AMENDMENT TO RULES COMMITTEE PRINT

116–63

OFFERED BY MR. LAMB OF PENNSYLVANIA

Page 432, after line 15, insert the following:

Subtitle C—FUSION ENERGY RESEARCH

SEC. 4301. FUSION ENERGY RESEARCH.

(a) PROGRAM.—Section 307 of the Department of Energy Research and Innovation Act (42 U.S.C. 18645) is amended—

(1) by redesignating subsections (a) through (g) as subsections (b) through (h), respectively;

(2) by inserting before subsection (b), as so redesignated, the following:

''(a) PROGRAM.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139) and section 972 of the Energy Policy Act of 2005 (42 U.S.C. 16312), the Director shall carry out a fusion energy sciences research and enabling technology development program to effectively address the scientific and engineering challenges to building a cost competitive fusion power plant and to establish a competitive fusion power industry in the United States. As part

of this program, the Director shall carry out research activities to expand the fundamental understandings of plasmas and matter at very high temperatures and densities for fusion applications and for other plasma science applications.'';

(3) by amending subsection (d) to read as follows:

''(d) INERTIAL FUSION RESEARCH AND DEVELOPMENT.—

''(1) IN GENERAL.—The Director shall carry out a program of research and technology development in inertial fusion for energy applications, including ion beam, laser, and pulsed power fusion systems.

''(2) ACTIVITIES.—As part of the program described in paragraph (1), the Director shall support activities at and partnerships with universities and the National Laboratories to—

''(A) develop novel target designs;

''(B) support modeling of various inertial fusion energy concepts and systems;

''(C) develop diagnostic tools; and

''(D) improve inertial fusion energy driver technologies.

''(3) AUTHORIZATION OF APPROPRIATIONS.—Out of funds authorized to be appropriated under subsection (o), there are authorized to be appropriated to the Secretary to carry out the activities described in subsection (d)—

''(A) $25,000,000 for fiscal year 2021;

''(B) $26,250,000 for fiscal year 2022;

''(C) $27,563,000 for fiscal year 2023;

''(D) $28,941,000 for fiscal year 2024; and

''(E) $30,377,000 for fiscal year 2025.'';

(4) by amending subsection (e) to read as follows:

''(e) ALTERNATIVE AND ENABLING CONCEPTS.—

''(1) IN GENERAL.—The Director shall support research and development activities and facility operations at institutions of higher education, National Laboratories, and private facilities in the United States for a portfolio of alternative and enabling fusion energy concepts that may provide solutions to significant challenges to the establishment of a commercial magnetic fusion power plant, prioritized based on the ability of the United States to play a leadership role in the international fusion research community.

''(2) ACTIVITIES.—Fusion energy concepts and activities explored under paragraph (1) may include—

''(A) alternative fusion energy concepts, including—

''(i) advanced stellarator concepts;

''(ii) non-tokamak confinement configurations operating at low magnetic fields;

''(iii) magnetized target fusion energy concepts; or

''(iv) other promising fusion energy concepts identified by the Director;

''(B) enabling fusion technology development activities, including—

''(i) high magnetic field approaches facilitated by high temperature superconductors;

''(ii) liquid metals to address issues associated with fusion plasma interactions with the inner wall of the encasing device; and

''(iii) advanced blankets for heat management and fuel breeding; and

"(C) advanced scientific computing activities.

"(3) INNOVATION NETWORK FOR FUSION ENERGY.—

"(A) IN GENERAL.—The Secretary, acting through the Office of Science, shall support a program to provide fusion energy researchers with access to scientific and technical resources and expertise at facilities supported by the Department, including such facilities at National Laboratories and universities, to advance innovative fusion energy technologies toward commercial application.

"(B) AWARDS.—Financial assistance under the program established in subsection (a) may be in the form of grants, vouchers, equipment loans, or contracts to private entities.

"(3) AUTHORIZATION OF APPROPRIATIONS.—Out of funds authorized to be appropriated under subsection (o), there are authorized to be appropriated to the Secretary to carry out the activities described in subsection (e)—

"(A) $100,000,000 for fiscal year 2021;

"(B) $105,000,000 for fiscal year 2022;

"(C) $110,250,000 for fiscal year 2023;

''(D) $115,763,000 for fiscal year 2024; and

''(E) $121,551,000 for fiscal year 2025.''; and

(5) by adding at the end the following:

''(i) MILESTONE-BASED DEVELOPMENT PROGRAM.—

''(1) IN GENERAL.—Using the authority of the Secretary under section 646(g) of the Department of Energy Organization Act (42 U.S.C. 7256(g)), notwithstanding paragraph (10) of such section, the Secretary shall establish, within 3 months of enactment of this Act, a milestone-based fusion energy development program that requires projects to meet particular technical milestones before a participant is awarded funds by the Department.

''(2) PURPOSE.—The purpose of the program established by paragraph (1) shall be to support the development of a U.S.-based fusion power industry through the research and development of technologies that will enable the construction of new full-scale fusion systems capable of demonstrating significant improvements in the performance of such systems, as defined by the Secretary, within 10 years of the enactment of this Act.

''(3) ELIGIBILITY.—Any entity is eligible to participate in the program provided that the Under Secretary has deemed it as having the necessary resources and expertise.

''(4) REQUIREMENTS.—In carrying out the milestone-based program under paragraph (1), the Secretary shall, for each relevant project—

''(A) request proposals from eligible entities, as determined by the Secretary, that include proposed technical milestones, including estimated project timelines and total costs;

''(B) set milestones based on a rigorous technical review process;

''(C) award funding of a predetermined amount to projects that successfully meet proposed milestones under paragraph (1), or for expenses deemed reimbursable by the Secretary, in accordance with terms negotiated for an individual award; and

''(D) communicate regularly with selected eligible entities and, if the Secretary deems appropriate, exercise small amounts of flexibility for technical milestones as projects mature.

''(5) AWARDS.—For the program established under paragraph (1)—

''(A) an award recipient shall be responsible for all costs until milestones are achieved, or reimbursable expenses are reviewed and verified by the Department; and

''(B) should an awardee not meet the milestones described in paragraph (4), the Secretary may end the partnership with an award recipient and use the remaining funds in the ended agreement for new or existing projects carried out under this section.

''(6) APPLICATIONS.—Any project proposal submitted to the program under paragraph (1) shall be evaluated based upon its scientific, technical, and business merits through a peer-review process, which shall include reviewers with appropriate expertise from the private sector, the investment community, and experts in the science and engineering of fusion and plasma physics.

''(7) PROJECT MANAGEMENT.—In carrying out projects under this program and assessing the completion of their milestones in accordance with paragraph (4), the Secretary shall consult with experts that represent diverse perspectives and professional experiences, including those from the private sector, to ensure a complete and thorough review.

''(8) PROGRAMMATIC REVIEW.—Not later than 4 years after the Secretary has established 3 milestones under this program, the Secretary shall enter into a contractual arrangement with the National Academy of Sciences to review and provide a report describing the findings of this review to the House Committee on Science, Space, and Technology and the Senate Committee on Energy and Natural Resources on the program established under this paragraph (1) that assesses—

''(A) the benefits and drawbacks of a milestone-based fusion program as compared to traditional program structure funding models at the Department;

''(B) lessons-learned from program operations; and

''(C) any other matters the Secretary determines regarding the program.

''(9) ANNUAL REPORT.—As part of the annual budget request submitted for each fiscal year, the Secretary shall provide the House Committee on Science, Space, and Technology and the Senate Committee on Energy and Natural Resources a report describing partnerships supported by the pro-

gram established under paragraph (1) during the previous fiscal year.

''(10) AUTHORIZATIONS FOR APPROPRIATIONS.—Out of funds authorized to be appropriated under subsection (o), there are authorized to be appropriated to the Secretary to carry out the activities described in subsection (i), to remain available until expended—

''(A) $45,000,000 for fiscal year 2021;

''(B) $110,000,000 for fiscal year 2022;

''(C) $140,000,000 for fiscal year 2023;

''(D) $110,000,000 for fiscal year 2024; and

''(E) $45,000,000 for fiscal year 2025.

''(j) FUSION REACTOR SYSTEM DESIGN.—The Director shall support research and development activities to design future fusion reactor systems and examine and address the technical drivers for the cost of these systems.

''(k) GENERAL PLASMA SCIENCE AND APPLICATIONS.—The Director shall support research in general plasma science and high energy density physics that advance the understanding of the scientific community of fundamental properties and complex behavior of matter to control and manipulate plasmas for a broad range of ap-

plications, including support for research relevant to advancements in chip manufacturing and microelectronics.

''(l) SENSE OF CONGRESS.—It is the sense of Congress that the United States should support a robust, diverse program in addition to providing sufficient support to, at a minimum, meet its commitments to ITER and maintain the schedule of the project as determined by the Secretary in coordination with the ITER Organization at the time of the enactment of this Act. It is further the sense of Congress that developing the scientific basis for fusion, providing research results key to the success of ITER, and training the next generation of fusion scientists are of critical importance to the United States and should in no way be diminished by participation of the United States in the ITER project.

''(m) INTERNATIONAL COLLABORATION.—The Director shall—

''(1) as practicable and in coordination with other appropriate Federal agencies as necessary, ensure the access of United States researchers to the most advanced fusion research facilities and research capabilities in the world, including ITER;

''(2) to the maximum extent practicable, continue to leverage United States participation ITER, and prioritize expanding international partnerships

and investments in current and future fusion research facilities within the United States; and

''(3) to the maximum extent practicable, prioritize engagement in collaborative efforts in support of future international facilities that would provide access to the most advanced fusion research facilities in the world to United States researchers.

''(n) FISSION AND FUSION RESEARCH COORDINATION REPORT.—

''(1) IN GENERAL.—Not later than 6 months after the date of enactment of this Act, the Secretary shall transmit to Congress a report addressing opportunities for coordinating fusion energy research and development activities between the Office of Nuclear Energy and the Office of Science.

''(2) COMPONENTS.—The report shall assess opportunities for collaboration on research and development of—

''(A) liquid metals to address issues associated with fusion plasma interactions with the inner wall of the encasing device and other components within the reactor;

''(B) immersion blankets for heat management and fuel breeding;

''(C) technologies and methods for instrumentation and control;

''(D) computational methods and codes for system operation and maintenance;

''(E) codes and standard development;

''(F) radioactive waste handling;

''(G) radiological safety;

''(H) potential for non-electricity generation applications; and

''(I) any other overlapping priority as identified by the Director of the Office of Science or the Assistant Secretary of Energy for Nuclear Energy.

''(3) IMPLEMENTATION.—The Secretary shall implement the recommendations made by the report directed in this section upon transmission of the report to Congress.

''(o) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

''(1) $976,000,000 for fiscal year 2021;

''(2) $1,033,000,000 for fiscal year 2022;

''(3) $1,104,000,000 for fiscal year 2023;

''(4) $1,181,000,000 for fiscal year 2024; and

''(5) $1,264,000,000 for fiscal year 2025.''.

(b) ITER.—Section 972(c) of the Energy Policy Act of 2005 (42 U.S.C. 16312) is amended to read as follows:

''(c) UNITED STATES PARTICIPATION IN ITER.—

''(1) IN GENERAL.—There is authorized United States participation in the construction and operations of the ITER project, as agreed to under the April 25, 2007 'Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project'. The Director shall coordinate and carry out the responsibilities of the United States with respect to this Agreement.

''(2) REPORT.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to Congress a report providing an assessment of the most recent schedule for ITER that has been approved by the ITER Council.

''(3) AUTHORIZATION OF APPROPRIATIONS.—Out of funds authorized to be appropriated under section 307(o) of the Department of Energy Research and Innovation Act (42 U.S.C. 18645), there shall be made available to the Secretary to carry out the construction of ITER—

''(A) $374,000,000 for fiscal year 2021; and

"(B) $300,000,000 for each of fiscal years 2022 through 2025.".

Page 5, in the table of contents, after the matter related to subtitle B of title IV, insert the following: