

The massive EMP threat

By F. Michael Maloof, 13 Mar 2015

Editor's note: *The solar storm of 1859, also known as the Carrington event, was a powerful geomagnetic solar storm in 1859 during solar cycle 10. A solar coronal mass ejection hit Earth's magnetosphere and induced one of the largest geomagnetic storms on record. The associated "white light flare" in the solar photosphere was observed and recorded by English astronomers Richard C. Carrington and Richard Hodgson. Studies have shown that a solar storm of this magnitude occurring today would likely cause widespread problems for modern civilization. The solar storm of 2012 was of similar magnitude, but it passed Earth's orbit without striking the Earth. A study by Lloyd's of London has concluded that it would have taken a \$2,600,000,000,000 chunk out of the global economy, and it would take up to a decade to repair the damage. Unfortunately, scientists insist that it is going to happen at some point. The only question is when.*

WASHINGTON – The sun's first X-flare of the year – packed with an electromagnetic pulse effect capable of damaging electrical grids and unguarded electronics – erupted Wednesday in the direction of Earth, and its full impact is yet to be felt.

The flare, observed by NASA's Solar Dynamics Observatory satellite, contains the energy of millions of hydrogen bombs exploding all at once.

The sun is at its solar storm maximum, but solar flare activity on its surface has been unusually quiet.

A direct hit can have a major impact

However, a direct hit from an X-flare, the most powerful category, can have a major impact on communications, electrical grid systems and other unprotected electronics and automated control systems that run life-sustaining critical infrastructures.

The flares – some of which can be more than 20 times the size of the Earth – spew electromagnetic energy such as gamma rays.

The radiation travels at the speed of light, or around 186,000 miles a second, meaning it could reach Earth in as little as eight minutes.

EMP threat? Yes, it's real

'A Nation Forsaken' exposes the little-reported danger of an American catastrophe.

The flares come in a number of categories, with X being the most powerful and A being the weakest, followed by B, C and then M. Each letter represents a 10-fold increase in energy from the flare. An X-flare, therefore, is 10 times as powerful than M and 100 times more powerful than C. Within each letter class, there is a scale of 1 to 9.

The flare that spewed from the Sun on Wednesday was an X2.1.

Within the flares are tons of highly charged particles of matter known as coronal mass ejections, or CMEs, which in turn cause geomagnetic storms. It is the geomagnetic storms that cause the massive disruptions of Earth to communications and electrical grids.

The particles, however, don't travel as fast as the radiation in the flares.

Earth has yet to experience the effects of the CME that was unleashed on Wednesday from the X2.1 flare.

The area of the Earth most affected by the solar flares and CMEs extends from the Northeastern United States, down the East Coast, into the Gulf of Mexico, then into Central and all of South America.

The initial effect first felt Wednesday from the X2.1 flare was on communications, with a radio blackout in the frequency range of 15 MHz to 26 MHz for about a half hour on the sunlit side of Earth.

Because the United States and other Western countries are technologically based societies, with critical infrastructures run by electronics, the space weather takes on an added importance.

U.S. national grid system is vulnerable

For one thing, the U.S. national grid system already is vulnerable.

An electromagnetic pulse, or EMP, can seriously damage or fry the unprotected grid, including transformers, electrical components and automated control systems that everyone takes for granted in their everyday lives.

As a consequence, it could take months, if not years, to replace.

A direct hit would have a catastrophic, cascading impact

NASA estimates a direct hit to Earth from one of these enormous flares would have a catastrophic, cascading impact on the nation's critical infrastructures over a very wide geographical area.

In the first year alone, NASA estimates, such a disaster could cost just the U.S. upward of \$2 trillion. It also would take from four to 10 years to recover – if that even would be possible – and affect the lives of some 160 million people, threatening starvation and death.

Some EMP experts say that such a catastrophic event could wipe out America's urban centers, due to their total dependency on critical infrastructures for electricity, communications, food and water delivery, oil and gas, transportation, automated banking and financial institutions, and even emergency services.

Panic would sweep the population

The experts say grocery stores, for example, would have their shelves cleared in a matter of hours due to the panic that would sweep the population. Normally, grocery stores carry a maximum of three days of products before being restocked. However, restocking would come

to a halt due to the inability of trucks to function, with fueling stations unable to pump the fuel needed to run the vehicles.

Automated control devices that regulate the flow of oil and natural gas through the hundreds of thousands of miles of pipelines that crisscross the nation would be tripped, causing geographically widespread secondary fires and explosions.

Such an event would not just occur in a remote field. Fires and explosions also could occur under streets and even into people's houses.

The inability of fire and medical emergency services to respond would result in further disastrous consequences for the population.

Because automated systems ensure fresh water delivery, all filtering and sewage systems in the urban setting would face the high prospect of shutting down, leading to disease such as cholera and dysentery. In addition, there would be little likelihood of medical attention because the hospitals and first responders' emergency equipment which rely on electronics and communications equipment might no longer function.

Hospitals generators might not function

Hospitals would have backup generators. However, if the generators have electrical starters, they might not function at all. Others may run on gasoline or diesel and only function for as long as there is fuel, which would need to be trucked in by vehicles with automated starters.

NASA estimates that as many as 350 of the large, customized transformers, which maintain a power supply across the nation and are only produced abroad, would be destroyed.

Because they are expensive – some costing as much as \$20 million a copy – utilities don't keep spares on hand. They could take years to replace, especially if a number of technologically dependent countries' transformers are affected by a direct solar flare or CME impact.