SECA Regulation: Co-operation Alignment Strategies for Maritime Sector

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EnviSuM Project

• EnviSuM - Environmental Impact of Low Emission Shipping: Measurements and Modelling Strategies (Sponsored by European Regional Development Fund).

• Aim: Addresses measurement and modelling strategies to assess present and future cost and the health and environmental effects of ship emissions in view of the IMO emission regulations

• Goals

  ✓ To enhance clean shipping

  ✓ Secure a level playing field for the maritime actors

  ✓ To connecting different maritime stakeholders of the Region in cross sectorial collaboration and events
Setting the Scene…

Sulphur Emission Regulations’ Diary

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Marpol Annex VI</td>
</tr>
<tr>
<td>2006</td>
<td>Baltic sea SECA</td>
</tr>
<tr>
<td>2007</td>
<td>North sea SECA</td>
</tr>
<tr>
<td>2009</td>
<td>EU legislation</td>
</tr>
<tr>
<td>2010</td>
<td>SECA limit dropped to 1.0%</td>
</tr>
<tr>
<td>2011</td>
<td>Global cap dropped to 3.5%</td>
</tr>
<tr>
<td>2012</td>
<td>North America SECA</td>
</tr>
<tr>
<td>2015</td>
<td>SECA limit drop to 0.1%</td>
</tr>
<tr>
<td>2016</td>
<td>China SECA</td>
</tr>
<tr>
<td>2020</td>
<td>Global cap 0.5%</td>
</tr>
</tbody>
</table>


Results so far show…

- The BSR is in the forefront of clean shipping campaigns with over a 95% compliance.
- Impact on economic parameters like costs, pricing, FDI, cargo flows and modal splits are considered negligible.
- Significant SECA impacts were attributed to innovation and reputation of BSR.
- Results shows that the ports feel negative about modal split while ship owners are positive.
- Over capacity is witnessed in the industry.
- Response outcomes are country specific.
- No level playing among stakeholders.
- Until now most stakeholders are “waiting” but if the oil price goes up a new direction is eminent.
The Dilemma of Investments Choices for Regulation Compliance

- SECA fuel use requires high investments, either from the fuel producers (LS-fuel) or from fuel users for abatement technologies.
- Going forward, fuel producing companies must make tough and strategic business decisions, which are linked to high investments and serious financial risks in the maritime fuel markets.
- Shipping sector and ship owners situation:
  - Current figures indicate stagnating scrubber installations due to low bunkering prices and low freight rates.
  - LNG is missing additional use outside shipping and has only limited availability
  - Game changer! Global cap from 2020 will increase the pressure on HFO producers

Consequence: Traditional fuel companies will not be able to cope with the decreasing demand for HFO because their major product will no longer be competitive in the market.

(Wiśnicki (2014); Olaniyi & Viirme (2016); Prause & Olaniyi (2017))
Entrepreneurial Pathways for Fuel producers (Traditional)

- **Upward vertical integration**
  - Blending HFO with the 0.1% MGO or other low-Sulphur content fuel

- **Products Upgrade**
  - Building a new refinery to yield: V Diesel, 0.1% Sulphur marine fuel oil and stabilized naphtha.

- **Hydrodesulphurisation**
  - Partial hydrogenation of product oil for Sulphur removal

- **Product Discount**
  - Market products at discount

- **Process innovation**
  - Significantly improved production method

**Options**

- **Hydrodesulphurisation and Product upgrade could yield a significant return on investment.**
- **But both are very expensive and highly risky.**

Olaniyi & Viirme, 2016
Anyway out?
Technology push effect for the EU

The European technology will have an advantage if scrubbers are chosen but how many ship owners can afford it?

Introducing MEC…

✓ Marine Energy Contracting - a radical new business model.

✓ Metamorphose from being just fuel producers to energy service companies and focus instead on fuel supply and services.

✓ Energy Supply Contract (ESC) concept is transferred to the maritime sector to create MEC with scrubber installation i.e. supply the HFO to contracted ships, pre-finance the project in order to protect the SECA compliance.

✓ Value proposition:
  - Optimisation and economies of scales (cost reduction, infrastructure sharing/outsourcing, total package offerings)
  - Economics of scope (cost advantage and increased distribution channel) and fixed cost contract
  - Risk reduction (financial risks, market risks and price uncertainties), ease of transactions and accessibility (removal of intermediaries)

✓ Creates unprecedented opportunities in the maritime sector - actionable and offers feasible and fresh way to innovation in an uncertain, fast-moving and unpredictable environment.
Value at Risk (VaR) for Investment Appraisal

- The value at risk (VaR) approach was used to provide the linkage between capital budgeting methods and their related risks.

- VaR describes the capital or percentage of capital loss to be surpassed with an assured probability or words confidence level over a certain time period.

- The related value of the scrubber investment was determined by the NPV of net fuel cost savings.

