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INEEL Probabilistic Risk Monitor Software for SAPHIRE

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ABSTRACT

Over the past decade government and industry have become increasingly aware of the importance of using risk assessment tools to support complicated operations and management decisions. Risk analyses, including probabilistic risk assessment (PRA), help to formulate and present a wide variety of essential information for optimizing operation, maintenance, and training tasks for operators of complex systems. However, logic models, which are the underlying basis for PRA, are difficult to understand for the common operator. The challenge is to create advanced PRA tools, which utilize basic risk assessment methodology and communicates this information to operators and maintainers in an understandable manner. This paper presents such a communication tool a risk monitor developed at the Idaho National Engineering and Environmental Laboratory for the SAPHIRE Version 7.17 PRA code.

The SAPHIRE Risk Monitor uses the logic models developed for complex systems to calculate system risk status due to current operational conditions and/or maintenance tasks. The INEEL Risk Monitor also identifies risk essential plant trains and components when the plant is in an increased risk state where maintenance is being performed and systems, trains, or components are unavailable. Operators can use the monitor to plan and coordinate maintenance tasks based on current plant status and planned maintenance events during operation at power or during shutdown periods, based on the risk of single or concurrent tasks.

The primary focus of this advanced tool is to support maintenance planning, risk informed regulations, and technical specification and plant modifications. However, this tool is not limited to applications for nuclear power plants and has been adapted in risk and reliability areas outside of nuclear power industry.

Advanced risk monitor features such as creating a plant specific taxonomy by mapping basic events to components understood by operators, assigning components that are out-of-service to tasks and procedures, providing on-line procedures, facility diagrams, and repair simulations, and multi-user capability will be shown. Future work on the SAPHIRE risk monitor such as supplemental algorithms, which will provide a real-time solution to cutset development and incorporating dynamic fault tree extensions being considered in later versions of SAPHIRE, will be discussed.