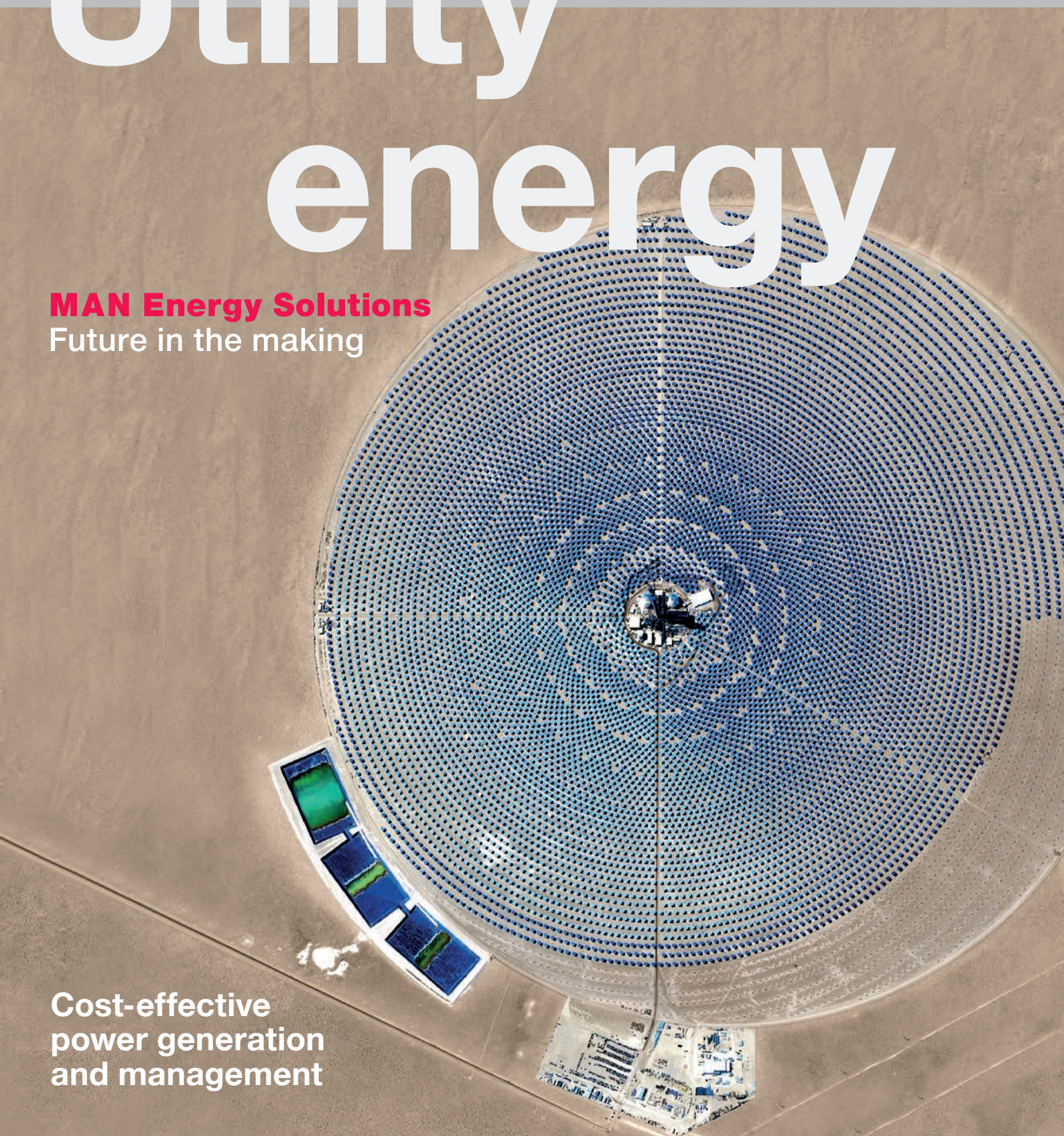
Energy &
storage
systems

Utility energy

MAN Energy Solutions
Future in the making



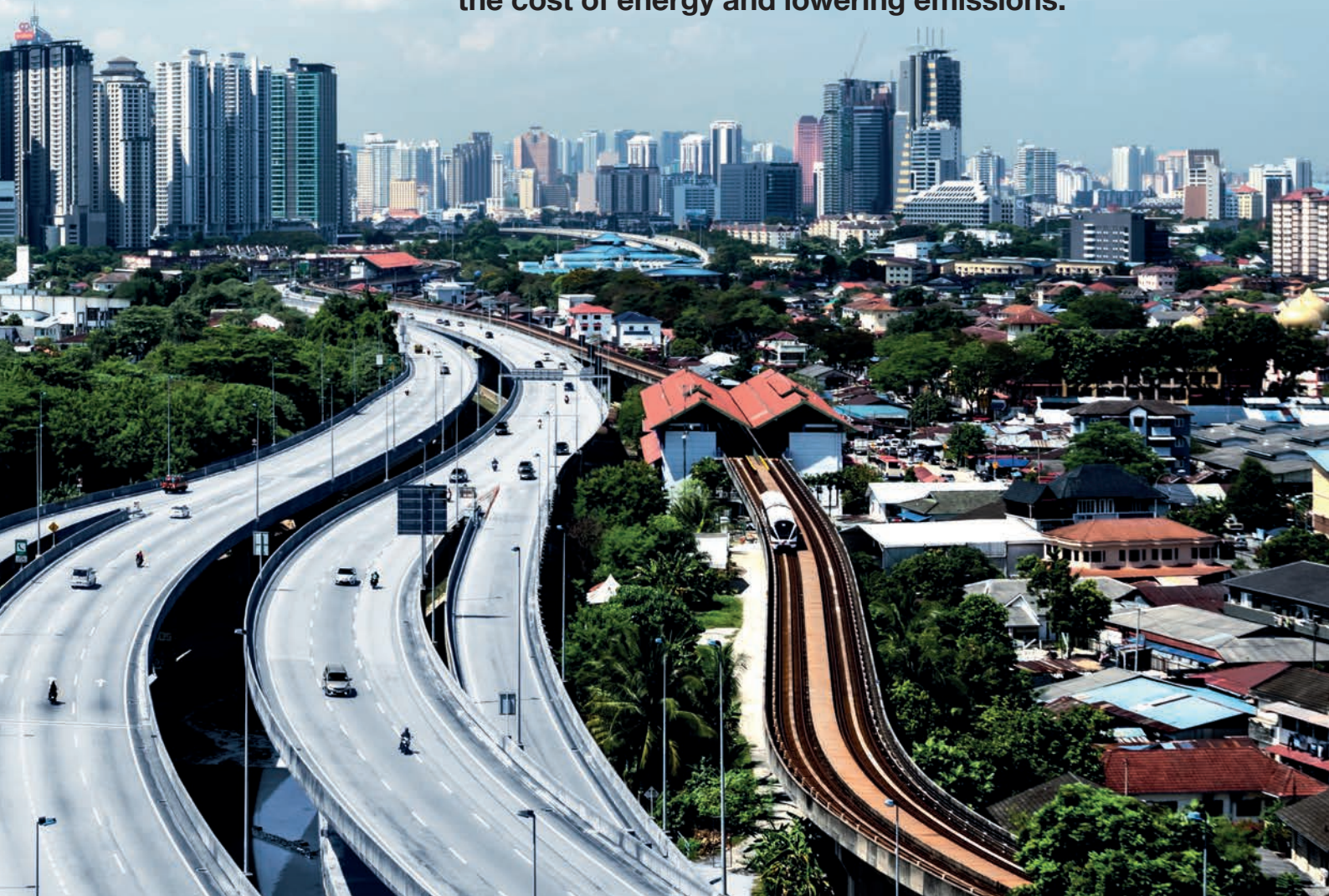
Cost-effective power generation and management

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. Businesses, public infrastructure developments and the quality of life of millions of people depend on the energy supplied by utility companies.

Our aim is to help you strengthen your competitive position and profitability. We ensure you can look confidently into the future by applying flexible technology concepts, integrating renewables, reducing the cost of energy and lowering emissions.



Making the most of change

A time for challenges and opportunities

Supplying energy is a serious responsibility in our changing times. Around the world, utility companies are facing many different types of challenges: from coping with growing demand and unexpected peaks to modernizing grids with climate friendly technologies. Market liberalization adds another layer of complexity. And, in the end, whether public or private, utility companies have to be cost effective.

Total EPC capability

A power plant project has many steps from development to operation and can easily run into delays when many different suppliers are involved. We have worldwide 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.

