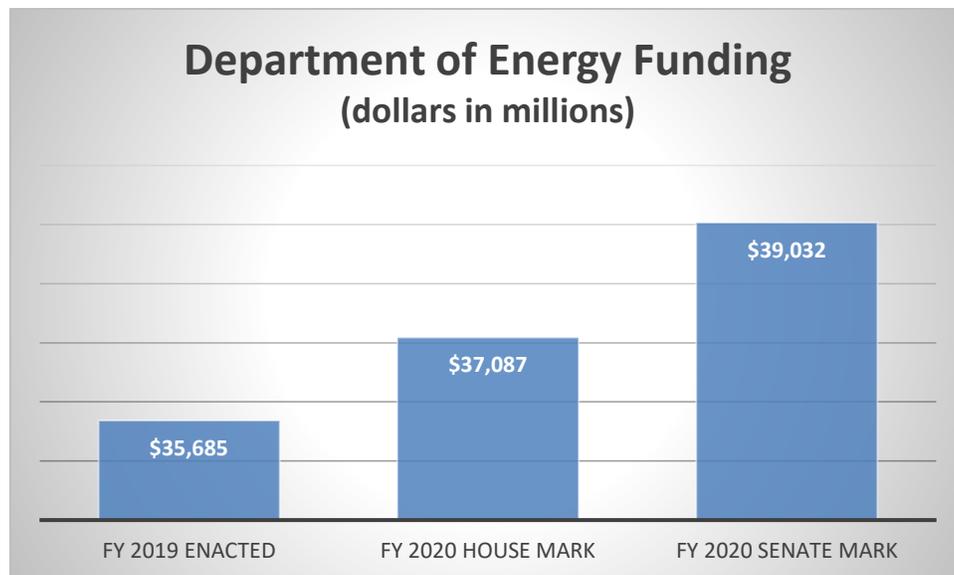


Appropriations Update: Senate Appropriations Committee Favorably Reports FY 2020 Energy and Water Development Appropriations Bill

Lewis-Burke Associates LLC – September 18, 2019

The Senate Appropriations Committee approved the fiscal year (FY) 2020 Energy and Water Development appropriations bill with a bipartisan vote of 31-0 on September 12. The bill's jurisdiction includes civilian and defense-related programs of the Department of Energy (DOE), civil works projects of the Army Corps of Engineers, the Department of the Interior's Bureau of Reclamation, and related independent agencies. The House passed its FY 2020 Energy and appropriations bill on May 21 on a party line vote of 31-21.

