



PROVARIS ENERGY LTD.

# Compressed Hydrogen

connecting the world to a clean energy future.

5 September 2022

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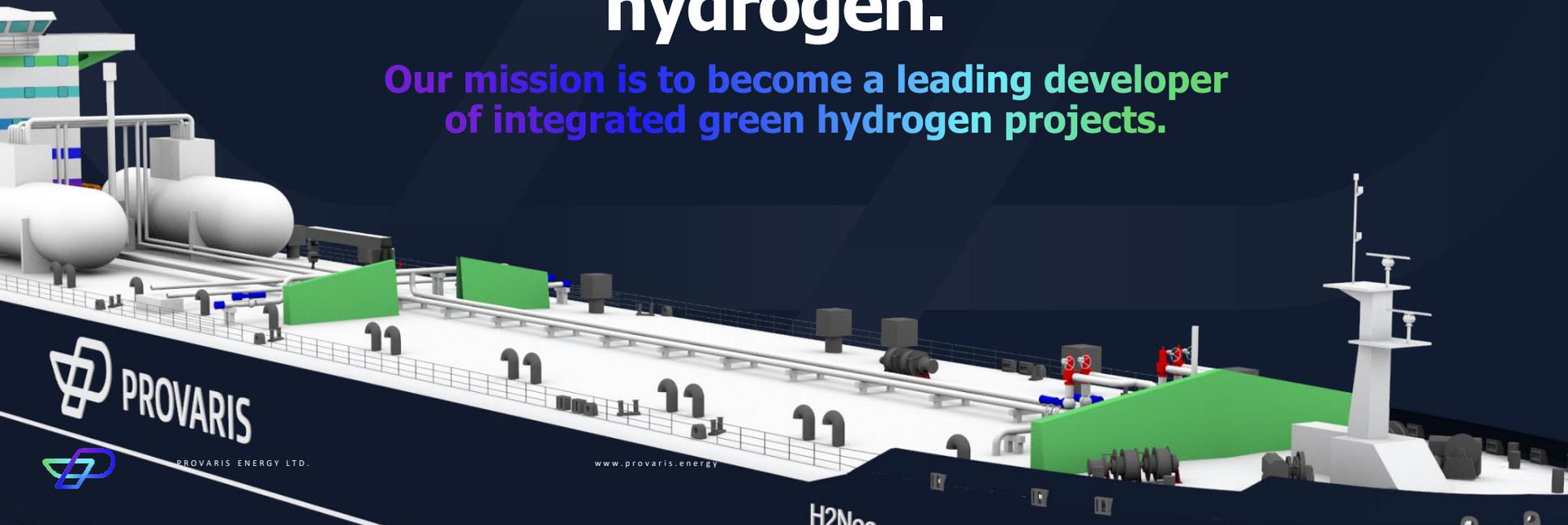
*\$ refers to Australian Dollars unless otherwise indicated.*

**This presentation was authorised by the CEO for release on 5 September 2022**



# Provaris is making the future of green hydrogen accessible through the simplicity and efficiency of compressed hydrogen.

Our mission is to become a leading developer of integrated green hydrogen projects.



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H<sub>2</sub>N<sub>2</sub>

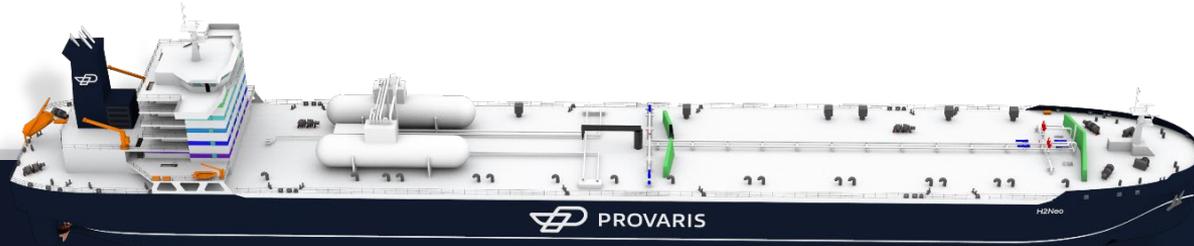
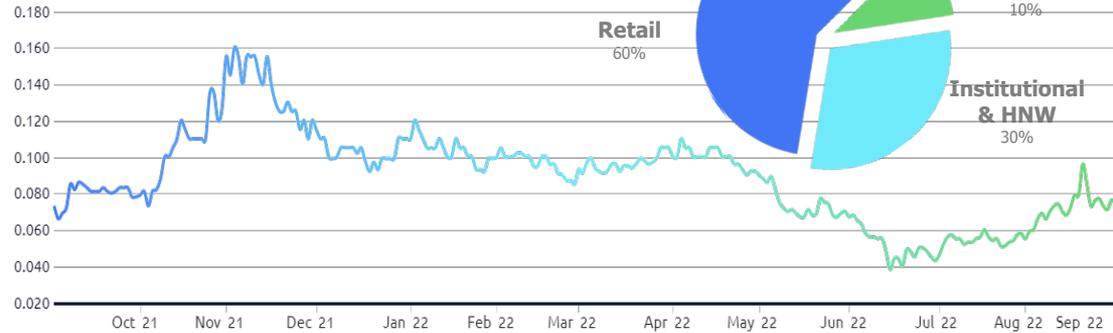
# Corporate Overview

Ordinary Shares on Issue (PV1.ASX)	544m
Market Capitalisation (at 8c)	\$43m
Cash (at 30 June 2021)	\$11.6m
Listed Options on Issue (PV10A.ASX) <sup>1</sup>	96.7m
Performance Rights & Shares <sup>2 3</sup>	43.0m
Unlisted Options <sup>4</sup>	9.0m

- Listed Options PV10A, expiry 26 May 2023, exercise \$0.12
- Performance Rights & Shares issued to Board, Management and Consultants
- Refer to the 30 June 2021 Annual Report for full details of all Milestone Conditions
- Broker options exercisable at 18.75c, Expiry November 2024