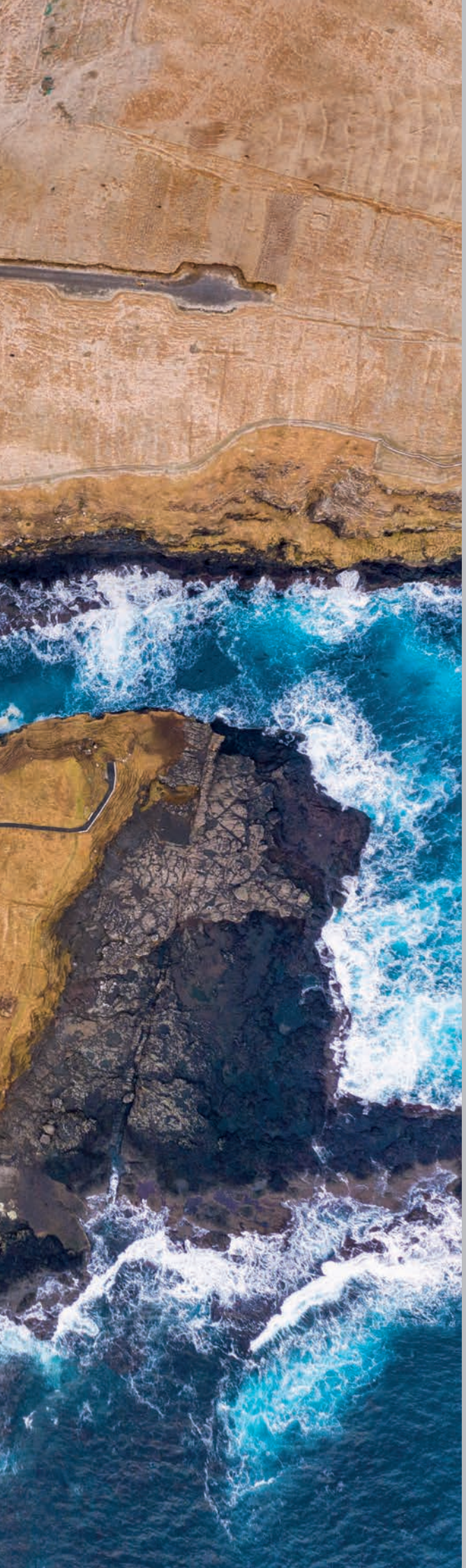
Future-proof solutions

Cost-effective production of electricity demands innovative solutions: using available fuels, combining different technologies, managing load fluctuations and balancing capital and operational expenses. Working in partnership with utilities, we can help create resilient and flexible power grids that are low in operational costs and compliant with environmental regulations.

Partner for reliability and innovation

Building on decades of MAN innovation, we can help secure clean and efficient energy supplies for your customers. Our area of expertise includes smart solutions for base load electricity, grid stability and energy storage.

Innovative solutions for utilities



Create security

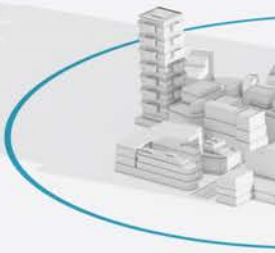
Base load electricity

Utility services are expected to run smoothly in the background, fulfilling their customers' demands for a reliable power supply at a reasonable price. We'll make sure you can satisfy the highest expectations even in the most remote corners of your grid.

Value in dependability

The ideal solution for reliable base load supply comprises many factors. Firstly, it should allow for continuous full, part and low load operation. The plant must be able to react quickly to changing load demands and have back-up for emergencies. Efficient power generation should not be compromised by difficult environments (high altitude, heat, and humidity). And fuel dependency should not restrict profitability. For you, as a plant operator dealing with all these challenges, the fewer different companies and technological systems you have to deal with, the better. MAN can supply a one-source solution.

A source of trust



Thermal power plants

Thermal power plants are a proven and cost-effective way to produce base load electricity. We provide holistic, sustainable power solutions from a single source – complete with long-term service packages. Our solutions include plants that run on fossil fuels, waste and biomass.

Reliability, availability and profitability

We can provide thermal power plant solutions up to 300 MW, based on four-stroke and two-stroke engines, as well as gas or steam turbines. The engine-based gensets reach fuel efficiencies of up to 50 %, which can be further increased by another 4 % in an Engine Combined Cycle (ECC), which includes the addition of a steam turbine to make use of the engine's heat.

High flexibility in terms of load and fuel is ideal for base load services. Our solutions ensure fast starting and continuous full, part and low load operation. Efficient systems are available for liquid and gaseous fuels. This also includes bio fuels and gases, which can even be generated from organic waste.

Benefits

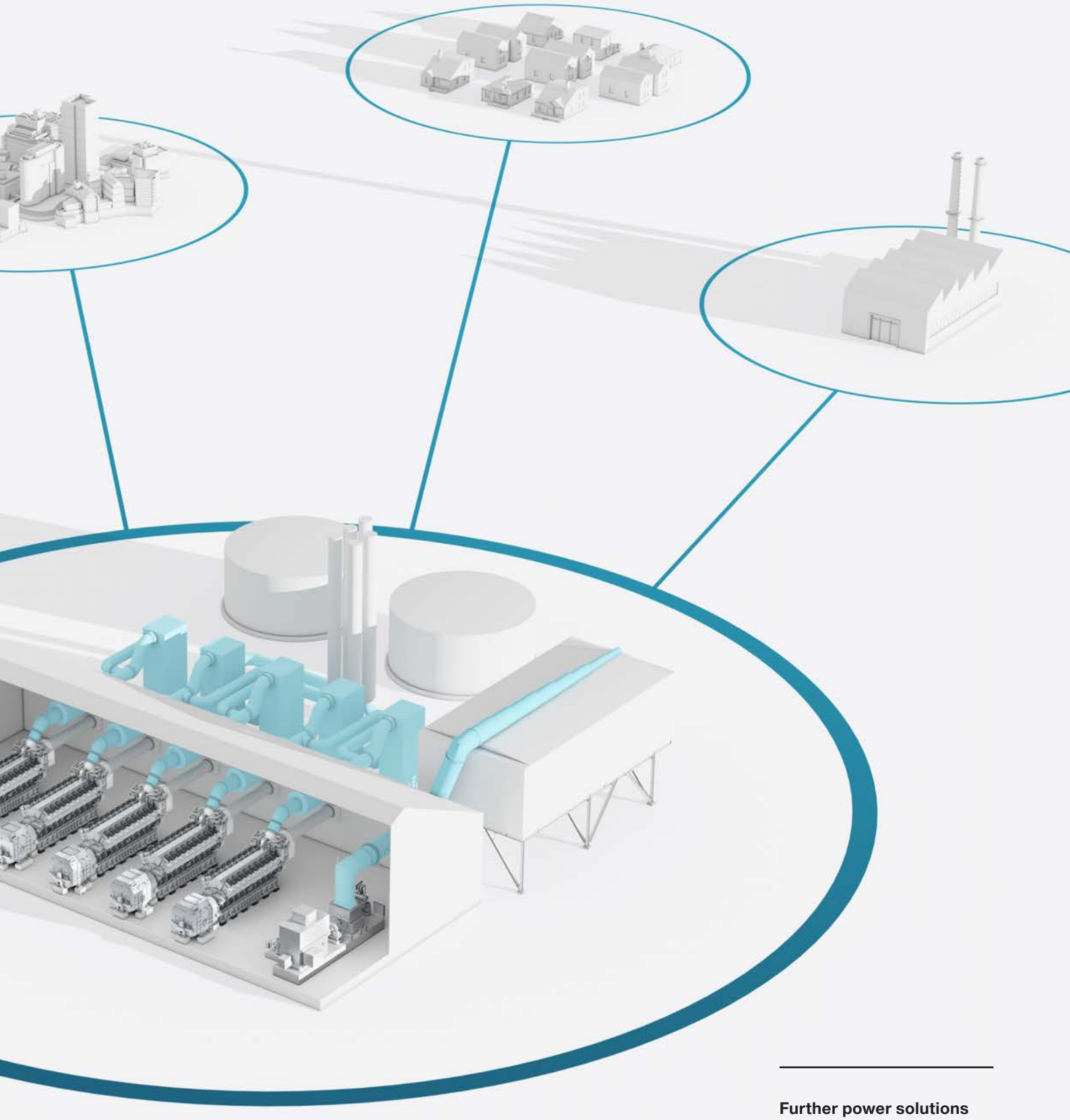
Excellent efficiency
Even in part load (up to 50 %)

