

## CARBON SEQUESTRATION COLLABORATION ACT

SEPTEMBER 22, 2023.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. LUCAS, from the Committee on Science, Space, and Technology, submitted the following

### R E P O R T

[To accompany H.R. 4824]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 4824) to amend the Energy Policy Act of 2005 to require the Secretary of Energy to carry out terrestrial carbon sequestration research and development activities, and for other purposes, having considered the same, reports favorably thereon without amendment and recommends that the bill do pass.

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#### PURPOSE AND SUMMARY

The purpose of this bill is to amend the Energy Policy Act of 2005 to direct the Secretary of Energy to carry out terrestrial carbon sequestration research and development activities. It also di-

rects the Secretary of Energy to submit reports to Congress on these activities.

#### BACKGROUND AND NEED FOR LEGISLATION

Land is a critical component of a climate system in which plants and healthy ecosystems can absorb carbon through photosynthesis and store it in biomass. Terrestrial carbon sequestration through land sinks currently removes close to one-quarter (24%) of human-caused carbon dioxide emissions from the atmosphere and the National Academies estimates that there is potential for soil alone to store up to 13% of the United States' annual CO<sub>2</sub> emissions. Recent studies suggest land-based mitigation options could sequester 200–440 million metric tons of CO<sub>2</sub> per year by mid-century. Many of these approaches, such as those that enhance carbon storage in agricultural soils, have many positive benefits, including increased productivity, water holding capacity, stability of yields, soil regeneration, and nitrogen use efficiency.

Yet, when it comes to the specifics of carbon land sinks, there remains a severe lack of coordinated research, modeling, and data that will be needed to realize the full potential of these methods. A better understanding of land-based carbon storage is necessary not only to maximize the environmental benefits, but also to ensure any potential voluntary certification programs are science-based. Additional research is needed to explore the full suite of carbon sequestration practices across geographies, measure and verify terrestrial carbon storage, and develop the next generation of agriculture and land-based solutions.

Despite its decades of leadership in both carbon management and environmental science, the U.S. Department of Energy (DOE)'s carbon storage research has focused primarily on large-scale carbon sequestration in geologic formations. This leaves a significant knowledge gap related to carbon storage potential in soils, rangelands, biochar, mine tailings, and other smaller scale methods. The Energy Act of 2020 included a comprehensive reauthorization of DOE's Fossil Energy and Carbon Management activities including in carbon storage validation and testing. H.R. 4824 would take this reauthorization one small but critical step further by expanding DOE's existing carbon storage program to leverage its expertise in terrestrial carbon sequestration and enhancing its coordinated research and development (R&D) efforts in this space.

#### LEGISLATIVE HISTORY

On July 24, 2023, Representative James Baird (R-IN) introduced H.R. 4824, with Representative Lofgren (D-CA) as the original cosponsor.

On July 27, 2023, the Committee on Science, Space, and Technology met to consider H.R. 4824. Chairman Lucas moved that Committee favorably report the bill, H.R. 4824, without amendment, to the House of Representatives with the recommendation that the bill be approved. The motion was agreed to by a vote of 35–0.

## SECTION-BY-SECTION

*Section 1. Short title*

This section establishes that this legislation may be referred to as the “Carbon Sequestration Collaboration Act”.

*Section 2. Carbon sequestration research initiative*

This section amends Section 963 of the Energy Policy Act of 2005 (42 U.S.C. 16293) to expand the Department of Energy’s carbon storage program activities to include both terrestrial carbon sequestration and carbon sequestration in geological formations. This section provides updates to this program authorization, including additional requirements for coordination with relevant federal agencies like the Department of the Interior and the U.S. Department of Agriculture. It also requires the Secretary of Energy to submit to Congress a long-term strategic and prioritized research agenda to identify and address scientific challenges for widespread adoption of terrestrial carbon sequestration and carbon sequestration in geological formations.

## RELATED COMMITTEE HEARINGS

On July 26, 2023, Chairman Frank Lucas presiding, the House Committee on Science, Space, and Technology’s Subcommittee on Energy held a hearing titled, “Unearthing Innovation: The Future of Subsurface Science and Technology in the United States” to explore the status of U.S. subsurface science and technology research including in the areas of fundamental scientific discovery, clean energy production and storage, waste management strategies, and next generation mining technologies. This hearing specifically examined research and development activities carried out or supported by the U.S. Department of Energy (DOE).

