ASX Announcement 13 May 2024
Hexagon Energy Materials Limited (ASX: HXG)

WAH_2 Project – Ammonia Bunkering Memorandum of Understanding

Hexagon Energy Materials Limited (ASX: HXG) ('Hexagon' or 'the Company') is delighted to announce that it has signed a Memorandum of Understanding ('MOU') with Oceania Marine Energy Pty Ltd ('Oceania') regarding the potential development of a low-emissions ammonia bunkering business at Dampier, in the Pilbara region of Western Australia.

While the primary market for the WAH_2 Project's low-emissions ammonia remains substitution of coal in thermal power generation in Japan and South Korea, ammonia bunkering has the potential to be a valuable, additional, domestic market. This would involve the supply of low-emissions ammonia as a fuel for the bulk carriers that ship iron ore exports from Australian producers to customers across Asia.

This collaboration has the potential to create a new Australian business that uses locally-produced low-emissions ammonia to help decarbonise Australia's iron ore exports.

Under the MOU, Hexagon and Oceania have committed to work together with the intention of:

(a) Demonstrating the feasibility of the supply of low-emissions ammonia as a bunker fuel for iron ore bulk carriers via ship-to-ship transfer;

(b) Confirming demand for ammonia bunkering and potential commercial terms;

(c) Defining an appropriate development plan; and

(d) Engaging with government and other stakeholders.

Hexagon and Oceania will jointly engage with stakeholders (including ship owners, fuel traders, iron ore producers, port authorities and government) to complete their market assessment, develop an appropriate business model and development plan and pursue preliminary offtake agreements for low-emissions ammonia as a bunker fuel. It is envisaged that this work will be completed in Q4 2024.

The MOU has a two-year term to allow for subsequent collaboration past the anticipated final investment decision for Hexagon's WAH_2 Project.

Hexagon's target remains WAH_2 front end engineering design (FEED) entry in mid-2024 following completion of planned technical work and finalisation of conditional commercial agreements for key aspects of the project (noting that a bunkering offtake agreement is not considered a pre-requisite for FEED entry, rather an opportunity to add incremental value during FEED).

Confidential negotiations continue and Hexagon intends to have the key agreements in place to support the start of FEED in Q3 2024.

Chief Executive Officer Stephen Hall commented:

"This Memorandum of Understanding with Oceania Marine Energy represents another significant step for Hexagon's WAH_2 low-emissions ammonia project.

It offers the opportunity to establish a new bunkering industry in Western Australia that could play a leading role in decarbonising Australia's iron ore exports for the benefit of Australia and its trading partners in Asia. This opportunity offers market diversity, requires no additional capital expenditure and is complementary to Hexagon's primary objective of exporting low-emissions ammonia from WAH_2 to help decarbonise power generation in Asia.

I look forward to making further announcements as Hexagon continues to progress confidential negotiations with key input providers, potential off-takers and strategic partners."

Oceania Marine Fuels

Oceania Marine Energy Pty Ltd is an Australian privately-owned company focused on establishing a bunkering business at Dampier in the Pilbara. The company aims to supply low-emissions fuel, such as ammonia, to iron ore carriers via ship-to-ship transfer and has a target of delivering over 1 million tonnes of low carbon marine fuel by 2030.

Oceania was established in 2019 by a team of marine industry professionals and has been developing the required feasibility studies, operational practices, agreements and partnerships to operate a low carbon marine bunkering business to serve the Australia-to-Asia deep sea shipping fleet.

Oceania is working closely with Kanfer Shipping of Norway to design and deliver a fleet of marine bunkering vessels that use best-in-class technology to offer operational efficiency and emissions reduction.

In 2022, Oceania completed its feasibility study into the bunkering of ammonia at Dampier. Since then, Oceania has continued to work with stakeholders across the value chain towards the establishment of a 'Green Shipping Corridor' between Australia and Asia.

Managing Director of Oceania Nick Bentley commented:

"Oceania is enthusiastic to work with Hexagon on aligning our low-emissions ammonia production and bunker operations to meet market requirements.

The key objective of our MOU is to demonstrate a viable supply of low-emissions ammonia bunker fuel, developed on a timeline to meet market demand, and in the most efficient location for the iron ore ships transporting Australian iron ore to Asia.

Oceania is thrilled to continue its work alongside Hexagon and Kanfer Shipping to jointly reach our mutual goal of decarbonising shipping."

Background

1. Hexagon's WAH_2 Project

The WAH_2 Project is Hexagon's flagship project and intends to supply low-emissions ammonia to the decarbonising powerhouse economies of the Asia Pacific, including Japan and South Korea. The project is well placed as Asia's energy transition drives an increasing demand for low emissions energy.

In April 2023, Hexagon was allocated land for the WAH_2 Project in the Maitland Strategic Industrial Area by the Western Australian Government.

In August 2023, Hexagon announced the completion of the WAH_2 Pre-Feasibility Study and based on the encouraging results commenced Pre-FEED studies.

Hexagon's target remains WAH_2 FEED entry in mid-2024 following completion of planned technical work and finalisation of conditional commercial agreements for key aspects of the project.

The project plans to use proven technology to convert natural gas into ammonia, and capture and sequester more than 90% of the associated CO_2, in order to produce 600 kTPA of low-emissions ammonia at its site in the Maitland Strategic Industrial Area[1]. The low-emissions ammonia would

[1] HXG ASX 'WAH_2 Project Pre-Feasibility Study' updated announcement dated 2 August 2023.

be transported by pipeline to the Port of Dampier where it would be loaded onto gas carrier ships for export. First production is targeted for late 2028.

