

VIVES – Interreg Stronghouse

Groningen 29/03/2023



production



PV 38 kWp



20 kWh Li Ion Battery



2 X 5 kW PEM Elektrolyser



600 l @20 bar - 1200 l @ 290 bar

storage



1.5 kW Compressor 300 bar



8.5 kW Fuel cell system



250 kVA GENSET Dual Fuel



C3 Project 33 kVA GENSET DI H2

KU LEUVEN



REDII PORTS
Waste scan
CCU + green methanol
Methanol ICE

KU LEUVEN

DEFRA HYDE
Sustainable Energy
Harvesting system



Toyota Mirai Gen 1



utilization

— Infrastructure VIVES

Production of hydrogen

❖ Solar panels : 38 kWp (86 x 450Wp)

❖ Inverters: total capacity 28 kW

❖ Elektrolyse-installatie in container

- ❖ 2 X 5 kW PEM elektrolyser (20 bar)
- ❖ 20 kWh Li-ion batteries
- ❖ 1,5 kW H₂ compressor 300 bar
- ❖ Water treatment
- ❖ Cooling system
- ❖ Storage low pressure 600 L, high pressure 1200 L
- ❖ Security system



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Production of hydrogen

❖ Max production per hour:

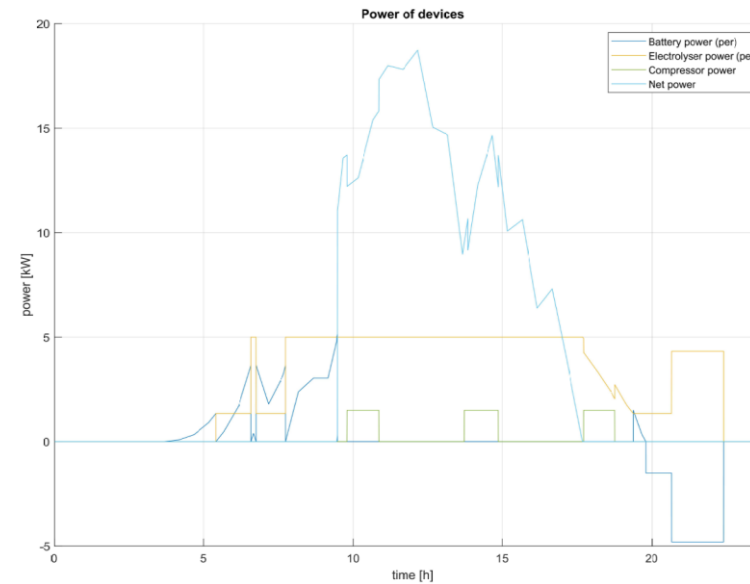
❖ 2 Nm³/h

❖ 0,18 kg/h

❖ Max yield on a sunny day:

❖ 2,3 kg H₂

❖ 76,5 kWh (stored energy in hydrogen)



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Storage hydrogen

Max storage

- ❖ 1200 L on 290 bar
- ❖ 30 kg H₂ storage
- ❖ 1000 kWh
- ❖ = 25 days of electricity for an average home



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Consumption of hydrogen

❖ Filling installation 300 bar

- ❖ H₂ dispenser (Staubli)
- ❖ Break-away coupler
- ❖ Purge unit

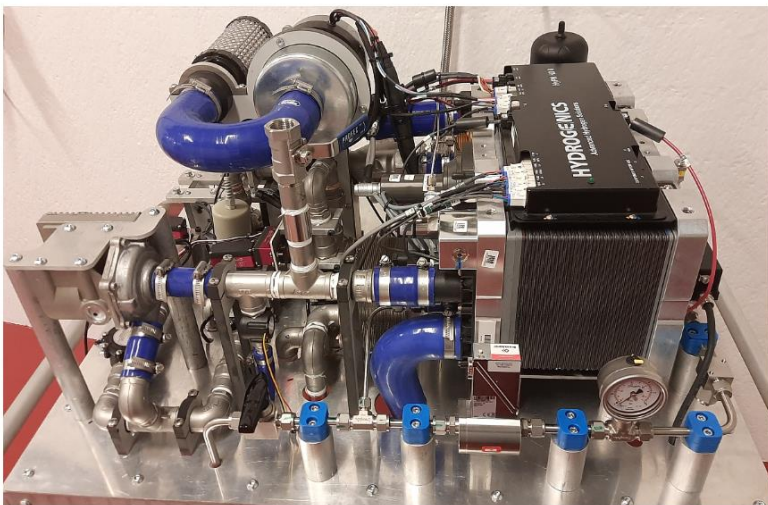
❖ Filling capacity Toyota Mirai

- ❖ 1,39 kg in 86s
- ❖ 41% filled
- ❖ End pressure 290 bar



— VIVES Fuel cell 8,5 kW

Consumption of hydrogen



— **VIVES generator 250 kVA**

Consumption of hydrogen

- Gensets for shore connection, shore-to-ship power
- Gensets for power in the vessels

