



Services

For Generator Circuit Breakers

Power generation operators rely on plant availability and reliability to deliver on their objectives. To achieve 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.

GE's Solution

GE provides a comprehensive set of services to help increase the life span of the Generator Circuit Breaker (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, GE can provide services including:

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

GE's multi-year service agreements focus on plant performance and outcome-based solutions to help power generation operators to optimize plant availability to expected levels.

Applications

GCB's service offerings enable plant operators to safely protect and simplify the operation of the High Voltage (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 optimized 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 GE 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



Preventive Maintenance

With this program, key components within the Generator Circuit Breaker (GCB) are checked and maintained on a periodic basis. This ensures that the GCB runs at optimal performance while reducing maintenance cost 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 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
- Mechanisms 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.

Digital Condition Assessment

This program provides an accurate status of the health of the Generation Circuit Breaker and includes the following solutions:

Online Monitoring Solution

GE'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 CBWatch 3.

Non-Intrusive Inspections

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

Non-Intrusive Inspection Methods

Vibration Monitoring

Assess the condition of the operating mechanism 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 contact

Spare Parts Safety Stock

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

GE customizes the safety stock content based on customers requirements.

Components can include:

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

GE 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 provides a troubleshooting service that provides fast and reliable support to understand the issue and recommend immediate corrective action that should be taken.

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

GE 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 on-hands capabilities
- Certified ISO 9001, ISO 14001 and OHSAS 18001



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

Upgrade

GE 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:

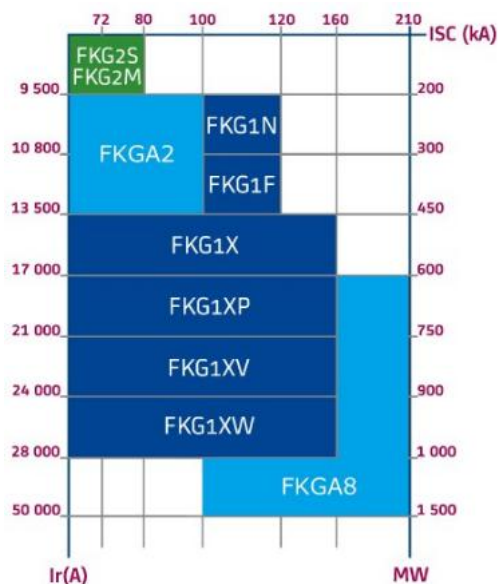
- Cooling system upgrade
- Cover upgrade
- Operating mechanism replacement

Replacement

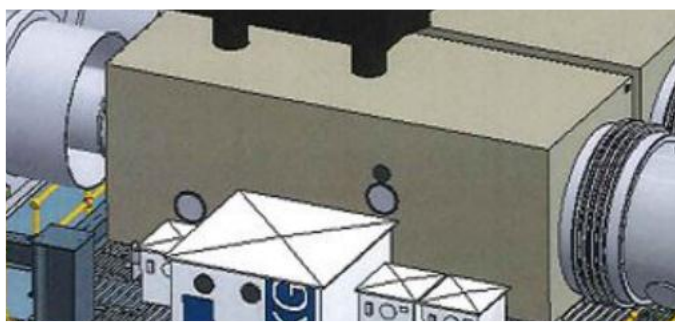
GE provides turnkey solutions to replace all types of GCB with GE's FKG range. For existing plants that operate without GCB, GE can design the installation of a new FKG.

Working with the customer, GE provides:

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



GE'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, GE cooperated with customers to replace over 200 generator circuit breakers worldwide.

Multi-Year Service Agreement 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 GE 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 generator circuit breakers

Through outcome based contracts, GE can ensure the performance and the availability of the Electrical Balance of Plant 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.



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Imagination at work