



Energy *Aspects*

London | New York | Houston | Singapore



Client Conference

London, 17-18 June 2019

IMO: Vision 2020

Workshop



Summary

Products

At \$47 per barrel (\$380 per tonne), Q1 20 ULSD-HSFO spreads are not discouraging simple refinery runs. HSFO must decline relative to diesel to do the work.

Low diesel inventories will complicate this shift as there is upside risk to ULSD cracks in H2 19 while fuel oil prices will be supported by structural supply problems.

East-West HSFO flows will fall sharply in Q4 19 but more HSFO will likely flow to the USGC to fill cokers, particularly if Venezuelan crisis continues.

Distillates look tight if refinery additions to not come online as planned: Jazan is a key sensitivity given it will produce 0.24 mb/d of 10 ppm diesel.

But MGO's moment in the sun will be short-lived as shipowners overcome VLSFO compatibility fears.

Tight diesel into IMO 2020 will accelerate the shift to VLSFO. There is upside to our forecast of 1 mb/d of VLSFO demand and downside to our forecast of 2 mb/d of MGO demand.

Crude

Given our expectation for HSFO oversupply, crude pricing will be driven by the sulphur content of VTBs.

The value of VTBs quickly falls to zero (or negative) as the sulphur content rises as HSFO will be in surplus.

Three other specifications—sulphur content of VGO layer, middle distillate cut and naphtha cut—will be important in setting value.

Crudes like Forcados occupy a sweet spot on this new valuation grid and will trade at multi-year highs.

Others, like Maya, will be penalised.

Even Forties—in reality a light sour crude—will be penalised (owing to its high naphtha content) and high sulphur VTBs.

This implies a narrower Brent-Dubai spread than might otherwise be expected—though financial players will distort the spread at times.

WTI-Midland to Dated should strengthen on favourable sulphur levels, but more importance will be on quality specifics as not all US light sweet barrels are equal.

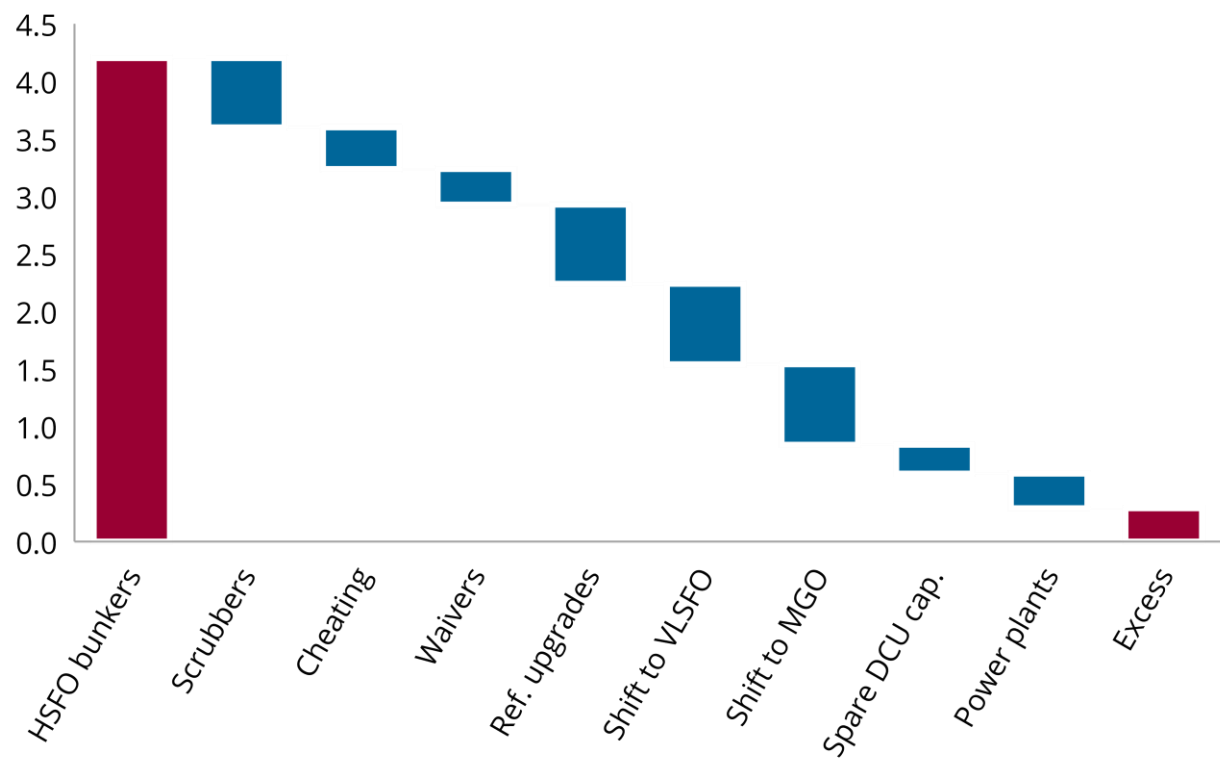
Source: National agencies, Energy Aspects analysis



HSFO supply bridge

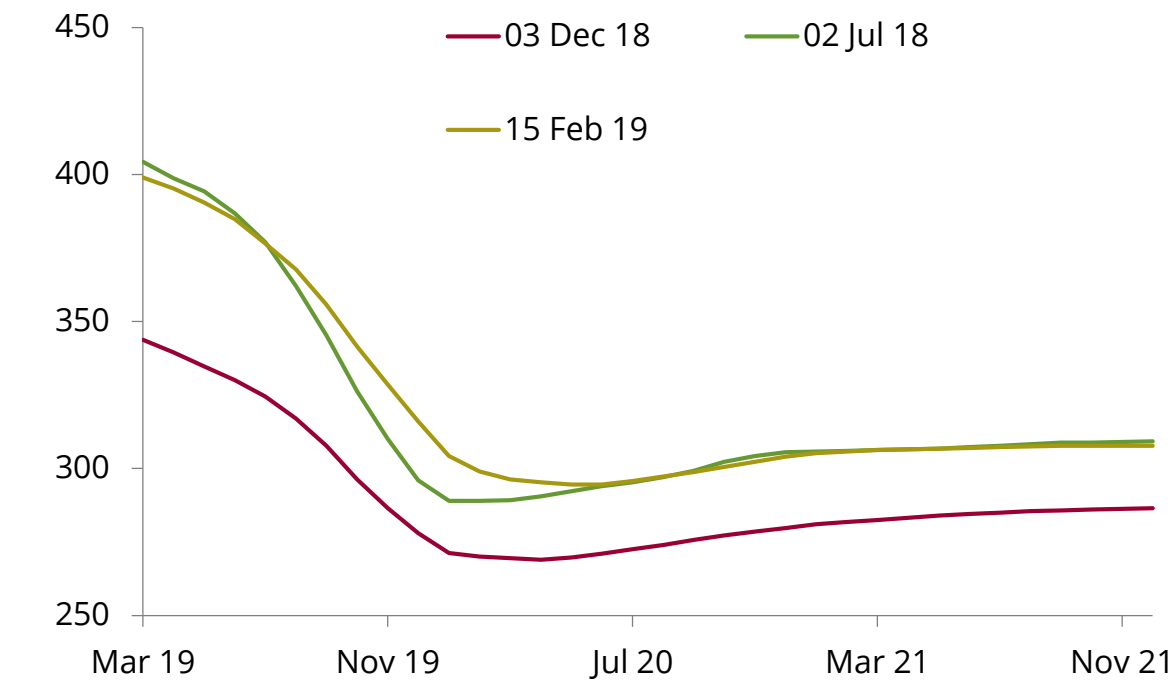
Market heading for HSFO oversupply from mid/late 2019

HSFO bunker supply bridge
2018 to 2020



Many moving parts, but some refiners are already preparing for run cuts in 2020

NWE HSFO forward curve
#



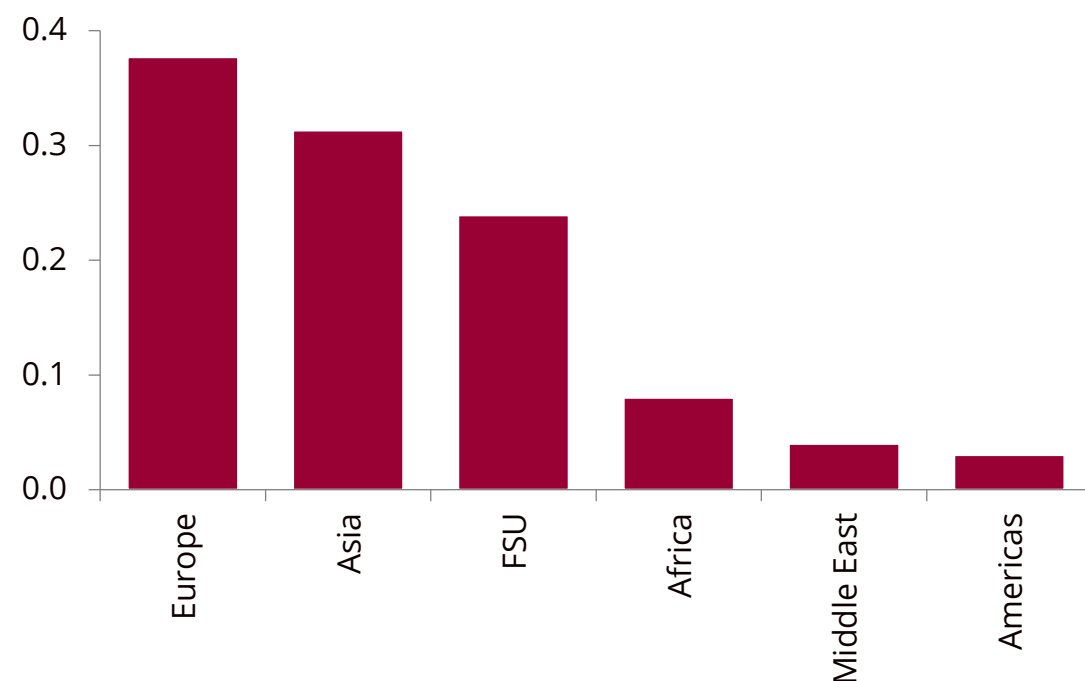
The HSFO forward curve is still backward through H2 19

Source: Company reports, Reuters, Energy Aspects

Refinery upgrades are relatively limited...

