October 2018 – Tommy Johnsen

MMAG 2018

Together to cut NOx emissions
Historical facts

- The NOx Fund was established in 2008, subject to a fiscal NOx tax introduced in 2007.
- The NOx Agreement between 15 Norwegian business sector organisations and the authorities replaces the tax.
- In the NOx Agreement the business sectors commit to collective quantitative emission reductions.
- Companies enroll the agreement individually and becomes members of the NOx Fund.
- The NOx Fund is the Norwegian business sectors’ administrative tool to meet emission reduction targets in the NOx Agreement.
- The NOx Agreement has been renegotiated two times (from 2011 and 2018).
- All emission reduction targets 2008-2017 has been met.
- In the same period 4 billion NOK as paid out as investment support to 1000 projects.
- NOx-reductions has been the primary target, but significant CO2 reductions has been achieved as a side effect (up to 37 000 tons NOx and 1 mill. tonn CO2).
The NOx agreement 2018-2025
Main results in shipping

12 large passenger ships on LNG, of which 9 is combined with battery power
More than 1 billion NOK in support

First fishing vessel on LNG, combined with battery power

50 ferries electrified
Up to 750 mill NOK in support

Coastal fleet on LNG, some including battery power
42 vessels supported with 1,3 billion NOK
Results 2

First aquaculture vessel (well boat) on LNG, combined with battery power

Offshore fleet
33 retrofitted to take shore power
13 on LNG
20 with battery power

Total invest. support: 500 mill. NOK
Small and large projects

Hywind Norwegian Continental Shelf (Equinor)
Wind power to offshore oil and gas installations replaces gas turbines
NOx Fund investment support: 566 mill. NOK (10-15%)
NOx-reduction: 1000 tons/yr

Trønderbas fishing vessel
Shore power home harbor
NOx Fund investment support: 330 000 NOK
NOx-reduction: 1 tonn
Incentives working in the same direction

- Push from technology and service providers
  - NMD open and able to handle new technologies
- The general GHG regulation treat
  - IMO SOx/NOx requirements
- Large companies’ environmental requirements when purchasing shipping services
  - Environmental requirements in public ferry contracts
- Financial incentives:
  - NOX Fund
  - Public funding schemes
  - Tax benefits
How the NOx Fund works

1. Emission sources report NOx-emissions quarterly.

2. Enterprises pay a fee, based on amount of NOx emitted, to the NOx Fund instead of fiscal tax to the State. The NOx Fund fee is lower than the tax.

3. Payments to the Fund is returned to the members as investment support to Nox reduction measures.

4. Lower emissions are reported and collective emissions level requirements are met.
Why it works - whip and carrot incentive scheme

Benefits:
- Investment support
- Lower tax
- Collective initiatives
- Time window
- Volume
- Continuity
- Private fund, less limited by state aid rules

Punishments:
- Sanctions from the tax authorities if targets are not met
- Higher tax over time
Investment Support

Support = Support Rate x NOx Reduction over 1 yr

• The support is limited to max. 80% of the investment cost

<table>
<thead>
<tr>
<th>Measure Type and Support Rates</th>
<th>250 NOK/kg</th>
<th>500 NOK/kg</th>
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<tbody>
<tr>
<td>• SCR and EGR or other NOx cleaning technologies</td>
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<td>• Shore power</td>
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<td>• Energy Efficiency Measures -retrofit</td>
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<td>• Engine Modifications –low NOx</td>
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<td>• Energy conversion: LNG, electrification and hydrogen</td>
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<td>• Energy storage systems (battery power)</td>
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<td>• Reduction of NOx factor from offshore gas turbines</td>
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<td>• Reduction of NOx emissions from flares</td>
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<td>• Engine replacement combined with Tier III measures</td>
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</tbody>
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Investment support calculation examples

- **Unit**: Fishing vessel
- **Measure**: Battery power
- **Cost**: 20 mill. NOK
- **Fuel reduction**: 20% = 400 ton per year
- **NOx factor before and after**: 40 kg/ton
- **Support rate**: 500 NOK/kg

\[ \text{Support} = 500 \times 40 \times 400 = 8 \text{ mill. NOK} \]

- **Unit**: Cargo ship
- **Measure**: LNG
- **Cost**: 40 mill. NOK (compared to diesel)
- **NOx factor before**: 40 kg/ton
- **NOx-factor after**: 5 kg/ton
- **Support rate**: 500 NOK/kg
- **LNG-consumption**: 4000 tons

\[ \text{Support} = 4000 \times (40-5) \times 500 : 32 \text{ mill. NOK (80\% limit)} \]
Other schemes similar to the NOx Fund

• Several initiatives historically, all failed
• Something for IMO to meet 50% GHG reduction target in 2050?
• Easier to apply the principles in small economies in countries/regions with «collective thinking cultures»

Island up next?
Thank you for your attention!
nho.no/nox