

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

*Lewis-Burke Associates LLC – May 22, 2019*

The House Appropriations Committee approved the fiscal year (FY) 2020 Energy and Water Development appropriations bill with a vote of 31-21 on May 21. 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 Senate has not yet started consideration of FY 2020 appropriations bills.

The House Energy and Water bill would provide \$37.1 billion for DOE, which is \$1.4 billion, or 3.9 percent, above the FY 2019 enacted level, and \$5.6 billion above the President's budget request. The Committee's top three funding priorities are:

- 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 \$273 million, or 11.5 percent, above the FY 2019 enacted level;
- Maintenance and expansion of the Advanced Research Projects Agency-Energy's (ARPA-E) research and development portfolio, with a proposed increase of \$59 million, or 16.1 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 \$661 million, or 6 percent, above the FY 2019 enacted level.

The House Appropriations Committee rejected all the steep cuts proposed by the Trump Administration for DOE research and development programs. Instead, all DOE programs would see increased funding except for fossil energy and nuclear energy research and development, which would be maintained at FY 2019 levels. Overall, the House bill advances all research programs of interest to universities, National Laboratories, and the broader research community.

The House Appropriations Committee once again rejected the Trump Administration's focus on supporting only early-stage research because it would "forego the nation's scientific capabilities in medium- and later-stage research and development and will not fully realize the technological advancements that can and should happen as a result of the Department's applied energy activities." The committee instead funded a more balanced, comprehensive research portfolio that includes "medium and later-stage research, development, deployment, and demonstration activities." The committee further directed DOE to "expend funding in an expeditions manner, to include the timely issuance of funding opportunity announcements and awards of funds." The committee would also direct DOE to expand opportunities for universities and develop solicitations in applied energy programs that "capitalize on the research infrastructure and expertise at universities across the country."

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

- **ARPA-E** would not be terminated as proposed again in the FY 2020 President's budget request and instead would see a \$59 million or 16.1 percent increase compared to FY 2019.

- Four **Energy Innovation Hubs** would be fully funded and would focus on energy storage, solar fuels, critical materials, and desalination, which is a new topic.
- The bill would provide funding for two **Clean Energy Manufacturing Innovation Institutes**: an existing one and a new one focused on cybersecurity for manufacturing. Two other institutes would expire at the end of their current five-year awards.
- The bill would provide \$809 million for the **Exascale Computing Initiative**, an increase of \$173 million or 27 percent compared to the FY 2019 enacted level. The Office of Science (SC) would receive \$500 million and NNSA would receive \$309 million.
- **SC** would receive a 4 percent increase above the FY 2019 enacted level, with a priority on construction and maximizing operations of new science facilities and exascale computers, as well as new quantum and machine learning initiatives.
- Within SC, the highest priority is the **Fusion Energy Sciences (FES)** program, with a significant increase in funding for the construction of the International Thermonuclear Experimental Reactor (ITER) fusion energy project.
- The bill would provide \$120 million for **Energy Frontier Research Centers (EFRCs)**, enabling continued support for 31 existing centers and a \$30 million competition for new centers.
- The four **Bioenergy Research Centers** would be fully funded at \$100 million.
- The bill would support at least \$168 million, consistent with the budget request, to maintain a core research program primarily for single Principal Investigators and small groups in **quantum information science (QIS)** and move forward with a competition for **National Quantum Information Science Research Centers**, but the bill does not allocate a specific funding amount for the centers and gives DOE discretion based on available funds.
- For **applied energy programs**, the bill provides increases for renewable energy, energy efficiency, grid modernization, and cybersecurity programs and keeps level funding for fossil and nuclear energy research and development programs.
- The bill establishes a new crosscutting program for **long duration grid-scale energy storage** that would advance a broad suite of energy storage technologies.
- The bill would provide \$5 million to the Office of Technology Transitions to compete **regional “incubators supporting energy innovation clusters.”**
- The bill directs DOE 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 \$269 million, or 12 percent above the FY 2019 enacted level, with increased funding for the academic alliance and partnerships program, inertial confinement fusion, exascale computing, and enhanced capabilities for subcritical experiments.
- The bill would fully fund the **University Consortia for Nuclear Nonproliferation Research**.

## The Office of Science and ARPA-E

The House bill would provide \$6.87 billion for **SC**, a \$285 million, or 4.3 percent, increase above the FY 2019 enacted level. However, the additional funding would not be applied proportionally across the six SC program offices. Changes relative to FY 2019 would range from an increase of 22 percent for FES to a small decrease of 1.1 percent for Basic Energy Sciences (BES).

