**REQUEST FOR INFORMATION**

**RFI: DE-FOA-0001863**

**Research Needs Related to Developing Technologies for Advancement of Geologic Storage in Basinal Geo-laboratories**

**DATE**: **November 21, 2017**

**SUBJECT**: Request for Information (RFI) to provide the broad research community with an opportunity to contribute views and opinions regarding research and development (R&D) needs associated with a variety of basin specific challenges to carbon dioxide (CO2) storage. Since there is a potential that DOE/NETL will release an Funding Opportunity Announcement (FOA) sometime in fiscal year (FY) 2018, DOE is seeking input on critical technology gaps that need to be addressed through scientific R&D.

**STRATEGIC OBJECTIVE**: This RFI is part of the Department of Energy’s (DOE) mission to lead research and technology development in support of the goals of advancing clean coal technology and advancing domestic production in the Administration’s “America First Energy Plan.” This includes value-added opportunities associated with geologic storage of CO2, or other approaches to effectively reduce the cost or enhance the benefits of safe and permanent storage activities. The DOE will accomplish this mission in cooperation with the private sector, academia, and other stakeholders.

**DESCRIPTION**: For this RFI, the DOE Office of Fossil Energy (FE) seeks input to support a better understanding of R&D needs specific to conventional and non-conventional reservoirs within various basins throughout the U.S. (e.g., Appalachian, Williston, Illinois, Michigan, Permian, Gulf Coast Region). Research completed to date by DOE and others demonstrates the site-specific nature of technological, resource, economic, and logistical challenges to implementing CO2 storage in an environmentally sustainable, permanent, publicly acceptable, technically feasible, and economically viable fashion. Input is sought to understand the existing research gaps, on a basin by basin basis, to value-added business case implementation of CO2 storage.  Such value-added opportunities could include but are not limited to enhanced oil recovery, enhanced gas recovery, enhanced water recovery, and subsurface energy storage.

**BACKGROUND**: DOE’s Carbon Storage Program field laboratory projects along with other supporting R&D projects have yielded significant advancements in carbon storage technology. However, key gaps in experience and knowledge remain, and it is observed that these gaps vary depending on the geologic setting of the storage complex. Thus, they change from one geologic basin to another, in different geographic regions of the country. There is a need to understand, on a basin by basin (geologic setting/storage complex by geologic setting/storage complex) basis, what specific challenges remain (technological, infrastructure, economic, etc.) that could hinder value-added CO2 geologic storage.

A storage complex consists of: (1) one or more storage reservoirs, with permeability and porosity that allow injection and storage of significant volumes of CO2; and (2) one or more low-permeability seals, which enclose the reservoir(s) and serve as barriers to migration of CO2 out of the reservoir. Geologic setting refers to the rock type, structural characteristics, stress state, and rock and fluid properties arising from the depositional environment and post-depositional processes at a potential storage site.

The Carbon Storage program continues to support R&D on CO2-enhanced oil and gas recovery as part of its mission to advance value-added geologic storage of CO2. Energy production from enhanced oil recovery (EOR) is expected to continue in the foreseeable future from both conventional and non-conventional reservoirs, which contributes to nation’s energy independence and security. An environmentally sustainable approach will be required to ensure that the additional large volumes of CO2 injected into both oil and gas reservoirs and saline formations remain in the reservoir. In addition, a carbon management approach capable of lowering industrial emissions in a manner that is both economically and publicly acceptable in the long-term is desirable. This includes reducing carbon emissions by achieving reduced carbon oil, which in this RFI is defined as oil whose net life cycle carbon emission to the atmosphere is reduced due to the amount of carbon permanently stored in a reservoir that occurs during EOR operations when all carbon emission from the production of the industrial products and finished fuel produced from the EOR operation have been accounted for on a life cycle basis.

