Generic Detector R&D for an Electron Ion Collider

10th Advisory Committee Meeting
January 28-29, 2016

Thomas Ullrich (BNL)
January 28, 2016
Long Range Plan Recommendations

Total of 4 recommendations

**RECOMMENDATION III**
Gluons, the carriers of the strong force, bind the quarks together inside nucleons and nuclei and generate nearly all of the visible mass in the universe. Despite their importance, fundamental questions remain about the role of gluons in nucleons and nuclei. These questions can only be answered with a powerful new electron ion collider (EIC), providing unprecedented precision and versatility. The realization of this instrument is enabled by recent advances in accelerator technology.

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

Total of 2 initiatives

**B: Initiative for Detector and Accelerator Research and Development**
U.S. leadership in nuclear physics requires tools and techniques that are state-of-the-art or beyond. Targeted detector and accelerator R&D for the search for neutrinoless double beta decay and for the EIC is critical to ensure that these exciting scientific opportunities can be fully realized.

- We recommend vigorous detector and accelerator R&D in support of the neutrinoless double beta decay program and the EIC.

Next Steps:

- National Academy of Science Review
  - Duration 18 month
  - Process has already started
- CD-0 possibly in 2017 (Mission Need)
The 2015 Long Range Plan for Nuclear Science

Reaching for the Horizon

...cost than by optimizing the science reach. This could affect the international competitiveness of the ton-scale neutrinoless double beta decay experiment and, likely, delay the results. While FRIB facility operations can be maintained, completion of experimental equipment needed to fully utilize FRIB beams would be stretched out in time. Other equipment and facility upgrades will not occur or, at best, will occur more slowly, reducing their scientific productivity.

In the short term, facility operations would need to be reduced from current already constrained levels. A potential, very significant, impact of a constant effort budget is the further reduction in facility operations that would be needed in order to begin EIC construction. Maintaining the U.S. leadership position in this subfield requires the generation of significant new capabilities for an EIC in a timely fashion. If budgets were restricted to constant effort, proceeding with the EIC as recommended in this plan would be possible only with a drawn-out schedule and would, in addition, require further reductions in funding for operations and research within the QCD program.

The most difficult choices outlined here for the constant effort budget scenario would occur at or beyond the mid-point of the time window of this LRP. Since nuclear science, like all areas of basic research, evolves in time, it would be unwise to prescribe now what strategy would minimize damage to the field if future budgets dictated such stark choices.

A Forward Look

We have witnessed many major new discoveries in nuclear science over the last decade that were the direct result of the construction and operation of new facilities and detectors as prioritized by previous Long Range Plans. We also have seen a growing use of exciting new technologies developed in nuclear science both in well-established areas of application, such as medicine and isotope production, and in important new areas, such as homeland security. Continuing this growth and reaping the benefits it provides will require new investments. With these investments, the United States will maintain its present world-leading position in nuclear science, and we will continue to contribute to the economic growth, health, and security of our Nation.

Figure 10.4: DOE budget in FY 2015 dollars for the Modest Growth scenario.

Is This Realistic?

DOE NP Budget history in as-spent dollars

from 2015 NSAC LRP

from D. Geesaman’s talk at EICUG Meeting at UCB
EIC User Group Is Being Formed

The EICUG

- will work together, across these efforts, to enhance and refine the science case beyond the one that has been presented in the EIC White Paper (http://arxiv.org/abs/1212.1701),
- help define and coordinate the research equipment including the necessary detector technologies & designs required to achieve the scientific goals of the EIC,
- effectively engage with other stakeholders (e.g. funding agencies, laboratories) to make EIC and its science a reality
- is not a collaboration

- Charter will be formulated in the next weeks, followed by UG wide discussion and vote likely in April.
- Discussion about Physics Working groups started
EIC User Group Is Being Formed

• So far 548 members from 121 institutions from 27 countries
• http://eicug.org (official announcement soon)

Institutes by country

To sign-up, send me an email
• EIC UG Meeting in Berkeley (Jan 6-8)
  ‣ Very well attended
  ‣ Good discussion on future direction and organization
  ‣ Parallel session on EIC R&D plus plenary summary (Klaus)
  ‣ Many speakers emphasized importance of EIC R&D incl. Tim Hallman (Ass. Director of OS NP) and Don Geesaman (NSAC Chair)
EIC R&D Advisory Committee

Standing Advisory Committee:

Marcel Demarteau* (Argonne)  Rick Van Berg (UPenn)
Carl Haber (LBNL)  Jerry Va’vra (SLAC)
Peter Krizan (Ljubljana)  Glenn Young (JLab)
Ian Shipsey (Purdue)  *chair

Please use coffee breaks and Thursday’s dinner for informal discussion with committee members

Note: Speakers (or representative) are invited to the Committee Dinner tonight at 7pm at the Brookhaven Center Club providing ample opportunities to touch base with committee
Transition in contract administration from Xiaofeng Guo to Liz Mogavero completed

**Remember**

- Please submit your invoices on a regular basis. Best is **monthly**. Do not wait for months and accumulate them.
- Many Statement of Work (SoW) were regarded as too short causing unnecessary delays. DOE requires more than a sentence. That should be easy since you can easily copy/paste from your proposals.
- DOE requires annual plan of anticipated conference (e.g. IEEE & workshop attendance (does not include test beams, small meetings etc). Send us your list now!
- Foreign travel to conferences needs to be **pre-approved 60 days in advance**. Contact Liz **before** you plan your travel. Submit your travel plans early.
Last But Not Least

• To the committee who does such an amazing job - the program is alive because of your work,

• to Liz for taking over the burden of dealing with the EIC contracts,

• to Tom Throwe and Alexander Kiselev for their A/V and help,

• and what would we do without Rachel who makes all this happen!

Thank you