U.S. Department of Energy
and the
National Science Foundation

September 12, 2003

Professor Richard Casten
Chairman
DOE/NSF Nuclear Science Advisory Committee
A.W. Wright Nuclear Structure Laboratory
Yale University
New Haven, CT 06520

Dear Professor Casten:

This letter requests that the DOE/NSF Nuclear Science Advisory Committee (NSAC) establish a Committee of Visitors to assess the operations of the DOE Office of Science Nuclear Physics program, and provide guidance regarding performance measures for the Nuclear Physics program of the Office of Science.

(1) NSAC is requested to establish a Committee of Visitors (COV) that can provide an assessment of process-related matters pertaining to the management of the Office of Science Nuclear Physics program. The COV should review the program management of the Nuclear Physics program to provide an assessment of the effectiveness, efficiency and quality of the processes used to solicit, review, recommend, and document proposal actions and monitor active projects and programs. In addition, the COV should also comment on how the award process has affected the breadth and depth of the Nuclear Physics portfolio elements, and the national and international standing of the Nuclear Physics program. Such an assessment is planned to be requested every three years. You should work with the Associate Director of the Office of Science for Nuclear Physics to establish the processes and procedures so as to enable the first COV to meet before the end of the 2003 calendar year. A report by the COV should be submitted by February 27, 2004.

(2) NSAC is requested to provide an assessment and recommendations to the Office of Science regarding performance measures for the Nuclear Physics program. The performance measures are intended to focus on outcomes and meaningfully reflect the purpose of the program, to guide program management and budgeting, and to promote results and accountability. Office of Management and Budget (OMB) guidance for these measures and the proposed Nuclear Physics measures are given in the enclosure. Assessments of progress towards meeting the goals are to be made every five years and some appropriate milestones have been requested by OMB to judge the

quality of progress that has been made. NSAC is requested to submit a report with comments on the appropriateness of these measures, that these measures are suitably ambitious and validly encompass the DOE Nuclear Physics program, and with recommendations for appropriate milestones for each of these measures. Your report should be submitted before the end of November 2003.

We appreciate NSAC's willingness to take on these important activities, and we look forward to learning of your progress in these important tasks.

Sincerely,

Raymond L. Orbach
Director
Office of Science

John B. Hunt
Acting Associate Director for
Mathematical and Physical Sciences

Long-term Performance Measures

Does the program have a limited number of specific long-term performance measures that focus on outcomes and meaningfully reflect the purpose of the program?

Purpose of the question: to determine if the program has long-term performance measures to guide program management and budgeting and promote results and accountability. This question seeks to assess whether the program measures are salient, meaningful, and capture the most important aspects of program purpose and appropriate strategic goals.

Elements of a Yes answer: a Yes answer would require identifying a limited number (e.g., two or three) of specific, easily understood program outcome measures that directly and meaningfully support the program's purpose. A "performance measure" is an outcome or output measure. "Long-term" is defined as covering a relatively long period of time relative to the nature of the program but is likely to be on the order of 5-10 years and consistent with time periods for strategic goals used in the Agency Strategic Plan.
Programs should have at least one efficiency measure.

Nuclear Physics

Proposed Long Term Measures

- Make precision measurements of fundamental properties of the proton, neutron and simple nuclei for comparison with theoretical calculations to provide a quantitative understanding of their quark substructure.
    - Timeframe – By 2015
    - Expert Review every five years rates progress as "Excellent"
    - Minimally effective – Quark and gluon contributions to the nucleon's spatial structure and spin measured; theoretical tools for hadron structure developed and tested; data show how simple nuclei can be described at a nucleon or quark-substructure level for different spatial resolution of the data.
    - Successful – Quark flavor dependence of nucleon form factors and structure functions measured; hadron states described with QCD over wide ranges of distance and energy; two-body and three-body nucleon-nucleon interactions expressed in a QCD basis; precision measurements of nucleon spin performed.

- Recreate brief, tiny samples of hot, dense nuclear matter to search for the quark-gluon plasma and characterize its properties.
    - Timeframe – By 2015
    - Expert Review every five years rates progress as "Excellent"

- Minimally effective – Existence of hot, high-density matter established; some of its properties (e.g., its initial temperature via the photon spectrum) measured; confinement properties, and energy transport (via jets) explored.
- Successful – Existence of a deconfined, thermalized medium determined; its properties such as temperature history, equation of state, energy and color transport (via jets), and screening (via heavy quark production) characterized.

- Investigate new regions of nuclear structure, study interactions in nuclear matter like those occurring in neutron stars, and determine the reactions that created the nuclei of atomic elements inside stars and supernovae.
  - Timeframe – By 2015
  - Expert Review every five years rates progress as "Excellent"
  - Minimally effective – Properties of nuclei and reactions near and far from stability measured allowing study of effective interactions, collective behavior, and structural evolution; new weakly bound nuclei observed and the limits of binding explored; some reactions of stellar interest measured.
  - Successful – Extensive measurements on stable and exotic nuclei and the drip lines performed; their structure established and the isospin dependence of effective interactions studied; new nuclei with neutron skins observed and studied; reactions for several astrophysical processes, including some r-process nuclei, measured.

- Measure fundamental properties of neutrinos and fundamental symmetries by using neutrinos from the sun and nuclear reactors and by using radioactive decay measurements.
  - Timeframe – By 2015
  - Expert Review every five years rates progress as "Excellent"
  - Minimally effective – Double beta-decay lifetime and neutron electric dipole moment limits extended; participated in low-energy neutrino experiments and beta-decay probing cosmologically relevant neutrino masses; parameters for quark mixing for nuclear beta-decay quantified.
  - Successful – Double beta-decay lifetime and neutron electric dipole moment limits extended 10-fold or more; R&D completed demonstrating if precision pp solar experiment is possible; played key roles in low-energy neutrino experiments and beta-decay probing cosmologically interesting neutrino masses.