

ESSF SAPS MEETING 26.09.23
UPDATE ON WORKSTREAM 1
Keno Leites, Zeppelin Power Systems



01 SCOPE AND WORK PROGRAM

02 TIMELINE

03 STATUS OF WORK

04 NEXT STEPS

- Criteria for Zero-Emission Technologies (ZET)
- Certification of ZETs
- Scope of “Zero-Emissions” – Direct Emissions/ focus on zero-pollutant emissions at berth
- Fuel Cells (PEM, Reformer emissions)
- Closed cycle engines/ energy conversion
- Develop standard reference list of ZETs

- Develop standard for GHG fuel certification to complement RED Sustainability fuel cert
- Objective: include all processes and economic operators involved in the marine fuel supply chain
- Link/cooperate with Renewable and Low Carbon Fuel Alliance (RLCF Alliance)
- Fuel certification companies to be involved

Workstream 3 – Energy Converter Certification

Validation of Energy Converters for TTW slippage emissions

Workstream 4 – FuelEU-specific MRV activities

- Implementing act | Articles 7(4), 12(5), 13(3),
- Work focused on existing MRV DAs
- Focus on addition of FuelEU-specific elements

SCOPE AND WORK PROGRAM



SCOPE OF WORKSTREAM 1

Workstream 1 –Zero Emission Technologies

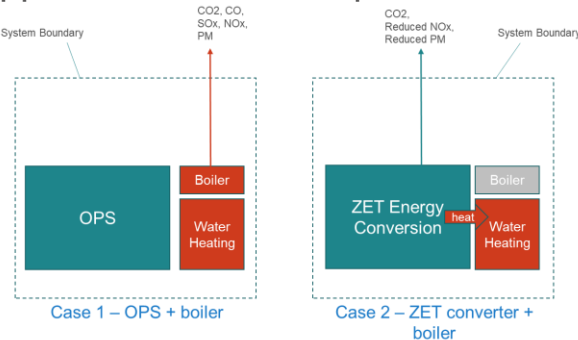
- Criteria for Zero-Emission Technologies (ZET)
- Certification of ZETs
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GUIDELINES FROM COMMISSION

In scope

- Text of FuelEU maritime is final
- Criteria for ZET listed in Annex III are priority
- Other ZET can be included additionally
- Zero is “0” (or close to detection limit)
- Criteria for the use of RED compliant fuels can be discussed
- An inclusive approach for heat and power can be discussed



Out of scope

- A phase out concept is not possible
- CCS is not welcomed
- Port side aspects are subject of AFIR



WORK PROGRAM

- Defining methods to certify that the fuel used at berth is RED compliant
- Defining an algorithm (or similar) for the adequate dimensioning of the boiler
- Defining criteria for the acceptance of fuel cell systems as ZET at berth (either hydrogen or other fuels)
- Defining criteria for the acceptance of energy storage systems at berth (especially charging conditions)
- Defining criteria for the acceptance of wind generated power at berth
- Defining criteria for the acceptance of photo voltaic power at berth
- Defining criteria for the acceptance of a mixed energy supply to the vessel including partial OPS
- Describing other ZET and definition of criteria for their acceptance

Types of technology	General requirements for operation
Fuel cells	Power supplied by onboard fuel cells with a fuel or a system ensuring that, when used to provide energy, it does not release any emissions referred to in Article 3, point (7), into the atmosphere
On-board electrical energy storage	Power supplied by on-board electrical energy storage systems previously charged via: <ul style="list-style-type: none"> – onboard power generation at sea – shore side battery charging – battery swapping
On-board power generation from wind and solar energy	Power supplied by on-board renewable energy sources, either directly supplying to the ship grid or via charging of on-board intermediate electrical energy storage

