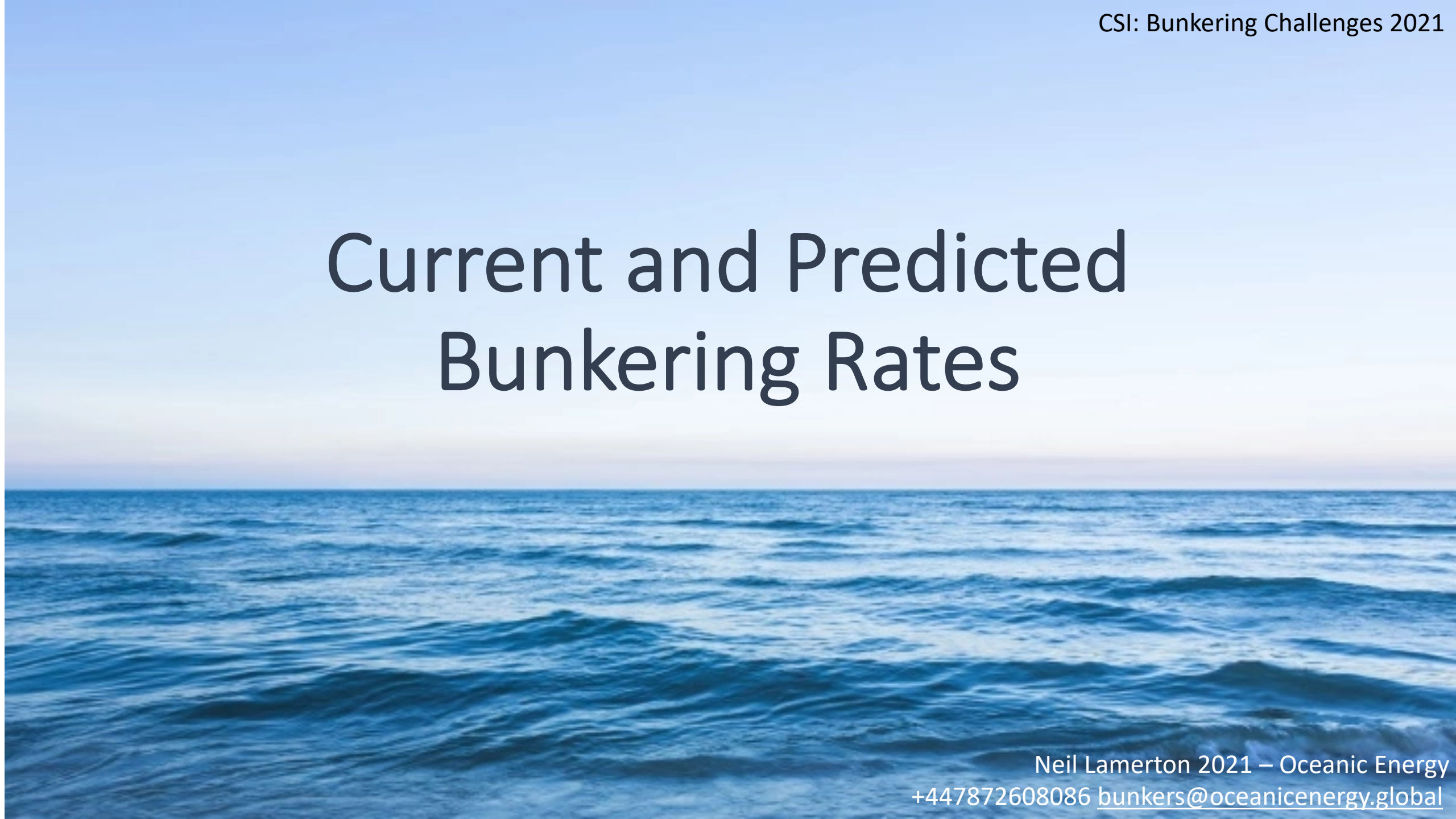
Current and Predicted Bunkering Rates



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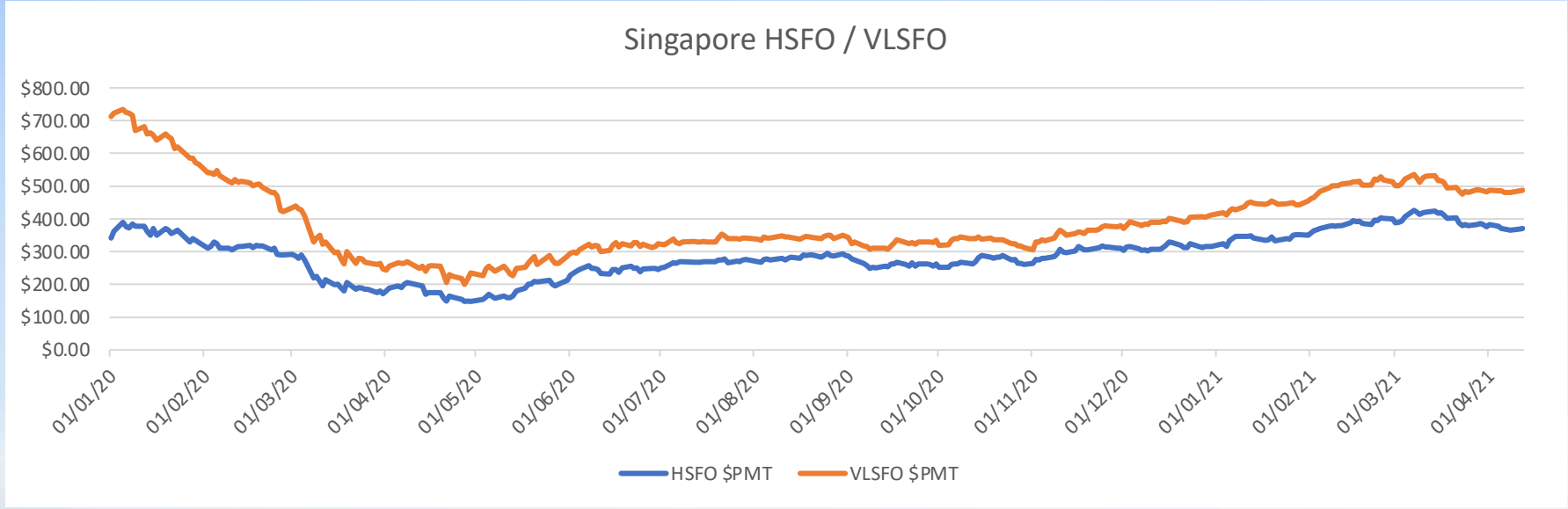
What will we discuss today

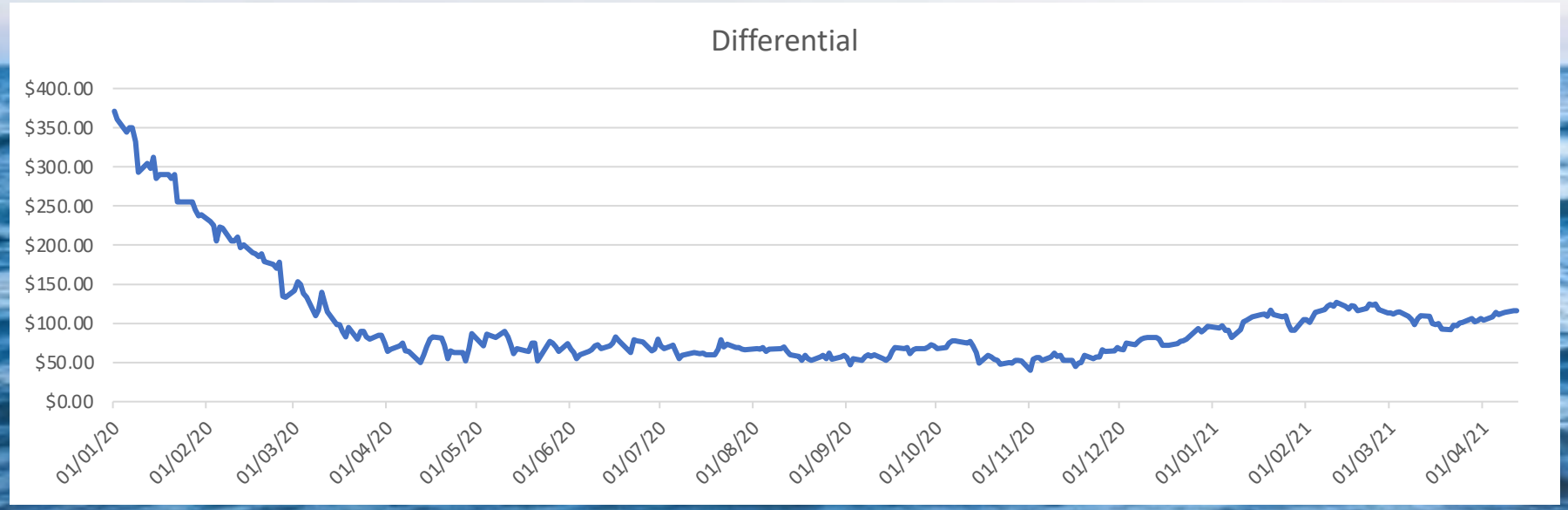
- Post 2020 Bunker Demand / Availability and Pricing
- Differentials between VLSFO and HSFO
- Predictions
- Alternative fuels for 2030 and 2050
- Indications of pricing

Post 2020 Bunker Demand / Availability and Pricing

- During 2019 there was lots of discussion about whether buyers would go for HSFO/Scrubber, VLSFO or LSGO
- Container and Cruise vessels went for HSFO/Scrubbers, most other vessels went for VLSFO, a few owners stuck with LSGO
- Q1 - Q2 of 2020, there was some turbulent avails of VLSFO and on occasion LSGO was cheaper than VLSFO
- Q3 onwards – generally avails settled down
- HSFO avails generally OK – a large quantity was contracted and some spot. As more scrubber equipped vessel come on stream avails tightened and prices rose (differential narrowed).

