Solar flares far more likely to hit nuclear power plants than tidal waves or earthquakes

Forget about the 2012 Mayan calendar, comet Elenin or the Rapture. The real threat to human civilization is far more mundane, and it's right in front of our noses. If Fukushima has taught us anything, it's that just one runaway meltdown of fissionable nuclear material can have wide-ranging and potentially devastating consequences for life on Earth. To date, Fukushima has already released **168 times** the total radiation released from the Hiroshima nuclear bomb detonated in 1945, and the Fukushima catastrophe is now undeniably the worst nuclear disaster in the history of human civilization.

But what if human civilization faced a far greater threat than a single tsunami destroying a nuclear power facility? What if a **global tidal wave** could destroy the power generating capacities of *all* the world's power plants, all at once?

Such a scenario is not merely possible, but factually *inevitable*. And the global tidal wave threatening all the nuclear power plants of the world isn't made of water but **solar emissions**.

The sun, you see, is acting up again. NASA recently warned that solar activity is surging, with a peak expected to happen in 2013 that could generate enormous radiation levels that sweep across planet Earth. The *National Oceanic and Atmospheric Administration* (NOAA) has even issued an urgent warning about solar flares due to strike in 2012 and 2013. *IBtimes* wrote, "With solar activity expected to peak around 2013, the Sun is entering a particularly active time and big flares like the recent one will likely be common during the next few years. ...A major flare in the mid-19th century blocked the nascent telegraph system, and some scientists believe that another such event is now overdue.

"Several federal government studies suggest that this extreme solar activity and emissions may result in complete blackouts for years in some areas of the nation. Moreover, there may also be disruption of power supply for years, or even decades, as geomagnetic currents attracted by the storm could debilitate the transformers."

All nuclear power plants are operated in a near-meltdown status. They operate at very high heat, relying on nuclear fission to boil water that produces steam to drive the turbines that generate electricity. Critically, the nuclear fuel is prevented from melting down through the steady circulation of **coolants** which are pushed through the cooling system using very high powered **electric pumps**.

If you stop the electric pumps, the coolant stops flowing and the fuel rods go critical (and then melt down). This is what happened in Fukushima, where the melted fuel rods dropped through the concrete floor of the containment vessels, unleashing enormous quantities of ionizing radiation into the surrounding environment. The full extent of the Fukushima contamination is not even known yet, as the facility is still emitting radiation.

It's crucial to understand that nuclear coolant pumps are usually driven by **power from the electrical grid**. They are not normally driven by power generated locally from the nuclear power plant itself. Instead, they're connected to the grid. In other words, even though nuclear power plants are generating megawatts of electricity for the grid, they are also dependant on the grid to run their own coolant pumps. If the grid goes down, the coolant pumps go down, too, which is why they are quickly switched to emergency backup power -- either *generators* or *batteries*.

As we learned with Fukushima, the on-site batteries can only drive the coolant pumps for around eight hours. After that, the nuclear facility is dependent on **diesel generators** (or sometimes propane) to run the pumps that circulate the coolant which prevents the whole site from going Chernobyl. And yet, critically, this depends on something rather obvious: The *delivery of diesel fuel* to the site. If diesel cannot be delivered, the generators can't be fired up and the coolant can't be circulated. When you grasp the importance of this supply line dependency, you will instantly understand why a single solar flare could unleash a nuclear holocaust across the planet.

When the generators fail and the coolant pumps stop pumping, nuclear fuel rods begin to melt through their containment rods, unleashing ungodly amounts of life-destroying radiation directly into the atmosphere. This is precisely why Japanese engineers worked so hard to reconnect the local power grid to the Fukushima facility after the tidal wave -- they needed to bring power back to the generators to run the pumps that circulate the coolant. This effort failed, of course, which is why Fukushima became such a nuclear disaster and released countless becquerels of radiation into the environment (with no end in sight).

And yet, despite the destruction we've already seen with Fukushima, U.S. nuclear power plants are nowhere near being prepared to handle sustained power grid failures. As *IBtimes* reports:

"Last month, the Nuclear Regulatory Commission said U.S. plants affected by a blackout should be able to cope without electricity for at least eight hours and should have procedures to keep the reactor and spent-fuel pool cool for 72 hours. Nuclear plants depend on standby batteries and backup diesel generators. Most standby power systems would continue to function after a severe solar storm, but supplying the standby power systems with adequate fuel, when the main power grids are offline for years, could become a very critical problem. If the spent fuel rod pools at the country's 104 nuclear power plants lose their connection to the power grid, the

current regulations aren't sufficient to guarantee those pools won't boil over -- exposing the hot, zirconium-clad rods and sparking fires that would release deadly

As any sufficiently informed scientist will readily admit, solar flares have the potential to **blow out the transformers** throughout the national power grid. That's because solar flares **induce geomagnetic currents** (powerful electromagnetic impulses) which overload the transformers and cause them to explode.