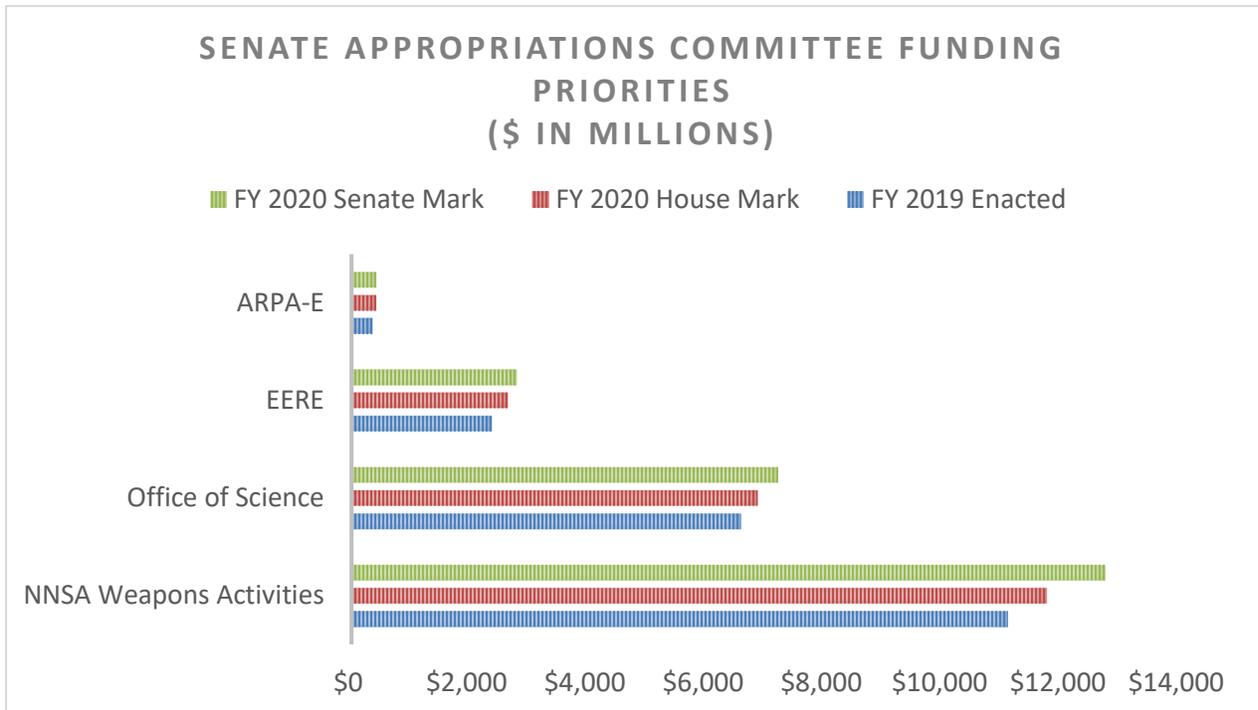
The Senate Energy and Water appropriations bill would provide \$39 billion for DOE. This is \$3.35 billion, or nine percent, above the FY 2019 enacted level, \$1.95 billion above the House mark, and \$7.53 billion above the President's budget request.



Similar to the House, the Committee's top four funding priorities are:

- Fundamental research in the physical sciences supported by the Office of Science, with a proposed increase of \$630 million, or 9.6 percent, above the FY 2019 enacted level;
- Renewable energy and energy efficiency programs to address climate change and accelerate deployment of energy technologies to maintain U.S. competitiveness, with a proposed increase of \$421 million, or 18 percent, above the FY 2019 enacted level;
- Advanced Research Projects Agency-Energy's (ARPA-E) energy technology research and development portfolio, with a proposed increase of \$62 million, or 17 percent, above the FY 2019 enacted level; and

- The National Nuclear Security Administration’s (NNSA) science-based stockpile stewardship and nuclear weapons modernization activities, with a proposed increase of \$1.64 billion, or 15 percent, above the FY 2019 enacted level.



Similar to the House, the Senate Appropriations Committee rejected all the steep cuts proposed in the Trump Administration’s budget request for DOE research and development programs. Instead, all DOE programs would see increased funding compared to FY 2019 levels. The Senate bill advances all research programs of interest to universities, National Laboratories, and the broader research community.

In addition, the Senate Appropriations Committee once again rejected the Trump Administration’s focus on supporting only early-stage research and instead directs DOE to “maintain a balanced portfolio of early-, mid-, and late-stage research, development, and market transformation activities that will deliver innovative energy technologies.” Later-stage research and development should include “filed evaluation of early-stage technology to provide testing and data collection in a real-world setting” and “attract private sector cost share that will advance technology to market.” The Committee also emphasized that DOE should “fully execute the funds appropriated in a timely manner” and avoid delays in releasing funding solicitations and funding projects, especially for applied energy programs.

Below is a summary of funding levels for relevant programs proposed in the bill, followed by a more detailed description of each program area:

- **The Office of Science** would receive a 9.6 percent increase above the FY 2019 enacted level, with a priority on construction and maximizing operations of new science facilities as well as new quantum and machine learning initiatives.
- Within the Office of Science, the bill would provide \$195 million for the **quantum information science initiative**, which includes \$120 million across the six Office of Science program to fund

fundamental research awards for single principal investigators and small groups and \$75 million to fund up to five **National Quantum Information Science Research Centers**.

