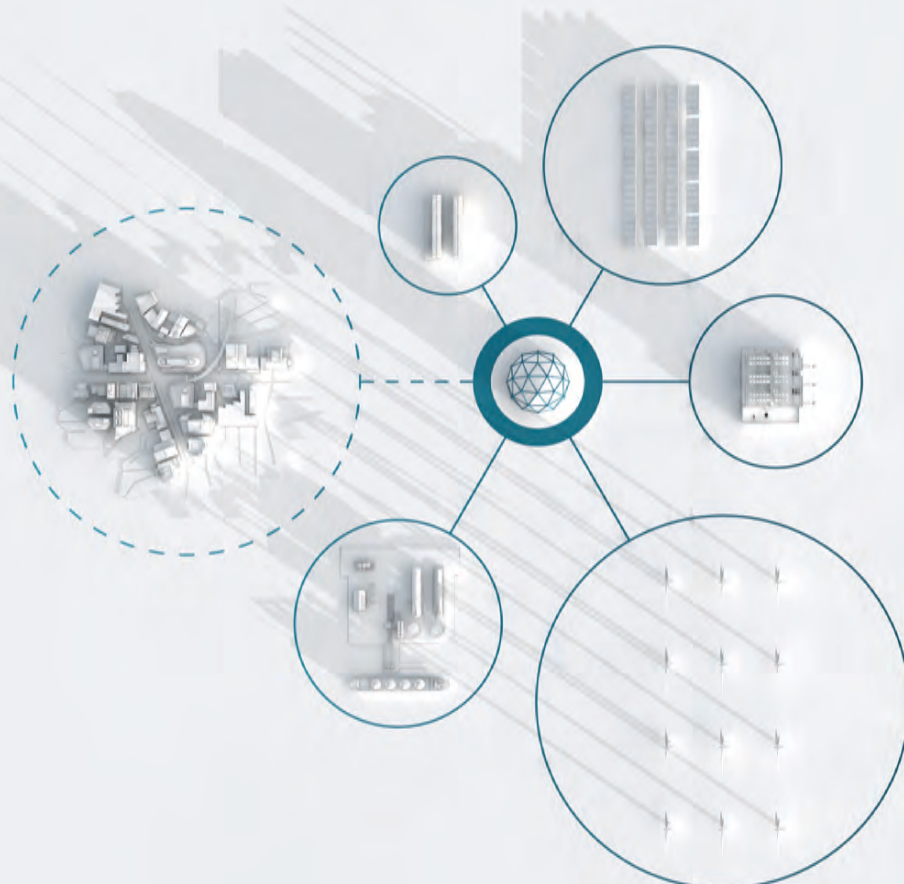


Hybrid power solutions

Our hybrid power solutions combine renewable energy sources, thermal power generation and energy storage systems in a hybrid power plant or microgrid. Storing surplus energy and using instant power top-ups from engine and turbine GenSets fueled with gas, liquid fuels or even synthetic or bio fuels can make wind and solar power systems more reliable.

Benefits at a glance

- Increased reliability
- Increased fuel efficiency
- Fewer emissions and better CO₂ footprint
- Enhanced flexibility and fuel independence
- Wide range of operating modes
- Reduced cost of energy



