

# Summary of Carbon Capture and Sequestration Technology RD&D Provisions in American Energy Innovation Act (AEIA)

*Resources for the Future, Fall 2020*

## Important Notes:

- This is a summary of the carbon capture and sequestration portion of the American Energy Innovation Act. We will call that portion “the Legislation.”
- In answering our questionnaire, please use the funding projections in this summary so that the funding scenarios you use are known by the readers of our report/paper and are consistent with those used by the other experts who are answering the same questions.
- The Legislation specifies funding authorizations only for FY2021-FY2025. This summary supplements those authorizations with a few additional assumptions to construct with the “with-Legislation” funding scenario that we ask you to base your answers on: :
  - We assume that funding authorizations will translate into actual funding.
  - Because FY2021 is well underway, it is unlikely that the Legislation would still provide substantial FY2021 funding. Consequently, all funding is shifted to one year later than what is stated in the Legislation.
  - It is quite common and expected for funding to continue beyond the initially authorized period. The funding scenario assumes that enacting the Legislation would result in higher funding for ten years (FY2022-FY2031), as specified below.
- For the first five years, the Legislation specifies the authorized funding. We base funding in years 6 – 10 on the year-5 funding, but scaled up with inflation, except as otherwise noted.
- For the scenario in which the Legislation is *not* enacted, we assume FY20 funding continues but grows at inflation rate.
- All dollar values in this summary are in 2020 dollars. Assumed annual inflation rate is 1.4%.
- The Legislation described below is a portion of a larger bill. However, this elicitation is just about this portion, not about the larger bill. In answering, please answer about the effects of this portion only.
- The Legislation specifies that all activities prescribed in it are to be the responsibility of the Department of Energy, unless otherwise mentioned.

## Summary of the Legislation

Based on the assumptions that we apply and ask you to apply in answering this expert elicitation, the Legislation would result in a projected ten-year total of \$11.2 billion dedicated to CCS research, development, and demonstration activities for FY2022 – FY 2031. This represents an increase of \$6.3 billion over the projected corresponding total of \$4.9 billion during the same ten years without the Legislation.

The Legislation would amend the part of the Energy Policy Act of 2005 that directs DOE to carry out RD&D, commercial application programs with the objective of improving “the efficiency, effectiveness, and environmental performance of fossil energy production, upgrading, conversion, and consumption.” The Legislation would add the following objectives:

- Technology development that reduces carbon dioxide and heavy metals emissions
- Increase exports of fossil-related equipment that includes emissions control technologies
- Develop carbon removal and utilization technologies that result in reductions in net carbon dioxide emissions and result in carbon utilization for commercial applications.
- Improve the “conversion, use, and storage of carbon dioxide produced from fossil fuels”

The programs that the Legislation would create or modify are listed below in approximate order from largest funding increase to smallest funding increase, compared to corresponding FY2020 funding. A table at the end of this summary repeats the program names, their projected annual average funding with the Legislation being enacted, and any corresponding funding that would occur without the Legislation being enacted.

The Legislation would also establish the following programs:

- **Coal and Natural Gas Technology Program**
  - Total funding for this program would be \$7.54 billion in FY2022-FY2031, for an average of \$754 million per year.
  - For comparison, corresponding projected annual funding in the without-Legislation scenario is \$56 million for CCUS cross cutting research and \$118 million for carbon capture.
  - The AEIA would replace the existing Coal and Related Technologies Program with the Coal and Natural Gas Technology Program with the intention of continuing the use of coal and natural gas resources in ways that are more efficient, lower-cost, and have better environmental performance.
  - Technology goals and objectives for the program would be focused on:
    - Improving the performance of coal and natural gas plants with respect to reliability, improved conversion efficiency, and reduced emissions
    - Advancing carbon capture and storage technologies to reduce carbon emissions from these sources through R&D for these technologies and for the carbon utilization and storage technologies
    - Reducing other non-carbon pollutants from natural gas and coal plants and reducing water usage
    - Exploring methods for converting coal and natural gas to produce hydrogen
  - The program would provide funding for:
    - Large-scale pilot projects

