

ERSTE BETRIEBSERFAHRUNGEN MIT WASSERSTOFF-KRAFTWERKEN

INITIAL OPERATIONAL EXPERIENCE WITH HYDROGEN POWER PLANTS

ENINNOV 2026

SESSION P4: NO. 311

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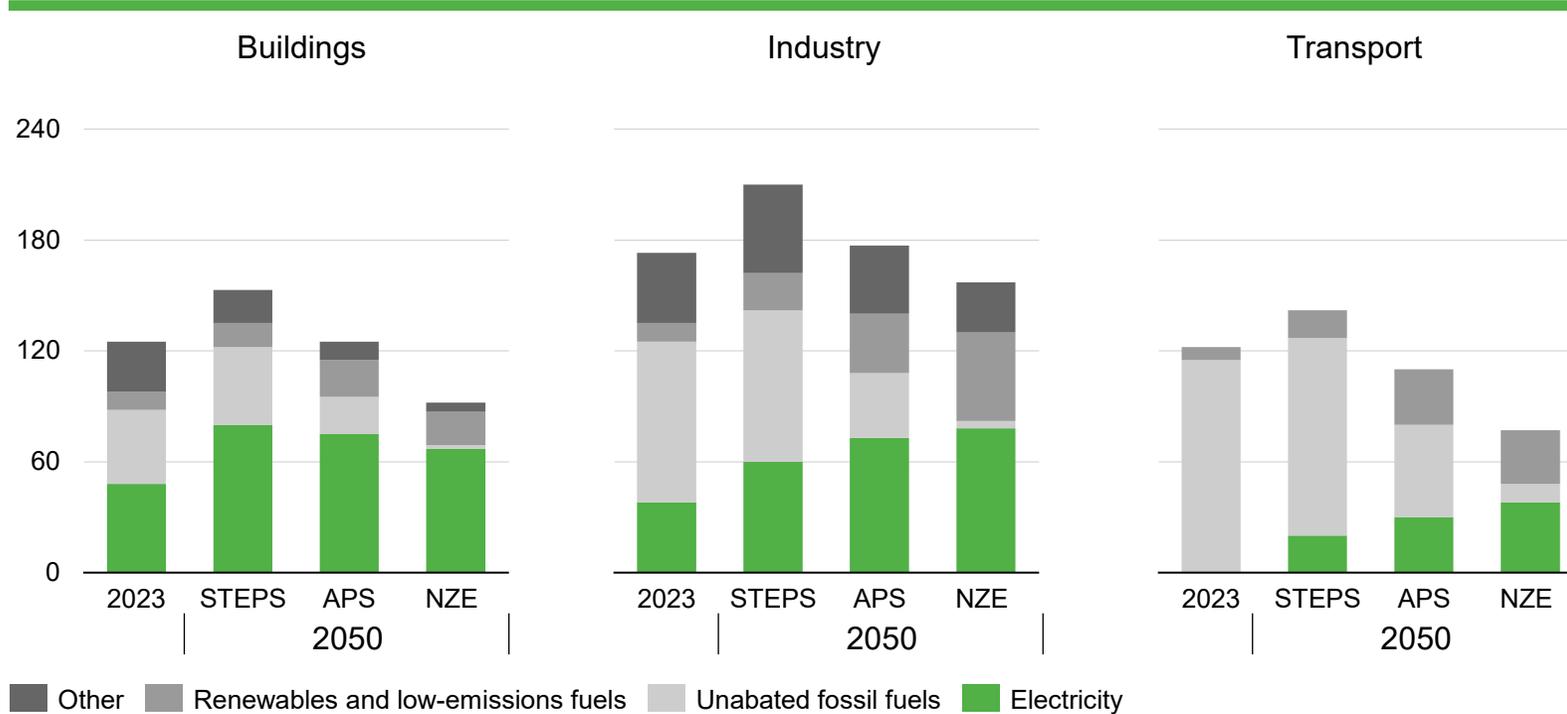
Graz, Feb. 12th, 2026

JENBACHER



GLOBAL FINAL ENERGY CONSUMPTION

Total final consumption by energy source in selected sectors by scenario (2023 and 2050)



Electricity increases its share of TFC in all sectors, while additional efficiency measures in the APS and NZE Scenario hold down overall demand growth and, in some cases, reverse it.

Notes: EJ = exajoules. Other in buildings includes district heat, traditional use of biomass, and non-renewable waste. Other in industry includes district heat, fossil fuel non-energy use, and non-renewable waste. Low-emissions fuels include modern bioenergy, fossil fuels with CCUS in industry, hydrogen, and hydrogen-based fuels.

