

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

**PUBLIC MEETING MINUTES**

**Gaithersburg Marriott Washingtonian Center  
9751 Washington Boulevard, Gaithersburg, MD 20878**

**December 19, 2013**

**DOE / NSF NUCLEAR SCIENCE ADVISORY COMMITTEE  
SUMMARY OF MEETING**

The U.S. Department of Energy (DOE) and National Science Foundation (NSF) Nuclear Science Advisory Committee (NSAC) was convened at 9:00 a.m. EST on Thursday, December 19, 2013, at the Gaithersburg Marriott Washingtonian Center by NSAC Chair, Donald Geesaman.

Committee members present:

Donald Geesaman, Chair	Zheng-Tian Lu	Kate Scholberg
Robert Atcher	Berndt Mueller	Jurgen Schukraft
Jeffrey Binder	Jamie Nagle	Matthew Shepherd
Jeffery Blackmon	Allena Opper	Julia Velkovska
Vincent Cirigliano	Erich Ormand	Raju Venugopalan
Alexandra Gade	Jorge Piekarewicz	
Karlheinz Langanke	Robert Rundberg	

Committee members absent:

Patrizia Rossi

NSAC Designated Federal Officer:

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

Others present for all or part of the meeting in person or by phone:

Phil Barbeau, Duke University  
 Cyrus Baktash, DOE SC, Office of Nuclear Physics (NP)  
 Julie Carruthers, DOE SC  
 Rod Clark, Lawrence Berkeley National Laboratory  
 Fleming Crim, National Science Foundation (NSF), Directorate of Mathematical and Physical Sciences, Assistant Director  
 David Dean, Oak Ridge National Laboratory  
 Patricia Dehmer, DOE SC, Deputy Director for Science Programs  
 Gail Dodge, NSF  
 Michelle Dolinski, Drexel University  
 James Dunlop, Brookhaven National Laboratory  
 George Fai, DOE SC, NP, Program Manager, Nuclear Theory  
 Manouchehr Farkhondeh, DOE SC, NP  
 Jehanne Gillo, DOE SC, NP, Director Facilities and Project Management Division  
 Joe Gintner, National Nuclear Security Administration  
 Harold Griesshammer, George Washington University  
 Joel Grimm, DOE SC, NP  
 Karsten Heeger, Yale University  
 Robert Janssens, Argonne National Laboratory  
 Kyungseon Joo, DOE SC, NP  
 Bradley Keister, National Science Foundation, Deputy Division Director, Nuclear Physics  
 Joshua Klein, University of Pennsylvania  
 Dennis Kovar  
 Richard Kouzes, Pacific Northwest National Laboratory

Dan Lehman, DOE SC, Office of Project Assessment  
 Kevin Lesko, Lawrence Berkeley National Laboratory  
 Thomas Ludlam, Brookhaven National Laboratory  
 Timothy Maier, DOE  
 Bob McKeown, Jefferson Laboratory  
 Erich Ormand, Lawrence Livermore National Laboratory  
 Dennis Phillips, DOE SC, NP  
 Robert Redwine, Massachusetts Institute of Technology  
 Jeff Salmon, DOE  
 Lee Schroeder, Lawrence Berkeley National Laboratory / TechSource Inc.  
 Michelle Shinn, DOE SC, NP  
 James Sowinski, DOE SC, NP, Acting Program Manager, Heavy Ion Nuclear Physics  
 Parrish Staples, NNSA  
 Alan Stone, DOE SC, Office of High Energy Physics  
 James Symons, Lawrence Berkeley National Laboratory  
 Crystal Trujillo, NNSA  
 Walt Warnick, DOE  
 Scott Wilburn, Los Alamos National Laboratory  
 John Wilkerson, University of North Carolina / Oak Ridge National Laboratory  
 Ray Won, DOE SC, Office of Project Assessment

### **OPENING REMARKS**

The Nuclear Science Advisory Committee (NSAC) was convened on Thursday, December 19, 2013, at the Gaithersburg Marriott Washingtonian Center, in Gaithersburg, MD, by NSAC Chair **Donald Geesaman**. The meeting was open to the public and conducted in accordance with the requirements of the Federal Advisory Committee Act. Attendees can visit <http://science.energy.gov/np/nsac> to learn about NSAC. The meeting was presented via webcast and is archived at this location: <http://www.tvworldwide.com/events/doe/131007/default.cfm>.

### **PRESENTATION OF THE DOE OFFICE OF SCIENCE PERSPECTIVE**

**Patricia Dehmer**, DOE Office of Science (SC) Deputy Director for Science Programs, announced two nominees for positions important to SC. Lynn Orr is the nominee for the Undersecretary for Science and Technology. Marc Kastner is the nominee for the Director of the Office of Science. Both have had hearings with nomination committees and are awaiting Senate action.

Dehmer reported on NSAC's work on prioritizing scientific user facilities based on impact and readiness to proceed to construction. Other SC advisory committees were also involved in this task. SC developed a list of about 50 ongoing and new facilities that were grouped in bins ranging from those currently under construction to those that are scheduled to close. SC looked at operating costs for current facilities over the next 10 years, and estimated project costs and eventual operating costs for those under construction that would be complete within 10 years. This information was presented to the Office of Management and Budget (OMB) without discrete rank orderings. OMB can link this data to projected flat budgets for the coming 10 years and better understand projected construction projects.

DOE Secretary Moniz asked Dehmer to present this information to both the Secretary of Energy Advisory Board (SEAB) and the National Laboratory Directors' Council (NLDC). She

shared a history of the SC, budget history, users served, and the number of facilities that have been opened and closed. These details were new to these audiences and will lead to the SC's distribution of this type of information in public communication materials. Dehmer shared the following with the NSAC:

- There are nearly 30,000 users of about 30 facilities
- About 75 percent of users use DOE Basic Energy Science and computing facilities
- The use of these two types of facilities has increased over the past five years
- There are many facilities that have been closed or not been completed in the past 25 years
- Funding for the six SC program elements grew from \$2.5B to around \$5B over 15 years

Dehmer reviewed the report "Facilities for the Future of Science: A Twenty Year Outlook" published in November 2003 by then SC Director Ray Orbach. Between 2003 and 2007, the SC budget doubled to more than \$5B. The report suggested where funding peaks would occur. Facilities were grouped into tiers, and investments were made based upon Orbach's views. One investment was in high-performance computing facilities. One investment not completed was the Basic Energy Research Centers. Dehmer reviewed other facilities that were successfully funded and those that were not, and pointed out that DOE leaders do not have the ability to construct everything its scientific communities envision but, based on advisory committee and public input, may be able to realize the construction of a subset of those projects during any given Administration. This view informs how DOE was able to respond to the OMB facility prioritization task in September 2013. The facilities that ranked highest were those under construction, facilities existing or being upgraded now, and others that already have Critical Decision-0. This is a group of around 15 facilities. In the current funding climate, there is little room for new starts, especially those in the billion dollar funding level category.

