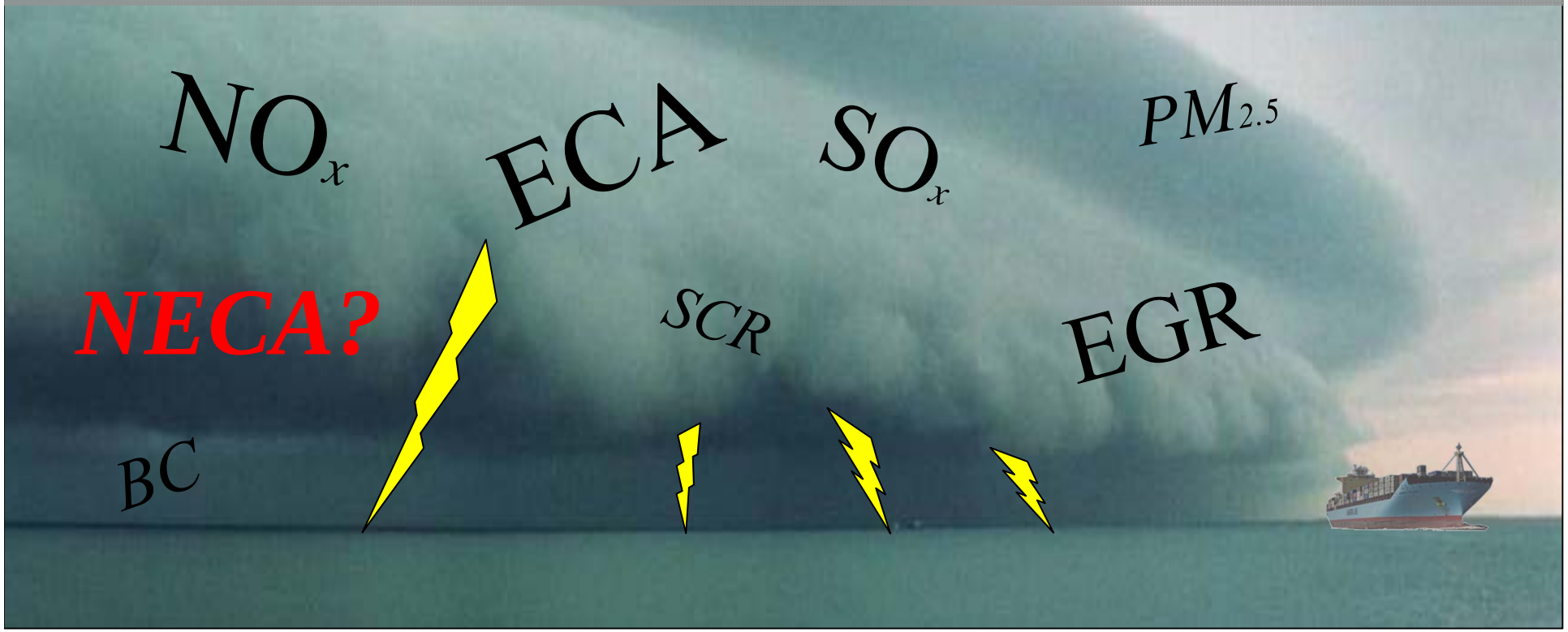
The experience of a shipowner on the operation of NOx abatement technologies

Christian Skoudal Løth
Senior Mechanical Engineer, Engine and Propulsion, Maersk Maritime Technology



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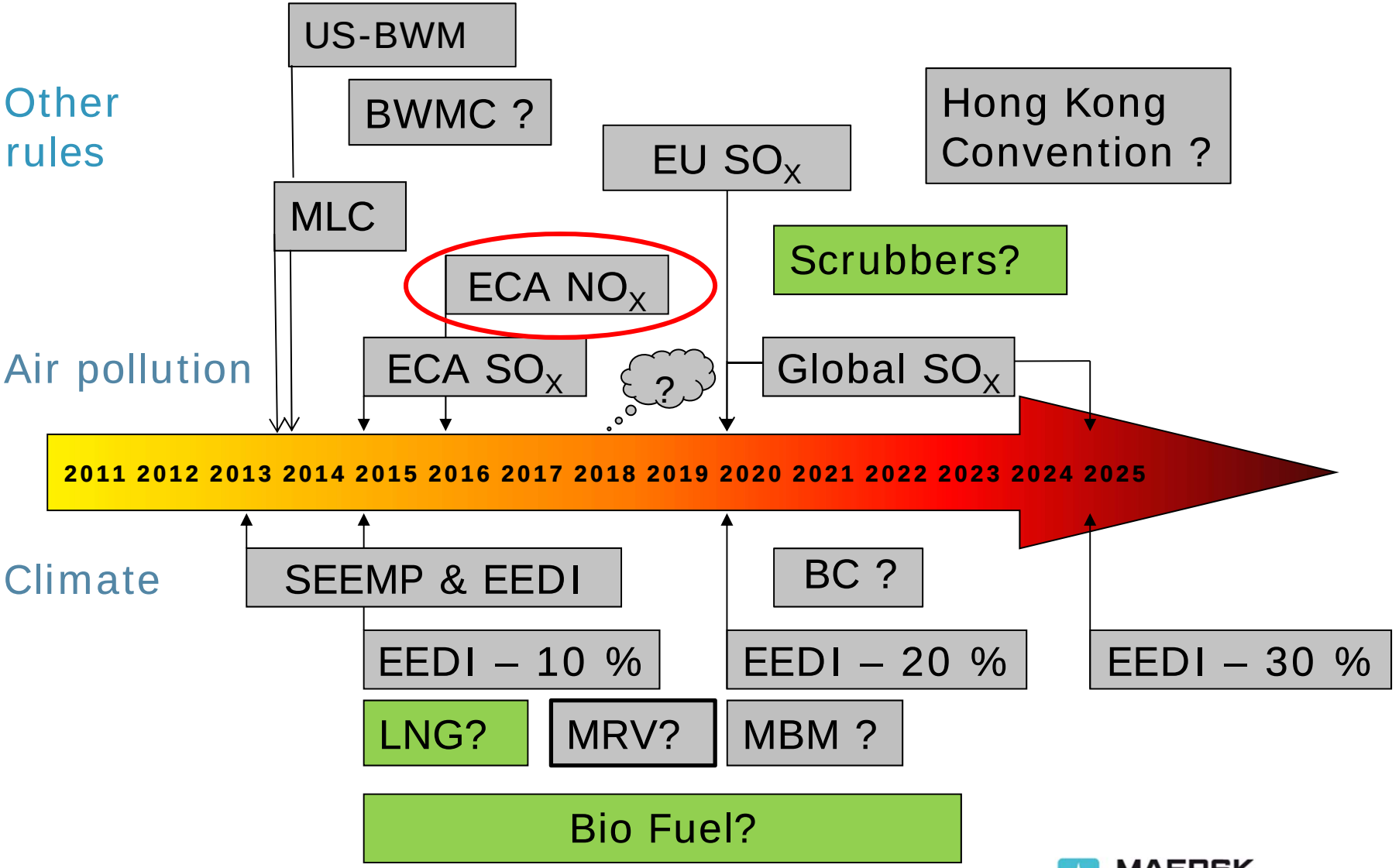
13 years of environmental regulation



MAERSK MARITIME TECHNOLOGY

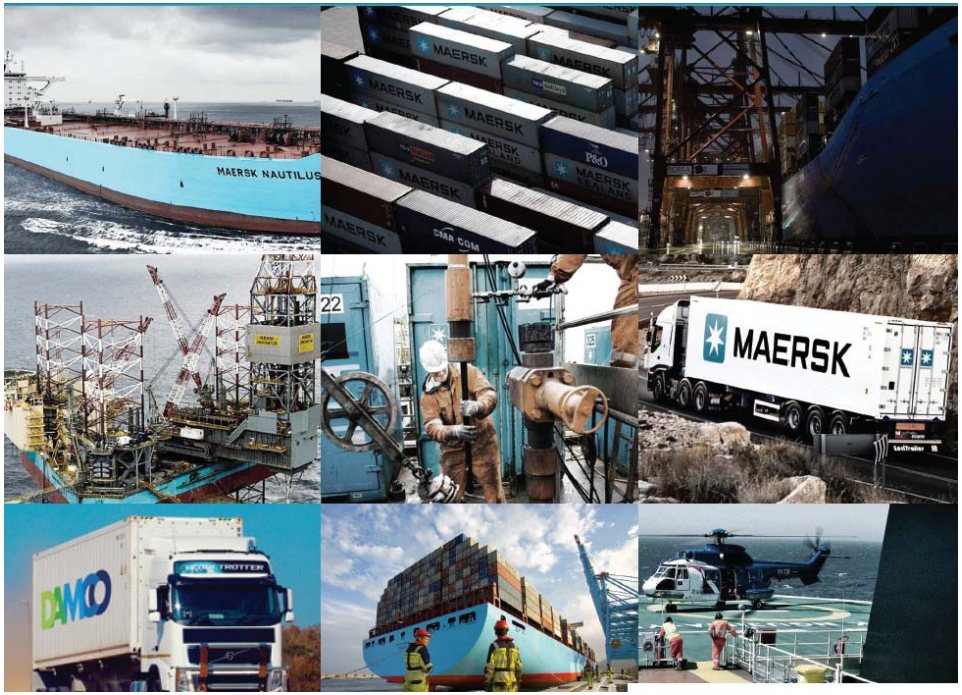
A.P. Moller-Maersk: A diversified conglomerate founded in 1904

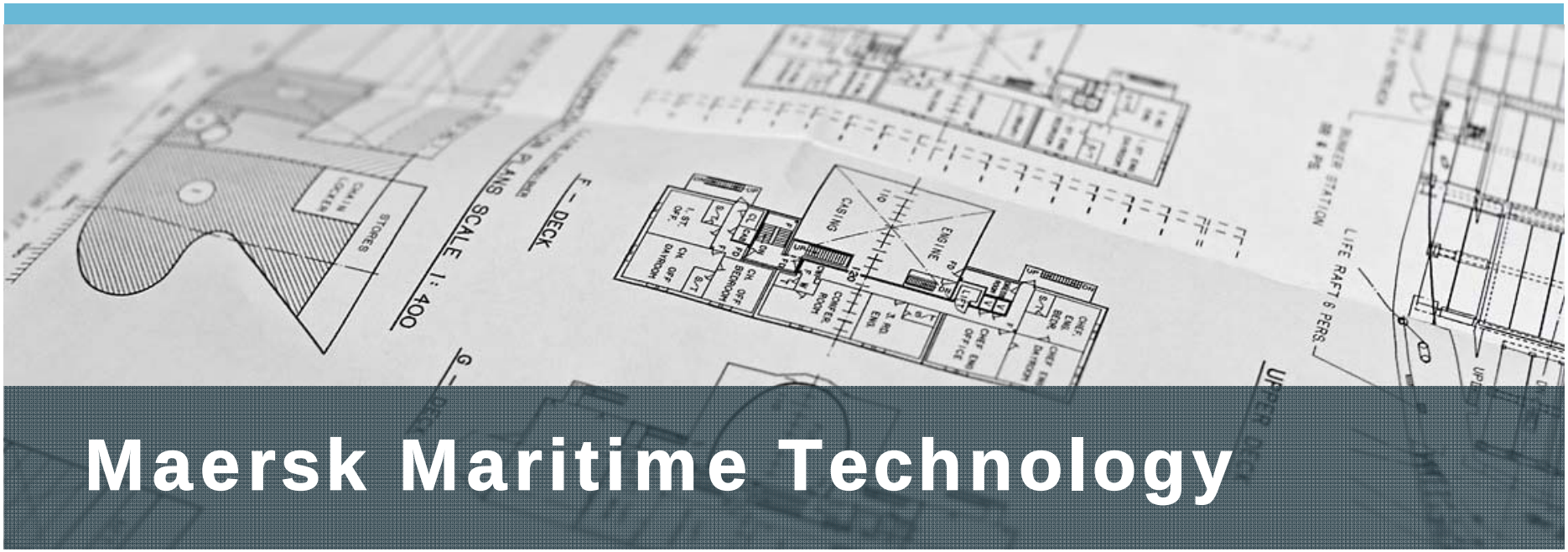
110,000 employees and operations
in over 130 countries

Headquarters in Copenhagen

Business segments:

- Container shipping (275/585 ships)
- Tankers (120/250 ships)
- Offshore supply services (65 ships)
- Drilling
- Oil and gas activities
- Terminals
- Retail, logistics and other activities





Maersk Maritime Technology

- A service function to the APMM Group,
- Works like a consultancy - fixed contracts + ad hoc
- Approx. 80 persons in Copenhagen + 50 in Mumbai, Singapore and on site offices in China, Korea and Chile
- Technical support, innovation and regulatory update

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The NOx Challenge

Means to meet the NOx Tier III:

1. Exhaust Gas Recirculation (EGR) technology,
2. Selective Catalytic Reduction (SCR) technology,
3. Use of LNG,
4. Cold Ironing (in port),
5. Fuel cells,
6. Nuclear power

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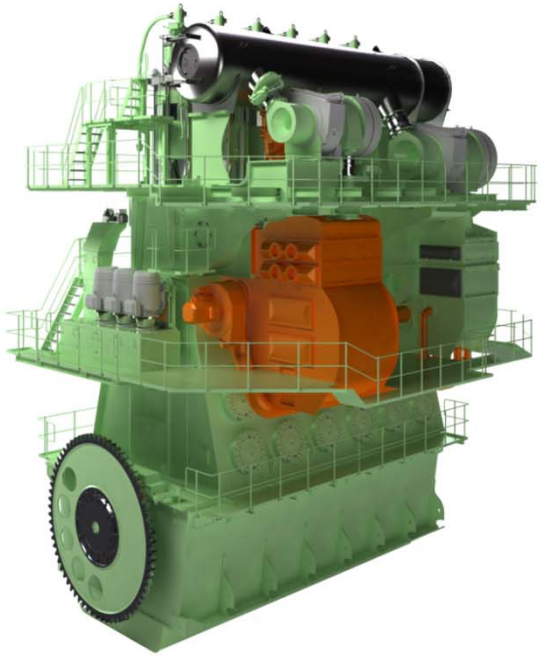
MAN NOx Tier III engines

SCR

EGR



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”Sofie Maersk” – SCR trials

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”Alexander Maersk” – EGR trials

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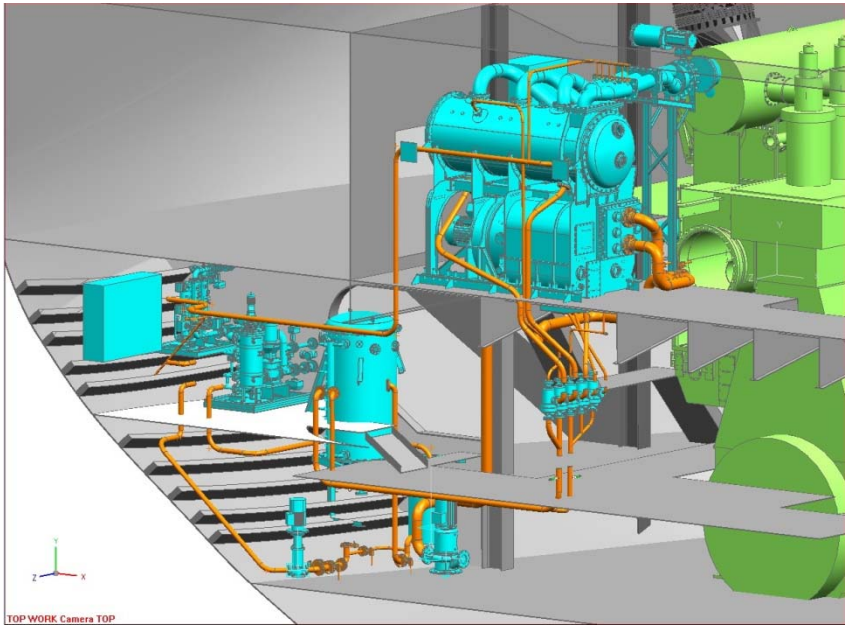
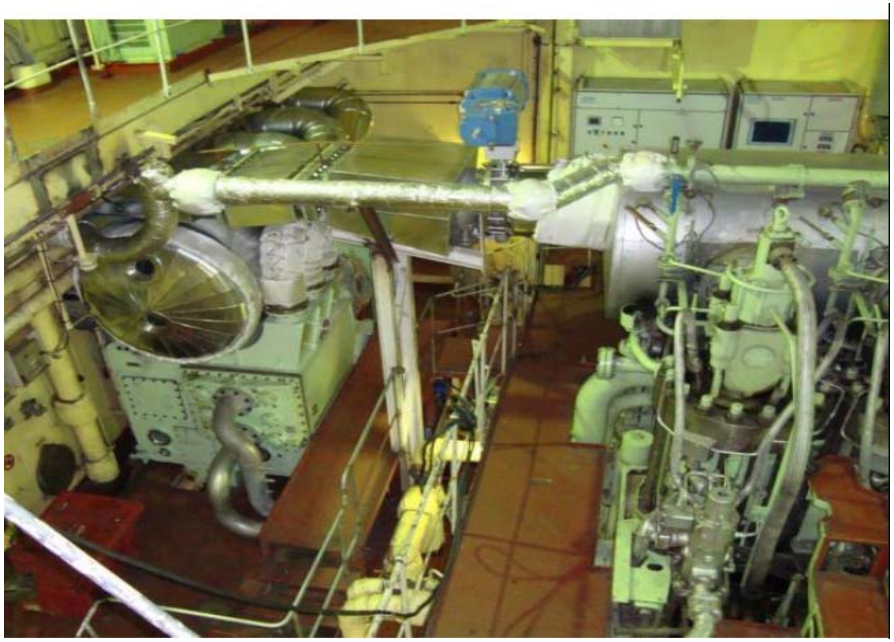
EGR in Service project



Source : MAN Diesel



Objective:

- Reduce NOx emissions by at least 50%

Status:

- System has been installed on board Alexander Maersk (1000 TEU, 10 MW)
- Cooperation with MAN Diesel and ABB, *Green Ship of the Future*
- Tests and evaluation of the concept was documented throughout 2010-13.

MAN Diesel

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”Maersk Cardiff”

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MAN Engine 2-stroke

- 6S80ME-C9-EGR
- On shop trial at HHI-EMD end 2012
- Vessel delivered end February 2013 and EGR is tested to end 2015

NOx reduction results from ”Maersk Cardiff”

- Shop test of the engine complied with Tier III.
- NOx Tier III mode has been tested at sea and is in full compliance.
- Purchase of NaOH done with truck delivery both in TPP and Busan ports
- Technical and regulatory issues with handling of the scrubber water.

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Impact by latest MEPC

- Consideration if vessel is to operate in US waters throughout the vessel life time?

- Installation of EGR or make vessel prepared for retro-fit and to what extent?

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Summary and Conclusion:

- **The main concerns for A.P.Moller-Maersk regarding ECA policy:**
  - ...not so much the extra cost for an EGR main engine,
  - ..not so much the technical challenges,

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THANK YOU
QUESTIONS?