- Research and development
    - Demonstration projects
    - Engineering and design
  - The program includes funding for the construction and operation of at least five demonstration projects for capturing carbon from natural gas and coal plants, of which at least two must be for natural gas plants and two must be for coal plants (no later than Sept 30<sup>th</sup> 2026). Subsequently must enter into agreements to support more demonstrations, as budget permits. This program will ensure a diversity in geographic distribution of sites, types of electric generation plants, and technology types.
  - This project will be carried out by the DOE, while coordinating with the National Laboratories and consulting with entities such as energy producers, related industries, environmental organizations, and organizations that represent workers and consumers.
- **Carbon Storage Validation and Testing Program**
    - Total funding would be \$1.14 billion in FY2022-FY2031, for an average of \$114 million per year.
    - For comparison, corresponding projected annual funding in the without-Legislation scenario is \$100 million for the CCUS carbon storage research.
    - This program would support RD&D for carbon storage. Program activities would include:
      - Development of monitoring tools for carbon containment and models of geologic formations
      - Research on the environmental, safety, and health risks of leakage of sequestered carbon into the atmosphere or into an aquifer
      - Research on the interactions between carbon dioxide with various compounds
      - Research on safe operations for geologic sequestration of carbon and better understanding of the path for carbon dioxide once it is injected into geologic formations
      - Developing business models to estimate the economics of carbon capture technologies and systems
      - Funding for demonstration projects for large-scale carbon sequestration, defined as the capacity to sequester at least 50 million metric tons of carbon dioxide over a 10-year period.
    - At the discretion of the Secretary, additional funding can also be provided for regional carbon sequestration partnerships that carry out a large-scale carbon sequestration demonstration project.
    - The Secretary may also transition the program away from large-scale carbon sequestration demonstration projects to focus on integrated commercial storage complexes. In that case, the program would be aimed at identifying storage sites capable of accepting large volumes of carbon dioxide and improving understanding of technical and commercial viability of geologic storage.
  - **Carbon Utilization Program**
    - Total funding would be \$308 million in FY2022-FY2031, for an average of \$30.8 million per year.

- Section 1404 would establish a program of research, development, and demonstration for carbon utilization. Program activities would include:
  - Assessing and monitoring any changes in lifecycle carbon dioxide and environmental safety monitors associated with technologies used in enhanced hydrocarbon recovery
  - Identification of potential uses for carbon oxides that would have market value
  - Identification of carbon capture technologies for industry
  - Identification of potential alternative uses for coal products
- This section requires that the Secretary establish a two-year demonstration project in the two major coal regions in the US for coal products.
- The Secretary must also instruct the National Academies of Science, Engineering, and Medicine to conduct a study on the commercialization of carbon products in the US.

### Projected DOE CCS Funding Without and With the Legislation Being Enacted

In the following table, the programs and projected funding in the “with-Legislation” scenario are shown on the right. The ones in blue are in the Legislation. To the left of them are the FY20 funding items that they would replace. Below the rows with blue are the current programs that would not be affected by the Legislation so they are the same in the without-Legislation and with-Legislation scenarios.

DOE Budget CCUS and Power Systems Programs	Avg. Annual Spending if AEIA Not Enacted	Matches?	AEIA CCS Programs	Avg. Annual Spending if AEIA is enacted
Cross Cutting Research	\$56,000,000	<-Matches->	Coal and NG Technology Program	\$754,499,000
Carbon Capture	\$117,800,000			
Carbon Storage	\$100,000,000	<-Matches->	Carbon Storage Validation and Testing	\$113,523,000
		New	Carbon Utilization Program	\$30,762,000
Advanced Energy Systems	\$120,000,000	Unaffected	Advanced Energy Systems	\$120,000,000
NETL Coal Research and Development	\$61,000,000	Unaffected	NETL Coal Research and Development	\$61,000,000
STEP (Supercritical CO2)	\$16,000,000	Unaffected	STEP (Supercritical CO2)	\$16,000,000
Transformational Coal Pilots	\$20,000,000	Unaffected	Transformational Coal Pilots	\$20,000,000
Projected Yearly Total if Legislation not Enacted:	<b>\$490,800,000</b>		Projected Yearly Total if Legislation Enacted:	<b>\$1,115,784,000</b>

For the first five years, the Legislation specifies the authorized funding. We base funding in years 6 – 10 on the year-5 funding, but scaled up with inflation. There is one exception, which is that for the Coal and NG Technology Program we base the funding in years 6-10 on the funding in year 2, scaled up with inflation. The reason is that there is higher funding in years 3-5 because of a higher rate of funding demonstration projects in years 3-5.