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TIMELINE



TIMELINE

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OCTOBER

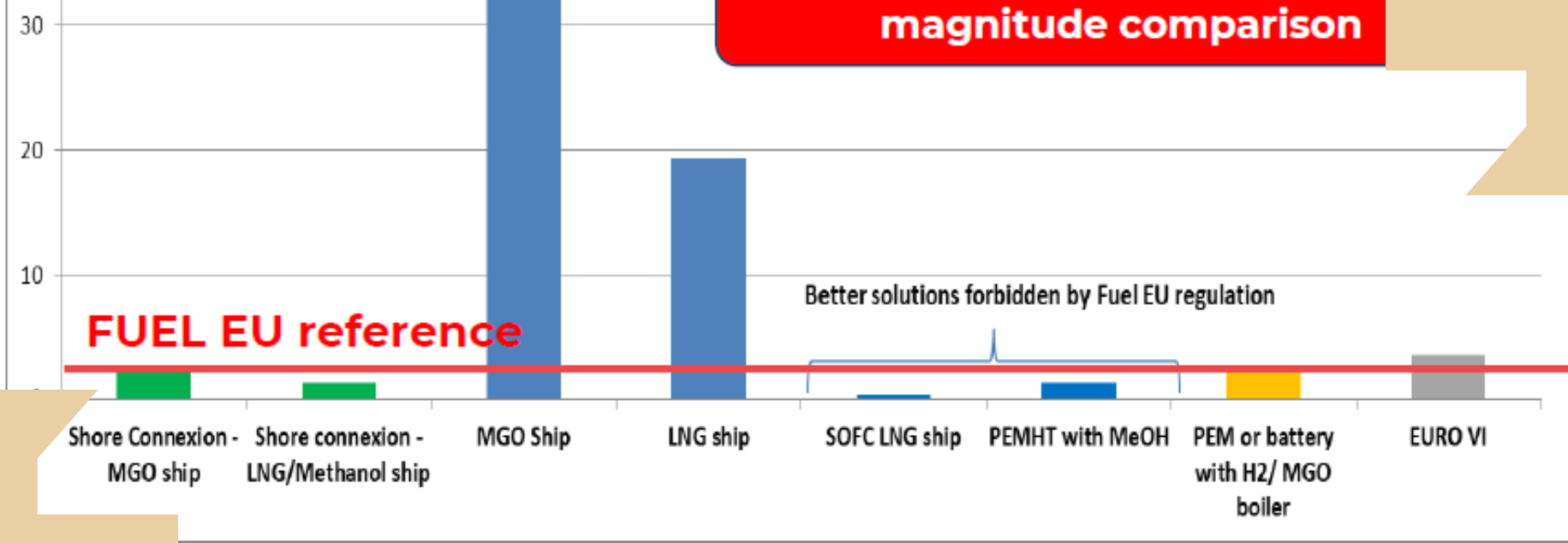
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DECEMBER

