

Report of the
Committee of Visitors of the Office of Nuclear Physics
(FY 2010, 2011 and 2012)
7-9 January 2013
Germantown, MD

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Nuclear Science Advisory Committee
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I. EXECUTIVE SUMMARY

A Committee of Visitors (COV) for the Office of Nuclear Physics (hereafter referred to as “NP” or “Office”) of the Department of Energy (DOE) was formed as a subcommittee of the Nuclear Science Advisory Committee (NSAC). The COV was charged by the Director of the Office of Science to provide an evaluation of (a) the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document application, proposal, and award actions and (b) the quality of the resulting portfolio, including its breadth and depth, and its national and international standing. The COV convened 7 – 9 January 2013 at the DOE in Germantown, MD to undertake the evaluation.

Additionally the COV panel was asked to comment on the observed strengths or deficiencies of any component or sub-component of the Office’s portfolio and to make suggestions for improvement. The panel was also asked to comment on the progress made towards addressing the action items of the previous COV review in 2010, and to provide recommendations for improving the review process in the future. The panel was asked to evaluate the program for the period of FY2010 – 2012. The COV was composed of 22 members with scientific expertise across the portfolio of the NP program or technical expertise in operations or project management.

The NP should be congratulated for its oversight of a distinguished nuclear science program that is world leading in many aspects. The NP operates world-leading user facilities in low-energy nuclear physics at ANL (ATLAS), medium energy physics at Jefferson Lab (CEBAF), and relativistic heavy ion physics at BNL (RHIC). In all of these areas the impact is enhanced by a smaller complementary research program at facilities outside the U.S. An important example is relativistic heavy ion physics at the LHC.

The U.S. nuclear science program is clearly world-leading in the exploration of hadron structure and the investigation of the properties of nuclear matter at high temperature and density. CEBAF and RHIC provide the U.S. nuclear physics community with facilities of unparalleled capabilities, which attract many international users.

In low energy physics and nuclear astrophysics, the current U.S. program shares leadership on the world scene with ATLAS in stable beam research and the NSF-funded NSCL in rare isotope research. However, the U.S. capabilities for research with rare-isotope beams have been reduced considerably with the recent closure of the HRIBF facility. Furthermore, the leadership position is threatened by upgrades and construction of rare isotope facilities in Europe and Asia that will surpass U.S. capabilities. The NP is pursuing the Facility for Rare Isotope Beams that is expected to return the U.S. to world leadership in this area.

In fundamental symmetries and neutrino (FS&N) physics, the U.S. shares leadership, competing in an active field worldwide. The requirements of these FS&N experiments often involve beams from facilities outside of the NP portfolio such as neutrons and muons. The next steps in neutrinoless double beta decay are being explored by a suite of experiments both in the U.S. and abroad with substantial U.S. contributions with the intent to choose an optimum technology for major efforts world wide. The COV endorses the plan to create a separate FS&N program

portfolio in the Office.

The U.S. nuclear theory program shares world leadership across the spectrum and is clearly world leading in the field of hot/dense QCD matter and relativistic heavy ion collisions. Investments of the NP, especially in the Institute of Nuclear Theory and collaborative programs (SciDAC, Topical Collaborations) have allowed U.S. nuclear theorists to attain or maintain leadership and have raised the international reputation of the theory program. Computational efforts are world class, for example in nuclear structure, but in some areas they are struggling to hold their leading position in competition with strong investments made elsewhere.

The responsibility of the NP is vast, requiring a high level of effort from individuals in the Office. The goals of the Office are met through dedication and hard work of the staff. It is the opinion of the COV that the processes utilized to evaluate proposals (grants and projects) and assign awards are appropriate; however, the balance between long-term productivity, innovation, and risk must continually be monitored to continue to foster forefront and world-leading research.

The Office of Science has been developing PAMS (Portfolio Analysis Management System) that will provide a database for tracking proposal and grant information, with phased implementation starting this year. This system should increase the ability and efficiency of the NP to process, evaluate, monitor, and make broad decisions on grants while decreasing to a more manageable level the workload and paperwork presently necessary in the office. The PAMS system will make it possible to track voluntarily collected diversity and demographic information with appropriate authorization. Considerations of excellence mandate that the field attracts and retains talent from as diverse a pool as possible. PAMS should also allow the NP to access and provide information to the COV, making future visits more effective. After the PAMS system is in operation, its effectiveness to address issues such as tracking demographics of the workforce, proposal and grant applications, workload of Project Managers, and impact on NP operations should be evaluated and reported to NSAC.

The effectiveness of the grant application and review process, and the NP's decision and approval process are at the heart of maintaining a quality scientific research program. The Program Managers in the NP shoulder a large burden in this respect and are devoted to maintaining excellence in the US nuclear physics research program. Potential grantees and new investigators in the application process would benefit from better communication of the criteria used to evaluate and decide on grant applications, especially in the Early Career Awards process. Implementation of some quantitative rating system to evaluate the quality of grant applications would benefit Program Managers in their efforts to rank applications with respect to each other, to decide on grant awards and to make tough decisions, especially in times of tight budgets. It would also permit the NP to continually assess the quality of its grant portfolio. Clear communication to the Principal Investigator (PI) of the relative ranking of their proposal and the rationale behind the funding decision would benefit the PI and improve future proposals.

The NP is to be commended for its efforts in support of the Early Career Award (ECA) Program, noting an exceptional quality of newly funded proposals and investigators. Receipt of the ECA has become an important factor in some academic departments in consideration of promotion

and tenure. There is a need for planning to support deserving new investigators beyond the scope of the ECA, especially in light of significantly constrained future budgets. NP would benefit from more control over the size and number of ECA awards and should advocate for greater flexibility in the management of the program.

The annual laboratory management budget briefings and the rotating program reviews at the laboratories provide significant feedback both to and from the DOE. A consistent approach in the rotating program reviews to proposal formats, panel selection, review process, and scoring guidelines is beneficial to maintaining a quality review process. It is important for the NP to devote increased effort to the production of timely review reports for the benefit of the Laboratory management in their decision-making, for support of the broader community in the entire NP decision-making process, and for the Associate Director (AD) to have timely information with which to make decisions impacting overall program balance.

The Isotope Program was transferred from the DOE Office of Nuclear Energy to the Office of Nuclear Physics just prior to the previous COV. This is the first evaluation of the Isotopes Program within the NP. The organization is now established, with competent and motivated staff having been hired. NP is providing clear leadership on issues of national importance, and the process and community guidance have been improved. The Isotope Program continues to play an important role in both national and international leadership for isotope production as well as isotope research and development. The COV views these interactions as critical and encourages their continued support.

Concerted progress has been made to re-establish stable isotope supplies. Stable isotope enrichment capability continues to be developed. Record supplies of critical isotopes are being delivered. In some important areas new supply chains of radioisotopes have been established. Notable enhancements have been made to the isotope R&D program through establishing routine funding opportunities. Separate funding opportunities focused on isotope production are leading to the increased availability and variety of isotopes. Production certainty is essential to continued success and requires a sustainable funding profile for this program. Robust enhancements in this area must continue; however, it is encouraged that novel methods such as collaborations with industry, other program offices, or the use of the revolving fund be considered to ensure continued development in the isotope R&D portfolio.

The COV proposes the following recommendations to provide guidance to the NP for future development to maintain excellence in the program office. The recommendations are listed below in three categories: major recommendations, process-specific recommendations, and COV-specific recommendations. The first set, major recommendations, is essential for continuous improvement in the NP. The second set of recommendations should assist in the improvement of specific processes of the NP and are in the order found in the report. The final recommendations are specifically related to improvement of the COV process.

Major recommendations:

- The COV recommended in 2007 and stressed again in 2010 that it was imperative to develop and implement a database to track relevant proposal and grant information. We

reiterate the critical need for the rapid implementation of such a database.

- We recommend that NP track the participation of under-represented groups and make the information available. The COV urges that the necessary authorization be obtained, consistent with Federal requirements, to track diversity and demographic information.
- We recommend that, after the PAMS system is in operation, its effectiveness to address the relevant issues raised in this report (such as tracking demographics of the workforce, proposal and grant applications, workload of Project Managers, and impact on NP operations) be evaluated. We request that NP report to NSAC yearly on this evaluation.
- The COV recommends an increased focus on timely delivery of reports, and development of a set of written guidelines for Laboratory Review Reports to streamline the process.
- The COV recommends the development of a set of guidelines defining roles, responsibilities, authorities, and accountabilities for both the research and facilities Program Managers. Such guidelines across the NP portfolio would help consolidate best practices throughout.

Process-specific recommendations:

Soliciting and reviewing proposals

1. The NP should work with the community to enhance the peer review process for university grants such that, while continuing to be fair, it is even more discriminating in the evaluation process. The NP could consider the implementation of a quantitative component into the grant evaluation process.
2. We recommend that NP advocate for a change in the administration of the ECA program to give greater control to the individual programs over the size and number of ECA awards. The NP should provide direct feedback to the Early Career Award applicants regarding the relative competitiveness of their proposals, relevance to the priorities of the NP program, and potential alternative routes for funding for the declined proposals.

Monitoring projects and programs

3. It is essential that the NP complete the filling of the Research Division Director and Medium Energy Program Manager positions.
4. The COV recommends that NP define the process and timeframes for the major reviews including the 2013 Comparative Review and communicate this to the field as soon as possible. It is important to provide the guidance to the PIs of the groups and to the panel as soon as possible.
5. The NP should perform further analysis of the workforce data and develop plans as

needed to mitigate the impact of potentially constrained budgets on the workforce.

6. We recommend continued engagement with the User Facilities to establish facility performance metrics that more directly measure the scientific productivity of those facilities.
7. The COV recommends that the coordination and the information exchange of accelerator R&D activities between SC offices be strengthened.

Portfolio for the future

1. We recommend a systematic assessment of computational needs across all theoretical and experimental subfields, especially for the smaller-scale projects in the Medium and Low Energy programs to see if further coordinated efforts within NP are needed.
2. The COV endorses the creation of a distinct neutrino, neutron, and fundamental symmetries portfolio within the office.

