



MANAGING RISK

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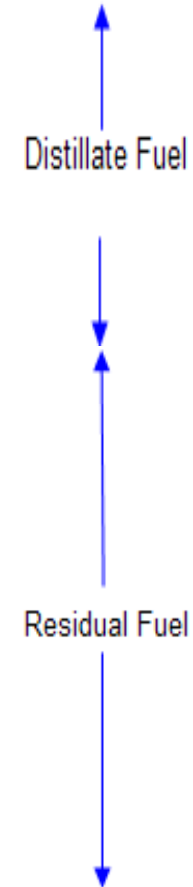
## MARINE FUELS of the FUTURE

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July 8, 9, 2008  
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# MILESTONES in MARINE DIESEL PROPULSION

YEAR	EVENT
1892	Diesel engine patent issued
1911	First diesel powered ship launched Royal Navy converts from coal to Boiler Fuel
1947	"Burning of Boiler Fuel in Marine Diesel Engines", by John Lamb
2005	Marpol Annex VI ratified, established SECA's
2006	Start-up of First SECA (Baltic Sea)
2007	Start-up of Second SECA (North Sea / English Channel)
2008	Unanimous recommendation of IMO Annex VI Expert Group on future emission limits



# EVOLUTION of INTERNATIONAL SPECIFICATIONS

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YEAR	SPECIFICATION
1900 - 1986	none
1987	5% S global max ISO 8217
2005 - 2006	4.5% S Global 1.5% S SECA
2010 <sup>1</sup>	1.0% S max ECA
2012 <sup>1</sup>	3.5% S max Global
2015 <sup>1</sup>	0.1% S max ECA
2020 <sup>1</sup>	0.5% S max Global <sup>2</sup>

<sup>1</sup> 3 April, 2008 – Report of the Working Group on Annex VI and NO<sub>x</sub> Technical Code to MEPC

<sup>2</sup> Subject to review in 2018 with authority to delay to 2025

# Sulfur Blending Arithmetic, wt. %

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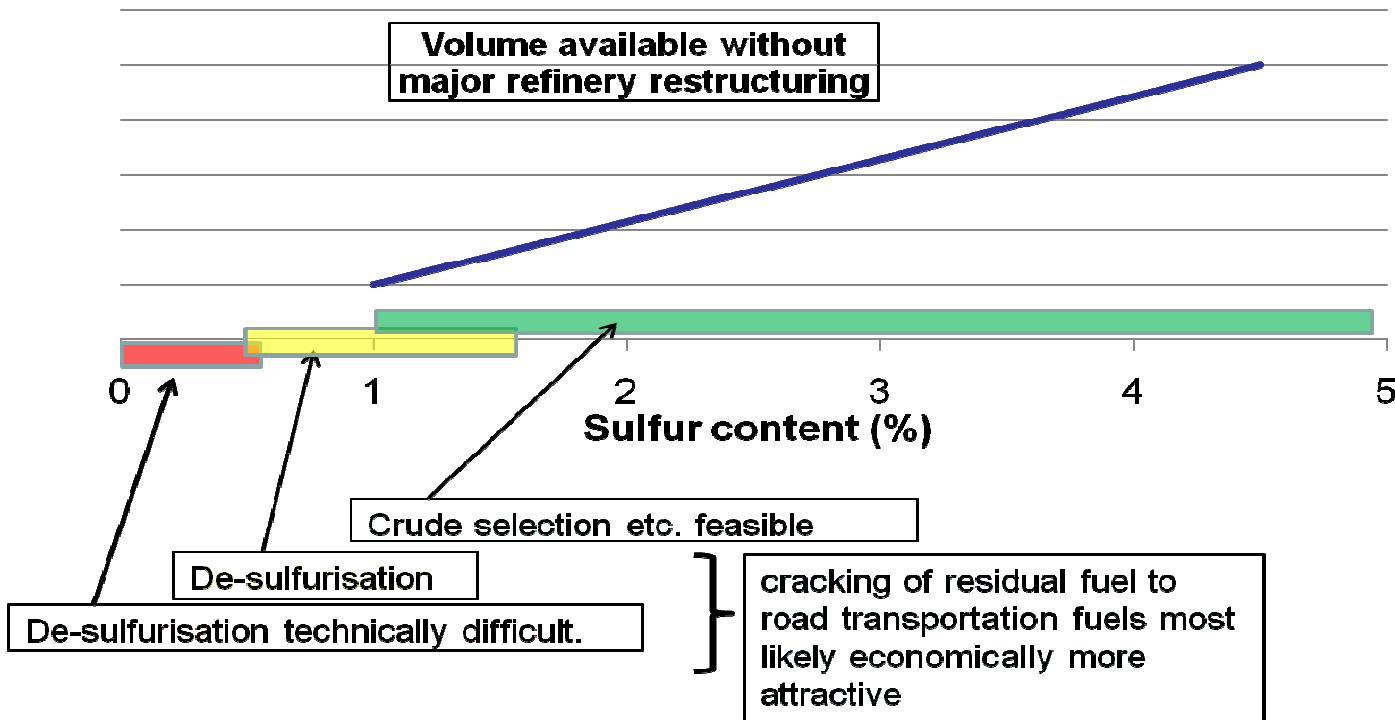


% S Spec	COMPONENTS	
	1.5 % S (SECA Fuel)	2.4% S (X <sub>H</sub> )
	wt. %, 0.1% S Distillate	(X <sub>L</sub> )
1.0% S	35.7	69.9
0.5% S	71.4	82.6
0.1% S	100	100

**Memo:**

$$\% S X_L = \frac{\% S X_H - \% S \text{ spec}}{\% S X_H - \% S X_L}$$

# Low Sulfur marine fuels Means and availability



Source: ARACON Conference,  
E. Van Bouwel, Europia

# Conclusions

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- Marine transportation will face pressure to further reduce all emissions (plus SO<sub>x</sub>, NO<sub>x</sub>, PM<sub>2.5</sub>, GHG)
- Fuel S reduction will require massive refinery investment
- Role of Stack Scrubbing for Marine Emission reduction still under development



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