

Apocalypse now (or soon)

By Caroline
Hayes,
Editor-in-Chief,
EPN



Anyone who has read or seen *I Am Legend* or *Day of the Triffids* knows that modern life would grind to a halt without the transport and communications infrastructure to provide food, water, fuel, lighting and heating as well as healthcare and security. In fact, forget apocalyptic fiction – just take a mobile phone away from a teenager and then ask him or her to arrange to meet several people at a certain time and place and watch the terrified desperation set in!

The likelihood of a plague or deadly plants destroying modern civilization is less of a threat than a natural phenomenon such as solar flares, which although occurring regularly to varying degrees of magnitude can pose a real threat to the modern digital infrastructure. The phenomenon was first recorded in 1859 when British astronomer Richard Carrington recorded a solar storm which set telegraph systems on fire. A flare is produced when magnetic energy stored in the corona in the solar atmosphere is released. Up to 10^{25} joules can heat up the photosphere, chromosphere and corona layers of the solar atmosphere, accelerating electrons, protons and ions close to the speed of light. The radiation can reach across all wavelengths, from radio waves to gamma rays and so affect the earth's ionosphere to disrupt radars, and any devices operating on the frequencies to disrupt long-range communications. Up to 10s of millions of Kelvin can be released, which can also disrupt, or destroy, the electrical grid, computers, satellites, telephone systems and transport.

Apart from forces of nature, another potential source of such a catastrophe is cyber warfare or a high-tech attack. Terrorists could paralyse a high street bank's computer system using a microwave generator, which can fit into a suitcase. At the other end of the scale, a nuclear weapon exploding in space could create a high altitude electromagnetic pulse which would have a more far-reaching effect on electrical equipment further afield.

In September, the first Electric Infrastructure Security Council was held in London, UK. The invited scientists, policy makers, energy ministers and members from 20 nations' administrations heard former US government adviser, Avi Schnurr, warn that the ubiquitous electrical infrastructure is vulnerable and one geomagnetic storm, EMP (electromagnetic pulse) or HEMP (high power EMP) "could shatter nations all over the Earth". HEMP can cover continents with a radius of up to 1000km from the burst location, whereas EMP has a 10km radius.

I visited MPE, in Liverpool, UK, which designs and manufactures HEMP filters to meet Mil-Std 188-125 parts 1 and 2. This supersedes the NATO specification for high altitude electromagnetic pulse filters. On my visit I learned that the company has opted not to add components to power line filters and instead designed smaller, lighter models than those available before, which have been designed to satisfy the specification's PCI (pulse current injection) requirements rather than the insertion loss specification. MPE is one of the friendliest and technically expert companies I have visited, so it is strange to report that I hope some of their products never get used!