COV-specific recommendations:

1. The COV recommends that the NP prepare a written response to the COV recommendations within 30 days of receiving them from NSAC as per guidance from the Office of Science. This response should contain a plan of action to address the recommendations in this report. A report card that details the progress on the COV recommendations should be sent to NSAC at the time of charging the next COV committee. We note that such a report card was not presented to NSAC in 2012 at the receipt of the current charge.

II. MAJOR FINDINGS, COMMENTS AND RECOMMENDATIONS

A. The effectiveness, efficiency, and quality of the processes used to solicit, review, recommend, and document proposal actions

FINDINGS:

University Research –

The COV observed that grants are still handled by the traditional office operational method, assembling large folders with grant paperwork and passing them between Program Managers as needed. The level and quality of documentation varied significantly between the different Program Managers. Thus the folders show a lack of uniformity, especially in the details contained in the memorandum justifying the funding decision and in the Program Manager comments. This variation made it difficult to peruse and compare grant files. Our interviews of the Program Managers confirmed that the handling of grants during the renewal process involves a lot of repetitive work and must rely on *ad hoc* spreadsheets generated by individual grant managers that are not uniform.

The COV recommended in 2007 and stressed again in 2010 that it was imperative to develop and implement a database to track relevant proposal and grant information. The Office of Science has been developing the PAMS system for this purpose, which is expected to begin phased operations by the end of 2013. Such a database should impact positively the operational ability of the NP to process, evaluate, monitor, and make broad decisions on grants and thus the more general grant portfolio. Implementation of the PAMS system is expected to decrease the intense workload and large amount of paperwork in the office, thereby enabling the Program Managers to focus more of their energy on the decision-making and grant-monitoring tasks. PAMS should also allow the NP to access and provide information to the COV in the future, making the visits more effective.

The lack of any quantitative measure for the quality of regular grant applications makes it hard to rank applications with respect to each other. It is difficult for the Program Managers to make hard decisions objectively in times of tight budgets. The NP has organized comparative reviews of their entire research program – a mammoth undertaking – to obtain an across-the-board assessment of the quality of the grant portfolio. But these are rather infrequent, with the most recent occurring more than ten years ago. A comparative review of all university and laboratory groups in the subfields supported by NP is planned in the Spring of 2013.

The criteria used to evaluate and decide grant applications appear not to be communicated effectively in all cases. In the grant process, redacted mail reviews are typically provided as feedback to the PI's, but the information passed back to both successful and unsuccessful grant applicants is uneven and often poorly documented in the grant files. There exists no systematic feedback process to ongoing grants during the annual report process that would allow PIs to assess their Program Manager's satisfaction with their progress, or to improve the next proposal if there are negative issues that need to be addressed. The relative ranking of the proposal and the rationale behind the funding decision is typically not clearly communicated to the PI.

To support new investigators, the NP participates in the Early Career Award (ECA) Program. We commend the Office for this effort, noting an exceptional quality of funded proposals and investigators. The criteria used to assess and approve ECAs appear not to be disseminated effectively. The ECA is highly competitive: many very compelling proposals cannot be funded, and the success rate is dramatically lower than for other parts of the program. For some strong, but unfunded, proposals in the ECA Program there is little constructive criticism in the redacted reviews that would help in preparing an improved proposal for future submission. These proposals cannot be considered by the program office outside of the ECA program. We strongly urge the NP to advocate for the standard use of panel reviews in the ECA process.

The Nuclear Physics Workforce Survey Report provided by NP shows appreciable growth since 2009: 12% in permanent staff, 19% in temporary staff, and 7% in graduate students. Contributing factors for this apparent growth may be the real growth in the NP budget through FY12, the injection of ARRA funding, and new initiatives such as the 12 GeV upgrade at CEBAF and FRIB development. It would be beneficial to understand to what degree the increase reflects real growth rather than better reporting, the underlying stimulus, and the demographics of the increase (e.g. university vs. laboratory).

The COV notes that with the PAMS system it will be possible to track diversity and other demographic information once the correct authorizations are in place. The information in this regards that the COV finds to be pertinent includes gender, race, and nature of the institution (PhD granting or not, HBC).

Scientific research in many sub-fields of Nuclear Physics relies heavily on the available computing resources. In particular, experimental data collected by medium- to large-scale experiments require event-by-event reconstruction, processing, and inevitably matching Monte-Carlo simulations. This need is recognized by the NP for the large experiments of the Heavy Ion program and is addressed via establishment and support of major computing facilities (RCF/BNL, NERSC/LBNL, CMS-Tier-II/Vanderbilt, CMS-Tier-III/MIT). We praise the Office for leading these efforts and suggest continuing to monitor closely the developments, as computational constraints are known to influence the shape of experimental programs since constant growth of the experimental data volume leads to an increasing pressure on these facilities.

Dedicated computing resources are also provided for the Theory program via SciDAC projects and CPU time buy-out at NERSC/LBNL. These resources provide high-performance parallel computing capabilities ideally suited for large-scale calculations used in LQCD and general many-body problems. The needs of “capability-computing” appear to be well taken care of by the Office.

We note that other types of theoretical calculations and computer simulations for smaller-scale projects or for problems that do not fit into a highly-parallel scheme seem to be left out of the NP strategic planning. We find that no specific provisions exist at the moment for researchers who work on projects in the Low Energy and Medium Energy (not based at JLab) programs to address the computational needs in theory and experiment. This is especially challenging for the groups not directly affiliated with the National Labs.

Facility and Operations –

Accelerator R&D within NP is most commonly carried out through laboratory operations-funded activities, as well as through a competitive program. Funding Opportunity Announcements were issued in FY10 and FY12. In FY10, 8 of 13 proposals were funded at a total of \$3.9M. Funding amounts ranged in from \$45k to \$1.49M. Four proposals were awarded to laboratories and four to universities, with approximately 25% of funding going to universities. In FY12, 10 of 20 proposals were funded at a total funding level of \$2.0M, with funding amounts ranging from \$25k to \$780k. Five proposals were awarded to laboratories and five to universities, with approximately 25% of funding going to university grants.

The Accelerator R&D program is focused on next generation nuclear physics accelerator facilities, with a strong emphasis on R&D important for an electron-ion collider. An advisory committee (the EICAC) was assembled by BNL and TJNAF that articulated high priority research topics used for assessing the relevance and importance of proposals.

Proposals were reviewed by an assembled panel that utilized the standard DOE-SC criteria as well as the criteria of relevance to the 2007 NP Long Term Plan and the EICAC priorities.

Projects –

Large projects are initiated with the CD-0 process that allows NP to identify “Mission Need.” The support of the mission need is obtained primarily from NSAC advice that is documented in the Long Range Plan. In the portfolio of large-scale projects, there are currently two projects being managed: the 12 GeV CEBAF Upgrade at Thomas Jefferson National Accelerator Facility (TJNAF) and the Facility for Rare Isotope Beams (FRIB) at Michigan State University. The two projects are in different stages: the 12 GeV Upgrade is in the construction phase and FRIB has passed CD1. In the case of FRIB, the project is being executed within the framework of a Cooperative Agreement.

The Facilities and Project Management Division (FPMD) considers specific proposals that might initiate Major Item of Equipment (MIE) projects. In most cases National Laboratory endorsement is a prerequisite for the initiation of a MIE. Science and technical review of the project by experts in the field are conducted prior to MIE project approval.

Smaller projects below \$2 M are often initiatives coming from the community. NP often conducts scientific and technical reviews to establish the need and requirement for a particular project.

SBIR –

The COV found that approximately 22 Phase 1 SBIR/STTR grants were approved in FY12 from among approximately 100 proposals. Approximately nine Phase 2 SBIR/STTR grants were approved of 20 proposals in FY12. The COV did not assess the SBIR evaluation process.

Isotopes –

The committee reviewed a representative sample of solicitations, proposals, review records and comments, and related award or denial feedback. The program makes solicitations and awards based on standard Office of Science practice and procedures. In correspondence sent to reviewers and potential grantees these procedures were clearly cited.

COMMENTS:

University Research –

Some quantitative evaluation, or ranking, of the quality of grant applications at renewal time, which uses appropriate review criteria, would permit the NP to continually assess the quality of its grant portfolio. The introduction of structured reviews of grants in PAMS should allow Program Managers to better compare the quality of grant applications, allow for a more uniform implementation of the decision criteria, and simplify the process of generating the documentation underpinning the grant decision. More generally, the introduction of PAMS should increase the effectiveness of the research division by reducing the workload and the amount of rote paperwork, thereby reducing the time to a funding decision. If properly constructed, PAMS should also help make the feedback to the PIs more informative and uniform.

Regarding the comparative review of all the University grants in the subfields supported by NP that is planned for the spring of 2013, we have the following comments. We note that the metrics of success, e.g., numbers of publications and citation rates, can vary considerably across the subfields supported by the NP and should be considered in comparing activity in different subfields. These considerations also operate within subfields and are associated, e.g., with the nature of the work or investigation, the phase of the project, and the size of the group.

Since theoretical nuclear physics is of very broad scope, spanning the four subfields of LE, MEP, HI, and FS, and more general connections to other disciplines, it can be challenging to find a review panel with appropriate breadth and depth. It may be desirable or even preferable to review theory within the context of the other subfields.

Receipt of the ECA (or lack thereof) has become an important factor in some academic departments in consideration of promotion and tenure. Feedback from the panel (formally or informally) regarding factors such as the relative competitiveness of the proposal and its relevance to the priorities of the NP program may help improve the quality of future submissions. Recognition, i.e. naming a set of proposals as "finalists," may encourage and benefit strong young scientists. Since the individual award amount for ECAs is defined across the Office of Science program, NP should advocate for flexibility in the award amounts. While management of the program is beyond the NP, the program should advocate for improvements and a commitment to panel reviews for the ECA decision process. Additionally, there is a need for planning to support deserving new investigators beyond the scope of the ECA. Many very high quality proposals are not funded by the ECA program due to the highly competitive nature of the program. The NP has funded small grants and supplements for young investigators outside the ECA program, and the Office should continue to be mindful of creating opportunities outside

the ECA program and making young investigators aware of such opportunities.

