

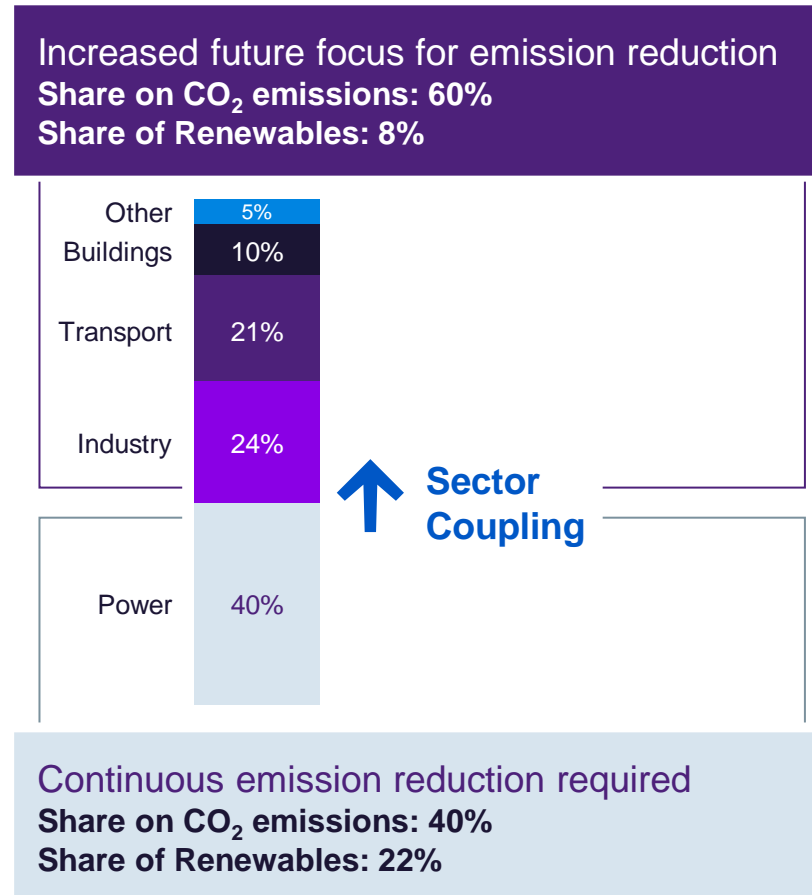
Workshop PtG/ PtL

Large Scale PEM Electrolysis and Sector Coupling
8th of March, 2021; Ilona Dickschas