Fuel oil destruction projects to 2020

Mb/d



Coker/SDA projects up to and including 2020 will destroy around 1 mb/d of HSFO

Despite multiple IMO-related projects, Europe (including Turkey and Greece) will have excess HSFO in 2020.

Elsewhere, the project list is thin. Globally, announced fuel oil destruction projects amount to around 1 mb/d.

Increased coker utilisation in the US and China could destroy another 0.3 mb/d.

Asia's net short will shrink by more than half, backing up HSFO in Europe.

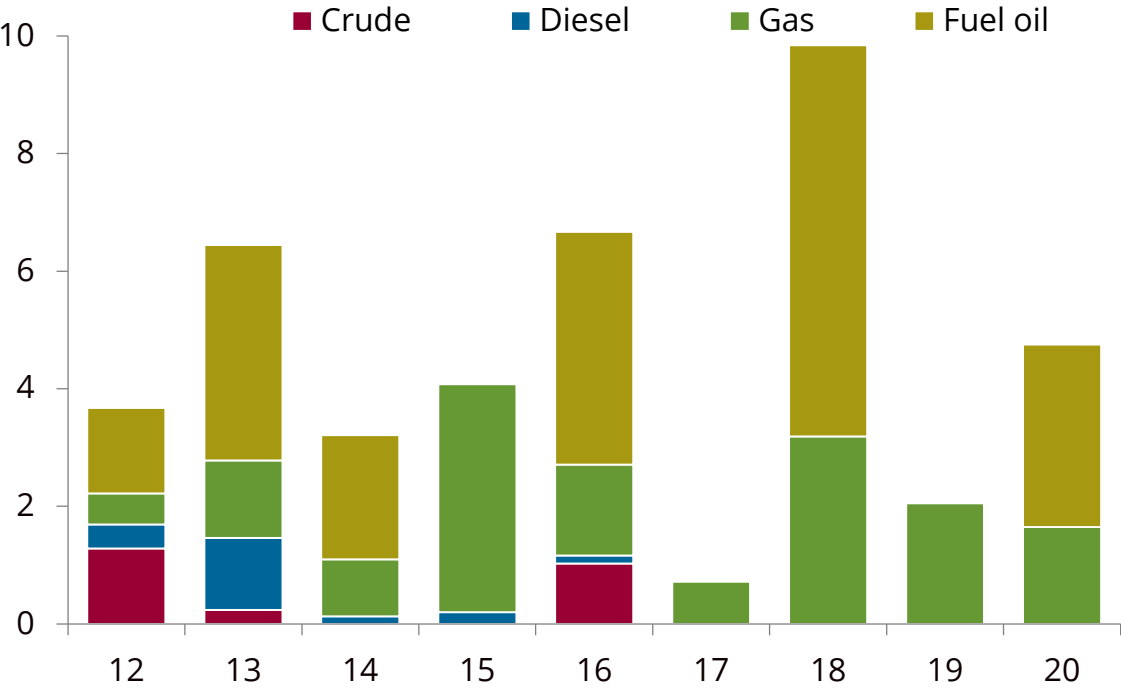
We are expecting HSFO oversupply in LatAm, Europe, the FSU, South Africa and parts of Asia.

In Russia, the government has pledged financial support to the refining sector. This will increase pressure on simple refiners elsewhere in the world.

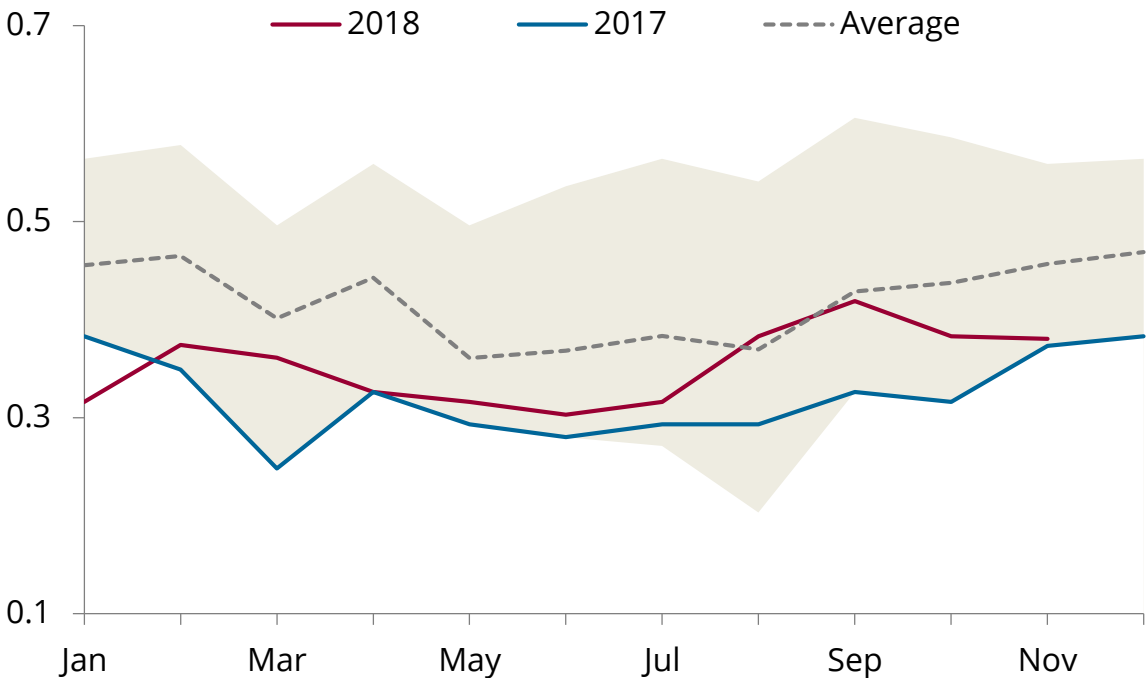
There are few concrete projects in Africa, the Middle East or North America, but all three regions are relatively well insulated.

Demand from power/industry will not save HSFO

Saudi power plant investment
GW



FSU fuel oil demand
Mb/d



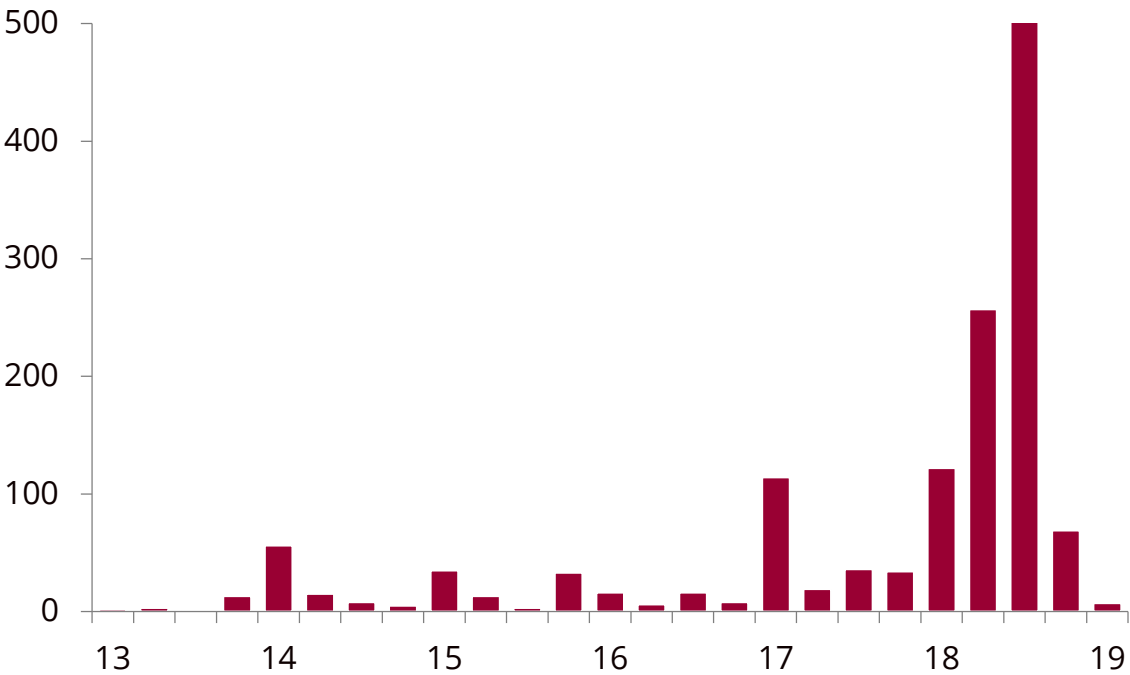
Incremental HSFO demand in Saudi Arabia will come mainly from greenfield power plants

Industrial gas prices of around \$2/mmbtu equate to \$80 per tonne of fuel oil

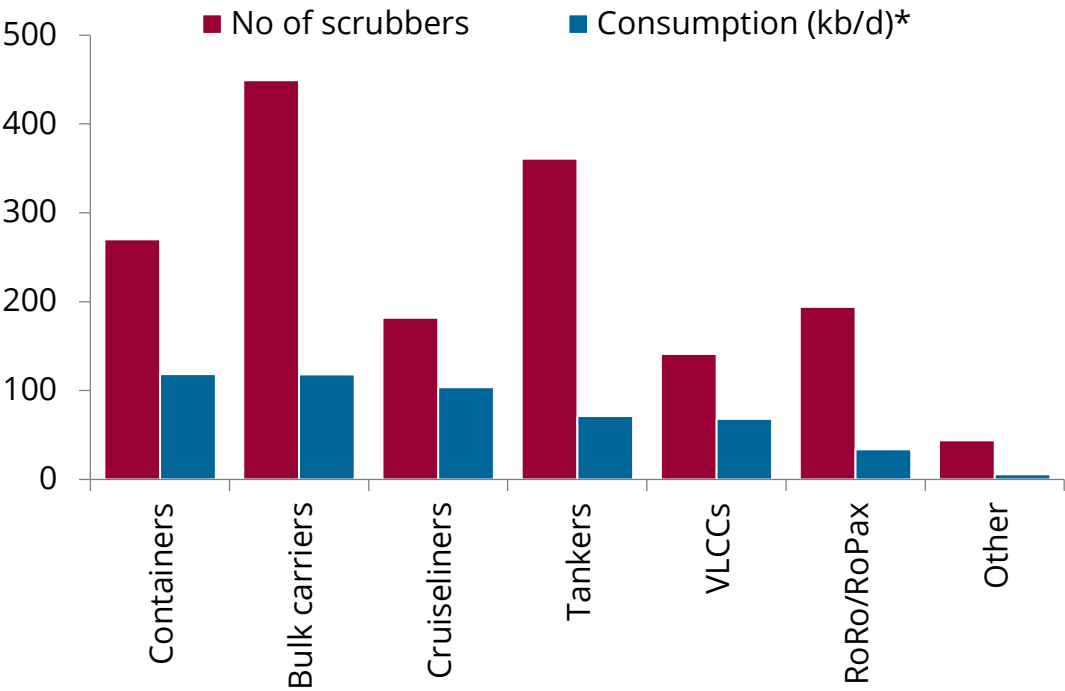
Source: Company reports, Reuters, Energy Aspects

Slowing scrubber orders will exacerbate HSFO oversupply at the margin

Scrubber orders by quarter
#



NWE HSFO forward curve
#



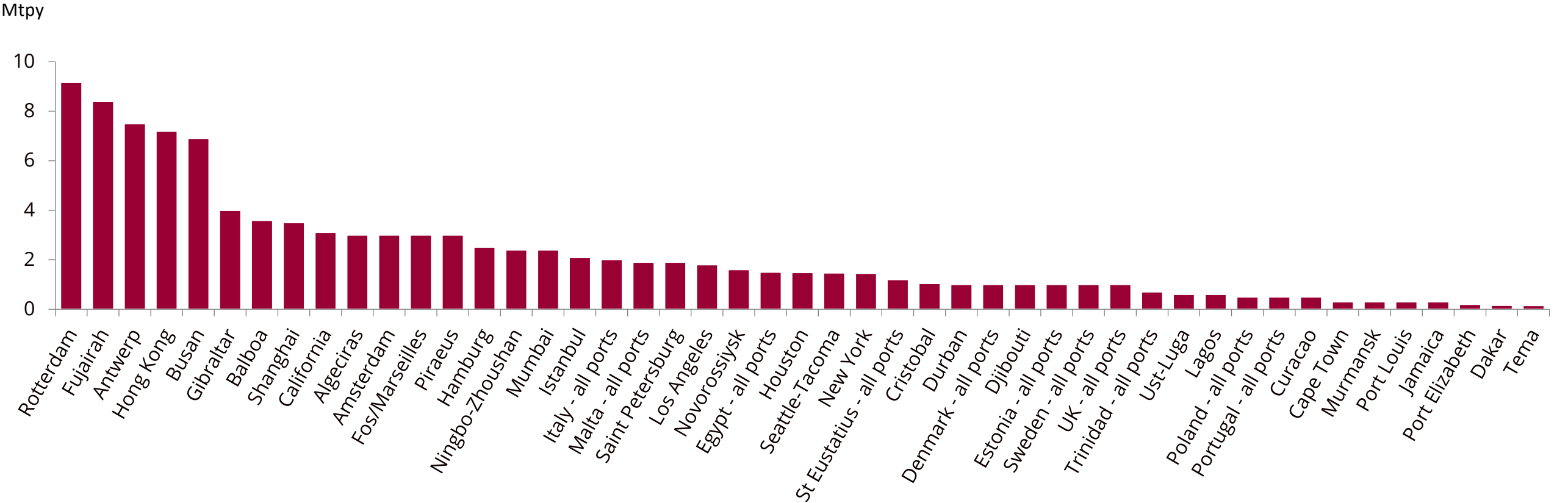
New scrubber announcements have slowed considerably since Q3 18

Volume of HSFO 'saved' by scrubbers is similar to CE Delft estimate (0.6-0.7 mb/d)—but the number of vessels is lower

Source: Company reports, Reuters, Energy Aspects

HSFO availability will be restricted to the largest ports

Bunker sales for selected ports

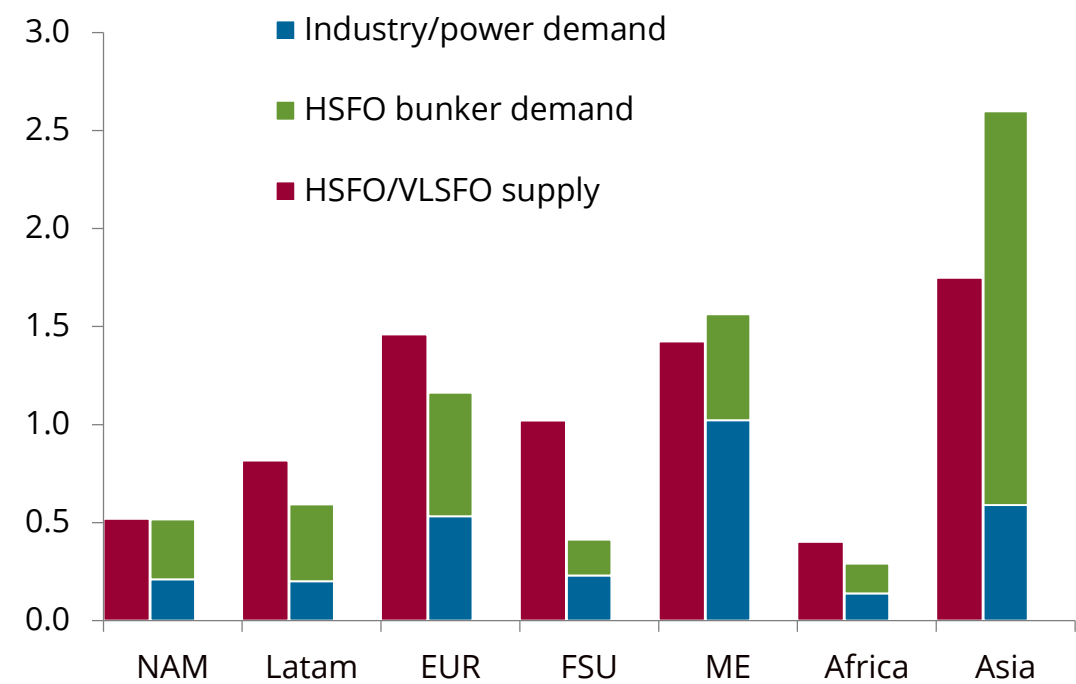


We believe HSFO bunkers will be available in: Singapore, Rotterdam, Fujairah, Antwerp, Hong Kong, Busan, Gibraltar, Balboa, Shanghai, California, Algeciras, Amsterdam, WAF, Piraeus, Hamburg, Ningbo-Zhoushan and New York

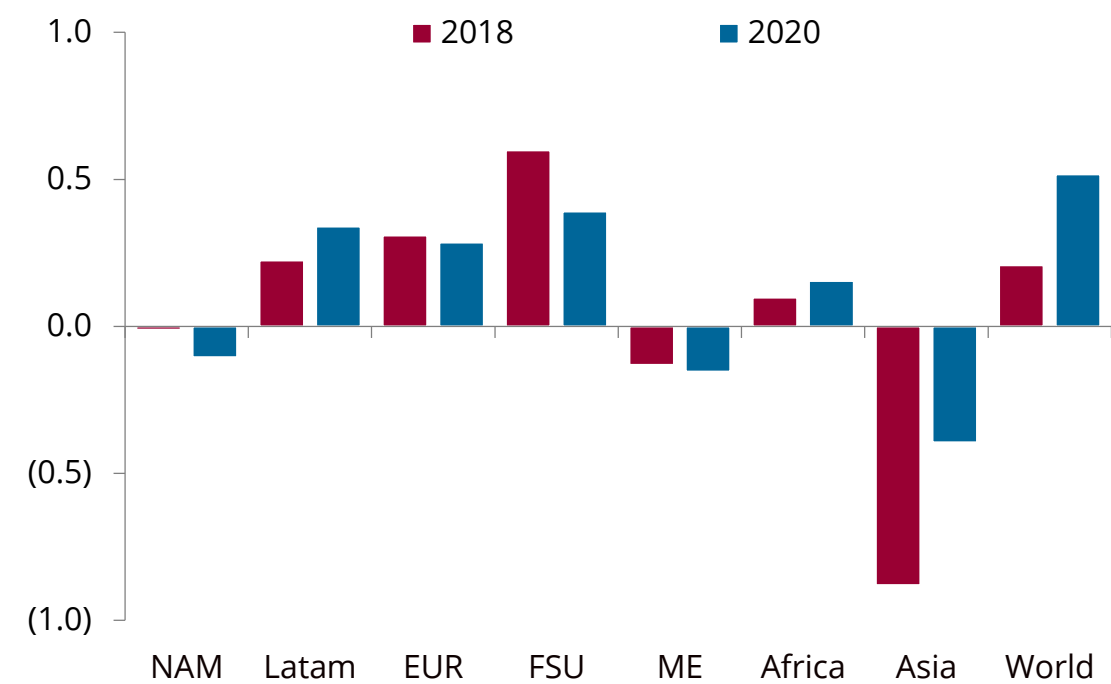
Note: Singapore (c. 50 Mtpy) not shown
Source: Company reports, Energy Aspects analysis

Europe will be at the epicentre of the HSFO oversupply

Regional fuel oil supply & demand (2018)
Mb/d



Regional net FO balance (2020 vs 2018)
Mb/d



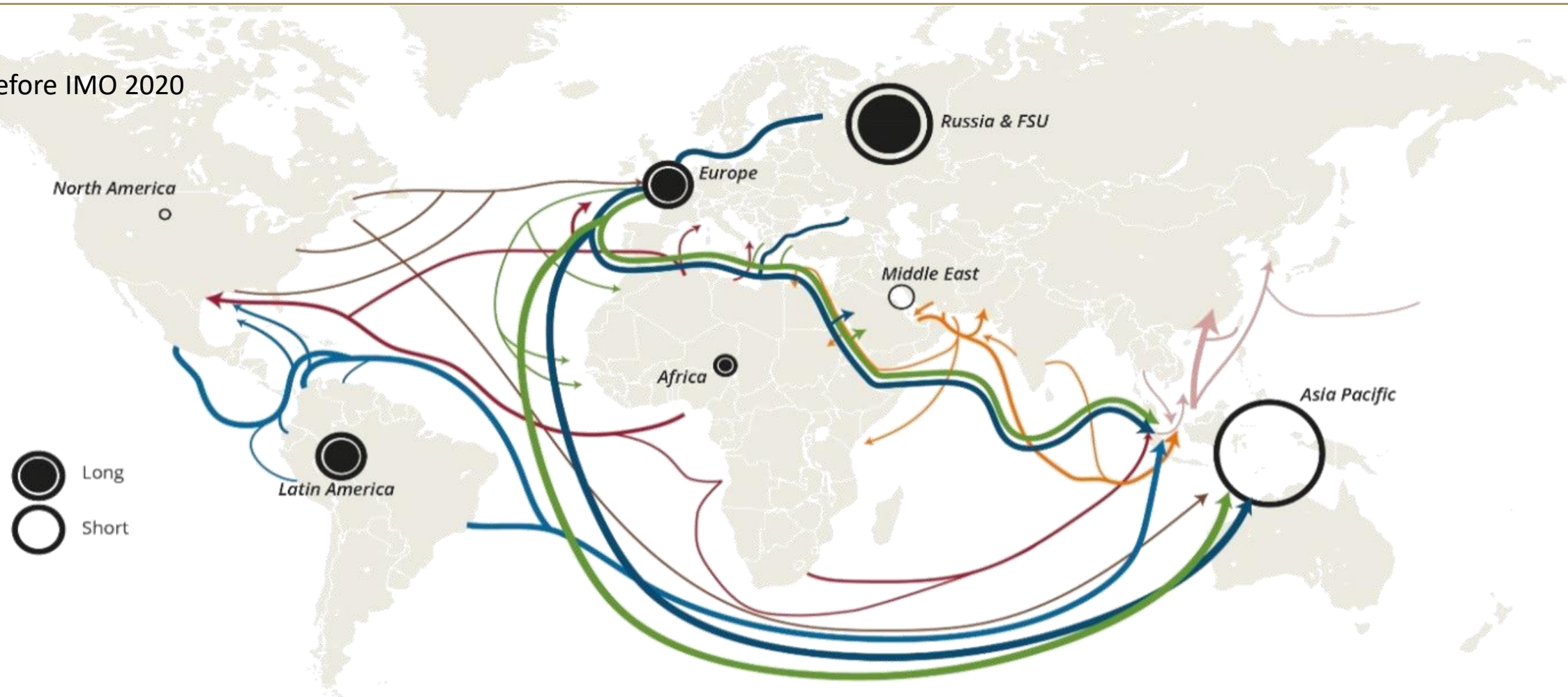
Europe will be left exposed by its reliance on HSFO bunker demand and its role as a transit hub for FSU barrels

Asia's net short will shrink by half as its HSFO bunker market dried up

Source: National agencies, Energy Aspects

East-West flows will collapse in spectacular fashion

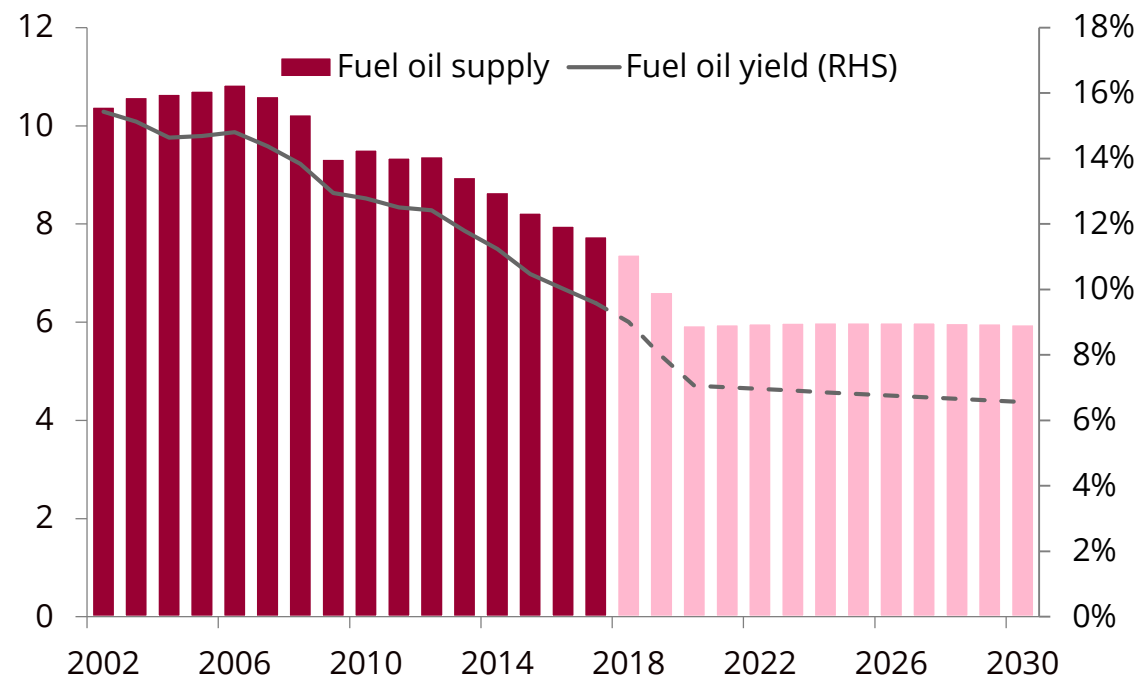
FO flows before IMO 2020



HSFO flows from the Atlantic Basin to Singapore will fall by up to 2 Mt per month, equivalent to 6-8 VLCCs, more will likely flow to the USGC to feed cokers

HSFO availability will tighten over 2020-2030

Global FO supply scenario needed to meet demand
Mb/d



Fuel oil yield declines would need to slow considerably to meet demand—something we think is unlikely

Source: National agencies, Energy Aspects analysis

Global fuel oil yields fell from 15.4% in 2002 to 9.6% in 2017, an average y/y decline of 0.4 pts.

To have enough fuel oil supply (on a total molecule basis) to meet our demand projections, the pace of y/y declines would need to slow considerably, to below 0.1 pts.

The new mega-refineries being added over 2019-2022 (STAR, Hengli, Rongsheng, RAPID, Dangote) will have little or no fuel oil output. Al Zour (Kuwait) is an exception.

Refineries under study for 2025 onwards will also target zero fuel oil production. Refinery investment economics usually assume a project life of 25-30 years.

Any zombie restarts will destroy HSFO.

Long-term refiner decision-making is unlikely to be swayed by a short-lived uptick in scrubber demand (which will have little impact on the direction of fuel oil demand in absolute terms).

HSFO bunkers will increasingly become a niche product, with traded volumes locked in under long-term strategic partnerships.

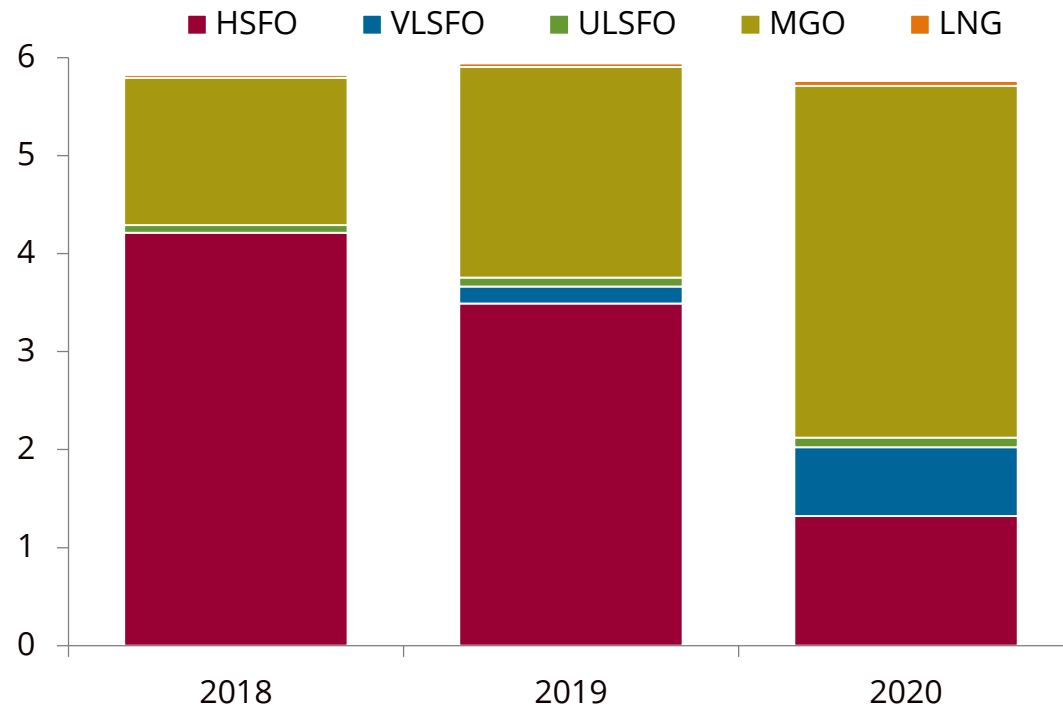


Meeting the new demand mix

MGO demand in 2020 will be 2.1 mb/d higher than 2018...

Bunker demand: before and after

Mb/d



MGO will be the initial winner until VLSFO compatibility fears are assuaged

We expect only 1.1 mb/d of HSFO bunker demand in 2020, made up of scrubbers (0.7 mb/d), cheating (0.1 mb/d) and waivers, or 'FONARs' (0.2 mb/d).

In the first instance, much of the lost HSFO demand will likely shift to MGO, as happened with the switch to more stringent ECA requirements in 2015.

VLSFO will then gain market share as customers become more comfortable burning it, and refiners become more adept at producing it.

To date, only a handful of refiners (including Saras, Cepsa and Exxon) have actually committed to producing VLSFO, but turnaround work between now and 2020 will see many refiners undertaking debottlenecking work to optimise their operations.

Optimisation will involve cleaning trays, changing cut points, revamping pumps, changing catalysts and trialling new crudes, all with a view to improving segregation of fuel oil streams and maximising desulphurisation/coking capacity.

