

INNIO JENBACHER

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JENBACHER



MOVING ENERGY FORWARD

INNIO Jenbacher is...

...a **leading energy solution and service provider** empowering industries and communities to make sustainable energy work today.

...**headquartered in Jenbach (Austria)**, with other primary operations in Waukesha (Wisconsin, U.S.) and Welland (Ontario, Canada).

...**delivering innovative solutions for the power generation** and compression segments through our Jenbacher and Waukesha product brands and our digital platform myPlant.

...**helping industries and communities sustainably generate and manage energy** while navigating the fast-changing landscape of traditional and green energy sources.

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MOVING ENERGY FORWARD

With our diverse product & service portfolio, INNIO Jenbacher...

...offers **flexible, scalable, and resilient energy solutions** and services, enabling our customers to manage the energy transition along the energy value chain wherever they are in their transition journey.

...provides **life-cycle support to 55,000+ delivered engines** globally through our **team of 4,000+ experts** and our **service network in 100+ countries**.

...received the **#1 ESG Risk Rating** by Sustainalytics among 500+ machinery industry companies worldwide.



Jenbacher engines provide power for a broad range of applications, generating reliable & efficient power in the 250 kW to 10.6 MW range at or near the point of use.

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INNIO'S JENBACHER BRAND IS A LEADING SOLUTIONS PROVIDER IN POWER GENERATION

Our solutions provide power and heat for versatile applications worldwide



250 kW → 10.6 MW

High efficiency & fuel flexibility

When & where it is needed



Commercial customers



Data centers & emergency power



Greenhouses



Landfill gas*



Coal mine gas



Special gases



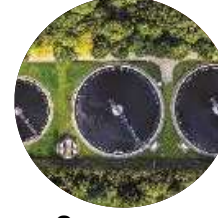
Utilities, municipalities, IPPs



Microgrids



Biogas



Sewage gas

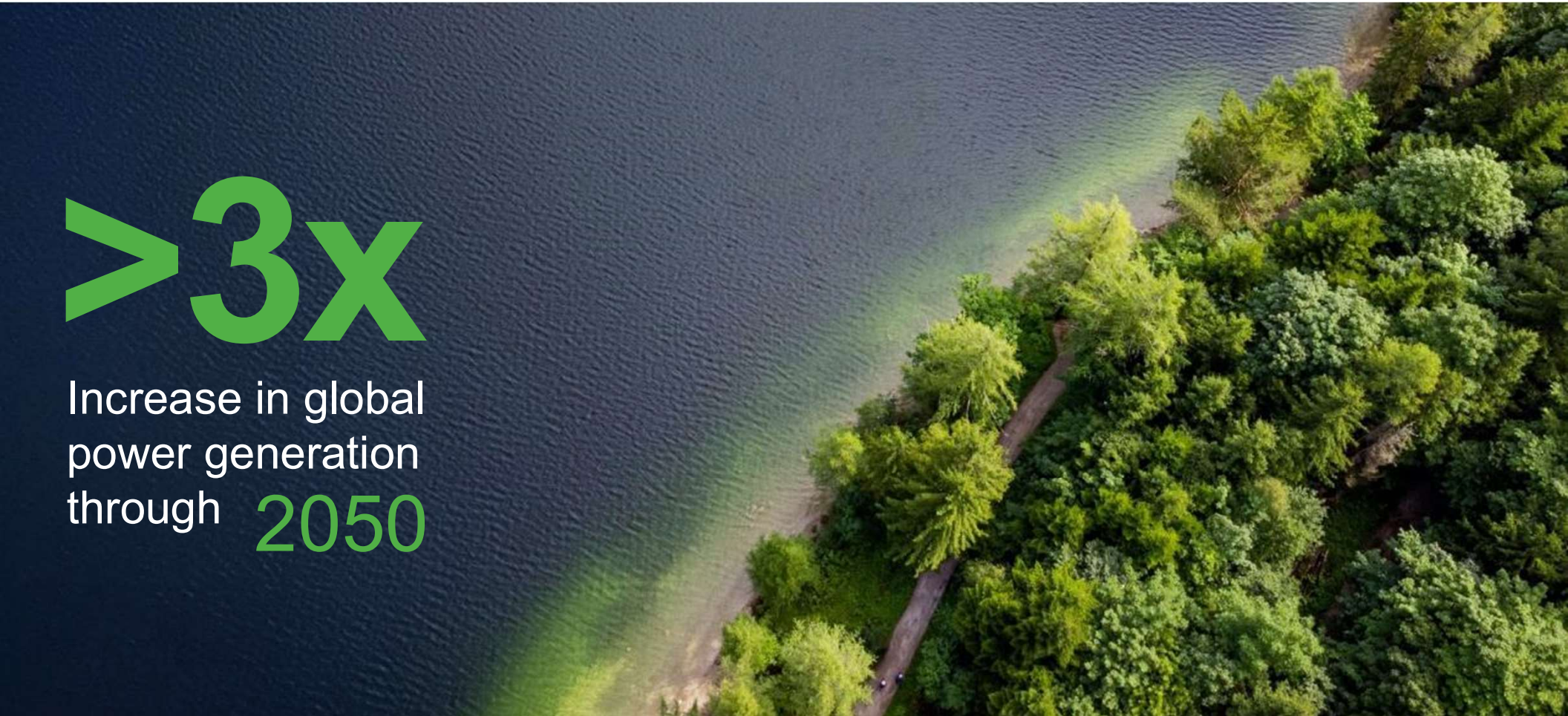


Associated petroleum gas

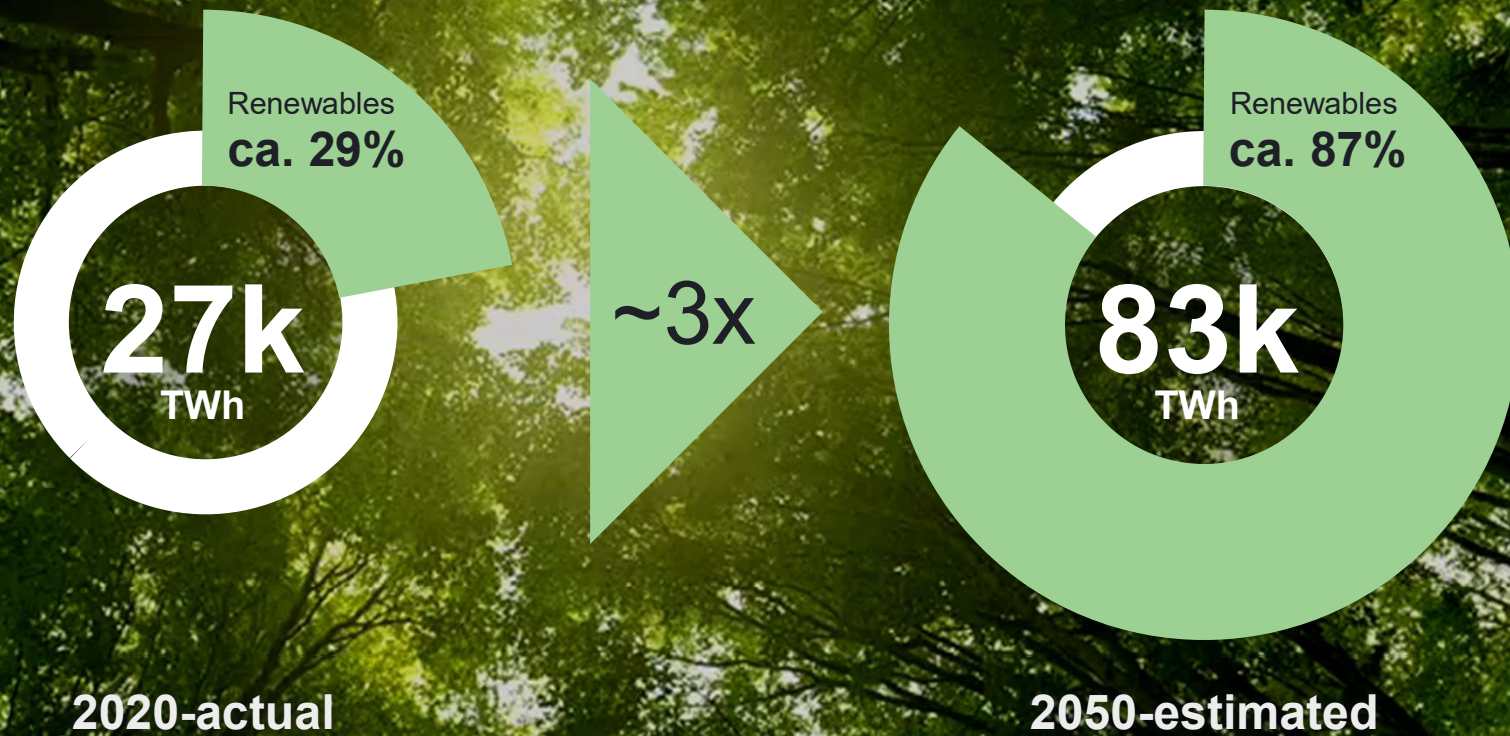
STRONG TAILWINDS FROM GLOBAL DECARBONIZATION

>3x

Increase in global
power generation
through 2050



SHARE OF RENEWABLES IN GLOBAL POWER GENERATION



Source: 2022 McKinsey Global Energy Perspectives published in April 2022.
Showing Further Acceleration, a 1.9 degree Celsius warming scenario; McKinsey Power Solutions Team

McKinsey & Company

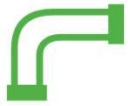
INNIO IS READY FOR THE AGE OF HYDROGEN!

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THE JENBACHER SOLUTION

3 ways to use hydrogen with Jenbacher engines



H₂ in pipeline gas

All new Jenbacher plants are „Ready for H₂“. In addition, engine variants with a corresponding option can be operated with up to 25% (vol) of H₂ in the pipeline gas.

As hydrogen availability increases, all new plants and most of the currently installed Jenbacher natural gas engines can be converted to run on 100% hydrogen.



H₂ locally admixed to pipeline gas

Up to 60% (vol) hydrogen content can be admixed to pipeline gas for use in specific versions of our Type 2, 3, 4 and 6 engines. Type 4 engines and cogeneration systems are available today as dual-gas-fuel solutions capable of running on 100% conventional gas, 100% H₂ or mixtures of pipeline gas and H₂.



100% H₂ as an energy source

Jenbacher Type 4 engines and CHP systems are now available for operation on 100% hydrogen.

These plants are CO₂-free by design!



RAVEN ONE GREEN H2 BLENDING, RICHMOND, CALIFORNIA, US

H2 rich process tailgas blended with landfill gas

Raven pioneers Green H₂ production for transportation

- Raven's patented **Steam/CO₂ Reforming process** takes any organic waste and converts it to green hydrogen for H₂ fuel stations
- In the initial step a synthetic gas with 55-65% hydrogen is produced. The carbon is then separated from the gas, **producing 99.999% pure H₂**
- Raven One at Republic Landfill in Richmond, Cal. will process at most 100 short tons/day of organic waste to create **up to 2,000 metric tons/year of green hydrogen**

3 MW CHP plant

- Fuel: 100% LFG or LFG & Tail Gas (contains CO and unrecoverable H₂)
- 3 x J420 Jenbacher engines
- Engine waste heat used for drying gasification waste
- Electricity used for gasification plant

Raven selects Stellar J and Power Engineers

- Power Engineers is leading engineering firm for power gen projects
- Stellar J is specialized EPC for waste to energy projects

Under California's low carbon fuel standard (LCFS), the hydrogen will achieve a **negative carbon intensity credit**

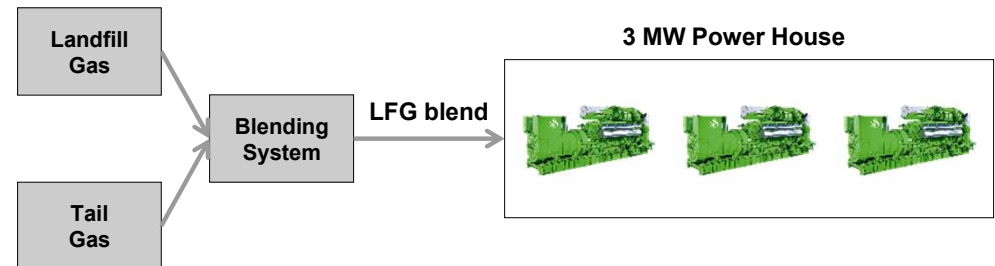
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RAVEN

POWER
ENGINEERS

STELLAR J



INNIO'S SUSTAINABLE ENERGY SOLUTIONS

Powerful molecules

2008

70,000+ operating hours with up to 42% hydrogen since 2008 in Argentina

At the Hychico Diadema Wind Park and Hydrogen Plant, renewable hydrogen is produced using water electrolysis. Hydrogen is stored underground for research purposes, and a 1.4 MW Jenbacher J420 engine produces power running on a mixture of conventional gas and hydrogen.

2020

First 1-MW engine globally to run on up to 100% H₂ commissioned in Germany

HanseWerk Natur, an EON company, runs a flagship project in Hamburg. The 1 MW Jenbacher J416 engine can run on variable hydrogen mixes as well as 100% hydrogen.



2 RENEWABLE GASES & WASTE-TO-ENERGY UTILIZATION, PLUS BYPRODUCT GASES



1. Biogas solutions



2. Landfill gas solutions*



3. Sewage gas solutions



4. Coal mine gas solutions



5. Associated petroleum gas (APG**)



6. Steel production gases



PLUS: Hydrogen

RENEWABLE GASES & WASTE-TO-ENERGY UTILIZATION, PLUS BYPRODUCT GASES

Today, about 40% of all Jenbacher systems delivered worldwide already operate with **renewable gases**.

Moreover, the **use of waste for power generation** enables a reduction in greenhouse gas emissions while providing a reliable energy supply.

Also, **byproduct gases** from industrial processes or mining can be employed, mitigating emissions that otherwise would go to the atmosphere.



~ 11.000 Jenbacher units operating on non-pipeline gas

corresponding to ~ 11.500 MWe

Turn biomass into power & heat with innovative and flexible Jenbacher solutions.

Make use of sewage gas – a renewable energy source with a high heating value.

Gain proven solutions that operate with a broad range of byproduct gases from various industrial processes.

BIOGAS SOLUTIONS

Turning biogas into heat & power



Jenbacher
CHP system
powered by
biomass at the
Heslerhof Farm in
Germany

Key benefits:



Sustainable



Economical



Ready for tomorrow



Increased resilience



Less waste



Anaerobic
digestion of
organic & animal
waste for
biogas production

Solution that
complements
other renewable
energy sources
such as wind &
solar

Example: 5,000
cows can power
a 1 MW plant

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LANDFILL GAS SOLUTIONS

Putting waste to work as an energy source



3
Jenbacher engines
to power
10 MW Biomont
Énergie SEC plant
in Canada

Key benefits:



Harness the power of landfill gas while mitigating greenhouse gas emissions



Enjoy smooth, reliable operation



High profitability with overall efficiencies



Carbon credits for reduced methane emissions or special renewable energy tariffs



Organic substance
decomposition for
landfill gas (LFG)
production

1 million tons of
municipal waste
produce 6,500 to
10,000 MWh of
electricity per year

Overall efficiencies
of up to 86% in
CHP applications
and up to ~44%
with power
generation alone

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* Image: Deponie Wernsdorf, 2015; Landfill operator: Berliner Cleaning Service;
Image Author: Firma Helicolor Luftbild Ost GmbH

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SEWAGE GAS SOLUTIONS

Turning wastewater into green energy



2 Jenbacher engines supporting a wastewater treatment plant in Strass im Zillertal, Austria

Key benefits:



Cut your energy costs and emissions



Cost-effective operation



Reliability of supply through alternative energy sources



High operational reliability 24/7



Renewable sewage gas is used to generate electricity and heat

Jenbacher solutions can provide up to 100% of a sewage plant's energy needs

Long-term savings delivered for sewage treatment plants

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Thank You!

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