Witnesses:

- Dr. Alexandra Hakala, Senior Fellow, Geologic and Environmental Systems, National Energy Technology Laboratory, U.S. Department of Energy
- Mr. Ben Serrurier, Government Affairs and Policy Manager, Fervo Energy
- Dr. Kevin M. Rosso, Associate Director, Physical Sciences Division, Pacific Northwest National Laboratory
- Dr. Haruko Murakami Wainwright, Norman C. Rasmussen Career Development Professor, Assistant Professor of Nuclear Science and Engineering, and Assistant Professor of Civil and Environmental Engineering, Massachusetts Institute of Technology
- Ms. Allyson Book, Chief Sustainability Officer, Baker Hughes

## COMMITTEE CONSIDERATION

On July 27, 2023, the Committee met in open session and ordered reported favorably the bill, H.R. 4824, without amendment, by a recorded vote of 35 yeas to 0 nays, a quorum being present.

ROLL CALL VOTES

Clause 3(b) of rule XIII requires the Committee to list the record votes on the motion to report legislation and amendments thereto. The following reflects the record votes taken during the Committee consideration:

House Committee on Science, Space, and Technology  
 118th Congress  
 Full Committee Markup

Bill # HR 4824  
 Motion to report HR 4824 to the House

Majority	Aye	No	Present
Frank Lucas, Oklahoma	1		
Bill Posey, Florida	1		
Randy Weber, Texas	1		
Brian Babin, Texas	1		
Jim Baird, Indiana	1		
Daniel Webster, Florida			
Mike Garcia, California	1		
Stephanie Bice, Oklahoma			
Jay Obernolte, California	1		
Chuck Fleischmann, Tennessee	1		
Darrell Issa, California	1		
Rick Crawford, Arkansas	1		
Claudia Tenney, New York	1		
Ryan Zinke, Montana			
Scott Franklin, Florida	1		
Dale Strong, Alabama	1		
Max Miller, Ohio	1		
Rich McCormick, Georgia	1		
Mike Collins, Georgia	1		
Brandon Williams, New York			
Tom Kean, New Jersey	1		
Minority	Aye	No	Present
Zoe Lofgren, California	1		
Suzanne Bonamici, Oregon	1		
Haley Stevens, Michigan	1		
Jamaal Bowman, New York	1		
Deborah Ross, New Carolina	1		
Eric Sorensen, Illinois	1		
Andrea Salinas, Oregon	1		
Val Foushee, North Carolina	1		
Kevin Mullin, California	1		
Jeff Jackson, North Carolina	1		
Emilia Sykes, Ohio	1		
Maxwell Frost, Florida	1		
Yadira Caraveo, Colorado	1		
Summer Lee, Pennsylvania	1		
Jennifer McClellan, Virginia	1		
Ted Lieu, California	1		
Sean Casten, Illinois	1		
Paul Tonko	1		
<b>Total</b>	35	0	

Date: 7/27/23

<b>Result?</b>	Agreed To: [ X ]		
	Not Agreed To: [ ]		
	Withdrawn: [ ]		
<i>Voice Vote</i>	<i>Ayes</i>	<i>Nays</i>	<i>Present</i>
	35	0	

## APPLICATION OF LAW TO THE LEGISLATIVE BRANCH

The Committee finds that H.R. 4824 does not relate to the terms and conditions of employment or access to public services or accommodations within the meaning of section 102(b)(3) of the Congressional Accountability Act (Public Law 104–1).

## STATEMENT OF OVERSIGHT FINDINGS AND RECOMMENDATIONS OF THE COMMITTEE

In compliance with clause 3(c)(1) of rule XIII and clause (2)(b)(1) of rule X, the Committee’s oversight findings and recommendations are reflected in the descriptive portions of this report.

## STATEMENT OF GENERAL PERFORMANCE GOALS AND OBJECTIVES

Pursuant to clause (3)(c)(4) of rule XIII, the goal of H.R. 4824 is to amend the Energy Policy Act of 2005 to direct the Secretary of Energy to carry out terrestrial carbon sequestration research and development activities. H.R. 4824 takes DOE’s Fossil Energy and Carbon Management activities, including in carbon storage validation and testing, one small but critical step further by expanding its existing carbon storage program to leverage existing expertise in terrestrial carbon sequestration and enhancing its coordinated R&D efforts in this space.

## DUPLICATION OF FEDERAL PROGRAMS

Pursuant to clause 3(c)(5) of rule XIII, the Committee finds that no provision of H.R. 4824 establishes or reauthorizes a program of the Federal Government known to be duplicative of another Federal program, including any program that was included in a report to Congress pursuant to section 21 of Public Law 111–139 or identified in the most recent Catalog of Federal Domestic Assistance.