The impact on the workforce of significantly constrained future budgets in light of the recent appreciable growth since 2009 is a cause for concern. The NP should work to mitigate budgetary impacts to the degree possible. The committee feels it would be valuable to perform a more in-depth analysis of the workforce survey to better understand the nature of the recent increases in the workforce (e.g. fraction supported by ARRA funds, university vs. national lab, increased group size vs. new awards, etc.) A better understanding of the demographics of the workforce should help in developing plans to manage constrained budgets to lessen the impact on the workforce, especially in light of the recent growth.

Considerations of excellence mandate that the field attracts and retains talent from as diverse a pool as possible. The COV recognizes that the field is under-represented by women and minority groups relative to the population at large by a large margin. In this context we encourage the Office to collect statistical data to document the progress of under-represented groups throughout the scope of their activities, be it in the participation of research activities at the undergraduate, graduate, and postdoctoral level, as well as at the PI level. In the latter case the monitoring activities should include the awarding and reviewing of grants, as well as funds granted. Such information may help to develop approaches (e.g. in solicitations and programs) to encourage under-represented groups to enter the field.

Facility and Operations –

COV members looked at several grants and spent time with the relevant Program Manager discussing his methods and priorities in this area. We believe the program is well managed and meeting its objectives for NP missions. Even during tight budget times, the Program has developed a reasonable portfolio that will address outstanding accelerator R&D issues for the EIC. We noted that the Program Manager worked with the PIs to optimize the grant scope to deliver the highest priority science given the budget constraints.

Other offices (HEP and BES) also have programs in accelerator R&D tied specifically to mission related needs. Coordination of NP activities with other Office of Science activities in accelerator R&D may benefit the program in the future.

Projects –

MIE funding has decreased to 1/3 of its level at the time of the previous COV, being squeezed by an increasing construction budget for large initiatives. The correct balance between future investments such as construction, equipment funding, and R&D, and ongoing research including facility operations and research is critical to maintain the vitality and the future of the experimental program.

The Committee understood the challenges NP faces with a \$2M MIE threshold when trying to plan small MIE projects into the DOE budget. Given the general two-year lead time required for budgeting it is difficult at times to accept new ideas or proposals for an MIE project and to get the project funded in an appropriate time frame. The possibility of raising the MIE threshold

from \$2M to \$10M was one of the 18 operational improvement items suggested by the National Laboratory Directors Council (NLDC) to the Secretary in the 2011 timeframe. The DOE Chief Financial Officer's Office (CF) had agreed to pursue a legislative change to raise the threshold. It is important that NP follow up with CF to determine the current status of that possible improvement item and to encourage and support such a change. A higher MIE threshold could increase the flexibility to manage projects below the threshold.

SBIR –

The SBIR program provides value to NP programs and activities. The SBIR-supported work continues to play an important role in Accelerator and Detector R&D activities. An important benefit of the program is the bridging of laboratory and university capabilities with those that reside in the small business community.

In order to better disseminate SBIR/STTR developments within the nuclear science community, regular information exchange meetings have been initiated, with one held in each of the last three years. We suggest expanding the invitation to the annual SBIR meeting to the university community, in addition to the laboratory staff invitations.

Isotopes –

Based upon the evidence presented to the COV, it is our opinion that grants are well written and reviews were adequate. Solicitations continue to improve, the review process has been greatly enhanced over the past three years, and the feedback on award and denial was found to be generally good. Review comments were reasonable, and we saw evidence of the stated policy to provide reviewer comments back to the potential grantees being implemented. In one case there was no evidence that required user facility support was available to the grantee. This confirmation that user facilities can support the research is encouraged. Confirmation could be accomplished by including a letter of support from the collaborator associated with the facility.

General Comments –

It is important that the community has confidence that all program managers act in a timely, fair, and consistent fashion. This is especially critical at a time of continuing fiscal constraint.

RECOMMENDATIONS:

University Research –

- The NP should work with the community to enhance the peer review process for university grants such that, while continuing to be fair, it is even more discriminating in the evaluation process. The NP could consider the implementation of a quantitative component into the grant evaluation process.
- The COV recommends that NP define the process and timeframes for the major reviews including the 2013 Comparative Review and communicate this to the field as soon as possible. It is important to provide the guidance to the PIs of the groups and to the panel

as soon as possible.

- We recommend that NP advocate for a change in the administration of the ECA program to give greater control to the individual programs over the size and number of ECA awards. The NP should provide direct feedback to the Early Career Award applicants regarding the relative competitiveness of their proposals, relevance to the priorities of the NP program, and potential alternative routes for funding for the declined proposals.
- The NP should perform further analysis of the workforce data and develop plans as needed to mitigate the impact of potentially constrained budgets on the workforce.
- We recommend that NP track the participation of under-represented groups and make the information available. The COV urges that the necessary authorization be obtained, consistent with Federal requirements, to track diversity and demographic information.
- The COV recommended in 2007 and stressed again in 2010 that it was imperative to develop and implement a database to track relevant proposal and grant information. We reiterate the critical need for the rapid implementation of such a database.
- We recommend that, after the PAMS system is in operation, its effectiveness to address the relevant issues raised in this report (such as tracking demographics of the workforce, proposal and grant applications, workload of Project Managers, and impact on NP operations) be evaluated. We request that NP report to NSAC yearly on this evaluation.
- We recommend a systematic assessment of computational needs across all theoretical and experimental subfields, especially for the smaller-scale projects in the Medium and Low Energy programs to see if further coordinated efforts within NP are needed.

Other Recommendations –

- Following the successful example of the detailed guidelines for Program Managers for the isotope portfolios, the COV recommends the development of a set of guidelines defining roles, responsibilities, authorities, and accountabilities for both the research and facilities Program Managers. Such guidelines across the NP portfolio would help consolidate best practices throughout.

B. The monitoring of active projects and programs

FINDINGS:

University Research –

The committee notes that the AD has been acting in the Research Director position. As a new AD this has allowed him to evaluate the functioning of the division in detail and to begin to reposition it in light of the changing directions of the field. However, this situation cannot continue as it has caused a significantly increased workload on the AD, and possibly a reduced

level of oversight and day-to-day management for the PMs in the research division. The COV is pleased to hear that interviews are progressing and that a new Research Director should be in place imminently. Similarly, the position of PM for medium energy programs is in the process of being filled.

The present solicitation and hiring process in the NP is highly limited by procedures of the Office of Science, potentially impacting negatively the ability to recruit top-notch candidates. The short time between solicitation and closing dates negatively impacts recruiting of quality applicants.

The COV heard from the AD that a new portfolio being considered to bring together neutrino, neutron, and fundamental symmetries (FS&N) research. Currently, the FS research efforts are located in three portfolios, with the majority in LE. The FS area has undergone growth following from significant successes and has been identified in the LRP as one of the four major strategic directions of the field. Experiments in this area typically require significant R&D and dedicated instrumentation. Establishing a new portfolio will provide coherence and more opportunities for strategic planning.

The COV learned that the nuclear physics facilities manager was temporarily reassigned to manage the HI portfolio in the research division. The COV believes it is important to have a dedicated program manager for this, as well as all the other research programs.

The COV noted that the Facilities and Project Management Division has recruited and effectively utilized detailees to support the activities of the division during the review period. This has reduced the workload on the permanent staff and brought in new expertise and ideas. This has been less true in the research division. The COV notes that a healthy balance of detailees and IPAs (temporarily assigned personnel) is beneficial to both the Office and the community by promoting communication and helping to share expertise and experience.

Laboratory Research –

The material provided by the DOE indicated that the main mechanisms used to manage the Laboratory research programs are the annual laboratory management budget briefings to the DOE and the rotating set of program reviews that look at the four programs (Theory, Heavy Ion, Medium Energy, and Low Energy) across all of the Laboratories. The research programs at facilities are addressed at the bi-annual Science and Technology reviews. Other activities are periodic project reviews.

The program reviews that were carried out during the reporting period were Medium Energy and Low Energy. The committee also examined material from the Theory and Heavy Ion reviews that occurred during the previous review period. The reviews follow the same overall pattern from proposal formats, panel selection, review process, and scoring guidelines.

In the cases of Medium Energy and Theory (where reports were issued) funding decisions could be related to the results of the reviews. In the case where the report was not yet issued, the PM told the committee that he had informally communicated the results to the Laboratory groups and

used these results in his budget decisions in FY12.

The reports from the laboratory reviews are not being issued in a timely fashion. The stated policy of the Directorate is to issue these reports within 4 months. The Medium Energy report was released 20 months after it occurred. In this case there are understandable reasons for the delay. However, the issuing of the Low Energy review report is still outstanding after 17 months.

Facilities and Operations –

General:

The Office of Nuclear Physics operated four national user facilities during this assessment period: RHIC (BNL), CEBAF (TJNAF), ATLAS (ANL), HRIBF (ORNL).

The Holifield Radioactive Ion Beam Facility (HRIBF) was closed as a user facility on October 1 2011, and operations ceased in April 2012. The decision to close the HRIBF was made without consultation with the community including NSAC. Planning for disposition of equipment activities of HRIBF is now underway.

Facility Operations accounts for 52% of the NP FY2013 Congressional Request (of \$527M).

The Program Manager for Nuclear Physics Facilities is currently serving as the acting Heavy-Ion Program Manager. The Facilities & Project Management Division Director is currently serving as the Nuclear Physics Facilities Program Manager in an acting capacity.

Monitoring Facility Performance:

The total operating hours of NP's national user facilities has declined from ~19,000 (in FY11) to ~12,200 (in FY12) to ~5,400 (in FY13) due to the termination of HRIBF operations, the continued under-utilization of RHIC, and the scheduled shutdown of CEBAF to implement the 12 GeV Upgrade. Operating hours following CEBAF's upgrades are projected to total ~11,000 hours. The FY13 budget Request supports RHIC operation at 1,360 hours, which given an optimum utilization of 4,100 hours amounts to 33% utilization.

