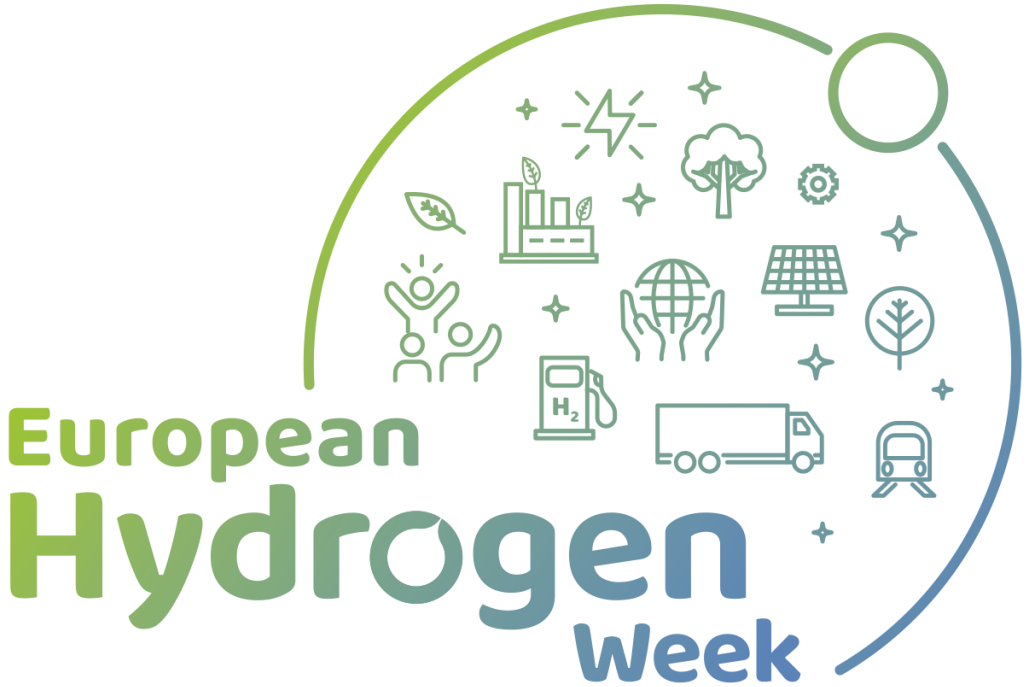
H2FUTURE

HYDROGEN MEETING FUTURE NEEDS OF LOW CARBON MANUFACTURING VALUE CHAINS

H2FUTURE
Green Hydrogen



Mr Robert Paulnsteiner

Verbund

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Clean Hydrogen Partnership
EUROPEAN PARTNERSHIP

Co-funded by the European Union

#EUResearchDays
#PRD2022
#CleanHydrogen

Project Overview

Call year: **2016**
Horizon2020
FCH-02-7-2016
Call topic:
Demonstration of large-scale rapid response electrolysis to provide grid balancing services and to supply hydrogen markets

Project dates:
[01/01/2017- 30/06/2021]
Extension to 31/12/2021

Total project budget:
[17,823,264.13 €]

