Demo4Grid
Demonstration for Grid Services

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Demo4Grid Project Overview

- Call year: 2016
- Call topic: FCH-02-7-2016 Demonstration of large-scale rapid response electrolysis to provide grid balancing services and to supply hydrogen markets
- Project dates: 01/03/2017 > 31/08/2023 (72 instead 60 months)
- % stage of implementation 01/11/2023: 100 %
- Total project budget: 7,736,682.50 €
- Clean Hydrogen Partnership max. contribution: 2,932,554.38 €
- Other financial contribution: 1,380,000.00 € Swiss Government
- Partners: DBC DIADIKASIA (GR), FEN SUSTAIN SYSTEMS GMBH (AT), FHA ARAGON (ES), SUNFIRE (former IHT SA) (CH), INYCOM SA (ES), MPREIS WARENVERTRIEBS GMBH (AT)
Demo4Grid Project Objectives

➢ Deploy, operate and demonstrate a beyond state-of-the-art single stack Pressurized Alkaline Electrolyser (PAE) under real market conditions at the production facility of MPREIS

➢ A business case based on
  ▪ the provision of grid balancing services, capturing of attractive power price opportunities on the spot and intraday market and hydropower energy sources
  ▪ valorization of the electrolytic hydrogen in industrial and FC mobility use.
Green Hydrogen for MPREIS, Tyrol & Europe
from Vision
Opening Demo4Grid Electrolysis Plant at MPREIS in Völs
https://www.youtube.com/watch?v=uu1VXSiZt24
Green Hydrogen for MPREIS, Tyrol & Europe to Reality
Green Hydrogen for MPREIS, Tyrol & Europe to Reality

Gas
- 12 GWh/year
- 2,400 tons CO2 equivalent/year

Diesel
- 1.6 Mio l Diesel/year
- 4,200 tons CO2 equivalent/year

Butchery
- Photovoltaics 1 GWh/year

Bakery
- TIWAG Hydropower

Convenience
- Regional Hydropower Plant

Cooling

Hydrogen Storage

Hydrogen Heat

Hydrogen Logistic

Hydrogen Refueling Station

Hydrogen Truck

Opening of the Electrolyser

Pressurised Alkaline Electrolyser
- 3.2 MW, 117.2 kg H2/h, 30 bar

Hydrogen Purification

Green Hydrogen Production
- 3 MW Alkaline Electrolyser up to 1,3 tons H2 per day

Substitution up to 6,600 tons CO2 equivalent/year
• Nominal power: 3.2 MW EOL
• H2 production capacity: 1300 kgH2 per day
• Operating pressure: 31 bar
• Operating temperature: 80 °C
• Heat extraction: approx. 600 kW @ 65 °C
• Electrolysis water: ground water (no drinking water quality!)
• Balance of Plant can provide full dynamic ELY operation
• Purity H2
  • Before gas cleaning: 99.8 % by volume
  • After gas cleaning: min. 99.97 % by volume
• Purity O2: 99.2 % by volume
• **Manufacturer:** Fives Pillard Deutschland GmbH

• **Model:** Burner Pillard LONOXFLAM

• **Thermal Output:** 0.275 to 1.1 MW

• **Fuel**
  - Natural Gas (100 %) or Hydrogen (100 %)
  - → Any mixtures of H2 and natural gas possible, but not tested

• **NOX from burning H2:**
  - Measurements: < 60 mgNOX per Nm³
  - Legal requirement: ≤ 200 mgNOX per Nm³

• **Gas Supply pressure:**
  - 0.5 bar for Natural gas
  - 3.7 bar for Hydrogen
Demo4Grid Business Case

Power Price Opportunities on Day Ahead Spot Market
Timing is Key

Origin of electricity in the last 24 h

Energy Prices in the last 24 h

Solar

Power Price Opportunity

Source: Electricity Map / GEK
Demo4Grid Business Case

Power Price Opportunities on Day Ahead Spot Market
Timing is Key

Ressources

- Electricity
- Nitrogen
- Ground Water
- Sodium

Coverage of Hydrogen Demand

- AC/DC
- PAE 50 to 100%
- Purification > 99.97%
- Well
- Water Purification
- H2 Storage @30 bar
- Compression 5 to 500 bar
- HRS + Storage @500 bar
- Trailer Filling Station

Hydrogen Demand

- Bulk Supply
- Mobility & H2 Truck(s)
- H2 Burner

Power Price Opportunity on Day Ahead Spot Market → Program ELY C&C accordingly (hourly)
→ Power on ELY as programmed → Produce until (i) demand is covered and/or (ii) storage is full
Demo4Grid Dissemination Activities

Plant Visitors: 311 from Feb 23 to Aug 23

Workshops: 8 from Feb 23 to Aug 23

Publications*: 20 from March 17 to Aug 23

Website Visitors: 543,910 from March 17 to Aug 23

“Hydrogen in Grid Balancing: The European Market Potential for Pressurized Alkaline Electrolyzers” [link](https://www.mdpi.com/1452760)

“Establishment of Austria’s First Regional Green Hydrogen Economy: WIVA P&G HyWest” [link](https://www.mdpi.com/2260342)
Outlook: Establishment of the Green Hydrogen Economy

Since 2014: Hydrogen Highway, Hyundai Friendly User Hydrogen Families

Since 2016: Green Hydrogen for MPREIS, Tyrol and Europe

Since 2014: Hydrogen Highway, Hyundai Friendly User Hydrogen Families

Since 2017: Zillertalbahn 2020+ energy autonomous with Hydrogen

Since 2018: Power to X Hydrogen Center