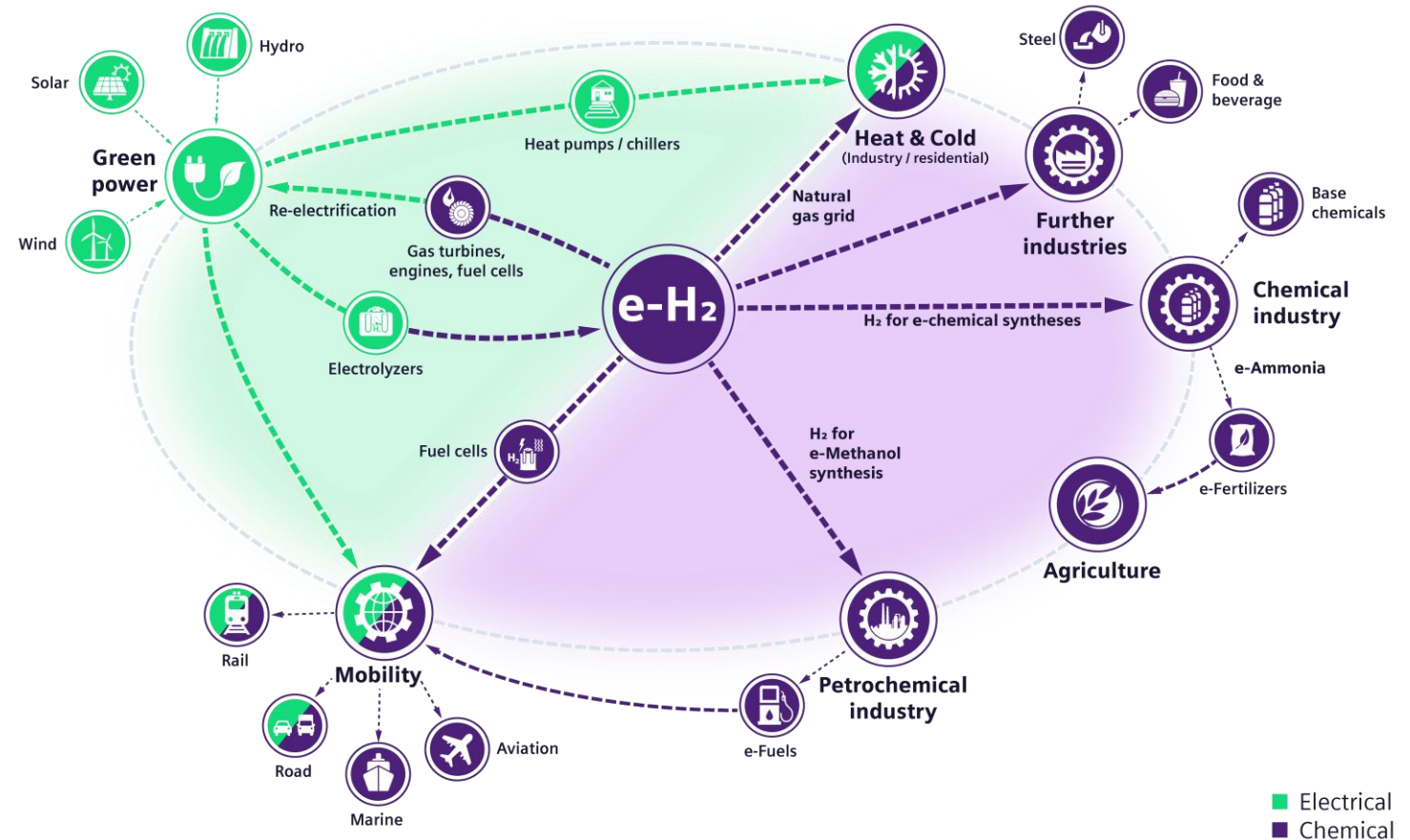


“Sector Coupling” is the key lever for decarbonization of all end-user sectors

Shares in global CO₂ emissions by sectors

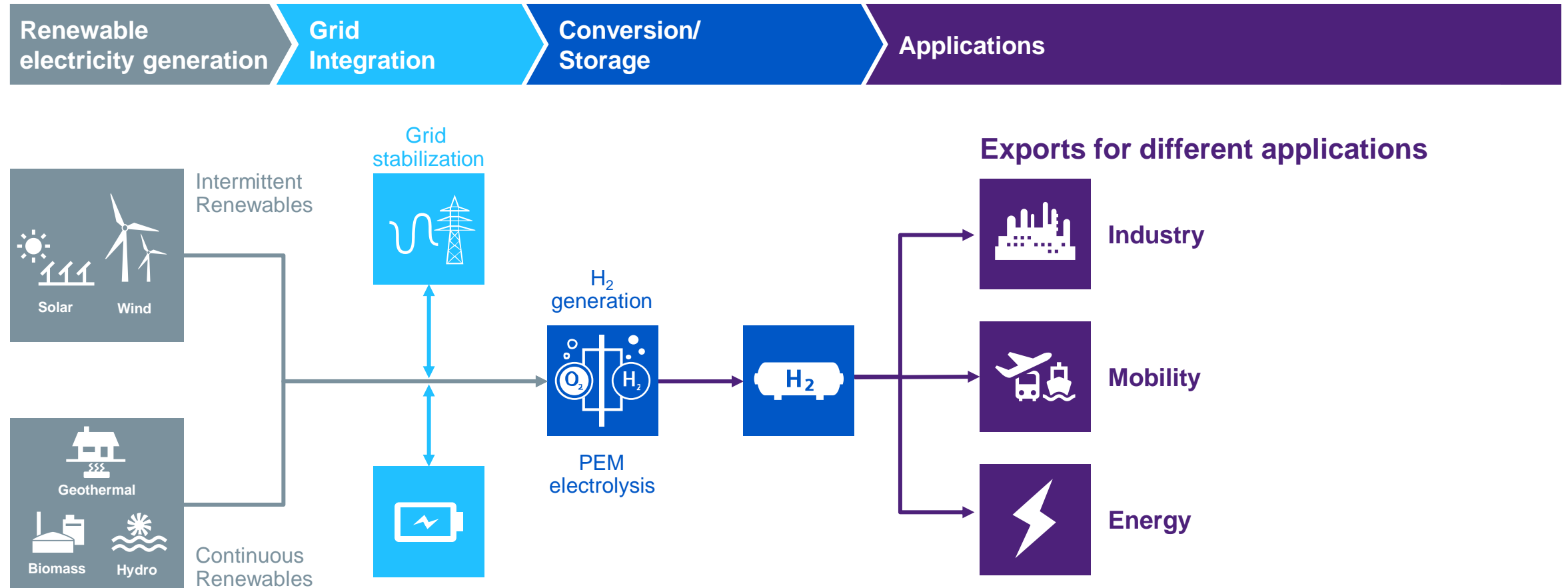


Sector Coupling – Links and Interactions



Source: World Energy Balances 2018

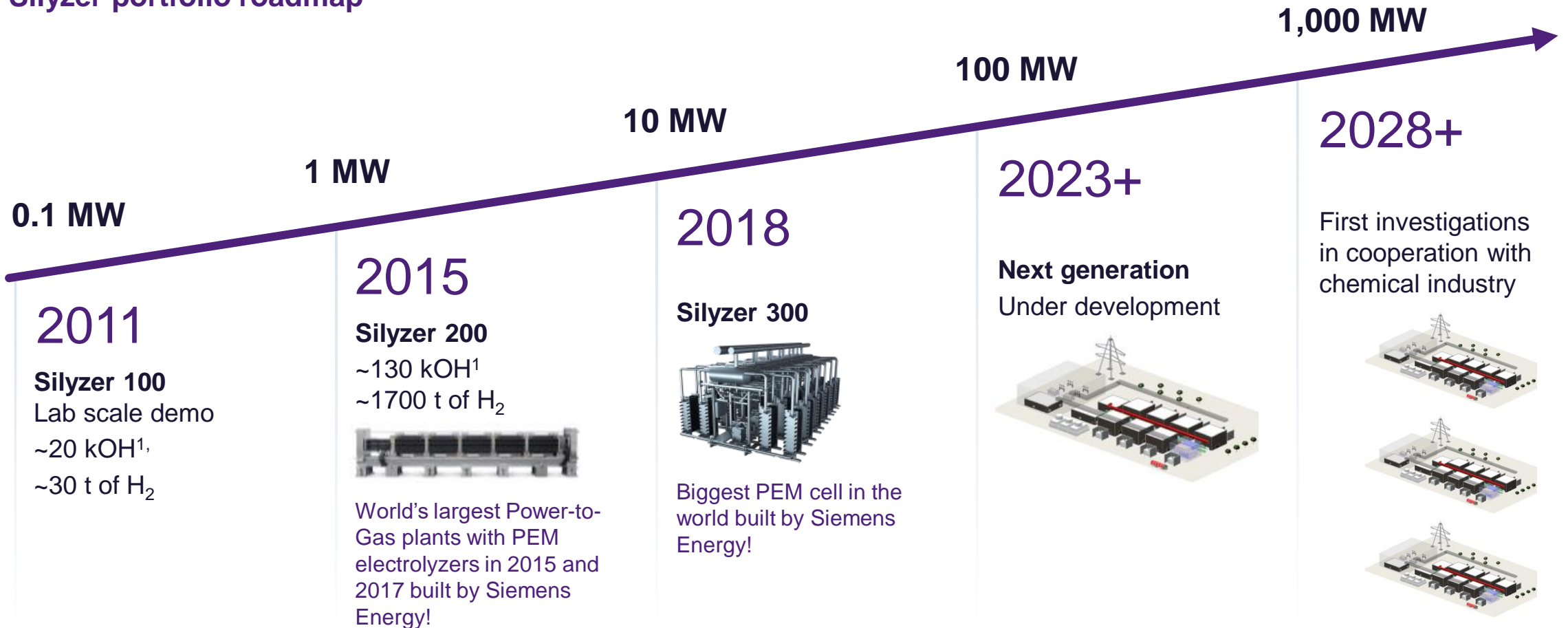
Hydrogen from renewables enables large scale long-term storage and sector coupling