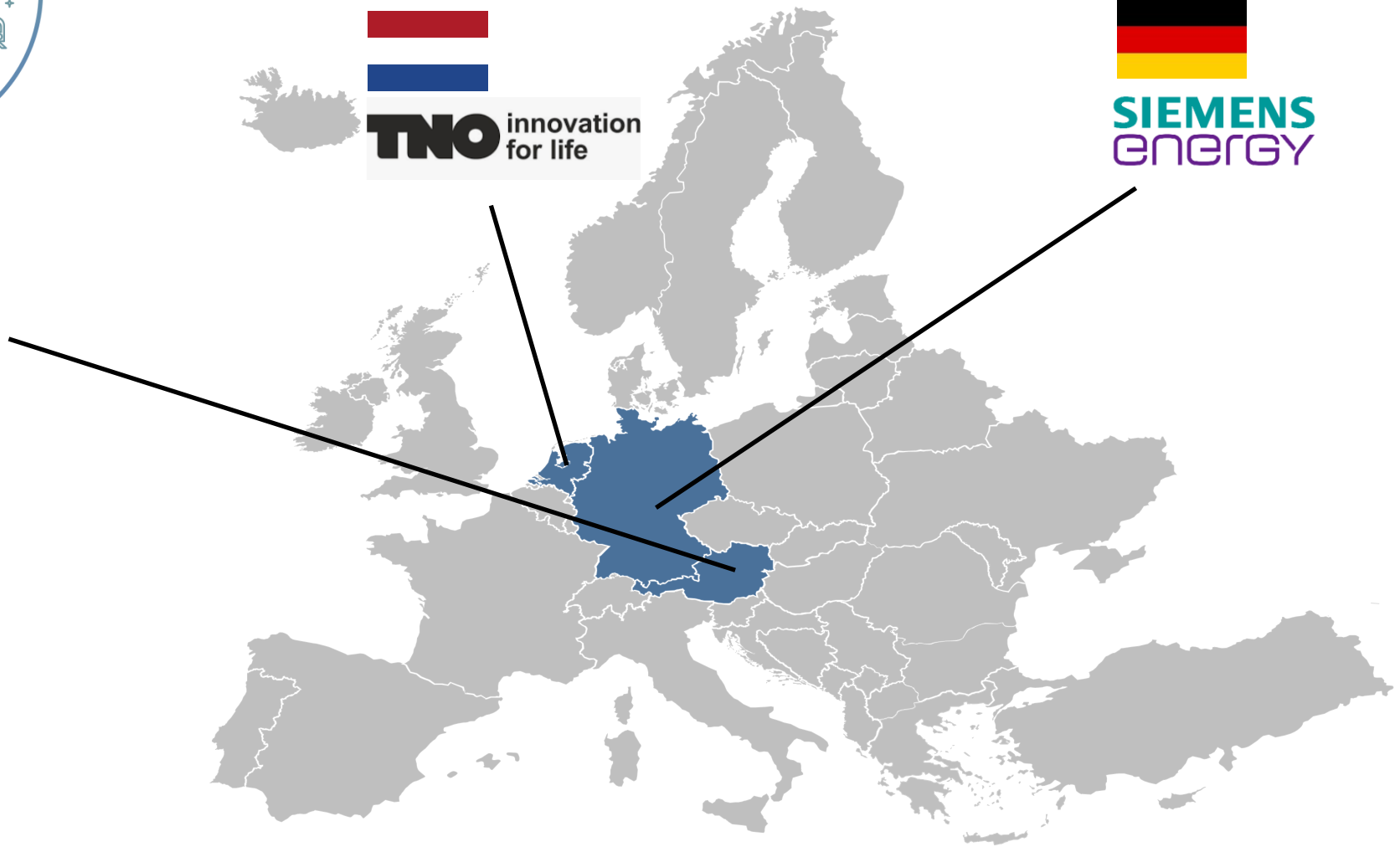
H2Future

% stage of implementation 31/01/2022: [100 %]

Clean Hydrogen Partnership max. contribution: [11,997,820.01 €]
Other financial contribution: [- €]

European Hydrogen Week

Partners



Verbund

voestalpine
ONE STEP AHEAD.

K1 MET
metallurgical competence center

APG

TNO innovation for life

SIEMENS energy

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Project Summary

Main Goals

- **Design and installation of a 6 MW Siemens PEM electrolyser system** at the voestalpine steel plant in Linz, Austria
- **Two-year demonstration** of the electrolyser system, including grid services by VERBUND and ambitious efficiency target

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Project Milestones

Ground breaking

01/18

Completion of installation northern row

09/19

1st gas Oct 14th 2019

1st two row operation Jan 14th 2020

10/19

01/20

03/20

2017

2018

2019

2020

11/17

Certificate of approval

08/18

09/18

Finalization building

03/19

Delivery of first two modules

10/19

11/19

12/19

02/20

Official permission for continuous operation

Training operator crew finished Feb 5th 2020

5 months commissioning

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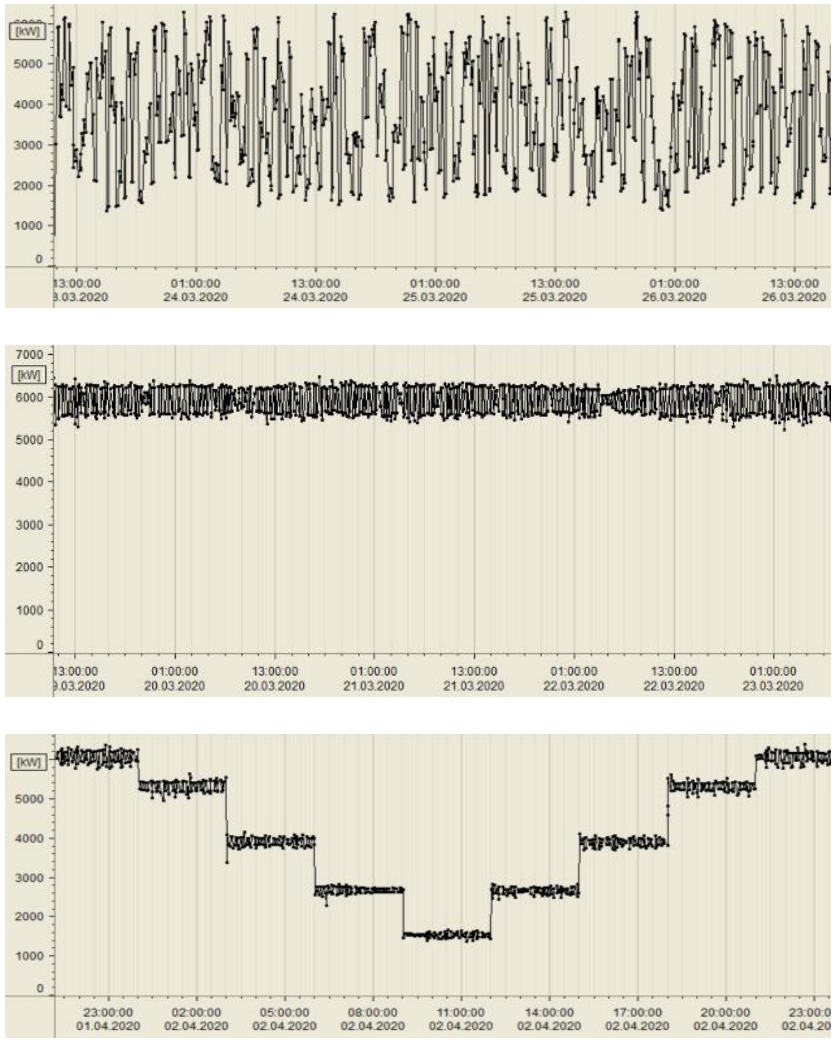
H2FUTURE demonstration operation

- Start of pilot test phase on March 12th, 2020
  - Use Case 1: Stress test – Partial load behavior of the system
  - Use Case 2: Continuous operation 24/7 – Full load behavior
  - Use Case 3: Balancing services – Participation in balancing markets
  - Use Case 4 - Integration into future steel site – Following of load profile
  - Use Case 5 - Integration into current steel site – Balancing of load fluctuation
- Quasi-commercial operation since October 15th, 2020 (until end of 2021)
- Final 1-month technical review