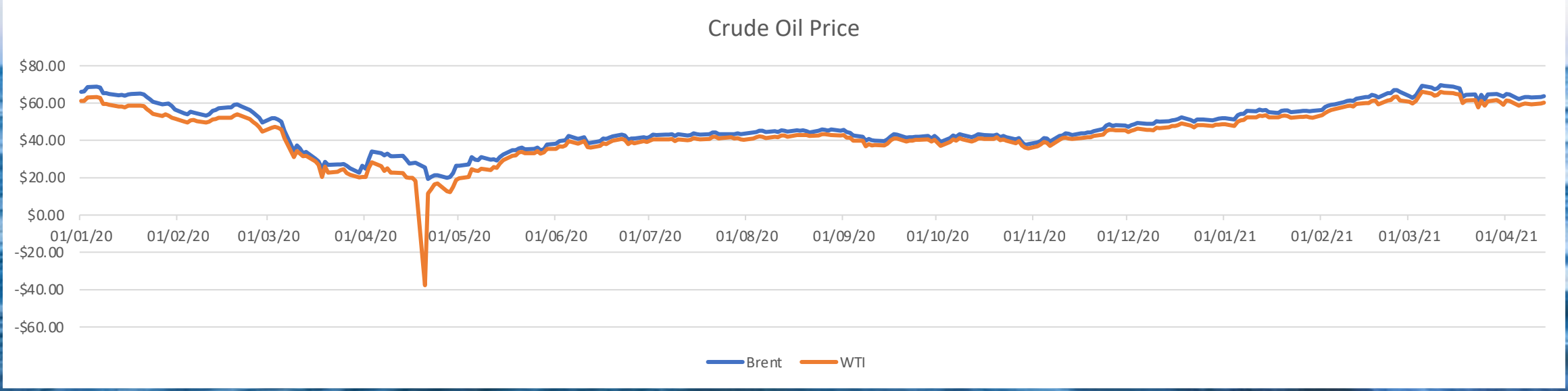
Singapore – HSFO v's VLSFO prices





Predictions

- The biggest issue is of course Covid-19, which has dampened demand of all products and meant refiners have cut refinery runs to reduce product for the Aviation and Road market but this also affected Bunkers. SUPPLY
- Some of the product destined for the Aviation and Road market has come into the marine market with mixed results, the product is generally low density and a good blend product, but can have low Flash Points. QUALITY
- Crude oil runs have been cut to support the crude oil prices, which has been successful SUPPLY



Predictions

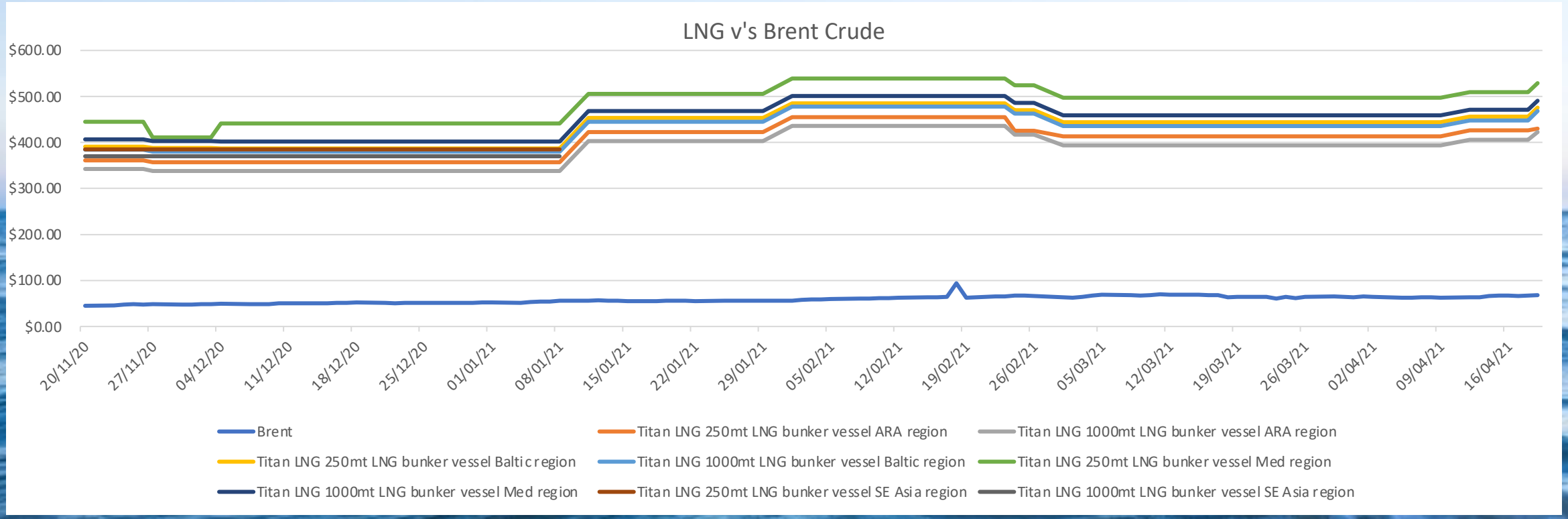
- Depending on how discussions between Iran and the USA develop the Iranian Crude and Fuel Oil would come back into the market, which would depress prices further. SUPPLY
- Once Covid settles (it wont go away) and demand from Shops/Manufacturing etc. improve demand will increase, and unless Crude supply increases, we will see prices continue to rise. DEMAND
- As we head towards 2030 demand for Alternative fuels will continue to improve and reduce demand for VLSFO/HSFO DEMAND
- More alternative fuel vessels are being ordered/trialled – Many LNG vessels working, First Ammonia fuelled vessel on Order, Smaller Hydrogen powered vessels on order. DEMAND
- As demand for VLSFO recovers we can see the differentials between HSFO and VLSFO recovering, but not to the levels we saw at the beginning of 2020. PRICING
- With more Scrubber equipped vessels coming on line demand for HSFO will increase and we may see short term blips (as we saw in Fujairah during March when Fujairah/Singapore differential went from -$10 to +$40) so where and when to purchase bunkers will remain as important as ever. PRICING

