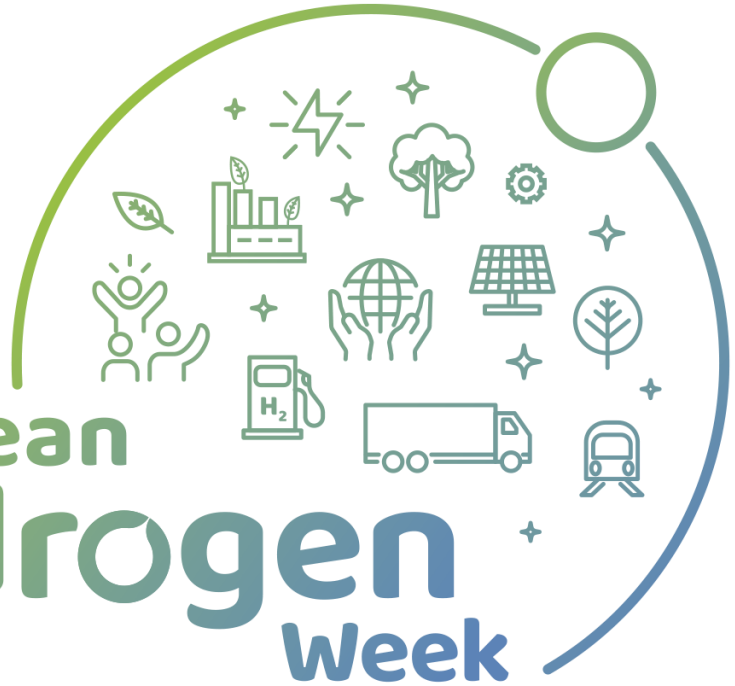
HySTOC

Hydrogen supply and transportation using liquid organic hydrogen carriers



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FCH

European Commission

Project Overview

- Call year: 2017
- Call topic: HySTOC H2020-JTI-FCH-2017-1
- Project dates: 01.01.2018 – 31.03.2022
- % stage of implementation 01/11/2021: 92 % (project months)
- Total project budget: 2,499,921.25 €
- FCH JU max. contribution: 100 %
- Other financial contribution: n.a.
- Partners: Hydrogenious LOHC Technologies GmbH, FAU, HyGEAR, VTT, Woikoski

European Hydrogen Week

Partners

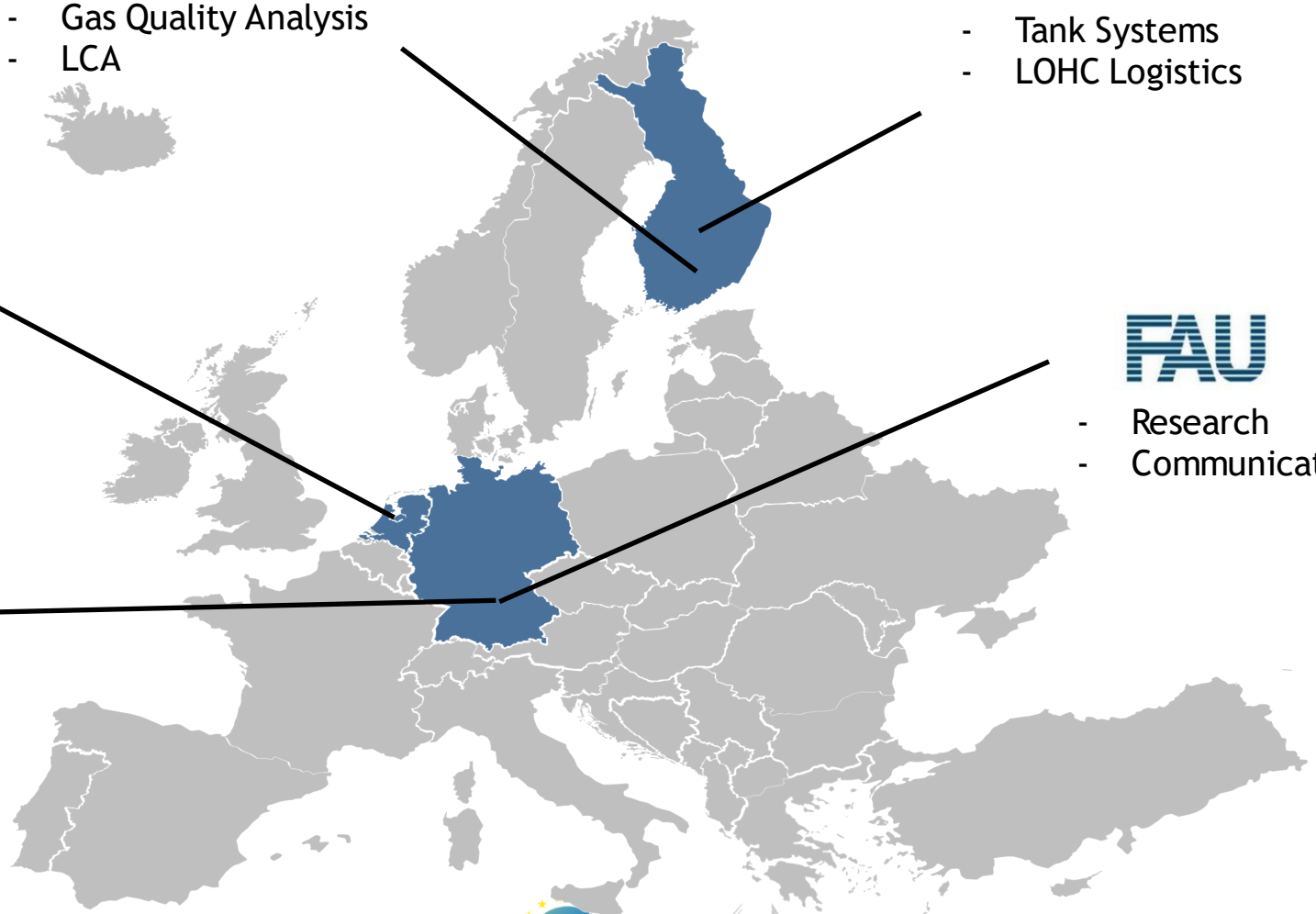
VTT
- Research
- Gas Quality Analysis
- LCA