You've probably witnessed this yourself during a lightning storm when lightning unleashes a powerful electromagnetic pulse that causes a local transformer to explode. Solar flares do the same thing on a much larger scale. A *global* scale, in fact.

The upshot of this situation is that suddenly and without warning, the power grid infrastructure across nearly the entire planet could be destroyed. As a bonus, nearly all satellites will be fried, too, leaving GPS inoperable and causing millions of clueless drivers to become forever lost in their own neighborhoods because they never paid attention to the streets and always relied on a GPS voice to tell them, "In fifty feet, turn right."

Communications satellites will be obliterated, too. This, of course, will halt nearly all news propaganda distribution across the planet, causing tens of thousands of people to instantly die out of the sheer fear of suddenly having to think for themselves. As another bonus, nearly all mobile phone service will be disrupted, too, meaning all the teenage text junkies of the world will, for the first time in their lives, be forced to lay down their iPhones and interact with real people in the real world.

But the real kicker in all this is that **the power grid will be destroyed nearly everywhere**.

Imagine **a world without electricity**. Even for just a week. Imagine New York City with no electricity, or Los Angeles, or Sao Paulo. Within 72 hours, most cities around the world will devolve into total chaos, complete with looting, violent crime, and runaway fires.

But that's not even the bad news. Even if all the major cities of the world burned to the ground for some other reason, humanity could still recover because it has the farmlands: the soils, the seeds, and the potential to recover, right?

And yet the real crisis here stems from the realization that once there is no power grid, all the nuclear power plants of the world suddenly go into "emergency mode" and are forced to rely on their on-site emergency power backups to circulate coolants and prevent nuclear meltdowns from occurring. And yet, as we've already established, these facilities typically have only a few hours of battery power available, followed by perhaps a few days worth of diesel fuel to run their generators (or propane, in some cases).

Did I also mention that half the people who work at nuclear power facilities have no idea what they're doing in the first place? Most of the veterans who really know the facilities inside and out have been forced into retirement due to reaching their **lifetime limits** of on-the-job radiation exposure, so most of the workers at nuclear facilities right now are *newbies* who really have no clue what they're doing.

There are **440 nuclear power plants** operating across 30 countries around the world today. There are an additional 250 so-called "research reactors" in existence, making a total of roughly **700 nuclear reactors** to be dealt with (http://www.world-nuclear.org/info/inf01.html).

Now imagine the scenario: You've got a massive solar flare that knocks out the world power grid and destroys the majority of the power grid transformers, thrusting the world into darkness. Cities collapse into chaos and rioting, martial law is quickly declared (but it hardly matters), and every nation in the world is on full emergency. But that doesn't solve the really big problem, which is that you've got **700 nuclear reactors** that can't feed power into the grid (because all the transformers are blown up) and yet simultaneously have to be fed a steady stream of emergency fuels to run the generators the keep the coolant pumps functioning.

How long does the coolant need to circulate in these facilities to cool the nuclear fuel? **Months.** This is also the lesson of Fukushima: You can't cool nuclear fuel in mere hours or days. It takes *months* to bring these nuclear facilities to a state of cold shutdown. And that means in order to avoid a multitude of Fukushima-style meltdowns from occurring around the world, you need to **truck diesel fuel**, generator parts and nuclear plant workers to every nuclear facility on the planet, ON TIME, every time, without fail, for months on end.

Now remember, this must be done in the middle of the total chaos breakdown of modern civilization, where there is no power, where law enforcement and emergency services are totally overrun, where people are starving because food deliveries have been disrupted, and when looting and violent crime runs rampant in the streets of every major city in the world. Somehow, despite all this, you have to run these diesel fuel caravans to the nuclear power plants and keep the pumps running.

Except there's a problem in all this, even if you assume you can somehow work a logistical miracle and actually deliver the diesel fuel to the backup generators on time (which you probably can't).

The problem is this: **Where do you get diesel fuel?**

From **petroleum refineries.** Most people don't realize it, but petroleum refineries **run on electricity**. Without the power grid, the refineries don't produce a drop of diesel. With no diesel, there are no generators keeping the coolant running in the nuclear power facilities.

But wait, you say: Maybe we could just acquire diesel from all the gas stations in the world. Pump it out of the ground, load it into trucks and use that to power the generators, right? Except there are other problems here: How do you pump all that fuel without electricity? How do you acquire all the tires and spare parts needed to keep trucks running if there's no electricity to keep the supply businesses running? How do you maintain a truck delivery infrastructure when the electrical infrastructure is totally wiped out?

Some countries might be able to pull it off with some degree of success. With **military escorts** and the total government control over all fuel supplies, a few nations will be able to keep a few nuclear power facilities from melting down.

But here's the real issue: There are 700 nuclear power facilities in the world, remember? Let's suppose that in the aftermath of a massive solar flare, the nations of the world are somehow able to control half of those facilities and nurse them into cold shutdown status. That still leaves roughly 350 nuclear facilities at risk.

