Reactor Hot Cell Upgrades to Support LEU-converted Reactor Characterization at the University of Florida Training Reactor and Enable Capabilities for Nuclear Materials Research

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Program: Infrastructure

ABSTRACT:

The University of Florida Training Reactor (UFTR) has undergone recent relicensing (March-2017), and a fuel conversion to LEU during the last decade which also contained a long operations outage for the majority of a decade. As the reactor is ow operational we aspire to expand on the reactor capability and usability for research and training. The fuel conversion has led to revised core flux profiles which are very important to carefully characterize to allow for irradiation-based research. The UFTR has leveraged support from the Department of Energy to construct the Integrated Nuclear Fuel and Structural Materials Research Center, a regional center for irradiated materials characterization hosting a Focused Ion Beam (FIB) microscope, a TEM, hydraulic mechanical testing stand, and neutron activation analysis, all for use with irradiated materials.

There is a desire to expand and upgrade the reactor to allow a direct path from core-irradiations to generate materials usable in Materials research. Accuracy for UFTR in-core irradiations require two unique components to highly characterized, one being the neutron flux and effect of core flux of inserted materials which requires the UFTR hot-cell to be upgraded in shielding and instrumentation aspects. Secondarily allowing for well-controlled sample transport directly into the hot cell from the UFTR core ports, allowing for precise known irradiation parameters including but not limited to irradiation-time, transport-time, and cool-down of samples before detailed materials testing and evaluation.

We will expand the capabilities and developments of the reactor's material's handling by expanding and refurbishing our hot cell and sample handling capabilities. The goal for this upgrade phase will be to expand the utility of the UFTR as a research facility; characterize the LEU core flux impact of large materials samples; and to enable new measurement capabilities via the new hot cell and rabbit equipment including online testing of sensors and as an experimental base for advanced manufacturing techniques.

The proposed project has three key components:

1. Refinish the existing reactor hot cell by replacing the existing manipulators with more capable modern units and reconnecting the reactor fast rabbit to the hot cell. The present reactor hot cell manipulators are nonfunctional rendering the cell unused for many years.

2. Install the infrastructure necessary for upgraded radioactive materials storage capability through hot cell upgrades to ventilation, monitoring, detection, and transfer capabilities.

3. Upgrade the fast rabbit system to a direct connection with the hot cell via a new trench connection between the cell and the reactor core. This will enable new kinds of reactor experiments and tests on materials without a cooldown period.


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