Electrification

Global: ~20%

EU from 23% to

32%

until 2030

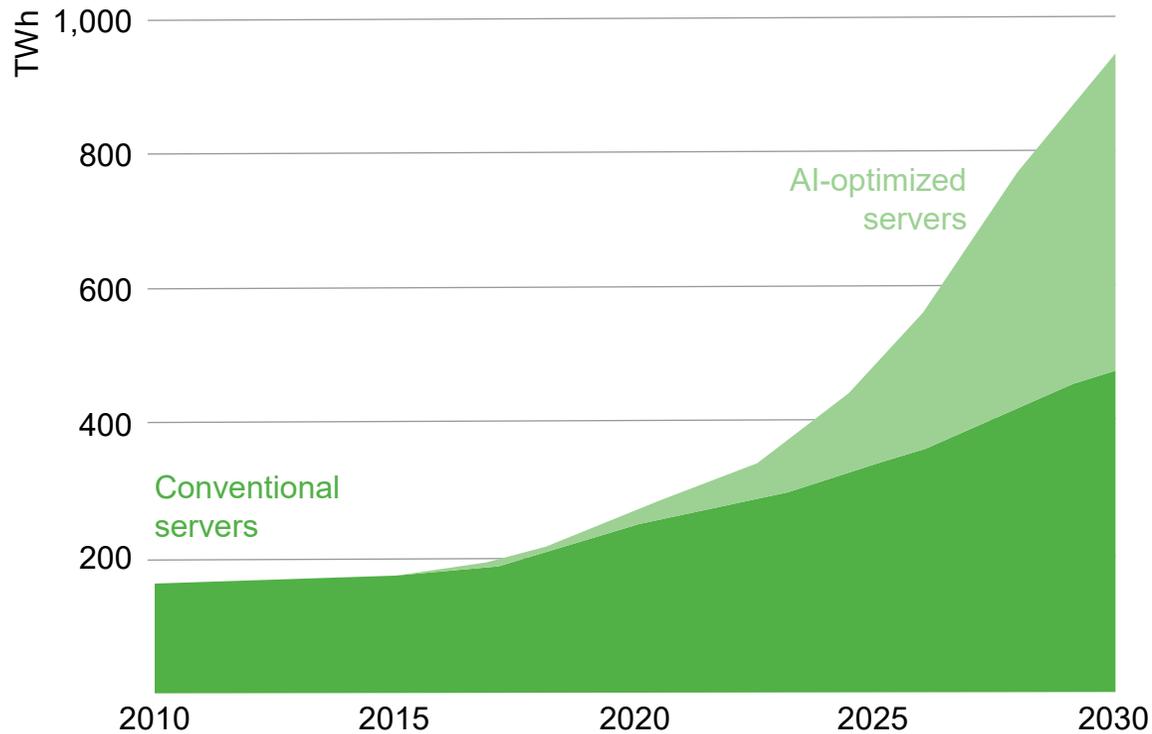
According Electrification Action Plan

REASONS FOR ELECTRICITY GENERATION GROWTH

Worldwide

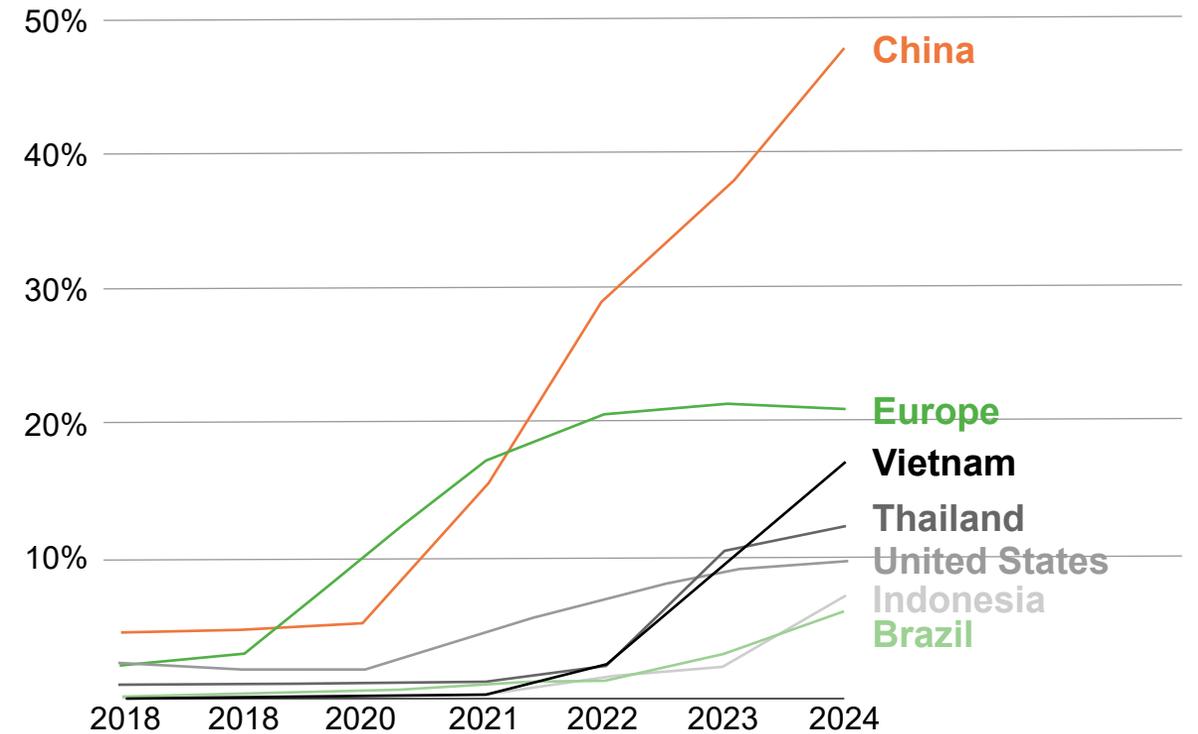
Electricity demand for AI is set to rise quickly

Data center electricity demand, historical and projected through 2030



Emerging markets in Asia and Latin America are becoming new centers of EV growth

Share of electric cars in total car sales in selected regions / countries, 2018–2024

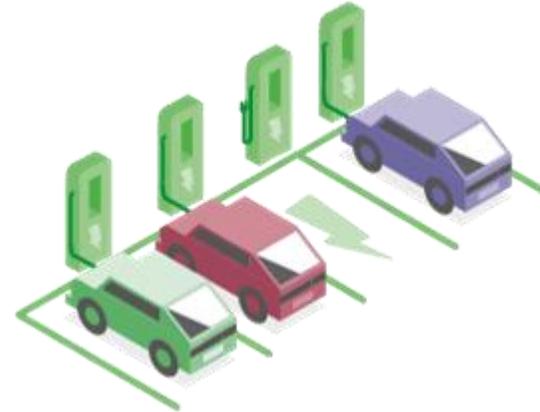


RE-FUELING VS. EV-CHARGING



10 kWh / ltr

- **50 ltr**
 - driving distance
 - Re-fueling time:
(1 to 1½ min.)
- 500 kWh**
~700 km
- 80 sec.



77 kWh / car

- **~80 % re-charge**
 - driving distance
 - Charging time
(80% in 10 min.)
- 60 kWh**
~300 km
- 600 sec.

Re-fueling Power: 22,000 kW

Charging Power: 360 kW

ENERGY TRANSPORT AND DISTRIBUTION

Gas transport



80 bar

1,200 mm diameter

30 GW capacity

Source: Cerbe, 2008

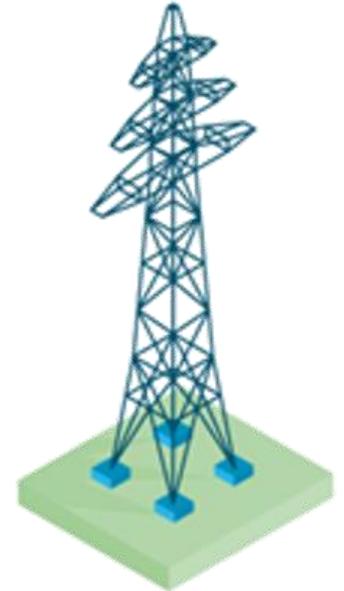
Electricity transport

525 kV

DC cable

4 GW capacity

Source: Suedlink.com



Share of **Electricity** in final energy consumption **20/23%**
Share of **Oil and Gas** in final energy consumption **56%**