- Within the Office of Science, the bill would also provide \$71 million to support **artificial intelligence and scientific machine learning** research efforts and \$2.5 million to support the coordination and execution functions of the new **Office for Artificial Intelligence and Technology** at DOE.
- The bill would provide \$819 million for the **Exascale Computing Initiative**, an increase of \$183 million or 29 percent above the FY 2019 enacted level. The Office of Science would receive \$510 million and NNSA would receive \$309 million.
- The bill would provide \$130 million for **Energy Frontier Research Centers** (EFRCs), which is \$10 million more than the House level. This level of funding would support the 31 existing centers and \$40 million for a competition to award new centers in quantum information science, microelectronics and environmental management.
- Like the House, the four **Bioenergy Research Centers** would be fully funded at \$100 million.
- Like the House, four **Energy Innovation Hubs** would be fully funded and would focus on energy storage, solar fuels, critical materials, and desalination. These hubs are currently being competed.
- **ARPA-E** would not be terminated as proposed again in the FY 2020 President's budget request and instead would see a \$62 million, or 17 percent, increase compared to FY 2019.
- The bill provides increases for all **applied energy programs**, including renewable energy, energy efficiency, fossil energy, nuclear energy, grid modernization, and cybersecurity programs.
- The highest priority cross-cutting issues include the Grid Modernization Initiative, a new Advanced Energy Storage Initiative, cybersecurity of energy assets, small modular energy solutions for fossil, renewable energy, and nuclear applications, and direct air capture research and development.
- Like the House, the bill would provide \$28 million to fully fund two **Clean Energy Manufacturing Innovation Institutes**, including an existing one on industrial-scale materials production and processing and a new one currently being competed focused on cybersecurity for manufacturing. Two other institutes would expire at the end of their current five-year awards.
- The bill directs the National Academies of Public Administration to evaluate the benefits of creating a **DOE foundation** to leverage private sector funding to advance DOE-funded energy technologies.
- NNSA's **Research, Development, Test, and Evaluation** program would see an increase of \$428 million, or 21 percent, above the FY 2019 enacted level, with increased funding for all programs.
- The bill would increase funding for the **academic alliance and partnership program** by \$17 million, or 32 percent, above the FY 2019 enacted level, to fully fund the academic centers of excellence and expand the Minority Serving Institution Partnership program.
- The bill would also fully fund the three **University Consortia for Nuclear Nonproliferation Research Centers**.

The Office of Science and ARPA-E

The Senate would provide the **Office of Science** with \$7.215 billion in FY 2020, an increase of \$630 million above the FY 2019 enacted level and \$1.669 billion or 30.1 percent above the Administration's request. The Senate mark is also \$345 million or five percent higher than that which is proposed in the House version. The additional funding relative to FY 2019 would not be distributed evenly, with changes ranging between 10 percent growth for Advanced Scientific Computing Research (ASCR) and a 1.2 percent increase for Fusion Energy Sciences (FES).

The report accompanying the bill would include support for several SC-wide initiatives. In keeping with FY 2019, the Senate mark would prioritize funding for Office of Science-wide initiatives including:

- **Quantum information science (QIS).** A total of \$195 million would be provided to carry out activities authorized under the *National Quantum Initiative Act* (P.L. 115-368), including \$75 million to establish up to five National Quantum Information Science Research Centers. The remaining \$120 million would be dedicated to a basic research program—also authorized under P.L. 115-368—aimed at developing a broader QIS research community and consistent with Office of Science funding awards over the last two years across all programs.
- **Artificial intelligence/machine learning (AI/ML).** The Senate would provide the Administration’s request of \$71 million to support AI/ML research activities across all Office of Science program offices with the exception of Nuclear Physics (NP). ASCR would be tasked with leading all AI/ML activities across the Department.
- **Exascale computing.** The bill would provide \$509.7 million for activities associated with the Exascale Computing Initiative (ECI), \$5 million above the Administration’s FY 2020 request.

