Cost-effective ship NOx control

Christer Ågren
AirClim
IMO NOx-standards for new ship engines

Compare to EU-standards (Euro VI) for new heavy duty diesel engines in trucks and buses set at 0.4 g/kWh as from 2013 - down from 8 g/kWh from 1992 (Euro I).
NOx-abatement measures

Some of the main NOx-abatement options for ships:

- **Exhaust gas after-treatment** (e.g. SCR)
- **Combustion modifications** (e.g. EGR)
- **Fuel switch** (e.g. to LNG or methanol)
- **Reduced fuel consumption** (e.g. lower speed)
Reducing NOx by NECA – new studies

NOx emissions in the Baltic Sea and North Sea with/without NECA from 2021

Sources: IVL/CE Delft (2016); IVL (2017)
Reducing NOx by NECA + Levy & Fund

Sources: IVL/CE Delft (2016); IVL (2017)
Some conclusions from the studies

- Baseline (BAU) projection up to 2040 indicates a slight NOx reduction (-14% 2015-2040) (due “optimistic” assumptions on improved efficiency?)

- A NECA would significantly cut NOx in the longer term (-63% 2015-2040), but not so much in the near term (-37% 2015-2030)

- Significant short-term reductions are possible through the use of economic instruments, e.g. Levy & Fund (-72% 2015-2030)

- A Levy & Fund can cut NOx by around 500,000 tonnes/year throughout the 2020s. This equals current total annual land-based emissions from SE, DK, FI and NO combined.

Sources: IVL/CE Delft (2016) + IVL (2017)
CBA for NECA in Baltic Sea & North Sea

NECA: Benefits as VSL vs. costs (central valuation)

<table>
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<tr>
<th>Year</th>
<th>Benefits</th>
<th>Costs</th>
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<tr>
<td>2025</td>
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<td>2035</td>
<td>VOLY 884</td>
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<td>2040</td>
<td>VOLY 1147</td>
<td>563</td>
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Source: IVL (2017)
CBA for NECA + Levy & Fund

NECA + Levy & Fund: Benefits as VSL vs. costs (central valuation)

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<tr>
<th>Year</th>
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<td>2040</td>
<td>VOLY 1395</td>
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Source: IVL (2017)
Measures to cut ship emissions

- Improved emissions monitoring and compliance control
- Lowered speeds
- Emission standards for PM
- Develop and adopt an EU marine fuels quality directive
- Designate all European seas as full Emission Control Areas
- Emission charges to cut NOx (and PM?) from existing ships
- Enforce ECA limits + global 0.5% sulphur limit from 2020
More information?

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