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Provaris launches H2Leo – a bulk-scale compressed hydrogen floating storage solution

HIGHLIGHTS:

- Provaris has launched a gaseous hydrogen floating storage solution called H2Leo, with a design capacity range of 300 to 600 tonnes of hydrogen, expandable to up to 2,000 tonnes. This solution provides the global hydrogen industry with an energy efficient and cost-effective storage solution.
- The American Bureau of Shipping (ABS) has provided 'Approval In Principal' for the H2Leo storage solution, enabling greater flexibility and optimization of Provaris' compressed hydrogen supply chain projects under development in Asia and Europe.
- The company targets a US$ 0.2 – 0.3 million / tonne capital cost for the H2Leo, making it significantly cheaper than onshore solutions. The floating storage solution is suitable for various hydrogen supply chains and applications, including bunkering for the maritime sector, intermittent/buffer storage for green hydrogen production, and long-duration storage for excess renewable energy.
- H2Leo allows for greater flexibility and optimization of Provaris' compressed hydrogen supply chain projects, reducing the total cost of supply by providing buffer storage at export and / or import locations.
- The development of H2Leo will run parallel to the remaining engineering and approvals for H2Neo, targeting prototype testing and final class approval later this year, with H2Leo set to become available in 2025.

Provaris Energy Ltd (ASX: **PV1**, **Provaris** or the **Company**) is pleased to advise of the launch of a compressed hydrogen floating storage solution which has applications across many hydrogen industries seeking cost-effective storage solutions at scale.

Provaris' Managing Director & Chief Executive Officer, Martin Carolan commented: *"Provaris sees the development of a floating storage solution as a natural extension of its compressed hydrogen IP, providing an alternative to current high-cost bulk-scale storage solutions and improving the economics of its existing projects. We believe a floating storage solution will complement our pipeline of hydrogen production and transport projects and decrease timelines to first revenues and IP commercialisation."*

With an increasing demand for clean renewable energy, the ability to store compressed hydrogen is an integral part of the hydrogen supply chain. Over the last 18 months Provaris has been studying ways of leveraging its shipping IP, engineering and Class approvals obtained to date on cargo containment and ship designs, to develop a solution for the industry that is in need of hydrogen storage at scale.

Provaris' Chief Technical Officer, Per Roed added: *"The H2Leo is a flexible hydrogen floating storage unit that can be optimized in size, capacity, and operations for different applications. Its SIMOPs capability allows for continuous operations, and it has a large working deck and hull for installing auxiliary systems such as compression and H2 bunkering. Provaris is developing production capacity for cargo tanks that can be operational for floating storage by 2025 which will cater to short term demand for storage and allow Provaris to gain operational experience and de-risk the continued development of the H2Neo carrier."*

'Approval in Principle' milestone for the H2Leo leverages the completion of extensive FEED, critical safety studies and 'Design Approval' for the H2Neo carrier.

Leveraging the FEED-level engineering, safety studies, and Design Approval for the H2Neo carrier received in December 2022, the American Bureau of Shipping (ABS) has provided 'Approval In Principal' (AIP) for a compressed hydrogen floating storage solution (the **H2Leo class**), the first of its kind to receive this level of approval.

The AIP allows for a flexible solution for specific industry applications with a design capacity range of 300 to 600 tonnes of hydrogen. The future development and approvals include expanding the storage capacity from 100 to 2,000 tonnes of hydrogen storage.

Figure 1: Illustration of the H2Leo 26,000m³ compressed hydrogen floating storage

The H2Leo floating storage unit will have two cargo tanks with independent isolation, safety valves, and manifolds for compressed hydrogen transfer. The SIMOPS capability allows for continuous production and discharge. ABS has carried out risk and safety workshops to assess and mitigate hydrogen handling risks. Provaris will work with ABS for Design Approval, cargo tank testing, and construction. The H2Leo class will have a fixed beam and depth of 31.00 m and 17.00 m, respectively, with length and draft varying according to the specified cargo capacity.