...but IMO 2020-compliant marine fuels will not be the same as diesel

Marine fuel specifications

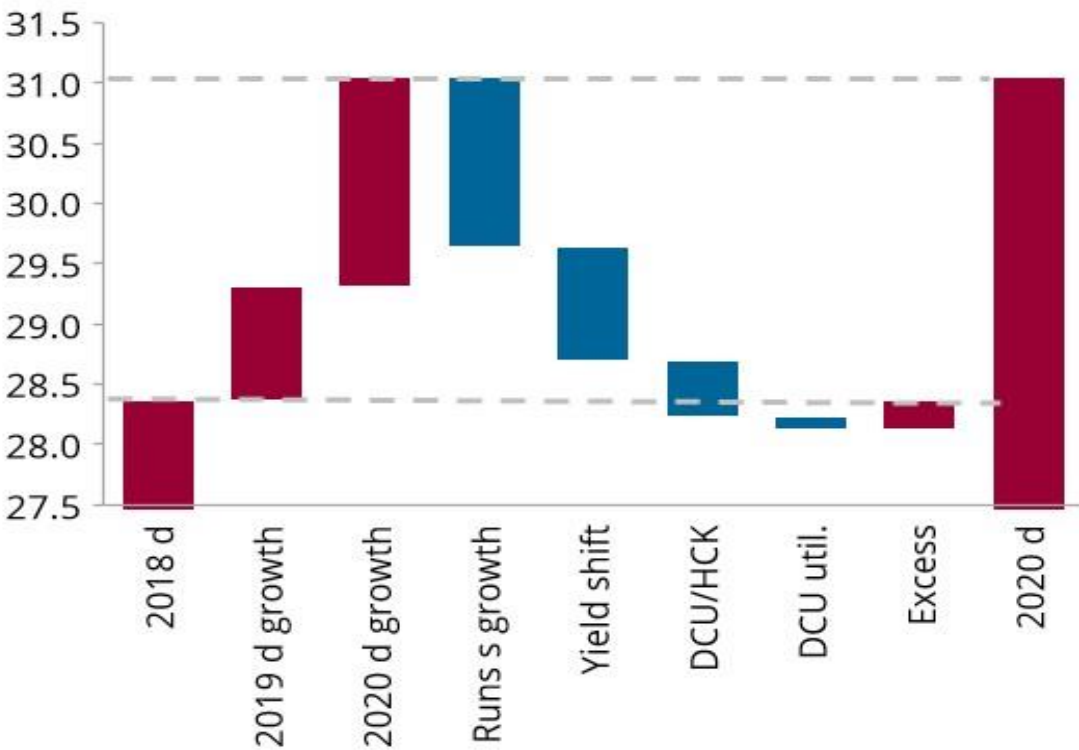
	Diesel	MGO	MDO	IFO	IFO	IFO	ULSFO
Standard	En590	DMA	DMB	RMG 180	RMG 380	RMK 500	HDME 50
Max density	845	890	890	991	991	1010	900-915
Cetane index	46	40	35	n/a	n/a	n/a	n/a
Sulphur, % mass	10 ppm	1	1	Statutory	Statutory	Statutory	<0.1
Flash point, C	55	60	60	60	60	60	>70
Pour point, C	n/a	-6	-6	30	30	30	6-12
Viscosity (max) at 40 C	2	6	11	n/a	n/a	n/a	n/a
Viscosity (max) at 50 C	n/a	n/a	n/a	180	380	500	30-45
Appearance	C&B	C&B	Black	Black	Black	Black	Brown

Winter specifications shown, density measured at 15 C; viscosity measured in mm²/s; C&B = Clear and Bright

- Current standards for marine gasoil (MGO) and marine diesel (MDO) are significantly less stringent than on road diesel standards in terms of density, cetane index and viscosity suggesting that IMO-compliant MGO will contain heavy oils that cannot currently be included in the diesel pool.
- ULSFO is already being made for use by ships operating in Emissions Control Areas and has an even higher density specification, suggesting that a 0.5% VLSFO product will be feasible to manufacture.

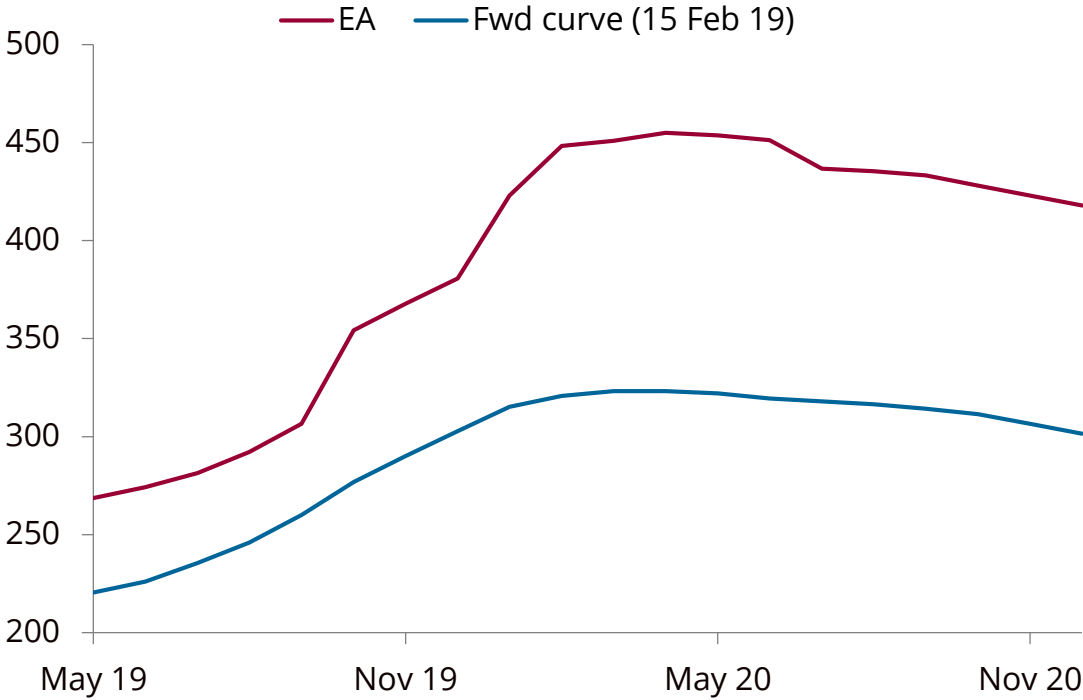
Refineries will be resourceful at meeting distillate demand

Distillate supply/demand bridge
Mb/d



Diesel supply/demand bridge looks manageable—but only if greenfield refineries ramp up as planned

ULSD-HSFO spread
\$/t

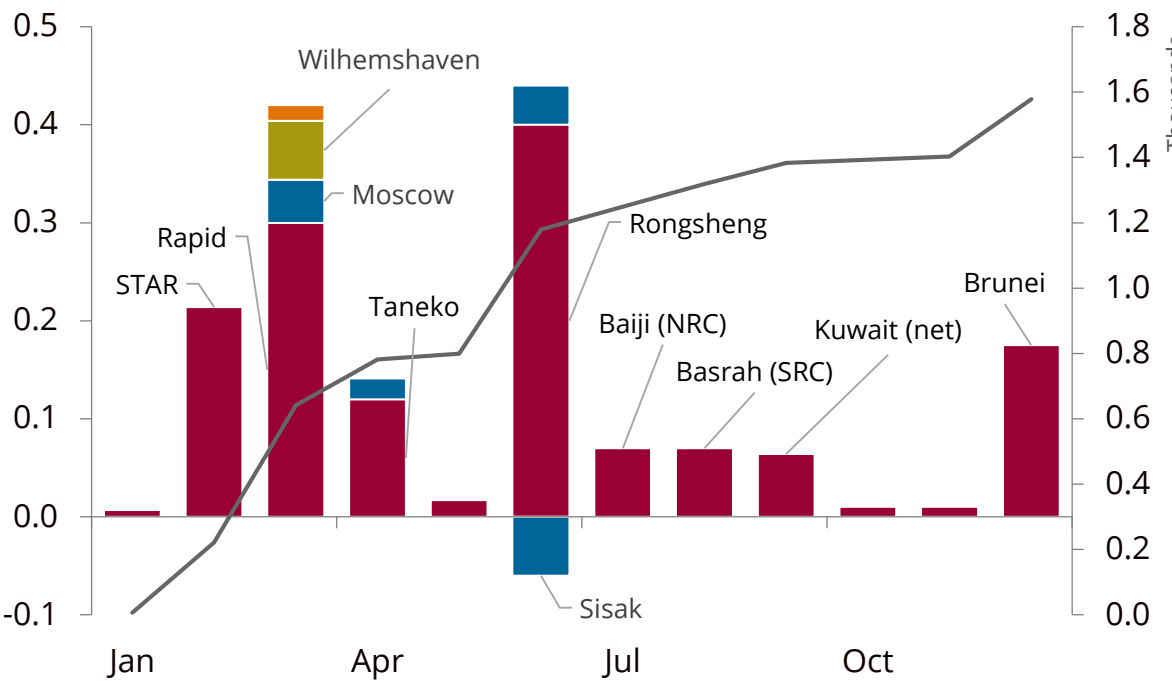


Distillate-HSFO spreads will naturally widen if crude prices surprise to the upside

