

## Quadrise Overview

Quadrise Fuels International plc ("Quadrise", "QFI" or the "Company") is a technology and services company listed on the AIM Market of the London Stock Exchange. The Company provides the technology that enables the production of MSAR<sup>®</sup>, a lower cost, cleaner synthetic heavy fuel oil ("HFO") for the \$200 billion p/a global power, marine and industrial fuels market.

### Rapid, low cost refinery upgrade

QFI's proprietary refinery upgrading technology significantly increases refinery profitability by replacing the high value distillate products currently used in the production of HFO. The margin generated from the increased yield (shown in green in the graphic to the right) can then be shared between the refinery, MSAR<sup>®</sup> fuel consumers and Quadrise. MSAR<sup>®</sup> technology unlocks value in refineries by improving crude yields and enhancing overall product values.



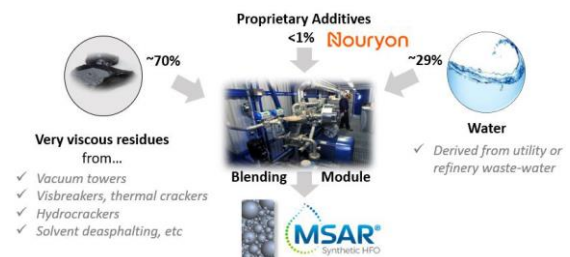
MSAR<sup>®</sup> technology is modular and can be implemented at the refinery within 1 year. Assuming the refinery retains 50% of the increased margin generated, this amounts to margins of \$5-10 million p/a for each 40 t/hr MSAR<sup>®</sup> Manufacturing Unit ("MMU"), installed at a cost of around \$5 million.

### Consumer savings

A typical 400MWe power plant consuming 600,000 tonnes per annum of HFO can save between \$10m-\$20m p/a for an investment of \$5m. A VLCC tanker consuming 15,000 tonnes p/a can save around \$0.2 to 0.4m p/a with payback in around one year.

### How is MSAR<sup>®</sup> made?

Hot oil residues (barrel bottoms) are mixed with water and proprietary additives in a high-speed colloid mill under pressure. After cooling, the MSAR<sup>®</sup> (a highly stable synthetic HFO, consisting of 5-10 micron droplets of residue dispersed in water) is transferred to tanks and stored at ambient temperatures. MSAR<sup>®</sup> uses existing HFO infrastructure from production through to use, enabling rapid market adoption. There is extensive on-site QA to ensure product quality from production, storage, transit and through to end-use. IP and additives are supplied exclusively by Quadrise and Nouryon.



### Proven and verified technology & commercial market

MSAR<sup>®</sup> technology is built on a unique combination of proprietary equipment, additive formulation, know-how and unparalleled emulsion fuel experience. Oil-in-water emulsion fuels are an established and proven option in power generation applications, with more than 60 million tons of Orimulsion<sup>®</sup> used by major utility companies in Europe, the Americas and Asia for base load power generation.

MSAR<sup>®</sup> technology builds on this experience, as a significantly enhanced fuel, suitable for use in a wide variety of applications and developed alongside major companies such as Nouryon, Cepsa, Maersk, GE Alstom, Wärtsilä & MAN.

There have now been 150,000 hours of service on Wärtsilä 4-stroke engines, and an interim Letter of no Objection ("LONO") has been awarded for Wärtsilä 2-stroke RT FLEX engines following an operational trial on the Seago Istanbul with Maersk (see details below). The fuel has also been tested on MAN-ME marine engines. From June to September 2008, over 20,000 tonnes of MSAR<sup>®</sup> was manufactured at the AB Mazeikiu Nafta oil refinery in Lithuania under the supervision of QFI,

transported 300 km by rail, and then consumed at the Elektrenai power plant meeting all appropriate EU standards. The market for MSAR® is proven.

#### **Case Study: Cepsa MSAR® production & Maersk marine trial**



In preparation for the Maersk marine trial, a 40 tonne per hour MSAR® production system was installed at the Cepsa's 240,000 barrel per day refinery at San Roque in Spain. The equipment commissioning, fuel production and quality control activities were all undertaken by Quadrise. The plant was operational within 9 months from contract signature. Some 7,000 tonnes of MSAR® were produced and subsequently consumed by the Maersk Seago Istanbul during around 1,500

hours of operation up to March 2017. Unfortunately, the vessel had to go into dry dock following a collision (unrelated to MSAR®) and subsequently Maersk took the decision to cancel the trial (see IMO regulations below) and adopt, at that time, a policy of using compliant fuel (though this has subsequently changed. The interim LONO from Wärtsilä (confirming no detrimental effects on the engine) was received in June 2017.