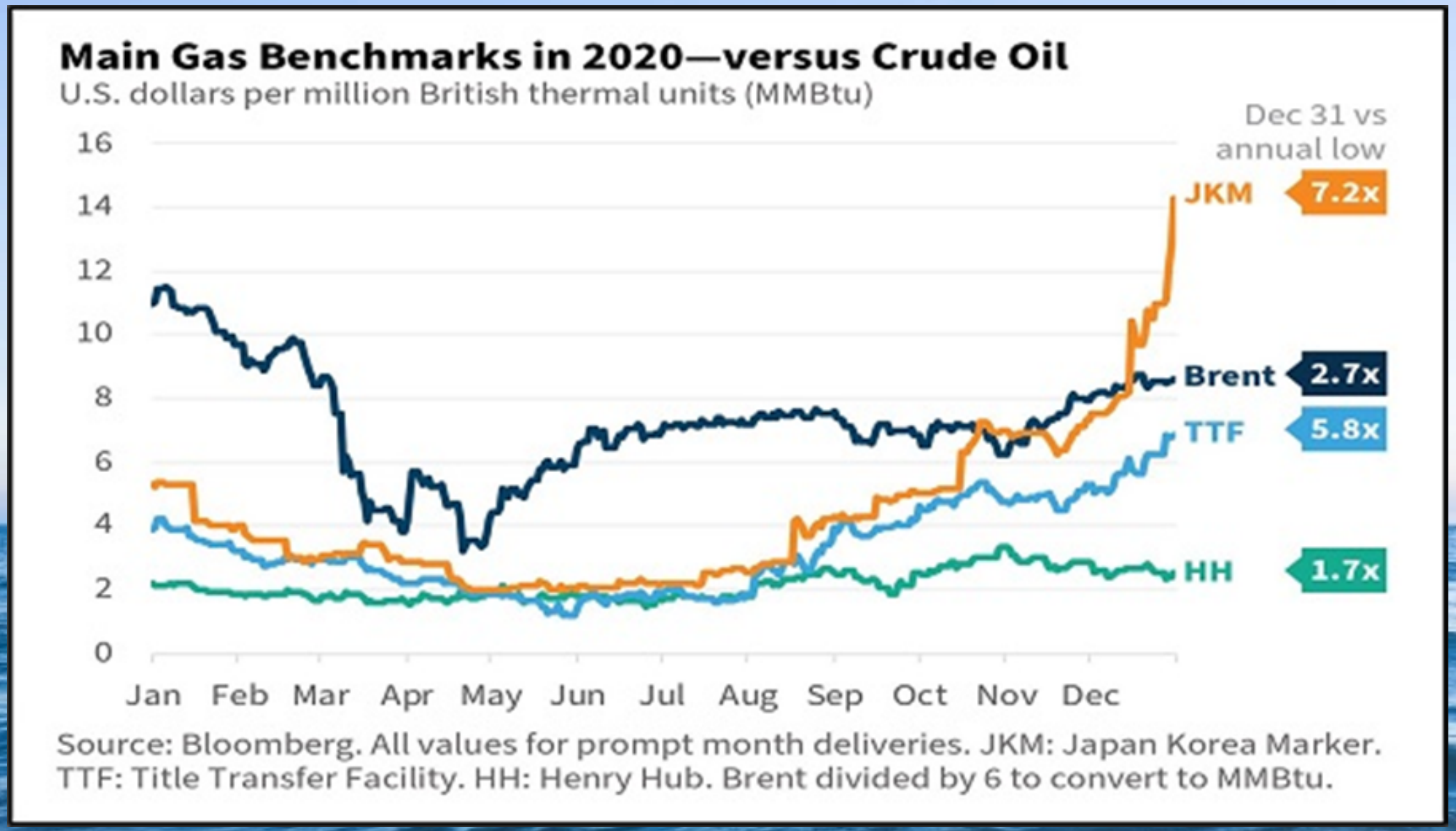
De-carbonization of international shipping – innovative technology and alternative fuel

