



TOWARDS **FOSSIL**  
**FREE** SHIPPING





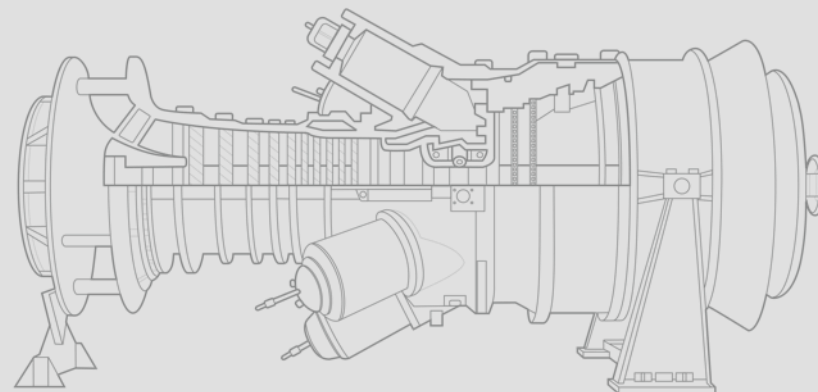
# GOTLAND HORIZON

- Gotland Horizon is **Sweden's first large-scale** project for a **hydrogen powered RoPax**.
- Hydrogen causes  $H_2O$  as main emission – allowing for **climate neutral crossings**.
- Maintaining the **same speed (28 knots) and capacity (1900 passengers, 600 cars/100 trucks) as today's service to Gotland**.
- The ambition is to put Gotland Horizon on the market **no later than 2030**.



# GAS TURBINES COMBINED WITH STEAM TURBINES

- Gas turbines, in combination with steam turbines, enables efficient **high-speed crossings**.
- The turbines are developed to be able to be **powered by 100% hydrogen**.
- A typical gas turbine unit with a generator is 14 metres long, weighs about 85 tonnes and has an **output of up to 15MW**.
- A **multi-fuel function** enables the gas turbines to be powered by **different types of fossil free fuels**.
- A combined cycle increases the efficiency from **35 to 50 per cent**.



