Woodside Energy

INFORMATION SHEET

HYDROGEN AND AMMONIA

At Woodside we provide energy to heat and cool homes, keep lights on, and support industry through our portfolio of oil and gas assets. But the science of climate change is clear: if the world is to limit temperature rise, it will need to change the way it produces and consumes energy. This process – sometimes called the "energy transition" – has already begun.

Our aspiration is to thrive through the energy transition with a low cost, lower carbon[1], profitable, resilient, and diversified portfolio[2].

To help meet this aspiration, we are assessing opportunities to invest in new energy products, such as hydrogen and ammonia, that can help avoid or reduce customer emissions.

What is hydrogen and ammonia?

Hydrogen is the simplest element in the universe. It is abundant, versatile, and can act as an energy carrier, storing and transporting energy in a usable form from one place to another.

Ammonia can be used as a carrier for hydrogen, either to be used directly (as feedstock for chemicals such as fertilisers or as a fuel for power generation and maritime transportation) or to be reconverted to hydrogen.

Why are hydrogen and ammonia important?

Both hydrogen and ammonia have the potential to decarbonise hard to abate sectors which are difficult to electrify (such as in heavy transport, chemical feedstocks, or in steel and alumina). They also have the potential to firm renewables as a substitute to natural gas where batteries lack scale and longevity.

What can hydrogen and ammonia be used for?

Heavy duty transport

Liquid hydrogen is a potential substitute for diesel in trucking fleets, utilising fuel cells that need liquid hydrogen for fuel.

Shipping and aviation fuels

Ammonia as a marine fuel could reduce emissions relative to the use of conventional fuels for bulk carriers. Hydrogen is a potential substitute for aviation fuel.

Power generation

Ammonia can be blended into the fuel used for existing coal-fired power generation to reduce greenhouse gas emissions from existing power generation assets.

Industrials and chemicals

Hydrogen and ammonia are used as industrial and chemical feedstocks and are primarily manufactured from fossil fuels without carbon management. This creates an opportunity for the same products to be manufactured, but through renewable electrolysis or fossil fuels with carbon capture and storage.

1. Woodside uses this term to describe the characteristic of having lower levels of associated potential GHG emissions when compared to historical and/or current conventions or analogues, for example relating to an otherwise similar resource, process, production facility, product or service, or activity.
2. For Woodside, a lower carbon portfolio is one from which the net equity scope 1 and 2 greenhouse gas emissions, which includes the use of offsets, are being reduced towards targets, and into which new energy products and lower carbon services are planned to be introduced as a complement to existing and new investments in oil and gas. Our Climate Policy sets out the principles that we believe will assist us achieve this aim.

For more information, please visit our website
www.woodside.com.au

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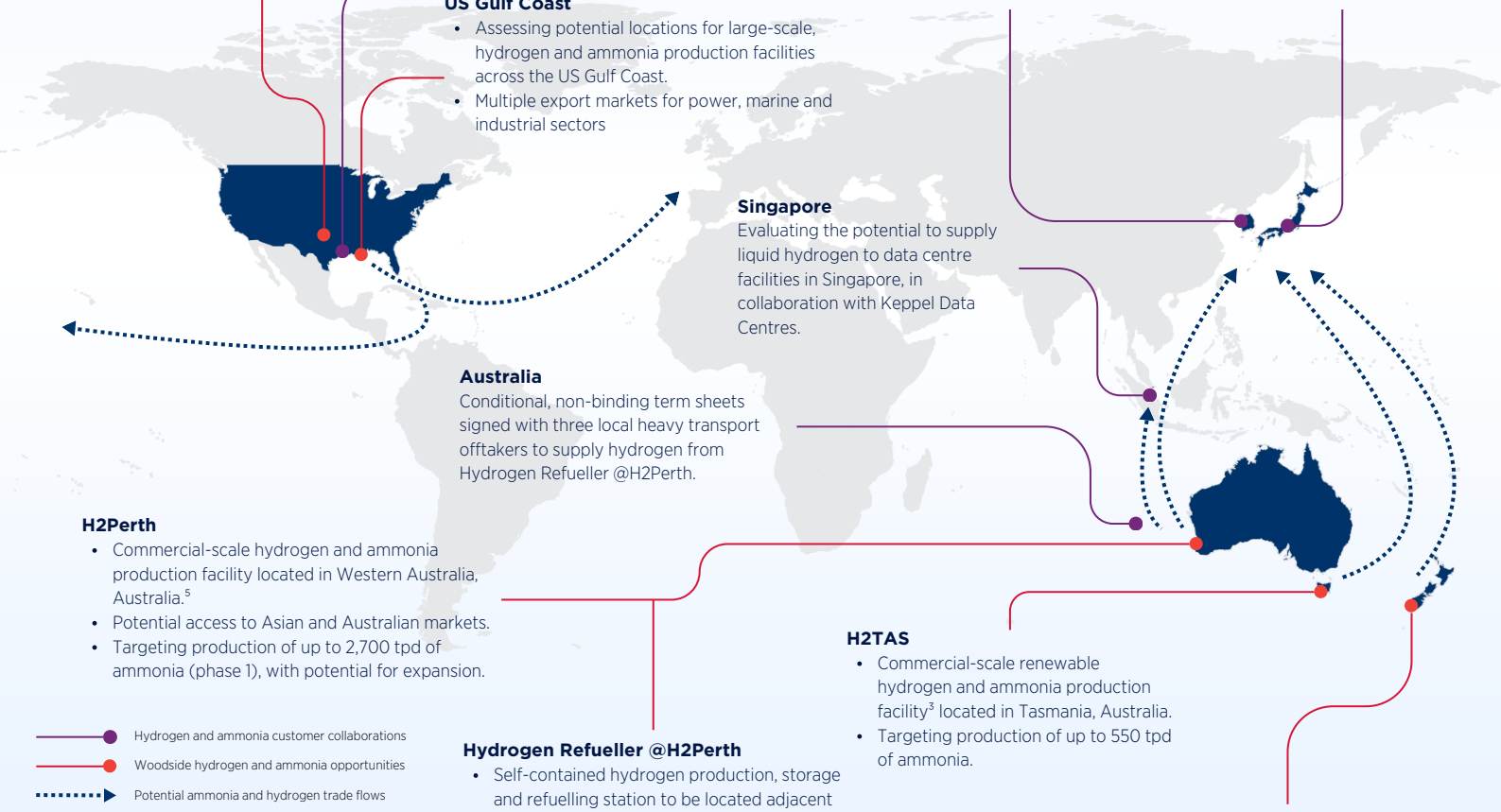
OUR PORTFOLIO OF HYDROGEN AND AMMONIA OPPORTUNITIES

