

vehicle manufacturers continue to update their technology and fuel systems, ethanol provides further opportunity for improving vehicle performance, fuel economy and emissions.

“We know more than 64 countries have mandated ethanol in their petrol not only to increase their fuel quality, but also to boost jobs, secure their fuel supply and decarbonise transport sectors,” said Mr Yallouridis.

With extensive experience working globally in the motor vehicle industry, the MTA CEO is aware of the benefits of local fuel ethanol industry – so a recent visit to Shoalhaven Starches left a big impression.

“We were blown away by the scale of manufacturing and continual innovation at the facility, as well as the positive contribution ethanol could make to the wider motoring industry,” he said after the behind-the-scenes tour of the world-class site at Nowra in regional NSW.

Manildra Group’s fully integrated, state-of-the-art manufacturing facility uses wheat starches from flour milling to produce a range of ethanol grades – used not just for transport fuels but also food and beverages, pharmaceuticals, personal care and industrial applications worldwide.

Manildra Group Head of Ethanol, Debra Forster, said ethanol with a natural octane of 108 was distributed to oil companies to blend with petrol to produce E10 (95 RON) and E85 (108 RON) fuel.

Turbocharging an old station wagon really drove home the value of ethanol-enhanced fuels for the duo behind Mighty Car Mods, the world’s most-watched DIY online auto show. Recently ranked among the most influential digital stars on the globe, Australian car enthusiasts Blair ‘Moog’ Joscelyne and Marty Mulholland count some 2.8 million YouTube subscribers and up to 4.2 million monthly views for their handy and humorous demonstrations of at-home automotive improvements.

The pair first became fans of high-performance, ethanol-based fuels after nearly doubling the power of a 15-year-old Subaru by using E85 – a blend of 85 per cent ethanol and 15 per cent petrol.

Mr Mulholland said they picked up the station wagon dubbed “Supergramps” for a couple of thousand dollars and “swapped the engine out for an EZ36, the biggest engine that Subaru makes”.

“Problem was, it was already super-high compression and we were going to turbocharge it,” he said. “By using E85, we could raise the tuning headroom; adding

more ignition timing and boost pressure – resulting in almost double the factory power of the original car with its original engine.”

Mr Mulholland said they were struck by the versatility of 100 per cent Australian ethanol for value-adding uses ranging from fuel to food, beverages and pharmaceuticals.

They were also surprised at how many Australian-made products used raw and refined materials made in the same plant that produces both household-grade and fuel-grade ethanol.

“There is always a lot of talk about future technologies, where they will take us and how clean they are,” Mr Mulholland said. “We’re excited about all of them, and one thing about renewables such as ethanol is that they are here, right now – we can create it from scratch in Australia, put it in a vehicle and go.

“I’m a big fan of Australian-made and it’s great to add an Australian-made product to imported petrol to increase octane and improve performance.”



# Green Ammonia as Marine Bunker Fuel

Freight & Trade Alliance (FTA) has partnered with Renewable Hydrogen as a technical advisor on renewable policy to support our engagement with government and to be at the forefront of emerging initiatives through collaborative relationships with key sectors of commerce.

Sal Milici (Head of Border and Biosecurity, FTA / APSA) had the opportunity to speak with Brett Cooper, Chief Executive Officer, and founder of Renewable Hydrogen.

## 1. SAL MILICI – Brett, please tell us about Renewable Hydrogen and your reach locally and internationally.

I established Renewable Hydrogen Pty Ltd in 2008 to develop supply chain pathways by which Australia’s vast renewable energy resources could be exported in the form of Green Hydrogen and its carriers such as Green Ammonia. In this regard over the last 12 years or so we have worked on these types of projects with a leading Japanese Trading house, several State Govts, CSIRO and the world’s largest ammonia fertiliser producer Yara.

## 2. SAL MILICI – After more than a decade in planning, on 1 January 2020 the International Maritime Organisation (IMO) mandated that ships use low sulphur fuel. Will it take another decade or longer before we see the next leap in environmental measures?

In recent years there has been a dramatic increase in global interest in the use of Green Ammonia as a carbon free bunker fuel for shipping.

This interest has arisen as a result of policy settings announced in April 2018 by the IMO

that set policy objectives aimed at a 50% reduction in Greenhouse Gas emissions from shipping by 2050.

In response to these policy settings, leading ship operators such as Maersk, have announced targets to be 100% free of CO2 emissions by 2050.

The maritime industry has recognised that in order to meet these objectives, new zero carbon propulsion fuels will need to be developed for shipping.



Because ships being built now will be operational for the next 20 years or more, ship designers have already commenced designing ships to be powered by carbon free fuels.