- Why are we discussing this and how can it be done?
- In response to the Paris Agreement in 2015, the IMO adopted an Initial Strategy for reducing GHGs caused by ships in April 2018. This Initial Strategy is to reduce the total annual GHG emissions by 50% by 2050 compared to 2008, and aims to decrease the Carbon Emission by 40% by 2030, and by 70% by 2050 to decarbonize as soon as possible within this century.

Alternative fuels for 2030 and 2050

- LNG is already in the market with Shell and Total being the front runners and large supplies being made in Rotterdam, Singapore and in the Mediterranean as well as further afield. More LNG and LNG ready vessels are coming out of the yard and this market will continue to increase, but LNG still contains Carbon C_4H (Methane) and C_2H_6 (Ethane) so this cannot be a full term replacement fuel as we head to 2050.




Main Gas Benchmarks in 2020—versus Crude Oil
U.S. dollars per million British thermal units (MMBtu)
Dec 31 vs annual low
16
14
12
10
8
6
4
2
0
JKM 7.2x
Brent 2.7x
TTF 5.8x
HH 1.7x
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Source: Bloomberg. All values for prompt month deliveries. JKM: Japan Korea Marker.
TTF: Title Transfer Facility. HH: Henry Hub. Brent divided by 6 to convert to MMBtu.

