



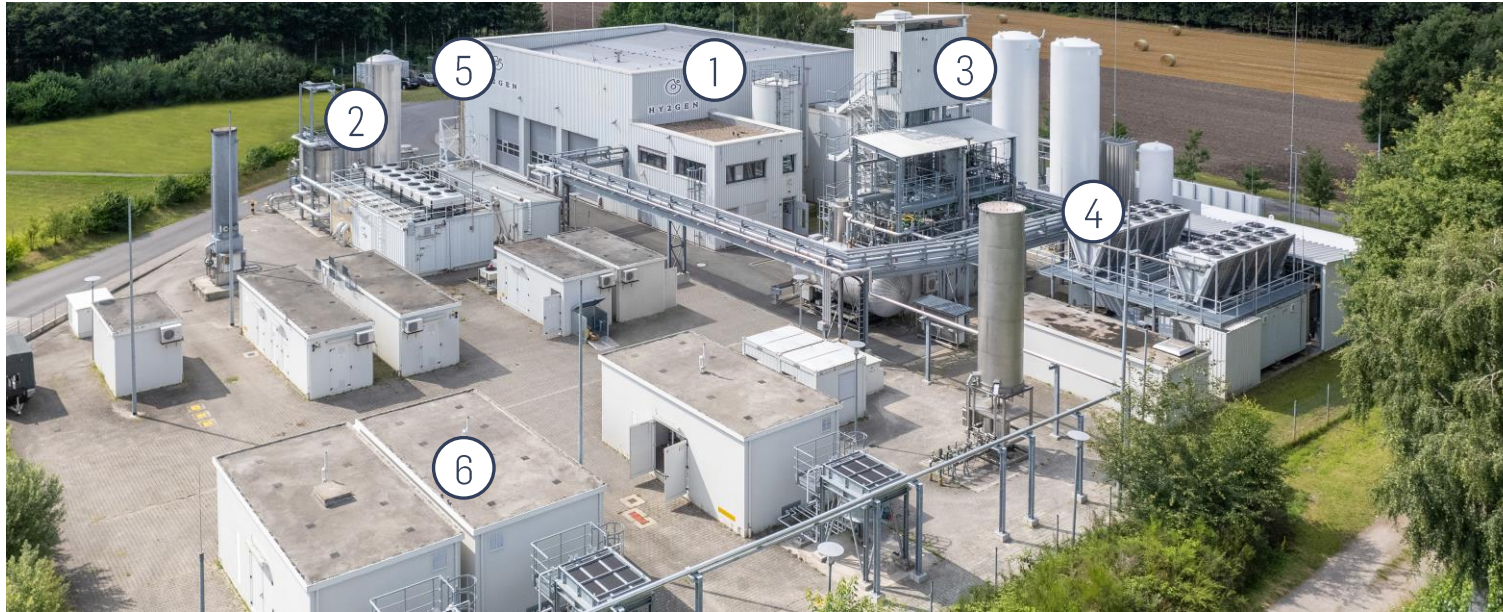
EXPERIENCE FROM AN OPERATING PLANT

HY2GEN DEUTSCHLAND GMBH / HYDROGEN CROSS BORDER CONFERENCE

13.03.2025

HY2GEN ATLANTIS

E-RNG POWER-TO-FUTURE PLANT



- The Werlte plant is the biggest industrial plant to convert green hydrogen from electrolysis combined with green CO₂ into Renewable Natural Gas (e RNG).
- Research capabilities include more than 1,000 sensors in the plant, allowing continuous monitoring and evaluation of the 10 years operation



Three electrolyzers



Amine scrubber



Methanisation tower



Liquefier and e-LNG filling station



Hydrogen filling station



Grid injection plant

HY2GEN ATLANTIS

E-RNG POWER-TO-FUTURE PLANT

PRODUCT SOLD 100%

- 100% of the plant's capacity is commercially sold
- Flushing of new hydrogen trailers possible
- Injection of e-RNG into regional gas-pipeline

GREEN TECHNOLOGY CAMPUS WERLTE

- Largest e-RNG plant in operation in the world
- Supply of renewable hydrogen for first commercial SAF plant in Germany
- Biogas plant to deliver CO₂ for Methanisation

FUTURE EXTENSIONS

- Production capacity will be doubled until 2026

ATLANTIS HEAT-MANAGEMENT SYSTEM ALLOWS

- ▶ > 90% Heat Recovery from Methanisation, covering 100% use of the Carbon Capture Amine Plant
- ▶ Thus increase efficiency of Methanisation to over 90%!

