

Fuel & Energy Outlook for the Marine & Aviation Sectors

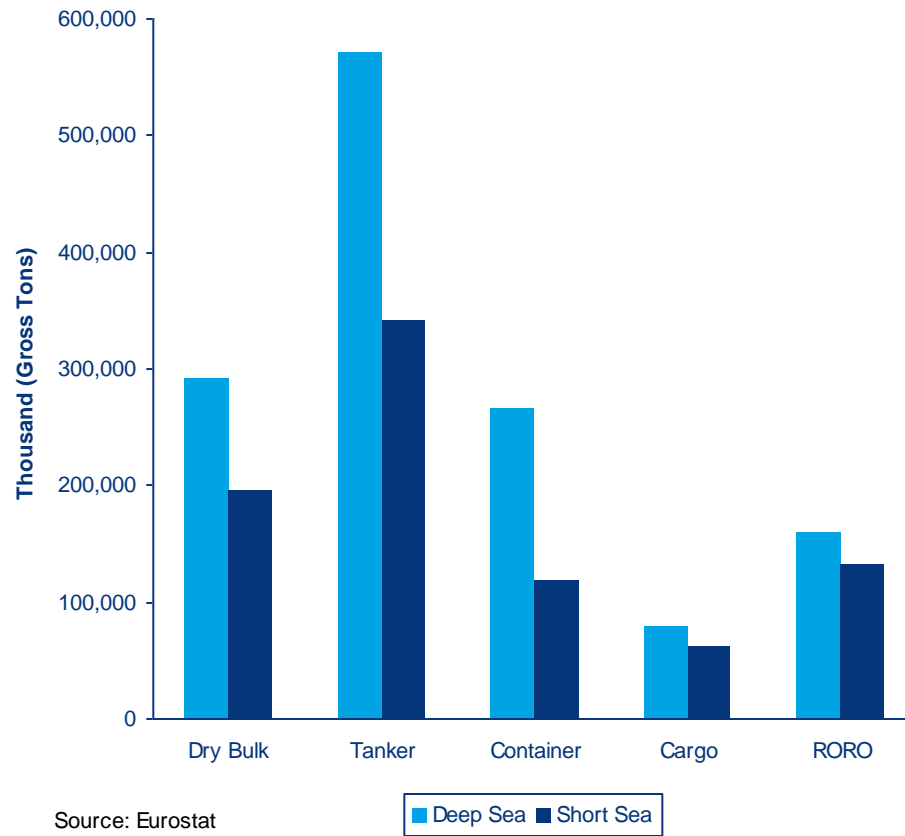
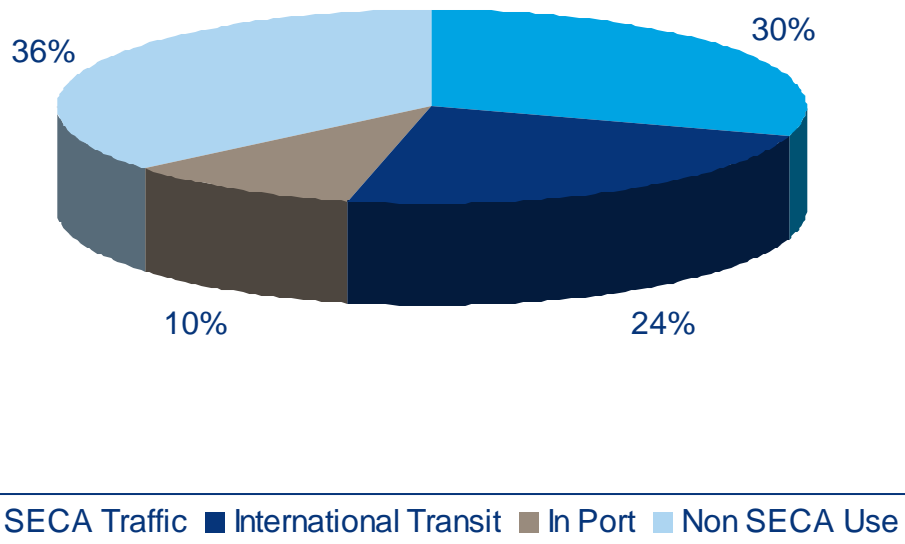
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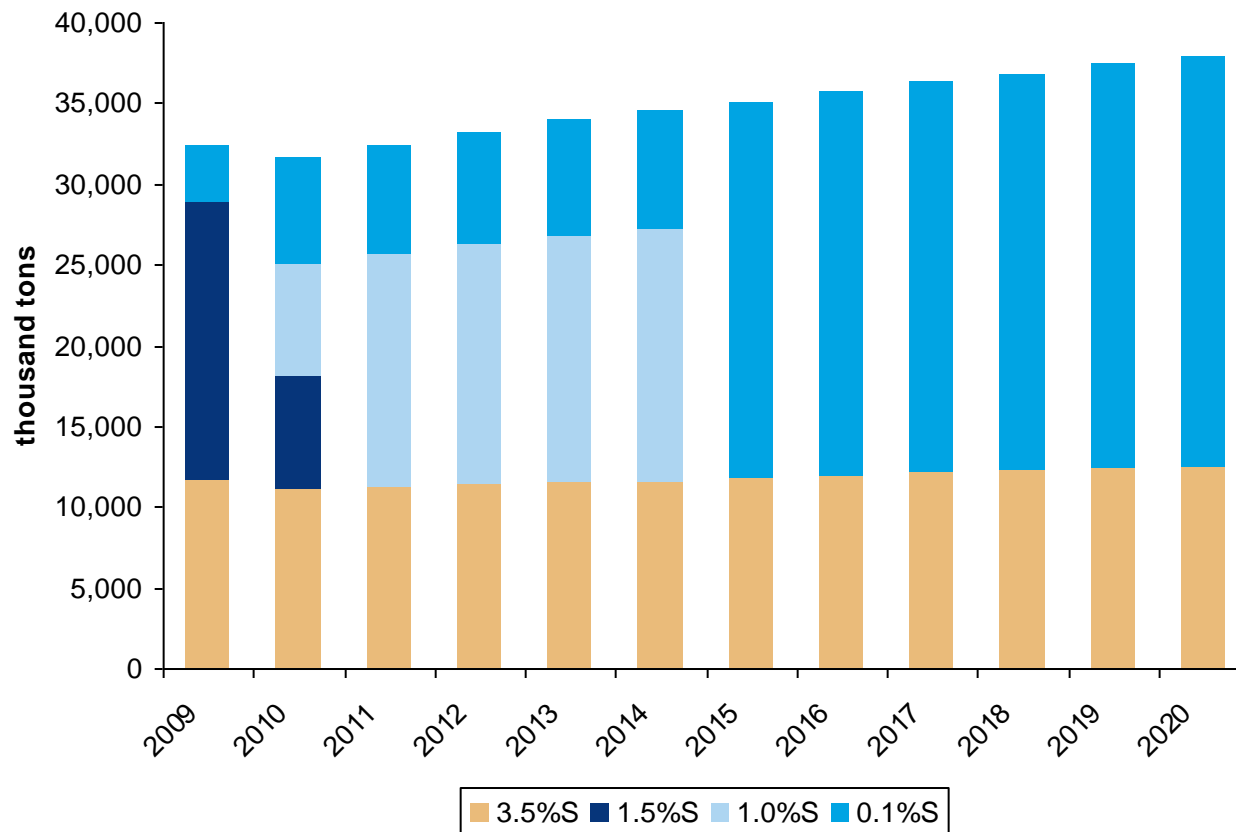
European SECA bunker sales are around 30-35 Mt – using trade and port arrival data as a starting point, around two thirds of vessel traffic are estimated to be in the SECA