Silyzer portfolio scales up by factor 10 every 4 – 5 years driven by market demand and co-developed with our customers



Silyzer portfolio roadmap

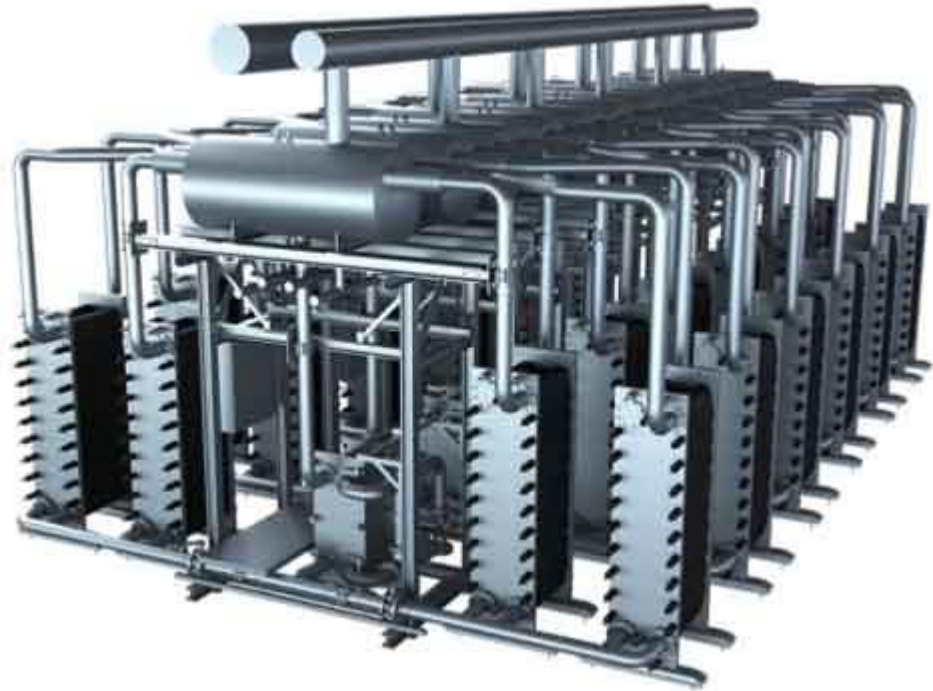


1 1000 accumulated Operating Hours; Data OH & tons as of Oct 2020

Silyzer 300 – Full Module Array

The next paradigm in PEM electrolysis

Silyzer 300 – full module array (24 modules)