There is a push to write up this information and publish the list of facilities. This may emerge around Spring 2014 around the time of the Federal budget hearings.

### **Roundtable discussion**

**Berndt Mueller** asked about lessons to be learned from this study of facilities. Dehmer commented that reasons for terminating construction projects include construction cost overruns despite the potential value of those facilities. Some closed because their time had come, and some closed due to fiscal exigencies and public outcry over accidents or contamination events. New facilities succeed due to strong agreement within the scientific community and alignment between the community, the program within SC, DOE, the White House Office of Science and Technology Policy (OSTP), OMB, and Congress.

**Donald Geesaman** noted that communities want to put forth a plan to achieve the best science. More ambitious communities try to do many things at once. Nuclear science has stuck to a consistent roadmap and that is why facilities have been successful. Dehmer agreed and pointed out that when one facility peaks, another rolls off. Construction timelines have been reasonable.

**Jurgen Schukraft** asked about whether the counting of computing facilities users as computing is done in multiple programs. Dehmer noted that users doing work at Advanced Scientific Computing Research (ASCR) facilities are counted as ASCR users. Computing users at other facilities are counted separately and this total amount is small compared with ASCR users.

## **PRESENTATION OF NSF NEWS**

*Nuclear Science Advisory Committee – December 19, 2013 - Meeting Minutes*

**Fleming Crim**, Assistant Director for Mathematical and Physical Sciences (MPS), gave an update on NSF and the MPS. Dr. France Cordova has been nominated to serve as the Director of NSF and the nomination process is proceeding. MPS is one of seven directorates that report to the Director and the NSF reports to the National Science Board. The Office of Polar Programs and the Office of Cyber Infrastructure are now located within the Geosciences and Computer and Information Science and Engineering Directorates, respectively.

MPS is one of the largest directorates with a budget of \$1,250M in FY13. This is spread across five divisions each with a budget of around \$250M. MPS includes the Office of Multidisciplinary Activities. The divisions spend funds differently with different levels of investment in facilities, individual investigators, centers, and educational efforts.

Each division has a different view of facilities. Astronomy, Materials Research, and Physics invest in facilities, whereas Chemistry and Mathematics do not. Facilities are not distinct from investments made in investigators as science occurs on all fronts.

The MPS budget between FY00 and FY13 shows fluctuations and an overall increase, yet the directorate is operating with a flat-budget perspective. Over this period, the number of proposals has nearly doubled while the funding rate has decreased from 37 percent to 23 percent. MPS made 258 fewer awards in FY13 due to sequestration.

MPS's FY13 budget is 4.58 percent less than in FY12. Cuts were not equal across the divisions due to decisions to support early career initiatives and decisions about specific areas of focus by the NSF. The FY14 request is 10.9 percent higher and would be a small increase relative to FY12 levels.

NSF and MPS are dealing with community issues and priorities that include the transition of the National Superconducting Cyclotron Laboratory (NSCL) to the Facility for Rare Isotope Beams (FRIB). There is a strong partnership between NSF and the DOE on this and other common interests.

MPS has appreciated community input on the midscale instrumentation programs initiative. Crim sees the value of community-based decisions and communicating those up through government and in other communities. Major Research Equipment and Facilities Construction is another area of near-term emphasis. NSF is heavily committed to seeing the start of construction of the LSST and the Daniel K. Inouye Solar Telescope.

Long-term investments will be driven by making a compelling case to match the NSF's mission to support fundamental research and achieve compelling science. Hard decisions are being made that involve thinking about building new facilities and the operation costs of those facilities.

### **Roundtable discussion**

**Geesaman** asked what the NSAC can do for NSF. Crim shared that the double-beta and isotope charges given to NSAC are important. The articulation of community priorities is important. NSF is attuned to this input. Also vital is NSAC's communication to the community.

**Jorge Piekarewicz** asked if there are ways to bring new researchers into nuclear science. Crim shared that the NSF career program is one way to fund new investigators or help them move in new directions. There is not enough new hiring at universities. NSF cannot change that but is supportive through career programs and educational development. **Brad Keister** of NSF added that proposals from new principal investigators (PIs) are considered along with others, and nuclear physics made several new PI awards in FY13 despite funding hurdles. The community recognizes that new researchers need opportunities. Community articulation of this is helpful.

Crim confirmed for **Jurgen Schukraft** that proposal submissions and rejections currently represent a mixture of new people submitting proposals and more proposals from the same people. Crim suspects that proposers who are rejected by one agency turn to the other agency with similar proposals. DOE may be feeling similar proposal review pressures.

**Karlheinz Langanke** noted that budgets have been relatively flat. Other countries have had increased budgets for nuclear physics, and asked about comparisons between the U.S. and others. Crim thinks that this climate may not change and this may hamper U.S. competitiveness. The U.S. should embrace partnerships to conduct research internationally and the facilities are a reflection of this approach. Dehmer added that DOE is struggling with this question and trying to identify facilities that are appropriate for joint research, and where the U.S. needs to be the global leader. Secretary Moniz is trying to identify where the U.S. should be the leader. Crim noted that the Astronomy Division and the telescope in Chile are a good example of the value of multinational partnership.

**Zheng-Tian Lu** asked if there is a funding amount in mind for midscale instrumentation. Crim believes that NSF will see proposals around \$10M to \$15M. NSF has major research instrumentation grants that run up to \$4M that represent a lower limit. Around \$50M would be the upper range and \$100M starts to get toward being a Materials Research Science and Engineering Centers (MSERC) project. Instruments on a facility or a stand-alone initiative represent a range in which the NSF could be doing more work.

## **PRESENTATION OF NEWS FROM THE DOE OFFICE OF NUCLEAR PHYSICS**

**Tim Hallman**, DOE SC Associate Director, Office of Nuclear Physics (NP), shared an update on the activities of the DOE NP. SC is the largest funder of U.S. nuclear science.

The NP budget appropriation for FY13 was approximately \$520M. The FY14 President's Request was approximately \$570M. This was reduced to \$552M in the House Mark and held at \$570M in the Senate. Recent discussions by lawmakers have been underway. There is funding requested for facilities including FRIB, Relativistic Heavy Ion Collider (RHIC), ATLAS, and the 12 GeV CEBAF Upgrade. There may be some constraint depending on the level of budget NP receives. This uncertainty places pressure on planning and the community.

The 12 GeV CEBAF Upgrade at Jefferson Laboratory (JLab) is having scientific impacts on many aspects of nuclear science including accelerator R&D, medical imaging, theory and computation. The Upgrade is about 83 percent complete. When done it will support the search for new exotic mesons, perhaps related to gluon excitations, the search for fundamental symmetries like parity violation, and detailed understanding of the internal structure of the proton. The Total Project Cost (TPC) for the CEBAF Upgrade was recently rebased lined from \$310M to \$338M. The increase in the TPC results from decisions by Congress and management challenges in designing magnets. NP will have to absorb this increase and this will impact other areas of the program.

