

**United States Energy Association  
Promoting Domestic and International Consensus on Fossil Energy Technologies  
(CONSENSUS)**

**Cooperative Agreement #DE-FE-0024159**

**REQUEST FOR PROPOSALS (RFP)  
DE-FE-0024159-20-01**

**Potential to Increase Oil Production and Hydrocarbon Liquids Using CO<sub>2</sub> in US Shales in the Following Geological Formations: Cana-Woodford Shale in the Anadarko Basin, Niobrara Shale in the DJ Basin, and the Mowry Shale in the Powder River Basin**

**Questions Due: December 11, 2020**

**Proposals Due: December 18, 2020**

**Background**

The potential to produce oil and related hydrocarbon liquids from shale formations is vast. The amount currently produced is typically between 5 - 10% of the known resource, varying by the shale characteristics, operator processes, and original well completion. Improvements will result in significant increases in production and reserves.

Work has been underway for several years using mixed gas, including CO<sub>2</sub>, methane, ethane, and nitrogen, for enhanced oil recovery (EOR) in shale formations. Experience and knowledge gained from this work indicates that CO<sub>2</sub>, for use in EOR, has significant potential to increase oil production in shale formations.

The use of Carbon Capture, Utilization and Storage (CCUS) technologies could be deployed on coal fueled power generation plants or industrial facilities to provide large scale, reliable sources of CO<sub>2</sub> for EOR in shale formations. Policies to mitigate CO<sub>2</sub> and increase US oil production are expected to drive higher demand for captured CO<sub>2</sub> and new incentives under the modified 45Q Tax Credit are expected to make the business case for the use of CO<sub>2</sub> for EOR in shale formations more attractive.

The use of CO<sub>2</sub> derived from CCUS technologies for EOR in shale formations is virtually untapped as a tool to increase oil/hydrocarbons production. The objective of this study is to estimate the:

- Potential CO<sub>2</sub> demand for use in EOR in the Cana-Woodford Shale in the Anadarko Basin, the Niobrara Shale in the DJ Basin, and the Mowry Shale in the Powder River Basin;
- Potential for increased oil and hydrocarbon liquids resulting from the use of CO<sub>2</sub> for EOR in the the Cana-Woodford Shale in the Anadarko Basin, the Niobrara Shale in the DJ Basin, and the Mowry Shale in the Powder River Basin.

## **Scope of Work**

The United States Energy Association (USEA), in cooperation with the U.S. Department of Energy Office of Fossil Energy (DOE), seeks proposals for a contractor to complete a study on the potential of CO<sub>2</sub> utilization volumes to increase oil and hydrocarbon liquids production in US shales. The study should focus on the potential in the following undeveloped (with regards to CO<sub>2</sub>) basins: the Cana-Woodford Shale in the Anadarko Basin, the Niobrara Shale in the DJ Basin, and the Mowry Shale in the Powder River Basin. The study is expected to be between 75-175 pages in length, excluding appendices and references.

In preparing the study, the Contractor will:

- 1) Estimate the size of recoverable oil/hydrocarbon liquids resources, through the utilization of CO<sub>2</sub> driven EOR, in each of the target areas by providing a high/low set of estimates expressed as a likely percent of additional production of the original oil in production (OOIP). This is to be done with industry-accepted best practices for making these assumptions, with practices identified, including: how they were used (accompanied by mapping of the basins) and identifying areas with the best attributes and potential for employing CO<sub>2</sub>-EOR.
- 2) Characterize the likely produced crude oil, related hydrocarbon liquids, and volumes produced by utilizing CO<sub>2</sub> for EOR. The characterization should include the high/low likely percent of additional production of OOIP.
- 3) Estimate the size of potential additional reserves (oil and hydrocarbon liquids) for each formation that could be produced by utilizing CO<sub>2</sub> for EOR. This would utilize the likely high/low percent of additional production of OOIP as a guide, incorporating the current reserve methodology for shale and modifying it with CO<sub>2</sub>-EOR reserve calculations, if possible. The contractor will identify how these estimates were derived.
- 4) Estimate the likely decline curves for CO<sub>2</sub>-Shale EOR in each formation.
- 5) Estimate the size of potential CO<sub>2</sub> demand from CO<sub>2</sub>-EOR for each targeted area, with a high/low set of estimates included. This is to be done with industry-accepted best practices for making these assumptions, with practices identified and demonstrated as to how they were used.
- 6) Estimate the potential for storage in each of the targeted areas and the range of variables that impact this estimate. This is to be done with industry-accepted best practices, where practical, for making these assumptions. Practices should be identified and demonstrated how they were used.
- 7) Estimate additional water resource requirements, produced water volumes, and likely disposal-reuse in each area based on the production from CO<sub>2</sub>-EOR and storage processes. This is to be done with industry-accepted best practices for making these assumptions, with practices identified and shown how they were used.
- 8) Produce a list of commercial and pilot projects (current and proposed) in the Cana-Woodford Shale in the Anadarko Basin, the Niobrara Shale in the DJ Basin, and the Mowry Shale in the Powder River Basin where CO<sub>2</sub>-EOR and mixed gas with CO<sub>2</sub>-EOR are being used. Include research and commercial production projects and include as much detail on process, results, and current status as publicly available.

