

A Major Advance in Methane Emissions Imaging, Quantification & Mapping

Imaging & quantification of methane emissions from airborne & space-based platforms is emerging as an effective way to detect and monitor large emissions from fossil-fuel producing assets.

However, there are also significant emissions from millions of orphaned & marginal wells and from the 2.5 million miles of local gas distribution pipelines in the U.S. which lack cost-effective imaging & quantification technologies. These leaks total up to 1/3 of all emissions in the natural gas sector.

This non-profit collaboration among LBNL, CH₄IQ & SRRR will develop 3 new methane imaging systems to fill these technology gaps, accelerating a reduction of methane emissions by identifying & prioritizing wells to plug and leaky distribution pipelines to repair or replace. Substantial Federal funds have been allocated to perform repairs without effective means to quantify & prioritize leaks.

- **Tripod-mounted Low-Cost Methane Imaging & Quantification (I&Q) sensor** to quantify leaks in orphan & marginal wells, and distribution pipelines
 - Development & Field Testing Period: 9 months
 - Estimated Budget (Berkeley Lab, CH₄IQ, SRRR): \$725K
- **Drone-mounted Methane I&Q (hovering) sensor system:** to address wells with toxic emissions, in heavy foliage or polluted soil, in water, or on private property
 - Development & Field Testing Period: 16-18 months
 - Estimated Budget (Berkeley Lab, CH₄IQ, SRRR): \$2.5M
- **Truck-mounted Methane I&Q sensor system** to quantify & map gas leaks along millions of miles of distribution pipelines
 - Development & Field Testing Period: 18-24 Mo.
 - Estimated Budget (Berkeley Lab, CH₄IQ, SRRR):
Year 1 (\$3.6M) Year 2 (\$3.4M)



We seek mission-based donors who see the opportunity to accelerate this advance in methane leak quantification to enable prioritizing leaks to plug in orphan wells and distribution lines.



Funds are received by Lawrence Berkeley National Laboratory (LBNL) through the Berkeley Lab Foundation (the 501(c)(3) conduit for private contributions to LBNL). The Foundation will direct funds to the **Methane Imaging & Quantification Project**.



For questions, to request a briefing, or discuss support for this project contact us at
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Methane Imaging & Quantification Project.
Lawrence Berkeley National Laboratory (LBNL),
Methane Imaging & Quantification (CH₄IQ)
The Sustainable & Resilient Resources Roundtable (SRRR)

Project Team



LBNL: Dr. Sebastien Biraud, PhD: Biogeochemist, is Climate Sciences Head at LBNL, Dr. Biraud leads projects to quantify methane emissions for the U.S. Dept. of Energy (<https://ameriflux.lbl.gov>; [CATALOG – Consortium Advancing Technology for Assessment of Lost Oil & Gas Wells](https://catalog.lbl.gov)) and the California Energy Commission (<https://summation.lbl.gov>). The projects aim to reduce the rate of global warming by improving the speed & accuracy of methane emissions detection and mitigation.



CH₄IQ: Dr. Allen Waxman, PHD: Physicist (Astrophysics PhD, U. of Chicago), has 40 years leading development of multi-sensor imaging & analysis systems for Dept. of Defense & Intelligence Community. as a senior staff member at MIT Lincoln Lab and in industry. Invented three generations of short-wave infrared (SWIR) spectral cameras for methane emissions imaging & quantification (awarded 9 US patents), Founded MultiSensor Scientific, Inc. & MultiSensor Canada, divested in 2019. Founded CH₄IQ (Methane Imaging & Quantification), consultant to industry & national labs.



SRRR: David Berry: After leaving the White House CEQ, David founded *The Sustainable & Resilient Resources Roundtable, SRRR*, in 2002, first as a Federal Advisory committee, then as a 501(c)(3) non-profit. (<https://sustainableroundtable.org>) SRRR brings leaders & professionals together in workshops on sustainability, climate, resilience & innovation and facilitates collaboration on practical applications & projects. He is a member of the Balaton Group, a global forum on systems & sustainability.

Collaboration Background

We conducted a demonstration at the PG&E test site in Winters CA, for state agencies & gas companies. Scientists working on methane emissions at 3 National Labs accepted our invitation to attend. The scientist from Los Alamos Nat. Lab said, "Good technology - definitely a breakthrough." The scientist from the DOE National Energy Technology Lab said our demos confirmed it was possible to quantify emissions at a safe stand-off distance using advanced optics. The scientist from LBNL was enthusiastic and reported it to Dr. Sebastien Biraud, the Head of Climate Science at the lab. That led to signing an MOU and a multi-staged plan to jointly develop and field-test the systems for identifying, imaging, quantifying and mapping emissions from orphan (abandoned) wells and distribution lines.

Project Progress and Path of Development

- We signed a MOU among our organizations that formally establishes our collaboration.
- We already have initial designs for all 3 sensor systems and will begin development as soon as sufficient funding is raised.
- All 3 projects will utilize commercially available laser sensors (LiDARs) for methane detection, incorporating them into systems.
- Following successful field testing, our system designs will be transferred to industry along with guidance on modifications to their commercial LiDAR products enabling methane imaging & quantification for the applications noted in the 3 project summaries.

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