

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

PUBLIC MEETING MINUTES

**Virtual Meeting
October 4, 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) meeting was convened at 10:00 a.m. Eastern Time on Wednesday, October 4, 2023, 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 <http://science.energy.gov> for more information about NSAC.

NSAC Members Present

Gail Dodge (Chair)	Yordanka Ilieva
Christine Aidala	Jorge Lopez
Paulo Bedaque	Rosi Reed
Kelly Chipps	Lijuan Ruan
Ian Cloet	Carol Scarlett
Andre Luiz de Gouvea	Daniel Tapia Takaki
Romualdo deSouza	Derek Teaney
Haiyan Gao (<i>ex officio</i>)	Fred Wietfeldt
Austin Harton	Richard Wilson (<i>ex officio</i>)
Calvin Howell	

NSAC Members Absent

Cecilia Lunardini

NSAC Designated Federal Officer and DOE Presenter

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

Committee Manager

Brenda May, DOE SC NP

NSF Presenter

Allena Opper, NSF, Nuclear Physics, Program Director

October 4, 2023

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

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

DOE NP's mission to discover, explore, and understand all forms of nuclear matter delivers ground-breaking research and new tools, which have applications that are critical for national needs in nuclear data, quantum information science (QIS), artificial intelligence and machine learning (AI/ ML), and microelectronics. Several nuclear physics research thrusts overlap with Administration priorities. Beyond national initiatives, society benefits from the

application of nuclear physics discoveries to diverse sectors, including medicine, food safety, energy, fire safety, and deep space exploration.

DOE NP operates four world-leading national user facilities (the Relativistic Heavy Ion Collider – RHIC; the Continuous Electron Beam Accelerator Facility – CEBAF; the Argonne Tandem Linac Accelerator System – ATLAS; and the Facility for Rare Isotope Beams – FRIB). FRIB, completed ahead of schedule and under budget, provides access to 80% of all isotopes predicted to exist in nature.

Science highlights featured results from the HELical Orbit Spectrometer (HELIOS) at ATLAS regarding (d,p) reactions; FRIB studies of excited sodium-32 with a spherical wave function; nuclear resonance fluorescence from studies at the High Intensity Gamma Ray Source (HIγS) at the Triangle Universities Nuclear Laboratory (TUNL); and the creation of lead-glass “SciGlass” scintillator for nuclear physics detectors funded by the Small Business Innovation Research (SBIR) program.

DOE NP projects include the Super Pioneering High Energy Nuclear Interaction eXperiment (sPHENIX), which was completed at a total project cost of \$26.5M in December 2022; the Gamma-Ray Energy Tracking Array (GRETA) project, which holds critical decision-2/3 (CD-2/3) with a fully funded total project cost (TPC) of \$58.3M and completion expected in fiscal year 2028 (FY28); the Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) which holds CD-3A with a fully-funded TPC point estimate of \$48.66M and completion expected in FY27; the substantially funded High Rigidity Spectrometer (HRS) which holds CD-1 with a TPC range of \$85.0M-\$111.4M and completion expected in FY29; the Electron-Ion Collider (EIC) which holds CD-1 with a TPC range of \$1.7-2.8B and completion expected in FY33; and Ton Scale Neutrinoless Double Beta Decay (TS-NLDBD) which holds CD-0 with a TPC range of \$215M-\$250M and no determined completion date.

The EIC, a priority from the 2015 Long Range Plan (LRP), will be the most advanced accelerator in the world and the only new collider built for decades. This future collider will maintain U.S. leadership in accelerator physics. The project is pursuing CD-3 A to be followed by CD-2 and has enjoyed significant staffing increases using funds from the Inflation Reduction Act (IRA). The EIC users group formed in 2016 and currently has ~1,400 users representing 37 countries and ~280 institutions. The EIC project envisions international in-kind contributions of ~\$100M and ~\$50M to the EIC detector and accelerator, respectively. About half of these contributions have already been notionally identified by international collaborators. The EIC Resource Review Board (RBB) is being established to coordinate these contributions in a manner analogous to RBBs at the European Center for Nuclear Research (CERN). The next EIC RBB will meet in December 2023 in Washington D.C.

