

(A) the Director of the Office of Basic Energy Sciences and the Associate Director of Biological and Environmental Research shall investigate phenomena of mesoscale electrochemical confinement for the purpose of replicating and controlling new electrochemical behavior; and

(B) the Assistant Secretary for Energy Efficiency and Renewable Energy shall support translational research, development, and validation of physical concepts developed under the program.

(3) Standard of review

The Secretary shall review activities carried out under the program described in paragraph (1) to determine the achievement of technical milestones.

(4) Funding

Of the funds authorized to be appropriated for basic energy sciences in a fiscal year, there is authorized to be appropriated to the Secretary to carry out activities under this subsection \$20,000,000 for each of fiscal years 2023 through 2027.

(Pub. L. 109–58, title IX, §975, Aug. 8, 2005, 119 Stat. 903; Pub. L. 115–246, title III, §303(g)(1), formerly §303(e)(1), Sept. 28, 2018, 132 Stat. 3143, renumbered §303(g)(1), Pub. L. 117–167, div. B, title I, §10102(a)(1), Aug. 9, 2022, 136 Stat. 1409; Pub. L. 117–167, div. B, title I, §10102(c), Aug. 9, 2022, 136 Stat. 1415.)

Editorial Notes

AMENDMENTS

2022—Subsec. (a)(1)(C). Pub. L. 117–167, §10102(c)(1)(A), added subpar. (C).

Subsec. (a)(2)(C). Pub. L. 117–167, §10102(c)(1)(B), added subpar. (C).

Subsec. (b)(4). Pub. L. 117–167, §10102(c)(2), added par. (4) and struck out former par. (4). Prior to amendment, text read as follows: “No funds allocated to the program described in paragraph (1) may be obligated or expended for commercial application of energy technology.”

Subsec. (c)(4). Pub. L. 117–167, §10102(c)(3), added par. (4) and struck out former par. (4). Prior to amendment, text read as follows: “No funds allocated to the program described in paragraph (1) may be obligated or expended for commercial application of energy technology.”

Subsec. (d)(4). Pub. L. 117–167, §10102(c)(4), added par. (4) and struck out former par. (4). Prior to amendment, text read as follows: “No funds allocated to the program described in paragraph (1) may be obligated or expended for commercial application of energy technology.”

2018—Pub. L. 115–246 amended section generally. Prior to amendment, text read as follows: “The Secretary shall conduct a program of fundamental research on solid state lighting in support of the Next Generation Lighting Initiative carried out under section 16192 of this title.”

§ 16316. Advanced scientific computing research and development program

(1) In general

The Secretary shall conduct an advanced scientific computing research and development program that includes activities related to applied mathematics and activities authorized by the American Super Computing Leadership Act of 2017 (15 U.S.C. 5541 et seq.).

(2) Goal

The Secretary shall carry out the program with the goal of supporting departmental missions, and providing the high-performance computational, networking, advanced visualization technologies, and workforce resources, that are required for world leadership in science.

(Pub. L. 109–58, title IX, §976(a), Aug. 8, 2005, 119 Stat. 903; Pub. L. 115–246, title III, §304(b)(1)(B), formerly §304(a)(1)(B), Sept. 28, 2018, 132 Stat. 3145, renumbered §304(b)(1)(B), Pub. L. 117–167, div. B, title I, §10104(a)(1), Aug. 9, 2022, 136 Stat. 1433.)

Editorial Notes

REFERENCES IN TEXT

The American Super Computing Leadership Act of 2017, referred to in par. (1), is Pub. L. 108–423, Nov. 30, 2004, 118 Stat. 2400, which is classified principally to subchapter III (§5541 et seq.) of chapter 81 of Title 15, Commerce and Trade. For complete classification of this Act to the Code, see Short Title note set out under section 5501 of Title 15 and Tables.

AMENDMENTS

2018—Par. (1). Pub. L. 115–246 substituted “American Super Computing Leadership Act of 2017” for “Department of Energy High-End Computing Revitalization Act of 2004”.

§ 16317. Systems biology program

(a) Program

(1) Establishment

The Secretary shall establish a research, development, and demonstration program in microbial and plant systems biology, protein science, computational biology, and environmental science to support the energy, national security, and environmental missions of the Department.

(2) Grants

The program shall support individual researchers and multidisciplinary teams of researchers through competitive, merit-reviewed grants.

