



# AGM Business Review

30<sup>th</sup> November 2018





# THE EMULSION FUEL TECHNOLOGY & SERVICES COMPANY

- Supplier of proprietary MSAR® technology.
- Produces low-cost/cleaner synthetic HFO.
- Proven and verified commercially, at significant scale (~60 million tons Orimulsion).
- Joint IP & exclusive global supply with Nouryon (formerly AkzoNobel Specialty Chemicals).
- Established relationships with leading global partners to accelerate development.
- Exciting new business development prospects with Freepoint and a European Oil Major.
- Positive fuel market fundamentals.



**Quadrise**  
Fuels International plc

Slide 2



# EXECUTIVE DIRECTORS (PRESENTING)



**Mike Kirk**

**Executive Chairman**

- Former Partner at Cazenove, energy sector advisor and board member.
- Joined Quadrise in 2015.
- Chemical Engineer, Masters in Nuclear Fuel Technology, MBA.



**Jason Miles**

**Chief Operating Officer**

- Managed the commercialisation of BP / PDVSA's Orimulsion® business.
- Joined Quadrise in 2006.
- >20 years of emulsion fuels experience.
- Chartered Chemical Engineer, MBA.

## NON-EXECUTIVE DIRECTORS



**Laurie Mutch**



**Philip Snaith**



**Hemant Thanawala**



**Dilip Shah**

## COMPANY SECRETARY



**Audrey Clark**



# A CHALLENGING YEAR, BUT THERE ARE GENUINE REASONS FOR OPTIMISM...

## Repositioning the Business:

- Strategic review completed in Q2'18, lessons learned re sales diversification & partners.
- Delivering MSAR® sales directly, and through global partners to broaden reach.
- IMO2020 impacting fuel prices worldwide in marine & power markets, good for MSAR®.

## Power:

- Complex KSA Power Trial project, plan developed and led by QFI - proving project management capability.
- KSA did not progress due to inter-company politics, but remains an active opportunity.
- Other markets & alliances being progressed.

## Marine:

- Many owners reassessing their IMO2020 strategy, including Maersk.
- Scrubber installations have accelerated sharply in H2 2018 – retrofit and new-build across all shipping segments.
- Dialogue continues with major shipping co's.





# GLOBAL OPPORTUNITIES – “HFO HOTSPOTS”

## Americas

NOCs, refiners & utilities:

Mexico 5-7m tpa

Ecuador 1-2m tpa

## Middle East

Mostly NOCs & utilities:

Saudi Arabia >25m tpa

Kuwait 6m tpa

## Asia

Mostly powerplants:

Japan 10m tpa

South Korea 2m tpa

Russia >3m tpa

## Africa

NOCs, refiners,  
utilities & upstream:

Egypt 9m tpa

Morocco ~1m tpa

## Marine

~230m tpa HFO demand today

60-80m tpa HFO “scrubbed” by 2020/25

>50% Supply from major bunker hubs.

**Plus petrochemicals, upstream & cement niches**



# EXTENDING OUR GLOBAL REACH (1)

## Existing partners...



Quadrise and AkzoNobel Specialty Chemicals have worked together since 2004.

Following the acquisition of Akzo Nobel's Specialty Chemicals business by The Carlyle Group in October 2018 it now operates as "Nouryon". Joint MSAR® IP is shared and additive supply is exclusive to QFI globally under latest agreements. New 3 year agreement to be signed with Nouryon later next year.



**JGC**

Working jointly on MSAR® projects in Japan, Colombia and Peru under MOA.

Combining Quadrise MSAR® technology, additives and emulsion fuel experience with JGC's relationships within the refining, marine and power industries in Japan, and upstream opportunities elsewhere.

Working jointly with Singapore's YTL PowerSeraya under a MOU.



Sourcing of residues for MSAR® supply to allow YTL PowerSeraya thermal boiler to compete with LNG and natural gas.



# EXTENDING OUR GLOBAL REACH (2)

## New partners...

New Partnership with a European Oil Major recently announced for a programme of testing (residue to MSAR®) and to investigate global supply opportunities from a European refinery.

