14 December 2018

Re: Emission Standards for New, Reconstructed, and Modified Sources Reconsideration (2018)
Docket ID No. EPA-HQ-OAR-2017-0483
Proposed Revision of Alternative Means of Emission Limitation (AMEL) 40 CFR 60.5398a

Dear Acting Administrator Wheeler,

I am writing with respect to the above-named Reconsideration. I recently retired after a forty year career in the oil and gas industry, having worked at both an operating company – Exxon – and at an oilfield services company – Schlumberger. My job was to invent apparatus and methods to make oil and gas exploration and production safer and more efficient. My professional record is reflected in more than 100 scientific and technical publications, and 39 U.S. patents. In recognition of my expertise and achievements, I was elected to the National Academy of Engineering.

I have for some time been concerned that the 2016 40 CFR 60 OOOOa regulations tend to discourage technological innovation in methane leak detection and repair (LDAR). I am very glad to see palpable improvements in the 2018 Reconsideration, particularly in the provisions for alternative means of emission limitation (AMEL). However, in my opinion, the proposed 2018 AMEL regulation, 40 CFR 60.5398a, does not go far enough in encouraging the development and deployment of new means of LDAR, which would both better serve the underlying purposes of 40 CFR 60 OOOOa, and potentially do so at lower cost to regulated entities.

I. Commentary

The only approved methods for methane leak detection and repair (LDAR) specified in the 2016 OOOOa regulation are optical gas imaging (OGI) and Method 21. These component-level methods of leak detection have been found to be effective in identifying leaks from individual components and connections. Strong baseline regulations to reduce methane emissions — at least as protective as those adopted by EPA in the 2016 new source performance standards (NSPS) for the oil and gas sector — are a cost-effective and technically achievable way to conserve resources and protect communities. However, given the vast number of components and connections dispersed over large areas in U.S. natural gas production and transmission systems that must be inspected periodically, I believe it is desirable to permit alternative means of emission limitation (AMEL) to make methane leak detection and repair more efficient, thereby reducing the cost of compliance.

Moreover, one underlying motivation for the regulations in question is the reduction of greenhouse gas emissions at the national level, see for example “Regulatory Impact Analysis for the Proposed Reconsideration of the Oil and Natural Gas Sector, Emission Standards for New, Reconstructed, and Modified Sources”, EPA-452/R-18-001, September 2018, Section 3.3. Although the OOOOa provisions are written to be site-specific, greenhouse gas emissions assessed in the Regulatory Impact Analysis have national impact. Therefore, an explicit goal of this regulation should be reduction of greenhouse gas emissions at the national level.

As a hypothetical, consider a methane detection system based on national technical means of verification, e.g. an earth-orbiting satellite capable of locating methane emission anomalies. Such satellites are already in operation (e.g. GHGSat, GOSAT), though not yet necessarily capable of usefully directing repair efforts. Foreseeable improvements may lead to satellite-based detection of super-emitters – sources of unusually large quantities of vented or fugitive methane – which may be responsible for the bulk of methane emissions (see e.g. Ravikumar et al., Environ. Sci. Technol. (2017) 51 718, Supporting Information).

Satellite or aerial surveillance is not capable of locating super-emitters at the component level, but it can eliminate facilities or groups of facilities from suspicion. Thus component-level leak detection can be focused on limited areas defined by the spatial resolution of the overhead measurement. Sites which overhead surveillance shows do not host super-emitters can be exempted from component-level inspection.

Thus, I contend that the detection and repair of super-emitters, with on-site component-level inspection triggered by overhead surveillance, may come to constitute a more effective means of mitigating anthropogenic methane emissions than sole reliance on methods specified by the 2016 OOOOa regulation, while materially reducing the costs of compliance. However, space-based and overflight means of surveillance are clearly outside the scope of the 2016 AMEL provision.

Development and testing of new, more cost effective, methane detection paradigms and methodologies are likely to require significant research and development expenditures. In order for innovators to make these investments, they must see the possibility of market access beyond individual sites (as specified by 2016 AMEL regulation) or even producing basins (as foreseen by the 2018 Reconsideration). Thus, regulations that permit only site-specific or even basin-specific comparison with OGI and Method 21 measurements are very likely to inhibit development of some classes of technologies that could lead to larger national-level methane emission reductions at lower cost. Therefore I propose allowing methods to be judged based on their national impact on LDAR efficacy. National-level efficacy cannot be based only on site-specific component-level field test results, but must also include other test data, and mathematical and statistical modeling.