The Program monitors and reports operational metrics from the operating facilities, such as operating hours, downtime hours, availability and reliability, and other facility specific performance measures. In addition, the Program utilizes performance measures for Accelerator Improvement Programs (AIPs) and other activities, all of which are reviewed and assessed at Science and Technology (S&T) reviews and site visits, and throughout the year in other forums.

Assessment of Operating Facilities:

The Office relies primarily on annual (now biennial) Laboratory S&T Reviews and the newly established regular Facility Operations Reviews to assess the scientific and technical progress as well as the operational efficiency. Facility Operations reviews were initiated in 2010 as a

response to the 2007 COV recommendation and are specifically focused on budgets, operations staffing, and short- and long-term maintenance; they replace the Science and Technology review in the year in which it occurs. The expected frequency of facility operations reviews is once every 3-4 years. In addition, NP continues to collect detailed information on facility budgets and long-term plans at its annual budget meetings.

Facility Operations Reviews were carried out at the four user facilities (ATLAS, HRIBF, RHIC, TJNAF) in 2010 to assess performance, staffing levels, and cost savings. Another review (of RHIC operations) is scheduled for 2013. S&T reviews were carried out at ATLAS (2011), RHIC (2011), and TJNAF (2012).

Transition to and from Operations:

Two forms of transition occur during the life of an experiment or facility. The first transition, from construction to operations requires a careful analysis of resources (people, materials and supplies, maintenance) required for robust operations and a transition plan. Our discussions with the Division Director for Facilities indicated that planning for the transition from construction to operations is well underway. A plan has been developed in conjunction with TJNAF and will be continuously iterated.

The second transition process occurs when operations at a facility are terminated. This has recently occurred at the Wright Nuclear Structure Laboratory at Yale and at the Holifield Radioactive Ion Beam Facility at ORNL. The Office has the responsibility to transition the facility to some stage of non-operations (warm standby, cold standby, demolition or transfer) and procedures for doing so are somewhat different at a university and a national laboratory. The Office is currently working with Yale to plan for the decommissioning of WNSL and with ORNL to plan for the decommissioning and transition of HRIBF. This takes time, effort, funding, and coordination among various parties.

Accelerator R&D at the User Facilities (excluding competitive accelerator R&D):

In addition to the competitive accelerator R&D program, the facilities (RHIC, CEBAF, ATLAS, HRIBF) carry out R&D activities supported from their base operations funding. These R&D efforts cover both short term commissioning and performance-improving activities at the facility as well as R&D for next generation NP facilities. Over the last three years the total effort at the four facilities was about \$12-13M of which about \$3M are spent on short-term accelerator R&D.

Accelerator R&D is routinely assessed during S&T reviews and in formal and informal presentations, discussions, and meetings with NP program management. A first in-depth assessment of the complete Accelerator R&D program was carried out in December 2011 in a review of BNL's C-AD R&D activities. An in-depth review of the TJNAF Accelerator R&D program is in the planning stages for 2013.

Projects –

There are currently two major (> \$50M) active projects that are being managed and monitored

within NP. One is the TJNAF 12 GeV Upgrade Project which is a capital asset project that is required to be managed per the requirements of DOE Order 413.3B. The project is working on a re-baseline due to a directed change from the Congressional budget shortfall of \$16M in FY2012. The other is the FRIB Project which is managed as a cooperative agreement (CFR 600 financial assistance requirements apply) project that is outside of the applicability area of 413.3B. However, NP is managing the FRIB project using a tailored approach under the 413.3B requirements.

Additionally, there are currently 14 projects that fall below a \$50M TPC that are also being managed and monitored using 413.3B, tailored as appropriate. Order 413.3B is required for projects with a TPC at or above \$10M, and the SC Office of Project Assessment (OPA) is involved as well in monitoring these projects. SC expects tailored management practices within 413.3B to be used on all Major Items of Equipment (MIE) projects. MIE projects are defined as projects with a TPC greater than \$2M. OPA can choose to and is also involved in monitoring projects that are less than a TPC of \$10M but greater than \$2M.

Status and plans for projects are reviewed in various ways depending upon the size and complexity of the project. All projects provide a quarterly written report to NP. The two major projects provide a monthly teleconference status report and are reviewed normally semi-annually using the OPA (Lehman review) process. The two major projects are also reviewed quarterly by a broader DOE group including the Acquisition Executive. The 12 GeV Upgrade Project status is updated monthly in the DOE project management and reporting system (PARS II). The FRIB Project does earned value management system (EVMS) reporting to NP but does not report in PARS II since 413.3B is not required. Smaller projects are generally reviewed at least annually and may at times use monthly teleconferences, with these reviews tailored to focus on projects with particular challenges or in need of help.

Isotopes –

In 2009 the Isotope Program was transferred from the DOE Office of Nuclear Energy to the Office of Nuclear Physics. Following this transfer a workshop for the isotope community was hosted to gain a sense of R&D priorities, and NSAC was requested to form a subcommittee to provide advice on the current priorities for the isotope production and R&D program and on the longer term strategic needs of the community. Tremendous progress has been made subsequent to these activities to address the recommendations of the related reports.

Notable progress includes:

- Cf-252: Restart production at HFIR important for the oil and gas community
 - Formed industrial consortium
 - Responded to Congressional inquiries
 - Interface with BES (HFIR operations)
 - Interface with NP program at ATLAS (CARIBU)
- He-3: Work with White House and 15 Federal Agencies to develop mechanism by which to allocate He-3 to stakeholders during times of shortage
 - Develop mechanism and implement a He-3 auction

- Congressional testimony, briefings, inquiries
- Interface with industry on possible new sources of He-3
- Provided input to GAO (Government Accountability Office) audit
- Li-7: Facilitate discussions with NNSA, NE and stakeholders to explore impacts of potential Li-7 shortage
 - Identify solution for backup to Nuclear Power Industry
 - Respond to Congressional inquiries
 - Provide input to ongoing GAO audit
- Stable isotopes: Initiate an R&D program in Stable Isotope Production
 - Interactions with other federal programs
- Am-241: Initiate Am-241 extraction program at LANL
 - Formed industrial consortium
 - Consideration of other sources within Department
- Ge-68: Working with industry to commercialize production
 - Public notification for possible withdrawal from market in progress
- Co-60: Work with INL, NE, and customers to transfer production contracts
 - Work with stakeholders on target breach incident
 - Congressional briefings, inquiries
- Sr-82: Work with FDA, NRC, and stakeholders when generators recalled
 - Provide technical support to industry to address technical difficulties
 - Consideration of withdrawal from market on generator refurbishment
 - Consideration of new customers
- Heavy Water: Interfaced with industry on potential shortage and facilitated discussions with Department of State and White House to mitigate shortage
 - Provide technical support to OSTP
 - Facilitate discussions with NNSA
- He-4: Work between Office of Science and Chief Laboratory Council
 - Provide technical support to OSTP
- Bk-249: IP made available Bk-249 from Cf-252 production to research community, facilitating the discovery of new element
- U-233: GAO report to consider U-233 stockpile at ORNL to provide Thorium-229 that decays to Ac-225
 - Developed alternative production path to Ac-225
 - Congressional inquiries
- Mo-99: Provide technical support to NNSA
 - Respond to White House working group
 - Respond to Congressional inquiries

COMMENTS:

University Research –

The COV strongly supports the deployment of detailees where appropriate. This is beneficial

both to the Office and to educating the scientific community about how decisions are made when detailees return to their home institutions.

Laboratory Research –

The annual laboratory management budget briefings and the rotating program reviews at the laboratories provide significant feedback both to and from the DOE. The reviews have followed the same overall pattern from proposal formats, panel selection, review process, and scoring guidelines. This consistent approach has certainly been of value to the COV in evaluating these processes.

It is important for the Directorate to devote an increased effort to the production of timely review reports for the following reasons. They are important to Laboratory management in making their own decisions on discretionary funding and management of people. Transparency in the review process is important to achieving buy-in and support from the broader community. The relevance of the report decreases quickly with time, whereas the effort required to generate the report increases. The AD needs to have timely information with which to make decisions impacting overall program balance.

Facilities and Operations –

General:

NP supports and oversees the operation of its suite of scientific user facilities in a responsible and professional manner, demonstrating a high level of engagement with the management of these user facilities.

The HRIBF was a radioactive ion beam facility supporting over 150 users per year, with unique ISOL capabilities, notably in accelerating fission fragments to Coulomb barrier energies. To date, these capabilities have not been reproduced anywhere worldwide and will not be fully available in the US until well into the FRIB era. The decision to close the HRIBF was announced in February 2011, without prior consultation, community input, peer review, or warning. This sets a disturbing precedent in terms of lack of process in decision-making.

The Nuclear Physics Facilities Program Manager oversees the largest program in the Office, yet it is managed by a manager who has many other duties and responsibilities. We note that program oversight appears to be functioning well. However, the committee suspects that the division of responsibilities could be further optimized within the total headcount constraints of the Office.

Monitoring Facility Performance:

Performance of user facilities is typically compared to various metrics that include, for example, the planned-versus-delivered hours of operation and the fraction of time that beam of sufficient quality (dependent on individual experiment) is delivered to experiments. NP has continuously worked with the facilities to develop metrics that are clearly defined and easily

measured. One parameter that appeared in the NP presentations was the fraction of optimal utilization defined as the number of operating hours relative to what could be achieved in an “optimum” budget. This parameter is of value as it is convenient to use to make an argument for missed opportunities imposed by fiscal limitations. With such a measure RHIC, for example, continues to be under-utilized. Yet one might be led to the wrong conclusion that RHIC’s 33% utilization means that only 33% of the science is getting done, which the COV does not believe is the case. The planned operations follow in part from fiscal constraints but also from the fact that improved accelerator capabilities, detection capabilities, and variety of beam conditions are important considerations in optimizing facility utilization. We appreciate that the three user facilities cannot be assessed by a common set of beam performance parameters, since RHIC, CEBAF, and ATLAS are very different accelerator facilities. We encourage NP to continue to work with facility management and the user communities to establish performance metrics that are more closely tied to physics goals and output. The goal is to more accurately reveal the impact of potential funding increases or cuts.