Source: Eurostat

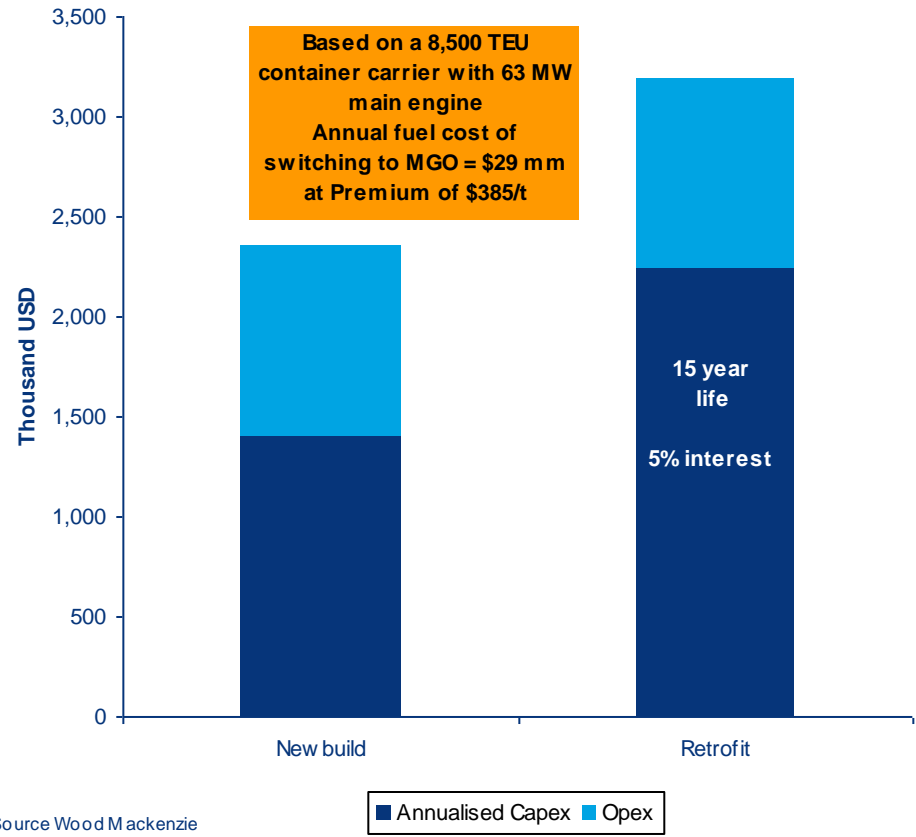
Source: Wood Mackenzie

After a small decline last year, sales should start to grow again as the GDP outlook improves – total sales over 35 Mt by 2020 with 0.1%S material moving from a minority to a majority

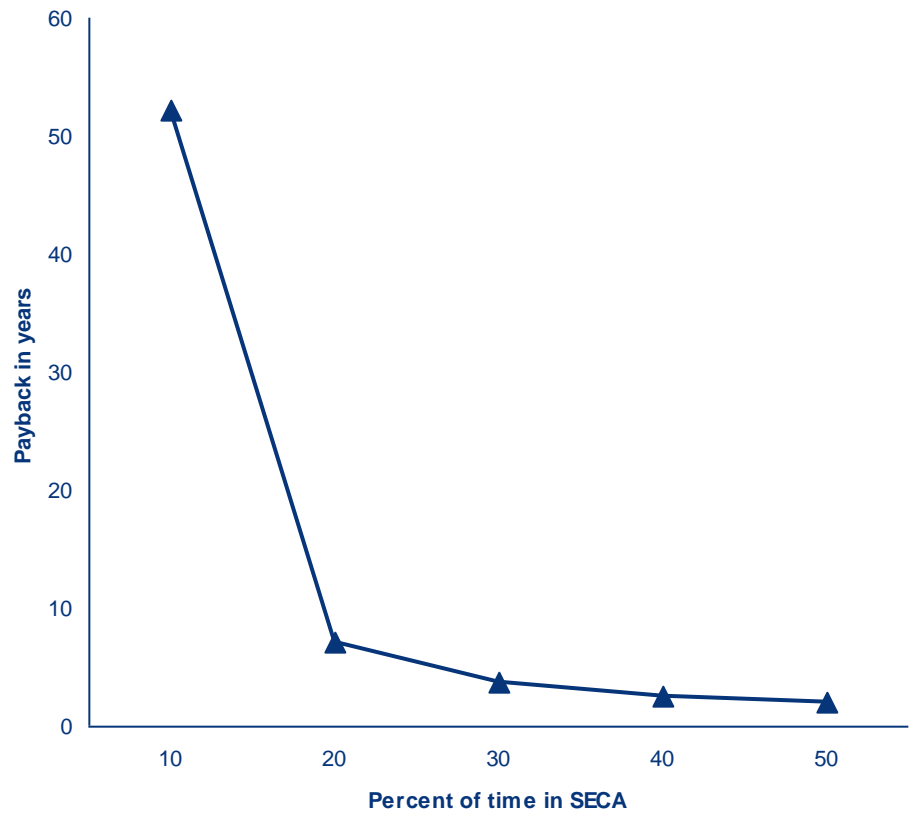


Source: Wood Mackenzie

The economics of Scrubbing look compelling given potential price premiums for Gasoil – although not for all