Maximum flexibility
Fast starting and wide range of load profiles

One-source solution
From planning to turnkey power plants including operation and maintenance

Modular structure
For fast erection and expansion

Decentralization of the base load
Closeness to consumers reduces transmission losses



Further power solutions
LNG to power solutions
Combined heat & power
Hybrid power solutions

Ensure constant quality

Grid stability

On one side of the energy equation, there's grid stability – the quality of steadiness in power supply. On the other side, there are goals like reducing costs, lowering emissions or integrating renewables. Finding a solution requires skill and experience.

Rapid responses needed

In order to modernize the grid, to make it cost-effective and green, you have to be able to integrate renewable energy sources like wind and solar power. Given that the supply of renewables can fluctuate, this requires new techniques for managing and storing energy.

If supply and demand can change rapidly, the response must be just as rapid. Constant grid stability requires the installation of highly flexible peak and backup capacity. MAN can provide the intelligent energy management system required for hybrid energy control.

Strong and steady service

Hybrid power solutions

Discover a cost-effective way to integrate renewable resources in utility grids. Hybrid power solutions help you deal flexibly with fluctuating demand and supply conditions. A hybrid power solution can also include highly flexible peaking and backup plants.

Storage for reliability

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

Increasing the share of renewables not only lowers your CO_2 footprint but reduces energy costs. To keep the energy system dynamic and dispatchable, it is necessary to store these fluctuating energy supplies and integrate fast-reacting components.