Model:

\[
\int_{-\infty}^{-\text{VaR}_\alpha} f(x)dx = 1 \quad | \quad \alpha
\]
Findings: Quantiles of VaR and NPV of Spread Distribution

<table>
<thead>
<tr>
<th>Historical Data</th>
<th>Days</th>
<th>Saving money from the fuel difference annually/ USD</th>
<th>Fuel Spread</th>
<th>NPV in 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% days</td>
<td>96.2</td>
<td>4 180 680,52</td>
<td>193,375</td>
<td>$24 123 780,96</td>
</tr>
<tr>
<td>5% days</td>
<td>48.1</td>
<td>3 691 193,64</td>
<td>174,625</td>
<td>$21 176 531,16</td>
</tr>
<tr>
<td>1% days</td>
<td>9.62</td>
<td>2 772 997,66</td>
<td>134,500</td>
<td>$15 707 227,67</td>
</tr>
</tbody>
</table>

- Using historical data analysis of empiric probability distribution of the spread between HFO and MGO between 2013 and 2017 (962 days) using a ferry ship – RoPax.
- VaR of the lower 10%, 5% and 1% quantiles of related distribution of the spread was used.
- Results shows lower 5% quantile of the spread distribution would save a minimum of 3 691 193,64 USD per year.
- Thus, a savings with a 95% probability will yield a benefit of minimal about 21 million USD in 15 years (Scrubber life span).
- Also note: A decrease of the spread to 134.5 USD will lead to a lower saving but this situation is also related to the lower 1% quantile of the spread distribution.
Using the Critical Value with Changing Volatility of Fuel Prices

- The current value of assets is used to encourage or discourage investment.
- Determines the critical EU call option value (also called investment value), i.e. an increase in market volatility or change in volatility of the market.
- For example, if the volatility of the market exceeds 0.73, investment should be postponed for about a year.
- If volatility is at 0.73 or less, then investment can be made now.

<table>
<thead>
<tr>
<th>Volatility</th>
<th>Eu call option value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>12618996.43</td>
</tr>
<tr>
<td>0.20</td>
<td>12628680.31</td>
</tr>
<tr>
<td>0.30</td>
<td>12774718.94</td>
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<tr>
<td>0.40</td>
<td>13369239.22</td>
</tr>
<tr>
<td>0.50</td>
<td>14017724.99</td>
</tr>
<tr>
<td>0.60</td>
<td>14435734.41</td>
</tr>
<tr>
<td>0.70</td>
<td>14623321.26</td>
</tr>
<tr>
<td>0.71</td>
<td>14638054.69</td>
</tr>
<tr>
<td>0.72</td>
<td>14645752.03</td>
</tr>
<tr>
<td>0.73</td>
<td>14654813.92</td>
</tr>
<tr>
<td>0.74</td>
<td>14662488.11</td>
</tr>
<tr>
<td>0.76</td>
<td>14669485.71</td>
</tr>
</tbody>
</table>
MEC Financial Dimension: 
Contract, Pricing and Contract Conditions

The cost of MEC will be calculated as:

$$MEC\ Price = Fuel\ cost + Scrubber\ costs + Adjustments$$

- Fuel cost =
  $${\text{AP}}_{\text{HFO}}\ [€/\text{mt}] = {\text{AP}}_{\text{O,HFO}}\ [€/\text{mt}] + \text{FS}\ [€/\text{mt}] - {\text{FS}}_0\ [€/\text{mt}]$$  \hspace{1cm} (1)

  Where:
  
  - $${\text{AP}}_{\text{HFO}}$$: Working price during contract time per metric tonne of fuel (€/mt)
  - $${\text{AP}}_{\text{O,HFO}}$$: Baseline price according to official statistics in the certain period €/mt
  - FS: Price for fuel supply per metric tonne €/mt
  - FS<sub>0</sub>: Fuel supply baseline in a particular period (i.e. 01-06/2017) €/mt

- Adjustment (non assets) =
  $${\text{LP}}\ [€/\text{a}] = {\text{LP}}_0\ [€/\text{a}] \times (0.5 + 0.3 + \frac{l}{L_0} + 0.2 \times \frac{L}{L_0})$$  \hspace{1cm} (2)

  Where:
  
  - $${\text{LP}}$$: New price during contract time per annum [€/a]
  - $${\text{LP}}_0$$: Base price according to official statistics at particular time [€/a]
  - $$l$$: Current price index for consumer goods taken as the baseline (i.e. the consumer index of common goods of the year 2017 set at 100). 
  - $$I_0$$: Current price index for consumer goods comparable to the $$l$$ (e.g. September 2017 = 103)
  - $$L$$: Average salary index at a certain time during the contract time
  - $$L_{re}$$: Average salary index for setting as starting point for the contract
MEC Offers…

✓ Environmental benefits (SOx emissions reduction).

✓ Money savings on initial investment costs + other costs
  ✓ Jobs and career creation.
  ✓ Reduced operational costs.

✓ Free technology and expertise support for the ship owner.

✓ A scalable investment for the fuel company.

✓ Higher margin for the fuel production company compared to the traditional HFO supply approach.

✓ Customer fitted model i.e. customized contracts with the ship owners.
On a final note…

“In the end, sustainable development is not a fixed state of harmony, but rather a process of change where the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are consistent with the future as well as with the present needs…Painful and radical choices have to be made. Thus in the end, a sustainable development must rest on political will.”

- WCED 1997, Our Common Future
Thoughts:

The scrubber:
- A much needed technology push for EU!!!
- As residual oil, what happens when HFO is no longer in use ... how do we ensure it does not lead to a technical waste?
- What does this mean for the EU?
- So what are the policy options?
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Thank you!