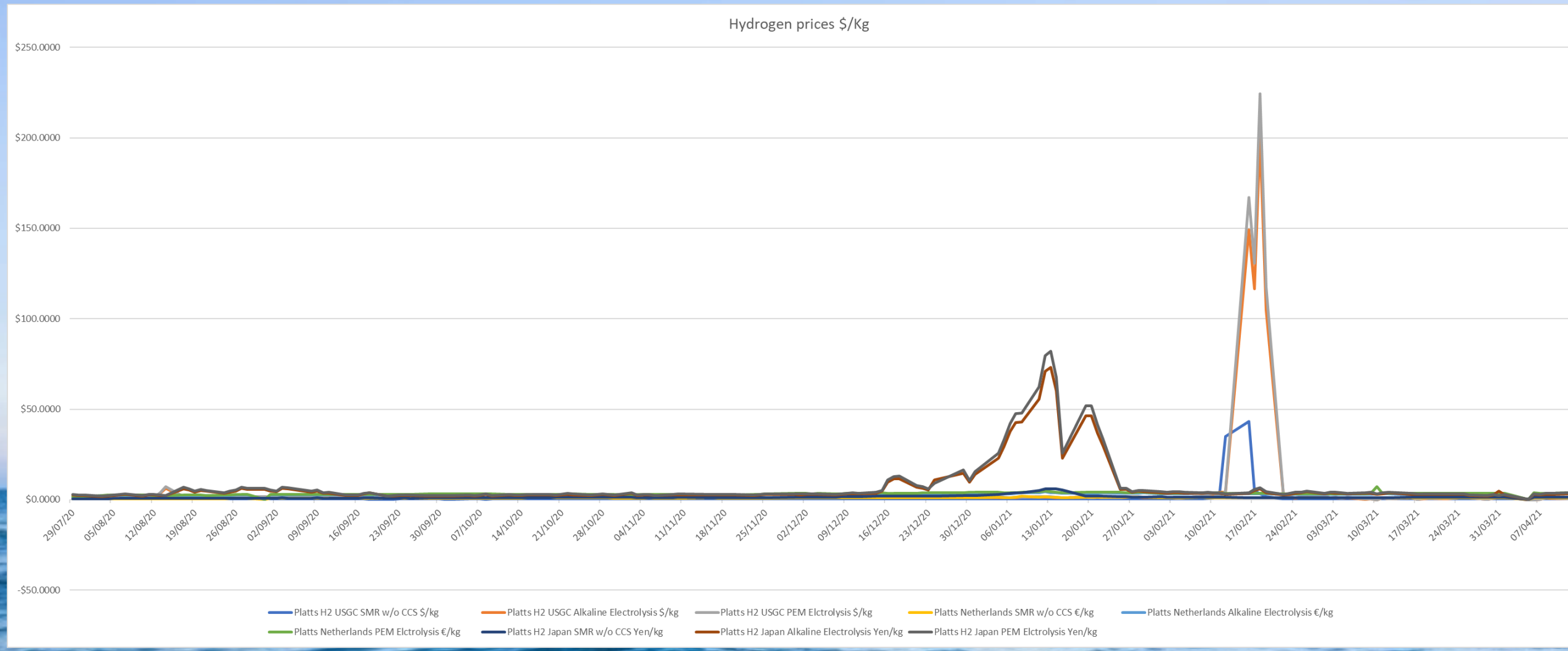
Alternative fuels for 2030 and 2050

- Ammonia / Hydrogen These two products can be good replacements for LNG for 2050, but the storage and transportation of pure Hydrogen is difficult as this has small molecules and can easily leak through normal steel and other pipework, so the infrastructure can be expensive, and easier way to get Hydrogen H_2 would be to use Ammonia NH_3 as a carrier and take the Hydrogen out at the end to burn.
- There are lots of different types of Hydrogen and pricing.

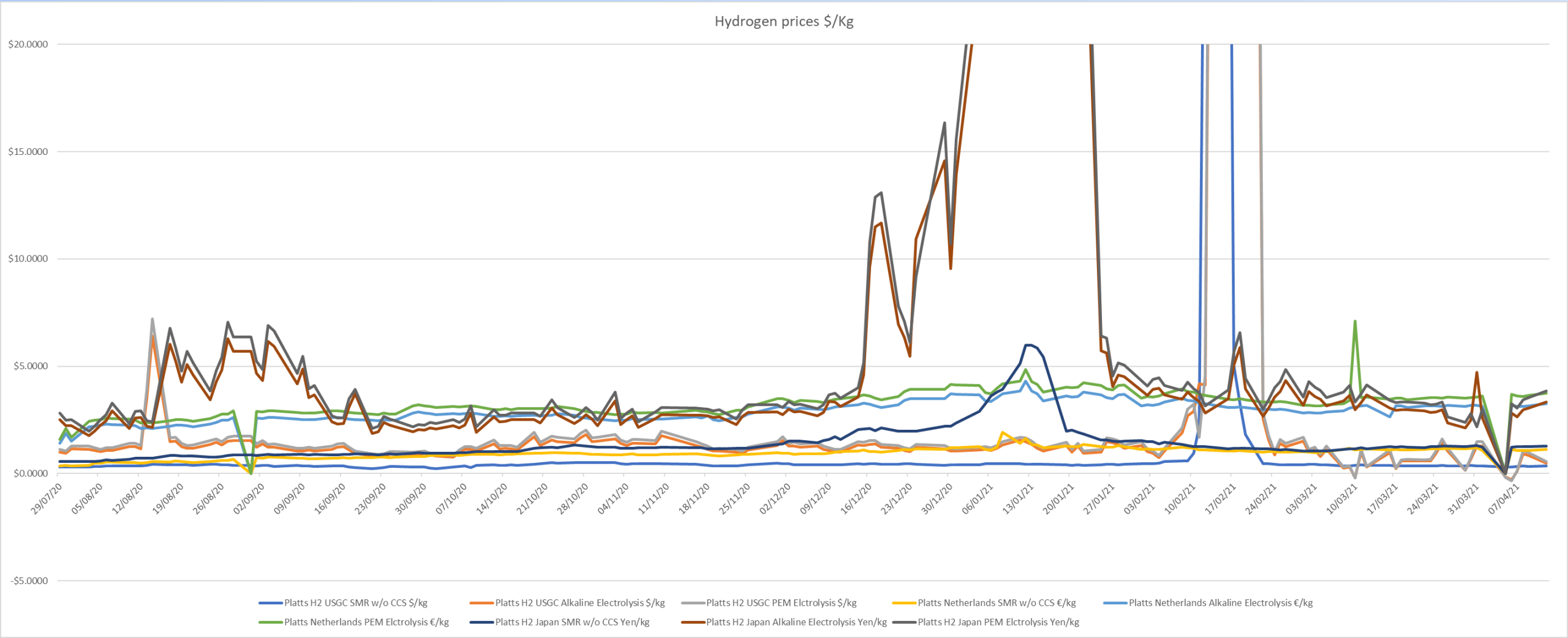
Grey Hydrogen	Grey Hydrogen is hydrogen produced using fossil fuels such as natural gas
Brown Hydrogen	Brown hydrogen is is produced when the element is stripped out of fossil fuels such as coal
Blue Hydrogen	Blue hydrogen or low carbon hydrogen is used when the CO2 released in the process of grey hydrogen production is largely (80-90%) captured and stored. This is also called CCS: Carbon Capture & Storage
Green Hydrogen	Green hydrogen, is made by using clean electricity from renewable energy technologies to electrolyse water (H2O), separating the hydrogen atom within it from its molecular twin oxygen
Nuclear Hydrogen	Produced from water by electrolysis or high temperatures from nuclear energy