#### **Impact of the new International Maritime Organisation ("IMO") regulations**

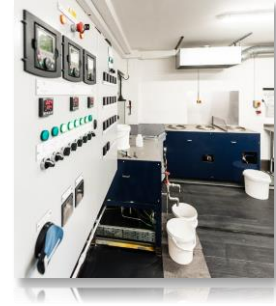
The marine industry was surprised by the decision of the IMO in October 2016 to implement the open ocean 0.5% sulphur standards in 2020 rather than the expected date of 2025, and this caused a period of significant inertia in the industry until late 2018. The main options available to vessel operators are to consume <0.5% S compliant fuel at significant cost increase, or to burn high-sulphur fuel in a vessel equipped with exhaust gas cleaning systems ("EGCS" or "scrubbers"). The implementation in January 2020 will lead to a major supply and demand shift, with some 100 million tonnes p/a of low sulphur fuel required to meet the 0.5%S standard. As a result, the low sulphur gasoil versus high sulphur HFO "spreads" are already increasing and in the futures and forward market are already in the \$350-\$400/t range, driving both the adoption of scrubbers (including by Maersk) and the use of HFO for power generation as its price falls. The IMO 2020 marine regulations thus create a strong case for the adoption of MSAR® fuel alongside scrubbers for the marine market, as well as MSAR® adoption in the power generation and industrial markets.

#### **Global warming mitigation**

There are material environmental advantages to the MSAR® technology: Firstly, energy is saved because MSAR® - unlike conventional HFO is stored and transported at ambient temperatures. Because the MSAR® oil droplets are tiny, the fuel burns efficiently, resulting in almost complete carbon burnout. This results in much lower particulate matter emissions, with virtually no black soot produced – lowering ash disposal costs and enabling more efficient metals recovery from the ash. The water in MSAR® reduces the combustion temperature, resulting in 30% lower NOx emissions. The use of MSAR® oil refinery upgrading, versus the alternative upgrading technologies available to refiners, results in a considerable reduction in CO<sub>2</sub> emissions.

## Research and Development

The Quadrise Research Facility ("QRF") in Essex, UK can test and produce emulsion fuels from laboratory to industrial scale and carries out R&D activities to support projects, enhance fuel formulations, optimise process economics and enable the provision of process related guarantees. The Company is continuously improving MSAR® technology and fuel performance, strengthening IP and increasing barriers to entry.



## 2018 Strategic Review: Extending global reach

Over the last two years the Company and its market value suffered two significant setbacks, firstly the termination of the Maersk trial in March 2017 (discussed above) and secondly the inability in Q2 2018 to conclude the agreements enabling the much-anticipated boiler trial in the Kingdom of Saudi Arabia ("KSA"). The latter was a complex project led by QFI utilising the MSAR® production facilities established at Cepsa. The trial did not proceed because of inter-company issues between the KSA counterparties that were outside QFI's control.

Nevertheless, there were lessons to be learned regarding sales diversification, direct sales delivery and the need to establish strong and knowledgeable local partners to broaden reach. This has been successfully progressed during the latter part of 2018 and has accelerated significantly during 2019 (as described below) with the share price more than doubling in the six months to mid-June 2019.