Assessment of Operating Facilities:

Successful and efficient operation of facilities is a primary mission of the Office and regular assessment is an important activity. The committee commends the Office on its implementation of dedicated Operations reviews that focus on maintenance, operating staffs, AIP programs, etc., as a useful process that should serve the program and field well. The use of bi-annual S&T and Operation reviews every 3-4 years appears to be reasonable and should provide the Office and facilities with a robust process to plan and manage their operation.

The committee was pleased to note that S&T reviews contain an assessment of previous review recommendations and responses to ensure follow-through. Overall, reviews appear well organized and provide the information to ensure an effective evaluation and to gauge future needs. However, it is also noted that review effectiveness, specifically regarding the newly initiated Operations review, could benefit from more written (instead of verbal) direction to the facilities regarding the material presented to reviewers. This may improve as further Operations reviews are carried out, but some thought to this in the meantime seems warranted.

Transition to and from Operations

The COV was pleased to hear from the Facilities Division Director that a plan is in place for the transition of TJNAF from construction to operations, although details were not provided. Transitions at other facilities from operations to D&D and D&D planning were touched upon, but not discussed in detail. It is clear that NP is trying to manage these transitions under stressful budgetary conditions throughout the program. It should be noted that both Yale and HRIBF have unique equipment and capabilities that are now laying fallow. We did not see plans for how these capabilities would be transferred to other facilities.

Accelerator R&D

The accelerator R&D program at all NP facilities is well focused on maximizing the facility performance and on future NP facilities, for the most part a future Electron Ion Collider (EIC).

The next generation facility accelerator R&D for the EIC accelerator of both the competitively funded and the part funded from the operations base are guided by an integrated R&D plan for EIC accelerator R&D as recommended in the 2007 NP LRP. Maintaining the present level of accelerator R&D is important for the present and future health of accelerator-based nuclear physics research.

Although targeted towards the NP facilities the NP supported accelerator R&D has applications beyond the NP needs. It is also the case that NP is benefitting from the Accelerator R&D performed in other SC offices. Good communication and even coordination between the SC offices of accelerator R&D activities is highly beneficial.

Projects –

NP is very effectively monitoring a large number of projects across a spectrum of various sizes and complexities. The Office has achieved a successful record of project management, contributing significantly with this past performance to the expectation of the Office of Science Director to maintain and improve upon the overall SC project success record. This past record and expectation is part of the basis for the tailored SC Critical Decision approval authorities that have been granted under the 413.3B exemption. NP is balancing the need to maintain a successful project record with the challenges of managing small research and equipment projects using tailored approaches of 413.3B principles and requirements.

Isotopes –

The organization has been established, competent motivated staff have been hired, national leadership has been demonstrated and accepted by the community, process, and guidance has been improved. Two vacancies exist, and the NP is encouraged to continue to pursue high quality personnel to fill these positions.

Concerted progress has been made to re-establish stable isotope supplies. Stable isotope enrichment capability continues to be developed. It is recognized that other facility initiatives recommended by the NSAC Isotopes subcommittee (NSACI) have been hampered by ongoing budget challenges (i.e., variable to high energy dedicated cyclotron.) Continued consideration of these needs is encouraged.

Regular operational reviews of the production facilities and related processes are effective in monitoring and improving the supply of isotopes. Record supplies of critical isotopes are being delivered. In some important areas new supply chains have been established.

RECOMMENDATIONS:

University Research –

- It is essential that the NP complete the filling of the Research Division Director and Medium Energy Program Manager positions.
- The COV endorses the creation of a neutrino, neutron, and fundamental symmetries

portfolio.

Laboratory Research –

- The COV recommends an increased focus on timely delivery of reports, and development of a set of written guidelines for Laboratory Review Reports to streamline the process.

Facilities and Operations –

- We recommend continued engagement with the User Facilities to establish facility performance metrics that more directly measure the scientific productivity of those facilities.
- The COV recommends that the coordination and the information exchange of accelerator R&D activities between SC offices be strengthened.

Research and Facilities Program Management –

- The COV recommends the development of a set of guidelines defining roles, responsibilities, authorities, and accountabilities for both the research and facilities Program Managers. Such guidelines across the NP portfolio would help consolidate best practices throughout.
 - We recommend consideration of the following aspects in developing these guidelines:
 - Define clearly tasks and responsibilities for the PMs, specifying their roles as stewards of their programs based on office strategic directions and peer review input.
 - Use a common template for the Laboratory Review Reports.
 - Streamline reports to make the job more manageable for the PMs.
 - Promote the Theory review of 2009 as an effective example of good practice.

C. Within the boundaries defined by DOE missions and available funding, how the award process has affected the breadth and depth of the Nuclear Physics portfolio elements

FINDINGS:

The SC program is mission-driven with NP currently operating three national user facilities (RHIC, CEBAF, ATLAS), having recently closed another (HRIBF). Operation of these facilities accounts for slightly more than half of the NP Budget and when combined with facility construction and instrumentation accounts for approximately two-thirds of the budget. As a result these facilities, and on a smaller scale the research at facilities outside the U.S., continue to foster a world-class program and world-wide leadership in nuclear physics research among U.S. institutions. Accelerator research and development is essential for the NP to continue to develop the next generation of nuclear physics accelerator facilities.

Although research funds are constrained, the award program in the NP as a whole is well

managed and promotes the highest quality scientific research. The NP program is broad with particular strengths in the properties of nuclear matter at high temperature and density, hadron structure, and nuclear structure research. This preeminent stature depends significantly on the availability of the above-mentioned facilities and will depend on continued development of a portfolio of modern facilities to address the forefront questions of nuclear physics.

NP receives advice from the nuclear physics community on the directions and priorities of the field through the Long Range Plan process of NSAC. This develops into proposals for large projects to fulfill the “mission need” through the CD-0 process. (At present there are two large-scale projects at different stages managed by NP: the 12 GeV CEBAF Upgrade at TJNAF and new FRIB facility at Michigan State University.) In addition, proposals for major equipment (MIE) projects costing more than \$2 M and smaller projects undergo different degrees of scrutiny. Science and technical review of MIE projects by experts in the field are conducted prior to project approval. Smaller projects below \$2 M often undergo similar science and technical reviews to establish the need and requirement for a particular project. This is generally a well conceived and effective approach that nurtures new projects of all scales that are required to conduct the forefront research of the field. New projects and their development are key to scientific advances in the field.

Typically, a two-year lead-time is required for projects to get into the budget cycle. New ideas and proposals for projects therefore incur a significant delay from conception through review and approval to completion. The funding of MIE and smaller projects has been diminished by an increasing construction budget for the largest projects.

The Department of Energy’s FY 2009 Congressional Budget Request transferred the DOE Isotope Program from the Office of Nuclear Energy (NE) to the Office of Science’s (SC) Office of Nuclear Physics (NP). To prepare for this transfer, the Office of Nuclear Physics and the Office of Nuclear Energy organized a workshop held in August 2008, which brought together the varied of stakeholders in the isotopes enterprise to discuss “the Nation’s current and future needs for stable and radioactive isotopes, and options for improving the availability of needed isotopes.” On August 8, 2008, the DOE NP charged NSAC to establish a standing committee, the NSAC Isotopes subcommittee (NSACI). The first charge requested the NSACI to develop a prioritized list of research topics using isotopes, and the second charge, to develop a long-range strategic plan for stable and radioactive isotope production. The first NSACI report, released in April 2009, includes federal, commercial, and community input, and establishes priorities for the production of research isotopes. The second NSACI report on a long-range strategic plan was released in November 2009, includes opportunities and priorities for ensuring a robust national program in isotope production and development, and recommends a coordinated framework for a long-term strategic plan. To date, much effort has been expended on establishing long-term strategies, priorities, peer review mechanisms, and effective lines of communication with isotope stakeholders. The mission of the Isotope Program is threefold:

- Produce and distribute radioactive and stable isotopes that are in short supply, associated byproducts, surplus materials and related isotope services.
- Maintain the infrastructure required to produce and supply isotope products and related services.

- Conduct R&D on new and improved isotope production and processing techniques.

Notable accomplishments are evident in non-accountable materials (Lithium-7), progress in re-establishing stable isotope production, supported redesign of Selenium-75 production targets that increase the target production yield by 50%. Efforts to re-establish production of critical research isotopes such as Carbon-14, Strontium-89, and Potassium-40 are underway as well. These are a subset of many examples reviewed by the committee. R&D activities have expanded in many additional regions of the country.

COMMENTS:

The quality of the science supported by NP is extremely high. Peer reviews and panels are utilized to ensure the breadth and depth of the scientific research program in nuclear physics, which remains world-leading. The scope, size, and duration of awards take advantage of the strengths and capabilities of the various research groups. Early Career Awards are a strong encouragement for new investigators entering the field and should be promoted. Emerging scientific opportunities in terms of new grants and projects always require continued attention and fine-tuning in the award and review processes. This includes special attention to ensure a balance between innovation and risk, while promoting a stable future world-leading program in nuclear physics research.

NP is encouraged to pursue ideas to introduce more flexibility for smaller projects to be able to enter the funding cycle with less delay.

A challenge to the NP and the community is to find the correct balance between future investments (e.g. construction, equipment funding, and R&D) and ongoing research and facility operations. Grants for research and R&D are critical to maintain the vitality and the future in the experimental NP program.

Tremendous progress is evident in implementing the recommendations of the NSACI reports (2009) over the past three years.

Notable enhancements have been made to the isotope R&D program through establishing routine funding opportunities. This has developed new participation and ideas and increased attention to workforce development. Students supported by the program went from zero to twenty-four in less than three years.

Separate funding opportunities focused on isotope production are leading to the increased availability and variety of isotopes.

It is recognized that production certainty is essential to continued success and ensuring a sustainable funding profile for this program. Robust enhancements in this area must continue; however, it is encouraged that novel methods like collaborations with industry, other program offices, or use of the revolving fund be considered to ensure continued strong funding in the isotope R&D portfolio.

D. The national and international standing of the portfolio elements

FINDINGS:

The NP should be congratulated for its oversight of a distinguished nuclear science program that is world leading in many aspects. The NP operates world-leading user facilities in low-energy nuclear physics at ANL (ATLAS), medium energy physics at Jefferson Lab (CEBAF), and relativistic heavy ion physics at BNL (RHIC). In all of these areas the impact is enhanced by a smaller complementary research program at facilities outside the U.S., especially at the LHC.

