

## NIST Technology Innovation Program Announces New R&D Projects To Develop Infrastructure Monitoring and Inspection Technologies

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GAITHERSBURG, Md.—The National Institute of Standards and Technology (NIST) today announced nine awards for new research projects to develop advanced sensing technologies that would enable timely and detailed monitoring and inspection of the structural health of bridges, roadways and water systems that comprise a significant component of the nation's public infrastructure. The awards are the first to be made under NIST's new Technology Innovation Program (TIP), which was created to support innovative, high-risk, high-reward research in areas of critical national need where the government has a clear interest because of the magnitude of the problems and their importance to society.

The cost-shared awards announced today initiate up to \$88.2 million in new research over the next five years on structure monitoring and inspection technologies, \$42.5 million of it potentially funded by TIP.

TIP was established by the 2007 America COMPETES Act to support, promote, and accelerate innovation in the United States through high-risk, high-reward research in areas of critical national need. The merit-based competitive program can fund cost-shared R&D projects by single small-sized or medium-sized businesses and joint ventures that also may include institutions of higher education, non-profit research organizations and national laboratories. TIP awards are limited to no more than \$3 million total over three years for a single company project and no more than \$9 million total over five years for a joint venture.

The first TIP competition for research funding, announced July 9, 2008, targeted new, efficient, accurate, low-cost and reliable sensors and related technologies that provide quantitative assessments of the structural integrity or degree of deterioration of bridges, roads, water mains and wastewater collection systems. The nation's economy depends critically on a large and complex civil infrastructure of water pipelines, roads, bridges and tunnels. The United States has 1 million miles of water mains, 600,000 bridges and 4 million miles of public roadway.

Experts have pointed to serious gaps in the nation's ability to monitor these networks adequately to ensure timely maintenance and repair. Twenty-five percent of U.S. bridges were rated as structurally deficient or functionally obsolete in 2007, according to the Federal Highway Administration, and the Environmental Protection Agency reported that there are 240,000 water main breaks per year in the United States. Baltimore, Maryland, as an example of an older urban area, suffered almost 1200 water main breaks in 2003. Leakages and breaks in water distribution systems are estimated to waste up to 6 billion gallons of drinking water each day.

Damaged infrastructure also directly affects large numbers of Americans. The American Society of Civil Engineers estimates that Americans spend \$54 billion each year in vehicle repairs caused by poor road conditions.

The TIP white paper "Advanced Sensing Technologies for the Infrastructure: Roads, Highways, Bridges and Water Systems" can be obtained from the NIST Web site at [www.nist.gov/tip/cnn\\_white\\_paperfinal.pdf](http://www.nist.gov/tip/cnn_white_paperfinal.pdf). Additional information on the Technology Innovation Program is available at [www.nist.gov/tip](http://www.nist.gov/tip).

A list of the 2008 TIP project awards and links to additional details for each follows.

### Technology Innovation Program 2008 R&D Awards Advanced Sensing Technologies for the Infrastructure

#### Development of SCANS<sup>n</sup> for Advanced Health Management of Civil Infrastructures

Acellent Technologies, Inc. (Sunnyvale, Calif.)

- Project duration: 3 years
- Projected TIP contribution: \$2,995 K
- Project cost-share contribution: \$2,995 K

Develop an extensible and self-powered sensor network using a peer-to-peer communication protocol for nondestructive evaluation (NDE) and health monitoring of bridges, buildings, pipelines and other major infrastructure components. [Read more...](#)

#### Fiber Sensing System for Civil Infrastructure Health Monitoring

Distributed Sensor Technologies, Inc. (Santa Clara, Calif., Joint Venture Lead)

- Project duration: 3 years
- Projected TIP contribution: \$4,030 K
- Project cost-share contribution: \$4,518 K

Develop an economical, fiber-optics-based system for monitoring the structural health of large infrastructure elements such as bridges or pipelines utilizing light pulses traveling down a cable to provide high-resolution, localized identification of both static and dynamic conditions without the need for installing large networks of discrete sensors. [Read more ...](#)

