

## Oracle: Technology Identification and Transfer Program for the Development of New State-of-the-Art Technologies for the Natural Gas Industry

**Description:** On-going program that has already resulted in a number of projects  
**Status:** On-going. A number of programs have been identified and implemented. R&D results have been provided.

### BENEFITS

This program is dedicated to the development of disruptive technologies that could fundamentally alter the way natural gas companies do business in various areas of their operations, thus resulting in drastically decreased operational costs, increased safety and lower environmental impact. While the evolutionary technologies being developed by NYSEARCH and other industry research consortia continue to provide significant results, the identification and development of new technologies, radically different from the ones used currently by utilities, could result in quantum leaps in organizational performance in both safety and productivity.

### BACKGROUND

Since its inception, NYSEARCH has been involved in the research, development and commercialization of numerous technologies, which over the years have contributed significantly to improved operations, increased safety, improved environmental compliance, as well as higher natural gas loads through new end-use technologies. While evolutionary technologies form the vast majority of any natural gas company's or research organization's project portfolio, it is important that a certain fraction of resources is dedicated to the development of quantum leap technologies; technologies that can be disruptive to existing technology markets and sometimes change the gas company's way of doing business.

For this reason, periodically NYSEARCH holds brainstorming sessions in an effort to identify those areas related to gas industry operations that can provide the greatest potential if new quantum leap technologies were to be developed. Areas that have been identified as those that would be valuable quantum leaps include advanced materials, advanced sensors, and nanotechnology.

Advanced materials could revolutionize the way the gas system is managed and provide new ways for dealing with problems that affect the life and safety of the piping network, such as corrosion and pipe damage. Advanced sensors, advanced sensory devices and systems, and advanced diagnostics tools could result in improved monitoring and/or control of the gas network and other utility operations; thus greatly reducing O&M costs and increasing safety. Finally, nanotechnology could provide quantum leaps in many areas pertaining to utility operations.

There are several/ongoing or completed NYSEARCH R&D projects that resulted from the Oracle effort. These projects address advanced sensory systems for the mitigation of stray currents in gas transmission and distribution pipelines, state-of-the-art robotic devices for the inspection of gas distribution and transmission pipelines, distributed sensor networks for the monitoring of pipeline

networks, and advanced systems for the underground mapping of utility facilities.

### TECHNICAL APPROACH

The Oracle effort is designed to generate for NYSEARCH a continual flow of new technology concepts that, if successfully developed for gas applications, would provide the natural gas industry with quantum leap advances in gas operations and/or customer service. Through the dedicated efforts of NYSEARCH staff, new and emerging technologies are identified in the areas of advanced sensors, sensory devices, detection technologies and new materials and develop a framework for adopting them into the gas industry.

The individual dedicated to this effort monitors businesses, technologies and professions unrelated to the gas LDC industry for solution concepts. Technology-heavy disciplines and industries such as telecommunications, defense, remote sensing, sensors, optics, robotics and aerospace are excellent solution concept candidates. Solutions offered are technologies, but also can be procedures and/or practices.

The ORACLE effort was initiated in 2004. Technology areas such as fiberoptics, microelectromechanical systems, micro- and nano-sensors, and non-intrusive detection have been identified and scanned for promising new concepts and technologies. Technologies from the military, biomedical, aerospace, and telecommunications industries have been tracked and evaluated for application in the gas industry. These efforts have already resulted in the identification of technologies that are now being funded by NYSEARCH for development and adaptation to the natural gas industry.

### PROGRAM STATUS

Several Oracle projects have been developed. Two examples are provided below.

The gas industry has a great interest in developing a low cost, highly accurate and robust methane sensor for leak detection. Low cost methane sensors suffer from false positive alarms. Through Oracle, a hydrogen micro-

sensor, developed for certain manufacturing applications, was adopted to natural gas applications. These sensors utilize micro-resonator technology to measure the viscosity of gases. Prototype units (see Figure 1) have been built successfully and extensively tested in the



Figure 1: Prototype Methane Sensors

lab. They are now undergoing field testing.

A second example project is designed to detect mercaptans in natural gas. Expensive desktop size in-line gas chromatographs are now used by utilities in dedicated monitoring stations. Based on the research performed in Oracle, technology that is used in the biomedical industry and developed to measure various analytes, is being adopted for use in the gas industry. This portable, highly accurate and relatively low cost device (see Figure 2) is based on a combination of gas chromatography and differential mass spectroscopy. The mercaptans sensing instrument promises to allow utility personnel the ability to measure the presence of mercaptans in natural gas at the same level with a human nose, i.e. at the level of one part per billion (1 ppb). An engineering prototype system has been developed and successfully tested in the lab.



Figure 2: Prototype Mercaptans Sensor

For more information contact:  
[admin@NYSEARCH.org](mailto:admin@NYSEARCH.org)