



Energy &
storage
systems

Urban energy

MAN Energy Solutions
Future in the making

**Decentralized
energy generation
and storage**

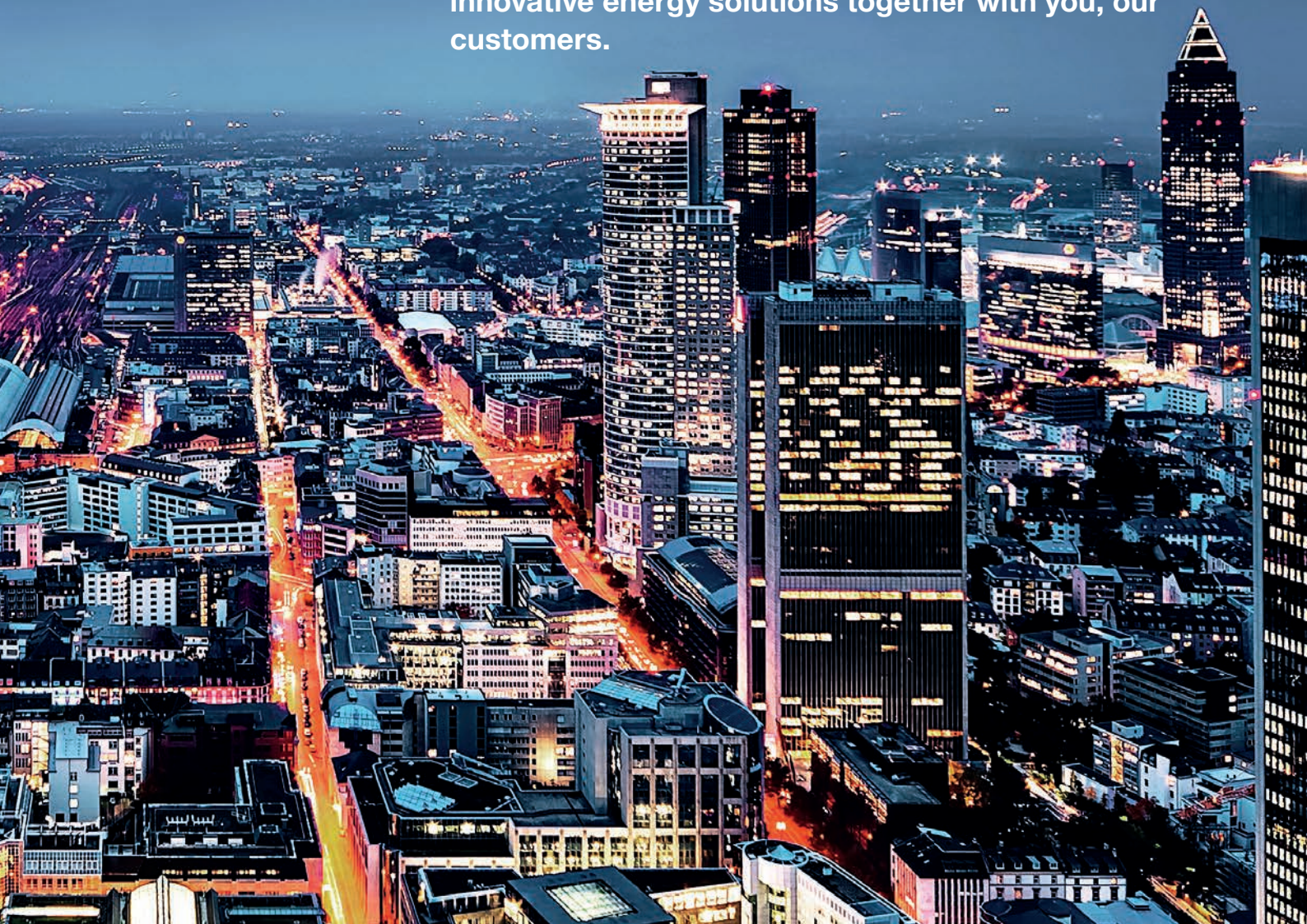
Future in the making



MAN Energy Solutions is the world's leading provider of integrated power systems. Our product portfolio comprises low- and medium-speed engines for marine and power applications, turbochargers and propellers, gas and steam turbines, compressors and chemical reactors.

We focus our expertise on converting energy into sustainable progress and prosperity, sharing responsibility for the quality, reliability and sustainability of the energy supply. Our broad portfolio offers many ways to optimize your grid with customized, modular, one-source solutions.

Urban environments are also being affected by the changes to the energy market. On the basis of our long-standing expertise, we are ready to develop innovative energy solutions together with you, our customers.



Let's make your city shine

Urban power in transition

Urban growth, suburban industrial zones, energy-intensive technologies, emission reduction and the promotion of renewable energies: these are all important challenges to your great responsibility as a reliable energy supplier. Our modular and compact energy solutions support the growing demand for energy and give you the flexibility to assure its availability.

