

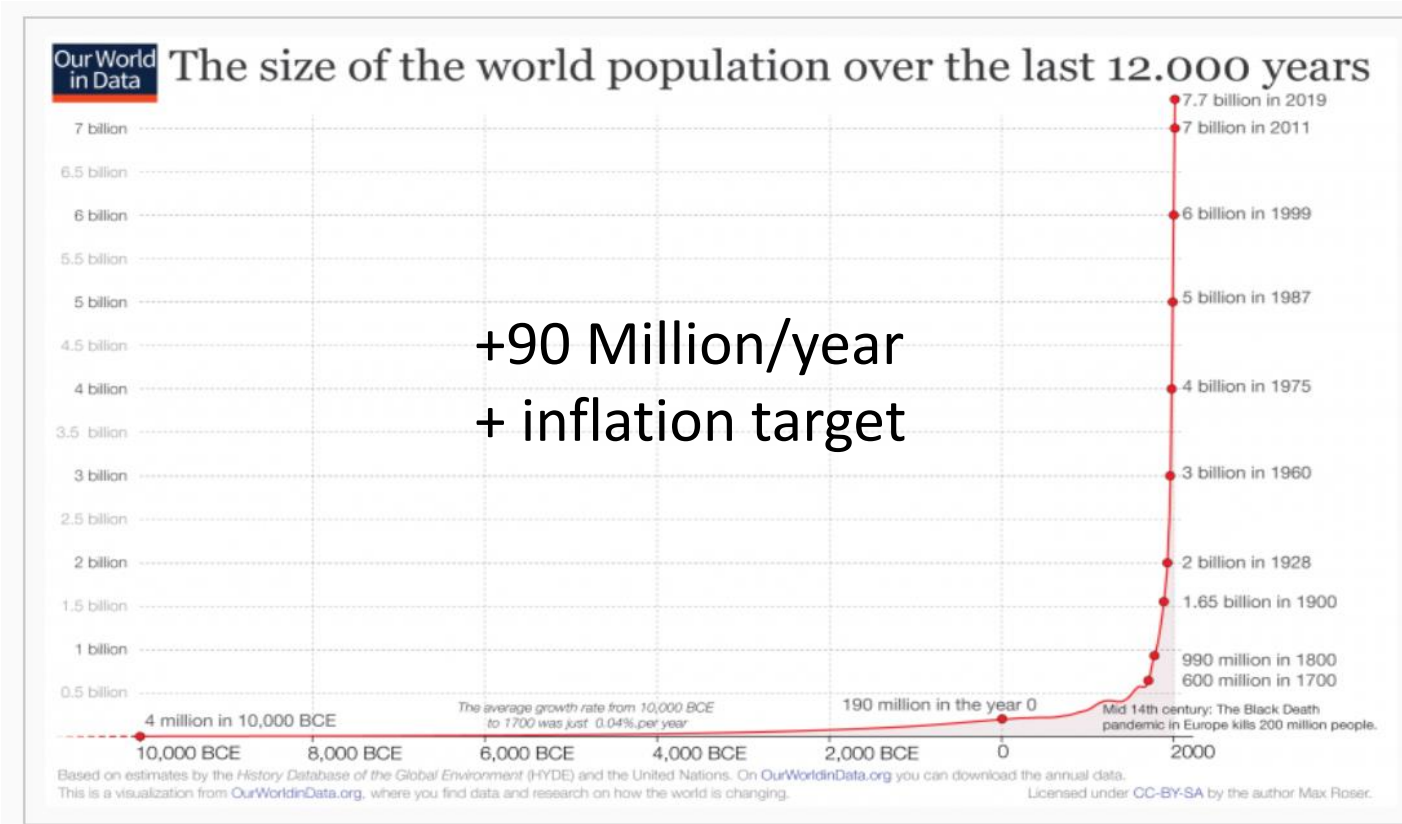


SMTF

Fuel Cells a Paradigm shift for Maritime

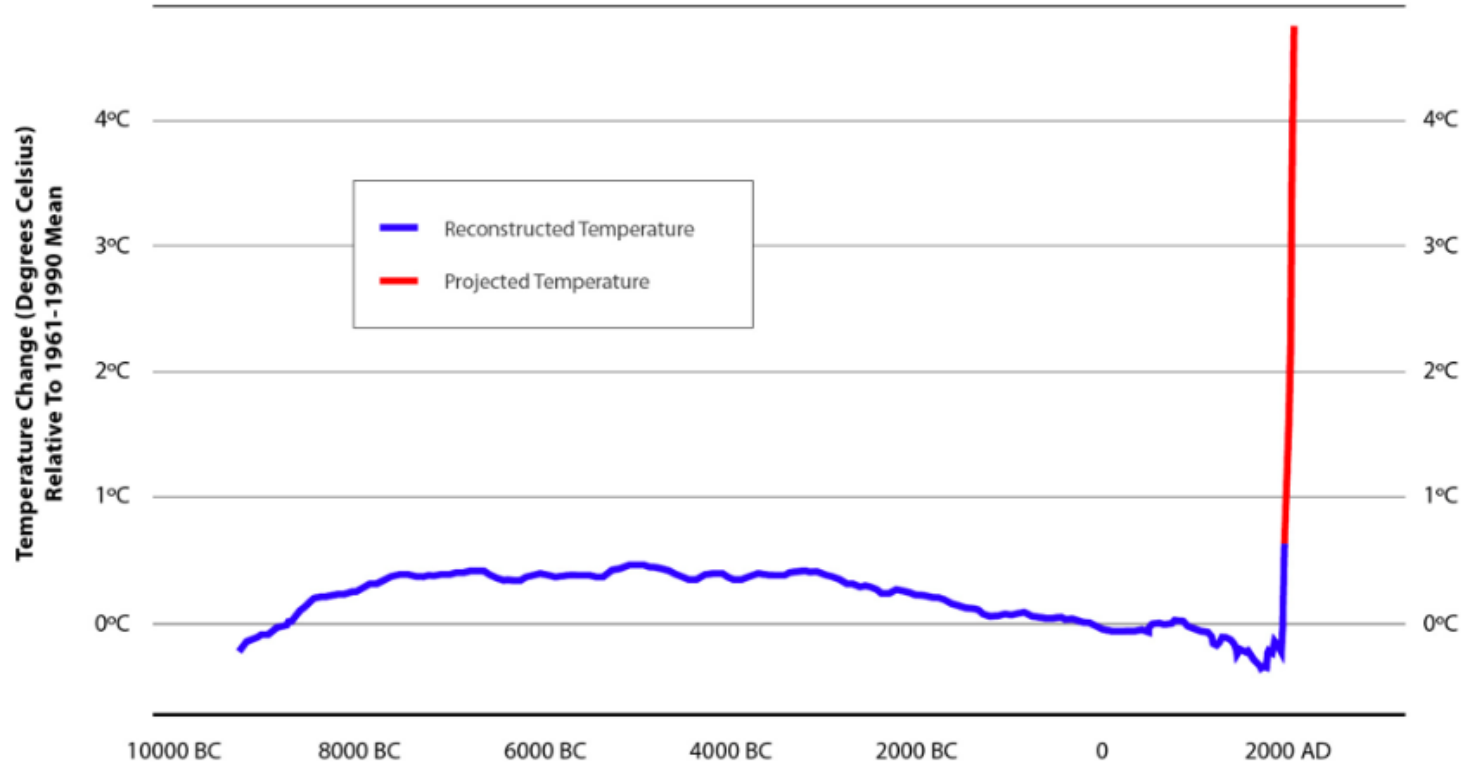
Johan Burgren
Sales Director Marine

Demographic growth drives global trade

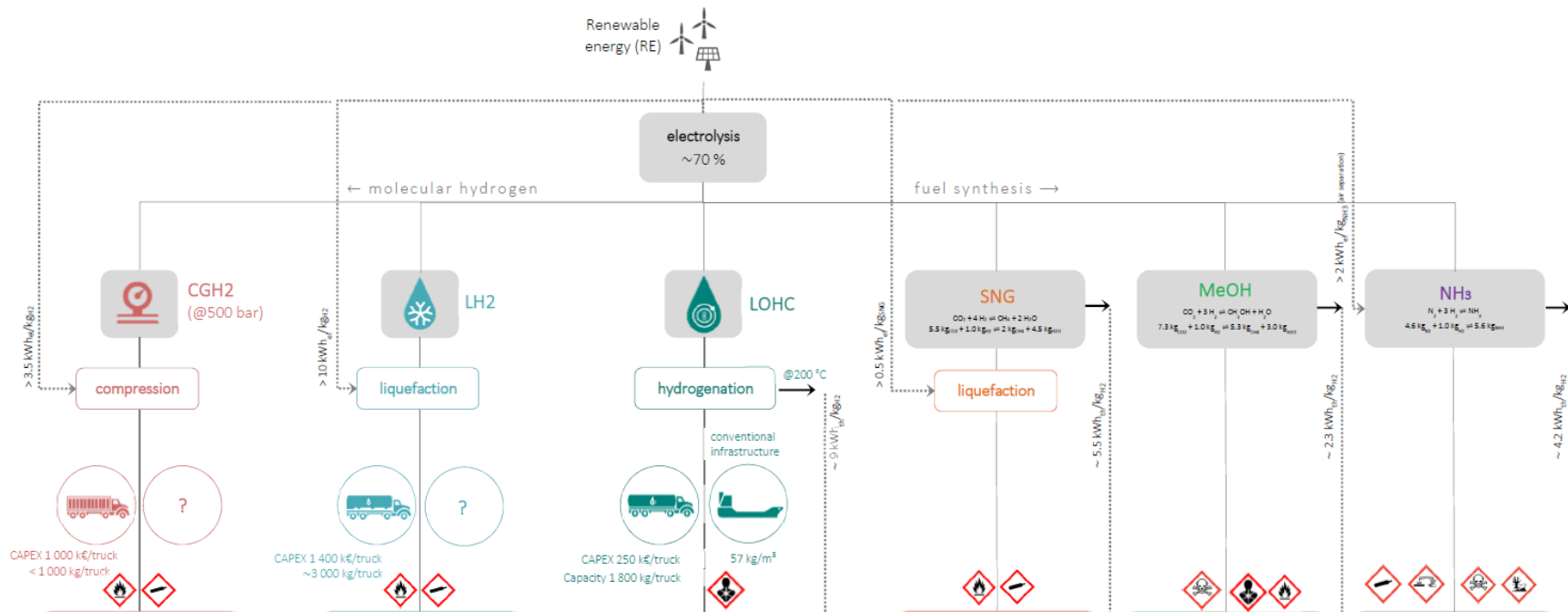


Source: World Bank

Carbon Pollution set to end era of stable climate



Electro fuels



Zero Emission For **Maritime**



BRUSSELS (Reuters) - The European Union agreed on Tuesday to reduce emissions of carbon dioxide (CO₂) from new trucks and buses by 30 percent by a 2030 deadline as part of its commitment to cut its output of greenhouse gases. 15% by 2025!! All compared with 2019 levels.



50% GHG reduction by 2050 compared to 2008 on your total tonnage

Evaluation ongoing for 40 % by 2030 and 70% by 2050!

