COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY
U.S. HOUSE OF REPRESENTATIVES
HEARING CHARTER

Investigating the Nature of Matter, Energy, Space, and Time

Jun 22, 2022
10:00 AM ET

PURPOSE

The Subcommittee's hearing will examine two major components of the Department of Energy's Office of Science: the High Energy Physics (HEP) program and the Nuclear Physics (NP) program. The Isotope Program and potential impacts and supply shortages due to the Russia-Ukraine conflict and the development of accelerator technology through the Accelerator R&D and Production program will also be discussed. The hearing will focus on initiatives to advance foundational research on the nature of matter, energy, and the cosmos; the construction and operation of large-scale experiments and unique user facilities; and the relevance of these research areas to the development of accelerator technologies, isotope production, and other applications. The centrality of these activities to U.S. preeminence in particle and nuclear physics, and to isotope research and supply, will also be highlighted. Finally, the hearing will examine ways that Congress and the Administration should consider directing the activities of these programs going forward.

WITNESSES

- **Dr. Asmeret Berhe**, Director, Office of Science, Department of Energy
- **Professor Brian Greene**, Director, Center for Theoretical Physics, Columbia University
- **Dr. Lia Merminga**, Director, Fermi National Accelerator Laboratory
- **Mr. Jim Yeck**, Associate Laboratory Director and Project Director, Electron-Ion Collider, Brookhaven National Laboratory
- **Mr. Michael Guastella**, Executive Director, Council on Radionuclides and Radiopharmaceuticals, Inc.

BACKGROUND

High Energy Physics Program

The mission of the High Energy Physics (HEP) program is to understand how the universe works at its most fundamental level by discovering the elementary constituents of matter and energy, probing the interactions between them, and exploring the basic nature of space and time. HEP pursues this mission through particle physics research, and through stewardship of unique scientific user facilities and large-scale experiments.

The Administration requested $1.12 billion for HEP in Fiscal Year (FY) 2023, which would constitute an increase of $44 million or 4.1 percent above the FY 2022 enacted level. Of the additional funding, $30 million would be provided to ongoing construction projects while the remaining $14 million would be allocated for research. Despite the disproportionate growth to the construction line, HEP's flagship project, the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE) would be underfunded relative to what the National Laboratories and the Department itself have estimated will be required to maintain its schedule while minimizing total costs. This issue is not unique to HEP and would stymie efforts to control the cost and schedule of several projects across multiple Office of Science programs, including NP and Isotope R&D and Production (IP).[1]

HEP Research

The research agenda of HEP and its counterpart programs at the National Science Foundation (NSF) are largely guided by the May 2014 report of the Particle Physics Project Prioritization Panel (P5), "Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global Context".[2] The P5 report outlines a ten-year strategic plan in the context of a 20-year vision for particle physics. While the process for updating the P5 recommendations is currently underway, the science drivers that the 2014 report originally identified are still applicable. These specific lines of inquiry could inform what lies beyond the Standard Model[3], which currently governs our understanding of matter and energy. These lines of inquiry are as follows:

- Use the Higgs boson as a new tool for discovery.
- Pursue the physics associated with neutrino mass.
- Identify the new physics of dark matter.
- Understand cosmic inflation, acceleration, and dark energy.
- Explore the unknown: including new particles, interactions, and physical principles.

HEP addresses the priorities outlined the P5 report through a strategy organized along three interrelated frontiers of particle physics. Frontier research is supported by a theory program and enabled by the development of advanced technology. The Accelerator Stewardship program, which makes investments in accelerator technology available to U.S. science and industry, was

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[1] The Office of Science's management of large construction projects was the focus of the Committee's April 27th hearing entitled, *Science and Energy Research Infrastructure Needs of the U.S. Department of Energy*. The hearing charter, which provides expansive detail on how the Administration's FY 2022 and FY 2023 requests would underfund LBNF/DUNE and other projects, can be found at https://science.house.gov/imo/media/doc/Hearing%20Charter%20-%20DOE%20Science%20and%20Energy%20Infrastructure%20Needs%20-%20FY23%20Request%20-%204.27.22.pdf.

[2] *Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global Context*, Available at https://www.usparticlephysics.org/wp-content/uploads/2018/03/FINAL_P5_Report_053014.pdf.

[3] "The Standard Model describes the elementary particles, which come in three distinct types: (i) the matter particles, quarks and leptons, (ii) the photon, gluons and massive W and Z, which mediate the electromagnetic, strong, and weak forces, respectively, and (iii) the Higgs boson, which gives mass to the elementary particles. The Standard Model provides a quantitative, quantum mechanical description of the interactions of these particles that has been remarkably successful." See page 3 of the P5 report linked in reference 3.

previously funded through HEP but has since been relocated to the newly formed Accelerator R&D and Production (ARDAP) program.[4] Descriptions of each HEP subprogram follow below:

- **Energy Frontier** researchers use sophisticated accelerators and detectors to accelerate particles to the highest-energies ever made by humanity, and collide them to produce and study the fundamental constituents of matter and the architecture of the universe.

- **Intensity Frontier** researchers use a combination of intense particle beams and highly sensitive detectors to make extremely precise measurements of particle properties, study some of the rarest particle interactions predicted by the Standard Model of particle physics, and search for new physics.

- **Cosmic Frontier** researchers seek to reveal the nature of dark matter and dark energy by using ultra-sensitive underground detectors to study particles from space and explore new phenomena.

- **Theoretical, Computational, and Interdisciplinary Physics** provide the framework to explain experimental observations and gain a deeper understanding of nature. A thriving theory program is essential to support current experiments and identify new directions for the field. Advanced computing tools are necessary for designing, operating, and interpreting experiments while performing the computational science and simulations that enable discovery research in the three frontiers.

- **Advanced Technology R&D** fosters fundamental research into particle acceleration and detection techniques and instrumentation. These in turn provide the enabling technologies and new research methods that can advance scientific knowledge in high energy physics and a broad range of related fields.

In addition to pursuing research in the P5 priority areas, HEP also supports research that contributes to areas of strategic national importance, including quantum information science (QIS) and artificial intelligence and machine learning (AI/ML). Conversely, these emerging capabilities will also help advance scientific knowledge in particle physics. Many of the advanced technologies, research tools, and analysis techniques originally developed for high energy physics have proved widely applicable to other scientific disciplines as well as for health services, national security, and the private sector. For example, the superconducting magnet technology originally developed for particle physics research comprises the core of MRI machines, greatly enhancing our medical diagnostic capabilities.[5]

HEP Facilities

HEP supports two scientific user facilities and is currently supporting construction of three large-scale experiments and the development of five major items of equipment (MIEs), which are smaller in scale. Descriptions of each of these facilities and projects can be found below.

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[4] https://science.osti.gov/hep/Research.
[5] https://science.osti.gov/hep/Benefits-of-HEP

Construction Projects:

- **Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE)** – DUNE is an international flagship experiment to unlock the mysteries of neutrinos, and will be installed in the LBNF. DUNE will pursue three major science goals: 1) determine whether neutrinos could be the reason the universe is made of matter; 2) look for subatomic phenomena that could help realize Einstein's dream of the unification of forces; and 3) watch for neutrinos emerging from an exploding star, perhaps witnessing the birth of a neutron star or a black hole.[6] The project is overseen by HEP and hosted at the Fermi National Accelerator Laboratory (Fermilab), with the major underground component of the experiment located in the Sanford Underground Research Facility in South Dakota. The preliminary total project cost (TPC) range is $1,260,000,000 to $1,860,000,000, as approved on September 1, 2016, but additional planning and analysis has resulted in an increased scope and thus an updated TPC estimate of $3,000,000,000.[7]

- **Proton Improvement Plan II (PIP-II)** – The PIP-II project will enhance the Fermilab Accelerator Complex to enable it to deliver higher-power proton beams to the neutrino-generating target for groundbreaking discovery in neutrino physics. PIP-II will be a critical component of LBNF/DUNE. The project will design and construct an 800 megaelectronvolt superconducting radio-frequency proton accelerator and beam transfer line, with associated modifications of other components to withstand the increased beam intensity. Some of the new components and the cryoplant will be provided through international, in-kind contributions. The approved project baseline included a TPC of $978,000,000.[8]

- **Muon to Electron Conversion Experiment (Mu2e)** – Mu2e, under construction at Fermilab, will search for evidence that a muon can undergo direct (neutrinoless) conversion into an electron, enabling investigations into new physics at energy scales beyond the collision energy of the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN). If observed, this major discovery would signal the existence of new particles or new forces beyond the Standard Model. The funding profile through FY 2019 supported the current TPC of $273,677,000. However, the COVID-19 pandemic caused delays and disruptions that necessitate a rebaselining of the project. Until that process is complete, none of the funds appropriated in FY 2021 or FY 2022 will be available to spend and construction of Mu2e will remain unfinished.[9]

[6] https://lbnf-dune.fnal.gov/
[7] DOE FY 2023 Congressional Budget Request, Science, pages 321-322: https://www.energy.gov/sites/default/files/2022-05/doe-fy2023-budget-volume-5-science-v2.pdf.
[8] Ibid.
[9] Ibid.

MIEs:

- **Accelerator Controls Operations Research Network (ACORN)** – ACORN will replace Fermilab's dated accelerator control system with a modern system which is maintainable, sustainable, and capable of utilizing advances in AI/ML to create a high-performance accelerator for the future. ACORN will also be compatible with PIP-II, and the lab plans to collaborate with other national labs that have experience with accelerator control systems. The project has an estimated cost range of $100,000,000 to $142,000,000.[10]

- **Cosmic Microwave Background Stage 4 (CMB-S4)** – CMB-S4 is expected to be carried out as a partnership with NSF, with DOE as the lead agency and a distribution of scope planned to be determined by FY 2023. The project supports the fabrication of an array of small and large telescopes at two locations: the NSF Amundsen-Scott South Pole Station and the Atacama high desert in Chile. Lawrence Berkeley National Laboratory was selected in August 2020 to lead the efforts in providing the DOE scope for the project. The project has an estimated cost range of $320,000,000 to $395,000,000.[11]

- **High-Luminosity Large Hadron Collider (HL-LHC) Upgrades** – HEP is supporting upgrades to the LHC Accelerator, ATLAS Detector, and CMS Detector. Collectively, these projects ultimately will increase the particle collision rate by a factor of at least five and integrate a higher amount of data per run by a factor of at least ten. This will make the physical conditions in which the detectors operate very challenging, necessitating significant upgrades to various detector components. The President's FY 2023 budget request notes that the COVID-19 pandemic caused delays and increased costs for each of these three projects, which may necessitate the Office of Science to consider additional funding during the baselining process. The current estimated TPC for each of these MIE projects is below:

    - **HL-LHC Accelerator** – $242,720,000.

    - **HL-LHC ATLAS Detector** – estimated range of $149,000,000 to $181,000,000.

    - **HL-LHC CMS Detector** – estimated range of $144,100,000 to $183,000,000.[12]

User Facilities:

- **Fermilab Accelerator Complex** – Fermilab's particle accelerators help drive discovery in fundamental physics, innovations in accelerator science and advances in accelerator-based applications. Its main accelerator complex comprises four particle accelerators and storage rings — the Linac, Booster, Recycler and Main Injector — the last of which produces the world's most powerful high-energy neutrino beam and provides proton

[10] DOE FY 2023 Congressional Budget Request, Science, pages 328-329.
[11] Ibid.
[12] Ibid.

beams for various experiments and R&D programs. PIP-II will significantly enhance this facility's capabilities.[13]

- **Facility for Advanced Accelerator Experimental Tests (FACET-II)** – FACET-II provides DOE with the unique capability to develop advanced acceleration and coherent radiation techniques with high-energy electron and positron beams. It is hosted at SLAC National Accelerator Laboratory.[14]

Nuclear Physics Program

The mission of the Nuclear Physics (NP) program is to discover, explore, and understand all forms of nuclear matter observed in nature and how that knowledge can benefit society in the areas of commerce, medicine, and national security. The NP program stewards theoretical and experimental research, user facilities, and training in support of this mission. DOE and NSF together fund almost all basic research in nuclear physics.

The Administration requested $739.2 million for NP in FY 2023, which would be an increase of $11.2 million or 1.6 percent above the FY 2022 enacted level.

NP Research

The NP program supports research in the following areas:

- **Medium Energy Physics** focuses primarily on the experimental tests of the theory of the strong nuclear force, which is the most powerful force involved in holding matter together.[15] This research contributes to the search for possible explanations of the excess of matter over antimatter in the universe.[16]

- **Heavy Ion Physics** focuses on studies of nuclear matter at extremely high densities and temperatures by trying to recreate and characterize new and predicted forms of matter and other new phenomena which may not have existed since the Big Bang.[17]

- **Low Energy Physics** focuses on using nuclear interactions and decays to answer overarching questions related to nuclear structure, nuclear astrophysics, and fundamental symmetries.[18] This research aims to understand the basic properties and nature of matter and nuclear interactions, and uses this information to try to understand more about the composition of the cosmos and what drives stellar phenomena.

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[13] https://www.fnal.gov/pub/science/particle-accelerators/accelerator-complex.html
[14] https://facet-ii.slac.stanford.edu/overview
[15] https://www.energy.gov/science/doe-explainsquarks-and-gluons
[16] DOE FY 2023 Congressional Budget Request, Science, page 388.
[17] https://science.osti.gov/np/Research
[18] DOE FY 2023 Congressional Budget Request, Science, page 399.

- **Nuclear Theory** provides the theoretical support needed to interpret the wide range of data obtained from the experimental nuclear science programs and to advance new ideas and hypotheses that identify potential areas for future experimental investigations.[19]

Like HEP, NP also contributes to crosscutting initiatives across DOE such as AI/ML and QIS. Improvements in these research areas can lead to improvements in nuclear physics research.

NP Facilities

NP supports four scientific user facilities and is currently supporting construction of one large-scale facility and the development of five MIEs. Descriptions of each of these facilities and projects can be found below.

Construction Projects:

- **Electron Ion Collider (EIC) –** The EIC, to be located at Brookhaven National Laboratory with significant support from Thomas Jefferson National Accelerator Facility, will be used to help understand how the fundamental properties of the proton are generated by the nuclear strong force. The project is expected to attract international collaboration and contributions. The project has an estimated TPC range of $1.7 billion to $2.8 billion.[20]

MIEs:

- **Super Pioneering High Energy Nuclear Interaction Experiment (sPHENIX)** – sPHENIX will use advanced measurement techniques to further characterize nuclear phenomena discovered at the Relativistic Heavy Ion Collider (RHIC) user facility. The project has a TPC of $27,000,000 and is funded within the existing funds for RHIC operations.[21]

- **Gamma-Ray Energy Tracking Array (GRETA) –** GRETA is an advanced detector that will improve detection techniques in homeland security and medicine. It will be used to understand the structure of nuclear matter, the processes of nuclear astrophysics, and the nature of the cosmos. Without GRETA, the Facility for Rare Isotope Beams (FRIB) user facility will be subject to accommodating less experiments, and some experiments would not be feasible at all. The project has a TPC of $58,300,000.[22]

- **High Rigidity Spectrometer (HR) –** The HRS at FRIB will increase the scientific potential of state-of-the-art devices, such as GRETA, and other ancillary detectors. The HRS will provide access to critical isotopes not available otherwise. The project has an estimated cost range of $85,000,000 to $111,400,000.[23]

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[19] DOE FY 2023 Congressional Budget Request, Science, page 405.
[20] DOE FY 2023 Congressional Budget Request, Science, page 405.
[21] DOE FY 2023 Congressional Budget Request, Science, page 418.
[22] DOE FY 2023 Congressional Budget Request, Science, page 418-419.
[23] Ibid.

- **Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) –** The MOLLER experiment would use new, advanced techniques to provide an ultra-precise measurement which would inform the nature of nuclear matter. The project has an estimated cost range of $42,000,000 to $60,100,000.[24]

- **Ton-Scale Neutrinoless Double Beta Decay (NLDBD) –** The NLDBD experiment explores a unique nuclear interaction. The observation of this experiment could answer questions surrounding nuclear matter and interactions that have perplexed modern physics for decades. The project has an estimated cost range of $215,000,000 to $250,000,000.[25]

User Facilities:

- **Relativistic Heavy Ion Collider (RHIC) –** RHIC, located at Brookhaven National Laboratory, is the first machine in the world capable of colliding heavy ions. The observation of the collision of these particles helps inform the nature of matter.[26]

- **Continuous Electron Beam Accelerator Facility (CEBAF) –** CEBAF, located at Thomas Jefferson National Accelerator Facility, produces a stream of charged electrons used to probe the nucleus of the atom. The observation of experiments at CEBAF helps inform the structure of the nucleus of an atom.[27]

- **Facility for Rare Isotope Beams (FRIB) –** FRIB, located at Michigan State University, is a heavy-ion accelerator which enables scientists to make discoveries about the properties of rare isotopes, nuclear astrophysics, and nuclear interactions. Research carried out at this facility has applications for society including medicine, homeland security, and industry.[28]

- **Argonne Tandem Linac Accelerator System (ATLAS) –** ATLAS is the world's first superconducting accelerator for projectiles heavier than the electron. ATLAS is able to produce high precision heavy-ion beams of all kinds and energies, which allows for a wide range of experimental capabilities to help inform our understanding of nuclear matter.[29]

Isotope R&D and Production

The Isotope R&D and Production (IP) Program develops isotope production methods and supplies isotopes and related services to the U.S. IP produces critical radioactive and stable isotopes in short supply for the nation or that no domestic entity has the infrastructure or core

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[24] DOE FY 2023 Congressional Budget Request, Science, page 418-419.
[25] Ibid.
[26] https://www.bnl.gov/rhic/physics.php
[27] https://www.jlab.org/accelerator
[28] https://frib.msu.edu/about/index.html
[29] https://www.anl.gov/atlas/about-atlas

competency to produce. It is typically the only, or one of few, global producers for these novel isotopes. Isotopes are high-priority commodities of strategic importance and are essential in medical diagnosis and treatment, discovery science, national security, industrial processes and manufacturing, space exploration and communications, biology, archaeology, quantum science, and other fields.[30]

The administration requested $97.5 million for IP in FY 2023, which would be an increase of $15.5 million or 18.8 percent above the FY 2022 enacted level.

IP Research

IP supports research and development associated with creating novel and more efficient isotope production and processing techniques to assure availability of critical isotopes that are in short supply to address the needs of the nation. IP research is focused on technologies for production and processing of radioisotopes using reactor and accelerator facilities and new technologies for enriching stable isotopes. The program lies at the intersection of many scientific disciplines including nuclear and radiochemistry, nuclear physics, accelerator and reactor science, materials science and engineering, separations science, isotope enrichment, and nuclear data. Workforce development is viewed as an essential component of IP's research program.[31] IP produces and distributes isotopes critical for advances in quantum information science.[32]

IP Facilities

IP supports dozens of facilities across the nation at national laboratories and universities to advance research and development of isotope production methods and to produce and distribute critical radioactive and stable isotopes.[33] The sale and distribution of isotopes is coordinated through the National Isotope Development Center.[34]

IP supports the construction of the U.S. Stable Isotope Production and Research Center (SIPRC) at Oak Ridge National Laboratory. The SIPRC is intended to expand gas centrifuge production capability and significantly increase electromagnetic isotope separation production capability to meet the nation's growing demand for stable isotopes and mitigate dependence on foreign countries for stable isotope supply. The project has an estimated cost range of $187,000,000 to $338,000,000.[35]

<u>Accelerator R&D and Production</u>

The mission of the Accelerator R&D and Production (ARDAP) program is to help coordinate Office of Science accelerator R&D; advance accelerator science and technology relevant to the Department, other Federal Agencies, and U.S. industry; foster public-private partnerships to

[30] https://www.energy.gov/science/ip/isotope-rd-and-production-doe-ip
[31] https://science.osti.gov/Isotope-Research-Development-and-Production/Research
[32] https://science.osti.gov/Isotope-Research-Development-and-Production/Research/Quantum-Information-Science
[33] https://science.osti.gov/Isotope-Research-Development-and-Production/Facilities
[34] https://www.isotopes.gov/
[35] DOE FY 2023 Congressional Budget Request, Science, page 439.

develop, demonstrate, and enable the commercial deployment of accelerator technology; support the development of a skilled, diverse, and inclusive workforce; and provide access to accelerator design and engineering resources. The overarching goal is to ensure a robust pipeline of innovative accelerator technology, train an expert and diverse workforce, and reduce significant supply chain risks by reshoring critical accelerator technology. By ensuring the supply of leading accelerator technology and facilities, ARDAP supports physical science research that provides the foundations for innovative technologies for clean energy, medicine, security, and new tools to help clean up the environment and safeguard the water supply.[36]

The President's budget request for FY 2023 would provide ARDAP with $27.4 million, an increase of $9.4 million or 52.4 percent over the FY 2022 enacted level of $18 million.

ARDAP was established in 2020 following the removal of its component activities from HEP. DOE implemented this reorganization in an effort to ensure that the development of innovative accelerator technologies and associated workforce activities were carried out in a way that would benefit multiple Office of Science programs rather than being oriented primarily towards the needs of HEP.

ARDAP Research

ARDAP carries out its mission through two subprograms:

- **Accelerator Stewardship** – The Accelerator Stewardship subprogram supports cross-cutting R&D; facilitates access to unique state-of-the-art accelerator R&D infrastructure for the private sector and other users, including operating a dedicated user facility for accelerator R&D; and drives a limited number of specific accelerator applications towards practical, testable prototypes in a five-to-seven-year timeframe. The Accelerator Stewardship subprogram also supports the curation of software and material properties databases commonly used for accelerator design.[37]

- **Accelerator Production** – The Accelerator Production subprogram supports public-private partnerships to develop new accelerator technologies to sufficient technical maturity for use in scientific facilities, commercial products, or both. Development activities will support partnerships in advanced superconducting wire and cable, superconducting radiofrequency (RF) cavities, and high efficiency RF power sources for accelerators, among other areas.[38]

ARDAP Facilities

ARDAP maintains the Accelerator Test Facility (ATF), which is the DOE Office of Science User Facility providing users with high brightness electron beams, near-infrared and long-wave

[36] DOE FY 2023 Congressional Budget Request, Science, pager 463.
[37] Ibid.
[38] Ibid.

infrared laser beams, and an ultrafast electron diffraction facility. It is hosted at Brookhaven National Laboratory.[39]

COMMITTEE ACTIVITY

Legislation

The Committee has sought to provide comprehensive policy direction to HEP, NP, IP, and ARDAP as well as empower each program to complete the projects in its construction portfolio on time and on budget, as exemplified by the Department of Energy Science for the Future Act (H.R. 3593)[40], which is also included in the America COMPETES Act of 2022 (H.R. 4521)[41]. In addition, the funding profiles authorized for construction projects in each of these programs were incorporated into the Committee-passed portion of the *Build Back Better Act* (H.R. 5376)[42]. More information about each of these sections in H.R. 3593 and H.R. 4521 follows below:

- **HEP** – The bill authorizes theoretical and experimental research in elementary particle physics and fundamental accelerator science and technology development. Specific activities are detailed for high energy and cosmic frontier research, and the bill provides explicit direction regarding international collaborations such as those in support of LBNF/DUNE and the LHC. The bill authorizes five-year funding profiles that would enable optimal operation start dates for LBNF/DUNE, PIP-II, and CMB-S4, and includes support for other projects articulated in the P5 report. Finally, the bill authorizes targeted initiatives in underground science and in accelerator and detector research and development.

- **NP** – The bill authorizes research to discover and understand various forms of nuclear matter. It also authorizes appropriations for the construction of the Electron Ion Collider.

- **IP** – The bill authorizes a research, development, and production program for isotopes that are needed for research, medical, and industrial purposes.

- **ARDAP** – The bill authorizes research to advance accelerator science and technology. It also supports activities to improve stakeholder partnerships to develop accelerator technology and support the accelerator research workforce.

Oversight Activities

During the 116th and 117th Congresses, the Committee has held several hearings examining various Office of Science programs and initiatives. Most recently, the Subcommittee on Energy held a hearing on April 27 centered on the goals and impacts of DOE's FY 2023 budget request, with a primary focus on budget planning and management of construction of Office of Science

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39 https://www.bnl.gov/atf/
40 https://science.house.gov/bills/the-doe-science-for-the-future-act
41 https://science.house.gov/americacompetes
42 https://science.house.gov/markups/full-committee-markup-of-committee-print-to-comply-with-the-reconciliation-directive-included-in-section-2002-of-the-concurrent-resolution-on-the-budget-for-fiscal-year-2022-s-con-res-14

user facilities, experiments, and upgrades, including those highlighted in this charter.[43] Dr. Geraldine Richmond, DOE's Under Secretary for Science and Innovation, served as the lone witness. Committee Members used this occasion to voice their interest in seeing the Administration provide budget requests that adequately meet the Office of Science's research and construction needs. Separately, Committee staff have been consistently engaging with officials from the Office of Science and DOE leadership, as well as the White House through the Office of Management and Budget and the Office of Science and Technology Policy, to convey the same points.

The Committee has also engaged with the IP program and other stakeholders in the past few months about the instability of the isotope supply chain due to the Russia-Ukraine conflict. Many of the critical isotopes that IP supplies to the nation, and many of the isotopes more readily available in the commercial market, have single sources in the world. And many of those sources rely directly on Russia at some point in the supply chain. Various isotopes that the nation depends upon for cancer treatments or food irradiation or other industrial purposes are facing potential shortages pending any future policy decisions related to sanctions. Several of these isotopes are only useful for a short period of time and impacts from the conflict such as constrained shipping relationships have threatened their supply. The Committee is actively conducting oversight and pursuing potential solutions to address this issue.

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[43] https://science.house.gov/hearings/science-and-energy-research-infrastructure-needs-of-the-us-department-of-energy