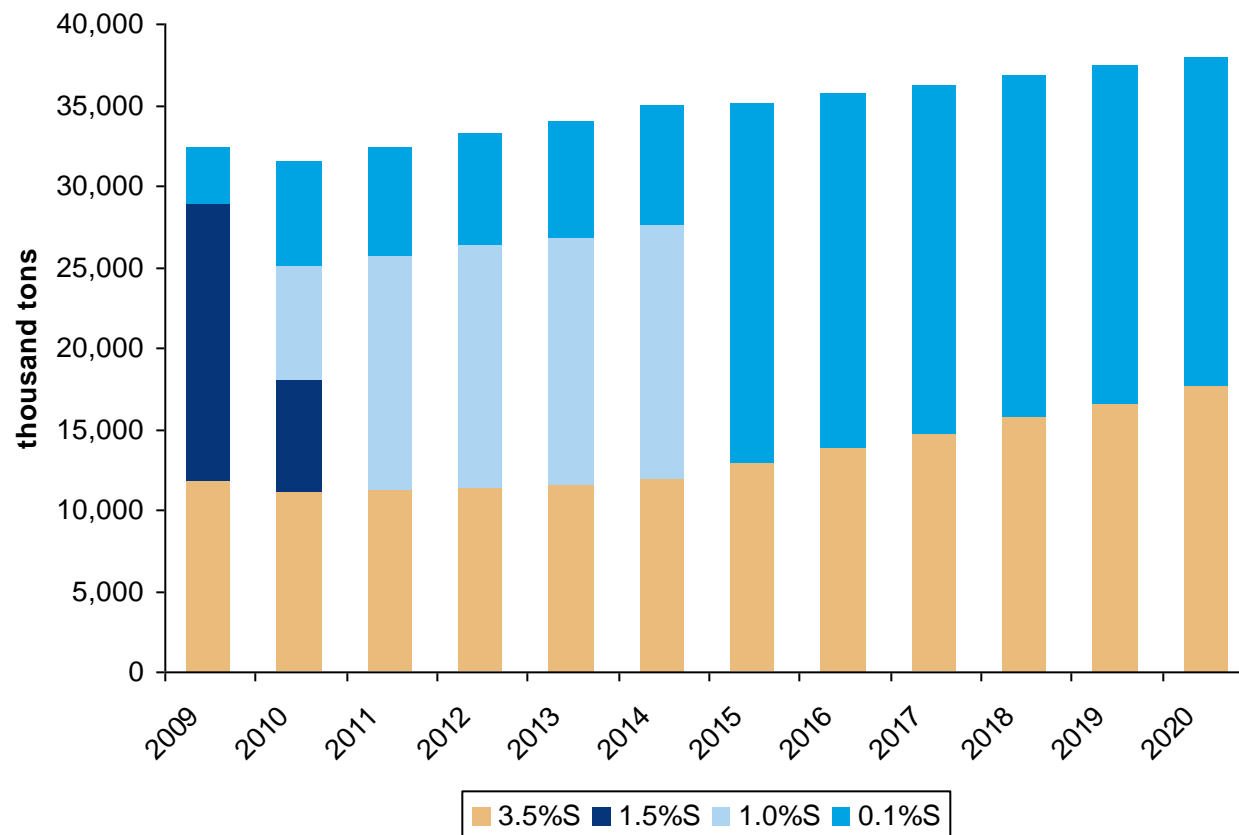
Source Wood Mackenzie



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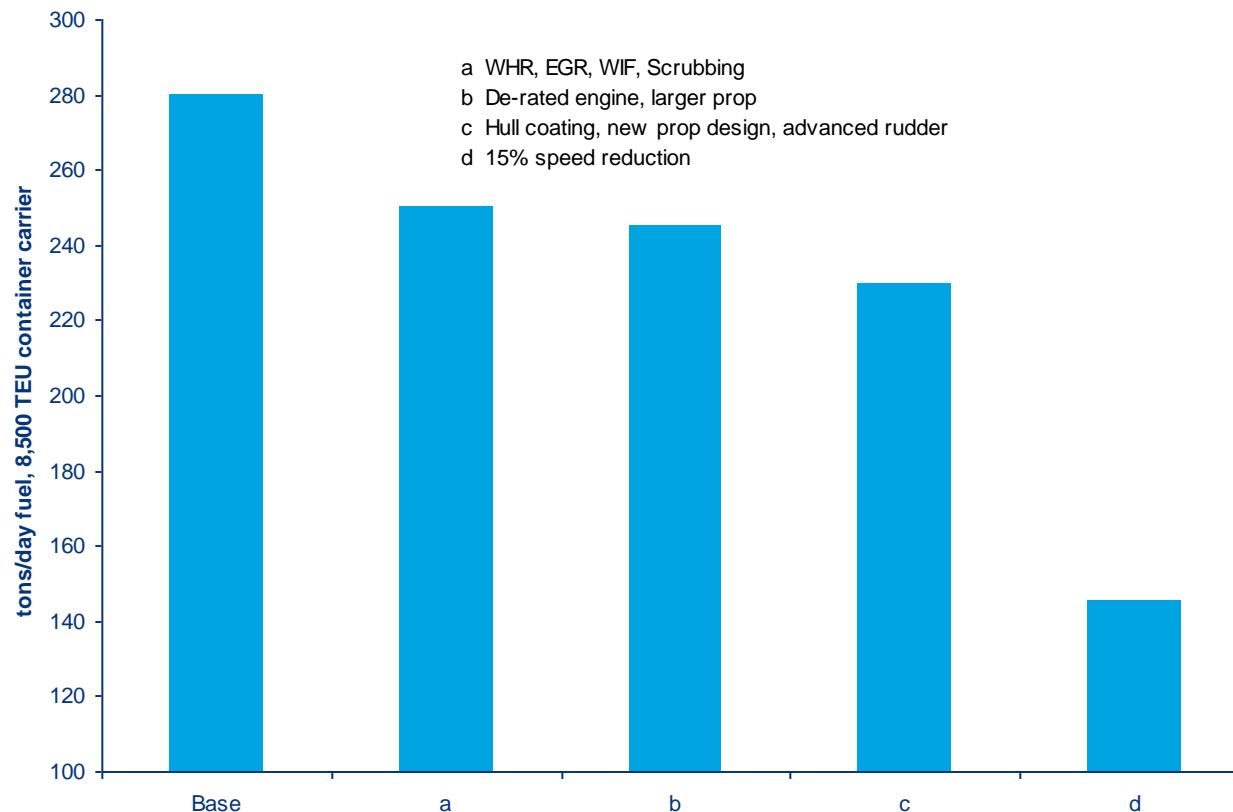
Source: Wood Mackenzie

If transit traffic continues to use gasoil the amount of 3.5%S material allowed back in by scrubbing may be relatively limited (~5Mt in 2020?) – although mass take-up of scrubbing in 2015 is highly unlikely