## Shareholding (Undiluted)

### 12mth Share Price Performance



Australia | Norway | Canada



# Board & Management

Australian company with offices in Sydney, Perth, Oslo and Calgary providing global experience across energy infrastructure, utilities, ship newbuilds, operations, and capital markets



**Martin Carolan**

Managing Director &  
Chief Executive Officer  
*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*

CORNWALL



**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



**Luke Velterop**

Project Manager  
*Project Development*

PERTH



**Dave Stenning**

GH2 Carrier Development  
*Ship Design, Class Approvals,  
Commercial*

CALGARY



**John Fitzpatrick**

Naval Architect & Inventor  
*Ship Design, Class Approvals*

CALGARY



**Emma Connor**

Chief Financial Officer  
*Accounting, Finance*

PERTH



# Progressing our commitment to ESG reporting

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

While our business and future projects can create inherent positive impact, the adoption of the WEF framework has already paid ESG dividends. Provaris will update the market regularly on its ESG progress and seek to ensure the company remains an impact investment for shareholders and local communities.

## Our commitment to a fair and sustainable future:

- **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.

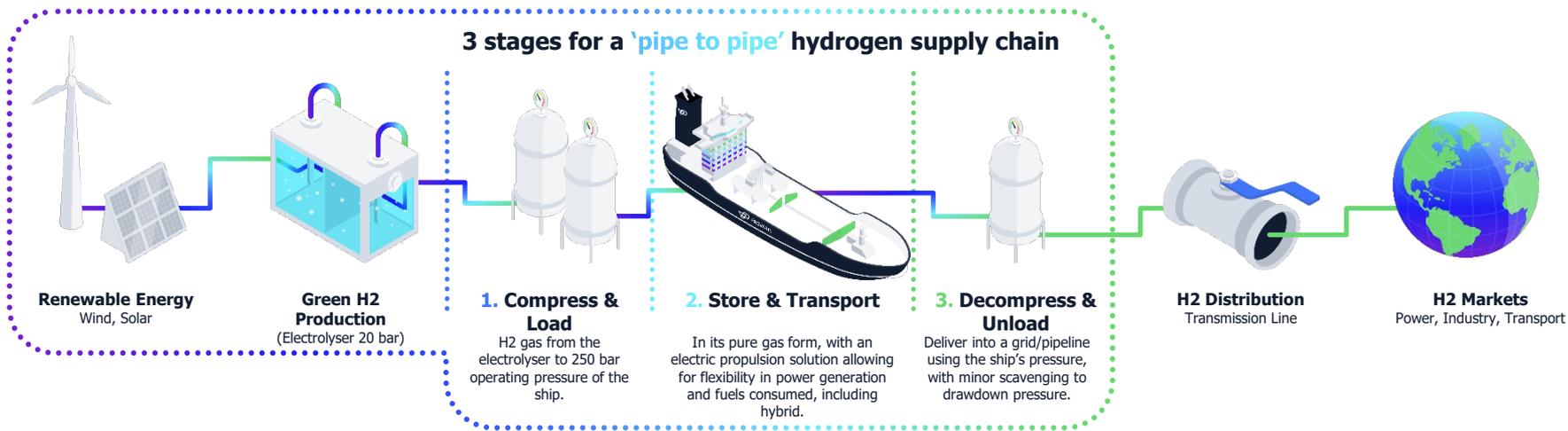
We're connecting the world to a **clean energy**  
**future.**



# Fundamentals for Compressed Hydrogen



# Compression provides a **simple and energy efficient** supply chain for green hydrogen



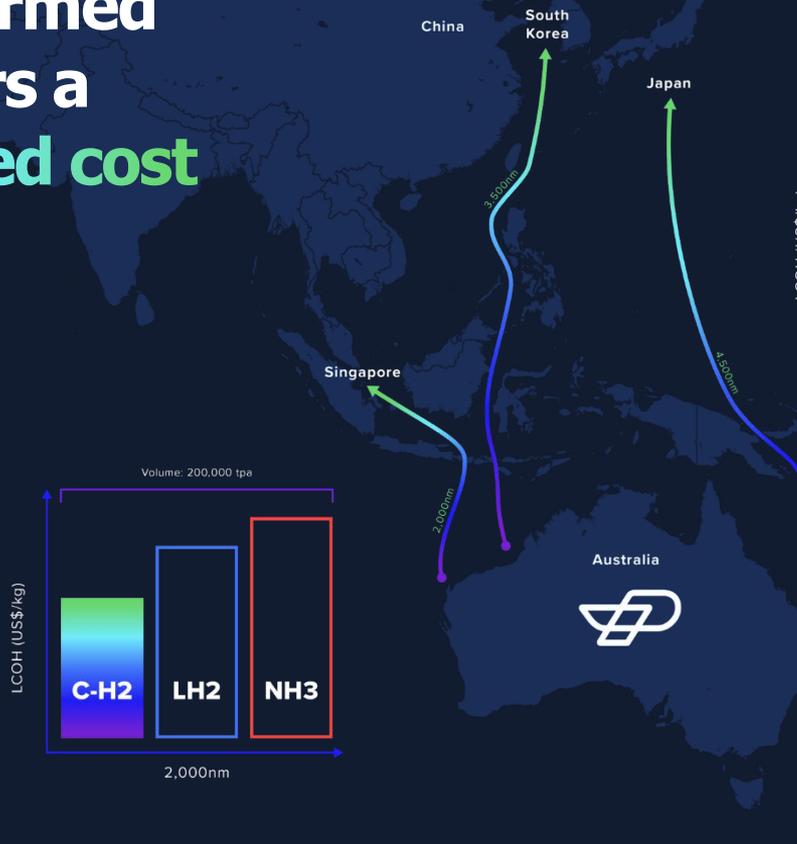
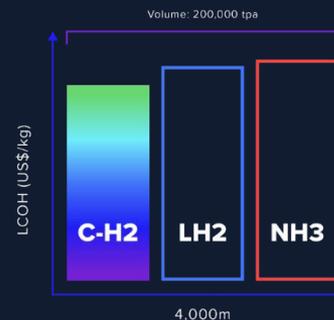
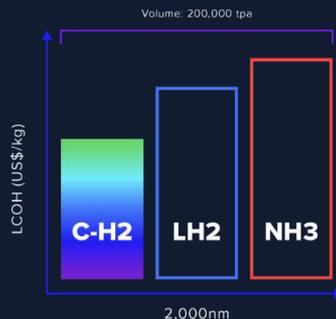
## Advantages of Compression:

