

2019 MSAR® BUSINESS OVERVIEW



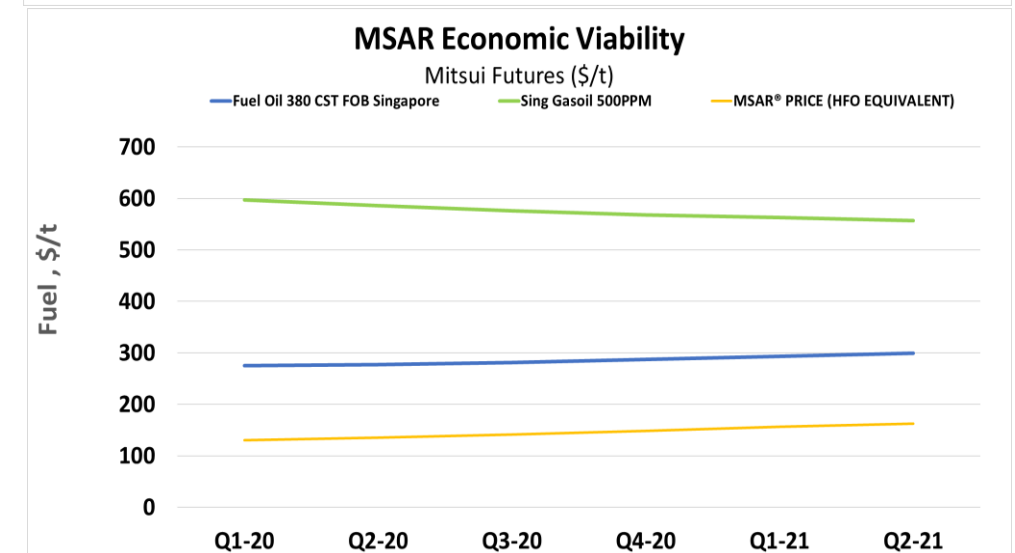
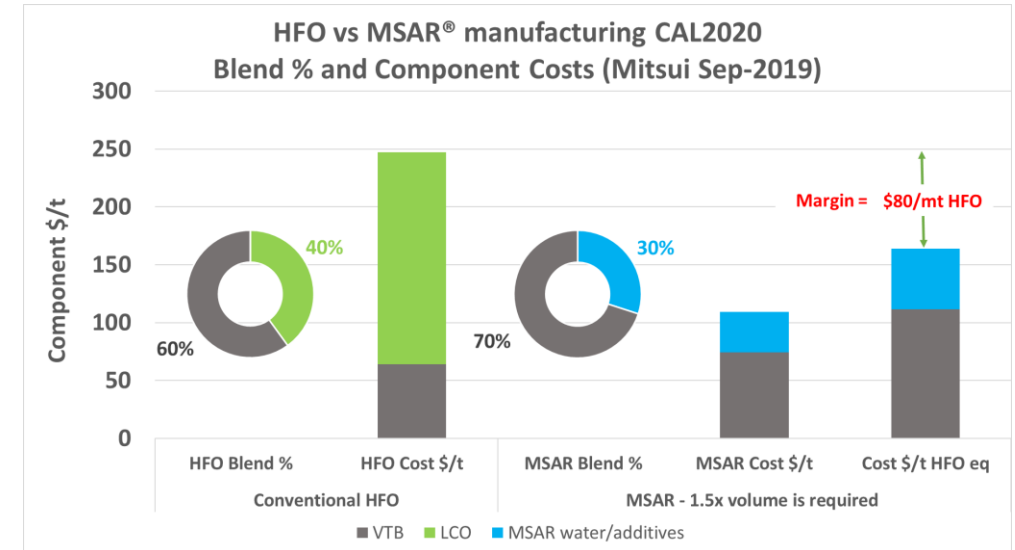
27 September 2019

MSAR[®] – REFINERY ECONOMICS

Low Cost - Rapid Payback - IMO2020 Solution

- Refinery fuel oil production typically uses significant amounts of distillate products to blend with residuals, mainly to reduce viscosity.
- MSAR[®] technology releases these high value distillates from the low value fuel oil “pool” – significantly improving refinery economics.
- The “MSAR[®] margin” is a function of the distillate / fuel oil “spread”.
- This spread widened during 2019, driven by impending IMO regulations for marine fuels for 2020+, further strengthening MSAR[®] economics.
- CAPEX for implementing each 1,000tpd MSAR[®] module at a refinery is ~\$5m; installed in <1 year with typical paybacks <1 year.
- The modular nature of MSAR[®] technology provides a low cost, low-risk, highly profitable, bottom of the barrel upgrading option.

IMO = International Maritime Organisation. CAPEX = Capital Expenditure. HFO = Heavy Fuel Oil. \$/t = US\$ / metric ton. VTB = Vacuum Tower Bottoms. LCO = Light Cycle Oil.



Graphs above are typical examples based on a refinery with vacuum residues blending with LCO to make HFO in 2020 versus MSAR[®].

MSAR[®] – ENERGY COST SAVINGS TO CONSUMERS



400MWe POWER PLANT BOILER

consuming 600,000 tpa HFO:

MSAR[®] saving vs HFO

\$15m per year *

CAPEX <\$5m modifications.



