



# LOWER EMISSIONS PARTNER

A CLEAR VISION TO A LOWER EMISSIONS MARINE  
INDUSTRY WITH OUR SUITE OF SOLUTIONS

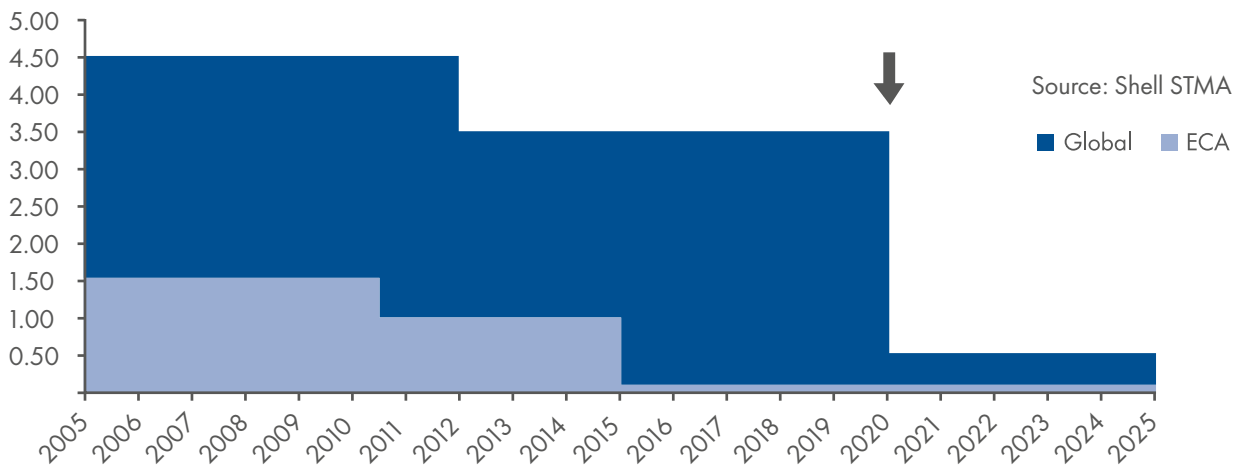


## LIFE AFTER IMO 2020: EMISSIONS REDUCTIONS CONTINUE

In 2016, the International Maritime Organization (IMO) announced that the effective date for the reduction of marine fuel sulphur will be 2020. Under the new global cap, ships will have to use marine fuels with a sulphur content of no more than 0.50%S against the current limit of 3.50%S in an effort to reduce sulphur oxide emissions. The Emission Control Areas (ECAs) will remain at the 2015 standard of 0.10%S content.

In addition, in 2018, the IMO agreed on its initial international shipping greenhouse gas (GHG) reduction strategy, setting out a vision to decarbonise shipping as soon as possible this century. This vision is supported by specific ambitions to improve the energy efficiency of new ships, reduce the carbon intensity of shipping by 40% by 2030, and make total GHG reductions of 50% by 2050 (both compared to 2008 levels).