For the purposes of this RFI, “conventional reservoirs” are defined as oil/gas-bearing reservoirs that:

* Have been through primary and secondary (e.g., water-flood) production
* Include brownfield residual oil zones (ROZ) that underlie primary oil reservoirs

For the purposes of this RFI, “non-conventional reservoirs” include but are not limited to:

* Residual oil zones (ROZ) that include fairway crude oil saturation zones that do not underlie a crude oil reservoir;
* Tight oil formations (e.g. shale oil) with combined primary and secondary recovery below 20% original oil-in-place (OOIP)
* Enhanced coalbed methane production
* Enhanced shale gas production

**PURPOSE:** The purpose of this RFI is to solicit feedback from industry, academia, research institutions, research laboratories, government agencies, and other stakeholders. This is solely a request for information and not a FOA. Based on the input provided to this RFI, and other considerations, DOE may decide to issue a formal FOA. No FOA exists at this time. DOE reserves the right to never issue an FOA associated with this RFI.

Additionally, DOE may, at its discretion and with the consent of the technology owner, perform an independent techno-economic analysis on technologies identified and described under this RFI, in order to determine their feasibility and fit with the DOE program. Analysis results would remain confidential.

Respondents shall not include any information in the response to this RFI that might be considered proprietary or confidential.

**DISCLAIMER AND IMPORTANT NOTES**: This RFI is NOT a FOA; therefore, DOE is not accepting applications at this time. DOE may issue a FOA in the future based on or related to the content and responses to this RFI which may or may not contain the same FOA number; however, DOE may also elect not to issue a FOA. 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. Final details, including the anticipated award size, quantity, and timing of DOE funded awards, will be subject to Congressional appropriations and direction.

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. In accordance with the Federal Acquisition Regulations, 48 C.F.R. 15.201(e), responses to this RFI are not offers and cannot be accepted by DOE to form a binding award. 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. 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 to NOT 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.

Responses containing confidential, proprietary, or privileged information must be conspicuously marked as described below. 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 U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

**Notice of Restriction on Disclosure and Use of Data**:

Pages [list applicable pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI, DE-FOA-0001829. 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 confidential, proprietary, or privileged information must be marked as follows: “Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure” and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

**EVALUATION AND ADMINISTRATION BY FEDERAL AND NON-FEDERAL PERSONNEL:**

When considering responses to this RFI**,** 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. 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 CATEGORIES AND QUESTIONS:**

**Responses may be provided to any or all of the questions. Responses may also be provided specific to one or to multiple geologic U.S. Basins (e.g., Appalachian, Williston, Illinois, Michigan, Permian, Gulf Coast Region) and/or storage complexes within such basins. In providing responses, please be clear to which basin(s) the responses are applicable.**

**Field Laboratory Studies and Laboratory Based R&D.** DOE’s Carbon Storage research program has included field laboratory activities focused on developing specific subsurface engineering approaches that address research needs that are critical for widespread deployment within multiple geologic settings in basins across the United States. Based on past R&D, DOE understands that each basin and targeted study location, while perhaps having similarities with other locations, has a unique set of conditions due to the type of storage reservoir and variability of surface and subsurface conditions encountered in each geologic setting. Due to these differences, each field effort also addresses a unique set of subsurface research challenges. Nonetheless, lessons learned from and technologies developed at one or more field sites may be applicable to other sites in different geologic settings or with different rock and fluid properties. Particularly, technologies are needed to accurately define and characterize non-conventional associated storage (e.g., ROZ, Shale, Coal), improve model accuracy, understand reservoir conformance, and monitor fate of CO2 injected within a reservoir. Technologies should be able to quantify the future use of anthropogenic CO2 for understanding reduced carbon oil. Additional information is being sought to identify field laboratory opportunities that can address specific research needs for specific basins and geologic settings in those basins.

In support of field laboratory work, laboratory-based R&D studies have provided critical data to understand the unique conditions encountered at each carbon storage field site. To date, such studies include geomechanical, geochemical, geophysical, and fluid flow analyses using core and data obtained from the targeted basin and specific field study areas. The laboratory studies have helped to modify and tailor the characterization and injection/monitoring operations to the specific basin and geologic setting. Additional information is being sought to determine laboratory studies that can help determine and characterize the unique conditions for specific basin and geologic settings.