Regarding Office of Science program office priorities, the bill would provide **ASCR** with \$1.029 billion, an increase of \$93.5 million or 10 percent over the FY 2019 level, and \$108.1 million or 11.7 percent above the request. Like the House bill, the Senate mark would provide the Administration’s proposed level of \$188.7 million for the Exascale Computing Project (ECP), a decrease of 19 percent from the FY 2019 level. This reduction signals the ramp-down of development activities in preparation for the planned deployment of exascale computing systems starting in 2021. In preparation for the next-generation of high-performance computing systems, the bill would provide \$160 million—an increase of 22.5 percent—for **mathematical, computational, and computer science research**. Part of this funding will support foundational research in AI/ML with applications for DOE’s user facilities and large experiments. Funding for the **Computational Science Graduate Fellowship program** would receive an additional \$2 million for a total of \$12 million in FY 2020, the first increase to the program in several years.

Basic Energy Sciences (BES) would receive \$2.325 billion, an increase of \$159 million or 7.3 percent over the FY 2019 enacted level. This is a contrast to the House bill, which would cut funding to BES by 1.1 percent relative to current levels. Within this amount, \$130 million would be provided for **Energy Frontier Research Centers (EFRCs)**, matching the Administration’s request and exceeding both the House mark and the FY 2019 enacted level by \$10 million and \$20 million, respectively. The level proposed by the Senate would allow for between seven and 15 new EFRCs in emerging areas like QIS and microelectronics while also ensuring the continuation of the four centers currently focused on environmental management. The bill would maintain funding for the **Batteries and Energy Storage Innovation Hub** at \$24.1 million and provide an additional \$5 million for the **Fuels from Sunlight Hub** for a total of \$20 million.

The Senate would provide \$770 million for **Biological and Environmental Research (BER)**, an increase of \$65 million or 9.2 percent over the FY 2019 enacted level. Like the House, the Senate would fully fund the **Bioenergy Research Centers** at \$100 million and provide \$10 million for microbiome research activities, including continued support for a microbiome database. In a reflection of DOE’s growing interest in AI/ML, the report includes language encouraging DOE “to enhance investments in machine learning to advance the use of diverse and increasingly autonomous datasets to understand environmental and climate dynamics; rapidly incorporate datasets into predictive watershed, ecosystem and climate models; and project the onset of and track extreme events, such as atmospheric rivers and hurricanes.” The report also expresses support for BER’s funding of university-led Earth systems and

climate modeling efforts and would provide \$15 million for BER's activities associated with ECI—\$5 million above the request. Additional allocations would include: \$20 million for modeling and observation of land-water interfaces that leverages the capabilities and expertise of the National Laboratories and local universities; and \$15 million for “cloud-aerosol research, technology innovation and computing.”

High Energy Physics (HEP) would receive \$1.065 billion, an increase of \$20 million over the House bill and \$85 million, or 9 percent, over the FY 2019 level. These funds would support construction of the **Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE)** and the **Proton Improvement Plan (PIP-II)** accelerator upgrade at \$175 million and \$65 million, respectively. In addition, the Senate would provide \$35 million for the **Sanford Underground Research Facility** and \$100 million for the **High Luminosity Large Hadron Collider (HL-LHC) upgrade** at CERN, both increases over the House levels. Unlike the House report, the Senate does not call out its allocations to accelerator research and development or provide recommendations to the agency on the balance of its research portfolio.

The bill would provide \$736 million for **Nuclear Physics (NP)**, an increase of \$46 million or 6.6 percent over FY 2019. This would include \$45.3 million to complete construction of the Facility for Rare Isotope Beams (FRIB) at Michigan State University, \$28.5 million for early operations at FRIB, and \$11 million for design and early-stage research and development in support of the Electron Ion Collider (EIC), NP's future flagship experiment. The bill would also provide full funding to operate NP's four major facilities.

