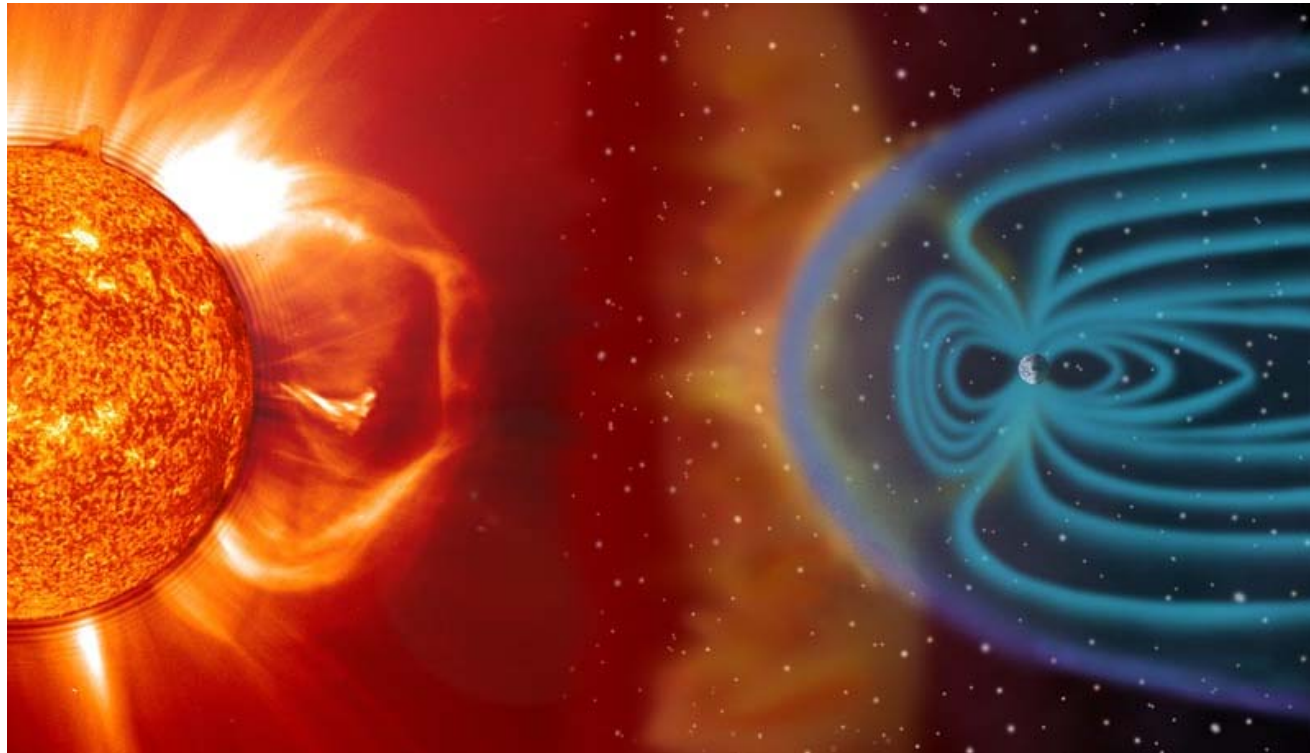


The 2012 Apocalypse — And How to Stop It

By Brandon Keim ✉ April 17, 2009 | 2:37 pm | Categories: [Space](#), [Survival](#)



For scary speculation about the end of civilization in 2012, people usually turn to followers of cryptic Mayan prophecy, not scientists. But that's exactly what a group of NASA-assembled researchers described in a chilling report issued earlier this year on the destructive potential of solar storms.

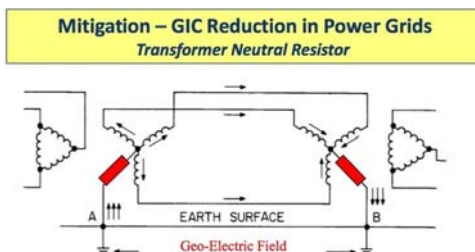
Entitled "[Severe Space Weather Events — Understanding Societal and Economic Impacts](#)," it describes the consequences of solar flares unleashing waves of energy that could disrupt Earth's magnetic field, overwhelming high-voltage transformers with vast electrical currents and short-circuiting energy grids. Such a catastrophe would cost the United States "\$1 trillion to \$2 trillion in the first year," concluded the panel, and "full recovery could take 4 to 10 years." That would, of course, be just a fraction of global damages.

Good-bye, civilization.