Providing energy access while reducing emissions

Growing demand

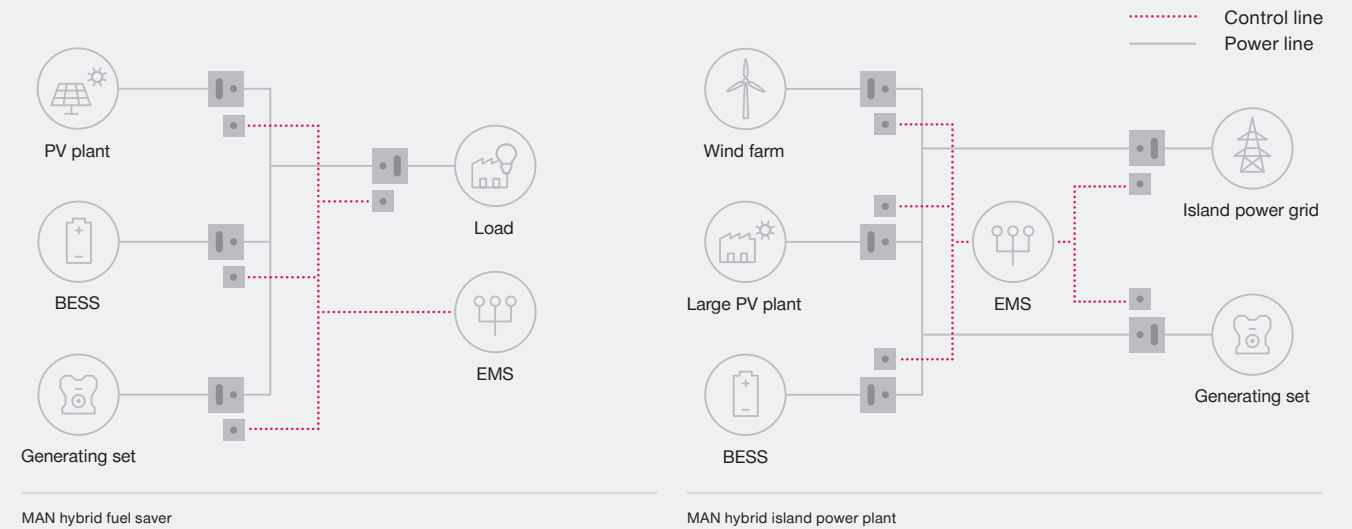
Electricity production is set to increase by 50 % in the next 20 years. Major nations around the world have committed to decarbonization as a way of combating climate change effectively. The Paris climate agreement states that the world needs to be carbon neutral by 2050.

To implement low-carbon energy systems of this size, it is necessary

to accelerate the development of renewable energies such as wind and solar. This means that energy production will become more decentralized and will change from demand to a supply-driven system. Consequently, there is a need to integrate viable and cost-effective energy storage solutions to store excess power in times of oversupply, and to install highly flexible peaking and backup plants for supply shortages or sudden peaks in load demand.

Reduced carbon footprint

MAN Energy Solutions provides hybrid power solutions for utilities, municipalities, industrial customers, independent power producers (IPPs) and system operators (TSO/DSO) who want to reduce their CO₂ footprint or simply their cost of energy. Power plants can also incorporate renewable energy systems to serve as fuel savers or hybrid island power systems.



General competence

MAN provides a full range of hybrid power products and services that support global decarbonization targets. From engine- and turbine-based power solutions, energy storage solutions, and GenSet and equipment supply, to combined heat and power solutions (CHP). We also offer full engineering, procurement and construction (EPC) services anywhere in the world.

Our focus is on the essential security of supply systems: GenSet, battery energy storage systems (BESS), and energy management systems (EMS). The MAN EMS decides when to store the surplus energy and which power generation unit will supply the energy.

System solutions

MAN hybrid fuel saver

MAN integrates renewable energy sources (RES), a battery energy storage system and highly fuel-efficient GenSets via an energy management system that optimizes and decides upon the share of each power production unit. The RES system can always provide the maximum possible CO₂-neutral power, while the GenSet compensates for power fluctuations and provides a certain share of base load power.

MAN hybrid island power plant

MAN provides complete hybrid power solutions for on- or off-grid applications, where security of supply is of the essence. The smart integration of distributed sources of renewable energy and highly fuel-efficient GenSets as well as energy storage solutions is provided on the energy production side. The energy management system aligns the energy production and the energy consumer side in an efficient way.

Key components

- **Wind power**
Wind power can be integrated into a hybrid power solution as a renewable energy source.
- **Photovoltaic (PV)**
PV technology can be integrated into a hybrid power solution as a renewable energy source, and converts solar radiation into electricity.
- **Battery energy storage systems (BESS)**
The Li-ion battery storage system is a proven technology for energy storage as well as fast and flexible discharge.
- **Energy management system (EMS)**
Each hybrid power solution contains an EMS that monitors, controls and optimizes the overall system according to customers' needs.
- **Thermal power plants**
MAN can provide power plant solutions up to 300 MW, based on four-stroke and two-stroke engines, as well as gas or steam turbines.



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