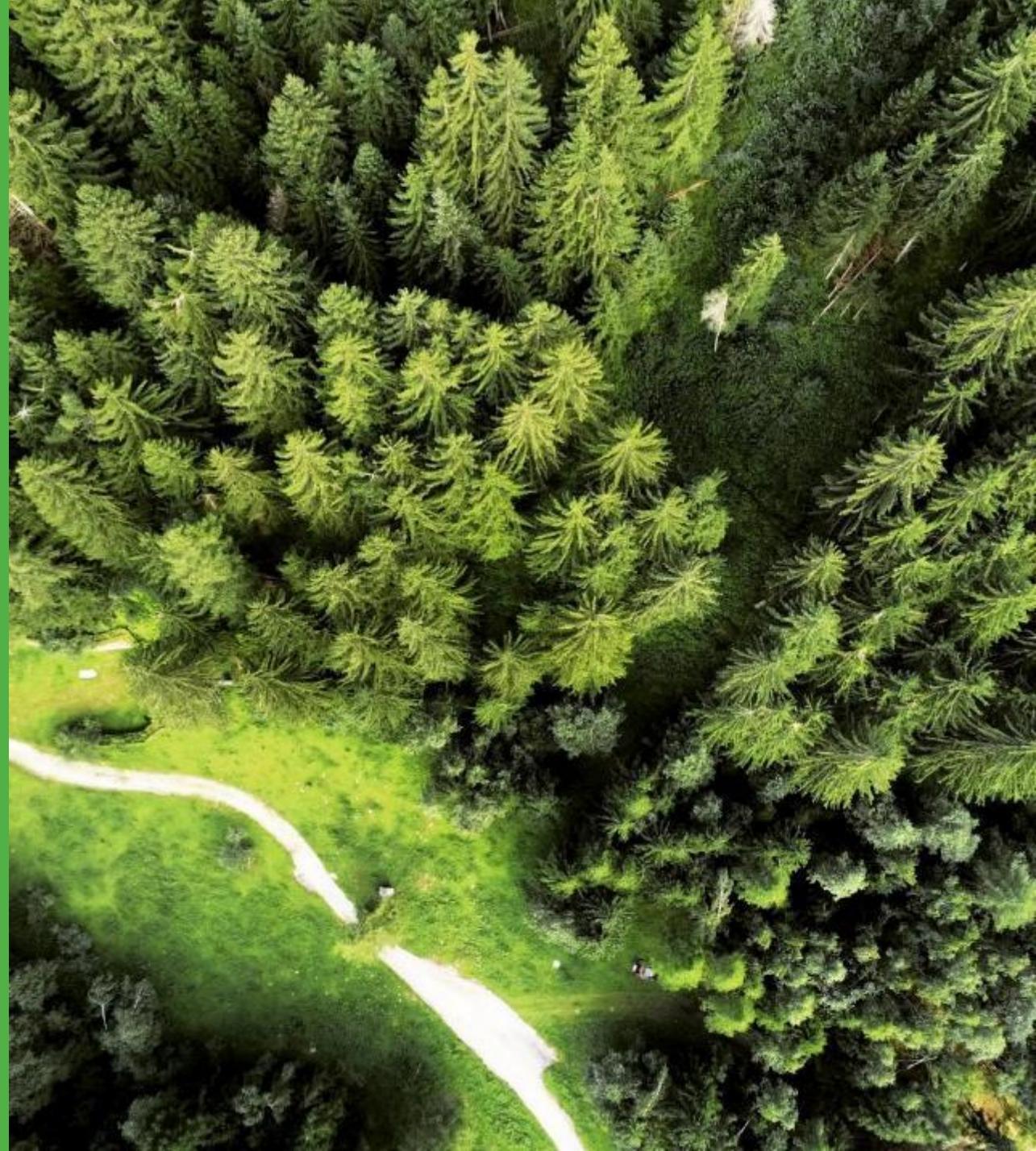


“All Electric” will not work everywhere
(especially in industrialized regions)

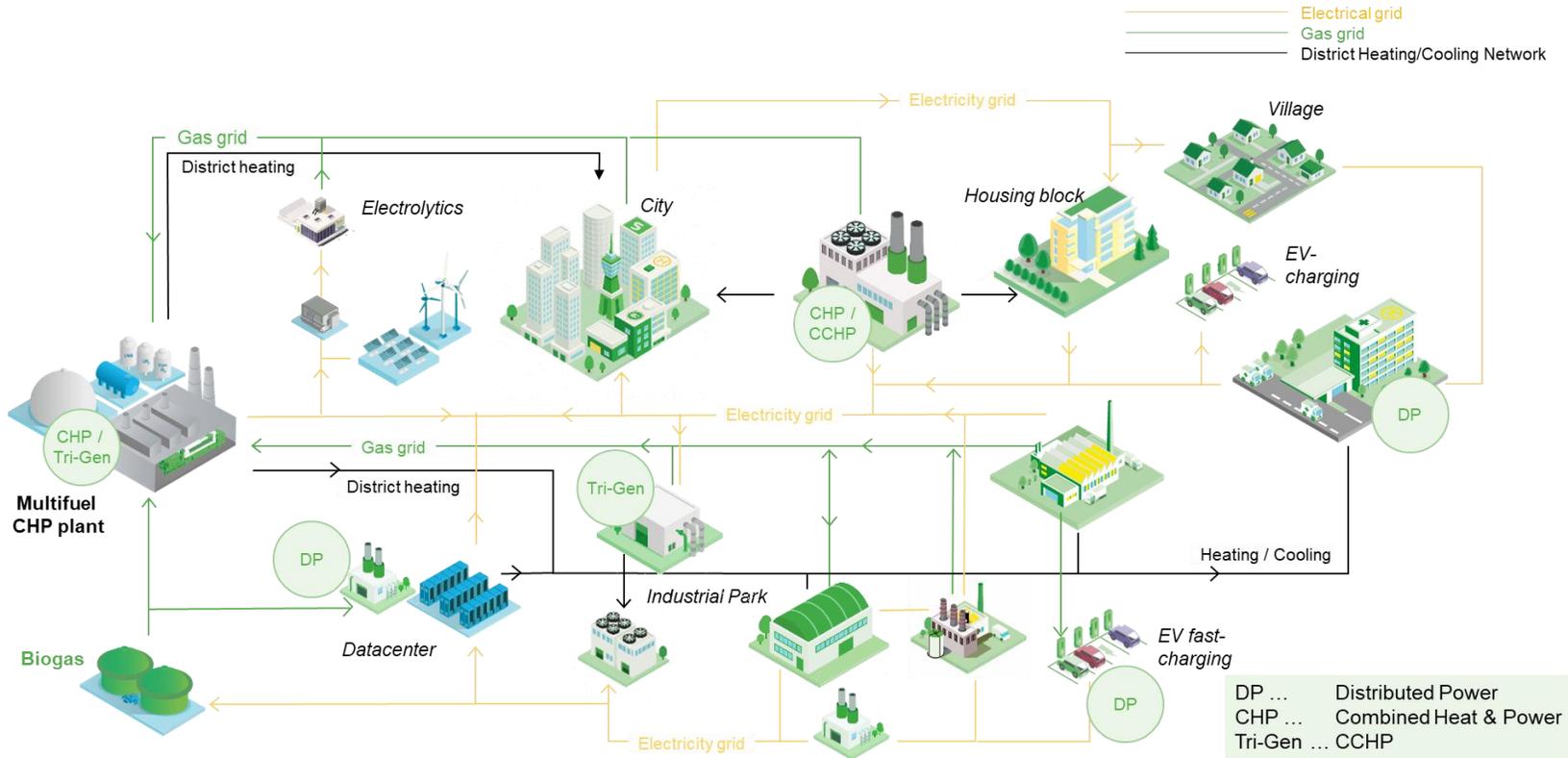
SOLUTIONS

With Distributed Power

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RELIABLE AND SUSTAINABLE DISTRIBUTED POWER SUPPLY



Gas & Electricity Networks:

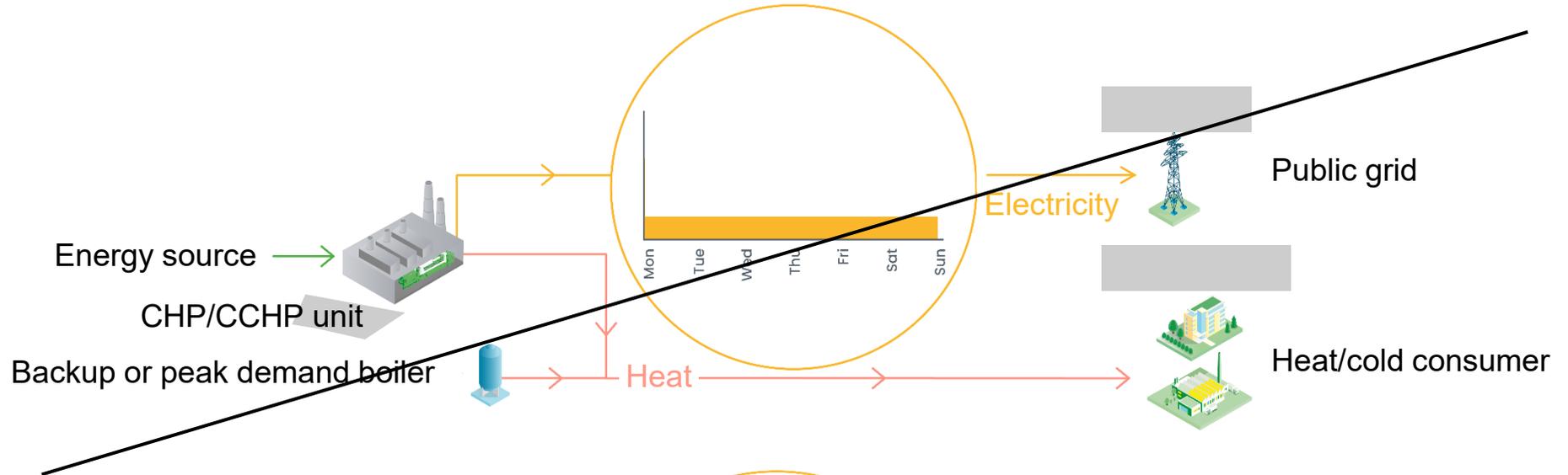
with
**“Power Generation
 (Gas-2-Power)
 at or near the point of use”**

- EV growth
- Heat Pumps and Air Conditioning
- Electrification in the industry

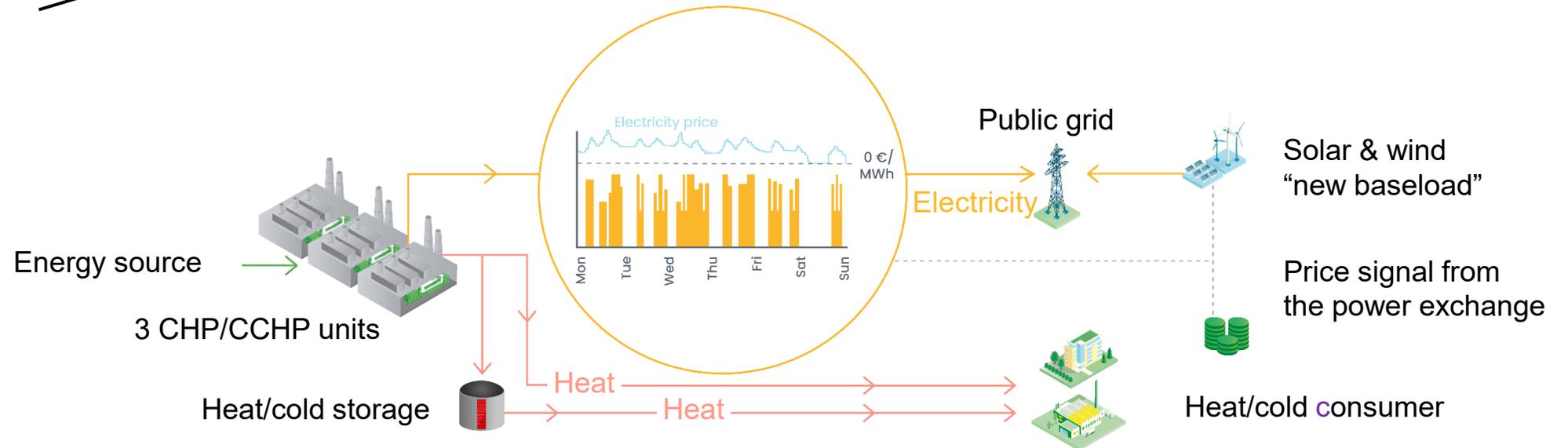


CHP AS BALANCING POWER PLANTS

Base load operations



Highly flexible operations



ROLE OF GAS IN COMBINATION WITH HEAT PUMPS (HP)