## FEDERAL ADVISORY COMMITTEE ACT

The Committee finds that the legislation does not establish or authorize the establishment of an advisory committee within the definition of section 5(b) of the Federal Advisory Committee Act.

## UNFUNDED MANDATE STATEMENT

The Committee adopts as its own the estimate of Federal mandates prepared by the Director of the Congressional Budget Office pursuant to section 423 of the Unfunded Mandates Reform Act.

## EARMARK IDENTIFICATION

Pursuant to clauses 9(e), 9(f), and 9(g) of rule XXI, the Committee finds that H.R. 4824 does not include any congressional earmarks, limited tax benefits, or limited tariff benefits.

## COMMITTEE COST ESTIMATE

Pursuant to clause 3(d)(1) of rule XIII, the Committee adopts as its own the cost estimate prepared by the Director of the Congressional Budget Office pursuant to section 402 of the Congressional Budget Act of 1974. At the time this report was filed, the estimate was not available.

NEW BUDGET AUTHORITY, ENTITLEMENT AUTHORITY, AND TAX  
EXPENDITURES

Pursuant to clause 3(c)(2) of rule XIII, the Committee finds that H.R. 4824 would result in no new or increased budget authority, entitlement authority, or tax expenditures or revenues.

CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

Pursuant to clause 3(c)(3) of rule XIII, at the time this report was filed, the cost estimate prepared by the Director of the Congressional Budget Office pursuant to section 402 of the Congressional Budget Act of 1974 was not available.

CHANGES IN EXISTING LAW MADE BY THE BILL, AS REPORTED

In compliance with clause 3(e) of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italics, and existing law in which no change is proposed is shown in roman):

**ENERGY POLICY ACT OF 2005**

\* \* \* \* \*

**TITLE IX—RESEARCH AND  
DEVELOPMENT**

\* \* \* \* \*

**Subtitle F—Fossil Energy**

\* \* \* \* \*

**SEC. 963. CARBON STORAGE VALIDATION AND TESTING.**

(a) DEFINITIONS.—In this section:

(1) *CARBON SEQUESTRATION IN GEOLOGIC FORMATIONS.*—The term “carbon sequestration in geologic formations” means carbon sequestration methods or technologies utilizing existing permeable or porous formations in geologic settings, such as basins or aquifers.

[(1)] (2) *LARGE-SCALE CARBON SEQUESTRATION.*—The term “large-scale carbon sequestration” means a scale that—

(A) demonstrates the ability to inject into geologic formations and sequester carbon dioxide; and

(B) has a goal of sequestering not less than 50 million metric tons of carbon dioxide.

[(2)] (3) *PROGRAM.*—The term “program” means the program established under subsection (b)(1).

(4) *TERRESTRIAL CARBON SEQUESTRATION.*—The term “terrestrial carbon sequestration” means carbon sequestration methods or technologies engineered by humans and targeted at rangelands, agricultural lands, fallow lands, or forest stands to increase soil organic carbon levels or sequester carbon through

*transport processes via plant and root biomass, including through soil additives, geochemical approaches, and other engineered solutions that can increase the storage of produced carbon in inorganic or mineral forms, such as biochar and carbon mineralization utilizing mine tailings.*

(b) CARBON STORAGE PROGRAM.—

(1) IN GENERAL.—The Secretary **[shall establish]**, *in coordination with the heads of relevant Federal agencies, carry out a program of research, development, demonstration, and commercialization for carbon storage, including through terrestrial carbon sequestration and carbon sequestration in geologic formations.*

(2) PROGRAM ACTIVITIES.—Activities under the program shall include—

(A) **[in coordination with relevant Federal agencies,]** developing and maintaining mapping tools and resources that **[assess the capacity of geologic storage formation]** *evaluate terrestrial carbon sequestration and carbon sequestration in geologic formations* in the United States;

(B) developing monitoring tools, modeling of geologic formations *and terrestrial carbon storage sites*, and analyses—

(i) to predict carbon dioxide containment; and

(ii) to account for sequestered carbon dioxide in **[geologic storage]** *across a variety of ecosystems* sites;

(C) researching—

(i) potential environmental, safety, and health impacts in the event of a leak into the atmosphere or to an aquifer; and

(ii) any corresponding mitigation actions or responses to limit harmful consequences of such a leak;

