

**U.S. Department of Energy
Office of Fossil Energy and Carbon Management**

Request for Information (RFI)

DE-FOA-0003052

Issue Date: April 21, 2023

Program Area: Office of Fossil Energy and Carbon Management U.S. Department of Energy

Title: RFI related to Opportunities to Reduce Greenhouse Gas Emissions and Other Air Pollutants Associated with U.S. Liquefied Natural Gas (LNG) Exports

RESPONSES DUE: 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER

Purpose:

This is a Request for Information (RFI) issued by the U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM). The intent of this RFI is to obtain input to inform DOE's research and development activities within the Office of Research and Development's Methane Mitigation Technologies Division and the Office of Carbon Management Technologies' Point Source Carbon Capture Division. In addition, these data and information could help inform the Office of Regulation, Analysis, and Engagement's capabilities to assess natural gas import and/or export applications under the Natural Gas Act of 1938, as amended.

DOE is requesting information on strategies and technologies that natural gas and liquefied natural gas (LNG) companies are deploying, or could deploy, to reduce greenhouse gas emissions and other air pollutants associated with natural gas delivered to a liquefaction facility, at liquefaction facilities, and during the loading, transport, and delivery of natural gas to a regasification facility.

This is solely a request for information for planning purposes, only; this RFI is not a Funding Opportunity Announcement (FOA). U.S. DOE is not accepting applications to this RFI, nor will DOE reimburse any of respondents' costs in preparing a response.

Background:

FECM's Methane Mitigation Technologies Division aims to eliminate non-trivial fugitive and vented methane emissions from the natural gas supply chain to reduce the climate impacts from the production and use of natural gas. The division is focused on developing accurate, cost effective, and efficient technology solutions and best practices to identify, measure, monitor, and minimize methane emissions from these sources.

Ongoing research helps advance the development of new technologies for mitigating methane emissions across the entire natural gas and oil supply chain, as well as the development of an integrated approach to reconciling conflicting assessments of the primary sources of emissions. Only by quickly and accurately identifying the location and rate of methane emissions within the natural gas and oil supply chain can mitigation efforts be prioritized.

FECM's Point Source Carbon Capture Division's research, development, demonstration, and deployment portfolio is facilitating development of technologies and infrastructure that improve performance, reduce costs, and scale the deployment of technologies to decarbonize the industrial and power sectors and to remove carbon dioxide from the atmosphere. Within the natural gas and oil supply chain, these efforts include research and commercial-scale demonstration to advance the deployment of carbon capture and storage on natural gas-fired power plants and industrial natural gas combustion streams. FECM is working to support efforts to decarbonize LNG terminals through deployment of carbon capture on gas separation and combustion streams and the use of electric motor drives supplied by net-zero emissions electricity. Decarbonizing LNG terminals is a key part of the effort to reduce life cycle emissions associated with the export of natural gas to global allies.

Additionally, DOE has regulatory responsibilities related to LNG. Companies that want to export natural gas must get authorization to do so from DOE FECM. The Natural Gas Act (NGA) requires DOE to make public interest determinations on applications to export LNG to countries where the U.S. does not have existing free trade agreements. FECM's natural gas import-export regulatory program is implemented by the Division of Regulation in the Office of Regulation, Analysis, and Engagement.

Typically, the Federal Energy Regulatory Commission (FERC) has direct regulatory responsibility over the siting, construction, and operation of LNG export facilities in the U.S. In these cases, FERC leads the environmental impact assessments of proposed projects consistent with the National Environmental Policy Act, and DOE is typically a cooperating agency as part of these reviews.

Requested Information:

The purpose of this RFI is to solicit feedback from industry members, investors, project developers, nongovernmental organizations, academia, research laboratories, government agencies, and other stakeholders on technologies and strategies that LNG companies are deploying, or could deploy, to reduce greenhouse gas emissions and other air pollutants. For the purposes of this RFI, this includes emissions of carbon dioxide, methane, criteria pollutants, and hazardous air pollutants that occur during production through transportation of natural gas delivered to a liquefaction facility; at liquefaction facilities; and during the loading, transport, and delivery of LNG to a regasification facility.

Organizations that respond to the RFI can respond to all or only a portion of the RFI. For this RFI, DOE is requesting input on four topical categories.