The report accompanying the bill would include support for several SC-wide initiatives. In keeping with FY 2019, the report includes language offering congressional support for investments in **QIS** within SC, including a competition for **National Quantum Information Science Research Centers**. While the report does not specify a funding level for these activities, the additional funding for SC would support the

requested level of \$168 million. Likewise, the report expresses support for SC-wide **artificial intelligence (AI) and machine learning activities** without allocating funding. Similar to quantum, DOE would have the discretion to use \$71 million in AI and machine learning investments, as proposed in the budget request. In keeping with ongoing Administration and congressional priorities, the bill would provide the requested \$500 million for the SC portion of the **Exascale Computing Initiative (ECI)**. The bill also encourages DOE to pursue collaborations with the National Institutes of Health (NIH) that leverage the Department's research and instrumentation assets to address biomedical research challenges.

The bill would provide **Advanced Scientific Computing Research (ASCR)** with \$956.5 million, an increase of \$21 million or 2.2 percent over the FY 2019 level, and \$35.7 million or 3.9 percent above the request. The bill would provide the Administration's proposed level of \$188.7 million for the Exascale Computing Project (ECP), a significant 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. The requested cut to ECP, coupled with modest growth to the ASCR topline, would accommodate a major increase of \$24.4 million or 18.6 percent to fundamental research through the **Mathematical, Computational, and Computer Science Research programs**. Funding for the Leadership Computing Facilities at Argonne and Oak Ridge National Laboratories would also increase, including \$275 million for ECI-related activities. Meanwhile, funding for the **Computational Science Graduate Fellowship program** would be held flat at \$10 million.

The bill would decrease funding for **BES** by \$23 million or 1.1 percent below the FY 2019 enacted level for a total of \$2.14 billion. The reduction in funding is primarily due to the end of construction for the Linac Coherent Light Source-II (LCLS-II) at Stanford Linear Accelerator Center (SLAC) and prioritizing research and operations over accelerated construction of new facilities. The bill prioritizes funding for the Advanced Photon Source upgrade at Argonne and the high energy upgrade at LCLS-II. The bill would also grow BES research and operations by 3.5 percent. Within this account, the bill would provide \$24.1 million for the Batteries and Energy Storage Innovation Hub and \$15 million for the Fuels from Sunlight Innovation Hub. The **EFRC program** would receive \$120 million, \$10 million below the request but \$10 million above the FY 2019 enacted level. At this funding level, DOE would be able to support the existing 31 EFRCs and issue a \$30 million funding opportunity announcement to fund between seven and 15 new EFRCs in the highest priority areas, including quantum information science, the energy-water nexus, and advanced microelectronics.

**Biological and Environmental Research (BER)** would be funded at \$730 million, an increase of \$25 million or 3.5 percent over FY 2019 and 47.6 percent above the request. The bill would fully fund the **Bioenergy Research Centers** at \$100 million and provide \$10 million for microbiome research activities, including a microbiome database. The report expresses support for BER's funding of university-led Earth systems modeling efforts and would maintain funding of \$15 million for developing next-generation cloud-aerosol modeling as part of ECI. The report frames the need for these activities within the context of the National Climate Assessment. 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 \$10 million to restart the Low Dose Radiation program, which was authorized into law in September 2018 under P.L. 115-246, the *Department of Energy Research and Innovation Act*.

The largest increase in terms of both percentage and total funding would go to **FES**. The office would receive an increase of \$124 million or 22 percent above FY 2019 for a total of \$688 million. The vast majority of the additional funding would be driven by a \$98 million increase to the U.S. contribution to ITER and a \$20 million increase to support the Matter in Extreme Conditions Petawatt Upgrade at SLAC.

The growth in the topline would also enable a modest increase of \$6 million to the FES research account. In addition, the report would provide \$4 million for a new Fusion Public-Private Partnership Program to support basic research and development to advance U.S.-based fusion capabilities. Within 90 days of enactment, DOE would be required to provide a report to the Appropriations Committee on the “technical objectives, eligibility requirements, and funding profile in future fiscal years” for the new program.

**High Energy Physics (HEP)** would receive \$1.045 billion, an increase of \$65 million over the FY 2019 enacted level and \$277 million above the President’s budget request. This topline level would support increases for the construction of the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE) and Proton Improvement Plan II (PIP-II) accelerator upgrade to keep both projects on schedule. This funding level would also accommodate an increase for research activities, as well as facilities maintenance and modernization needs. Additional allocations would include \$25 million for the Sanford Underground Research Facility, \$50 million for accelerator research and development, and \$98 million for the High Luminosity Large Hadron Collider (HL-LHC) upgrade at CERN. The report also includes language urging DOE to cultivate a balanced portfolio of small- to large-scale projects and “ensure adequate funding for research performed at universities and national laboratories.”

