

# AGM Update Presentation 8th December 2017





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# **Company Representatives**



Mike Kirk
Executive Chairman



Jason Miles
Chief Operating Officer



**Laurie Mutch Non-Executive Director** 



Philip Snaith
Non-Executive Director



Mark Whittle
General Manager, Refining



Martin Verle
General Manager, Marine



**David Scott Group Financial Controller** 



# **Quadrise Overview**

- Developer and supplier of MSAR® technology.
- Produces a lower cost, cleaner alternative to Heavy Fuel Oil ("HFO") a c.US\$100 billion per annum market.
- IP is protected and significant know-how and experience creates further barriers.
- Targeting the Power and Marine markets as a licensor.
- Working with World Class partners.



#### **Industry participation**





















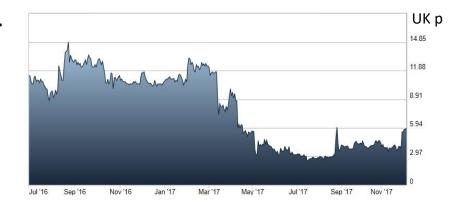






# A Challenging Year – but demonstrable progress

- IMO 2020 vs 2025 decision was a shock to industry.
- Led to Maersk ending Marine MSAR® trial early.
- Protracted process Interim LONO and Report.
- Delays to signing KSA Power trial agreements.



#### But .....

- Marine trial demonstrated reliable MSAR® production, logistics and consumption.
- Essential in securing future marine business, supportive to progressing KSA Power trial.
- Pursuing many potential new business streams such as JGC MOA.
- Continued process improvement via Research, Development & Innovation programmes.



# Highlights



#### Kingdom of Saudi Arabia (KSA) Power MSAR® Project:

- Preparations for the commercial-scale trial are progressing with major stakeholders.
- Project activities are underway, to enable commencement in line with 2018 timetable.

#### **Cepsa/Maersk Marine MSAR® Trial:**

- Reliable 24 hour MSAR® production from a variety of crude oils
- Positive operational feedback and Interim LONO.

#### **Opportunities Approaching IMO2020:**

- Various opportunities are also being developed globally.
- MOA with JGC signed Japan market and other projects worldwide.





# MSAR® Project and Market Updates Synthetic HFO



# Refinery Production Of MSAR®



- 6,000 BPD MSAR® commercial reference facility operational within 9 months of sign-off.
- Proven reliability and quality of MSAR® production from July 2016:
  - High and low sulphur residues used blended in MSAR® bulk storage.
  - 24hr production from early 2017 to supply larger batches.
  - Quadrise team managed MSAR® production and quality control throughout.
- Client visits to the production facility arranged, including representatives from KSA.









## Marine MSAR® - Commercialisation

- LONO trial progressed well, positive operational feedback from Maersk and Wärtsilä important for 3<sup>rd</sup> parties.
- Operators are evaluating future compliance options and investments.
- High sulphur fuels + EGCS widely regarded as the lowest cost of compliance, but requires funding.
- Cruise and ferry operators are the leading EGCS adopters to date Carnival investing \$1B on EGCS for their fleet, \$700M/year savings.
- Quadrise close engagement with shippers and industry groups.























## Marine MSAR® - Current consensus on IMO 2020

#### Industry surprised by IMO 2020 marine fuel 0.5% sulphur decision

Main options: <0.5%S compliant fuel, >0.5%S fuel plus EGCS, or LNG

#### <0.5%S compliant fuel

2M BPD (~100M tpa) of low Sulphur (mostly distillate) fuel required by 2020 to meet 0.5%S.

Source: KBC

Forecast Gasoil-HFO "spreads" expected to increase by >\$100/t, to over \$300/t

>0.5%S non-compliant fuel

1M BPD (~50M tpa) of high sulphur fuel will be consumed, either via EGCS ("scrubbers") or noncompliance.