- 9) Produce a list of technical developments that are unique to CO<sub>2</sub>-EOR in shale. Identify where future research could improve these developments.
- 10) Develop a list of known and likely technical challenges that require better understanding. Identify research and resources necessary to overcome them.
- 11) As necessary and in council with USEA, coordinate with the U.S. Department of Energy's Office of Oil and Natural Gas.

It is understood that information related to ongoing CO<sub>2</sub>-EOR in shale is proprietary, has not yet started in some areas, and large sections of the study will be based on hypothetical outcomes.

The contractor will designate a primary contact to coordinate and provide monthly updates on the status via written high-level reports and conference calls between the contractor and USEA to commence within the 15 days after the initial award is formally accepted and contracted.

### Deliverables

The contractor will be required to submit the following deliverables:

- Written monthly status updates detailing progress to date, challenges and recommendations for overcoming them
- Individual drafts of each chapter of the study for each primary shale basin (Cana-Woodford, Niobrara, and Mowry)
- Draft final report
- Final Report

### Proposal Preparation

Interested parties are requested to submit a fixed-price cost proposal and a brief technical proposal of no more than 10 pages, including the following:

- Qualifications Statement demonstrating expertise and technical understanding of the likely CO<sub>2</sub>-EOR and or mixed gas-EOR process in shales with a focus within these primary shale basins: Cana-Woodford, Niobrara, and Mowry which are under typical production now.

Primary requirements: Demonstrate a technical understanding of CO<sub>2</sub>-EOR-storage, CO<sub>2</sub>-Shale EOR, CO<sub>2</sub>-mixed gas with CO<sub>2</sub>-EOR and/or mixed gas-EOR, with an emphasis on the following:

- A technical and basic commercial understanding of resource development and basic knowledge of reserves estimation where applicable pertaining to CO<sub>2</sub>-EOR and/or mixed gas-EOR.
- Technical understanding of likely volumes and characteristics of the produced fluids, such as crude oils, hydrocarbon liquids, and water.
- Technical understanding of CO<sub>2</sub> storage and capacity as potentially applicable to shale in each of these shale basins: Cana-Woodford, Niobrara, and Mowry for greenhouse gas mitigation purposes.

- Basic understanding of infrastructure development and requirements for high-level estimation of infrastructure needs in these shale basins: Cana-Woodford, Niobrara, and Mowry from potential CO<sub>2</sub>-EOR and storage.
- A list of recent (last three years) related peer-reviewed studies, presentations at industry forums, articles in trade journals, and current/completed research projects the contractor has done or participated in.

Offers must include an expected timeline with agreed milestones and proposed workflow leading to the deliverable. It should be noted, this project is required to be completed no later than September 30, 2021.

Collaborations or consortiums set up to pursue this work are acceptable as long as one entity is the primary contractor.

The sub-agreement between USEA and the winning offer will be structured as a fixed sub-agreement for labor, fringe benefits and overhead. USEA will fund other direct costs, including travel (transportation, lodging and a U.S. Government approved daily meals and incidental allowance) directly. The cost proposal should include an estimate of the number of trips required to organize and conduct this study. **DO NOT** include travel costs, as USEA will fund this directly.

Labor costs should include a level of effort for each person proposed to work on this assignment, their daily loaded rate, and the total estimated charge for each individual proposed.

CVs of each person proposed to work on this project must be included as an appendix and will not count toward the technical proposal page limit.

### **Selection Criteria**

The following criteria will be used to evaluate proposals:

40% -- Proven experience in, and knowledge of CO<sub>2</sub>-EOR-Storage, CO<sub>2</sub>-Shale EOR and/or Mixed gas with CO<sub>2</sub>-EOR and Mixed gas EOR.

30% -- Proven expertise in reserves estimation in CO<sub>2</sub>-EOR, CO<sub>2</sub>-Shale EOR and/or Mixed gas with CO<sub>2</sub>-EOR, and mixed gas EOR.

10% -- Proven experience in infrastructure and commercial development of CO<sub>2</sub>-EOR related production.

20% -- Price

### **Schedule**

Interested parties are requested to register their interest prior via email to the following mailbox: [proposals@usea.org](mailto:proposals@usea.org). Registering interest will ensure you receive all questions submitted by interested parties and the corresponding responses from USEA.

Questions on the terms of this request for proposals must be submitted prior to December 11, 2020 by email to the following mailbox: [proposals@usea.org](mailto:proposals@usea.org). All questions received and their corresponding

responses and other RFP related announcements will be posted on the USEA website and distributed to parties registering interest in this RFPs.

Final proposals must be submitted by email by 5:00 pm on December 18, 2020 to the following mailbox: [proposals@usea.org](mailto:proposals@usea.org).

The review process will take up to 60 days. Notification will be sent to the selected offeror, at which point, contract negotiations, including setting milestones and deliverable due dates, will commence.