### 3. SAL MILICI – Why Green Ammonia as a bunker fuel?

There have been several fuel contenders for carbon free ship propulsion, including batteries, hydrogen, synthetic LNG and synthetic methanol.

Batteries are challenging for long range ocean going shipping because of volume and range limitation, whereas hydrogen has difficulties when it comes to storage and the need for high pressurisation or very low cryogenic temperatures.

Carbon neutral synthetic LNG and methanol (both of which require recycled carbon for manufacture) are seen as being limited in scale.

For the above reasons there has been growing global maritime interest in Green Ammonia which is manufactured via the combination of hydrogen from renewably powered electrolysis with nitrogen extracted from the air.

A remarkable degree of uniformity has emerged amongst maritime industry leaders and organisations such as Lloyd's Register, Korean Register, Royal Society and NYK Line (Japan) issuing reports favourable to the use of Green Ammonia as bunker fuel.

### 4. SAL MILICI – Is there an example of a ship engine capable of running on Ammonia?

In response to growing maritime industry interest in ammonia as bunker fuel, leading manufacturers have announced programs for modifying existing ship engine designs to run on ammonia.

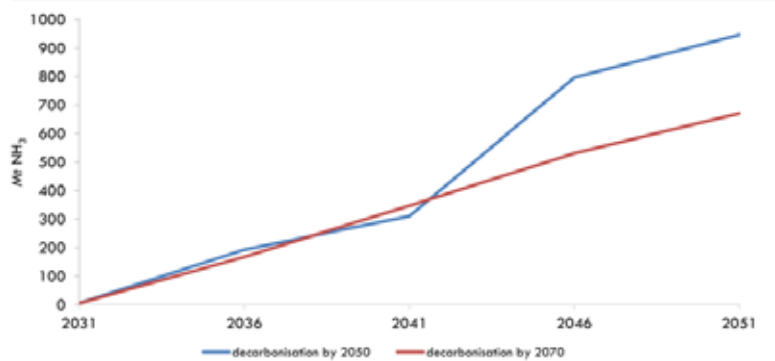
The world's largest ship engine builder, MAN Energy Solutions (a division of VW) has announced plans to develop modified versions of its widely used, large scale two-stroke ship engines to run on ammonia.



Brett Cooper, Chief Executive Officer, and founder of Renewable Hydrogen

Annual ammonia demand could increase by 670 to 946 million tonnes and represent a potential 5 USD trillion market up by 2050

Ammonia market opportunity  
Million tonnes ammonia



Growth in ammonia for shipping could represent +400% capacity increase relative to 2018 global ammonia production capacity

Source: UMAS GloTrom (2019)

Note: assumes NH<sub>3</sub> constant price of USD603/tonne from 2030; reported 2018 global ammonia capacity was 188Mt

Meanwhile MAN's close competitor Wärtsilä has announced successful testing of four-stroke ship engines being powered by ammonia.

### 5. SAL MILICI – What is the potential large scale demand for Green Ammonia Bunker Fuel?

Currently the world produces approximately 190 million tonnes pa of ammonia, used mostly for fertiliser and produced mostly from fossil fuels.

A number of industry reports have projected very significant demand in growth for Green Ammonia over the next 30 years as a result of its uptake as marine bunker fuel.

One of the most influential maritime industry research groups, whose reports are often considered by IMO Committees, is University College London's UMAS group. In early 2020 UMAS issued a report to the Copenhagen based Getting to Zero Coalition which projected a fourfold increase in global ammonia demand as a result in its uptake as marine bunker fuel:



Sal Milici, Head of Border and Biosecurity, FTA / APSA

### 6. SAL MILICI – Can Australia play a role in this reform and what benefits could it deliver?

Australia certainly can play a role because of its natural comparative advantage with regard to renewable resources and the vast land areas from which they can be harvested. Over time the renewable energy super-powers of the future will be those countries with stable political systems, access to renewables and a commercial business environment in which investors will be happy to invest 100s of billions of dollars. Australia is blessed with all these attributes.

### 7 SAL MILICI – What are some of the challenges preventing development of a Green Hydrogen / Ammonia manufacturing industry given our comparative advantage in renewable energy?

The main challenge, at the moment, is the high capital cost of the equipment required to convert renewable electricity into Green Hydrogen and Ammonia. The main cost element is that of electrolysis. Until recent times the world has not spent a lot of money on improving the efficiency and cost of electrolysis because there has not been big demand. But this has now radically changed with the European commission for example announcing, on July 8, 2020, that it wants to start to deploy 40,000 MW of new electrolysis over the next 10 years. This is likely to dramatically reduce the cost of this equipment which will be of much benefit to Australia's plans for Green Hydrogen and Ammonia.