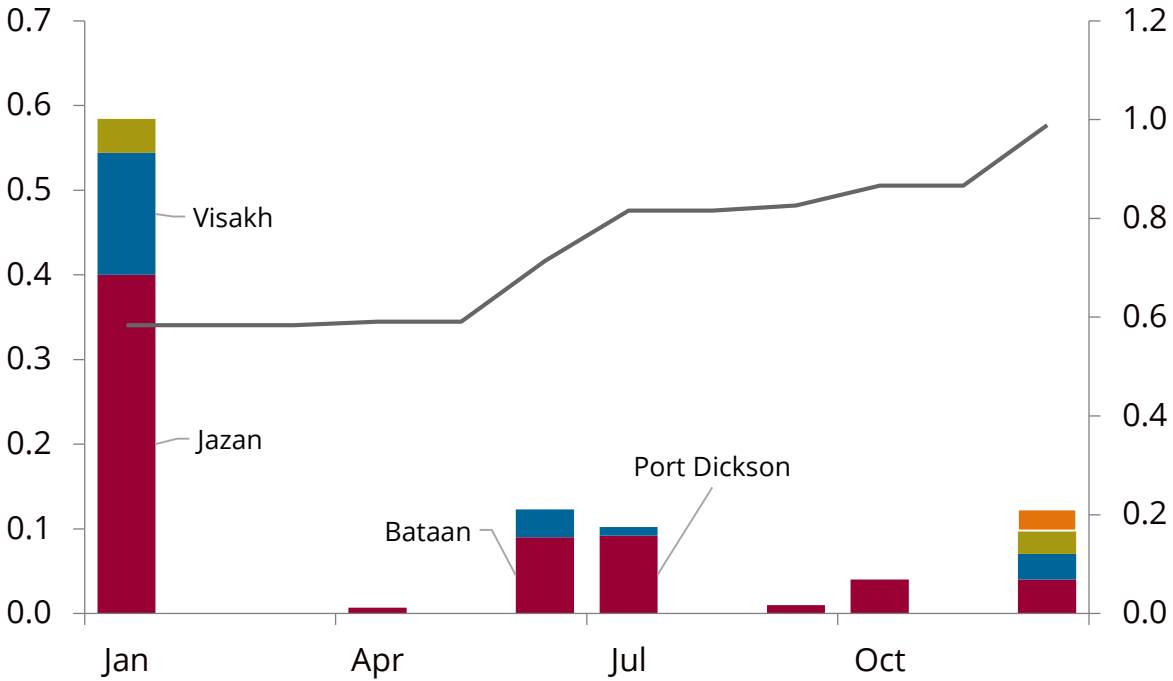
Source: Company reports, Energy Aspects

Still, distillates look tight if greenfield additions do not happen on time

2019 firm CDU additions
Mb/d



2020 firm CDU additions
Mb/d



Several of the 2019 additions could easily slip into 2020 (or beyond). Rongsheng tankage is not yet complete

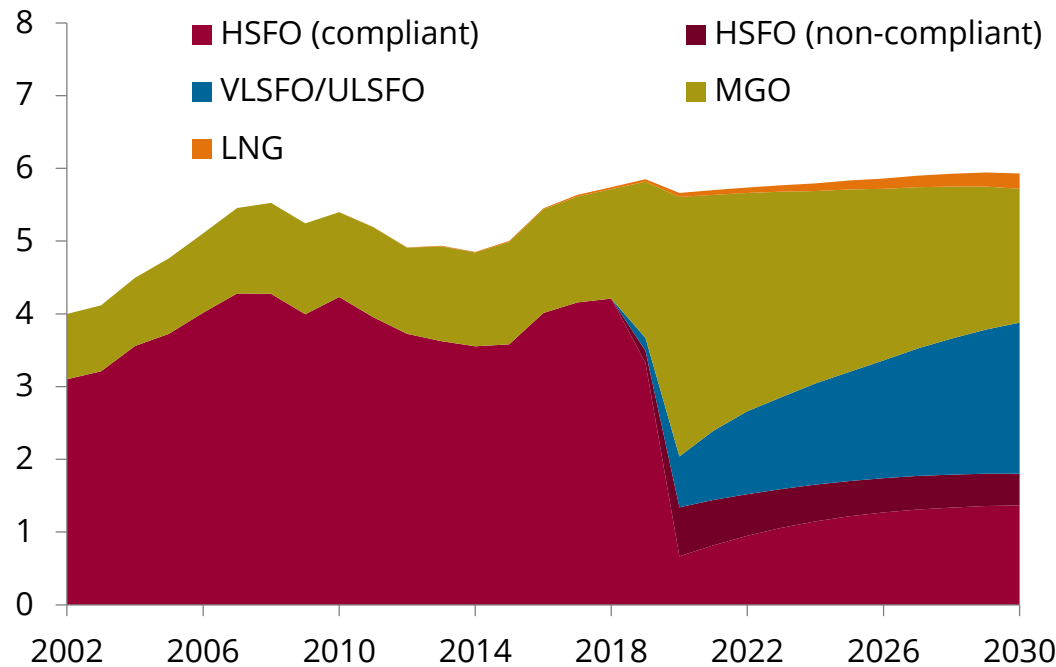
We expect 2.6 mb/d of firm CDU additions by end 2020. Jazan looks complete, apart from the port infrastructure

Note: Cumulative net additions shown on RHA (grey line). Each block of colour represents an individual refinery CDU addition.
Source: Company reports, Energy Aspects

Bad bunker saga (and patent threat) are wrongly writing off VLSFO

Global bunker demand mix forecast

Mb/d



VLSFO supply and demand will rise over time as compatibility issues are managed

From Panama to Singapore, off-spec bunkers have caused mechanical problems on hundreds of ships. Rumours that US shale oil is at least partly to blame.

The 'bad bunker' saga has prompted speculation that many shipowners will steer clear of VLSFO

But we expect VLSFO demand to average 1 mb/d in 2020—with upside.

Patents filings suggest the majors are confident about VLSFO prospects.

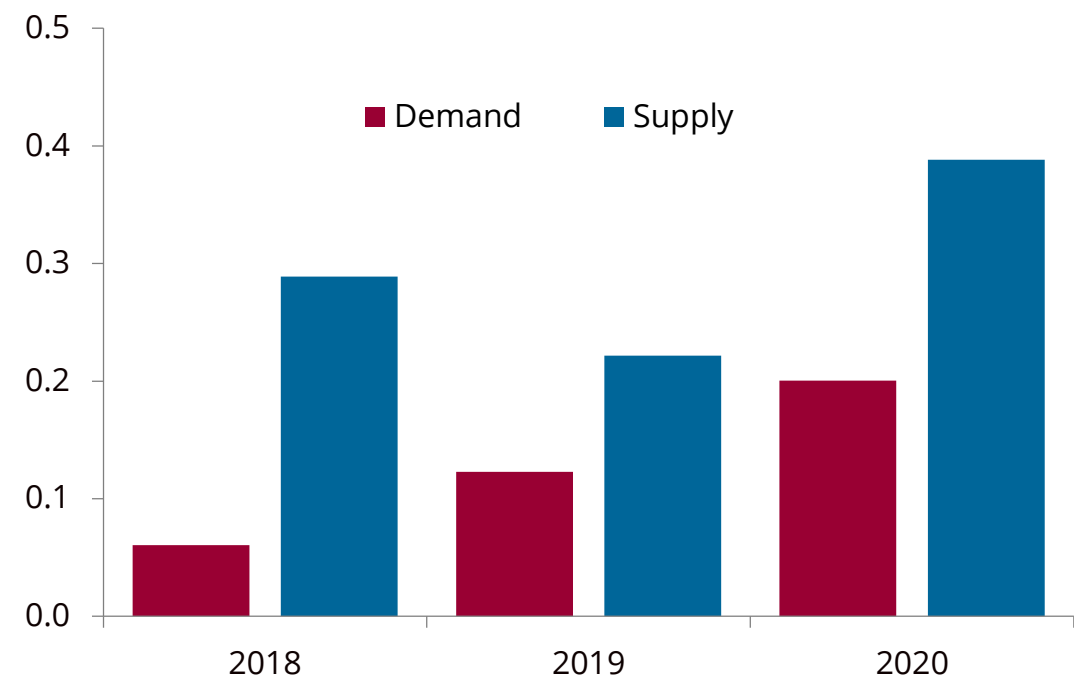
The patents are likely an attempt to encourage refiners elsewhere in the world to licence the recipes/processes in order to service customers demanding, for example, 'Exxon-compatible' VLSFO.

We see little chance of patent holders successfully pursuing infringement actions.

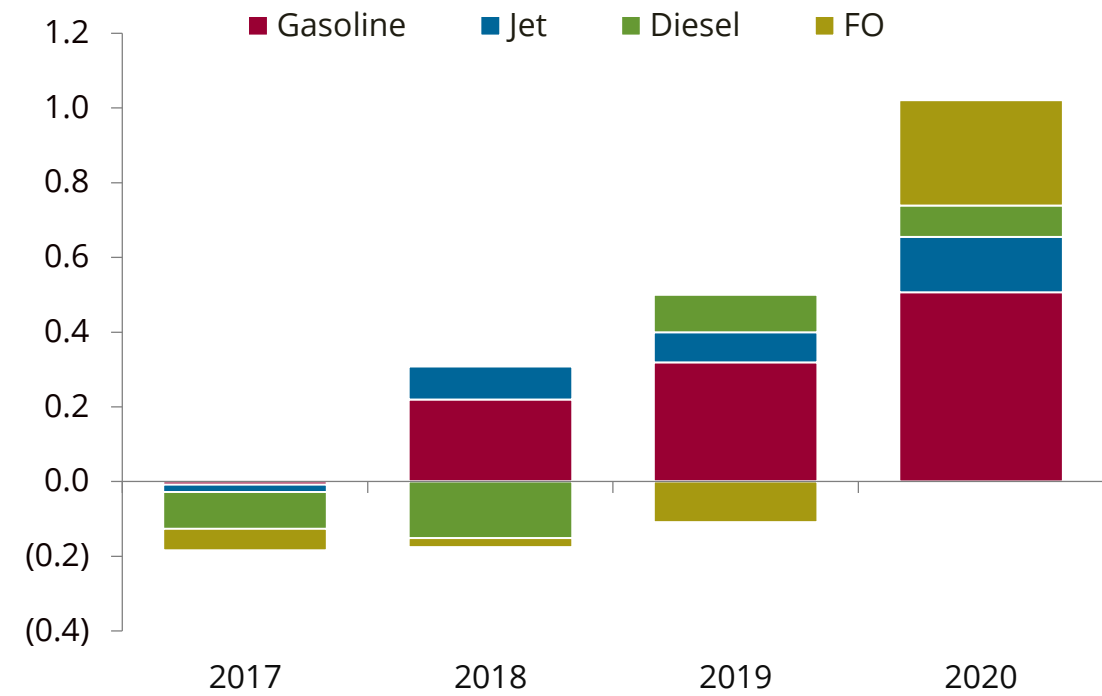
There is therefore little risk of refiners scaling back their VLSFO production intentions.