(3) Consultation

In carrying out the program, the Secretary shall consult with other Federal agencies that conduct genetic and protein research.

(b) Goals

The program shall have the goal of developing technologies and methods based on the biological functions of genomes, microbes, and plants that—

(1) can facilitate the production of fuels, including hydrogen in sustainable production systems that reduce greenhouse gas emissions;

(2) convert carbon dioxide to organic carbon;

(3) detoxify soils and water, including at facilities of the Department, contaminated with heavy metals and radiological materials;

(4) develop cellulosic and other feedstocks that are less resource and land intensive and that promote sustainable use of resources, including soil, water, energy, forests, and land, and ensure protection of air, water, and soil quality; and

(5) address other Department missions as identified by the Secretary.

(c) Plan

(1) Development of plan

Not later than 1 year after August 8, 2005, the Secretary shall prepare and transmit to Congress a research plan describing how the program authorized pursuant to this section will be undertaken to accomplish the program goals established in subsection (b).

(2) Review of plan

The Secretary shall contract with the National Academy of Sciences to review the research plan developed under this subsection. The Secretary shall transmit the review to Congress not later than 18 months after transmittal of the research plan under paragraph (1), along with the Secretary's response to the recommendations contained in the review.

(d) User facilities and ancillary equipment

Within the funds authorized to be appropriated pursuant to this part, amounts shall be available for projects to develop, plan, construct, acquire, or operate special equipment, instrumentation, or facilities, including user facilities at National Laboratories, for researchers conducting research, development, demonstration, and commercial application in systems biology and proteomics and associated biological disciplines.

(e) Prohibition on biomedical and human cell and human subject research

(1) No biomedical research

In carrying out the program under this section, the Secretary shall not conduct biomedical research.

(2) Limitations

Nothing in this section shall authorize the Secretary to conduct any research or demonstrations—

- (A) on human cells or human subjects; or
- (B) designed to have direct application with respect to human cells or human subjects.

(f) Bioenergy research centers

(1) In general

In carrying out the program under section 18644(a) of this title, the Director shall support up to 6 bioenergy research centers to conduct fundamental research in plant and microbial systems biology, biological imaging and analysis, and genomics, and to accelerate advanced research and development of advanced biofuels, bioenergy or biobased materials, chemicals, and products that are produced from a variety of regionally diverse feedstocks, and to facilitate the translation of research results to industry. The activities of the centers authorized under this subsection may include—

- (A) accelerating the domestication of bioenergy-relevant plants, microbes, and associated microbial communities to enable high-impact, value-added coproduct development at multiple points in the bioenergy supply chain;

(B) developing the science and technological advances to ensure process sustainability is considered in the creation of advanced biofuels and bioproducts from lignocellulosic biomass; and

(C) using the latest tools in genomics, molecular biology, catalysis science, chemical engineering, systems biology, and computational and robotics technologies to sustainably produce and transform biomass into advanced biofuels and bioproducts.

(2) Selection and duration

(A) In general

A center established under paragraph (1) shall be selected on a competitive, merit-reviewed basis for a period of not more than 5 years, subject to the availability of appropriations, beginning on the date of establishment of that center.

(B) Applications

The Director shall consider applications from National Laboratories, multi-institutional collaborations, and other appropriate entities.

(C) Existing centers

A center already in existence on August 9, 2022, may continue to receive support for a period of not more than 5 years beginning on the date of establishment of that center.

(D) New centers

The Director shall select any new center pursuant to paragraph (1) on a competitive, merit-reviewed basis, with special consideration for applications from an institution of higher education (as defined in section 1001 of title 20) that is located in an eligible jurisdiction (as defined in section 13503(b)(3)(A) of this title).

(3) Renewal

After the end of the applicable period described in paragraph (2), the Director may renew support for a center for a period of not more than 5 years on a merit-reviewed basis. For a center in operation for 10 years after its previous selection on a competitive, merit-reviewed basis, the Director may renew support for the center on a competitive, merit-reviewed basis for a period of not more than 5 years, and may subsequently provide an additional renewal on a merit-reviewed basis for a period of not more than 5 years.

(4) Activities

Centers shall undertake research activities to accelerate the production of advanced biofuels and bioproducts from biomass resources by identifying the most suitable species of plants for use as energy crops; and improving methods of breeding, propagation, planting, producing, harvesting, storage and processing. Activities may include the following:

(A) Research activities to increase sustainability, including—

- (i) advancing knowledge of how bioenergy crop interactions with biotic and abiotic environmental factors influence crop growth, yield, and quality;

(ii) identifying the most impactful research areas that address the economics of advanced biofuels and bioproducts production; and

(iii) utilizing multiscale modeling to advance predictive understanding of advanced biofuel cropping ecosystems.