- **Proven application of compression** to deliver green hydrogen at a competitive cost
- **Commercial at low volumes** – does not require economy of scale
- **Small footprint** compared to hydrogen liquefaction and/or ammonia facilities enables 'plug and play' deployment model for new markets
- **Load follow power generation** to minimise storage and ESS requirements
- **Flexibility in loading** via onshore berth facilities or offshore buoy systems
- **Modular development** aligns with market growth



# Scoping Study confirmed compression delivers a competitive delivered cost with zero emissions

- 100% green supply chain analysis for hydrogen
- Export volumes of 50,000 to 400,000tpa
- Market distances of 2,000 to 4,000 n.m.



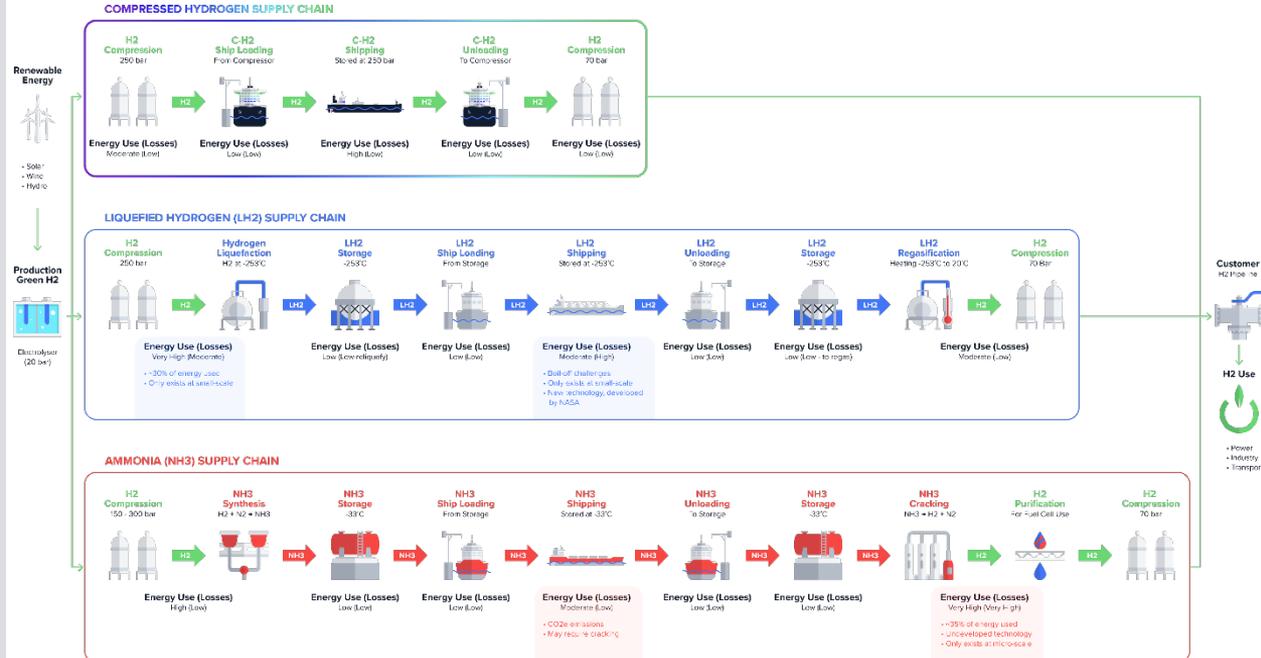
# Supply chain efficiency has significant impact on delivered cost

Key findings – Provaris Scoping Study, March 2021

- Compression is integral to all three supply chains to increase the volumetric energy density of H<sub>2</sub>
- Compression has minimal technical barriers, with ship classification approvals being key
- LH<sub>2</sub> supply chain is significantly more complex with additional energy intensive processes as well as onshore storage requirements
- NH<sub>3</sub> involves mature and well-developed technologies. However, if the end user requires high purity hydrogen, then **technical barriers and energy penalty to crack and purify (reconversion)**

- > Compression is an energy efficient solution for delivery of green hydrogen over regional distances
- > Removes cost and energy penalties of conversion and reconversion

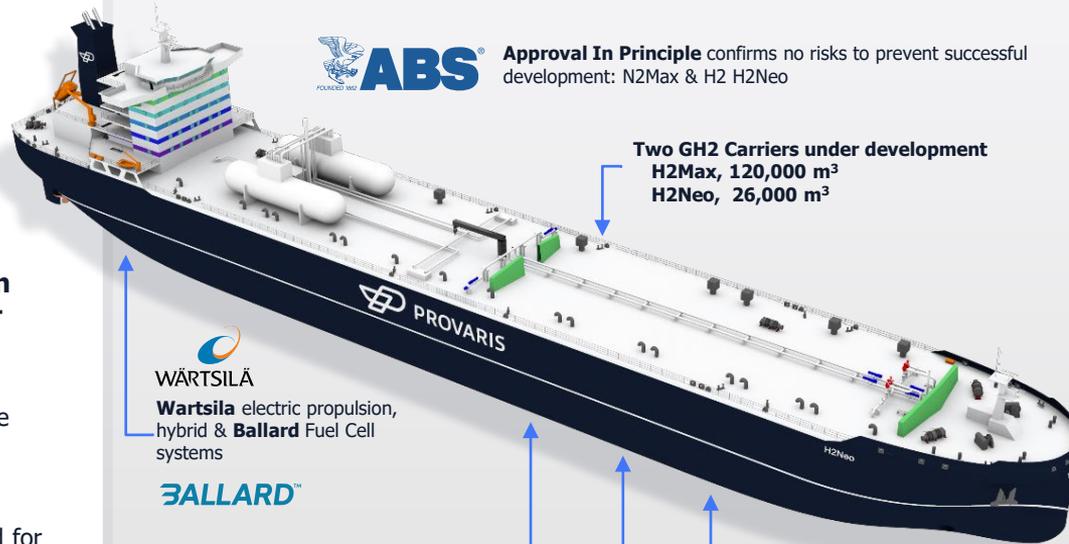
Energy Rating for C-H <sub>2</sub> , LH <sub>2</sub> and NH <sub>3</sub>		
	Use (kWh / kg H <sub>2</sub> )	Losses (% day)
<b>Very High</b>	10.0 +	2.0 + %
<b>High</b>	5.0 –10.0	0.5 –2 %
<b>Moderate</b>	1.0 –5.0	0.2 –0.5 %
<b>Low</b>	Less than 1.0	Less than 0.2 %



# GH2 Carrier provides **first mover advantage** for bulk marine hydrogen export

Roadmap to zero carbon shipping through electric propulsion system that allows for full flexibility in green fuels for power generation, including Fuel Cell and Hybrid integration

- Standard MR tanker with a proprietary design for integrated tanks to store hydrogen at 250 bar pressure
- Approval in Principle achieved for two capacity designs in 2021
- H2Neo advancing to Design Approval for Construction from Class targeted for December 2022.
  - > H2Neo Engineering design package complete and under review by ABS.
  - > Hydrogen Dispersion, Fire and Explosion study completed with no material design issues.
  - > Testing of welds for structural steel and liner materials in a hydrogen environment.
- Engagement with Shipyards for commercial estimate of capital cost and schedule, leading to maiden ship construction contract in 2023.
- Partnership with Northern Marine to assist with construction, safety protocols and operational requirements for fleet management.
- **Targeting first commercial scale fleet in 2026**



**Approval In Principle** confirms no risks to prevent successful development: N2Max & H2 H2Neo

Two GH2 Carriers under development  
H2Max, 120,000 m<sup>3</sup>  
H2Neo, 26,000 m<sup>3</sup>



Wartsila electric propulsion, hybrid & Ballard Fuel Cell systems



Bulk hydrogen storage at **250 bar operating pressure & ambient temp.**

Proprietary IP with **US Patent filed** on tank design

Maneuvering capability tailored to operating requirements, including **offshore loading**



Technical Partner



Clarksons Platou  
Ship Broker

**Integration underway with fixed jetties solutions** for both near and off-shore applications, accounting for storage, water depths, metocean, and seabed (soil) conditions into consideration.



# Developing a portfolio of **integrated green hydrogen projects**, leveraging innovative compressed shipping IP to be first to market

Value creation through innovative IP and project origination, development, construction and operations.

## Ship Engineering & Approvals

- > +20yrs with experience in bulk-scale gas carrier solutions
- > Proprietary GH2 Carrier under development
- > Technical partners include: Wartsila, Ballard, APL/NOV, Northern Marine
- > Patent IP portfolio
- > Integration with compression, terminal and mooring systems

## Hydrogen Export Projects

- > **Origination** of integrated hydrogen export projects for regional export markets
- > 2.8 GW Tiwi H2 project (Tiwi Islands, Northern Territory, AU)
- > Commercial, technical and financial partners introduced at the right time to maximise value

## Midstream Hydrogen Transport

- > **Collaboration** with bankable green hydrogen export projects suitable for compression
- > MOU with 8GW HyEnergy Project, Western Australia
- > Screening continues across a global portfolio of opportunities



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# Future Project Development Underway With Significant Tailwinds



# Hydrogen market set for remarkable growth through to 2050

Role of hydrogen in the energy transition: The key tool for harder-to-decarbonize sectors: Iron & Steel, Refining, Power Generation, Heavy Transport, Heat, & Shipping

**+30 Countries**  
Established Hydrogen Strategies

**USD 70 Billion**  
Public Funding Commitments

**USD 5 Trillion**  
Investment in H2 Supply Chains

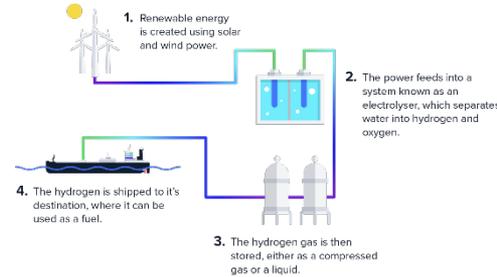
**150M Tonnes**  
Seaborne Trade by 2050

Safe and cost-efficient transport, storage and distribution of hydrogen will be critical in setting the pace of its large-scale deployment

^ International Renewable Energy Agency (IRENA); Wood Mackenzie Company Research

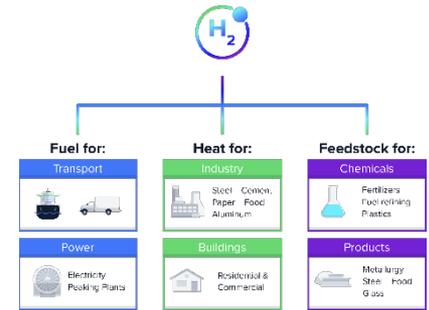


## Green H2 production



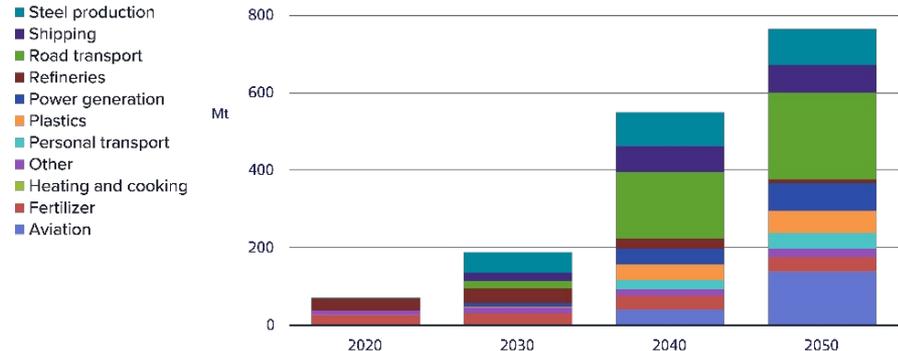
Falling costs of renewables and hydrogen technologies to make green hydrogen cost competitive by 2030

