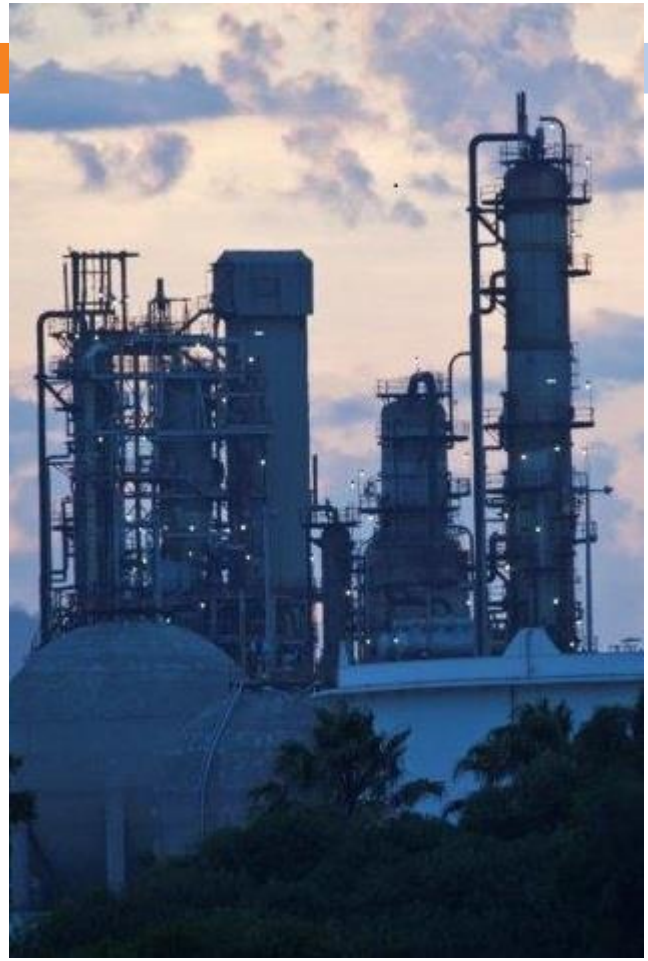


SAPIA

IMO 2020

July 2019

sapia | South African Petroleum Industry Association

About SAPIA

The South African Petroleum Industry Association (SAPIA) represents the collective interests of the South African petroleum industry. The Association plays a strategic role in addressing a range of common issues relating to the refining, distribution and marketing of petroleum products, as well as promoting the industry's environmental and socio-economic progress. SAPIA fulfils this role by contributing to the development of regulation in certain areas of South African policy; proactively engaging with key stakeholders; sharing research information; providing expert advice; and communicating the industry's views to government, members of the public and the media.

Presentation outline

1. Liquid Fuels Sector
2. GHG Emissions – context
3. IMO Sulfur Cap
4. Bunker quality
5. Summary

Liquid Fuels Sector

The liquid fuel sector is well developed across the value chain with significant infrastructure, a broad range of products and a wide range of consumers. The products are important to the overall energy requirement of the country and the sector is highly regulated

Economic contribution

The oil industry contributed **8.9%** RSA's 2014 GDP

Supplies **18%** of South Africa's primary energy needs through annual sales of **27 billion litres** of liquid fuels

Government participation

The Department of Energy (DOE) is responsible for ensuring the secure and sustainable provision of energy for socio-economic development.

Significant public entities include:

- The Central Energy Fund
- PetroSA
- NERSA – the national energy regulator

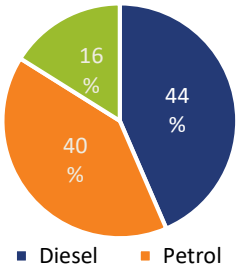
Natural resources

South Africa produces **50%** of its liquid fuel needs from crude oil, **35%** from coal and **5%** from gas.