PowerCell fuel cell



1994



POWERCELL

2008



autostack moves

2011



autostack core

2012



2014



2015



2017



2018



autostack industrie

2021



PowerCell in the World



Sales in > 80 countries
90% sales to Germany and China
Sales offices in Strategic Markets

Our segments

Transportation



Cars



Buses



Trucks



Material
Handling

Marine



Cruise Ships



Ferries



Leisure marine

Stationary



Micro CHP

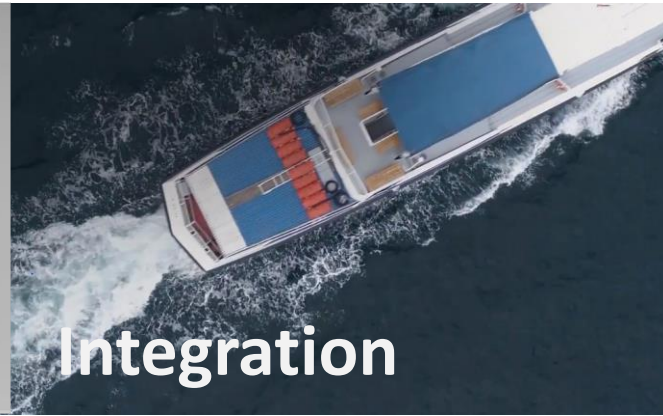
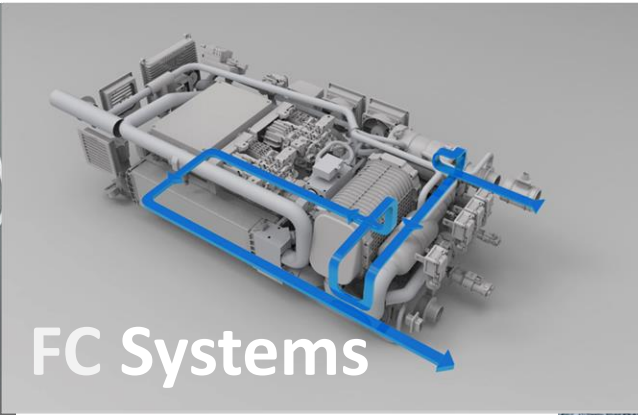


