

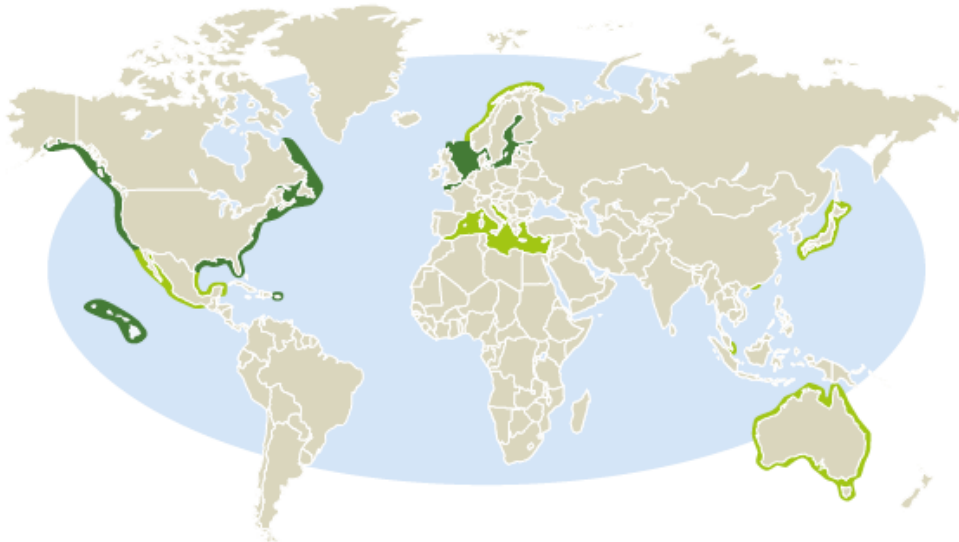


METHANOL AS A MARINE FUEL

A researcher's perspective

Increased focus on environment and resources in shipping

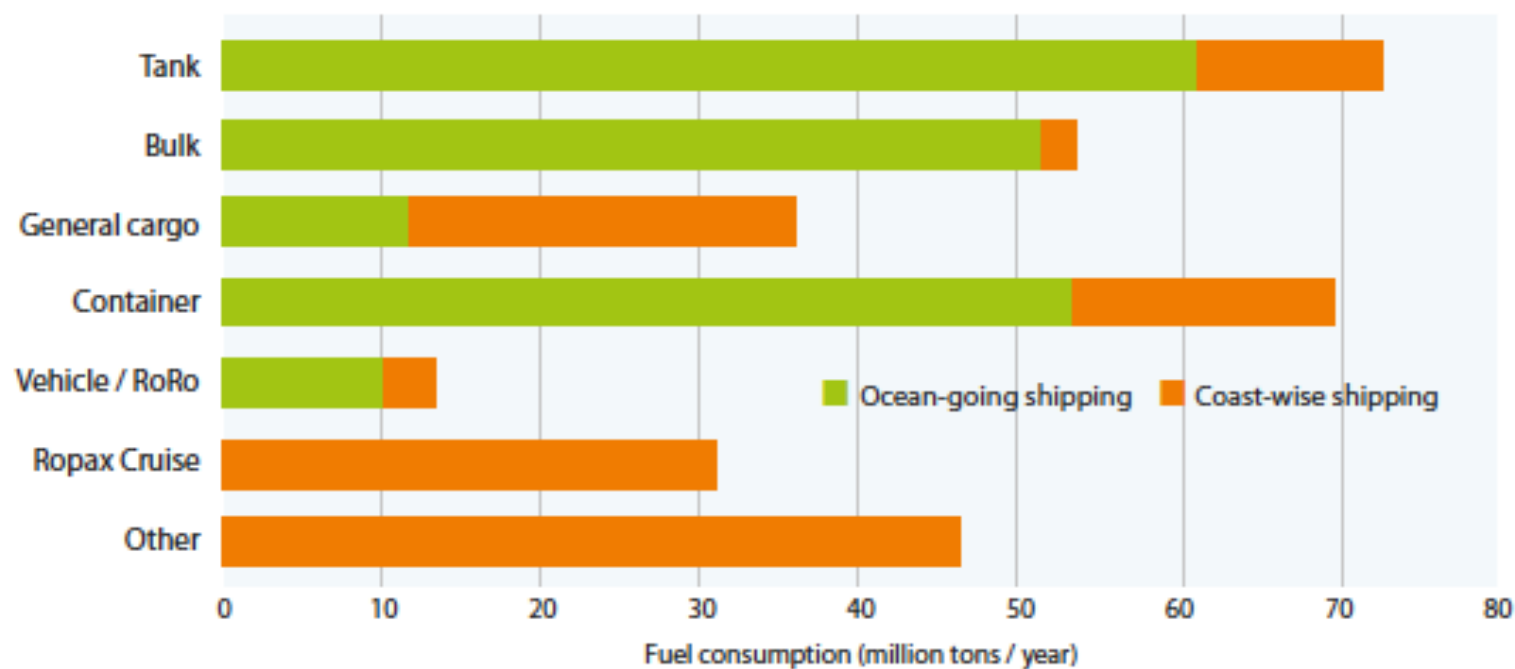
Shipping is traditionally using large amounts of residual fuel, heavy fuel oil (HFO) often with high sulphur contents.