Proven crude oil and gas reserves are limited so feedstock is imported, whereas the country has large coal deposits

SOUTH AFRICAN FUEL SECTOR

Liquid fuel demand



SA liquid fuel demand currently exceeds refinery production – resulting in SA being a net importer

Refining

6 refineries

- **4** crude oil
- **1** coal-to-liquid fuels and gas-to-liquid fuels
- **1** natural gas to liquid fuels

Transport

Ship

4 ports equipped for crude imports 80% through the SBM at Durban;

7 ports for loading / discharging liquid bulk

Pipe

Pipelines transport **>65%** of all refined products to inland market; **>70%** of all jet fuel consumed at OR Tambo International Airport;

Road & Rail

Well established rail and road networks for fuel distribution to end customers

Consumers

Approximately 4,600 service stations across the country

5 main international airports

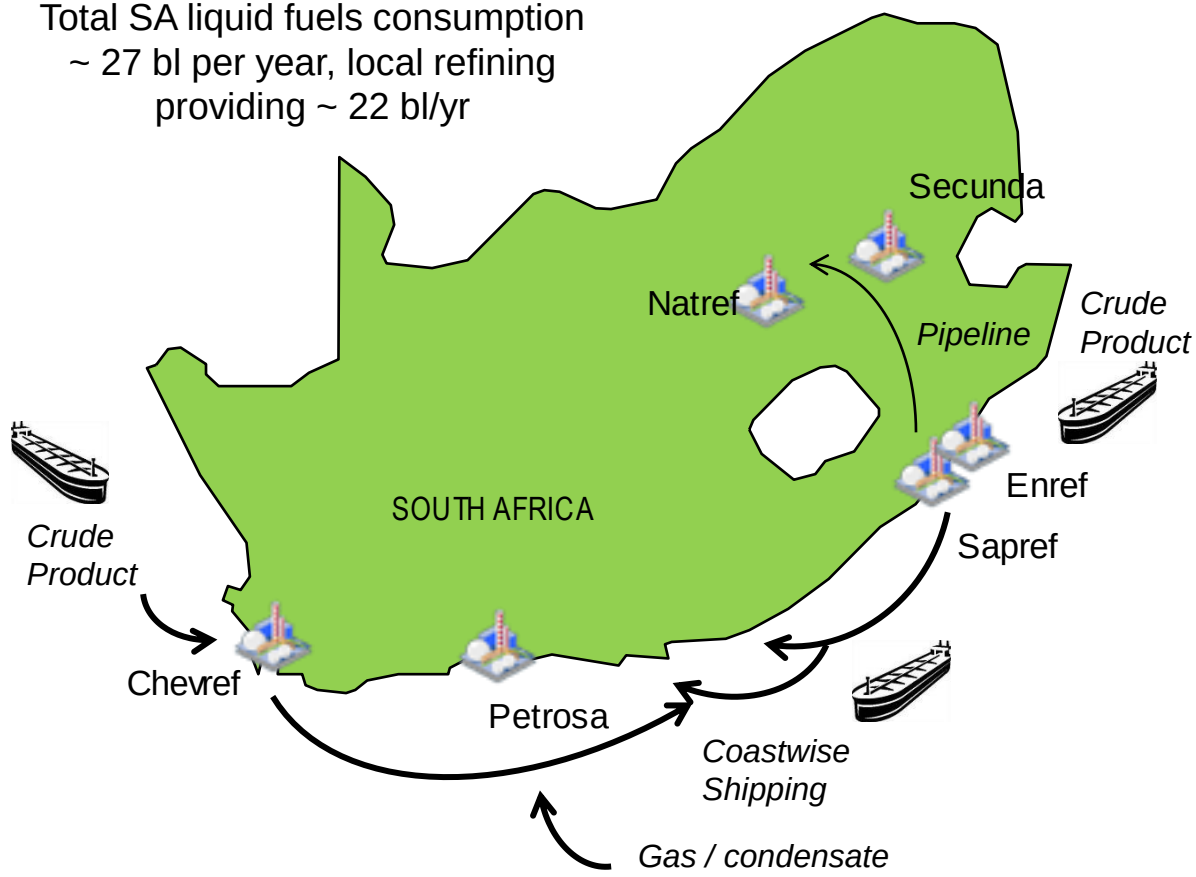
Industrial customers

Economic contribution

ECONOMIC GROWTH	INVESTMENT	BALANCE OF PAYMENTS AND TRADE	CONTRIBUTION TO PUBLIC FINANCES	JOB CREATION AND SKILLS DEVELOPMENT
▪ **8.9%** contribution to SA's GDP (2014) ▪ **Over R 120 Bn** spent on suppliers annually ▪ **27 Bn litres** of liquid fuels sold every year ▪ **18%** of South Africa's primary energy needs provided by liquid fuels	▪ **R 83 Bn** industry investment in South Africa from 2015-2018 ▪ **R 155 Bn** planned industry investment in for 2019-2024 (including