# Report of the Committee of Visitors of the Office of Nuclear Physics to the Nuclear Science Advisory Committee

Review of FY 2004, 2005, and 2006

January 9-11, 2007

Germantown, MD

# Executive Summary

A Committee of Visitors (COV) for the Office of Nuclear Physics (ONP) was formed and charged as a subcommittee of the Nuclear Sciences Advisory Committee (NSAC). The committee met for 2.5 days on January 9-11, 2007, to assess (a) the processes used to solicit, review and make decisions on the funding of projects and proposals, and (b) the monitoring of active programs, facilities and projects, as well as evaluate how the award process has affected (c) the depth and breadth of ONP's portfolio, and (d) the national and international standing of the program. The Committee was additionally asked to comment on ONP's response to recommendations from the 2003 COV, as well as suggestions for improving the review process in the future. The years covered by this COV were Fiscal Year (FY) 2004, 2005, and 2006. The committee consisted of 17 members with scientific expertise across the portfolio of the ONP program, along with additional members who have technical expertise in facility operations and project management but who are not directly involved with ONP's facilities and projects.

In general, the COV found the office to be very well managed, with dedicated and hard-working staff. The environment appears to be a very collegial one, and all program managers are involved in strategic planning and budget decisions. It is our sense that the reorganization of personnel that took place since the 2003 COV is very beneficial to the program. There are a number of open positions to be filled, and we found ample evidence of the need for these additional personnel based on the workload of the present staff.

The process used to solicit, review, recommend, and document proposal actions for the university grants portion of the portfolio is excellent and of the highest quality. Several recommendations of the 2003 COV were implemented to further improve this process, including a more standardized set of guidelines for evaluation criteria and identification of conflicts of interest, a deadline for submission of new proposals, a template for annual reports, and a more formal procedure for evaluating the research programs at the national laboratories. Use of international reviewers has increased as recommended, and we encourage their additional use for some of the larger group grants. One improvement the COV thought could still be made would be to make better use of an office-wide database for tracking reviewers, grant and PI statistics, grant turnover, and international participation, in order to more closely monitor the vitality of the program.

As of 2004, a new review process is in place for the laboratory research groups, and the COV views this as largely successful. We have some recommendations for additional improvements, such as more directly mapping the review criteria, particularly in the area of graduate student and postdoc mentoring, to the suggested list of materials to be provided by the labs for the review.

There has been an evolution of the program with respect to operating national user facilities, with two recent closures, the MIT-Bates accelerator and the 88-inch cyclotron facility at Lawrence Berkeley National Laboratory. While closure of user facilities always represents a loss to the community, the resulting available resources have been redirected towards new opportunities. The request for proposal (RFP) for the Rare Isotope Accelerator was cancelled during this period, but upgrade investments have begun at the existing low energy facilities to provide some

continuity until a next generation U.S. facility becomes a reality. The program's accelerator R&D program is playing a more visible role, and the COV supports the ONP's consideration of expanding the scope of this program to include less targeted research, including potential new programs at universities.

The portfolio of projects supported by the ONP is very diverse, ranging from a major facility upgrade at Jefferson Laboratory to relatively small-scale neutron experiments. The COV found the balance of projects to also be scientifically diverse, with priorities closely tied to the recommendations of NSAC subcommittees. Initiation and oversight of the various projects are tailored to their individual scope and risk, and the COV was impressed with the rigor and attention given to their management. However, it is our observation that the procedure for initiating projects is not well understood by scientists in the field, which can lead to delays and frustration, so we recommend increased efforts to educate the scientific community in this area, through conversations, presentations at national meetings, and/or possibly a written primer on the ONP website.

The portfolio of science supported by the Office of Nuclear Physics is outstanding, world-leading in some areas and world class in others. As with the projects and facilities supported, the science program is also remarkably diverse. Partnerships with the international community are substantial. The office makes excellent use of advisory mechanisms such as NSAC and the long-range planning process and is very responsive to community input.

We conclude with the list of our major recommendations, which are described in more detail in the body of the report. We wish to thank everyone in the office for their responsiveness during our visit, particularly in our request for additional background material at various points during our short visit, as well as their willingness to engage in frank and open discussions regarding all aspects of the program.

**Major Recommendations:**

1. While there is an Office of Science-wide database for grants and contracts, a common database of reviewers for university grants specifically for the ONP office is needed, one that can be shared among the program managers, particularly as there continues to be more cross-over between the different subprograms.

2. We recommend a more extensive database of the information contained in the university grants, to facilitate tracking of the overall health of the program. Statistical data such as the number of PI's per grant, average grant size, and time to notification of a proposal action are among the statistics that would be valuable to track.

3. There is ample evidence of the need for the additional staff requested by ONP. We encourage the filling of the vacant positions as soon as possible, and strongly support the use of detailees where appropriate.

4. For the review process of the laboratory research groups, we recommend that there be a more direct mapping between the review criteria and the suggested list of materials to be

included for the review. Examples are in the area of outreach activities and in workforce development. We recommend that the hosting of graduate students and the mentoring of postdocs be incorporated as an assessment item in the review process.

5. "Cost effectiveness" is a performance measure that is difficult to determine. We recommend that the program office continues to improve this measure for the laboratory research groups, and to develop a more uniform methodology to evaluate the cost effectiveness of the laboratory research programs.

