

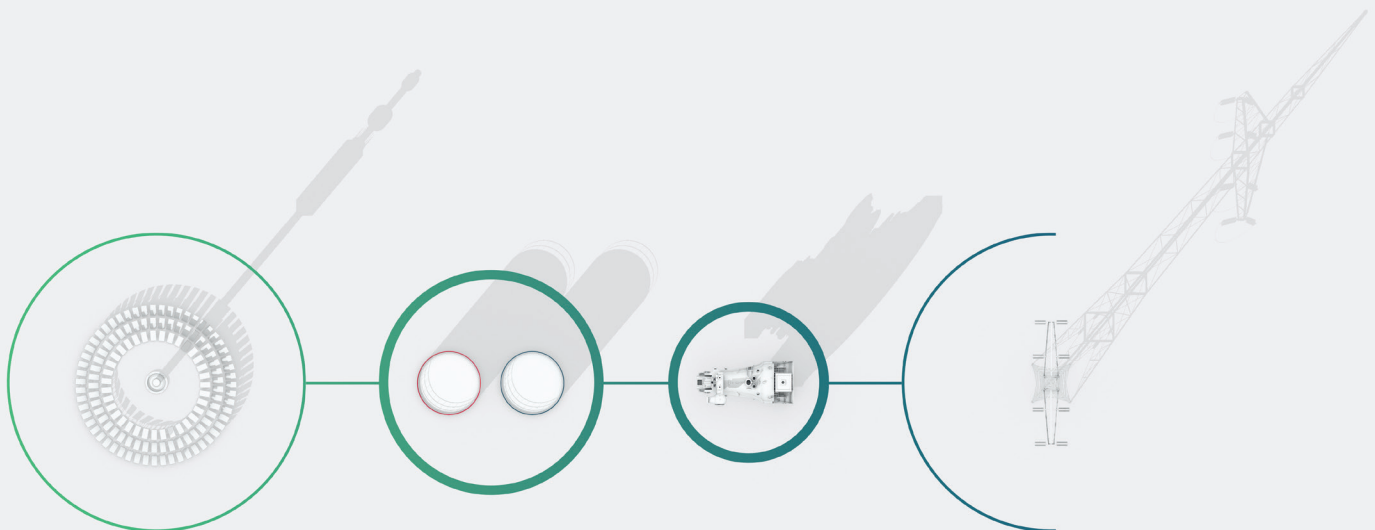
MAN CSP

Concentrated solar power

Concentrated solar power plants generate electricity from pure solar energy. Our customized solutions match all your needs while enabling different plant concepts, including the integration of high-temperature heat storage facilities, highly efficient and robust steam turbines and hybrid concepts with PV, biomass or clean gas co-firing. The MAN CSP hybrid variants allow a base-load supply of 100 % solar energy.

Benefits at a glance

- Up to 365 days/year 24/7 pure solar base-load supply
- Peaker plant for night-time power generation
- Thermal and electrical power generation from 100 % solar energy
- Daily storage of solar energy
- Emission-free power generation
- Combinable/expandable with further renewable energy systems (RES) from MAN Energy Solutions



Decarbonized energy for the future

Dispatchable solar power

Solar energy is a cost-free but unpredictable source of energy. Night times and sudden weather changes make permanent power generation complicated. Concentrated solar power is the perfect solution for dispatchable solar power generation. The combination of a solar field and molten salt storage enables a base-load or peak energy supply from pure solar energy.

Concentrated solar power

Concentrated solar thermal power plants consist of three main systems: The solar field, based on well proven parabolic trough, linear Fresnel or solar towers, a thermal energy molten salt storage system (MAN MOSAS) and a highly efficient steam turbine cycle. The solar field is used to obtain the energy that heats up the salt. A certain share of the molten salt is subsequently used to generate steam which is fed into the steam turbine to generate electricity while the remaining share of the molten salt is stored for night operation. With this combination, MAN offers dispatchable solar thermal power generation independent of the solar field technology. The challenge of using solar energy at night is mastered with molten salt storage, the heart of the solution. It enables a permanent power supply from 100 % solar energy. This combined base-load and peaker capability makes concentrated solar power one of the most attractive renewable energy systems.

The broad portfolio of MAN Energy Solutions offers further possibilities to generate energy for nightly electricity demand.

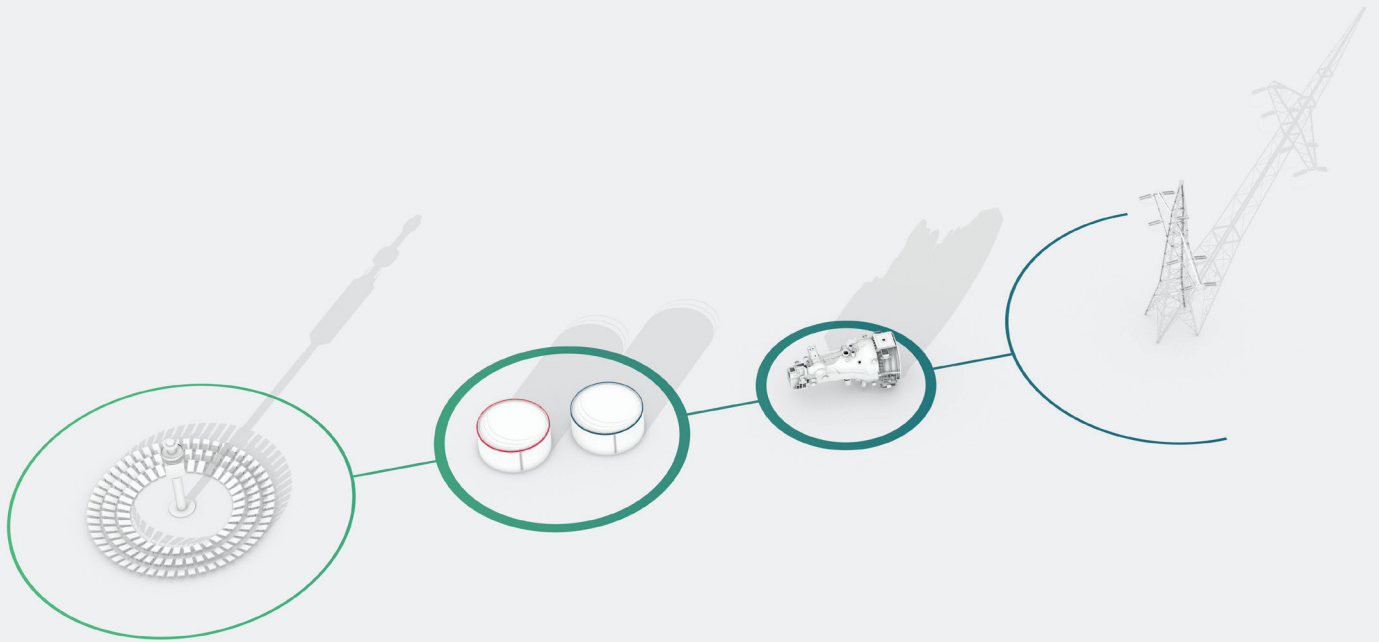
General competence

Using renewable energy sources (RES) for sustainable power generation is the ultimate global goal. However, RES depend on the weather, which is unpredictable and makes consistent energy production difficult to ensure.

MAN MOSAS masters this challenge by storing solar energy for nightly use or to bridge short periods of bad weather conditions. With its high efficiency, durability and robust construction, MAN MOSAS converts solar energy into a reliable electricity supply and allows MAN CSP to provide dispatchable power.

Flexible energy storage in combination with MAN's highly efficient and quick-starting steam turbines also makes MAN CSP one of the most reliable RES solutions – with power plant lifetimes of over 25 years and a high profitability.

With more than 10 years of experience in CSP power generation, expertise in molten salt handling for thermal energy storage, and more than 100 years of building steam turbines, MAN meets all customer requirements. Our customized solutions are suitable for all CSP technologies.



System solutions

MAN CSP can be installed as a stand-alone solution. It can also be combined with other power generation methods such as photovoltaic (PV), biomass or supplementary firing.

Additional photovoltaics

PV and concentrated solar power are an ideal combination for a 100 % base-load supply. The PV modules, which are becoming increasingly more cost efficient, supply electricity during the day, while the MAN CSP technology charges the thermal storage in order to generate electricity via steam turbines after sunset. The combination with PV technology also has a positive effect on the overall energy costs.

Additional biomass

Biomass is another possibility for hybrid concentrated solar power which MAN Energy Solutions can offer as a single-source solution. Biomass is used for additional power generation or to fill the gap when solar power is not sufficiently available. Together with you, MAN can customize hybrid solutions that take all specific boundary conditions into account, support decarbonization and optimize the costs of the renewable energy.

As well as electricity, MAN hybrid solutions can supply thermal energy, e.g. for sea water desalination, heating or cooling applications.

Supplementary firing

In order to make your solar power plant even more independent of weather conditions, an additional back-up gas-firing unit can be installed. The firing system not only serves as an emergency back-up but also as a supplement to the MAN CSP system at times of low solar energy.

Key components

– Solar field

Solar power heats the molten salt and provides the energy for 100 % CO₂-free power generation.

– Molten salt storage

The heated molten salt is stored in a hot tank and then passes through the heat exchanger to a cold storage tank.

– Molten salt heat exchangers

Heat exchangers are an efficient and technologically proven way to turn the heat of the molten salt into steam.

– Steam turbine generator set

MAN steam turbines generate electricity and feed it to the grid.

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