Crawford®

FACT SHEET

Common causes of loss

Considering the challenges faced in the successful operation of renewable energy resources

Partial discharge / the corona effect

Partial discharge (PD) is a localised electrical discharge that occurs within insulation materials, such as those used in high voltage equipment. It can be caused by various factors such as voids, impurities, or other imperfections within the insulation, and can lead to insulation breakdown and eventual equipment failure if not detected and remediated promptly.

PD can have a significant impact on wind farm operations by degrading the performance and reliability of key equipment. PD can occur in a variety of wind farm components, including the generator, transformer, switchgear, cables, and other insulation materials.

In wind turbine generators, PD can occur in the stator winding insulation and can cause premature aging, resulting in reduced generator output and increased downtime. PD can also occur in transformer insulation and can lead to transformer failure and subsequent downtime.

Detection and monitoring of PD is essential, regular PD testing and analysis can help identify potential issues and enable maintenance teams to take appropriate action before equipment failure occurs.

Symptoms of partial discharge

Partial discharge may not always be immediately detectable, but there are several symptoms that can indicate its presence, including:

- **Increased noise:** PD can cause a range of acoustic emissions, including cracking or hissing sounds, which can be detected using specialised equipment.
- **Temperature rise:** PD can generate localised heating within the insulation, which can cause a temperature rise in the equipment, detectable through thermal imaging.
- **Changes in electrical signals:** PD can cause fluctuations in voltage, current, or phase angle, which can be monitored using electrical sensors.
- **Vibration:** PD can cause mechanical vibration in the insulation material or surrounding equipment, which can be detected using accelerometers.
- **Discoloration or erosion of insulation material:** PD can cause physical damage to the insulation material, leading to visible discolouration, erosion or cracking.
- **Foul odour:** PD can sometimes produce a foul odour, which can be detected by human senses.

Detecting these symptoms and conducting regular PD testing and analysis is critical to avoiding premature equipment failure and maintaining the safety and reliability of electrical equipment.

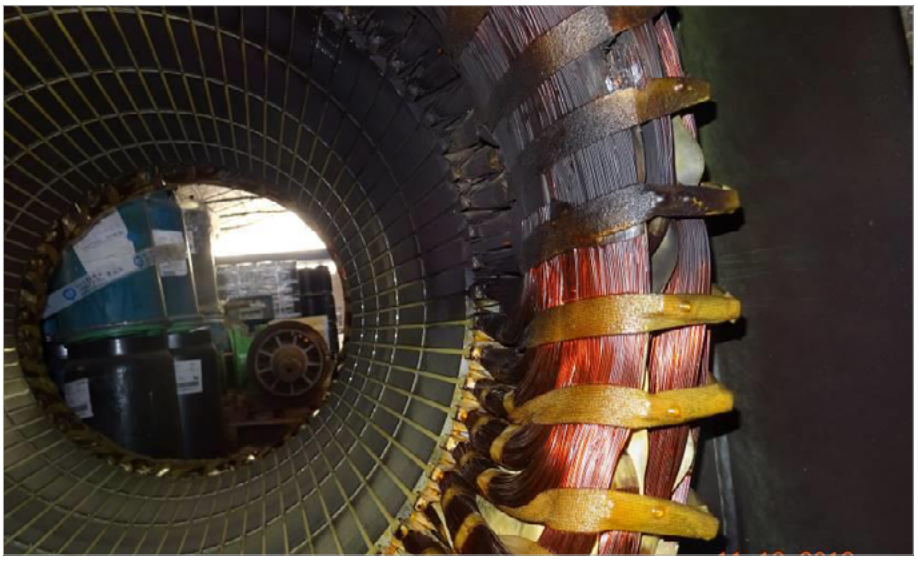

Fig 01 – Example of partial discharge damage to generator

Fig 02 – Example of partial discharge damage to generator