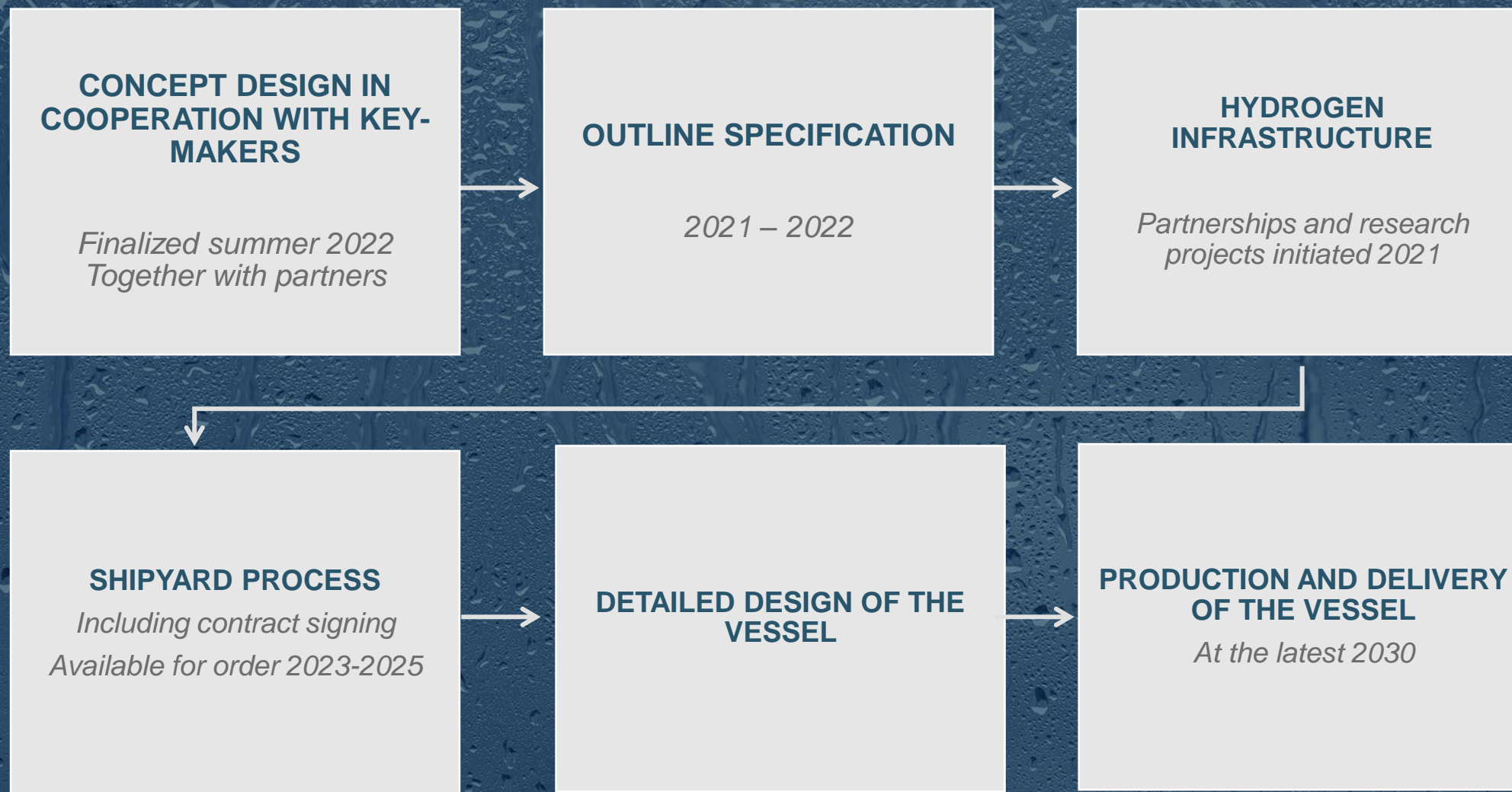
## HIGHLIGHTS FROM DNV MARITIME ADVISORY

- **DNV Maritime Advisory** has reviewed the **concept** to assure that the conclusions and recommendations rest on firm ground
- **Technology is available today**
- **Competitive efficiency** in combination with steam turbines
- **High fuel flexibility** – likely possible to run on 100% hydrogen

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We assess the concept to be exciting, forward looking and a potential flagship project for Sweden and Gotland in the work to decarbonize shipping.





# GOTLAND **TECH** DEVELOPMENT

- Drives the development of **sustainable technological solutions** for a maritime industry with CO<sub>2</sub> emissions.
  - **Partner-based and collaborations across industries** with a focus on new technological solutions for the maritime industry and energy sector.
  - **Testbed** for new technology and innovative solutions with our own fleet.
- Charging-hybrids of existing vessel, useful for entering and leaving port
  - Establishing partnerships with companies working with sustainable development
  - Participates in several research projects (LBG, hydrogen, electrification etc.)
  - Investigates the possibility to produce hydrogen locally while the ocean floor is oxygenated
  - Associated member for a new five year period for the Biogas Solution Research Center

# APPROVED RESEARCH PROJECT

## – HYDROGEN POWERED SHIPPING

- The project aims to **evaluate the possibility** to use green hydrogen as a fossil free maritime fuel. Gotland Horizon is used as a **case study**.
- **Technological solutions** on-board the vessel, complete supply systems, including production of renewable energy in a sea-based wind farm.
- The goal is to present a complete, sustainable and reliable fuel system to be **implemented by 2030**.

*Uppsala University is the project owner, Gotland Tech Development, Rederi AB Gotland, Bassoe Technology, Energicentrum Gotland, IVL, Lighthouse, Linde gas, OX2, Uniper and Region Gotland participate in this project.*



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Gotland is a natural testbed for **hydrogen development**.

Björn Samuelsson, Uppsala University

Photo: Daniel Olsson





- **Cargo Capacity:** 600 cars / 100 trucks
- **Passenger Capacity:** 1900 passengers
- **Speed:** up to 28 knots
- **Multi-fuel engine:** allows for shift and blending fuels
- **Combined Cycle:** Increased efficiency with gas turbines and steam turbines in combination (from 30 to 50% efficiency)
- **Cleaner engine room with less vibrations** thanks to gas and turbines (compared to oil)



**THANK YOU!**

**Christer Bruzelius**

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