SIEMENS energy

Hydrogen and Power-to-X solutions

Our experience for scalable and reliable technology making a difference in the energy transition



siemens-energy.com/electrolyzer

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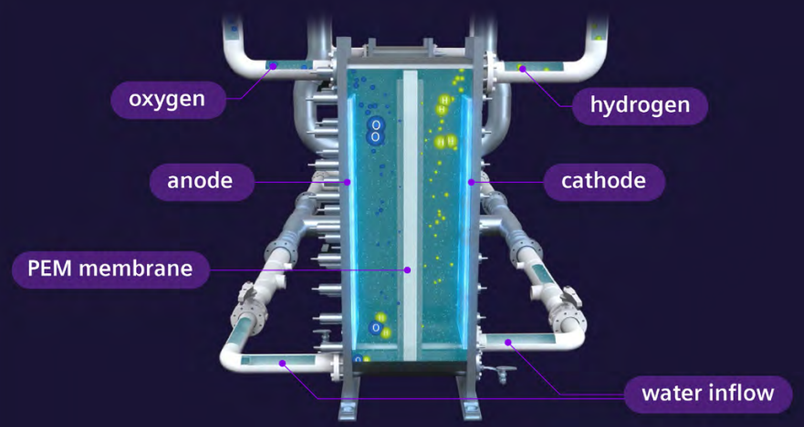
Elyzer P-300 – Technical data

Benefits of PEM electrolysis

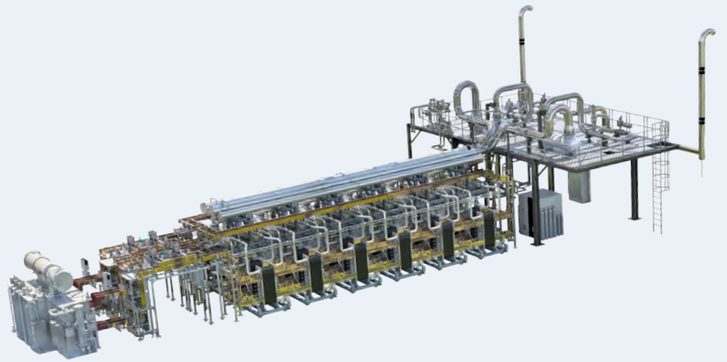
- High power density
- Safety-oriented PEM design
- High dynamic operation range; direct coupling to renewables
- High efficiency and low module internal losses
- High gas purities
- Extreme low standby consumption
- Low maintenance needs
- Consumes only water and power, no hazardous chemicals
- Technology Readiness Level 9 (TRL 9) according to European standard

Electrolysis type:	Proton Exchange Membrane
Output pressure (array):	Customized
Plant efficiency:	>75.5%
Minimum load:	40% single stack
Demineralized water consumption:	10 l per kg hydrogen
Hydrogen quality:	up to 99.999% with de-oxo dryer
Startup time:	<1 minute
Dynamics:	up to 10 %/s in 0 - 100 %
Stack design:	Optimized for 80k EOH*. Operation beyond 80k EOH possible.

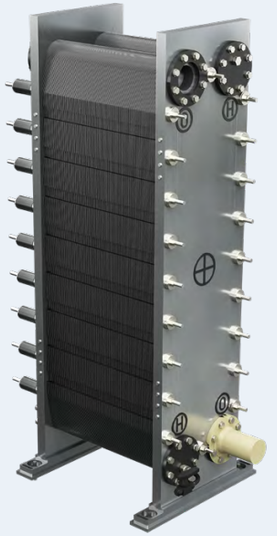
PEM electrolysis – how does it work?



For our hydrogen electrolyzer system, we focus on PEM technology taking its name from the proton exchange membrane. The membrane's special property is that it is permeable to protons but not to gases such as hydrogen or oxygen. As a result, in an electrolytic process the membrane takes on, among other things, the function of a separator that prevents the product gases from mixing.



24 stacks
to build a full stack array



17.5 MW
plant power demand

>75.5 %
plant efficiency

335 kg
hydrogen per hour

*Equivalent Operating Hours

Everything from one place

Leveraging our experience from system up to full turnkey projects

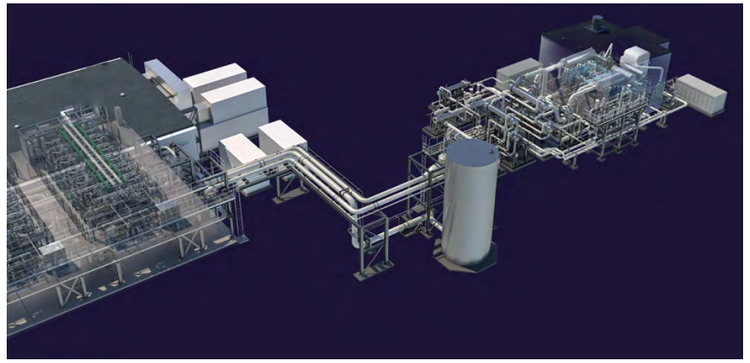
Elyzer P-300 system

- PEM technology with safety-oriented stack design
- High performance and flexible operation
- Pre-fabricated and pre-installed skids