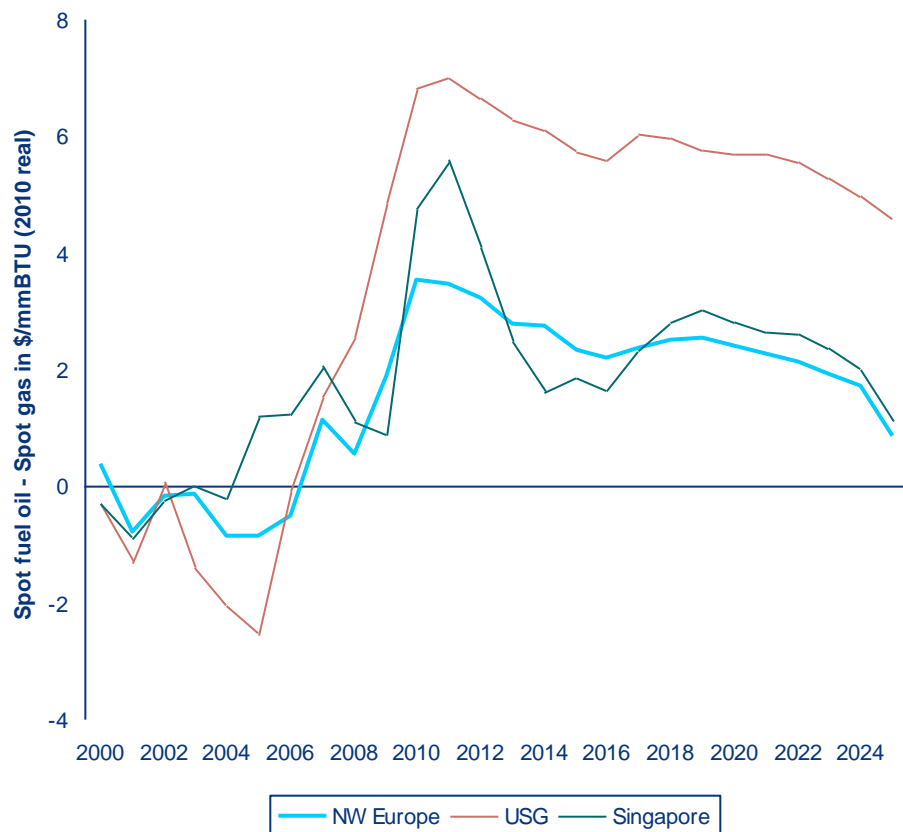
Source: Wood Mackenzie

The search for reduced emissions gains added impetus from high bunker costs – known technical advances could yield 20% efficiency gain but slow steaming