

Considerations of High Power Electromagnetics (HPEM) Transients with Respect to Smart Grid

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As part of the Smart Grid Interoperability Panel (SGIP) work, Electromagnetic Compatibility (EMC) was introduced as an integral process for the design of devices that will be used as part of the Smart Grid. This resulted in the formation of the Electromagnetic Interoperability Issues Working Group (EMII WG). This working group has produced a draft report that evaluates the electromagnetic environment for new electronic devices to be introduced into the Smart Grid of the future. This evaluation is needed to determine if existing EMC immunity standards are available now or whether new standards need to be developed.

While everyday EM environments need to be evaluated to ensure that the future Smart Grid will be able to operate without interference, there are three additional High Power EM (HPEM) transient environments that are low probability in nature, but could cause a large impact on the operation of the power grid in the future. These environments include: the High-altitude Electromagnetic Pulse (HEMP) produced by a nuclear detonation in space; Intentional Electromagnetic Interference (IEMI) produced by a criminal or terrorist using an electromagnetic weapon; and an Extreme Geomagnetic Storm, produced by a solar storm that impacts the Earth.

This paper will introduce each of the HPEM threats and indicate the potential interaction of each of them with particular portions of the Smart Grid. In addition, the relationship of the induced currents and voltages in the power network and its controls will be compared to the usual levels of EMC immunity standards applied by the power industry. In conclusion, the status of international standards to deal with these HPEM threats will be described.