Integrated electrolyzer-compressor solution

- De-risking hydrogen projects
- Fully integrated scope
- Reduced interfaces



Elyzer reference plant 100 MW

- Optimizing system cost
- Accelerating projects
- Basis for customization

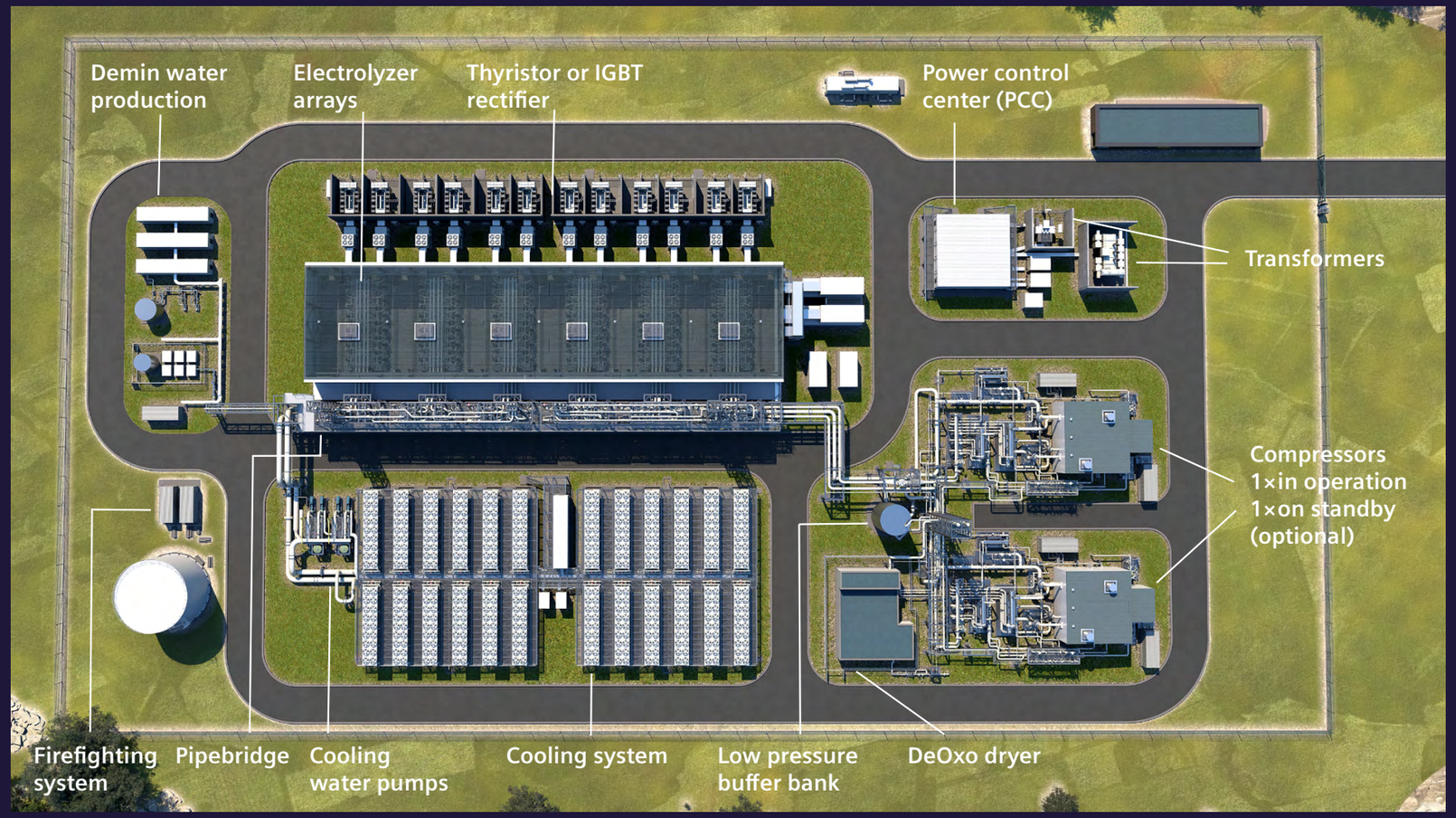


Global expertise:
electrolyzer and compression technology, grid connection, project execution, and service