Clean Fuels II investment)	▪ **17% (R 1,308 Bn)** of South Africa's imports are crude oil and petroleum products ▪ The sector is the biggest contributor to trade ▪ **Only 3% (R 248 Bn)** of South Africa's exports are crude oil or petroleum products	▪ **~R 110 Bn** on duties and levies collected by SAPIA members on behalf of government in 2017 ▪ **Additional R 1 Bn** generated by petroleum product excise duties in 2017 ▪ **Income Tax** payable to Treasury in 2017 ~R 4bn	▪ **~8,000** direct jobs in South Africa (Service stations ~ 70 000) ▪ Total direct / indirect and induced employment est ~750 000 ▪ **83%** of jobs are managerial and skilled jobs in 2018 ▪ Highly skilled sector supporting institutions of higher learning ▪ **R 6 Bn** spent on salaries per annum ▪ **R 537 Mn** spend In training (2015 - 2018)

Refining in SA

Total SA liquid fuels consumption ~ 27 bl per year, local refining providing ~ 22 bl/yr



Crude Oil Refineries	Nameplate bbl/day
Sapref	180 000
Enref	135 000
Chevref	100 000
Natref	108 000
	523 000
Synfuels Refineries	**Nameplate bbloe/day**
Secunda	150 000
PetroSA	45 000
	195 000
	718 000

Petrol Imports	**~ 1 bl per year**
Diesel Imports	**~4 bl per year**

South Africa has the largest refining capacity in Sub Saharan Africa

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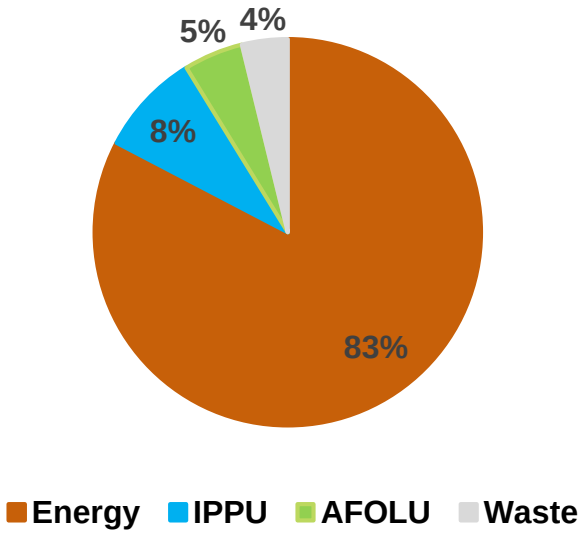
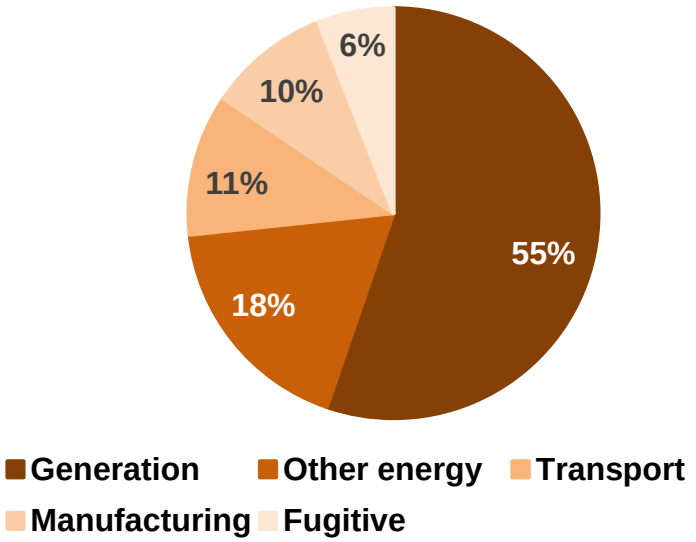
GHG Emission - context