NLDBD is also a priority from the 2015 LRP. Approximately \$12.8M from IRA and DOE NP program funds have been allocated to three exploratory technologies: 1) next Enriched Xenon Observatory (nEXO); 2) Large Enriched Germanium Experiment for Neutrino-less double beta Decay-200 (LEGEND-200); and 3) Cryogenic Underground Observatory for Rare Events (CUORE) Upgrade with Particle ID (CUPID). Additional resources are being provided by international partners. The inability to procure isotopes from Russia is severely impacting this effort. The second NLDBD international summit was held in April 2023 at the Sudbury Neutrino Observatory Laboratory (SNOLab). The recently published, final results from the Majorana Demonstrator (MJD) Experiment are comparable to those of EXO200.

International partnerships are central to the field. Recent examples showcasing international collaborations include the signing of a memorandum of understanding for the

FRIB-Centre National de la Recherche Scientifique (FRIB-CNRS) International Research Laboratory in July 2023 and the 25th anniversary of the RIKEN-Brookhaven National Laboratory Research Center (RBRC) collaboration with Japan in June 2023.

Sectors in science, commerce, medicine and defense all benefit from nuclear physics Ph.D.s. DOE NP has pioneered programs in diversity, equity, inclusion, and accessibility (DEIA) to ensure the future nuclear physics workforce leverages the diverse intellectual capital in the U.S. For example, DOE NP supported an early traineeship initiative towards DOE SC's Reaching a New Energy Sciences Workforce (RENEW) Program. Notably, 25% of DOE NP funding awarded in FY23 was issued to Historically Black Colleges and Universities (HBCUs) and 20% of funds were awarded to emerging research institutions.

A joint DOE and National Institutes of Health (NIH) workshop titled "Advancing Medical Care through Discovery in the Physical Sciences Workshop Series: Radiation Detection" identified several areas where nuclear physics discoveries could be translated to medical technologies.

The FY24 Presidential Budget Request (PBR) of \$811M is greatly appreciated and is ~\$6M greater than the enacted FY23 budget of \$805M and falls between the FY24 House and Senate marks of \$800M and \$818M, respectively. Excluding the construction budget, however, the FY24 PBR of ~\$716M, the House mark of ~\$705M, and the Senate mark of ~\$723M all fall below the enacted FY23 budget of ~\$755M. This indicates DOE NP should prepare for a year of restricted funding for the core research programs. The FY24 PBR, would allow NP National User Facilities to operate at or above 90% of optimal funding. That said, this level is not sufficient for adequate RHIC running.

NP Research funding allows for a compelling program of science but continues to be constrained due to the priority of increased funding for FRIB operations and EIC construction. Regardless of final FY24 funds, DOE NP will continue to steward a world-leading program in nuclear physics that delivers new science, operates unique leadership user facilities, supports and enhances a diverse workforce, and delivers impactful applications. The nuclear physics community must remain united in realizing current and future goals; division can set back the entire field.

Discussion

Chipps sought clarification on which FY24 budget request or mark will support user facilities at 90% of the optimal funding level. **Hallman** replied the FY24 PBR offers 90% support. First, however, there must be an appropriation, which might not be at the level of the FY24 PBR.

NSF Nuclear Physics Overview, Allena Opper, Program Director

NSF does not follow the Long Range Plans closely in that we typically respond to the proposals that are submitted each year. However, those proposals are evaluated in the context of the LRP. NSF is grateful to the NSAC subcommittee, the American Physical Society Division of Nuclear Physics (APS DNP), and the nuclear science community for producing the new 2023 LRP.

The FY24 PBR of ~\$11.6B is the highest request for NSF funding to date and represents an 18.2% increase over FY23's base. Under this request, the Mathematical and Physical Sciences (MPS) Directorate would receive ~\$1.7B, a 9.1% increase in funding over the FY23 base figure. The Physics (PHY) Division would see a 3.5% increase over the FY23 base figure to ~\$324.1M.