The U.S. nuclear science program is clearly world-leading in the exploration of hadron structure and the investigation of the properties of nuclear matter at high temperature and density. CEBAF and RHIC provide the U.S. nuclear physics community with facilities of unparalleled capabilities, which attract many international users.

In low energy physics and nuclear astrophysics, the current U.S. program shares leadership on the world scene with ATLAS in stable beam research and the NSF-funded NSCL in rare isotope research. However, the U.S. capabilities for research with rare-isotope beams have been reduced considerably with the recent closure of the HRIBF facility. Furthermore, the leadership position is threatened by upgrades and construction of rare isotope facilities in Europe and Asia that will surpass U.S. capabilities. The NP is pursuing the Facility for Rare Isotope Beams that is expected to return the U.S. to world leadership in this area.

In fundamental symmetries and neutrino (FS&N) physics, the U.S. shares leadership, competing in an active field worldwide. The requirements of these FS&N experiments often involve beams from facilities outside of the NP portfolio such as neutrons and muons. The next steps in neutrinoless double beta decay are being explored by a suite of experiments both in the U.S. and abroad with substantial U.S. contributions, with the intent to choose an optimum technology for major efforts world-wide. The COV endorses the plan to create a separate fundamental symmetries and neutrino physics program.

The U.S. nuclear theory program shares world leadership across the spectrum and is clearly world leading in the field of hot/dense QCD matter and relativistic heavy ion collisions. Investments of the NP, especially in the Institute of Nuclear Theory and collaborative programs (SciDAC, Topical Collaborations) have allowed U.S. nuclear theorists to attain or maintain leadership and have raised the international reputation of the theory program. Computational efforts are world class, for example in nuclear structure, but in some areas they are struggling to hold their leading position in competition with strong investments made elsewhere.

Isotopes –

In the area of isotope production the isotopes program is the principle supplier of many important isotopes. As examples, seventy-percent of the world supply of Cf-252 is made possible through the isotopes program, and the supply of Sr-82 has been increased by a factor of four. The Office also plays a key role in important research initiatives. For example, Bk-249 was supplied to an international research collaboration between the US and Russia leading to the

discovery of the new element-117. The isotopes program also coordinates with other federal agencies for critical isotopes such as Tc-99m and He-3.

COMMENTS:

One evidence for the level of international standing is the large number of international users (30-45%) and foreign investment at the U.S. facilities (e.g. RIKEN/BNL, TJNAF CLAS-12) and the competitiveness of U.S. researchers at leading international facilities. U.S. scientists play leading roles in large international collaborations.

The performance of the national program is monitored against long-term performance measures and identified milestones that are established by NSAC.

There is clear tension in constrained budgets to balance construction projects needed to have world leading facilities and major items of equipment. In 2013 the budget for MIE is projected to be significantly lower than in previous years. This poses particular issues for research that is not based at the major NP facilities.

For experiments that are not associated with established large US facilities, there is often significant competition throughout the world for the same science. For domestic efforts, the Office takes a responsible approach toward surveying the international playing field and determining whether a new project should be undertaken within the US given the schedule, progress, and expected sensitivity of competing experiments worldwide. The Office of Nuclear Physics has been a strong partner with other countries in experiments hosted abroad. It was recognized by the COV that quite often these experiments are very costly and technically difficult, thus their schedules are usually driven by funding profiles or necessary long-term R&D. Nevertheless, to ensure a world-class US Nuclear Physics program, the COV encourages the Office to seek ways other than increased funding in which new projects could be undertaken and completed more quickly.

The committee noted that the review criteria for university and laboratory research do not contain an explicit request for comparisons of the proposed research in an international context. Such a criterion would help to give a higher degree of discriminatory power to the evaluations. Ensuring the involvement of a significant fraction of reviewers from outside the U.S. is an important element in this.

Isotopes –

The Isotope Program office continues to play an important role in providing both national and international leadership for both isotope production and isotope research and development. The committee views these interactions as critical and encourages their continued support. It was brought to our attention that difficult budget restrictions have constrained program manager travel for many important interactions. This issue needs to be closely monitored to ensure essential collaborations do not suffer.

E. Progress made towards addressing action items from the previous COV review

FINDINGS:

The 2010 COV report was presented to NSAC on February 26, 2010. The response of the NP to the COV Report was written on December 17, 2010. An Update was presented to this COV for this Report. The recommendations of the 2010 COV are presented below (•) along with findings of the present COV on the progress towards addressing these recommendations.

- Consistent with the recommendations of the 2007 COV, it is imperative that the NP immediately establish a database that can be used to track relevant proposal and grant information.

The Office of Science has been developing a data management system called PAMS, which is expected to begin phased operations by the end of 2013. Such a database should impact positively the operational ability of the NP to process, evaluate, monitor, and make broad decisions on grants and thus the more general grant portfolio. Implementation of the PAMS system should decrease the workload and paperwork in the office, which is much needed. It should also allow the NP to access and provide information to the COV in the future, allowing more productive visits.

- The COV recommends that a discussion of workforce development and diversity be required in all proposals. The COV further recommends that the NP modify the proposal review / scoring method to elevate the importance of workforce development with emphasis on attracting and training women and members of under-represented groups.

This has not been implemented and the COV has been informed that this may not be consistent with federal guidelines of collecting information that could lead to potential biasing of awards. However, it is important to collect data to monitor workforce development and to implement ways of attracting and training women and members of under-represented groups. This should be possible with the new PAMS system with appropriate planning and implementation of polling and tracking devices.

- The COV strongly recommends that the NP develop a written policy to finalize the reports of the laboratory research group reviews within four months after the panel review.

The NP provided the following input: “The NP has implemented a policy of returning reports within four months of laboratory research reviews. Of 53 reviews conducted in the 2010-2012 period, 51 review reports were transmitted within the recommended timeframe. The two exceptions were due to temporary workforce shortages or transitions of personnel.” After further discussion with NP it was established that a total of 54 panel reviews were conducted in this period, of which 52 (excluding the two exceptions) were transmitted within an average timeframe of 16.6 weeks. This amounts to completion of 69% of the review reports within four months and 94% within 6 months, when the two exceptions are excluded. These numbers include

not only laboratory research reviews, but also S&T reviews and various project reviews.

- The COV recommends that the NP prepare a written response to the COV recommendations within three months of receiving them from NSAC. This response should contain a plan of action to address the recommendations in this report. A report card that details the progress on the COV recommendations should be sent to NSAC at the time of charging the next COV committee.

The response to the 2010 COV Report was transmitted approximately nine months after receipt of the report from NSAC.

- The COV recommends that the NP work toward improved feedback to PIs. Feedback to PIs on reviews of proposals in general, including the OJI/Early Career Awards and Theory Topical reviews, should provide sufficient detail to enable the PI to improve future proposals. Additionally, the review documentation should be uniform and include panel rankings when panels have been used.

The NP has worked towards fulfilling this recommendation. All reviews are now returned as a matter of course. There is an ongoing effort to improve the review report guidelines and to make uniform the information provided to proposers.

- The COV recommends that NP develop a metric that effectively measures the performance of SBIR projects in contributing to the NP mission and goals. Equally important, the COV recommends that NP proactively work to make the Nuclear Physics Community aware of new technological developments which result from the SBIR / STTR program.

The NP has fulfilled this recommendation.

- The COV recommends that NP identify ways for Program Managers to have face-to-face contact with university research groups at least once during a grant cycle. Such meetings should be documented to ensure that they are taking place and to provide useful feedback to the NP and the PI. This could be accomplished with site visits, reverse site visits, or at conferences.

The NP has worked towards more face-to-face contact with PIs within the framework of constraints on federal travel and limited time of individuals in NP. Fulfilling this recommendation entails a heavy burden on NP Program Managers, and other means of contact have been investigated. This has resulted in increased presence at important meetings (e.g. the broad annual DNP Meeting and program-specific meetings like Quark Matter) where individual face-to-face meetings can be undertaken with PIs in a single trip. The NP is investigating the idea of holding Principle Investigator Meetings to further enhance communication and feedback to PIs.

- The COV recommends that the NP consider a way to compare university grants across each program. It is important that a process be developed to establish, normalize and

monitor research grant support and performance across each program element.

The NP is investigating ways to enhance communication and consistency of management practices throughout the program. This is an ongoing effort. The NP is planning in 2013 a comparative review of grants across the program.

- The COV recommends strengthening and formalizing the regular review of facility operations at the four national user facilities operated by the Office of Nuclear Physics to better address maintenance, budgetary efficiency and long term planning issues in facility operations.

The NP now holds facility operations reviews at national user facilities on a regular basis. S&T reviews are held every two years.

- The COV recommends that the Associate Director be involved in developing and approving the final strategy for the handoff of a project to scientific operations. Effective coordination between the Physics Research Division and the Facilities and Project Management Division on the CD-4 requirements for projects is essential to optimize the overall benefit of the project with consideration of the budgets for both divisions.

The transition from construction to operations requires a careful analysis of resources (people, materials and supplies, maintenance) required for robust operations and a transition plan. Transition policies and plans for both the move from construction to operations at TJNAF and the transition from operations to closure at WNSL and HRIBF appear to be well managed by the Office. Discussions with the Division Director for Facilities indicated that planning for the transition from construction to operations is well underway and will be continuously iterated. It was assumed that the AD, also acting as the Research Division Director, has been involved and concurs.

- The COV recognizes that DOE Order 413.3A is an effective tool for developing and monitoring projects and recommends that the NP consider further tailoring in the application of the order for smaller low-risk projects. Prudent reduction in documentation and other requirements on small projects should reduce cost and effort without significantly increasing risk.

The Office of Science (SC) requested and in 2011 the Deputy Secretary approved an exemption from the requirements of 413.3B. The exemption was based on SC having satisfactorily met all criteria necessary for exemption set forth in the Order including an excellent past performance record in the area of project management. The exemption delegates most Acquisition Executive approval authorities for project Critical Decisions (CD) down to the SC Director with the ability to further delegate and tailor application of Order requirements. The SC Director then further delegated to Associate Directors including NP some project approval authorities and tailoring of the Order.

NP has benefited from the tailored approach and has implemented tailored management practices where appropriate to all projects. Although most of the tailoring has been for smaller projects in

the portfolio, NP has also applied tailoring to the FRIB Project. The FRIB Project is an example of NP use of a “tailored-up” application of 413.3B since although it is not required, the project execution plan and the Cooperative Agreement define the tailored project requirements. The NP has imposed tailored project management practices for all Major Items of Equipment (MIE) Projects with a Total Estimated Cost (TEC) greater than \$2M, and to other small projects that have particularly challenging scope or technical risks.

The NP is very effectively monitoring a large number of projects across a spectrum of various sizes and complexities. The Office has achieved a successful record of project management, contributing significantly with this past performance to the expectation of the Office of Science Director to maintain and improve upon the overall SC project success record. This past record and expectation is part of the basis for the tailored SC Critical Decision approval authorities that have been granted under the 413.3B exemption. NP is balancing the need to maintain a successful project record with the challenges of managing small research and equipment projects using tailored approaches of 413.3B principles and requirements.

- The COV recommends that the NP establish a mechanism for funding travel expenses for all members of review panels and site visits other than using the individuals’ research grants.

This recommendation has been fulfilled.

- The COV recommends that the NP continue to pay close attention to the issue of supporting new investigators and new scientific opportunities. Even in tight budget times the importance of investing in the future is crucial.

The NP has continued to sponsor new faculty and laboratory scientists through the Early Career Award (ECA) Program. The number of ECAs is substantially less than the number of incoming faculty/staff in nuclear physics, and the success rate for the ECA program is very low. The Office has also been mindful of supporting high quality proposals from young scientists outside of the ECA program, though constrained budgets have allowed only modest support.

- The COV review materials (COV book) should be made available electronically to the Committee two weeks prior to the visit. The NP should work closely with the COV Chair to determine the contents of these review materials.

This recommendation has been fulfilled.

- As part of preparations for the next COV, the COV chair should solicit comments from the community regarding the operation of the NP.

This recommendation has been fulfilled.

COMMENTS:

The data management system PAMS has been in development by the Office of Science since the

last COV visit. Commencement of the phased operations of PAMS by the end of this year is highly welcomed. The new database should be implemented to increase the operational ability of the NP to monitor grants and personnel, and to develop effective tracking data. It should also result in increased efficiency in the NP and allow more information to be provided to the COV in the future, for more productive visits.

The 2010 COV recommended that a discussion of workforce development and diversity be required in all proposals. This was not implemented due to potential inconsistencies with federal guidelines. The 2010 COV also recommended that the NP modify the proposal review / scoring method to elevate the importance of workforce development with emphasis on attracting and training women and members of under-represented groups. It is important for the NP to utilize the PAMS system to collect these data and to monitor workforce development. Furthermore, the NP should analyze these data with the idea to investigate ways of attracting and training women and members of under-represented groups with the goal of a more equitable balance in the workforce.

The NP has worked towards improving review feedback to PIs. All reviews are now returned and there is an ongoing effort to improve the review report guidelines and make uniform the information provided to proposers. Feedback to PIs on reviews of proposals should provide sufficient detail to enable the PI to improve future proposals. Furthermore, the NP should strive for uniformity in review documentation including panel rankings when panels are used.

The NP should endeavor to enhance communication and seek consistency of management practices throughout the program. The NP should continue to work towards more face-to-face meetings with PIs within the framework of constraints on federal travel and limited time of individuals in NP. Increased presence at important meetings is one way to maximize contact while minimizing travel. The NP might consider holding Principle Investigator Meetings to further enhance communication and feedback to PIs. Comparative reviews are one means of accomplishing reviews and consistency across the program. Such a review is planned in 2013 and should be carefully planned.

The transition from construction to operations requires a careful analysis of resources (people, materials and supplies, maintenance) required for robust operations and a transition plan. Discussions between the AD and the Division Directors on strategies and the approach to operations are essential for effective transitions.

The NP is very effectively monitoring a large number of projects across a wide spectrum that varies in size and complexity. NP should continue to balance the need to approve and maintain successful projects with the challenges of allowing and managing smaller research and equipment projects and use the tailored approaches allowed by 413.3B.

The Early Career Award (ECA) Program has been the major source of support of new faculty (and new laboratory research scientists) by the NP. Since there is a larger number of incoming faculty in nuclear physics than can be supported by ECAs, other means of support for new nuclear physics faculty should be considered.

RECOMMENDATIONS:

The COV recommends that the NP prepare a written response to the COV recommendations within 30 days of receiving them from NSAC as per guidance from the Office of Science. This response should contain a plan of action to address the recommendations in this report. A report card that details the progress on the COV recommendations should be sent to NSAC at the time of charging the next COV committee. We note that such a report card was not presented to NSAC in 2012 at the receipt of the current charge.

F. Suggestions regarding the COV process

FINDINGS:

Members of NP were very helpful and cooperative in all aspects of the review. The DOE COV Book was available on the web for the COV five weeks prior to the review. The presentations were available to the COV three days before the review. The PMs were very forthcoming in their response to requests from the COV and in the discussions. The lack of a comprehensive database made retrieval of information sometimes difficult and in some cases impossible during the review.

There was a lead-time of three months between COV committee appointment and the review. This was sufficient time to adequately plan for the review. Prior to the review there were COV teleconference meetings to discuss the charge, consider and discuss the guidance from SC for COV Reviews, formulate questions and issues for NP to address prior to and/or during the review, and to discuss and define the agenda. The COV requested a self-assessment from NP, primarily following questions in the charge to the COV, which was presented at the review.

Of the 22 members of the 2013 COV, two served on the 2010 COV with one having served as Chair of the 2007 COV.

The COV solicited feedback from the community on the various processes of NP that followed the lines of the charge to the COV. The community input was largely anecdotal, but the breadth of the COV and the time before the review allowed for COV discussion of issues that were raised. Some of the community feedback was highly relevant and found its way into the report.

Presentations from the PMs followed a prescribed template that allowed for efficient presentation of materials within the time allocated in the agenda. Breakout sessions were held to review grant materials to understand grant actions, and to discuss program issues with the PMs. Separate sessions were also held with the AD and Division Directors early on and later in the review to discuss issues.

COMMENTS:

The lead-time between committee appointment and the review was essential for an effective review, especially in the limited time of the review itself.

Timely presentation of materials from the DOE was very helpful to the COV process. Availability to access the internet (and electronic mail) during the review to retrieve background information would be useful for the review.

It is important to maintain continuity between COV reviews. This has two components. In terms of the COV itself, representation on the COV from the previous COV is essential. With regard to continuity in the process of NP to address issues between COV reviews, perhaps the AD should either present an annual update on COV issues or include in his/her annual presentation to NSAC an update on how issues pointed out by the previous COV are being addressed.

G. Appendices



Department of Energy
Office of Science
Washington, DC 20585

Office of the Director

July 23, 2012

Dr. Donald Geesaman
Chair
DOE/NSF Nuclear Science Advisory Committee
Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Dear Dr. Geesaman:

This letter requests that the Nuclear Science Advisory Committee (NSAC) assemble a Committee of Visitors (COV) to review the management processes of the Department of Energy (DOE) Office of Science's Office of Nuclear Physics program. The panel should provide an assessment of the processes used to solicit, review, recommend, and document proposal actions and monitor active projects and programs for both the DOE laboratory and university programs.

The panel should assess the operations of the Office's programs during the fiscal years 2010, 2011, and 2012. The panel may examine any files from this period for all actions administered by the program for the period under review, including funding at national laboratories, universities, and other activities handled by the program. The panel should consider and provide evaluation of the following major elements:

- (a) the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document application, proposal, and award actions; and
- (b) the quality of the resulting portfolio, including its breadth and depth, and its national and international standing.

In addition to these findings, comments on observed strengths or deficiencies in any component or sub-component of the Office's portfolio and suggestions for improvement would be very valuable. The panel should also comment upon what progress has been made towards addressing action items from the previous COV review. You should work with the Associate Director of Science for Nuclear Physics to establish the processes and procedures so as to enable the first COV meeting to take place before the end of January 2013. The results of this assessment should be documented in a report with findings, comments, and recommendations clearly articulated; the report should be submitted to NSAC by March 15, 2013.



We appreciate the Committee's willingness to take on these important activities, and we look forward to your final report concerning these important tasks.

Sincerely,

A handwritten signature in black ink, appearing to read 'W. F. Brinkman', with a stylized flourish at the end.

W. F. Brinkman
Director, Office of Science

cc:

Edward Seidel, NSF
Bradley Keister, NSF



Donald F. Geesaman 1-630-252-4059 phone
Distinguished Argonne Fellow 1-630-252-3903 fax
geesaman@anl.gov

Physics Division
Argonne National Laboratory
9700 South Cass Avenue, Bldg. 203
Argonne, IL 60439-4845

September 25, 2012

Prof. John Harris
Department of Physics
Yale University
268 Whitney Ave ·
PO Box 208120 ·
New Haven · CT · 06520 - 8120

Dear John,

As you know Dr. William Brinkman, Director of the Office of Science at the Department of Energy (DOE), has charged NSAC to establish a Committee of Visitors (COV) to review the management processes of the DOE Office of Science's Office of Nuclear Physics. The committee should provide an assessment of the processes used to solicit, review, recommend, and document proposal actions and monitor active projects and programs for both the DOE laboratory and university programs.

I am writing to formally ask you to serve as the Chair of an NSAC subcommittee to consider this charge and report back to NSAC. The work of this COV is of great importance for the future of nuclear science. Previous COV reports were issued in 2004, 2007 and 2010. Such COV serve a valuable purpose in assessing the management of key areas of the country's research portfolio.

The charge, of which you have a copy, asks that the report be submitted to NSAC by March 15, 2013. It is expected that the site visit will take place during the week of January 7-11, 2013. I anticipate scheduling an NSAC meeting in early March and I would like to ask you to make a presentation on the findings of the COV. The report will need to be sent to me for distribution to NSAC in sufficient time before the NSAC meeting to ensure that the NSAC membership has time to read and reflect on your report.

