

## Proposed Agreement between California Energy Commission and University of California

**Title:** Natural Gas Pipeline Research - Innovative Monitoring Technologies  
**Amount:** \$478,457.00  
**Term:** 18 months  
**Contact:** Matt Coldwell  
**Committee Meeting:** 3/16/2011

### Funding

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
09	Natural Gas	ETSI	Integration of Smart Grid technologies	\$1,000,000	\$478,457	\$0	0%

### Recommendation

Approve this agreement with University of California, Center for Information Technology Research in the Interest of Society for \$478,457.00. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

### Issue

The State's natural gas supply is conveyed through a system of pipelines that run throughout the state, including underneath areas of high population. The safety and security of the natural gas system infrastructure are important priorities for California, especially the prevention of catastrophic events on the natural gas pipeline. In the interest of enhancing the safety, operation, and management of the overall natural gas pipeline infrastructure, public interest research is needed to explore opportunities and apply new and emerging technologies related to natural gas pipeline integrity, operation, and safety.

### Background

The State's natural gas system consists of a complex network of pipelines, designed to quickly and efficiently transport natural gas from its origin to areas of demand. California is the second-largest natural gas consuming state in the United States, just behind Texas. About 85 percent of the natural gas consumed in California is delivered on interstate pipelines from out-of-state supply basins located in the southwestern U.S, the Rockies, and Canada. As demand continues to increase, the systems' capacity needs to be assessed to ensure that it operates efficiently, safely, and that good technologies are used to report the system status.

Natural gas pipelines are routinely inspected for corrosion and defects in an effort to ensure pipeline safety and integrity. Inspections are conducted using various techniques. Inspection methods include direct assessment - physically going to the section of pipeline and inspecting it in person or through satellite surveillance. Hydrostatic assessment - demonstrating the integrity of a section of pipeline by increasing gas flows and pressure beyond its normal operation. Or, using "Smart Pigs" that are intelligent robotic devices that are propelled down pipelines to evaluate the interior of the pipe. Smart Pigs can test pipe thickness, and roundness, check for signs of corrosion, detect minute leaks, and any

other defect along the interior of the pipeline that may either impede the flow of gas, or pose a potential safety risk to the operation of the pipeline.

### **Proposed Work**

The Energy Commission proposes supporting research that will explore innovative technologies and approaches to inspect, monitor, and report on the status of natural gas pipelines. This research will design, prototype, and pilot-test a family of next generation Micro-Electro-Mechanical System (MEMS) platforms that have the potential to significantly improve the safety and security of natural gas pipelines. Three prototypes will be developed: 1) a prototype MEMS that will monitor the pressure in a standard natural gas pipeline and, through wireless communications inside the pipe, guard against over pressuring, 2) a prototype MEMS that will be a laser-based system for inspecting seam welds, and 3) a prototyped MEMS that will be a communicating micro-sensor for corrosion. These MEMS will be able to operate inside regular pipelines during normal operations to monitor pipeline safety and integrity. Additionally, a database and 3D-GIS system will be developed to support condition-based- monitoring and decision-making for the oversight of natural gas lines. The product of this research will be a final report that includes the design platforms for these new sensors and communication technologies that can significantly improve the safety and security of gas-lines.

### **Justification and Goals**

Supports California's goal to the 2008 Program Plan and Funding Request as approved by the CPUC; and to ensure that its infrastructure can both convey and store supplies per the Integrated Energy Policy Report 2005.

This will be accomplished by:

- Developing a prototype that will monitor the pressure in a standard gas-line and, through wireless communications inside the pipe, guard against over-pressuring.
- Developing a prototype that will be a laser-based system for inspecting seam-welds.
- Developing a prototype that will be a communicating micro-sensor for corrosion.