Further projects and partnerships in pipeline to be progressed during 2019.



freepoint  
commodities

Working jointly with Quadrise on MSAR® projects in the Americas, Asia and the Middle East under a new Co-Marketing & Project Development Agreement.

Combines Quadrise MSAR® technology, additives and emulsion fuel experience with Freepoint's marketing, trading, logistics and financial services expertise. Exciting new opportunity for Quadrise to participate as an equity partner in "Build-Own-Operate" or "Tolling" projects, or simply License & supply the technology, additives and services.

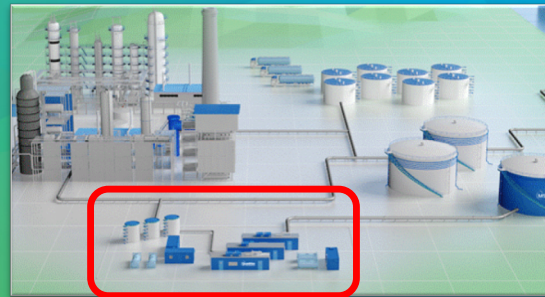
# “Build-Own-Operate” Prospects under the Co-Marketing & Project Development Agreement



## About Freepoint Commodities LLC...

- Freepoint is both an established global merchant of physical commodities and a financier of upper and mid-stream commodity-producing assets.
- They also provide physical supply services & related structured solutions for counterparties worldwide.
- Freepoint are partnered with Stone Point Capital (a private equity firm with over \$10bn of committed capital) to build a physical commodity platform.

## Complementary skillsets with QFI...



## What does “Build-Own-Operate” (BOO) really mean...?

- Jointly investing in the MSAR<sup>®</sup> production facility.
- Capturing the value from residue purchases and MSAR<sup>®</sup> sales, net of operating & logistics costs.
- Utilising QFI blendmaster and QC services.
- Utilising physical oil and logistics expertise.
- Sharing of profits based on project contributions.

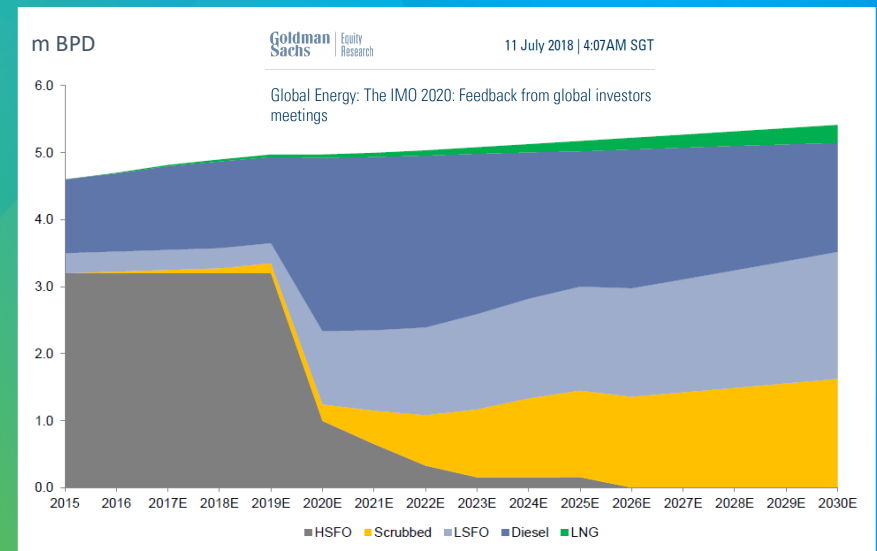


# POSITIVE REGULATORY ENVIRONMENT

2020 IMO regulations are impacting the oil markets and global trade – not just the marine market.

1.5-2m BPD surplus of HSFO by 2020 - reducing price of HSFO relative to distillates and LSFO - driving use of marine scrubbers & HSFO use for power generation.

(HSFO = High Sulphur Fuel Oil, LSFO – Low Sulphur FO)



MSAR<sup>®</sup> economics are strengthening favourably as a result...

