

# Thomas Jefferson National Accelerator Facility (Jefferson Lab)

12000 Jefferson Avenue, Newport News, VA 23606

Thomas Jefferson National Accelerator Facility in Newport News, Virginia, one of ten Office of Science national laboratories in the Department of Energy, is poised to begin the 12 GeV Upgrade scientific program. This \$338M federal investment in advanced nuclear physics experimental capabilities will maintain Jefferson Lab's and our nation's world leadership position in the field of Nuclear Physics. Funding is critical to support operation of this new capability as the lab transitions to 12 GeV Operations and to realizing the discovery-caliber science program it was built for.

Support for the operations of this upgraded facility is the first priority of the Nuclear Science Advisory Committee's (NSAC) 2015 Long Range Plan for Nuclear Science, "Reaching for the Horizon." This document identifies the nuclear physics community's priorities necessary to provide world-leadership in Nuclear Science for the next decade.

The first recommendation in the 2015 Long Range Plan reads:

**"The progress achieved under the guidance of the 2007 Long Range Plan has reinforced U.S. world leadership in nuclear science. The highest priority in this 2015 Plan is to capitalize on the investments made."**

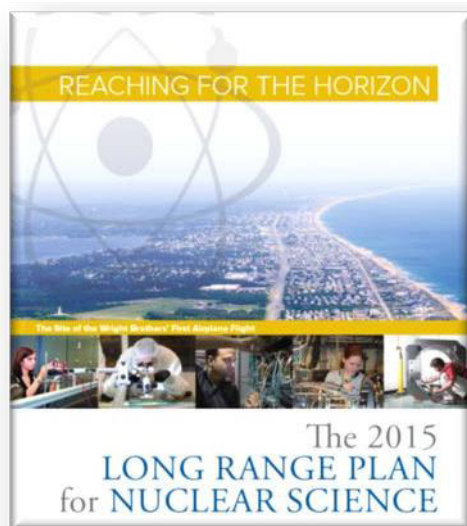


Aerial view of Accelerator Site with new experimental Hall D in upper left, and overhead view of Hall D experimental equipment

## 2015 NSAC Long Range Plan

The top priority listed under this recommendation relates to realizing the scientific potential of Jefferson Lab's Continuous Electron Beam Accelerator Facility (CEBAF):

***"With the imminent completion of the CEBAF 12-GeV Upgrade, its forefront program of using electrons to unfold the quark and gluon structure of hadrons and nuclei and to probe the Standard Model must be realized."***



Indeed, the 12 GeV Upgrade to CEBAF provides capabilities unique in the world. The 12-GeV Upgrade is poised to begin discovery caliber experiments this year that will help to answer fundamental scientific questions, such as why quarks are never found alone.

Other major features of the NSAC Long Range Plan include the following:

- Identification of new opportunities for investment beyond the 2007 plan
- A proposed responsible funding scenario that involves modest growth at a level consistent with that realized in the last decade

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## Requested Action

An FY18 budget for DOE Nuclear Physics consistent with the recommendations of the NSAC Long Range Plan, within the President's Request for the DOE Office of Science, would address the needs identified for maintaining the U.S. world-leading position in this field. Funding at that level will enable Jefferson Lab and its scientific community to realize the potential of the 12 GeV Upgrade by providing an operational level of 80% capacity (30 weeks) at CEBAF to address the top recommendation in the Plan.

Without this funding, Jefferson Lab would be forced to severely reduce its facility operating time, to the detriment of Jefferson Lab's 1,500-strong scientific user community, including scientists from 95 U.S. universities and research institutions in 34 states.

Full CEBAF operations will enable fundamental scientific discoveries in nuclear physics, a field that has a very strong track record in enabling technical innovations with very high societal and economic benefits, including applications in nuclear energy, nuclear medicine and cancer treatment, as well as the use of isotopes and particle accelerators in the fields of manufacturing and national security.

At the requested FY18 funding level, the set of already-approved experiments would take seven years to complete; without full operations funding, the backlog extends for two decades or more, requiring operation into the mid-2030s to complete those experiments already approved. Additionally, this would damage the training of the future of the nuclear science workforce and the U.S. will likely see an erosion of its leadership in the field of nuclear physics as other international facilities are planning on major upgrades and investments over the next few years.

## Emerging Initiatives

The proposed funding for Jefferson Lab would assist with the MOLLER experiment, a midscale project scheduled to begin in FY19 that aims to conduct the first measurement of the weak charge of the electron. This measurement will have a broad impact on the fields of nuclear and particle physics.

Another important NSAC recommendation that relates to Jefferson Lab is the Electron Ion Collider (EIC), the next planned large nuclear physics facility to ensure that the U.S. remains on the cutting edge of nuclear and accelerator science in coming decades:

**“We recommend a high-energy high-luminosity polarized EIC as the highest priority for new facility construction following the completion of FRIB.”**

The Plan recommends additional R&D to further the design of an EIC. Jefferson Lab is one of two labs positioned to develop the design for and construct this future facility.

## Conclusion

The 2015 NSAC Long Range Plan is a balanced and prudent approach to “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.”

Without the resources to reach 30 weeks of operations at Jefferson Lab in FY18, the U.S. will not be able to fully utilize a nuclear physics research facility whose science experiments were top rated in the NSAC 2015 Long Range Plan, thus creating a more significant backlog of work whose unrealized results could eventually jeopardize U.S. leadership in nuclear physics.