#### **Infrastructure Defect Recognition, Visualization and Failure Prediction System Utilizing Ultrawideband Pulse Radar Profilometry**

ELXSI Corporation (Orlando, Fla., Joint Venture Lead)

- Project duration: 3 years
- Projected TIP contribution: \$3,119 K
- Project cost-share contribution: \$3,629 K

Develop a novel, deep-penetrating scanning system based on ultrawideband radar for inspecting buried infrastructure such as pipelines, tunnels, and culverts that can detect fractures, quantify corrosion and determine the presence of voids in the surrounding soil to "see" beyond the structure to prevent accidents. The technology provides analysis that cannot be detected by current pipe inspection techniques. [Read more ...](#)

#### **Microwave Thermoelectric Imager for Corrosion Detection and Monitoring in Reinforced Concrete**

Newport Sensors, Inc. (Irvine, Calif.)

- Project duration: 3 years
- Projected TIP contribution: \$1,249 K
- Project cost-share contribution: \$1,249 K

Develop a novel nondestructive technology for early detection of corrosion in reinforced concrete structures. [Read more ...](#)

#### **VOTERS: Versatile Onboard Traffic Embedded Roaming Sensors**

Northeastern University (Boston, Mass., Joint Venture Lead)

- Project duration: 5 years
- Projected TIP contribution: \$9,000 K
- Project cost-share contribution: \$9,802 K

Develop a novel system based on instrument packages that can be installed on a wide variety of private and public vehicles to assess the conditions of bridges and roadways through several different and complementing methods at regular driving speeds during the course of ordinary use of the vehicles. [Read more ...](#)

#### **Self-Powered Wireless Sensor Network for Structural Bridge Health Prognosis**

Physical Acoustics Corporation (Princeton Junction, N.J., Joint Venture Lead)

- Project duration: 5 years
- Projected TIP contribution: \$6,930 K
- Project cost-share contribution: \$6,969 K

Develop a novel system for continuously monitoring the structural health of bridges using wireless sensors that "harvest" power from structural vibration/wind energy and assembles data from a variety of sensors for interpretation through damage assessment/reliability algorithms. [Read more ...](#)

#### **Next Generation SCADA for Prevention and Mitigation of Water System Infrastructure Disaster**

University of California at Irvine (Irvine, Calif., Joint Venture Lead)

- Project duration: 3 years
- Projected TIP contribution: \$2,800 K
- Project cost-share contribution: \$2,885 K

Develop a novel monitoring and inspection system for pipes and pipe networks in water and wastewater infrastructure systems using wireless sensor nodes incorporated in an advanced Supervisory Control And Data Acquisition (SCADA) system. [Read more ...](#)

#### **Cyber-Enabled Wireless Monitoring Systems for the Protection of Deteriorating National Infrastructure Systems**

University of Michigan (Ann Arbor, Mich., Joint Venture Lead)

- Project duration: 5 years
- Projected TIP contribution: \$8,998 K
- Project cost-share contribution: \$10,164 K

Develop a comprehensive system for monitoring and assessing the structural health and integrity of major infrastructure elements such as bridges on a regional basis, with innovations ranging in scale from "smart material"-based sensors at the level of individual structural components up through structure-level data integration and interpretation to a Web-based system for information aggregation and decision support at the regional level. [Read more ...](#)

### **Development of Rapid, Reliable and Economic Methods for Inspection and Monitoring of Highway Bridges**

The University of Texas at Austin (Austin, Texas, Joint Venture Lead)

- Project duration: 5 years
- Projected TIP contribution: \$3,421 K
- Project cost-share contribution: \$3,421 K

Develop a pair of complementing sensor networks for bridge inspection, including an active, self-powered system for continuous monitoring for cracks or defects in fracture critical bridges and a passive system for monitoring corrosion in reinforced concrete bridge decks. [Read more ...](#)



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