Platts H2 USGC SMR w/o CCS $/kg	SMR - Steam Methane Reformer -	leading technology for hydrogen production from Natural Gas - Most hydrogen produced today in the United States is made via steam-methane reforming, a mature production process in which high-temperature steam (700°C–1,000°C) is used to produce hydrogen from a methane source, such as natural gas - CCS - Carbon Dioxide Capture & Storage
Platts H2 USGC Alkaline Electrolysis $/kg	Alkaline Electrolysis	Water Electrolysis
Platts H2 USGC PEM Elctrolysis $/kg	PEM	Polymer Electrolyte Membrane Electrolysis
Platts Netherlands SMR w/o CCS €/kg		
Platts Netherlands Alkaline Electrolysis €/kg		
Platts Netherlands PEM Elctrolysis €/kg		
Platts H2 Japan SMR w/o CCS Yen/kg		
Platts H2 Japan Alkaline Electrolysis Yen/kg		
Platts H2 Japan PEM Elctrolysis Yen/kg		

CSI: Bunkering Challenges 2021



CSI: Bunkering Challenges 2021



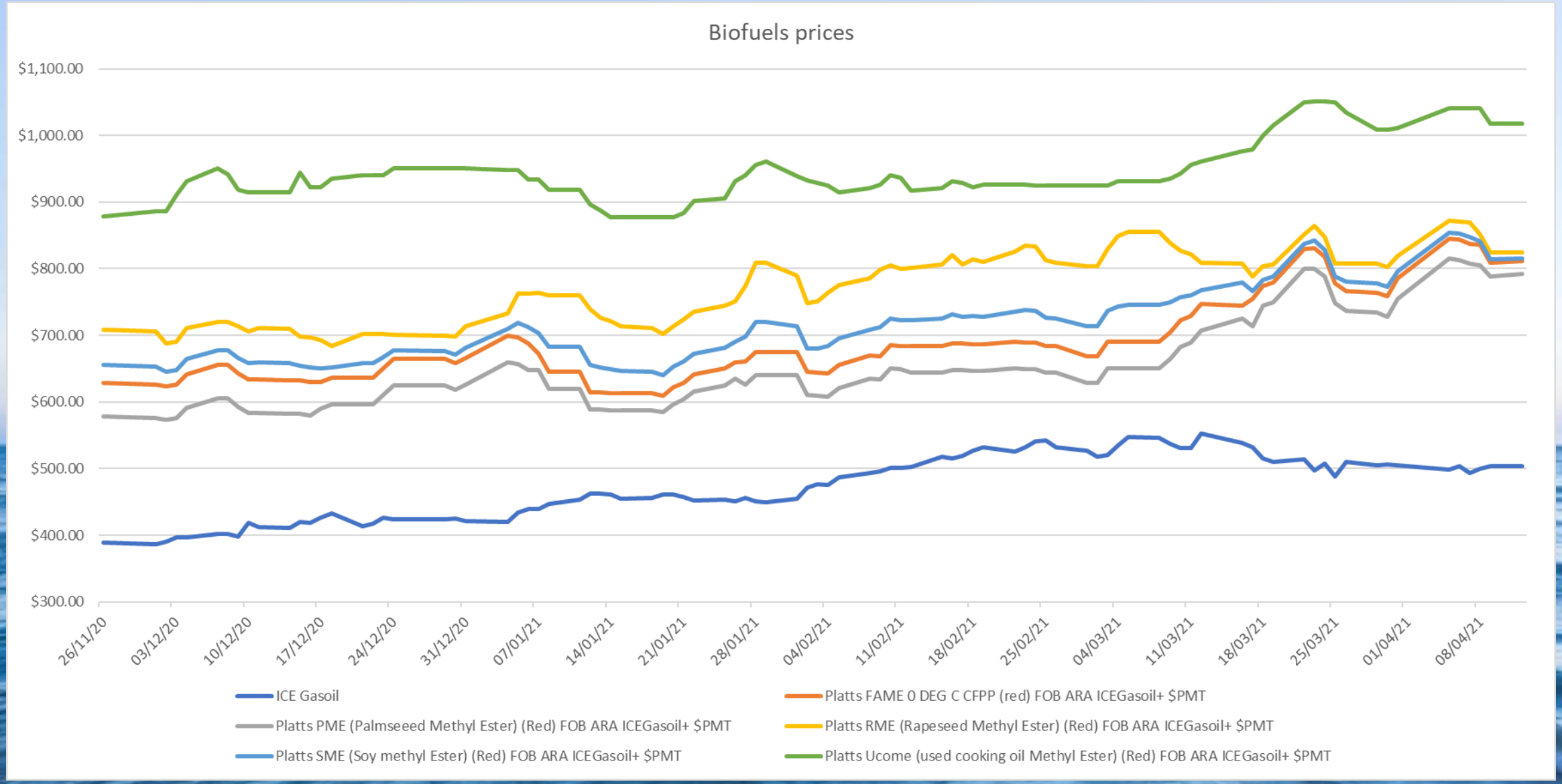
Alternative fuels for 2030 and 2050

- Biofuels are an expensive but easy replacement fuel. Being liquid they are a ‘drop in replacement fuel’ but some engine adjustments could be needed.
- Availability of biofuels can be an issue, one client in Greece was looking for about 4,000mt/ B100 (100% biofuels) and some of the local refineries only supply 200mt per year!
- There are four Generations of Biofuels

