

Final report

1. Project details

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| Project title | IEA-HIA Task 39 |
| File no. | 64018-0088 |
| Name of the funding scheme | EUDP |
| Project managing company / institution | Ballard Power Systems Europe A/S |
| CVR number (central business register) | 30804994 |
| Project partners | Ballard Power Systems Europe A/S |
| Submission date | 25 March 2021 |

2. Summary

English summary:

Participation in IEA-HIA Task 39 working group for hydrogen in maritime transport provides a good platform to gain insight into activities in the field worldwide. BPSE works among other things with development of fuel cell products within the transport sector, where maritime transport has BPSE's interest to develop and deliver fuel cell products. Participating in Task 39 will strengthen the companies relevant international network and provide insight into the market in other countries. Participation will be a good platform for greater international cooperation both professionally and commercially. The insight gained will be beneficial for the Danish maritime community as BPSE will present information and findings from the activities in the Task 39 at a number of Danish events. BPSE is pursuing integration of hydrogen and fuel cells in ships and in that context work with the Danish maritime community.

Danish summary:

Deltagelse i IEA-HIA Task 39 arbejdsgruppen for brint til maritim transport er en god platform for at få indsigt i aktiviteter på verdensplan. BPSE arbejder bl.a. med udvikling af brændselscelleprodukter inden for transportsektoren, hvor maritim transport har BPSEs interesse for udvikling og levere brændselscelleprodukter. Deltagelse i opgave 39 vil styrke BPSEs relevante internationale netværk og give indsigt i markedet i andre lande. Deltagelse vil være en god platform for større internationalt samarbejde både fagligt og kommercielt. Den indsigt, der er opnået, vil være gavnlig for det danske maritime samfund, da BPSE vil præsentere oplysninger og nyheder fra aktiviteterne i Task 39 ved en række danske arrangementer. BPSE forfølger integration af brint-

og brændselsceller i skibe og arbejder i den sammenhæng sammen med det danske maritime samfund eller "Det blå Danmark".

3. Project objectives

The specific objective of the project is to provide knowhow on the use of hydrogen and fuel cell solutions in the maritime segment, evaluate concepts and initiate research and demonstration projects.

Sub-goals are:

- Investigate possibilities for use of hydrogen in the maritime applications
- Monitor, review and contribute to new concepts, technologies and components
- Initiate research and demonstration projects
- Overview of regulations, codes and standards
- Dissemination
- Generate an international expert group on the subject

The energy technology surrounding the IEA – HIA task 39 is that of using hydrogen for maritime applications this includes hydrogen tanks, hydrogen fuel cells, bunkering and electrolysis.

4. Project implementation

The project included the participation in several IEA-HIA Task 39 meetings (WP2).

- Meeting in Madrid, Spain. 12-13 March 2018.
- Meeting in Trieste, Italy. 20-21 September 2018.
- Meeting in Southampton, Great Britain. 18-19 March 2019.
- Online working group meeting 16. November 2020
- Online meeting 2 December 2020



Picture from IEA-HIA Task 39 meeting in Madrid 12-13 March 2018.

The project also included dissemination of the learnings obtained in the IEA-HIA Task 39. These learnings have been disseminated during presentations at different events. See the list below:

| Event | Presentation | Date | Place |
|---|----------------------------|-------------------|-------------|
| Developing Hydrogen Ports and Maritime Policy in The North Sea Region | Kristina Juelsgaard Fløche | 26. March 2019 | Scotland |
| Brintbranchens års dag | Kristina Juelsgaard Fløche | 10. April 2019 | Denmark |
| Norsk Hydrogen Forum | Kristina Juelsgaard Fløche | 27-28. May 2019 | Norway |
| Energy Efficiency Network Meeting in Bremerhaven | Kristina Juelsgaard Fløche | 18. June 2019 | Germany |
| Conf: How hydrogen fuel cells will revolutionise maritime | Kristina Juelsgaard Fløche | 03. October 2019 | Norway |
| Green Shipping Summit | Kristina Juelsgaard Fløche | 08. November 2019 | Netherlands |
| REGWA Symposium | Kristina Juelsgaard Fløche | 06. November 2019 | Germany |
| Skagerak Business Summit 2019 | Kristina Juelsgaard Fløche | 12. November 2019 | Denmark |
| PtX I tung Transport Conference | Kristina Juelsgaard Fløche | 29. Oktober 2020 | Denmark |
| SEA Europe Maritime Fund working group | Kristina Juelsgaard Fløche | 16. November 2020 | Belgium |
| Decarbonizing Esbjerg Port | Kristina Juelsgaard Fløche | 27. November 2020 | Denmark |

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|---|---------------------|--------|-------------------|---------|
| Power-2-Mobility Conference, COWI | Kristina Juelsgaard | Fløche | 1 December 2020 | Denmark |
| 2020 Sino-Danish Shipbuilding Dialogue Seminar | Kristina Juelsgaard | Fløche | 2. December 2020 | Denmark |
| Maritime Hybrid Electric & Fuel cell Conference | Kristina Juelsgaard | Fløche | 7-8 December 2020 | Norway |



Picture from præsentation at Norsk Hydrogen Forum i Oslo 27-28 May 2019

Three main risk was associated with completing the project.

1. Too busy to participate in the meetings.
2. The activity in the project losing its strategic value for Ballard.
3. Risk of the IEA network being shut down due to a change in the political agenda of the IEA.

These risks never materialised and thus had no impact on the result of the project. But an unforeseen risk in the form of the Covid-19 pandemic made it necessary to shift planned meetings to an online forum. This was also the case for the dissemination activities as presentations was moved online.

5. Project results

The results of the project

- Increased knowledge of hydrogens potential use for maritime applications in Europe and Denmark.
- Increased the maritime network of Ballard connecting us to valuable new customers and partners.
- Overview of regulations, codes and standards which has proven valuable in Ballard's development of maritime fuel cells and several development projects.
- Dissemination on the use of fuel cells and hydrogen for marine applications to the Danish maritime industry.

6. Utilisation of project results

Ballard will continue to expand our maritime knowledge and development of new maritime fuel cell products thus utilizing the knowledge gained in participating in the meetings. The increased network in the maritime industry will also continue to assist Ballard in developing the marine market for fuel cells.

7. Project conclusion and perspective

The project has provided Ballard with critical knowledge about the maritime industry and how hydrogen can have a role in the decarbonization of several maritime applications. The overall conclusion from the project is that hydrogen and fuel cells can play a role in the decarbonization of the maritime industry. Ballard's next steps include introducing its new 200 kW marine module FCwave to the European market. This will initially be in the form of funded demonstration projects showcasing hydrogen and fuel cells as a viable power option before a commercialization of the product.

8. Appendices

Link to project home page: <https://www.ntnu.edu/oceans/iea-hydrogen>

Report: <https://webstore.iea.org/download/summary/2803?fileName=English-Future-Hydrogen-ES.pdf>