



American Nuclear Society

South Carolina State University Chapter



James Allen Anderson Seminar Series

Coupling of Thermal Energy Storage with Small Modular Reactors

The contribution of intermittent (renewable) energy sources such as wind and solar continues to increase as renewables improve in both efficiency and price-point. However, the variability of renewables generates additional challenges for the electric grid in the form of rapidly varying electric loads.

Proposed options for accommodating this load have included operating nuclear reactors in a load follow mode, or operating the reactor at or near steady state and bypassing steam directly to the condenser. Both of these strategies result in lost energy potential. In addition to lost energy potential, load follow operation can result in increased stress on the fuel and other mechanical components. A more attractive approach is to operate the reactor at or near steady state and bypass excess steam to a thermal energy storage system. The thermal energy can then be recovered, either for electric generation during periods of peak electric demand, or for use in ancillary applications such as desalination and hydrogen production.

Sensible Heat Thermal Energy Storage is a mature technology currently used in solar energy systems. This talk investigates the design and coupling of such a system to Small Modular Reactors (SMRs), typical of Integral Pressurized Water Reactor (IPWR) designs currently under development.

Dr. J. Michael Doster is an Alumni Distinguished Undergraduate Professor of Nuclear Engineering at NC State, the Director of Nuclear Engineering Undergraduate Program, the Director of the Consortium of Advanced Simulation of Light Water Reactors (CASL) Education Program, and the recipient of the 2016 Glenn Murphy Award. His research activities include system dynamics, systems simulation, computational multi-phase flow and advanced control strategies for next generation nuclear power systems. Dr. Doster received his BS in Nuclear Engineering from NCSU in 1977 and PhD in Nuclear Engineering from NCSU in 1982. Dr. Doster has over 20 years experience in developing high fidelity, full plant simulation capabilities for predicting the dynamic response of pressurized water reactors during normal and off-normal operational conditions, and the use of these models for evaluation of advanced control strategies for conventional and next generation light water reactors, including Small Modular Reactors (SMRs). Dr. Doster's recent work focuses on novel deployment strategies for SMRs in Nuclear Hybrid Energy Systems.

This seminar series is named after Dr. James Allen Anderson, who contributed significantly in the establishment of the first undergraduate Nuclear Engineering Program in a Historically Black College/University (HBCU).

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ECSC Auditorium, Wednesday, October 26, 12 pm-1:00 pm, Free Pizza and Drink