# *NUCLEAR SCIENCE – ENGINE OF INNOVATION AT A CRITICAL CROSSROAD*

***The U.S. nuclear physics research community is most grateful that Congress and the Administration provided a modest budget increase for the Department of Energy Nuclear Physics Program in FY14 – consistent with the recommendations of the Nuclear Science Advisory Committee (NSAC) – to preserve the vitality of the three lead U.S. nuclear physics facilities. The Administration's FY15 budget request of $593.57 million, while tight, would continue this policy and preserve the critical components of the nation's nuclear science program. Groundbreaking science, crucial new technologies, and the education of excellent scientists would continue, helping to drive the U.S. economy and maintain our nation's leadership role in a core scientific discipline.***

**RESEARCH AND FACILITIES:** Nuclear science research drives technical innovation in fields far removed from the original research: modern medical imaging, drug design, cancer treatments, national security, energy production and storage and climate modeling. The three facilities that enable scientists from across the country to pursue this critical research are:

- The Continuous Electron Beam Accelerator Facility (CEBAF) in Virginia, where more than 1,300 scientists study the fundamental structure of protons, neutrons, and nuclei and the force that bind them.
- The Relativistic Heavy Ion Collider (RHIC) in New York, where over 1,200 researchers recreate the conditions of the very early universe to study a new state of matter, the hottest matter ever produced on Earth, and explore its fundamental constituents and forces.
- The Facility for Rare Isotope Beams (FRIB) under construction in Michigan, which will provide intense beams of rare isotopes to help over 1,300 scientists better understand the characteristics of atomic nuclei, their origin in the cosmos, and their potential applications.

**LONG-RANGE PLAN:** In 2013, the U.S. nuclear science community worked with NSAC in response to a federal charge to recommend a path forward given significant budget constraints. The resulting "modest growth scenario" is a bare minimum plan to maintain U.S. innovation leadership in this vital area by preserving the critical components of the nuclear science program.

*"Measured by its impact on society, the return on investments made by the U.S. in nuclear science research is large…If the past can be used as a guide, the isotopes, data, and technologies nuclear science will generate in the coming years will provide substantial new benefits to society, demonstrating once again that nuclear science solves practical problems in our every-day lives as well as answering some of the largest questions about the nature of our universe.*

*The close connection between fundamental research in physical sciences and economic strength is well documented… The intellectual grand challenges inherent in understanding our universe draw many of the best minds in the world to the U.S. Equally importantly, they serve as powerful attractors of young people to the sciences… Losing U.S. leadership in Nuclear Physics would have a deleterious impact on attracting young people into science careers."*

**POSSIBLE BUDGET IMPACTS:** The NSAC members also outlined serious threats posed by the more austere budget scenarios it considered. A "no growth" budget would require the program to shrink by closing one of its two existing large facilities (RHIC or CEBAF) or by abandoning construction of FRIB. With China, France, India, Japan, Russia, and South Korea significantly investing in nuclear science, leadership will shift away from the United States. The ability to train the next-generation U.S. nuclear science workforce will erode resulting in permanent losses.

Flat funding or budgets that keep pace with inflation would decimate this strategically important field. The opportunity to reap reward from past investments to build and maintain our facilities would be lost, the science would suffer dramatically, hundreds or thousands of scientists would move overseas to do their work, and the U.S. would unilaterally cede the intellectual and technical leadership it has provided to the world for more than half a century – with drastic negative long-term impacts on the country's economic health.