Optimized electrolyzer plant design:
basis for your customization

Future-proof power supply design:
fulfilling new grid compliance standards with Thyristor- or IGBT-based rectifiers

Optimized 100 MW Elyzer P-300 plant
with modular and easy-to-install components



Plant power
~110 MW

Hydrogen production
~2,000 kg/hour

Dry gas quality
99.999%

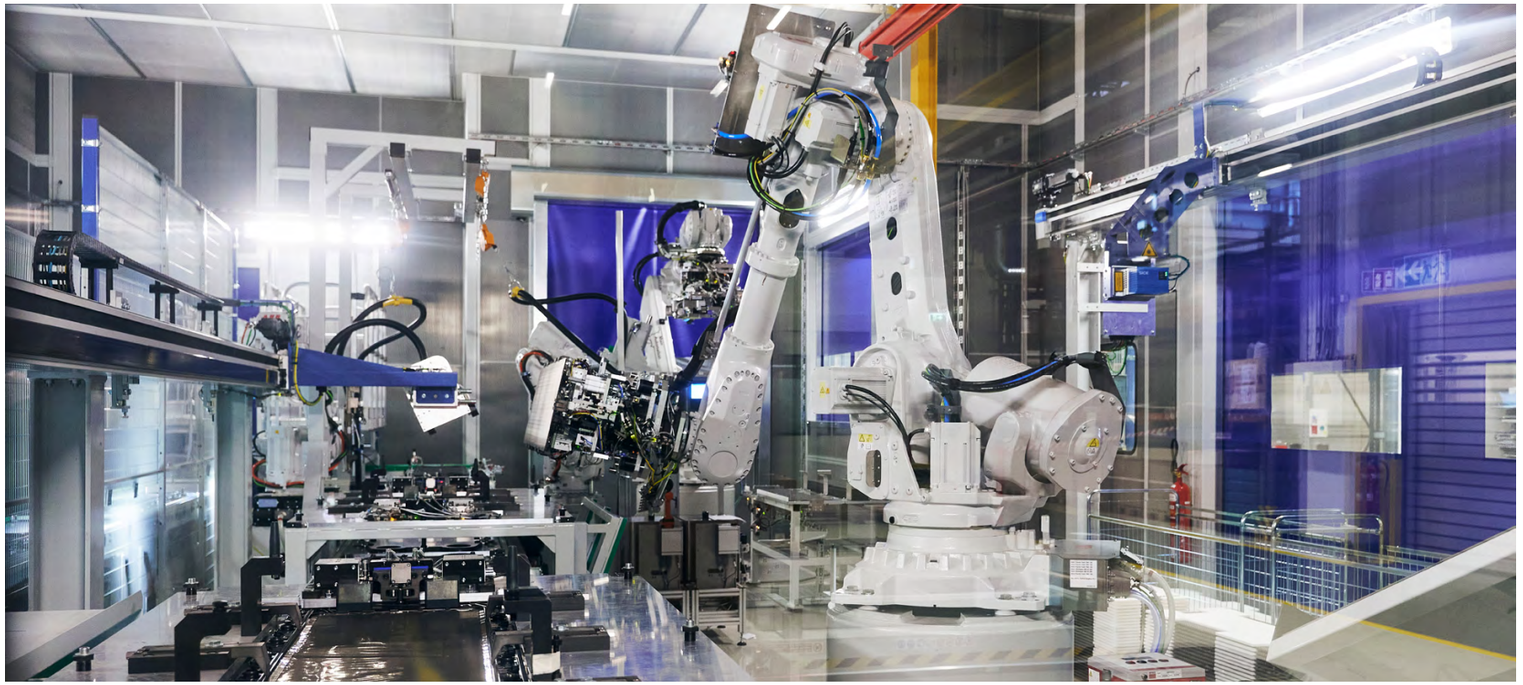
Demin water consumption
~ 10 kg/kg H_2

Total electrolysis plant space
186 × 90 m (Thyristor)
186 × 96 m (IGBT)

Pressure
30 bar

serving as a basis for customization of pressure, cooling, scale, etc.

Gigawatt-scale series production of electrolyzer stacks in Berlin



In 2023, industrial production of PEM electrolysis stacks began at our multi-gigawatt electrolyzer facility in Berlin – highly automated according to latest production standards. It can be ramped up any time depending on market demand.