I realize this task places an extra burden on you. I and our whole community very much appreciate your willingness to take on this task. I therefore want to take the opportunity to express to you and to the sub-committee in advance my thanks for what you are doing. I will be available to help you in any way I can and I will serve on the COV in an ex officio capacity.

Sincerely yours,

A handwritten signature in blue ink, appearing to read "D.F. Geesaman", with a long horizontal flourish extending to the right.

Donald F. Geesaman
Chair, Nuclear Science Advisory Committee

Tuesday, January 8

8:00 am Meet in DOE Lobby
8:15 am Executive session

9:30 am Committee Breakouts (Program Managers available for discussion with breakout groups as requested)

<u>Grants 1</u> (A-410)	<u>Grants 2</u> (E-301)	<u>Lab Res.</u> (J-108)	<u>Facility Ops</u> (E-114)	<u>Projects</u> (F-441)	<u>Isotopes</u> (G-426)
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10:30 am Break (A-410)
10:45 am Committee Breakouts (Program Managers available for discussion with breakout groups as requested)
12:30 pm Working Lunch (A-410)
1:15 pm Committee Breakouts (Program Managers available for discussion with breakout groups as requested)
2:30 pm Executive session (A-410) Discuss initial findings
4:30 pm Committee work or Meet with program managers, assign homework
6:30 pm Adjourn
7:30 pm Dinner

Wednesday, January 9

8:00 am Meet in DOE Lobby
8:30 am Report on Homework
9:30 am Executive session (A-410)
Preparation of report

12:00 pm Working Lunch

1:00 pm Preparation of report
3:00 pm Meet with the Associate Director and Division Directors
3:30 pm Closeout
4:00 pm Adjourn

Office of Nuclear Physics Committee of Visitors 2013 Panel Members

Professor John Harris, Chair
Physics Department
Yale University
P. O. Box 208120
New Haven, CT 06520-8120
Phone: 203-432-6106
Email: john.harris@yale.edu

Mr. Joseph Arango
Department of Energy
Thomas Jefferson Site Office
12000 Jefferson Avenue
Newport News, VA 23606
Phone: 757-269-5094
Email: arango@jlab.org

Dr. Kelly Beierschmitt
Oak Ridge National Laboratory
P. O. Box 2008, MS: 6477
Oak Ridge, TN 37831-6477
Phone: 865-241-1499
Email: beierschmitt@ornl.gov

Professor Elizabeth Beise
Department of Physics
University of Maryland
College Park, MD 20742
Phone: 301-405-6109
Email: beise@physics.umd.edu

Professor Jeffery Blackmon
Department of Physics & Astronomy
Louisiana State University
202 Nicholson Hall
Baton Rouge, LA 70803
Phone: 225-578-7283
Email: blackmon@lsu.edu

Dr. David Dean
Oak Ridge National Laboratory
P. O. Box 2008, MS: 6369
Oak Ridge, TN 37831-6369
Phone: 865-576-5229
Email: deandj@ornl.gov

Dr. Latifa Elouadrhiri
Thomas Jefferson National Accelerator
Facility
12 GeV Director's Office
12000 Jefferson Avenue
Newport News, VA 23606
Phone: 757-269-7303
Email: latifa@jlab.org

Professor Olga Evdokimov
Department of Physics
University of Illinois
845 West Taylor Street, M/C 273
Chicago, IL 60607-7054
Phone: 321-996-3413
Email: evdolga@uic.edu

Dr. Paul Fallon
Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, CA 94720
Phone: 510-486-4243
Email: pfallon@lbl.gov

Professor Alexandra Gade
National Superconducting Cyclotron
Laboratory
Michigan State University
East Lansing, MI 48824-1321
Phone: 517-355-9672
Email: gade@msu.edu

Professor Susan Gardner
 Department of Physics & Astronomy
 University of Kentucky
 Lexington, KY 40506
 Phone: 859-257-4391
 Email: gardner@pa.uky.edu

Dr. Donald Geesaman
 Physics Division
 Argonne National Laboratory
 9700 South Cass Avenue
 Argonne, IL 60439
 Phone: 630-252-4059
 Email: geesaman@anl.gov

Dr. Stuart Henderson
 Fermilab
 P. O. Box 500
 Batavia, IL 60510
 Phone: 630-840-4666
 Email: stuarth@fnal.gov

Professor Kate Jones
 Department of Physics & Astronomy
 Experimental Nuclear Physics
 University of Tennessee
 Knoxville, TN 37996
 Phone: 865-974-4022
 Email: kgrzywac@utk.edu

Professor Joshua Klein
 Department of Physics & Astronomy
 University of Pennsylvania
 3451 Walnut Street
 Philadelphia, PA 19104
 Phone: 215-573-3599
 Email: jrk@hep.upenn.edu

Professor Reiner Kruecken
 Physics Division
 TRIUMF
 4004 Wesbrook Mall
 Vancouver BC V6T 2A3
 Canada
 Phone: 604-222-7365
 Email: reinerk@triumf.ca

Professor Berndt Mueller
 Department of Physics
 Duke University
 Box 90305
 Durham, NC 27708
 Phone: 919-660-2570
 Email: Mueller@phy.duke.edu

Dr. Michael Pennington
 Theory and Computational Physics Division
 Thomas Jefferson National Accelerator
 Facility
 12000 Jefferson Avenue
 Newport News, VA 23606
 Phone: 757-269-6026
 Email: michaelp@jlab.org

Ms. Aundra Richards
 U.S. Department of Energy
 Berkeley Site Office
 Upton, NY 11973
 Phone: 510-486-4345
 Email: aundra.richards@bso.science.doe.gov

Professor Lee Roberts
 CAS Physics
 Boston University
 590 Commonwealth Avenue
 Boston, MA 02215
 Phone: 617-353-2187
 Email: Roberts@bu.edu

Dr. Thomas Roser
 Physics Department
 Brookhaven National Laboratory
 Upton, NY 11973
 Phone: 631-344-7084
 Email: roser@bnl.gov

Professor Susan Seestrom
 Experimental Physical sciences
 Los Alamos National Laboratory
 Los Alamos, NM 87545
 Phone: 505-665-4454
 Fax: 505-665-1293
 Email: Seestrom@lanl.gov

REPORT TEMPLATE FOR THE FY 2013 NP COMMITTEE OF VISITORS

January 2013

2012 Charge to the Nuclear Science Advisory Committee:

“This letter requests that the Nuclear Science Advisory Committee (NSAC) assemble a Committee of Visitors (COV) to review the management processes of the Department of Energy (DOE) Office of Science’s Office of Nuclear Physics program. The panel should provide an assessment of the processes used to solicit, review, recommend, and document proposal actions and monitor active projects and programs for both the DOE laboratory and university programs.

The panel should assess the operations of the Office’s programs during the fiscal years 2010, 2011, and 2012. The panel may examine any files from this period for all actions administered by the program for the period under review, including funding at national laboratories, universities, and other activities handled by the program. The panel should consider and provide evaluation of the following major elements:

- (a) the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document application, proposal, and award actions; and
- (b) the quality of the resulting portfolio, including its breadth and depth, and its national and international standing.

In addition to these findings, comments on observed strengths or deficiencies in any component or sub-component of the Office’s portfolio and suggestions for improvement would be very valuable. The panel should also comment upon what progress has been made towards addressing action items from the previous COV review. You should work with the Associate Director of Science for Nuclear Physics to establish the processes and procedures so as to enable the first COV meeting to take place before the end of January 2013. The results of this assessment should be documented in a report with findings, comments, and recommendations clearly articulated; the report should be submitted to NSAC by March 15, 2013.”

Based on the COV's study of proposal actions completed within the past three fiscal years, please provide concise findings, comments and recommendations on the following aspects of the programs' processes and management related to:

A. The effectiveness, efficiency and quality of the processes used to solicit, review, recommend, and document proposal actions.

Consider for example:

- Consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- Appropriateness of project initiation and selection and adequacy of project definition
- Appropriateness of review mechanism (panels, ad hoc reviews, site visits)
- Adequate number of reviewers for balanced review; use of reviewers having appropriate expertise/qualifications; use of a sufficiently broad pool of reviewers; avoidance of conflicts of interest
- Efficiency/time to decision
- Completeness of documentation making recommendations

Findings:

Comments:

Recommendations:

B. The monitoring of active projects and programs.

Consider for example:

- Grant progress reports
- Appropriateness and effectiveness of review mechanisms:
 - Annual Science and Technology reviews of National User Facilities
 - Program Reviews
 - Project Reviews
 - Other review mechanisms
- Program Manager briefings
- Contractors meetings
- Site Visits
- Interactions at topical, national and other meetings
- Effectiveness of monitoring project/program execution
- Completeness and quality of documentation

Findings:

Comments:

Recommendations:

C. Within the boundaries defined by DOE missions and available funding, how the award process has affected the breadth and depth of the Nuclear Physics portfolio elements.

Taking into account DOE and NP missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected the breadth and depth portfolio elements.

Consider for example:

- The overall quality of science
- The appropriateness of award scope, size, and duration
- The evolution of the portfolio with respect to new investigators and science opportunities
- The balance of projects with respect to innovation, risk and interdisciplinary research
- Long term goals of the NP office (tracked by OMB)

Findings:

Comments:

Recommendations:

D. The national and international standing of the portfolio elements.

Taking into account DOE and NP missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected the national and international standing of the portfolio elements:

Consider for example:

- The uniqueness, significance, and scientific impact of the portfolio;
- The stature of the portfolio principal investigators in their fields;
- The leadership position of the portfolio in the nation and the world.

Findings:

Comments:

Recommendations:

E. Progress made towards addressing action items from the previous COV review

Findings:

Comments:

Recommendations:

F. Suggestions regarding the COV process

This section is to be based on the COV's impression of the overall process used for this review and comment on which processes best enabled the committee to address its charge and suggestions on processes that could be implemented to improve future such reviews.

Findings:

Comments:

Recommendations: