



# Waterborne Transport



# HORIZON EUROPE

NAUTILUS

Nautical Integrated Hybrid Energy  
System for Long-haul Cruise Ships

Clean and sustainable shipping

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# The challenge

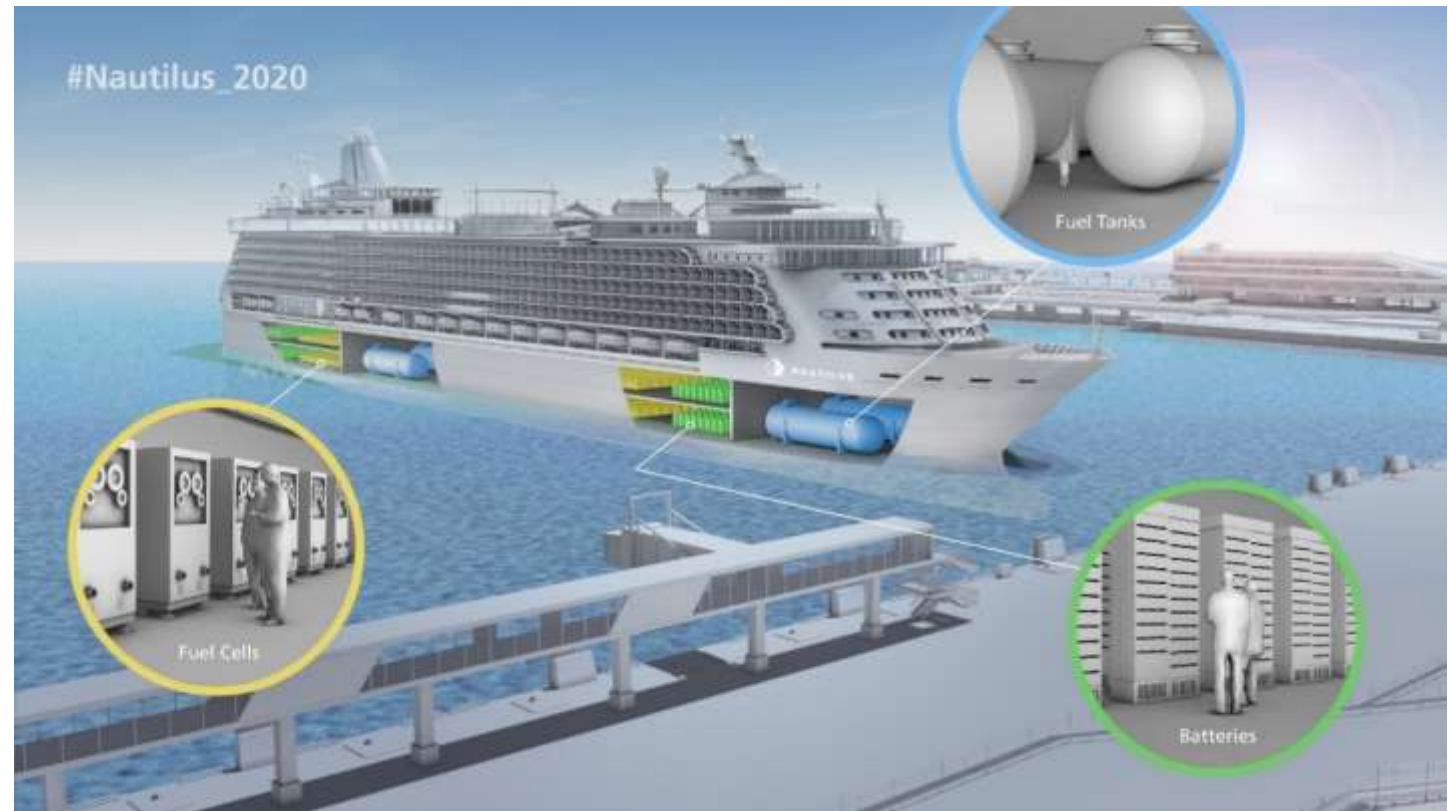
## Reaching IMO targets of 2030

- 10% increase in energy efficiency
- 40% CO<sub>2</sub> reduction (LNG fuel) thanks to **improved efficiency** and **no methane slip**
- 99% reduction of other pollutants (NO<sub>x</sub>, SO<sub>x</sub>, PM2.5, Black Carbon, etc)