FES would be funded at \$570 million, an increase of \$6 million or 1.2 percent above FY 2019. The House provided \$118 million more than the Senate. Like prior years, this program faces the sharpest disagreement between the House and Senate. While investments in FES are the House's top priority, it is the lowest priority for the Senate. The first point of contention is over funding for **ITER**, the international nuclear fusion science experiment, in which the US is a major contributor. The Senate would provide \$180 million while the House would provide \$230 million. Even sharper contrast is in funding for the domestic fusion program. The Senate would provide \$376 million, a cut of \$56 million compared to FY 2019, while the House would provide \$438 million, an increase of \$6 million above FY 2019. Despite these differences, the Senate would invest in new science efforts. For example, the Senate would provide \$16 million for the construction of the **Matter in Extreme Conditions petawatt laser** at SLAC and \$20 million for the **LaserNetUS consortium**. The Senate would also provide \$20 million for a new **Fusion Public-Private Partnership Cost Share Program** that would leverage private sector investments in fusion energy. The funding would be used to support “up to three private fusion energy companies pursuing diverse technological approaches to commercial fusion energy to support large-scale integrated performance prototype demonstrations within the next five years.”

ARPA-E would not be terminated, as proposed in all three of the Trump Administration's budget requests, and instead would receive an increase of \$62 million over the FY 2019 enacted level. This increased funding would allow ARPA-E to create two additional focused programs. ARPA-E plans to support research on flexible carbon capture, electric motors for aviation, low-cost fusion energy devices and technologies, and carbon-optimized bioconversion. Like the House, the Senate Appropriations Committee also included report language preventing DOE from using any appropriated funds to plan or execute the termination of the agency. In addition, the Senate directed DOE to “disburse funds appropriated for ARPA-E on eligible projects within a reasonable time period, consistent with past practices.”

Applied Energy Programs

Like the House, the Senate bill would reject the budget request proposal to make steep cuts to all applied energy programs. Instead, the Senate bill increases funding for all applied energy programs with the largest overall funding increase (\$421 million) for renewable energy and energy efficiency programs. The Senate bill highlights several cross-cutting research initiatives:

- **Grid modernization:** The bill supports the research goals of the Grid Modernization Initiative, the Grid Modernization Lab Consortium, and continuing collaborations between national laboratories, industry and research universities. The bill directs DOE to invest in specific research areas including national energy systems resilience modeling, grid cyber resilience, energy storage, and advanced sensors and controls.
- **Energy storage:** The bill supports DOE's effort to launch an Advanced Energy Storage Initiative which would consider energy storage more holistically including controllable loads, hybrid systems, and new approaches to energy storage. This would coordinate efforts across the Office of Science, ARPA-E, the Office of Electricity, and renewable energy and energy efficiency programs. The bill is supportive of DOE's cost and performance targets for specific battery storage technologies but further directs DOE to establish cost and performance targets for long duration and seasonal grid scale energy storage to guide future investments. The largest funding sources would be \$135 million for vehicle battery technologies under the Office of Energy Efficiency and Renewable Energy and \$51 million for grid-scale storage under the Office of Electricity.
- **Small modular energy solutions:** The bill directs DOE to establish a cross-cutting program to explore small modular designs across all generation technologies in concert with microgrid concepts.
- **Decarbonization Roadmaps:** The bill directs DOE to develop "industry-specific decarbonization roadmaps to guide research development activities across the Department to phase out net greenhouse gas emissions by 2050, considering technologies such as energy efficiency, process electrification, and carbon capture." Consultation with external stakeholders is required and present an opportunity for research universities to offer ideas.

The **Office of Energy Efficiency and Renewable Energy (EERE)** would receive \$2.8 billion in the Senate bill, which is 18 percent above the enacted FY 2019 level, six percent above the House level, and \$2.5 billion or 716 percent above the budget request. The bill would provide increases above the enacted level to all EERE programs. The Committee proposed a \$55 million increase to the Water Power Technologies Office, which would be the highest percentage increase over enacted levels, at 52 percent. The bill would provide geothermal, building technologies, and hydrogen and fuel cell technologies with increases of roughly 30 percent above enacted funding. Solar, bioenergy, and wind would see single digit percentage increases and slightly lower funding than proposed by the House. The Senate would prioritize funding for water power, geothermal, and building technologies significantly more than the House.

