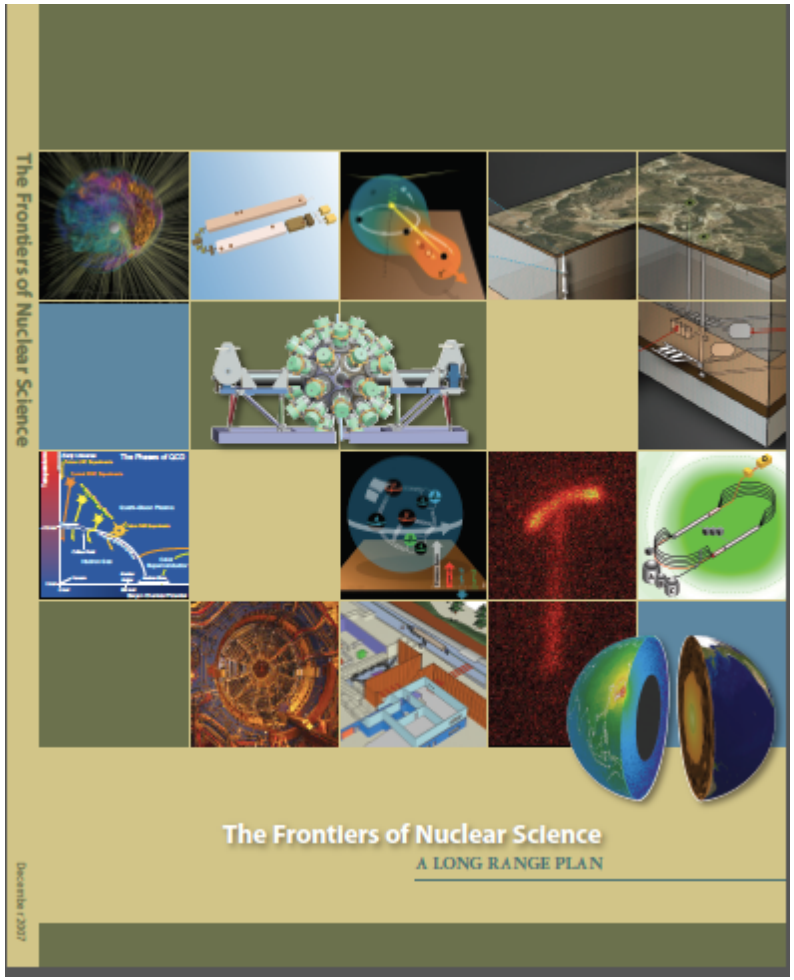
The 2015 NSAC Long Range Plan



Donald Geesaman

Chair, NSAC

Charge to NSAC to Develop a New Long Range Plan

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

Dr. Donald Geesaman
Chair
DOE/NSF Nuclear Science Advisory Committee
Argonne National Laboratory
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Dr. Geesaman:

This letter requests that the Department of Energy (DOE)/National Science Foundation (NSF) Nuclear Science Advisory Committee (NSAC) conduct a new study of the opportunities and priorities for United States nuclear physics research and recommend a long range plan that will provide a framework for coordinated advancement of the Nation's nuclear science research programs over the next decade. This exercise should exclude the DOE Isotope Program managed by the DOE Office of Science's Office of Nuclear Physics, for which a dedicated strategic planning exercise will be convened.

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The new NSAC Long Range Plan (LRP) should articulate the scope and the scientific challenges of nuclear physics today, what progress has been made since the last LRP, and the impacts of these accomplishments both within and outside of the field. It should identify and prioritize the most compelling scientific opportunities for the U.S. program to pursue over the next decade and articulate their scientific impact. A national coordinated strategy for the use of existing and planned capabilities, both domestic and international, and the rationale for new investments should be articulated. To be most helpful, the LRP should indicate what resources and funding levels would be required (including construction of new facilities, mid-scale instrumentation, and Major Items of Equipment) to maintain a world-leadership position in nuclear physics research and what the impacts are and priorities should be if the funding available provides for constant level of effort from the FY 2015 President's Budget Request into the out-years (FY 2016-2025), with constant level of effort defined using the published OMB inflators for FY 2016 through FY 2025. A key element of the new NSAC LRP should be the Program's sustainability under the budget scenarios considered.

The extent, benefits, impacts and opportunities of international coordination and collaborations afforded by current and planned major facilities and experiments in the U.S. and other countries, and of interagency coordination and collaboration in cross-cutting scientific opportunities identified in studies involving different scientific disciplines should be specifically addressed and articulated in the report. The scientific

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impacts of synergies with neighboring research disciplines and further opportunities for mutually beneficial interactions with outside disciplines, should be discussed.

In the development of previous LRP's, the Division of Nuclear Physics of the American Physical Society (DNP/APS) was instrumental in obtaining broad community input by organizing town meetings of different nuclear physics sub-disciplines. The Division of Nuclear Chemistry and Technology of the American Chemical Society (DNC&T/ACS) was also involved. We encourage NSAC to exploit this method of obtaining widespread input again, and to further engage both the DNP/APS and DNC&T/ACS in laying out the broader issues of contributions of nuclear science research to society.

Please submit your report to DOE and NSF by October 2015. The agencies very much appreciate NSAC's willingness to undertake this task. NSAC's previous LRP's have played a critical role in shaping the Nation's nuclear science research effort. Based on NSAC's laudable efforts in the past, we look forward to a new plan that can be used to chart a vital and forefront scientific program into the next decade.

Sincerely,

Patricia M. Dehmer
Acting Director
Office of Science

F. Fleming Crim
Assistant Director
Directorate for Mathematical
and Physical Sciences

For More Information

You can find more information on the NSAC web site:

http://science.energy.gov/np/nsac/

This will give you the charge, membership of the Long Range Plan working group and a link to a site at ANL with further information such as the schedule for upcoming activities.

http://www.phy.anl.gov/nsac-lrp/

Anticipated LRP Schedule

- ✓ Charge delivered at 24 April NSAC Meeting
- ✓ LRP Working Group formed in early June ~ 60 members
  - Some international members will soon be added.
- ✓ Community organization this summer
- ✓ DNP town meetings in the July/September
- ✓ Joint APS-DNP-JPS Meeting Oct 7-11, 2014 – Wednesday afternoon discussion.
- Working Group organizational meeting Nov 16, 2014 in Rockville, MD
- Time for more community meetings in November- January
- White papers by end of January to have greatest impact
- Resolution meeting of Long Range Plan working group in April 16-20, 2015.
- Draft report reviewed by external wise women and men.
- LRP final report due October 2015

The Long Range Plan Has Been Discussed at All the Facility Users Group Meetings

- ATLAS Strategic Plan Meeting: May 15-16
- JLAB Users Group Meeting: June 2-4
- ARUNA Workshop: June 12-13
- RHIC and AGS Users Group Meeting: June 17-20
- EIC Users Group Meeting: June 24-27

Community Organized Town Meetings

- High Performance Computing: July 14-15, Washington, DC
- Education and Innovation: August 6-8, MSU
- Nuclear Structure and Astrophysics: August 21-23, Texas A&M
- QCD: September 13-15, Temple
- Fundamental Symmetries: Sept 28-29, Chicago

See http://www.aps.org/units/dnp/meetings/town.cfm

I really want to thank the Division of Nuclear Physics for their outstanding leadership here.

Other Thoughts

- I will chair the LRP
- Likely organization
  - Four-Six science areas
  - Education and Workforce
  - Applications/ Societal Benefits
  - International context
  - Budgets
- Still discussing nature of the report to optimize effect.
- There will be cost estimate reviews of major projects, i.e. EIC, in the December-January time scale to check scale, not to provide a detailed estimate.
- It will be informed by the NRC 2012 decadal survey:

  Nuclear Physics – Exploring the Heart of Matter.
- I believe highlighting the role for NSF, especially as NSCL transitions to FRIB is an important issue.
- The charge to the P5 process the HEP community went through was quite different. We are not P5.

Recommendations of the 2007 NSAC Long Range Plan

Recommendation I

- We recommend completion of the 12 GeV CEBAF Upgrade at Jefferson Lab. The Upgrade will enable new insights into the structure of the nucleon, the transition between the hadronic and quark/gluon descriptions of nuclei, and the nature of confinement.

Recommendation II

- We recommend construction of the Facility for Rare Isotope Beams (FRIB), a world-leading facility for the study of nuclear structure, reactions, and astrophysics. Experiments with the new isotopes produced at FRIB will lead to a comprehensive description of nuclei, elucidate the origin of the elements in the cosmos, provide an understanding of matter in the crust of neutron stars, and establish the scientific foundation for innovative applications of nuclear science to society.

Recommendation III

- We recommend a targeted program of experiments to investigate neutrino properties and fundamental symmetries. These experiments aim to discover the nature of the neutrino, yet-unseen violations of time-reversal symmetry, and other key ingredients of the New Standard Model of fundamental interactions. Construction of a Deep Underground Science and Engineering Laboratory is vital to U.S. leadership in core aspects of this initiative.

Recommendation IV

- The experiments at the Relativistic Heavy Ion Collider have discovered a new state of matter at extreme temperature and density—a quark-gluon plasma that exhibits unexpected, almost perfect liquid dynamical behavior. We recommend implementation of the RHIC II luminosity upgrade, together with detector improvements, to determine the properties of this new state of matter.

Recommendations for the further future: R&D for an EIC

Initiatives: Theory, Accelerator R&D, Gamma-ray tracking

What has happened since 2007

- Construction of the JLAB 12 GeV upgrade is almost complete.
- FRIB has started construction: CD-3A.
- The RHIC Luminosity upgrade was completed at about 1/10 the initially estimated cost.
- While the US underground science program has been negatively impacted by the cancelation of DUSEL, NP is supporting a DBD prototype experiment at the Homestake mine as well as other efforts.
- R&D and technology confirmation stage efforts continue on EDM measurements and neutrino-less double beta decay.

Summary

- There are exciting new scientific challenges across nuclear physics.
- There has been major progress in fulfilling the promise of the 2007 Long Range Plan.
- The new Long Range Plan is the time for the community to say what the future should be.
- We and the agencies are listening carefully to what you tell us.
- The issues we face are complex, balancing research, operations and construction, but the opportunities appear very bright.