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STATUS OF WORK



COLLECTED ANSWERS FROM ROUND 1

Question	DE	ABS	Carnival	Royal Caribbean	MSC	UGS
1: Terms of Reference	We see the need to define the term "Zero-Emission Technology" more precisely and develop a common understanding, whether ZET means no pollutant and GHG (TW) emissions at all or if very low pollutant emissions that seem to occur when using fuel cells with other fuels than H ₂ as well as GHG emissions on a TW-basis could be accepted for qualifying as ZET.	We propose to add the following point: Requirements on the port infrastructure for charging at berth (Low/High voltage from utility, Use of Pre-charged batteries, etc.)	Agree to the list.	Would like to propose BAT approach on the emission limits – not stating specific technologies accepted. Would like to propose building a more complete list of GHG's into the 3(7).	As we discussed in the meeting this is not going to be a forum for policy but strictly confined to technical , keeping the same in view ToR is ok	
2: Scope (Other fuels)	In our view there is no urgent need to promote the use of RFNBOs at berth, neither is there any need to exclude them in principle. The aim is to reach (near-) zero emissions at berth. Nevertheless, as currently formulated in FEUM, besides H ₂ , it seems that only ammonia used in fuel cells could be GHG-free on a TW -basis operated under certain conditions - either using a cracker that splits NH ₃ into N ₂ and H ₂ (emitting low NOx for heating the cracker) or a proton-conducting SOFC. Nonetheless DEU has always been a strong promoter for RFNBO's for FUEM, therefore, these fuels should be eligible for use at berth as long as we have no (considerable) air pollutant emissions and the GHG emissions stay net zero (within the fuels value chain). Having said this, all fuels that could be used in fuel cells on a zero TW basis should be allowed.	Yes. Possible alternative fuels are 1. Ammonia (with NOx catalyst) 2. Electrofuels such as E-Diesel 3. Nuclear	The Tank-to-Wake approach for ZET is not reasonable. Limiting the possible fuel de-facto to hydrogen is preventing important technology from developing and is directly hindering the promotion of e-fuels as hydrogen carrier, that are supported in other sections of FEUM. We see three options: Open FEUM ZET to net-zero low carbon fuels (Life-Cycle - Well-to-Wake). Or define the system boundaries in a way, that the conversion of low carbon fuels to hydrogen is not considered part of the ZET (e.g. reforming the fuel). Third define fuel cells as heat production and take electric power as a side product.	Following the zero emissions definition in article 3(7)" "zero-emission technology" means a technology that, when used to provide energy, does not result in the release of the following greenhouse gases and air pollutants into the atmosphere by ships" – Why setting the limit GHG concerns only to CO ₂ , CH ₄ and N ₂ O? CO ₂ , CH ₄ and N ₂ O emissions should be treated in the same way both under Energy use Underway (Article 4) and Additional requirements for zero emissions at berth (Article 6) and follow the methodology set out in Annex 1 for both. Article 6 should only deal with additional requirements for zero emission of pollutants There is no logical reasons for treating GHG emissions at berth differently from GHG emissions at sea, whilst there is a very good and logical reason to treat the emission of air pollutants in populated areas differently from at sea.	Again as discussed in the forum it was neither a yes or no to this particular question ; ZET seems to be at odds with Net Zero etc but it was left open for debate ; development of low carbon fuels in combination with LCA is only going to delay the development of ZET ?	We consider that renewable and low carbon fuels can be options to meet the requirements, though this may require capture/mitigation/abatement. As such, we consider that with respect to ZET, fuels should not be limited to hydrogen only.