The benefit of this national-level approach over the site specific method specified by the 2016 §60.5398a is, principally, a clear path to wide-spread commercialization. This encourages innovators to invest the research and development resources required to bring genuinely new and more effective measurement paradigms and methodologies to market.

In **Section II** I propose changes relative to the existing (2016) 40 CFR 60. In **Section III** I propose changes relative to the Reconsideration published on 15 October 2018. It will be noted that many of my proposed changes to the 2016 rule have already been incorporated into the 2018 Reconsideration.

II. Proposed Rule Change relative to 2016 40 CFR 60

§ 60.5398a What are the alternative means of emission limitations for GHG and VOC from well completions, reciprocating compressors, the collection of fugitive emissions components at a well site and the collection of fugitive emissions components at a compressor station?

(a) If, in the Administrator's judgment, an alternative means of emission limitation will achieve a local or national reduction in GHG (in the form of a limitation on emission of methane) and VOC emissions at least equivalent to the corresponding reduction in GHG and VOC emissions achieved under §60.5375a, §60.5385a, and §60.5397a, the Administrator will publish, in the Federal Register, a notice permitting the use of that alternative means for the purpose of compliance with §60.5375a, §60.5385a, and §60.5397a. The notice may condition permission on requirements related to the operation and maintenance of the alternative means.

(b) Any notice under paragraph (a) of this section must be published only after notice and an opportunity for a public hearing.

~~(c) The Administrator will consider applications under this section from either owners or operators of affected facilities.~~

(c) The Administrator will consider applications under this section from owners or operators of affected facilities, and joint applications from regulated entities and manufacturers, vendors of leak detection technologies, trade associations, or other interested entities.

(d) Determination of equivalence to the design, equipment, work practice or operational requirements of this section will be evaluated by the following guidelines:

> (1) The applicant must collect, verify and submit test data, covering a period of at least 12 months to demonstrate the equivalence of the alternative means of emission limitation at local or national level. The application must include the following information: (i) A description of the technology or process. (ii) The monitoring instrument and measurement technology or process. (iii) A description of performance based procedures (i.e., method) and data quality indicators for precision and bias; the method detection limit of the technology or process. (iv) For affected facilities under § 60.5397a, the action criteria and level at which a fugitive emission exists. (v) Any initial and ongoing quality assurance/quality control measures. (vi) Timeframes for conducting ongoing quality assurance/quality control. (vii) Field data verifying viability and detection capabilities of the technology or process. (viii) Frequency of measurements. (ix) Minimum data availability. (x) Any restrictions for using the technology or process. (xi) Operation and maintenance procedures and other provisions necessary to ensure local or national reduction in methane and VOC emissions at least equivalent to the corresponding reduction in methane and VOC emissions achieved under § 60.5397a. (xii) Initial and continuous compliance procedures, including recordkeeping and reporting.

(2) For each determination of equivalency requested, the emission reduction achieved by the design, equipment, work practice or operational requirements shall be demonstrated by appropriate combinations of field data, test data, and mathematical or statistical modeling.

~~(3) For each affected facility for which a determination of equivalency is requested, the emission reduction achieved by the alternative means of emission limitation shall be demonstrated.~~

(4) Each owner or operator applying for a determination of equivalence to a work practice standard shall commit in writing to work practice(s) that provide for emission reductions equal to or greater than the emission reductions achieved by the required work practice.

(e) After notice and opportunity for public hearing, the Administrator will determine the equivalence of a means of emission limitation and will publish the determination in the Federal Register.

(f) An application submitted under this section will be evaluated as set forth in paragraphs (f)(1) and (2) of this section.

(1) The Administrator will compare the demonstrated local or national emission reduction for the alternative means of emission limitation to the corresponding demonstrated emission reduction for the design, equipment, work practice or operational requirements and, if applicable, will consider the commitment in paragraph (d) of this section.

(2) The Administrator may condition the approval of the alternative means of emission limitation on requirements that may be necessary to ensure operation and maintenance to achieve the same emissions reduction as the design, equipment, work practice or operational requirements.

(g) Any equivalent means of emission limitations approved under this section shall constitute a required work practice, equipment, design or operational standard within the meaning of section 111(h)(1) of the CAA.

