CUTSFORTH

The Power of Innovation

Cutsforth™ specializes in developing innovative new technologies and monitoring systems empowering data-driven decisions to improve availability, reliability, and operating costs.

Case Study: Electromagnetic Interference Monitoring (EMI)

East Coast Generation Facility: Background and Challenges

This East Coast plant is part of a large conglomeration of electric generation facilities. Through cutting-edge technologies they provide environmentally responsible and high performing solutions to their customers.

The plant is newer and has had multiple issues with generators amongst the fleet, leading to forced and unplanned outages. Plant personnel have been looking for better technologies and ways to monitor the overall health of their critical assets. After reviewing different technologies to help identify problems, EMI was determined to be one of the technologies that might show promise.

Electromagnetic Interference Monitoring:

EMI is a non-intrusive surveillance technology to detect and identify electrical defects. Integrating seamlessly into the InsightCM™ platform, plant personnel are able to trend current flow from arcing or discharges. This current emits radio and electromagnetic noise, which can be sensed by interference analyzers. During an uncontrolled release (such as defects in equipment) the noise or emissions can interfere with the controlled transmission of information or interfere with the operation of electrical equipment near the uncontrolled release.

EMI looks for patterns in the RF spectrum to indicate potential failures along the generator, transformer, and isophase bus, among other critical equipment. The system is able to detect failures early such as:

- Arcing
- Coronal Discharges
- Gap Discharges
- Partial Discharges
- Sparking

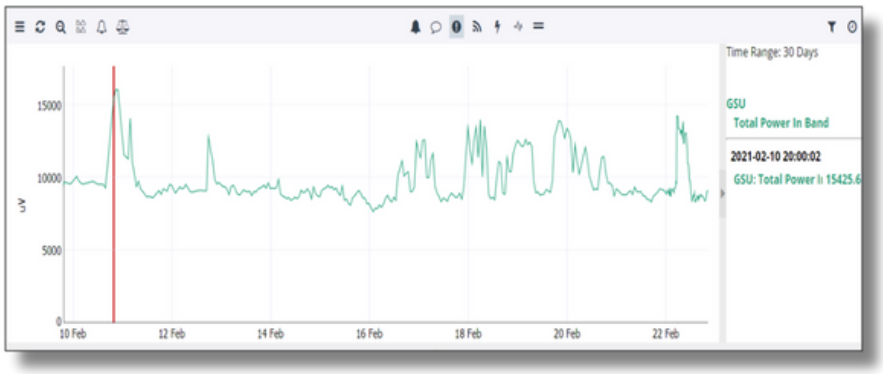
Initial EMI Testing and Recommendations:

Initial EMI testing was conducted to locate issues, many of which were successfully corrected. Early on, the plant encountered low stator grounding resistance issues. Findings from the original EMI test showed loose connections that were picked up first by EMI.

They were interested in ensuring high reliability, since all issues had not yet been resolved (there was still some risk on the STG circuit). Continuous online EMI Monitoring was recommended to further the detection.

Key Findings:

EMI was installed late in the year along the GSU, GCB, and generator. The first weather-related event was detected a few months later during a rain and snowstorm at the GSU. However, the RFCTs at the GCB and generator did not detect similar spikes. The following week, a second event was detected during another snowstorm.



First weather-related event

Cutsforth.com/EMI

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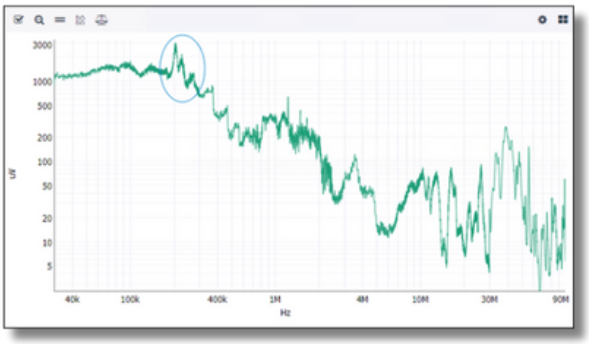

Image 1

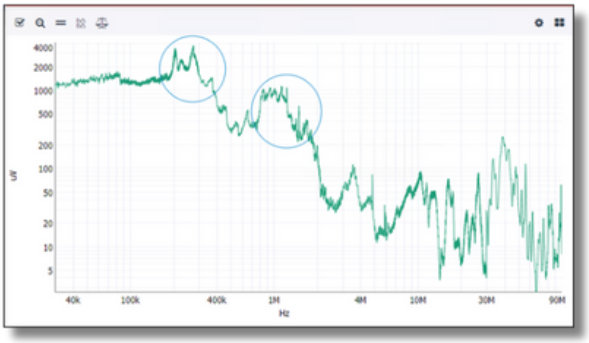

Image 2

Range	Noise	Corona	Tone	Discharge	Arcing	RMS
30kHz-500kHz	0.5443	0.3224	0.5109	0.5896	0.1732	735.9084
500kHz-5MHz	0.7516	0.0612	0.0539	0.7886	0.0172	80.3882
5MHz-30MHz	0.9208	0.0248	0.0559	0.8459	0.0218	11.1353
30MHz-100MHz	0.9910	0.0076	0.0000	0.3124	0.0106	7.1241

Range	Noise	Corona	Tone	Discharge	Arcing	RMS
30kHz-500kHz	0.6428	0.6377	0.3018	0.6826	0.3475	1095.7615
500kHz-5MHz	0.9352	0.6084	0.1161	0.8347	0.3945	253.9154
5MHz-30MHz	0.9252	0.0257	0.1300	0.8631	0.1388	11.4877
30MHz-100MHz	0.9898	0.0107	0.0082	0.3058	0.0118	7.3244

Image 3

Image 1 shows the EMI Power Spectrum waveform before the snowstorm, while Image 2 shows the Power Spectrum during the event.

Image 3 displays the EMI Assessment Table before (top) and during (bottom) the same event. The increase in values helped plant personnel to determine the cause of the concern.

Spring Outage:

The plant put together a checklist of assets to inspect and clean based on the EMI readings. Team members weren't originally planning on opening the isophase bus during the next outage. However, based upon EMI system findings and corresponding HiPot test results, it was determined that an inspection of connection points at the generator, GCB, and GSU would be warranted. Upon further inspection on the phase with the lowest HiPot results, thirteen insulators were identified with moisture damage.

Thirteen insulators in one of the isophase ducts were damaged by water intrusion, which would have led to a forced outage.

Resolution:

The plant was able to identify problem areas by permanently installing a system that constantly takes readings versus doing periodic readings of EMI levels. Cutsforth's EMI system identified weather-related increased noise levels, which would not have been detected by the ad hoc EMI inspections. Undetected, this would have led to a costly multi-day forced outage.

With the combination of the multiple RFCTs with the Cutsforth EMI system and use of the sniffer, the plant was able to clearly identify locations to inspect during the scheduled outage. The permanently installed Electromagnetic Interference system allowed the plant to quickly and easily determine the corrective action to help reduce EMI levels following the scheduled outage.

Using the EMI Monitoring solution, plant personnel were able to detect the failure early and continue operations without the fear of a costly forced outage. The team is now able to perform maintenance activities using the analytics provided by the monitoring system, thus increasing reliability and efficiency, while reducing downtime and optimizing maintenance and capital budgets.