We are pursuing a number of proposed hydrogen and ammonia opportunities[1], leveraging our decades of experience as an energy producer. At the same time, we are collaborating with potential customers[2] to support the development of demand for these new energy products.



H2OK

- Commercial-scale renewable liquid hydrogen project[3], located in Oklahoma, US.
- Centrally located to service the domestic truck market.
- Targeting production of up to 60 tpd of hydrogen.

US

Dedicated US-based team targeting potential customers across a range of sectors.

US Gulf Coast

- Assessing potential locations for large-scale, hydrogen and ammonia production facilities across the US Gulf Coast.
- Multiple export markets for power, marine and industrial sectors

South Korea

Collaborating on opportunities relating to long term hydrogen and ammonia offtake and participation in production projects, with SK E&S Co Ltd.

Japan

Non-binding agreements to collaborate individually with Sumitomo Corporation and Sojitz Corporation on opportunities which could include ammonia, hydrogen, carbon capture and storage and carbon management.

Singapore

Evaluating the potential to supply liquid hydrogen to data centre facilities in Singapore, in collaboration with Keppel Data Centres.

Australia

Conditional, non-binding term sheets signed with three local heavy transport offtakers to supply hydrogen from Hydrogen Refueller @H2Perth.

H2Perth

- Commercial-scale hydrogen and ammonia production facility located in Western Australia, Australia.[5]
- Potential access to Asian and Australian markets.
- Targeting production of up to 2,700 tpd of ammonia (phase 1), with potential for expansion.

Hydrogen and ammonia customer collaborations

Woodside hydrogen and ammonia opportunities

Potential ammonia and hydrogen trade flows

Hydrogen Refueller @H2Perth

- Self-contained hydrogen production, storage and refuelling station to be located adjacent to H2Perth.
- Initial production of .2 tpd of hydrogen, with the potential to scale up to 1 tpd.

H2TAS

- Commercial-scale renewable hydrogen and ammonia production facility[3] located in Tasmania, Australia.
- Targeting production of up to 550 tpd of ammonia.

Southern Green Hydrogen

- Commercial scale renewable hydrogen and ammonia production facility[3] located in Southland, New Zealand.[5]
- Targeting production of up to 1,400 tpd of ammonia.

1. Proposed hydrogen and ammonia opportunities are subject to commercial arrangements, commercial feasibility, regulatory and Joint Venture approvals, and third party activities (which may or may not proceed). Project capacities are subject to further engineering. Individual investment decisions are subject to Woodside's investment targets. Not guidance.
2. Customer collaborations are non-binding.
3. Opportunity proposes to use electricity sourced from the grid from renewable sources and to procure renewable energy certificates to abate remaining emissions.
4. For the electrolysis component of H2Perth, H2Perth proposes to use a target of 80% renewable electricity from start-up for Phase 1, stepping up to 100% renewable electricity for the entire facility by 2040.
5. Woodside's equity in Southern Green Hydrogen is subject to finalising commercial agreements