WOIKOSKI
- Tank Systems
- LOHC Logistics

HYGEAR
- H2 Purification

FAU
- Research
- Communication/Pubilcation

hydrogenious LOHC TECHNOLOGIES
- Storage Box SB1040
- Release Box RB1041
- Project Coordinator



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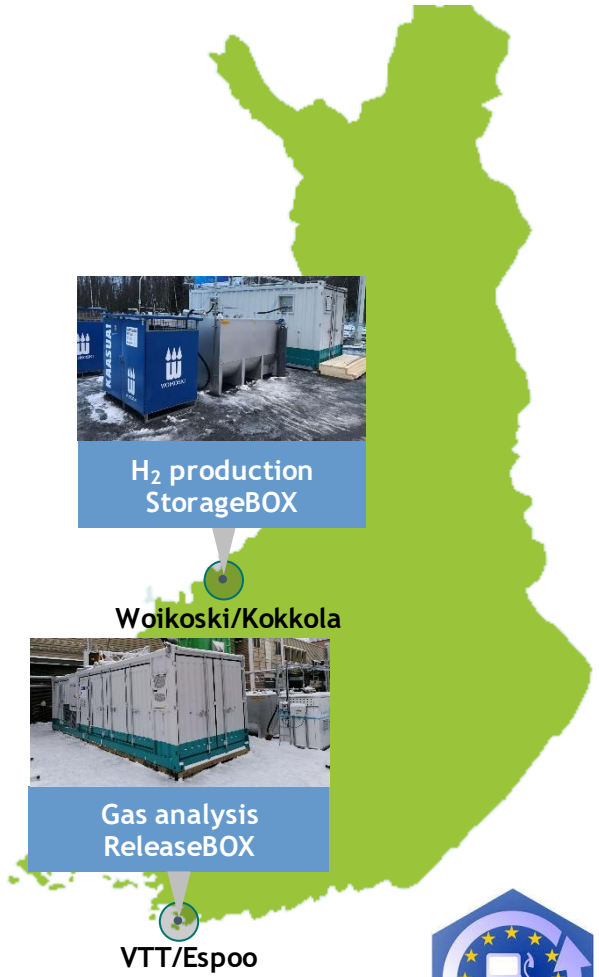
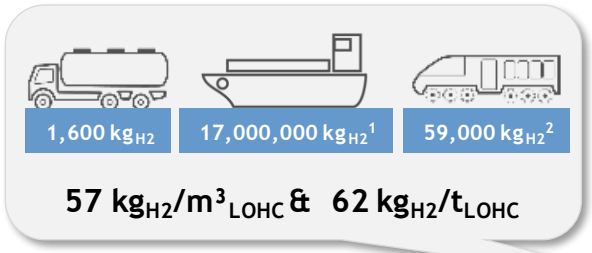
Project Summary

- Hydrogen production and hydrogenation in Kokkola, Finland
- Storing of hydrogen in Liquid Organic Hydrogen Carrier (LOHC)
- Transportation of the loaded LOHC (DBT) to VTT and subsequent dehydrogenation for gas quality measurement
- Extended test program (LOHC technology and gas analysis) at VTT
- Main objectives:
  - Development of a cost efficient, fully automated LOHC hydrogen storage and release system
  - Demonstration of LOHC suitability for commercial roll out
  - Reduction of CAPEX and OPEX for storage and transport

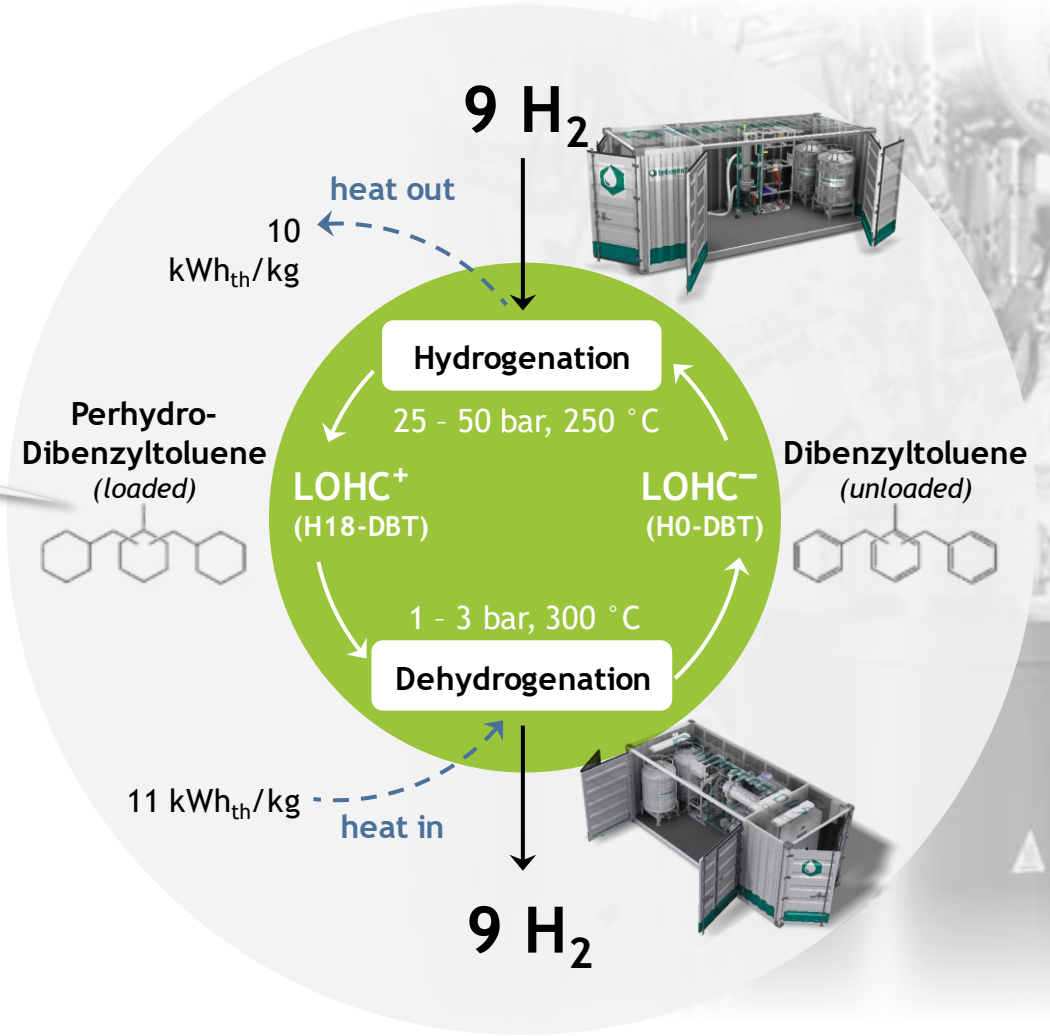


LOHC Insights



(Perhydro-)Dibenzyltoluene

- Non-explosive
- Diesel-like liquid
- Hardly flammable
- Liquid state until -39 °C
- Stored at ambient conditions
- Commercial heat transfer oil



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Status: Storage System

Achievement to-date

PROJECT START → 25% → 50% → 75% → TARGET: REGULAR OPERATION[1)]

- The Storage Box…
  - … is supported with hydrogen from Woikoski
  - … is operated by the project partner Woikoski
  - … has hydrated around 17,5 tons of LOHC (ca. 1t H2)

- Regular operation started in November 2020
- LOHC logistics between StorageBox (Kokkola) and ReleaseBox (Espoo) by the project partner Woikoski

1) No specific KPIs were defined for this project

Status: Release System

Achievement to-date

PROJECT START → 25% → 50% → 75% → TARGET: REGULAR OPERATION[1)]

