

“NUCLEAR ENERGY APPLICATIONS OF DIGITAL TWINS”

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ABSTRACT

A digital twin (DT), as part of a DT system, is a virtual representation of an entity, process, or system, synchronized at a frequency and fidelity sufficient to maintain state concurrence. A DT leverages various types of models, data, and frameworks to produce knowledge/insights about the represented entity, process, or system to fulfill an intended purpose. Digital twins and digital-twin-enabling technologies are expected to integrate with future nuclear reactor designs and have the potential to impact currently operating nuclear power plants. Greater digital integration, advanced instrumentation and control systems, and advanced operations and maintenance practices are all associated with digital twin-enabling technologies. This presentation provides an overview of DT for nuclear reactor applications and discusses challenges and gaps in developing and implementing DT enabling technology in current and advanced reactor applications. It is important to address some of the challenges and gaps to enable a successful near-term deployment of advanced sensors, instrumentation and communication technologies integrated with digital twins.

BIOGRAPHY

Vaibhav Yadav is a senior scientist at Idaho National Laboratory with extensive experience in several areas of research such as risk, reliability, safety, security, and regulations of nuclear power plants. He has been leading and managing research and development projects sponsored by a variety of agencies such as the US Department of Energy, US Nuclear Regulatory Commission, US Department of State, and others. Dr. Yadav has been leading a pioneering effort focused on regulatory aspects of digital twin application for nuclear facilities which has resulted in several high-impact publications in this novel area. He is currently serving as a member of the Physical and Cyber Security Subcommittee of the ANS/ASME Joint Committee on Nuclear Risk Management; the ANS Human Factors, Instrumentation & Controls Division; and the ANS Nuclear Installations Safety Division.