(D) evaluating the interactions of carbon dioxide with **[formation]** solids and fluids, including the propensity of injections to induce seismic activity, *and determining the fate of carbon dioxide concurrent with and after injection into geologic formations;*

(E) assessing and ensuring the safety of operations relating to **[geologic sequestration of carbon dioxide]** *terrestrial carbon sequestration and carbon sequestration in geologic formations;*

**[F]** determining the fate of carbon dioxide concurrent with following injection into geologic formations;

**[G]** supporting cost and business model assessments to examine the economic viability of technologies and systems developed under the program; **]**

**[H]** *(F)* providing information to the Environmental Protection Agency, States, local governments, Tribal governments, and other appropriate entities, to ensure the protection of human health and the environment; **[and]**

**[I]** *(G)* evaluating the quantity, location, and timing of geologic carbon storage deployment that may be needed, and developing strategies and resources to enable the deployment**[.]**

*(H) enhancing the scientific understanding of, and reducing uncertainties associated with, the cycling of carbon in*

agriculture lands, forests, and geologic formations, including long- and short-term behavior and potential environmental effects of sequestered carbon;

(I) identifying scientific barriers and pursuing research solutions to challenges preventing terrestrial carbon sequestration and carbon sequestration in geologic formations, including supporting cost and business model assessments to examine the economic viability of technologies and systems developed under the program;

(J) collecting, identifying, standardizing, and utilizing data and data sharing practices needed to—

(i) increase the understanding of terrestrial carbon sequestration, in particular carbon sequestered through agricultural practices and conservation agriculture, such as rangeland and grazing management, soil cover, and crop rotations; and

(ii) support the development and demonstration of new carbon sequestration tools and technologies; and

(K) coordinating across Federal agencies research efforts regarding terrestrial carbon sequestration and carbon sequestration in geologic formations.

(3) *LEVERAGING.*—In carrying out activities under the program, the Secretary shall leverage for the advancement of monitoring, reporting, and verification, including tools, modeling, and analysis, the collective body of knowledge and data, including experience and resources from existing carbon utilization and sequestration research, entities, and demonstrations, from the following:

(A) The United States Geological Survey, the Agricultural Research Service, and the national Carbon Utilization Research Center.

(B) The Department of Energy, including the Office of Science, the Office of Fossil Energy and Carbon Management, and the Office of Clean Energy Demonstrations.

(C) Interagency research and development initiatives and data collection activities.

(D) Other Federal agencies, research communities, and users of the data referred to in subparagraph (J) of paragraph (2), including the Farm Service Agency, the National Institute of Food and Agriculture, the Forest Service, and the Natural Resources Conservation Service.

(4) *COORDINATION.*—The Secretary of Energy shall carry out the program in coordination with, and avoid unnecessary duplication of, the following:

(A) Other research entities of the Department of Energy, including the National Laboratories and the Advanced Research Projects Agency–Energy.

(B) Research entities, services, and partnerships of the Department of Agriculture, including the Agricultural Research Service, the Natural Resources Conservation Service, the Farm Service Agency, and the Forest Service.

(C) Research entities of the Department of the Interior.

(D) Other entities within Federal agencies that conduct research, development, or demonstration on terrestrial car-

*bon sequestration and carbon sequestration in geologic formations.*

[(3)] (5) GEOLOGIC SETTINGS.—In carrying out research activities under this subsection, the Secretary shall consider a variety of candidate onshore and offshore geologic settings, including—

- (A) operating oil and gas fields;
- (B) depleted oil and gas fields;
- (C) residual oil zones;
- (D) unconventional reservoirs and rock types;
- (E) unmineable coal seams;
- (F) saline formations in both sedimentary and basaltic geologies;
- (G) geologic systems that may be used as engineered reservoirs to extract economical quantities of brine from geothermal resources of low permeability or porosity; and
- (H) geologic systems containing in situ carbon dioxide mineralization formations.

(6) RESEARCH PLAN.—*Not later than two years after the date of the enactment of this paragraph and annually thereafter, the Secretary shall submit to the Committee on Science, Space, and Technology, the Committee on Natural Resources, and the Committee on Agriculture of the House of Representatives and the Committee on Energy and Natural Resources and the Committee on Agriculture, Nutrition, and Forestry of the Senate the long-term strategic and prioritized research agenda to identify and address scientific challenges for widespread adoption of terrestrial carbon sequestration and carbon sequestration in geological formations, including in shallow formations and sites not used for enhanced oil recovery.*

(c) LARGE-SCALE CARBON SEQUESTRATION DEMONSTRATION PROGRAM.—

(1) IN GENERAL.—The Secretary shall establish a demonstration program under which the Secretary shall provide funding for demonstration projects to collect and validate information on the cost and feasibility of commercial deployment of large-scale carbon sequestration technologies.