- Commissioning in January 2021 despite heavy winter conditions
- Supported with hydrated LOHC from the StorageBOX
- Regular operation by the project partner VTT started in March 2021
- Service and modification work done by Hydrogenious in July
- PSA testing by project partner HyGEAR
- Gas quality analysis of the released hydrogen at VTT on going

→ According to the results so far, the H2 meets the requirements of ISO14687 (99.97 % H2 purity)

1) No specific KPIs were defined for this project

General Status

Achievement to-date

PROJECT START → PROJECT TARGET[1)]

25% 50% 75%

- Reporting on going
- Extended test program at VTT instead of HRS at Woikoski

Recent achievements

hydrogenious LOHC TECHNOLOGIES / WOIKOSKI

D7.3: Test report on initial test protocol for systems and logistics

HYGEAR

Draft

D6.5: Performance test of the PSA in single pass and recirculation mode

FAU Friedrich-Alexander Universität Erlangen-Nürnberg

D5.5: Pathway of reduction of heat in the dehydrogenation reation selected

VTT

Draft

D7.4: Test results on hydrogen purity and impact on PEM fuel cells

1) No specific KPIs were defined for this project

General Status

StorageBOX (Kokkola) H2 Storage

LOHC Logistics

ReleaseBOX (Espoo) H2 Release

RISK, CHALLENGES AND LESSONS LEARNED

Covid-19

- Covid-19 pandemic, lockdown, travel restrictions, unclear future
- Slowing down of the project progress. Travel restrictions delayed the commissioning of the ReleaseBOX and maintenance work at both systems.

General conditions

- No availability of H2 cars and HRS in Finland
- Project plan was changed together with the EU. Extended test program for the LOHC ReleaseBOX. Developed by Hydrogenious and implemented by VTT in Espoo.

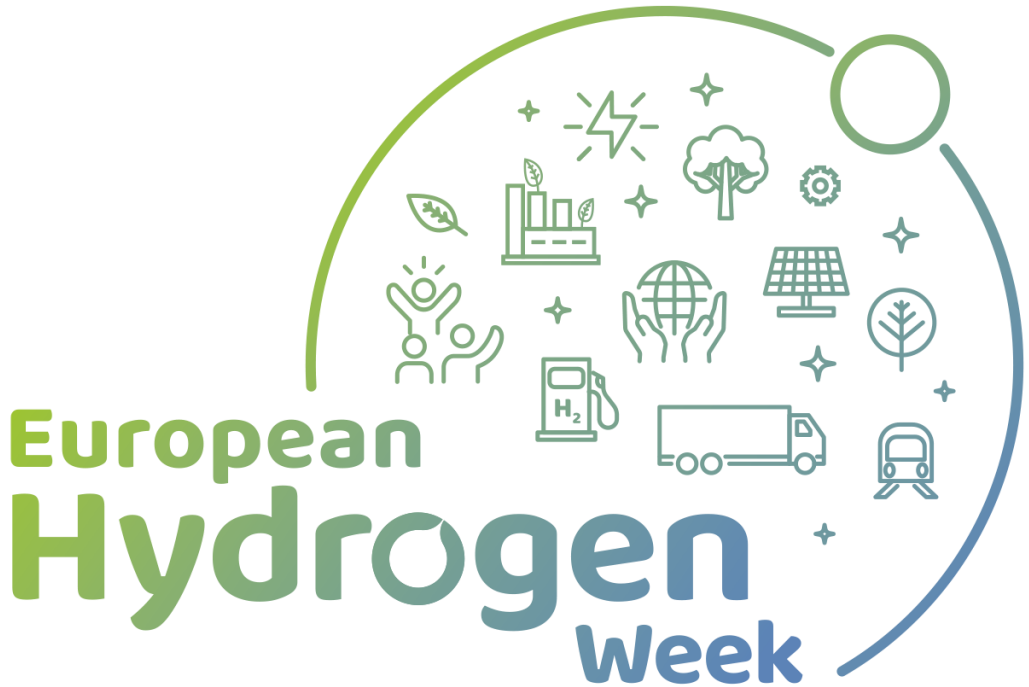
EXPLOITATION PLAN/EXPECTED IMPACT

Exploitation

- The project findings/results are described in detail in the individual deliverables
- Deliverables will be uploaded in the EU-Portal and are differentiated by confidentiality (internal use for further development, public)
- Status and results are discussed in regular project meetings
- Results of gas quality measurement by VTT are particularly important to all partners; VTT will regularly share the measurement results with the project partners, which may result in technical adjustments

Impact

- Further technical development and commercialization of the LOHC technology
- Results give a basis for a possible upscaling of future systems
- Further development of LOHC logistics (use of standardized trailers in the future)
- Further technical development of hydrogen purification



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