S 2503

Department of Energy Research and Innovation Act

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Sponsor

Name: Sen. Murkowski, Lisa [R-AK]
Party: Republican • **State:** AK • **Chamber:** Senate

Cosponsors (1 total)

Cosponsor	Party / State	Role	Date Joined
Sen. Cantwell, Maria [D-WA]	D · WA		Mar 6, 2018

Committee Activity

Committee	Chamber	Activity	Date
Energy and Natural Resources Committee	Senate	Reported By	May 9, 2018

Subjects & Policy Tags

Policy Area:

Energy

Related Bills

Bill	Relationship	Last Action
115 HR 589	Related bill	**Sep 28, 2018:** Became Public Law No: 115-246.
115 HR 5905	Related bill	**Jun 28, 2018:** Received in the Senate. Read twice. Placed on Senate Legislative Calendar under General Orders. Calendar No. 496.

Summary (as of Jul 23, 2018)

Department of Energy Research and Innovation Act

TITLE I--LABORATORY MODERNIZATION AND TECHNOLOGY TRANSFER

Laboratory Modernization and Technology Transfer Act

(Sec. 102) This bill instructs the Department of Energy (DOE) to permit specified National Laboratories owned by DOE to use funds authorized to support technology transfer within DOE to: (1) carry out early stage and precommercial technology demonstration activities to remove technology barriers limiting private sector interest, and (2) demonstrate potential commercial applications of any research and technologies arising from activities of the national laboratories.

(Sec. 103) The bill expresses the sense of Congress that Congress, DOE, and energy industry participants should advance efforts to promote international, domestic, and regional cooperation on the research and development of energy innovations that:

- provide clean, affordable, and reliable energy;
- promote economic growth;
- are critical for energy security; and
- are sustainable without government support.

(Sec. 104) DOE shall ensure that laboratory operating contractors do not allocate costs of general and administrative overhead to laboratory-directed research and development. This prohibition does not apply to certain national security laboratories.

(Sec. 105) DOE shall establish and maintain a public database, accessible on its website, containing a searchable listing of each unclassified research and development project contract, grant, cooperative agreement, task order for a federally funded research and development center, or other DOE-administered transaction.

DOE shall provide information through such database on relevant literature and patents that are associated with each such project contract, grant, or cooperative agreement, or other transaction, of DOE.

(Sec. 106) Within one year of enactment of this bill and as often as determined to be necessary thereafter, DOE shall report on its ability to successfully transfer new energy technologies to the private sector.

(Sec. 107) DOE shall carry out the Agreements for Commercializing Technology pilot program in accordance with this bill, including by giving the contractors of the national laboratories increased authority to negotiate contract terms and making every such facility eligible for the program. The pilot program is extended through FY2019.

DOE shall permit the directors of the national laboratories to execute agreements with non-federal entities.

The bill: (1) subjects funding agreements to the requirements of the Bayh-Dole Act (concerning patent rights to inventions arising from federally-supported research and development), and (2) imposes contractor certification requirements for the avoidance of direct competition with the private sector and conflicts of interest.

(Sec. 108) The bill amends the Energy Policy Act of 2005 to exempt institutions of higher education and nonprofit institutions from the cost-sharing requirements for research and development for two years.

During such period, DOE shall submit an initial report, then subsequent annual reports, that describe the use of cost-sharing waivers by DOE with regard to carrying out research, development, demonstration, and commercial application programs and activities that have been initiated since August 9, 2005.

TITLE II--DEPARTMENT OF ENERGY RESEARCH COORDINATION

Department of Energy Research Coordination Act

(Sec. 202) The bill amends the America Competes Act to require the following types of information collected by the Advanced Research Projects Agency-Energy (ARPA-E) from recipients of financial assistance awards to be considered commercial and financial information obtained from a person and privileged or confidential and therefore not subject to disclosure under the Freedom of Information Act:

- plans for commercialization of technologies developed under the award,
- investments provided to an awardee from third parties,
- additional financial support that the awardee plans to or has invested into the technology developed under the award or is seeking from third parties, and
- revenue from the licensing or sale of new products or services that result from the research conducted under the award.

