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

PUBLIC MEETING MINUTES

Hybrid Meeting
March 7, 2023

NUCLEAR SCIENCE ADVISORY COMMITTEE
SUMMARY OF MEETING

The U.S. Department of Energy (DOE) and National Science Foundation (NSF) Nuclear Science Advisory Committee (NSAC) hybrid meeting was convened at 9:00 a.m. Eastern Time on Tuesday, March 7, 2023, via Zoom® and at the Hilton Washington DC/ Rockville Hotel (Rockville, Maryland) by **Committee Chair Gail Dodge**. The meeting was open to the public and conducted in accordance with Federal Advisory Committee Act (FACA) requirements. Visit http://science.energy.gov for more information about NSAC.

NSAC Members Present

Gail Dodge (Chair)
Christine Aidala
Sonia Bacca (virtual)
Paulo Bedaque
Lee Bernstein
Kelly Chipps (virtual)
Ian Cloet
Andre Luiz de Gouvea (virtual)
Romualdo deSouza (virtual)
Evangeline Downie
Senta Victoria Greene (*ex officio*)
Austin Harton
Calvin Howell
Yordanka Ilieva (virtual)
Oliver Kester (virtual)
Joshua Klein
Jorge Lopez
Cecilia Lunardini
Rosi Reed
Lijuan Ruan
Carol Scarlett
Daniel Tapia Takaki
Derek Teaney
Nathalie Wall (*ex officio*)
Fred Wietfeldt
Richard Wilson (*ex officio*)

NSAC Members Absent

Haiyan Gao (*ex officio*)

NSAC Designated Federal Officer

Timothy Hallman, DOE, Office of Science (SC), Office of Nuclear Physics (NP), Associate Director

DOE Presenters

Asmeret Asefaw Berhe, DOE, Office of Science, Director (virtual)
Julie Carruthers, DOE, Office of Science, Office of Scientific Workforce Diversity, Equity, and Inclusion (SW-DEI), Acting Director

NSF Presenters

Denise Caldwell, NSF, Physics Division Director
Allena Opper, NSF, Nuclear Physics, Program Director
Souleymane Omar Diallo, NSF, Division of Materials Research, Program Director (virtual)

March 7, 2023

Welcome and Introduction, Gail Dodge, NSAC Chair, welcomed attendees and asked committee members, NSF representatives, DOE representatives, and in-person attendees to introduce themselves.

Perspectives from the Department of Energy, Asmeret Asefaw Berhe, DOE SC Director

As the country's largest funder of physical sciences research, the SC synthesizes input from legislation, Congress, the White House, DOE leadership, professional society meetings, community forums, and advisory committees such as NSAC to establish priorities. NSAC is instrumental in guiding research-based programmatic directions towards solutions to support the nation.

NP plays an important role in achieving the SC's goal through research in critical areas such as artificial intelligence (AI), quantum information sciences (QIS), and microelectronics. The SC is focused on healthy stewardship of the national laboratories, emphasizing their roles as regional hubs with connections to local communities, universities, the private sector, and state and local governments.

The SC's integration of belonging, accessibility, diversity, equity, and inclusion (BAJEDI) principles into all practices and policies is a continuing priority. Publicly funded science must benefit all and come from researchers which reflect America's diversity. Meaningful steps are being taken in this area through the SC-wide Reaching a New Energy Sciences Workforce (RENEW) traineeship and Funding for Accelerated, Inclusive Research (FAIR) initiatives. All are urged to take meaningful steps in broadening science participation.

Promoting Inclusive and Equitable Research (PIER) Plans, which describe how applicants will incorporate BAJEDI principles into their work, are now a required component of all SC funding opportunity announcements (FOAs), DOE National Laboratory Announcements and other funding solicitations. All conference proposals requesting funding must include an anti-harassment plan (code of conduct), along with recruitment and accessibility plans for speakers and attendees.

The SC continues to enable important scientific discoveries and new technologies, and it is imperative that the public is aware of these advances. Thus, developing strategies to effectively communicate success is an important priority.

The SC supports world-leading nuclear physics accelerator user facilities. The completion of the Facility for Rare Isotope Beams (FRIB) was highlighted, as it finished construction on budget and ahead of schedule. This success was due to the strong partnership between SC, NSF, and Michigan State University (MSU). NP has identified the Electron-Ion Collider (EIC) as the next highest construction priority following the FRIB. The Inflation Reduction Act (IRA) provides significant funding for the EIC project to advance towards critical decision 2 (CD-2). With a user group of 1,300 scientists and engineers from 36 countries, international interest in the EIC is extremely high. IRA funds will also enable progress towards the deployment of ton-scale neutrinoless double beta decay (TS-NLDBD) experiment research and development (R&D). Expanding interagency partnerships to maximize federal spending on R&D and enabling facilities is an SC priority.

NSAC's strategic planning is currently ongoing, and the resulting Long Range Plan (LRP), outlining the community's global vision for the following decade, is anticipated this

summer. Berhe looks forward to hearing about this vision and appreciates NSAC's contributions through this process.

