NUCLEAR SCIENCE ADVISORY COMMITTEE
to the
U.S. DEPARTMENT OF ENERGY and NATIONAL SCIENCE FOUNDATION

PUBLIC MEETING MINUTES

Hybrid Meeting
September 12, 2024
NUCLEAR SCIENCE ADVISORY COMMITTEE
SUMMARY OF MEETING

The U.S. Department of Energy (DOE) and National Science Foundation (NSF) Nuclear Science Advisory Committee (NSAC) meeting convened at 9:00 a.m. Eastern Time (ET) on Thursday, September 12, 2024, at the Hilton Washington, DC/Rockville Hotel & Executive Meeting Center and via Zoom® by Committee Chair **Gail Dodge**. The meeting was open to the public and conducted in accordance with Federal Advisory Committee Act (FACA) requirements. Visit https://science.osti.gov/np/nsac for more information about NSAC.

NSAC Members Present

Gail Dodge (Chair)
Christine Aidala
Manuel Calderón de la Barca Sánchez
Kelly Chipps
Ian Cloet
Zohreh Davoudi
André Luiz de Gouvêa
Gwen Grinyer
Austin Harton
Calvin Howell
Yordanka Ilieva
Dean Lee (*American Physical Society [APS] ex-Officio*)
Jorge Lopez
Lijuan Ruan
Francesca Sammarruca
Carol Scarlett
Daniel Tapia Takaki
Derek Teaney
Justin Walensky (*American Chemical Society [ACS] ex-Officio*)
Fred Wietfeld

Committee Manager

Brenda May, DOE Office of Science (SC), Office of Nuclear Physics (NP)

DOE SC Presenters

Linda Horton, NSAC Designated Federal Officer, DOE SC, NP, Acting Associate Director
Harriet Kung, DOE SC, Acting Director
Paul Mantica, DOE SC, NP, Facilities and Project Management Division (FD), Director
Sharon Stephenson, DOE SC, NP, Physics Research Division (RD), Director

NSF Presenters

Denise Caldwell, NSF, Office of the Director (OD), Senior Advisor
Senta (Vicki) Greene, NSF, Nuclear Physics Program Director

Additional Presenters

Vincenzo Cirigliano, Professor of Physics, University of Washington
Rolf Ent, Electron-Ion Collider (EIC) Co-Associate Director, Thomas Jefferson National Accelerator Facility (TJNAF)
Alexandra Gade, Scientific Director, Facility for Rare Isotope Beams (FRIB)
Richard Milner, Professor of Physics, Massachusetts Institute of Technology (MIT)
Maria Żurek, Assistant Physicist, Argonne National Laboratory (ANL)

September 12, 2024

Welcome and Introduction

Dodge welcomed attendees and asked NSAC members, NSF representatives, and DOE representatives to introduce themselves.

Perspectives from the Department of Energy, Harriet Kung, DOE SC Acting Director

Kung presented SC staffing updates. Starting in early October 2024, Sarah Staton will serve as the new Director of the Office of International Activities, Research Security, and Interagency Coordination (IRIC). Christopher Landers will serve as the new Director of the Office of Isotope Research & Development (R&D) and Production (IRP).

The SC FY 2025 budget request of ~$8.58B represents an increase of ~$343M (4.2%) over the FY 2024 appropriation. This increased funding targets the high priority areas of Artificial Intelligence (AI) (+$93M over FY 2024; $259M); Fusion Innovation Research Engine (FIRE) Collaboratives (+$15M; $60M); Reaching a New Energy Sciences Workforce (RENEW) (+$69M; $120M); Funding for Accelerated, Inclusive Research (FAIR) (+$32M; $64M); Microelectronics (+$22M; $95M); and SC Energy Earthshots (+$95M; $115M). Furthermore, a new Climate Initiative ($20M) seeks to augment the successful Urban Integrated Field Laboratories (IFLs), launched several years ago by the Biological and Environmental Research (BER) program, by broadening the program's scope to address rural areas across the U.S.

Regarding SC-stewarded national laboratories, the FY 2025 budget request aims to upgrade core lab infrastructure (*i.e.*, utilities and lab workspaces) through ongoing Scientific Laboratory Infrastructure (SLI) projects and General Plant Projects (+$32M over FY 2024; $50M); reduce the backlog of deferred maintenance and improve obsolete infrastructure; and continue the Laboratory Operations Apprentice Program (+$2M; $5M). The FY 2025 budget request will support facilities at ~88.3% of optimal operation and continue to support ongoing scientific user facility upgrade construction and infrastructure projects.

The FY 2025 House mark funds SC at ~$8.39B, which is $150M over the FY 2024 enacted budget and $193M below the FY 2025 SC request. The FY 2025 House mark supports Quantum Information Science (QIS) research at $245M, with $15M in support of the Quantum User Expansion for Science and Technology (QUEST) program and $20M for testbeds to integrate high-performance computing (HPC) and QIS, consistent with the FY 2025 SC request. Additionally, the FY 2025 House mark funds $20M for Energy Earthshots ($95M below request) and $40M for FIRE Collaboratives ($20M below request), as well as supports the expansion of microelectronics research, including the Microelectronics Science Research Centers, and directs the establishment of a Carbon Sequestration Research and Geologic Computational Science Initiative. Lastly, the FY 2025 House mark provides no funding for RENEW and FAIR initiatives but funds most construction projects at or near the SC request.

The FY 2025 Senate mark funds SC at ~$8.60B, which is $360M over the FY 2024 enacted budget and $17M over the FY 2025 SC request. The Senate mark supports Artificial Intelligence / Machine Learning (AI/ML) at $160M, with $100M for the Frontiers in Artificial Intelligence for Science, Security and Technology (FASST) initiative, consistent with the FY 2025 SC request. The Senate mark funds not less than $265M for QIS research, including five National QIS Research Centers ($15M below request); $60M for Energy Earthshots ($55M below request); $110M for microelectronics ($15M above request); not less than $45M for FIRE Collaboratives ($15M below request); $25M to the aforementioned Carbon Sequestration

Research and Geologic Computational Science Initiative; and $10M for atmospheric methane removal research. Lastly, the FY 2025 Senate mark supports RENEW and FAIR initiatives and funds most construction projects at or near the SC request.

The speed and scale of AI development requires investment in strategic capabilities to meet DOE mission needs of national security, energy security, and scientific discovery that will support sustained economic prosperity for the nation for future decades. A focused approach is needed to prevent the U.S. from losing its competitive scientific edge and ability to maintain national and economic security; catalyze a diverse and competitive AI ecosystem; build technical expertise necessary to govern AI; and attract and train a talented workforce. FASST will build the world's most powerful integrated scientific AI systems through four key interconnected pillars: (1) AI-Ready Data; (2) Frontier-Scale AI Computing Infrastructure and Platforms; (3) Safe, Secure, and Trustworthy AI Models and Systems; and (4) AI Applications.

Research security at DOE is an evolving landscape, with a long history in safeguarding and stewarding highly sensitive information. Risk is at the core of developing the DOE Research, Technology, and Economic Security (RTES) policies and informing their implementation. Given DOE's broad mission space, RTES needs to address a wide range of risk levels. DOE and the national labs must cooperate to continue to attract and retain the best and brightest talent, as well as to promote principled international collaborations that: (1) are built upon openness, transparency, parity of intellectual and financial contributions, and mutual respect of intellectual property (IP) rights; (2) are driven by scientist-to-scientist ties and scientific community interest; and (3) advance U.S. competitiveness and discovery with the "best science." The SC is engaged in formulating and harmonizing the RTES.

