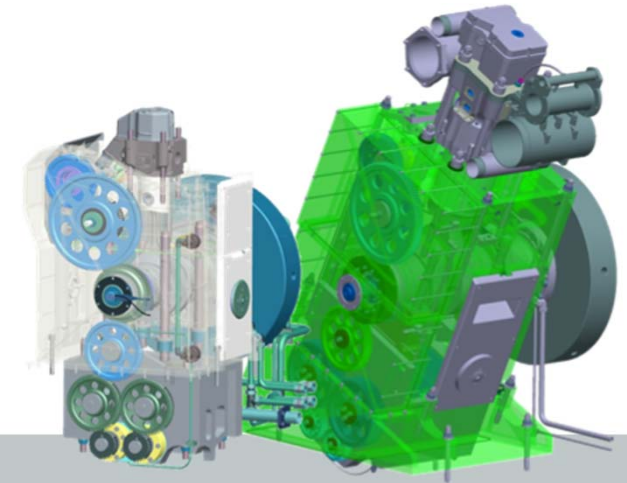
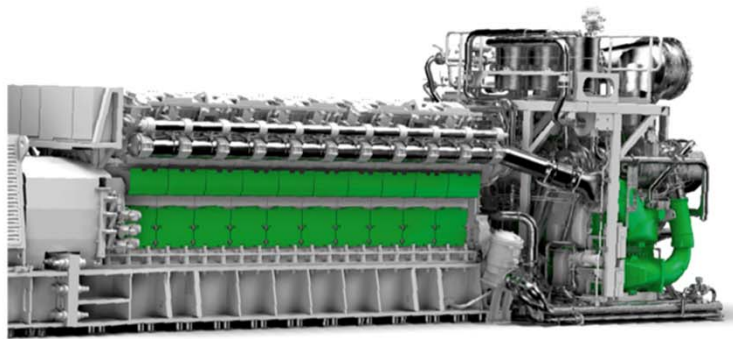


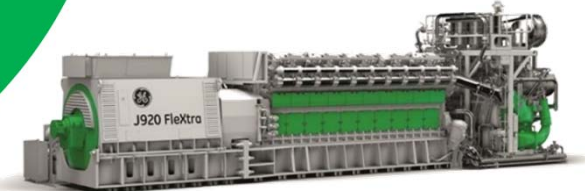
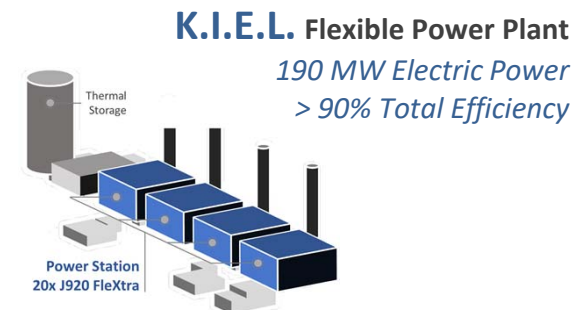
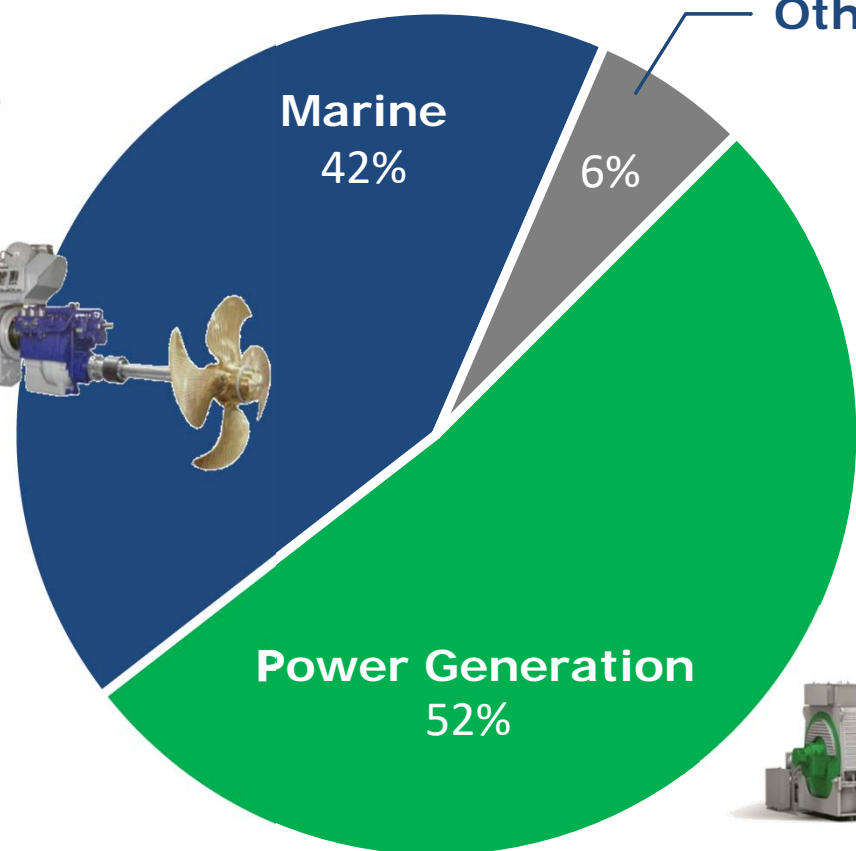
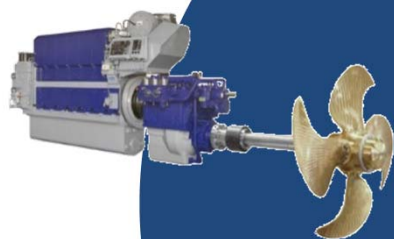