Complementing not competing

Nat. Gas, Bio-Gas, H2 for residual generation

Heat Pumps

&

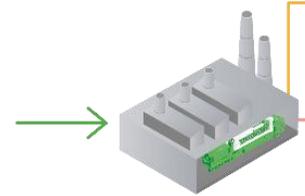
Decentralized
Flex-CHP + HP

Gas Boiler

Power/CHP



Power

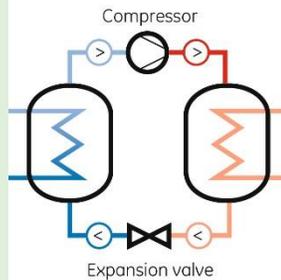


CHP plant

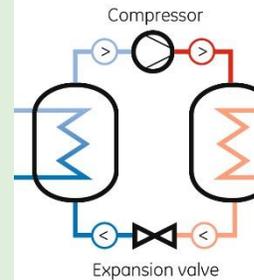
>90%
efficiency

Power

Heat generation
incl. Heat Pumps



~400%

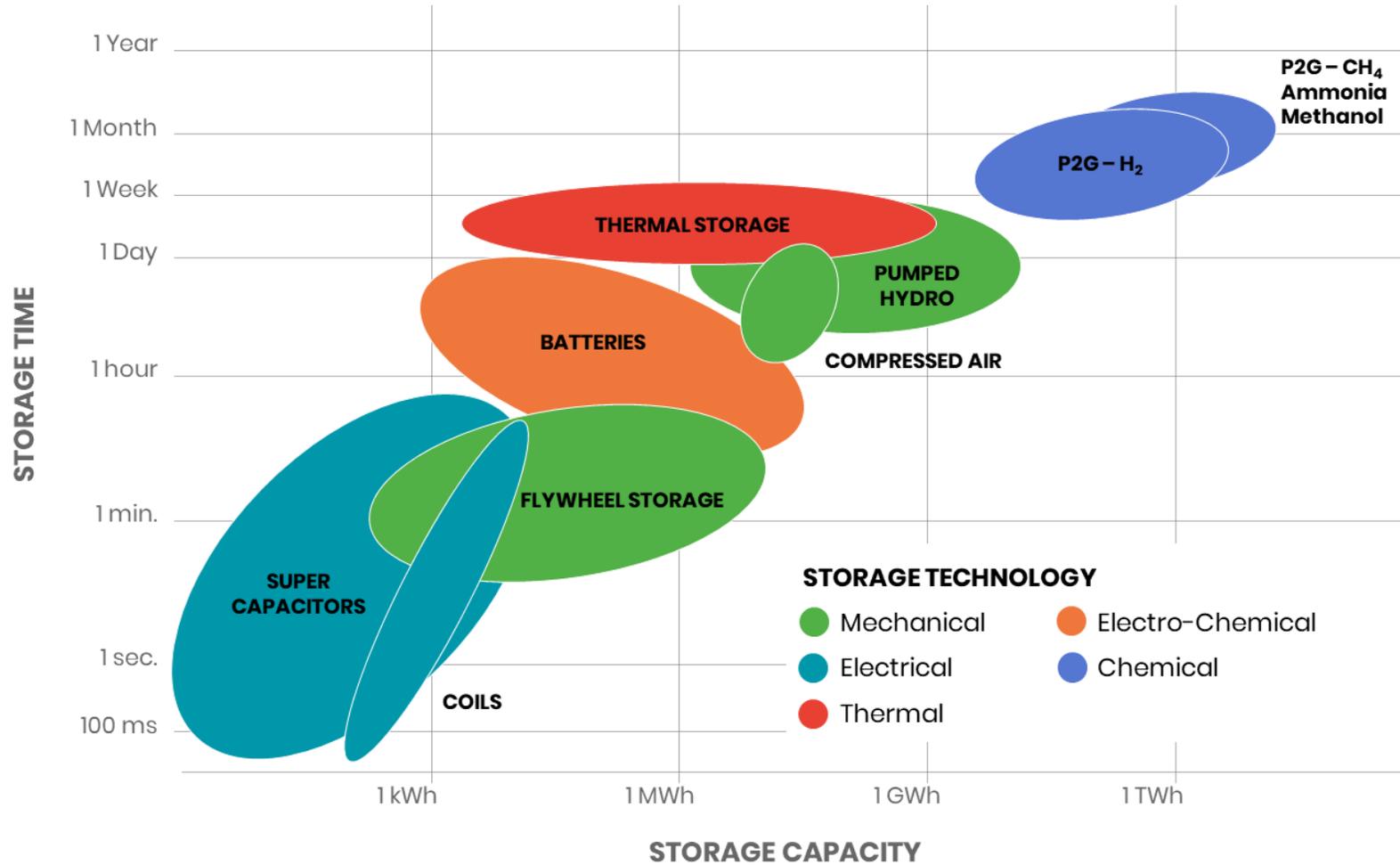


~200%



~90%

ELECTRICITY STORAGE OPTIONS



Long Duration Energy Storage

INNIO Jenbacher Focus:
on carbon free fuels

Hydrogen (H₂)
and
Ammonia (NH₃)

H2 IN POWER GENERATION

and first field experience

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H₂ APPLICATIONS FOR POWER GENERATION

First H₂ movers



Developed H₂ infrastructure

Datacenter

3



back-up power

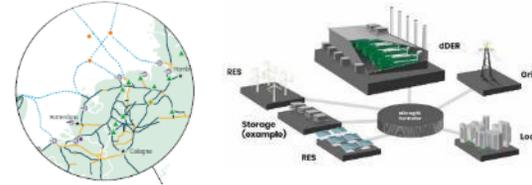
H₂-Demo projects

4



typically green H₂

H₂-Hub & Microgrids



Grid balancing

5



blue or green H₂

1 Industrial H₂

2

EV fast charging



typically gray H₂



Islands



Flexible CHP



blue or green H₂

KremsChem, KREMS, AT

H2 rich process tailgas expansion project

Existing since 1996



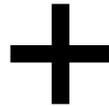
4 x J320
~2,400 kW

Baseload operation

- 8,000+ oph / yr / engine
- 200,000 oph / engine (2023)

H₂: ~15-17 vol%
 CH₄: ~1.5 vol%
 Rest: N₂ and CO₂ } **>95% H₂ as fuel**

LHV: ~0.5 kWh/m³



Extension 2024 (COD Q2, 2024)



*

4 x J420
~3,300 kW

Baseload operation

- CHP with steam generation

H₂: ~19 vol%
 CH₄: ~0 vol%
 Rest: N₂ and CO₂ } **>98% H₂ as fuel**

LHV: ~0.55 kWh/m³

HYOSUNG H2-ENGINE, ULSAN, SOUTH KOREA

J420	Pipeline Gas	100% H ₂
Electrical output	1,060 kW	1,060 kW
Electrical efficiency*	38.4%	~38.4%
Total efficiency	~89%	~85%
NO _x emissions	<250 mg/Nm ³ @ 5%O ₂	<100 mg/Nm ³ @ 5%O ₂
CO ₂ emissions	226 g/kWh _{el}	0 g/kWh _{el}
H ₂ consumption		~83 kg/h

Largest 60 Hz H2-Engine IPP CHP in Asia

Hydrogen as a by-product from polypropylene production from Hyosung chemical

Hyosung Heavy Industries is demonstrating the use of hydrogen and designed it as an industrial CHP (with steam boiler)

