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EXHIBIT 1 - SCOPE OF WORK

Ref. TTE OneTech Ref CT00001236

Developing a Path Toward International Standards for Leak Detection and Quantification Solutions

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Methane is responsible for around 30 percent of the rise in global temperatures and the energy sector accounts for nearly 40 percent of methane emissions from human activity. According to International Energy Agency's (IEA) Global Methane Tracker, more than 260 billion cubic meters (bcm) of natural gas was lost worldwide in 2021 due to flaring, venting and leaking. The IEA estimates that around 70 percent of methane emissions from fossil fuel operations could be reduced with existing technology in a cost-effective way.

In this context, the United States and European Union initiated the Global Methane Pledge initiative in 2021, which now includes 150 countries, and are collaborating to reduce global emissions in the energy sector under the U.S.-EU Energy Council.

There is today no common agreement for validating measurement methods nor is there international consensus on how to compare top down measurements (satellite, aircraft, mobile and fixed equipment). With no standards or common protocols to gauge accuracy, there is risk of inequity and disagreement with regards to measurement results.

At the 9th U.S.-EU Energy Council Ministerial in 2022, Ministerial co-chairs acknowledged that the development of an international standard for leak detection and quantification solutions is of key relevance and that bringing together centers of expertise on both sides of the Atlantic to cooperate would be beneficial. The United States' Department of Energy (DOE) and European Commission's Directorate-General for Energy (DG-ENER) identified the two first of a kind centers with expertise in this field and facilities at global level, namely Colorado State University's Methane Emission Technology Evaluation Center (METEC) and TotalEnergies Anomaly Detection Initiative (TADI) of the Pôle d'Etudes et de Recherche de Lacq of TotalEnergies, as unique test and research facilities for emissions detection and quantification, methods development, and training.

Since 2016, METEC and TADI have built up strong scientific collaboration encompassing developing common testing protocols and exchanging expertise and staff. In the frame of this cooperation, METEC and TADI have jointly prepared a scope of work titled, *"Developing a Path Toward International Standards for Leak Detection and Quantification Solutions."*

DOE and DG-ENER are supportive of METEC and TADI's collaboration under the umbrella of the EU-US Energy Council.

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Overview

Recently, several entities have moved toward more comprehensive and transparent reporting of greenhouse gas (GHG) emissions from oil and gas production, with specific emphasis on the well-to-burner GHG intensity of market gas and LNG. These efforts have resulted in multiple *certified gas*[1] initiatives by NGOs (e.g. MIQ[2] from the Rocky Mountain Institute and SystemIQ), industry associations (e.g. Natural Gas Supply Initiative[3] or Oil and Gas Methane Partnership[4]), R&D groups (e.g. Gas Technology Institute[5]), and even solution vendors (e.g. IES[6]). Enhanced regulatory approaches are also under discussion, notably in the United States, European Union, and Canada, at both federal and state/provincial levels.

Underpinning these efforts is an assumption that a combination of measurements and inventory reporting will provide an accurate accounting of GHG emissions. It is important to note that the reputation of, and trust in, inventory approaches is at an all-time low. Repeated top-down observations of basin-level emissions have highlighted top-down emissions estimates that are more than 1.5 times the emissions estimated by bottom-up inventories, even those updated with the most current observations. Additionally, the development of satellite, aircraft, and mobile measurement techniques have made tiered[7] observations of O&G facilities less expensive and more practical, including 3rd party observation of facilities without site access using airplanes or satellites. As a result, buyers and regulators are moving toward programs that couple self-reported inventory estimates with audited facility- or basin-scale observations, with and without cooperation of the facility owners.

In general, these new programs will provide new insights into the GHG emissions of natural gas and produce global pressure for GHG reductions. Unfortunately, there is no common standard for validating the proposed measurement methods – detection limits, quantification accuracy, limitations, etc. – and no international consensus on how to compare top-down measurements, which are short-duration snapshots, to long-duration inventory estimates. With no standards to gauge accuracy, there is a substantial risk of inequity and disagreement.

There is common interest in the United States and European Union to address this issue with a systematic and scientific approach. Further, we understand that there is an interest in leveraging existing facilities and methods in active development on both sides of the Atlantic, including developments driven by our respective organizations.

We therefore recommend an international program to develop *one set of standards* that: (1) Certifies the accuracy, detection limits, and operational restrictions of measurement methods

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[1] Also known as *responsibly sourced gas* (RSG) programs, or *monitoring, reporting and validation* (MRV) programs.
[2] https://miq.org/
[3] https://www.aga.org/contentassets/c87fc10961fe453fb35114e7d908934f/ngsi_methaneintensityprotocol_v1.0_feb2021.pdf
[4] https://www.ogmpartnership.com/
[5] https://www.gti.energy/veritas-a-gti-differentiated-gas-measurement-and-verification-initiative/#:~:text=Veritas%2C%20a%20GTI%20Differentiated%20Gas,leakage%20from%20natural%20gas%20systems.
[6] http://onefuture.us/wp-content/uploads/2019/06/Independent-Energy-Standards.pdf
[7] Tiered observations are typically structured to include inventories at the component or equipment level, coupled with facility-scale or basin-scale, measurement of total emissions.

used for GHG accounting; and (2) Develops a consensus method for comparing measurements of varying duration with long-duration inventory reporting of GHG, and possibly other, emissions.