## Integration of high power fuel cells into ship

- Multi-MW fuel cell based marine power system concept and on board integration

## New energy system SOFC + Battery (+ ICE)



# The NAUTILUS project

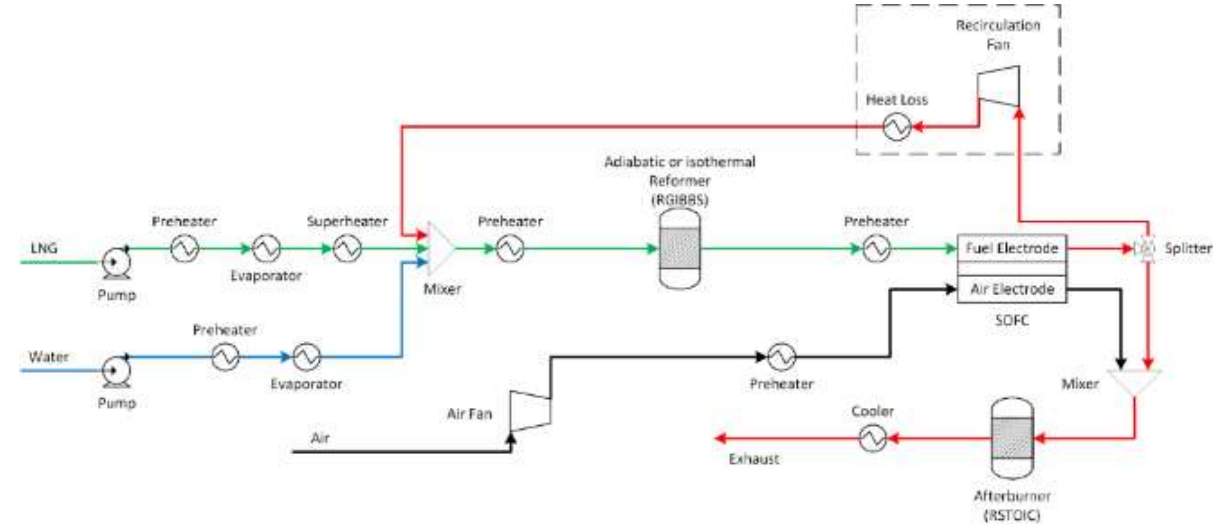
- Expert consortia



- Budget: € 7,9 M with EU support of € 7,9 M
- Duration: 48 months, from August 2020 until July 2022.

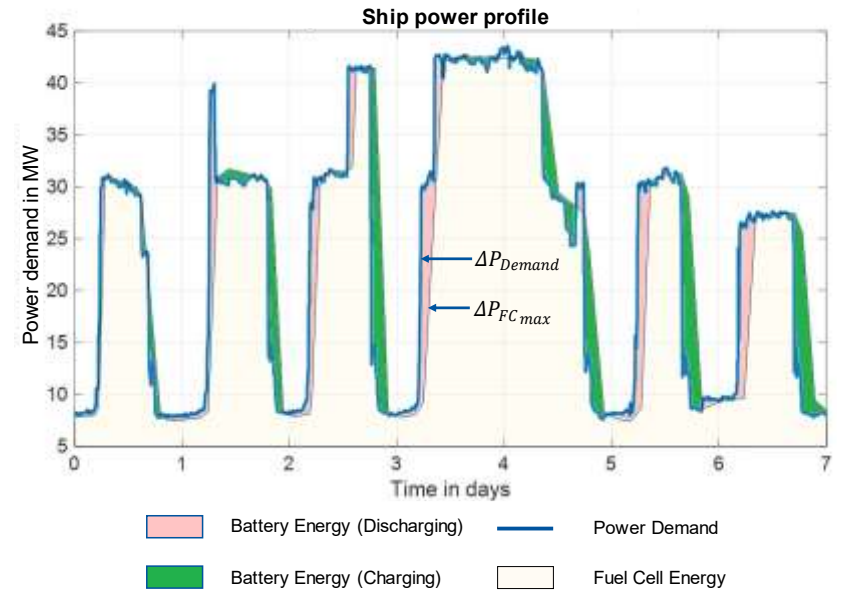
# Achievements

- On-board energy system (P&ID) with optimized Heat Exchange Network and Anode Recirculation
  - 64% electrical efficiency
  - 87% electrical+thermal efficiency
- Lab-scale proof-of-concept under testing.
- Testing of fuel cell on inclination pod

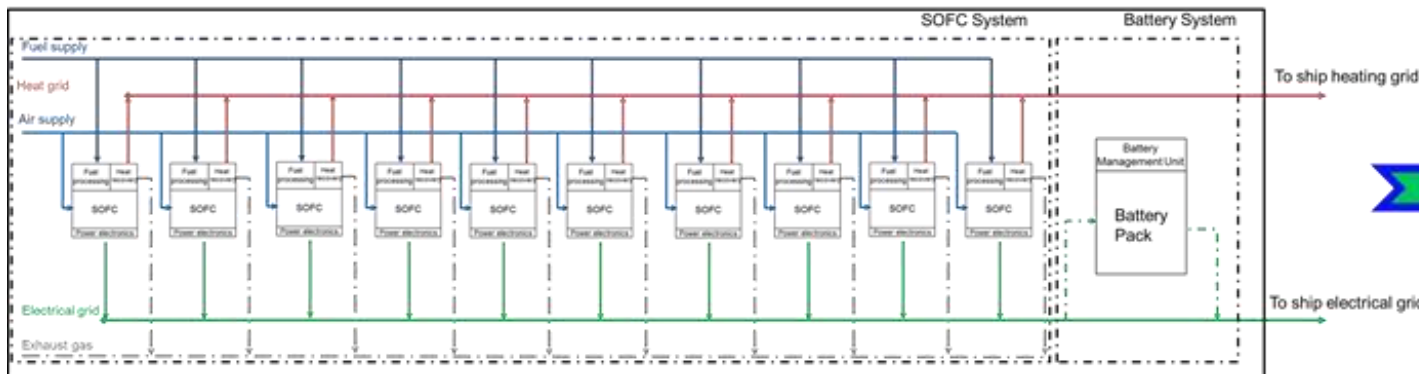


# Next Steps

- Optimization of the fuel cell + battery hybridization & controls strategy
- Ship integration concept, layout and digital twin
- 90 kW genset demonstrator to be built and tested at shipyard



Ship power profile with an exemplary control strategy performing the load distribution between the two propulsion components (SOFC & battery).



NAUTILUS genset demonstrator







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This project has received funding from the European Union's Horizon 2020 research and innovation program under the grant agreement No 861647

## Q&A ?

**Speaker will be available on the stand for the remainder of the day.**

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- Horizon Europe | European Commission (europa.eu)
- Waterborne TP: [Welcome to Waterborne - Setting the agenda for Maritime Research in Europe - waterborne.eu](#)