HY2GEN ATLANTIS THREE ELECTROLYSERS



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TECHNICAL DATA

- **In operation since 2013**
- Type: alkaline, non-pressurized
- Electrolyte: Potassium Hydroxide (KOH)
- Number of stacks: three
- Total capacity: 1,300 Nm³/h¹ hydrogen
- Power: 2 MW each, six MW total
- Current: max. 9,600 Ampere (A)
- Voltage: 220 Volt (V)
- Operation temperature: 75°C
- Heat: 500 kilowatt (kW) at 65°C

USAGE

- production of renewable hydrogen by use of water and renewable green energy

Notes: 1) Abbreviation for Normal Meter Cubes per Hour

HY2GEN ATLANTIS METHANISATION TOWER



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TECHNICAL DATA

- Reactor type: tube & shell
- Process: catalytic methanation Capacity: 1,300 Nm³/h hydrogen
- Output: 350 Nm³/h e-RNG
- Product quality: 94% CH₄ (methane), 3% hydrogen, 3% CO₂
- Cooling system: molten salt
- Heat recovery: max. 600 kW at 170°C

USAGE

- The produced green hydrogen can be further processed to methane by adding CO₂ and a process called catalytic methanisation

HY2GEN ATLANTIS HYDROGEN FILLING STATION



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TECHNICAL DATA

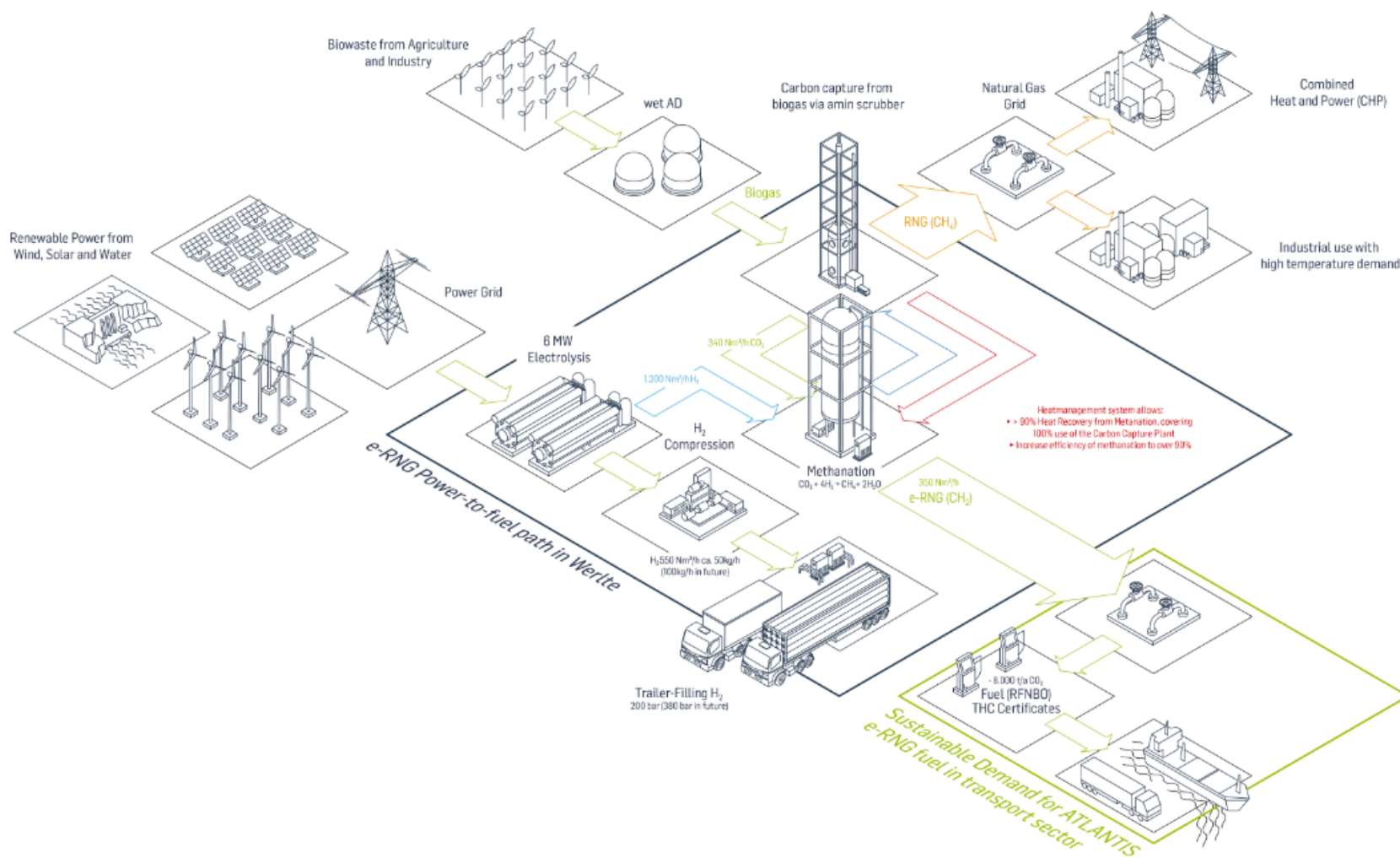
- Type: ionic compressors
- Start: August 2018
- Pressure: 200 up to 700 bar after compression
- Pressure at trailer: 200-300 bar
- Capacity: 50 kg/h
- Hydrogen quality: 5.0 / 99.999% purity