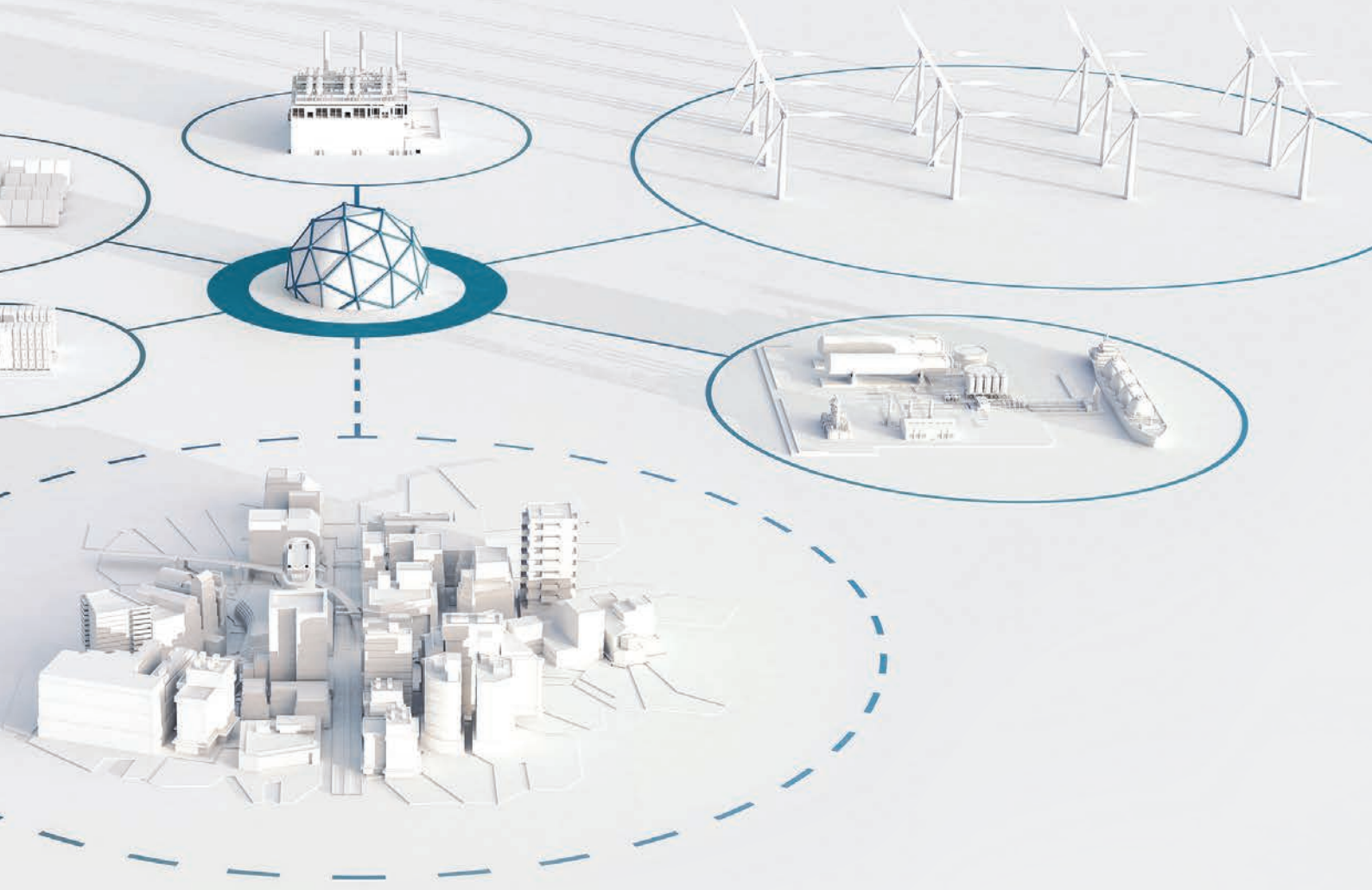
Storing surplus energy and using instant power top-ups from engine and turbine gensets fueled with gas, biofuels or even synthetic fuels can make wind and solar power systems more reliable. The MAN energy management system ensures reliable operation at optimum levels. Using MAN gas engines or turbines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

Benefits

Lower emissions and CO_2 footprint
Making the most of renewables

Increased grid reliability
Enhanced flexibility with large-scale use of renewables

Reduced cost of energy
Thanks to lower energy wastage and fuel flexibility



Further power solutions
Thermal power plants
Energy storage solutions

Harness the forces of nature

Energy storage

Renewable energy used to be a challenging commodity to manage, because it couldn't be stored. A whole range of new technologies is making profitable energy storage possible by enabling grids to become more flexible and participate in sector coupling.

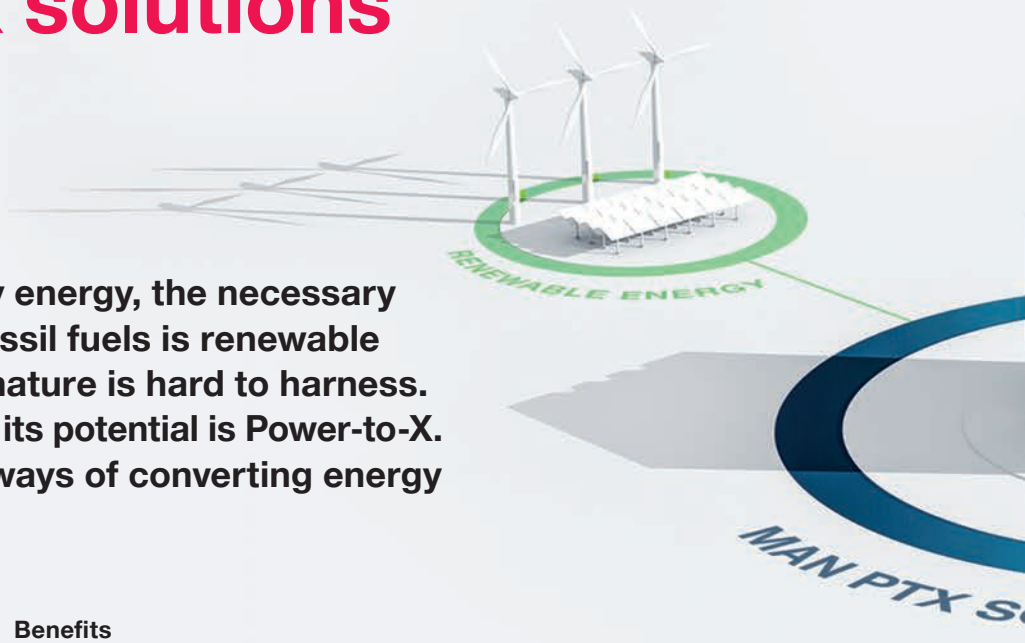
Smooth integration for maximum value

As the share of renewable energies increases, so does the need for so-called 'demand response' solutions that can compensate fluctuating electricity yields from the wind and sun. Using decentralized RES reduces the rotating mass, consequently reducing the instantaneous reserve of the grid.

Smart storage solutions help you use renewables to their full extent. At the same time, they open up new business opportunities in sectors such as transport, heating or cooling and allow you to be successful in energy arbitrage.

Sustainable energy

Power-to-X solutions



In a world that is driven by energy, the necessary and clean alternative to fossil fuels is renewable energy. But the power of nature is hard to harness. An effective way to control its potential is Power-to-X. MAN has developed new ways of converting energy into storable fuels.

Diversify your power stocks

MAN Power-to-X solutions turn energy into gas or liquid fuels. Once transformed into fuel, energy can be stored or used directly in sectors such as heating or transport. It means that electricity should no longer be considered as a final product. It can even be converted into chemicals for industrial processes.

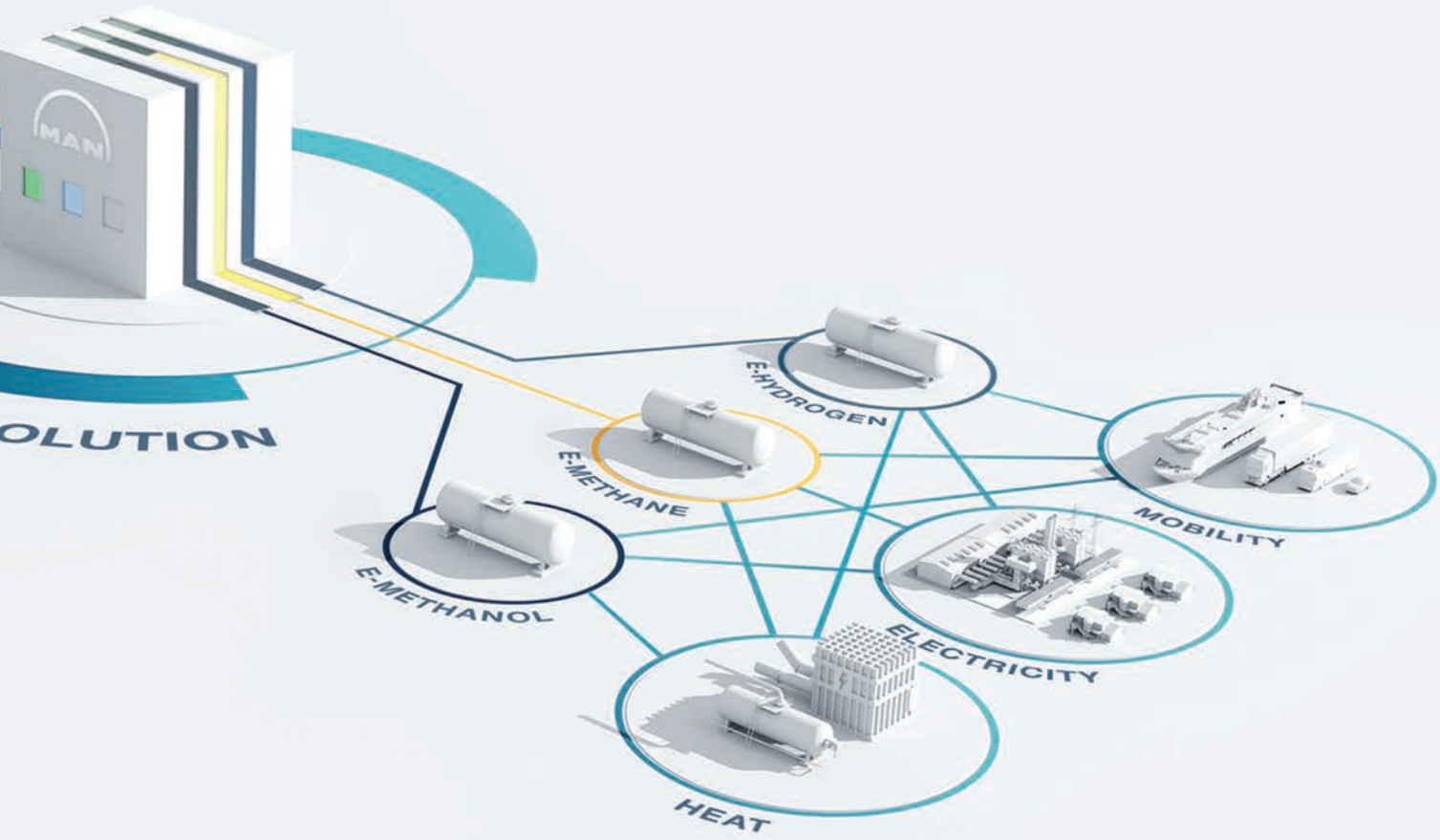
Power-to-X technology is modular, so it does not require massive investments. Existing gas infrastructure can be used for transport and storage. This helps integrate high shares of RES into the power system, ensuring smooth and sustainable grid services. Effectively managing the surplus produced from renewable resources is economically beneficial and contributes to the goals of the Paris Agreement.

Benefits

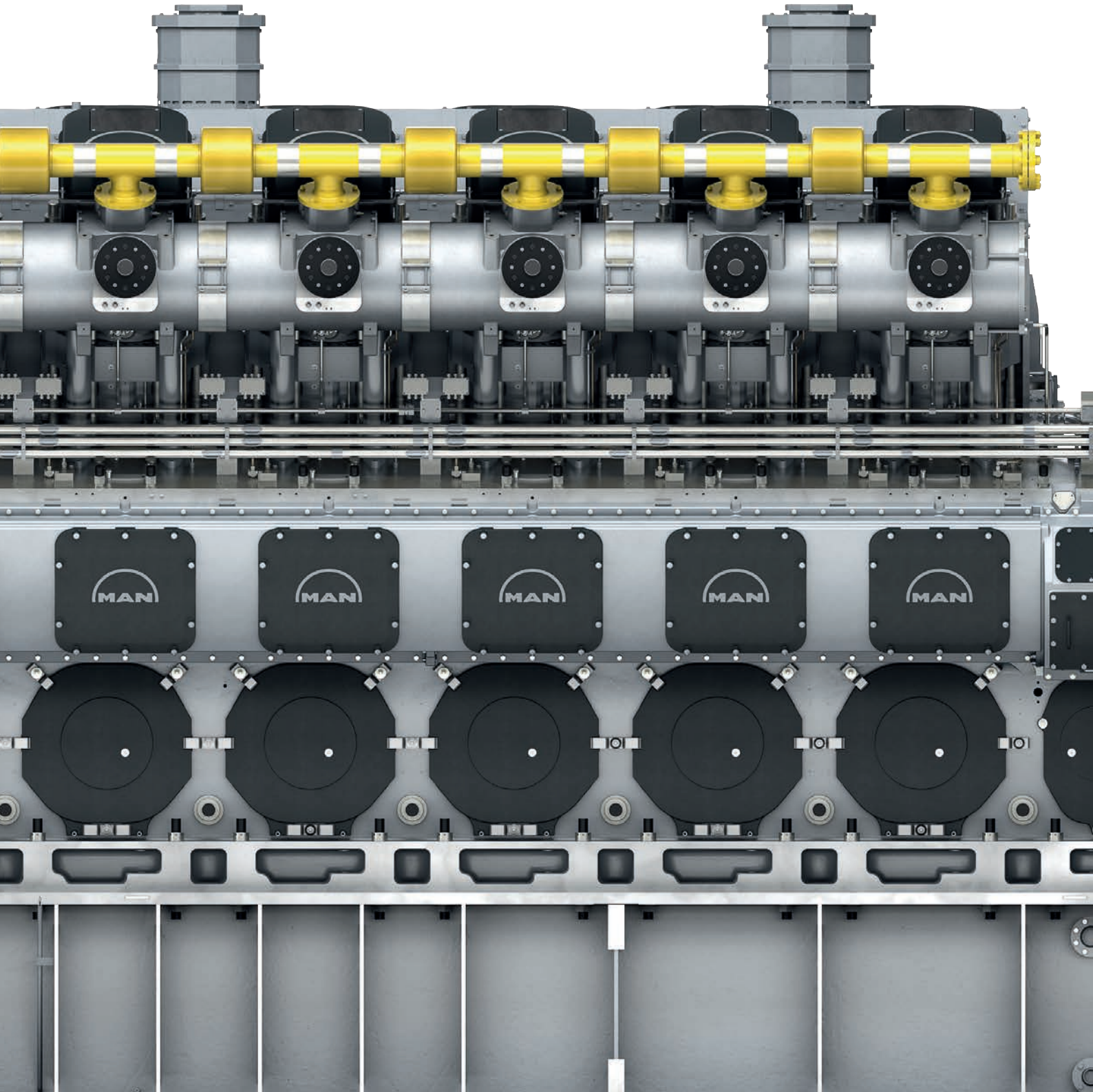
Flexibility of application
Ideal for sector coupling

Low environmental impact
Integration and storage of renewable energy and reduction of CO_2 emissions

High overall efficiency
Energy cost optimization and creation of new revenue streams



Further power solutions
Molten salt energy storage
Electro-thermal energy storage
Battery energy storage system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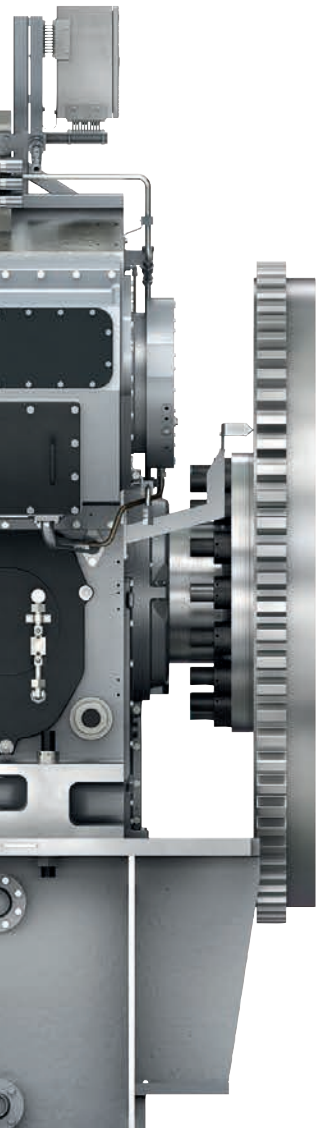
Secure your supply MAN engines



The genius of gas

Gas is widely available and generally cheaper than other fossil fuels. It drastically reduces emissions compared to other fuels. 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.

Dual fuel flexibility

MAN dual fuel engines switch seamlessly between gas and diesel operation, delivering maximum output flexibility and reliability in both two-stroke and four-stroke designs. Our dual fuel engines are environmentally friendly and comply with international environmental requirements. Modular design supports fast realization times and the easy extension of existing power plants. Dual fuel 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.

Liquid fuel work-horses

MAN two-stroke and four-stroke diesel engines are renowned for their fuel flexibility and high fuel efficiency. They burn HFO, diesel, crude oil and liquid biofuels. They are also agile, with fast starting and ramp-up capability as well as high part load efficiency and low load operation capacity. MAN exhaust gas after-treatment technologies can be used to meet strict international emission levels.

Benefits

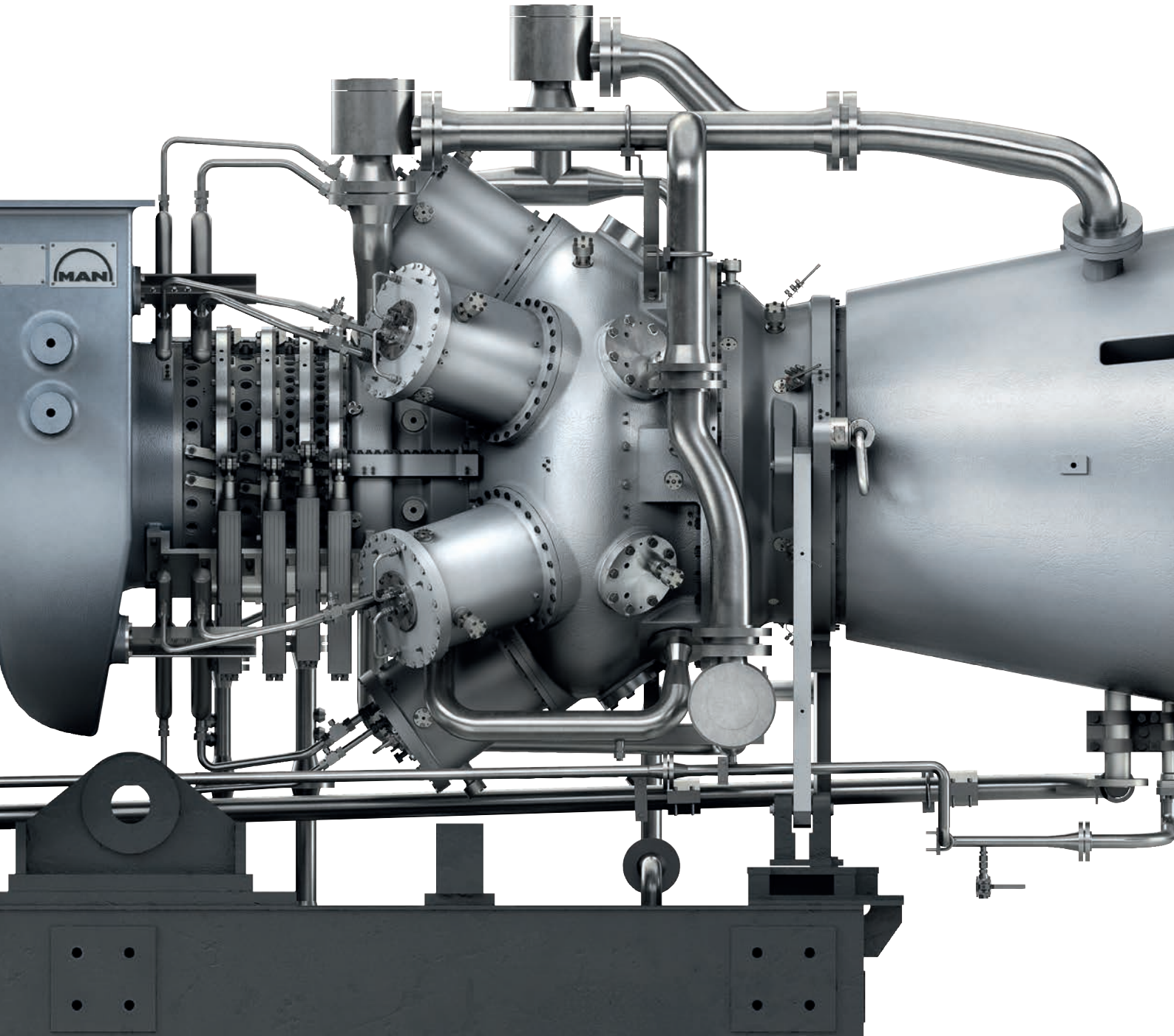
Most powerful gas engine on the market
Highest power density

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


MAN

Raise the bar on efficiency

MAN gas & steam turbines

State-of-the-art gas

The MAN gas turbine portfolio for power generation covers the range of 6-13 MW. The focus is on high-efficiency operation, high availability, fast start-up as well as start 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.

Modern steam

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 180 MW.

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 a remote monitoring solution that empowers you to maximize the efficiency, safety and availability of your MAN machinery and helps you reduce OPEX through proactive maintenance and performance optimization.

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.

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