H2-Engine delivery in 2023, successfully commissioned in mid-2024

H2-Engine installation and service provided by INNIO Group's Jenbacher authorized distributor RNP



NORTH C DATACENTERS, EINDHOVEN, NL

First data center with H2-Engines for emergency backup

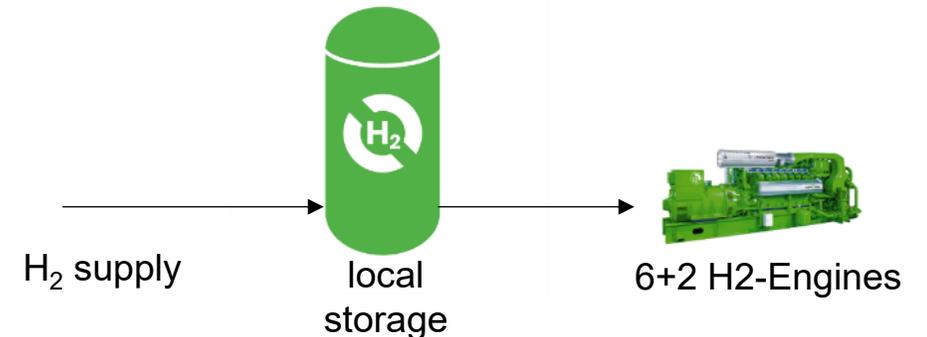
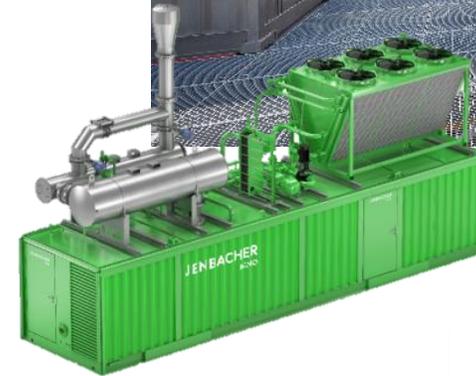
NorthC Data Center

- Small-scale regional DC in Netherlands, Germany, & Switzerland
- 15 local DCs, with 10 in NL
- Carbon neutral by 2030
- Going forward ... new and replacement standby power based on H₂

Data Center Eindhoven – 6 + 2 H2-Engines

- 6+2 MWe ... standby power based on 6+2 x 1 MWe JGC420 H2-Engines
- Replacing concept with multiple 1.5 – 2.0 MWe standby diesel generators
- Dual fuel H2-Engines (pipeline gas as back-up fuel)
- H₂ as main fuel from local H₂ storage until H₂ pipeline is available

<https://www.northcdatacenters.com/en/about-us/sustainable-data-centers/>



RAG UNDERGROUND HYDROGEN STORAGE, AUT

1st of its kind in Europe - world's 1st 100% hydrogen storage facility in a porous underground reservoir

Summer operation

- Solar PV overcapacity
- 2 MW electrolyzer for green H₂ production
- H₂ compression

Seasonal storage

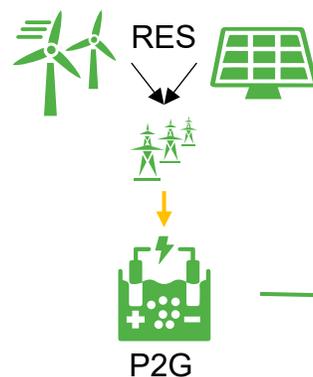
- 1.2 million Nm³ H₂ storage in modified NG storage
- Gas chromatograph at H₂ discharge
- 8 km H₂-pipeline from H₂-storage to CHP unit
- Up to 600 Nm³/h H₂-pipeline capacity

Winter operation

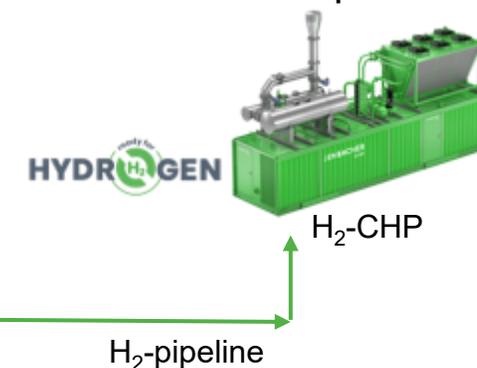
- J412 containerized CHP
- 530 kW electrical output & 550 kW heat output
- 100% H₂ & up to 40% NG/60% H₂ mixture
- Commissioning date early 2024
- ~2,000 to 4,000 oh/yr



Summer operation



Winter operation



“READY FOR H2” - GUNDREMMINGEN, GER

Highly flexible gas power plant

5

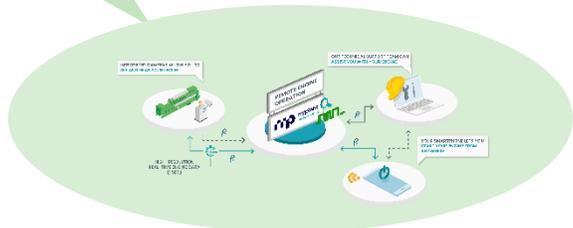


Modular Gas Engine plant with low installation costs

<5 min. startup time to 110 kV

Remote monitoring with myplant

“Ready for H₂”