New paths in energy management

New systems, new technologies and new sources of energy have to work together with the existing components and be capable of aligning with evolving requirements. The efficiency and future flexibility of your plans depend on careful and imaginative energy management.

Sustainable solutions

We know that cities are highly sensitive to environmental change and therefore we all want to find energy solutions that are sustainable in terms of emissions and efficiency, and combine the integration of renewable energies with the storage of surplus energy. Our hybrid, CHP and storage solutions support you in this goal.







Innovative solutions for urban applications



Power generation

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Hybrid power solutions

District heating

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Combined heat & power (CHP)

Trigeneration

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Electro-thermal energy storage (ETES)



Electricity for all

Power
generation



Electricity is essential for households, industry and business. Consumers expect a reliable and affordable power supply. We help you exceed these expectations.

Here are the tools you need

Our portfolio consists of highly efficient and dynamic power generators, energy storage systems, integrated renewable energy systems, and energy management systems. On the basis of this modular portfolio, we can develop the optimal power generation system together with you and make it work for your business. Our hybrid power plants bring these technologies together in a decentralized and environmentally friendly solution.

Ensuring security of supply

Hybrid power solutions

Discover a cost-effective way to integrate renewable resources in urban grids. Hybrid power solutions ensure grid stability, and help you deal flexibly with fluctuating demand and supply conditions.

Storage for reliability

MAN hybrid power solutions combine renewable energy sources, thermal power generation and battery energy storage systems (BESS) under the control of an energy management system (EMS).

A truly decarbonized future is only possible by switching from fossil energy to renewable energy sources. To keep the energy system dynamic and dispatchable, it is necessary to store these fluctuating energy supplies and integrate fast-reacting components.

Storing surplus energy and using instant power top-ups from engine and turbine gensets fueled with gas, biofuels or even synthetic fuels can make wind and solar power systems more reliable. The MAN energy management system ensures reliable operation at optimum levels. Using MAN gas engines reduces emissions drastically compared to other fossil fuels. If gas is not available via a pipeline, it is easy to transport in liquefied form (as LNG).

Benefits

Reduced energy costs

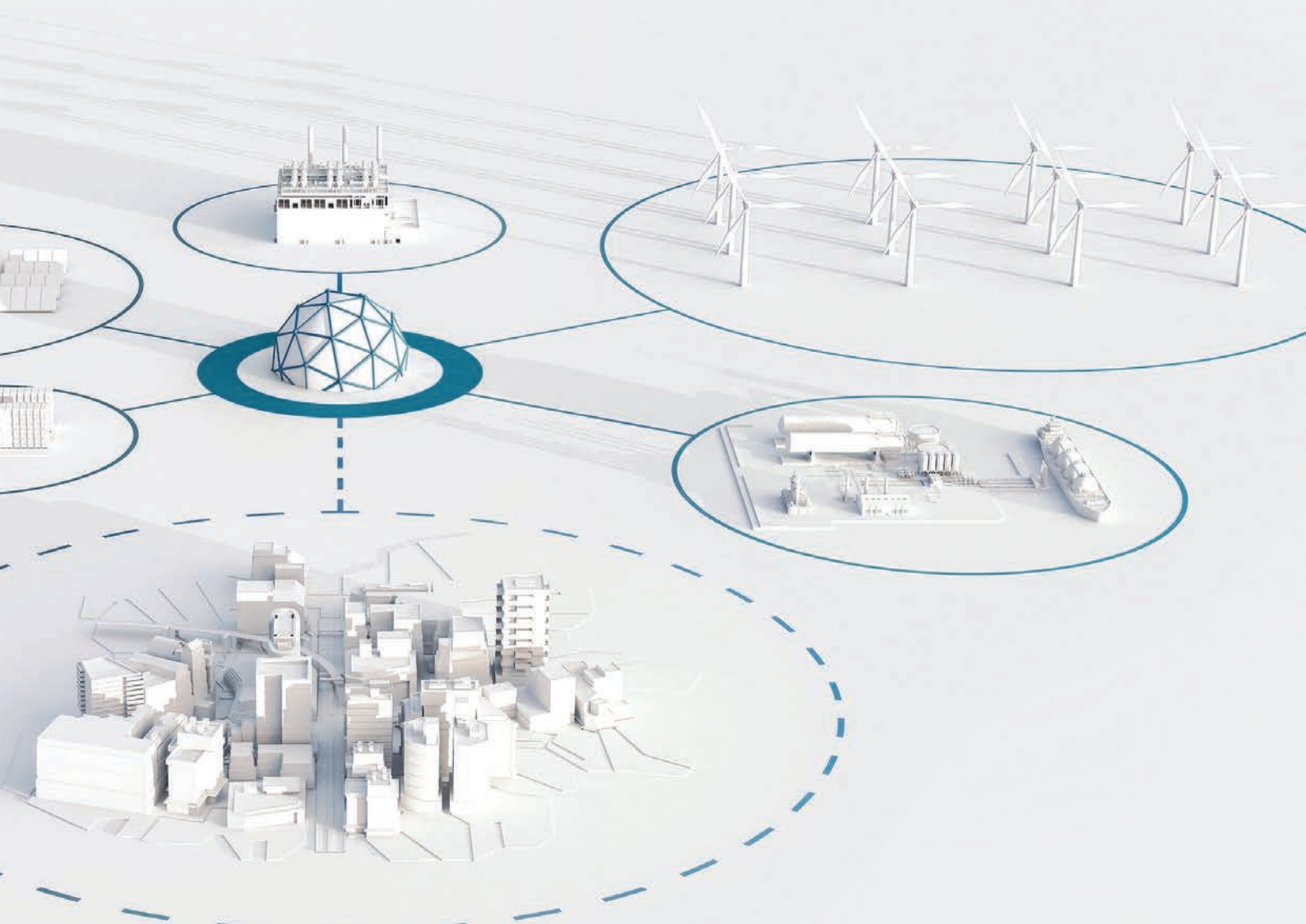
Thanks to fuel flexibility and lower energy wastage