(B) Research activities to further feedstock development, including lignocellulosic, algal, gaseous wastes including carbon oxides and methane, and direct air capture of single carbon gases via plants and microbes, including—

(i) developing genetic and genomic tools, high-throughput analytical tools, and biosystems design approaches to enhance bioenergy feedstocks and their associated microbiomes;

(ii) conducting field testing of new potential bioenergy feedstock crops under environmentally benign and geographically diverse conditions to assess viability and robustness; and

(iii) developing quantitative models informed by experimentation to predict how bioenergy feedstocks perform under diverse conditions.

(C) Research activities to improve lignocellulosic deconstruction and separation methods, including—

(i) developing feedstock-agnostic deconstruction processes capable of efficiently fractionating biomass into targeted output streams;

(ii) gaining a detailed understanding of plant cell wall biosynthesis, composition, structure, and properties during deconstruction; and

(iii) improving enzymes and approaches for biomass breakdown and cellulose, hemicellulose, and lignin processing.

(D) Research activities to improve the feedstock conversion process for advanced biofuels and bioproducts, including—

(i) developing high-throughput methods to screen or select high-performance microbial strains and communities to improve product formation rates, yields, and selectivity;

(ii) establishing a broad set of platform microorganisms and microbial communities suitable for metabolic engineering to produce advanced biofuels and bioproducts and high-throughput methods for experimental validation of gene function;

(iii) developing techniques to enhance microbial robustness for tolerating toxins to improve advanced biofuel and bioproduct yields and to gain a better understanding of the cellular and molecular bases of tolerance for major chemical classes of inhibitors found in these processes;

(iv) advancing technologies for the use of batch, continuous, and consolidated bioprocessing;

(v) identifying, creating, and optimizing microbial and chemical pathways to produce promising, atom-economical intermediates and final bioproducts from

biomass with considerations given to environmentally benign processes;

(vi) developing high-throughput, real-time, in situ analytical techniques to understand and characterize the pre- and post-bioproduct separation streams in detail;

(vii) creating methodologies for efficiently identifying viable target molecules, identifying high-value bioproducts in existing biomass streams, and utilizing current byproduct streams;

(viii) identifying and improving plant feedstocks with enhanced extractable levels of desired bioproducts or bioproduct precursors, including lignin streams; and

(ix) developing integrated biological and chemical catalytic approaches to valorize and produce a diverse portfolio of advanced biofuels and bioproducts.

(5) Industry partnerships

Centers shall establish industry partnerships to translate research results to commercial applications.

(6) Coordination

In coordination with the Bioenergy Technologies Office of the Department, the Secretary shall support interdisciplinary research activities to improve the capacity, efficiency, resilience, security, reliability, and affordability, of the production and use of advanced biofuels and bioproducts, as well as activities to enable positive impacts and avoid the potential negative impacts that the production and use of advanced biofuels and bioproducts may have on ecosystems, people, and historically marginalized communities.

(7) Funding

Of the funds authorized to be appropriated under subsection (k) of section 18644 of this title for a fiscal year, there is authorized to be appropriated to the Secretary to carry out this subsection \$30,000,000 per center established under paragraph (1) for each of fiscal years 2023 through 2027.

(8) Definitions

In this subsection:

(A) Advanced biofuel

The term “advanced biofuel” has the meaning given the term in section 8101 of title 7.

(B) Bioenergy

The term “bioenergy” means energy derived from biofuels.

(C) Biomass

The term “biomass” has the meaning given the term in section 15852(b) of this title.

(D) Bioproduct

The term “bioproduct” has the meaning given the term “biobased product” in section 8101 of title 7.

(Pub. L. 109-58, title IX, §977, Aug. 8, 2005, 119 Stat. 903; Pub. L. 110-140, title II, §§232(a), 233, Dec. 19, 2007, 121 Stat. 1537; Pub. L. 117-167, div. B, title I, §10103(e), Aug. 9, 2022, 136 Stat. 1430.)

