Natural Gas Pipeline Safety and Integrity Research

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Staff Workshop on
Natural Gas Pipeline Safety and Integrity Management
Current Research and Future Research Needs and Opportunities
California Energy Commission
Rosenfeld Hearing Room
July 16, 2015

Goals

- Conduct research in natural gas infrastructure not covered by the regulatory and competitive markets
- Provide research that results in tangible benefits to utility customers
  - Focus is on projects that have the potential to increase safety and enhance transmission and distribution capabilities of the natural gas system

Policy Drivers

Research to meet our Energy Policy Goals

Public Resources Code 25620

- The program goal is to develop and bring to market technologies that provide greater system reliability, increased environmental benefits and lower system costs

2011 Integrated Energy Policy Report

- *"The state needs public interest energy research to explore opportunities and apply new and emerging technologies that provide innovative options for natural gas pipeline integrity, operations, and safety."*

Greenhouse Gas Emission Reduction – AB 32

- Reduce greenhouse gas emissions to 1990 level by 2020

CPUC Natural Gas Safety Action Plan (April 2013)

- More research is needed to develop cost-effective natural gas safety inspection equipment and tools for risk analysis.

Past Research and Accomplishments

Natural Gas Pipeline Research - Best Practices in Monitoring Technology - Gas Technology Institute

Purpose: To develop a baseline assessment of technologies currently used nationwide and in California to manage natural gas (NG) pipeline integrity and safety, Identify emerging technologies, and develop an implementation plan to bring emerging technologies to California.

Results:

- Successfully completed a baseline assessment of technologies.
- Identified emerging technologies.
- Developed an implementation plan to advance emerging technologies.
- Published Final Report (CEC-500-2014-024)

http://www.energy.ca.gov/2014publications/CEC-500-2014-024/CEC-500-2014-024.pdf

- Presented results at public workshops.
- Used results to develop FY14-15 and FY15-16 NG pipeline integrity research initiatives, develop solicitations and fund research projects.

Current Research and Highlights

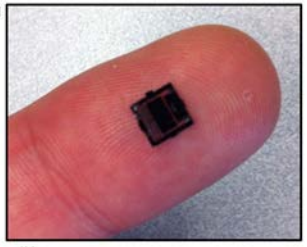
Project	Description	Status and Highlights
Contractor: The Regents of the University of California – UC Berkeley – CITRIS/CIEE	**Purpose:** To explore innovative sensor and communication technologies and approaches for inspecting and monitoring natural gas pipelines, and develop a testbed for testing sensors under simulated field conditions in the lab.	**Highlights** • Designed, developed and tested an innovative low-cost, miniature Micro Electro-Mechanical Sensor system prototype to inspect, monitor and report on the operating condition of natural gas pipelines. Final Report in publication.
Contractor: Diakont Advanced Technologies, Inc., San Diego, CA	**Purpose:** To demonstrate a multi-channel electromagnetic acoustic transducer sensor module for pipeline (in-line) inspection crawler for accurately detecting, locating, and measuring pipeline girth weld defects.	**Highlights** • Demonstrated sensor hardware and software integrated with Diakont's Robotic Operational Defect Inspection System on PG&E pipeline. Final Report in publication.
Contractor: Acellent Technologies, Inc, Sunnyvale, CA.	**Purpose:** To develop and demonstrate a continuous integrity monitoring system for natural gas pipeline for providing operators with increased information on the current status of the pipeline networks.	**Highlights** • Developed and tested a prototype pipeline corrosion monitoring system at PG&E test lab with complete remote monitoring capability and active 24X7ongoing testing. Final Report due in Summer 2015.

Major Accomplishment

Natural Gas Pipeline Research - Innovative Monitoring

- **Contractor: The Regents of the University of California – UC Berkeley – CITRIS/CIEE**
- **PIER Funds**: $855,835
- **Description:** This project explored innovative sensor and communication technologies and approaches for inspecting and monitoring natural gas pipelines, and developed a testbed for testing sensors under simulated field conditions in the lab.
- **Results:** Designed, fabricated, and tested the micro-electro-mechanical system pressure sensor and flow sensor, and the testbed for testing sensors.
- The pressure sensor showed good sensitivity and accuracy up to 200 pounds per square inch pressure but the flow sensor did not work in the test bed, as iron particles in the test bed—just like gas pipelines—interfered with the tiny sensor mechanism.
- **Ratepayer Benefits:** This project will benefit the ratepayers by improving the safety of natural gas pipelines.

