



Sustainable HYdrogen  
powered Shipping

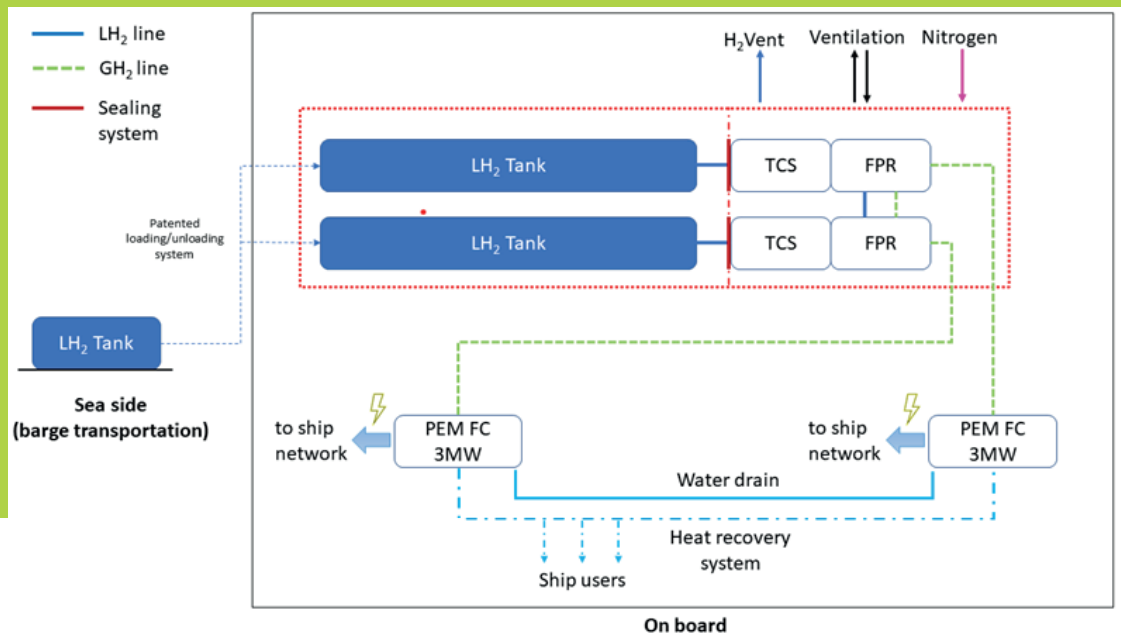
## Design of GH2 system

The hydrogen system corresponds to the backbone of the alternative energy generation system, it ensures the proper fuel flow from the tank, where it is stored in liquid phase, through the evaporator, which allows to reach the users (fuel cell modules) in gaseous phase.

The layout of the plant has been studied to guarantee multiple layer of protection to the piping, in order to be able to safely monitor and contain the hydrogen.

In addition to the main hydrogen fuel system, all the auxiliary systems necessary for the operability of the hydrogen plant have been studied and defined in detail. For spaces containing hydrogen, the following systems have been designed:

- Ventilation;
- Emergency and normal operation vent;
- Inert gas;
- Fire protection.



The high explosive potential of hydrogen used as propelling fuel requires a meticulous and forward-thinking approach to safety on board. This approach also encompasses a thorough examination of the current regulations and available guidelines, including the adoption of the best solutions and technologies available on the market, to achieve the goal of ensuring the vessel's safety for both the crew and passengers.

The hydrogen plant is thought to be installed onboard in fully dedicated areas in order to minimize the likelihood of malfunction, hence the ship will be sustained by two independent generating system; the set pressure of the system has been lowered to the minimum value acceptable by the fuel cell (considering the pressure drop along the lines), this will limit the amount of dispersed fuel in the remote case of leakage, and allow a higher filling level for the tank with resulting increase in autonomy.

The alternative system will be able to work in different operation modes, always guaranteeing the full operation of the vessel, such as

- normal operation, at different loads based on ship energy request
- stand-by when hydrogen is present onboard but not used
- emergency

The auxiliary systems have been designed with the dual purpose of enabling the operation of the main plant and providing additional protective measures in addition to the conventional means (water mist, etc.).

Different ventilation and pressure conditions are foreseen for the rooms where hydrogen system is present: the operating philosophy of the plant is based both on Rules and Regulation compliance and on adequate safety measures to segregate and contain any hazardous atmosphere.

Following the completion of the design a series of additional and detailed studies, e.g. CFD calculation, Quantitative Risk Assessment and Failure Mode and Effect Analysis, have been addressed and will be submitted to Class for formal approval, previous activities are part of the Risk Based Certification process that will be implemented to certify the overall project.

# PARTNERS



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