Gasoline oversupply will free up LSVG0 for VLSFO production

Gasoline demand/supply growth, y/y
Mb/d



Implied stock build/draw, by product
Mb/d



Crude slate changes have overwhelmed the global refining system

Gasoline oversupply increasingly looking like the 'solver' to IMO 2020

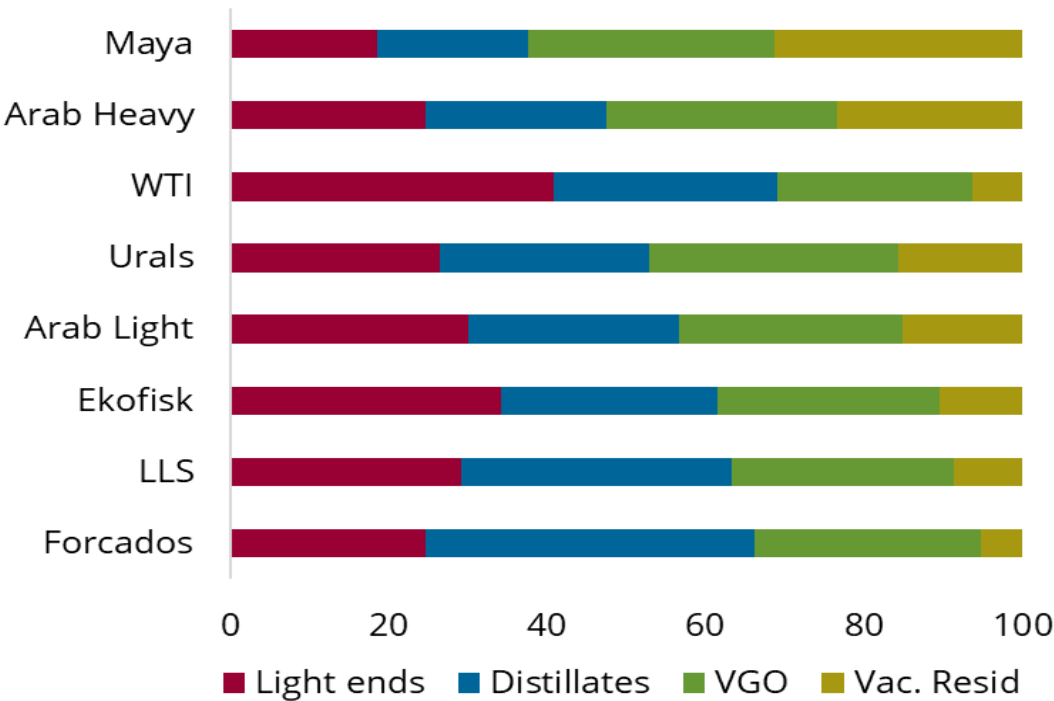
Source: Company reports, Energy Aspects



Crude pricing

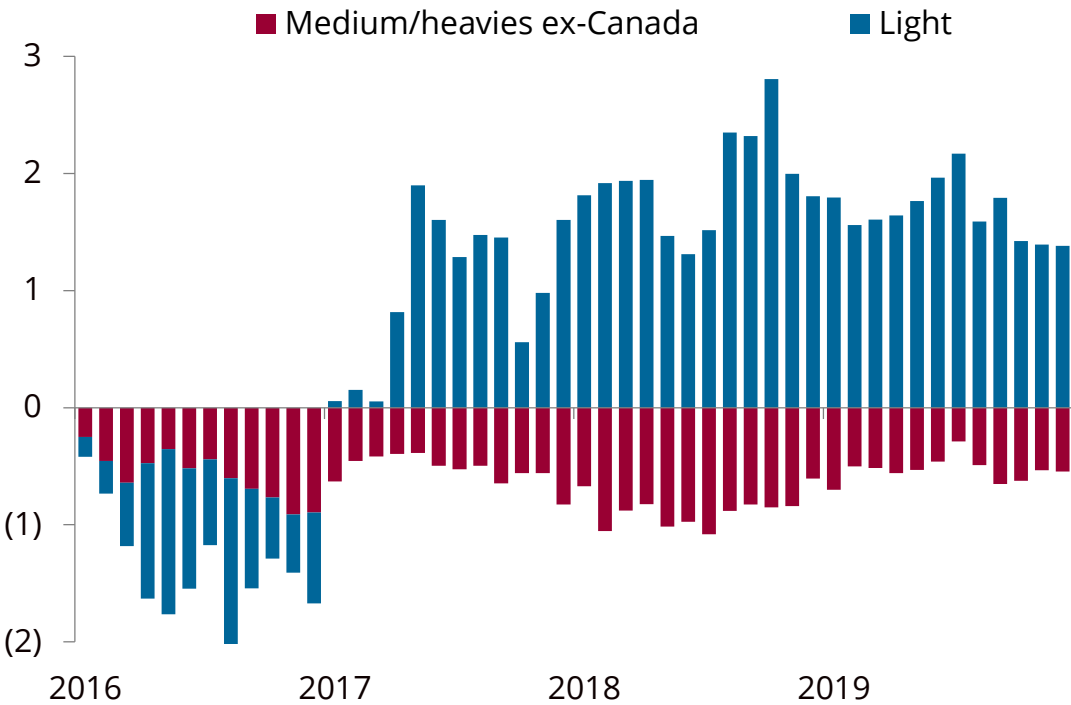
Distillate cuts as important as sulphur

Distillate cuts by crude
% vol.



Producers offering distillate-rich crudes with low levels of sulphur in their VTBs will be handsomely rewarded

Light vs heavy global supply growth, y/y
Mb/d

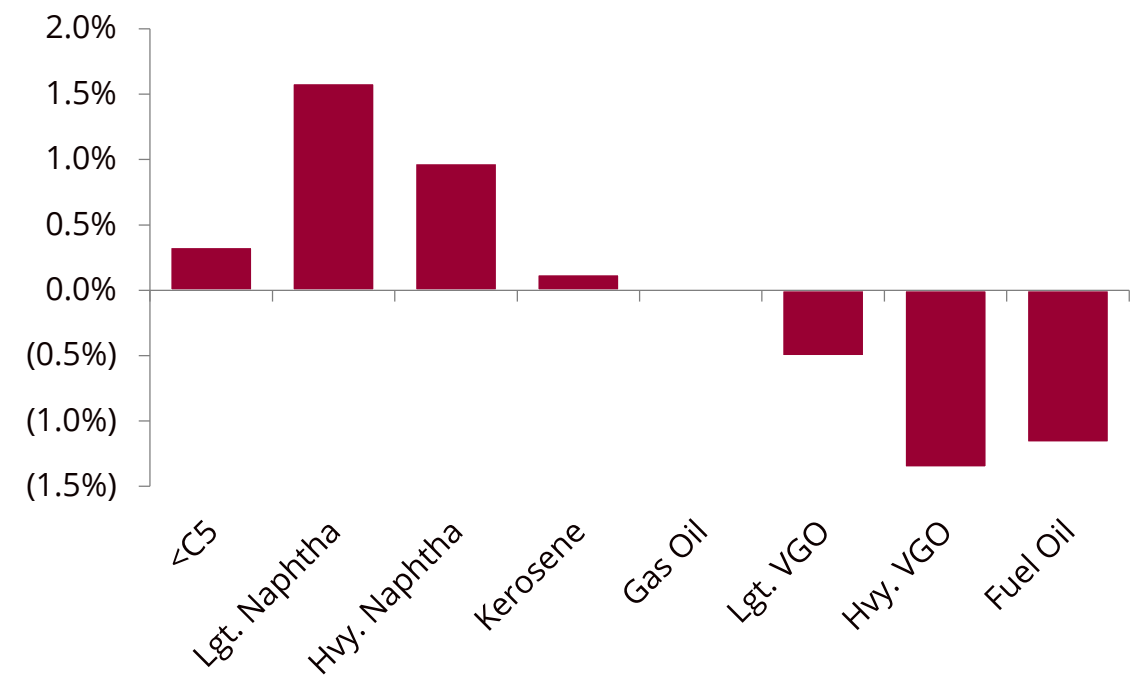


Light sweet crudes are not necessarily distillate-rich, with the naphtha cut rising amidst growing shale volumes

Source: Company reports, Energy Aspects

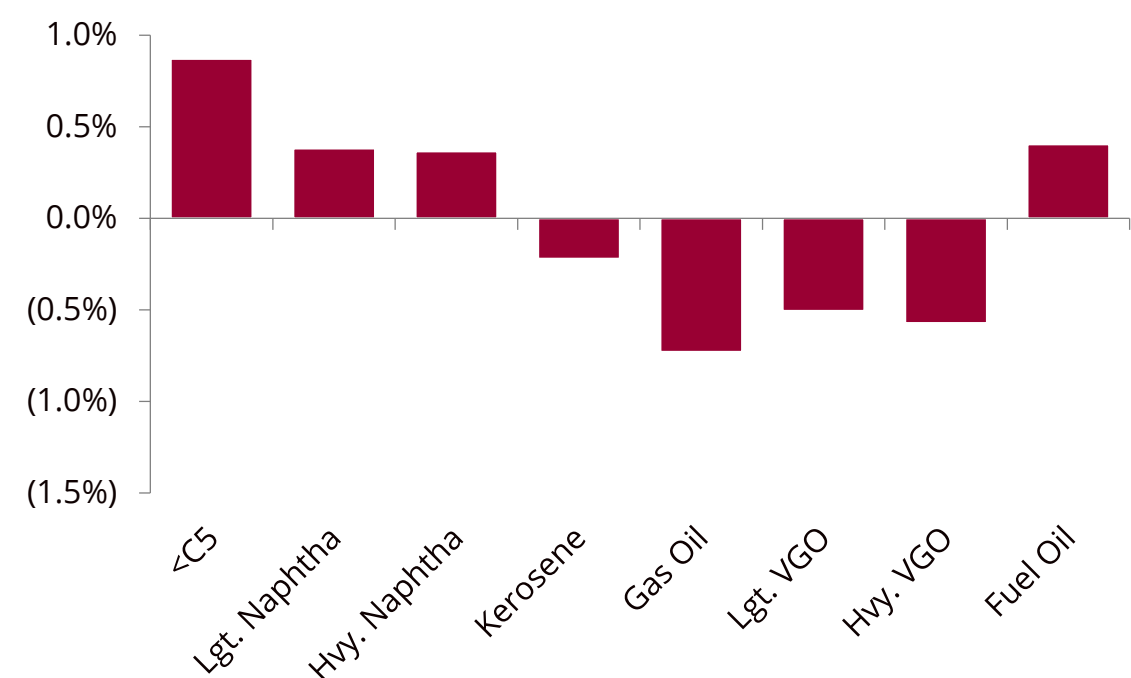
Crude slates getting structurally lighter

UK crude import yields, Q4 18 y/y ch.
By cut



Light and heavy naphtha cuts expanding at the expense of middle distillates...