No additional infrastructure would be required to load ammonia onto an ammonia bunker vessel, such as that being developed by Oceania.

2. Export Market Developments

The market for low-emissions ammonia is strengthening and uncertainty is reducing.

- There is increasing recognition of the importance of low-emissions ammonia to Japan's and South Korea's energy transitions by independent institutions[2];
- The Japanese Government has introduced an additional target for the import of low-emissions hydrogen/ammonia of 12 MTPA H_2e by 2040[3] – if half of this was ammonia, it would equate to ~30 MTPA of ammonia; and
- Demonstration of commercial-scale co-firing of ammonia in Japan's Hekinan power plant commenced on 1 April 2024[4].

Japan has confirmed its definition of low-emissions ammonia. Hexagon's WAH_2 Project would clearly exceed those expectations.

- Japan's updated Basic Hydrogen Strategy[3] sets a low-emissions benchmark of 0.84 kg CO_2e/kg NH_3. The WAH_2 PFS Base Case[1] has an expected emissions intensity of approximately one quarter of this (0.2 kg CO_2e/kg NH_3).

Costs for electrolysis-based ('green') low-emissions ammonia are increasing, strengthening the competitive position of Hexagon's WAH_2 Project as a planned early mover.

- The cost of producing electrolysis-based 'renewable hydrogen' was assessed in December 2023 to be US$4.5 – 6.5 /kg, an increase of between 30% and 65% over previous estimates[5]. This reflects the increasing costs of renewable energy, rising interest rates, and supply chain constraints; and
- This implies a cost of electrolysis-based ammonia of at least US$800[6] T NH_3 – which is significantly greater than the WAH_2 PFS Base Case[6] cost of production of US$552 /T NH_3 (and target of US$500 /T NH_3).

3. Domestic Bunkering Market Opportunity

The export of iron ore from the Pilbara to northern Asia is one of the largest global shipping routes by tonnage with exports exceeding 800 million tonnes per year. The ore is transported by bulk carriers that are typically fuelled by low-sulphur diesel or marine fuel oil.

Mining companies and shipping companies are seeking to decarbonise the transport of iron ore and one of the most effective ways to do so is to use low-emissions fuel to power the bulk carriers.

Ammonia-fuelled bulk carriers are being developed as a means to achieve this and will require a supply of low-emissions ammonia. This could be most efficiently achieved if low-emissions ammonia could be supplied close to its point of manufacture without the ore carriers having to deviate from their most direct shipping routes.

The supply of low-emissions ammonia from the WAH_2 Project using a purpose built bunker vessel would offer such an opportunity.

[2]The Oxford Institute for Energy Studies, November 2023, Issue 138, 'The role of clean hydrogen/ammonia in Japan's energy transition', H Gordenker.
[3] Japan's Basic Hydrogen Strategy, June 2023, Ministerial Council on Renewable Energy, Hydrogen and Related Issues.
[4] JERA press release 1 April 2024 'Start of Demonstration Testing of Fuel Ammonia Substitution at JERA's Hekinan Thermal Power Station'.
[5] Hydrogen Insights December 2023, Hydrogen Council and McKinsey & Company.
[6] ~180 kg hydrogen is required to manufacture 1T ammonia (180*4.5 = 810). Excludes other costs of conversion.

The Global Maritime Forum (GMF) assessed the potential to use low-emissions ammonia to decarbonise iron ore shipping between the Pilbara and East Asia[7] and concluded that:

- It could be feasible to get ammonia-powered bulk carriers on the water by 2028 (subsequently Eastern Pacific Shipping has ordered four ammonia-fuelled bulk carriers to be delivered from 2026[8]);
- Either the Pilbara or Singapore could introduce clean ammonia bunkering in the next five years, in time to meet demand; and
- If clean ammonia bunkering were to become available in the Pilbara, it would represent a competitive option - fuel could be relatively efficiently delivered to the port from local production and the need for ore carriers to make costly deviations from their trade route would be avoided.

The size and ramp-up of market demand will be driven by the number of ore carriers using low-emissions ammonia as fuel. GMF estimates demand of up to 0.1 MTPA in 2028 increasing to 0.3 MTPA in 2030 and 1.2 MTPA by 2035 for the Pilbara-East Asia trade route as a whole[7]. The proportion of ore carriers choosing to bunker in the Pilbara would drive the size of the market opportunity for Hexagon's WAH_2 Project.

A domestic bunkering market of ~100 kTPA of low-emissions ammonia is considered indicative of potential opportunity for Phase 1 of Hexagon's WAH_2 Project.

Authorisation

This announcement has been authorised by the Board of Directors.

About Hexagon Energy Materials Limited

Hexagon Energy Materials Limited (ASX: HXG) is an Australian company focused on *Future Energy* project development and *Future Energy* materials exploration and project development.

Hexagon is developing a business to deliver decarbonised Hydrogen into export and domestic markets at scale, via its WAH_2 Project. The Company plans to use renewable energy to the greatest extent practicable.

To learn more please visit: www.hxgenergymaterials.com.au

FOR FURTHER INFORMATION,

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[7] Global Maritime Forum 'Fuelling the decarbonisation of iron ore shipping between Western Australia and East Asia with clean ammonia', May 2023.
[8] Ammonia Energy Association, 7 May 2024,'Ammonia-fuelled vessels:shipyard orders and new concepts'.