Cost-efficient multi-gigawatt stack factory

- Highly automated central PEM manufacturing according to latest production standards
- Large quantities and strong supply chain management
- Strong partner relationships for supply of key components



Localized decentralized packaging

- High quality through pre-assembly
- Transportable units
- Local packagers in key regions facilitate local value chains



Scalable electrolysis system

- Minimized on-site installation
- Clearly defined interfaces maximize standardization
- Pre-engineered for contract manufacturing

Operation & Service

Custom-tailored services

Advanced programs

Since operating efficiency and value creation are your priorities, let us take care of your electrolysis plant. We strive to enhance the value of your asset over time.

- Elyzer coverage programs
- Service frame agreement
- Long-term service agreement
- Plant service agreement

Availability & On-demand services

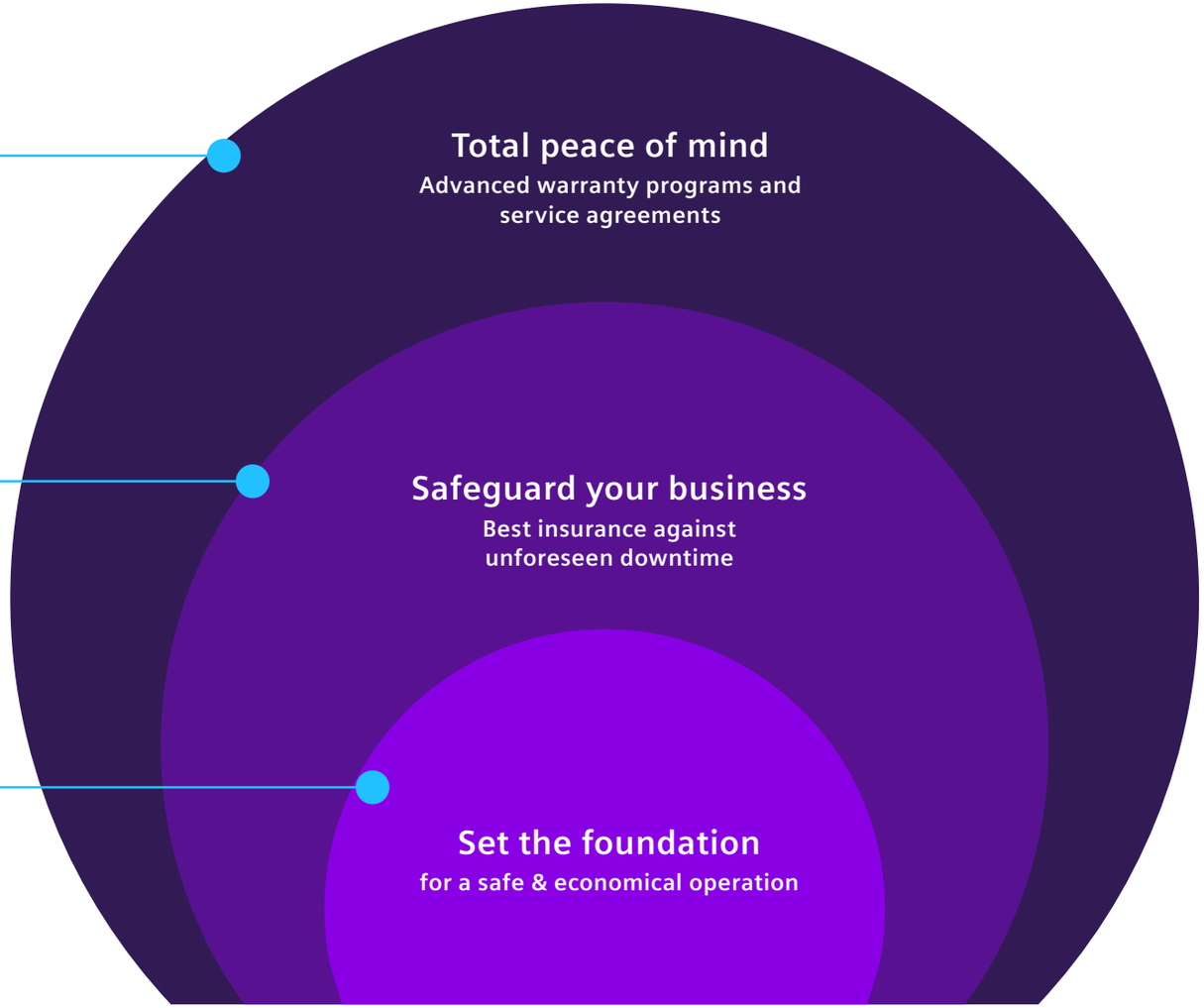
Based on your business model, we optimize your asset and reduce risks, supporting your business case.

- Stack exchange
- Spare parts
- Corrective maintenance
- Electrolyzer training

Basic modules

Set the basis for a safe, economical and smooth operation with basic modules of maintenance, support & digital services.

