



Enhancing power plant availability

Generator circuit-breakers Portfolio

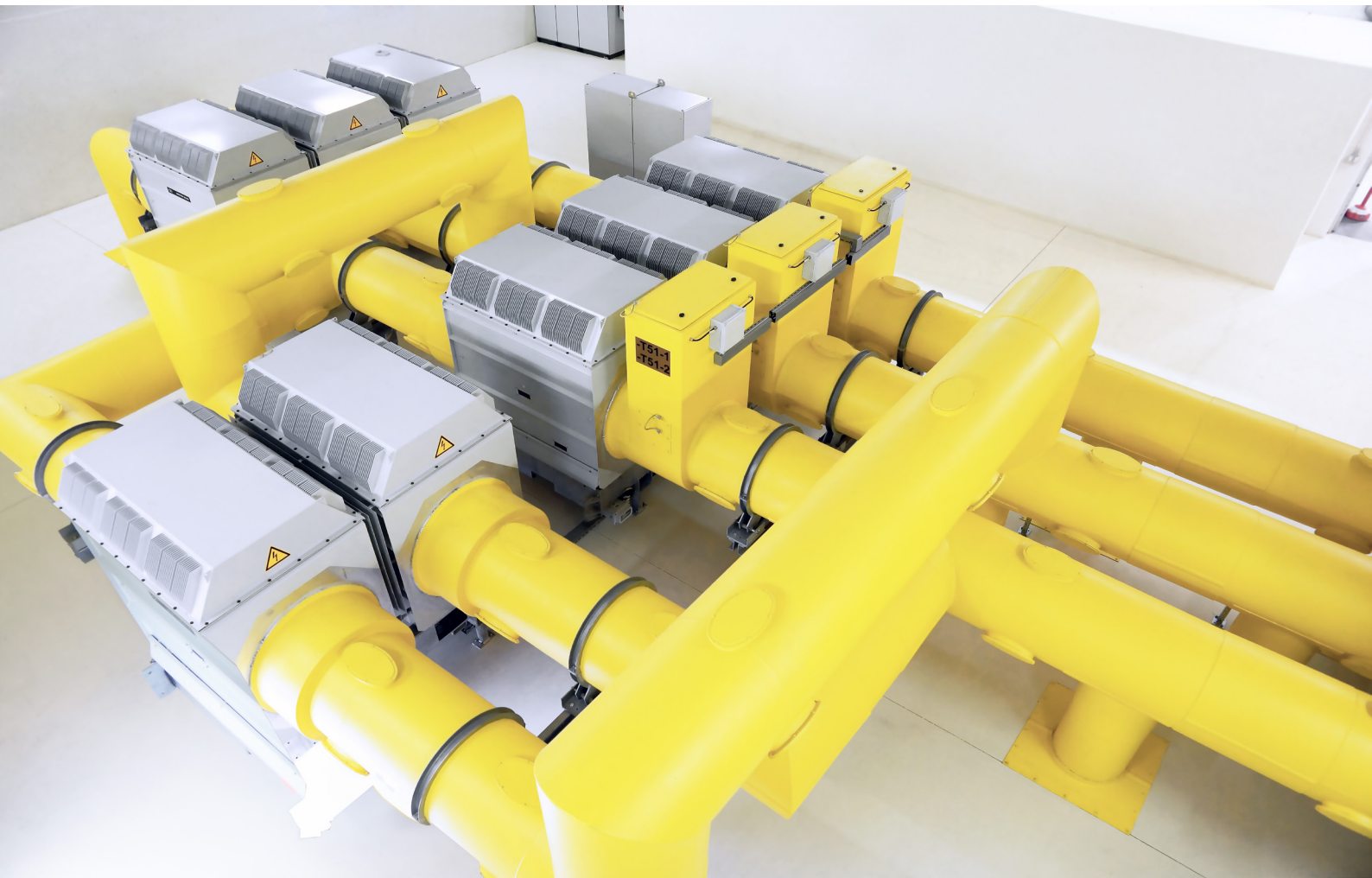
Increasing operational availability, safety and flexibility

At Hitachi Energy we use leading open digital platforms to bring our grids into the age of the sustainable energy future. We are contributing with pioneering solutions that are making the world's power grids stronger, smarter and greener.

Hitachi Energy is a leader in the design and manufacturing of generator circuit-breakers (GCBs) since 1954 with more than 8,000 deliveries in over 100 countries. We offer the widest and most modern portfolio of GCBs in SF₆ and vacuum technology with a range of short-circuit current ratings from 50 kA to 300 kA and nominal currents from 3,150 A to over 50,000 A to meet the demand of all types of power plants around the globe.

GCBs protect the important assets in power plants such as generators and transformers by clearing potential harmful short-circuit faults in tens of milliseconds preventing severe damages and possibly lengthy plant downtime.

Hitachi Energy GCBs serve all types of power plants around the globe to increase both safety and flexibility. With world-leading technology, they meet customers' needs, to achieve the highest possible plant availability at the lowest possible cost.



Wide range of technological and economic benefits



SIMPLIFIED OPERATIONAL PROCEDURES

- Clear and logical plant arrangement
- Clearly defined responsibilities for the operation of the plant. GCB is operated by the power plant owner while high-voltage breaker is controlled by the grid operator
- No auxiliary supply changeover necessary. Only one circuit-breaker has to be operated during the starting-up or shutting-down of the generator



ECONOMIC ADVANTAGES

- Disconnectors, earthing switches, instrument transformers, surge arresters etc. can be integrated into the GCB enclosure
- Station transformers and relevant high-voltage and medium-voltage connection equipment can be omitted
- Increased power plant availability means higher profits for the operator



IMPROVED PROTECTION

- The differential protection zones of the generator and the transformers can be arranged to achieve the maximum selectivity
- More protection for transformers as generator-fed short-circuit faults are interrupted within a maximum of four cycles whereas the de-excitation equipment requires several seconds

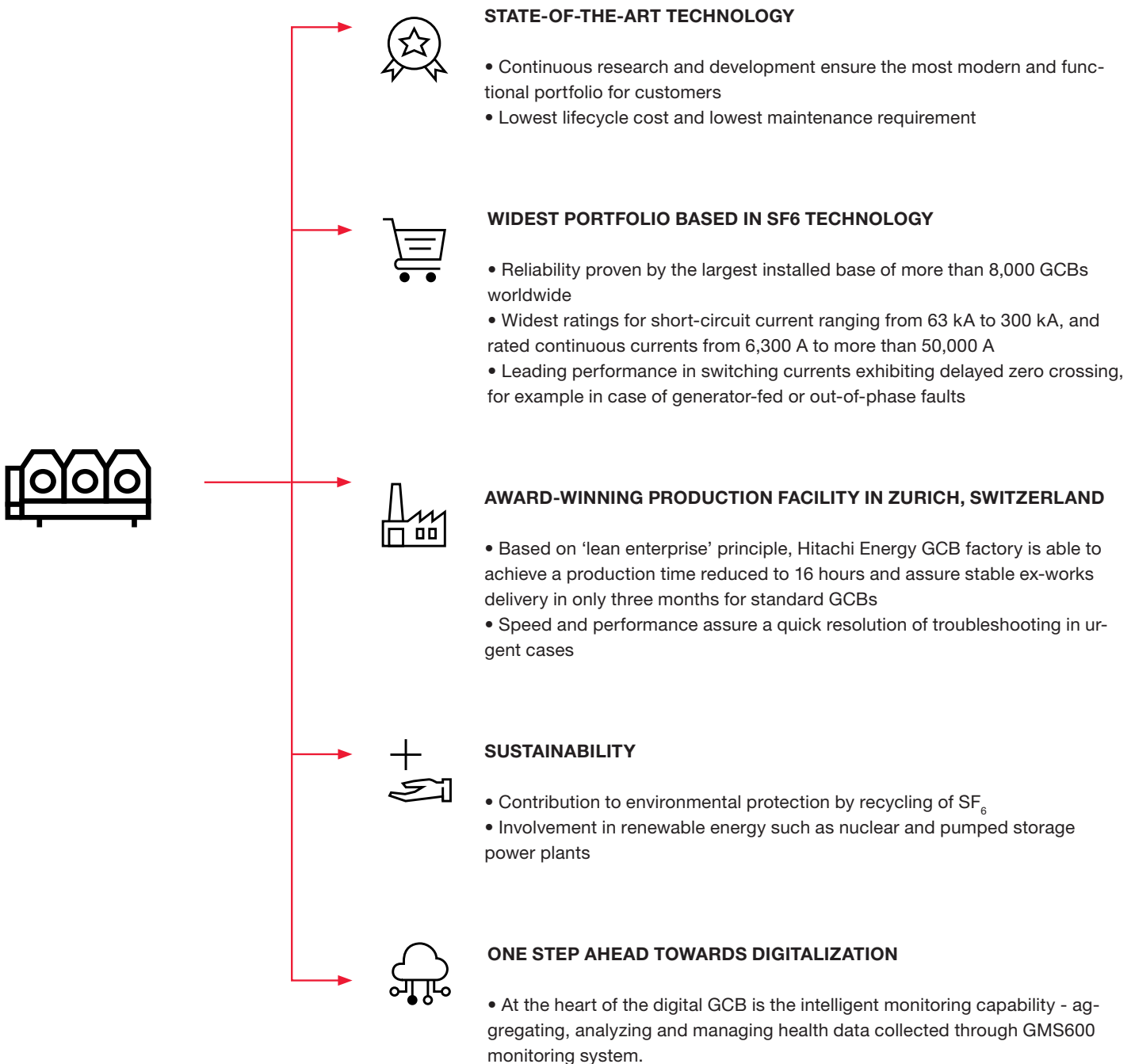


HIGHER POWER PLANT AVAILABILITY

- Reduced possible costly damages of primary and secondary equipment in case of failure
- More reliable synchronization of the generator with the high-voltage transmission network
- Unit auxiliaries' supplies can be drawn directly from the high-voltage transmission network

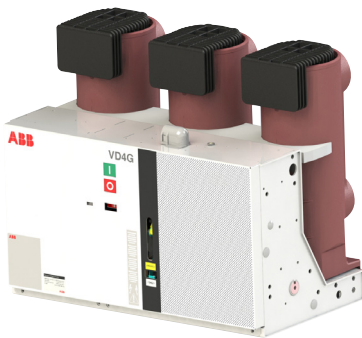
Hitachi Energy GCBs offer the best value in products and services

As a global leader for GCB, Hitachi Energy strives for excellence in technology and processes, never compromising in quality.



VD4G-50

up to 63 kA – 4,000 A

**Cost-optimized solutions for generators up to 90 MW**

Hitachi Energy offers GCBs with both vacuum and SF₆ switching technologies. Based on the well-proven and highly reliable VD4 platform, VD4G-50 and VD4G-63 are type tested according to IEC/IEEE 62271-37-013. It is capable to interrupt generator-source short circuit current of 37 kA showing a delayed current zero up to 130 percent degree of asymmetry as per G2 class.

HVR-63

up to 63 kA – 8,000 A

**The first built-in mechanical erosion indicator for arcing contact**

The innovative built-in direct contact erosion indicator offers a clear visualization of the remaining length of the arcing contact for the highest degree of safety and reliability. HVR-63 is best suited for retrofit in power plants with a unit power of up to 200 MW. The open design and small footprint make it perfect for systems with open busbar and short-circuit ratings up to 63 kA. The HVR generator circuit-breaker is available as HVR-63XS with rated continuous currents up to 6300 A or as HVR-63S with rated continuous currents up to 8000 A. Both variants offer flexible busbar connection.

HVS-63S

up to 63 kA – 7,150 A

**The most reliable system solution with the contact erosion indicator**

HVS-63S is a complete 3-phase system type solution, which is based on the highly reliable technology of HVR-63. HVS-63S offers a clear visualization of the remaining length of the arcing contacts for the highest degree of safety and reliability. It is designed to have low environmental impact with only 5.1 kg of SF₆ in three poles and a leakage rate lower than 0.1 percent per year.

GMS600 Monitoring System



State-of-the-art monitoring for GCB

GMS600 provides valuable insights on GCB operational parameters enabling preventive and predictive maintenance. Built on the well-proven technology, it offers unique features such as SF₆ gas monitoring and trending (GMS600-G), temperature monitoring of primary conductors (GMS600-T) and ablation monitoring (GMS600-A). In addition, it is also able to provide operating mechanism supervision. GMS600 can be integrated in new GCBs or retrofitted into existing GCB applications. Ablation monitoring with GMS600-A, is the first product in the market that is able to measure online contacts overlapping time and give indication of the ablation without the need to go out of operation. It supports the overall increase of power plant safety and availability whilst enabling cost-effective lifetime management by the innovative Value Based Customer Care (VBCC) concept of Hitachi Energy.

HECS

up to 130 kA – 23,500 A



Highest installed base worldwide

The wide range of ratings with short-circuit currents from 80 to 130 kA makes HECS the most used GCB in the world for power plants with a unit power of up to 800 MW. With small and standardized dimensions HECS is easy to install and highly suitable for replacements and retrofits in existing power plants. HECS has very low lifecycle cost with up to 20,000 close-open (CO) no-load operations or 20 years between main overhauls.

HECPS

up to 130 kA – 17,500 A



Unique solution for pumped storage power plants

The generator circuit-breaker system HECPS is one integrated solution which provides all functions required by pumped storage power plants (PSPP) in one system and from a single manufacturer. The integrated solution HECPS is delivered fully assembled to minimize the installation and commissioning time at site. HECPS has been designed to meet the requirements of IEC/IEEE 62271-37-013 and in some respects, its performance even exceeds the minimum requirements of this standard.

HEC 7/8

up to 210 kA – 28,000 A

**One step ahead in SF₆ technology**

HEC 7/8 is suitable for power plants up to 1,600 MW. Naturally cooled up to 25,000 A, its arc interrupting technology allows to clear fault currents exhibiting very high degree of asymmetry up to 130 percent. It is also recommended for retrofits or replacements of old generator circuit-breakers based on air-blast technology.

HEC 9

up to 300 kA – 33,500 A

**The most powerful GCB in the world**

HEC 9 has been developed for large sized power plants up to 2,000 MW such as nuclear and coal fired. It has the world's highest performance with short-circuit currents up to 300 kA and is also highly suitable for retrofits or replacements of old GCBs based on air-blast technology. It is highly reliable in case of seismic events, such as earthquakes, as tested according to IEC/TR 62271-300 standard.

HEC 10

up to 210 kA – 29,000 A

**High performance system solution**

Based on well proven benefits of HEC technology, the newly developed HEC 10 interrupting chamber encompasses almost two decades of successful GCB field operations. It is type-tested according to IEC/IEEE 62271- 37-013, including switching with full-phase opposition fault current (180° out-of-phase). Both main and arcing contacts of circuit-breaker are fully in SF₆ for safe and reliable power plant operations. The disconnecter is fitted in series with the main contacts of the circuit-breaker to provide safe and visible isolation between the step-up transformer and the generator. The solution is available with fully integrated starting switch for gas turbine application with short-circuit current rating meeting IEC/ IEEE 62271-37-013 latest standard.

We offer full consultancy, services and trainings to support our customers

Application study group

A highly competent team of GCB experts is available to support customers in the proper selection of GCB during all phases of power plant design. Competence is available to find the best solution for each customer, from the simplest question to the most complex analysis.

Service

We help customers to ensure the reliability and safety of their operations at optimized cost. Hitachi Energy's service supports our customers over the entire lifetime of equipment covering all essential parts to give the GCB a longer life. A team of experts is available to deliver the following benefits:

- 24/7 hotline
- Certified GCB field service engineers located in our local service organizations around the globe
- Customized maintenance and retrofit solutions to extend the lifetime of GCBs
- Options to adapt your GCB to future requirements including rating upgrades and modernizations

Trainings

Fully-equipped training centers are available to all customers located in strategic areas. GCB training programs are available in the training centers or at the power plants covering a range of topics to enable customers to:

- Ensure safe operation of the investment
- Allow a cost-efficient performance of the breaker
- Guarantee a risk-free utilization
- Reduce risk of unexpected downtimes
- Minimize lifetime cost of the breaker



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