6. The ONP should seek opportunities to better educate the scientific community regarding the process, approach and constraints in the development of new initiatives into projects. This could, for example, include a primer posted on the ONP website and explanations during presentations at relevant national meetings.

7. We recommend continued incremental improvements to the laboratory research reviews procedures with a specific goal of developing consistency between the 4-year review process and the research reviews during the annual site visits to facilities.

8. We recommend that the appropriate program manager visit each laboratory at least once during a 4-year cycle.

9. Site visits, even informal ones, are extremely important for communicating project issues concerns and needs. As more staff are added to ONP, we encourage more frequent, but informal, visits (more than once per year) to sites with projects in progress. The COV noted that all program managers already have significant travel obligations, so this recommendation depends strongly on filling the vacant positions within the office. While travel funds have increased since the last COV, additional funds will be needed in the ONP program management budget to accommodate the recommended more frequent site visits as well as address inflation of travel expenses.

10. We encourage the ONP to consider a fellowship program, working with other offices within DOE-SC, as an element of an expanded accelerator R&D effort.

11. The COV encourages the use of retiring grants to fund new young investigators (whether through the OJI program or through the regular grants program).

# I. Introduction

A Committee of Visitors (COV) for the Office of Nuclear Physics (ONP) was formed and charged as a subcommittee of the Nuclear Sciences Advisory Committee (NSAC). A copy of the charge letter to NSAC, from DOE's Office of Nuclear Physics Director Dennis Kovar and NSF's Acting Director for Mathematical and Physical Sciences Judith Sunley, is included in Appendix A. The committee met for 2.5 days on January 9-11, 2007. The focus of the meeting was to assess ONP practices in the following areas, as stipulated in the charge letter.

- Evaluate the effectiveness, efficiency and quality of the processes used to solicit, review, recommend and document proposal actions as well as monitoring of active programs

and, within the boundaries defined by DOE missions and available funding,

- Evaluate how the award process has affected the breadth and depth of the Nuclear Physics portfolio elements, and the national and international standing of the portfolio elements.

We were additionally asked to comment on ONP's response to recommendations from the 2003 COV, as well as suggestions for improving the review process in the future. The years covered by this COV were FY 2004, 2005, and 2006.

The committee consisted of 17 members, whose expertise spans the portfolio of the ONP program, as well as individuals who have technical expertise in facility operations and project management but who are not directly involved with ONP's facilities and projects. The committee included NSAC's present chair, Dr. Robert Tribble, new NSAC member Dr. Charlotte Elster, and two international representatives. A complete listing of the committee membership is provided in Appendix B. As shown in the agenda (Appendix C), the COV was organized into four parallel subgroups who looked independently at major facility operations, management of the research programs at major laboratories, the monitoring of major projects, and at the management of university grants. Prior to breaking into subgroups, the full committee heard presentations by ONP Director Dennis Kovar, Division Directors Jehanne Simon-Gillo and Eugene Henry, and by each of the Program Managers. These presentations resulted in valuable exchanges between the COV members and the ONP staff, such that they extended through nearly all of the first full day of the meeting. The first in depth look at the office documentation began the second day of the meeting. Unlike the 2003 COV, there was only one subgrouping of panel members rather than a reshuffling of the groups after a first read, which allowed for a more in-depth look at the available documentation by each subgroup. The specific subgroup to review the laboratory research groups was established in order to look carefully at the new mechanism for reviewing these groups which had been established since the 2003 COV.

Appendix D contains the table of contents of the material provided to the committee upon our arrival. At the end of the first day, the COV members reviewed the listings of documentation and selected specific documentation to review: we were given access to all available documentation upon request. The subgroup reviewing the university grants program looked

collectively across the various research thrusts in order to develop a broad perspective on the decision process and to compare and contrast actions by the individual program managers. This "grants" group reviewed about a third of the approximately 180 active grants in the program plus a number of the declinations. The group reviewing laboratory research was able to review all of the available material.

The COV's evaluation process greatly benefited from frank and open discussions with the Program Managers and Division Directors during our 2.5 day visit. The staff were also very responsive to our requests for additional material. We also wish to thank the administrative staff in the office for helping to make what is by nature a somewhat chaotic investigation process proceed smoothly and efficiently.

The remainder of this document summarizes the Committee's findings, comments and recommendations on each of the areas in which we were asked to comment. These are presented within the framework of a provided template, which is included as Appendix E.

# II: Major Findings, Comments, and Recommendations

**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.**

**Findings:**

We generally found that the process used to solicit, review, recommend, and document proposal actions for the grants portion of the portfolio is excellent and of the highest quality. The new explicit instructions for preparation and electronic submission of grant proposals are clear and detailed. Following the recommendation of the previous COV, a new deadline of November 1 has been implemented for the submission of new proposals. From sampling the jackets we found the time to decision process was variable, but satisfactory given the various constraints involved. The number of reviews sought, typically five, is sufficient and the reviewers chosen were highly qualified. The letter of request to reviewers clearly states the criteria to be used in evaluating proposals. Following the recommendation of the previous COV, the letter of request also contains a formal and clearly stated set of guidelines for identifying possible conflicts of interest. A reasonable level of international reviewers is used, particularly for university Centers of Excellence, which can and should have wide international exposure. The COV encourages increased use of international reviewers for some of the larger grants as well. Overall, the quality of the reviewers is excellent, both in terms of expertise and in the thoughtfulness and thoroughness of their reviews.