		1st Gen	2nd Gen	3rd Gen	4th Gen
		FAME			
		are made from the sugars and vegetable oils found in food crops using standard processing technologies	production of biofuels manufactured from agricultural and forest residues and from non-food crop feedstocks	specially engineered crops such as algae as the energy source.	uses genetically modified (GM) algae to enhance biofuel production
Feedstock		Ethanol Based Sugar Starch Oil Based Corn Rapeseed Soybean Palm	Agriculture/food processing waste Grasses Trees	Transgenic Materials Low lignin Eucalyptus Poplar Trees Sorghum e.g. Higher Yield Feedstocks and.. Algae	
Process		Fermentation (bioalcohol) Transesterification (biodiesel)	Fischer Tropsch Biomass-To-Liquid (BTL) Fermentation Gasification	Fischer Tropsch Biomass-To-Liquid (BTL) Fermentation Gasification Algae Processing	
Product		Bio Alcohols Ethanol Biodiesel Fatty Acid Methyl Esther (FAME) Unprocessed Vegetable Oil as fuel	Cellulosic Ethanol Biogas Biohydrogen Fischer Tropsch Diesel	Cellulosic Ethanol Biogas Biohydrogen Fischer Tropsch Diesel Algal Oil	

Alternative fuels for 2030 and 2050

Biofuels prices are a premium to Ice Gasoil



Alternative fuels for 2030 and 2050

There are of course many other Alternative fuels being discussed

- Biogas – CH_4 - as a greener alternative for LNG
- Methanol – CH_3O_3
- Ethanol – C_2H_3OH
- LPG – normally Butane C_3H_8 and Propane C_4H_{10}
- Coal Waste Microfine – can be made using Coal waste into microfine powder, which is blended with residual fuel oil
- BIOMSAR - combines conventional MSAR® technology and fuel with renewable glycerine to produce an oil-in-water emulsified synthetic HFO with lower emissions, including 20-30% less carbon dioxide

- Synthetic Fuels – can also be made using CO_2 from Refinery / Industry

- As you can see from the Chemical Specs above most contain Carbon components

- Fuel Cell / Electric propulsion, currently only an option for short sea vessels
- Solar / Wind – as an addition to other main propulsion units.
- Nuclear – very clean in use – but problematic in disposing of waste and many countries wouldn't let nuclear powered vessels into their ports, currently.

Alternative fuels for 2030 and 2050

Obtaining pricing on nearly all Alternative Fuels is very difficult currently as suppliers are keeping their pricing close to their chest and only sowing the numbers to customers with firm enquiries.

The biggest problem though still is the Supply/Availability – as we touched on with Biofuels the supply doesn't match the marine requirements. The marine market is 200-300 million MT – none of the Alternative fuels is anywhere close to being able to supply this quantity (but there also wasn't the availability of oil when we changed from Coal) so as demand increases the markets will adjust to providing more availability.

Prices will also become more economic as supply is scaled up, from a supply point of view it will not be a profitable business in the short term as demand is not there and suppliers will loose money in the short term, but as demand picks up it will work.

On the owners side initial supplies of all grades will be expensive as the markets are not set to supply the marine business and most markets are reasonably balanced, but again this will improve as demand picks up. Currently there are not delivery facilities for the quantities larger vessels require, but that will improve as well.

Carbon Offset for the Marine business

As we head towards 2030 and the reduction of Marine emissions and ultimately to 2050 there could be a new market for Carbon Offsets.

Shipping companies could still use HSFO/VLSFO and purchase Carbon Credits to offset their emissions and reduce their overall Carbon Footprint. This may not be a legal requirement yet – but we have already seen customers like IKEA looking for their transport companies to reduce their emissions and Carbon Credits could be a way of doing this.

There are also some companies set up to do this (as it is a well established market in other transportation industries) and expect the marine demand to increase by 2022-2023

It will take time to get the alternative fuels markets running but I am positive the other markets will increase production and supply infrastructure as it is needed.

HSFO, VLSFO, LSGO will also still be available for many years to come and with minor blips will not be an issue for the life of the current fleet.

Questions?

Please ask anything you would like to know on the online chat, we will have a Q&A session at the end of all the presentations, if I don't have answers, I will come back to you, or contact me later on

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