The attached workplan describes how such an international program could be initiated using existing expertise and facilities at both Colorado State University (CSU) *Methane Emissions Technology Evaluation Center* (METEC)[8], in Fort Collins, Colorado, USA and the TotalEnergies Anomaly Detection Initiatives (TADI) of the *Pôle d'Études et de Recherche de Lacq* (PERL), in Lacq, France. This effort could also be proposed to be extended to testing centers/efforts in Canada, and potentially in other countries.

Work Plan

The proposed work is intended to quickly initiate a program that addresses the objectives listed above. The TADI and METEC teams have been in communication for some time, including staff exchanges, and are in general (but not in detail) aware of each other's capabilities. While both facilities are set up to test leak detection and quantification (LDAQ), the facilities have significant complimentary capabilities.

First, the work plan emphasizes extension of existing efforts where possible. METEC has developed a set of consensus protocols with industry participation under the Department of Energy (DOE)-sponsored project *Advancing Development of Emissions Detection* (ADED)[9] whereas TADI developed test protocols focusing on quantification accuracy for large leak rates. These existing test protocols will be the basis of testing protocols that can move into an internationally recognized standardization process.

Second, the required methods for comparing measurements of varying duration with long-duration inventory reporting of GHG, called "Modeling Emission Extrapolation Processes" (MEE) – under development at both organizations, but at different stages – will need to be further discussed to standardize approaches.

Tasks listed below are those that must be executed by both TADI and METEC. In practice, both organizations will develop complimentary proposals for funding that add specific detail for each organization.

Task 1. Scope definition. Establish the range of technologies & applications (ground, airborne, flux plane, satellite...) that will be addressed by the standardized testing protocol. Develop required qualification processes provided by the test centers, and all points to be addressed by the testing protocol and testing methods.

Task 2. Evaluate protocols for transferability between test centers. The teams will jointly review and evaluate existing ADED protocols and extensions of those protocols for application at TADI, and test procedures used at TADI for application at METEC. Protocols will test both the sensing of data (input measurements) and the analytics to detect emissions and calculate emission rates. Since the ultimate use of testing results is to give confidence and accuracy on real site

[8] https://energy.colostate.edu/metec/#
[9] https://energy.colostate.edu/metec/aded/

measurements, there is also a need to consider how test results will be integrated into Modeling Emission Extrapolation Processes (MEE) including operational restrictions of measurement methods.

Work:

a. Review ADED protocols and TADI test procedures, by both teams.
b. Review of testing procedures used by both teams that augment/extend those in the protocols.
c. Identify shortcomings that impact the ability of multiple test centers to use the protocols.
d. Identify key variables that impact input measurements or flux calculations
e. Identify how the controlled testing (and, as required, field confirmation of controlled testing) impact the extrapolation of controlled testing to measurement performance at real facilities.
f. Identify existing status of extrapolation to real site according to temporal & spatial coverage of measurement in variable meteorological situation.
g. Synchronize on major questions and issues with respect to MEE work.

Task 3. Develop adaptation plan for both facilities based upon the results from Task 1. It is anticipated that both METEC and TADI will have differences that impede use of the same protocol at both facilities. In this task, the teams will identify the critical gaps in both test sites which must be rectified to support Task 4. Note that this effort *is not* meant to eliminate the complimentary nature of the two facilities: Either facility may be more capable for certain types of testing. However, it is critical that the core capabilities of both facilities – and any additional international partners – can conduct comparable testing.

Work:

a. The joint teams will walk through typical test scenarios *as if they were executed on either site*, identifying required capabilities and any shortfalls in facility capabilities to complete the testing. Shortfalls will be prioritized and identified as critical or non-critical issues. The team will consider both the emissions emulation requirements and critical management functions, such as results reporting, and test analysis; both teams have substantial software investments to support these functions.
b. Each team will develop a work plan to address critical issues.
c. Each team will present their plan to the cognizant funding authorities for review and approval.
d. Teams will jointly or separately review proposed changes with their steering / advisory committees.
e. Each team will finalize funding and detailed plans for any required modifications.
f. Reporting.

Task 4. Modify facilities as needed. Both teams will make required modifications to the facilities, software, and procedures to support a practical comparison between the facilities. Specific work items will be dependent on the results of Task 2 and 3, and modifications will be required for Task 5.