Source: KBC

Increased "spreads" enhance MSAR® refinery economics.

Large market opportunity for MSAR®, linked primarily to the uptake of EGCS.



IMO = International Maritime Organisation EGCS = Exhaust Gas Cleaning Systems, LNG = Liquefied Natural Gas

# Market Opportunity - Kingdom of Saudi Arabia

### Replace up to 500KBD HFO\*, plus crude oil:

- National imperative, Vision 2030.
- HFO demand exceeds domestic supply,
   >50% is imported.
- Major utilities, OEMs and energy companies are actively engaged in the MSAR® project.
- The QFI team have been very active during year.
- Final contracts progressing with major partners.
- Potential to supply MSAR® from KSA and other oil refineries supplying the region.



#### \*500KBD of HFO = ~30M tpa HFO

- 25% of current global HFO power demand
- 50% of projected marine demand in 2020



### Typical activities necessary to complete a MSAR® boiler trial

Phase 1 - Production Phase 2 - Transport

Phase 3 – End Use











**MSAR® Production & Bulk Storage Engineering & Operations** e.g. 200-400,000 BPD Refinery

**Status: Technical preparations** significantly completed.

**Logistics & Shipping Handling & Quality Control** e.g. Aframax Tanker 600,000 BBL capacity

Status: QC plans are completed, Logistics being finalised by clients.

MSAR® Consumption Site Prep & Trial Support. e.g. 400MWe\* Boiler Trial ~1,000,000 BBL MSAR®

**Status: Engineering study** delivered. Planning underway.

#### Quadrise's involvement is across all Phases of the Trial (Production to Consumption).

Specific activities include; Project Management, Quality Control, Operational Production Support, Ongoing RDI, Scheduling, Transportation, Site & Value Engineering, Risk Management and Combustion Trial Support & Analysis.

\* 400MWe is ~1/10<sup>th</sup> of the size of Drax (3,900MWe) the largest power station in the UK, and ~1/10<sup>th</sup> of Greater London's electricity demand.





## Quantification of power opportunity 2018+



\* A typical 150-200KBD semi-complex refinery produces 25KBD residue (1.5M tpa)

#### Supportive economics at each refinery...

- ✓ MSAR® "value-add" comes from distillate savings
- ✓ Pays for investments at Refinery and Powerplant
- ✓ <12 months installation, <12 months payback



KBD = Thousand Barrels per Day, MWe = Mega Watts (Electric)
M tpa = million metric tons per annum

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# MSAR® Global Opportunities



#### **Complementary Solutions:**

- Refinery heaters & boilers.
- National Oil Company synergies to provide MSAR® for Marine & Power.
- Selected upstream options.



The recent JGC MOA covers Japan and other opportunities.



#### Power

- Initial focus on KSA PowerGen (40% of global power market).
- Expand selectively into other Middle East and Asia regions.



#### **Marine**

- Obtain engine LONO approvals for MSAR®, combine with EGCS.
- Secure commercial shipping operators deploying EGCS.



EGCS = Exhaust Gas Cleaning Systems, LONO = Letter Of No Objection

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## MSAR® Research, Development & Innovation Activities

Practical experience of Cepsa production is combined with focused RDI efforts to continually expand MSAR® applications and enhance performance:

- MSAR® Production Process Enhancements:
  - Further improve production reliability/availability.
  - Simplify MMU control processes and operations.
- Product Development at QRF and University of Surrey:
  - Continued development for both power and marine:
    - Ongoing optimisation for commercial opportunities.
    - Aligning MSAR® technology with future refinery technology.
    - Investigating new applications of oil-in-water fuel technology.













## Outlook for 2018

- Substantial commercial opportunity in the power and marine sectors.
- Leverage the marine trial to progress opportunities with ship operators.
- KSA power trial: significant commercial and technical preparations completed.
- MoA with JGC is a catalyst for accelerated commercial development.
- QFI team has the proven experience to deliver the MSAR® business.