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HYDROGEN SUPPLY CHAIN

1 Production

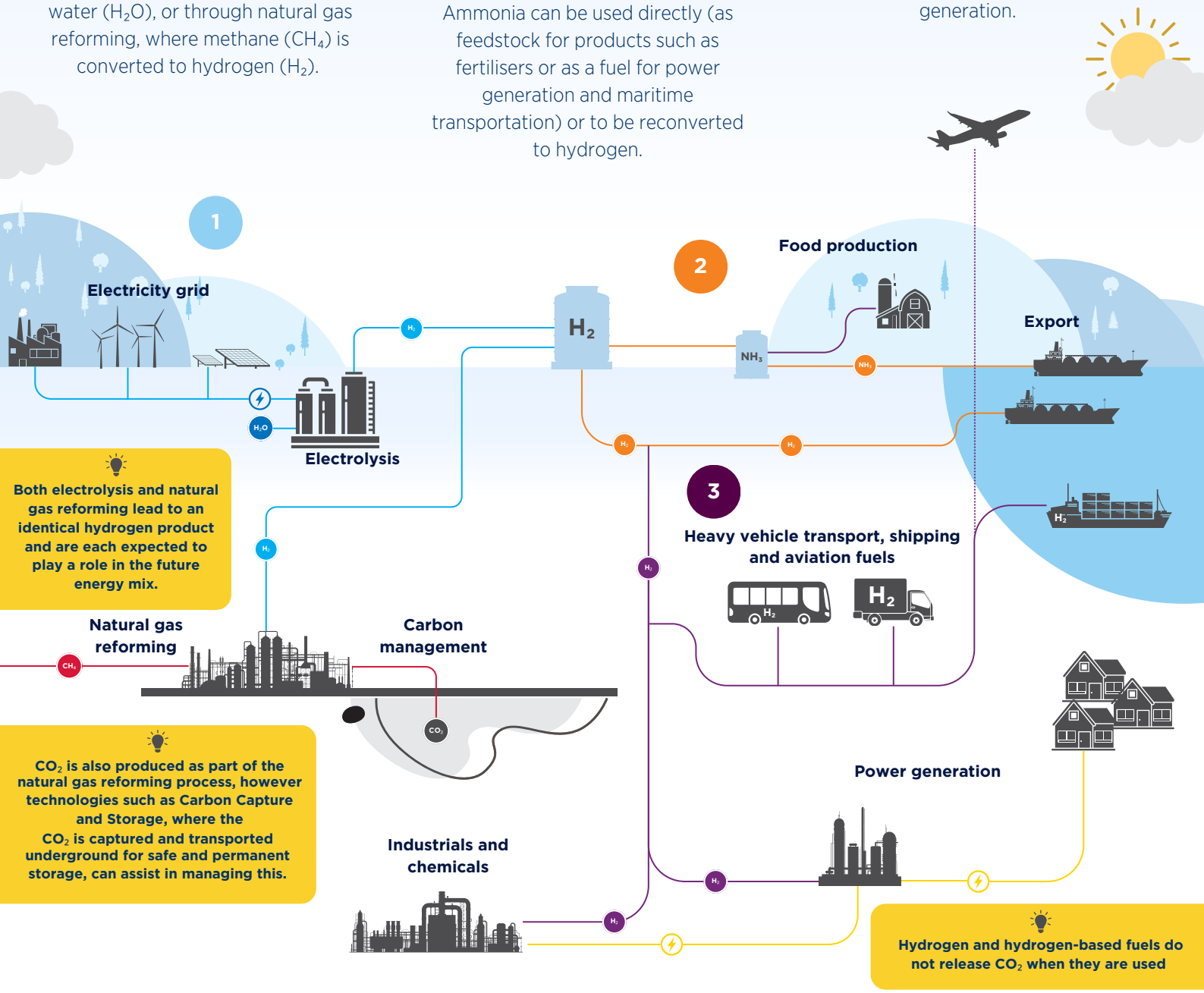
Hydrogen can be produced through a variety of different methods. For instance, hydrogen can be produced using electrolysis, where electricity is used to separate hydrogen (H_2) from water (H_2O), or through natural gas reforming, where methane (CH_4) is converted to hydrogen (H_2).

2 Hydrogen Storage and Transport

Once produced, hydrogen can be stored and transported as either a gas or a liquid through tanks, vessels, and pipelines, or in material-based forms such as ammonia (NH_3). Ammonia can be used directly (as feedstock for products such as fertilisers or as a fuel for power generation and maritime transportation) or to be reconverted to hydrogen.

3 End use

Hydrogen has a variety of potential uses, including as an input in industrials and chemicals production, in heavy vehicle transport, shipping and aviation as fuel or in power generation.



Both electrolysis and natural gas reforming lead to an identical hydrogen product and are each expected to play a role in the future energy mix.

CO_2 is also produced as part of the natural gas reforming process, however technologies such as Carbon Capture and Storage, where the CO_2 is captured and transported underground for safe and permanent storage, can assist in managing this.

Hydrogen and hydrogen-based fuels do not release CO_2 when they are used

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