AMENDMENT TO RULES COMMITTEE PRINT 116–63

OFFERED BY M__. _____

Page 4, after the item relating to section 2562, insert the following:

At the end of subtitle E of title II, add the following:

PART 5—BIOENERGY RESEARCH AND DEVELOPMENT

SEC. 2571. DEFINITIONS.

For purposes of this part:

(1) BIOENERGY.—The term ''bioenergy'' means energy derived from biomass or waste streams.

(2) BIOFUELS.—The term ''biofuels'' means liquid or gaseous fuels derived from biomass or waste streams.

(3) BIOINTERMEDIATE.—The term ''biointermediate'' means an intermediate product that is derived from biomass or waste streams.

(4) BIOMASS.—The term ''biomass'' has the meaning given the term in section 932 of the Energy Policy Act (42 U.S.C. 16232) and shall include organic and inorganic feedstocks and also include diverse waste streams.

(5) BIOPOWER.—The term ''biopower'' means the generation of electricity or process steam or both through the combustion of biomass or waste streams.

(6) BIOPRODUCTS.—The term ''bioproducts'' means materials and chemicals derived from biomass or waste streams.

(7) BIOREFINERY.—The term ''biorefinery'' means a facility that integrates conversion processes and equipment to produce fuels or other byproduct streams such as power, chemicals, and byproducts from biomass or waste streams.

(8) BIOTECHNOLOGY.—The term ''biotechnology'' means any technology for the production of biofuels, bioenergy, or bioproducts.

(9) PHYTOBIOME.—The term ''phytobiome'' means a network of interactions of plants, their associated communities of organisms, and their environmental context.

(10) PROGRAM.—The term ''program'' means the program conducted under section 2573.

(11) SECRETARY.—Unless otherwise specified, the term ''Secretary'' means the Secretary of Energy.

(12) WASTE STREAMS.—The term ''waste streams'' includes, but is not limited to, municipal solid waste, farm waste, forest waste, food processing and fermentation waste, sewage, and waste gases that are effluents or byproduct streams from various societal pursuits that are targeted toward disposal, discharge, or burning.

SEC. 2572. BIOENERGY RESEARCH, DEVELOPMENT, DEMONSTRATION, AND COMMERCIAL APPLICATION.

The Secretary, in consultation with the Secretary of Agriculture, shall conduct a program of research, development, demonstration, and commercial application for bio-

energy, including biopower energy systems, biofuels, bioproducts, and biorefineries, including activities to—

(1) assist technology development at a variety of scales, including commercial scale demonstrations, to provide cost reduction and perform improvements throughout the bioenergy value chain;

(2) integrate green chemistry, circular economy, and engineering principles such as designing for energy efficiency, minimizing material use, and minimizing with the objective to eliminate waste and releases, or to create closed-loop systems;

(3) link biophysical, weather, engineering, transportation, environmental, biogeochemistry, lifecycle analysis, and economic models to better understand options and impacts of supply chain decisions for integrated environmental sustainability;

(4) provide comprehensive data for the inventory, analyses, and access of biomass and waste streams;

(5) establish methods to densify feedstocks to minimize their cost and variability and maximize their yield and accessibility;

(6) improve reliable feedstock separation and processes to enable conversion to competitive products;

(7) develop methods for the production of fuels and high value products directly in the plant body;

(8) refine methods for measuring and verifying feedstock sustainability, including—

(A) improving sensors;

(B) gathering a deeper understanding of the soil organic carbon in the land; and

(C) gather deeper scientific insights into the impacts over a wider geographical and temporal range;

(9) research the potential for advanced energy crop material, together with best land management practices, and utilization to sequester carbon;

(10) identify, breed, and engineer resilient crops that are highly productive in marginal environments;

(11) develop feedstock crop plants with improved yields and quality, less recalcitrance to deconstruction, and more tolerant of variable weather conditions such as drought using tools from genetics and genomics;

(12) improve knowledge and tools to identify and develop approaches to expand the oil production and productivity of bio-produced microbial lipids from renewable resources such as seeds, nuts, macro- and micro-algae, and other viable lipids;

(13) support the development of flexible biomass-to-biofuels conversion pathways that can be modified to produce fuels and or products based on market conditions;

(14) analyze and understand biotic and physio-biochemical control factors and manipulate microbial, soil carbon, and nitrogen cycling to improve yield and manage site productivity, environmental sustainability, and resilience;

(15) research and develop strategies to increase the viability and cost-effectiveness of carbon utilization and management including use of industrial emissions and direct air capture;

(16) incorporate low-cost intermediate production pathways to more easily produce advanced bioproducts and biofuels; and

(17) develop feedback loops to coordinate research with downstream areas that most efficiently facilitate technology transfer.

SEC. 2573. BIOMASS CONVERSION RESEARCH AND DEVELOPMENT.

As part of the program, the Secretary, in coordination with relevant Federal agencies, shall support research, development, demonstration, and commercial application of technologies to convert biomass feedstocks into

transportation fuels, products, and chemicals. In carrying out this section, the Secretary shall support activities to—

(1) improve enzyme and catalyst effectiveness, efficiency, and regeneration through a combination of biology, chemistry, genetics, genomic, and engineering approaches;

(2) develop new products, coproducts, and processes via advanced chemistry, synthetic biology, biochemistry, biological, engineering plant metabolism, and thermochemistry and catalytic processes, and/or combinations thereof;

(3) utilize adaptive intelligence-based control systems, including artificial intelligence, for conversion processes, characterization, and validation, including for the design of new biological pathways, catalysts, and enzymes;

(4) develop smart reactors, devices, or systems, that are highly-instrumented, flexible, and automated;

(5) support research and development for continuous fermentation processes;

(6) support computational fluid dynamics and engineering for new reactor designs and efficient separations; and

(7) support research and development to improve the efficiency of energy and water use and minimize waste in the production of biofuels, bioproducts, and biointermediate.

SEC. 2574. WASTE STREAM CONVERSION RESEARCH AND DEVELOPMENT.

(a) IN GENERAL.—As part of the program, the Secretary, in coordination with relevant Federal agencies, shall support research, development, demonstration, and commercial application activities to transform waste streams into biofuels, bioproducts, and bioenergy.

(b) ACTIVITIES.—In carrying out this section, the Secretary shall support activities to—

(1) develop advanced tools and technologies to standardize safe and efficient methods for the separation and processing of waste materials;

(2) identify methods to transform waste materials into high value chemicals including those defined in section 2572(11) into multiengine transportation fuels, energy sources, high value chemicals, or other products;

(3) support research activities to identify pathways to convert waste carbon oxides and waste methane into intermediates for subsequent upgrading to fuels and bioproducts; amd

(4) support scientific research activities that develop tools, knowledge, and technologies to increase the efficiency of bio-based energy and bio-product supply chains through the utilization of waste streams as feedstocks.

SEC. 2575. AQUATIC BIOMASS RESEARCH AND DEVELOPMENT.

(a) IN GENERAL.—As part of the program, the Secretary, in coordination with relevant Federal agencies, shall support research, development, demonstration, and commercial application of aquatic biomass, aquatic plants, and organisms that grow in aquatic environments, such as micro- and macro-algae biofuel and bioproducts production, addressing technical challenges related to scale-up, biotechnology tools, strain development, harvesting, agronomy strategies, conversion, and sustainable resource use.

(b) ACTIVITIES.—In carrying out this section, the Secretary shall support activities to—

(1) advance research to improve the ability to grow and harvest highly productive aquatic plants and organisms with the potential to grow quickly and thrive in harsh conditions, such as intense heat, sunlight, and hyper-saline waters at large scale;

(2) improve the efficiency of the conversion of aquatic biomass into fuels and products;

(3) improve advanced separation technologies for aqueous and organic systems;

(4) evaluate the sustainability of aquatic biomass cultivation by developing analytical assessments on water and nutrient use and recycling; and

(5) improve the understanding of the resources needed for the distribution and utilization of a national aquatic biomass industry, including the development of methods to characterize aquatic biomass intermediates, biofuels, bioproducts, contaminants, ideal storage and transportation conditions, weather impacts, stability, and end-product variability.

SEC. 2576. FEEDSTOCK RESEARCH AND DEVELOPMENT.

As part of the program, the Secretary, in coordination with relevant Federal agencies, shall—

(1) develop productive, high-yielding, regionally adapted biomass and oil producing crops by—

(A) identifying key traits of genes and gene networks, such as stress resistance, drought tolerance, and yield, and translate information to crops in the field using traditional breeding or genetic engineering approaches;

(B) investigating the influence of the phytobiome on these traits, and how it can be

manipulated to maximize benefits and reduce negative environmental impacts;

(C) investigating the impacts of bioenergy feedstock production on biodiversity, soil health and water quality, nutrient utilization and potential run-off, resource use, greenhouse gas emissions, including carbon management and carbon footprint across diverse feedstocks; and

(D) integrating and validating biophysical and ecosystem-level crop models to predict how specific genotypes will perform in the field under fluctuating environmental conditions;

(2) coordinate with the Department of Agriculture to launch local or regional programs to conduct ongoing stakeholder engagement and to gather data on plant breeding and informatics;

(3) support research activities focused on increasing feedstock production and decreasing variability per unit of land area;

(4) conduct regional field trials and management of energy crops across varying climate and soils;

(5) support accessible nationwide data on feedstock characteristics and attributes with management applications; and

(6) conduct research and development activities to address barriers to biointermediate refining and upgrading.

SEC. 2577. TRANSPORTATION, DISTRIBUTION, AND END-USE RESEARCH AND DEVELOPMENT.

(a) IN GENERAL.—As a part of the program, the Secretary, in coordination with other relevant Federal agencies, shall conduct research, development, demonstration, and commercial application activities regarding the transportation, distribution, and use of biofuels and bioproducts.

(b) ACTIVITIES.—In carrying out this section, the Secretary shall support research and development of the following:

(1) TRANSPORTATION.—Efficient transportation methods for new biofuels and bioproducts by—

(A) increasing understanding of truck transport impacts on highway and rural roadway infrastructure; and

(B) fostering collaboration among relevant agencies to identify challenges related to the safe transport of feedstocks, biointermediates, biofuels, and bioproducts.

(2) DISTRIBUTION.—Efficient distribution methods for new biofuels, which shall include—

(A) identifying and addressing challenges and opportunities related to the storage, deliver, and receipt of feedstocks, biofuels, biointermediates, and bioproducts; and

(B) advancing approaches to tracking and blending advanced biofuels and biointermediates.

(3) OPTIMIZATION OF ENGINES.—Optimization of transportation engines and systems for alternative fuels, which shall include—

(A) advancing research and development of biofuels and additives for advanced engines, including improving molecular level understanding of fuels and the structure property relationship on enabling more energy efficient engines while reducing criteria pollutants;

(B) identifying and advancing technology options for optimal biofuel utilization for on-road vehicle fleet using computation chemistry and in-lab testing;

(C) identifying biofuel blends that have the potential to yield significant efficiency improve-

ments in an optimized engine-biofuel system, including catalysis and in-cylinder visualization;

(D) evaluating the effect of all potential biofuel components on engine, fuel, and aftertreatment system durability as well as their effect on engine efficiency and emissions; and

(E) collaboration with original equipment manufacturers, energy companies, biorefineries, and other relevant stakeholder to identify current technical issues with current products as well as future engine and aftertreatment products.

(4) EXPANSION OF COMMERCIAL APPLICATION.—The expansion of commercial application of novel biofuels for use in existing surface vehicles, vessels, and aircraft by—

(A) developing tests and predictive models that will enable qualification of fuels with lower-cost testing methods and lower volumes of new biofuels;

(B) supporting testing to ensure the compatibility of new equipment with new fuels and to generate technical information for standards adoption; and

(C) supporting continued development, refinement, and execution of a research and development roadmap for sustainable aviation fuels, including development of feedstock supply chains, and new and innovative production technologies.

(5) REQUEST FOR INFORMATION.—Not later than 6 months after the date of enactment of this section, the Secretary shall publish a request for information that shall be used by the Secretary to evaluate the optimal utilization of biofuels in the transportation sector.

SEC. 2578. PROCESS DEVELOPMENT FACILITIES.

(a) IN GENERAL.—Not later than 2 years after the date of the enactment of this Act, as a part of the program, the Secretary shall enter into agreements to establish at least 3 small-scale process development facilities to assist researchers, industry, and the farming community in de-risking bioenergy technologies and in producing small quantities of advanced biofuels and bioproducts for testing purposes. The Secretary shall ensure that these facilities are geographically diverse and complimentary to each other and any existing facilities.

