

# Project X Energy Station Workshop

**January 29-30, 2013**

**Fermilab National Accelerator Laboratory  
Batavia, IL USA**

## Workshop Charge

Fermilab is developing a design of a High Intensity Proton Linac, known as Project X, to support future High Energy Physics Programs. The workshop is being organized by Pacific Northwest National Laboratory in collaboration with Fermilab and Argonne National Laboratory. We propose to bring together US researchers working in areas as diverse as:

- Accelerator-based applications
- Nuclear and material science
- Isotope production
- Applications of high intensity proton beams and targets
- Advanced nuclear reactor concepts, advanced nuclear fuel cycles, light water reactor sustainability, enhanced and accident tolerant fuels

Fermilab's accelerator R&D program is focused on the SRF linac for the proposed Project X. Pacific Northwest National Laboratory and Argonne National Laboratory, two US laboratories with substantial experience in Nuclear Energy are supporting Fermilab by focusing on developing and evaluating the concept of a high intensity continuous wave proton beam target station for nuclear energy applications. The present design of the Project X linac will provide up to 1 Megawatt of continuous wave beam power at about 1 GeV for nuclear energy applications.

The objective of the workshop is to identify and explore the nuclear energy relevant research and development that would be possible in a Nuclear Energy Station associated with the Project X linac and identify the design requirements for conducting the research. The U. S. Nuclear Energy mission will always require the use of test reactors but one of the hypotheses is whether a Nuclear Energy Station associated with Project X could accelerate and enhance the ability to test and evaluate early research concepts. This workshop will identify the synergy and benefit that the Project X Linac brings to the nuclear energy community. The workshop will also cover topics related to design requirements, challenges and trade-offs associated with optimizing a high-power continuous wave linear accelerator target station for nuclear energy research.

The workshop will begin with an overall session that focuses on the Nuclear Energy research and development plans. The workshop will then be divided into two working groups. Working Group One will focus on proton beam requirements and target design requirements for Nuclear Energy applications. Working Group Two will investigate the use of the Project X high-intensity proton beam energy station target for synergistic nuclear and material science and isotope production. The outcome will be plan describing the nuclear energy relevant research and development that could be conducted with a particular nuclear energy station design.

The following section outlines the specific charges to the working groups:

### **Working Group 1 (Proton Beam and Target Design Requirements) Charge**

To support the overall Workshop objective, WG1 shall:

- Review target technology options for the Energy Station concept and explore the interplay with the scientific requirements developed in WG2.
- Evaluate the proposed PNNL conceptual facility design in regards to reliability, ease of operations, radiological protection, flexibility, and scientific capability (along with WG2).
- Identify Fermilab site-specific regulatory and internal policy limitations to the Energy Station science scope and conceptual facility design.
- Develop, to the extent possible, the target facility design requirements for a Project X Energy Station (in concert with WG2).
- Identify areas for R&D to validate and/or develop the required technologies for a Project X Energy Station.

### **Working Group 2 (Science and Technology Applications) Charge**

To support the overall Workshop objective, WG2 shall:

- Review existing and proposed accelerator based nuclear materials science facilities and available test reactors with an eye to opportunities for exploiting unique, complementary, and niche characteristics of the Project X proton beam.
- Identify the role(s) that a Project X Energy Station could play to fill the immediate and future needs for the nuclear fission and fusion research communities and define the path forward for identifying and creating a viable user base.
- Evaluate the proposed PNNL conceptual facility design in regards to meeting the identified scientific and technological needs (along with WG1).
- Work with WG1 to understand how a Project X Energy Station scientific program might be bounded by Fermilab site-specific regulatory and internal policy directives.
- Develop, to the extent possible, the target facility scientific requirements for a Project X Energy Station (in concert with WG1).
- Identify knowledge or data gaps that R&D could address in the near term to validate the proposed science program, refine the target facility scientific requirements, and/or develop the required technologies for a Project X Energy Station.