Florida Department of Transportation Research

Development of Low Voltage/Extended Runtime Signalized Intersection Using Backup Power after the Loss of Utility Power Due to Hurricanes

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Project Number
BE703

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Current Situation

Hurricanes have struck Florida more than any other state, and they can cause severe damage. This includes transportation infrastructure as high winds and downed trees interrupt electrical service, taking traffic signals out of service during and after the hurricane and creating additional hazards at intersections for emergency response vehicles as well as other drivers, especially at night. Some signals currently have a battery backup using traditional lead-acid batteries, but these provide power to traffic signals for only a few hours. Alternative means of powering traffic signals for longer times under emergency conditions could help alleviate hurricane hazards associated with traffic signals.

Road hazards increase during post-hurricane power outages.

Research Objectives

University of South Florida researchers developed recommendations for specific technologies to be tested as extended backup power for traffic cabinets in case of power loss.

Project Activities

In a literature review, the researchers identified the requirements for traffic signal backups and possibilities for alternative power sources, including a variety of battery backup systems, natural gas, portable gasoline generators, and solar and wind power.

In consultation with staff at the Florida Department of Transportation (FDOT) Traffic Engineering Research Lab (TERL) and the FDOT Project Manager, the research team selected a liquid propane (LPG) generator system, a lithium battery system, and a lithium battery with solar backup system for testing. Some alternative power system fuel types could be hazardous. Additional safety precautions must be taken for these systems. Testing was conducted at the TERL in Tallahassee, where the systems were installed at a test intersection and connected to the traffic cabinet.

The lithium battery system presented many advantages: power from the battery transfers instantly with no interruption of traffic signal function and the battery automatically recharges when electrical service is restored. However, the lithium battery can still run out of power during an electrical outage. It is possible to extend its service by adding more batteries, but lithium batteries at that size are costly.

Adding a solar power backup to the lithium battery provided the best solution to extending battery life and reducing overall cost. In the specific setup the researchers tested, the battery recharged in a few hours of morning light and was ready for a full-night's service of 14 hours. Next steps include specifying which products will fulfill FDOT requirements and providing guidance so that agencies can select the appropriate combination of devices for specific intersections.

Project Benefits

The results of this project can improve safety on Florida roads during power outages, especially the large scale outages caused by hurricanes and other severe storms.

For more information, please see www.fdot.gov/research/.