(Sec. 203) DOE shall use its capabilities to identify strategic opportunities for collaborative research, development, demonstration, and commercial application of innovative science and technologies.

DOE shall seek to leverage existing DOE programs and consolidate and coordinate activities throughout DOE to promote collaboration and crosscutting approaches within its programs.

Also, DOE shall:

- prioritize activities that use all affordable domestic resources;
- develop a planning, evaluation, and technical assessment framework for setting long-term objective strategic goals and evaluating progress that ensures integrity and independence and provides the flexibility to adapt to market dynamics;
- ensure that activities do not duplicate other activities within DOE or other federal government activities; and
- identify programs that may be more effectively left to the states, industry, nongovernmental organizations, institutions of higher education, or other stakeholders.

(Sec. 204) The bill amends the Energy Policy Act of 2005 to require DOE, when periodically reviewing all of its science and technology activities in a strategic framework, to also take global energy dynamics into account under such a review.

Plans developed by DOE to improve coordination and collaboration in research, development, demonstration, and commercial application activities across DOE's organizational boundaries shall also include:

- critical assessments of any ongoing programs that have experienced subpar performance or cost overruns of 10% or more over 1 or more years;
- any activities that may be more effectively left to the states, industry, nongovernmental organizations, institutions of higher education, or other stakeholders; and
- evaluations and proposals for innovation hubs, institutes, and research centers of DOE, including an affirmation that they will advance DOE's mission, prioritize research, development, and demonstration, and that those that are

established or renewed within the Office of Science are consistent with its mission.

(Sec. 205) The bill amends the Energy Policy Act of 2005 to require DOE to submit a report for FY2018 concerning the development and implementation of a strategy for facilities and infrastructure supported at certain DOE offices, the national laboratories, and single-purpose research facilities.

(Sec. 206) DOE shall carry out a program to enhance economic, environmental, and energy security by making awards to consortia for the establishment and operation of Energy Innovation Hubs to conduct and support at one centralized location, multidisciplinary, collaborative research, development, demonstration, and commercial application of advanced energy technologies.

DOE shall: (1) designate a unique advanced energy technology basic research focus for each hub, and (2) ensure coordination and avoid unnecessary duplication of each hub's activities with those of other DOE research entities.

To become eligible to receive an award to establish and operate a hub, a consortium must:

- be composed of at least two qualifying entities;
- operate subject to a binding agreement, entered into by each consortium member, which documents the proposed partnership agreement, including the governance and management structure of the hub; and
- operate as a nonprofit organization.

Each hub shall conduct or provide for multidisciplinary, collaborative research, development, demonstration, and commercial application of advanced energy technologies.

In addition, each hub shall:

- encourage collaboration and communication among the members of the qualifying entities of the consortium and awardees;
- develop and publish proposed plans and programs on a publicly accessible website;
- submit annual reports to DOE summarizing its activities;
- monitor project implementation and coordination; and
- maintain conflict of interest procedures, consistent with those of DOE.

TITLE III--DEPARTMENT OF ENERGY OFFICE OF SCIENCE POLICY

Department of Energy Office of Science Policy Act

(Sec. 302) The bill states that the mission of the Office of Science shall be the delivery of scientific discoveries, capabilities, and major scientific tools to transform the understanding of nature and to advance U.S. energy, economic, and national security.

(Sec. 303) The Office of Science shall carry out an awards program to conduct fundamental and use-inspired energy research to accelerate scientific breakthroughs.

The office shall carry out a program for the development, construction, operation, and maintenance of national user facilities. Such facilities shall serve the needs of DOE, industry, the academic community, and other relevant entities in creating and examining materials and chemical processes for the purpose of improving U.S. competitiveness.