One of the highest priorities remains battery research for vehicles. The bill proposes \$135 million to continue efforts to "lower the cost of batteries across light-, medium-, and heavy-duty vehicles through battery processing science, advanced battery chemistries, materials research, and modeling and simulation of battery performance." Additional priorities include marine and hydrokinetic technologies, direct air carbon capture, photovoltaics, and plastics recycling.

The bill would provide \$28 million to support the two **Clean Energy Manufacturing Institutes** that address reducing emissions and cybersecurity for energy. This year, the bill would again provide \$25 million for the **Critical Materials Institute** (Energy Innovation Hub). In addition, the bill would provide \$25 million to continue Energy-Water Desalination Hub efforts. Combined with prior year funding, the Desalination Hub would have \$85 million available to carry out its research and development goals when the award is announced in Fall 2019. The bill also emphasizes the need to maintain a skilled workforce to advance renewable energy and energy efficiency technologies and directs EERE to allocate more funding to training and workforce development programs. The Committee further pushes DOE to work with “2-year, public community, and technical colleges for job training programs that lead to an industry-recognized credential in the energy workforce.”

Fossil Energy research and development would receive a \$60 million or eight percent increase compared to the FY 2019 enacted level and the House mark. Like the House, the Senate’s proposal emphasizes research, development, and deployment of **carbon capture, utilization, and storage (CCUS) technologies**. Reflecting the growing awareness of and recommendations within the 2019 National Academies’ *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda*, the Senate would provide \$20 million for **direct air capture research** and direct FE to increase coordination with EERE and the Office of Science. The House provided similar guidance but allocated only \$10 million toward the effort. Consistent with ongoing Senate priorities, the bill also includes funding for research, development, and pilot-scale CCUS activities in many broad areas, including improved gasification systems; energy conversion systems; higher efficiency turbines; fuel cells; and coal and methane conversion to liquid fuels. The bill would provide \$20 million to expand the infrastructure development for carbon storage and transportation systems of **Regional Carbon Sequestration Partnerships** and \$30 million to continue the **CarbonSAFE initiative** and have DOE select projects to “support site characterization, permitting, and construction of the regional storage complexes.” Lastly, the bill would maintain and, in several cases increase, support for FE’s oil and natural gas technology programs.

The **Office of Nuclear Energy (NE)** would see an increase of \$192 million or 14.5 percent compared to FY 2019. The bill maintains strong support for the Nuclear Energy University Program (NEUP), requires DOE to set aside 10 percent of funding from each research and development account for the program, and warns DOE not to divert funding from NEUP for other purposes. The bill would also restore \$5 million for the integrated university program which supports nuclear science and engineering.

The bill would advance the top DOE and congressional research and development priorities for nuclear energy, including:

- \$100 million to continue the development and support deployment of the first small modular reactor;
- \$200 million to support the construction of two advanced reactors and, as a first step, requires the Secretary of Energy to establish an evaluation board to review advanced reactor proposals from private industry and make a recommendation on the two designs that best meet technical feasibility, licensing, affordability, and 50/50 cost share criteria;
- \$40 million for the joint modeling and simulation program;
- \$50 million for high-assay low enriched uranium (HALEU) fuel recovery and production, even though the Committee remains concerned that DOE lacks an overall strategy for HALEU and directs DOE to establish a team of experts to evaluate the anticipated demand for HALEU and options for meeting that demand;
- \$115 million for accident tolerant fuels;
- \$40 million to evaluate design options for a Versatile Advanced Reactor at Idaho National Laboratory; and

- \$30 million for the Transformational Challenge Reactor which involves 3-D printing a reactor.

Similar to the House, the Senate bill would not provide funding for the Yucca Mountain spent fuel repository and instead would allocate \$22.5 million to move forward with interim storage. Funding could be used to consolidate spent nuclear fuel from over 60 reactor sites to one or more private or government interim central storage facilities and priority should be given to shutdown reactors.