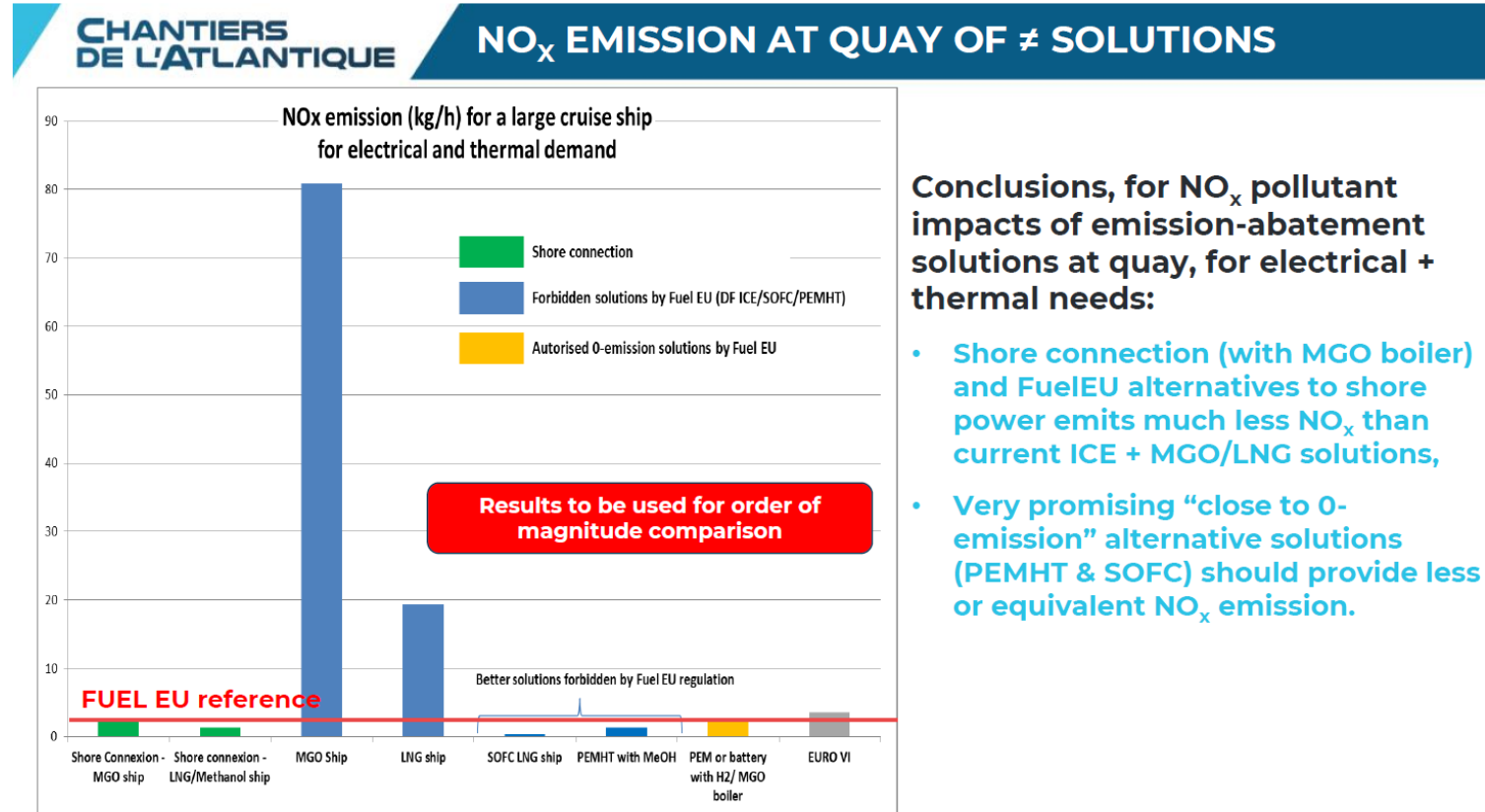


AGGREGATED ANSWERS ROUND 1

- Majority promotes to accept RED compliant fuels as zero GHG
- Majority accepts heat and power balance as method to define emission allowances for a vessel
 - definition of zero emission boundary
 - definition of NOx emissions for boilers necessary
- A number of participants requested to be technology agnostic
- Additional candidates as ZET were promoted: ICE with exhaust gas treatment, nuclear, energy harvesting
- References to standards were more general
- Certification of zero emission was proposed as test bed result as well as operational measurement
- The effectiveness of after treatment was questioned



EMISSIONS BALANCE FOR HEAT + POWER





ROUND 2

- Round 2 questionnaire is distributed
 - Focussing on facts and figures for acceptance criteria
 - Structured according to Annex III
 - Answers invited within this week

5. Defining acceptance criteria and certification references for onboard electrical storage systems
6. Defining acceptance criteria for onboard wind and solar energy generating
7. Defining acceptance criteria for the use of combinations of ZET and OPS
8. Defining further ZET and their acceptance criteria

Do you agree with the list of work items proposed above? Please propose any points you would like to add, for possible consideration.