Natural gas pipeline sensors testbed at UC Berkeley



Miniaturized sensor

Major Accomplishment

Commercialization of In-line Technology which Accurately Detects, Locates, and Measures Pipeline Girth Weld Defects

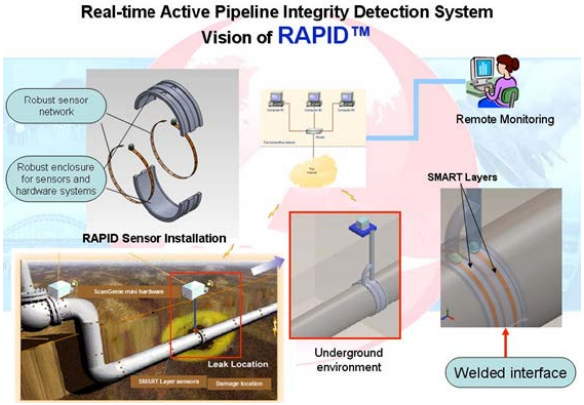
- **Contractor: Diakont Advanced Technologies, Inc., San Diego**
- **PIER Funds**: $1,000,000
- **Description:** This project demonstrated a multi-channel electromagnetic acoustic transducer sensor module on an in-line inspection robotic crawler for accurately detecting, locating, and measuring natural gas pipeline girth weld defects on PG&E pipeline in San Francisco.
- **Results:** Results indicated reduced cost and faster inspections.
- **Ratepayer Benefits:** Reduced cost and improved safety.

Diakont's Robotic Operational Defect Inspection System at the pipeline entry

Major Accomplishment

Real-time Active Pipeline Integrity Detection

- **Contractor:** Acellent Technologies, Inc., Sunnyvale, CA
- **PIER Funds**: $622,622
- **Description:** Developed a prototype pipeline corrosion monitoring system per PG&E specifications and tested at PG&E test lab with complete remote monitoring capability and active 24X7ongoing testing.
- **Results**: The system, in blind tests, detected accurately and consistently multiple corrosion damages induced by PG&E and showed capability for corrosion damage detection accuracy for both location and size.
- **Ratepayer Benefits:** This project will benefit ratepayers and pipeline operators by providing a cost-effective real-time pipeline monitoring system for improving pipeline safety and integrity management.



Acellent's RAPID system using piezoelectric transducers/sensors

Recent Program Opportunity and Status

Name of Initiative*	Description	Status
Natural Gas Pipeline Safety and Damage Prevention **Group 1:** Technologies to Monitor and Report Encroachments on the Pipeline Right of Way **Group 2**: Technologies that Improve Situational Information; and **Group 3:** Technologies that Enhance Integrity Management Practices through Risk Analysis	**PON:** PON-14-503 **Release Date:** 12/12/2014 **Applications Due:** 2/2/2015 by 3:00 p.m. **Notice of Proposed Award: 2/24/2015** **R&D Funds:** Up to $4,600,000 (FY13/14 & FY14/15) **Purpose:** To demonstrate natural gas pipeline right-of-way (ROW) monitoring technologies that are past the “proof-of-concept” stage in a utility setting, and to develop programs that promote knowledge regarding pipeline safety for both the public and non-industry workers.	**Status** • Two Grant Agreements approved and executed effective from June 30, 2015.. • **GAS TECHNOLOGY INSTITUTE - PIR 14-014 - $1,049,978** grant to demonstrate a Pipeline Right of Way Monitoring and Notification System. . • **ACELLENT TECHNOLOGIES, INC. - PIR-14-015 - $1,633,093** grant to deploy and field test a Real-time Active Pipeline Integrity Detection (RAPID+) System for Natural Gas Pipeline Integrity Management

*Initiatives refer to the Natural Gas RD&D Program Plan and Funding Request

Future Research Plan and Opportunities

Name of Initiative*	Plan Description	Status
Natural Gas Pipeline Safety and Integrity Assessment **Group 1**: Technologies that Improve Situational Information. (FY2014/15) **Group 2:** Technologies that Enhance Integrity Management Practices through Risk Analysis. (FY 2014/15), and **Group 3:** Natural Gas Pipeline Safety Integrity Monitoring Technologies Assessment. (FY 2015/16)	**Staff Workshop:** July 16, 2015, Rosenfeld Hearing Room Solicit input from stakeholders on future research plan and Grant Funding Opportunity (GFO) **R&D Funds:** Up to ~$3 Million (FY2014/15 and FY2015/16) **PON Release Date:** September 2015 **Applications Due:** Mid November 2015. **Notice of Proposed Award:** Mid December 2015 **Approvals at Business Meeting:** January 2016	In progress.

*Initiatives refer to the Natural Gas RD&D Program Plan and Funding Request

Questions and Contact Information

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