The bill would provide \$735 million for **Nuclear Physics (NP)**, an increase of \$45 million or 6.5 percent over FY 2019 and 17.6 percent above the request. The growth in the topline would be driven entirely by a \$54 million increase to the Operations and Maintenance account, within which \$10 million would be directed toward early-stage research and development in support of the Electron Ion Collider (EIC), NP’s future flagship experiment. Funding for the Facility for Rare Isotope Beams would be decreased by \$35 million as planned based on the construction schedule.

**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 \$59 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 energy-smart farms, advanced nuclear reactors, performance-based energy resource feedback, optimization, and risk management for grid operations, and low-cost fusion energy devices and technologies. The House 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 House report included language highlighting the scientific and economic value of ARPA-E-supported research and called previous proposals to eliminate the agency short-sighted.

## Applied Energy Programs

The House bill would reject the budget request proposal to make steep cuts to all applied energy programs. Though the bill prioritizes renewable energy, energy efficiency, and grid modernization research efforts, it maintains a balanced approach by also maintaining stable funding for fossil and nuclear energy research.

The **Office of Energy Efficiency and Renewable Energy (EERE)** would receive \$2.65 billion, which is \$273 million, or 11 percent, above the FY 2019 enacted level and \$2.3 billion above the budget request. The bill would increase all renewable energy and energy efficiency programs, though the level of increases varies from 20 percent for Hydrogen and Fuel Cell Technologies to 7 percent for Geothermal Technologies. Some of the priorities identified in the sustainable transportation section of the House bill include innovative battery research for vehicles, as well as hydrogen and fuel cell technologies for

stationary, vehicle, and portable power applications. Renewable energy priorities include research and development to improve photovoltaic cell technologies, overcome grid integration challenges, reduce the costs of solar adoption, as well as advance technologies for concentrated solar power, next generation offshore wind energy, and marine energy. The committee would encourage DOE to hold a workshop that includes “behavioral and social scientists to explore ways to improve the adoption rate of energy efficient technologies” and to support related research. The committee recommends energy efficiency priorities include research and development on advanced manufacturing and natural gas use in residential applications. The bill would provide \$28 million to support two **Clean Energy Manufacturing Innovation Institutes**, including a new cybersecurity for manufacturing institute. However, the committee expressed concerns that such an institute would be duplicative of existing Department of Defense (DOD) efforts and recommended that DOE coordinate with DOD before issuing an award. The bill would also provide \$25 million for the Critical Materials Institute (Energy Innovation Hub) and \$20 million for the **Desalination Hub**, which would provide funding for the fourth year of the program.

**Fossil Energy research and development** would remain flat compared to the FY 2019 enacted level. Reflective of House Democrat priorities, FE would undergo a major shift from the narrow development of technologies focused largely on de-carbonized power generation to a wider array of activities aimed at addressing carbon storage and utilization in multiple sectors. This includes \$10 million for research in direct air capture and \$30 million for carbon utilization, including the conversion of carbon dioxide to higher-value products such as “chemicals, plastics, building materials, curing for cement...and biological conversion systems. The bill also directs the Office of Fossil Energy to partner with the Office of Science and the Bioenergy Technologies Office to develop a program based on the recommendations of two National Academy of Sciences reports, “Negative Emissions Technologies and Reliable Sequestration: A Research Agenda” and “Gaseous Carbon Waste Streams Utilization: Status and Research Needs.” While funding for carbon capture, storage, and utilization accounts would see slight increases, the portfolio of natural gas and unconventional fossil energy technologies would see a reduction below FY 2019 enacted of \$3 million and \$16 million, respectively.

The **Office of Nuclear Energy (NE)** would see a slight decrease of \$8 million or 0.6 percent compared to FY 2019, but that level is \$494 million or 60 percent above the budget request. The bill highlights strong support for the Nuclear Energy University Program, reminds DOE to set aside 20 percent of nuclear energy research and development funding for university-led research and development and infrastructure projects, and would provide no less than \$40 million to support “R&D activities performed at U.S. colleges and universities.” 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 for light water and non-light water small modular reactors;
- \$20 million for a new solicitation for at least two new public-private partnerships to advance non-light water reactor designs toward demonstration;
- \$76 million for accident tolerant fuels;
- \$45 million for high-assay low enriched uranium fuel recovery and production;
- \$11 million for a hydrogen production demonstration at an existing nuclear reactor; and
- \$65 million to complete conceptual design for a Versatile Advanced Reactor at Idaho National Laboratory.