- Service hotline 24/7
- Scheduled maintenance
- Condition monitoring



A service program to support the bankability of your project

Elyzer® Coverage+ program

Our electrolyzer Elyzer Coverage+ program brings you certainty in your business case:

- Keeping your operating costs in check
- Ensuring stack and plant safety and operability
- Enabling transparency on your operating data
- Delivering a predictable outage schedule for effective operation and commercial planning

We are offering service solutions with our breadth and depth of expertise in electrolyzer and compression technology, grid connection, instrumentation and controls, project execution, and global service:

Over 380.000 operating hours of electrolyzers

Over 130 electrolyzer outages performed

Global service with over 11.000 employees

Extended warranties with a make-good-approach

Elyzer P-300 stacks, atmospheric PEM
Industrial-scale and inherent safety-oriented design

Long-term service agreement
Reducing your risks with our experience at your disposal

Long-term warranties
Enabling bankability for your project business case with Coverage+

- Scheduled maintenance
- Condition monitoring
- 24/7 Hotline | remote support
- Tailored stack exchange
- Extended warranties

Warranted over term

- Long-term degradation
- H_2 in O_2 concentration
- Stack integrity
- Fixed stack pricing

Secured by additional stack pool





Track your KPIs with Omnivise Asset Health App

Smart data management

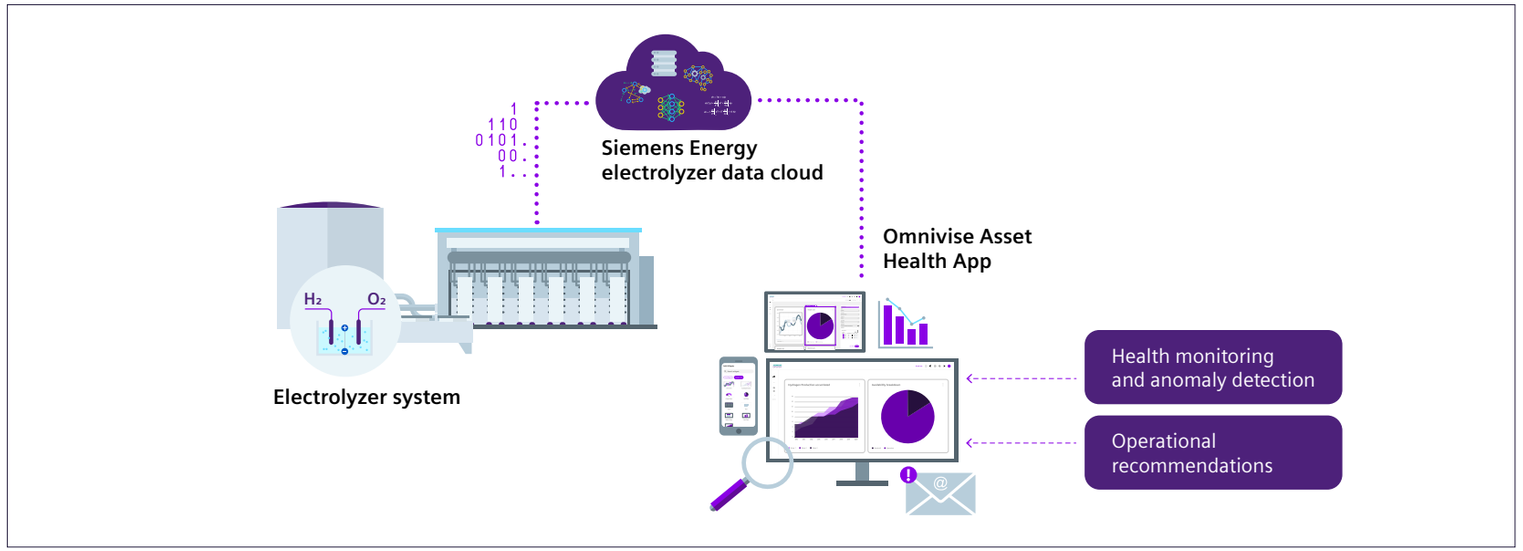
- Fast, seamless access to electrolyzer system data* ensures you have the right information exactly when you need it.
- Be ready the moment it matters: All data is readily available and prepared for rapid analysis, enabling swift and confident responses to any issues.

Automatic visualization of signals

- Instant, intelligent operational insights provide full visibility into plant performance at a glance.
- Deep-dive access to all operational details empowers fast, data-driven decisions and seamless analysis.

Siemens Energy models

- Always-on anomaly detection and health monitoring proactively protect your stacks – maximizing performance and minimizing risk.
- We turn insights into actions with smart recommendations and fleet-proven models that boost uptime and plant availability.
- Do more with less: Our highly automated solutions reduce labor effort while delivering outstanding cost efficiency and operational excellence.