An Emission Control Area can be designated for SO_x and PM or NO_x, or all three types of emissions from ships, subject to proposal from a Party to Annex VI.

- ECA/SECAs (Emission control areas). Sulphur (0.1%) and NO_x
- IMO - global reduction of sulphur (0.5%) coming (2020?)
- Greenhouse gases, energy efficiency not enough
- Local regulations in shipping lanes and ports
- Competition for oil and other fossil fuels (or Oil price....)
- Competition with other means of transport
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Figure 12: Global fuel consumption for shipping by main ship categories

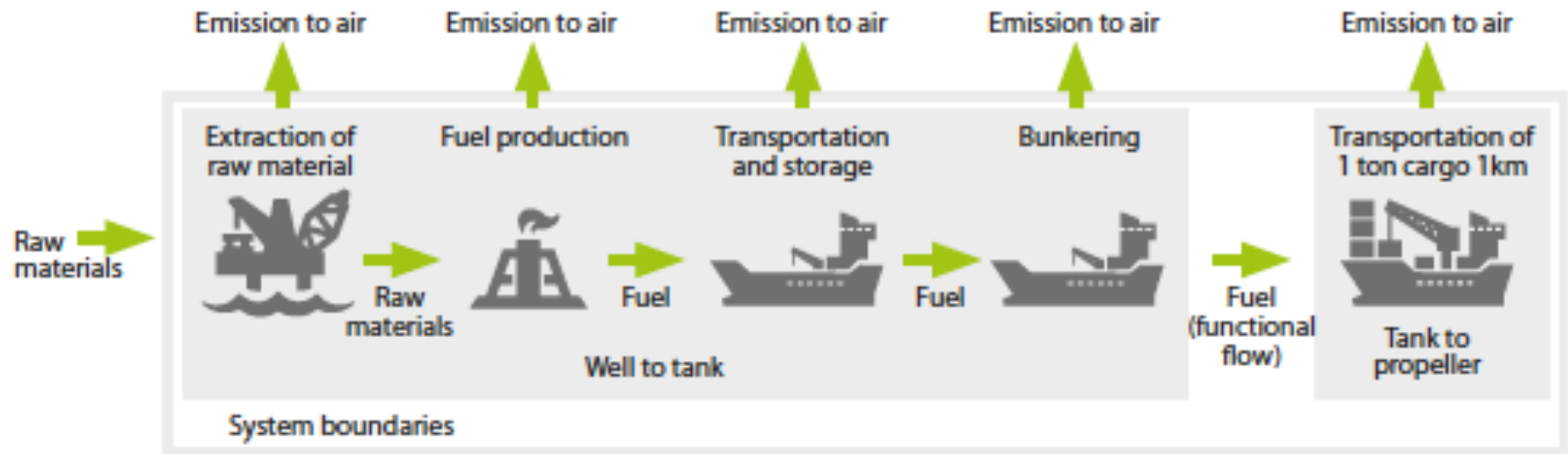


Note: Coastwise shipping is mainly ships < 15,000 dwt, ro-pax, cruise, service and fishing