<Your reply here>

QUESTION 2 (reference lines)

Ships at berth have both electrical and thermal power needs. Some Energy Conversion technologies provide both. To this end, a ZET may be considered:

- 1) A power production equipment (functional role 1)
- 2) A thermal energy supply (functional role 2)

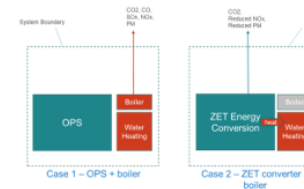
This distinction of a dual-functional role for ZETs would allow the assessment of emissions at berth with both functions integrated. ZET certification could then assess technologies in comparison with the equivalent "OPS+boiler".

If electric power generation can integrate exhaust heat recovery, replacing the boiler in part or total, the emissions can be evaluated together (case 2) and compared to an OPS+boiler configuration (case 1).

This concept requires a reference value (reference lines per ship type), for a mode of operation of a respective vessel, where the thermal energy is provided solely by a boiler (case 1).

Please propose a method/calculation to define the size and emissions of a boiler of a respective vessel to be used as a reference for a CHP installation fulfilling the Annex III requirements.

This method has to include all emissions according to article 3(7). Please include references to analogous methods.





NEXT STEPS



NEXT STEPS

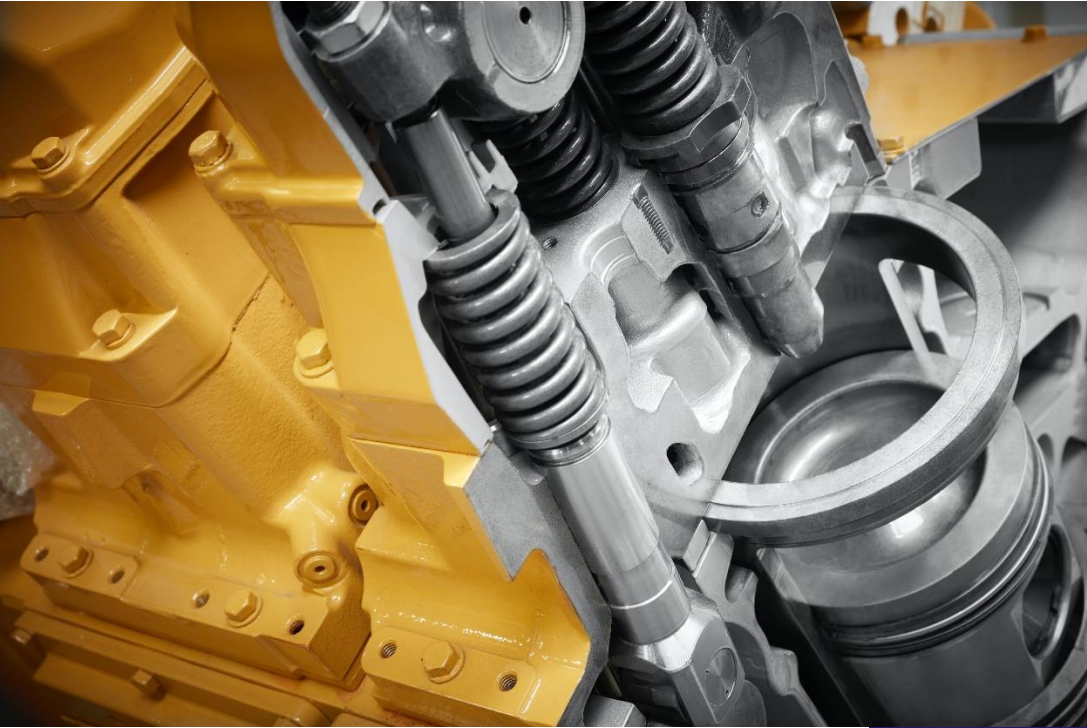
- Summarizing the answers round 2
- Next meeting October 5th
 - Discussion of proposed norms and standards
 - Seeking for common view
- Preparing round 3 questionnaire
 - Proposals for open questions
 - Proposals for wording of IA
- Start preparing report
- Reporting to plenary

OCTOBER

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ESSF SAPS WS1 REPORT



Thank you!