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NEWS RELEASE

Wireless Nanotech Sensors Could Monitor Power Systems 24/7

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BUFFALO, N.Y. -- As electric power this week returned to the last of the homes and businesses in Western New York affected by the devastating October snowstorm, researchers at the University at Buffalo were discussing how tiny, nanoscale sensors could make power systems far more resilient.

Engineers with UB's Energy Systems Institute, one of the nation's few academic research centers that studies the fundamentals of electric power, have for the past year been considering how nanoelectronics could dramatically shorten, or in some cases eliminate, crippling power outages.

"Until now, we've had to do everything with wires and that makes it very expensive," said W. James Sarjeant, Ph.D., James Clerk Maxwell Chair Professor of Electrical Engineering at UB and director of the institute.

"What we're proposing is to use wireless communications, by embedding tiny sensors at every point in the system," he said. "The nanosensors would then send in real-time a signal to a centralized computer using wireless communications. It would monitor the power coming to every home or business in the system at every instant in time."

Such an embedded, low-cost, self-powered system would provide integrated prognostic and diagnostic capabilities, detecting problems and in some cases prescribing solutions, thus greatly expediting the time it would take to prevent cascading effects.

According to Sarjeant, one of the factors contributing to the enormous investment of time needed to get all of the 390,000 customers back online last week was that the utilities needed to send crews street-by-street just to identify the problems in the field.

"The utilities had no way of knowing what happened at specific locations," he said, "whether it was a wire down, or a transformer that had blown up.

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"Wireless sensors, on the other hand, could give you a very low-cost way to monitor the health, quality and safety of every element in the system, without having to dispatch a crew to investigate," he said.

Since the information transmitted from sensors could instantly indicate to a central computer the

nature of a problem, the utility would know immediately whether it needed to send a truck out or simply inform the property owner that a main circuit breaker had tripped.

The wireless sensors also could be used in sump pumps, Sarjeant said, creating a kind of "smart house" that could detect and report malfunctions in its systems before a catastrophic failure occurs.

For electric power applications, such a capability would be nothing short of a revolution, Sarjeant said.

"This could change the way electricity is managed from a safety point of view," he said.

A key advantage of the wireless sensor system is that because nanoscale sensors are by definition very small and use low power, they could be designed into power components or retrofitted at a minimal cost, according to the UB scientists.

Sarjeant noted that such a system would be a far more efficient, cost-effective way to modernize the power grid than replacing components after they fail.

He and his colleagues in the department of electrical engineering and others in the UB departments of civil, structural and environmental engineering and mechanical engineering have developed a multidisciplinary team with expertise in nanoelectronics, sensors, power systems and networking to tackle the issue.

Unfortunately, Sarjeant noted, funding for electrical power research has dwindled substantially over the past few decades.

While that may not make sense to Buffalo home- and business owners, whose lives still may not be back to normal after last week's storm, the reality is that there is currently very little federally or industry-funded research on enhancing power systems, Sarjeant said.

The UB engineers currently are seeking funding for their research.

The UB multidisciplinary team in the School of Engineering and Applied Sciences is pursuing the power systems research as part of UB's 2020 strategic strength initiative in integrated nanostructured systems. The goal is to improve the response of power systems during catastrophic or extreme events.

In addition to Sarjeant, the team includes Jennifer Zirnheld, Ph.D., adjunct lecturer in electrical engineering and deputy director of UB's Energy Systems Institute; Jonathan Bird,

Ph.D., Alexander Cartwright, Ph.D., and Albert Titus, Ph.D., professors of electrical engineering; Vladimir Mitin, Ph.D., professor and chair of electrical engineering; and Cemal Basaran, Ph.D., professor of civil, structural and environmental engineering.