

SERVICES

For Generator Circuit Breakers

Power generation operators rely on plant availability and reliability to deliver on their objectives. Achieving this requires limited planned outage time for substation maintenance and zero tolerance for unscheduled interruption in energy supply.

The Generator Circuit Breaker (GCB) is a critical component of the electrical balance of plant, providing safe and fast protection to eliminate faults between the generator and transformer. The GCB simplifies plant operations and maintenance as work can be carried out in isolation from the HV substation.

Grid Solutions at GE Vernova

Grid Solutions provides a comprehensive set of services to help increase the lifespan of the GCB, while drastically reducing the risk of failure and collateral damage to the generator and transformer. According to the GCB's model, age, operating conditions, and ratings, grid Solutions can provide services including:

- Preventive maintenance program
- Digital condition assessment
- Spare parts safety stock
- Troubleshooting
- Upgrade and replacement

Our multi-year service agreements focus on plant performance and outcome-based solutions to help power generation operators to enhance plant availability to expected levels.

Applications

Our GCB service offerings enable plant operators to safely protect and simplify the operation of the HV substations for power plants that range from 50 to 1,500 MW and support the following applications:

- Steam and combined cycle power plants
- Renewable power plants
- Pumped storage power stations
- Electro-intensive industries



Increased Availability

- Up to 45% reduction in unscheduled downtime with preventive maintenance
- Reduced planned outage for condition assessment with non-intrusive inspection

Improved Predictivity

- Reduced repair cost and improved maintenance plans
- Accelerated return to operation with spare part safety stock program from 5 months to 1 week in event of failure
- Diagnosis and recommendations delivered by our experts

Safer Environment

- Reduced SF₆ leakages with regular maintenance, and online monitoring
- Highly secure environment for field operators with non-intrusive inspections

Extensive Experience

- 40+ years of expertise in equipment design, manufacturing and service
- 3,000+ high voltage generator circuit breakers installed worldwide



GE VERNOVA

Preventive Maintenance

With this program, key components within the GCB are checked and maintained on a periodic basis. This ensures that the GCB runs at optimal performance while reducing maintenance costs in the long run. Budgets and onsite work can be planned up to a year in advance and scheduled within generator outage planning.

The program consists of the following periodic activities:

Once a year: A visual external check is performed while the asset remains in operation

Every 5 years: A health diagnostic, within a scheduled outage, is performed including the following measurements:

- Timing test
- Dynamic and static contact resistance measurement
- Electrical testing including interlocks
- SF₆ densimeter check
- SF₆ pressure adjustment
- Mechanism checks

Every 10 or 20 years: Upgrade or replacement of the mechanism and renovation of the pole is performed taking into account the model, number of operations, electrical wear limit and the diagnostics from the previous periodic activities.



Preventive maintenance onsite work can be scheduled in advance within the generator outage planning.

Non-Intrusive Inspections

Travel measurement

Assess the mechanical behavior and damping system of the generator circuit breaker



Digital Scan

Assess the condition of the insulation and inner parts

Dynamic Contact Resistance Measurement

Assess the condition of the main and arcing contract

Digital Condition Assessment

This program provides an accurate status of the health of the GCB and includes the following solutions:

Online Monitoring Solution

Grid Solution's CBWatch3 solution is applicable on all GCB brands and provides a real-time view of all functions including:

- SF₆ gas density, alarms, trends
- Operating times, speed and number of operations
- Spring mechanisms recharging time and efficiency
- Current measured during interruption and arcing time and arc energy calculation
- Auxiliaries voltage, heating, coil continuity and contact switching position



Online monitoring solution CBWatch3.

Non-Intrusive Inspections

When the asset reaches midlife, Grid Solution recommends a comprehensive condition assessment with a non-intrusive inspection of the insulation part and mechanism. The result of the measurements is used by our experts to scope and schedule the needed maintenance activities with the associated budget.

Spare Parts Safety Stock

The Spare Parts Safety Stock accelerates the return to operation in case of unexpected failure.

Grid Solutions at GE Vernova customizes the safety stock content based on customer requirements.