USAGE

- Delivery of renewable hydrogen to industrial customers/partners

HY2GEN ATLANTIS -. THE WORLD'S LARGEST GREEN POWER-TO-METHANE PLANT

E-RNG POWER-TO-FUEL PATH IN WERLTE



SUMMARY

HYDROGEN & E-FUELS

CERTAIN DEMAND FOR HYDROGEN

- Material Use: Refineries, steel industry
 - >630.000 t / a in Germany only (>7GW electrolyzer capacity)
- Feedstock for e-Fuels in hard to abate sectors (aviation, shipping)

POTENTIAL DEMAND FOR HYDROGEN

- Public transport as alternative to e-Mobility
- Decarbonization of additional industrial sectors
- Power Supply & Storage

E-FUELS WILL SUBSTITUTE FOSSIL EQUIVALENTS

- Aviation: SAF will replace fossil kerosene, especially on long-distance flights (starting 2025!)
- Shipping: eNH₃, eMeOH, eLNG (e-RNG)
- Chemical Industry: eNH₃, eMeOH
- Agriculture: eNH₃

HYDROGEN LOCATION GERMANY

- First hydrogen pipeline network in the world
- Diverse EU, national and regional subsidies
- Hydrogen friendly legislation (acceleration of permitting process)
- Largest industrial market in Europe and very likely also largest offtake market in Europe for hydrogen

GERMANY WILL REMAIN AN ENERGY IMPORTING COUNTRY, BUT...

- ▶ A certain percentage of needs will be produced in Germany
- ▶ until pipeline connections from Denmark, Norway, Spain or the Netherlands are in place, national production is needed to cover first hydrogen needs
- ▶ eFuels can already today be shipped from international locations, produced with best LCOE in the world

POWER PURCHASE AGREEMENTS

PPA FOR ELECTROLYSIS TO PRODUCE RFNBO-COMPLIANT PRODUCTS

1. Introduction to PPAs & RFNBO

- Importance of PPAs – Securing renewable power for electrolysis, differences from standard PPAs
- RFNBO & Regulations – Key EU criteria, impact on project viability

2. Challenges in Securing PPAs

- Availability & Duration – Long-term supply constraints, limited market options
- Price Volatility – Impact on costs, strategies for risk mitigation

3. Commercial & Pricing Considerations

- Electricity Costs – Fixed vs. market-based pricing, grid fees impact
- Cost Optimization – Hybrid models, demand-side flexibility

POWER PURCHASE AGREEMENTS

PPA FOR ELECTROLYSIS TO PRODUCE RFNBO-COMPLIANT PRODUCTS

4. Regulatory Compliance & RFNBO Criteria

- Key Criteria – Additionality, temporal & geographic correlation
- EU Regulations – Legal & financial impact, certification requirements

5. PPA Negotiation & Structuring

- Key Terms – Contract length, pricing, off-take volumes
- Risk Allocation – Managing surplus energy

6. Future Outlook

- Market Trends – PPA price evolution, policy impact (bidding zone split)
- Innovative Models – Storage integration, flexible electrolysis

THANK YOU.