# IMO 2020 RESPONSE - SCRUBBER UPTAKE

The widening spread between low and high sulphur fuel has triggered a “sea change” in scrubber demand...

INTERVIEW: 0.5% and 3.5%-S bunkers spread could reach \$400/mt in 2020 : consultant

8th November 2018 05:21 GMT

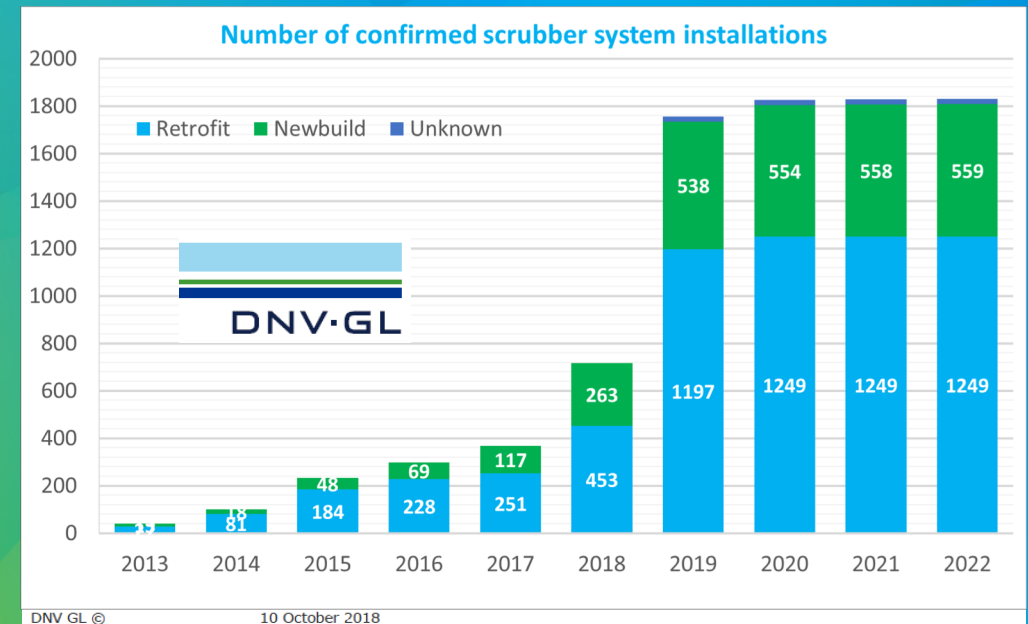
S&P Global Platts

BUNKERWORLD

Wood Mackenzie’s “base case” increase for the global shipping fuel bill in 2020 is \$24 billion, compared with ~\$100 billion today (+24%).



Cruise and RoPax were initially the largest segments. Now bulkers, tankers & containers are the largest segments, with the majority retrofits.



Star Bulk Carriers to equip entire fleet with scrubbers

Star Bulk Carriers Ltd. has announced that it will equip its entire fleet of 15 bulk carriers with scrubbers by the end of 2020.

Golden Ocean to install scrubbers

Golden Ocean Group Ltd. has announced that it will install scrubbers on its entire fleet of 10 bulk carriers by the end of 2020.

Maersk Line Confirms Scrubber Investment

Maersk Line has confirmed its investment in scrubbers in its latest announcement on fuel adjustment surcharge ahead of the 2020

