Solar-Powered RFID Reader Measures Road Traffic

The portable device holds promise for deployment in areas and under conditions for which a permanent RFID installation would be too expensive or impractical.

By Claire Swedberg

Nov. 17, 2006—Transportation researchers at Rensselaer Polytechnic Institute and the New York State Department of Transportation (DOT) are testing a solar-powered mobile RFID interrogator that will monitor traffic flow by reading EZPass tags attached to passing cars. Motorists use the tags to pay for bridge and highway tolls wirelessly. Last week, Rensselaer began testing a single RFID reader on Jordan Road in Troy, N.Y. In the spring, they plan to hold a pilot involving six solar-powered readers.

New York State currently monitors traffic flows on certain roads via 15 permanently stationed readers, which collect data from the EZPass tags. The new solar-powered portable solution provides a method of monitoring traffic flow for situations where it's too costly or unnecessary to install a permanent RFID reader—such as on roads where construction is underway, or on those traveled heavily only for special events.

"There are lots of traffic-monitoring points out there, but they rely on AC power," says Paul Manuel, vice president of sales and marketing at the Mark IV IVHS, which manufactures the solar-powered solution. Providing a permanent power source, he explains, is not always practical under such conditions.

The portable RFID unit, dubbed mGate, connects to a laptop computer via a USB cable, with batteries charged by a solar panel. Operators load the unit onto a trailer hitched to a truck for transport. When deployed alongside a road, the unit's laptop sends the encrypted tag ID, timestamp and reader location via a wireless Internet connection to the Rensellaer server.

The system will ultimately be used to calculate how long it takes traffic to move from one installed RFID reader to another. However, the current pilot is only testing read rates. Eventually, traffic data from the mGate system could be used to reroute traffic when congestion looms, or to alert motorists via signage or the Internet about slow-moving road conditions, reducing the need for employees to identify problems as they arise.

Researchers received a $3.9 million grant from the Federal Highway Administration (FHWA) to fund the program, says Jeffrey Wojtowicz, a research engineer in civil and environmental engineering at Rensselaer. Also participating in the pilot are the New York State Thruway Authority, and North Carolina State University.

Annese & Associates is providing some of the software needed for the pilot. This software will scramble the unique ID numbers captured by the readers so the system cannot be used to identify individual drivers, or to collect data about their movements or speed.

The portable device on Jordan Road is positioned on the side of the road; its two RFID antennas can be raised

above the road to capture the EZPass tags on passing motorists' vehicles. At present, approximately 18 million EZPass battery-powered transponders are in use in New York. The mGate interrogator slated to collect the data from such passes is powered by a single 100-watt solar panel. Manuel declined to name the solar-technology provider but described it as an "off-the-shelf" solution.

Data from the mGates could eventually be integrated with data derived from existing permanent traffic-management readers, Wojtowicz says. Currently, such integration is not possible. "We are implementing a different data-encryption algorithm than the traditional system," he says, "and the data is being sent to a different location."

RELATED_ARTICLES Researchers will test the mGate system deployed on Jordan Road until weather makes the pilot inconvenient (the operation of snow plows, for example, would put the reader at risk of damage). During that time, they will fine-tune the system as they evaluate read rates. This spring, the team will put six mGate units at various sites on the Route 4 area in and around Troy to prove such devices can capture travel times on local arterials. "Deploying six readers will give us the ability to monitor vehicles taking different paths," Wojtowicz says, and to capture their speed between several points along those paths.

In the meantime, the researchers are testing the reader deployed on Jordan Road for the optimal capture angle. "We can work on any changes we need to make over the winter," Wojtowicz says. "We want to prove the technology works—how reliable it is—and verify what the system's read rates are."