The bill would not provide any additional funding support for the Nuclear Energy Innovation Hub, with the last year of funding in FY 2019, and instead it would transfer the Hub activities to the nuclear energy advanced modeling and simulation program. The bill would not provide funding for the Yucca Mountain spent fuel repository and instead would allocate \$25 million to move forward with interim storage. Further, it would direct the National Academy of Sciences to launch a study that “evaluates the merits and viability of different nuclear fuel cycles and technology options, including both existing and future technologies.” Consistent with a recommendation from the Blue Ribbon Commission of America’s Nuclear Future, the study would “account for linkages among all the elements of the fuel cycle (including waste transportation, storage, and disposal) and for broader safety, security, and non-proliferation concerns.”

The bill would provide a significant funding boost to grid modernization and cybersecurity programs. The **Office of Electricity (OE)** would be increased by \$44 million or 28 percent compared to FY 2019 enacted levels. The bill would continue its strong support for the **Grid Modernization Initiative (GMI)**, and direct DOE to “continue the ongoing work between the national laboratories, industry, and universities to improve the grid reliability and resiliency through the strategic goals” of the GMI. The bill’s top research and development priorities align with DOE’s priorities, including a North American energy resiliency model with improved grid cyber resilience, megawatt scale energy storage, advanced sensors and controls, and more resilient transmission assets.

The report specifically calls out efforts to “support the integration of sensors into the nation’s electric distribution systems, fundamental research and field validation of microgrid controllers and systems, and transactive energy concepts, including studies and evaluations of energy usage behavior in response to price signals.” The report would also direct DOE to establish a crosscutting program for **long duration grid-scale energy storage** that would advance a broad suite of energy storage technologies and examine technical, regulatory, and market issues to achieve cost, performance, reliability, and resilience targets. This effort would be coordinated with the SC, EERE, NE, and FE and is consistent with the Administration’s request for an Advanced Energy Storage Initiative.

The House bill would also boost funding for the **Office of Cybersecurity, Energy Security, and Emergency Response (CESER)**. It would fund research and development activities under the cybersecurity for energy delivery systems program at \$95 million, an increase of \$5.5 million or 5.7 percent above FY 2019 enacted levels. The committee specifically calls out \$10 million to “isolate automated systems and remove vulnerabilities that could allow unauthorized access to the grid through digital software systems and \$4 million for new university-based research of “scalable cyber-physical platforms for resilient and secure electric power systems that are flexible, modular, self-healing, and autonomous.” Overall, the committee “places a high priority on ensuring the protection of the grid against cyberattacks and extreme weather events caused by climate change.”

## **National Nuclear Security Administration**

The House bill would fund **NNSA** at \$15.9 billion, \$666 million above the FY 2019 enacted level and \$591 million below the President’s budget request. This is the first time in five years that the House has released an Energy-Water bill that would provide less funding than requested for NNSA. The biggest increase would be for nuclear weapons activities, which would grow \$661 million or 6 percent above the FY 2019 enacted level, but still \$648 million below the budget request. The bill would also reject new projects proposed in the Nuclear Posture Review. Specifically, it 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.

Funding for **research, development, testing, and evaluation** activities, which support applied research and engineering programs for the stockpile stewardship program, would be funded at \$2.3 billion, an increase of \$269 million or 12 percent above the F 2019 enacted level. The bill would fund the **academic alliance and partnership program** at \$56 million, an increase of \$2.6 million or 4.8 percent above the FY 2019 enacted level. This would fully fund university-led Centers of Excellence and calls for a new “cooperative education pilot initiative focused on workforce readiness in disciplines such as materials science, manufacturing, and engineering.” The bill would also increase funding for the **inertial confinement fusion program** by \$20 million for a total of \$565 million to fully support 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, it would provide the full \$309 million request to support NNSA’s exascale research and infrastructure improvement efforts.

The House bill would also provide \$2.1 billion for **nonproliferation**, \$145 million above FY 2019. The bill includes \$15 million to fully fund the three **University Consortia for Nuclear Nonproliferation Research**.

