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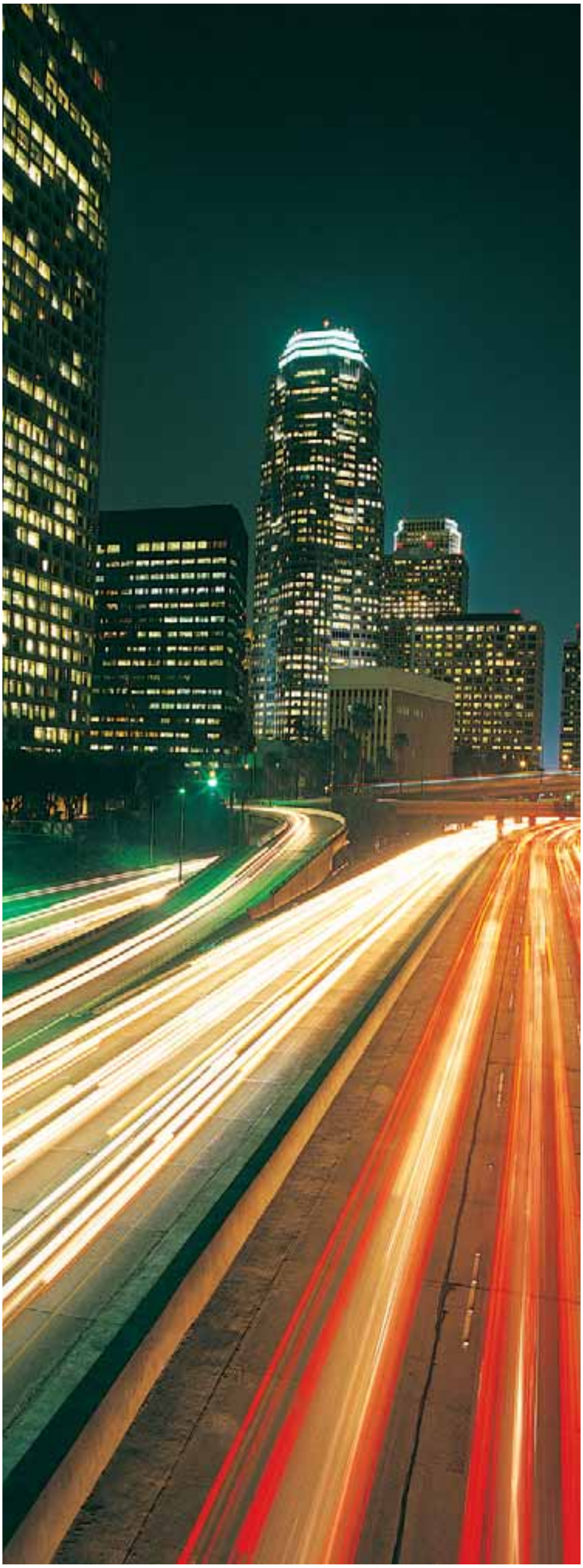

Bad news: outages happen. Good news: the grid can adapt

The names are familiar to all of us: Katrina, Ike, Sandy. But while everyone has some idea of the impact of major storms like these, their full reach is hard to overstate.

According to a White House report published in August, severe weather accounted for 58 percent of all power outages in the US since 2002, but among larger blackouts (those impacting more than 50,000 people) the figure rises to 87 percent. Meanwhile, the incidence of both severe weather events and the outages they cause is increasing. Over the past ten years, there has been a sharp rise in weather-related outages while non-weather related events have remained essentially flat.

The cost of severe weather incidents is staggering. Estimates range from $18 billion to $33 billion per year according to the White House report, and seven of the ten most costly storms in US history have occurred within the last ten years. While there is little we can do to prevent storms from happening, there is much we can do to make the grid more resilient. As with most large challenges, though, the solution will not be one-size-fits-all.

For example, underground power lines are virtually impervious to most storms but they carry a cost premium and if they do experience a fault it can take much longer to diagnose and address the problem. For some utilities, it may make more sense to stick with overhead lines and invest in outage recovery capabilities. It is typically more cost-effective, for example, to rebuild a substation damaged by flooding than it is to install flood control measures around the facility.

Still, there are a number of technologies that are already having an impact on storm recovery in a wide range of locations. Smart meters, for example, are mostly associated with time-of-use pricing, but they also serve as a sensor network indicating precisely where power is on and where it is off. Automation solutions such as FDIR (fault detection, isolation and restoration) further mitigate the scope of an outage by automatically isolating the area around a fault and feeding power from alternate pathways to those locations capable of receiving it. This capability allows utilities to better manage resources during an outage and focus on the most severely impacted areas.

Microgrids, small self-sufficient "grids within grids," offer the ability to switch to local generation during a storm and reconnect to the grid when the system has been restored. As distributed generation (e.g., rooftop solar, microturbines, fuel cells) and energy storage technologies continue to improve, we can expect to see more microgrids in every type of environment from critical facilities like hospitals to essential businesses like gas stations.

Of course, technology can only do so much. Improving the resiliency of our power supply will also require investments in expanded training for grid operators, simulation and analysis of severe weather events and improved communications (e.g., that use social media channels to provide information on restoration efforts).

Changes will be needed in some policy areas, too, for example to simplify the integration of microgrids and small generation sources. Eventually, the utility industry itself will need an alternative to the cost recovery models of the past so that the investments they make in preserving grid reliability can be supported. The tools to improve grid resiliency are available today. The next step is to create an environment in which they can be applied more broadly.

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