The bill would provide a significant funding boost to grid modernization and cybersecurity programs. The **Office of Electricity (OE)** would be increased by \$65 million or 42 percent compared to FY 2019 enacted levels. The bill highlights continued research and development in “advanced grid modeling algorithms and tool development to ensure resilient grid controls and protection systems” and further development of the North American Energy Resilience Model. The bill also increases funding for energy storage and specifically non-battery advanced storage components, including compressed air energy storage development, and novel materials and systems components for electrochemical energy storage systems based on earth abundant advanced chemistries.

The Senate bill would also grow the **Office of Cybersecurity, Energy Security, and Emergency Response (CESER)** by 49 percent for a total of \$179 million. Of this amount, \$96 million, an increase of \$6.5 million or seven percent above FY 2019 enacted levels, would support research and development activities under the cybersecurity for energy delivery systems program. The bill calls out specifically research in addressing “power system vulnerabilities in supply chain and life cycle management for critical power system components and advanced adaptive defense methods for grid control systems.”

National Nuclear Security Administration (NNSA)

The Senate bill would fund **NNSA** at \$16.9 billion, \$1.7 billion above the FY 2019 enacted level and \$425 million above the President’s budget request. This funding level is in sharp contrast with the House mark of \$15.9 billion, which is \$1 billion below the Senate recommendation. The biggest disagreement between the House and the Senate over the Energy and Water bill will fall over nuclear weapons policy. The House bill, for example, would provide no funding to complete a new low-yield submarine launched missile and would significantly reduce funding for a new nuclear intercontinental ballistic missile warhead until NNSA completes an assessment of alternatives and provides independent cost estimates. Considering these reductions and restrictions, the House bill provides \$5 billion for **Directed Stockpile Work** which funds refurbishment of nuclear weapons and strategic materials. Instead, the Senate would advance all requested nuclear weapons programs under the Nuclear Posture Review and provide funding above the President’s budget request for uranium and plutonium operations. The Senate would fund Directed Stockpile Work at \$5.5 billion, \$500 million more than the House.

Similar to the House, funding for **research, development, testing, and evaluation** activities, which support applied research and engineering programs for the stockpile stewardship program, would be funded at \$2.4 billion, an increase of \$428 million, or 21 percent, above the FY 2019 enacted level. The bill would fund the **academic alliance and partnership program** at \$70 million, a boost of \$17 million or 32 percent above the FY 2019 enacted level. This would fully fund existing and new university-led Centers of Excellence and the bill recognizes the importance of this program in “supporting fundamental science and technology research at universities that support stockpile stewardship, the development of the next generation of highly-trained workforce, and the maintenance of strong network of independent technical peers.” The bill would also increase funding for the **inertial confinement fusion program** by \$25 million for a total of \$570 million to fully support the operations of the three major science facilities, target production, and academic user programs. The bill also calls for an independent JASON advisory

committee review of the program to assess the value and effectiveness of the program and recommend future research priorities. Further, the bill would provide the full \$309 million request to support NNSA’s exascale research and infrastructure improvement efforts.

The Senate bill would also provide \$2.1 billion for **nonproliferation**, \$155 million above FY 2019. The bill includes \$15 million to fully fund the three **University Consortia for Nuclear Nonproliferation Research**. The bill would also provide \$22.5 million to establish a new **Nonproliferation Stewardship Program** to identify gaps in capabilities, expertise, and technology in detecting future proliferation threats and setting up new testbeds to test new technologies and capabilities.

Department of Energy

(In thousands of \$)