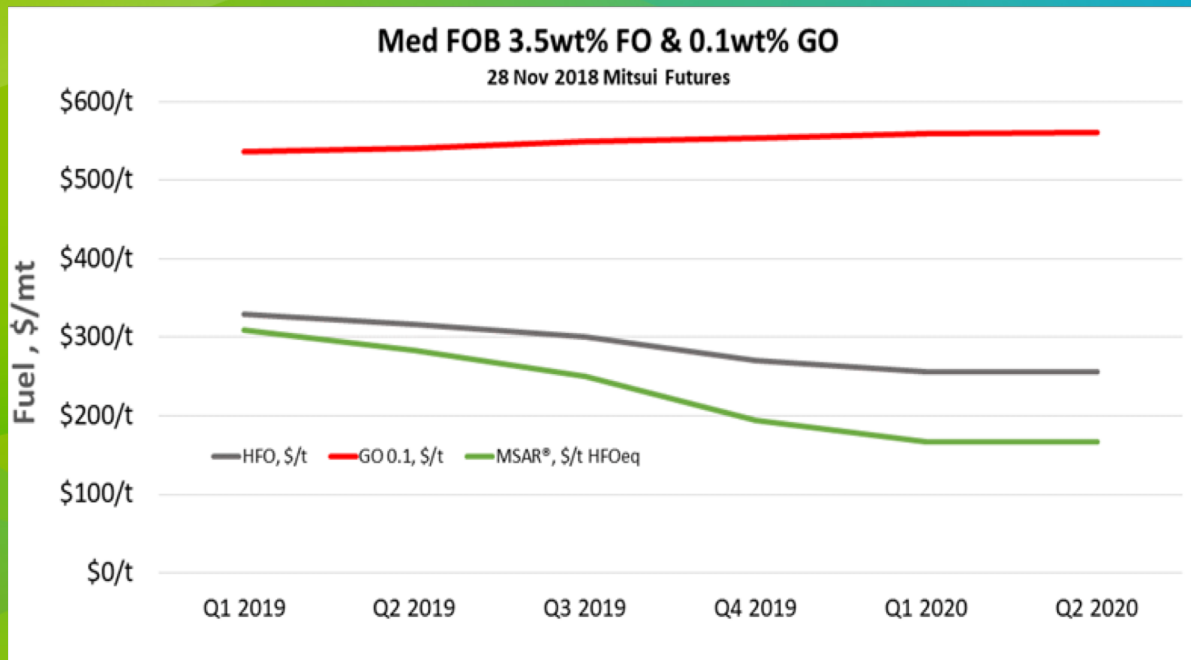
Trafigura joins rival traders in



Danish liner giant Maersk Line has confirmed its investment in scrubbers in its latest announcement on fuel adjustment surcharge ahead of the 2020



# MSAR<sup>®</sup> ECONOMICS BENEFIT FROM IMO



## Assumptions:

- Vacuum Residue + Light Cycle Oil blended to Med HFO.
- Mitsui futures prices as at 28 November 2018.

- Widening GO/HFO spreads (the “delta” between the grey line and the red line) looking ahead...
- Results in cheaper MSAR<sup>®</sup> (green line) vs HFO per unit energy...
- Savings at the refinery pay for MMU module investment in under 12 months...
- ...Also provide sufficient fuel cost savings to incentivise end-users, whether power or marine, with paybacks of under 12 months...

# IMO2020 LOW SULPHUR (0.5%S) FUEL QUALITY

Compatibility issues between different 0.5%S fuels will become more challenging, with most owners opting for gas oil.

BP advancing the energy transition: MARPOL 2020

Technical Guide for 0.50% Sulphur Marine Fuel



## Operational Considerations for Handling VLSFO

...As most VLSFO available will be blended from residual and distillate components, **stability and compatibility will be key considerations**. Depending on the manufacturing route and blending component availability, fuels may be predominantly aromatic or paraffinic in nature, and hence may be incompatible if mixed on board ship. BP will continue to supply stable fuels and is actively supporting current initiatives within ISO and CIMAC to evaluate stability and compatibility test methods for better control.

Contaminated marine fuel can damage ship engines and clog systems, resulting in extensive flushing and repairs, and potentially loss of propulsion.

More owners are now looking at term fuel supply agreements direct from refiners to ensure fuel provenance.



LOW SULPHUR FUEL ISSUE



LOW SULPHUR FUEL TANK

*"The biggest challenge when it comes to such fuels is compatibility and pour point."*

P. Das, Senior Exec, Asia at Lloyd's Register (FOBAS)



The background of the slide is a collage of three images. On the left, two men in dark shirts and safety glasses are working on a complex piece of industrial machinery with various pipes and gauges. In the center, a laptop screen displays a software interface with a red area chart. On the right, a man in a dark shirt and safety glasses is working on a piece of equipment, possibly a fuel cell or engine component, with a blue glove visible. The entire slide has a green and blue geometric overlay.

