ELECTRIC FAULTS IN STATCOM CAUSE ARCING AND FIRE IN SOLAR POWER PLANT

Case Study

CEERISK
Bridging the Gap

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An explosion was heard at a PV solar power plant by two security guards who were in their office at the time. The piece of machinery in question was the STATCOM—a piece of machinery installed to address operator requirements for reactive power sources, to protect renewable energy against network faults and voltage drops, and to ensure that electricity generated through renewable energy means is successfully introduced to the national grid with minimal complications.

Hearing this explosion, they arrived at the STATCOM to find that a fire had broken out. Upon seeing this they commenced trying to manage the fire using fire extinguishers, but the fire was too big to control and the civil defence was called.

Once the fire was put out, the civil defence examined the scene and conducted an investigation, concluding that the cause of the fire was an electrical short in the electrical transformer, and that the

Expert Involvement

CEERISK experts were called to investigate following the advice of a loss adjuster hired by the company that manufactured the STATCOM.

Through meetings and interviews, it was revealed that the STATCOM was installed at the request of the national power company, to meet standards that would satisfy national standards related to energy. Initially there was a delay installing it due to a discovered circuitry error; CEERISK experts were shown 'expediting' reports documenting the faults and the progress to correct them, in addition to other documents regarding the testing and commission of the STATCOM.

CEERISK learned that upon instillation a live test was carried out with witnesses, and the test failed: it could not be connected after the switchgear was flipped. The defective module was replaced and the machinery appeared to run smoothly—however, five days before the explosion the STATCOM became unresponsive, even while the circuit was closed. Monitoring systems detected nothing. This manufacturer had plans to repair the STATCOM, and following the explosion hired a loss adjuster, who suggested appointing an expert after investigations reached an unsatisfactory conclusion. Inspection revealed that the fire damage was extensive, originating from one particular corner of the power room while leaving limited damage to the equipment rack. The door had been blown off, but retained little fire damage, indicating that the door had been blown off before the fire even started; there were no signs of burning outside.

Experts found damage consistent with electrical arcing near the cable connection, between the control and power rooms of the STATCOM. Electrical arcs are known to cause explosions in enclosed space. In addition, fire damage was significantly worse by the control panel, indicating that the fire spread towards the door.

Bridging the Gap

Experts concluded that the fire was caused by electrical faults, as evidenced by damage consistent with electrical arcing. The arcing either occurred simultaneously, or sequentially, resulting from consumption of insulation.

CEERISK experts considered different causes, including improper cable connection, damaged cable insulation, defective design, or electrical fluctuations resulting from external factors. Of these options only the final can be eliminated as impossible; meanwhile, due to the extent of the damage, it is impossible to eliminate damage to cable insulation, while the possibility that defective design led to this failure will require further testing.

When there are connected properly, Ohmic heat generated by electrical currents, is able to dissipate naturally, but when cables are improperly connected a high resistance forms, giving way to arcing. Based on physical evidence and available information, the conclusion reached by our experts is that this was the most likely cause of failure.