(2) EXISTING REGIONAL CARBON SEQUESTRATION PARTNERSHIPS.—In carrying out paragraph (1), the Secretary may provide additional funding to regional carbon sequestration partnerships that are carrying out or have completed a large-scale carbon sequestration demonstration project under this section (as in effect on the day before the date of enactment of the Energy Act of 2020) for additional work on that project.

(3) DEMONSTRATION COMPONENTS.—Each demonstration project carried out under this subsection shall include longitudinal tests involving carbon dioxide injection and monitoring, mitigation, and verification operations.

(4) CLEARINGHOUSE.—The National Energy Technology Laboratory shall act as a clearinghouse of shared information and resources for—

- (A) existing or completed demonstration projects receiving additional funding under paragraph (2); and
- (B) any new demonstration projects funded under this subsection.

(5) REPORT.—Not later than 1 year after the date of enactment of the Energy Act of 2020, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a report that—

(A) assesses the progress of all regional carbon sequestration partnerships carrying out a demonstration project under this subsection;

(B) identifies the remaining challenges in achieving large-scale carbon sequestration that is reliable and safe for the environment and public health; and

(C) creates a roadmap for carbon storage research and development activities of the Department through 2025, with the goal of reducing economic and policy barriers to commercial carbon sequestration.

(d) INTEGRATED STORAGE.—

(1) IN GENERAL.—The Secretary may transition large-scale carbon sequestration demonstration projects under subsection (c) into integrated commercial storage complexes.

(2) GOALS AND OBJECTIVES.—The goals and objectives of the Secretary in seeking to transition large-scale carbon sequestration demonstration projects into integrated commercial storage complexes under paragraph (1) shall be—

(A) to identify geologic storage sites that are able to accept large volumes of carbon dioxide acceptable for commercial contracts;

(B) to understand the technical and commercial viability of carbon dioxide geologic storage sites; and

(C) to carry out any other activities necessary to transition the large-scale carbon sequestration demonstration projects under subsection (c) into integrated commercial storage complexes.

(e) LARGE-SCALE CARBON STORAGE COMMERCIALIZATION PROGRAM.—

(1) IN GENERAL.—The Secretary shall establish a commercialization program under which the Secretary shall provide funding for the development of new or expanded commercial large-scale carbon sequestration projects and associated carbon dioxide transport infrastructure, including funding for the feasibility, site characterization, permitting, and construction stages of project development.

(2) APPLICATIONS; SELECTION.—

(A) IN GENERAL.—To be eligible to enter into an agreement with the Secretary for funding under paragraph (1), an entity shall submit to the Secretary an application at such time, in such manner, and containing such information as the Secretary determines to be appropriate.

(B) APPLICATION PROCESS.—The Secretary shall establish an application process that, to the maximum extent practicable—

(i) is open to projects at any stage of development described in paragraph (1); and

(ii) facilitates expeditious development of projects described in that paragraph.

(C) PROJECT SELECTION.—In selecting projects for funding under paragraph (1), the Secretary shall give priority to—

(i) projects with substantial carbon dioxide storage capacity; or

(ii) projects that will store carbon dioxide from multiple carbon capture facilities.

(f) PREFERENCE IN PROJECT SELECTION FROM MERITORIOUS PROPOSALS.—In making competitive awards under this section, subject to the requirements of section 989, the Secretary shall—

(1) with respect to the research, development, demonstration program components described in subsections (b) through (d) give preference to proposals from partnerships among industrial, academic, and government entities; and

(2) require recipients to provide assurances that all laborers and mechanics employed by contractors and subcontractors in the construction, repair, or alteration of new or existing facilities performed in order to carry out a demonstration or commercial application activity authorized under this section shall be paid wages at rates not less than those prevailing on similar construction in the locality, as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code, and the Secretary of Labor shall, with respect to the labor standards in this paragraph, have the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (15 Fed. Reg. 3176; 5 U.S.C. Appendix) and section 3145 of title 40, United States Code.

(g) COST SHARING.—Activities carried out under this section shall be subject to the cost-sharing requirements of section 988.

(h) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Secretary to carry out this section \$2,500,000,000 for the period of fiscal years 2022 through 2026.

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