ATLAS continues to operate well. The CARIBU operation continues to improve which will also improve non-accelerated and accelerated rare isotope beam availability. This will be the SC workhouse for rare isotope beam studies until FRIB comes online in the next decade. ATLAS is important for the low energy nuclear structure and nuclear astrophysics communities.

FRIB has been baselined and it has received CD-2 approval. This presumes a construction start on April 1<sup>st</sup>, 2014 subject to NP receiving a 2014 budget and a notice to proceed. The total cost is \$730M. The DOE share is \$635.5M. The project has been well managed and is ready for construction. FRIB will address important questions to include identifying isotopes with

unknown properties, and access to a sufficient number of isotopes to recognize changes in patterns of nuclear structure to inform theory and lead to predictive theory of nuclear structure.

RHIC is described as the most capable and successful collider operation in the world. It led to the discovery of a completely new state of matter - a perfect quark-gluon liquid. There is a sizable scientific community trying to understand the properties of this new state of matter. Collaborators provide important benefits to RHIC including expertise and equipment. There is a process to understand the details of the new matter, search for new discoveries, and explore the gluon and sea-quark contributions to the spin of the proton.

Preparations are continuing for neutrino-less double-beta ( $0\nu\beta\beta$ ) decay experimentation. There are many efforts ongoing to explore the approaches for this search. Work continues at the Sanford Underground Research Facility (SURF) in South Dakota on electroforming copper for use in a cryostat where Germanium will be used to study background levels and the feasibility of a large-scale experiment in search for  $0\nu\beta\beta$  decay.

The NP Isotope program is continuing to produce and distribute radioactive and stable isotopes, to maintain needed infrastructure, and continue R&D on isotope production. The appropriation for this program is modest but the work has enormous impacts on the economy and the medical community. This is a challenging program that had more than 225 customer orders and 470 shipments in FY2013.

Research on isotope R&D has been a great achievement. We now know how to produce as much actinium 225 in a few days as was once produced in one year. This takes alpha-emitting isotopes into a realm where they can be considered for cancer treatment. This may be a very exciting story for the future and advances in the treatment of cancer, and is due to starting a research component of the isotope program when it came over from Nuclear Energy in the 2009 appropriation.

Hallman shared other NP news to include awaiting the pass back for FY15, a successful review of RHIC, the completion of the competitive research review of all laboratory and university research grants supported by NP, the Federal Isotope Workshop in September 2013, and NSAC charges for 2014 that may include revisiting the 2007 long-range plan, revitalizing performance measures for community goals and achievements, and another NSAC-I charge. Hallman announced that Dan Lehman will retire in January 2014, and he has been instrumental in conducting program reviews. The Neutron Electric Dipole Moment (EDM) had a successful review in December and dealt with a number of concerns raised in a previous NSAC review. And, DOE's implementation strategy for open access has been proposed to the OSTP.

In 2014, NP will conduct another round of competitive reviews looking at proposals up until May 1, 2014. These will be separated by sub-fields and will be announced on the DOE NP website.

Recommendations were made to NP through a Committee of Visitors (COV) to include making the portfolio review and analysis (PAMS) fully functional. Partial functionality is underway and will address long-standing concerns. COV recommendations included more focus on the timely delivery of reports, the formation of guidelines defining roles and responsibilities, that NP work with the community to enhance the peer-review process. The latter is being furthered through the Comparative Research Review (CRR) conducted in 2013 and the insight gained versus mailing out research reviews. It was also suggested that NP fill several program positions, define the process and timelines for major reviews including the 2013 Comparative Review, and perform further analysis of workforce data along with understanding the constraints of budget shortcomings. NP is working on further engagement with user facilities to discuss

performance metrics. It has initiated an exchange forum on accelerator R&D activities between SC Offices and will meet about twice per year to discuss this area of investment. NP has put together a survey to respond to the recommendation that it conduct a systematic assessment of computational needs across the fundamental symmetries experimental subfield. NP is developing a fundamental symmetries subprogram and intends to separate it from the Low Energy subprogram portfolio, as recommended by the COV. In 2014, NP will work to provide direct feedback to applicants for the Early Career Awards program on proposal competitiveness and other routes for funding among other issues.

Hallman and Brad Keister shared their appreciation for departing NSAC members by giving certificates to Jeffrey Binder, Jeffery Blackmon, Alexandra Gade, Karlheinz Langanke, Zheng-Tian Lu, Berndt Mueller, Robert Rundberg, and Julia Velkovska.

### **Roundtable discussion**

**Jeffery Blackmon** asked about the production of a Californium source for the CARIBU. Jehanne Gillo shared that the source was fabricated and was much stronger than Argonne had anticipated. They are struggling with how to handle the source and will resolve this situation shortly. There may be a one to two month delay in making the source available for experiments.

### **Public comment**

None

## **PRESENTATION OF NEWS FROM THE NSF NUCLEAR PHYSICS**

**Bradley Keister**, NSF, Program Director, Nuclear Physics (NP), shared an update on NP activities. Funding for nuclear physics at NSF is provided by both dedicated nuclear physics programs and those that support other activities as well.

One research campaign highlight is the GRETINA work at the NSCL that features a DOE-funded detector at a facility for which NSF has stewardship. NSF also supports scientists and instrumentation at a polarized proton run recently completed at the DOE-sponsored RHIC, and the Qweak experiment at the DOE-sponsored JLab with instrumentation funded by NSF.

The Physics Division is part of the NSF Mathematical and Physical Science Directorate (MPS). MPS requested a FY14 budget increase of around 10 percent to \$1,386M. The Physics Division budget was down by 10 percent in FY13. Some investments, such as facility operations, were held flat and investigator funding was down about 12 percent. This impact was felt almost entirely by FY13 investigator proposals.

There are other funding areas with connections to nuclear physics. One example is the ongoing program with Domestic Nuclear Detection Office at DHS. The awards made in FY13 were less oriented toward nuclear physics than usual and covered areas such as computer science and social factors. The 2014 process has not started yet. Another example is the Major Research Instrumentation (MRI) program, which represents a good match for NP. There were two awards made in 2013, one for improved resolution at the AMS beam line at Notre Dame, and one for the upcoming muon g-2 measurement at Fermilab. One additional funding example is the physics frontier centers. The pre-proposal stage is complete and invited full proposals are being considered in early 2014.

One NSF-wide initiative in which physics is playing a role is Computational and Data-Enabled Science and Engineering (CDS&E). This is a program that the Physics Division finds is



a good match for its investigator communities. There may be more funding for this in 2014 or beyond. Proposals for this have been received from many communities including nuclear physics.