## Recent Progress

- In **November 2018**, the Company entered into a Co-Marketing and Project Development Agreement ("CMPDA") with **Freepoint Commodities** LLC, an established global merchant of physical commodities and an investor in commodity-producing assets. The parties are working together to progress MSAR® projects in the **Americas and Asia**. The preferred business model is to 'Build, Own and Operate' a facility, to purchase residual streams under long-term contracts and supply counterparties with MSAR® fuels.
- On **26 February 2019**, QFI announced the signing of a **Kuwait** Service Agreement with **Aleph Commodities Ltd** ("Aleph") a UK Company with significant experience in the Middle East. The agreement provides Aleph with a success-based structure upon achieving milestones and contracts leading to the establishment of MSAR® projects and commercial sales in Kuwait.
- In **March 2019**, Quadrise entered into a Representation Agreement with **Younes Maamar**, a former CEO of the Moroccan state electricity Company, to assist Quadrise in its pursuit of opportunities for the use of MSAR® in **Morocco**.
- On **27 March 2019**, the Company announced a Memorandum of Understanding ("MOU") with **Bitumina** UK (under incorporation). The Bitumina Group, led by Dr Bernd Schmidt, is a world leader in producing, trading and supplying a wide range of bitumen products for use in road construction. Quadrise and Bitumina will progress MSAR® project opportunities in the **Commonwealth of Independent States (including Russia), Poland, Romania, and Vietnam**. The parties will explore the use of existing Bitumina terminal assets and, in parallel, Quadrise will test Bitumina's technology and IP.
- In **May 2019** Quadrise concluded an Agency Agreement with **Hawazin** Regional Trading Company and a corresponding MOU with **Hawazin and Aleph**. Hawazin is an investor and provider of services to the oil and gas industry in Kuwait, and a major shareholder of Petroleum Dynamics Oil & Gas, whose President and CEO is Ahmad Al-Otaibi, who has significant experience in the oil and gas sector in the Middle East. Fellow Hawazin shareholder, Faisal Al-Kharafi, is on the Executive Committee of M.A. **Al-Kharafi & Sons** (a multinational trading company with annual sales of over \$5 billion) and Chairman of Al-Kharafi Construction KSCC.

Quadrise and Hawazin will combine their expertise to fast-track MSAR® projects in **Kuwait**, a country covered by both the CMPDA with Freepoint and the Kuwait Services Agreement with Aleph announced on 26 February 2019.

- On **13 May 2019** QFI announced an MOU with **API POLY-GCL** Alliance Limited, an alliance between Ample Power Investments Limited of the British Virgin Islands and POLY-GCL Petroleum Group Holdings Limited of Hong Kong. POLY-GCL is a partnership between China's POLY Group and Golden Concord Holdings Ltd, one of the top 500 companies in the Peoples Republic of China with over 300,000 employees.

The MOU defines how Quadrise and API POLY-GCL will pursue the production and supply of MSAR® fuel in China for marine (including river transportation), power and industrial fuel consumers.

- On **20 May 2019** the Company provided an update on the progress made with a European multinational integrated oil and gas company ("**Oil Major**") client, following an MOU announced on 28 November 2018. The intention is to undertake an MSAR® fuel market assessment, meet with potential consumers and plan a Pilot Test Programme. The joint objective is to conclude a feasibility study agreement with a potential fuel client for the consumption of MSAR® that would be produced at the Oil Major's candidate refinery. The Quadrise Research Facility will undertake analytical testing once the required residue samples are available.
- On **30 May 2019** Quadrise announced a Memorandum of Agreement ("MOA") with the **Al Khafrah Holding Group** ("AKHG"), a company based in the Kingdom of **Saudi Arabia**. AKHG, chaired by Mubarak Al-Khafrah, is a private holding company that invests in KSA and internationally. It has a portfolio of 42 industrial companies employing around 45,000 people, with partners in the oil, gas and petrochemical sectors that include Air Liquide and Gulf Chemicals & Industrial Oils.

The MOA commits the parties to an exclusive relationship to progress and supply MSAR® projects for KSA. In addition, once contract terms are finalised for the first MSAR® installation in a major refinery for commercial supply of fuel to buyers in KSA, QFI and AKHG plan to form a joint venture company to progress further joint opportunities in KSA

- On **11 June 2019** QFI announced an agency agreement with Laqua S.A. de C.V. operating under the name of **Redliner** in **Mexico**. The company has over 30 years of experience in industrial infrastructure rehabilitation in Mexico for the oil and gas, water, and chemical industries. Redliner will propose and assist the development of MSAR® projects in Mexico for refinery and power generation applications. The country is also covered by the CMPDA with Freepoint.
- On **13 June 2019** the Company announced a **Kingdom of Saudi Arabia** Services Agreement ("SA") with **Aleph** to provide services to the Company for the use of MSAR® in KSA. Quadrise is now working with both Aleph and Al Khafrah to progress projects and supply MSAR® in the Kingdom.

#### **Key QFI Differentiators:**

- QFI's technology and the commercial market are proven.
- Recent agreements with well-established and strong partners to develop MSAR® projects in key markets in the Middle East, Asia, Americas and Eastern Europe/FSU.
- The IMO 2020 marine regulations create a strong case for the adoption of QFI's technology.
- MSAR® economics are compelling.
- The environmental contribution of the technology is significant at a time when global warming is an increasingly important issue for the fossil fuels industry.