Worse yet, the next period of intense solar activity is expected in 2012, and coincides with the presence of an [unusually large hole](#) in Earth's geomagnetic shield. But the report received relatively little attention, perhaps because of 2012's supernatural connotations. Mayan astronomers supposedly predicted that 2012 would mark the calamitous "birth of a new era."

Whether the Mayans were on to something, or this is all just a chilling coincidence, won't be known for several years. But according to Lawrence Joseph, author of "[Apocalypse 2012: A Scientific Investigation into Civilization's End](#)," "I've been following this topic for almost five years, and it wasn't until the report came out that this really began to freak me out."

Wired.com talked to Joseph and John Kappenman, CEO of electromagnetic damage consulting company [MetaTech](#), about the possibility of geomagnetic apocalypse — and how to stop it.



Wired.com: What's the problem?

John Kappenman: We've got a big, interconnected grid that spans across the country. Over the years, higher and higher operating voltages have been added to it. This has escalated our vulnerability to geomagnetic storms. These are not a new thing. They've probably been occurring for as long as the sun has been around. It's just that we've been unknowingly building an infrastructure that's acting more and more like an antenna for geomagnetic storms.

Wired.com: What do you mean by antenna?

Kappenman: Large currents circulate in the network, coming up from the earth through ground connections at large transformers. We need these for safety reasons, but ground connections provide entry paths for charges that could disrupt the grid.

Wired.com: What's your solution?

Kappenman: What we're proposing is to add some fairly small and inexpensive resistors in the transformers' ground connections. The addition of that little bit of resistance would significantly reduce the amount of the geomagnetically induced currents that flow into the grid.

Wired.com: What does it look like?

Kappenman: In its simplest form, it's something that might be made out of cast iron or stainless steel, about the size of a washing machine.

Wired.com: How much would it cost?

Kappenman: We're still at the conceptual design phase, but we think it's do-able for \$40,000 or less per resistor. That's less than what you pay for insurance for a transformer.

Wired.com: And less than what you'd willingly pay for insurance on civilization.

Kappenman: If you're talking about the United States, there are about 5,000 transformers to consider this for. The [Electromagnetic Pulse Commission](#) recommended it in a report they sent to Congress last year. We're talking about \$150 million or so. It's pretty small in the grand scheme of things.

Big power lines and substations can withstand all the other known environmental challenges. The problem with geomagnetic storms is that we never really understood them as a vulnerability, and had a design code that took them into account.

Wired.com: Can it be done in time?

Kappenman: I'm not in the camp that's certain a big storm will occur in 2012. But given time, a big storm is certain to occur in the future. They have in the past, and they will again. They're about one-in-400-year events. That doesn't mean it will be 2012. It's just as likely that it could occur next week.

Wired.com: Do you think it's coincidence that the Mayans predicted apocalypse on the exact date when astronomers say the sun will next reach a period of maximum turbulence?

Lawrence Joseph: I have enormous respect for Mayan astronomers. It disinclines me to dismiss this as a coincidence. But I recommend people verify that the Mayans prophesied what people say they did. I went to Guatemala and spent a week with two Mayan shamans who spent 20 years talking to other shamans about the prophecies. They confirmed that the Maya do see 2012 as a great turning point. Not the end of the world, not the great off-switch in the sky, but the birth of the fifth age.

Wired.com: Isn't a great off-switch in the sky exactly what's described in the report?

Joseph: The chair of the NASA workshop was Dan Baker at the Laboratory for Atmospheric and Space Physics. Some of his comments, and the comments he approved in the report, are very strong about the potential connection between [coronal mass ejections](#) and power grids here on Earth. There's a direct relationship between how technologically sophisticated a society is and how badly it could be hurt. That's the meta-message of the report.

I had the good fortune last week to meet with John Kappenman at MetaTech. He took me through a meticulous two-hour presentation about just how vulnerable the power grid is, and how it becomes more vulnerable as higher voltages are sent across it. He sees it as a big antenna for space weather outbursts.

Wired.com: Why is it so vulnerable?

Joseph: Ultra-high voltage transformers become more finicky as energy demands are greater. Around 50 percent already can't handle the current they're designed for. A little extra current coming in at odd times can slip them over the edge.

The ultra-high voltage transformers, the 500,000- and 700,000-kilovolt transformers, are particularly vulnerable. The United States uses more of these than anyone else. China is trying to implement some million-kilovolt transformers, but I'm not sure they're online yet.

Kappenman also points out that when the transformers blow, they can't be fixed in the field. They often can't be fixed at all. Right now there's a one- to three-year lag time between placing an order and getting a new one.