Those facilities shall include x-ray light sources, neutron sources, nanoscale science research centers, and other

appropriate facilities, consistent with the duties and responsibilities of the office under the Department of Energy Reorganization Act.

The office shall carry out research and development on advanced accelerator and storage ring technologies that are relevant to the development of basic energy sciences user facilities.

The bill repeals provisions for the catalysis research program and instead directs DOE to carry out a Solar Fuels Research Initiative to expand theoretical and fundamental knowledge of photochemistry, electrochemistry, biochemistry, and materials science that is useful for the practical development of experimental systems for the conversion of solar energy into chemical energy.

In carrying out programs and activities under the Initiative, DOE shall leverage expertise and resources from: (1) the Basic Energy Sciences Program and the Biological and Environmental Research Program of the office, and (2) the Office of Energy Efficiency and Renewable Energy.

Under the Initiative, DOE shall organize activities among multidisciplinary teams to leverage expertise from the national laboratories, institutions of higher education, and the private sector. Such teams shall pursue aggressive, milestone-driven, basic research goals.

DOE shall carry out under the Initiative a program to support research needed to bridge scientific barriers to, and discover knowledge relevant to, artificial photosynthetic systems.

As part of such program, the Office of Basic Energy Sciences shall support basic research to pursue distinct lines of scientific inquiry, including:

- photoinduced production of hydrogen and oxygen from water; and
- the sustainable photoinduced reduction of carbon dioxide to fuel products which include hydrocarbons, alcohols, carbon monoxide, and natural gas.

DOE shall carry out under the Initiative a program to support research needed to replicate natural photosynthetic processes by the use of artificial photosynthetic components and materials.

Under such program, the Office of Basic Energy Sciences shall support basic research to expand fundamental knowledge to replicate natural synthesis processes, including:

- the photoinduced reduction of dinitrogen to ammonia,
- the absorption of carbon dioxide from ambient air,
- molecular-based charge separation and storage,
- photoinitiated electron transfer, and
- catalysis in biological or biomimetic systems.

Also under such program:

- the Office of Biological and Environmental Research shall support systems biology and genomics approaches in understanding genetic and physiological pathways connected to photosynthetic mechanisms; and
- the Office for Energy Efficiency and Renewable Energy shall support translational research, development, and validation of physical concepts developed under the program.

The bill repeals the program of fundamental research on solid state lighting in support of the Next Generation Lighting Initiative and instead directs DOE to carry out an Electricity Storage Research Initiative to:

- expand theoretical and fundamental knowledge to control, store, and convert electrical energy into chemical energy and chemical energy into electrical energy; and
- support scientific inquiry into the practical understanding of the chemical and physical processes occurring within systems that involve crystalline and amorphous solids, polymers, and organic and aqueous liquids.

In carrying out programs and activities under the Initiative, DOE shall leverage expertise and resources from: (1) the Basic Energy Sciences Program, the Advanced Scientific Computing Research Program, and the Biological and Environmental Research Program of the office; and (2) the Office of Energy Efficiency and Renewable Energy.

Under the Initiative, DOE shall organize activities among multidisciplinary teams to leverage expertise from the national laboratories, institutions of higher education, and the private sector.

Also, DOE may organize additional activities under the Initiative through Energy Frontier Research Centers, Energy Innovation Hubs, or other organizational structures.

Under the Initiative, DOE shall carry out a program to support research needed to bridge scientific barriers to, and discover knowledge relevant to, multivalent ion materials in electric energy storage systems.

As part of such program:

- the Office of Basic Energy Sciences shall investigate electrochemical properties and the dynamics of materials, including charge transfer phenomena and mass transport in materials; and
- the Office for Energy Efficiency and Renewable Energy shall support translational research, development, and validation of physical concepts developed under the program.