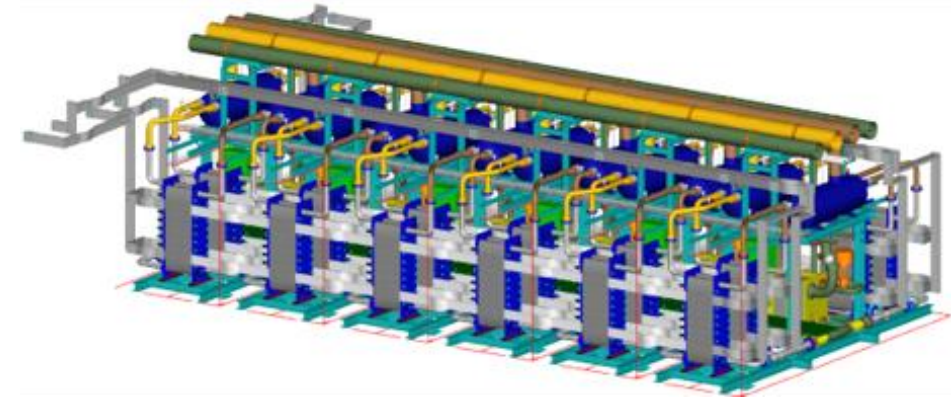
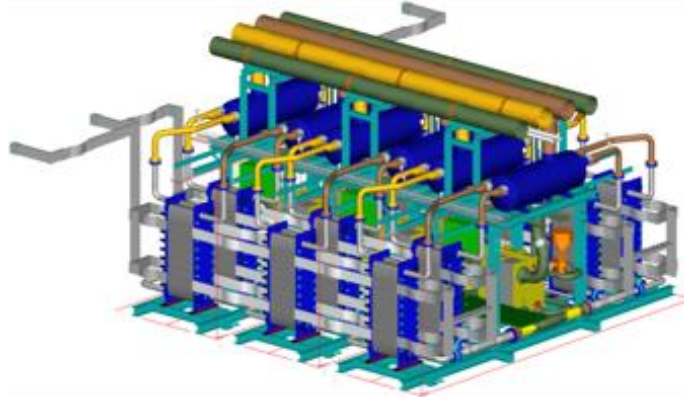
17.5 MW
plant power demand

> 75.5 %
plant efficiency

24 modules
to build a full module
array

330 kg
hydrogen per hour

Cost-optimized and pre-engineered solutions for Silyzer 300 – can be multiplied up to Gigawatt-scale solutions



Half Array – 12 Modules

Full Array – 24 Modules

Rated H ₂ production	165 kg/h at rated power	330 kg/h at rated power
Rated Silyzer 300 plant power ¹	8.7 MW	17.5 MW
Plant efficiency Silyzer 300 ¹	>75.5%	>75.5%
Dimension array	8.0 x 7.5 x 3.7 m	15.0 x 7.5 x 3.7 m
Output pressure	Array: 100 mbar(g); Plant: project specific	
Hazard concept	Standard industrial building, only water no additional chemicals	