III. Proposed Rule Change relative to Reconsideration, 15 October 2018

§ 60.5398a What are the alternative means of emission limitations for GHG and VOC from well completions, reciprocating compressors, the collection of fugitive emissions components at a well site and the collection of fugitive emissions components at a compressor station?

(a) If, in the Administrator's judgment, an alternative means of emission limitation will achieve a local or national reduction in GHG (in the form of a limitation on emission of methane) and VOC emissions at least equivalent to the corresponding reduction in GHG and VOC emissions achieved under §60.5375a, §60.5385a, and §60.5397a, the Administrator will publish, in the Federal Register, a notice permitting the use of that alternative means for the purpose of compliance with §60.5375a,

§60.5385a, and §60.5397a. The notice may condition permission on requirements related to the operation and maintenance of the alternative means.

(b) [Deleted]

~~(c) The Administrator will consider applications under this section from owners or operators of affected facilities, or manufacturers or vendors of leak detection technologies, or trade associations provided they are submitted in conjunction with an owner or operator.~~

(c) The Administrator will consider applications under this section from owners or operators of affected facilities, and joint applications from regulated entities and manufacturers, vendors of leak detection technologies, trade associations, or other interested entities.

(d) Determination of equivalence to the design, equipment, work practice or operational requirements of this section will be evaluated by the following guidelines:

(1) The applicant must provide information that is sufficient for demonstrating the alternative means of emission limitation is at least as equivalent as the relevant standards at local or national level. At a minimum, the applicant must collect, verify, and submit field data to demonstrate the equivalence of the alternative means of emission limitation; the field data must encompass seasonal variations over the year to ensure that the technique works appropriately in different conditions that will be encountered during monitoring surveys. The field data may be supplemented with modeling analyses, test data, or other documentation. The application must include the following information: (i) A description of the technology, technique, or process. (ii) A description of the monitoring instrument or measurement technology used in the technology, technique, or process. (iii) A description of performance based procedures (i.e., method) and data quality indicators for precision and bias; the method detection limit of the technology, technique, or process. (iv) For affected facilities under § 60.5397a, the action criteria and level at which a fugitive emission exists. (v) Any initial and ongoing quality assurance/quality control measures necessary for maintaining the technology, technique, or process. (vi) Timeframes for conducting ongoing quality assurance/quality control. (vii) Field data verifying viability and detection capabilities of the technology, technique, or process. Test data, modeling analyses, or other documentation may be used to supplement field data. (viii) Frequency of measurements and surveys conducted with the technology, technique, or process. (ix) For continuous monitoring techniques, the minimum data availability. (x) Sufficient data and other supporting documentation for determining the emissions reductions achieved or avoided by the technology, technique, or process. (xi) Any restrictions for using the technology, technique, or process. (xii) Operation and maintenance procedures and other provisions necessary to ensure local or national reduction in methane and VOC emissions at least equivalent to the corresponding reduction in methane and VOC emissions achieved under § 60.5397a. (xiii) Initial and continuous compliance procedures, including recordkeeping and reporting, if the compliance procedures are different than those specified in § 60.5397a(d).

(2) For each determination of equivalency requested, the emission reduction achieved by the design, equipment, work practice or operational requirements shall be demonstrated by field data, which can be supplemented with modeling analyses at an active production site or test data at a controlled test environment or facility.

(3) For each technology, technique, or process for which a determination of equivalency is requested, the local or national emission reduction achieved by the alternative means of emission limitation shall be demonstrated.

(4) [Deleted]

(e) [Deleted]

(f)

(1) An application submitted under this section will be evaluated based on the field data, modeling analyses, and other documentation that was provided to demonstrate the equivalence of the alternative means of emission limitation under this section.

(2) The Administrator may condition the approval of the alternative means of emission limitation on requirements that may be necessary to ensure that the alternative will achieve at least equivalent local or national emission reduction(s) as the corresponding reduction(s) achieved under the requirement(s) for which the alternative is being requested.

(g) [Deleted]

Respectfully submitted,

Robert L. Kleinberg, Ph.D.

Institute for Sustainable Energy, Boston University
Center on Global Energy Policy, Columbia University
Member of the Society of Petroleum Engineers
Member of the National Academy of Engineering

The opinions expressed herein are those of the author, and do not necessarily represent the views of the institutions with which he is affiliated.