Source: Smith et al, 2014, Buhaug et al, 2009

Total annual fuel consumption:

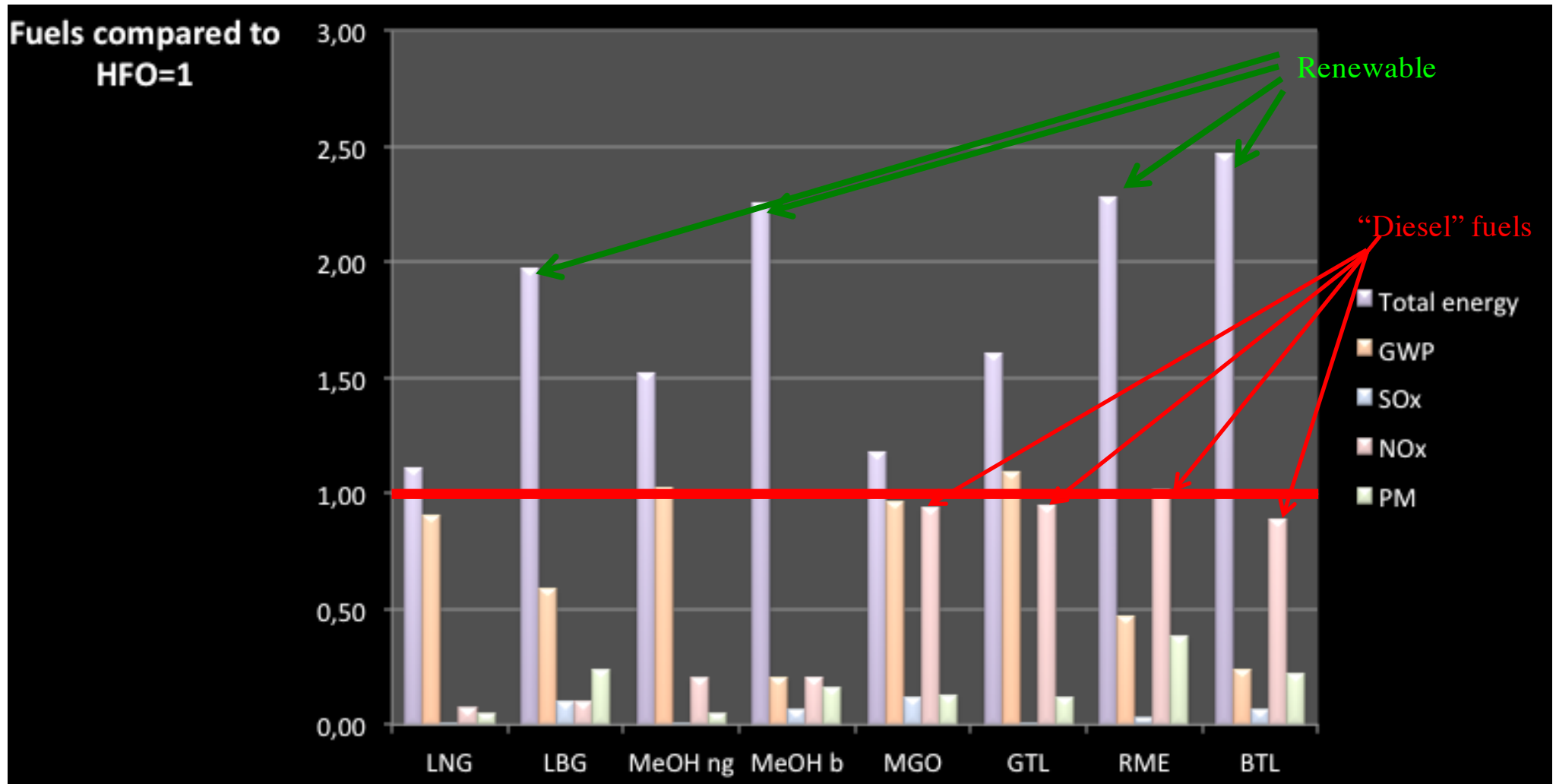
- internationally 300 million tonnes,
- in North Sea/Baltic Sea ECA 20 - 25 million tonnes