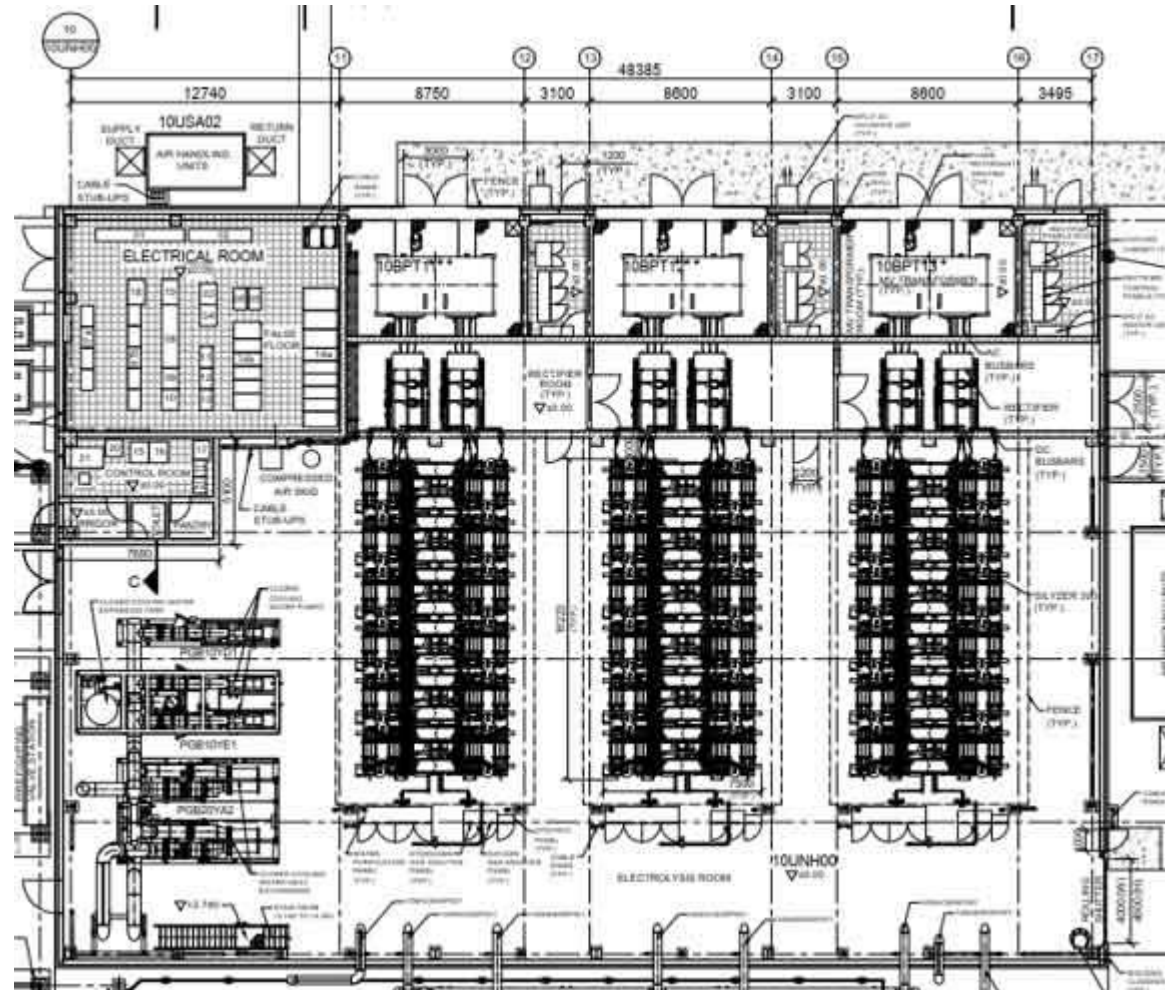
¹ Power demand and efficiency calculated for the air-cooled plant, new and clean, T_{amb} = 15°C, HHV = 39.45 kWh/kg



- Pre-fabricated and pre-tested module groups for reduced onsite effort
- Compact footprint
- Standard industrial building
- No indoor crane necessary
- Separate rooms for power electronics
- Future upgrades compatible