Figure 2: Illustration of the H2Leo Floating Storage integrated with H2Neo 430t carrier for loading/unloading

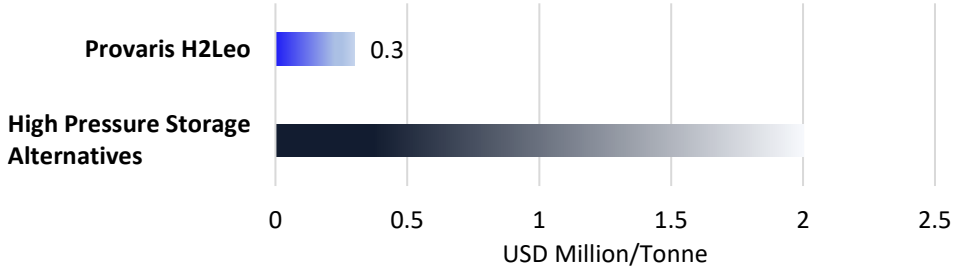
H2Leo provides an alternative to bulk storage at a material discount to market alternatives

Provaris, together with industry consultation, has studied the market alternatives for storing compressed hydrogen and found two key solutions - containerized tube matrices for smaller scale storage and static hydrogen storage vessels for large scale storage.

The cost of large-scale static storage is currently estimated by external studies to be in the range of USD 1-2 million per tonne of storage installed, while Provaris estimates that the cost of hydrogen storage using a floating storage solution such as the H2Leo will target a capital cost of USD 0.2-0.3 million / tonne (USD 200-300/kg H2).

This cost difference could make onshore static storage cost-prohibitive for large-scale hydrogen derivative projects, such as ammonia, creating an opportunity for Provaris to establish market share and achieve attractive returns on investment.

Figure 3: Comparison of H2Leo (430t) cost per tonne of storage with onshore alternatives (Source: Provaris)



H2Leo extends Provaris' compressed hydrogen IP and role to the hydrogen industry

Provaris has two compressed hydrogen carriers in development, the H2Neo and the H2Max, designed to align with product supply and regional trade. The newly developed H2Leo extends the compressed hydrogen's flexibility to include floating storage solutions, expanding the market application of our IP beyond the supply chain. Carrier volumes can exceed production capacity, with selection based on shipping distance and hydrogen volumes.

	H2Leo (Storage)	**H2Neo**	**H2Max**
			
Cargo Carrying Capacity	300 to 600t (at 250 bar)	26,000 m^3 at 250 bar (430t)	120,000 m^3 at 250 bar (2,000t)
Development Timeline	✓ **AiP Received 2023** • Design Approval (FEED) 2023 (scheduled) • **First operations 2025 (target)**	✓ **AiP Received 2021** ✓ **Design Approval (FEED) 2022** • Effective Shipbuilding Contracts 2023/24 (scheduled) • **First operations 2026/27 (target)**	✓ **AiP Received 2021** • Design Approval (FEED) 2024 (scheduled) • Effective Shipbuilding Contracts 2027 (target) • **First operations 2030 (target)**
Project Export Capacity **	n/a	**200,000 tonnes pa**	**950,000 tonnes pa**
Shipping Range	n/a	Up to 2,000 nautical miles	Up to 3,000 nautical miles

** Note:
- Based on unloading in 18 hours
- Fleet size is based on project production rates and distance to market
- Actual importation volumes can be multiples of the above "fleet" production facility capacities.

- END –

This announcement has been authorised for release by the Board of Provaris Energy Ltd.

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About Provaris Energy

Provaris Energy Ltd (ASX: PV1) | www.provaris.energy

Provaris Energy Ltd (ASX: PV1) is developing a portfolio of integrated green hydrogen projects in the regional trade of Asia and Europe, leveraging our innovative compressed hydrogen bulk carrier. Our focus on value creation through innovative development that aligns with our business model of simplicity and efficiency. The choice to support all development phases of a project is in line with Provaris' strategic desire to develop and invest in profitable hydrogen projects across the value chain, establish an early-mover advantage for regional maritime trade of hydrogen, and to retain an equity position of these assets over the long term. With offices in Sydney, Perth and Oslo, the company's integrated approach to producing and transporting hydrogen can unlock a world of potential.