Task 5. Perform a test comparison by testing specific solutions at both facilities. In this task, a minimum of two LDAQ solutions will be tested at both facilities, using the same protocols, to assure that (1) the results are comparable between facilities, (2) the protocols can be executed in both locations without ambiguity and/or to identify ambiguities which must be addressed, and (3) to determine best methods for future testing.

To focus on the performance of the *test centers,* rather than the solution under test, this work will be performed using methods which can be executed by team personnel, at both locations, with minimal logistical overhead. Using this approach, the teams can eliminate most differences in how the LDAQ solution is executed, thus highlighting any difference in the performance of the test centers.[10] The test will include, at a minimum, one continuous monitoring solution and one survey solution, in line with the two existing ADED protocols.

Work:

a. Identify specific methods to test at both centers. Methods will be selected including practical considerations, such as transporting equipment between sites, as well as assuring that the methods are representative of solutions that will be tested in the future.
b. Develop a detailed joint plan for performing the paired testing.
c. Plan and execute the tests at both facilities.
d. Evaluate results.
e. Repeat tests with protocol or facility modifications, if required.
f. Reporting.

Task 6. Evaluate process to develop protocols into standards. In this task, the teams will map out the route to take the existing testing protocols, including identified extensions and improvements, into a standardization process.

Several organizational homes are possible for the resulting standards in both the EU and the USA. For example, prior VOC standards work (EN17628) in the EU was driven by UK/National Physical Laboratory to develop an official standard; an equivalent process in the USA would be the development and adoption by EPA of an EPA-approved method. Alternatively, standards could be routed through broader standards organizations, such as NIST, ANSI or ASTM in the

[10] ... in contrast to inviting solution developers to test at both facilities. A robust method, executed by the joint team, can be precisely controlled, use specific reporting methods that minimize confusion, and will support flexible timing to minimize the time required for testing in multiple weather conditions at both sites.

USA, or CEN in the EU or ISO at international level. In all cases, the goal is for a single standard to results, either via a single approval, or via cross-reference between standards.

Work:

a. Query or survey a wide variety of stakeholders to determine possible standardization routes meeting the objectives listed in Section 1.
b. In consultation with sponsors, recommend the best practical route for standardization.
c. Assemble working groups to review the standardization proposal for broad, cross-sector, feedback.
d. Initiate the standardization process, accompanying work plan, schedule, and budget.

Task 7. Develop Modeling Emission Extrapolation (MEE) **approach and development plan.** METEC, TADI, and associated partners have been working on emissions modeling approaches for facility, regional, and supply-chain systems. To support next-generation LDAQ systems, models must include both spatial and temporal variability in emissions, and variations in performance, and possibly emission rates, due to meteorological conditions, facility operating state, or other variables; these variations have order-of-magnitude impacts on the net performance LDAQ solutions in real-world deployments.

The key focus of this work is to understand how performance measured in controlled testing will be reflected in results when the LDAQ methods are utilized in field conditions, on facilities with highly skewed and variable emission rates. The work will address three questions:

1. Ability of test results to evaluate LDAQ solutions, or combinations of solutions, in practical emissions detection & measurement programs. Specifically, we anticipate that multiple LDAQ solutions will likely be deployed within one emissions reduction program, and interactions, gaps, and overlaps between the methods will have substantial impact on the performance of the program.

2. Performance of LDAQ methods to estimate emission rates in real-world facilities. In real facilities emissions vary in composition, timing, location, and other factors, which cannot be replicated in controlled testing. This portion of the MEE effort will analyze the impact of these facility-specific variables on the quantification accuracy, and to a lesser extent the detection accuracy, of LDAQ methods.

3. Since real world facilities have highly variable emission rates, and LDAQ solutions vary widely in when, how often, and how accurately, they estimate emissions, we expect substantial variability in the capacity of any one method, or a program with several methods, to extrapolate from individual measurements to longer-duration (e.g. annual) emission estimates. For example, a continuous monitor solution may be low accuracy and produce many measurements *per day*, compared with a survey solution that is high(er) accuracy but produces only a few measurements *per year*. These differences will have profound impacts on the accuracy by which long-duration average emissions can be estimated. This portion of the MEE effort will develop methods to

extrapolate controlled testing results, combined with expected emissions profiles from facilities, to long duration emissions estimates.

Underlying this work, testing and modeling must support *tiered observation systems,* particularly using remote sensing (aircraft, satellites, towers, etc.) to confirm results from inventory emissions.

MEE developments are at an earlier development stage than testing protocols. Therefore, this task is primarily a scoping exercise with the following work items:

Work:

a. Identify gaps in the currently available modeling approaches, software, data sets, etc.
b. Develop research programs required to fill gas identified in (a).
c. Recommend a plan of action to sponsors.

Brussels, April 4th, 2023.

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