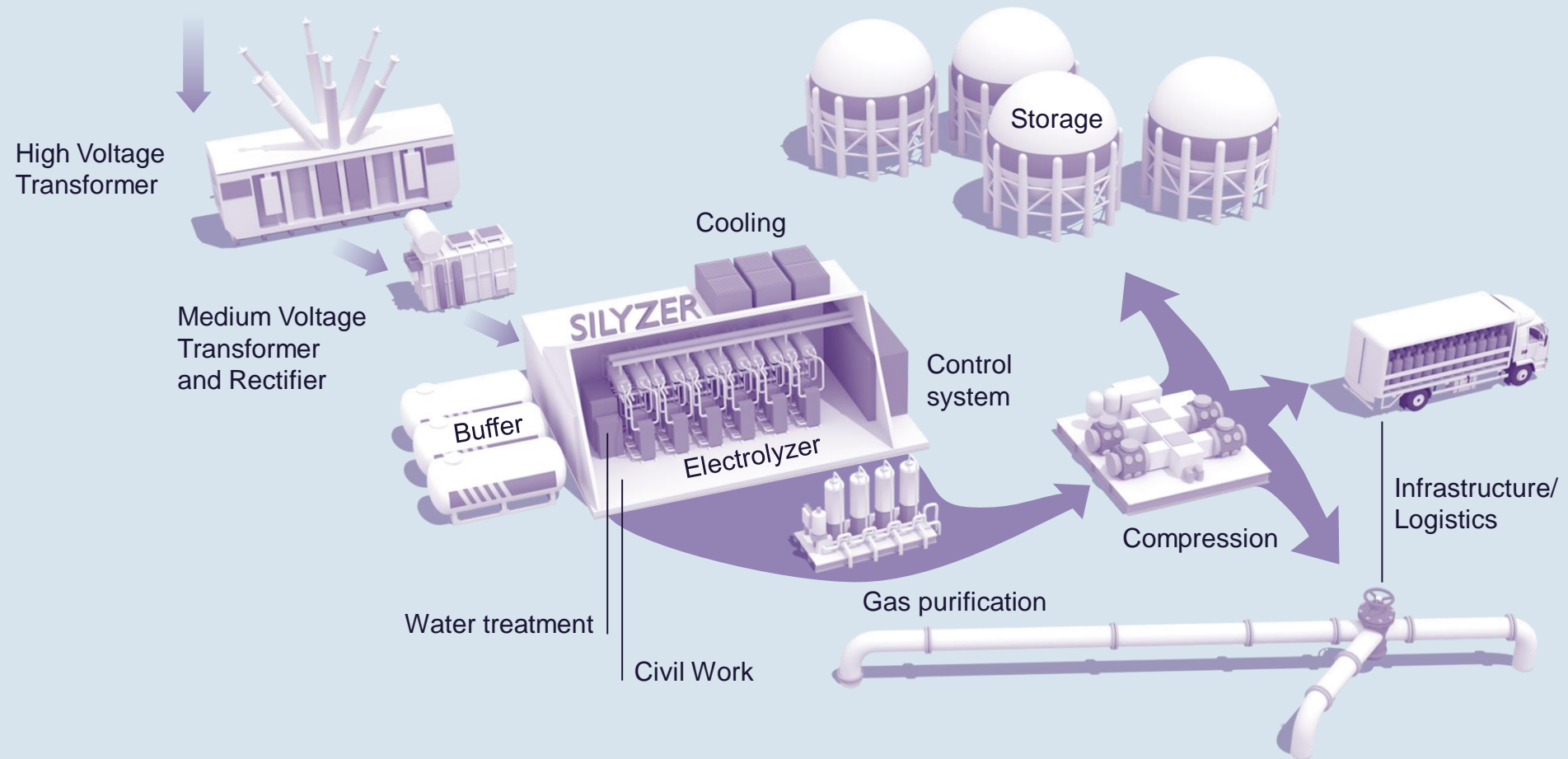
Optimized plant design for fast installation, low cost and maintenance friendliness

Plant layout



Hydrogen generation

More than just an electrolyzer





6 MW

Power demand based on Silyzer 300

1,200 Nm³

of green hydrogen per hour

January 2021



H2FUTURE

A European Flagship project for generation and use of green hydrogen

Project

- Partner: VERBUND (coordination), voestalpine, Austrian Power Grid (APG), TNO, K1-MET
- Country: Austria
- Installed: 2019
- Product: Silyzer 300

Challenge

- Potential for “breakthrough” steelmaking technologies which replace carbon by green hydrogen as basis for further upscaling to industrial dimensions
- Installation and integration into an existing coke oven gas pipeline at the steel plant
- High electrolysis system efficiency of 80%

Use cases



Hydrogen for the steel making process



Supply grid services

Solutions

- Operation of a 12-module array Silyzer 300
- Highly dynamic power consumption – enabling grid services
- State-of-the-art process control technology based on SIMATIC PCS 7



This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 735503. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovative programme and Hydrogen Europe and NERGHY

Future of energy in Europe is about decarbonization through “Sector Coupling” and a new market design

Cornerstones of a future energy system

Decarbonization of energy



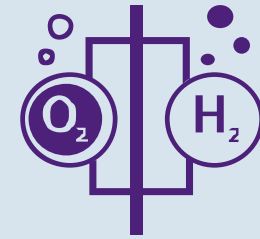
Transforming the conventional generation capacity into low-carbon assets

Sector coupling



Leveraging renewables in power sector to decarbonize heat, mobility, industry

Electrolysis



Key technology for P2X/sector coupling

§ Regulatory framework: Has to value CO₂ reduction and needs to be technology open – necessary now!

Disclaimer



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