Notably, the Office of Strategic Initiatives (OSI) would see a 44.8% increase in funding over the FY23 base figure to ~\$152.5M. OSI funds are available to all the divisions in MPS to support new initiatives (e.g., QIS, AI/ ML) and emerging institutions, such as those in Established Program to Stimulate Competitive Research (EPSCoR) jurisdictions, predominately undergraduate institutions (PUIs), and minority serving institutions (MSIs). The FY24 House and Senate marks for NSF are ~\$9.6 and ~\$9.5B, respectively. If funded at a level lower than the PBR, funding the Administration's initiatives through the OSI often take precedence over research program funding.

NSF is currently operating under a continuing resolution (CR). Consequently, NSF is being conservative in issuing grants in case the actual FY24 budget is lower than the FY24 PBR or the FY23 appropriation. This means Principal Investigators (PIs) expecting funding for the first quarter of this fiscal year may have to wait.

If there is a lapse in appropriations (i.e., a "government shutdown"), NSF will continue to accept proposal preparation and submission via Research.gov and Grants.gov. Notifications and requests, project reporting, and *ad hoc* proposal review will continue via FastLane. However, panelist functions and most NSF staff will be unavailable. Proposal deadlines during or after a lapse may be considered for extension.

The Major Research Instrumentation (MRI) solicitation now includes three tracks. Tracks 1 and 2 award projects between \$100K to \$1.4M and \$1.4M to \$4M, respectively. Up to two Track 1 projects can be awarded to a single university while universities can only receive one Track 2 award per cycle. Track 3 focuses on the acquisition, development, installation, operation, and maintenance of equipment and instrumentation to reduce consumption of helium. Each university is eligible for one Track 3 award per cycle. Submissions to all tracks must be shovel ready. The 30% cost-share requirement for Ph.D.-granting institutions has been waived for the next five years, thanks to funding from the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act. The submission window is between October 16 and November 15, 2023.

All PHY proposals must be submitted through the PHY Investigator Initiated Research Solicitation. The deadline for Experimental and Theoretical Nuclear Physics is December 12, 2023. All proposals must conform to NSF's latest Proposal & Award Policies & Procedures Guide (PAPPG).

NSF is currently funding four Physics Frontier Centers: the Center for Living Systems at the University of Chicago; the Institute for Quantum Information and Matter at the California Institute of Technology; the Comprehension and Control of Emerging Complexity at the Quantum Frontier Center at the University of Colorado, Boulder; and the Center for Ultracold Atoms at the Massachusetts Institute of Technology.

Science highlights featured 1) new results from Fermi National Laboratory for the muon g-2 experiment; and 2) investigation of ⁴⁵Sc for use as a nuclear clock.

The Assistant Director for MPS, Sean Jones, has taken a new position at Argonne National Laboratory. Denise Caldwell is serving as Acting Assistant Director. A new PHY Division Director will be announced as will the new Experimental Nuclear Physics Program Director following Alfredo Galindo-Uribarri's rotation completion.

Discussion

Dodge asked about overlap between the OSI and research program goals. **Opper** explained the OSI is the office within MPS that manages funds for the Administration's

initiatives and also for directorate wide initiatives. Very often there is overlap between the goals of OSI and research programs.

Scarlett inquired about new mechanisms for time measurements. Is this an area in which anyone can submit proposals, or are these new technologies on the horizon? **Opper** explained that the research programs generally support basic research rather than new technologies, but there often is funding available through SBIR. The PI of the example presented today was funded through NSF's Atomic Molecular and Optical Physics (AMO) program and NSF's Nuclear Physics program; the proposal used AMO techniques in nuclear physics. The research programs are open to proposals that use techniques from other fields to address nuclear physics questions. Proposals should be submitted to the Nuclear Physics program, and NSF program officers will work with colleagues to evaluate proposal feasibility.