According to Kappenman, there's an as-yet-untested plan for inserting ground resistors into the power grid. It makes the handling a little more complicated, but apparently isn't anything the operators can't handle. I'm not sure he'd say these could be in place by 2012, as it's difficult to establish standards, and utilities are generally regulated on a state-by-state basis. You'd have quite a legal thicket. But it still might be possible to get some measure of protection in by the next solar climax.

Wired.com: Why can't we just shut down the grid when we see a storm coming, and start it up again afterwards?

Joseph: Power grid operators now rely on one satellite called [ACE](#), which sits about a million miles out from Earth in what's called the gravity well, the balancing point between sun and earth. It was designed to run for five years. It's 11 years old, is losing steam, and there are no plans to replace it.

ACE provides about 15 to 45 minutes of heads-up to power plant operators if something's coming in. They can shunt loads, or shut different parts of the grid. But to just shut the grid off and restart it is a \$10 billion proposition, and there is lots of resistance to doing so. Many times these storms hit at the north pole, and don't move south far enough to hit us. It's a difficult call to make, and false alarms really piss people off. Lots of money is lost and damage incurred. But in Kappenman's view, and in lots of others, this time burnt could really mean burnt.

Wired.com: Do you live your life differently now?

Joseph: I've been following this topic for almost five years. It wasn't until the report came out that it began to freak me out.

Up until this point, I firmly believed that the possibility of 2012 being catastrophic in some way was worth investigating. The report made it a little too real. That document can't be ignored. And it was even written before the THEMIS satellite [discovered a gigantic hole](#) in Earth's magnetic shield. Ten or twenty times more particles are coming through this crack than expected. And astronomers predict that the way the sun's polarity will flip in 2012 will make it point exactly the way we don't want it to in terms of evading Earth's magnetic field. It's an astonishingly bad set of coincidences.

Wired.com: If Barack Obama said, "Let's prepare," and there weren't any bureaucratic hurdles, could we still be ready in time?

Joseph: I believe so. I'd ask the President to slipstream behind stimulus package funds already appropriated for smart grids, which are supposed to improve grid efficiency and help transfer high energies at peak times. There's a framework there. Working within that, you could carve out some money for the ground resistors program, if those tests work, and have the initial momentum for cutting through the red tape. It'd be a place to start.

See Also:

- [Sunspot Appearance Marks Beginning of New Solar Cycle](#)
- [Apocalypse Prep Friday: Step One, Buy an Ark](#)
- [Yucatan Jungles Are Feral Maya Gardens](#)
- [Scientists Discover What Makes Northern Lights Dance](#)

Images: 1. NASA 2. MetaTech

Brandon Keim's [Twitter](#) stream and [Del.icio.us](#) feed; Wired Science on [Facebook](#).

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Comments (16)

Posted by: k7aay | 04/26/09 | 9:38 pm

JOSEPH: Kappenman also points out that when the transformers blow, they can't be fixed in the field. They often can't be fixed at all. Right now there's a one- to three-year lag time between placing an order and getting a new one.

OK, now go read "RULES OF THE GAME" for a quick, easy if scary explanation of what happens if we lose those transformers...

<http://web.archive.org/web/20050406214119/http://www.liddyshow.us/mustread11.php>

—

KiloSeven, living happily in Portland right by Bonneville Dam

Posted by: justaxi | 04/26/09 | 9:47 pm

I AM NOT BELIEVEING IN EXPLODEING

<http://www.oyunvakti.org/>

Posted by: bryancostanich | 04/26/09 | 11:54 pm

@Brandon - As a journalist, don't you feel that it's a bit disingenuous to regurgitate an interview like this, from someone that benefits financially from freaking everyone out about solar flares?

Posted by: perfectclarity | 04/27/09 | 2:17 am

When you hear that NASA scientists are looking at 10 year old sites like <http://www.magic-point.org> you start to worry...

Posted by: supermonzon | 04/27/09 | 12:43 pm

Why is everyone thinking the Mayans thought about a date for the end of the world? The ancient Mayans were far more intelligent, able to predict eclipses and understanding time far better than their more advanced European counterparts. And regarding this understanding of time, they built a calendar like any calendar, based in cycles. One cycle is due to end in 2012. What happens when a cycle ends? Another cycle begins. And so on. Back in 2000 people went crazy about vicious computer and microwave ovens being released from being passive servants to becoming active enemies of humankind. But of course nothing happened. And the Mayans never expected anything to happen in 2012 either. The only thing is, a new cycle will start according to that calendar, just like every year there's a new year, and every century there's a new century and every 1000 years there's another millenium and so on. Get it? It ain't so tough to understand, is it? But I wonder, why is the human being so prone to stupid superstitious thoughts? Ghosts, gods and arbitrary ends of the world...

