
Advanced SMR Simulator to Reinforce Nuclear Engineering Infrastructure at Rensselaer

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ABSTRACT:

We propose to upgrade our scientific infrastructure for advancing nuclear science and technology in the Nuclear Engineering (NE) Program at Rensselaer Polytechnic Institute (RPI). The overall objective of the application is to develop and upgrade RPI's infrastructure to enhance multidisciplinary research, education, and training capabilities. Infrastructure funds are requested for installing the NuScale Energy Exploration (E2) Center simulator and a digital control room at RPI. The proposed advanced small modular reactor (SMR) simulator will be utilized in multiple research areas such as thermal hydraulics, reactor physics, and dynamic risk assessment. Additionally, it will supplement multiple nuclear engineering undergraduate courses and will be used for developing a new course, namely "Nuclear Power Plant Dynamics". Finally, the advanced simulator will be used to extend our education mission to enhance Science, Technology, Engineering, and Mathematics (STEM) participation for K-12 students.

The advanced SMR simulator will greatly enhance our capabilities in performing cutting-edge research and education on various disciplines in nuclear engineering as well as training reactor operators, directly supporting Department of Energy - Office of Nuclear Energy missions and ongoing Nuclear Energy University Program research and development projects. RPI's acquisition of the advanced SMR simulator will enhance current capabilities of National Scientific User Facilities (NSUF) through unique training experiences in a control room setting. Combined with the current capabilities available at RPI, the acquisition will position RPI at the forefront of nuclear energy research and education. For NE communities, this will also be a very valuable asset in developing a complete suite of capabilities for future licensing of advanced SMRs or microreactors.

In addition, the proposed NuScale E2 Center simulator will have synergistic scientific and educational impacts at all professional levels by integrating research and education in nuclear energy, and engaging K-12, undergraduate, and graduate students together. Specific educational objectives include: (1) attracting and educating the younger generation (K-12) in counteracting global climate change through promoting advanced nuclear energy systems of enhanced safety, efficiency, and competitiveness, (2) integrating research materials into nuclear energy education through RPI's Undergraduate Research Program, senior design projects, and courses for both undergraduate and graduate students on the topics of advanced SMR system design, operation, and control, and (3) promoting diversity in education by engaging students and young scientists with different scientific and ethnic backgrounds and involving more underrepresented groups.