Preparing to Harden Electrical Resources for Hurricane Season

By PURC Team

PUBLIC UTILITY RESEARCH CENTER

Experts responsible for predicting storms that will affect United States communities estimate that up to twenty named storms will cause significant damage in 2021. The first one, Ana, has already occurred before the beginning of June, announcing the start of our annual Hurricane Season.

Communities nationwide are responding to this unwelcome news by mobilizing resources to ameliorate the effects of predictably costly and even devastating storms like the infamous catastrophes Katrina, Sandy, Harvey, and Irma. Popular strategies feature presumably reliable, familiar policies and practices designed to harden electrical cable arrays. The purpose of hardening outdoor electrical systems has been to ensure their capacity to resist storm damage and reduce costs to areas predictably affected by extremely bad weather.

The following text is indebted to and based in large part upon The Conversation article, "Should the U. S. Put Power Lines Underground?" by Dr. Theodore Kury, Director of Energy Studies, University of Florida. Several additional experts contributed comments on the article and related topics.

Some popular, conventional responses, such as relocating electricity cables underground, may encourage automatic, simplistic, and even counterproductive policy approaches to address the need for effective management of electrical utilities.

Costs of Named Storm Damage

The impacts of severe storms are:

- Varied: Energy consumption across households is enormously varied when quantified by state. In California, the average household used about 6,200 kWh in 2019, compared to about 14,800 kWh in Louisiana — a difference of about 8,600 kWh per household.

- Complex: Costs are rarely, if ever, confined to conventional measures such as average costs of power outages to businesses and residences. The costs of power outages not only vary across the type of customer, but they also increase substantially as the length of the outage increases. A five minute outage may be a nuisance for a household, but disastrous for a nylon manufacturer. An hour-long outage may be manageable for a household that doesn't have specific medical needs, but a week-long outage alters the way we live. There may even be additional impacts related to factors such as population densities, the structure(s) of local governments, ownership structures, climate, and natural hazards.

- Diverse: Impacts often include negative effects that may not be noticed by all residents — on mental as well as physical health, for example, which may affect employment and workplaces without warning.

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- Often difficult to quantify in advance: Moving distribution systems underground can be expensive, with $1 million per mile often used as a benchmark, but local factors can halve that cost or can triple them.

- Sometimes cost-effective, but sometimes not: Dr. Kury's article cites a 2010 study of a District of Columbia hardening project supported by The Mayor's Power Line Undergrounding Task Force. A major finding was that nearly 80 percent of the cost of a $5.8 billion project would benefit only 35 percent of the customers. As a result, the Task Force recommended the funding of a more focused, $1.1 billion project that would benefit 65% of the customers.

There may also be differences in the costs required to maintain an underground system relative to an overhead one. After a storm, workers may have to pump out water from an underground system or wait for it to recede, or clear damaged vegetation from an overhead system, before restoration work can begin. So again, local factors will influence the choice of where to locate power lines.

A 2009 study from Lawrence Berkeley National Laboratory analyzed costs of an eight-hour power outage; the study compared the cost to average residential customers to costs incurred among small and medium to large commercial and industrial customers:

- Residential: $10.60

- Small commercial/industrial: $5,195

- Medium to large commercial/industrial: $70,000

The study concluded that the economic benefits of storm hardening projects may be significant. Nevertheless, major costly decisions such as relocating power lines should always be evaluated on a case by case basis by the local utility and should never be approved without systematically investigating alternative hardening approaches.

Planners Need to Collaborate and Conduct Case-by-Case Analyses

Communities that are likely to suffer effects of significant damage from named storms need to have confidence that cost estimates and projected benefits are reliable. This transparency to administrators, political leaders, and planners conveys a public message that utility hardening policies such as undergrounding cables and vegetation maintenance reflect a broad consensus among diverse experts.

Collaboration among varied planners also ensures that widely noticed disparities among individual estimates do not confuse concerned public observers of the decision-making process.

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Consensus among local and regional policymakers and planners also provides a baseline for future analyses of the effectiveness of the criteria governing decision-making. Creating this collaboratively developed, data-driven baseline also enables planners to respond to unforeseen changing conditions and circumstances that affect costs, both negatively and positively.

Finally, such a consensus would counteract the adverse effects of arbitrary assumptions, popular and widely held beliefs, and counterproductive traditional practices that may otherwise affect methods by which costs of storm damage are calculated.