Large Engines Competence Center

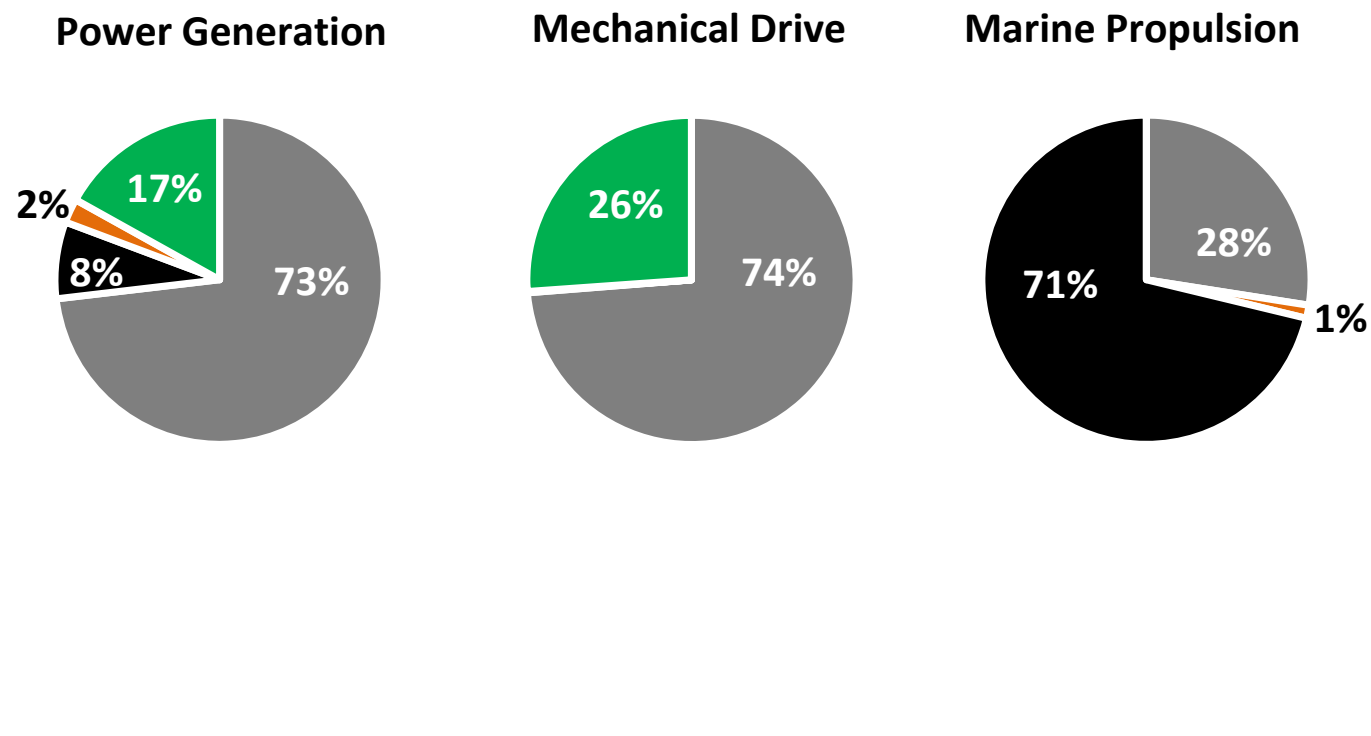
Pressegespräch „Emissionsfreie Hochseeschifffahrt: Grazer Forscher übernehmen europaweit das Steuer“