Discussion

Lopez asked about data evaluating efficacy of the RENEW and FAIR programs for consideration by the LRP Workforce committee. **Berhe** stated RENEW and FAIR are very new, and data are limited. However, the Office of Workforce Development for Teachers and Scientists (WDTS) and SW-DEI may supply information about other programs that have been going on for longer.

Dodge added nuclear physics community events already require a code of conduct and have an Allies Program for welcoming all attendees. Welcoming undergraduates at conferences is an ongoing focus. **Berhe** commended the nuclear physics community's progress on BAJEDI initiatives and encouraged continued work in this area.

Howell inquired about DOE outreach tools for middle-school students as data suggest many minority students lose interest in science, technology, engineering, and mathematics (STEM) at this point. **Berhe** agreed efforts in this area are important and has seen progress in the engagement of national laboratory scientists with community schools through WDTS and scientific grant programs. Efforts such as these can be included in PIER Plans. The SC usually approaches large-scale efforts like this through partnerships with the scientists and institutions that they fund.

Reed suggested creating an undergraduate fellowship for students who have not taken high school calculus as a way to increase diversity. **Berhe** emphasized the importance of preparing students for research; this could be an area for future partnerships and a way for the SC to raise visibility for early interventions.

Dodge added the LRP committees have discussed how graduate student and postdoctoral researcher salaries can act as an economic filter for some students. **Berhe** echoed concerns. Graduate students supported by SC grants and fellowships should be paid at least $45K annually, which is above average for post-graduate salaries across the field. The SC cannot influence what universities pay. It is important to change the way science is funded. **Bernstein** agreed, stating that the cost-of-living, especially in the San Francisco Bay Area, is detrimental to increasing BAJEDI. **Downie** struggled with the costs of graduate school in the past and suggested entry-level teaching assistant positions need to provide a living wage.

Perspectives from the National Science Foundation, Denise Caldwell, Physics Division Director

The budget details of fiscal year 2023 (FY23) NSF appropriations cannot be shared until NSF's FY24 Budget Request is released to the public. Congressional appropriations provided NSF with a total of $9.9B between Omnibus and Disaster Relief Supplemental Appropriation (DRSA) Act funding. The DRSA Act allocates NSF additional funds beyond the standard funding provided through the Omnibus bill. Part of this additional funding comes from the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act. This funding has allowed NSF to create a new directorate called Technology, Innovation, and Partnerships (TIP) to bridge the gap between research and commercialization. TIP aims to create an ecosystem that enables innovation and technology to exist regardless of location, while simultaneously focusing on engaging the nation's diverse talent. As a result, some NSF investments have been realigned under TIP including the Small Business Innovation Research

(SBIR) program, Innovation Corps (I-Corps), and Convergence Accelerator. New TIP investments include the Regional Innovation Engines program.

The NSF has three major priorities: strengthening the established NSF with investments that expand the frontiers of knowledge and technology; inspiring the missing millions using interventions and capacity building that enhance and broaden participation; and accelerating technology and innovation through cross-cutting partnerships and programs. An MPS program broadening participation is Launching Early-Career Academic Pathways in the Mathematical and Physical Sciences (LEAPS-MPS). These grants support early career principal investigators (PIs) at institutions that do not traditionally receive significant amounts of MPS funding. Another funding program broadening the participation of postdoctoral fellows from historically excluded and currently underrepresented groups is called MPS Ascending Postdoctoral Research Fellowship (MPS-Ascend). Partnership programs within MPS are designed to connect faculty at minority serving institutions with one of the existing MPS centers. Individual partnership programs support the material sciences, astronomy, chemistry, physics, and education subject areas. MPS also is strengthening and scaling a dynamic, diverse, and well-coordinated portfolio of physics investments associated with emerging industries, such as advanced manufacturing, advanced wireless, AI, and QIS.

With respect to NSF's third priority ("accelerating technology and innovation"), MPS has created the Transformational Advances in Quantum Systems (TAQS) series. TAQS funds interdisciplinary research focusing on quantum functionality for small groups of three or more researchers. MPS has funded three TAQS programs and will fund a fourth this year. MPS also continues to steward the Quantum Leap Challenge Institutes (QLCIs), which support large-scale projects driven by a cross-disciplinary challenge research theme for advancing QIS and engineering. There are currently five QLCIs, each consisting of multiple institutions. Another new program, Expanding Capacity in Quantum Information Science and Engineering (Expand-QISE), aims to increase the nation's research capacity and broaden participation in this area. Expand-QISE's two tracks offer awards for 1) institutions with a minimal current focus on research; and 2) institutions with strong research activity, but no substantial investment in QISE.

The MPS portfolio supports notable nuclear physics facilities; the construction of the A Toroidal LHC ApparatuS (ATLAS) is complete and work on the Compact Muon Solenoid (CMS) detectors at the High Luminosity-Large Hadron Collider (HL-LHC) is moving forward. COVID-19 caused severe delays to the phase one upgrades on the Ice-Cube Neutrino Observatory (ICNO), but efforts are progressing. The next scientific run of the Laser-Interferometry Gravitational Wave Observatory (LIGO) is expected in May.

The NSF-funded National Superconducting Cyclotron Laboratory (NSCL) has successfully transitioned to the DOE-funded FRIB in August 2022. This effort was an excellent example of the two agencies working together.

Caldwell will be leaving the role of Division Director for the Division of Physics at the end of 2023. A search committee has been formed and the position has been posted online.

Discussion

Dodge appreciated Caldwell's many years of service and expressed gratitude for the smooth transition of the NSCL to the FRIB.

Lopez asked whether PIs can be funded by both DOE and NSF. **Caldwell** explained DOE and NSF are not allowed to fund the same research. This only applies to individual investigator science awards, so DOE-funded researchers may apply for TIP funding.

DOE Office of Nuclear Physics Overview, Timothy Hallman, Associate Director

Appropriations supporting the NP work plan since FY17 have tracked with the modest growth scenario set forth in the 2015 LRP. This shows the importance of the ongoing LRP efforts as content may guide budget decision makers in the future. NP operations funding has increased in recent years, largely due to the FRIB coming online and reliability upgrades at the Continuous Electron Beam Accelerator Facility (CEBAF). NP enacted appropriations have increased from $728M in FY22 to $805M in FY23. Approximately 60% of this increase has been allocated to EIC funding and FRIB operations. Research funding is mostly unchanged between these years, but there is a $6M discretionary budget to address important opportunities that may arise. Work on atomic electric-dipole-moments (EDMs) at the FRIB is a notable opportunity that will be challenging to address with current research funding. The FY23 President's Budget Request is expected to be released on March 9, 2023.

NP received IRA funding, with significant money going towards the EIC, the Gamma-Ray Energy Tracking Array (GRETA) project at Lawrence Berkeley National Laboratory (LBNL), and the Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) experiment at the Thomas Jefferson National Accelerator Facility (TJNAF). IRA funding is also allocated for TS-NLDBD. FRIB and the Super Pioneering High Energy Nuclear Interaction Experiment (sPHENIX) at Brookhaven National Laboratory (BNL) are complete, reaching CD-4 and project decision-4 (PD-4) respectively in calendar year 2022. sPHENIX was a successful test case for DOE delegating project management responsibility to a national laboratory. GRETA has achieved CD-2/3 and MOLLER has achieved CD-1 and both are fully funded. The High Rigidity Spectrometer (HRS) at MSU has received CD-1 and is substantially funded. The EIC and TS-NLDBD have received CD-1 and CD-0 respectively and will remain a focus of NP from a funding perspective.

The first physics research from FRIB has been published, which includes the production of never-before-observed isotopes. Other NP user facilities highlights include a successful review for the EIC by the DOE Office of Project Assessment (OPA) and staffing increases from IRA funds. There is high interest internationally for the EIC, and the EIC has established both an Advisory Board and Resource Review Board to discuss international funding contributions. Progress is also being made towards determining the fundamental nature of the neutrino, with $12.8M of IRA and NP program funding going towards three TS-NLDBD experiments. However, the current geopolitical situation has impacted isotope procurement. There will be a meeting in April 2023 at SNOLAB to discuss prospects for an international double beta decay (DBD) collaboration.

Nearly $50M of federal investment has gone into the Nuclear Data Interagency Working Group (NDIAWG) program since 2016 to address the growing need to have reliable, new nuclear data. The deadline for submitting a letter of intent (LOI) to the new NDIAWG Research Program FOA has closed.

The next QIS FOA will be released in FY24.

Diversity is a fundamental part of the SC business model, and steps have been taken to advance diversity, equity, and inclusion (DEI) further. This includes the establishment of the SW-DEI office and awarding NP traineeships. Approximately 70% of the funds awarded in FY21 towards traineeships went to minority serving institutions (MSIs), MSI faculty, or MSI students. The traineeships are coordinated by the Institute for Nuclear Science to Inspire the next

Generation of a Highly Trained workforce (INSIGHT); INSIGHT assesses the program's effectiveness, facilitates communication, and surveys students about their experiences. About 50% of trainees entered a graduate student program.

The NP programmatic peer review process is evolving into comparative reviews, as one-off reviews have lacked critical assessments. The four-year Laboratory Research Review cycle was interrupted by COVID-19; this cycle will resume.

Hallman reviewed DOE NP staff changes: Paul Mantica is the new NP Director of Facilities and Projects Division and Kelsie Krafton, who was leading DEI at NP, has taken a position at the National Academy of Science. There will be a solicitation for a new Director of the NP Physics Research Division.

Discussion

James Fast (via chat, TJNAF) shared Urenco as a possible alternative supplier for enriched isotopes.

Reed drew attention to improving the quality of life at national laboratories. **Hallman** said the government cannot subsidize food services and such services are finding it difficult to be profitable with reduced on site demand on a daily basis. A framework to create a welcoming environment is needed. This has been a topic of recent annual reviews and continued addition will be given at future.

Greene questioned the all-male EIC Advisory Board. **Hallman** is unaware how this happened and will look into fixing it.

Ilieva wondered if there are programs specifically targeting students from economically disadvantaged communities as there is already an emphasis on origins and gender. **Hallman** stated the RENEW and FAIR programs and NP traineeships are intended to target students from socioeconomically disadvantaged areas.

Dodge dismissed the meeting for a break at 10:52 a.m. and reconvened the meeting at 11:05 a.m.

NSF Nuclear Physics Overview, Allena Opper, Program Director

The NSF Physics Division (PHY) recently completed a committee of visitors (COV) review, and the resulting report is anticipated in April 2023. There is no budget information available at this time.

Opper pointed out that a Dear Colleague Letter on Precision Measurements was issued some time ago encouraging interdisciplinary research across precision atomic, mechanical, and optical physics (AMO) and elementary particle physics (EPP) to search for physics beyond the standard model. Proposals can include research, conceptual development, conferences, or the development of new instruments. This has been broadened to all physics disciplines and is not limited to those working in AMO and EPP.

The Windows on the Universe (WoU-MMA) for multi-messenger astrophysics (MMA) program was created to support advances in the exploration of the universe using electromagnetic waves, high-energy particles including neutrinos and cosmic rays, and gravitational waves. Funding from WoU-MMA can be used for hardware, software, or other infrastructure that is needed to coordinate observations using more than one messenger. Most relevant to the nuclear physics community is through research interpreting multi-messenger astrophysical observations. For example, the low energy nuclear astrophysics community could

provide the nuclear physics needed to understand observations coming from neutron star mergers.

Due to language in the CHIPS and Science Act, the 2023 MRI solicitation waives the 30% cost share requirement for PhD granting institutions for the next five years. Track 1 proposals can request between $100K and $1.4M, with a limit of two applications per university. Track 2 proposals can request between $1.4M and $4M, with a limit of one application per university. Track 3 is newly created and is for funding the acquisition, development, installation, operation, and maintenance of equipment and instrumentation to reduce the consumption of helium. There is a limit of one application per university for Track 3. In total, universities can submit up to four MRI proposals. Beginning this year, the submission window is between October and November, which may be challenging for some applicants, as MRI proposals in previous years were due in January.

PHY has a funding program similar to MRI for high priority, shovel-ready instrumentation projects called Mid-scale Instrumentation. This is for projects that are between ~$4M and up to ~$20M over multiple years. There are currently five experimental nuclear physics projects supported by MsRI funding: the neutron Electric Dipole Moment (nEDM) experiment at the Spallation Neutron Source (SNS); the MUon proton Scattering Experiment (MUSE); Large Enriched Germanium Experiment for Neutrinoless Double Beta Decay-200 (LEGEND-200); MOLLER; and the Beam Lifetime (BL3) experiment.

Similarly, there is a funding program for Mid-scale Research Infrastructure (MsRI). The first solicitation (MsRI-1) will fund shovel-ready infrastructure projects requesting between $6M and $20M. There is also funding available for the design and development of mid-scale research infrastructure with total requests between $600K and $2M. The second solicitation (MsRI-2) will fund projects requesting between $20M and $100M. These solicitations are published in alternate years and are NSF-wide; proposals are being accepted for MsRI-1 in 2023. Projects that have received funding from MsRI-2 include the High Magnetic Field Beamline (HMF) at the Cornell High Energy Synchrotron Source (CHESS); the Global Ocean Biogeochemistry Array (GO-BGC); the Distributed Energy Resources Connect (DERConnect) infrastructure project at University of California, San Diego (UCSD); the Research Data Ecosystem (RDE) at the University of Michigan Institute for Social Research (ISR); and Network for Advanced Nuclear Magnetic Resonance (NAN). The NSF Large Facilities Office is hosting a webinar series on mid-scale project management, targeted towards both applicants and awardees. The first part has been posted online and parts two and three will be taking place in March and April of 2023, respectively.

There is funding available for the MPS Workshop for New Investigators in June. The goal of this workshop is to provide guidance on NSF policies, procedures, and opportunities, while training a pool of future reviewers.

A program director rotator position in the Nuclear Physics Program is currently accepting applications.

Discussion

Bernstein asked whether the MPS Workshop is restricted to those at a university. **Opper** will find out; those from underrepresented groups are especially encouraged to attend.

Tapia Takaki asked how the nuclear physics community can encourage interdisciplinary collaboration while ensuring university faculty positions for these programs will go to physicists and not engineers or other disciplines. **Opper** stressed the importance of maintaining a strong

base in the core physics discipline when considering multidisciplinary activities. When submitting a proposal to NSF, it will get in the hands of the right program.

Howell asked whether there are any lessons learned from the RDE project about reporting data at various stages of its life cycle. **Opper** clarified the goal of the RDE project is to store data in a way that is accessible to everyone, not at different stages. Bernstein's presentation on the Nuclear Data Report was called out as more relevant to this question.

Presentation on the Nuclear Data Report, Lee Bernstein, Nuclear Data Subcommittee Chair

In April 2022, NSF and DOE jointly charged NSAC to form a subcommittee to assess nuclear data stewardship with the results to be delivered in two reports. A first report, delivered on September 15, 2022, listed 25 nuclear data achievements, including databases and tools as well as collaborative domestic efforts; international efforts and collaborations; nuclear data needs in basic sciences, energy, medicine, national security, nonproliferation, and space areas; and cross-cutting needs in workforce development, ongoing fission evaluation, accelerated decay data evaluation, statistical structure evaluation, (n,x) data, and high energy data. A new view of nuclear data's role has emerged, presenting an interconnected system among facilities and capabilities, codes, applications, and nuclear data itself. This interconnected system is much more complex than the traditional linear model of nuclear data, which can miss or hide connections between nuclear data and code. Three areas with hidden nuclear data needs include non-proliferation activities using anti-neutrino monitoring, decay heat calculations, and physics beyond the standard model. In cases like these, codes can hide shortcomings in the underlying nuclear data, but collaborations like the Workshop for Applied Nuclear Data Activities (WANDA) have made those hidden connections more visible.

The second report, delivered on March 7, 2023, contains recommendations for maintaining effective stewardship of nuclear data, based on the United States Nuclear Data Program (USNDP) Status Report found in the first report. Overall, the report identified a continued need for existing nuclear reaction, structure, and mass evaluation efforts supported by the Evaluated Nuclear Data File (ENDF), the Evaluated Nuclear Structure Data File (ENSDF), and the Atomic Mass Evaluation (AME) programs. Second, new initiatives are needed to address society's evolving nuclear data needs which will require sustained support to build and implement a concerted workforce recruitment effort. Last, evaluators should be a part of all experimental activities to ensure expedited data incorporation and understanding of the nominal values and uncertainties of the data being measured. Currently, evaluators must try to understand all systemic uncertainties of older measurements, so the USNDP should be brought into these collaborations to understand the experiments and the primary sources of uncertainty. The report recommends USNDP members be part of topical nuclear data collaborations (TNDC), bringing together application and data subject matter experts, while also including a workforce development component so these embedded evaluators can be trained on the job. The resulting research output would not just be feeding existing databases, but also be published in peer-reviewed journals and included in new databases.

The second report also presents 14 nuclear data initiatives, 11 of which are new. Each initiative is presented as a one- to two-page write up targeted towards non-experts, to guide policy making efforts. Initiatives are categorized as existing efforts, topical initiatives, or enabling initiatives. Existing efforts include supporting structure evaluation capabilities; enhancing reaction evaluation capabilities; and maintaining atomic mass and nuclear property evaluation. Topical initiatives include nuclear astrophysics evaluation; developing statistical

nuclear structure data evaluation and databases; establishing methods for continuous fission evaluation; targeted accelerated decay data evaluations; providing comprehensive, consistent neutron reaction and structure data; charged particle stopping powers measurement and evaluation; and comprehensive reaction measurement and evaluation for high-energy projectile reactions. Enabling initiatives are continuing development of modern data formats; AI/ machine learning (ML) for modern nuclear data compilation, evaluation, and dissemination; and creating an infrastructure for data preservation and open data. Providing nuclear data for fusion energy, the 14th initiative, falls outside these categories and will be discussed at a workshop in April 2023.

The 14 nuclear initiatives connect to data needs in the basic sciences, energy, medicine, national security, nonproliferation, and space areas. Each new nuclear data initiative will require one to two full time equivalent (FTE) employees on an ongoing basis, with an expected figure of ~$450K per FTE. Depending on funding and recruitment profiles, the timeline for initiative expansion varies. However, all scenarios require significant recruiting and training activities.

Discussion of the Nuclear Data Report

Caldwell stated her appreciation for Bernstein and all who contributed to the report.

Klein asked how consumers of nuclear physics data such as those in space and neutron propagation might share relevant data with nuclear physics researchers. **Bernstein** said collaborators in these areas understand the value of data. Creating alliances and bringing the relevant data into collaborative experiments is vital and might require designing new data storage formats or databases. Entities such as the Gesellschaft für Schwerionenforschung (GSI) Helmholtz Centre for Heavy Ion Research are working in this direction.

Aidala sought clarification about recommendation 11 in the second report. Are the two recommended TNDCs directed towards inertial confinement and magnetic confinement fusion research respectively? **Bernstein** confirmed this was the intention, as the two research areas have very different nuclear data needs. There should be crossover between the two TNDCs in the area of tritium production, as this is a relevant challenge for both.

Aidala asked about engaging commercial entities that have in-house research facilities. **Bernstein** mentioned the complexities of working with commercial entities, as their goals are usually different than those of the academic research community. This might be complex, but it is possible that placing industry partners on TNDCs could be a solution.

Lunardini asked about the professional profile of a nuclear data evaluator and whether there are any initiatives to attract young people to this role. **Bernstein** indicated a professional role as a nuclear data evaluator requires a certain degree of obsessiveness. The goal is to have PhD programs in Nuclear Data Evaluation; currently the University of California, Berkeley and a handful of other universities have students on this track.

Downie wondered about designating internal nuclear data coordinators on experiments as points of contact between researchers and external evaluators. **Bernstein** agreed embedded evaluators are the best way to advance this effort. This is mutually beneficial for spotting any issues or assumptions the research team might be missing.

DeSouza mentioned forming collaborations with international facilities for more robust nuclear data. Do these partnerships pose any unique problems? **Bernstein** stated these connections tend to form organically. Including international facilities is also important. However, intentional effort is often needed to forge these connections in high-energy physics.

Greene mentioned the timescale for this effort. Do national security and non-proliferation data initiatives need to be fast tracked? **Bernstein** confirmed the urgency of these efforts. Organizations like the National Nuclear Security Administration (NNSA) will get involved if needed to support their nuclear data needs.

Lunardini commented nuclear astrophysics data might be perceived as a low priority; are there efforts to ensure it does not fall through the cracks? **Bernstein** was not aware of any special efforts in this area. Improvements in nuclear data overall will have a positive effect on nuclear astrophysics.

Aidala inquired whether there have been discussions with those behind the Rivet (Robust Independent Validation of Experiment and Theory) toolkit and the particle-physics community. **Bernstein** remarked there have not been discussions but expressed interest in learning from other data efforts like Rivet.

Wietfeldt expressed appreciation for the initiative to improve the software tools used for finding nuclear data. **Bernstein** mentioned an online tool being developed at University of California, Berkeley, which will allow searching data using natural language processing.

Dodge *called a vote on accepting the Nuclear Data Report. NSAC was unanimous in accepting the report.*

Dodge dismissed the meeting at 12:58 p.m. for lunch and reconvened the meeting at 2:30 p.m.

Update on the Long Range Plan Process, Gail Dodge, NSAC Chair and Old Dominion University

At present, 62 individuals have agreed to serve on the LRP Writing Committee, including two international observers. There are 11 subcommittees: quantum chromodynamics (QCD); fundamental symmetries; nuclear structure & nuclear astrophysics; workforce; applications; theory; crosscutting/interdisciplinary; impacts and synergies with other fields; facilities; international context; and budget.

White papers were submitted at the end of February 2023, and more will continue to come in. Comments and modifications to the draft outline are expected by mid-March 2023. First drafts of chapters two through 12 are due to the internal reviewers in June 2023. Second drafts of those chapters are due in July, followed by a resolution meeting. Based on meeting outcomes, writing will begin for the executive summary, as well as revisions to the outline and text of each chapter. The draft report will be due in October 2023 and must be presented to NSAC for adoption; that will likely happen during a planned Fall 2023 meeting.

Whether the second report chapter — renamed from "The Story of Nuclear Physics" to "Nuclear Physics: Opportunity and Impact" — will remain in the LRP is unclear. The writing process will determine whether it will add value to the report.

Information on the LRP process is currently being communicated through the American Physical Society (APS) Engage platform and NuclearScienceFuture.org. The latter is a simple website with planning information and white papers but will eventually contain long-term information and ancillary materials related to the LRP. Attendees are encouraged to submit any remaining white papers. A communication plan/roll-out committee is currently being formed with four responsibilities: polishing and formatting the LRP for digital and print platforms; planning and creating additional useful materials; designing and maintaining the

NuclearScienceFuture.org page; and planning meetings and presentations with organizations such as DOE, NSF, and Congress.

Discussion of the Long Range Plan

Klein asked if there are specific criteria for white papers to be added to the APS Engage platform. **Dodge** stated relevant white papers that were not explicitly written from an LRP perspective can and should be included.

Wietfeldt stressed the importance of the proposed chapter two in the LRP and sought clarification around potentially leaving it out. **Dodge** said until written, the chapter's value is unknown. All are welcome to participate in the writing. **Bernstein** voiced the importance of this part of the LRP, as it should highlight everything happening in the nuclear physics community.

Tapia Takaki suggested documenting the process of creating the LRP for future reports and other disciplines. **Dodge** agreed but suggested waiting to see how the LRP comes out to have confidence in the process. **Downie** emphasized that all involved should be taking notes on things that worked or need improvement.

Peter Petrezcky (BNL) was surprised to see nuclear theory as a separate chapter in the LRP outline. Why was that change made? **Dodge** said that the committees discussed this and decided that nuclear theory should be discussed in each science chapter but that crosscutting issues merited a separate chapter as well.

***Dodge** ended the discussion. **Hallman** and **Opper** presented certificates of appreciation to the outgoing NSAC members and thanked these individuals for their service.*

Overview of DEI Workforce Initiatives at NSF, Souleymane Omar Diallo, Division of Materials Research, Program Director

DEI is part of the NSF's DNA and a universal mandate across all directorates. The NSF has strategic priorities to advance DEI in the organization that include preparing a diverse, globally engaged STEM workforce; integrating research with education and building capacity; expanding efforts to broaden participation from underrepresented groups and diverse institutions across all geographical regions in all NSF activities; and improving processes to recruit and select highly qualified reviewers and panelists that reflect the nation's diversity.

To advance DEI, the NSF has focused programs with explicit broadening participation (BP) program goals and emphasis programs, which have an additional review criterion beyond BP. Specific to the MPS directorate, there are programs to increase DEI from the high school level to established academic faculty, with some of the more recent being MPS-High, MPS Ascend, and LEAPS-MPS. MPS has also established partnerships to increase recruitment, retention, and degree attainment by members of those groups most underrepresented in research. Example programs are Partnerships for Research and Education in Physics (PREP) and Expand-QISE.

The newest DEI initiative at NSF is the Growing Research Access for Nationally Transformative Equity and Diversity (GRANTED) program. GRANTED addresses systemic barriers within the nation's research enterprise by improving support and service capacity at emerging research institutions. There is a particular focus on building and enhancing sustainable institutional resources in support of faculty and students in these areas, while increasing proposals, participation in funding research and training from emerging research institutions, MSIs, historically black colleges and universities (HBCUs), community colleges, and others.

Update on DEI Workforce Initiatives at DOE, Julie Carruthers, SC, SW-DEI, Acting Director

Beginning in FY23, all SC solicitations require applicants to submit a PIER Plan alongside their research proposals. PIER Plans are an opportunity for PIs and research personnel to explain how they will integrate DEI into their projects. Within these plans the SC has encouraged applicants to consider the composition of the project team, including project personnel and partnering institutions; the research environment; and the implementation of the research project and scholarly and professional growth of project personnel. Resources and information for PIER Plans have been released to guide applicants and awardees. Each PIER Plan will be evaluated under a new merit review criterion as part of the peer review process.

The standard merit review criteria have been updated to incorporate the PIER Plan requirements. The merit review criteria for the evaluation of applications are as follows, in descending order of importance: scientific and/or technical merit of the project; appropriateness of the proposed method or approach; competency of applicant's personnel and adequacy of proposed resources; reasonableness and appropriateness of the proposed budget; and quality and efficacy of the plan for promoting inclusive and equitable research. Importantly, the sponsoring SC Program Office may elect to modify this order at the time the solicitation is developed.

Also beginning in FY23, all proposals to SC requesting support for conferences require the host organization to have a code of conduct addressing the following: discrimination and harassment; how to report issues and address complaints; and how to inform all attendees of these policies and procedures. Proposals also require a recruitment and accessibility plan that includes the recruitment of speakers and attendees from groups underrepresented in the community associated with the meeting's technical focus.

An internal review of SC's awards management practices yielded 14 overarching recommendations and over 40 actions for advancing DEI in SC business practices, resulting in a new SC DEI Working Group to focus on implementing these recommendations. Programs implemented so far include the PIER Plans and SC conference policy, along with new public resources to increase awareness of existing flexibilities and support allowed under financial assistance awards. This includes increasing transparency around reasons applicants can request supplemental funding; Carruthers gave the example of supplemental funding for a part-time research associate to keep research going while a PI is on family leave. This information is now available on a new webpage dedicated to applicant and awardee resources that includes an extensive list of FAQs.

The SC Statement of Commitment was also updated in October 2022. The initial statement was released in April 2019 with language that largely focused on discrimination and harassment. Updates reflect the SC's DEI priorities and broadening participation. Updates include a commitment to promoting people from all backgrounds, including individuals and communities that were historically underrepresented and minoritized in STEM fields; the SC's right to take appropriate action at SC-hosted meetings should participants not adhere to expectations for responsible workplace behavior; and strongly encouraging recipient and partner institutions to adopt and implement their own codes of conduct.

In FY20, the SC conducted the first ever external peer review of the SC laboratories' DEI strategies. Reviewers identified strengths and weaknesses of each laboratory's DEI efforts, as well as laboratory-wide opportunities for improvement. Reviewers provided recommendations to the SC on how to improve oversight and promote advancement of DEI at the laboratories. Since then, the SC has restructured the annual guidance to the laboratories on their DEI strategies to

address peer review recommendations; initiated a triennial external peer review process; and added DEI objectives to laboratories' performance evaluation and management plans (PEMPs).

Discussion of Nuclear Physics Workforce Needs

Ruan asked for more details on the MPS-High program. **Diallo** explained the program pays a nominal fee for high school students to spend the summer doing research.

Ilieva requested more information on the GRANTED program. **Diallo** pointed to a Dear Colleague Letter that has been posted online for full details.

Reed sought lessons learned from the DEI evaluations at national laboratories. **Carruthers** stated the evaluation criteria are posted on the SC website. Many of the laboratories have DEI websites. **Reed** asked how the SC evaluates laboratory adherence to DEI plans. **Carruthers** confirmed laboratories must report major DEI initiatives annually, but many have struggled to develop data-driven evaluation strategies. External peer review panels are a potential way to evaluate the laboratories in this area. **Reed** suggested facility users be included on external peer review panels because of their unique point of view. **Carruthers** agreed with this idea.

Ruan wondered about follow-up processes for PIER Plan execution after funding. **Carruthers** said there is no specific evaluation mechanism post award. However, PIER Plans are considered during each project's overall annual report.

Wilson expressed concern about the replacement of data management plans with PIER plans and inquired about reasons behind this decision. **Carruthers** stated that because SC research is funded by taxpayers, the funding must be inclusive and in the public interest. Priorities can change with each solicitation, so there is some flexibility in changing the contents and ordering of merit review criteria.

Lunardini raised the possibility of blind proposal reviews. **Carruthers** said demographic data is needed to evaluate whether blind proposal reviews would be effective, and the SC does not have this data. However, one SC user facility is piloting a double-blind reviewer process for applications to the facility.

Ilieva requested guidelines for conference proposals to ensure issues can be reported, and complaints will be addressed. **Carruthers** explained some scientific professional organizations have these protocols in place, and their plans can be modified to meet the needs of academic institutions and national laboratories.

Chipps asked for guidance on achieving gender parity in the STEM workforce. **Diallo** believes an approach led by data and sufficient monetary investments is needed. NSF is looking into the National Institutes of Health (NIH) K99 program which guarantees funding for faculty positions for postdoctoral researchers. **Carruthers** believes national laboratories should be pushed to think about the personnel on large research proposals and whether retirement might be appropriate for some individuals.

Bernstein expressed concern that economic factors are not being addressed in DEI initiatives. **Carruthers** stated during SC listening sessions in 2021, there was discussion around economics factors. The SC is looking at adequate compensation at every level and is thinking more carefully about this moving forward. **Diallo** emphasized investing in MSIs. Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM) is one NSF program specifically targeting economically disadvantaged students.

Tapia Takaki inquired whether SC will share successful DEI and PIER Plan activities. **Carruthers** said sharing data-driven, not just anecdotal, findings is something of interest.

Ilieva pondered whether there are plans to follow the proposed increase in workforce with an increase in budget to support this growth. **Dodge** shared the LRP will be grappling with this question. **Carruthers** stated growing a workforce within the constraints of a budget is a complex push-and-pull exercise.

Reed voiced concerns over onboarding training for students and asked about the possibility of connecting university groups and national laboratories for both training and DEI purposes. **Chipps** (via chat) mentioned the Exotic Beam Summer School (EBSS) as an example program. **Carruthers** asked if training videos would be helpful. **Reed** responded hands on training is needed; what inspires students is going to the laboratories, talking to people, and seeing the equipment. **Carruthers** appreciated these comments.

Lopez asked whether there is an SC program for promoting research programs for underrepresented students at their current universities and creating bridge positions with national laboratories. **Carruthers** said there are not any specific programs, but this could fall within the scope of a RENEW proposal. **Stuart Henderson** (TJNAF, via chat) shared TJNAF is still using the bridge faculty approach.

Downie inquired about a program like GRANTED for institutions that might not have the necessary expertise for efforts such as creating PIER Plans. **Carruthers** appreciated this idea and stated funding for creating PIER Plans can be requested as part of the project proposal.

Howell noted there are many people who make up the experimental science workforce beyond researchers and wondered about creating welcoming workplaces for these individuals. **Carruthers** said the SC has more influence over the national laboratories. Laboratory feedback indicates non-scientific staff need more professional development. SC will continue to elicit laboratory feedback. **Dodge** added Research Experiences for Undergraduates (REU) and Science Undergraduate Laboratory Internships (SULI) programs have proven effective.

Ruan sought input on how to reach students who are not already in an internship program. **Reed** reiterated the efficacy of the REU programs but would like other resources as well. **Dodge** agreed collecting relevant programs in this area will create efficiencies for everyone. **Wilson** emphasized the importance of following up on investments made in undergraduates to ensure students move forward in the field. **Shelly Lesher** (University of Wisconsin-La Crosse, via chat) said the white paper from the NSAC LRP Town Hall Meeting on Nuclear Structure, Reactions and Astrophysics contains relevant recommendations.

Scarlett works at an HBCU and has been successful in getting students into physics but would like a class or curricula for students with academic deficiencies. **Klein** added bridge programs have been successful in taking undergraduates to graduate school, but further support is needed from funding agencies in this area.

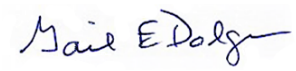
Tapia Takaki stressed the importance of training international students and associated benefits to producing a diverse workforce.

Public Comment

None.

Meeting adjourned at 4:23 p.m. by Gail Dodge.

The minutes of the U.S. Department of Energy and the National Science Foundation/Nuclear Science Advisory Committee meeting, held on March 7, 2023, via hybrid by zoom are certified to be an accurate representation of what occurred.



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Gail E Dodge
NSAC Chair
Date: July 1, 2023