(b) REQUEST FOR INFORMATION.—Not later than 90 days after the date of enactment of this section, the Sec-

retary shall publish a request for information that shall be used by the Secretary to evaluate—

(1) existing process development facilities in the United States;

(2) best practices for collaboration at these facilities; and

(3) how the data derived at the facilities translates to the next scale-up of bioenergy technologies and has the data enabled computational modeling.

(c) ACCESS.—The Secretary shall ensure that access to the facilities described in subsection (a) is provided to eligible notifies on a competitive, technical merit-reviewed basis to activities that demonstrate advanced bioenergy technologies with the potential to lower the cost and improve the environmental impact of advanced biofuels and products, including improving the release of data to broaden the dissemination of information.

SEC. 2579. BIOENERGY INCUBATOR FUNDING.

(a) IN GENERAL.—As a part of the program, the Secretary shall award grants and cooperative agreements on a competitive, technical merit-reviewed basis to eligible entities to support innovative technologies that are not represented in a significant way in—

(1) the portfolio of bioenergy research activities carried out by the Department of Energy as of the date of the enactment of this Act; or

(2) technology roadmaps used by the Department of Energy as of such date of enactment.

(b) ACCESS.—In carrying out this section, the Secretary shall coordinate across all relevant Department program offices, including the Office of Energy Efficiency and Renewable Energy, the Advanced Research Projects Agency–Energy, the Office of Science, and the Office of Fossil Energy.

SEC. 2580. SUSTAINABILITY RESEARCH AND DEVELOPMENT.

As part of the program, the Secretary, in coordination with other relevant Federal agencies, shall support research of the environmental, social and economic effects of growing and using large quantities of biomass, and identify strategies to integrate biomass and bioenergy production into existing agricultural and forestry systems. In carrying out this section, the Secretary shall—

(1) support research to assess the potential impacts of the bioenergy ecosystem at multiple scales, including impacts on—

(A) net greenhouse gas emissions, including—

(i) reduction of criteria pollutants; and

(ii) efficient use of resources;

(B) land-use changes; and

(C) the nexus of water, food, biodiversity, and energy resources;

(2) support decision-making at the agency, program, and stakeholder level that enables continuous progress towards sustainability;

(3) develop methodologies by which the value of environmental services from the bioenergy sector might be defined, valuated, and monetized in order to benefit the continued expansion of a bioeconomy framework; and

(4) identify scientific and technical issues associated with accounting for emissions of carbon dioxide from biogenic feedstocks used at and for stationary and mobile sources.

SEC. 2581. COORDINATION AND COLLABORATION.

In carrying out the program, the Secretary shall—

(1) coordinate cross-cutting research priorities with other relevant Federal agencies through the Biomass Research and Development Board established in section 305 of the Biomass Research and Development Act of 2000; and

(2) collaborate with industry, National Laboratories, institutions of higher education, including Historically Black Colleges and Universities and other minority-serving institutions, Tribes, rural communities, and international bodies with relevant scientific expertise.

SEC. 2582. STRATEGIC PLAN.

(a) IN GENERAL.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall create a plan to implement the program and update such plan on an annual basis.

(b) SCOPE.—The plan shall address near-term (up to 2 years), mid-term (up to 7 years), and long-term (up to 15 years) research challenges to the advancement of biofuels and bioproducts

(c) REPORT TO CONGRESS.—Not later than 1 year after the date of the enactment of this Act, and at least once every 2 years thereafter, the Secretary shall provide, and make available to the public and the relevant authorizing and appropriations committees of Congress, a report on the findings of research conducted and activities carried out pursuant to this Act, including the most current strategic plan under subsection (a) and the progress made in implementing such plan.

SEC. 2583. AUTHORIZATION.

There are authorized to be appropriated to the Secretary to carry out this part—

(1) $272,475,000 for fiscal year 2021;

(2) $286,091,000 for fiscal year 2022;

(3) $300,396,000 for fiscal year 2023;

(4) $315,416,000 for fiscal year 2024; and

(5) $331,187,000 for fiscal year 2025.

☒