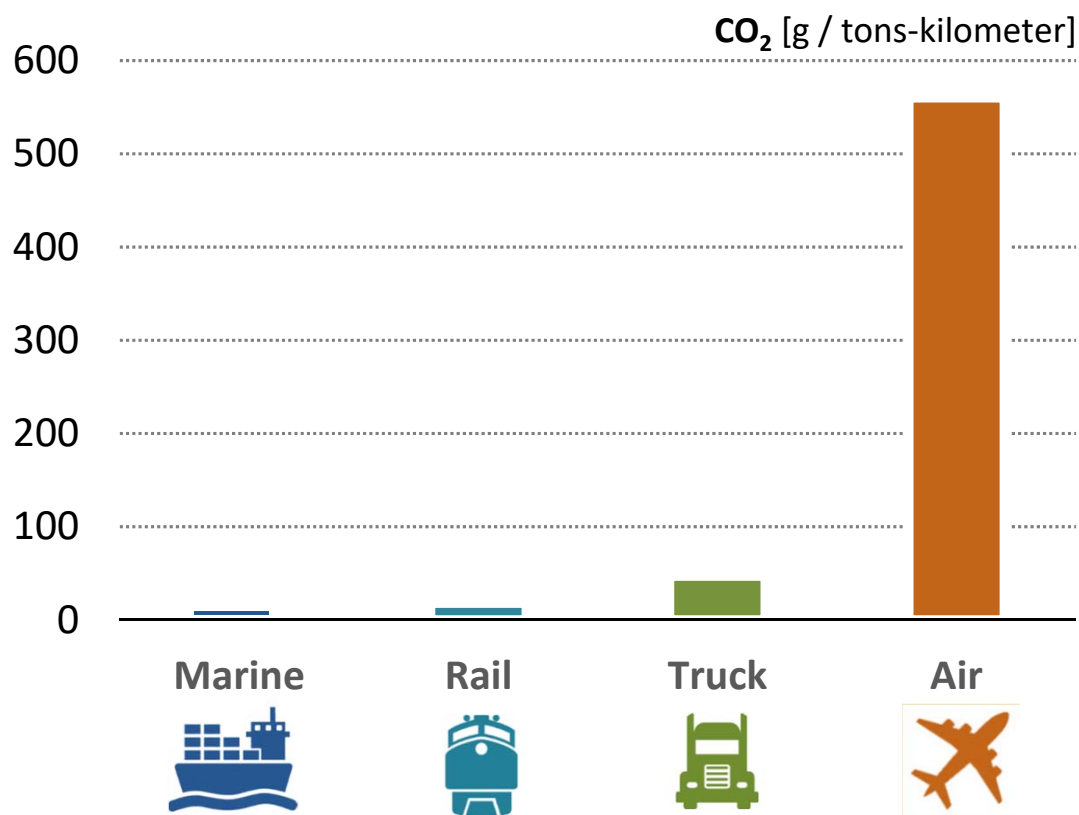
Applications



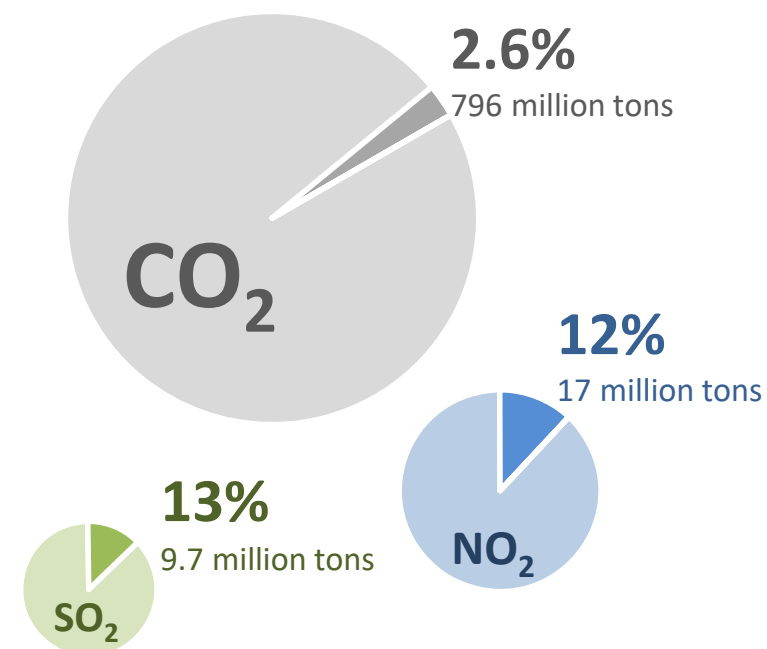
Types of Fuel



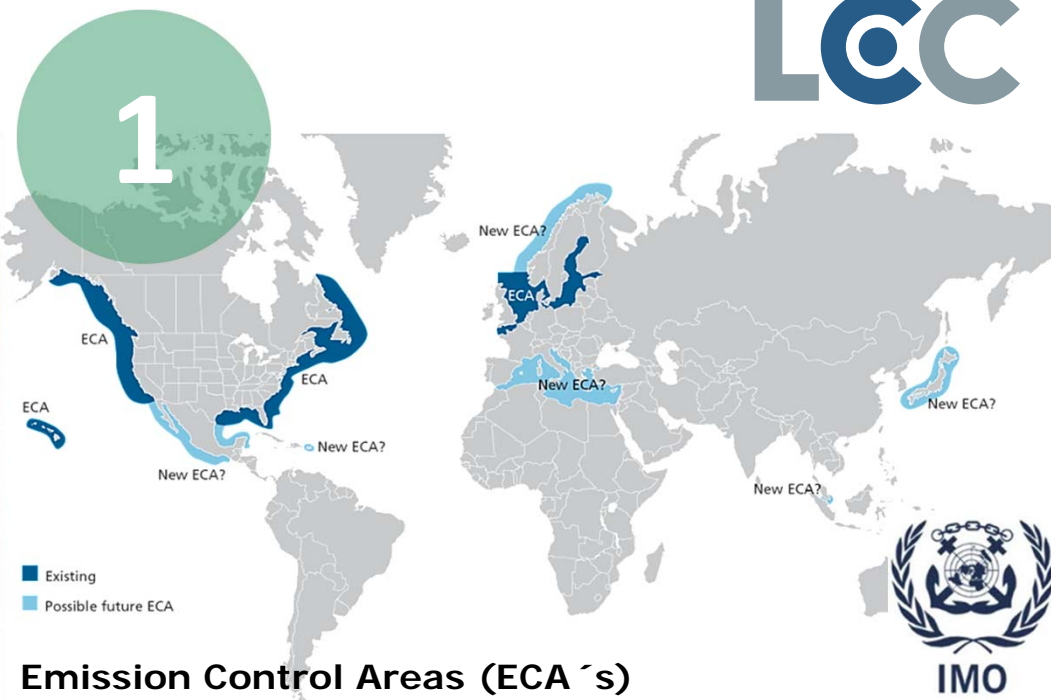
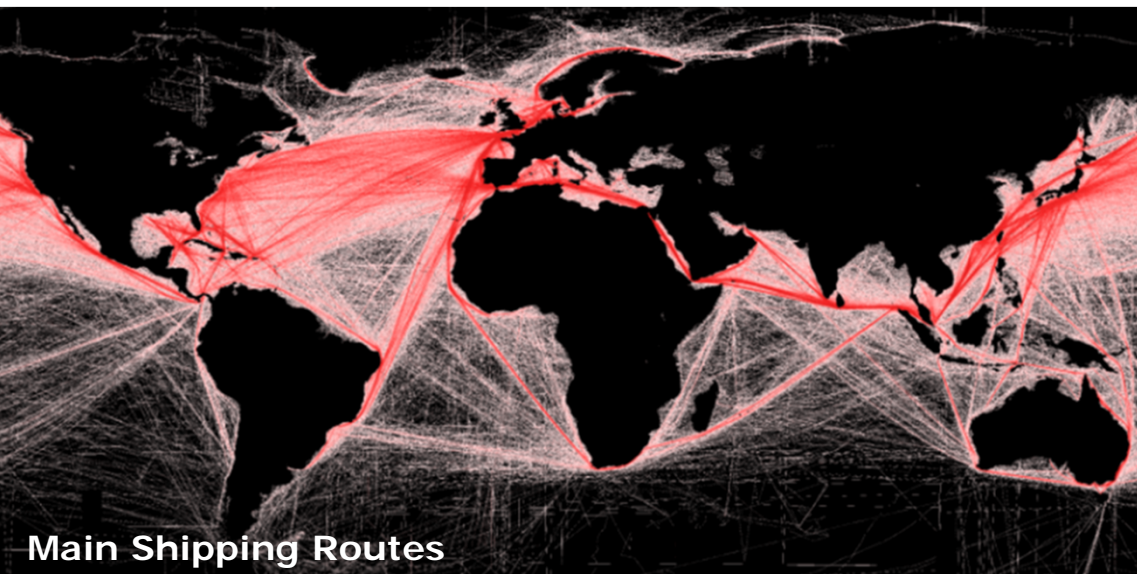
Shipping Emissions



Percentage of ship emissions vs. total global emissions



Ship Emissions



1

October 2016

2 Global Sulphur Cap 2020

... the decision to implement a global sulphur limit of 0.50% m/m (mass/mass) in 2020 ...

2

April 2018

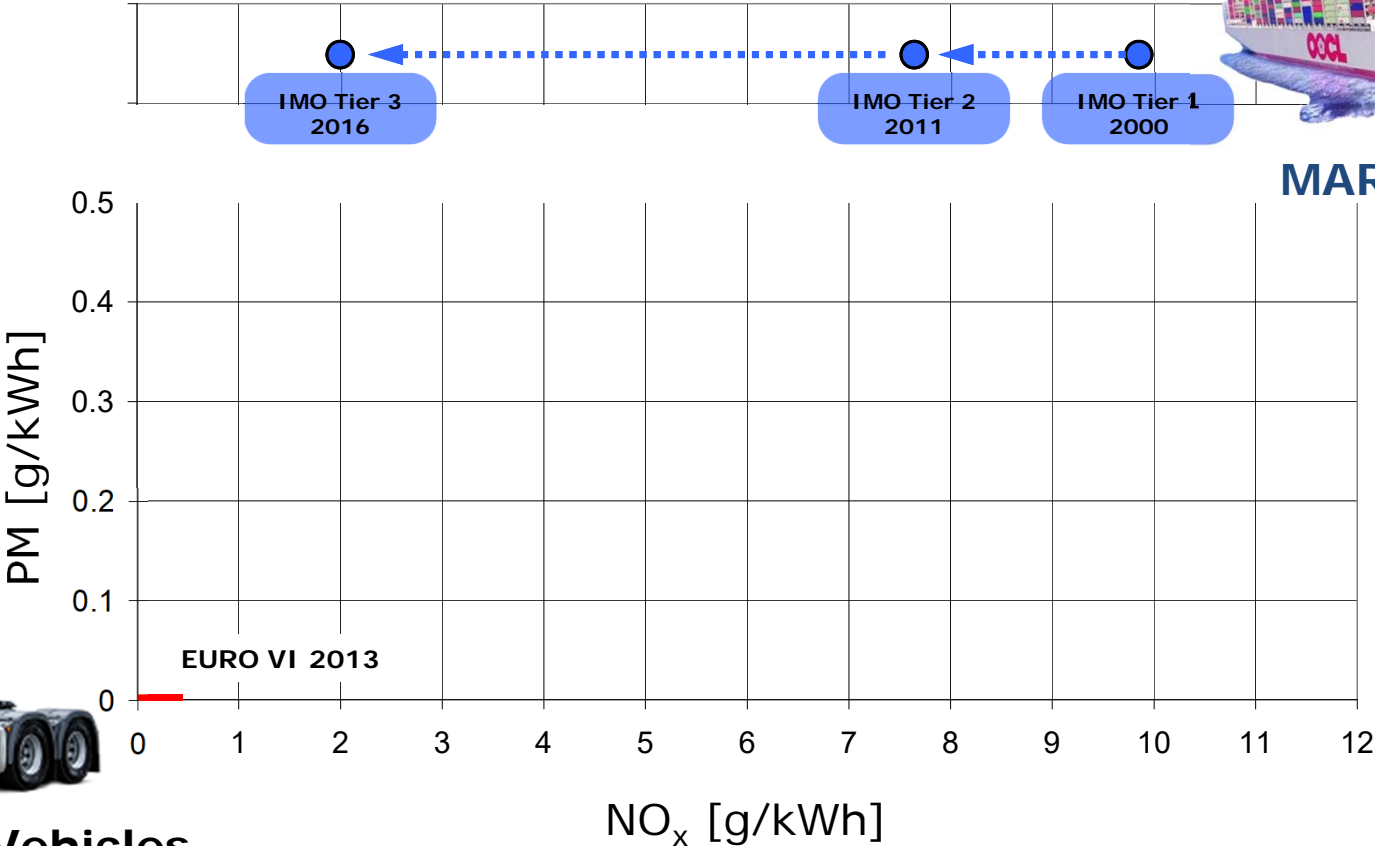
3 GHG Target 2050

... to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008 ...