2010 SA GHG Emissions by IPCC sector



2010 GHG Emissions breakdown of the energy sector



- Africa responsible for ~4 % of total global CO_2 emissions (South Africa contribution 39%). Total SA GHG emissions for 2010 - 518 239 kT CO_{2e} (2010)
- For South Africa transport emissions (road, rail and aviation) comprise 9.2% of total emissions (14% internationally)
- Emissions from maritime activities have been estimated to be 0.3% of SA emissions – globally maritime emissions estimated at 2% of total GHG emissions

Source: SA GHG Inventory 2010; IPCC

GHG regulatory framework

- April 2017 : Mandatory GHG reporting regulations gazetted under NEMA:AQA
- June 2017 : Declaration of certain GHGs as priority pollutants with requirement to submit a pollution prevention plan
- July 2017 : Regulations concerning submission of PPPs
- February 2019 : passing of Carbon Tax Bill by Parliament
  - Carbon Tax Act effective from 1 June 2019
  - Headline carbon tax at R/t 120 with a number of allowances
  - Already effective in terms of fuels – petrol and distillates (diesel, MGO, MDO)
- Development of climate change bill in process
  - Presently under discussion in NEDLAC
- Number of outstanding issues related to both GHG reporting and the carbon tax and its implementation

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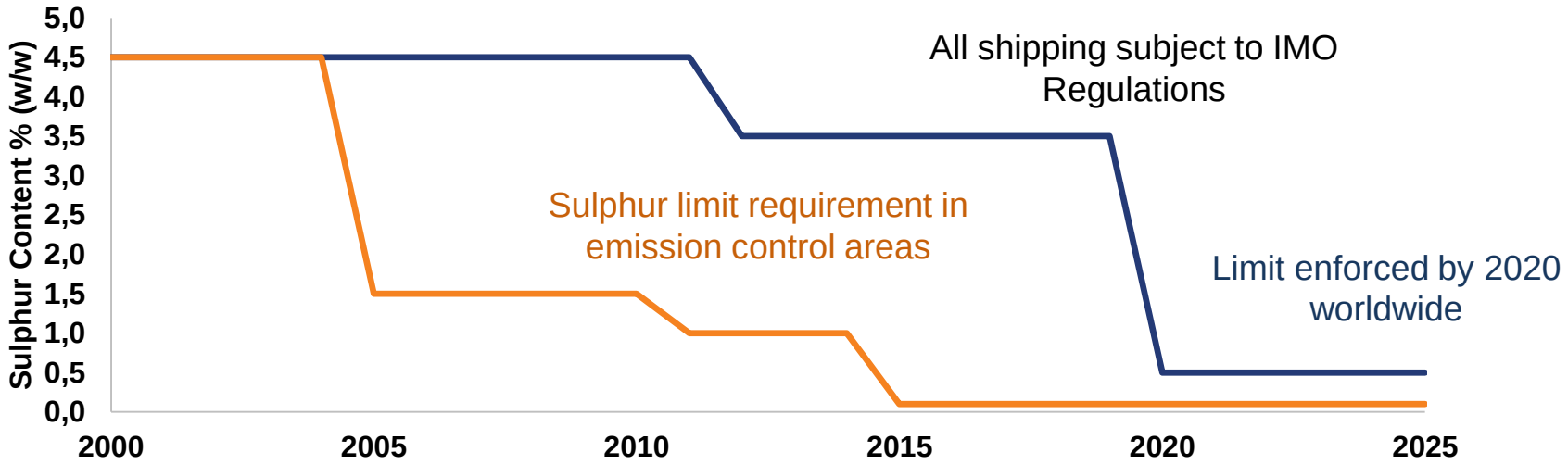
Sulphur Cap history

Sulphur cap of fuel oil used on board ships – MARPOL Annex VI Reg 14



- Annex VI adopted in 1997 – prevention of air pollution from ships and to limit SOx, NOx, ODS and VOCs (later included energy efficiency)
- S14 (1) regulates the sulphur used on board ships
- MEPC 70 : sulphur cap of 0.5% from 1 January 2020 was mandated
- Decision based after studies to assess the fuel oil availability
  - Two studies conducted one funded by the IMO and the other IPIECA and others off same terms of reference

Studies' outcomes

- The two studies reached very different conclusions
- CE Delft / Stratas consortium;

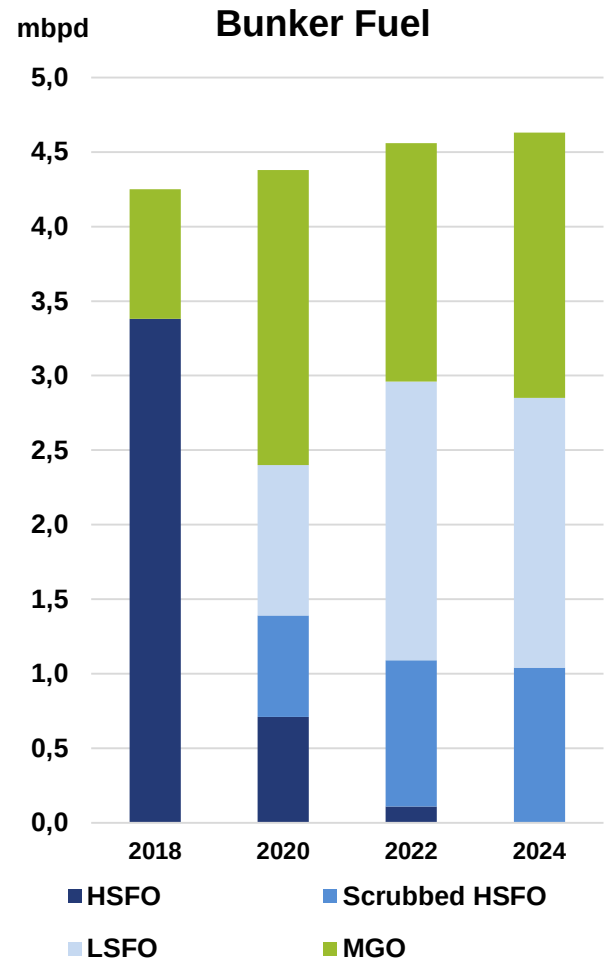
  ….results indicate that the refinery industry can produce sufficient amounts of marine fuels of the required quality ….while at the same time supplying other sectors with the petroleum products they require…

- EnSys and Navigistics;

  …results point to extreme difficulty…for the refining sector to supply the needed fuel under the Global Sulphur Cap and to simultaneously meet all other demand without surpluses or deficits. Market impacts are projected as very substantial across all products and regions worldwide…and, potentially significant impacts across economies and sectors…

Source: IPIECA / MEPC 70-5-3 / MEPC 70-5-6

What does this mean for bunkers?



Source: IEA, SAPIA

- Shift from high sulphur fuel oil to more expensive low sulphur fuel oil / distillates (MGO)
- Shipper options
  - Scrubbers – to meet emissions regulations
    - But installation est. <30% of the fleet
  - Purchase compliant fuel – 85% compliance
  - Conversion to LNG - unlikely in short term
  - Cheat !
- Refiners response
  - Increased distillate production for bunkers
  - Crude slate changes – shift to sweet crudes
  - Increased conversion unit utilization
  - Minor investment – stream rerouting
  - Investment for HFO destruction

Implications of the cap

- Upward pressure on oil prices
  - Middle distillate cracks expected to increase sharply later this year, peak in 20 / 21 and then decline
    - Major implications for all diesel users
  - Gasoline cracks expected to widen but not as much
  - Low sulphur / high sulphur crude spreads widen
  - Higher freight costs will widen inter – regional arbitrage differentials
- Other implications
  - Expected increase in crude runs to satisfy distillate demand and with widening sweet / sour spreads – crude prices will rise
  - Complex refiners expected to experience wind fall
  - Increase shipping and oil prices may push world into recession

Source: Platts, Wood Mackenzie, Argus

Winners and Losers

Winners

- Public health
  - Reduction in SOx and PM emissions
- Power generation
  - Switch to HSFO from gas or thermal coal in countries with less stringent emissions regulations
- Oil refiners
  - Margin increase due to wider distillate / gasoline crack spreads
- LNG
  - New ship builds based on LNG
- Ships equipped with scrubbers

Losers

- Consumers
  - Consumer goods due to freight costs
- Aviation and road haulage
  - Increase in crude and distillate prices
- Commodities – agriculture / coal / minerals / metals / oil
  - Arbitrage flows covering long distances
  - Sour crude supplies
- Petrochemicals
  - Middle distillate production impacting naphtha supply