Increased reliability

Enhanced flexibility and fuel independence

Lower emissions and CO₂ footprint

Making better use of renewables



Further power solutions
Thermal power plants
Energy storage solutions



Bringing waste heat to life

District heating



As cities expand, the new residential areas, shopping opportunities, leisure facilities and industrial zones demand their share of energy. Using exhaust heat from power generation for district heating is becoming a great way to lower local energy costs and emissions.

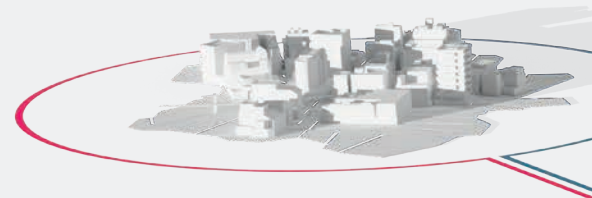
Keep the city warm

Your business is the reliable and sustainable supply of electricity and heat to your customers and you are looking for an energy-efficient and environmentally friendly solution. Scalable and highly efficient combined heat & power plants (CHP), biomass and waste-to-energy systems are the solution to this challenge.

Whereas conventional power plants normally waste exhaust heat, district heating uses it by feeding it into a network of insulated water pipes. As well as reducing costs and emissions, MAN systems provide added flexibility and security of supply. Our CHP solutions can also integrate energy from renewable sources.

Low-carbon efficiency

Combined heat & power (CHP)



CHP can help your power plant reach a fuel efficiency of up to 95 % and contributes to global decarbonization targets.

Flexible and cost-effective

The objective of our CHP solutions is to get the most out of the injected energy in a sustainable way through the use of highly efficient and reliable gas engines and gas turbines. The almost complete conversion of the input energy can be achieved with efficiencies of up to 95 %.

Our CHP plants offer full fuel flexibility with liquid and gaseous fuels. This also includes biofuels and gases that are CO₂ neutral. High power density and fuel efficiency lower CO₂ emissions and keep your costs down.

Continuous partial-load operation and low-load operation down to 15 % are possible and can therefore easily keep up with the changing power-to-heat ratios of the urban market. When there is no demand for heat, the fast-starting gensets can be used as a peaking plant.

Benefits

Low CO₂ emissions

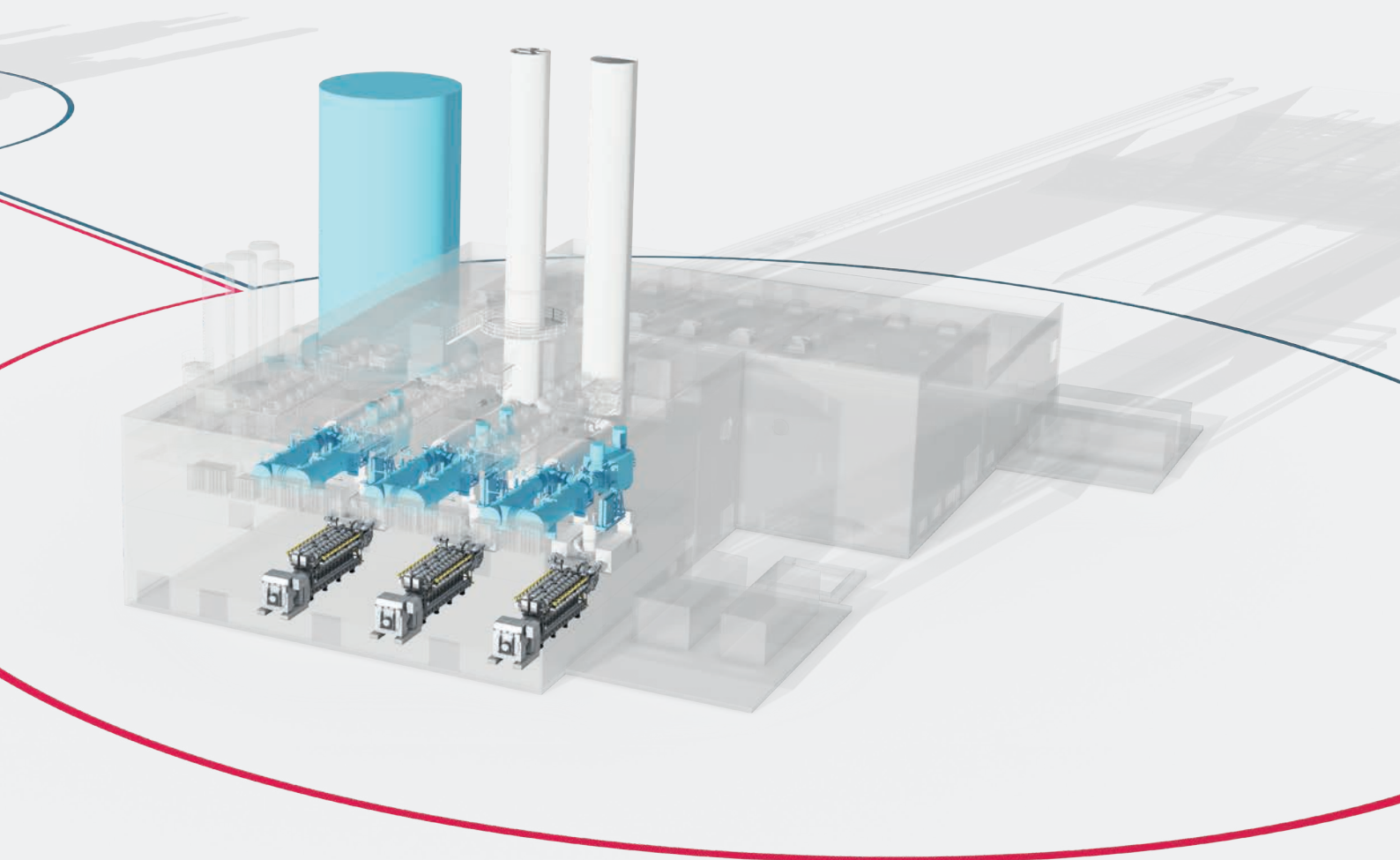
Thanks to fuel flexibility and efficiency

High power density

Low plant footprint

Compact and modular design

Fast and easy to install



A large, modern, multi-level shopping mall interior. The space is characterized by white, curved architectural elements and glass railings. Several escalators are visible, with people moving between levels. The ground floor has a polished floor and some seating areas. The overall atmosphere is bright and spacious.

Combining electricity, heat and cold

Trigeneration



Particularly in urban areas, consumers need both electrical and thermal energy in the form of heat and cold. Trigeneration offers the smart solution to meet these needs.

Compensate for fluctuations in demand and supply

As the share of renewable energies increases, so does the need for 'demand response' solutions that can compensate for fluctuating electricity yields from wind and sun. Trigeneration also allows you to adapt to seasonal variations in heating and cooling energy demands.

Heat can be turned into cold in various ways. The absorption and adsorption processes use treated water as the refrigerant transport medium. A possible alternative is desiccant and evaporative cooling (DEC), which uses air as the cooling medium.

Making the most of trigeneration's efficiency requires extremely flexible systems that can deal with different load profiles. Solutions such as electro-thermal energy storage (ETES) are able to absorb large amounts of excess renewable energy.

Multifunctional energy

Electro-thermal energy storage (ETES)

Electro-thermal energy storage (ETES) is a large-scale trigeneration energy storage and management system for the simultaneous storage, use and distribution of electricity, heat and cold. It responds to two major challenges of urban power generation by balancing the grid and integrating multiple sectors.

Low-emission sector coupling

MAN ETES uses renewable energy to generate heat and cold, which can be stored and converted back into electricity or used directly. Utilization and distribution can take place in parallel to the storage process. Typical heat applications include district heating and supplying the food industry, while cooling is used to refrigerate data centers or air-condition large buildings. MAN ETES is also suitable for use as a black start reserve capable of restarting the power grid after a blackout.

This pioneering solution, developed jointly with ABB, is entirely based on proven and reliable technology and physical processes.

Benefits

Flexibility of application

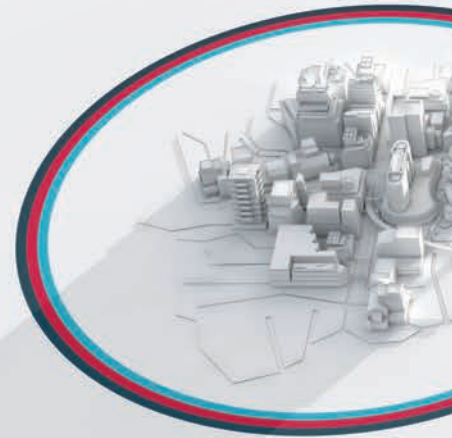
Ideal for sector coupling

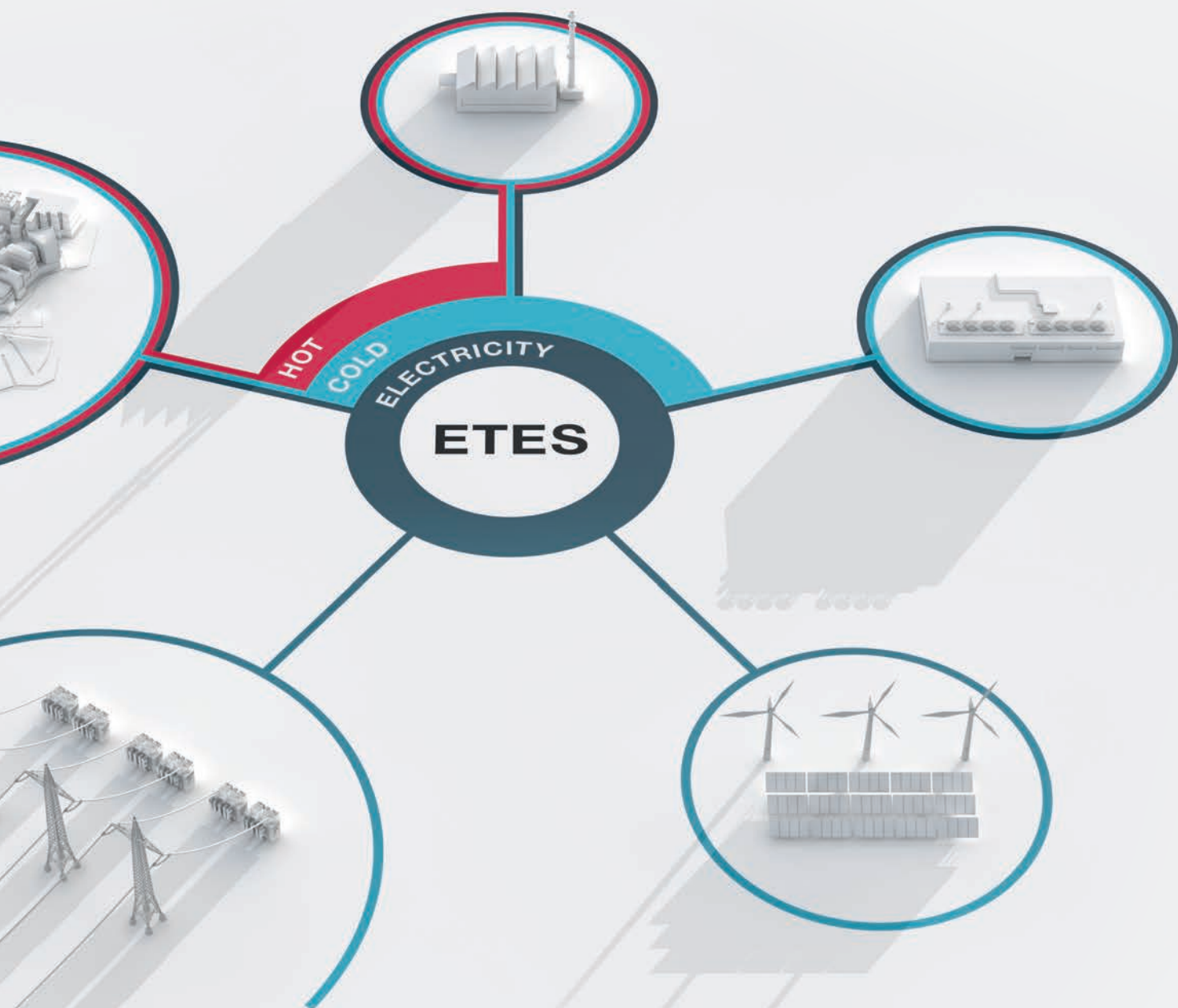
Low environmental impact

Integration and storage of renewable energy and reduction of CO₂ emissions

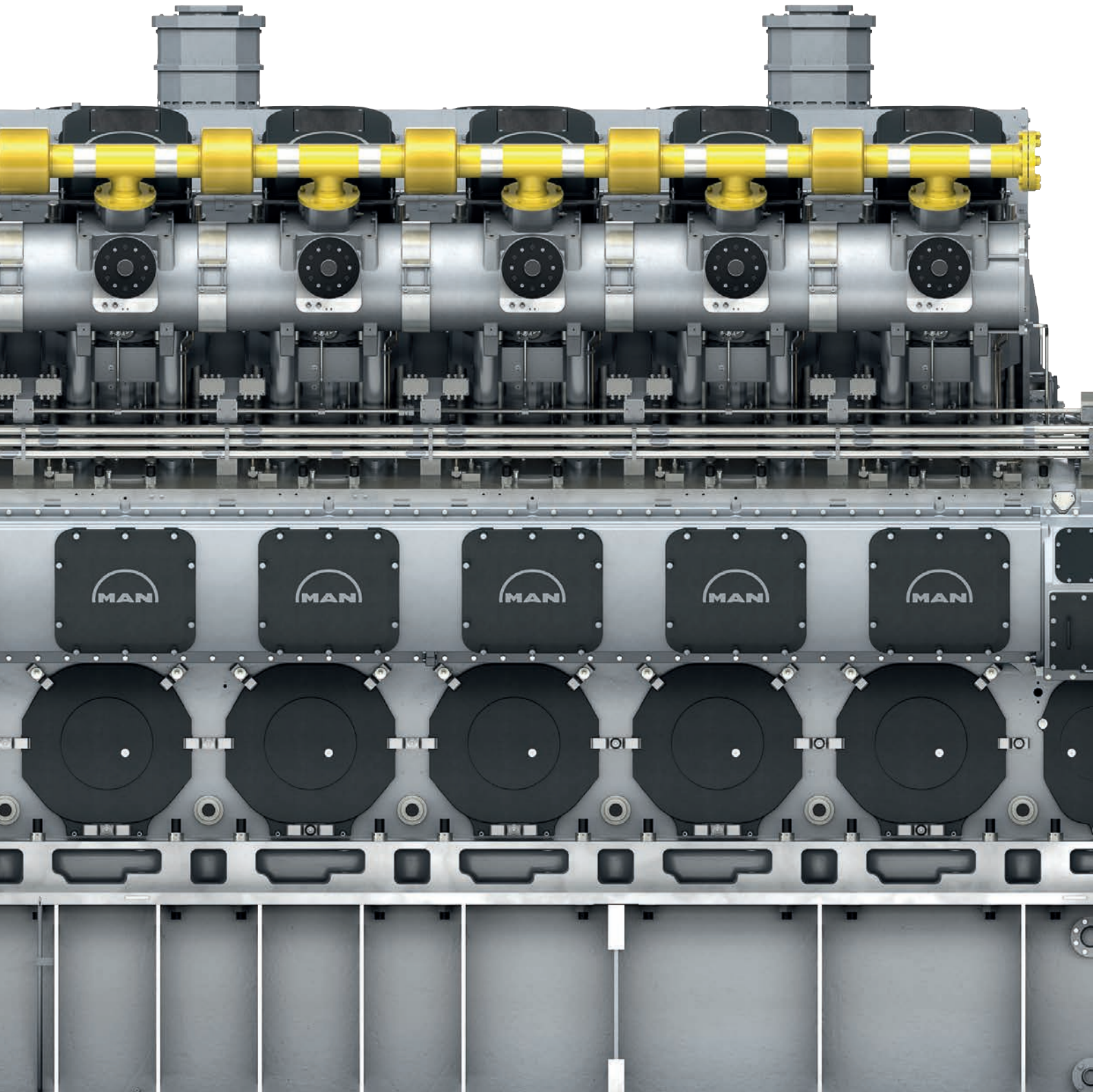
High overall efficiency

Energy cost optimization and creation of new revenue streams





Further power solutions
Combined heat & power



Secure your supply

MAN gas & dual fuel engines

The genius of gas

Gas engines enable the highly efficient conversion of clean natural gas into reliable energy without compromising the security of supply at any time.

Gas is the cleanest fossil fuel and drastically reduces emissions compared to other fuels. It is widely available and generally cheaper than other fossil fuels. The high efficiency and flexibility, fast start and ramp-up capability, and low load performance make MAN gas engines an excellent choice for peak-load and base-load power plants. Electrical efficiency of up to 50 % and total efficiency of around 95 % for CHP applications are possible. MAN's gas engines cover a power range from 7 to 20.7 MW.

Dual fuel flexibility

Dual fuel engines burn either clean natural gas or liquid fuels. This adds flexibility to the future of your investment if you plan to switch to gas at a later stage or if an uninterrupted gas supply cannot be provided.

Our engines switch seamlessly between gas and diesel operation, enabling multiple applications with a variety of fuels and delivering maximum output flexibility and reliability. MAN dual fuel engines are environmentally friendly, clean and comply with international environmental requirements. MAN's dual fuel engines cover a power range from 1 to 20.7 MW.