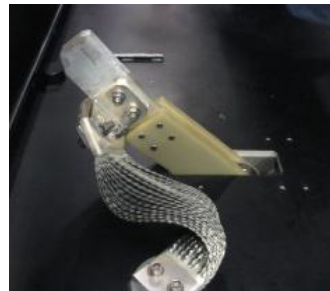
Components can include:

- Switches
- Current and voltage transformers
- A selection of motor and mechanism parts

Grid Solutions can also support groups of customers within the same region by defining the process and content of a shared safety stock that meets their specific needs and constraints.



GCB - Active Parts



GCB - Switch

Troubleshooting

When a minor or major failure occurs, GE Vernova provides a trouble-shooting service that provides fast and reliable support to understand the issue and recommend immediate corrective action that should be taken.

Our technicians can be reached by phone, message or chat 24/7, with support delivered in the requested language. When necessary, our field engineers can exchange information with GE Vernova certified experts remotely through smart helmet devices.

GE Vernova's GCB Service Worldwide Center of Excellence, located in France, supports the regional field teams and customers with extensive technical troubleshooting and repair capabilities including:

- High-voltage dielectric, electronic and mechanical testing capabilities
- Training centers with hands-on capabilities
- Certified ISO 9001, ISO 14001 and OHSAS 18001



High-voltage dielectric, electronic and mechanical testing capabilities at GE Vernova's GCB Service Worldwide Center of Excellence.

Upgrade

Grid Solutions at GE Vernova delivers turnkey solutions for generation circuit breakers when they become obsolete and can support power plants to increase capacity while saving on maintenance cost.

Upgrade solutions include:

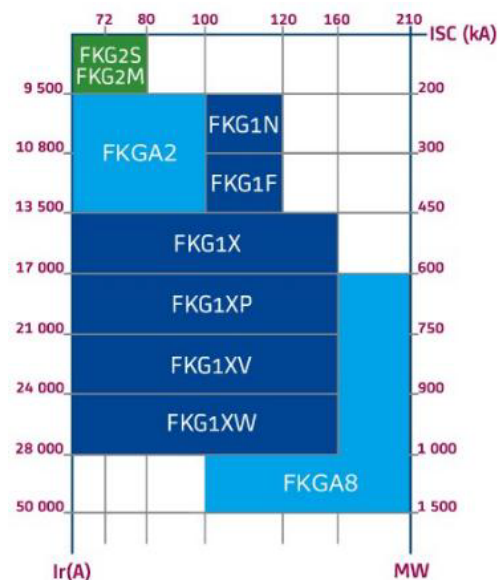
- Cooling system upgrade
- Cover upgrade
- Operating mechanism replacement/lage, heating, coil continuity and contact switching position

Replacement

We provide turnkey solutions to replace all types of GCBs with our FKG range. For existing plants that operate without GCBs, Grid Solutions can design the installation of a new FKG.

Working with the customer, we provide:

- Site assessment
- Design of the engineered solution ensuring minimum site modification
- Installation, test and commissioning of the new system



GE Vernova's FKG range is available from 50 to 1500 MW and is one of the most reliable technologies with a full spring mechanism and SF₆ insulation as stated in CIGRE 2012-A3.206 report.



In the last decades, Grid Solutions cooperated with customers to replace over 200 generator circuit breakers worldwide.

Multi-Year Service Agreements and Outcome-Based Contract

Multi-year agreements and outcome-based contracts provide power generation operators and industries a long-term reliability and availability of their Electrical Balance of Plant (EBoP) systems. Costs are contractually guaranteed while onsite jobs can be planned months ahead during scheduled outages.

Fully integrated within our global solution for EBoP, the customized multi-year contracts can include:

- 24/7 support
- Outage & contingency planning
- Maintenance and operations
- Obsolescence and spare parts management
- Monitoring, Grid APM and digital platform
- Upgrades, overhaul and repair
- Fleet management for all brands of GCB

Through outcome-based contracts, Grid Solutions can ensure the performance and the availability of the EBoP equipment, including generator circuit breakers from all brands and types of technology. The contractual set-up is tailored to serve the power plant operators' objectives.



For more information, visit
gevernova.com/grid-solutions



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