delivers the biggest fuel saving even allowing for capacity adjustment



Source: Wood Mackenzie

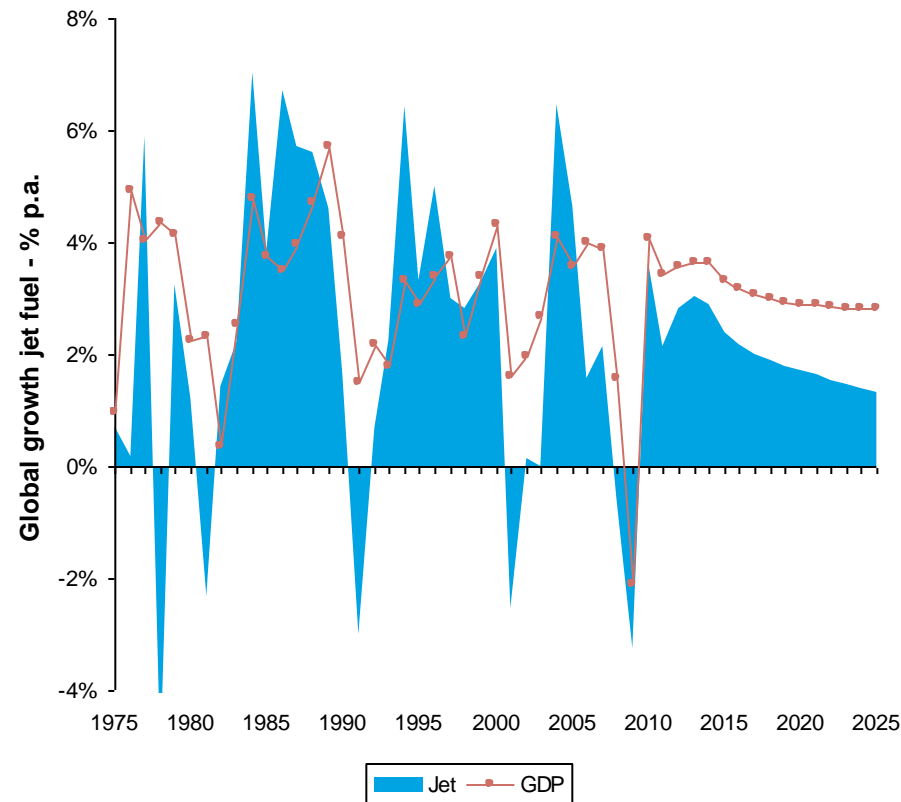
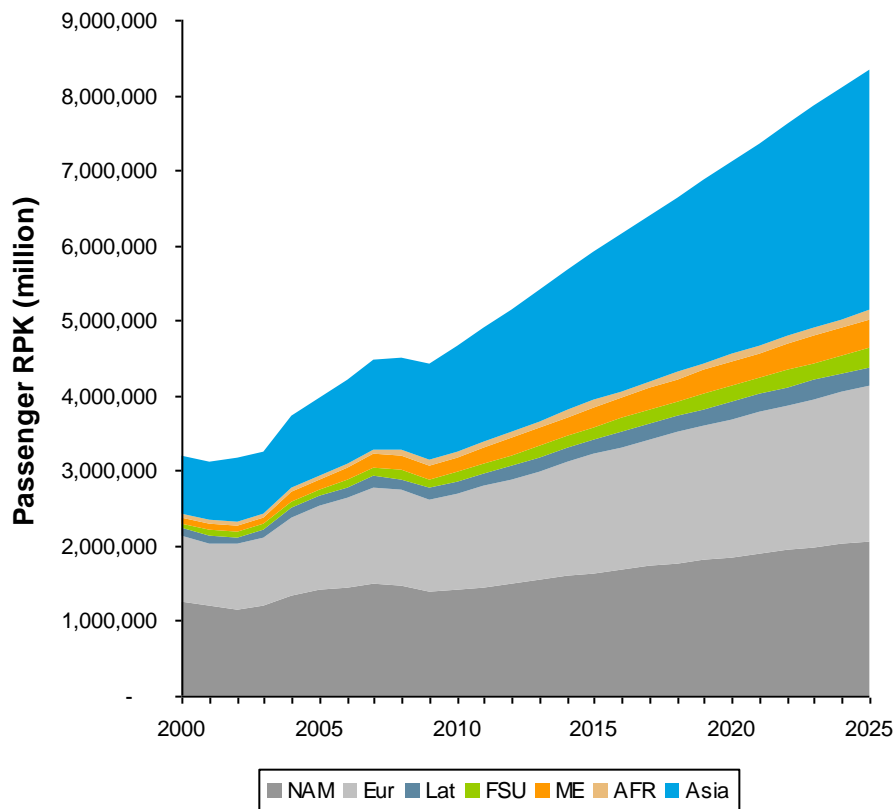
Can LNG make a difference?