You may answer as few or as many of the questions below as you would like. Please use the bolded category and the sub-numbers as headings in your response to the greatest extent possible

and refer to the questions in the body of your response. This helps save time for both the responder and the reviewers. Please be as specific as possible in all responses.

As previously stated, this is solely a request for information and is not a Funding Opportunity Announcement (FOA). DOE is not accepting applications to this RFI, nor will DOE reimburse any of respondents' costs in preparing a response. DOE plans to publish all comments, except for information that is conspicuously marked confidential, as described below, and exempt by law from public disclosure.

Topic 1: Environmental Profile of Upstream Supplies

- 1.1. What technologies or strategies are being used to mitigate the greenhouse gas emissions and other environmental impacts of the natural gas delivered to a liquefaction facility?
- 1.2. To what extent do exporters request or have access to information about the source (e.g., production basin, transportation pipeline, custody transfers) of the natural gas they are liquefying for export? For those exporters that do not request or have access to such information, to what extent could they obtain access upon request or by other means? Do the answers vary by the extent to which the gas is supplied by natural gas marketers or through bilateral contracts?
- 1.3. To what extent do exporters request or have access to information about the greenhouse gas emissions and/or practices to limit greenhouse gas emissions of the natural gas they are liquefying for export prior to delivery at the liquefaction facility? For those exporters that do not request or have access to such information, to what extent could they obtain access upon request or by other means?
- 1.4. To what extent do exporters request or have access to information on non-greenhouse gas emissions, including criteria air emissions or hazardous air pollutants, and/or other practices to address other environmental impacts (e.g., strategies to protect water quality or limit water consumption) of the natural gas they are liquefying for export prior to delivery at the liquefaction facility? For those exporters that do not request or have access to such information, to what extent could they obtain access upon request or by other means?
- 1.5. What role do or could differentiated natural gas certification programs (also referred to as certified natural gas or responsibly sourced natural gas) play in helping ensure the suppliers of natural gas sourced for export have taken measures to mitigate greenhouse gas emissions and other environmental impacts?
- 1.6. What differentiated natural gas certification programs are LNG companies currently using? Are there any market gaps currently not filled by existing programs?
- 1.7. What role do or could differentiated natural gas certification programs play in helping to create a competitive advantage for U.S. natural gas in foreign markets as compared to other sources of natural gas? Do or could such programs facilitate long-term contracting by purchasers of U.S. natural gas?

Topic 2: Strategies to Measure and Reduce Emissions at Liquefaction Facilities

- 2.1. What technologies or strategies are companies deploying to reduce greenhouse emissions at liquefaction facilities?
- 2.2. In addition to published data sources such as EPA's Greenhouse Gas Reporting Program and Greenhouse Gas Inventory, are there other data and information available on identification and location of point sources of greenhouse gas emissions within liquefaction facilities?
- 2.3. What methodologies do operators use to estimate and measure greenhouse gas emissions at liquefaction facilities?
- 2.4. Are companies deploying advanced technologies, such as drones or aerial surveys, to monitor greenhouse gas emissions at liquefaction facilities? If so, what technologies are they using or planning to use?
- 2.5. When is the decision to select electric, natural gas-powered, or hybrid compressor driven systems made during the facility design process? What are the key factors that influence this design choice?
- 2.6. What data and information are available related to the feasibility of electrifying new facilities or the ability to repower existing liquefaction facilities to use electric motor drives?
- 2.7. When companies have electrified facilities, what steps have they taken to quantify the emissions associated with purchased electricity?
- 2.8. When companies have electrified facilities, to what extent are they reducing consumption of natural gas that would otherwise be used for facility operation? What is the magnitude of such natural gas savings?
- 2.9. Do companies have specific plans to deploy carbon dioxide capture at liquefaction facilities in the future on low and high purity CO₂ gas streams? In addition to financial considerations, are there technical or other limitations to deploying carbon dioxide capture at liquefaction facilities?
- 2.10. Are there data or information available on other technologies or strategies operators could deploy to reduce or avoid greenhouse emissions at liquefaction facilities? Are these technologies or strategies considered experimental or pre-commercial? Are there estimates of emission reductions and/or gas savings associated with implementation of these technologies?
- 2.11. What data and information are available on the co-benefits of practices to limit greenhouse gas emissions at liquefaction facilities (e.g., reductions in criteria pollutants, hazardous air pollutants)?
- 2.12. What data and information are available to assess potential improvements to local air quality or benefits to communities from mitigation practices implemented at liquefaction facilities?

Topic 3: Strategies to Measure and Reduce Emissions during Loading, Transport, and Delivery

- 3.1. What technologies or strategies are being deployed to reduce greenhouse gas emissions during the loading, transport, and delivery of LNG?
- 3.2. What approaches do LNG operators use to capture boil off gas (BOG) and limit loss of natural gas when storing, loading, transporting, and unloading LNG?
- 3.3. What approaches do LNG operators use to minimize greenhouse emissions during tanker transport of LNG?
- 3.4. For contractual agreements that include the transport of LNG, what measures, if any, are taken to assure natural gas is not lost and greenhouse emissions are minimized during shipping?
- 3.5. Are there data or information available to assess potential improvements to local air quality or benefits to communities from mitigation practices implemented during the loading, transport, and delivery of LNG?

Topic 4: Additional Information

- 4.1 What non-US requirements for greenhouse gas performance are LNG exporters being asked to respond to with emissions data? Are emission reduction requirements included in any contracts or other importing country requirements?
- 4.2 What changes or technology advances does industry think are needed to decarbonize the LNG supply chain from production through delivery? What are the economic benefits or challenges associated with the measures to decarbonize the LNG supply chain? Is there data or information available on the costs or savings associated with implementing these measures?
- 4.3 Is there any other information that would be relevant and necessary to assess emission reduction opportunities associated with LNG export?

Disclaimer and Important Notes:

This RFI is not a FOA; therefore, DOE is not accepting applications at this time. DOE may or may not elect to issue a FOA in the future based on or related to the content and responses to this RFI. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if DOE chooses to issue a FOA regarding the subject matter.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. DOE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. As previously stated, DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information

submitted under this RFI. Responses to this RFI do not bind DOE to any further actions related to this topic.

Proprietary Information:

Because information received in response to this RFI may be used to structure future programs and FOAs and/or otherwise be made available to the public, **respondents are strongly advised NOT to include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

FREEDOM OF INFORMATION ACT:

Responses received under this RFI are subject to public disclosure under the Freedom of Information Act. Because information received in response to this RFI may be used to structure future programs and funding opportunity announcements and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive (e.g., commercial or financial information that is privileged or confidential), trade secrets, proprietary, or otherwise confidential.**

Consistent with 10 CFR 1004.11, DOE requires that any person submitting information that they believe to be confidential and exempt by law from public disclosure should submit **two well-marked copies**: one copy of the document marked “confidential” which must clearly and conspicuously identify the business sensitive, trade secrets, proprietary, or otherwise confidential information, and one copy of the document marked “non-confidential” with the information believed to be confidential deleted. **Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise.** The Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

If you choose to provide business sensitive, trade secrets, proprietary, or otherwise confidential information, you must include a cover sheet marked as follows identifying the specific pages containing business sensitive, trade secrets, proprietary, or otherwise confidential information:

Notice of Restriction on Disclosure and Use of Data: Pages [List Applicable Pages] of this response may contain business sensitive, trade secrets, proprietary, or otherwise confidential information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI DE-FOA-0003052. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains business sensitive, trade secrets, proprietary, or otherwise confidential information must be marked as follows: “Contains

Business Sensitive, Trade Secrets, Proprietary, or Otherwise Confidential Information Exempt from Public Disclosure” and (2) every line and paragraph containing such information must be clearly marked with double brackets or highlighting. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Evaluation and Administration by Federal and Non-Federal Personnel

Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to DOE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to:

ReduceGHGE_LNG_RFI@NETL.DOE.GOV with the subject line “DE-FOA-0003052_RFI” no later than 5:00 p.m. (ET) by **60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER.**

Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25 MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (*.docx) or Adobe Acrobat (*.pdf) attachment to the email, 12-point font, 1-inch margins. Only electronic responses will be accepted.

DOE will not respond to individual submissions or publicly publish a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

DOE requests respondents provide the following information at the start of their response to this RFI:

- Company/institution name;
- Company/institution contact; and
- Contact’s address, phone number, and e-mail address.

On behalf of the FECM Team, thank you in advance for providing your input on this important topic and contributing to the U.S. DOE’s success in achieving its objectives.