DOE shall carry out a program under the Initiative to: (1) support research to model and simulate organic electrolytes, and (2) support research needed to reveal electrochemistry in confined mesoscale spaces.

As part of such program, the Office of Basic Energy Science and the Office of Biological and Environmental Research shall investigate phenomena of mesoscale electrochemical confinement for replicating and controlling new electrochemical behavior, and the Office for Energy Efficiency and Renewable Energy shall support translational research and validation of physical concepts developed under the program.

(Sec. 304) The Department of Energy High-End Computing Revitalization Act of 2004 is renamed as the American Super Computing Leadership Act of 2017.

The bill repeals requirements under such renamed Act for high-end software development centers and instead directs DOE to conduct a research program for exascale computing, including the development of two or more exascale computing machine architectures, to promote DOE missions.

The bill defines "exascale computing" as computing through the use of a computing machine that performs near or above 10 to the 18th power operations per second.

In carrying out the research program, DOE shall:

- establish two or more national laboratory partnerships with industry partners and institutions of higher education for

the research and development of two or more exascale computing architectures across all applicable DOE organizations;
- conduct mission-related codesign activities in developing such architectures;
- develop advancements in hardware and software technology required to fully realize the potential of an exascale production system in addressing DOE target applications and solving scientific problems that involve predictive modeling and simulation and large scale data analytics and management;
- explore the use of exascale computing technologies to advance a broad range of science and engineering; and
- provide on a competitive, merit-reviewed basis, access for researchers in U.S. industries, institutions of higher education, national laboratories, and other federal agencies to the exascale computing systems developed pursuant to these partnerships.

DOE shall: (1) carry out the program through an integration of applications, computer science, applied mathematics, and computer hardware architecture using the partnerships to ensure that two or more exascale computing machine architectures are capable of solving DOE target applications and broader scientific problems; and (2) conduct outreach programs to increase the readiness for the use of such platforms by domestic industries, including manufacturers.

DOE shall report to Congress on: (1) how such integration is furthering application science data and computational workloads across application interests, including national security, cybersecurity, the Materials Genome and BRAIN initiatives, advanced manufacturing, and the national electric grid; and (2) the roles and responsibilities of the national laboratories and industry to ensure an integrated program across DOE.

Exascale architectures developed by these partnerships shall be reviewed through a project review process. DOE shall report to Congress on: (1) the results of such reviews, and (2) the coordination and management of the program, ensuring that there is an integrated research program across DOE.

DOE shall submit annual reports to Congress describing funding for the program.

The Office of Science shall support research in high-performance computing and networking relevant to energy applications, including modeling, simulation, and advanced data analytics for basic and applied energy research programs carried out by DOE.

The Office of Science shall carry out activities to develop, test, and support: (1) mathematics, models, and algorithms for complex systems and programming environments; and (2) tools, languages, and operating systems for high-end computing systems.

(Sec. 305) The Office of Science shall ensure the access of U.S. researchers to the most advanced accelerator facilities and research capabilities in the world, including the Large Hadron Collider.

The Office of Science shall carry out research on: (1) rare decay processes and the nature of the neutrino, and (2) the nature of dark energy and dark matter.

(Sec. 306) The Office of Science shall carry out research and development activities in fundamental, structural, computational, and systems biology to increase systems-level understanding of complex biological systems, which may include activities to:

- accelerate breakthroughs and new knowledge to enable the cost-effective, sustainable production of biomass-based liquid transportation fuels, bioenergy, and biobased materials;

improve understanding of the global carbon cycle, including processes for removing carbon dioxide from the atmosphere, through photosynthesis and other biological processes, for sequestration and storage; and
- understand the biological mechanisms used to transform, immobilize, or remove contaminants from subsurface environments.

The office shall not approve any new climate science-related initiatives without first determining that such work will be well-coordinated with any relevant work being carried out by other federal agencies.

The office shall carry out a low-dose radiation research program to enhance the scientific knowledge of, and reduce uncertainties associated with, the effects of exposure to low-dose radiation to inform improved risk-management methods.