Source: Platts, Wood Mackenzie, Argus

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Sulphur handling

- Sulphur distributed unevenly throughout crude oil with highest levels in the heavier components making up the bulk of residual oils
  - Specific refining to remove sulphur - else it remains in the product
- Residual oil treatment has generally followed two paths worldwide in order to reduce the yield of residual oils and increase that of transport fuels
  - Coking – conversion to solid coke for use in alternate markets
  - Visbreaking – fuel oil viscosity reduction
- Further sulphur reduction possible via hydrodesulphurisation
  - Very expensive and presently uneconomic
- Other alternate routes available typically in conjunction with other units

Fuel Oil / Bunker quality

- Fuel Oil quality is a direct consequence of the type of crude processed and the processing route chosen to upgrade residue
  - South Africa's crude oil diet has been 'sour' – high sulphur crudes from the Middle East
  - From mid 2000's to more 'sweeter' West African grades included to meet for lower sulphur transportation fuels production
    - Result - South African residual fuel oils tends to be high sulphur
    - Processing route means residual fuel oils typically consist of vacuum residue and the residual products from other processes
- Distillate bunker fuels (MDO / MGO) - sulphur quality varies
  - Dependent on each facility and local plant / port logistics
  - But not seen as a major stumbling block to Annex VI implementation (replacement with current diesel quality – road fuels supply impacts ?)

Local Refining Response

- All local manufacturers of bunker fuels have committed to manufacturing IMO 2020 compliant bunker fuels
- This will mean a number of options open to local refiners;
  - Continue to market high sulphur fuel to vessels with scrubbers
  - Replacement of high sulphur residual fuels with distillate material
    - Disposal of HSFO offshore
  - Change the crude diet to provide sweeter crudes for residual oils
    - But requires cut back of distillate material to meet sulphur cap
    - Limited change possible due to refinery designs and availability
  - Modifications within the refinery to route specific streams to bunkers
    - Rebalancing of units required and impact on other fuels production
  - Combination of the above most likely – dependent on each refinery
- Means a range of fuels potentially offered with stability and compatibility of primary focus for buyers and suppliers

Current focus

- Fuel quality aspects that will need attention
  - Flash Point and Pour Point
  - Stability
  - Compatibility
  - Concerns over the emergence of “boutique” fuels
- What can we expect in the real world?
  - 0.50% S demand will likely be met by a mix of components
  - ISO 8217 is considering 0.50% S developments in their next revision cycle
  - PAS 23263 will be released Q3 2019 providing guidance applicable to all 0.50 % S fuels which include; S / Flash / Cold Flow / Stability
  - Traceability of fuels will become increasingly important
  - IMO guidelines on supply clearly state the need to provide assurance along the bunker fuel supply chain:

Source: IPIECA

A change of culture required

- Ship crews will have to become familiar with new fuel rules - understand the product (BDN insufficient)
  - Choose fuels with similar viscosities and densities
  - Store fuels separately until compatibility testing has been carried out
  - Avoid mixing bunker fuels from different sources wherever possible - especially paraffinic with aromatic blended fuels
  - Do not mix straight-run fuel oil with cracked oils
  - Do not mix fuels with greatly dissimilar densities
  - Do not mix a fuel oil with a marine diesel oil or marine gas oil

Source: IPIECA

International Response

- Most majors have announced readiness for IMO 2020, examples

ASTRON ENERGY Ship owners and maritime operators will be supplied through the port of Cape Town with LSFO

bp BP “supports the reduction in air pollution from ships that the global sulphur cap” Range of products available to meet ships’ fuel requirements HSFO / VLSFO / MGO

Shell “has a clear vision into 2020 with our suite of solutions” - MGO / VLSFO / HSFO

Source: Astron Energy; BP; Shell

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Summary

- The 0.5% S cap is set to be enforced from 2020
- IMO 2020 will be disruptive for both refiners and shippers
- Expected price increases and price volatility
  - But market will eventually return to equilibrium at a higher level than before the change
- Concerns by bunkering and ship owning industry on availability, compatibility and stability
  - Significant work going into this area
  - Ship crews will be required to familiar with the new fuels
- Environmental compliance of whatever sort always has cost implications ultimately borne by the consumer

End

Thank you
Dankie
Ngiyathokoza
Ke a leboha
Ke a leboga
Ke a leboga
Siyabonga
Inkomu
Ndo livhuwa
Enkosi
Ngiyabonga