Now let's suppose half of those are somehow luckily offline and not even functioning when the solar flare hits, so they need no special attention. This is a very optimistic assumption, but that still leaves **175 nuclear power plants** where all attempts fail.

Let's be outrageously optimistic and suppose that a third of those somehow don't go into a total meltdown by some miracle of God, or some bizarre twist in the laws of physics. So we're still left with **115 nuclear power plants** that "go Chernobyl."

Fukushima was one power plant. Imagine the devastation of 100+ nuclear power plants, all going into meltdown all at once across the planet. It's not the loss of electricity that's the real problem; it's the **global tidal wave of invisible radiation** that blankets the planet, permeates the topsoil, irradiates everything that breathes and delivers the final crushing blow to human civilization as we know it today.

Because if you have **100 simultaneous global nuclear meltdowns**, the tidal wave of radiation will make farming nearly impossible *for years*. That means no food production for several years in a row. And that, in turn, means a near-total collapse of the human population on our planet.

How many people can survive an entire year with no food from the farms? Not one in a hundred people. Even beyond that, how many people can essentially **live underground** and be safe enough from the radiation that they can have viable children and repopulate the planet? It's a very, very small fraction of the total population.

What's the chance of all this actually happening? A report by the Oak Ridge National Laboratory said that "...over the standard 40-year license term of nuclear power plants, **solar flare activity enables a 33 percent chance of long-term power loss, a risk that significantly outweighs that of major earthquakes and tsunamis**.")

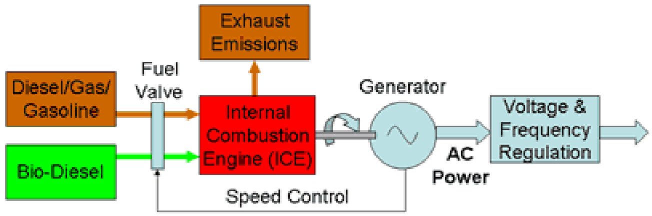
The world's reliance on nuclear power, you see, has doomed us to destroy our own civilization. Of course, this is all preventable if we would only **dismantle and shut down ALL nuclear power plants on the planet**. But what are the chances of that happening? Zero, of course. There are too many commercial and political interests invested in nuclear power.

So the power plants will stay, and we will therefore be vulnerable to a solar flare which could strike us at any time and unleash a global nuclear holocaust. Planet Earth has been struck by solar flares before, of course, but all the big hits in recorded human history took place **long before the age of modern electronics**, so the impacts were minimal. Today, society cannot function without electronics. Nor can nuclear facility coolant pumps. Once you realize that, you begin to understand the true danger in which humanity has placed itself by relying on nuclear power.

By relying on nuclear power, we are risking everything. And we're doing it blindly, with no real acknowledgement of the dangers of running 700+ nuclear facilities in a constant state of "near meltdown" while foolishly relying on the steady flow of electricity to keep the fuel rods cool. If Fukushima, all by itself, could unleash a tidal wave of deadly radiation all by itself, imagine a world where **hundreds of nuclear facilities** go into a total meltdown *simultaneously*.

A repeat of the 1859 solar storm -- called the Carrington Event -- would "devastate the modern world," admits a *National Geographic* article:

What can we do about any of this? **Build a system that can regenerate electrical power sufficiently to the electrical systems and electric motor pumps that maintain and prevent a meltdown**.



Electric Power Generation by Internal Combustion Engine (ICE)

Adapting the Battery Alternating Recharging Process to this type of speed control will contain a much more mitigating safety window than a 72 hour power auxiliary system to date.

Standby liquid control system (SLCS)

The standby liquid control system is used in the event of major contingencies as a last measure to prevent core damage. It is not intended ever to be used, as the RPS and ECCS are designed to respond to all contingencies, even if a quite a few of their components fail, but if a complete ECCS failure occurs, during a limiting fault, it could be the only thing capable of preventing core damage. The SLCS consists of a tank containing borated water as a neutron absorber, protected by explosively-opened valves and redundant battery-operated pumps, allowing the injection of the borated water into the reactor against any pressure within; the borated water can and will shut down a reactor gone out of control. The SLCS also provides an additional layer of defense in depth against a ATWS derangement, but this is an extreme measure that can be avoided by numerous other channels (ARI and use of redundant hydraulics).

Versioning note: The SLCS is a system that is never meant to be activated unless all other measures have failed. In the BWR/1 – BWR/6, its activation could cause sufficient damage to the plant that it could make the older BWRs inoperable without a complete overhaul. With the arrival of the ABWR and (E)SBWR, operators do not have to be as reticent about activating the SLCS, as these reactors have a Reactor Water Cleanup System (RWCS) – once the reactor has stabilized, the borated water within the RPV can be filtered through this system to promptly remove the soluble neutron absorbers that it contains and thus avoid damage to the internals of the plant.

Thus the Battery Alternating Recharging Process could easily be converted into the existing electrical system adjusted to meet the nrc.gov standards and policies.