### Department of Energy

(In thousands of \$)

	FY 2019 Enacted	FY 2020 Request	FY 2020 House	House vs. FY 2019 Enacted	House vs. FY 2020 Request
<b>DOE, total</b>	<b>35,685,317</b>	<b>31,501,929</b>	<b>37,087,431</b>	<b>1,402,114 (3.9%)</b>	<b>5,585,502 (17.7%)</b>
<b>Science</b>	<b>6,585,000</b>	<b>5,545,972</b>	<b>6,870,000</b>	<b>285,000 (4.3%)</b>	<b>1,324,028 (23.9%)</b>
Advanced Scientific Computing Research	935,500	920,888	956,540	21,040 (2.2%)	35,652 (3.9%)
Basic Energy Sciences	2,166,000	1,858,285	2,143,000	-23,000 (1.1%)	284,715 (15.3%)
Biological and Environmental Research	705,000	494,434	730,000	25,000 (3.5%)	235,556 (47.6%)
Fusion Energy Sciences	564,000	402,750	688,000	124,000 (22.0%)	285,250 (70.8%)
High Energy Physics	980,000	768,038	1,045,000	65,000 (6.6%)	276,962 (36.1%)
Nuclear Physics	690,000	624,854	735,000	45,000 (6.5%)	110,146 (17.6%)
Workforce Development for Teachers and Scientists	22,500	19,500	25,000	2,500 (11.1%)	5,500 (28.2%)
Science Laboratories Infrastructure	232,890	163,600	250,830	17,940 (7.7%)	87,230 (53.3%)
<b>ARPA-E</b>	<b>366,000</b>	<b>-287,000<sup>1</sup></b>	<b>425,000</b>	<b>59,000</b>	<b>712,000</b>

<sup>1</sup> The President’s FY 2020 budget request proposed terminating ARPA-E entirely and remitting leftover funds back to the federal government.

				(16.1%)	(248.1%)
<b>EERE</b>	<b>2,379,000</b>	<b>343,000</b>	<b>2,651,713</b>	<b>272,713</b> <b>(11.5%)</b>	<b>2,308,713</b> <b>(673.1%)</b>
Hydrogen and Fuel Cell Technologies	120,000	44,000	144,000	24,000 (20.0%)	100,000 (227.3%)
Bioenergy Technologies	226,000	40,000	256,000	30,000 (13.3%)	216,000 (540.0%)
Solar Energy Technologies	246,500	67,000	270,000	23,500 (9.5%)	203,000 (303.0%)
Wind Energy Technologies	92,000	23,700	103,692	11,692 (12.7%)	79,992 (337.5%)
Geothermal Technologies	84,000	28,000	90,000	6,000 (7.1%)	62,000 (221.4%)
Water Power Technologies	105,000	45,000	125,000	20,000 (19.0%)	80,000 (177.8%)
Vehicle Technologies	344,000	73,400	370,000	26,000 (7.6%)	296,600 (404.1%)
Building Technologies	226,000	57,000	248,000	22,000 (9.7%)	191,000 (335.1%)
Advanced Manufacturing Technologies	320,000	80,500	360,000	40,000 (12.5%)	279,500 (347.2%)
<b>Nuclear Energy</b>	<b>1,326,090</b>	<b>824,000</b>	<b>1,317,808</b>	<b>-8,282</b> <b>(0.6%)</b>	<b>493,808</b> <b>(59.9%)</b>
<b>Fossil Energy R&amp;D</b>	<b>740,000</b>	<b>562,000</b>	<b>740,000</b>	--	<b>178,000</b> <b>(31.7%)</b>
<b>Cybersecurity, Energy Security, and Emergency Response</b>	<b>120,000</b>	<b>156,500</b>	<b>150,000</b>	<b>30,000</b> <b>(25.0%)</b>	<b>-6,500</b> <b>(4.2%)</b>
<b>Electricity</b>	<b>156,000</b>	<b>182,500</b>	<b>200,000</b>	<b>44,000</b> <b>(28.2%)</b>	<b>17,500</b> <b>(9.6%)</b>
<b>National Nuclear Security Administration</b>	<b>15,228,618</b>	<b>16,485,000</b>	<b>15,894,281</b>	<b>665,663</b> <b>(4.4%)</b>	<b>-590,719</b> <b>(3.6%)</b>
Weapons Activities	11,100,000	12,408,603	11,760,800	660,800 (6.0%)	-647,803 (5.2%)
Defense Nuclear Non-proliferation	1,930,000	1,993,302	2,074,930	144,930 (7.5%)	81,628 (4.1%)

Source: The Energy and Water Development Appropriations Bill, 2020 Committee Report is available at <https://appropriations.house.gov/sites/democrats.appropriations.house.gov/files/FY2020%20E&W%20Report%20Draft.pdf>.