Regarding the evolution of RTES, in 2016, early working groups were established to safeguard protections of IPs and prevent foreign influence, focusing on DOE national labs. In 2019, policy was established to prohibit participation in foreign talent programs, but the restrictions only applied to federal employees and DOE lab contractors. In 2019, the Science and Technology (S&T) Risk Matrix was also developed and issued. In January 2021, the National Security Presidential Memorandum 33 (NSPM-33) established national security policy for U.S. government-supported R&D and served as a foundation for research security policy. In January 2022, the NSPM-33 Implementation Guidance was established, followed by the creation of the Office of the Secretary (S1) department-wide RTES Policy Working Group (PWG), which functions to address RTES policy development and consistency with interagency processes, including financial assistance (FA) and laboratory policies.

In 2023, the RTES office was established to provide consistency and support for due diligence reviews and risk mitigation in DOE FA and loan activities. Specifically, the RTES office functions in three main areas: (1) Due Diligence, Liaison, & Assessment; (2) Internal Information Sharing; and (3) External Communications & Outreach. Due diligence review consists of three phases. First, the RTES office will review Funding Opportunity Announcements (FOAs) prior to their release to ensure proper language and allow the community to understand the role of due diligence review in the solicitation process. Second, after a proposal has completed peer review, it is reviewed by the RTES office for potential risk factors and risk mitigation. Third, throughout the life cycle of projects, additional risk mitigation may be warranted if changes occur in foreign access.

The RTES PWG is in the process of updating DOE FA policies, recently discussing the adoption of a single common NSF-stewarded disclosure form across agencies, as well as releasing a Conflict of Interest (COI) / Conflict of Commitment (COC) Notice of Proposed

Rulemaking (NOPR) in the Federal Register, which closed on August 19, 2024. SC is working closely with the RTES Office to ensure due diligence reviews maintain transparency and do not create undue burden on the community. SC continues to recommend universal disclosure forms for sources of support, positions, and appointments; use of the Science Experts Network Curriculum Vitae (SciENcv); and the adoption of digital persistent identifiers (PIDs) to reduce administrative burden. SC has announced the acceptance of interagency common formats for current and pending support and bio-sketches. SC supports recent actions emerging from interagency partners, such as the Department of Defense (DoD) and National Institutes of Health (NIH) Decision Matrices, the NSF Trusted Research Using Safeguards and Transparency (TRUST) Framework, and the continued development of the NSF Safeguarding the Entire Community of the U.S. Research Ecosystem (SECURE) Center.

The DOE uses the S&T Risk Matrix to manage risks at national labs associated with critical and emerging technologies that otherwise do not have control mechanisms. The Risk Matrix only applies to countries of concern (currently China, Russia, Iran, and North Korea) and to the guidance and management of certain activities at national labs (*e.g.*, foreign engagements, official travel, foreign national access). The Risk Matrix is divided into three categories: Green (emerging technology topics with no sensitivities to economic or national security); Yellow (emerging technology topics with potential for sensitivities, potentially requiring additional protective measures); and Red (economic or national security sensitive technology topics requiring additional protective measures). DOE updated the Risk Matrix in 2023 and will continue annual updates to ensure consistency with scientific and technological developments. An unlimited distribution S&T Risk Matrix has been developed and disseminated to the national labs, university partners, and sister science funding agencies. In addition, the DOE is working to update implementing orders related to RTES policy to meet statutory requirements.

Regarding interagency and community engagement, the DOE must coordinate its research security policy with partners, as well as increase public-facing engagements with leaders and membership of organizations such as the Federal Demonstration Partnership (FDP), the Council on Governmental Relations (COGR), the Association of American Universities (AAU), the Association of Public & Land-Grant Universities (APLU), and the Asian American and Native Hawaiian/Pacific Islander (AANHPI) research community.

Discussion

Tapia Takaki questioned why core research funding decreased in the budget, and whether core research must be "rebranded" into a new name to garner attention and emphasis. **Kung** replied that core research has been sacrificed due to overall budget constraints, since stronger support and advocacy is given for facility operations and construction projects. The overall topline budget for SC could be higher; the community could better communicate the consequences of not having robust support for core research. This could be a shared goal across all SC programs to advocate for core research by leveraging initiatives from AI/ML, QIS, and microelectronics, which are highly supported by Congress.

Scarlett asked how the disagreement in budget support for RENEW and FAIR initiatives between the FY 2025 House and the Senate marks will impact those programs. **Kung** remarked when there is a disagreement between House and Senate marks, new awards cannot be made until the final appropriation. However, a similar disagreement occurred for the FY 2024 budget, but funding was ultimately received for both RENEW and FAIR initiatives. Another challenge is the need to communicate to Congress that the goal of RENEW and FAIR is to broaden overall

participation, instead of enhancing participation by a specific gender or race/ethnicity, a common misconception about these initiatives.

Davoudi inquired about the RTES proposal review process, such as what occurs when problems are identified in a proposal and whether resubmission of such proposals are allowed, as well as how the RTES review will affect the timeline of scientific proposal review, especially if these two processes will be concurrent. **Kung** clarified there will be time added to the life cycle from submission to award, as the RTES review must be completed before an award can be made. Perception and understanding of risk will differ across different research departments, so education on risk is critical. The Program Office should engage early and often with the Sponsored Research Office to determine whether an item is a risk, whether additional information is needed to determine risk, and/or to discuss the mitigation process; transparency is key.

Perspectives from the National Science Foundation, Denise Caldwell, NSF OD Senior Advisor

Caldwell presented MPS staffing updates. David B. Berkowitz has been appointed Assistant Director for Mathematical and Physical Sciences, effective September 9, 2024. NSF is now hiring a new Division Director for Chemistry and a new Division Director for Astronomy.

There are various inputs to decision-making at NSF: acts of Congress (*e.g.*, Affordable Care Act [ACA], National Quantum Initiative [NQI], Creating Helpful Incentives to Produce Semiconductors [CHIPS] & Science Act); administration priorities (*e.g.*, climate change, biotechnology); National Academies of Sciences, Engineering, and Medicine (NASEM) studies (*e.g.*, Astro2020, decadal surveys, special topics); advisory committees (*e.g.*, NSAC, High Energy Physics Advisory Panel [HEPAP], Astronomy and Astrophysics Advisory Committee [AAAC], Mathematical Physical Sciences Advisory Committee [MPSAC]); workshop reports; new proposals and ideas from the community; and program director expertise.

The FY 2025 NSF budget request is $10.18B, with $1.68B requested for MPS. The FY 2025 NSF request is +$1.12B (11.0%) above the FY 2024 enacted budget. Overall, FY 2024 NSF appropriations resulted in a total of ~$9.06B, compared to the FY 2024 request of ~$11.3B. The FY 2025 NSF request is $8.05B for Research & Related Activities. For NSF construction projects, it is important to note that the Major Research Equipment & Facilities Construction budget line (MREFC) only pays for construction. Operations and management, design costs must come from the division in which the facility is housed. As facilities become more expensive in the future, those costs may take up a huge portion of the budget, impacting the extent to which research facilities can be supported.

The 2022-2026 NSF Strategic Plan has three pillars: (1) advancing the frontiers of research and innovation; (2) ensuring accessibility and inclusivity; and (3) being a leader in the global science and engineering (S&E) enterprise. The FY 2025 budget request reinterpreted the NSF pillars into three main investment opportunities: (1) strengthening the established NSF; (2) inspiring "Missing Millions," which aims to expand workforce capacity and inclusion; and (3) accelerating technology and innovation, a growing area of the NSF portfolio. Within these three NSF pillars, the FY 2025 budget request identified four major themes: (1) advance emerging industries for national and economic security; (2) build a resilient planet; (3) create opportunities everywhere; and (4) strengthen research infrastructure. Key emerging industries relevant to MPS include QIS, AI, and advanced manufacturing.

A primary focus at NSF is workforce development. The announcement of FY 2024 awardees from the Future of Semiconductors (FuSe) program is expected soon. FuSe comprises 24 research and education projects with a total investment of $45.6M in FY 2023, with Ericsson, IBM, Intel, and Samsung as partners. NSF has partnered with the Department of Commerce (DOC) to create a national network for microelectronics education; in particular, a coordination hub will oversee a suite of regional consortia to offer curricula, instructional materials, and experiential opportunities throughout U.S. institutions. This is an opportunity to focus and develop the workforce for fundamental S&E, as well as prepare talent for transitions to the commercial sector. A Request for Information (RFI) has been released, and a call for proposals is expected soon.

The NSF National Quantum Virtual Laboratory (NQVL) is an overarching shared infrastructure designed to facilitate the translation from basic S&E to the resultant technology. Using a co-design approach, NQVL aims to use fundamental knowledge and ideas from the QIS community to work with end users to develop prototyping phase application-oriented quantum technologies, which will increase convergence, translation, innovation, and partnership. NQVL aims to develop devices or new measurement techniques that utilize QIS and demonstrate a true quantum advantage. The first five pilot projects have been identified, and review for a second five projects is underway.

NSF supports several research institutes which focus on AI. The MPS National AI Research Institutes aim to accelerate research, transform society, and grow the U.S. workforce. The theme for Group 1 awards in FY 2024 is AI for Astronomical Sciences, jointly funded with the Simons Foundation, and will soon be announced. The theme for Group 2 awards in FY 2025 is AI for Discovery in Materials Research, jointly funded with Intel Corporation. The AI Research Institute for Fundamental Interactions will enable the development of novel AI approaches that incorporate principles from fundamental physics. In addition, the Molecule Maker Lab Institute (MMLI) is an AI institute in chemistry, focusing on molecular discovery, synthetic strategy, and efficient manufacturing.

NSF invests in sustainable chemistry in response to the 2021 National Defense Authorization Act (NDAA) and the 2022 CHIPS and Science Act. NSF works closely with the White House Office of Science and Technology Policy (OSTP) through its National Science and Technology Council (NSTC) Sustainable Chemistry Strategy Team, both through the core and center research programs, as well as through metaprograms and solicitations. NSF also supports the integration of sustainable chemistry into all levels of education and professional development.

The Critical Aspects of Sustainability (CAS) metaprogram, funded through the core program investment in sustainable chemistry, seeks to improve the sustainability of resources for future generations while maintaining or improving current products to offer technologically advanced, economically competitive, and environmentally benign materials to a global society. The CAS metaprogram includes an interdisciplinary, collaborative team of program officers from many directorates and divisions within NSF (*e.g.*, MPS, Engineering [ENG], Biological Sciences [BIO], Geosciences [GEO], and Technology, Innovation and Partnerships [TIP]).

Further regarding sustainable chemistry, NSF has a special funding call for the Molecular Foundations for Sustainability: Sustainable Polymers Enabled by Emerging Data Analytics (MFS-SPEED) program, which supports fundamental research enabling the accelerated discovery and ultimate manufacturing of sustainable polymers using state-of-the-art data science.

The MFS-SPEED program also seeks to enhance development of a cross-disciplinary workforce in polymer science, emphasizing the formation of partnerships domestically and internationally.

The MPS Missing Millions programs have established a number of special programs: Ascending Postdoctoral Research Fellowships (MPS-Ascend) (20 awards in FY 2024); Ascending Faculty Catalyst Awards (MPS-AFCA), which supports MPS-Ascend postdoctoral research fellows who transition into tenure-track faculty positions; Launching Early-Career Academic Pathways in MPS (LEAPS-MPS) (65 awards in FY 2024); and MPS partnerships programs, which support partnerships between minority serving institutions (MSIs) and MPS centers, institutes, and facilities. The announcement of FY 2024 awardees is soon expected.

NSF's budget theme is to strengthen research infrastructure and follows the NSTC's definition, such that Research and Development Infrastructure (RDI) is defined as "facilities or systems used by scientific and technical communities to conduct R&D or foster innovation." The NSF further promotes the concept that "RDI elements include experimental and observational infrastructure, knowledge infrastructure, and research cyberinfrastructure—all of which are integrated resources relied upon by our nation's R&D enterprise."

The Mid-scale Research Infrastructure (MsRI) programs support either design activities or implementation of unique and compelling research infrastructure (RI) projects. The MsRI-1 program consists of two tracks, Implementation or Design; individual awards range from $6M to <$20M, depending on project type, overall number of awards, and availability of funds. Implementation projects may include any combination of equipment, instrumentation, cyberinfrastructure, broadly used large-scale datasets, and the personnel needed to successfully commission the project. Design projects include the design efforts intended to lead to eventual implementation of a mid-scale class RI project. The MsRI-2 program targets larger-scale projects with total project costs (TPCs) beyond the MsRI-1 program limit; individual awards range from $20M to <$100M. The MsRI programs are NSF-wide and encompass all scientific disciplines, with solicitations published in alternate years. The MsRI programs are complemented by the Major Research Instrumentation (MRI) program, which funds <$4M, as well as NSF programs in the Divisions of Physics (PHY) and Astronomical Sciences (AST).

NSF, and in particular, MPS were assigned by Congress the responsibility of developing public ground-based astronomical telescopes. To meet this responsibility, NSF has developed a number of facilities that observe the radio, infrared, optical, and gravitational signals from astronomical phenomena. The NSF-DOE Vera C. Rubin Observatory is newly constructed in Chile and contains the largest camera ever built in the world to capture the faint light of distant brown dwarfs, which will facilitate understanding of the Milky Way's formation and evolution. Other MPS major facilities include the National High Magnetic Field Lab, as well as the ATLAS and CMS detectors at the Large Hadron Collider (LHC). The upgrade of those LHC detectors for high luminosity running continues.

Discussion

Lopez inquired whether NSF funding programs and opportunities would accept applications from non-tenure track faculty members (*e.g.*, research professors). **Caldwell** remarked these programs were developed with the expectation of awardees entering full tenure-track positions at universities that would support them. Such discussions involving tenure-track status of prospective applicants has not occurred.

Tapia Takaki asked whether statistics were available on the number of proposals submitted to the MRI programs within the scope of nuclear science, and whether NSF would

consider removing restrictions limiting the number of applications that can be submitted per institution. **Caldwell** replied the restrictions on application number exist to ensure manageability of the review workload. Regarding statistics on applications, NSF does not release information about declined proposals.

DOE Office of Nuclear Physics Overview, Linda Horton, DOE SC NP Acting Associate Director; Sharon Stephenson, NP-RD Director; Paul Mantica, NP-FD Director

Horton presented NP staffing updates.

FY 2024 NP funding ($804M) supports user facilities at ~90% optimal operation, with a modest increase in core research budget. The FY 2025 President's budget request (PBR) for NP (~$833M) is ~3.6% above FY 2024, with facility operations at >90%, increased support for the EIC, as well as increased support (+$23M) for AI/ML, RENEW, and FAIR; while overall research investment increased, core research (i.e., research not associated with initiatives) decreased (~$17M). The FY 2025 House mark is consistent with the FY 2025 PBR, while the Senate mark exceeds the request (+$20M), including +$25M for the EIC.

The FY 2025 House mark includes no less than $105M for FRIB operations, no less than $150M for the Continuous Electron Beam Accelerator Facility (CEBAF) operations, and $15M for the High Rigidity Spectrometer (HRS). The House mark also supports SC initiatives including AI / ML, QIS, the Established Program to Stimulate Competitive Research Implementation Grants (EPSCoR), and Microelectronics. From the FY 2025 Senate mark, NP is directed to give priority to optimizing operations for all NP user facilities, including the Relativistic Heavy Ion Collider (RHIC), CEBAF, FRIB, and the Argonne Tandem Linac Accelerator System (ATLAS). The Senate recommendation includes $2.85M for other EIC project costs and also supports SC initiatives including AI/ML, QIS, RENEW, FAIR, EPSCoR, Microelectronics, and the Accelerate Innovations in Emerging Technologies (Accelerate) initiative.

Regarding the budget timeline for FY 2024-26, NP is formulating the FY 2026 budget, is awaiting final appropriation for the FY 2025 budget, and is closing out FY 2024. During any given FY, program offices concurrently manage at least 3 budget cycles. For FY 2026, the appropriation path begins with the SC receiving guidance and input from DOE for initial budget planning, followed by discussions with and feedback from the Office of Management and Budget (OMB) to justify and modify the request. Discussions for FY 2026 will continue into calendar year 2025, likely extended due to the presidential election, after which the PBR is released and then reviewed by Congress to produce the House and Senate marks.

Stephenson provided an overview of FY 2024 funding opportunities and national lab calls: the Early Career Research Program (ECRP), which provided 12 awards for a total of $14.85M for NP; the EPSCoR State-Lab Grants, which provided 4 awards for a total of $2.8M; the Nuclear Data Interagency Working Group (NDIAWG) Research Program, which provided NP researchers with 4 awards for a total of $1M; the Research and Development for Next Generation Nuclear Physics Accelerator Facilities, which provided 10 awards for a total of ~$2.7M (plus ~$2.4M in FY 2025 funds); FAIR, which will announce awards in Fall 2024 and provides ~$2M to NP researchers; and RENEW, which will announce awards in Fall 2024 and provides ~$6M to NP researchers.

Starting FY 2025, FOAs will instead be described as Notices of Funding Opportunities (NOFOs), to be consistent with funding language used in other agencies and departments. Release dates for the majority of FY 2025 NOFOs are yet to be determined (TBD), including:

ECRP; EPSCoR State-Lab Grants; NDIAWG Research Program; and the AI / ML Applied to Nuclear S&T Program. The Continuation of Solicitation for the SC FA Program will release around October 1, 2024.

Regarding research highlights, Oklahoma recently became another EPSCoR state with NP-funded research. Lawrence Berkeley National Laboratory (LBNL) published a paper in September 2024 on the first reported production of the superheavy element, livermorium using a titanium-50 beam.

The DOE SC Roundtables on Transformational Science Enabled by AI will take place on October 28-31 and November 7-8, 2024. The roundtables will explore science questions that can be addressed by AI/ML and complements the focus of the Advanced Scientific Computing Research (ASCR) program's AI workshops. The roundtables will encompass six categories: (1) high energy & nuclear physics; (2) biosciences & environmental sciences; (3) materials & chemical sciences; (4) fabrication science; (5) fundamental energy research; and (6) user facility science and operations. Roundtable participants will identify Priority Research Opportunities (PROs) for using AI capabilities to address the top challenges associated with the different scientific themes. NP will participate in roundtables 1,4, and 6. A public report will be created from each roundtable.

Mantica provided an update and overview on NP facilities and projects. NP operates four world-leading user facilities for community research and scientific leadership: RHIC, CEBAF, ATLAS, and FRIB. The Gamma-Ray Energy Tracking In-beam Nuclear Array (GRETINA) was moved from FRIB to ATLAS earlier in 2024. RHIC plans to operate for 25 weeks in FY 2024 and focus on proton-proton collision data for the super Pioneering High Energy Nuclear Interaction Experiment (sPHENIX) and the Solenoidal Tracker at RHIC (STAR) detector, with three weeks devoted to Au+Au data at the end of Run 24. CEBAF operated for 30 weeks in FY 2024, scheduling three additional weeks beyond what was originally planned to complete experiments in Hall A. ATLAS plans to run 39 weeks in FY 2024 and a GRETINA campaign is underway. The neutron-generator-based Californium Rare Isotope Breeder Upgrade (nuCARIBU) driver cyclotron passed site acceptance tests. Overall, FRIB operated for 24 weeks in FY 2024 at 10 kilowatts (kW) and demonstrated 20 kW capability at the end of the run period.

Based on the FY 2025 PBR, all NP user facilities are expected to operate at ~90% (consistent with FY 2024), with RHIC operating 22 weeks at 95% optimal operation; CEBAF operating 25 weeks at 89% optimal operation; ATLAS operating 40 weeks at 90% optimal operation; and FRIB operating 26 weeks at 90% optimal operation. The FY 2025 PBR allocates a total estimated cost (TEC) of $110M for the EIC, $2M for Ton-Scale Neutrinoless Double Beta Decay (TS-NLDBD), and $3.3M for HRS. The Gamma Ray Energy Tracking Array (GRETA) and Measurement of Lepton-Lepton Electroweak Reactions (MOLLER) were fully funded in the FY 2023 enacted budget, so no new funding is requested.

The EIC remains the highest priority for new facility construction, with the aim of expedient completion, as identified in the Long Range Plan (LRP). The EIC will be the most advanced accelerator in the world and the only new collider built for decades, contributing to maintaining U.S. leadership in accelerator physics. In March 2024, the EIC received Critical Decision-3A (CD-3A) approval to execute ~$90M of long lead procurements to reduce technical risk. The EIC project continues to support preliminary engineering and design and is pursuing additional long lead procurements, CD-3B followed by CD-2. The EIC project has an international user group of ~1,500, representing ~290 institutions across 40 countries, and envisions international in-kind contributions of ~$100M to the EIC detector and ~$50M to the

accelerator. The EIC Advisory Board and EIC Resource Review Board (RRB) facilitate international collaboration and coordinate in-kind contributions.

The TS-NLDBD program was identified by the LRP as the highest priority for new experimental construction. Three proposed technologies to realize the discovery of NLDBD have been funded with a total of ~$20M since 2020: the Cryogenic Underground Observatory for Rare Events with Particle Identification (CUPID), the Large Enriched Germanium Experiment for NLDBD (LEGEND-1000), and the next Enriched Xenon Observatory (nEXO). A working group has been charged with defining an organizational framework for a Virtual Global DBD Observatory. A third DBD international summit is being planned for Spring 2025. Planned CD-1 reviews for TS projects were postponed, awaiting outcome of the SC Project Prioritization exercise, which should be completed in October 2024 [*update: by the end of CY 2024*]. Significant investment and collaboration from international partners remain critical for success.

Regarding the status of other Major Items of Equipment (MIE) projects, GRETA is fully funded, with CD-4A forecasted for Q3 FY 2025. MOLLER is fully funded and achieved CD-2/3 in May 2024. HRS will have an independent project review for a high-transmission beamline in October 2024, with the subproject CD-2/3 forecasted for Q1 FY 2025. Several international engagement activities have occurred recently, and forthcoming is the EIC RRB at Brookhaven National Laboratory (BNL), to be held on November 12-13, 2024.

Former SC Director Asmeret Asefaw Berhe charged NSAC with forming a subcommittee to assess which new or upgraded NP facilities would best serve NP needs. The subcommittee evaluated the facilities' potential to contribute to world-leading science in the next decade, as well as their construction readiness, completing assessments in May 2024. Overall, the EIC and TS-NLDBD were determined to be of "absolutely central" scientific importance and were "ready to initiate" in terms of construction readiness. The HRS, FRIB Energy Upgrade (FRIB400), and Solenoid Large Intensity Device (SoLID) were deemed scientifically "important" and "ready to initiate" construction. Project 8 and the EIC Detector II were deemed scientifically "important," but having "mission and technical requirements not yet fully defined" to be construction ready.

Horton reviewed the NP LRP, which capitalizes on the opportunities for scientific discovery made possible by substantial and sustained investments of the U.S. The 2023 LRP provided an excellent opportunity to educate stakeholders through multiple community organized events. Implementing the aspirations of the 2023 LRP will need to account for budget realities, and an appropriate balance among core research, operations, projects, and initiatives must be realized.

Discussion

Davoudi asked how much of the budgets targeting AI/ML, QIS, and other initiatives were dedicated to NP programs, as well as how discussions and negotiations within the SC informed those budgets. **Horton** replied those budget numbers are available, such as in the annual solicitation, but were not shown in this presentation. Community reports and workshops, such as roundtables, can inform budget distributions, as well as the specific language used to describe initiatives.

Howell inquired about ways to impact the final outcome of a proposed budget for a cycle year, especially if a line item is zeroed out in the House or Senate marks. **Horton** replied if a line item is zeroed out in the House or Senate marks, the final decision depends on whether a compromise or the appropriation is made. Universities and national labs often try to influence the

budget process by advocating for support. Congressional hearings may be held for such discussions.

de Gouvêa requested more clarification on the decision to postpone TS CD-1 and the lack of development of a new timescale. **Horton** replied that the decision was driven by budget realities and the necessity to balance concurrent, competing priorities. Additionally, time is needed to understand the outyear and the best path forward, before decisions can be made.

NSF Nuclear Physics Overview, Senta (Vicki) Greene, NSF Experimental Nuclear Physics Program Director

Greene presented MPS PHY staffing updates; Senta (Vicki) Greene is Program Director of ENP.

Regarding the FY 2024 budget, ~$9.03B was requested for Research & Related Activities, with House and Senate marks at $7.87B and $7.61B, respectively. Regarding FY 2024 appropriations, final budget allocations for NSF overall, Research & Related Activities, STEM Education, and Agency Operations & Award Management all decreased from the prior year, except for MRE & Facilities Construction, which increased from $187M to $234M. Compared to the FY 2025 President's total budget request for NSF ($10.18B), the House and Senate marks were lower at $9.26B and $9.55B, respectively. Under the FY 2025 President's budget request, NSF requested $8.05B for Research & Related Activities, with NSF budgetary resources totaling $10.41B. Regarding the PHY budget, the FY 2025 request represents a 1.4% increase from the FY 2023 base plan (from $308.65M to $312.90M).

The Early Faculty Career Development Program (CAREER) provides awards in support of early-career faculty with the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization. To be eligible, an applicant must be an untenured assistant professor in a position that is at least 50% tenure-track.

The MRI (Major Research Instrumentation) program consists of three tracks: Track 1 provides from $100k up to $1.4M and a maximum of two proposals per university is allowed; Track 2 provides from $1.4M up to $4M and one proposal per university is allowed; and Track 3 involves acquisition, development, installation, operation, and maintenance of equipment and instrumentation to reduce consumption of helium for a single proposal per university. Individuals may apply between October 15 to November 15, 2024.

The Physics Mid-Scale Instrumentation program supports design and construction or acquisition of instrumentation and funds projects at ~$4M-$20M. Currently there exist three Mid-Scale projects in the PHY Nuclear Physics - Experiment (ENP) program: Beam Lifetime 3 (BL3), LEGEND-200, and MOLLER.

For the PHY funding opportunity, Investigator-Initiated Research Projects, proposals must conform to the NSF Proposal & Award Policies & Procedures Guide (PAPPG), which has updated instructions regarding current and pending support as well as biographical sketches of senior personnel. The deadline to apply is December 10, 2024.

NSF and DOE coordinate together in NP projects, such as MOLLER, EIC, and NLDBD. However, NSF differs from DOE in that it responds to proposals instead of LRP priorities, assessing the individual intellectual merit and broader impacts of each proposal. There is no guarantee of NSF participation in future mission-driven DOE projects.

Selected highlights include a CAREER-funded physics summer camp for students with autism spectrum disorder, an experiment from FRIB advancing nuclear equation-of-state

research, undergraduate student travel to the LHC to study relativistic heavy-ion collisions, promising preliminary data from the MUon proton Scattering Experiment (MUSE), and the future possibilities of nuclear clocks, which open a new world of precise nuclear spectroscopy.

Discussion

Tapia Takaki noted a funding opportunity not well-utilized by the nuclear physics community, known as the Science and Technology Centers: Integrative Partnerships (NSF 24-594).

Public Comment

John Wilkerson (Professor, University of North Carolina at Chapel Hill) highlighted the need for the nuclear science community to better advocate their research and communicate goals to agencies and Congress.

Giorgio Gratta (Professor, Stanford University) agreed the community can better advertise their science. The U.S. does not have a good record of transforming ideas into action, particularly within the context of TS-NLDBD. In the past, despite initial discoveries and ideas originating in the U.S., actual experiments ended up taking place in foreign countries.

Results from the Facility for Rare Isotope Beams, Alexandra Gade, FRIB Scientific Director

Gade remarked FRIB is the newest DOE SC user facility. Since commencing user operations in May 2022, FRIB has been ramping up capabilities every year. FRIB has surpassed the Radioactive Isotope Beam Factory (RIBF) / RIKEN as the most powerful rare isotope beam facility in the world. FRIB's user community has ~1,800 members and beam time is oversubscribed at a ratio of 3:1.

FRIB's science is interdisciplinary and features a scientifically diverse community with skills straddling nuclear physics, atomic, molecular, and optical (AMO) physics, radiochemistry, computational quantum chemistry, and nuclear many-body theory. FRIB results come from various experimental schemes, ranging from decay studies to in-beam spectroscopy and precision measurements. Various exploratory efforts are underway, aspiring different radioactive molecules and trapping approaches, ranging from Penning traps to capturing candidate nuclei in a solid noble-gas matrix.

FRIB responds to national priorities and enables answers to fundamental questions posed by the LRP, such as the limits of nuclear existence, the nature of the nuclear force, and the nuclear processes that drive the birth, life, and death of stars. FRIB's isotopes may help explain the existence of more matter than anti-matter in the universe. FRIB's fundamental symmetry program will use rare isotopes to search for physics beyond the Standard Model.

FRIB prepares the U.S. for rare new element discovery. Recent highlights from FRIB include the discovery of five never-before-seen isotopes of the element's thulium, ytterbium, and lutetium. In July 2024, four additional new isotopes, the heaviest of their respective elements (vanadium, titanium, scandium, and calcium), were produced, separated, and identified for the first time.

Research at FRIB can inform the next generation of nuclear models. FRIB opportunities in nucleosynthesis and neutron-star physics have been featured in the 2023 LRP. FRIB has begun to address all astrophysical processes that involve short-lived rare isotopes, including reaction rates for X-ray bursts and neutron star crust processes. FRIB also plays a key role in multi-messenger nuclear astrophysics.

Isotope harvesting at FRIB will provide candidate isotopes that can be used for fundamental symmetry studies, as well as presenting an opportunity to recover unused beam fragments for future use through commensal harvesting. The DOE Isotope Program (IP) and Michigan State University (MSU) have invested in isotope harvesting, new faculty, and workforce development. Experiments with the dedicated harvester are awaiting scheduling. Following a request by former DOE SC Deputy Director, Stephen Binkley, MSU has established a for-fee chip-testing facility (FSEE) based on the FRIB linear accelerator, serving government and industry.

Future aspirations are well-defined and community-supported, specifically involving HRS and FRIB400. HRS would extend the reach of reaction experiments to the most neutron-rich isotopes through a combined production-rate and luminosity increase of up to a factor of 100. HRS will host GRETA and anticipates a user community of 500+. The HRS high-transmission beam line subproject has its CD-2/3 independent project review scheduled for October 2024.

FRIB400 would double the energy of the FRIB accelerator to: (1) enable significant gains in isotope yields; (2) create dense nuclear matter of up to twice the saturation density, critical for multi-messenger astrophysics; (3) provide up to two-orders-of-magnitude increase in luminosity for spectroscopy in key regions of the nuclear chart; and (4) expand the scientific impact of harvested isotopes by increasing available yield by 10 times.

Discussion

Sammarruca inquired about the theoretical support received by FRIB experimentalists, in pursuit of understanding nuclear force. **Gade** replied FRIB has a vibrant program in nuclear theory, which spans nuclear structure theory. The FRIB Theory Alliance is a DOE NP funded effort to foster the connections between experimentalists and theorists. Theory is the motivation behind experiments at FRIB; the work of experimentalists is important for theorists, and vice versa.

Cloet asked about the role of strangeness and quark stars in the equation of state for nuclei. **Gade** replied what strangeness does in the nucleus has a strong connection with the equation of state because strangeness may play a role in the core of neutron stars. This topic is actively being discussed at FRIB and TJNAF.

EIC: Communicating the Science, Maria Żurek, ANL Assistant Physicist; Richard Milner, MIT Professor; Rolf Ent, TJNAF EIC Co-Associate Director

Zurek remarked imaging, especially microscopy, is key to understanding the subatomic world. Through high-energy electron-ion collisions, the EIC will revolutionize our understanding of the fundamental structure of matter. The EIC will uncover the hidden, three-dimensional (3D) structure of protons and nuclei with precision and provide the first ever 3D images of gluons inside protons, using special reactions that keep the proton intact and produce a quark-antiquark bound state. With its ability to collide electrons and protons at various spin orientations, the EIC will be crucial in unraveling the mystery of the origin of the proton spin. The EIC will probe the unexplored dense gluon environments using heavy ion beams, potentially unveiling new states of matter and deepening our understanding of quantum chromodynamics (QCD).

Ent remarked visualization is essential to communicate nuclear science, given the counterintuitive and complex nature of nuclear matter. Artistic visualization of proton structure, while not entirely scientifically accurate, facilitates understanding of the three main dynamics of

quarks. Regarding visualizing nuclei structure, a collaborative effort across TJNAF, MIT, and Sputnik Animation has created animations of the size, shape, and motion in nuclei. A short movie, "Visualizing the Nucleus," will be released at the APS Division of Nuclear Physics (DNP) Fall 2024 meeting. Next goals include the development of quark-gluon-based animations of nuclear binding, short-range correlations, exotic gluon, and saturation, as well as a series of one-minute video clips to explain basic nuclear phenomena and contemporary nuclear science research. The team's visualizations have had a positive impact, having been featured at the Summer 2022 MIT Research Science Institute and on Public Broadcasting Service (PBS) Space Time, among other platforms.

Based on the 2023 LRP, the nuclear science enterprise would benefit from a coordinated outreach effort, which would share best practices and new ideas, reduce the overhead required to develop and adopt new outreach tools, connect with established science communications, and enable a more unified message. A Nuclear Science Communication Alliance has been proposed, to be governed by universities active in nuclear science research and closely tied to the national labs. The mission of the Alliance is to increase public awareness of U.S. nuclear science goals, opportunities, and societal benefits, focusing on unifying separate outreach efforts across the country to forge a powerful national resource available to all nuclear scientists.

Discussion

Sammarruca asked if an estimated scale exists for the extreme densities at which gluon multiplication stops. **Żurek** replied the density number of gluons per unit of the Parton momentum fraction can be calculated from the presented plot.

Wiefeldt asked if the visualizations are available on TikTok. **Ent** replied they have yet to make the visualizations available on social media platforms such as TikTok but aim to do so in the future. Short clips, ranging from 30 seconds to one minute, must be created for those platforms.

Calderón de la Barca Sánchez commented the European Council for Nuclear Research (CERN) has an artist-in-residence program, and something similar could be established across the national labs. NSF has the Advancing Informal STEM Learning (AISL) program, which is another way to connect artists and animators with scientists. **Ent** replied MSU has an artist-in-residence program supported by the university. Previous submissions to programs like AISL have received poor reviews, since reviewers assumed such educational outreach already existed and did not need further investment. **Aidala** commented Fermi National Accelerator Laboratory (Fermilab) has had an artist-in-residence program since 2014.

Davoudi inquired about the kind of data and scientific input that were used to demonstrate real-time motions and dynamics inside the nucleus, and to what extent the dynamics were based on artistic impressions. **Ent** replied the protons and neutrons were designed to move separately, and random stirring effects were used to move them at roughly the accurate speed, but scientific accuracy of these visualizations remains a challenge.

Tapia Takaki hoped to see substantial efforts to create this coordination of nuclear science outreach mentioned in the 2023 LRP, whether through applying to NSF funding opportunities or leveraging the expertise of the National Aeronautics and Space Administration (NASA) to learn best practices. **Dodge** remarked this coordination effort is necessary, such as the development of an outreach center similar to NASA's.

Lee commented the APS DNP would be interested in working with Milner and Ent to create similar visualizations targeting physicists outside nuclear science. **Dodge** noted the

community must be cognizant of the different audiences in science communication and outreach (*i.e.*, scientists outside nuclear science; physicists outside nuclear physics; the general public; OMB; Congress, etc.).

Horton commented on the distinction between communicating science and communicating the importance of science, the latter of which is critical in outreach. Audiences may become interested in science upon learning its larger impacts to society. The EIC website could be improved to better communicate scientific impact. **Dodge** agreed with Horton and noted articulating to Congress and OMB the impact and applications of nuclear science would strengthen future funding prospects. **Lee** noted the importance of communicating the need for fundamental science, as well as the connection of nuclear science to other fields.

Tapia Takaki noted airports often showcase art; the Washington, DC airport features a large artistic panel on the NASA James Webb Space Telescope (JWST). A similar feature on FRIB could be advertised at the Detroit airport, which would require a coordinated effort. **Ilieva** commented the Nuclear Science Communication Alliance needs to be implemented as soon as possible, which can develop a long-term outreach vision overseen by full-time professional(s). Since different target audiences exist, outreach must incorporate different messages, objectives, questions, and languages.

Sammarruca noted challenges for the average student, taxpayer, and Congressperson to understand the present necessity of nuclear science, when a worthwhile technical application may come 50 to 100 years in the future. It must be communicated if the nuclear science community stops fundamental research, then decades from now, society will not have ideas for technological advancement. **Aidala** added it can be valuable to discuss historical examples with a government audience to facilitate understanding of future applications for basic science research. For example, proton spin was first discovered in the 1920s and is now widely implemented in magnetic resonance imaging (MRI).

Davoudi commented on the importance of workforce development in nuclear science, amidst competition with other STEM disciplines. Young students should be made aware that by studying nuclear science, they will gain cutting-edge skills in advanced technology relevant to a wide spectrum of industries and disciplines. **Chipps** remarked the nuclear science community keeps track of workforce statistics, so the community understands their impact across other fields.

Dodge noted the astrophysics community does not focus on communicating their impact and applications, but the general public remains interested in their science. **Horton** agreed NASA remains popular because the general public finds the nature of their science to be fascinating. The nuclear science community needs to improve its message on why our research is interesting and important.

Lopez commented young students, and the general public are attracted by NASA's flashy and attractive media but can misunderstand the reality of astrophysics and astronomy research and what it means to be a scientist. This is a multi-dimensional problem, and the nuclear science community needs to focus on accurately communicating our science.

Neutrinoless Double Beta Decay: Communicating the Science, Vincenzo Cirigliano, University of Washington Professor

Cirigliano remarked the search for NLDBD is one of the most compelling challenges in contemporary physics. The observation of NLDBD would demonstrate matter creation and point to an explanation of the matter-antimatter asymmetry in the universe, as well as demonstrate the

neutrino is its own anti-particle and point to a new means for the generation of mass. The TS-NLDBD was highlighted in the 2003 "Facilities for the Future of Science" report; was recommended as a high priority in the 2004 APS multidivisional study, "The Neutrino Matrix"; was mentioned in the 2007 LRP; and was featured as a major recommendation in the 2015 and 2023 LRPs. Capitalizing on investment, technology, and workforce development over the years, the U.S. is in position to lead an international effort to address this exciting science.

Ongoing experiments and technology demonstrators have proven the principles required for successful NLDBD searches at the TS. The international TS program consists of three experiments using different isotopes and experimental technologies: CUPID, LEGEND-1000, and nEXO. The three experiments have undergone a DOE portfolio review and are ready to start construction with simultaneous deployment, given the long timeframe for construction and operations. Multiple experiments with different isotopes, backgrounds, and detector systematics are needed to confirm a discovery.

Science communication of NLDBD should be built around three key elements: (1) the neutrino and its mysteries; (2) the cosmic mystery of the Big Bang; and (3) the "matter-creating" nuclear process. An effective communication campaign should connect NLDBD to fundamental scientific questions and multidisciplinary impact; address the "cool factor" of low-background science, such as working in underground laboratories with ultra-pure materials; and address positive societal impacts, including technology spinoffs, national security, and workforce development in basic science. Such a campaign will require significant contributions from communication experts.

Channels for communicating NLDBD include conferences and workshops, white papers, LRPs, and Capitol Hill Day. Resources for communicating NLDBD include NSAC, the APS DNP, the DNP funding committee, LRP town halls, and Snowmass meetings. Public lectures are typically successful broad efforts, while YouTube and the global web contain many resources, but none of these efforts are coordinated. Coordination is challenging because the NLDBD program is not represented by a single institution, but there are existing pledges of support by multiple lead institutions. The community will be surveyed to identify existing efforts as a step towards a more coherent outreach program in the future. Next steps also include consideration of the type of model upon which to base this outreach program.

Discussion

Lee asked which foreign countries would be next in line to complete the NLDBD experiment, if the U.S. lost the opportunity to lead. **Cirigliano** replied the Italian National Institute for Nuclear Physics (INFN) would likely take the lead on NLDBD, since INFN is the U.S.'s main partner and is currently hosting CUPID and LEGEND-200. Italy would most likely partner with Germany, thereby moving NLDBD operations to Europe. China could also potentially take a lead role.

Cirigliano commented NASA invests 10-15% of their budget for the JWST into communications. One benefit of having a centralized nuclear science communications program is budget subsidization. **Calderón de la Barca Sánchez** asked how the JWST communications budget is funded. A **meeting attendee** replied Charles Mattias ("Matt") Mountain formerly managed the JWST communications and may be a source of lessons learned. An article by APS discussed how JWST was overbudget and focused on leveraging efforts in communications to avoid cancellation.

Lopez commented the NSF has some funding opportunities for informal education and dissemination of science (*i.e.*, AISL program), as well as the APS. **Lee** noted such funds are very limited, and the AISL program is highly education-oriented, with a successful proposal likely requiring partnerships with specific specialists, based on past experience with unsuccessful applications.

Ilieva asked how DOE NP envisions its role in supporting efforts to create a "comprehensive and coherent communication plan" across NP. **Horton** replied the purpose of this meeting is for the community to gather information and develop ideas.

Cirigliano asked if DOE would accept a funding proposal with a large communications budget. **Horton** replied many user facilities have personnel dedicated to communications. Some but not all projects have communication expert(s), depending on the size and type of project, the goal of communications for that project, and the best use of limited funding.

Dodge inquired if RENEW or FAIR funds could be reprogrammed to consider efforts in communications, which fall into the category of workforce expansion. **Horton** replied neither initiative could be reprogrammed.

Grinyer noted the lack of official training in science communication for students. Rather than embedding communications experts in projects, which can be costly, all scientists by default could already have been trained during university. **Aidala** commented that some universities have science communication programs, but it can be rare or optional, and ultimately not widely utilized by students. **Lee** commented that outreach activities can also serve as science communication training. For example, undergraduate and graduate students working at FRIB discuss their research with elementary school to high school students through outreach.

Facilities and Project Management Division Committee of Visitors (COV)–Presentation of Charge, Paul Mantica, FD Director

Mantica remarked NSAC was charged on August 19, 2024, to assemble a COV to assess the FD of the NP. NSAC will use the COV to assess the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document proposal actions and monitor active projects and programs for the DOE laboratories and universities. The typical COV review cycle is once every three to five years, with NP last reviewed in 2019. Each COV is composed of a group of recognized scientists and research program managers with broad expertise in the designated program areas and familiarity with DOE research programs. FD stands ready to support NSAC and the COV panel in addressing this charge.

The COV will assess operations of the FD between FY19-24. The COV may examine any files from this period for all actions administered by the FD, including funding at national laboratories and universities. The COV should evaluate the following: (a) the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document application, proposal, and award actions; (b) the efficacy and quality of the processes to monitor facility operations and active projects; and (c) the quality of the resulting portfolio, including its breadth and depth and its national and international standing. The COV should also comment upon progress made towards action items from the previous COV review. Results from the COV review should be documented in a report submitted to NSAC for consideration during the Fall 2025 meeting.

In 2019, the COV made five recommendations to NP, which have been addressed. First, regarding the vacant Research Division Director position, Sharon Stephenson has taken over this role, effective January 2024. Second, regarding the development of an office succession plan by

NP leadership, NP is fully staffed for the first time in ~15 years, with detail and Intergovernmental Personnel Act (IPA) positions being leveraged to manage succession planning. Well-defined processes have mitigated staff transitions. Third, regarding hiring of an additional scientist to support the nuclear theory program, one full-time program manager currently supports this program, with backup support from two other program managers. Additionally, a program manager for nuclear physics computing was hired, supporting the theory topical collaborations and the Scientific Discovery through Advanced Computing (SciDAC) program. Fourth, regarding the recommendation to increase diversity and inclusion in the community, RENEW and FAIR programs are enhancing these efforts. Fifth, regarding the recommendation to maintain strong relationships across the community, NP continues to work constructively with NSAC, most recently demonstrated through the 2023 LRP.

Regarding approximate annual funding and scope within FD, facility operations are funded at ~$400M across four SC user facilities: ATLAS, CEBAF, FRIB, and RHIC. Projects are funded at a total of ~$100M, with the EIC as one line-item construction project and four MIEs: GRETA, HRS, MOLLER, and TS-NLDBD. Advance Technology R&D is funded at ~$12M, which includes AI/ML and Accelerator R&D initiatives, both managed through biennial targeted funding opportunities. Industrial Concepts is funded at ~$10M, with Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR) managed through annual funding opportunities (Phase I and Phase II). Microelectronics is managed through laboratory field work proposals (FWPs), and EIC-related Generic Detector R&D is managed through the open call. Although international engagement and outreach is not included in the budget, they remain an important focus.

Discussion

Wietfeldt asked whether a perceived issue existed between DOE and the nuclear physics community via NSAC, given the fifth recommendation in the 2019 COV report, and if so, whether that issue has been resolved. **Mantica** suggested reviewing the 2019 COV report to better understand potential context or discussing the report with NSAC members with longer tenures. The COV's fifth recommendation may possibly stem from the 2019 Executive Order to review the efficacy of FACA committees, which had also suggested reducing the number of committees by one-third.

Lopez asked whether the COV subcommittee will consist of NSAC members or external individuals. **Dodge** replied the COV subcommittee will consist of a mixture of NSAC members and external individuals. However, NSAC will make a final decision on the COV report. Suggestions for potential candidates for the COV subcommittee, including self-nominations, are welcomed.

Tapia Takaki asked whether NSAC will have an opportunity to discuss and provide feedback before the COV report is finalized. **Dodge** replied the COV subcommittee will write the report, but NSAC will have sufficient time to read and provide questions and comments, before deciding to accept or reject the report. The COV report should be ready to review at least two weeks before the decision is due. In the past, the process began with NP providing substantial information to the COV subcommittee, who then reviewed the information to develop a set of questions. At the in-person meeting, the subcommittee discussed those questions with NP program managers. A final report from these discussions is then created offline. **Ruan** asked if the initial materials and information provided to the COV subcommittee would be made available to NSAC, to which **Dodge** replied no.

Aidala asked whether foreigners could serve on the COV subcommittee. **Dodge** was uncertain, but mentioned individuals who serve on the COV panel can still receive DOE funding. However, COV panel members cannot investigate matters related to their own work due to COI. **Horton** noted the COV subcommittee would not be reviewing the SBIR program for DOE.

Tapia Takaki commented the full funding rule by Congress is a burden to the community and funding agencies. Creative thinking is needed to improve the relationship between the community and funding agencies. **Horton** replied the limit for the full funding rule is $1.25M for FY 2024 and will be increased to $1.5M for FY 2025. NP will meet to discuss the implications of continuing to increase this limit in September 2024. **Mantica** noted all university awards for the AI/ML and Accelerator R&D two-year targeted FOAs have been fully funded in the past. From the FD's perspective, the full funding rule may not have much impact.

Stephenson noted the DOE EPSCoR NOFO was released on September 12, 2024; an informational webinar is scheduled for September 26, 2024.

Public Comment

Sanjay Reddy (Professor, University of Washington) inquired about the expected DOE NP budget for nuclear theory in FY 2025. Despite NSAC and the LRP highlighting the need for investments in nuclear theory, significant funding cuts to theory research groups have recently occurred. **Horton** replied none of the FY 2025 budgets have been determined.

Maria Chamizo Llatas (Director of the Detector Project Office, BNL) shared a fact sheet[1] which explains the impact and benefits of EIC to other fields using language that targets the general public.

Andrea Pocar (Professor, University of Massachusetts at Amherst) commented on the importance of minimizing delays in NLDBD progress from a workforce perspective. Over the last decade, NLDBD has continued to attract junior talent and the development of cutting-edge ideas, now pushing beyond TS. Delays risk the evaporation of this workforce.

Julieta Gruszko (Assistant Professor, University of North Carolina at Chapel Hill) commented on the distinction between communicating science and broader impacts to the general public versus to Congress. While the general public may be interested in understanding the universe, Congress may be interested in defense applications or technology development. This is a multi-pronged effort, in which the community must consider different messages to different audiences.

Abhay Deshpande (Associate Laboratory Director of Nuclear and Particle Physics, BNL) noted the value of science communication differs depending on the target audience. Since the community is facing issues with funding large projects, the immediate focus should be communicating the importance of nuclear science to Congress. The Alan Alda Center for Communicating Science at Stony Brook University is a great nationwide resource for universities and departments.

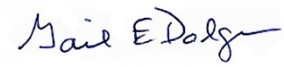
A **meeting attendee** inquired about the scientific interpretation of non-observation of NLDBD by the TS experiments, if such is the result ultimately achieved. **Cirigliano** replied given the multi-dependent state of the experiment, it is difficult to make a conclusion about a non-result, which must be evaluated in the context of other observations. A non-result would not conclude the neutrino is a Dirac particle.

[1] https://www.bnl.gov/eic/docs/eic-fact-sheet.pdf

A **meeting attendee** asked about the metrics used by the SC in the optimization and prioritization process of their facilities, given the complex parameters involved. No response was provided as the prioritization process in not complete.

Dodge *adjourned the meeting at 4:57 p.m. ET.*

The minutes of the U.S. Department of Energy and the National Science Foundation/Nuclear Science Advisory Committee meeting, held on September 12, 2024, via hybrid are certified to be an accurate representation of what occurred.



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Gail Dodge
NSAC Chair
Date: 1/3/2025