Dodge dismissed the meeting for a break at 11:15 a.m. and reconvened at 11:30 a.m.

Presentation of the 2023 Long Range Plan, Gail Dodge, NSAC Chair and Old Dominion University

In July 2022, NSAC was charged by DOE SC and NSF to develop the next LRP to coordinate the nation's nuclear science research program over the next decade. The LRP subcommittee received community input from town halls organized by APS DNP as well as white papers, which are available on the NuclearScienceFuture.org website. The 62-member writing committee assembled information regarding the following topics: Quantum Chromodynamics (QCD); Fundamental Symmetries; Nuclear Structure & Nuclear Astrophysics; Workforce; Applications; Theory; Crosscutting/Interdisciplinary Topics; Impact and Synergies with Other Fields; Facilities; International Context; and Budget. There were two international observers of the LRP process. Issued today, the report is titled, "A New Era of Discovery: the 2023 Long Range Plan for Nuclear Science."

The LRP has four recommendations. The first states, "The highest priority of the nuclear science community is to capitalize on the extraordinary opportunities for scientific discovery made possible by the substantial and sustained investments of the U.S. We must draw on the talents of all in the nation to achieve this goal." Realizing Recommendation #1 will require: 1) increasing the research budget to expand discovery potential and develop the workforce; 2) effective operation of national user facilities (ATLAS, CEBAF, and FRIB) and completing the RHIC science program; 3) increasing graduate student compensation to levels commensurate with cost of living; and 4) policies and resources to create a safe and respectful environment for all.

The second and third recommendations are of equal priority. Their order reflects their appearance in the preceding 2015 LRP. Recommendation #2 states, "As the highest priority for new experiment construction, we recommend that the U.S. lead an international consortium that will undertake a neutrinoless double beta decay campaign, featuring the expeditious construction of ton-scale experiments, using different isotopes and complementary techniques." Recommendation #3 states, "We recommend the expeditious completion of the EIC as the highest priority for facility construction." Completion of both projects offers major discovery potential.

Recommendation #4 advises "capitalizing on the unique ways in which nuclear physics can advance discovery science and applications for society by investing in additional projects and new strategic opportunities." This recommendation recognizes nuclear science's synergy

with and impact on other fields including through contributing a trained workforce and the development of computational techniques. Applications of the nuclear sciences are broad (energy, health care, environmental issues, radiation hardening for electronics, etc.). Strategic opportunities include accelerator and detector research & development (R&D); emerging technologies in computing and sensing (e.g., QIS, AI/ ML, and high-performance computing); and the ability to create multidisciplinary centers, and nuclear data utilization.

The report recognizes the central role of the workforce to the nuclear sciences; people are essential to accomplishing all the LRP's goals. NSF and DOE undergraduate research programs are essential to attracting talented students, and the removal of barriers is imperative to increase participation. Students trained in the nuclear sciences are very valuable to industry, the national labs, and to critical areas such as nuclear nonproliferation and security.

Though the U.S. is currently in a position of leadership, the world-wide nuclear physics landscape is becoming increasingly competitive. Both Europe and Asia are investing heavily in these areas and have plans to upgrade current facilities and build new facilities.

The 2023 LRP envisions maintaining world leadership in the nuclear sciences. Doing so will require investments in people, facilities, and projects/ experiments. Articulating priorities in the context of budgetary scenarios requires difficult choices. However, nuclear science brings tremendous benefits to the nation, through a trained workforce, impact on other fields, advancing cross-cutting technologies, and applications that benefit society.

Discussion of the Long Range Plan

Cloet asked about the overseas funding landscape. **Dodge** remarked billions of dollars are being spent in Asia. The international community is putting a lot of funding into nuclear science.

deSousa complimented the report's cover art. In contrast to prior LRP's art, there is correct emphasis on people as movers behind the science. **Dodge** agreed. The committee not only wanted an emphasis on people but also to acknowledge machinery and equipment. The art shows many aspects of what the field does, including undergraduate research and applications.

