

How the sun could
wipe us out

A burst of plasma
would set in
motion a
devastating cascade
of failures

The solar apocalypse is imminent. Credit:
Frederic J. Brown/AFP via Getty

- APOCALYPSE NOW

CIVILISATION

ELECTRICAL GRID

INDUSTRY

NUCLEAR POWER

THE END OF THE WORLD





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The world began to end on 12th May 2024, though another 309 years would pass before our species finally went extinct. The apocalypse was not the result of one thing, unless that one thing was that we repeatedly ignored signs that industrial civilisation had become increasingly fragile, even as it grew ever more powerful. But our end very definitely had a trigger. A burst of charged plasma from the sun caused the sudden, simultaneous collapse of numerous electrical grids across the world, setting in motion a cascade of devastating failures from which humanity would never recover.

In one regard, this was perfectly predictable. In any given decade since the grid’s invention, there was a one in eight chance that such an electrical collapse could occur. In 2013, [a report](#) had warned that an extreme geomagnetic storm was almost inevitable, and would induce huge currents in Earth’s transmission lines. This vulnerability could, with a little effort, have been completely addressed for a tiny sum of money — less than a tenth of what the world invested annually in text messaging prior to the great collapse of 2024.

And it wasn’t as if the profits of some powerful industry depended on leaving the vulnerability open; the fossil fuel industry had a reason to oppose sustainable power, but the grid’s vulnerability enriched no one. In fact, every person on Earth stood to benefit from fixing the flaw. And yet it remained, never a priority, perhaps because nobody could predict when the fuse would be lit.

The burst of plasma leapt from the Sun’s surface on 9 May, 2024. It was detected by Earthbound space-weather observers, [who track these dangerous Coronal Mass Ejections](#). They made the usual calculations and issued the

standard warnings. Had the grid been promptly disconnected, the crisis might have been lessened. But as was invariably the case with geomagnetic storms, they could not say how seriously — or even if — this burst would disrupt power, so the scientists' warnings were largely ignored by grid managers, who don't like blacking out vast areas on the remote chance of a severe problem. Crossing fingers had worked pretty well in the past. This time it did not.

The plasma cloud had hit the Earth just so, inducing violent current fluctuations that burned up numerous electrical power transformers from the inside. The blackouts that started in May 2024 were not universal at first. The eastern third of North America was among the most extensively affected areas, with 30 massive transformers completely destroyed. In ordinary times, a single replacement transformer took three years to deliver. Suddenly the world faced an emergency need for more than 100.

Few who faced the initial blackouts had any idea what had happened, how big an area was affected, or that substantial grid repair would take years. The blackout cut them off from power, yes, but also from information. Most assumed their electricity would be back within hours or days. When night fell, the solar storm filled the sky with a spectacular display of northern lights visible as far south as Costa Rica, all the more dramatic in the places that had suddenly gone dark — a dazzling final curtain for industrial civilisation. This brilliant sky created a festive atmosphere.

By the second and third consecutive nights, the mood became increasingly panicked. People started trying to flee the blackouts by car. Most, not knowing how far it extended, made their situation worse. Without power, no gas was available, and so these first refugees were forced to abandon their vehicles haphazardly. Roads became blocked. The military tried to keep order, but their attempts to calm the population with false promises and inadequate aid caused them to be viewed with suspicion and hostility and sometimes targeted. Desertions became common as soldiers set out to protect their families.



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Even where the power remained on, life was not normal. Those near the blackout border quickly faced armed raids from the dark zones. Residents fled toward the powered interior. Wave after wave of refugees arrived — drawn to anything functional, quickly overwhelming it and creating new refugees. As everyone saw chaos erupt around them, they became intensely focused on immediate needs. Everywhere, there was hoarding. The sound of gunfire became ubiquitous as armed syndicates emerged to overwhelm

isolated preppers. The distinction between offensive and defensive killing was lost. Canned and freeze-dried food became inconceivably valuable. Currency became worthless as people realised society was unrecoverable.

Humans model danger based on their own experiences and those of their ancestors. Solar storms were nothing new, in 2024, but the jeopardy they posed to humanity had increased only very gradually since the last really big storm, in 1859 — the year Darwin had published *The Origin of Species*. That storm caught the eye of a British astronomer named Richard Christopher Carrington, who noticed unusual solar activity and linked it to the spectacular aurora that had appeared. What became known as the Carrington Event damaged telegraph systems and delivered shocks to a number of operators. Some found they could send messages even with the loss of power, because the storm had induced currents in the wires. Fascinating, but not the stuff of the nightmares, on a planet not heavily dependent on industry. And as our civilisation became overwhelmingly electrical, solar flares never produced enough harm to focus our collective attention — there was no real prelude to the event that precipitated our downfall.

