

Book warns about the fragile, aging U.S. power grid

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In last week's article, I cited several incidents that have taken place that indicate the fragility of our power grid and how it presents itself to our enemies as an opportunity to do more damage to our nation and our lives than any terrorist attack that we have ever seen on our soil or overseas. I also cited as a basis of this the book *Lights Out* by Ted Koppel, former ABC anchor of the long-running *Nightline* show that began as a result of the taking of our embassy in Iran during the Jimmy Carter administration.

To recap the evidence that Koppel presents that I mentioned in last week's article, I cited three separate incidents

The first incident occurred in August of 2003 when a high-voltage power line overheated. As it got hotter and hotter, the power line expanded and drooped down until it brushed against some trees. When it made contact, it shorted out and began to overload the system and shut itself down, as it was designed to do to protect the components of the system. Unfortunately, as it shut down it overloaded other lines that were designed to sustain power to the grid, causing a cascade of power failures.

Ultimately, the power went out for 50 million people in eight states and parts of Canada, costing \$6 billion of damage and the lives of 11 people. Despite the damage, the safeties built into the system allowed it to limit the damage and the power grid was back up in two days.

The second incident took place ten years later when terrorists cut fiber-optic telecommunication lines at the Metcalf Transmission Substation owned by Pacific Gas and Electric Company, then fired hundreds of rounds from AK-47's into the substation, damaging 17 large transformers. Power was rerouted and a blackout was averted, so the system worked, even though it took 27 days to make repairs and get the substation back online.

The third incident was Stuxnet, the joint US-Israeli cyberattack on Iran's main uranium enrichment center in Natanz. The software worm caused the centrifuges to spin at an improper speed, causing them to self-destruct, all while Iranian technicians watched what appeared to be normal indications on their computer screens.

Our power grid is very fragile – it takes serious effort to coordinate the amount of power that crosses each portion of our power grid, and overloading a power line can cause the line to overheat, causing the lines to sag and short-circuit. In addition, there are tens of thousands of decades-old large power transformers (LPT) on our grid. These transformers are as large as houses, and many are more than forty years old.

Koppel quotes a senior Department of Energy (DOE) official who said, “Power transformers have long been a concern for the U.S. Electricity Sector. The failure of a single unit could result in temporary service interruption and considerable revenue loss, as well as incur replacement and other collateral costs. Should several of these units fail at the same time, it will be challenging to replace.”

A DOE report stated that “An LPT is a large, custom-built piece of equipment. Because LPT’s are very expensive (\$3 million to \$10 million each) and tailored to customer’s specifications, they are usually neither interchangeable with each other nor produced for extensive spare inventories.”

Koppel explains, “...there are only a handful of plants in the United States capable of building an LPT – as of this writing, ten such facilities. The vast majority of large power transformers are built overseas, and more than 75 percent of those purchased by the U.S. energy sector must be procured overseas. The estimated lead time, the time from production through shipping to delivery, is commonly between one and two years, and never less than six months.”

But finding replacement LPT’s quickly is not the only problem. Transporting them is another: “These transformers are so enormous – anywhere from 400,000 to 600,000 pounds – that they cannot be transported on a standard railroad freight car. It requires the use of a specialized freight car known as a Schnabel. There are only about thirty of these in North America, and ...some of the original transformers were delivered so many years ago that the rail lines on which they were transported no longer exist. When LPT’s are transported by road it calls for a modular device seventy feet long with twelve axles and 190 wheels. The unit occupies two lanes of traffic and requires special permits...”

The scenario Koppel fears is one in which a cyberattack mimicking Stuxnet allows our system to be overloaded without being alerted until it is too late, damaging our power lines and LPT’s. We are so unprepared to deal with a resulting blackout that could be so widespread and take so long to repair that it would send us back to the stone ages. Loss of life within the first year could be immense.

It is not hard to imagine that the terrorists are planning an attack from the comfort of their living room using only a laptop.



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