Most generators are in use over many years. Operating stresses and aging can cause successive damage to various components such as the high-voltage insulation. Greater flexibility requirements with an increasing number of starts and stops, changes in grid requirements and instabilities also contribute to increased stresses.

On-line monitoring can help with early detection of changes in the stator bar insulation. This should ideally prevent unscheduled and expensive outages and enable the scheduled implementation of measures for service life extension.

Electrical faults generally do not occur suddenly in high-voltage components such as generators. Such faults frequently develop with partial discharges that bridge parts of the high-voltage insulation. These discharges can be detected using high-frequency measurement methods. The insulation of the high-voltage components can be damaged depending on the intensity and location of the partial discharges, and in some circumstances even result in failure of the insulation.

**Our solution**

The modular GenAdvisor™ platform* provides various systems for monitoring Siemens generators as well as generators from other manufacturers. Each system can be implemented individually or in combination with a central server and other monitoring systems.

Our GenAdvisor partial discharge monitoring is based on coupling capacitor sensors that are installed in or near the generator, such as on the generator main bus bars. The signals from the sensors are transmitted to a data acquisition unit in the turbine building. All relevant data is stored there and can be downloaded for diagnosis purposes. Expansion of the system with a server enables monitoring of up to 20 generators and central storage, display and comparison of the data. The server can be integrated in any I&C systems such as the SPPA-T3000 or in plant information systems such as the PI server and WinTS. These systems can be used to automatically transfer the data to the Siemens Power Diagnostics Center** for further analysis.

**Features**

The most powerful method for detecting partial discharges is the analysis of the phase resolved partial discharge pattern (PRPD pattern). These patterns indicate the distribution of partial discharge pulses relative to the phase angle of the alternating current and provide a visual representation of partial discharge behavior during a predefined measurement period. These patterns can be classified and interpreted using the international pattern catalog from the IEC/TS 60034-27-2.

The plant-specific configuration enables checking not only the generator insulation, but also the high-voltage bushings, transformer windings or grounding brushes.

The phase angle of the discharge pattern relative to the generator voltage can be displayed with the visualization software and provides information on the cause of the discharges and enables conclusions to be drawn regarding the risk for further operation of the generator.

Visualization software for representing partial discharges (center: PRPD pattern)

* GenAdvisor is a registered trademark of Siemens AG, Germany

** Power Diagnostics is a registered trademark of Siemens Energy, Inc., USA

siemens.com/power-generation-services
The generator must be disconnected from the grid for installation of the sensors in the generator or on the generator leads. The data acquisition unit can be set up and connected at any time.

References
For more than twenty years Siemens has been implementing monitoring systems that contribute to the early detection of damage during operation and the partial discharge monitor is currently installed in more than 140 generators.

Your benefits
With GenAdvisor, Siemens provides you with customized solutions for reliable on-line monitoring of generators and high-voltage equipment. Advance recommendations based on generator condition enable scheduled outages to be optimized and shortened, as necessary repairs can be planned in advance and required spare parts can be provided as needed.

GenAdvisor partial discharge monitoring – optionally also in combination with the GenAdvisor server – can provide the following advantages:
• High measurement sensitivity of sensors with high capacitance enables the detection of partial discharges deep within the generator winding
• Partial discharge measurement and analysis through the evaluation of PRPD patterns in accordance with standards IEC/TS 60270 and 60034-27-2
• Lower maintenance costs due to condition-oriented maintenance
• Better estimation of maintenance requirements with trend analyses
• Optimization of maintenance intervals and maintenance measures as well as operating service life of monitored components
• Advance warning to reduce the risk of unscheduled standstills
• Easily integrated in I&C systems (e.g. SPPA-T3000) or plant information systems (e.g. PI Server, WinTS)
• Optional connection to the Siemens Power Diagnostics Center for remote evaluation/analysis of measured data
• Optional extension with additional GenAdvisor monitoring systems such as end winding vibration or rotor interturn short-circuit monitoring

GenAdvisor partial discharge monitoring (schematic)

On-site analysis by Siemens experts