

ONLINE PARTIAL DISCHARGES

Sector: Power generation – combined cycle.

Asset: 15 kV high-voltage generator, a main asset of high criticality for plant operational continuity, and a critical auxiliary motor associated with the feedwater pump. Both pieces of equipment were assessed based on their direct impact on availability, operational safety, and economic risk in the event of an unplanned outage.

Initial situation: The plant was not showing clear process symptoms or conclusive evidence of imminent failure. However, the generator presented an aging insulation-system context and high criticality within the plant's maintenance strategy. In that scenario, the client needed to answer one specific question: maintain condition-based follow-up or prepare an internal inspection during the next scheduled outage.

The uncertainty was not in the asset's visible operation, but in the actual condition of the electrical insulation. Waiting until the outage without further evidence could expand the scope of unnecessary work or, in the worst case, leave an already active degradation mechanism untreated. Therefore, an online partial discharge assessment was proposed in order to have a technical criterion before making intervention decisions.

Work methodology:

- Installation of appropriate measurement sensors for online assessment on the 15 kV generator and the critical auxiliary motor.
- Signal normalization and calibration to ensure consistency between phases, operating conditions, and capture points.
- Data acquisition using specialized software under different load levels, with recording of activity patterns and apparent magnitude.
- Comparative phase-by-phase review to identify asymmetries, pulse concentration, and anomalous behavior versus the expected pattern.
- Correlation of the detected activity with operating history, asset criticality, and electrical service conditions.
- Risk-oriented diagnostic interpretation: differentiation between stable activity compatible with monitoring and elevated activity compatible with localized degradation of the stator insulation.



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Identified technical findings: The analysis showed higher partial discharge activity in one of the generator phases, with behavior consistent with a localized stator-insulation degradation process. In contrast, the auxiliary motor showed a stable response, with no evidence of accelerated deterioration or signs justifying an intrusive intervention in the short term.

Based on these results, the recommendation was not the same for both assets. For the generator, it was justified to prepare a focused internal inspection during the next scheduled outage, prioritizing the phase with the highest activity and avoiding a generic intervention strategy. For the auxiliary motor, the recommendation was to maintain condition-based follow-up and trend control, without unnecessarily expanding the work scope.

Conclusions: Online partial discharge measurement made it possible to turn a situation of uncertainty into a maintenance decision supported by evidence. The main value of the work was not only detecting electrical activity, but also discriminating which asset required intervention planning and which could remain in operation under controlled monitoring.

In the 15 kV generator, the higher activity observed in one phase provided an early and actionable signal of localized stator-insulation degradation. This made it possible to orient the scheduled outage toward a more technically focused internal inspection, reducing the probability of allowing a defect with major failure potential to continue evolving. In the auxiliary motor, the stability of its behavior avoided overreaction and helped preserve maintenance resources for where the risk was truly higher.

From a management standpoint, the case reinforced the use of online partial discharges as a tool for prioritization, planning, and uncertainty reduction in critical electrical assets. The methodology made it possible to anticipate decisions by 2 to 6 months, improving outage preparation and resource allocation based on actual condition rather than only age or theoretical criticality.

Indicadores de impacto:

- Estimated 20–35% reduction in the risk of unplanned outage.
- Optimization of outage scope with a 15–25% reduction in non-priority work.
- Improvement in asset prioritization criteria by 30–50%.
- Increased anticipation in decision-making within a 2- to 6-month range.
- Greater technical focus in the generator inspection and continued monitoring of the auxiliary motor, without premature intrusive intervention.

