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CANGET

Center for Advancing Natural Gas Emissions Technology

Recent work has advanced the understanding of the sources and magnitude of emissions from both unplanned leaks and routine operational venting.[1–12] Investments by the US Department of Energy (DOE)[13] and others[14] have helped lower the cost of next-generation leak detection and quantification technologies, making continuous, automated monitoring viable for the first time. However, there are significant questions about how these new technologies can be translated into action and accepted by regulatory authorities.

The Center for Advancing Natural Gas Emission Technologies (CANGET) at Colorado State University (CSU) will focus on this "path to deployment" for methane emission measurement technologies on upstream oil and gas operations.

Center Operation

CANGET will be headquartered at Colorado State University (Director: Daniel Zimmerle). Research teams are being finalized, but it is anticipated that teams will include CSU, Colorado School of Mines and University of Colorado and 1-3 additional universities, to be determined in conjunction with center members. To eliminate bias while testing solutions, research team members will not develop technologies in competition with vendor members while involved in CANGET evaluation programs.

> CANGET is being initiated out of CSU, but we anticipate recruiting 3-5 university partners to form the core research team. Contact D. Zimmerle for interest or concerns.

Center membership will include operators, leak detection or mitigation solution developers ("vendors"), and other organizations with an interest in adopting new natural gas emissions technologies. Members will pay a nominal membership fee to participate in the center. CANGET will host a *core program* aimed at standardizing the evaluation of technologies, including development of testing protocols, hosting test periods at METEC, and disseminating results. To support this mission, CANGET is currently engaged in:

- OGI baseline testing in conjunction with EPA/ORD (Item 1, below)
- Developing a September '18 solution roundup featuring all tested leak detection and quantification technologies.
- Developing initial test protocols for well pads in conjunction with ARPA-E.

Compressor skid during a recent methane measurement field campaign by CSU.

In addition, **the research team will periodically propose projects to all center members**. Members can opt into, and help fund, projects that meet their interests. Proposals may be funded exclusively by the center or serve as cost share for federal, state, or NGO funding sources. Research will be performed by research members. When the research leadership deems it necessary, external research teams will be invited to participate in projects. Finally, members or outside research groups may propose research topics for the center to consider.

Projects:

While some results may be considered proprietary, **the core mission of the Center will most often be served by open access publication of the results**. That said, results of projects will be owned by the Center and accessible to participating members – i.e. core program results are accessible to all members and results from projects sponsored by a subset of members are accessible to that subset. In general, core test results will be unblinded – and often open to observation by other members – although confidentiality can be arranged if required for specific projects.

Since a core objective of CANGET is to encourage widespread adoption of next generation technologies, vendors are encouraged to participate in core program testing. However, any vendor may perform confidential testing by purchasing individual testing services, using Center protocols, at any time.

CANGET will disseminate information via regular calls or meetings for Center members and will organize symposia or workshops to showcase technologies or to work on issues of mutual interest. The Center will also engage regulators, exclusively on a scientific basis, to develop support for solutions.

Projects will be proposed & developed as described above. However, examples include:

- Testing for special conditions or with hybrid (multi-technology or multi-process) solutions.
- Investigating and solving specific deployment or measurement issues – locations, equipment type, gas types/mixes, etc.
- Optimizing sensor placement, data rates, communication methods, or analysis methods.
- Field validation of laboratory (e.g. METEC) results
- Developing operational protocols, such as deployment schemas, SCADA integration, work practices and training.

Vision:

We envision four steps to stimulate widespread use of these new technologies:

1) **Establish a *quantitative* baseline performance** for current leak detection technologies and deployment methods. A solid baseline is required to quantitatively compare new technologies to existing, regulatory-approved, leak detection methods, such as optical gas imaging (OGI) and EPA Method 21.

As of March 2018, CSU has completed 9 days of testing funded by the EPA and anticipate 10-20 additional days of testing in summer and fall conditions, funded by EPA and others, to complete this work. While predating CANGET formation, we anticipate rolling this effort into CANGET.
CSU is looking for industry participation July-October 2018. Contact Daniel Zimmerle or Kristine Bennett if interested. An EPA QAPP is available upon request.