VLCC TANKER

consuming 16,000 tpa HFO:

MSAR[®] saving vs HFO

\$0.4m per year *

CAPEX <\$0.4m modifications.

* assuming \$25/mt HFO (10%) equivalent energy savings with MSAR[®].

tpa = metric tons per annum. HFO = Heavy Fuel Oil.



Stored & transported at ambient temperatures

Less heating = energy savings

- ✓ Reduction in utilities consumption



Lower combustion temperatures

Less heating = more energy savings

- ✓ 20-30% less NO_x gases emitted



Virtually complete carbon burnout

Minimal black soot

- ✓ Reduction in global warming potential
- ✓ Reduced waste disposal costs

Lower cost MSAR[®] enables affordable compliance with regulations

NO_x = Nitrogen Oxides.

HFO MARKET OVERVIEW

Americas

NOCs, refiners & utilities:

Mexico 7m tpa HFO

Ecuador 2m tpa HFO

Marine

~230m tpa HFO demand today

60-80m tpa HFO “scrubbed” by 2020-25.

>50% supplied from major bunker hubs.

NOCs = National Oil Companies.

Africa

NOCs, refiners, utilities & upstream:

Egypt 6m tpa HFO

Morocco 1m tpa HFO

E. Europe/FSU

Russia 18m tpa

Middle East

Mostly NOCs & utilities:

KSA 28m tpa

Kuwait 6m tpa

Iraq 16m tpa

Asia

Mostly powerplants:

Japan 15m tpa

China 28m tpa

S. Korea 12m tpa

Pakistan* 10m tpa

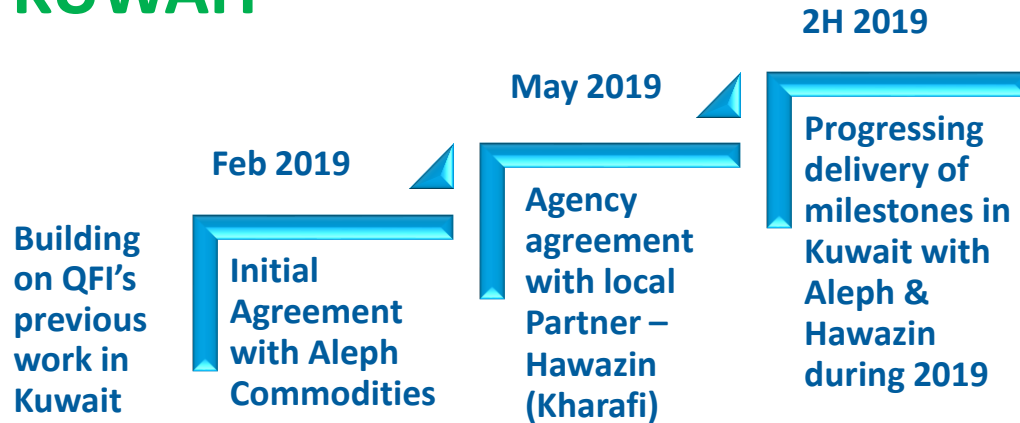
Notes: All figures rounded to nearest million tpa from 2018 JODI Data, unless stated otherwise. JODI data, is for all uses including marine bunkering, so there will be an element of double counting when looking at total demand, including marine.

Main uses in regions highlighted are power generation & utilities.

** Uses 2018 IEA data (based on 2016) for all uses excluding marine.*

MSAR[®] BUSINESS PIPELINE STRENGTHENED IN 2019

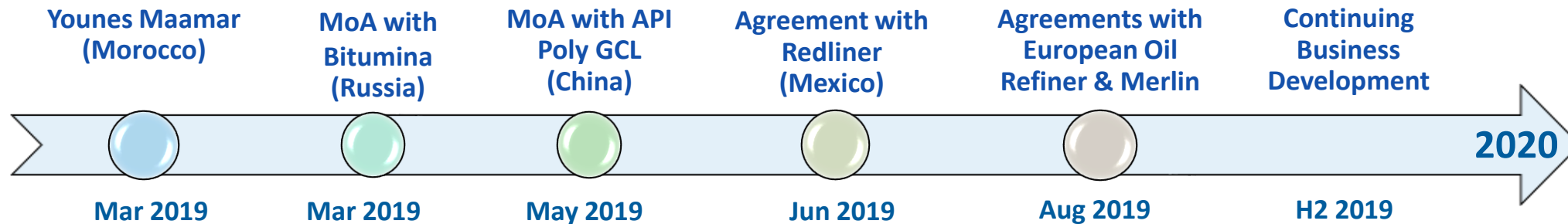
KUWAIT



SAUDI ARABIA



REST OF WORLD



RESEARCH, DEVELOPMENT & INNOVATION (RDI)

We're continually improving MSAR[®] technology and fuel performance at our UK RDI facility, strengthening our IP position, increasing barriers to entry.



Building on strong foundations made during 2019:

- Core MSAR[®] economics strengthened by IMO 2020 regulations.
- New relationships in key markets in the Middle East & Africa have demonstrated phased progress towards trial supply agreements as a prelude to commercial operations.
- Opportunities in Marine, Americas, Asia, Europe and FSU are being developed in tandem.
- Business development activities targeted to build on positive momentum and deliver commercialisation plans in 2019/2020.