## Hydrogen uses



Commitment to 2030 net-zero targets brings forward investment case for a 'green premium'

## Addressable market for hydrogen increases substantially to 2050, with 30% forecast for seaborne trade\*



Source: RystadEnergy HydrogenCube-high case scenario; \* Wood Mackenzie

# Techno-economic models emerging on a portfolio of hydrogen projects

Strategy to develop a portfolio of projects to position compression as a mainstream solution for regional shipping

**Tiwi H2, Australia**  
*100,000tpa to Singapore & Korea*

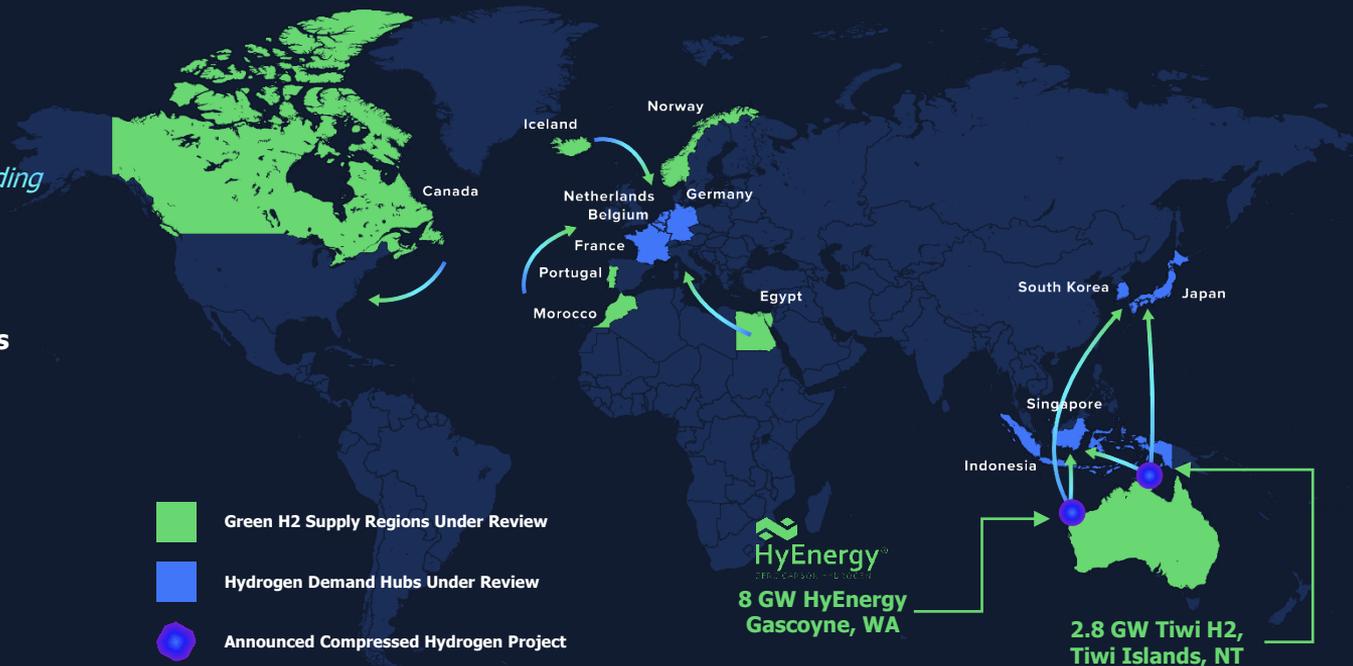
**HyEnergy, Australia**  
*200,000tpa to Singapore; offshore loading*

**Morocco to Rotterdam**  
*70,000tpa – 400,000tpa*

**Norway to Germany & Netherlands**  
*10,000tpa, 50,000tpa, 100,000tpa*

**Spain to Rotterdam**  
*50,000tpa*

**Europe/North Africa to Israel**  
*100,000tpa to 450,000tpa*



- Green H2 Supply Regions Under Review
- Hydrogen Demand Hubs Under Review
- Announced Compressed Hydrogen Project

**HyEnergy**  
Hydrogen Energy  
**8 GW HyEnergy Gascoyne, WA**

**2.8 GW Tiwi H2, Tiwi Islands, NT**



# Tiwi H2 Project strategically located to key export markets

- Positions Provaris as a developer/owner of hydrogen molecules and fully integrated compressed hydrogen supply chain for export
- First-mover advantage for export of gaseous green hydrogen from Northern Australia to key markets in Asia-Pacific
- World-first development of an integrated compressed hydrogen export project
- Major Project Status awarded by Northern Territory government

**2.8 GW**  
**Solar Generation**

**~100,000 tpa**  
**Green Hydrogen**

**2027**  
**Target first export**

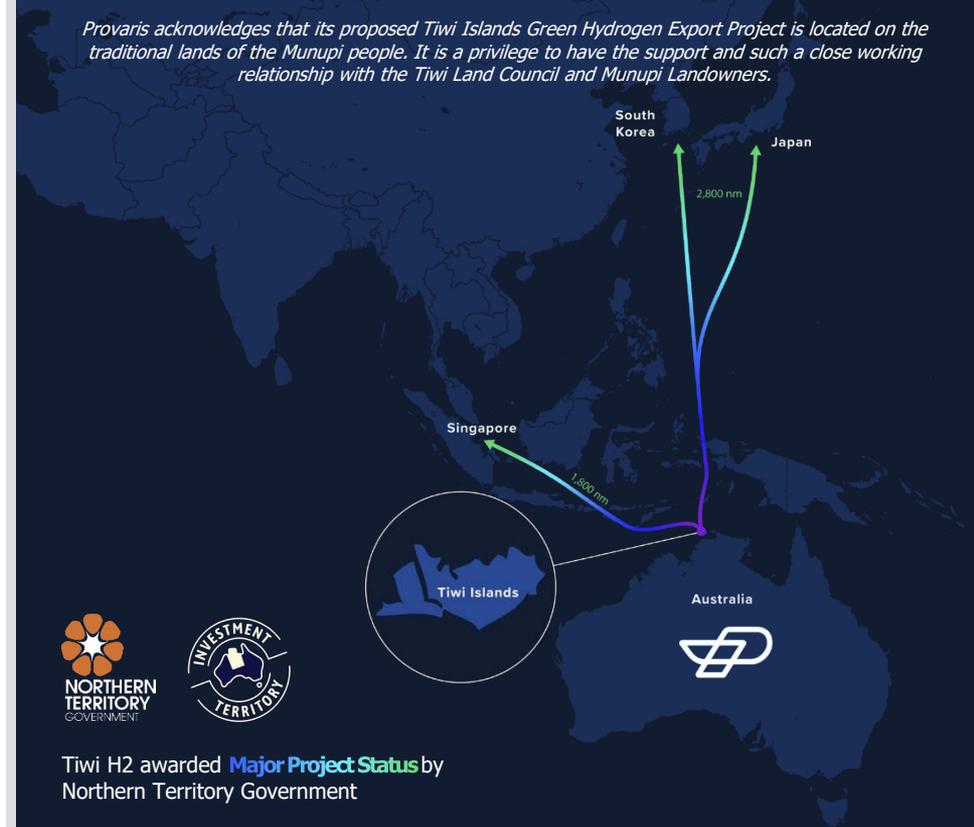
**~900,000 tpa**  
**CO2 Emissions Avoided**



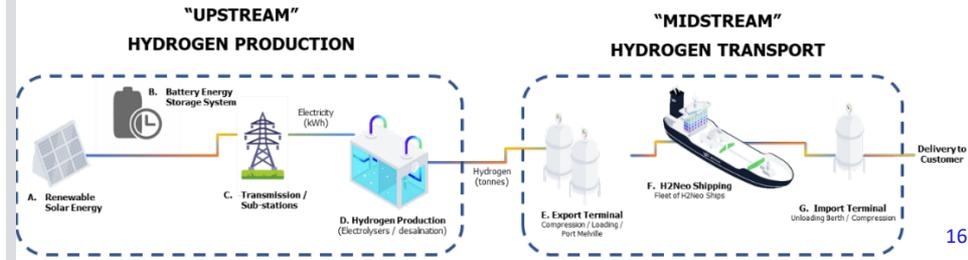
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*Provaris acknowledges that its proposed Tiwi Islands Green Hydrogen Export Project is located on the traditional lands of the Munupi people. It is a privilege to have the support and such a close working relationship with the Tiwi Land Council and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



Tiwi H2 awarded **Major Project Status** by Northern Territory Government



# Site infrastructure enables first-mover export project from Northern Australia

- Concept Design Study (August 2022) confirms feasibility for an integrated compressed hydrogen production
- USD 4.5-5.2B project including fleet of GH2 Carriers to support efficient and modular approach across two stage development
- Discussions with partners for offtake, technical and financing underway to de-risk project through to FID and maximise value to Provaris
- Strong ESG credentials for project financing
- **Milestones:** EIA referral outcome 4Q2022, Feasibility completion and FID decision 2H2023, first export early 2027

Strategic Location to Export Markets

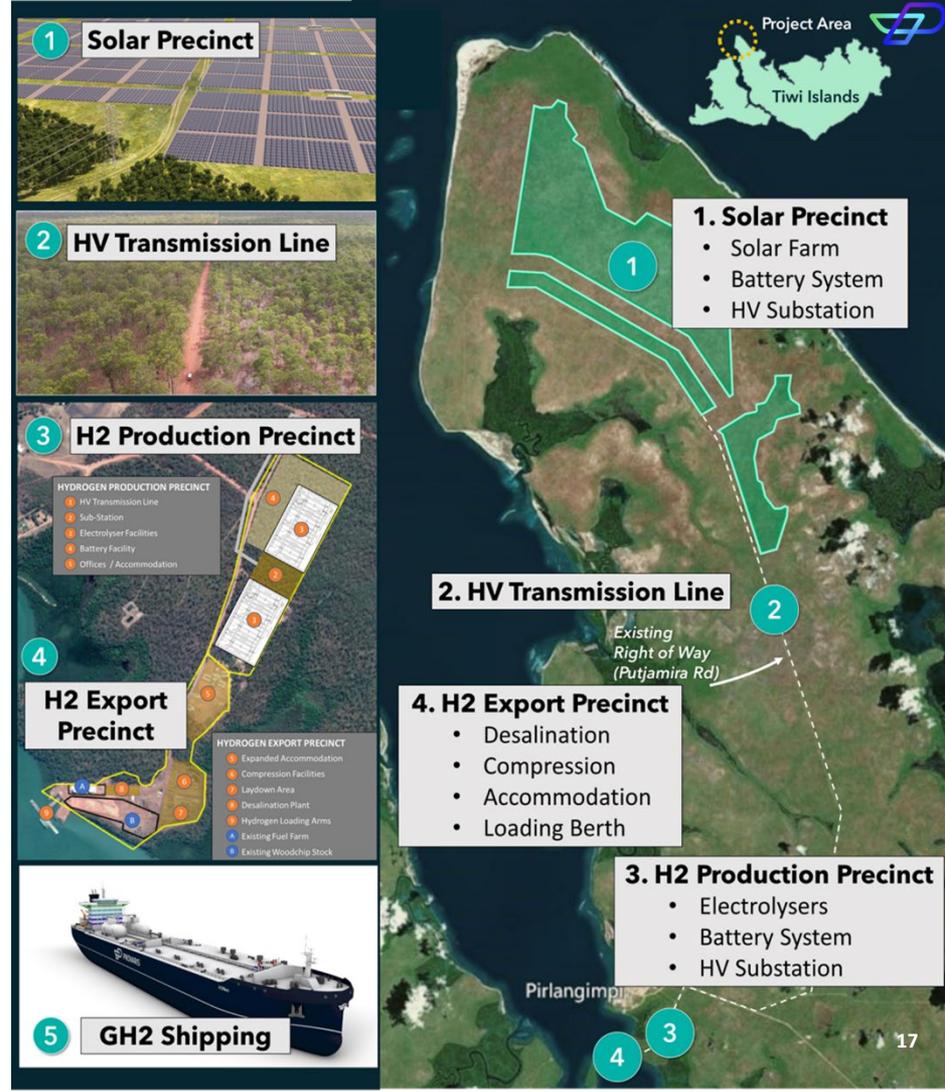
Solar Intensity & Water Access

Traditional Land Ownership

Existing Port Infrastructure

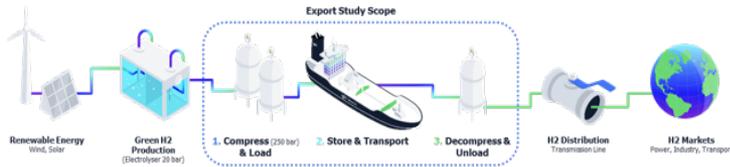
Low Environmental Impact

Landowner & Government Support



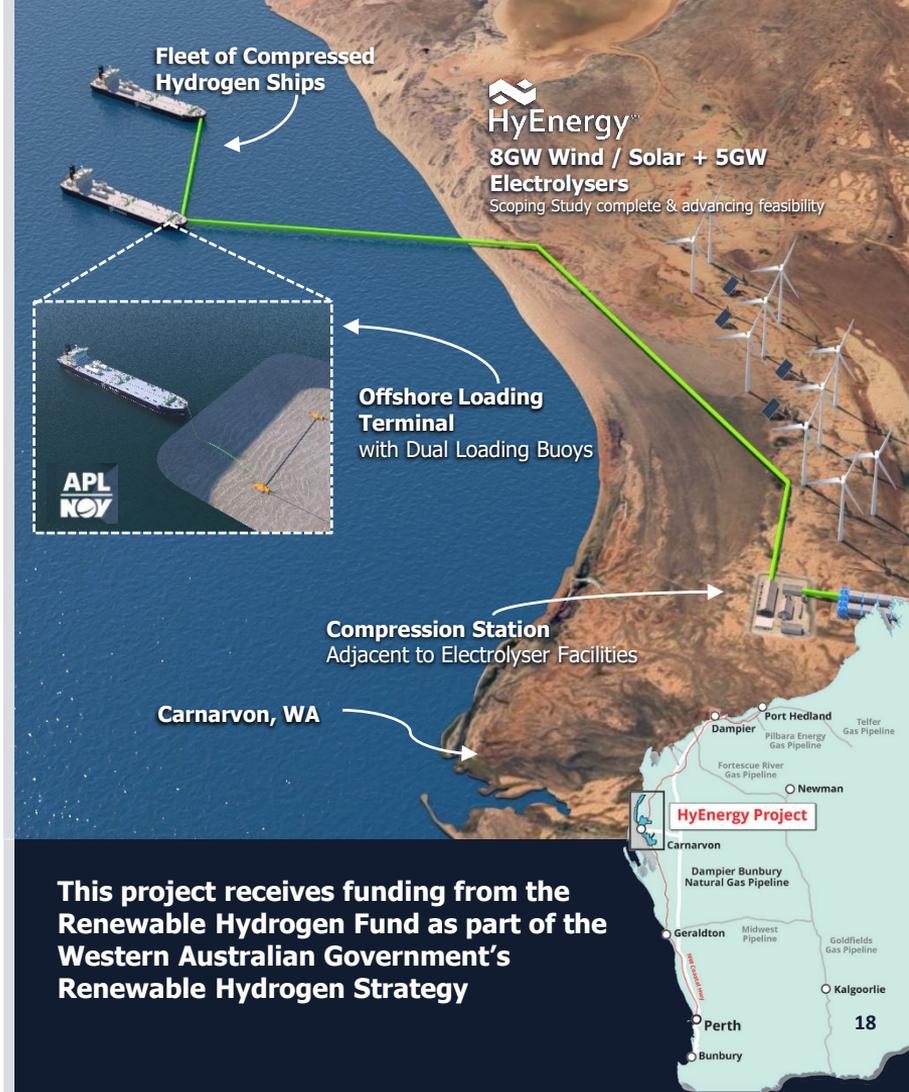
# MOU to to evaluate export of green hydrogen from 8GW HyEnergy Project to Asia-Pacific using GH2 Carriers

- 8 GW HyEnergy Project targeting 500,000 tpa of green hydrogen export
- Provaris feasibility study to demonstrate the technical & commercial advantages of compression using offshore loading solution for export to Asia-Pacific
- Scope includes the export of 200,000 tpa from a Phase 1 with a focus on Singapore (Compression, shore crossing, subsea pipeline, offshore loading)
- Compression is ideally suited for the HyEnergy Project
  - Scaled production with Phase 1 operations and exports
  - Proximity to Asia-Pacific markets (1,800nm to Singapore)
  - Mitigate environmental risks for traditional port berthing
- Completion of deliverables and draft report awaiting final acceptance from the WA Government in 2022.



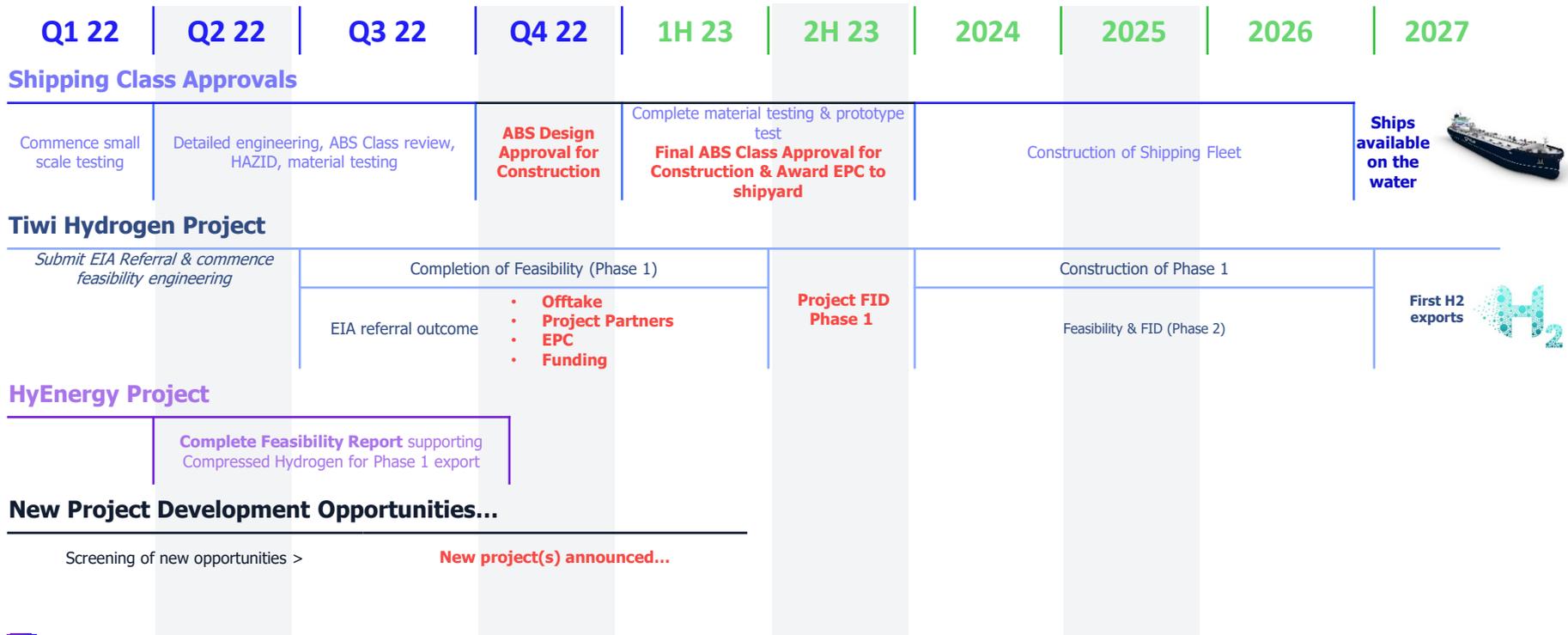
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This project receives funding from the Renewable Hydrogen Fund as part of the Western Australian Government's Renewable Hydrogen Strategy

# Forward Program for Shipping Class Approvals aligned with the **Tiwi H2 Project**



# Contact



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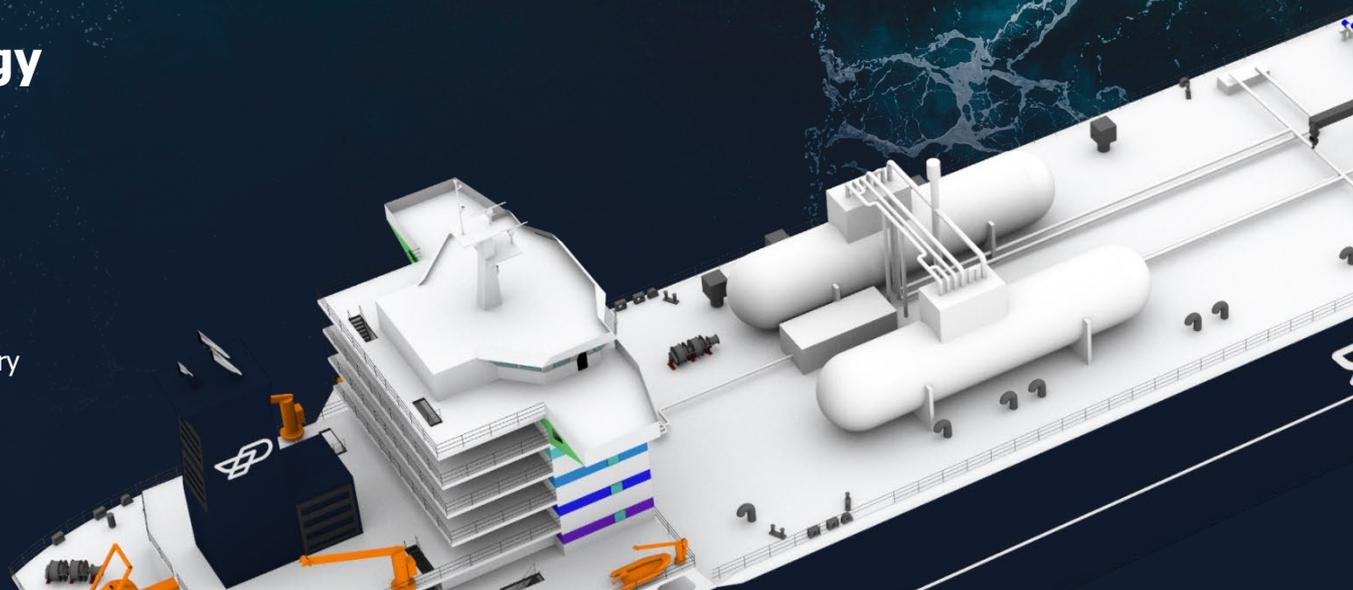
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# *Appendices*



# Compression provides for efficient offshore hydrogen production using installed wind generation

An energy efficient offshore transport solution for the development of a hydrogen production facility using "off-grid" wind power

PROVARIS SCOPE