- Changes in gas/fuel oil price relationship is sparking interest in LNG as a potential bunker fuel
- LNG also offers environmental benefits – 100% reduction SO_x, 90% NO_x, 19% CO₂ (source: Fjord1)
- 20 vessels operating in Norway – mainly ferries and offshore vessels
- Wartsila delivered ~60 dual-fuel vessels and researching engine with complete short term switching flexibility
- IMO safety guidelines by 2015
- Singapore talking of developing bunkering hub based on new LNG terminal
- Problems – storage (2-3 times FO), LNG distribution
- Baltic to become an oil free zone?

Source: Wood Mackenzie

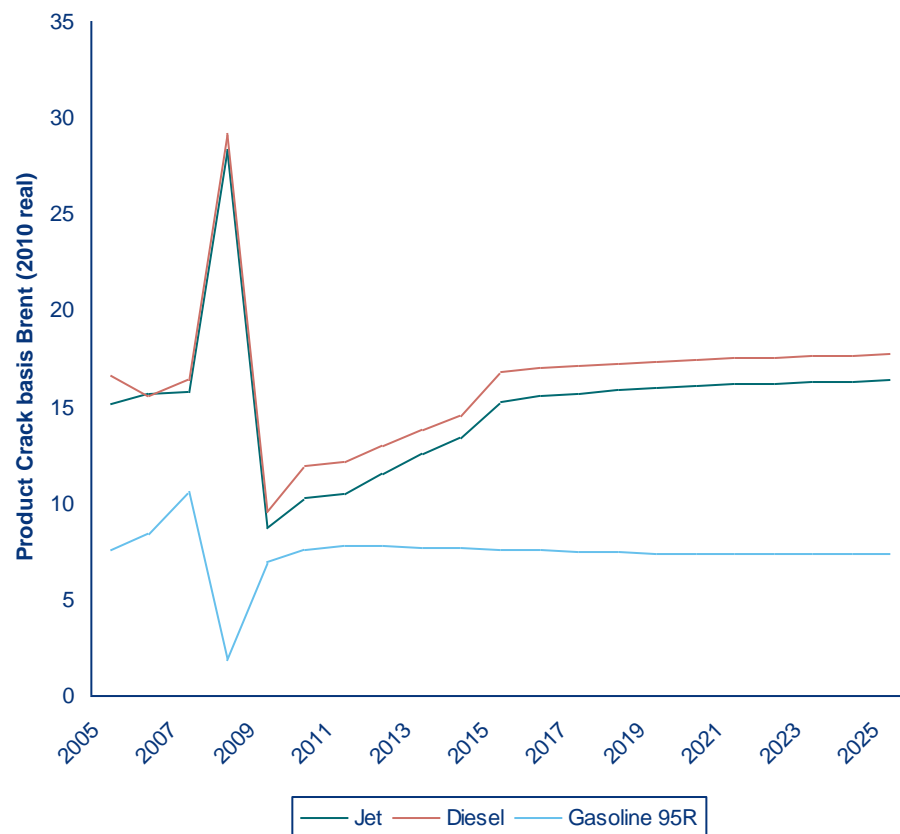
Jet fuel is 6% of global demand and until recession was growing at ~4% p.a. on average



