Lessons Learned from the 2003 Blackout

On August 14, 2003, at about 2 in the afternoon, a high-voltage power line in northern Ohio brushed against some overgrown tree branches and switched off. Under normal conditions, such a fault would have tripped an alarm in the control room of the local utility company. Unluckily, the alarm system failed. In less than two hours, three more lines sagged into trees due to the heat and shut down, forcing joining power lines to shoulder the extra burden. As the demand was extremely high on this hot and humid Thursday, these joining lines soon failed, too.

What ensued was a cascade of failures in a total of 265 power plants in eight states in the Midwest and Northeastern United States, and two Canadian provinces, resulting thus in the largest power outage in US history. Not only did the blackout leave a total of 60 million customers without power for up to two days but it also exerted a heavy toll on human life, as it contributed to almost 100 deaths. It was also estimated to have cost businesses approximately six billion dollars. The following extract, taken from a publication entitled '*Learning from the 2003 Blackout*', available at the official website of the US Department of Transportation, gives a vivid picture of the chaos that descended in New York City: 'The massive power outage left a swath 6,000 kilometers (3,700 miles) long in the dark. In New York City, workers poured out of the highrises only to find the streets gridlocked, because traffic signals at all of the city's 11,600 signalized intersections had ceased to operate. The New York subway system ground to a halt, stranding more than 400,000 passengers in tunnels. The city's extensive commuter rail network also closed down, leaving few options for routing stranded customers back to their homes in New Jersey and Connecticut since approximately three-fourths of work trips into Manhattan are made using transit.' (https://highways.dot. gov/public-roads/septemberoctober-2004/learning-2003-blackout)

The blackout (or 'voltage collapse', as such outages are frequently called) served as a wake-up call to the vulnerability of the electric energy grid and taught valuable lessons as to how such incidents could be averted. However, despite the recommendations included in the official reports that were compiled in the aftermath of the 2003 outage, the US electric power system still continues to be challenged. Between 2000 and 2009, hundreds of blackouts occurred affecting thousands of customers. In 2012, the prolonged power outages caused by Hurricane Sandy once again exposed the system's fragility.

So, what can and should be done? Here are some solutions that, once implemented, can substantially eliminate massive blackouts or at least mitigate their devastating impacts:

Leaving behind the conventional grid paradigm

The conventional grid is gradually being (and should be) phased out as recent technological advancements make the grid 'smarter'. Perhaps most consumers of energy have already heard of the term 'smart grid', but do they know exactly what it refers to?

According to the US Department of Energy, the 'smart grid' is defined as the 'digital technology that allows for two-way communication between the utility and its customers, and the sensing along the transmission lines. Like the Internet, the Smart Grid will consist of controls, computers, automation, and new technologies and equipment working together, but in this case, these technologies will work with the electrical grid to respond digitally to our quickly changing electric demand.' (https://www.smartgrid.gov/the_smart_grid/ smart_grid.html)

In a nutshell, the potential of the smart grid is enormous. To quote the US Department of Energy again, 'the Smart Grid represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency that will contribute to our economic and environmental health.'