PAME II 2018: Agenda item 6.2(a)(iii)

HFO project phase IV(d)

Alternative fuels for use by ships in the Arctic – a progress report

Background

PAME has conducted numerous projects related to the use of HFO in the Arctic. A record of decision (RoD) from PAME II 2016 invited members to serve as co-leads on each of four projects dealing with HFO issues. Norway, together with WWF volunteered to co-lead «a study that explores the environmental, economic, technical and practical aspects of the use by ships in the Arctic of alternative fuels, including LNG». In this process the US has also contributed with useful input and reviews.

The project was fully financed by the Norwegian Ministry of Foreign Affairs. DnV GL, who have successfully conducted several of the previous HFO-projects, were chosen as consultants.

PAME I 2018 video presentation

At PAME I 2018 the consultants held a video presentation about the work that had been done up to that point in time. That included looking at 3 alternative definitions of the Arctic and the significance the choice of definition for the Arctic has on the number and types of ships considered in the project. If the border is drawn at low latitudes the data from «true Arctic» shipping will be disguised by the large amount of data from shipping in more temperate climate. The polar code definition of the Arctic was therefore chosen. The work also included a statistical and geographical description of the shipping that is presently being conducted in Arctic waters. Such description is necessary in order to understand what alternative fuels may possibly replace existing HFO in the various types of shipping. For example, it's relevant whether the shipping is deep sea, short sea or just a ferry crossing. Location is relevant with respect to available infrastructure. Finally, the types of alternative fuels available, their status and characteristics were presented, but not conclusively.

Further developments

The latest development is a system for evaluating different fuel types according to criteria that reflect the contents of the RoD formulated by PAME. The sum total score becomes the basis for a rank order.

For illustration purposes only

Energy source/carrier	Environmental			Economic			Scalability				Sum total
	Air	Bunker	Enviror	Ship	Infra-struct.	al Econc	Techni cal	Applic ability	Availib ility	- Scalea	
HFO/CE	18	48	33.0	7.5	1.5	4.5	9.75	4.3	3.7	5.9	43.4
Diesel&MGO/CE/BE	13.4	39	26.2	7.5	1.5	4.5	6.75	4.3	3.7	4.9	35.6
Low Sulphure Hybrid/CE	15.4	51	33.2	6.75	1.5	4.1	9.75	4.3	4.0	6.0	43.4
Low Sulp Hybrid Arctic/CE	15.4	30	22.7	8.25	1.5	4.9	9.75	4.3	4.7	6.3	33.8
Bio Diesel(HVO)/CE	8.2	36	22.1	8.25	1.5	4.9	7.5	4.3	14.0	8.6	35.6
Bio-gas/CE/BE	5.6	9	7.3	10.5	5	7.8	15.75	15.3	21.3	17.5	32.5
LNG/CE/BE	7.4	9	8.2	9	5	7.0	15.75	15.3	8.0	13.0	28.2
Full electric/BE	3	9	6.0	8.25	5	6.6	9.75	24.0	15.0	16.3	28.9
Methanol/FC/BE	4.8	15	9.9	11.25	2.5	6.9	12.75	16.7	14.3	14.6	31.4
Hydrogen/FC/BE	3	9	6.0	14.25	6	10.1	27	26.0	19.0	24.0	40.1
Amonia/FC/BE	3	9	6.0	14.25	5	9.6	27	22.7	19.0	22.9	38.5

Assigning values to criteria and weights is achieved through discussions among competent persons in the fields that are involved. This is a somewhat subjective procedure, but with many participants the results are expected to be consistent with scientific knowledge. A table showing the milestones for this project is enclosed as an appendix.

The report will be finalized this year and the results will be presented at PAME I 2019. The report is expected to contain information that will be relevant for issues being discussed at the International Maritime Organization and elsewhere.

Appendix

Milestones	
No/Compl.	**Milestone/Activity**
M1	When alternative geographical definitions of the Arctic is discussed and the selected alternative is selected
100 %	Discuss the alternative definitions of the Arctic relevant for ship emission calculations and argue for the selected choice
100 %	Identify 3 relevant alternatives and illustrate the effect of choosing either with the respective effect on the traffic included
M2	When the ship activity in the Arctic region between 2013 and 2018 is described and illustrated by tables, plots and graphs
100 %	Establish plots of all ship activities for each year on a map of the region
100 %	Tabulate ship activities in the form of number of unique vessels, operational hours, sailed distance, fuel consumption as well as the emission components for each year. Create plots illustrating the data
100 %	Illustrate the changes from 2014 through to 2017 in the different ship traffic types by plotting on maps as well as tables and graphs|
90 %	Discuss the main changes in traffic and possible implication on the future choice of fuel in the Arctic region
M3	When the current (2017) fuel distribution is established and illustrated with plots and graphs
100 %	Establish an overview of the current (2017) use of fuel and the types of fuel carried
100 %	Show plots illustrating the use of fuel in a geographical context
M4	When the Current and future fuel alternatives are listed and systemized with respect to their technological maturity and compatibility with the current fleet in the Arctic
90 %	Evaluate the different fuel/propulsion alternatives with respect to climate impact, by emission to air - also including short-lived climate forcing components
90 %	Evaluate the different fuel/propulsion alternatives with respect to environmental impact (local effects) and the relevance in the Arctic
90 %	Include a tank to propeller analysis, but also consider upstream elements such as bunkering releases
M5	When the results from the Part 1 of the project is compiled and presented to the PAME I - 2018 meeting

100 %	Compile the results from the Phase 1 into a presentation for the PAME I-2018 session
100 %	Hold a video presentation for the PAME meeting
M6	When the fuel alternatives are discussed with respect to their future roles and strengths and challenges
100 %	Establish a methodology allowing for a rating of the different fuel alternatives
70 %	Adapt the method to short-sea and deep-sea shipping
M7	When a workshop is held including Sdir and KV for ranking the different alternatives according to the suggested criteria according to a NEBA (Net Environmental Benefit Assessment)
80 %	Arrange a Work Seminar with the relevant partners regarding the methodology from M6
80 %	Facilitate the Work Seminar according to plan
M8	When the different fuel alternatives are evaluated with respect to environmental aspects
80 %	Based on input from the workshop, complete a matrix (or one for short-sea and deep-sea separately) with the scores of the different alternatives - Applicability, Technical, Economic, Maturity and Environmental maturity
80 %	Set up plots illustrating the score if the different fuel alternatives as stacked columns
M9	When the fuel/propulsion alternatives that are expected further along the line are discussed and evaluated
80 %	Set up in accordance with the more established fuels, an overview of the fuels that may appear further along the line and discuss the strengths and weaknesses with respect to the set criteria
M10	When the main practical and barriers the coming years for the alternative fuels are identified and described
20 %	Evaluate the practical and economical barriers (near to mid-term future) of the different fuel/propulsion alternatives discussed in M8 and M7.
90 %	Discuss the main safety aspects of the different fuel alternatives including the supply safety
40 %	Identify strategies to overcome the main barriers and how this may support a future shift according to environmental criteria
0 %	Discuss how the possible regulation may be aligned with the current/future regional/national/international regulations

M11	When the technical solutions particularly suitable for Arctic operation are identifies (both short and deep sea shipping) and the emission reduction potential is defined
20 %	Based on the above described assessments - Identify technical solutions, separately for short and deep sea shipping, that are seen to have a particular suitability the Arctic and identify the potential for emission/risk reduction.
M12	When the final report is ready for verification
70 %	Generate report
0 %	Verify report
M13	When the final report is verified and ready for submittal
20 %	Submit report according to agreement