This RFI is requesting information to further understand what R&D is needed in both field laboratory studies and laboratory-based R&D related to unique basin characteristics and specific geologic settings within basins. Information is sought on what unique characteristics from specific basins and geologic settings require further study before full-scale carbon storage in those basins can be optimized. DOE is seeking answers to the following questions with a focus toward solutions that could be tested in a field laboratory where the field site would function as a “laboratory environment.”

1. What basins/geologic settings/storage complexes could be an opportunity for R&D? Within these basins, what storage reservoir types would be targeted for CO2 storage (oil and gas, shale, coal, saline etc.) Being as specific as possible, what type of reservoir comprises this setting (conventional versus non-conventional; conventional versus fairway ROZs; etc.)? Is there an opportunity for stacked storage in this setting?
2. For the basin/geologic setting/storage complex identified, what is the current state of science and status of relevant R&D? What are the challenges and what additional R&D is needed?

The following sub-bullets are potential areas for consideration. Technologies/methodologies for:

* 1. Site characterization including non-conventional characterization
	2. Tracking CO2 plumes/detecting CO2/monitoring and surveillance
	3. Measuring/modeling/predicting induced seismicity
	4. Locating wells or other relevant infrastructure
	5. Determining wellbore integrity
	6. Ensuring/assessing storage permanence/understanding storage mechanisms
	7. Optimizing CO2 geologic storage associated with EOR
	8. Other
1. For the basin/geologic setting/storage complex identified, what are the primary and secondary challenges to value added business case implementation of CO2 storage? What R&D is needed to address these challenges?

Additional sub-bullets for potential consideration include:

* 1. Value-added opportunities could include but are not limited to enhanced oil recovery, enhanced gas recovery, enhanced water recovery, and subsurface energy storage.
1. Is the research being identified also applicable to other basins/geologic settings/storage complexes? And if so, which ones?
2. Are there existing field laboratory sites that could present synergistic opportunities or could be leveraged for further carbon storage research (including sites funded by other DOE Programs and sites outside of DOE Programs)? What R&D is needed or could be performed at these sites?
3. For the specific basin/geologic setting/storage complex, what (if any) opportunities (and associated R&D needs) exist related to reduced carbon oil?

Additional sub-bullets for potential consideration include:

* 1. Life-cycle assessment
	2. Mass balance quantification
	3. Storage permanence
	4. Improving reservoir conformance
	5. Other
1. Are there other information or R&D gaps that should be considered?

**Responses Due**

Responses to this RFI are due no later than 11:59 PM ET on December 19, 2017. Responses are to be submitted electronically in Adobe Acrobat PDF, should include a reference to “RFI: DE-FOA-0001863”, use minimum font size 11, and be submitted to the National Energy Technology Laboratory (NETL) at the following e-mail address: Amanda.Lopez@netl.doe.gov. Please limit responses to 7 pages or less. The DOE will treat all responses as confidential business sensitive information, unless otherwise indicated by the Respondent. Responses should be marked accordingly.

**Applicant Information**

It is anticipated that an FOA could be issued in 2018. In anticipation of the FOA being released, there are several one-time actions prospective Applicants must complete in order to submit an Application. To this end, the following information is provided:

• Obtain a DUNS number (including the plus 4 extension, if applicable) at *http://fedgov.dnb.com/webform*.

• Register with SAM at *https://www.sam.gov*. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.

• Register in FedConnect at *https://www.fedconnect.net/*. To create an organization account, your organization’s SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at *https://www.fedconnect.net/FedConnect/PublicPages/FedConnect\_Ready\_Set\_Go.pdf*.

• Register in Grants.gov at *http://www.grants.gov/* to receive automatic updates when FOA Amendments are issued.