- RPK growth averages 4% p.a. to 2025 – Boeing/Airbus around 5% p.a.
- Fleet growth averages ~3.5% p.a. in all three (better load factor assumed by airlines)

Source: Wood Mackenzie

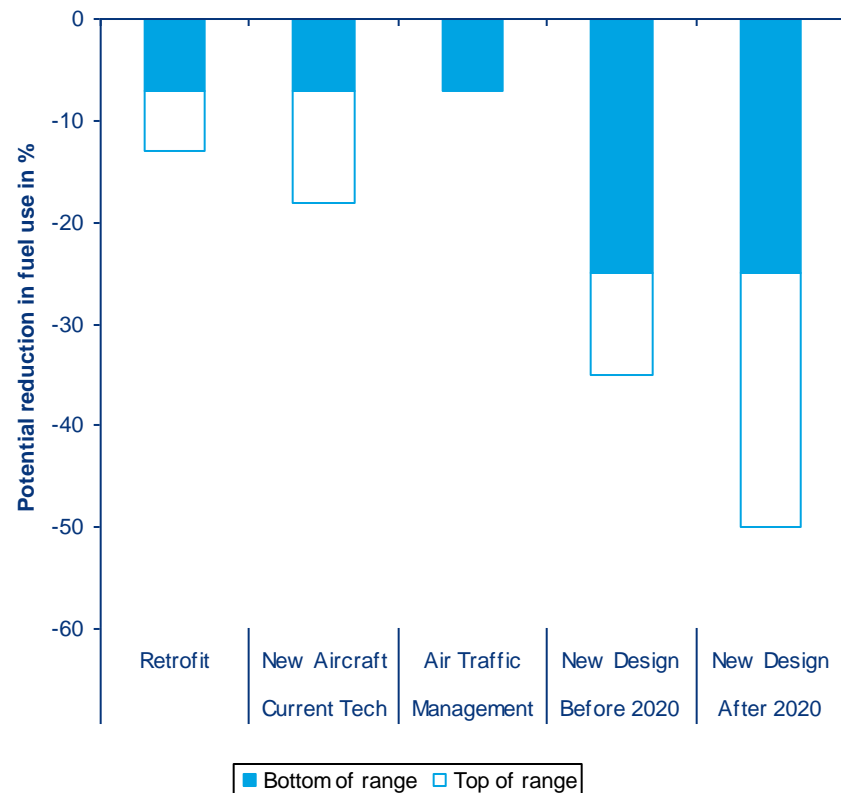
Jet fuel will be the highest priced main product in the future



- Fuel is ~25% industry costs at \$700/t (35% in 2008)
- IATA already expecting industry profits to halve in 2011 with fuel at ~\$825/t
- Current price is over \$1000/t and forecast to remain there in the medium and long term (maybe some post-crisis downward adjustment?)
- From 2012 inclusion in EU ETS adds a further layer of cost - recent study estimates this will add €1.1 billion at €30 t/CO₂
- Which would increase fuel cost by \$30/t
- So high fuel costs now reinforcing environmental moves to reduce fuel consumption – IATA target to reduce 2005 CO₂ emissions 25% by 2020, achieve carbon neutral growth after that with an aim for -50% by 2050

Source: Wood Mackenzie

Carbon neutral growth after 2020?



Source IATA

- On paper large efficiency gains possible now
- Future technology hold even greater promise although wide range of uncertainty
- But carbon neutral must mean alternative fuels
- ASTM approval currently delayed - to end-year?
- Lufthansa aims to replace 10% of fuel with bio component in a 50/50 mix by 2020
- BA to make 45 Kt of bio component from 500 Kt municipal waste after 2015
- Air France pursuing biomass-liquid plant

Source: Wood Mackenzie

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