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One power plant – three world records

Environmentally friendly, flexible and innovative

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Designing solutions for tomorrow's challenges

We have been building integrated, turnkey power plants throughout the world for over 130 years. This exceptional wealth of experience, combined with the quality of our pioneering work, helps you to avoid risk and safeguard your investment. Cost and resource efficiency combined with largest occupational safety and optimal plant availability is important to us as your partner. Ultimately this is the only way to build an environmentally friendly combined cycle power plant that sets new standards and achieves three world records: Lausward, "Block Fortuna".



Hand in hand with climate protection

Fossil-fired power plants still have an important role to play in the energy mix of the future. Our highly efficient combined cycle power plants and combined heat and power plants demonstrate that climate protection and conventional power generation can go hand in hand. They are used when there is not enough wind or the sun's rays are not strong enough. Finally, we all rely on a continuous power supply and need power plants that can be started or shut down as required.

Our power plants are already extremely cost-effective when simply used to generate electricity. Additionally, they recover process heat to make operation even more economical. Combined production of heat and power plays a substantial part in increasing energy productivity and protecting the climate worldwide.

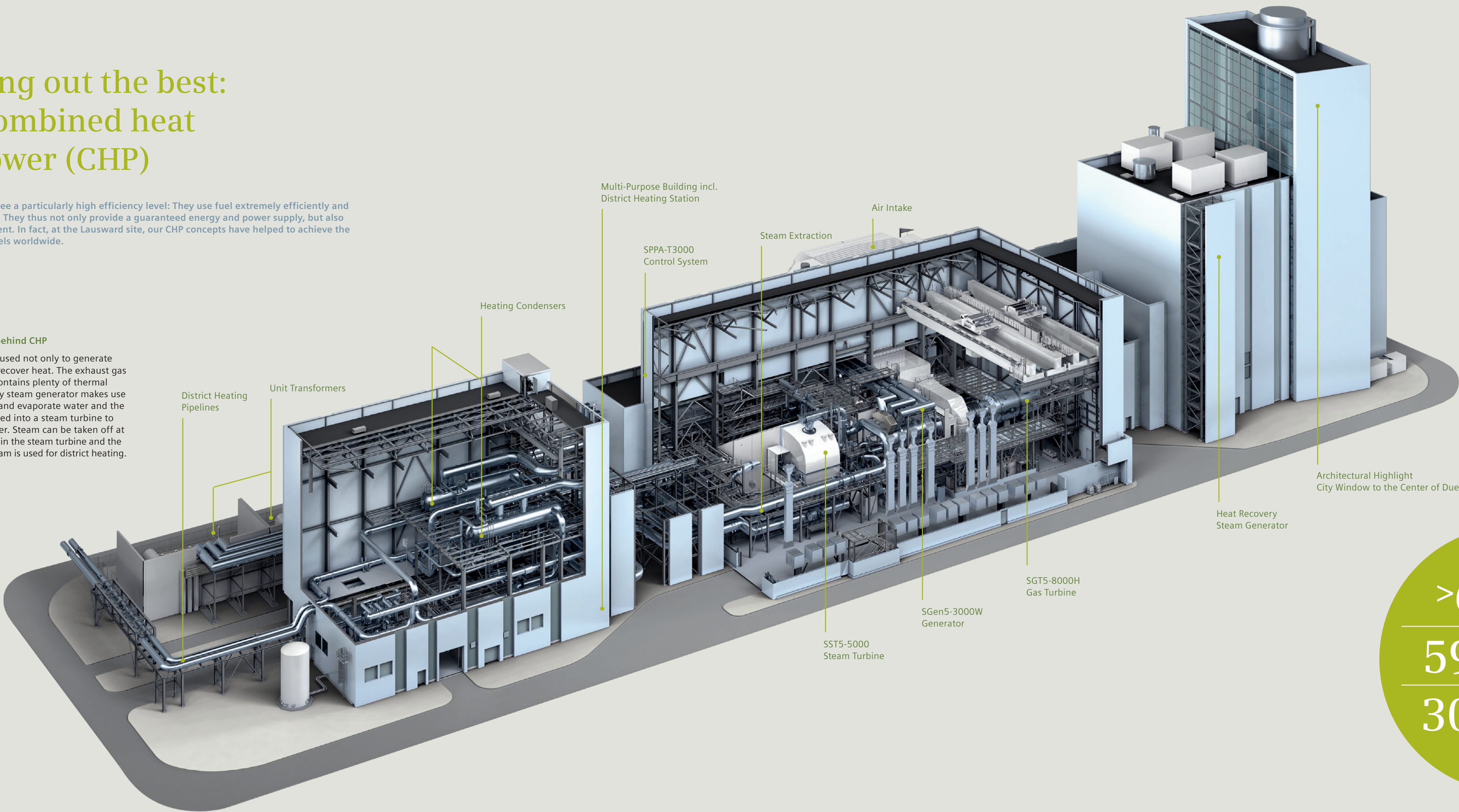


We bring out the best: with combined heat and power (CHP)

CHP concepts guarantee a particularly high efficiency level: They use fuel extremely efficiently and reduce CO₂ emissions. They thus not only provide a guaranteed energy and power supply, but also protect the environment. In fact, at the Lausward site, our CHP concepts have helped to achieve the highest efficiency levels worldwide.

The simple principle behind CHP

In CHP, a single fuel is used not only to generate electricity, but also to recover heat. The exhaust gas from the gas turbine contains plenty of thermal energy. A heat recovery steam generator makes use of this energy to heat and evaporate water and the resulting steam is passed into a steam turbine to create even more power. Steam can be taken off at three extraction points in the steam turbine and the heat content of the steam is used for district heating.



SCC5-8000H 1S

>61%
net efficiency

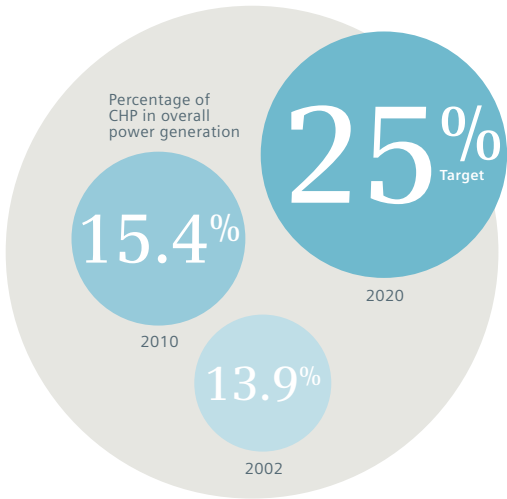
595 MW_{el}
maximum electricity output generated
by a single combined cycle unit

300 MW_{th}
Maximum district heating supply
by a single power plant unit with
>85% fuel efficiency

CCPP
WITH THREE
WORLD RECORDS



Our pioneering technology in detail



When heat and power are combined

Combined heat and power concepts based on gas and steam turbines guarantee considerably higher efficiency levels than conventional power plants. They thus lead to reduced CO₂ emissions as well as lower energy costs. They guarantee an energy supply and play a crucial role in protecting the environment by reducing the environmental pollution caused by power generation. The German Federal Government has set a target to increase the amount of power generated by CHP plants. This should reach 25% by 2020.

Our combined cycle plant at the Lausward site makes a significant contribution towards this target. It makes full use of the opportunities offered by combined heat and power technology and supplies the city of Duesseldorf directly with district heating, without creating any additional environmental pollution.

Particularly powerful: the gas turbine

The SGT5-8000H is the most powerful gas turbine in the world. It weighs 440 tonnes and is designed to generate 400 MW when operating just in gas turbine mode and up to 600 MW when operating in combined cycle mode. It can produce as much power as 1200 Porsche 911 Turbos. A single blade of the SGT5-8000H gas turbine also produces nearly as much power as a wind power plant with an output of 3.6 MW.

Individually adjustable: the steam turbine

The SST5-5000 series steam turbines can be used in combined cycle power plants and steam-fired power plants with outputs ranging from 120 to 750 MW.

They have a combined high and intermediate pressure section and a dual flow low pressure section. Each flow has a flow surface area of 12.5 square meters. Steam can be taken off at several points on the low pressure turbine as required. Optimized operation of the steam turbine ensures huge flexibility with regard to output, thus protecting the electricity grid and helping to compensate for fluctuations in renewable energies.

Optimized cooling concept: the generator

The SGen-3000W generator has two different cooling systems: a water-cooled stator and a hydrogen-cooled rotor. It is also designed to be particularly compact. It is therefore ideally suited for use in large combined cycle power plants with high outputs.

Special design: the heat recovery steam generator

The Benson-type heat recovery steam generator (HRSG) is an essential part of our power plants thanks to its higher steam parameters. As considerable emphasis is placed on increased efficiency and flexibility, the heat generator has a unique design. The process parameters for the water-steam circuit are increased to implement the efficiency requirements and advanced materials are used. The resulting steam generator is a technological milestone across all key parameters.