A meeting attendee (via Q&A) asked about graduate student compensation. **Dodge** stated the committee acknowledged differences in how universities set wages for graduate students. The LRP committee does not have the ability to affect individual students' wages. The committee focused on advocating for graduate students to be paid at a level commensurate with the cost of living in their location. Increasing salaries needs to be done without contracting the workforce; the committee is not trying to encourage higher wages for fewer students. Research budgets must ensure pay is not a barrier to student participation in science. The committee conducted an extensive survey of students. Results are available at NuclearScienceFuture.org and indicate students struggle financially and have trouble paying unexpected expenses. Though the committee can recommend money be made available, addressing universities policies, like flat stipend rates, is a separate issue.

A meeting attendee (Q&A) requested more information about the funding scenarios. **Dodge** said the funding scenarios considered were: 1) modest growth based on FY22 enacted appropriations; 2) constant effort; 3) modest growth based on the FY23 budget; and 4) the CHIPS and Science authorization.

A meeting attendee (Q&A) asked when the LRP will be available. **Dodge** said the report will be posted at the end of the meeting. The report has not been reviewed in its layout form, so there may be minor typos, which will be corrected over the next two to four weeks.

A **meeting attendee** (Q&A) asked about the priority of recommendations. **Dodge** explained the first recommendation was of highest priority. The second and third recommendations of equal priority are listed in the order presented in the 2015 LRP.

A **meeting attendee** (Q&A) sought more information about strategic opportunities mentioned in Recommendation #4. **Dodge** said strategic opportunities are provided throughout the report and are not limited to those listed. The report recommends funding agencies support strategic projects as funding becomes available.

A **meeting attendee** (Q&A) requested Hallman's slides. **Dodge** said these will be posted on NSAC's website later.

A **meeting attendee** (Q&A) asked if a compensation analysis was conducted for post-docs, part-time faculty, research faculty, and scientists. **Dodge** relayed there was limited examination of post-doc salaries, but the committee decided to focus on graduate student salaries as a first step.

Hallman asked if the LRP evaluated what resources are needed to fill the graduate student salary gap and posited filling this gap could create a standard of practice in the field that propagates appropriate compensations throughout the community. **Dodge** explained the LRP compared graduate student salaries provided by all participating universities to local costs of living. The committee estimated a salary gap of ~\$20M-\$25M for the nuclear science graduate workforce. Addressing graduate student compensation has to start somewhere, and universities must take all arguments into account when raising salaries. Ultimately, universities operate in a marketplace, and as more universities adopt policies, more progress will be made. This will be an iterative process. Students are struggling to make ends meet, and many rely on their families for support in emergencies. Low pay creates an economic filter.

Dodge dismissed the meeting for lunch at 12:30 p.m. and reconvened at 1:00 p.m.

Continued Discussion of the Long Range Plan

Howell asked about the FY24 House and Senate marks for Nuclear Theory. **Hallman** commented budget crosscuts with few categories must be interpreted with caution because figures are rolled up to larger line items. The NP program subtotal line, excluding construction funds, shows the FY24 PBR is ~\$39M less than the enacted FY23 budget while the FY24 House and Senate marks are, respectively, ~\$10M below and \$5M above the FY24 PBR. This means there may be a constrained budget scenario in FY24. Congress prescribes facility operations at 90%, so core research will likely take the brunt of the deficit. Theory, however, will be no worse off than any other NP subprogram. The community's funding recommendation is timely. **Dodge** added the LRP emphasizes the importance of robust research and operations budgets for both Theory and Experiment.

A **meeting attendee** (Q&A) commented that the Nuclotron-based Ion Collider Facility (NICA) at the Joint Institute for Nuclear Research in Russia should be mentioned as a new collider in addition to the EIC. **Hallman** said the energy and complexity scales of these machines differ significantly. NICA has been under development for a long time. What is the project's status, and when will NICA be ready to take data?

