



## **Natural Gas Distribution Integrity Management Using Advanced Mobile Methane Detection Technology**

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There are over 150,000 miles of underground natural gas pipelines in California, and there are thousands of leaks, large and small, scattered throughout this complex infrastructure. Understanding where these leaks are and how much natural gas is lost to the atmosphere via these leaks is of vital importance to California's efforts to reduce greenhouse gas (GHG) emissions due to methane, a potent greenhouse gas.

In recent years, Picarro has developed state-of-the-art methane detection and quantification technology that can be brought to bear on these challenges. We have developed and deployed a vehicle-based optical natural gas sensing technology based on Cavity Ring-Down Spectroscopy (CRDS) that is able to detect even small natural gas leaks at distances up to 100 meters or more. Geospatial awareness and on-board wind measurements localize the leak for rapid investigation and assessment. Natural gas leaks can be distinguished from other environmental sources of methane on the basis of other gases detected in the leak plume. All of this rich data on individual leaks is provided automatically, in a matter of moments, as the vehicle moves at the speed of traffic, and is uploaded to a secure web-based storage, analysis, visualization, and compliance reporting engine. The visualization and reporting engine incorporates geographical information systems from pipeline operators so that leak detections are reported in relation to actual pipeline locations. The immediate uses are clear: faster and more efficient leak survey and detection on distribution pipelines – mains and services; rapid response to odor calls to locate potentially hazardous leaks quickly; and assessment of the impact of natural disasters on the sensitive underground infrastructure can be assessed rapidly, as was demonstrated after the Napa earthquake in 2013.

Looking to the future, we see an urgent need for simple and rapid assessment of the GHG impact of the natural gas infrastructure. Using novel vehicle-based methane detection and with the application of advanced data analysis algorithms, Picarro has developed a system capable of directly quantifying the emission rate, and thus the GHG impact, of individual leaks. Areas of unusually high emissions can be mapped and tagged for future repair or replacement. Relatively leak free areas are identified and highlighted to be monitored over time to detect the first warning signs of degradation. In fact, the overall GHG impact of the natural gas distribution system can be quantified directly, over time, on a leak by leak basis, and not just approximated using an imperfect and limited emission inventory, as is done today.

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In addition, this same technology can be applied to on-going monitoring the integrity of underground natural gas storage facilities. The application of this technology has yet to be truly explored, despite the clear need for accurate and reliable data on methane emissions throughout the natural gas supply chain – from upstream oil and gas wells to the front doors of our homes and businesses in California.

These high quality data can be collected anywhere and anytime, providing unprecedented visibility into the state of the natural gas distribution and storage system today, and how it evolves over time. These revolutionary new tools can be instrumental in establishing protocols and procedures to quantify emissions and provide more transparency to the public as required by SB 1371. With these technologies, California can move beyond the costly and time-consuming manual leak search and repair paradigm of past years into a world of intelligent, data-based infrastructure integrity management, leading to a safer natural gas distribution system with a much smaller GHG footprint.

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