The review process for laboratory research programs was changed in 2004. The four major research thrusts: heavy ions (2004), theory (2005), medium energy (2006), and low energy

(2007), are now being reviewed on a rotating 4-year cycle. At the time of the COV, the first three reviews had been completed, with the review of the low-energy programs scheduled for this coming summer. The reviews consist of written proposals and oral presentations which are evaluated by a panel of experts in the sub-field representing both theory and experiment and U.S. and international communities. Following the presentations the panel members write individual letter reports. The program manager writes the overall review including excerpts from these letters.

The solicitation letters for the reviews clearly outline the format, content and evaluation criteria for the requested written proposals. The reviews are based on the submitted research proposals, consistent with the annually submitted field work proposals (FWPs). The proposals are assessed by the panel according to the specified criteria; in addition, the program managers derive the cost effectiveness based approximately on the budget per researcher. Feedback from the review process is transmitted to the laboratory in a timely fashion.

The COV noted that two facilities, the MIT-Bates accelerator and the 88 inch cyclotron at Berkeley, were shut down in the last two years, resulting in approximately $15M/year available for redirection to other programs. The decision-making process involved NSAC, and was thorough and well documented. The criteria involved an analysis of the status of the research being done at these facilities as well as where the ongoing scientific programs could be conducted. Careful consideration was given to the staff at the two locations, from the perspective of retention of unique skills and from the human resources perspective. We also note that during this 3-year period, the request for proposal (RFP) for the RIA facility was cancelled. The ONP has responded to needs in low energy physics by facilitating upgrades of the existing low energy facilities. This is seen as a bridge until a next generation rare isotope facility is built in the US.

Accelerator R&D proposals are handled in a manner similar to the other grant-based proposals. The majority of the accelerator R&D funding managed by the Advanced Technology R&D Program Manager has so far been targeted at rare isotope beam (RIB) research.

Project initiation, management, and oversight, gathered within the Facility & Project Management Division (FPMD), closely tracks the priorities and long range planning developed by the scientific community and advisory panels. Few, if any, unsolicited proposals are received directly by FPMD without previous discussion with the ONP staff. Projects proposed by universities for instrumentation that will be deployed at laboratories must include the ownership of that laboratory and have the laboratory leadership. A tailored/graded approach in the initiation and development of projects is followed depending on the project's cost, risk and scope. This tailored approach, while increasing the likelihood of success of a project, appears to be labor intensive and requires significant attention by ONP personnel.

**Comments:**

The program greatly benefits from the detailed expertise that each program manager has developed for his/her part of the portfolio. The documentation on the review and decision process is *outstanding***.** The review analyses by the Program Managers are complete and extremely well organized. Particularly noteworthy are the summaries and recommendations, which are extensive and well-documented, with the comments of the reviewers representatively quoted and accurately synthesized. Some COV members thought that having quick access to a historical list of the reviewers used for the continuing grants, for example in the front of the grant jacket, might be helpful for assessing the evolution of a grant over time.

The electronic process of transmitting proposals to reviewers is still somewhat awkward. While the COV appreciates that this process is dictated by GRANTS.GOV and thus is out of the purview of the NP office, we note that there is considerable room for improvement in the system.

The implementation of the new process for review of laboratory research incorporates many of the features of university grant proposal reviews. This process is carried out very professionally and effectively by the program office. The feedback of comments and recommendations from the expert panels is a constructive addition to the results of other reviews – S&T Reviews, Contractor, etc. The focus specifically on research activities, rather than broader issues, is valuable to the agency and laboratory management in shaping planning and resource decisions. These reviews are in their first round, and the process is under continuing improvement. For example, in the first two reviews, cost effectiveness was a review item evaluated by the review panel. However, based on feedback from the reviewers, this criterion is now derived and evaluated directly at the program office. Although training of the next generation scientists was mentioned in the solicitation letters and the request to the reviewers, a corresponding item was not included in the attachment to the solicitation for material to be included in the submission and was apparently not one of the major assessment criteria. Having this be a more explicit part of the submission step will give the program managers a more direct mechanism to assess this very important indicator of the health of the field.

We commend the ONP for creating the accelerator R&D funding for high priority strategic needs, and encourage the idea of expanding the scope of the program to include other strategic accelerator R&D areas as well as possibly less targeted programs at universities. We concur with the Program Manager's assessment that this is important on a number of fronts, including some continuity for providing opportunities for graduate students and postdoctoral candidates in this area.

The COV supports the process of evaluating laboratory associated proposals that require priority setting within multi-year plans. The FPMD is very thorough in its processes for project initiation and selection and adequacy of project definition and the staff should be commended for their understanding and successful application of DOE Order 413.3. However, while there is clearly a detailed process for initiation and development of projects,

tailored to size, complexity, and risk of the proposed projects, it is not well understood by the scientific community, resulting in a degree of frustration which is often misdirected. For non-accelerator based projects, development of formal proposals has been quite long and has impacted the competitiveness of the US program. Educating the community of the process will require effort, and the continued shortage of personnel makes this difficult, but if the community is well informed, the speed at which scientific initiatives become projects within ONP is bound to increase and fewer repetitive demands will be levied on ONP staff.

**Recommendations**

1. While there is an Office of Science-wide database for grants and contracts, a common database of reviewers for university grants specifically for the ONP office is needed, one that can be shared among the program managers, particularly as there continues to be more cross-over between the different subprograms.

2. We recommend a more extensive database of the information contained in the university grants, to facilitate tracking of the overall health of the program. Statistical data such as the number of PI's per grant, average grant size, and time to notification of a proposal action are among the statistics that would be valuable to track.

3. There is ample evidence of the need for the additional staff requested by ONP. We encourage the filling of the vacant positions as soon as possible, and strongly support the use 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.

4. For the review process of the laboratory research groups, we recommend that there be a more direct mapping between the review criteria and the suggested list of materials to be included for the review. Examples are in the area of outreach activities and in workforce development. We recommend that the hosting of graduate students and the mentoring of postdocs be incorporated as an assessment item in the review process.

5. "Cost effectiveness" is a performance measure that is difficult to determine. We recommend that the program office continues to improve this measure for the laboratory research groups, and to develop a more uniform methodology to evaluate the cost effectiveness of the laboratory research programs.

6. The ONP should seek opportunities to better educate the scientific community regarding the process, approach and constraints in the development of new initiatives into projects. This could, for example, include a primer posted on the ONP website and explanations during presentations at relevant national meetings.

**B. The monitoring of active projects and programs.**

Each university grant recipient is required to submit an annual progress report in order to obtain continuation funding. Following the recommendation of the previous COV, there are now new uniform standards and guidelines, resulting in more succinct and better focused reports. Nonetheless, these annual monitoring activities still consume a significant portion of the Program Managers' effort.

For the laboratory research groups, the field work proposals and the budget briefings are used as annual progress reports to review the progress of the research within the context of the 4-year proposal. In addition, research programs at the facilities are monitored within the annual Science and Technology (S&T) reviews. Site visits to review activities at other sites are carried out on occasion but are limited in number by personnel time and the travel budget.

ONP funds four National User Facilities: RHIC, CEBAF, ATLAS and HRIBF. RHIC and CEBAF are internationally unique, and are producing world class nuclear physics results. They both draw strong research groups from the US and from other nations. The ONP uses a variety of mechanisms to monitor the performance and productivity of these facilities, including annual S&T reviews, operations reviews including those specifically targeted at efficiency, as well as Program Manager briefings and annual laboratory manager briefings.

The project portfolio is diverse, covering everything from major line items (CEBAF 12 GeV Upgrade), major items of equipment (MIE), accelerator improvement projects (AIP), capital equipment and even an information technology (IT) project. The size ranges from >$200M down to ~$500k. The project oversight and progress monitoring documentation is very complete, with a well-defined and phased approach. Oversight is tailored to address the needs of the individual project circumstances with more direct attention given to those projects having greater risks. The review mechanisms to monitor the projects are rigorous, professionally conducted and reported in a timely manner. In order to provide maximum benefit to the project being reviewed closeout recommendations are communicated as quickly as possible (generally within a few days of the verbal closeout).

**Comments:**

The Program Managers spend considerable time reviewing annual reports for proposals in their portfolio, and this monitoring process is well documented. We note that this is an area where detailees could be particularly helpful.

The 4-year review by an international panel is an excellent way to review the laboratory research programs in a consistent way. The annual progress in research is monitored adequately with the FWPs, the budget briefings and (for the facilities) the S&T reviews.

The effective use of FWPs for review of facility operations was discussed at the last COV, and it was recommended that ONP make better use of them. Apparently, the timing of the budget process makes it difficult for the office to use the FWPs in the budget planning

process. However, the FWPs are required by DOE and they do serve a role in defining how budget authority will be utilized. The conclusion of ONP is that there is no clear path forward to eliminate the need for both the FWP and the input needed for budgetary planning. The COV recognizes this dilemma and has no further comment except to encourage ONP to look for opportunities for efficiency within the Department if the occasion should arise. We commend ONP for the detailed and thorough approach taken in the laboratory management briefings, and view these meetings as an important and effective management tool.

The ONP has responded to the concerns of the last COV regarding the lack of external review of the smaller (ATLAS and HRIBF) facilities by implementing S&T reviews on an annual basis at these facilities as well. The first ONP Operations Efficiency Review (08/06) is an example of how these reviews shape policy. At these reviews and facility operations reviews conducted in 2003 and 2004, ATLAS and HRIBF both noted that for a modest increase in funding, additional accelerator operators could be hired to allow the facilities to go from five days per week operation to seven days per week. This has been addressed in the President's FY07 budget.

The COV noted that the university-based capital projects can have less project management rigor when compared to equivalent-sized laboratory-based projects within the portfolio. However, the same procedures are used in each case, based primarily by project size, and the review mechanisms established within FPMD appear appropriate and effective. We note that on one joint project between the Office of High Energy Physics (HEP) and ONP, the FPMD was asked to provide oversight even though the relative budget contribution of NP is more than three times smaller than that of HEP. This provides evidence of the quality and effectiveness of project oversight in ONP.

**Recommendations:**

We are reluctant to recommend changes to the annual review process for the grants, other than to encourage the program managers to continue to streamline this step and evaluate the impact of detailed annual adjustments to individual grants on their overall flexibility in allocating funds.

7. We recommend continued incremental improvements to the laboratory research reviews procedures with a specific goal of developing consistency between the 4-year review process and the research reviews during the annual site visits to facilities.

