

# SETTING NEW STANDARDS FOR CLIMATE-NEUTRAL ENERGY SUPPLY

## Jenbacher large engines in Kiel ready for Hydrogen

### Background

For more than 100 years, Stadtwerke Kiel has supplied the region with electricity, gas, water, and heat—while also taking on social and community responsibility beyond its supply mandate. In search of a sustainable replacement for its coal-fired community power plant, the company decided in April 2013 on a gas engine solution. In July 2015, the key contracts for the new coastal power plant were signed, featuring a modular and flexible Jenbacher combined heat and power (CHP) plant from INNIO Group as its core component. After extensive construction work, the 20th Jenbacher engine was delivered to the newly built engine halls in February 2018, allowing the commissioning phase to begin immediately. Commercial operation of the KIEL coastal power plant began as planned in November 2019.

**»Since replacing our old coal-fired power plant with 20 highly flexible Jenbacher large engines, we have reduced emissions by around 70%, saving approximately 1 million tons of CO<sub>2</sub> per year. Together with INNIO Group, we are now converting the KIEL coastal power plant into the world's first 190 MW large-engine thermal power plant capable of running on hydrogen. From 2035 onward, our goal is to be climate neutral.«**

Dr. Jörg Teupen,  
Head of Technology and HR at the Stadtwerke Kiel AG

### Pioneering solution

Since the start of the 2019/2020 heating season, 20 Jenbacher large engines with a total output of 192 MW have been supplying electricity and district heating to more than 74,500 households and contributing to a secure, affordable, and sustainable energy supply in Kiel.

Thanks to its electricity-driven operation which is oriented toward current power demand—the Jenbacher CHP system at the coastal power plant sets new efficiency standards with an overall efficiency of around 91%, while simultaneously using the generated heat. It is complemented by a 60-meter-high heat storage unit, which can reliably supply around 74,500 households with district heating for up to eight hours, as well as a 35 MW electrode boiler, which converts excess grid electricity into heat. Together with the use of Power-to-Heat technology, this arrangement enables the decoupling of electricity and heat generation, significantly contributing to the plant's flexibility. Additionally, each of the 20 engines can be immediately ramped up or shut down—depending on whether additional energy is needed or if sufficient capacity is already available. Quick startups and shutdowns are particularly important for Kiel, as renewable energy production from wind fluctuates greatly—from strong winds to calm periods. This variability is why supplementary solutions are needed that can step in flexibly and dependably.



## Outcome

The KIEL coastal power plant is one of the most modern large-engine thermal power plants in Europe. According to Stadtwerke Kiel, the switch from the coal-fired power plant to the gas-fired power station already has resulted in savings of around 70% or 1 million tons of CO<sub>2</sub> emissions per year. This corresponds to the annual CO<sub>2</sub> emissions of roughly 500,000 combustion cars.

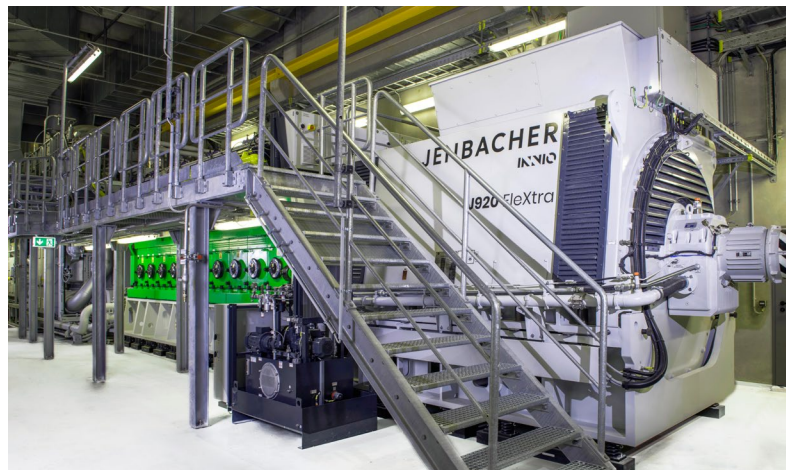
In 2024, Stadtwerke Kiel made a clear commitment to making the coastal power plant the world's first large-engine thermal power plant to achieve climate neutrality through the use of green hydrogen. This transition is planned for completion by 2035, 10 years ahead of the German federal government's target of achieving fully climate-neutral electricity and heat generation by 2045. Thus, the KIEL coastal power plant is setting standards in climate-neutral energy supply. The flexible Jenbacher CHP system demonstrates how the cooperation between a municipal energy supplier and INNIO Group can successfully support climate-neutral electricity and heat generation. However, the success of this transition depends on the availability of green hydrogen in sufficient quantities and under economically viable conditions.

## Key technical data

Installed engines	20 x J920 Flextra
Electrical output	190 MW
Thermal output	192 MW
Total efficiency	91%
Annual CO <sub>2</sub> savings	1 million tons
Energy source	Pipeline gas, hydrogen by 2035
Commissioning	November 2019

## Customer benefits

- Flexible ramp up or ramp down
- High energy efficiency
- Significant emission savings
- Convertibility to hydrogen operation



## Key technical data for thermal storage

Outer diameter	approx. 31.2 m
Height with roof and insulation	60 m
Total volume	approx. 42,000 m <sup>3</sup>
Usable volume	approx. 30,000 m <sup>3</sup>
Temperature of the hot suspension line	115°C
Temperature of the cold suspension line	60°C
Guaranteed heat storage capacity	approx. 1,500 MWh
Max. charging and discharging capacity	approx. 200 MW
Max. charging and discharging mass flow rate	3,100 t/h



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