| | FY 2019 Enacted | FY 2020 House | FY 2020 Senate | Senate vs. FY 2019 Enacted | Senate vs. House |
|--|--------------------|-------------------|-------------------|----------------------------------|-----------------------------|
| DOE, total | 35,685,317 | 37,087,431 | 39,031,910 | 3,346,593 (9.4%) | 1,944,479 (5.2%) |
| Science | 6,585,000 | 6,870,000 | 7,215,000 | 630,000 (9.6%) | 345,000 (5.0%) |
| Advanced Scientific Computing Research | 702,794 | 767,805 | 840,265 | 137,471 (19.6%) | 72,460 (9.4%) |
| Basic Energy Sciences | 2,166,000 | 2,143,000 | 2,325,000 | 159,000 (7.3%) | 182,000 (8.5%) |
| Biological and Environmental Research | 705,000 | 730,000 | 770,000 | 65,000 (9.2%) | 40,000 (5.5%) |
| Fusion Energy Sciences | 564,000 | 688,000 | 570,000 | 6,000 (1.1%) | -118,000 (17.2%) |
| High Energy Physics | 980,000 | 1,045,000 | 1,065,000 | 85,000 (8.7%) | 20,000 (1.9%) |
| Nuclear Physics | 690,000 | 735,000 | 736,000 | 46,000 (6.7%) | 1,000 (0.1%) |
| Workforce Development for Teachers and Scientists | 22,500 | 25,000 | 25,000 | 2,500 (11.1%) | -- (N/A) |
| Science Laboratories Infrastructure | 232,890 | 250,830 | 394,000 | 161,110 (69.2%) | 143,170 (57.1%) |
| ARPA-E | 366,000 | 425,000 | 428,000 | 62,000 (16.9%) | 3,000 (0.7%) |
| EERE | 2,379,000 | 2,651,713 | 2,800,000 | 421,000 (17.7%) | 148,287 (5.6%) |
| Hydrogen and Fuel Cell Technologies | 120,000 | 144,000 | 160,000 | 40,000 (33.3%) | 16,000 (11.1%) |
| Bioenergy Technologies | 226,000 | 256,000 | 245,000 | 19,000 (8.4%) | -11,000 (4.3%) |
| Solar Energy Technologies | 246,500 | 270,000 | 260,000 | 13,500 (5.5%) | -10,000 (3.7%) |
| Wind Energy Technologies | 92,000 | 103,692 | 100,000 | 8,000 (8.7%) | -3,692 (3.6%) |
| Geothermal Technologies | 84,000 | 90,000 | 115,000 | 31,000 (36.9%) | 25,000 (27.8%) |
| Water Power Technologies | 105,000 | 125,000 | 160,000 | 55,000 (52.4%) | 35,000 (28.0%) |

| | | | | | |
|--|-------------------|-------------------|-------------------|------------------------------|-----------------------------|
| Vehicle Technologies | 344,000 | 370,000 | 410,000 | 66,000 (19.2%) | 40,000 (10.8%) |
| Building Technologies | 226,000 | 248,000 | 300,000 | 74,000 (32.7%) | 52,000 (21.0%) |
| Advanced Manufacturing Technologies | 320,000 | 360,000 | 380,000 | 60,000 (18.8%) | 20,000 (5.6%) |
| Nuclear Energy | 1,326,090 | 1,317,808 | 1,517,808 | 191,718 (14.5%) | 200,000 (15.2%) |
| Fossil Energy R&D | 740,000 | 740,000 | 800,000 | 60,000 (8.1%) | 60,000 (8.1%) |
| Cybersecurity, Energy, Security, and Emergency Response | 120,000 | 150,000 | 179,000 | 59,000 (49.2%) | 29,000 (19.3%) |
| Electricity | 156,000 | 200,000 | 221,000 | 65,000 (41.7%) | 21,000 (10.5%) |
| National Nuclear Security Administration | 15,228,618 | 15,894,281 | 16,910,095 | 1,681,477 (11.0%) | 1,015,814 (6.4%) |
| Weapons Activities | 11,100,000 | 11,760,800 | 12,742,000 | 1,642,000 (14.8%) | 981,200 (8.3%) |
| Defense Nuclear Non-proliferation | 1,930,000 | 2,074,930 | 2,085,000 | 155,000 (8.0%) | 10,070 (0.5%) |

Source:

- The Energy and Water Development Appropriations Bill, 2020 Committee Report is available at <https://www.appropriations.senate.gov/imo/media/doc/FY2020%20Energy%20and%20Water%20Development%20Appropriations%20Act,%20Report%20116-1021.pdf>.