8. We recommend that the appropriate program manager visit each laboratory at least once during a 4-year cycle.

9. Site visits, even informal ones, are extremely important for communicating project issues concerns and needs. As more staff are added to ONP, we encourage more frequent, but informal, visits (more than once per year) to sites with projects in progress. The COV noted that all program managers already have significant travel obligations, so this recommendation depends strongly on filling the vacant positions within the office. While

travel funds have increased since the last COV, additional funds will be needed in the ONP program management budget to accommodate the recommended more frequent site visits as well as address inflation of travel expenses.

**Within the boundaries defined by DOE missions and available funding, how the award process has affected the following two elements:**

**C. The breadth and depth of the Nuclear Physics portfolio elements.**

**Findings:**

The Nuclear Physics portfolio consists of a remarkably diverse but inter-related set of elements that are all of very high quality and at the cutting edge of scientific research. The three main areas of research include the study of Quark Degrees of Freedom (QCD), Nucleon-Degrees of Freedom (Nuclear Structure & Astrophysics), and Fundamental Symmetries & Neutrino Science. Some of the basic questions addressed by this program are the following:

- What is the nature of the quark-gluon matter of the early universe?
- Where is the glue that binds quarks into strongly interacting particles?
- What is the internal landscape of the proton?
- What does QCD predict for the properties of nuclear matter?
- What binds protons and neutrons into stable and unstable nuclei?
- What is the origin of simple patterns in complex nuclei?
- When/how did the elements from Iron to uranium originate?
- What causes stars to explode?
- What are the masses of neutrinos and how have they shaped the universe?
- Why is there more matter than antimatter?
- What are the unseen forces that disappeared from view as the universe cooled?

The university grants program represents this diverse portfolio through its three main subdivisions of Heavy Ion, Medium Energy, and Low Energy, along with a cross-cutting Theory Program. The boundaries between the subprograms appear to be quite permeable, in the sense that Program Managers work closely together in areas where a research topic crosses more than one subdivision. Two examples are the spin physics program at RHIC, and projects connected to tests of fundamental symmetries.

The Outstanding Junior Investigator program is cross-cutting, in the sense that the program is administered office-wide, proposals are reviewed by a single external panel, and all Program Managers participate in the decision process. The COV sees this program as an excellent mechanism to attract and promote strong young scientists, as well as to stimulate the development of new research directions.

At the laboratories, the award scope, size, and duration range from small to large, from the RHIC and CEBAF facilities to the small-scale neutron experiments at LANSCE, and match well with the vigorous and diverse Nuclear Physics program elements. A total of 83

laboratory FWP documents were submitted for FY 2008. Due primarily to declining budgets, the Nuclear Physics portfolio has decreased with respect to the number of investigators and to the number of laboratory groups. Nevertheless, the Nuclear Physics program is aggressively pursuing long term goals with a number of future facilities and projects. Excellent use is made of NSAC subcommittee reports and the office has, to the extent possible, carefully enumerated their plans in the measurable milestone goals tracked by OMB. In several cases the ONP partners with the National Science Foundation in projects that include NSF-supported, university-based investigators.

The balance of projects is also well diversified in terms of scientific thrusts and interdisciplinary research. Interdisciplinary research projects and facility projects with the involvement of multiple funding agencies are increasing elements in the portfolio. Examples with the Office of High Energy Physics are LHC Heavy-Ion experiments at CERN and the SNO, KamLAND, and MiniBooNE neutrino experiments. Recent innovative results include the first observation of neutrinos from the inside the earth, and precision tests of Lorentz Invariance. Applications of Nuclear Physics research have had impacts on Stockpile Stewardship, Homeland Security, Non-Proliferation, and Neuroscience.

Recently, the ONP has created the position of Program Manager for Advanced Technology R&D, who has responsibility for the office's Small Business Innovation and Research (SBIR) and STTR programs, and for developing and managing the accelerator R&D program. The ONP is considering the development of a graduate and postdoctoral fellowship program in accelerator physics. ONP has actively been funding accelerator R&D for Rare Isotope Beams (RIB) since the year 2000. Following the "2003 Rare Isotope Accelerator (RIA) R&D Workshop" these activities were directed toward a RIA facility (in years FY04-05). Since that time they have been directed toward more generic RIB development. A new RIB R&D workshop is considered within the context of the overall approach to the planning for a new facility, following the NSAC taskforce report, to set the direction of this R&D in FY08 and beyond

**Comments:**

The COV believes that the breadth and diversity of the science elements is a key reason for the success of the Nuclear Physics program. The mix of primary facilities (e.g. RHIC & CEBAF) with parasitic operation at other laboratories (e.g. SNS, CERN, & FNAL) is a healthy aspect. The solicitation and the guidance for the reviewers are clear about the mission and goals of DOE and ensure that the proposed research programs are consistent with these goals.

The new emphasis in accelerator R&D adds to the breadth of the program. The COV commends the ONP for recognizing the need for accelerator R&D in support of NP, and for creating the position of Program Manager for Advanced Technology R&D, with the vision of enhancing the long-term Accelerator R&D program. These R&D programs will attract graduate students and post-docs in accelerator physics and related technology which will strengthen the program further. These R&D programs could take place at universities as well as the national laboratories.

We note that a comparable program of detector R&D at universities could add to the breadth and vitality of the NP program by providing more opportunities for graduate students to develop new instrumentation.

