On-site green hydrogen production with modular, scalable and standardized AEM electrolysers

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Enapter
Important steps have been taken to decarbonise electricity; molecules remain stubbornly dependent on fossil fuels.
Why Green Hydrogen?

- **Sector coupling**: the energy carrier hydrogen allows for the energy transition to reach all sectors.
- “Hydrogen could provide almost 1/5 of total energy consumed by 2050, and cut carbon emissions by about six billion tons compared to today” (Hydrogen Council).
- Green energy can help to increase independence and security.
Hydrogen momentum is picking up...

Support for hydrogen is growing around the globe. Think tanks, governments, industry and investors are realizing the potential of green hydrogen. The market will grow very fast.

In 2016
the global electrolyser market was small with industry turnovers at about EUR 100-150m per annum

In 2025
the global electrolyser market could reach EUR 75-120bn. While this looks massive, growth is mirroring the market developments in the solar industry.
... so is Enapter’s momentum

Forbes: Dedicated articles about Enapter as well as prominent mentions

Germany Trade and Invest about Enapter

Enapter Interview in Handelsblatt Online and Print

H2VIEW: Prominent coverage in industry news
Winning major Awards

Shell NEW ENERGY CHALLENGE
Amsterdam — 14.10.2018

Winner Start Up Award German Energy Agency (dena)
Berlin — 08.04.2019

Enapter about hydrogen at the IAA

Enapter at the World Energy Congress 2019. Meeting several high-level contacts such as the Energy Minister of UAE
Enapter AEM Electrolyser

Enapter develops and manufactures the patented AEM (anion exchange membrane) electrolyser
How is Enapter different?
Technology: AEM electrolyser
Strong Technology and R&D
Unique Technology for Electrolysis, proven and patented.

- Noble metals not required.
- Low cost.
- Great Performance.
- Simple Balance of Plant.
- Easy to handle.
- Low water input quality requirement.

**Durable**
> 30,000 hours
Facts about Enapter

Enapter acquired proven core technology, patents and key employees from ACTA S.p.A. ACTA had 10+ year track record of AEM electrolyser R&D and technology development and global installations.

Employee numbers are fast growing
01.11.2017: 11 employees
01.05.2019: 59 employees
01.01.2020: 83 employees
(16 chemists, 30 engineers, 11 mechanics, 26 others: HR, IP, Certifications, Technical Documentation, Administration, Business Development) (all full-time, 18% PhD, 55% Master, MBA etc.).

Locations
Italy: R&D centre and production (see picture). Offices in Germany, Russia and Thailand. Japan office will start in Q2/2020.
Enapter
Main R&D Facility in Pisa, Italy

Enapter Serial Production went live with a “soft starting” in July 2019 after 6 months of planning in record time.

Production capacity increased 8-fold.
New testing areas were built.
What makes Enapter special?

Scalability
Standardised
Software Approach
How is Enapter different?

Think of Electrolyser as a commodity.

Nothing has seen more rapid cost reduction in economic history than mass produced commodities. We will mass produce our electrolyser.

Enapter’s approach is different from most other electrolyser manufacturers and can be well understood by drawing an analogy between the electrolyser industry today and the IT industry in 1980. Today’s manufacturers of large-scale electrolysers are developing systems comparable to the IT industry’s early "Mainframes". Each system is designed as an individual project, demanding highly sophisticated engineers and planning.

Enapter is mimicking the introduction of the PC: a product that is small, modular and scalable. The Enapter Electrolyser vision has unique characteristics and capabilities poised to disrupt the storage and fuel markets.
The Product  Electrolyser EL 2.1
Production start today - EL 2.1 in February 2020

- **High Efficiency**
  4.4 kWh for 1 Nm³ of H₂

- **Hydrogen Production**
  500 NL/hr or 0.5 Nm³/hr

- **Hydrogen Purity**
  99.9%
  99.999% with optional dyer

- **Input Water Purity**
  <20 μS/cm

- **Output Pressure**
  35 bar

EL 2.1 Brochure available
How is Enapter different?

- Full energy monitoring system.
- Setup time in minutes with full remote monitoring and control.
- Any energy device can be integrated.
- Industry-grade security standards.
- All protocols are supported.
Use Cases

30 countries

90 customers

Electricity Storage (Seasonal) — French Alps
H2 as feedstock in Industry

Nitrogen purification, glass cutting, ...
Enapter Use Case

Refueling

One area of application for green hydrogen is the refueling. We are supplying drone, car, aviation and other vehicle manufacturers with our electrolysers.
Enapter Use Case

Power-to-Heat

In Rozenburg, the Netherlands, 8x EL 2.0 are producing green hydrogen that is used to heat a building complex.
Microgrid and Emergency / Back-up power

Our Electrolysers are used in Microgrid application (e.g. to bring electricity and storage to remote areas) as well as in back-up power for telco installation and in containerized emergency back-up power system.
In Münster, Germany, we commissioned 1x EL 2.0 in combination with a fuel cell to provide seasonal storage capabilities. Hydrogen could be used for much more than just power in the future.
Australia’s first hydrogen test station opens in Canberra

ACT gas network operator Evoenergy and the Canberra Institute of Technology have partnered to build a first of its kind hydrogen test facility at CIT Fyshwick. The station will test up to 100% hydrogen in deployments in which natural gas is currently used.

DECEMBER 5, 2018 MARIJA MAISCH

Enapter Use Case

Power-to-Gas

In Australia evo energy is using our AEM electrolyser in test facility for feeding hydrogen into gas grids.
Enapter aims to drive the cost for green hydrogen to a level where it is competitive with fossil fuels. This requires massive scaling efforts.
EL 500
Available 11/2017
- Separate stack and control modules
- Significant onsite installation tasks
- All 4 sides of the module need to be accessible for airflow, electrical, gas connections

EL 2.0
Introduced 01/2019
- Single module simplifies onsite installation
- Front-to-back airflow allows space saving and stackable systems
- Integration into Enapter EMS allows mobile setup and remote monitoring
- New stack 40% smaller

EL 2.1
Unveiled at FC EXPO, Tokyo, 26.02.2020, Production start today.
- Increased efficiency! 8% less energy needed and low standby power
- Revised interface design allows easier installation and hot-swapping
- Completely new FW improves reliability and introduces OTA capability for new features
Project: Enapter Campus

The Enapter Campus will become Enapter’s HQ, R&D and main production site to reach the needed cost reductions. It will be the first automated electrolyser mass-production facility in the world.

300+ employees can be hosted on the Enapter Campus

2021 will see soft launch of production at the campus

Sustainable: The campus will be fully energy independent, powered by solar.

Location: We are still scouting for the best possible location
Overall Roadmap

2019
- EL 2.0

2020
- EL 2.1
- Serial Production Capacity: 50/month

2021
- EL 4.0
- Serial Production Capacity: 100+/month

2022
- EL Model T
- Mass Production Soft Launch
Thanks for your attention!