Howell encouraged readers to review the Applications chapter. Unlike the 2015 LRP, the 2023 LRP contains a section on nuclear data that explains the direct, long-term benefits to society. Nuclear data is not only contributed by nuclear physics but also broadly contributed through interagency partnerships. **Dodge** applauded DNP's organization of town hall meetings,

which identified subtopics and raised crosscutting topics, like nuclear data and AI, at every meeting. This approach elevated crosscutting areas, as is reflected in the LRP.

Gao said LRP images feature workforce development and will leave a deep impression on readers. **Dodge** agreed. The LRP charge called for demonstrating how diversity, equity, and inclusion (DEI) supports all aspects of the field. Featuring people prominently is important.

Yury Kolomensky (University of California, Berkely) suggested emphasizing that the EIC is the first collider on U.S. soil since the Tevatron and Proton Improvement Plan-II (PIP-II), rather than arguing the EIC is the first collider since the Large Hadron Collider (LHC). Japan's SuperKEKB is a collider. **Dodge** agreed. This is a point well taken. **Gao** agreed.

A meeting attendee (Q&A) again requested information about the funding scenarios. **Dodge** repeated the four scenarios outlined earlier and referred the questioner to the report. The committee showed how initiatives fit into each budget, and the community's priorities guided what was stated in the report.

A meeting attendee (Q&A) asked about the next steps. **Dodge** said the next steps will be addressed at the end of the meeting.

A meeting attendee (Q&A) asked if NSAC supports training in advocacy, noting the potential for trainees to secure funds in the future. **Hallman** said DOE provides support for research opportunities and training in nuclear physics. DOE is not allowed to provide training in advocacy. For example, if community members have an annual day to visit Capitol Hill and articulate the value of nuclear physics to policy makers, DOE travel funds cannot be used. **Dodge** noted advocacy is important, but NSAC did not address this as part of the LRP charge.

A meeting attendee (Q&A) asked about the 2023 LRP title. **Dodge** clarified the title is "A New Era of Discovery: the 2023 Long Range Plan for Nuclear Science."

A meeting attendee (Q&A) asked if the committee considered how current DEIA programs may clash with future Supreme Court decisions or state laws. **Dodge** explained the committee focused on how to reduce barriers to participation in nuclear science by increasing the number of people entering the field, encouraging participation at early ages, and making it easier for faculty to mentor those individuals. For example, there's a large administrative cost to organizing training grants; the committee suggested providing support to faculty who receive training grants so they can focus more of their energy on mentoring. No suggestions conflict with state laws.

A meeting attendee (Q&A) asked about plans to roll out and socialize the report, including on Capitol Hill. **Dodge** said this will be discussed after the vote and additional suggestions will be welcome at that time.

A meeting attendee (Q&A) commented it is not illegal, even in Texas, to create a welcoming and supportive environment and to pay students enough that they do not need family support to thrive. **Dodge** agreed. Reducing barriers and paying a living wage will allow all to participate in nuclear physics. The field should be open to all talent in the nation.

Reed observed graduate student pay is governed by university rules. Are there creative solutions to increase student compensation while obeying federal and state rules and while pushing for institutions to do the right thing? For example, can graduate students temporarily stationed at more expensive locations receive a cost-of-living increase, separate from their stipend? **Dodge** added graduate students also have costs associated with moving to graduate school. Meeting these startup costs can be challenging. The committee focused on recommending an increased research budget, but the agencies will ultimately decide what to

fund. **Hallman** appreciated the LRP's granular approach to evaluating students' cost of living; the report indicates agencies should target the gaps in cost of living by location. It is difficult for the agencies to pressure universities, unless the agencies help set a new standard of what compensation is appropriate. If some universities start paying students more, students will want to go to those universities. Regarding increased costs of living for travel or extended stays, per diem for different locations are legitimate expenses. Normal proposal processes allow for such requests with explanations in the budget justification. Regarding start-up costs, some aspects of student needs fall under the purview of the Department of Education, not the DOE. **Opper** echoed Hallman's response. NSF does make allowances for cost of living if those are justified by the research. How requests for increases are made must be consistent with university guidelines. Universities are unlikely to change policies based on agency expectations. However, universities and PIs sometimes think there is a cap on student salaries. NSF has no input on salaries; salaries are set by the university. NSF can provide this information in writing.