One point of concern regarding the monitoring of grants is that there is a perception in the community that there is a very low turnover rate of existing grants, with a resulting low success rate for new proposals. The COV recognizes that there is a constant tension between maintaining a reasonable grant size versus using grant turnover to bring new PIs into the program. Because of this perception, and because of the value of growing strong new scientists, we support the Program Managers' practice of using funds released by retiring grants to start new PIs. However, part of this low turnover perception may have been created by the process of folding new investigators into existing programs rather than listing them as new grantees. This perception could be rectified as well by communicating the statistics of newly funded PI's at community meetings (such as the APS Division of Nuclear Physics annual meeting). However, the COV also noted a few specific cases where a group's productivity, as commented by the reviewers, had declined and the program action did not reflect the decline.

The COV was not asked to comment on the demographics of ONP's portfolio, although we were provided with diversity statistics in the presentations by the program managers. Support of female PI's is low but slowly increasing. Support for scientists from other under-represented groups is quite low. Both are consistent with other funding agencies and with the overall demographics of the scientific community. It is our observation that while the program managers expressed concern about the low numbers, ONP's approach is rather passive. Given the overall changing demographics of the U.S. workforce, we encourage the office to consider more proactive measures to increase the participation of women and minorities as a workforce development strategy.

In general, we find that the program office manages the available resources very effectively within tight constraints and it is difficult to recommend any improvement. The funding constraints, however, do limit the flexibility to support future innovative initiatives and therefore the vitality of the field.

**Recommendations:**

10. We encourage the ONP to consider a fellowship program, working with other offices within DOE-SC, as an element of an expanded accelerator R&D effort.

11. The COV encourages the use of retiring grants to fund new young investigators (whether through the OJI program or through the regular grants program).

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

In the limited time available, the COV was not in a position to *assess* comprehensively the national and international standing of all the portfolio elements of the ONP. Here we remark

only on the impact of priorities and decisions within the office on the perceived quality of the program.

With the resources steered by the ONP, the world leadership of the two large laboratories (RHIC and CEBAF) along with their respective science programs in both theory and experiment, remains unquestioned. The COV finds that the management of these facilities is outstanding and they clearly satisfy the criteria of uniqueness and impact. Access and partnerships with the international community are significant, and large fractions of the user communities in both cases come from overseas to carry out experiments. Many of the investigators supported by the grants program are recognized international leaders in their field in these two areas. With the support of the laboratory research programs, the groups are in many cases inside institutions with world-class facilities and/or access to unique technical resources, providing an "inside track" for international competition. The makeup of the review panels, with broad national and international representation, assures expert comment on the standing of the laboratory research groups.

In the area of theory, strategic use of programs such as SciDAC has stimulated U.S. leadership in the areas of stellar evolution and in theory based on lattice QCD.

More measured investments have been made in the research areas of fundamental symmetries and nuclear structure/astrophysics. These two elements add significant and necessary breadth to the portfolio, but there is substantial competition from the international community. From a facility perspective, the U.S. program is not dominant but often has a major participatory role. Individual researchers and groups supported by the ONP, both at universities and at the laboratories, often have positions of leadership within international collaborations.

**Comments:**

Overall, the DOE project portfolio reflects the balance of leadership described above. The cancellation of the RIA RFP in its original scope is a setback for the nuclear structure/astrophysics community who would make use of such a major new facility, but we note the steps that the ONP has taken to both recover from this delay and to stimulate research in this area through targeting resources to existing facilities. The timeliness of addressing proposed projects in new areas that are in competition internationally is also a concern, although the COV recognizes the fiscal constraints that lead to such decisions.

During the evaluation process, the COV asked for, and was provided with, data on portions of the budget associated with international participation in the program. This included both areas where the international community invests in the U.S. laboratories and areas where the NP office supports participation of U.S. scientists in offshore projects. While our evaluation of these data was rather cursory, it is our sense that it may be useful for the office to develop a more formal mechanism for tracking this kind of information as part of an annual assessment of the health of the program from an international perspective.

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

The COV that met in 2003 had nine major recommendations to the ONP. The 2007 COV is pleased to note that eight of them can be characterized as "complete", with only one, increasing the use of FWP's as part of the review process, still considered to be in progress. Most of these were already mentioned in the above text, but are again presented here in summary form.

1. Travel funds were increased, allowing for more opportunities by Program Managers to communicate with their constituents as well as for more oversight of facilities and projects. As indicated in the recommendations of section B, the 2007 COV came to the conclusion that the limit in the office's ability to oversee and manage projects is not only travel funding, but also personnel time and availability. Filling the available positions in the office may require additional increases in travel funds.

2. There is now a deadline for submission of new proposals of November 1. Discussions with the Program Managers indicated that this has improved the process of making funding decisions since all proposals are now "on the table" at the same time. It would be interesting for the next COV to learn quantitatively whether this has had an impact on the time to notify potential grantees of decisions.

3. The ONP director maintains a reserve which allows the possibility of responding to short term needs and opportunities. This COV did not probe this topic in detail but were convinced that significant thought has gone into determining the appropriate amount of reserve given budgetary constraints.

4. The Office of Science now has a comprehensive database of reviewers for grants. In addition, individual program managers maintain their own database for university reviews. As indicated in the recommendations of section A, we recommend a more useable database of reviewers for university grants that the program managers can share, that includes some kind if indicator of the responsiveness of the reviewer. This should in principle help optimize the selection of reviewers and decrease the time for getting reviews returned.

5. The participation of international reviewers has increased to an average of 17% for the review period of this COV.

6. Reviewers now receive formal conflict-of-interest guidelines, as governed by DOE, to which they are required to agree.