Advantages:

fast conversion of existing engines

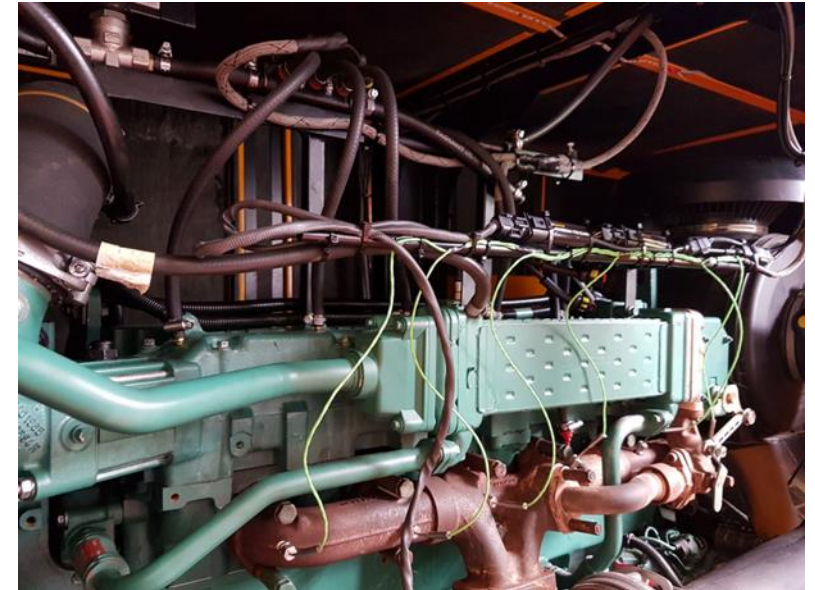
Back up from diesel power

Disadvantages:

use of fossil fuels

Overall efficiency

Hydrogen storage and supply



— VIVES generator 250 kVA

250 kVA GENERATOR SET

VOLVO TAD 754 GE 6 CYL TURBO

300 kW RESISTIVE Programmable Load bank

Data acquisition and visualisation

Cylinder pressure (Kistler)

Exhaust temperature

Exhaust emissions (Maha)

Hydrogen mass flow (Bronkhorst)

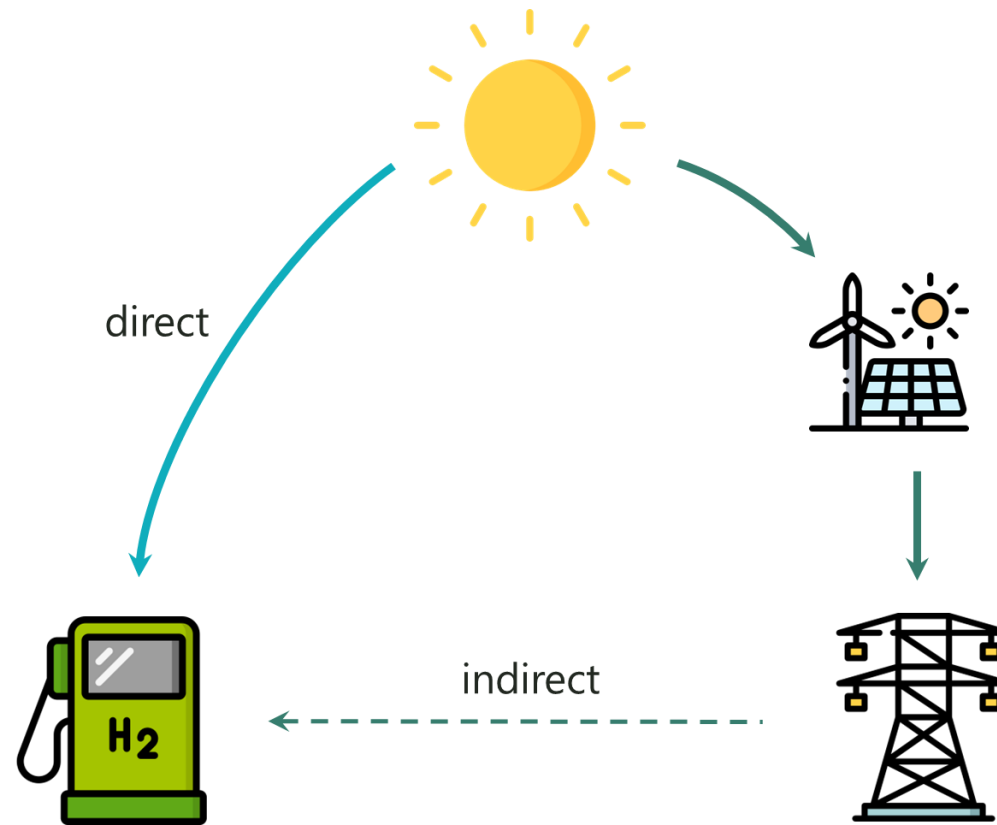
Diesel flow (bronkhorst)

