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Dr. Sijuan CHEN received her Ph.D. degree in nuclear engineering from Harbin Engineering University, China, in 2021. And has been an Assistant Professor and Master's Supervisor at Shenzhen Key Laboratory of Nuclear and Radiation Safety, Institute for Advanced Study in Nuclear Energy & Safety, College of Physics and Optoelectronic Engineering, Shenzhen University, China since 2021. Won the Shenzhen "Pengcheng Peacock Project" high-level talent project in 2022, and selected for the China International Standardization Youth Talent and IEC Youth Expert Selection and Training Plan in 2023. Engaged in research on the nuclear safety, reliability and risk assessment, intelligent operation support technology and human factor analysis for nuclear power plants. As the host and main contributor, has served on 24 research projects, published 26 academic papers, applied for 15 invention patents, and participated in the formulation of 2 international standards in the field of nuclear power. Reviewer for SCI/EI journals of the Annals of Nuclear Energy, the Nuclear Technology, the Frontiers Energy Research, the Science and Technology of Nuclear Installations, and the Journal of Harbin Institute of Technology, as well as the chairman and reviewer of the IEEE International Conference on Reliability and Safety Engineering, and others.



III-2 Research progress on operational safety and risk monitoring & prediction of nuclear power plants

Abstract ;

The risk monitor (RM) for nuclear power plants (NPPs) based on the Living Probabilistic Safety Analysis (Living PSA) technology can evaluate the instantaneous risk of the NPP and implement the configuration risk management based on the actual state of the system/component. During the long-term operation of NPPs, there is a possibility of component availability but performance degradation. However, the impact of component degradation on the risk of NPPs has not been considered in the current RM. The development of Prognostics and Health Management (PHM) technology provides an opportunity to predict the future state, remaining useful life (RUL) and time-varying probability of failure (POF) specific to the unique component. The combination of PHM and RM can compensate for the shortcomings of traditional RM. In this presentation, the latest progress of real-time online risk monitoring (RORM) technology of NPPs in China will be introduced, and on the basis of the previous research on RORM, the ongoing research progress of risk prediction technology combining PHM and RM will also be displayed. In the latest study, the risk prediction method framework combining PHM and RM was built, the risk prediction system was developed, and the feasibility of the scheme was proved through the case. The time-varying POF prediction was performed using the component health state and RUL predicted through PHM technology, and the quantitative indicators for the impact of component performance degradation and preventive maintenance plans on the risk of NPPs were further provided.