A meeting attendee (Q&A) wondered if the committee believes enough permanent scientist positions are currently available in the field. Living wages and wages competitive with industry are necessary. The field's next focus may be providing stable, long-term career paths for researchers. **Dodge** said there was limited discussion of these topics. The committee decided to advocate for an increase in the research budget. An increase would hopefully accommodate graduate student salaries and other needs. The committee understands career pathways are needed for students. The Workforce chapter contains relevant proposals.

A meeting attendee (Q&A) asked if the LRP contains longer-term scenarios for the operations of existing facilities. **Dodge** indicated the 2023 LRP lays out progress since the 2015 LRP and future plans for facilities and research programs. The first recommendation advises increasing the research budget to take advantage of the investments made in existing facilities.

A meeting attendee (Q&A) asked about the interplay among increasing the research budget, operating the labs, and new construction. **Dodge** recommended reading the report. The LRP subcommittee discusses various funding scenarios; the subcommittee cannot mandate specifics but does broadly show what activities fit under the different scenarios.

A meeting attendee (Q&A) drew attention to the tone of the recommendations, which seem to rally towards larger flagship labs and facilities. Was this the writers' intention? **Dodge** replied the LRP paid the Association for Research at University Nuclear Accelerators (ARUNA) labs and other university-based labs a great deal of attention. Recommendations #2 and #3 do highlight large efforts. However, smaller facilities are essential to research and training the workforce; these are affected by the research budget and discussed in Recommendation #1, which is the highest priority recommendation in the LRP.

Vote on the Long Range Plan

All NSAC members in attendance and eligible to vote (excluding *ex-officio* members) voted in favor of accepting the report.

Dodge declared the 2023 LRP accepted.

Discussion of the Rollout Process for the Long Range Plan

Dodge reviewed rollout steps and activities planned for the 2023 LRP.

- There is a rollout committee that has been focused on rollout aspects of the report.
- Dodge's presentation and the LRP will be posted on the NSAC webpage at 4 p.m. ET. Of note, typos can be introduced by the layout process, and the LRP draft will be carefully reviewed over the next two to four weeks before being finalized and printed.
- The report and presentations will also be posted on NuclearScienceFuture.org; the plan is for this site to become an information repository for the community. The goal is to expand materials beyond the LRP and white papers. Site expansion will be limited by the effort available.
- A hybrid webinar event to introduce the LRP to the community is planned at 18 locations across the country on Friday, October 6, 2023. Local hosts will introduce the event to audiences, Dodge will present a national webinar on the LRP, and local programming will follow. The press may attend. Attendees are encouraged to discuss the plan and take pictures, which will be used in additional rollout activities.
- Dodge and other subpanel members will brief the DOE, NSF, and other agencies. The community may request briefings at other institutions.
- On November 8, 2023, panel members and possibly students will visit Capitol Hill to explain the LRP to staffers and other policy makers. The event may be opened to the community and will be arranged with the assistance of a government affairs team. Information about which funds can be used to support participation will be provided. This event is separate from the APS-organized "Congressional Day on the Hill" event, which is usually held in April.
- The LRP will be presented at the next DNP meeting. There will be a table to encourage discussion of the LRP among the community.
- All community feedback on the report is welcomed.
- The community is encouraged to talk to the press about how the LRP will support research and positively impact nuclear science programs at local institutions. However, some questions from the press, such as those related to budget scenarios, should be directed to Dodge so that the community speaks with one voice.
- The success of the 2023 LRP will come from having a unified community. Friday's event is an opportunity to come together and celebrate the plan. The subcommittee has worked very hard to provide a plan that addresses the highest priorities of the community that all can support.

Public Comment

A meeting attendee (Q&A) commented that the press may reach out today once they hear the plan is posted. **Dodge** hopes there will be a lot of interest, not only from the community but also from the press. Everyone's participation is appreciated in socializing the report.

Joanne Hewett (BNL) congratulated the LRP panel and looks forward to working with the nuclear physics community to achieve the plan's bold and exciting vision for scientific success. **Dodge** appreciated these remarks.

Dodge referred a **meeting attendee** (Q&A) to the report to answer a question about LHC science, heavy ion research, and future LHC upgrades.

Zein-Eddine Meziani (Argonne National Laboratory) asked how to broaden the nuclear physics community at the top 20-30 U.S. institutions and how to recover nuclear physics programs that have been lost from institutions. Institutions must create excitement for the field to draw younger generations. **Dodge** believes most institutions are excited about nuclear physics. The LRP presents an opportunity for the community to bring the excitement of the field to institutions. The plan outlines outstanding and compelling research opportunities — in NLDBD and through the EIC — for young people. There are also opportunities in neutron star mergers and multi-messenger astronomy. **Hallman** agreed. Universities will act in their own self-interest, especially if there are opportunities to have faculty recognized internationally. A way to draw excitement is to point out opportunities for Nobel Prize-winning research. Beyond NLDBD and the EIC, there are opportunities to use laser-trapped ions for a program to explore fundamental symmetries at the FRIB. The FRIB Director has visited top-ranked universities to discuss opportunities.

Stuart Henderson (Thomas Jefferson National Accelerator Facility) is happy to see a coordinated rollout effort. The next several months are critical for capitalizing on the opportunities laid out in the 2023 LRP. There is a window of opportunity, while the plan is new, to reach the right audience in Congress and other decision makers. Everyone in the field is encouraged to strike while the iron is hot. Now is the time to come together and highlight the opportunities this report has identified with the goal of obtaining more resources for the field. **Dodge** agreed. Promoting the LRP must happen conversation by conversation. Activities begin with Friday's webinar events. There will be further opportunities for briefings, including at institutions. The November 8 visit to Capitol Hill will be effective. Who can argue the importance of funding science? This is an opportunity for the community to make the case for what the field provides to the whole nation. **Hallman** commented that normal business on the Hill has been interrupted by current events, creating a serendipitous window of opportunity for the community to send a message.

Chipp invited comments on how EPSCoR can build the nuclear community. **Hallman** remarked EPSCoR has risen in agency priorities. EPSCoR was always viewed as important but now carries a greater level of urgency. EPSCoR is taken as just as high a priority at DOE and NSF as gender diversity and other DEIA metrics. The program creates the opportunity to surmount geographic barriers and invite all to participate in nuclear physics.

An attendee asked (Q&A) how the LRP will be advertised to Program Advisory Committee (PAC) members? **Dodge** appreciated this remark; copies will need to be printed and distributed to PAC members.

Gao thanked the Oak Ridge National Laboratory's communications team, the science writers, graphic designers, and photographers. **Dodge** appreciated all who supported the report. The communications teams at the national labs are an outstanding resource for the community.

Dodge dismissed the meeting for a break at 2:20 p.m. and reconvened at 3:00 p.m.

Public Comment, continued.

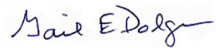
Dodge referred a **meeting participant** (Q&A) to the report to address a question on the role of the LHC in studying small-X values and saturation dynamics.

Dodge directed a **meeting participant** (Q&A) to the report's facilities chapter in response to a question about the U.S.'s lack of an active research program for fixed target proton multi-GeV machines. **Gao** noted town halls and whitepapers directed the LRP's topical focus, and the report reflects the community's views.

Dodge thanked the community, NSAC, and the LRP writing committee for their contributions and hard work. Dodge looks forward to the community reviewing the report and working together to roll out the 2023 LRP.

Meeting adjourned at 3:04 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 October 4, 2023, via virtual by zoom are certified to be an accurate representation of what occurred.



Gail Dodge
NSAC Chair
Date: Dec 3, 2023