In the initial weeks after the collapse, the military was tasked with a vital mission. Even dormant nuclear reactors — and their spent fuel pools — need to have cold water circulated through them constantly to prevent reactor meltdowns and devastating fuel-pool fires. Regulations required that each complex have a week's worth of backup diesel generator fuel on hand. Many had four times that amount, but none had planned for a blackout that would last a year or more, and that is what they were facing in the best-case scenario. It fell to the Army to make sure these backup diesel generators and pumps never failed or ran dry. For six months, they accomplished that mission across all the affected reactors, with one exception.

The Army had quickly found that for most reactors, creating a defensible perimeter around the site and delivering fuel by helicopter was the most reliable approach. In the third week after the collapse, a helicopter clipped a light pole in the fog and crashed at the North Anna reactor in Virginia, spilling its fuel and sparking a devastating fire that engulfed the generators. Retardant dropped from above was sucked into the air intakes, and the combination killed the power, which remained out long enough for the reactor cores to meltdown and slump. The containment breached, forcing the site to be abandoned.

As the fuel pools boiled and ran dry, the heat from radioactive decay caused the cladding on the fuel rods to burst into flame; a plume of highly radioactive smoke rose above the site, contaminating the region and driving essential governmental functions out of Washington D.C., one of few Eastern seaboard cities that had been successfully stabilised. The danger of the radioactive fallout was kept officially quiet, but rumours spread, confirmed by those few citizens with access to battery-powered Geiger counters. This sparked a massive refugee crisis as the region's population fled their homes, dodging precipitation, every squall now raining radioactive isotopes onto the

earth below. Ultimately, the spreading collapse of civilisation would cause every nuclear reactor complex on Earth to be abandoned, guaranteeing that all of its radioactive material would escape into the environment and begin to circulate.



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Meanwhile, the population was nearly helpless as the skills they had acquired for the pre-collapse world were rendered useless. Many thought that, with modern weapons, they could hunt their way through lean times — the result being that populations of every terrestrial animal one might think to eat crashed all at once. Hundreds of thousands of humans fled into the wilderness, many with no idea how to function there. The result that first summer was unprecedented wildfires — some started carelessly, some set deliberately by people hoping to flush out animals. In North America, 100 years of foolish forest management centred on fire suppression had left a giant tinderbox. Post collapse, there was no firefighting effort to contain these blazes. They burned, hot, until they went out, desertifying vast landscapes, killing many, and creating ever more refugees with nowhere to go.

The fires had another consequence. They filled the atmosphere with smoke, noticeably cooling the Earth for several years, delaying and masking a much bigger and more devastating effect. Vast quantities of carbon were transferred during the fires from living plants into heat-trapping gasses. At the same time, the sudden collapse of the world economy had brought industrial activity to a standstill — along with the pollutants it incessantly expelled into the atmosphere, which had had a cooling effect. The globe began to warm precipitously, hitting a tipping point in the fourth year after collapse, when the Arctic thawed sufficiently to set off the “clathrate gun”, where enough frozen methane was liberated to trigger positive feedback, with each newly thawed ton elevating the temperature enough to liberate yet more methane. The temperature of Earth jumped 7 degrees Celsius in 20 years, throwing every ecological process that endured the initial collapse into chaos.

The radical warming of the climate delivered a terrible blow to traditional agricultural systems, which were becoming the only source of food. Suddenly, every farmer lived in an altered habitat, and the crops they were expert in producing were no longer at home. Large-scale agriculture had already failed, utterly, in the first year of collapse. The really big crops had all been engineered to maximise profit under stable circumstances, and they didn’t grow at all without the fertilisers and machines around which they were designed. Most livestock had been killed by desperate people with no experience preserving meat and most of their bulk putrefied where they fell.



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The southern hemisphere fared better and held out longer because most of industrial civilisation was in the north, and the atmosphere and oceans are very slow to mix across the equator. But ultimately, they did mix, and the devastating rise in the Earth’s temperature spared no one. When the last human died on the shores of Comoros, it was for lack of food. Her family had learned to survive on gathered shellfish but ultimately even they, protected for so long by their isolation from the chaos, gave out, when the macroscopic ecology of the southern oceans gave way.

If there is a lesson to be gleaned from the cascading failures that ended our species and destroyed our planet, it is this: it didn’t need to happen. The vulnerability of the transformers was a solvable issue (as was the vulnerability of our nuclear reactors, our agriculture, our information infrastructure and our populations.) The fact that solar flares could precipitate a catastrophic power outage had been well understood, but minimising this hazard never became a global priority. All it would have taken is money and time. Once the transformers were destroyed, money became meaningless and time had run out.

Back in 2021, the sun was predicted to reach its next solar maximum in 2025. Humanity crossed its fingers one last time.

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