2) **Develop a technology-independent method to compare leak detection technologies.** New technologies utilize significantly different operational modes and have different strengths and weaknesses relative to OGI and other accepted methods. To compare these technologies, CANGET envisions a statistical simulation tool (see figure), where experimentally determined key parameters (e.g. probability of detection by leak size, site type, weather, and other variables) would be combined to estimate total emissions detected by a technology. These results, coupled with the corrective action protocols ("time to correction" in the figure) estimate total emissions eliminated if the technology were implemented. This type of analysis allows different methods to be fairly compared. The model will start with the FEAST tool developed at Stanford University[15], but significant enhancements are required to complete the work.
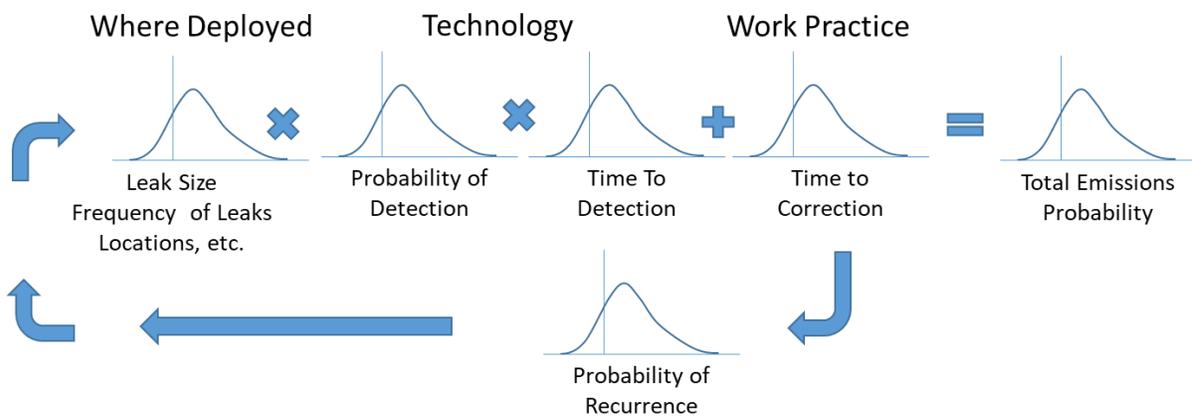
3) **Developing test and acceptance protocols** to support method and technology comparisons by all interested parties. Protocols will consist of laboratory testing (e.g. METEC facility at CSU) and in-field testing of technologies. Results from this testing will populate the distributions indicated in step 2, and full transparency is paramount to support widespread adoption of the technologies and protocols. In general, testing will be led by the METEC team at CSU.

Any member may bring technologies for testing. Vendors may provide their own technologies and expertise, operators may have purchased or loaned technologies (possibly non-member vendors), and research teams may propose technologies or techniques which are not yet in production.

4) **Preparing a diverse stakeholder base** for regulatory and policy adoption cycle(s). We anticipate some regulatory and environmental groups will join the Center as members, while others may be prevented from membership but be able to engage in public events. To reach beyond members, CANGET will conduct public outreach to engage and inform non-members. Outreach may include public, likely for-fee, conferences or workshops, and open-access publications. Currently, we are planning a twice yearly "roundup" which may include public and members-only events.

Membership Benefits

Core benefits include access to core research programs, accessible to all members. These will include:

- Participation in test protocol development and analysis methods.
- Access to testing results and analysis by CANGET research staff.
- Access to members-only events, and reduced cost access to public events.
- Bundled, reduced-cost, use of the METEC facility for training or testing.

Operators will additionally benefit by **pooling resources to understand / address issues and reduce the cost of early deployments**. Events will be arranged to facilitate efficient interaction between operators and multiple vendors. Standardized testing will help operators select appropriate solutions for different site types, sizes, and control objectives.

Vendors will additionally benefit by **participating in the development, and likely standardization, of test methods**. Early engagement will improve vendors' understanding of critical deployment requirements and conditions. Events will be arranged to facilitate interaction with multiple operators, reducing the cost of contact and engagement.

In addition, much of the research will be performed by graduate students and post-doctoral staff – who will also publish results – allowing sponsors to directly engage with well-trained potential employees.

Cost

Operators: Annual fee: $20K, Includes 3 days of testing or training time at METEC ($7K value).

Vendors: Annual fee: $15K. Includes one test round (typically 1-3 weeks of testing) at METEC per year during regularly scheduled test window ($5-15K value), or 2 days of ad-hoc test time at METEC.

Other non-testing participants: Annual fee: $10K, no test time at METEC.

Aerial view of the METEC test facility at Colorado State University in Fort Collins, Colorado.

Membership includes entrance to all group meetings, reviews, and access to internal research results. Major symposia or workshops may have additional fees to cover conference facility costs. Additional test or training time, or company specific projects can be purchased at any time using METEC published rates.

Additional Test Programs

In addition to CANGET testing, METEC will also develop and offer additional test services, including permanent equipment installation (data service for all released gas and meteorology), community education classes, and hosting training classes for vendors, industry groups or individual companies. If interested, contact metec@colostate.edu.

Contact

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