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# Are nuclear reactors vulnerable to solar storms?

By [Steve Tracton](#)

The subject of nuclear power plants and solar storms was not what I planned for the second part of the series: [Space Weather: Are we ready for a solar strike](#) (Part I)? But, in light of the nuclear disaster in Japan, caused by loss of external and backup electrical power needed for the reactors' cooling system, it occurred to me that renewed discussion on the safety of nuclear power ought to include concern about the prospects of widespread and long-lasting outages from solar storms.

The radioactive core of a nuclear reactor generates intense heat and must be cooled by continuously pumping water through the system. Otherwise the water surrounding the nuclear core would boil off, and the exposed nuclear core begin to melt. Should the build up of steam pressure or hydrogen gas released in the process explode (as in Japan) the containment structure built over the reactor might be compromised allowing dangerous amounts of the core's radioactive material to escape into the environment.

A basic feature of U.S. nuclear power plants is that they are not self-powered, i.e., the electricity to run the plant relies on the same power grid that runs the country at large. If this external power is lost, the plant must shut down. But, the nuclear core remains intensely hot for anywhere from several days to weeks or more. If not continuously cooled, a meltdown is likely.

As discussed in the earlier posts on space weather, intense solar storms could damage the nation's electric power grids beyond repair for several months to years according to [a report from the National Research Council](#) (further explanation forthcoming in what was meant initially to be Part 2). Moreover, as noted, the consequences could be devastating for commerce, transportation, agriculture and food stocks, fuel and water supplies, human health and medical facilities, national security, and daily life in general.

In many, but not all nuclear power generators (explained shortly) the essential cooling system pumps are electrically driven. And, here's the nub of the issue:

Those nuclear plants requiring external electric power to maintain the cooling system most assuredly have backup diesel generators and batteries to run the plant's vital command and control system. The issue is whether diesels and their onsite fuel supply would last long enough to keep the core from melting given that resupply would be a challenging proposition given the societal and infrastructure disruptions caused by effects of a possible catastrophic solar storm.

Even if diesel power was not a problem, some nuclear plants, such as the [Vermont Yankee](#) reactor on the Connecticut River in southern Vermont, rely on eight hour batteries as backup to run the command and control system - as did the Japanese plants. Without the command and

control system it is not possible to monitor vital sensors and operate required pumps, valves, etc. Are there contingency plans or is there even the capability to divert power from generators, if running, to keep the command and control system operative should replenishing the supply of batteries not be possible? In some nuclear plants the cooling system is self-contained, i.e., steam produced in the reactor turns a turbine to generate the electricity for pumping the cooling water. In principle (I say in principle because this same type of reactor is experiencing the current difficulties in Japan), when the plant shuts down the heat of the core continues to keep the steam for the turbine. But even if the cooling system does not fail (like it has in Japan), there remains the problem of maintaining battery power for command and control.

It is not clear to what extent - if at all - these issues have been raised or considered, but clearly now ought to be where they haven't been.

Let me say that I support expanding nuclear power – even if it is quite literally in my own backyard, almost in the shadow of the [Lake Anna Nuclear Facility](#) in north central Virginia where I have a second home. However, my support as should generally be true, is contingent on answers to the questions I've raised here, as well as the many others being asked concerning nuclear power in the wake of the catastrophe in Japan.

Keep in mind, however, that even now a disastrous nuclear accident is highly improbable. But, it is possible and it is imperative to further minimize the risks given the dire consequences should it occur.

P.S. As a concerned citizen, I have expressed the safety issues raised here to the U.S. Nuclear Regulatory Commission and Va. Department of Environmental Quality (DEQ) in a communication through the “Friends of Lake Anna” civic group. The NRC and Va. DEQ are considering whether to permit construction of an additional nuclear reactor within the site of the two existing plants at the Lake Anna facility

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