The NSF Physics Division now accepts proposals for accelerator science. The first proposals were received in the Fall of 2013 and the number to be awarded depends on available funding in 2014. Program officers have been in conversation with their counterparts at DOE in setting up this program.

Some awards have been made for mid-scale instrumentation. NSF has officially announced this opportunity and is working to ramp up this program to support proposals of \$4M to \$10M or more. Many proposals have been received. Proposers do not apply for mid-scale funds specifically, but rather submit proposals to the relevant disciplinary program in order to be candidates for funding at the mid-scale level.

Keister noted changes to NSF personnel including the search for an NSF Director. Keister will be the new MPS Physics Deputy Division Director. Within NP, Gail Dodge is continuing into her second year, Alice Mignerey from the University of Maryland is helping on a part-time basis, and Bogdan Mihaila has been supporting NP theory since January 2013. NSF will search for one and possibly two NP program directors.

Keister shared that NP has strong connections to other fields. Funding allocations are made at the division level, and the impact made by challenging budgets was felt in similar ways across all divisions. This is different from nuclear physics in DOE that is a direct line item. This has inspired the divisions and programs to talk to one another more.

### **Roundtable discussion**

**Geesaman** shared his gratitude for Keister's work and support of the nuclear physics community.

**Robert Atcher** noted the importance of training and his desire for someone associated with the recent National Academy of Sciences report on training in nuclear chemistry to do a crosswalk of their findings and the training needs identified by DOE and NSF.

**Julia Velkovska** asked why the Physics Division took a larger budget cut than other divisions at the NSF and if the division will experience the same proportionality if budgets are restored. Keister shared that cuts were affected by a number of things including the match of the physics division request to priorities at NSF. Crim added that the Presidential Administration has initiatives that flow down to NSF and will be identified during pass back. Those initiatives are at around an eight to 10 percent budget level for MPS and this can make a significant impact. The recent cuts were a confluence of events and policy decisions at the top level of the NSF. Physics had the biggest increase in the MPS FY14 request in an attempt to rectify earlier cuts. Crim hopes that the new budget will allow for some repairs suffered by Physics. It is unknown whether or not MPS' spending in certain areas will be constrained by OMB. MPS tries to buffer out those areas that are not identified.

**Keister** confirmed for **Raju Venugopalan** that the number of Early Career Awards given by physics has increased over the years. Each division can handle this differently. In Physics, there is understanding that the career award is the right thing for some investigators and not as helpful for others. There may be different interpretations of the importance and role of a career award among universities and how the award impacts tenure.

**Blackmon** noted that the strategy to honor prior funding commitments seems to amplify budget challenges rather than smoothing them out. He asked if there were ways to mitigate these

challenges. Keister shared that NSF's insistence on this strategy has been around for a long time and has not been relaxed over a history of past budget dips. Keister shared that in one sense there may be enough years that have been hard that the impact statistically averages out, but acknowledged that that may not be a good answer. Program managers might want as much flexibility as possible to adjudicate things on what the community believes is the best science. Crim noted that there are continuing awards that give some incremental money each year and standard awards that give money in the year that the award is made. If there are enough standard awards, then these can be converted to continuing awards. Managers are trying to figure out the best way to manage these subtleties and the tactical choices made to balance awards with the appropriations. In the past, NSF has used standard awards to mitigate program cuts like those made in 2009. Keister added that with regard to initiatives, OSTP issues an annual memo that states the White House priorities for science. These are high level budget drivers that affect all agencies. One example is CDS&E, and NP will receive funding for this. There are other initiatives that are things that Physics would not support. Keister asked the community to read these initiatives and tell the division if they think that it could play a role in some of them.

**Public comment**

None

**PRESENTATION OF THE DOE OFFICE OF NUCLEAR PHYSICS 2013  
COMPARATIVE RESEARCH REVIEW**

**Tim Hallman** shared findings from a comparative research review (CRR) of all university and laboratory physics research supported by NP. The review began in 2012 and sought to obtain independent, expert, peer review comparative evaluations of the competitiveness of supported research activities as part of NP's continuing effort to ensure the science it supports is of the highest merit, quality, and impact.

NP found that it was not receiving sufficiently insightful comments through its standard processes in order to prioritize within subfields in ways that would allow NP to enhance its competitiveness or make budget decisions if needed.

An international panel of experts participated in the review. Each was deemed to not be funded by DOE or have any conflicts of interest. The review was conducted in the following five subfields with each led by a panel co-chair:

- Nuclear structure and nuclear astrophysics
- Heavy ions
- Medium energy
- Nuclear theory
- Fundamental symmetries

The review chair was Dr. Shoji Nagamiya. He maintained consistency across the subfields.

The review was a retrospective evaluation of what was accomplished during the past three years and the quality and impact of NP-funded research. Scientific excellence was an overriding consideration, along with creativity, innovation, and additional criteria.

Planning for the review began in February 2013. Grantees and groups to be reviewed were notified of the CRR in April. The CRR occurred between May and June 2013. Grantees were also asked for feedback about the review itself. Reviews were conducted through PeerNet and initial results of the review were provided at the end of July. Panel members offered their scores independently and anonymously, and were able to give comments.

In September, program managers discussed the reviews, scores, and comments from panel members, and made decisions in response to the reviews. Assessments were well done and well-informed. The scores were provided in a letter to grantees that informed them of NP decisions. A final CRR report was published in December.

The letter sent to grantees in September explained the panel members' comments and scoring. The more competitive grants above the lowest 20 to 25 percent of the grants will be discussed by NP programs managers and PIs through ongoing program monitoring. This may include identifying ways to strengthen these efforts, and award continuity will continue as normal. Lower ranked grants may be adjusted to allow an early and orderly phase out, and would allow grantees to re-propose at the end of a revised project period if they chose to do so.

NP will collect all proposals received from now up until May 1<sup>st</sup> and have a competitive review of those proposals in order to strengthen the competitiveness of the U.S. nuclear science portfolio. Proposals can be completely new efforts or proposals from the PIs of grants that are phased out.

Hallman shared feedback on the process. Panel members were supportive of the process with suggestions on some of the technical details. 26 comments were received from PIs. They noted the need to take into account the academic schedule, provide feedback in a timely manner, that the process was well-organized, panel members were knowledgeable, and the process was efficient. There was a concern that there would be a tendency of the theory panel to inject bias on what topics are of more importance as theory spans many fields. One PI commented that the exercise was a waste of time as there is already a review in place, yet Hallman saw the exercise as an opportunity to view all projects at one time and in one place. Some commented that the intended ultimate outcomes of the process were not sufficiently clear.

NP will start a new round of competitive review but this is not a continuation of the comparative review. NP will try to give more timely and complete information for the next review and share more details about the desired outcome. This type of review was a major undertaking. It is unlikely be repeated often but can help to refresh the field periodically.

NP plans to return to its standard process following the Competitive Review in FY2014 of sending out proposals for comments for peer review and using the process with which people are more familiar.