France crude imports, Q4 18 y/y ch.
By cut

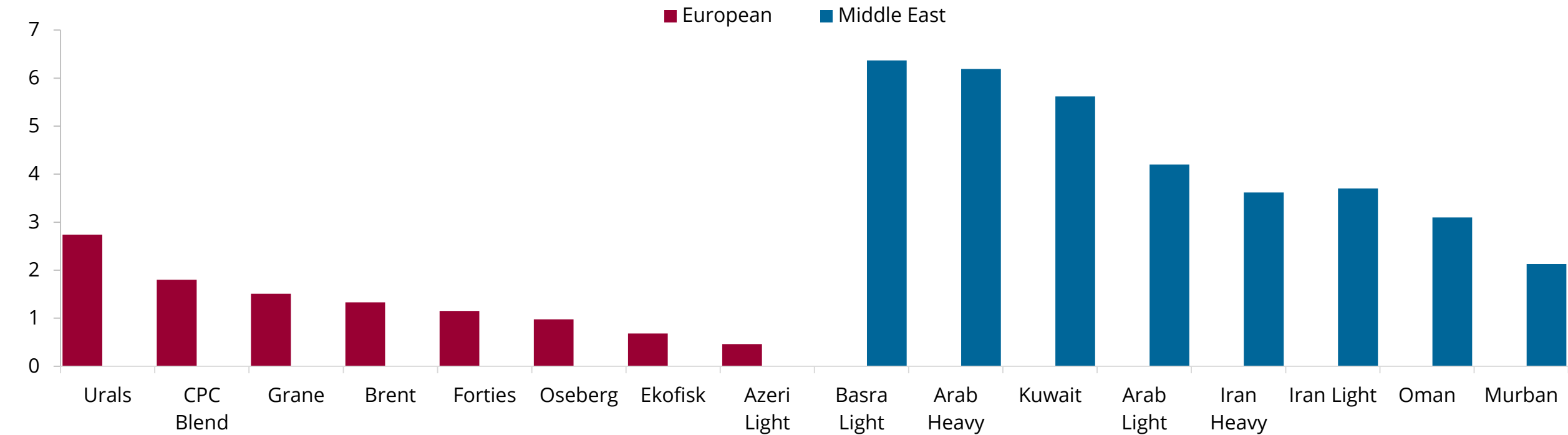


...as European imports are already indicating from a changing crude slate

Source: Company reports, Energy Aspects

VGO hydrotreating also takes on greater importance

VTB sulphur content in European and Middle East crudes
% wt

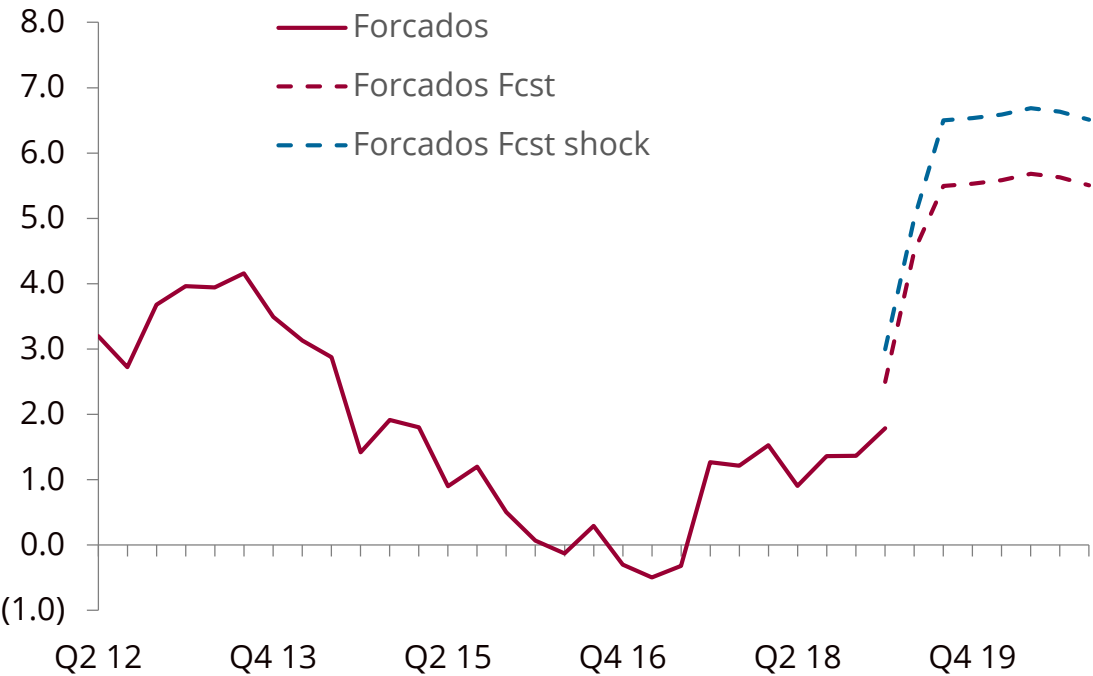


Low sulphur VGO is a prime candidate for blending down high sulphur components to make VLSFO. North Sea crudes are better placed than those in the Middle East.

Source: Company reports, Energy Aspects

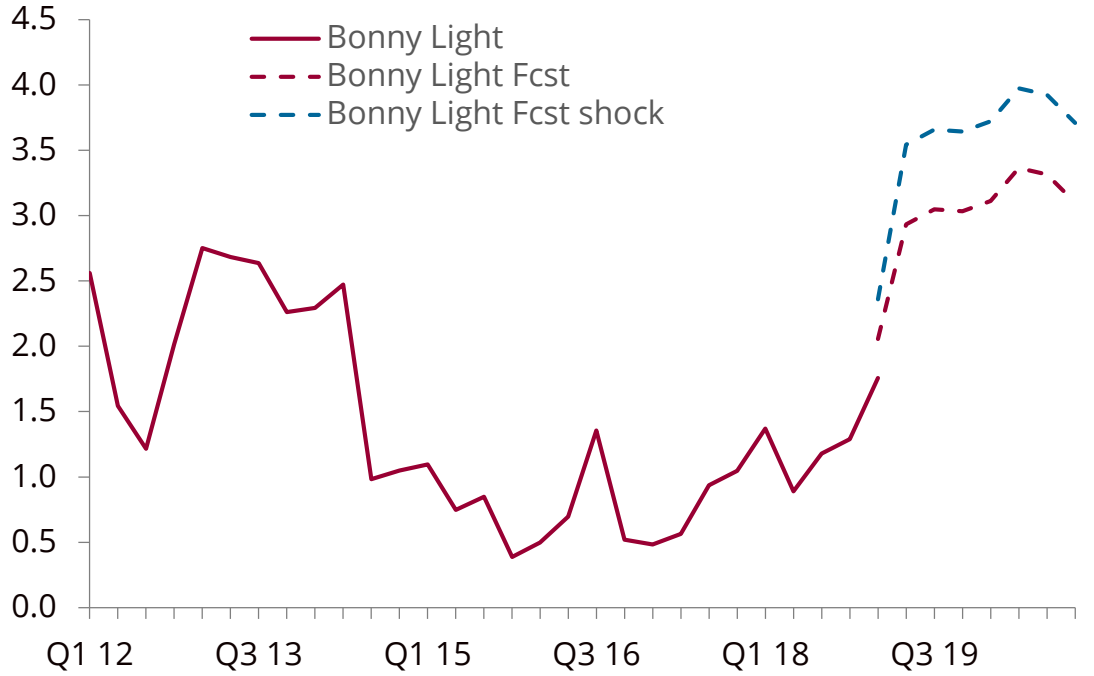
Crude differentials will need to do a lot of work

EA Forcados crude differentials
vs dated, \$/b



Distillate-rich Forcados and Bonga will be in high demand...

EA Bonny Light differentials
vs Dated, \$/b



...likely pushing differentials to multi-year highs

Source: Argus media group, Energy Aspects

DISCLAIMER

This publication has been prepared by Energy Aspects Ltd ('Energy Aspects'). It is provided to our clients for information purposes only, and Energy Aspects makes no express or implied warranties as to the merchantability or fitness for a particular purpose or use with respect to any data included in this publication

Prices shown are indicative and Energy Aspects is not offering to buy or sell or soliciting offers to buy or sell any financial instrument

Without limiting any of the foregoing and to the extent permitted by law, in no event shall Energy Aspects, nor any of their respective officers, directors, or employees have any liability for (a) any special, punitive, indirect, or consequential damages; or (b) any lost profits, lost revenue, loss of anticipated savings or loss of opportunity or other financial loss, even if notified of the possibility of such damages, arising from any use of this publication or its contents

Other than disclosures relating to Energy Aspects, the information contained in this publication has been obtained from sources that Energy Aspects believes to be reliable, but Energy Aspects does not represent or warrant that it is accurate or complete. Energy Aspects is not responsible for, and makes no warranties whatsoever as to, the content of any third-party web site accessed via a hyperlink in this publication and such information is not incorporated by reference

The views in this publication are those of the author(s) and are subject to change, and Energy Aspects has no obligation to update its opinions or the information in this publication. The analyst recommendations in this publication reflect solely and exclusively those of the author(s), and such opinions were prepared independently of any other interests, including those of Energy Aspects and/or its affiliates. This publication does not constitute personal investment advice or take into account the individual financial circumstances or objectives of the clients who receive it. The securities discussed herein may not be suitable for all investors. Energy Aspects recommends that investors independently evaluate each issuer, security or instrument discussed herein and consult any independent advisors they believe necessary. The value of and income from any investment may fluctuate from day to day as a result of changes in relevant economic markets (including changes in market liquidity). The information herein is not intended to predict actual results, which may differ substantially from those reflected. Past performance is not necessarily indicative of future results

This communication is directed at, and therefore should only be relied upon by, persons who have professional experience in matters relating to investments

© Copyright Energy Aspects Ltd (2019). All rights reserved.

No part of this publication may be reproduced in any manner without the prior written permission of Energy Aspects



Energy *Aspects*

London | New York | Houston | Singapore