7. Annual reports now conform to a more uniform reporting format. The anecdotal information from the Program Managers is that this has improved their efficiency and also provides useful guidance to grantees submitting the reports.

8. The 2003 COV recommended increasing the utility of the required FWPs in setting budget priorities. As indicated in the comments of section B, the COV recognizes the

inherent conflict in timing between the FWP and the need for the budget decision process, and can only encourage the ONP to look for additional opportunities for increased efficiency in any future restructuring of the budget process.

9. Workforce development is now assessed as part of the S&T reviews. As indicated in the recommendations of section A, for the laboratory research programs, some improvement can still be made in the mapping of the review requests to what the program managers use to assess the programs in this area.

## F. Suggestions regarding the COV process

**Findings:**

In general, the COV members found the process to be very informative and it underscored the excellent way in which the Office of Nuclear Physics carries out its challenging job. The Office was open and forthcoming, and the presentations were especially helpful in understanding the management processes of the ONP. The background material was readily available, and additional document requests were handled expeditiously. We also note that COV process is an excellent opportunity for informing the community about DOE operations and it improves communication between the office and the scientists that carry out research in the field.

**Comments:**

There were a few instances in which the committee asked for additional statistical data which required significant effort on the part of the program directors to get at. This was due in part to the fact that the primary database expert was called away to an external review on short notice.

The nature of the projects supported by ONP is such that they typically exceed the COV's three-year window by a wide margin. The COV's three-year look thus does not provide a comprehensive view of the project evolution and oversight.

**Recommendations:**

1. The mixed paper and electronic versions of the material provided was a bit cumbersome. We recommend that more electronic access be provided for the next COV. Public documents could be made available via a web interface. The private documents could be provided via USB flash drives or some other local medium.

2. We recommend that the next COV chair work with the NP staff in advance of the meeting to develop a list of some of the statistical data that the COV would likely wish to see.

3. We recommend that more time be built into the schedule for discussion during the formal presentations by the ONP staff.

4. For the review of the projects portion of the program, it would be helpful to have the complete project file available rather than just the 3-year snapshot.

# Appendix A: 2006 Charge to the Nuclear Science Advisory Committee:

"The Nuclear Science Advisory Committee (NSAC) is requested to assemble a Committee of Visitors (COV) to review the management processes of the Office of Science Nuclear Physics program of the DOE. 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 2004, 2005, and 2006. The panel may examine any files from this period for both DOE laboratory and university programs. The panel should consider and provide evaluation of the following major elements:

(a) the effectiveness, efficiency and quality of the processes used to solicit, review, recommend, and document proposal actions;
(b) the monitoring of active projects and programs;
(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, and
(d) the national and international standing of the portfolio elements.

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."

# Appendix B: Office of Nuclear Physics Committee of Visitors Panel Members


Professor Betsy Beise, Chair
Department of Physics
University of Maryland
2220C Physics Building
College Park, MD 20742
Phone: 301-405-6109
Fax: 301-405-8558
Email: beise@umd.edu

Professor Russell Betts
Department of Physics
University of Illinois
845 West Taylor Street
Chicago, IL 60607-7059
Phone: 312-413-2799
Fax: 312-413-9396
Email: betts@uic.edu

Dr. George Dodson
SNS Project
Oak Ridge National Laboratory
P.O. Box 2008, MS 6492
Oak Ridge, TN 37831-6492
Phone: 865-388-8068
Fax: 865-241-6587
Email: dodsong@sns.gov

Professor Charlotte Elster
Department of Physics & Astronomy
Ohio University
Athens, OH 45701
Phone: 740-695-1697
Email: elster@ohio.edu

Professor Brian Fulton
Department of Physics
University of York
Heslington, York
YO10 5DD UK
Phone: +44 0 1904 432217
Fax: +44 0 1904 433433
Email: brf@york.ac.uk

Dr. Rodney Gerig
Department of Physics
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439
Phone: 630-252-5710
Fax: 630-252-4599
Email: rod@aps.anl.gov

Professor Kirby Kemper
Physics Department
Florida State University
Tallahassee, FL 32306-4350
Phone: 850-644-3337
Fax: 850-644-2867
Email: Kirby@martech.fsu.edu

Dr. Volker Koch
Nuclear Science Division
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS70R0319
Berkeley, CA 94720
Phone: 510-486-5323
Fax: 510-486-4794
Email: vkoch@lbl.gov

Dr. William Louis
P Division H846
Los Alamos National Laboratory
Los Alamos, NM 87545
Phone: 505-667-6723
Fax: 505-667-7920
Email: louis@lanl.gov

Dr. Derek Lowenstein
Brookhaven National Laboratory
MS: 0911B
Upton, NY 11973
Phone: 631-344-4611

Fax: 631-344-5954
Email: Lowenstein@bnl.gov

Dr. Lia Merminga
Accelerator Operations R&D Division
Thomas Jefferson National Accelerator Facility
12000 Jefferson Avenue
Newport News, VA 23606
Phone: 757-269-6281
Fax: 757-269-5024
Email: merminga@jlab.org

Professor Alan Nathan
Department of Physics
University of Illinois
1110 Green Street
Urbana, IL 61801
Phone: 217-333-0965
Fax: 217-333-0965
Email: a-nathan@uiuc.edu

