi H2 EIS Submission, JV Partner, Offtake and RFP for EPC



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Corporate Overview

Capital Structure

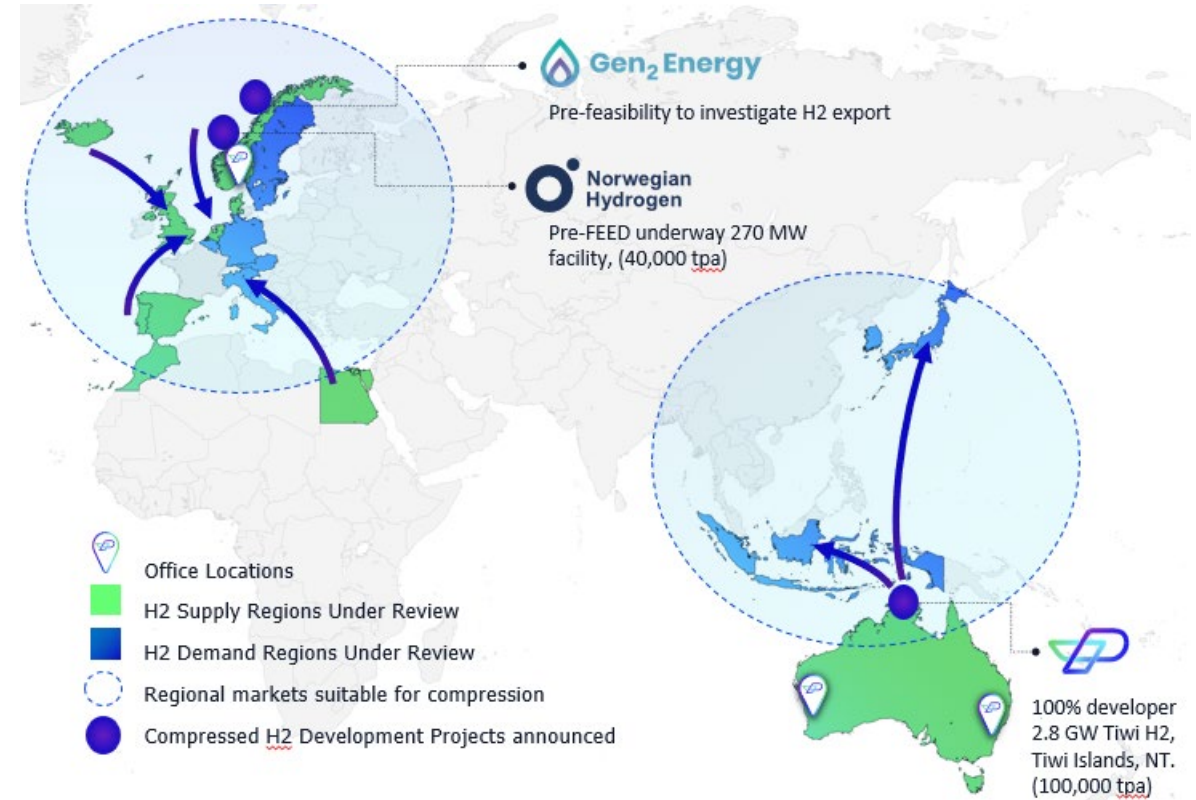
Ordinary Shares on Issue (PV1.ASX)	548 Million
Market Capitalisation (at 6.5 c)	A\$ 35 Million
Cash (at 30 June 2023)	A\$ 5.1 Million
Performance Rights ²	24.0 Million
Unlisted Options ³	9.0 Million

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



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 Business Leader, Energy, Infrastructure,
Governance