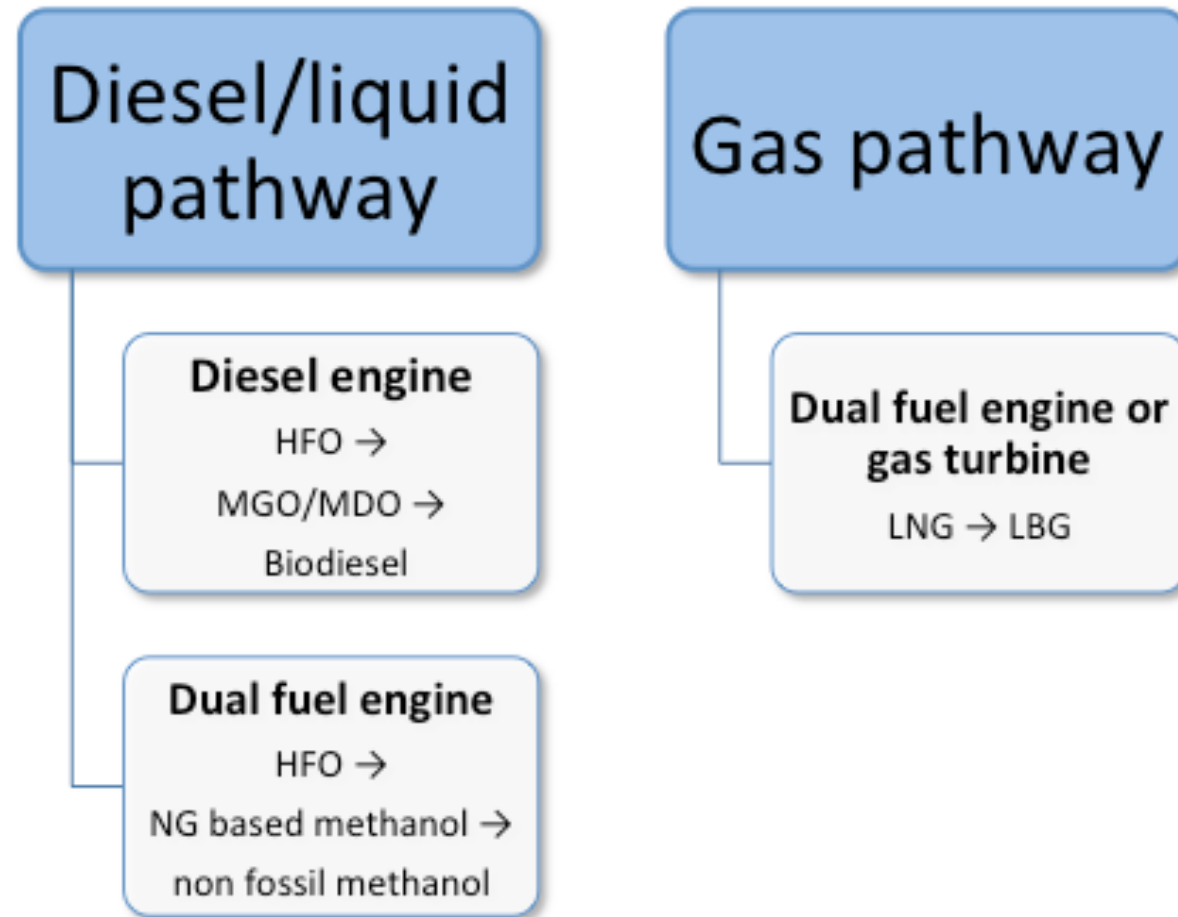
Source: Bengtsson et al., 2011

Impact of fuels from well to propeller

based on data from Brynolf 2014

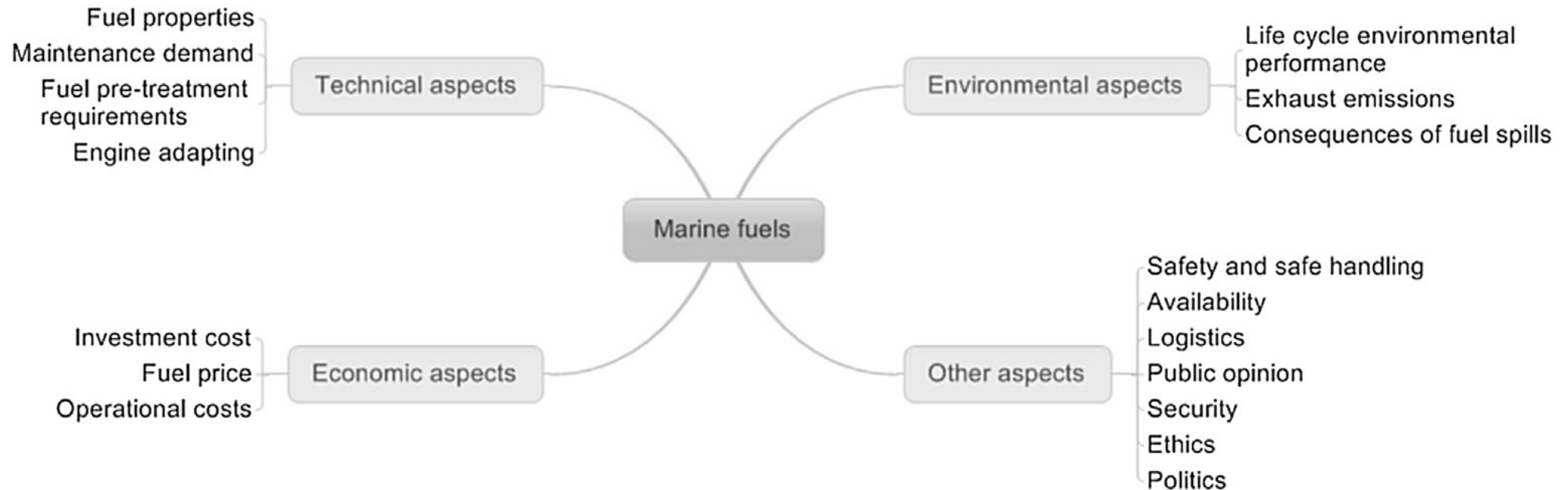


Pathways to non fossil fuel



Differs in infrastructure, fuel handling/combustion.....

Criteria when selecting fuel



S. Brynolf et al. / Journal of Cleaner Production 74 (2014)

But remember:

- Price is fundamental
- Regulations are driving change

METHANOL AS A MARINE FUEL

- Fulfills SECA regulation
- Can be used with high efficiency in marine diesel engines after minor modifications using a small amount of pilot fuel (Dual fuel)
- Low Tier II NO_x emissions, can be Tier III, low particle emissions
- Liquid at ambient temperature – easy distribution and use
- Long experience in handling
- Available on chemicals market – today in surplus
- Price has to be
 - Competitive with MGO for SECA
 - Competitive with LBG and biodiesel for non fossil fuel

Methanol is also a good fuel alternative to fulfill the 2⁰ C goal for climate.

Attractive pathway to carbon neutral fuel if produced with good energy efficiency as biomethanol or electrofuel

Applied R&D projects on methanol as marine fuel. Industry consortia

- **Effship (Efficient Shipping with Low Emissions) 2009-2013**
 - Evaluation of alternative fuels and lab tests. Conclusion – Methanol best in terms of availability in existing infrastructure, price, simple engine and ship technology and established applications on land.
- **CleanShip (Clean Baltic Sea Shipping) 2010-2013**
 - Methanol interesting alternative fuel in the Baltic Sea. Sub-project testing fuel cell auxiliary engine with methanol.
- **SPIRETH (Alcohol Spirits and Ethers as Marine Fuel) 2011-2014**
 - Tests on auxiliary engine on board. Conclusion – it is feasible to convert ships to methanol or DME
- **PILOT Methanol 2014 -2015**
 - Conversion of RoPax ferry engine. Full scale test ongoing.
- **MethaShip 2015-2017**
 - Assessment of design of two ships, RoPax and cruise.
- **Conversion of pilot boat 2015**
 - Swedish maritime administration.

Thank you