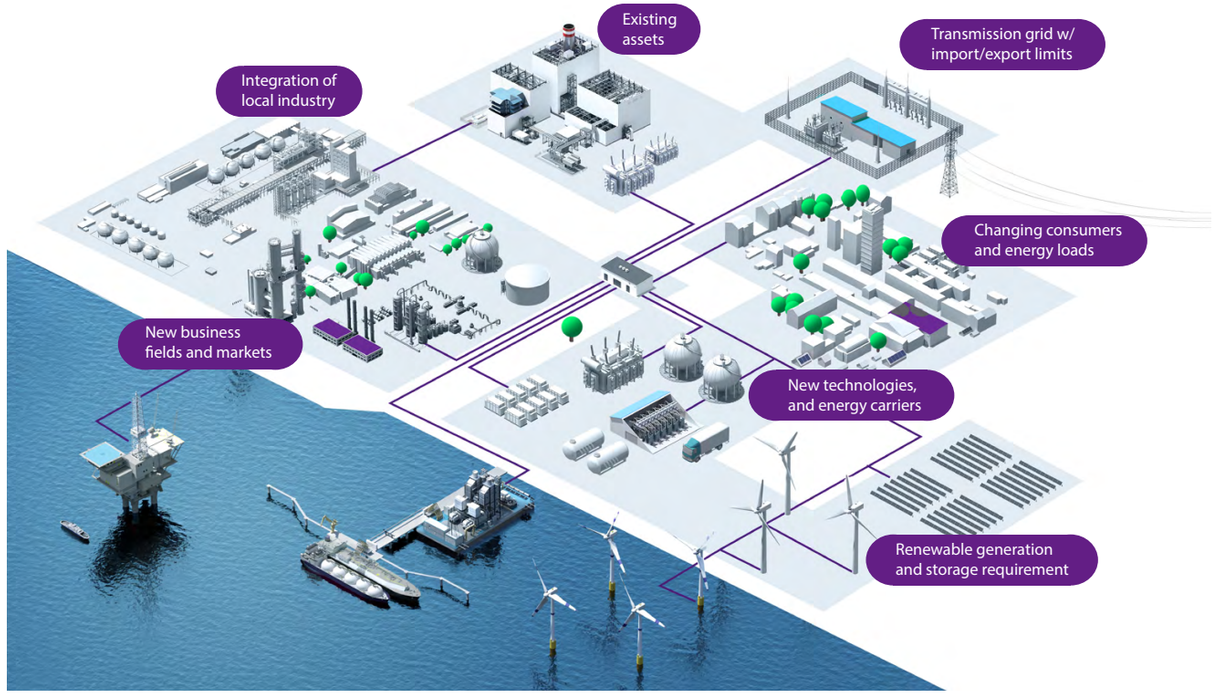




* Electrolyzer system + scope of supply + further jointly agreed signals

Energy System Design – unlocking new opportunities

The key to the future energy world lies in mastering techno-economic complexity – shaped by long-term investments, dynamic pricing, volatile renewables, and uncertainty across energy markets and regulatory frameworks



Energy System challenges

System complexity

- Growing solution space creates high complexity
- Multi-energy system interactions (power, heat, hydrogen, ...)
- Integrating renewables into existing industrial infrastructure

Economic uncertainty

- Volatile energy markets
- Business cases for hydrogen and new energy carriers
- Long-term investment risks

Decarbonization requirements

- Meeting ambitious CO_2 reduction targets and regulations
- Aligning sustainability goals with economic performance

Tailored consulting and results

Energy System Design

Holistic optimization resulting in:

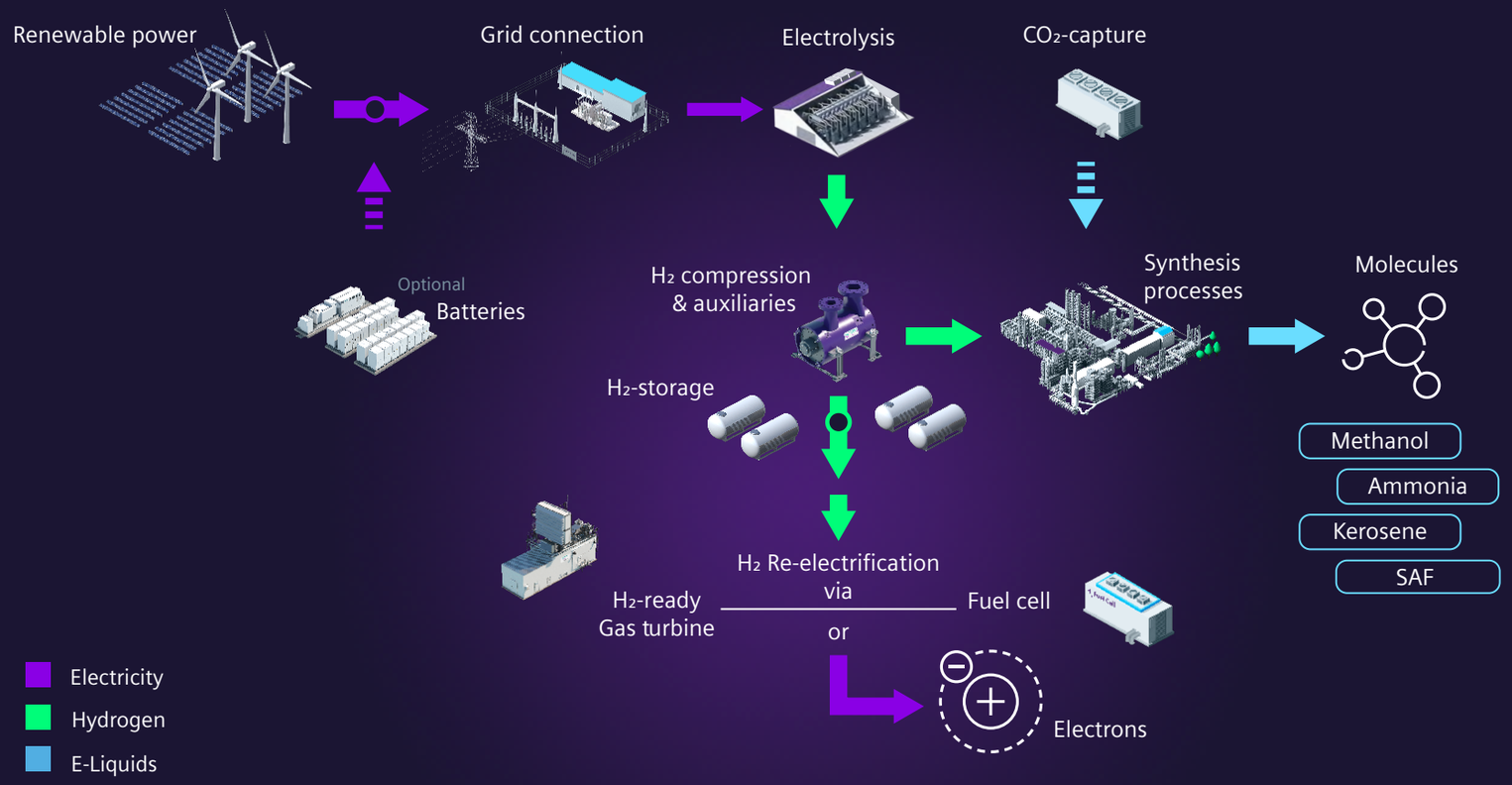
- Optimal technology selection
- Optimal sizing of assets
- Optimized operational strategies

Basis for decision making

- Techno-economic validation
- Optimization of cost & revenues
- Scenario and sensitivity analysis
- Transparent KPIs and tipping points

Energy landscape: Power-to-X and Hybrid Power Solutions

Decarbonization and cost optimization through integrated, customized technologies