In May 2014, the gas turbine was transported from the manufacturing site in Berlin to Duesseldorf, Germany



The world’s most efficient combined cycle power plant

The Lausward combined cycle power plant is an environmentally friendly and economical means of generating heat and power in a future with lower CO₂ levels – as such, it has won us three world records.

Our record figures



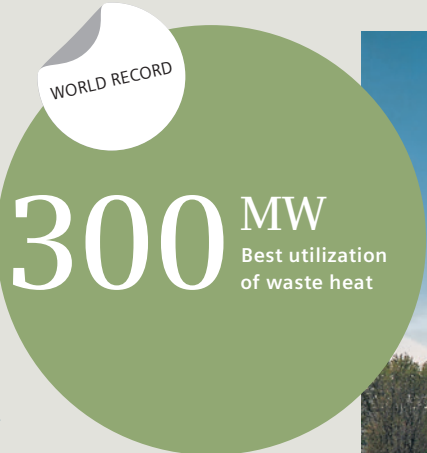
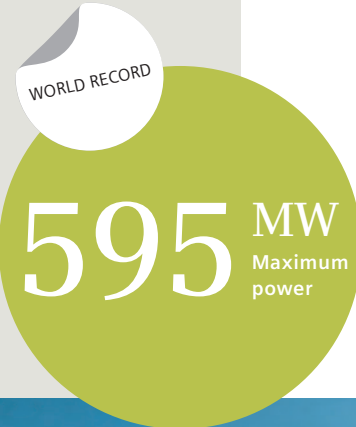
Maximum efficiency
Electrical efficiency in excess of > 61% even exceeds our previous world record, set by the Ulrich Hartmann combined cycle plant in Irsching in Germany, which recorded a figure of 60.75%.

The new landmark on Duesseldorf Harbor

A new building has arisen on the Lausward site in the heart of a modern cityscape. It represents innovative technology at its most environmentally friendly and also does justice to its prominent position on the harbor front.

The Aachen-based architects kadawittfeldarchitektur have used closed steel frames and intermediate joints to convey a special sense of rhythm. In addition, the stack is enclosed behind glass: The so-called “city window” to the northeast provides a panoramic view of the power plant, and shows everyone just where the city’s energy comes from.

Maximum power
A gas turbine forms the heart of our power plant and generates as much power as 22 jumbo jet engines. It provides an electrical output of 595 MW_e with the steam turbine. This output level won’t be achieved by any other combined cycle power plant.



Best utilization of waste heat
Energy recovered from waste heat is used to supply the city of Duesseldorf with district heating – a figure of 300 MW_{th} in combined cycle operation, more than anywhere else in the world.

Maximum flexibility with maximum power

In order to play an essential part in the energy mix of the future, we need a power plant that combines a number of features: it must be highly efficient, flexible, environmentally friendly and cost-effective. We have worked alongside the Stadtwerke Duesseldorf AG to bring about this flagship project, one that is set to make a crucial contribution to the changing face of energy generation.

Efficient

The outstanding engineering achievements that go to make our power plant have earned three world records. The “Block Fortuna” on the Lausward site in Duesseldorf Harbor is a new combined cycle power plant that exceeds the customary efficiency levels. Alongside maximum output, maximum efficiency and best use of waste heat, it also boasts an overall natural gas efficiency factor of approximately 85% and offers exceptional combined heat and power opportunities. The heat arising in the power generation process can thus be utilized efficiently as well.

Flexible

The combined cycle power plant can be run up from 0 to 100% in less than 40 minutes and shut down equally quickly. It is thus able to respond flexibly to meet all heat and power requirements. A wide range of load requirements can thus be satisfied with immediate effect: The plant can adapt to load changes between a minimum load of 325 MW and the base load of 595 MW at a rate of 35 MW per minute – not only is this the absolute peak value for such load ramps, but as a result, the power plant also meets the specific stability requirements for grids

including renewable energies such as solar and wind power. It is thus the ideal counterbalance for the fluctuating supplies from renewable forms of energy.

Environmentally friendly

Our power plant is the perfect way of bridging the technology gap towards a climate-neutral energy supply. Combined cycle power plants are exceptionally environmentally friendly and Lausward in particular is set to save around 43,000 tonnes of CO₂ each year thanks to its high fuel efficiency – the equivalent of the annual CO₂ emissions of about 10,000 medium-sized cars with an annual mileage of approximately 20,000 km per year.

Cost-effective

Alongside efficiency and flexibility, the power plant also displays optimum cost effectiveness, allowing it to operate for many hours and leading to a high utilization rate. Operating in power mode with heat recovery also increases the utilization rate, reducing specific costs and increasing the “power margin”.