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



Norman Marshall

Commercial
Manager

Legal, Commercial,
Project Finance

PERTH



Per Roed

Chief Technical
Officer

Newbuilds, Tankers, LNG, Ports,
Operations

OSLO



Mats Fagerberg

Business Development - Europe

Commercial, LNG, Infrastructure,
Shipbroking

LISBON



Dave Stenning

GH2 Carrier
Development

Class Approvals,
Commercial

CALGARY



John Fitzpatrick

Naval Architect
& Inventor

Ship Design,
Class Approvals

CALGARY



Emma Connor

Chief Financial
Officer

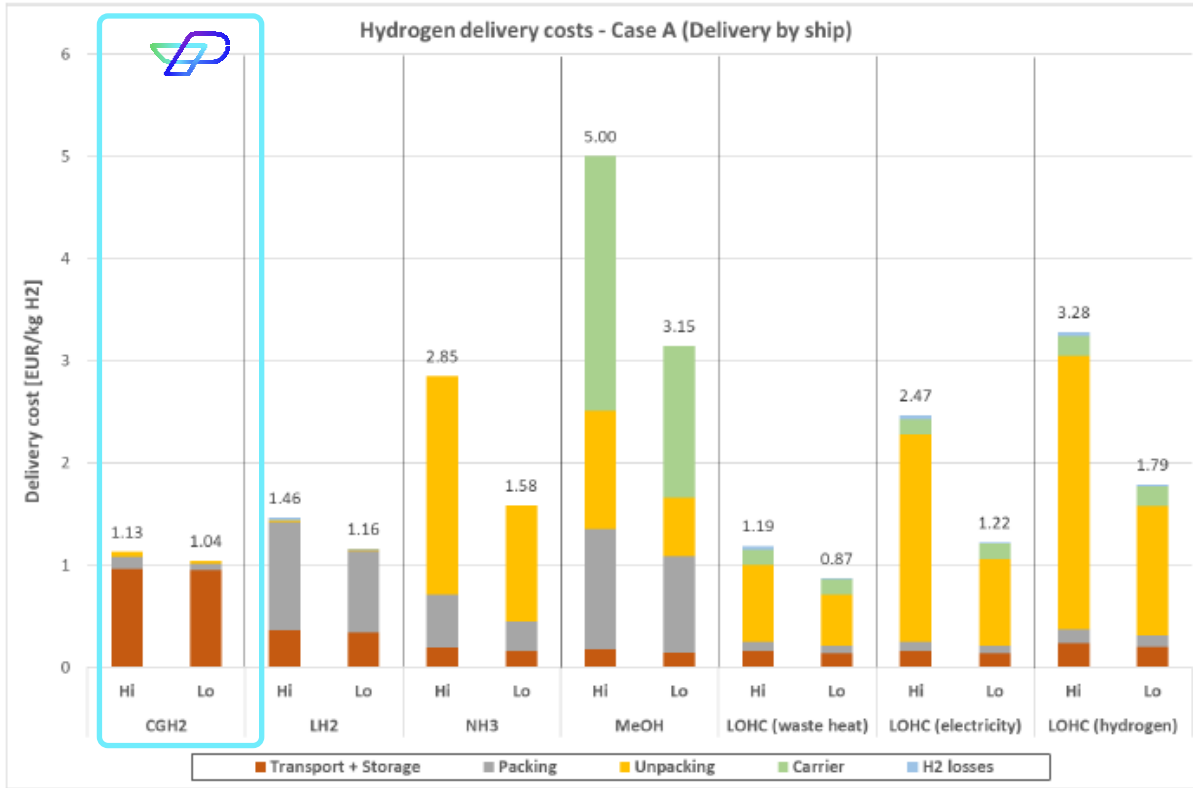
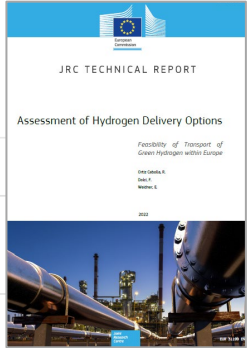
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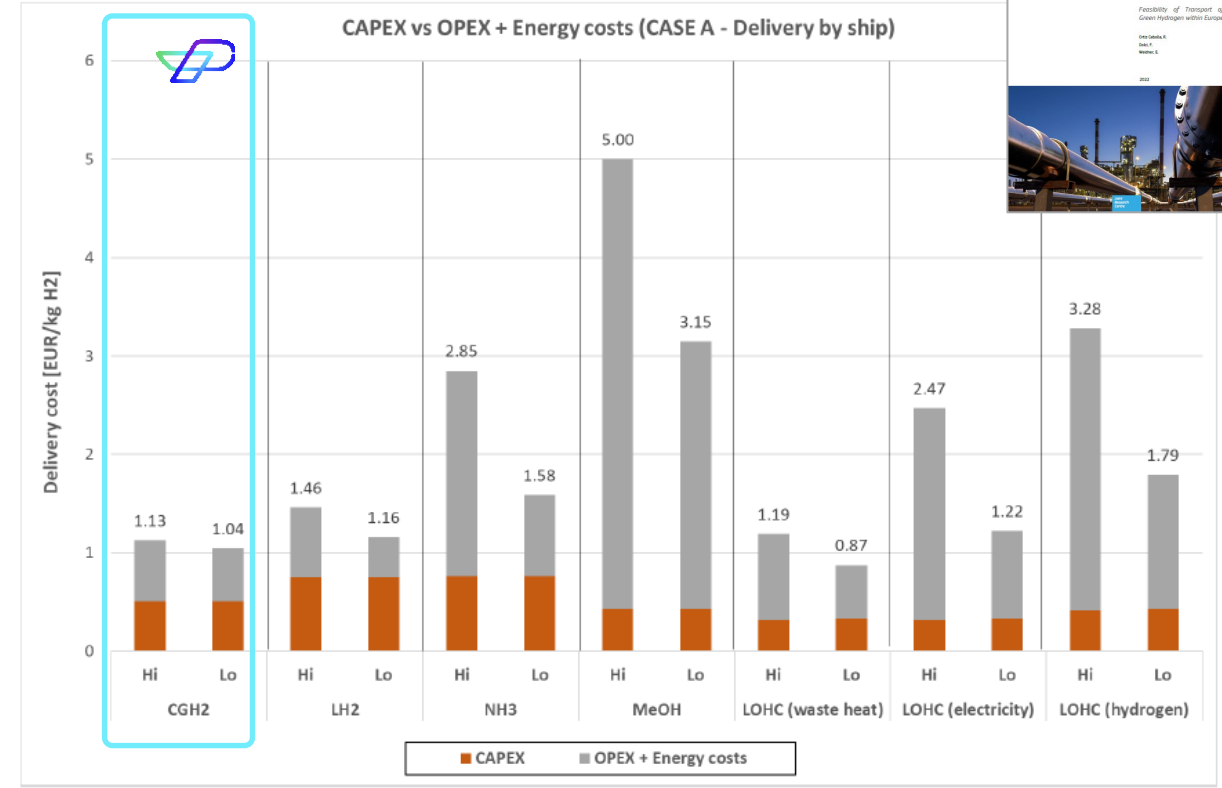


Independent research in Europe supports the cost advantage and efficiency of Compressed H2 over regional distance

(1Mtpa continuous delivery over a 2,500km distance to market)



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



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.