(Sec. 307) As part of the activities authorized under the fission and fusion energy materials research program, the Office of Science shall carry out research and development activities to identify, characterize, and demonstrate materials that can endure the neutron, plasma, and heat fluxes which are expected in a fusion power system.

The office shall also provide an assessment of:

- the need for one or more facilities that can examine and test potential fusion and next generation fission materials and other enabling technologies that are relevant to the development of fusion power; and
- whether a single new facility that substantially addresses magnetic fusion and next generation fission materials research needs is feasible, in conjunction with the expected capabilities of facilities that are operational as of this bill's enactment.

The office shall support: (1) research and development activities and facility operations to optimize the tokamak approach to fusion energy, and (2) research and development activities for inertial fusion for energy applications.

The office shall support research and development activities and facility operations at institutions of higher education, national laboratories, and private facilities 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, to be prioritized based on the ability of the United States to play a leadership role in the international fusion research community.

The office shall coordinate with ARPA-E to: (1) assess the potential for any ARPA-E-supported fusion energy project as representing an approach to a viable fusion power plant that is commercially viable, (2) determine whether the results of any such project merit the support of follow-on research activities carried out by the office, and (3) avoid unintentional duplication of activities.

DOE shall submit to Congress a report on the fusion energy research and development activities that the DOE proposes to carry out over a period of 10 years under at least 3 budget scenarios, including one based on 3% annual growth in the non-ITER portion of the budget for those activities.

Such report shall:

- identify specific areas of fusion energy research and enabling technology development in which the United States can and should establish or solidify a lead in global fusion energy development;
- identify priorities for the initiation of facility construction and facility decommissioning under each of the three budget scenarios; and

assess the ability of the U.S. fusion workforce to carry out these activities, including the adequacy of programs at institutions of higher education in the United States in training the leaders and workers of the next generation of fusion energy researchers.

To develop such report, DOE shall leverage best practices and lessons learned from the process used to develop the most recent report of the Particle Physics Project Prioritization Panel of the High Energy Physics Advisory Panel.

(Sec. 308) The Office of Science: (1) may carry out a program for the production of isotopes; and (2) shall ensure that isotope production activities do not compete with private industry, unless critical national interests require the involvement of the federal government.

The Rare Isotope Accelerator is renamed as the "Facility for Rare Isotope Beams."

(Sec. 309) The Office of Science shall carry out a program for improving the safety, efficiency, and mission readiness of infrastructure at its laboratories.

Such program shall include projects to:

- renovate or replace space that does not meet research needs,
- replace facilities that are no longer cost-effective to renovate or operate,
- modernize utility systems to prevent failures and ensure efficiency,
- remove excess facilities to allow safe and efficient operations, and
- construct modern facilities to conduct advanced research in controlled environmental conditions.

Actions Timeline

- **Jul 24, 2018:** Received in the House.
- **Jul 24, 2018:** Message on Senate action sent to the House.
- **Jul 24, 2018:** Held at the desk.
- **Jul 23, 2018:** Measure laid before Senate by unanimous consent. (consideration: CR S5219-5225; text: CR S5219-2525)
- **Jul 23, 2018:** Passed/agreed to in Senate: Passed Senate with an amendment by Voice Vote.
- **Jul 23, 2018:** Passed Senate with an amendment by Voice Vote.
- **May 9, 2018:** Committee on Energy and Natural Resources. Reported by Senator Murkowski without amendment. With written report No. 115-241.
- **May 9, 2018:** Placed on Senate Legislative Calendar under General Orders. Calendar No. 404.
- **Mar 8, 2018:** Committee on Energy and Natural Resources. Ordered to be reported without amendment favorably.
- **Mar 6, 2018:** Introduced in Senate
- **Mar 6, 2018:** Read twice and referred to the Committee on Energy and Natural Resources.