### **Roundtable discussion**

**Blackmon** described the process as valuable and well done. He asked about the review of the bottom 25 percent and if they will be done through a standard process, and how new proposals will figure in. Hallman clarified that the next round is not viewed as targeting a re-do of the grants in the affected category. Those grantees are welcome to propose new things, but all will be competed in the different sub-group categories against one another. The goal is to select proposals that will be in the highest ranks of competitiveness. This will not be a re-do of the grants phased out as a result of the CRR. Hallman commented that proposals received after the deadline may not get considered for funding until FY16.

**Mueller** asked how the NP will use scores to guide the program and how this will be used for grant administration and tracking. Hallman shared that the program managers are responsible for discussing the comments from panel members with grantees, and focusing on things that are positive and could be strengthened and improved. There may not be a detailed strategy beyond these discussions with the goal of devising ways that things could be strengthened even further.

**Langanke** commented that the process was very professionally done and provided a strong overview of where theory is headed. He asked why NP used the figure of 25 percent rather than 10 percent. Hallman clarified that this was decided by program managers. It is not necessarily uniform across all of the programs. It created ways for managers to have some flexibility for investments to respond to new opportunities and conduct a better research portfolio. It was mostly a judgment call and provides opportunity to respond to new opportunities. NP was heavily subscribed funding-wise previously and not able to respond to new opportunities, and this could keep the field fresh and vibrant.

**Jamie Nagle** commented that in moving to the competitive review, the reviewers may see proposals from more senior people they know who will come from this lower 25 percent category. He is worried that reviewers may speculate why those proposers scored low. Those proposals should not be seen as low as they may be reshaping their programs. Hallman responded that NP's view is all proposals received will be treated as new proposals without bias. Reviewers are expected to treat them that way and proposals should be judged on their own merits. NP will have to also choose reviewers carefully.

**Schukraft** was glad to see that the margin did increase from 10 to 25 percent. He added that the recommendations given to individual groups had strong and weak points, and that NP should use these recommendations and act upon them. Hallman commented that input from the review is important, and NP relies on the knowledge of the program managers. In determining where to draw the line in a portfolio, the program manager makes that decision after discussion with the NP Office. The program managers' judgment and results of the review help them know where to draw the line. Comments to grantees are important and some are already leading to changes in strategy in individual grants.

**Harold Griesshammer** asked about the 25 percent and awards that will be phased out and what fraction of budget that affect. Hallman indicated that that was about eight percent of the budget.

**Griesshammer** asked about the distribution of those low performing awards across award size respective to number of PIs, number of personnel, and budget size, respectively. Hallman noted that during the review, NP did some real time analysis to see the characteristics of those that were doing better. In at least one sub-field, this seemed fairly flat. He observed that in an affected group category, it tends to be smaller grants and not the larger grants. The correlation between levels of funding and ranking is not clear.

**Griesshammer** noted that the bulk of awards seemed to be in theory but that this is not the bulk of the award dollars. He asked how the appearance of bias between sub-fields was avoided. Hallman did not have a detailed response; the panel was asked during orientation not to make judgments between theory and he hoped that there were enough presentations so that things were not tilted toward one sub-field or another.

**Griesshammer** asked what steps NP will take in the future for normal award renewals to make them more competitive and avoid having to do this process often. Hallman shared that NP does not have a detailed plan yet but hopes that there will be opportunity at the DNP meeting to bring in presentations and discuss the review and why it was so important. He wants to generate critical comments on how the U.S.'s global ranking, and to engage the community in identifying what could be strengthened and where something may not be competitive. Internally, NP will have to be more selective based on what it knows from critical remarks and a meaningful assessment. That data may be limited as NP does not want to go back to same reviewers all of the time. Hallman imagines that NP will conduct a CRR every seven or eight years. He added

that NP does not want to use this exercise to make any judgments in comparing the sub-fields and the status of priorities.

### **PRESENTATION OF A CHARGE ON NEUTRINO-LESS DOUBLE BETA DECAY**

**Tim Hallman** introduced a charge from the DOE and NSF on neutrino-less double beta decay (NLDBD). The motivation for the charge is to search for the violation of lepton number. If it were observed, this violation would likely be associated with Majorana masses. This is a mass mechanism, unlike the Higgs mechanism, that reaches far outside the standard model, very possibly to the GUT scale. In addition, neutrino properties are an urgent scientific question and there are many ongoing experiments.

In SC, there is agreement that DOE NP is the steward of a tonne-scale NLDBD experiment. Once the experiment is chosen, support for groups related to this research will be determined.

NP wants to avoid stakeholders perceiving that there is duplication of effort. Through the R&D phase, there are first phase experiments that will continue in their normal trajectory and will be supported from their traditional SC program offices. The experiments stemmed from a recommendation by the Neutrino Scientific Assessment Group (NuSAG) in 2005. NP will look at all of these experiments and identify what technology will provide the best scientific value.

The SC Office of High Energy Physics (HEP) and NP discussed how to conduct this exercise. One approach was to reconstitute NuSAG but DOE SC ultimately decided to ask an NSAC sub-panel to look at the current status of first phase efforts. The sub-panel will provide input to DOE and NSF on conducting a second generation NLDBD experiment capable of determining whether the nature of the neutrino is Majorana or Dirac. Because of the broad interest in this task, NSAC should solicit input from the High-Energy Physics Advisory Panel (HEPAP) and the nuclear science community.

The sub-panel is asked to base its recommendations on the scientific merit of a second phase experiment, the status of current and planned phase one experiments, the science-driven criteria for conducting phase two experiments that get at the Majorana versus Dirac nature of neutrinos for the inverted hierarchy mass scenario, and the status and progress of theory calculations that would determine the sensitivity limits needed in NLDBD experiments. A sub-panel has been formed, will begin its work in February 2014, and will provide a report at the end of April 2014.

**Geesaman** added that Bob McKeown has agreed to be the sub-committee chair and announced the other members of the sub-committee: Frank Calaprice, Vincent Cirigliano, Peter Fisher, Donald Geesaman (ex-officio), Geoffrey Greene, John Hardy, Wick Haxton, David Hertzog, Karlheinz Langanke, Zheng-Tian Lu, Kate Scholberg, Thomas Shutt, Henry Sobel, and Steve Vigdor. The decision was made to not include people who are part of ongoing NLDBD experiments. NSAC looked at this issue recently in the facilities study undertaken earlier this year. McKeown has already appeared at a HEPAP Meeting to discuss the charge for this subpanel of NSAC.

**Geesaman** will send out the charge letter from DOE and NSF to the NSAC members for comment, with feedback to go to McKeown. Geesaman has asked the sub-committee to submit its report to NSAC by April 1, 2014.

**McKeown** reported that the sub-committee has had an initial discussion and recognizes ongoing projects that are obvious for consideration. PIs are being contacted for input. Later in February, those projects and others could have the opportunity to make presentations. In addition, an announcement is being prepared for publication by the APS Divisions of Nuclear

Physics and Particles and Fields, respectively, to get input from other projects. The sub-committee is also seeking details on international projects.

### **Roundtable discussion**

**Piekarewicz** asked about the role of the high-energy community. Geesaman noted that there are high-energy physicists involved in NLDBD experiments. He expects that if there is one larger experiment approved and they agree on the basis for the decision, then nuclear and high-energy physicists can work together to carry out the experiment. HEPAP will be kept aware but the charge is to NSAC. Hallman added that when an experiment is constructed, NP will conduct project management. Groups in both programs can participate in the research.

**Piekarewicz** asked how input from non-U.S. groups would feed into the process. Geesaman noted that NSAC is not asked to select a project but rather criteria for a project. While the broadest input is needed, there is major U.S. participation in most major efforts and input is welcome from anyone. The announcement will also go out through the high-energy physics community. McKeown added that how to get input from non-U.S. projects is not yet decided.

**Schukraft** noted that it is good to build in a process for international participation early on. McKeown shared that this would come later in the subcommittee discussion after they have looked at a basic set of information.

**Mueller** commented that a NLDBD experiment is unlikely to be carried out above ground. He asked if the sub-committee will address the conditions of availability and suitability in their criteria. McKeown shared that the sub-committee is asking about the depth of current projects and the depth requirements in researchers' visions of phase two experiments. There has been some controversy about the depth of NLDBD experiments and the sub-committee will likely discuss this. The location will not be discussed but they will get input for the next step.

A member of the audience asked if the criteria will take into account the impact that the experiment will have on dark matter searches. McKeown noted that this has not been entertained at this point and it is not in the charge, but that could be recommended as a consideration. The subject has come up in the sub-committee and they have talked about experiments that have capability in DBD. He is interested in hearing from leaders of dark matter experiments.

## **PRESENTATION ON NATIONAL NUCLEAR SECURITY ADMINISTRATION GLOBAL THREAT REDUCTION PROGRAM FOR MO-99 PRODUCTION WITHOUT HIGHLY ENRICHED URANIUM**

**Parrish Staples** of the National Nuclear Security Administration (NNSA) shared details as a lead up to a charge to be received by NSAC. The charge originates from the American Medical Isotopes Production Act of 2012 (AMIPA) that was in the National Defense Authorization Act (NDAA) for Fiscal Year 2013. It became law in 2013. The act calls for the Department of Energy to develop a program plan and annually update the program plan through public workshops. The intent of the act is to support projects for the production of molybdenum-99 (Mo-99) in the United States without highly enriched uranium (HEU).

The mission of the NNSA's Global Threat Reduction Initiative (GTRI) is to reduce and protect vulnerable nuclear and radiological materials located at civilian sites worldwide. The GTRI Reactor Conversion program has origins dating to 1978 under the Reduced Enrichment for Research and Test Reactors program. The program has expanded to include the conversion of

Mo-99 production in the interest of, HEU minimization and the establishment of a reliable supply of Mo-99 for the medical community.

The program is working to address weaknesses in the supply chain of Mo-99 that have been identified as risking long-term reliable supply, such as lack of investment in new infrastructure due to the economic situation of the current industry, the use of HEU to produce Mo-99, and subsidies that support production from foreign governments. The current supply is not sufficiently robust to meet the medical community's needs when one or more producers are not able to provide product. The current supply chain is dependent on aging facilities with little room for new commercial suppliers due to historic and present-day government-subsidization, which risks financial investment in new production. And, the current supply chain relies on one technology for production of Mo-99. The program seeks to accelerate commercial U.S. production for a long-term supply of Mo-99 for the medical community through non-HEU-based production, as well as support producers in other countries to convert to non-HEU production.

The international producers are converting to produce with low-enriched uranium (LEU) targets and GTRI provides support by assisting them in the conversion process. Facilities in The Netherlands (Mallinckrodt) and Belgium (IRE) have committed to convert by 2015. Canada has announced they will cease isotope production in 2016. To fill the gap left by Canada, domestic producers are expected to start up and are needed to meet the needs of the medical community.

GTRI has been recognized for its exceptional program management capabilities by both the American Nuclear Society and the Project Management Institute. It has provided hands-on experience with conversion for both research reactors as well as isotope production facilities.

GTRI has supported three basic technologies for Mo-99: LEU fission, neutron capture, and accelerator based production.

In 2010, GTRI issued a Funding Opportunity Announcement looking for commercial entities to demonstrate and achieve full-scale production of Mo-99. During this same period, as the medical community realized that there would be regular shortages, they started to implement efficiency and cost saving measures.

NNSA has partnered with NorthStar Medical Radioisotopes to pursue accelerator and neutron capture technologies. Another partner is the Morgridge Institute for Research to pursue accelerator with LEU fission technology in cooperation with SHINE Medical Technologies. Babcock and Wilcox is a third producer that pursues LEU solution reactor technology. And, General Electric-Hitachi was pursuing neutron capture technology but in February 2012, it announced a decision to suspend the project indefinitely due to market conditions.

Consistent with the 2005 Energy Policy Act, each cooperative agreement is executed under 50/50 cost share agreement. NNSA has also capped the government cost share at \$25M.

As the GTRI effort is carried out, it must counter risks related to the market, technology, regulations, contracting, and policy.

AMIPA calls for public participation and review of the program. The NNSA participates in quarterly stakeholders meetings hosted by OSTP to address this requirement in part, as well as annual topical meetings for in-depth discussion among all stakeholders. In addition, prior reviews through the National Academies of Science, the DOE Office of the Inspector General, and independent technical reviews of the cooperative agreement partners have been conducted. The NSAC review, a second National Academies study, and a report to Congress are all pending.

National laboratories support R&D associated with the domestic production of Mo-99 and have done so for many years. Additionally the national laboratories are working on developing a second generation high density LEU target that the international producers could adopt. Current targets used for medical isotope production are dispersion targets. To offset enrichment loss of uranium 235 through conversion to LEU, the density of the target material is increased through the use of metallic uranium foil. This was developed by Argonne National Laboratory and showed that Mo-99 could be produced through that process using LEU. The R&D program has expanded to other national laboratories.

The AMIPA calls for the DOE to develop a uranium lease and take back program by 2016. It has set up an inter-agency working group to make sure the program is Implemented as efficiently as possible. The program will be implemented under full cost principles but costs have not yet been determined and will take time as it involves waste disposition.

The AMIPA requires the DOE and Nuclear Regulatory Commission (NRC) to coordinate environmental reviews to avoid duplication of efforts. DOE has completed its environmental review of the NorthStar accelerator project. SHINE has submitted its documentation to the NRC for review.

The AMIPA limits HEU exports by initiating a cutoff date for which the U.S. can no longer export HEU for medical isotope production. Exports of HEU will cease seven years after the enactment of the Act; however, the date can be extended for up to 6 years if there is a shortage of medical isotopes. This recognizes the need to manage a cooperative interchange with international partners and to minimize exports and move toward conversion.

GTRI is working with international recipients of HEU for Mo-99 production to convert to LEU. At the Nuclear Security Summit in 2012, there was a four-party statement from Belgium, France and the Netherlands in cooperation with the U.S. to support conversion of the European Mo-99 production industries to non-HEU-based processes by 2015. GTRI is working with partners to implement this objective, and supports international producers' conversion. Similar statements are expected at the 2014 Nuclear Security Summit. The U.S. is also working in South Africa to support their transition to 100% LEU-based production. Canada will cease production in 2016. The Netherlands has experienced difficulties, and Mallinckrodt announced that it is delaying its targeted conversion date.

The AMIPA requires the DOE to submit reports to Congress to include the Annual DOE Secretarial Report and the National Academy of Sciences Report.



Staples shared other initiatives that include a White House fact sheet on Mo-99 issued in 2012, domestic and international working group participation, stakeholder outreach, and the implementation of Office of Economic and Cooperative Development (OECD) – Nuclear Energy Agency’s (NEA) policy recommendations.

An OECD-NEA working group identified six weaknesses in the supply chain that led to the supply chain shortage and informed ways to transition the industry to a full-cost non-HEU industry. The group operates on six principles that will strengthen Mo-99 supply security.

### **Roundtable discussion**

**Geesaman** asked about Canada’s proposed use of the Mo-99 reactor if production ceases. Staples shared that Mo-99 work was just a portion of the reactor use, and R&D activities in nuclear energy, power and other areas will continue.

**Rundberg** asked how much Mo-99 is required. Staples shared that the U.S. accounts for 50 percent of the global market. Supply is measured by a six-day curie and the U.S. uses around 6,000 curies per week. This is the standard measure used by the industry. The global industry uses around 40 to 50 kilograms of uranium per year to make 12,000 six-day curies per week. Staples confirmed that the use of LEU would decrease the amount of uranium needed.

**Binder** asked if some technologies would require isotopically enriched Mo to work. Staples shared that there are specific projects that are looking to use enriched Mo-100 or Mo-98 to increase production efficiency. There is an undefined list of risks about the sources for Mo-100 and Mo-98. Staples has discussed the use of specific isotopes with industry. There is capacity to produce 100s of kilograms required for industry, and Russia can produce this quantity. The risk of producing stable isotopes is not as strong as other issues, especially market condition dilemmas.

**Mueller** asked why the U.S. has not helped South Africa support global demand since it can produce Mo-99 in U.S. Food and Drug Administration-approved form. Staples commented that South Africa lacks the production capacity to meet global demand. The difficulty in relying on one facility is reflected in challenges in Canada.

**Mueller** speculated that the product is not expensive enough for industry to want to pursue production techniques, and wondered about raising the price dramatically. Staples believes that the legal ability to raise the price does not exist, and things can only be implemented as a cost recovery principle. Congress discussed the use of tariffs or taxes to address this but there may be barricades to charging more for the uranium. He is confident that appropriate reimbursement is an effective approach for the non-HEU based Mo-99.

**Jamie Nagle** asked about the cost of a typical thyroid scan and how much Mo-99 production contributes to the cost of a scan. Staples shared that views on cost distribution are broad but the cost of the isotope is less than one percent of the average procedure. There is a general \$10 cost that pays for the isotope and its production. The costs for the pharmaceutical compound used, along with imaging and handling in the process, is much higher. A procedure averages around \$1,500. The cost varies based on the ability of more efficient and large hospitals to use a generator versus rural locales that struggle with the isotope’s 66 hour half-life. The cost delta for a producer in transitioning from HEU to LEU is much higher.

**Nagle** wondered that even a dramatic price increase for the isotope would have little consumer impact. Staples shared that costing impacts long-term contracts in industry, how they operate, and their agreements for current and future supply. This points to the challenge in

working within government, with domestic and international commercial entities, and with international commerce laws that influence what can and cannot be done in terms of the cost structure. Staples recognizes the challenge in getting to a point where operations can work smoothly.

**Lu** pointed out that risks stated in the charge to NSAC involve issues in business, policy, law, and international relationships. He commented that nuclear science is the best understood and least controversial of these issues, hence felt that the NSAC would need to expand to a subcommittee with a broader base of expertise to address the risks.

#### **CHARGE TO THE NSAC RELATED TO THE NATIONAL NUCLEAR SECURITY ADMINISTRATION DEVELOPMENT OF THE MO-99 SUPPLY**

**Tim Hallman** presented the charge. Hallman stressed the importance of this charge, noting the use of technetium-99 in medicine, and that a high percentage is produced with HEU.

The nuclear science community is invited by Congress via the NSAC to add its expertise to this discussion. An NSAC subcommittee will consider progress in achieving NNSA-GTRI goals and recommend ways to reach greater effectiveness. Hallman reviewed specific elements for the subcommittee to consider. The subcommittee's initial assessment will be submitted to the DOE SC by April 30, 2014. The subcommittee will be a standing committee for three years providing subsequent assessments annually.

##### **Roundtable discussion**

**Mueller** noted that the charge asks for comment on risks that seem outside of nuclear scientists' expertise. Hallman clarified that the subcommittee should address risks within its realm of expertise or expertise it can access. NSAC is asked to weigh-in based on its capabilities. Geesaman added that the risks are mostly economic-related and believes that NSAC will use the earlier economic analysis done by the OECD. There are subcommittee members who can inform issues such as licensing, and it can admit that there are areas in which it does not have expertise.

**Velkovska** pointed out that the law requires an annual program review by NSAC yet a standing subcommittee is being formed for just three years. Hallman commented that the subcommittee will report annually for three years. There is hope that after three years everything could be converted to non-HEU production.

#### **NSAC DISCUSSION OF THE CHARGE TO REVIEW THE NATIONAL NUCLEAR SECURITY ADMINISTRATION DEVELOPMENT OF THE MO-99 SUPPLY**

**Donald Geesaman** reviewed the roster of subcommittee members and described the effort to identify people who could support risks related to nuclear science. The members represent expertise in isotope use in medicine, isotope production, radiochemistry, Mo-99 production, and other areas. The subcommittee will be chaired by Susan Seestrom.

##### **Roundtable discussion**

**Atcher** shared concern that no current subcommittee member is actually a user of technetium, and that there is a need for expertise with the Molybdenum process, and in nuclear pharmacy. He also expressed concern that the American Society of Cardiology and American Society of Nuclear Medicine were not contacted about subcommittee membership. Geesaman responded that there was an intention to contact those groups.

**Atcher** asked if the subcommittee meetings will be open to the public. Geesaman confirmed that the meetings will be open other than portions that involve various partners.

**Geesaman** shared a draft letter that will be presented to Susan Seestrom and that asks her to serve as the Chair, confirms the submission of a draft report by April 1, 2014, and reiterates the five main points of the charge. Geesaman will email the draft to NSAC members for comment.

## **PRESENTATION OF THE DOE OPEN ACCESS MODEL FOR PUBLIC ACCESS TO SCHOLARLY PUBLICATIONS**

**Jeff Salmon**, the DOE SC Deputy Director for Resource Management, presented DOE's open access plan to make R&D information broadly available. The plan's steward is the Office of Scientific and Technical Information (OSTI).

The plan originated with the America Competes Reauthorization Act of 2010. It called for the establishment of a committee in OSTP to look at open access. It was given a charge to steward the coordinated Federal government dissemination of R&D funded by science agencies. The Act followed the National Institutes of Health (NIH) creation of PubMed Central in 2005. In 2007, appropriations led to NIH's mandatory publication of work and there was growing impetus on open access journals. President Obama's first Presidential Memo advocated for transparency.

A memo was produced by the OSTP committee in February 2013 that called for increased access to Federally-funded research results. The memo spoke to agencies that provide at least \$100M in R&D funds. The committee consisted of those agencies and some that provide lesser amounts. The guideline suggests a 12-month embargo on agency release of publications that cover challenges and public interests that are unique to an agency's field and mission.

DOE's plan is called PAGES (Public Access Gateway for Energy and Science). It is under review by OSTP and OMB. DOE has been providing open access since 1947 and in a digital format since 1997. The plan will be driven by points-of-contact in DOE offices, laboratories, and research institutions. Research results are available through the OSTI website.

PAGES will provide public access to the best available version of peer-review publications sponsored by the DOE. It uses a hybrid approach with centralized metadata and OSTI will link to full text in institutional repositories. In some cases, PAGES will hold the manuscript. The PAGES approach is common now in the publication of technical reports and similar products.

Salmon explained the PAGES process. Authors submit publications to journals of their choosing. PAGES will use the DOE infrastructure for OSTI submissions to link to the final version of a publication in a publisher's website, or will link to an institutional repository or hold the publication in DOE's repository particularly if the publisher exceeds the 12-month embargo. DOE will use FundRef to identify and to link researchers' publications for citation in PAGES. NIH's success rate with FundRef and citing all funded research publications is about 85 percent.

Around 2002, OSTI had established a website to give open access to publications. Publishers were displeased with this and OSTI removed the website. Salmon believes that publishers are now more open to accommodating open access and are encouraged by OSTP. The CHORUS (Clearinghouse for Open Research of the United States) initiative recognizes the value of public access. Publishers are participating and identifying Federally-funded research to allow a centralized search area. DOE is testing CHORUS as a time-efficient and cost-effective way to identify articles that describe DOE-funded research and link to the articles. If CHORUS is ever obsolete, DOE can still give public access and share its own dark archive of articles.

DOE is pilot testing PAGES with end users and pulling in more articles. DOE is waiting for OSTP and OMB feedback prior to its official launch. PAGES should grow by 20,000 to 30,000 articles per year.

Salmon announced the retirement of Walter Warnick, Director of OSTI, effective January 3, 2014. Warnick has served in the Federal government for 43 years.

### **Roundtable discussion**

**Schukraft** asked if the copyright for an article must be changed if the research involves international collaborators. Warnick confirmed that the government has a general purpose license that gives the right to use the materials. The government can use an accepted manuscript for any purpose that government deems necessary. An accepted manuscript is any peer reviewed publication that is ready at a particular point. A version of record is the copy that actually appears in the journal and may contain links and elements that are not in the accept manuscript. The version of record is the version that a customer comes to on the publisher's website.

**Schukraft** asked if it is possible to integrate the use of preprint service that is heavily used before getting to a final version. Warnick commented that DOE has discussed this with publishers and will deem whether or not a preprint version is sufficient for DOE's purposes. Schukraft commented that it would be good to provide a link to ensure cross-checking for use of the correct version. Salmon shared that DOE has an e-print service that links to those versions.

**Schukraft** asked if DOE will expand to international access and if access has been discussed with the high-energy physics community. Salmon shared that DOE wants to ensure that its first steps are effective but then would like to see a single search engine for all U.S. Government research. DOE has had discussions with CERN (European Organization for Nuclear Research) who advocates for open access, but currently DOE is not participating and has not taken a stand on this particular issue.

**Mueller** commented that the material that DOE collects is already in the public domain yet there is data produced through government grants that is sometimes not published. This could be valuable information. Mueller asked if this should be collected and made available. Warnick responded that agencies are encouraged to make information available and DOE has an elaborate process to determine what information is releasable and is not. As an example, some research on weapons is publicly releasable whereas some research done under the Small Business and Innovation Research Program (SBIR) is protected. Salmon added that this information might later appear in DOE technical reports.

### **DISCUSSION OF DATA MANAGEMENT PLANS**

**Donald Geesaman** shared that DOE and NSF have submitted draft approaches to OSTP's call for data management plans. A draft approach was submitted to DOE laboratories. The plan calls for anyone submitting a proposal to explain how any research generated will be shared and preserved, or why it would not be possible for data to be shared or if sharing is not scientifically appropriate. In some instances, the cost of preservation may be greater than running an experiment. Proposers must at least describe how sharing will validate the results or how results could be validated. Research figures and data must be digitally accessible including video files.

Researchers are expected to follow the data management guidelines of their individual facility, and to follow personal privacy, confidentiality, and security guidelines.

In July 2011, NSAC was asked to describe what it does in the field. There is also OSTP guidance and DOE advice that provide guidance.

Geesaman shared that nuclear user facilities have their own specific standards for data preservation and accessibility, and these are familiar. The current issue is what is meant by data sharing and making data publicly accessible. Current NSF policy asks that primary data be shared at no more than incremental costs and within reasonable time. The definition of primary data is not necessarily clear.

Geesaman shared that guidelines will be produced by DOE and NSF, and that the NSAC will need to consider data sharing, justification for when data should be shared and preserved and associated costs, and what intermediary results will need to be shared. There will be a shift in thinking from holding data to sharing it publicly. Astronomy shares processed data for anyone to analyze it.

#### **PUBLIC COMMENT**

None

#### **BOARD BUSINESS**

NSAC will have a meeting in the latter half of April 2014, and Geesaman will poll NSAC members to understand their availability.

#### **CLOSING REMARKS AND ADJOURNMENT**

NSAC Chair Geesaman adjourned the meeting at 5:00 p.m. EST.

The minutes of the U.S. Department of Energy (DOE) and National Science Foundation (NSF) Nuclear Science Advisory Committee (NSAC) held at the Gaithersburg Marriott Washingtonian Center on December 19, 2013, are certified to be an accurate representation of what occurred.



Donald Geesaman  
Chair, Nuclear Science Advisory Committee