Benefits

Most powerful gas engine on the market

Highest power density

Fuel and operational flexibility

With HFO, diesel, natural gas, biogas

Environmentally friendly

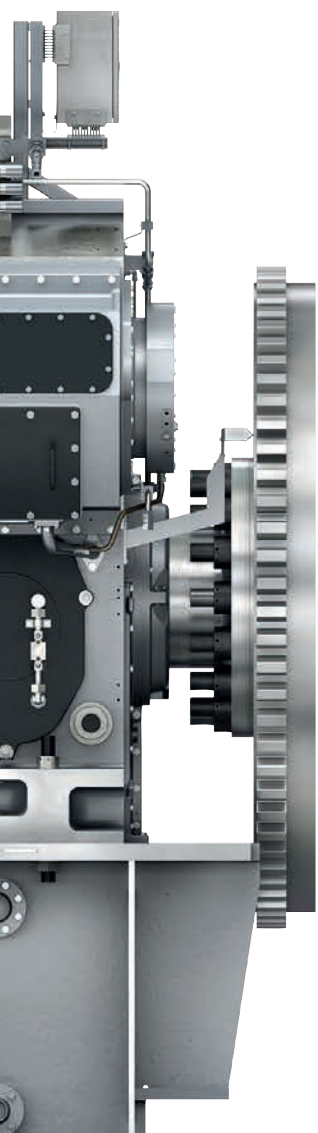
Clean and compliant with international environmental requirements

Modular design

Helps achieve a fast realization time and allows existing power plants to be easily extended

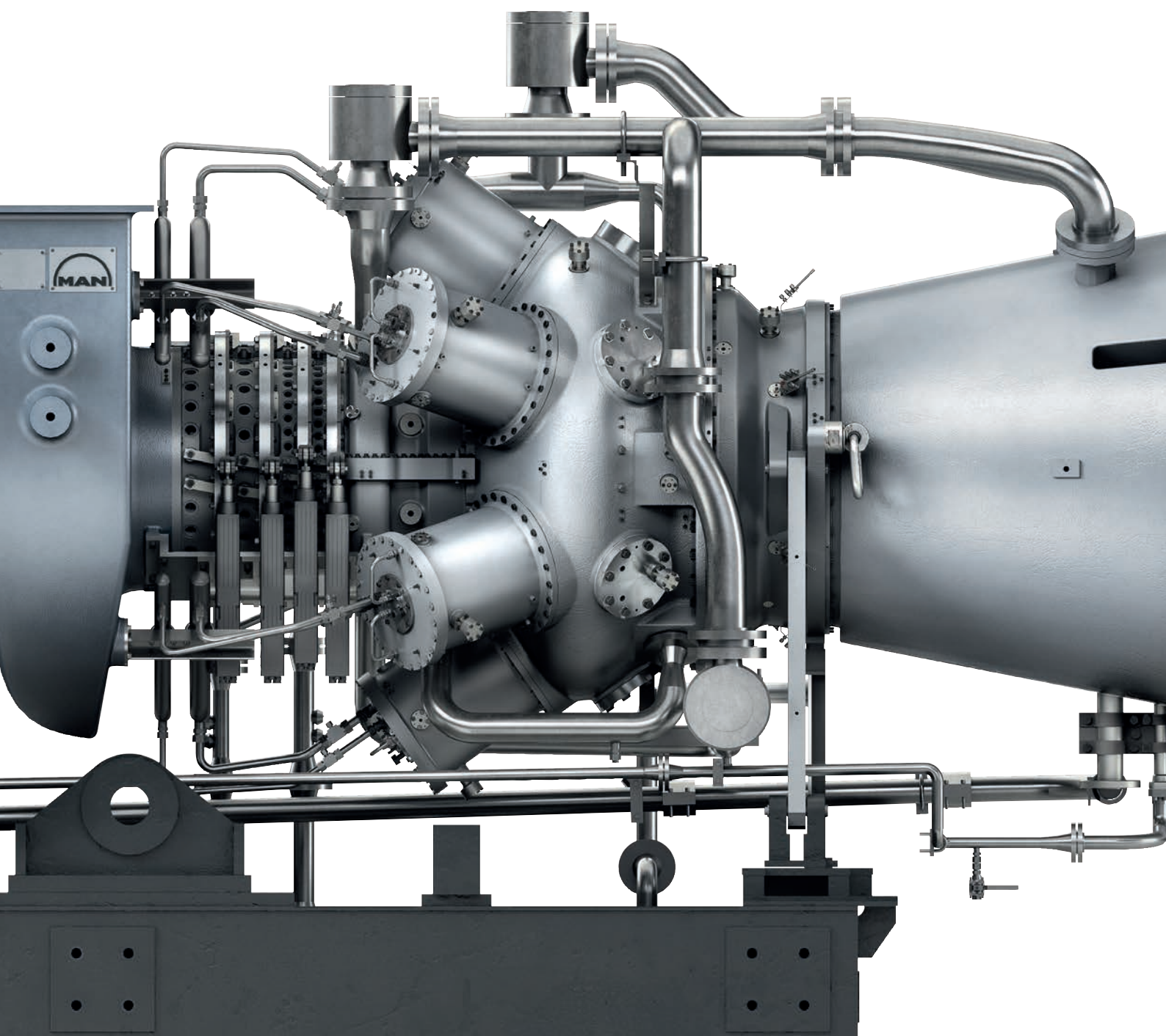
Retrofitting

Convert liquid fuel engine to dual fuel



90%

increased plant efficiency
for CHP applications



Raise the bar on efficiency

MAN steam & gas turbines



State-of-the-art steam

MAN is one of the world's leading suppliers of steam and gas turbines for urban power generation, district heating and trigeneration.

Our robust steam turbines combine experience with state-of-the-art technology. Various models and sizes are available, including condensing type turbines, backpressure and saturated steam turbines. Our steam turbines are characterized by a variety of modular design features for an optimized turbine configuration to meet challenging process conditions. This includes applications such as CHP, ECC, biomass, concentrated solar power (CSP), geothermal energy, waste-to-energy and regeneration in storage. The MAN steam turbine portfolio for power generation covers the range up to 160 MW.

Heavy-duty gas

The MAN gas turbine portfolio for power generation covers the range of 6-13 MW. The focus is on robust operation, high availability, fast start-up as well as starting reliability and the capability for quick transient load responses. Using our unrivaled grasp of large gas turbine technology, we aim to make our turbines progressively cleaner, more powerful and more efficient.

Benefits

Green power

Lowest emission levels in their class

Reliable and robust

Partial-load behavior at highest-in-class performance levels

Modular design

Very short erection and commissioning times

Fuel and operational flexibility

With natural gas, biogas and diesel fuel

Consulting services

Talk to the experts

Energy and storage projects are capital-intensive and need expert consultancy throughout their entire lifetime. We fully understand your needs and expectations, and are able to develop the best tailor-made solutions together with you. Hands-on technical expertise is what sets our service apart: it saves you money and time and gives you valuable insights into the future development of power generation technologies.





New project development

When developing new projects, it is important to consider different alternatives and assess competitiveness, security of supply and environmental friendliness as well as financing and partnerships. Early project development, financing support, and technical consulting are key building blocks.

On the basis of our international experience in energy solutions, we offer services for all power plant project phases. We act as a solution service provider for our customers to develop capital-intensive projects as partners. Our project development department will work with your team to develop the most fitting project solution.

Engineering, procurement, construction (EPC)

We have the experience and the capacity to work as a main contractor or consortium leader in the construction of complete power plants. Our scope of supply can range from individual gensets to complete, ready-to-run power plants based on full EPC.

Areas of expertise

- Project analysis, due diligence
- Development of business models (contractual, financial, commercial)
- Setup of the judicial, financial and fiscal framework requirements and structuring of contract
- Support for the bidding procedure, assignment of deliveries, commercial business planning
- Risk management, project controlling (costs, quality, target dates during the development)
- Negotiations for all project contracts (taking account of multifaceted interdependence between contracts)
- Financial engineering, financial model, negotiations with banks and guarantors

MAN PrimeServ

Service with passion





24

hours a day

365

days a year

MAN PrimeServ is the dedicated MAN Energy Solutions service brand. Via a network of over 100 service centers worldwide, MAN PrimeServ provides 24/7 service across the globe. Our range of services includes technical support, consulting and OEM spares, as well as maintenance, repair and comprehensive individualized service plans.

MAN PrimeServ provides

- Prompt delivery of high-demand OEM spare parts within 24 hours
- Fast, reliable and competent customer support
- Individually tailored O&M contracts
- Ongoing training and qualification of operators and maintenance staff
- Global service, 24 hours a day, 365 days a year
- Diagnosis and troubleshooting with our high-performance online service

Worldwide service

We offer retrofitting and upgrade services to bring engines, turbines and turbochargers already in service up to the very latest standards of performance and efficiency.

Using the latest digital technology, we enable you to maximize the performance and availability of your MAN equipment by accessing real-time data analysis, remote support and rapid solutions. We also offer an extensive range of training courses at MAN PrimeServ academies around the world.

PrimeServ Assist is our solution for remote monitoring and performance optimization. It helps you to increase the efficiency, safety and availability of your MAN products.

With our operation & maintenance agreements, PrimeServ can play a larger role in your facilities. This ranges from advisory management support to full management, operation and maintenance of a power plant.

For more information please visit
www.man-es.com/primeserv



100

service centers
worldwide



Let the energy flow ...



An interactive experience

Download our MAN Brochure Store app from the App Store or Google Play Store. Use its exciting interactive features to explore our complete range of products and services. Suitable for iPhone, iPad and Android.

MAN Energy Solutions

86224 Augsburg, Germany

P + 49 821 322-0

F + 49 821 322-3382

info@man-es.com

www.man-es.com

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