Emission Limits

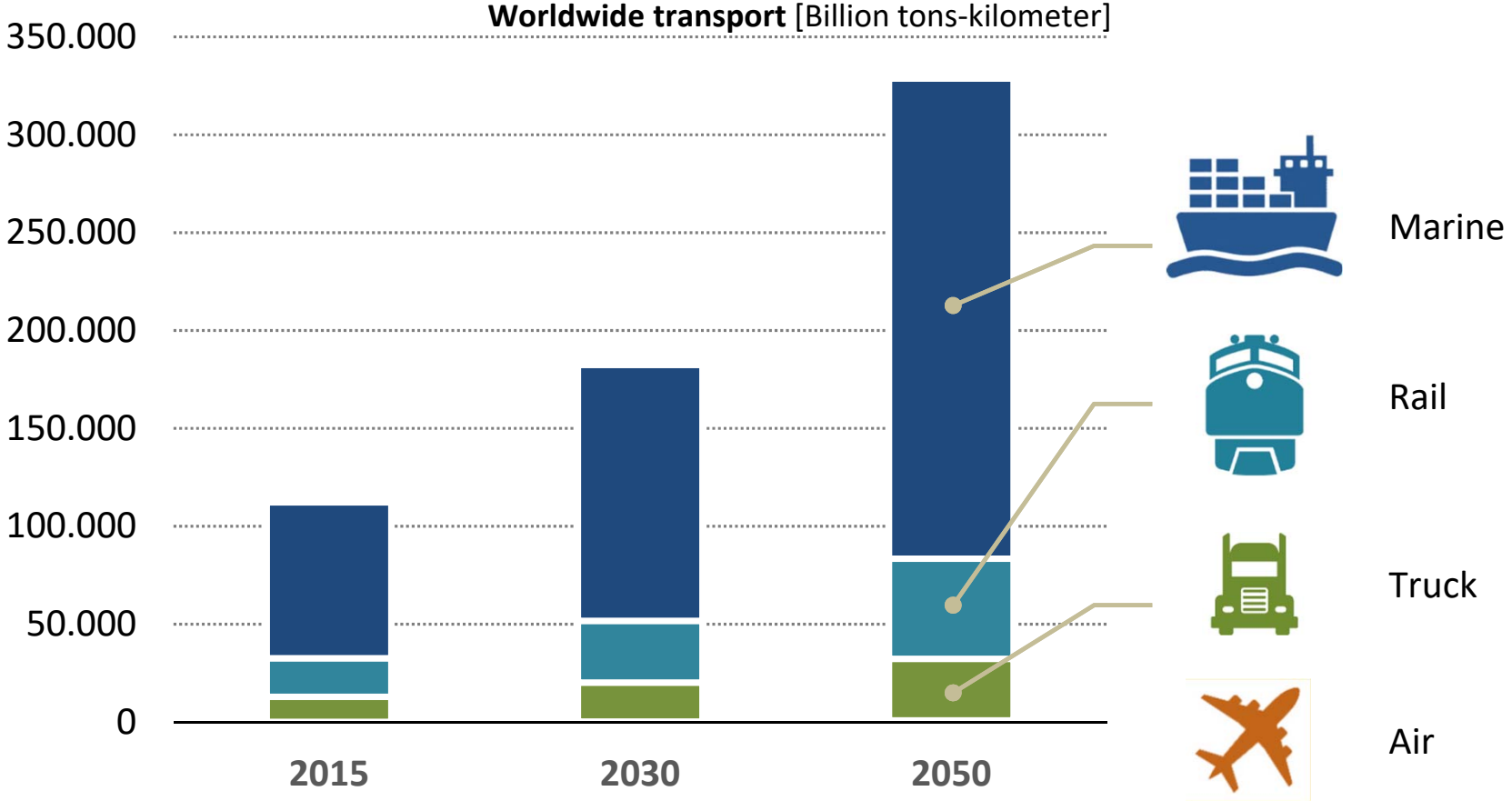


MARINE

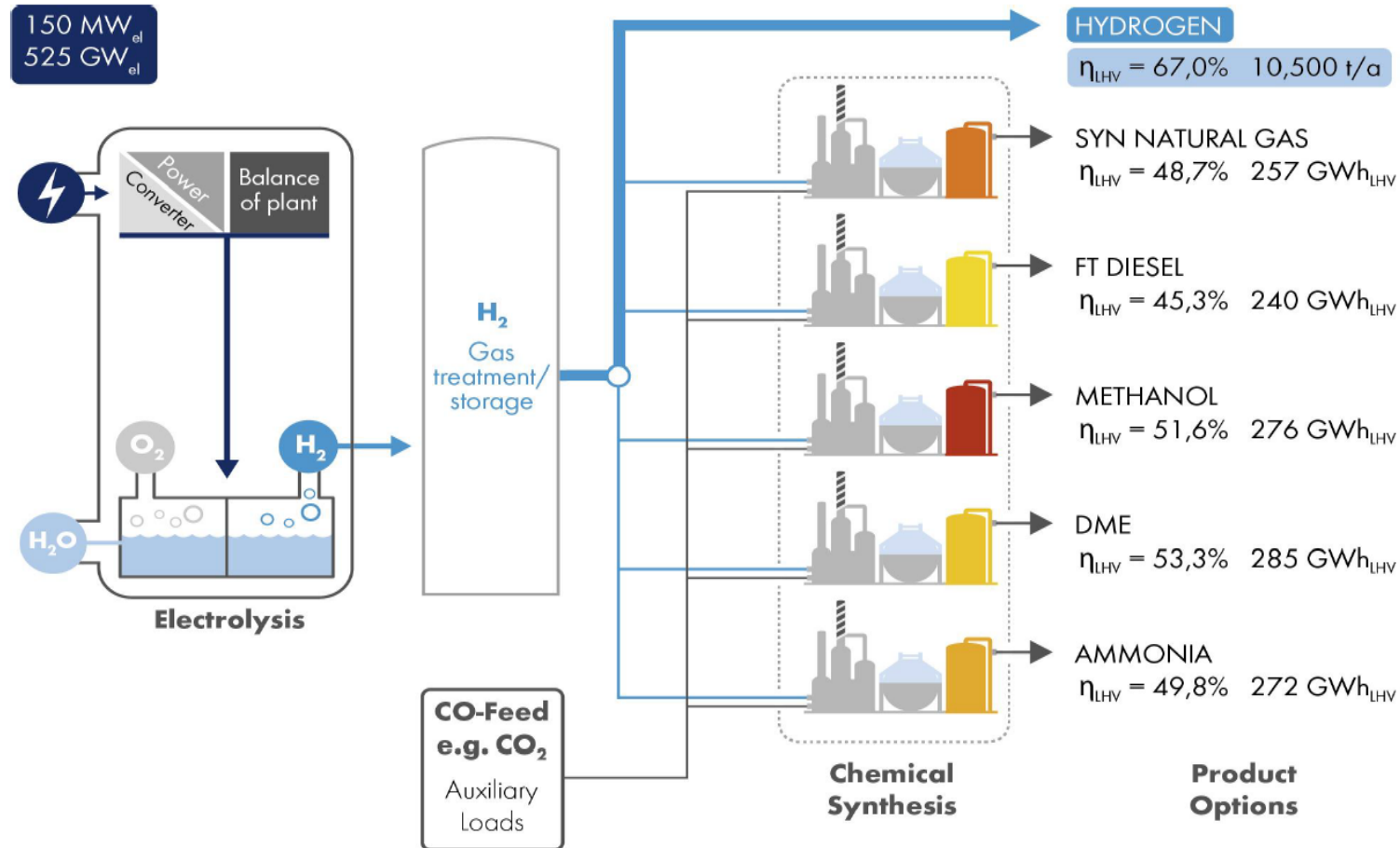


Commercial Vehicles

Development of Transportation



"Green" Hydrogen and SynFuels

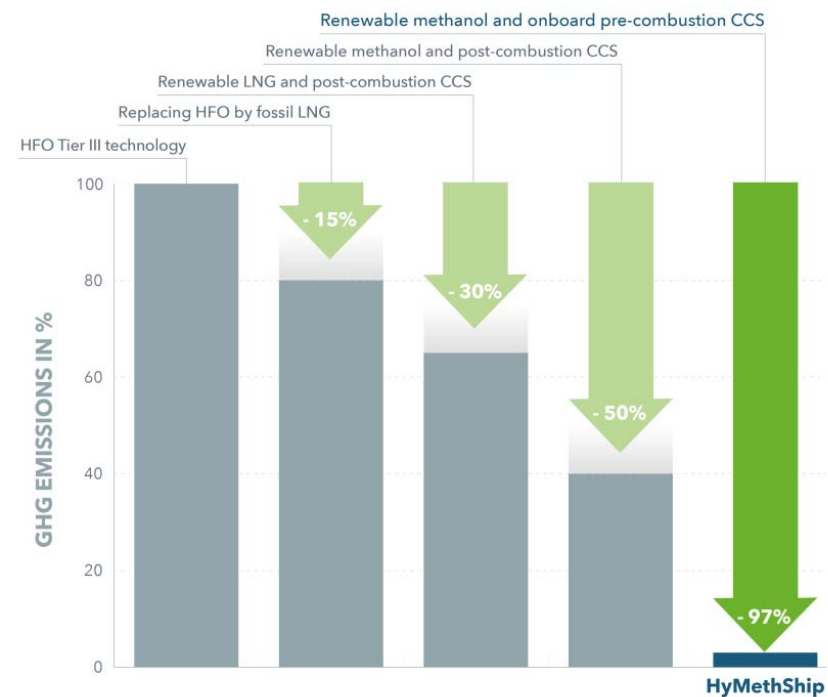
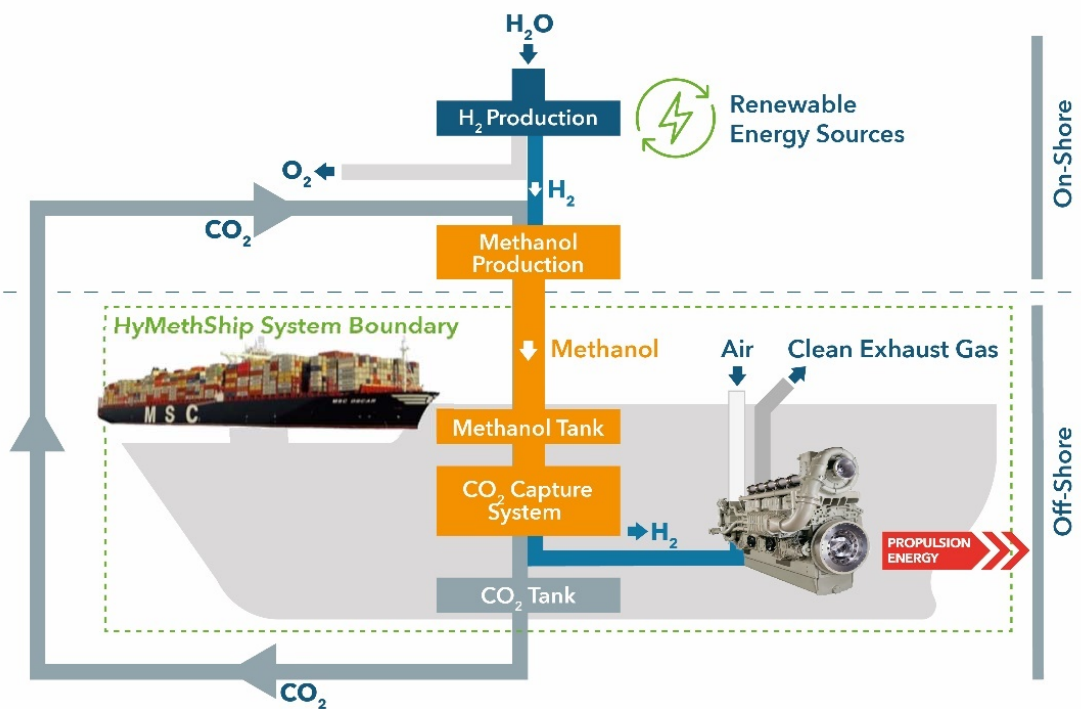


SIMULATION PARAMETERS

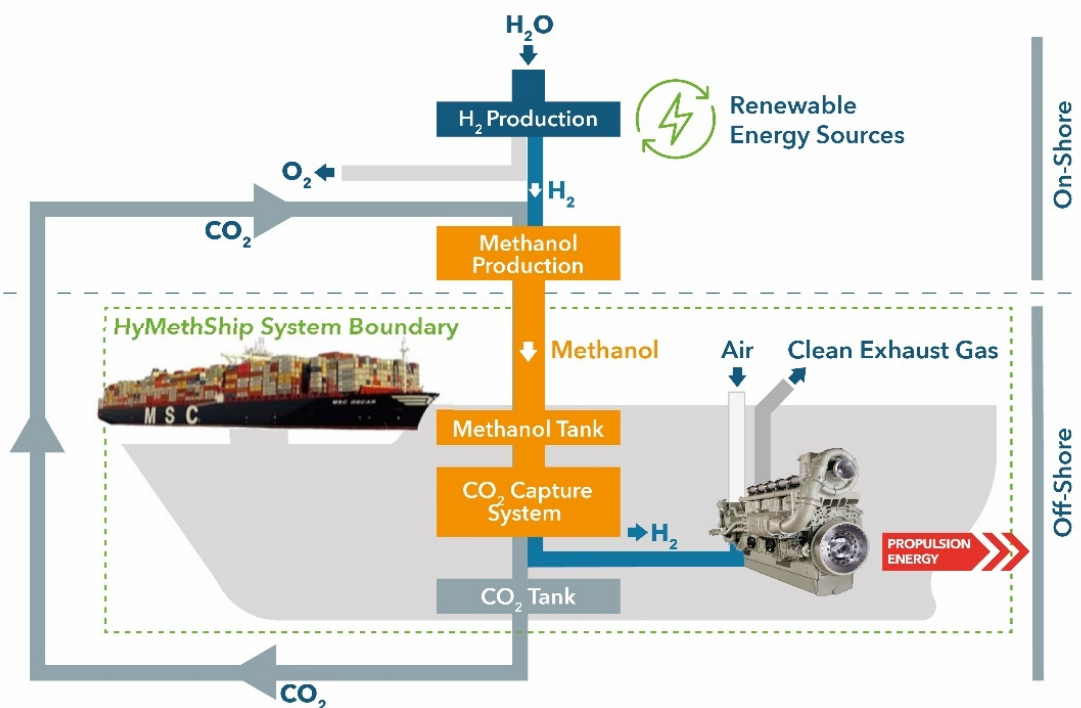
Electrolysis efficiency 4.5 kWh/Nm³ (average during operation). H₂ throughput: 150 MW electrolysis scale, 3500 EOH. H₂ loss: 1%. Auxiliary power consumption dependent on synthesis. Synthesis efficiency dependent on synthesis (thermodynamic limit as reference)

Source: Siemens Corporate Technology, Alexander Tremel: ATZ Automotive Conference, Baden Baden Feb. 2017.

“Emission-free” Ship Propulsion



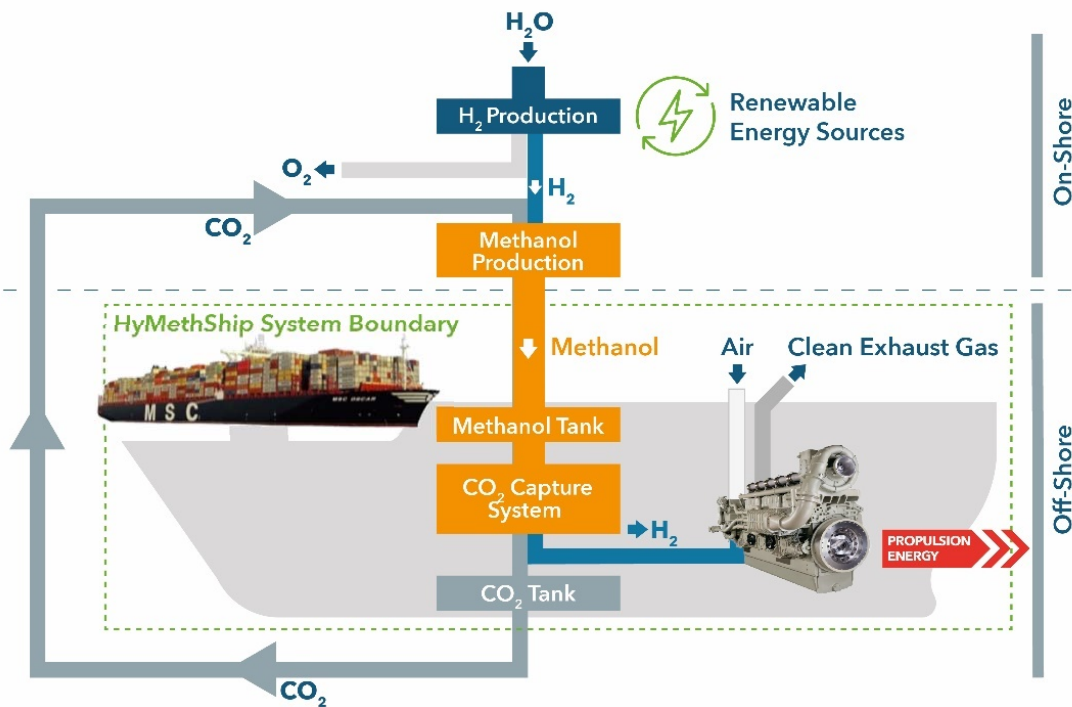
“Emission-free” Ship Propulsion



- 97% reduction in GHG emissions
 - Elimination of SO_x and PM emissions
 - Minimization of NO_x emissions
 - 45% increase in efficiency compared to the technology with conventional CO₂ capturing
- **Onshore full-size system demonstrator**



“Emission-free” Ship Propulsion



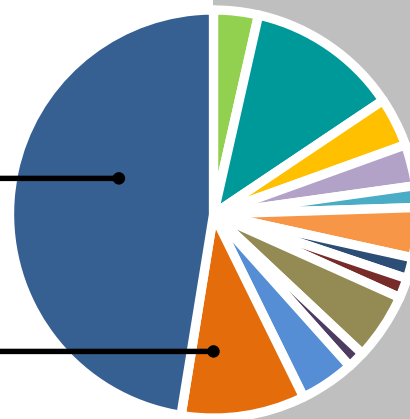
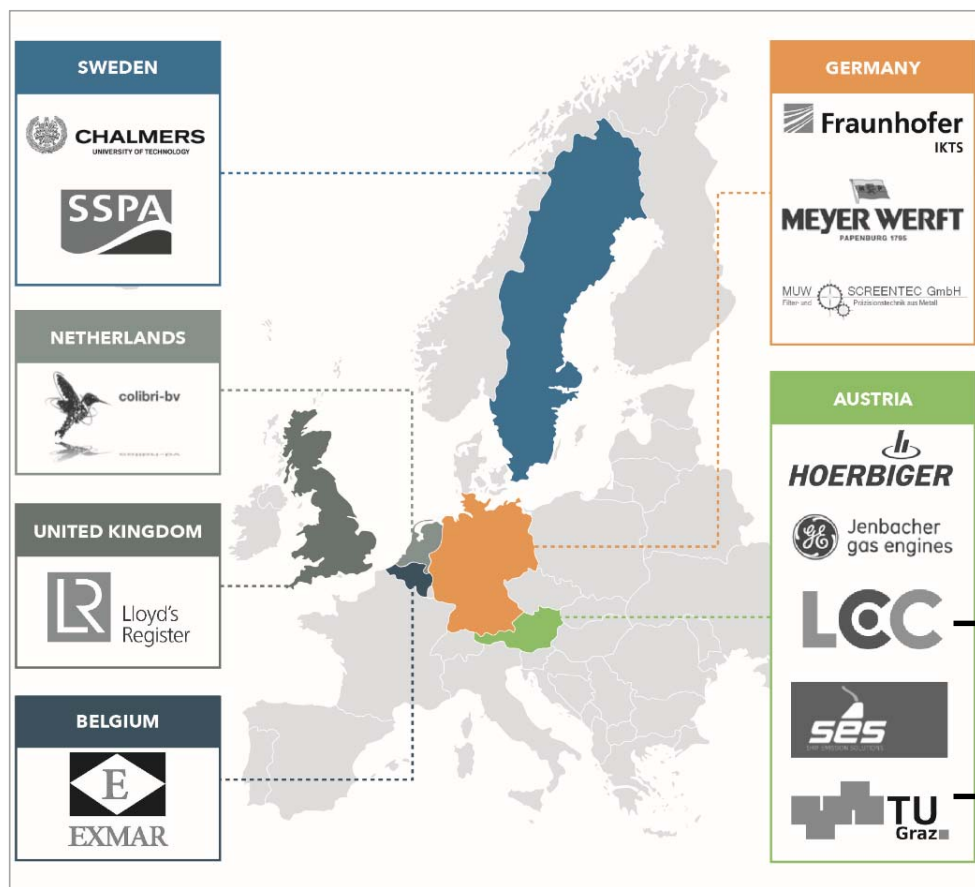
Evaluation Comments:

“... The extent to which the proposed work goes beyond the state of the art is excellent. The current state-of-the-art is very well established and advances from each component of the system are identified ...

...The innovation potential is excellent. The project will improve and employ technologies not yet applied to shipping and potentially eliminate the sulphur and CO₂ emissions. ...”



“Emission-free” Ship Propulsion



Coordinator
LEC

Total project budget
9,2 Mio. €

Project start
July 2018

Duration
36 months

Beneficiaries
13 partners



KONTAKT:

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LEC GmbH • Inffeldgasse 19 • A-8010 Graz, Österreich • Tel.: +43 (316) 873-30101 • Fax: +43 (316) 873-30102 • www.lec.at

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