Posted by: neeneko | 04/27/09 | 2:11 pm

@supermonzon

My best guess is that apocalyptic hope is embedded deeply in christian culture and thus people with that background search desperately for any hint or indication that the world will end within their lifetime. Thus since the Mayans can be interpreted as predicting the end of the world, people who really want it to end will see that pattern. And of course if the world ends in one's lifetime, one gets to say 'ha ha! we were right!' to everyone else, which is probably a big part of the appeal.

That and humans just LOVE the idea of having secret knowledge that the 'sheep' of society ignore at their own peril.

Posted by: samagon | 04/27/09 | 3:46 pm

~~~~~Back in 2000 people went crazy about vicious computer and microwave ovens being released from being passive servants to becoming active enemies of humankind. But of course nothing happened.~~~~~

They have taken over, they just did it very quietly.

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Posted by: ghmc1 | 04/27/09 | 4:33 pm

The article refers to "500,000 and 700,000-kilovolt transformers" and says the US "uses more of these than anyone else. Anyone know where there are some?"

Note that 500,000 kilovolts is 500 megavolts. The highest voltage transmission line near me is  $\pm 500$ kv DC which is sometimes referred to as a 1 megavolt line because that is the potential difference between the conductors. I line with 500 times that voltage is hard imagine.

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Posted by: pw622 | 04/28/09 | 4:42 am

I think some of the facts could have been better researched.

The Ultra high voltage transformers built by ABB for China are 800kV. The numbers quoted here are out by a factor of 1,000.

The ACE satellite (ACE-FTS) is in Low Earth Orbit (400 miles), no where near one million miles mentioned.

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Posted by: Marshall5 | 04/28/09 | 10:38 am

I've read two articles in the last week stating the Sun's activity is the quietest it's been in over 100 years and expected to stay in this cycle for some time. What gives?

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Posted by: endofitall | 04/28/09 | 1:57 pm

The problem is the gravitational/magnetic squeeze from the galactic plane alignment on the planet. Volcanoes, earthquakes, and a possible slip of the crust returning the poles to their previous or possibly new positions are of more concern than the electrical grid. Peace

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Posted by: alphabeta gamma | 04/28/09 | 2:29 pm

One point of clarification. There are no million-kilovolt systems anywhere. There are million KVA, Kilovolt-Amperes, (called VARS in the industry) which are like watts, a measure of power. A million kilovolts would break through the atmosphere so far the lines would have to be extremely far off the ground, even if such a system could to be made to work at all.

The general thrust of this article is surely interesting, in that any large breakdowns in the electrical system, whether caused by the sun or by an EMP attack, would take a very long time to repair.

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Posted by: rclaborne | 04/28/09 | 6:57 pm

First of all, this is NASA inciting FUD to get their funding restored. As a "journalist", you should know this. You could have, at least, mentioned their inherent bias.

Second, these people are called Maya; singular and plural. Mayan is their language, therefore there is no such word as "Mayans". As a "journalist" you could have spent 5 seconds on google to find this out.

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Posted by: [Don't Say You Weren't Warned « The Reformed Pastor](#) | 04/29/09 | 8:18 am

[...] the target date is 2012, and it won't even be caused by a presidential election, according to Wired: For scary speculation about the end of civilization in 2012, people usually turn to followers of [...]

Posted by: [Darwiniana » The 2012 Apocalypse](#) | 04/29/09 | 2:59 pm

[...] The 2012 Apocalypse — And How to Stop It By Brandon Keim April 17, 2009 For scary speculation about the end of civilization in 2012, people usually turn to followers of cryptic Mayan prophecy, not scientists. But that's exactly what a group of NASA-assembled researchers described in a chilling report issued earlier this year on the destructive potential of solar storms. Entitled "Severe Space Weather Events — Understanding Societal and Economic Impacts," it describes the consequences of solar flares unleashing waves of energy that could disrupt Earth's magnetic field, overwhelming high-voltage transformers with vast electrical currents and short-circuiting energy grids. Such a catastrophe would cost the United States "\$1 trillion to \$2 trillion in the first year," concluded the panel, and "full recovery could take 4 to 10 years." That would, of course, be just a fraction of global damages. [...]

Posted by: [nixon the hand » Blog Archive » 2012 Bullshit : Impending Doom and Solar Flares](#) | 04/30/09 | 4:30 pm

[...] bullshit? Yah, I'm embarrassed to admit it sorta freaks me out a bit too. Well, a recent Wired Science article has helped me to throw some realistic fear and actually tangible predicted doom into the mix. Seems [...]