Editorial Notes

REFERENCES IN TEXT

This part, referred to in subsec. (d), was in the original “this subtitle”, meaning subtitle G (§§971-984A) of title IX of Pub. L. 109-58, Aug. 8, 2005, 119 Stat. 898, which enacted this part and amended section 5523 of Title 15, Commerce and Trade. For complete classification of subtitle G to the Code, see Tables.

AMENDMENTS

2022—Subsec. (f). Pub. L. 117-167 added subsec. (f) and struck out former subsec. (f) which related to establishment of at least 7 bioenergy research centers to carry out the program under subsec. (a) of this section.

2007—Subsec. (a)(1). Pub. L. 110-140, §232(a)(1), substituted “computational biology, and environmental science” for “and computational biology”.

Subsec. (b)(1). Pub. L. 110-140, §232(a)(2)(A), inserted “in sustainable production systems that reduce greenhouse gas emissions” after “hydrogen”.

Subsec. (b)(4), (5). Pub. L. 110-140, §232(a)(2)(B)-(D), added par. (4) and redesignated former par. (4) as (5).

Subsec. (f). Pub. L. 110-140, §233, added subsec. (f).

Statutory Notes and Related Subsidiaries

EFFECTIVE DATE OF 2007 AMENDMENT

Amendment by Pub. L. 110-140 effective on the date that is 1 day after Dec. 19, 2007, see section 1601 of Pub. L. 110-140, set out as an Effective Date note under section 1824 of Title 2, The Congress.

§ 16318. Fission and fusion energy materials research program**(a) In general**

Along with the budget request of the President submitted to Congress for fiscal year 2007, the Secretary shall establish a research and development program on material science issues presented by advanced fission reactors and the fusion energy program of the Department.

(b) Administration

In carrying out the program, the Secretary shall develop—

- (1) a catalog of material properties required for applications described in subsection (a);
- (2) theoretical models for materials possessing the required properties;
- (3) benchmark models against existing data; and
- (4) a roadmap to guide further research and development in the area covered by the program.

(Pub. L. 109-58, title IX, §978, Aug. 8, 2005, 119 Stat. 904.)

§ 16319. Energy and water supplies**(a) In general**

The Secretary shall carry out a program of research, development, demonstration, and commercial application to—

- (1) address energy-related issues associated with provision of adequate water supplies, optimal management, and efficient use of water;
- (2) address water-related issues associated with the provision of adequate supplies, optimal management, and efficient use of energy; and
- (3) assess the effectiveness of existing programs within the Department and other Fed-

eral agencies to address these energy and water related issues.

(b) Program elements

The program under this section shall include—

- (1) arsenic treatment;
- (2) desalination; and
- (3) planning, analysis, and modeling of energy and water supply and demand.

(c) Collaboration

In carrying out this section, the Secretary shall consult with the Administrator of the Environmental Protection Agency, the Secretary of the Interior, the Chief Engineer of the Army Corps of Engineers, the Secretary of Commerce, the Secretary of Defense, and other Federal agencies as appropriate.

(d) Facilities

The Secretary may utilize all existing facilities within the Department and may design and construct additional facilities as needed to carry out the purposes of this program.

(e) Advisory committee

The Secretary shall establish or utilize an advisory committee to provide independent advice and review of the program.

(f) Reports

Not later than 2 years after August 8, 2005, the Secretary shall submit to Congress a report on the assessment described in subsection (b) and recommendations for future actions.

(Pub. L. 109-58, title IX, §979, Aug. 8, 2005, 119 Stat. 905.)

§ 16320. Spallation Neutron Source**(a) Definitions**

In this section:

(1) SING

The term “SING” means the Spallation Neutron Source Instruments Next Generation major item of equipment.

(2) SNS power upgrade

The term “SNS power upgrade” means the Spallation Neutron Source power upgrade described in the 20-year facilities plan of the Office of Science of the Department.

(3) SNS second target station

The term “SNS second target station” means the Spallation Neutron Source second target station described in the 20-year facilities plan of the Office of Science of the Department.

(4) Spallation Neutron Source Facility

The terms “Spallation Neutron Source Facility” and “Facility” mean the completed Spallation Neutron Source scientific user facility located at Oak Ridge National Laboratory, Oak Ridge, Tennessee.

(5) Spallation Neutron Source Project

The terms “Spallation Neutron Source Project” and “Project” means Department Project 99-E-334, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

(b) Spallation Neutron Source Project**(1) In general**

The Secretary shall submit to Congress, as part of the annual budget request of the Presi-