Dr. Kem Robinson
Lawrence Berkeley National Laboratory
MS: 50-4049
One Cyclotron Road
Berkeley, CA 94720
Phone: 510-486-6327
Fax: 510-495-2323
Email: kerobinson@lbl.gov

Professor David Sinclair
Physics Department
2420 HP
Carleton University
1125 Colonel By Drive
Ottawa, Ontario, KIS 5B6
Phone: 613-520-7536
Fax:
Email: sinclair@physics.carelton,ca

Professor Michael Thoennessen
NSCL
Michigan State University
East Lansing, MI 48824
Phone: 517-333-6323
Fax: 517-353-5967
Email: thoennessen@nscl.msu.edu

Professor Robert Tribble
Cyclotron Institute
Texas A&M University
College Station, TX 77843
Phone: 979-845-1411
Fax: 979-845-1899
Email: r-tribble@tamu.edu

Dr. Glenn Young
Physics Division
Building 6025
Oak Ridge National Laboratory
Oak Ridge, TN 37831
Phone: 865-574-4772
Fax: 865-576-8746
Email: younggr@ornl.gov

# Appendix C : Meeting Agenda

Tuesday, January 9, 2007

| | | |
|---|---|---|
| 8:00 am | Meet in DOE Lobby | |
| 8:15 am | Executive session/Continental breakfast (E-401)<br>COV charge, etc..., procedures | |
| 8:50 am | Welcome | Dennis Kovar |
| 9:00 am | Office of Nuclear Physics Overview (20+10) | Dennis Kovar |
| 9:30 am | Physics Research Division Overview (20+10) | Eugene Henry |
| 10:00 am | Facilities & Project Management Division Overview (20+10) | J. Simon-Gillo |
| 10:30 am | Break | |
| 10:45 am | Program Managers Presentations Research Division (15+5 min) each;<br>Rai, Henry, Coon, Tippens | |
| 12:05 pm | Working Lunch (E-401) | |
| 1:00 pm | Program Managers Presentations Facilities & Project Management Division (15+5 min) each; Farkhondeh, Hawkins | |
| 1:40 pm | Committee Breakouts (Program Managers available for discussion with breakout groups as requested) | |

| Grants 1 (E-301) | Grants 2 (E-401) | Lab Res. (H-412) | Facility Ops (E-114) | Projects (G-436) |
|---|---|---|---|---|
| Beise | Kemper | Louis | Dodson | Lowenstein |
| Fulton | Nathan | Betts | Merminga | Sinclair |
| Elster | Koch | Thoennessen | Gerig | Robinson |
| Young | Tribble | | | |

| | |
|---|---|
| 3:30pm | Break (E-401) |
| 3:45pm | Committee Breakouts (Program Managers available for discussion with breakout groups as requested) |
| 5:30 pm | Executive session (E-401) |
| 6:30 pm | Adjourn |
| 7:30 pm | Dinner |

Wednesday, January 10, 2007

| | |
|---|---|
| 8:00 am | Meet in DOE Lobby |
| 8:15 am | Executive session/Continental breakfast |
| 9:30 am | Committee Breakouts (Program Managers available for discussion with breakout groups as requested) |
| 10:30 am | Break (E-401) |
| 10:45 am | Committee Breakouts (Program Managers available for discussion with breakout groups as requested) |
| 12:30 pm | Lunch |
| 1:15 pm | Committee Breakouts (Program Managers available for discussion with breakout groups as requested) |
| 2:30 pm | Executive session (E-401) Discuss initial findings |
| 4:30 pm | Committee work or Meet with program managers, assign homework |
| 6:30 pm | Adjourn |
| 7:30 pm | Dinner |

Thursday, January 11, 2007

| | |
|---|---|
| 8:00 am | Meet in DOE Lobby |
| 8:30 am | Executive session/Continental Breakfast (E-401)<br>Preparation of report |
| 12:00 pm | Working Lunch |
| 1:00 pm | Meet with the ONP Director(s) |
| 1:30 pm | Closeout |
| 2:00 pm | Adjourn |

# Appendix D: Table of Contents of the COV Book

**Section I: - General COV Material**

1. Charge letter to NSAC
2. Agenda
3. List of COV panel members
4. Subpanel assignments
5. FY 2007 Report template
6. FY 2004 COV report
7. NP response to the FY 2004 COV report

**Section II: - General Office Material**

8. Organization chart and responsibilities
9. FY 2007 President's Request
10. NP PART Performance Measures
11. List of NSAC charge letters and reports
12. List of travel
13. Workforce survey
14. Review mechanisms and definitions
15. List of reviews FY 2004 - FY2006

**Section III: - Research Division Documentation**

16. Research highlights
17. List of solicitations FY 2004 – FY 2006
18. Annual new grant notice
19. Conflict of Interest statement
20. Listing of grants and status
21. Listing of grant declinations
22. Research grant statistics
23. Diversity statistics
24. List of laboratory research review documentation
25. List of SciDAC Proposals

**Section IV: - Facility & Project Division Documentation**

26. DOE Project management process
27. DOE Project Decision Matrix
28. Table of Critical Decision Actions
29. List of projects, ongoing or completed in FY 2004 - FY2006
30. List of joint projects
31. Listing of project documentation
32. Listing of facility review documentation
33. Listing of RIB University & RIB Lab Proposals

**Section V - XIV**

Presentations

# Appendix E: Report Template for the FY2007 NP Committee of Visitors

**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:**