# RESEARCH, DEVELOPMENT & INNOVATION (RDI)

Lies at the heart of our offering...

We are continually improving MSAR<sup>®</sup> technology and fuel performance at our UK RDI facility. Strengthening our IP and increasing entry barriers.

Industry leader, attracting opportunities from major companies for MSAR<sup>®</sup> projects.

# ESTIMATED TIMELINES...

DEC 2018

DEC 2019... 2020!

JGC (Japan)

Project  
Development

Progress  
Update

YTL PowerSeraya

Progress  
Update

Supply Study  
Completed

Nouryon

New JDA &  
Exclusivity Agmt.

European Oil Major

Residue Testing  
Completed

Supply Study  
Completed

Freepoint Commodities

Project  
Development

Progress  
Update

New Opportunities  
(Marine, Power, Alliances)

Progress  
Update



# SUMMARY

## Genuine reasons for optimism in 2019:

- Repositioned business – enabling our experienced team to work with major partners to accelerate development.
- Global partners – YTL PowerSeraya, JGC, and exciting recent opportunities with Freepoint & European Oil Major.
- Positive fuel market fundamentals resulting from future IMO2020 regs.
- Joint IP & exclusive global additive supply under the Nouryon brand.



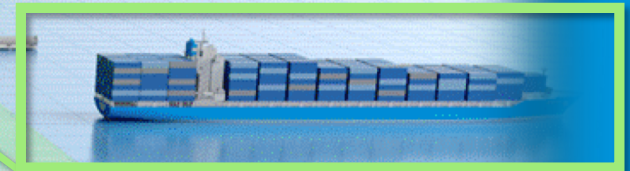
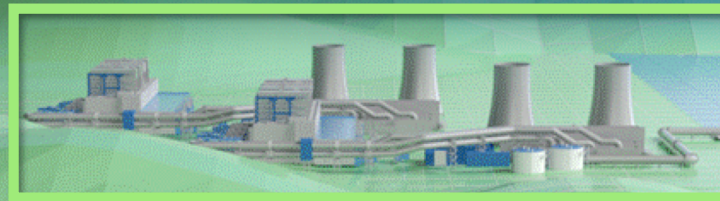




# WHAT IS MSAR® TECHNOLOGY?

## Proven blending technology

is deployed by QFI in oil refineries to mix ~70% residues with ~30% water and additives to make a lower cost HFO.



**Stable water-based MSAR® fuel** can be transported & used in the same way as HFO.

MSAR® = **M**ultiphase **S**uperfine **A**tomised **R**esidue





# HOW IS MSAR® MADE?

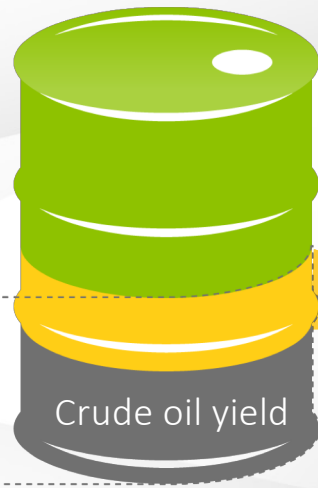
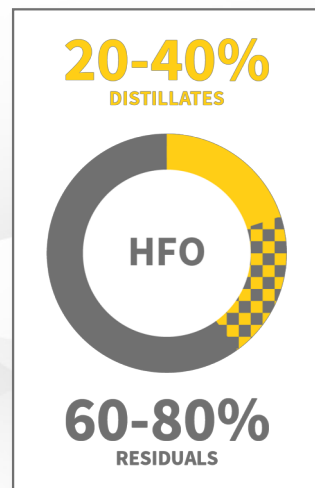
- Hot residue streams taken from refinery units and added to water, premixed with c1% additives in a high-speed colloid mill.
- MSAR® cooled and transferred to tanks using existing HFO infrastructure and stored at ambient temperatures.
- Extensive on site QA to ensure product quality from production, and in storage and transport through to end use.