26 x JGS 624
2 x JGS 620



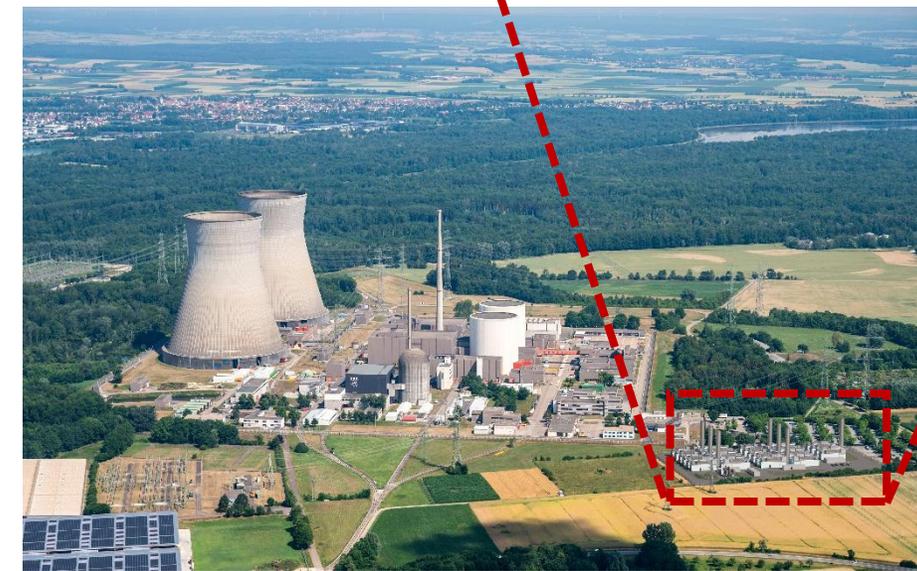
123.6 MW
Electrical Output



up to 46.8%
Electrical efficiency



2026+
Year of
commissioning



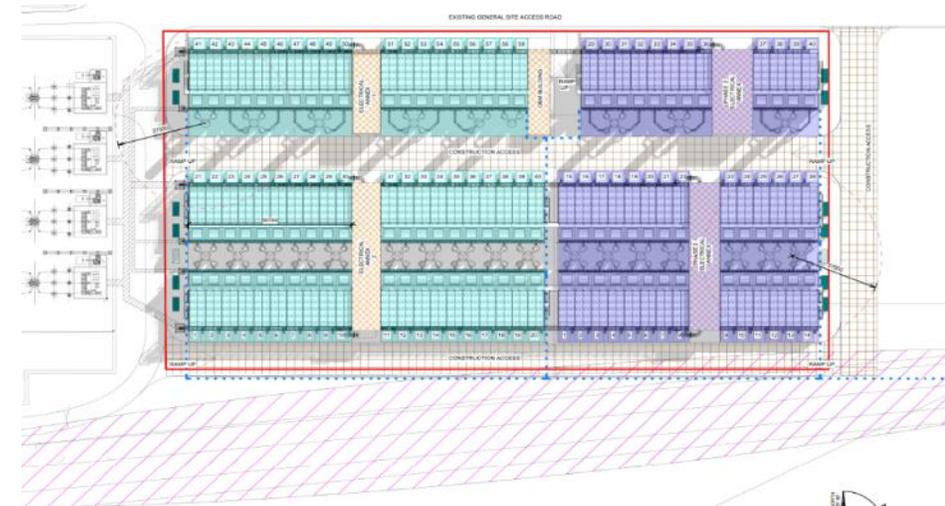
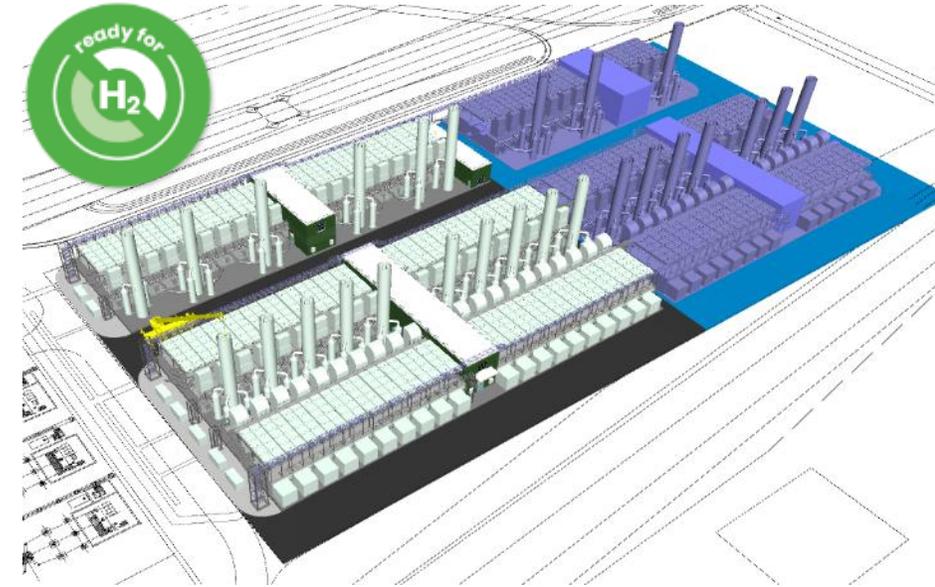
CASE STUDY: THURROCK POWER, UK

Flexible power generation

Jenbacher engines will be part of a combined capacity of up to 600MW. The project will be delivered in two phases.

The site will turn on, reaching its full output capacity in less than 10min and provide a sustained delivery of electricity to the grid.

Modular installation and modular technology will allow highest efficiency from 2MW up to full load



<2 min. start time

J624
Pipeline gas

450 MW
Electrical Output

up to 45.4%
Electrical Efficiency

2025+
Year of commissioning

60 MW JENBACHER GAS ENGINES, IRLAND

For large-scale data center



60 MW backup power for data center

22 x Type 6 containerized gas engines take over the peak and backup power supply

Ready to be converted to H₂ operation in the future

Europe's largest engine-powered data center that runs on natural gas instead of diesel

»Winthrop's Gen Team selected INNIO Group's Jenbacher team to build this power plant because these engines offer diesel-like performance combined with high efficiency and the ability to run continuously. Due to its consistent progress in implementing its ESG strategy, including hydrogen capability, the company has been awarded the Platinum Medal by EcoVadis. This makes INNIO Group's Jenbacher technology an obvious choice for us.«

Noel Molloy,
Operation Director at Winthrop Technologies



in 45 sec. to
100% load



for illustration only

DATA CENTER SOLUTIONS FOR THE US

200+ MW Prime/Back-up Power with 3 to 4.5 MW high efficiency gas engines

Container Solution



Pre-fabricated for plug & play

Powerhouse Solution



Powerhouse solution with 100 MW in 1 acre



VOLTAGRID, USA

Power generation with 3.3 MW J620 gas engine on a Trailer



INNIO AND VOLTAGRID DELIVER POWER GENERATION FOR ONE OF THE WORLD'S LARGEST DATA CENTERS

INNIO secures largest order in company history

INNIO to supply 2.3 gigawatts (GW) of power infrastructure, comprising 92 power packs of 25 megawatts (MW) each.

Partnership with VoltaGrid drives the expansion of AI data centers through fast, flexible, and sustainable energy solutions.

Collaboration enables VoltaGrid to seamlessly combine its power pack units with its large-scale portable data center power made up of INNIO's units.



2.3 GW

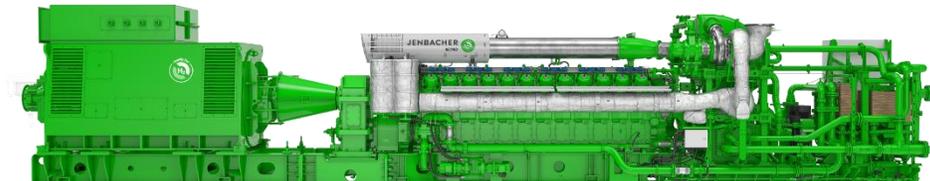
with 92 x 25 MW
power packs



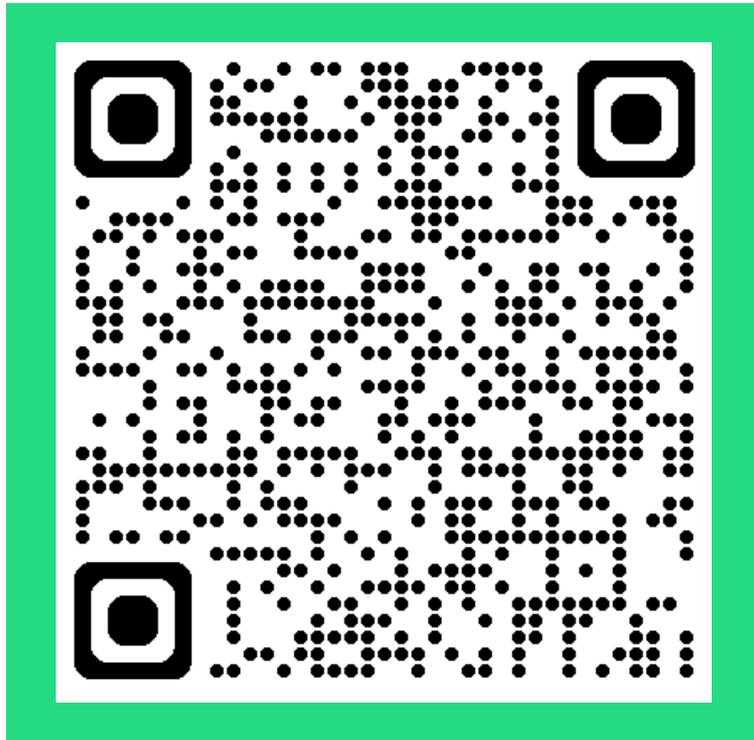
Up to

10%

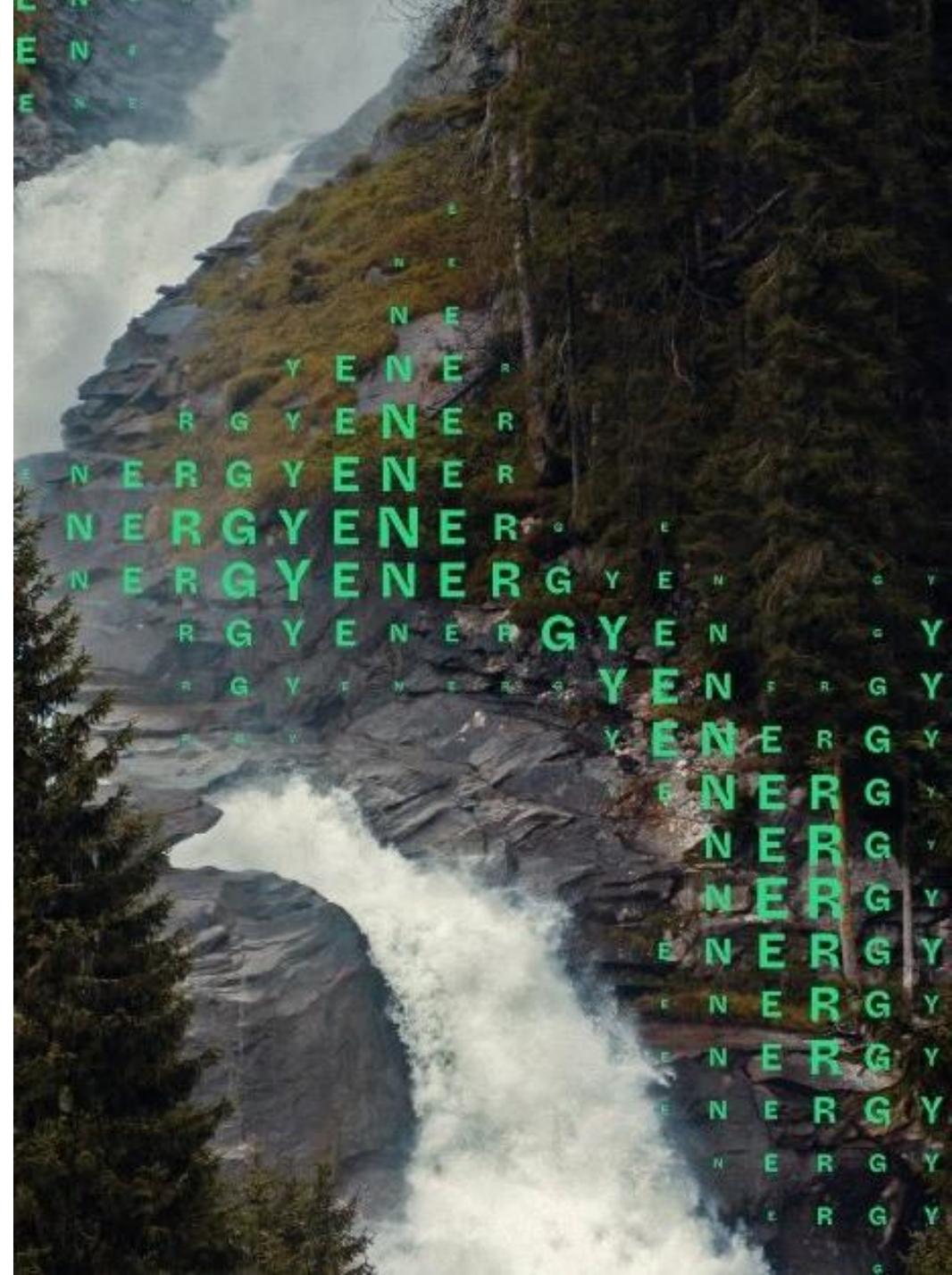
Efficiency gain vs.
alternative technologies



Energiegeladen in die Zukunft – Deine Karriere bei INNIO wartet!



<https://jobs.jobvite.com/innio/jobs>



About INNIO Group

INNIO Group is a leading energy solution and service provider that empowers industries and communities to make sustainable energy work today. With its Jenbacher and Waukesha product brands and its AI-powered myplant digital platform, INNIO Group offers innovative solutions for the power generation and compression segments that help industries and communities generate and manage energy sustainably while navigating the fast-changing landscape of traditional and green energy sources. With its flexible, scalable, and resilient energy solutions and services, INNIO Group enables its customers to manage the energy transition along the energy value chain wherever they are in their transition journey.

For more information, visit INNIO Group's website at innio.com. Follow INNIO Group on [X](#) and [LinkedIn](#).

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In general, "Ready for H₂" Jenbacher units can be converted to operate on up to 100% hydrogen in the future. Details on the cost and timeline for a future conversion may vary and need to be clarified individually.

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ENERGY SOLUTIONS.
EVERYWHERE, EVERY TIME.

