



---

## Development of a Neutron Irradiation Laboratory

**PI:** Mark Peirson- Virginia Polytechnic Institute and State University

**Collaborators:** NA

**Program:** General Scientific Infrastructure

---

### ABSTRACT:

The Virginia Tech Nuclear Engineering Program does not have access to either a research reactor or other high neutron flux generating system. Furthermore, there is no other facility in the entire state of Virginia that has a neutron irradiation capability. Having access to a reliable significant source of neutrons is a critical need for the program in order to expand our research and train highly qualified graduates. This is particularly true now that our M.S. and Ph.D. degrees in nuclear engineering should become effective next semester. Therefore, the project aim is to establish a neutron irradiation laboratory. This will involve purchasing a neutron generator system, a contaminated material glovebox/hot cell with pneumatic rabbit transfer system, and associated shielding, security and personnel protection safety systems. This facility will be used by undergraduate and graduate nuclear science and engineering students, science and engineering faculty, and other universities in the region.

The goal of this application is to establish a neutron irradiation laboratory in support of planned and current courses in the areas of radiation detection and measurement, radiation shielding, nuclear nonproliferation and safeguards, and particle transport. This will support both undergraduate and graduate-level classes consisting of about 100 students per year. In addition, it will support ongoing research activities in the areas of radiation detection and materials, nuclear materials, reactor physics and design, nuclear security and safeguards, nuclear forensics, homeland security, medical physics, and medical isotope production.

One function of this lab is to provide the necessary capabilities for working with neutrons, including generation, shielding and utilization. The lab will include the necessary devices and software for characterization and neutron dosimetry, calibration of neutron detectors, examination of limitations of different detector types, examination of shielding capabilities of different materials, and, especially for the students, neutron literacy.

Our project goals can be summarized as follows:

- Provide a neutron irradiation capability for students and faculty for education and research at both Virginia Tech and other regional universities
- Provide a neutron irradiation capability for the state of Virginia through the Virginia Nuclear Energy Consortium
- Train nuclear engineering students in neutron literacy
- Provide cutting edge nuclear science and engineering research for the Department of Energy