NEUP Nuclear Energy University Programs
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Infrastructure Upgrade for Nuclear Engineering Research and Education at Virginia Tech

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Program: General Scientific Infrastructure

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ABSTRACT:

Objectives: Virginia Tech will enhance their nuclear engineering research and education infrastructures with the purchase and installation of 1) 3D anemometer and wall shear stress probes and related instruments in the existing high turbulence corrosion loop to quantify how highly turbulent coolant flow affects the flow-assisted corrosion/erosion of reactor core materials; 2) A Raytrix PIV/fluid-motion 3D light-field camera system in existing thermal-hydraulics and multiphase flow loops and in the corrosion loop to enable us to measure the three-dimensional three-components (3D3C) velocity field in single- and two-phase flows; 3) High performance computing facilities to develop a computational nuclear engineering laboratory.

Project Description: Virginia Tech will provide $40 K in cost match to upgrade existing infrastructures to enhance the research and education capabilities in several technical areas related to nuclear energy. State-of-the-art devices such as a 3D anemometer, wall shear stress probes, and linear polarization and resistivity corrosion instrumentation will be installed in the existing high turbulence corrosion loop to provide the unprecedented capability to quantify how highly turbulent coolant flow (Reynolds number near 1,000,000) affects the flow-assisted corrosion/erosion of reactor core materials in current and future reactors. A Raytrix PIV/fluid-motion 3D light-field camera system will be installed in existing thermal-hydraulics and multiphase flow loops and in the corrosion loop to measure 3D3C velocity field in single- and twophase flows. The light-field camera system, combining with the existing measuring systems including a high speed optical imaging system, a fast X-ray densitometer, and advanced multi-sensor conductivity probes, will provide key validation data for reactor thermal hydraulics modeling. High performance computing facilities will be used to build a computational nuclear engineering laboratory that will be dedicated to computer modeling of a wide range of nuclear engineering problems.