Vibration sensor



— Golden hydrogen production

KU-Leuven Solhyd project



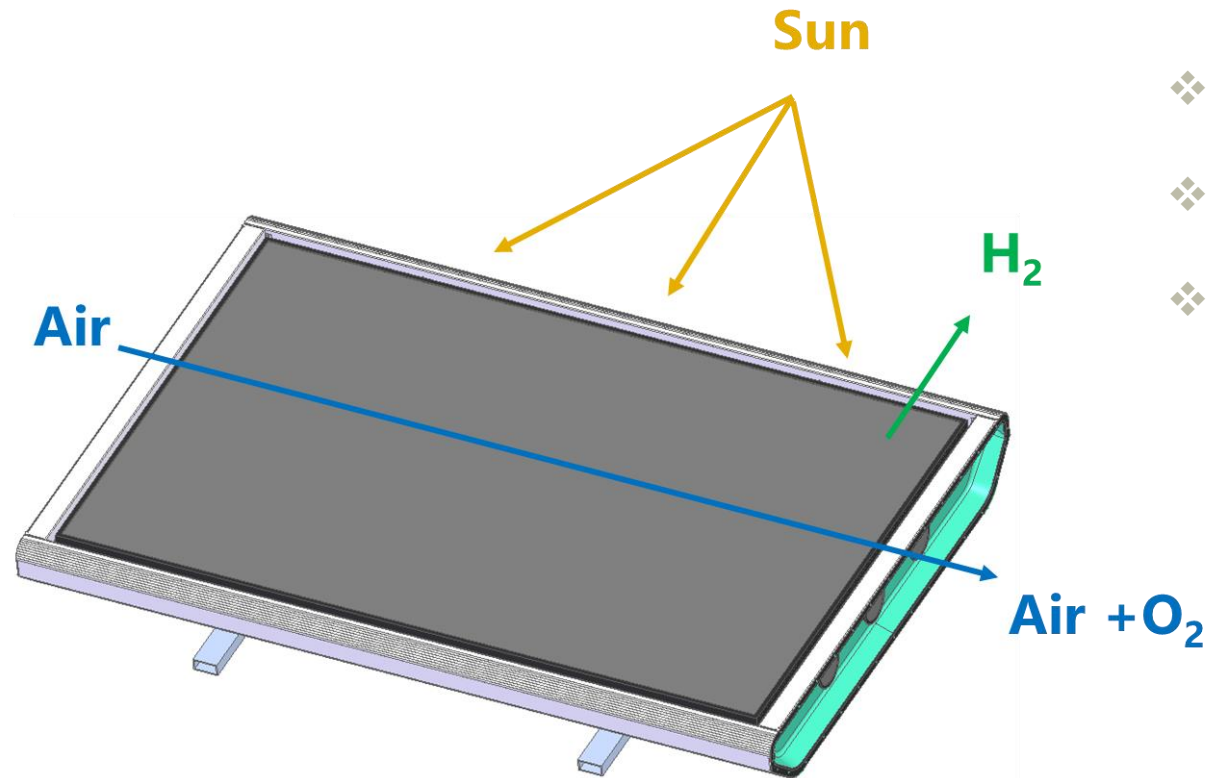
— Golden hydrogen production

KU-Leuven Solhyd project



— Golden hydrogen production

KU-Leuven Solhyd project



- ❖ Conventional solar panel
- ❖ Custom made high efficient electrolyser
- ❖ Extracts water from outside air

— Golden hydrogen production

KU-Leuven Solhyd project

❖ Max production North Western Europe:

❖ 6 kg H₂ / year = + 66 kWh / year / m²

❖ Advantages

- ❖ Modular system
- ❖ No water consumption
- ❖ Efficient: Less energy conversions, no large water treatment and cooling systems needed

❖ Disadvantages

- ❖ No heat or O₂ recuperation possible
- ❖ Low pressure 300-500 mbar



— **Thanks!**

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