Power
Container

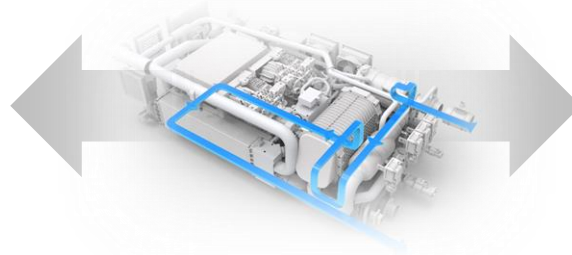


Small Generators

Our solutions



Automotive drives economy of scale for Maritime



Marine center of expertise

Fuel Cell stack development

FC system development

DCDC development capability

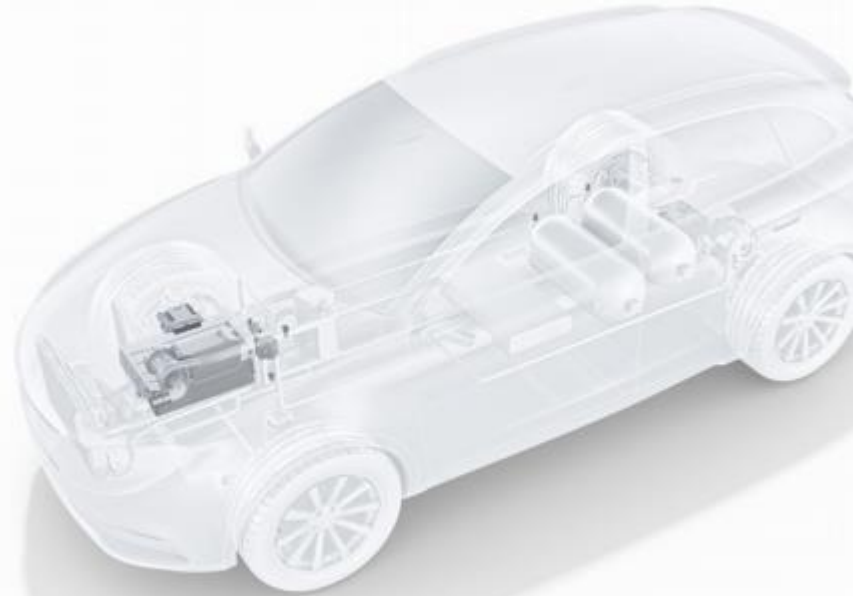
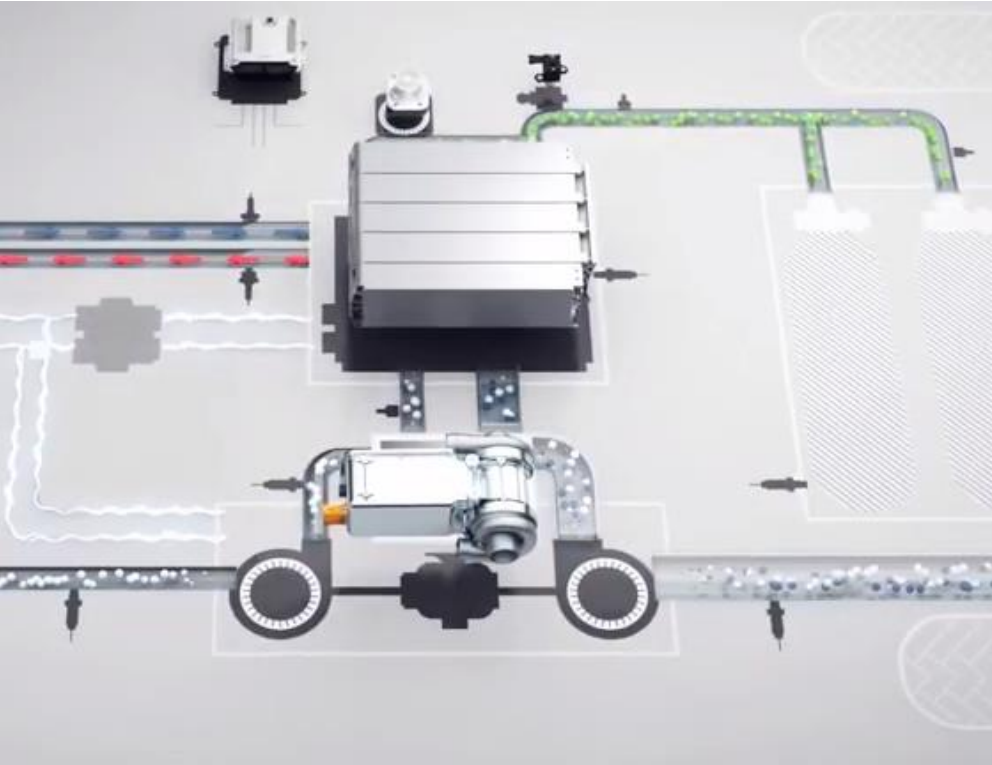
Marine facility close to Gothenburg harbor

Development partners

Challenges for maritime implementation

1. Bridging the cost gaps – Norway is in the forefront of implementing state funded demonstration projects- 12 projects running with hydrogen in maritime sector.
2. Bridging the technology matureness versus commercial expectations.
3. Making clean hydrogen available at a low cost in large quantities.
4. The real zero-emission alternatives are there – legislation needs to be established!

Bosch licensing for PowerCell S3 stack



BOSCH

Aranda reaserch vessel

- 165 kW (2 x 82.5 kW AC) fuel cell powertrain based on S3 stack
- Powering Artic research vessel Aranda's electrical equipment and dynamic positioning during measurements - free from vibration, noise and air pollution
- 18-month marine field testing including extreme cold and saline conditions
- Container installation on deck



Photographer: Panu Hänninen

Project consortium:

- VTT Technical Research Centre of Finland Ltd
- Powercell Sweden AB
- ABB Oy
- OMB Saleri SPA
- PersEE
- The Finnish Environment Institute (SYKE)
- Swiss Hydrogen SA


Multi Mega Watt feasibility studies



H2 powered Heavy Fork Lift

- 54 kW Fuel Cell
- 60 kWh Lion battery
- 9 kg hydrogen
- 1000 hour test so far...
- 18 ton lifting capacity





Towards Zero Emissions