Researchers can predict hurricane-related power outages (w/ Video)

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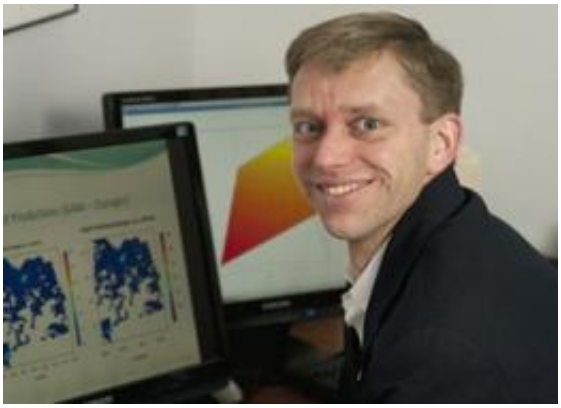

This is Seth Guikema, assistant professor of geography and environmental engineering at the Johns Hopkins University. Credit: Will Kirk/Johns Hopkins University

(PhysOrg.com) -- Using data from Hurricane Katrina and four other destructive storms, researchers from Johns Hopkins and Texas A&M universities say they have found a way to accurately predict power outages in advance of a hurricane. Their approach provides estimates of how many outages will occur across a region as a hurricane is approaching.

The information provided by their computer models has the potential to save utilities substantial amounts of money, savings that can then be passed on to customers, the researchers say. In addition, appropriate

crew levels and placements can help facilitate rapid restoration of power after the storm.

The study was a collaborative effort involving Seth Guikema, an assistant professor of geography and environmental engineering at Johns Hopkins and formerly of Texas A&M; Steven Quiring, an assistant professor of geography at Texas A&M; and Seung-Ryong Han, who was Guikema's doctoral student at Texas A&M and is now based at Korea University. Their work, which was funded by a Gulf Coast utility company that wishes to remain anonymous, is published in the current issue of the journal *Risk Analysis*.

The research focused on two common challenges. When a hurricane is approaching, an electric power provider must decide how many repair crews to request from other utilities, a decision that may cost the provider millions of dollars. The utility also must decide where to locate these crews within its service areas to enable fast and efficient restoration of service after the hurricane ends. Having accurate estimates, prior to the storm's arrival, of how many outages will exist and where they will occur will allow utilities to better plan their crew requests and crew locations, the researchers say.

What makes the research team's computational approach unique and increases its accuracy, Guikema and Quiring say, is the combination of more detailed information about the storm, the area it is impacting and the power system of the area, together with more appropriate statistical models.

"If the power company overestimates, it has spent a lot of unnecessary money," Quiring said. "If it underestimates, the time needed to restore power can take several extra days or longer, which is unacceptable to them and the people they serve. So these companies need the best

estimates possible, and we think this study can help them make the best possible informed decision."

In addition, more accurate models "provide a much better basis for preparing for restoring power after the storm," Guikema said, adding that "the goal is to restore power faster and save customers money."

In developing their computer model, the researchers looked at damage data from five hurricanes: Dennis (1995), Danny (1997), Georges (1998), Ivan (2004) and Katrina (2005). In the areas studied, Ivan created 13,500 power outages; Katrina, more than 10,000; Dennis, about 4,800; Georges, 1,075; and Danny, 620.

For the worst of these storms, some customers were without power for up to 11 days. The research team collected information about the locations of outages in these past hurricanes, with an outage defined as permanent loss of power to a set of customers due to activation of a protective device in the power system.

The researchers also included information about the power system in each area (poles, transformers, etc.), hurricane wind speeds, wetness of the soil, long-term average precipitation, the land use, local topography and other related factors. This data was then used to train and validate a statistical regression model called a Generalized Additive Model, a particular form of model that can account for nonlinear relationships between the variables.

More information: The team's *Risk Analysis* study: www3.interscience.wiley.com/cg … /122542675/HTMLSTART

Source: Johns Hopkins University