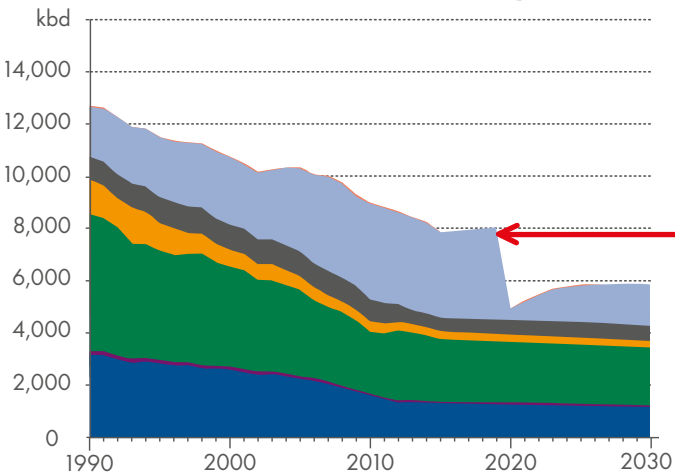
Sulphur limit pc



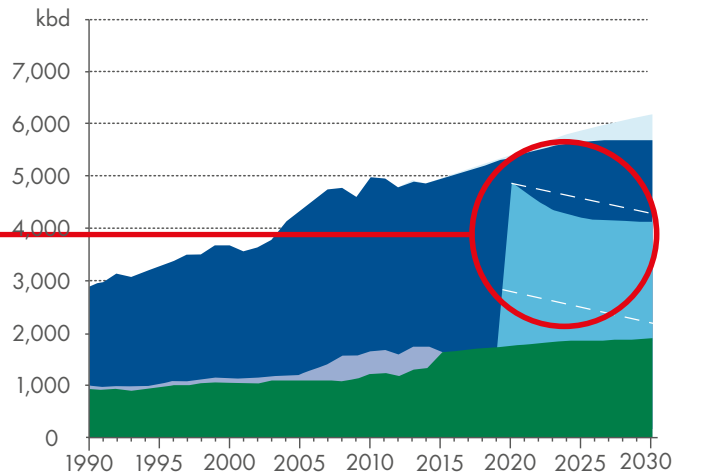
## WHY IT MATTERS

The transition to 0.50%S will cause more changes to the global marine industry than the switch to the 0.10%S fuel in the ECAs. The impact of this transition represents approximately 75% of the global marine fuel demand when compared to the demand of ECA. The demand profile of marine gasoil (MGO) and very low sulphur fuel oil (VLSFO) will depend upon compatibility and availability of VLSFO, while demand for high sulphur fuel oil (HSFO) will depend upon scrubber penetration. In addition, fuels such as LNG and bio blends will be needed to meet the IMO's ambition.

Global Residual Fueloil Demand by sector



Bunker Demand



- Industrial
- ResComPub
- Transport
- Non-Energy
- Own Use
- Power Generation
- Bunkers

- Natural Gas
- MFO 0.5
- RFO: HS
- Gasoil/Diesel (Exd Bio Diesel)
- RFO: LS
- Bio Bunker

Source: Shell Trading Market Analysis (STMA)

## SHELL IS READY TO BE YOUR 2020 FUEL SUPPLIER

- It is expected that demand for HSFO, currently three million barrels per day, will predominantly switch to 0.50%S.
- There will be large variability in fuel quality which can impact compatibility and handling of fuel on board vessels.
- Our experience in creating our 0.10%S ULSFO enables us to produce compliant, fit for purpose, low-sulphur fuels.
- We have partnered with ship owners to trial Shell's VLSFO, providing support during the voyage to increase understanding of compatibility and handling.
- We can provide handling guidelines to help our customers manage compatibility of Shell VLSFO fuel.
- We have a full suite of fuel solutions to help customers meet IMO 2020 requirements.
- LNG fuel can help ship owners and operators meet emissions regulations, as it contains virtually no sulphur, and offers reduced NOx and PM emissions. Shell LNG can also help reduce GHG emissions in shipping.

## SHELL FUEL AVAILABILITY

The table below shows general specification and availability for fuel products. Please approach the corresponding account manager for more information.

	HSFO				VLSFO	ULSFO	MGO	
	RME 180	RMG 380	RMK 500	RMK 700	0.50%S (2020)	<0.10%S	<0.10%S	0.50%S (2020)
<b>AMERICAS</b>								
Montreal & St Lawrence	■	■			■	■	■	■
Sarnia	■	■	■				■	■
New York	■	■	■	■	■	■	■	■
Freeport		■			■		■	■
Nassau		■					■	■
New Orleans		■			■		■	■
Houston		■	■		■		■	■
Vancouver	■	■					■	■
Baltimore		■					■	■
<b>EUROPE</b>								
Rotterdam		■*	■	■	■	■	■*	■
Antwerp			■	■	■	■		■
Barcelona					■		■	■
Piraeus		■	■		■		■	■
Danish Strait					■		■	■
<b>MIDDLE EAST + SOUTHERN AFRICA</b>								
Fujairah					■			■
Durban	■				■			■
Richards Bay	■				■			■
Mauritius	■	■			■		■	■
<b>ASIA</b>								
Singapore		■	■		■		■	■
Hong Kong		■	■				■	■

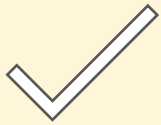
\* Ex-wharf business only

Find your contact person for Marine Bunkers in our global ports:

[www.shell.com/business-customers/marine/contact-shell-marine/fuel.html](http://www.shell.com/business-customers/marine/contact-shell-marine/fuel.html)

# LNG CAN ALSO HELP YOU TO REDUCE GLOBAL AND LOCAL EMISSIONS TODAY

## BENEFITS



**READILY AVAILABLE**



**CLEANER**

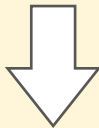


**COST COMPETITIVE**



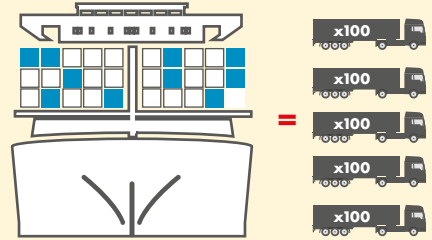
**MEETING CURRENT AND FUTURE EMISSIONS REGULATIONS**

## WELL-TO-WAKE EMISSIONS



**21%\***

LNG as a marine fuel can help reduce **well-to-wake greenhouse gas emissions by up to 21%\***



Equivalent to **500 heavy duty trucks removed from the road for a single trip.**

\* Thinkstep, Greenhouse Gas Intensity of Natural Gas prepared for Natural & Bio Gas Vehicle Association (NGVA) Europe, V1.0, 05/05/2017 for ship and truck WtW savings. One example of emissions reduction using one large high pressure 2-stroke engine. Unburned methane in the exhaust (methane slip) has higher GHG impact than fuel completely combusted to CO<sub>2</sub>.

## LNG has **lower local emissions (SO<sub>x</sub>, PM, NO<sub>x</sub>) vs heavy fuel oil in marine engines\***



Natural gas emits virtually **zero SO<sub>x</sub>**



Natural Gas combustion produces **90% lower emissions** from particulates than traditional marine fuels

\*Significantly reduced NO<sub>x</sub> depending on tier 1/2/3 engine: Particle- and Gaseous Emissions from an LNG Powered Ship; M. Anderson, K. Salo, E. Fridell; Environ. Sci. Technol. 2015, 49, 12568-12575

## SHELL OFFERS A FULL PORTFOLIO OF LUBRICANTS

### TWO-STROKE ENGINES

The Shell Alexia portfolio of high-performance cylinder oils is designed to cover all operating conditions. The technical DNA of Shell Alexia is underpinned by our rigorous scientific understanding of oil stress and proven performance in the field.

Introducing Shell Alexia 40 – a low-speed, two-stroke diesel cylinder oil designed to help you meet the IMO 2020 global fuel sulphur cap. With proven technology to provide reliable protection for engines using ultra-low sulphur fuel (0.10%) and very low-sulphur fuel (0.50%).

	Base number (BN)	SAE Engine viscosity grade	Fuel
Shell Alexia 25	25	50	0.10% sulphur fuel, Emission Control Areas and liquefied natural gas (LNG)
Shell Alexia 40	40	50	0.10% sulphur and 0.50% sulphur fuel
Shell Alexia 70	70	50	High sulphur and fuel oil* + scrubber
Shell Alexia 100	100	50	High sulphur and fuel oil* + scrubber
Shell Alexia 140	140	60	High sulphur and fuel oil + scrubber

\*0.50% sulphur fuel (if needed for cleanliness)

### FOUR-STROKE ENGINES

The Shell Argina and Shell Gadinia ranges of products are optimised to deal with the faster viscosity increase and BN depletion experienced by oils in the latest medium-speed engines. For vessels fuelled by LNG, Shell offers a range of Shell Mysella products.

### TECHNICAL SERVICE SOLUTIONS

Shell offers a range of technical solutions to help customers manage the transition to be IMO 2020 compliant as safely, efficiently and cost-effectively as possible.

#### **SHELL LUBEMONITOR:** Monitoring services to ensure engine performance during fuel transition.

Switching fuel can have a severe impact on your engine's performance. Shell LubeMonitor can help customers to understand engine performance during the transition to a low-sulphur fuel. The service is designed to monitor two- and four-stroke marine engine performance. It includes access to Shell tools and advice to help customers strike and maintain an acceptable balance between oil costs and maintenance expenses.

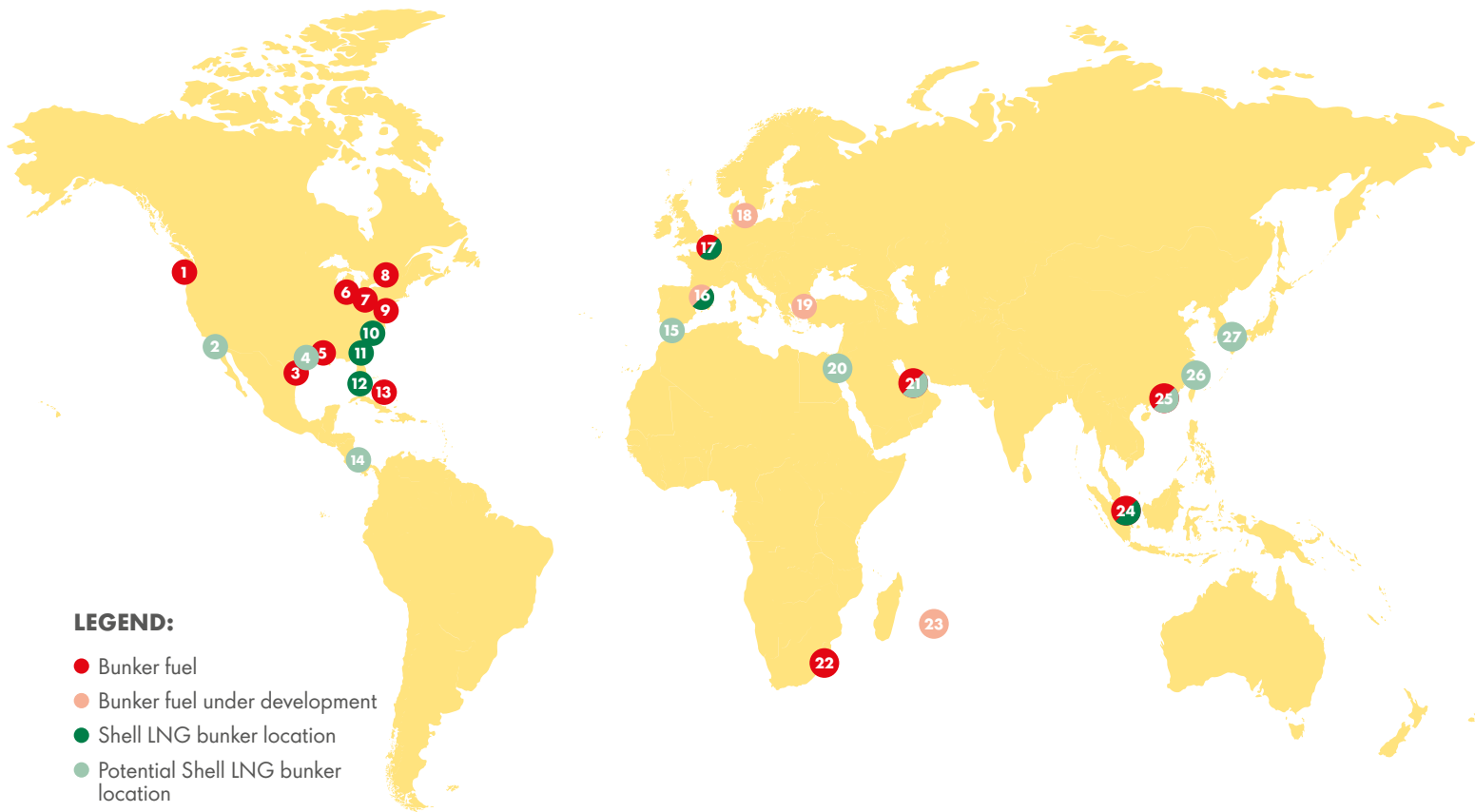
#### **SHELL LUBEADVISOR:** Expert guidance and transition planning

Shell LubeAdvisor can help customers with:

- Getting the right lubricant for the planned or the fuel in use
- Understanding fuel quality and compatibility
- Onboard testing of fuel
- Step-by-step vessel transition planning

## GLOBAL SHELL MARINE NETWORK

In line with growing customer demand, Shell is investing in its bunkering portfolio and infrastructure. In addition, our lubricants port network is available in: **700+ PORTS ACROSS 61 COUNTRIES.**



### THE AMERICAS

- 1 Vancouver
- 2 West Coast (LA/LB)
- 3 Houston
- 4 US Gulf Coast
- 5 New Orleans
- 6 Sarnia
- 7 Baltimore
- 8 Montreal
- 9 New York
- 10 US East Coast
- 11 Savannah
- 12 South Florida
- 13 Freeport
- 14 Panama

### EUROPE

- 15 Gibraltar
- 16 Barcelona
- 17 Rotterdam/Antwerp
- 18 Danish Strait
- 19 Piraeus

### MIDDLE EAST

- 20 Middle East
- 21 Fujairah/Dubai




### AFRICA

- 22 Durban, Richards Bay
- 23 Mauritius

### ASIA

- 24 Singapore
- 25 Hong Kong
- 26 Shanghai
- 27 Busan

## SHIP OWNERS WILL HAVE A NUMBER OF CHOICES OF HOW TO COMPLY WITH THE SULPHUR SPECIFICATIONS

0.10%S / 0.50%S Fuel Oil	0.10%S / 0.50%S MGO / DMA / GTL	Scrubber New/Retrofit	LNG
			
<ul style="list-style-type: none"> <li>■ Minimise operational difficulty and cost</li> <li>■ Variability of quality of blends per supplier</li> <li>■ Only a few suppliers can offer reliable supply</li> </ul>	<ul style="list-style-type: none"> <li>■ Convenient and widely available</li> <li>■ Operational experience in industry</li> <li>■ Higher cost</li> <li>■ Thermal shock and lubricity issues</li> </ul>	<ul style="list-style-type: none"> <li>■ Cheaper fuel and quick payback</li> <li>■ Acquiring operating experience</li> <li>■ Ship stability and space</li> <li>■ Safe sludge handling and disposal necessary</li> </ul>	<ul style="list-style-type: none"> <li>■ Proven technology and reduction SO<sub>x</sub>, NO<sub>x</sub> and PM</li> <li>■ Lower GHG emissions</li> <li>■ Growing availability</li> <li>■ Cost advantage to MGO/DMA</li> </ul>
Shell will supply differentiated VLSFO	MGO/DMA will remain key products for Shell	Shell can supply HSFO 3.50%	Shell is an innovation leader in LNG
LUBRICANTS FOR CROSSHEAD DIESEL ENGINES (2 STROKE)			
Shell Alexia 25, 40	Shell Alexia 25	Shell Alexia 70, 100, 140	Shell Alexia 25
LUBRICANTS FOR TRUNK PISTON ENGINES (4 STROKE)			
Shell Argina S2, S3	Shell Gardinia S3	Shell Argina S3, S4, S5	Shell Mysella S3 N, S5 N

## LOOKING TOWARD THE FUTURE: BIO INITIATIVE



Shell has also developed bio blends for marine fuels that:

- Lowers CO<sub>2</sub> emissions
- Improves combustion quality
- Contains components from renewable sources



FOR QUESTIONS OR MORE INFORMATION, PLEASE REFER TO OUR WEBSITE:  
**[www.shell.com/marine](http://www.shell.com/marine)**

---