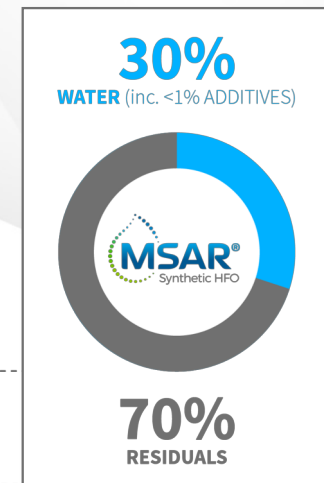
# ECONOMICS

## MSAR<sup>®</sup> creates value at the refinery

High value “premium” fuel used to create HFO is lost margin to the refinery



With MSAR<sup>®</sup> additional yield of 10-20% higher value products can be sold



High value fuel  
\$/bbl > crude oil



High value fuel sold as  
HFO \$/bbl < crude oil



Low value Residue  
\$/bbl < crude oil



Water & <1% chemicals  
\$/bbl < crude oil

Typical MSAR<sup>®</sup> savings are 10-20% per unit energy (i.e. \$45-90/mt @ \$450/mt HFO)

# ENVIRONMENTAL ADVANTAGES



**Stored & transported at ambient temperatures**

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Less heating = energy savings

✓ Reduction in utilities consumption



**Lower combustion temperatures**

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Less heating = more energy savings

✓ 20-30% less NO<sub>x</sub> gases emitted



**Virtually complete carbon burnout**

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Minimal black soot

✓ Reduction in global warming potential

✓ Reduced waste disposal costs

Lower cost MSAR® enables affordable compliance with environmental regulations



# PROVEN FUEL APPLICATIONS EXPERIENCE



## Steam boilers

(Power & Utilities)

>60 millions tons of emulsion fuel has been consumed for base-load electricity generation



## Diesel engines

(Marine & Power)

>150,000 hours of service on Wärtsilä 4-stroke engines, Interim LONO for Wärtsilä 2-stroke RT FLEX Engines, also tested successfully on MAN-ME.

## Upstream

(Steam & Power)

Successful Deer Creek steam flood boiler trial.

**...plus Cement etc...**

# REFINERY ECONOMICS

Modular, Low Capex, Rapid Payback

## Profitable

- ~\$5-10m p.a. per 40t/h MSAR® unit (assuming refiner gets 50% savings).

## Low capex

- ~\$5m per MSAR® unit & tie-ins.

## Short timescales

- Delivered & operating within 1 year.

## Rapid payback

- \$ payback typically <1 year.





# VALUE PROPOSITION TO CONSUMERS



**400MWe POWER PLANT**  
consuming 600,000 tpa HFO

MSAR® saving vs HFO

\$11-21m per year\*

CAPEX <\$5m modifications



**VLCC TANKER**  
consuming 15,000 tpa HFO

MSAR® saving vs HFO

\$0.3-0.5m per year\*

CAPEX <\$0.5m modifications

*Note\* assuming 40% share of total refinery savings, remaining 10% to Quadrise*



# PROVEN TECHNOLOGY

## **CEPSA CASE STUDY**

- A 40mT/h MSAR<sup>®</sup> system installed by QFI at Cepsa 240 KBPD Gibraltar refinery.
- MSAR installation, commissioning, operations & quality control by QFI.
- System designed to supply Marine & Power MSAR<sup>®</sup>, continuous or batch.
- Processed visbreaker residue 24/7.
- Supply via Cepsa HFO tanks / jetty.

| Sep-15 | Oct-15 | Nov-15 | Dec-15 | Jan-16 | Feb-16 | Mar-16 | Apr-16 | May-16 | Jun-16 | Jul-16 | Aug-16 |

Scoping

FEED, Detailed Engineering & Procurement

Construction

Commission

Production

Timeline – 9 months from scoping to production commencing