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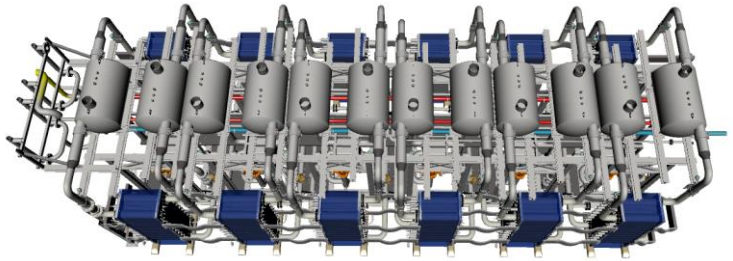
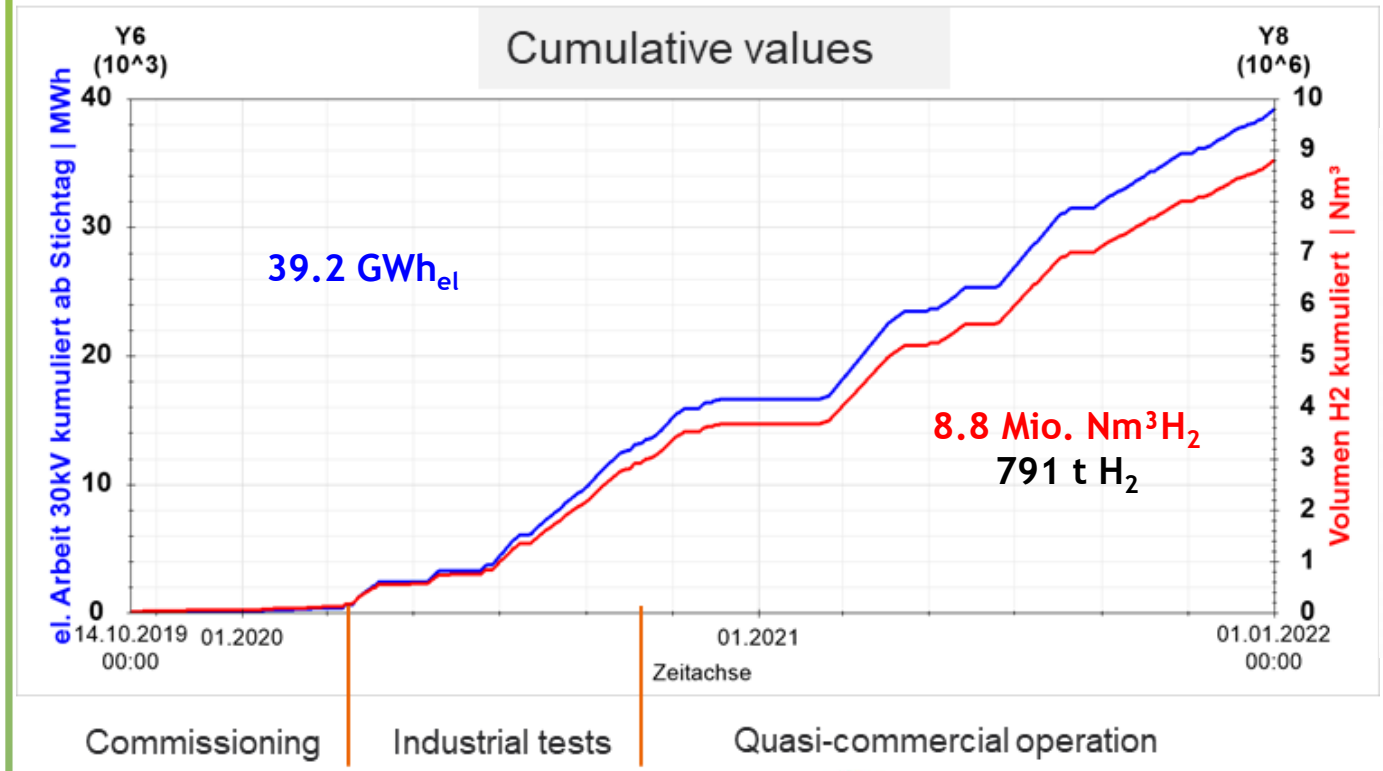
H2Future PEM electrolysis
Operational data



© Siemens Energy



CERTIFICATE

The Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH

certifies that

Verbund

VERBUND Energy4Business GmbH
Am Hof 6a, A-1010 Wien

for the following scope of application

Electrolytic hydrogen generation from renewable energies in the steelworks of voestalpine Linz (H2FUTURE)

conforms to the criteria of

TÜV SÜD Standards CMS 70: Generation of Green Hydrogen (01/2020)

- Cells: 600 (12 x 50)
- Cell voltage: < 2 V
- Pressure: ~100 mbar
- Purities: ~99,9 Vol.% H_2
  ~99,0 Vol.% O_2

without DeOxo and Dryer

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Conclusion

- Stable plant operation between 1,5 MW and 6 MW
  - Overload Operation up to 9 MW
- High qualitaty hydrogen directly from the PEM-Electrolyzer (no additional chemicals)
- High efficient process
  - Plant efficiency ~75%
  - Efficiency at stack up to 83%
- Flexible process that can meet load change requirements
  - Participation in all balancing energy markets
  - Electricity cost reduction between 25 and 50%
  - Large steps in load changes possible

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