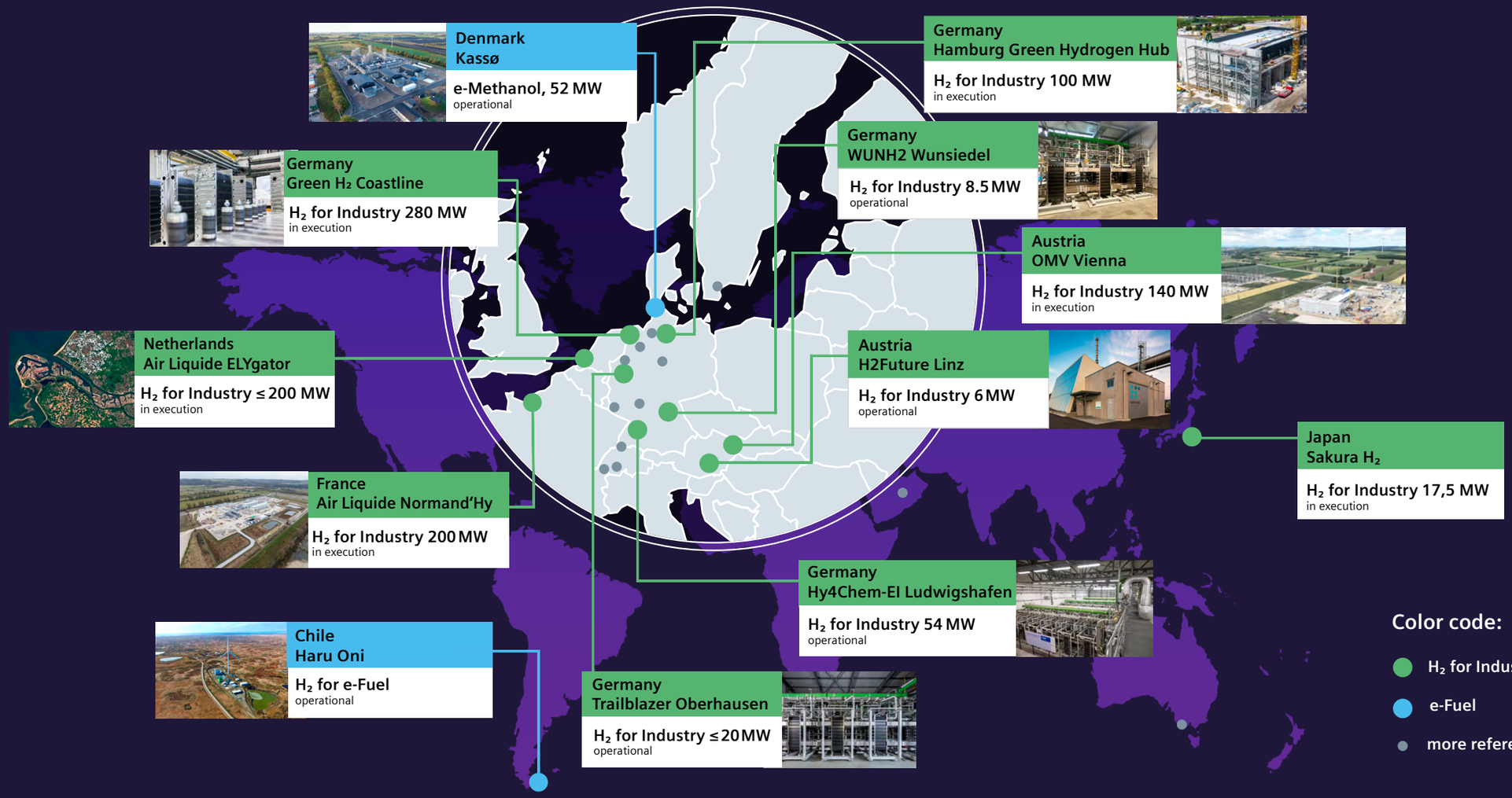
Power-to-X (PtX) and Hybrid Power Solutions are always a subset of the depicted energy landscape. In PtX applications, hydrogen is converted into molecules along the energy landscape via a synthesis process, but there is no re-electrification.

By integrating different technologies, our customized solutions are tailored to your local challenges and needs, regardless of remote locations, grid access, existing networks, or decarbonization requirements.

The challenges are many – but the solution is simple with Power-to-X or Hybrid Power Solutions from Siemens Energy.

- **Powerful and intelligent**
  Integrating multiple technologies through advanced control capabilities for simplified, improved and efficient operation of complex energy systems
- **Powerfully sustainable**
  through an increased share of renewable energies in power generation
- **Powerful and reliable**
  through the integration of storage solutions

Electrolyzer plants – our project experience



Reference projects



Normand'Hy Project – Green hydrogen for Air Liquide pipeline infrastructure

Power dimension:	200 MW based on Elyzer P-300
Installation:	2026
Location:	Port-Jérôme, Normandy, France
Customer:	Air Liquide

Use cases

- Hydrogen for refineries (particularly TotalEnergies' Gonfreville refinery) and intensive mobility

Potential

- Connecting hydrogen production to Air Liquides local hydrogen network, avoiding up to 250,000 tons of CO_2 emissions each year

Solution

- 12 array Elyzer P-300
- When operational, the plant will produce up to 28,000 tons of renewable and low-carbon hydrogen annually.



Kassø PtX Project – First large-scale e-Methanol project for marine use in Europe

Power dimension:	52 MW
Installation:	2025
Location:	Kassø Solar Park, Denmark
Customer:	Solar Park Kassø ApS (100% owned by European Energy)

Use cases

- Hydrogen for e-Methanol for shipping (e.g. MAERSK) and for plastics production (e.g. Lego)
- Decarbonizing the world's shipping industry

Potential

- Producing up to 6,000 tons of hydrogen per year
- Combined with biogenic CO_2 for up to 42,000 tons e-Methanol per year

Solution

- 3 full arrays Elyzer P-300, transformers, rectifiers, and demin water plant, commissioning by SE Denmark
- Powered by the largest solar park in Scandinavia

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