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Neutronic Analysis of Annular & MOX Fuel Designs for SMART Core Using DeCART2D Code

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The SMART (System-integrated Modular Advanced ReacTor) reactor is a small, pressurized water reactor that utilizes integral pressurized water coolant, which offers many advantages over traditional designs. In this paper, a neutronic analysis of the SMART modular reactor fuel using the DeCART2D computer code is performed, considering annular and mixed oxide (MOX) fuel types. The study modeled and analyzed the behavior of the SMART reactor fuel under different operating conditions, including the use of annular fuel design and MOX fuel. DeCART2D code is a two-dimensional neutron transport code that uses the method of characteristics to solve the neutron transport equation, to simulate the neutronic behavior of these fuel types. The study explores the use of annular fuel design for the SMART reactor in several areas, which are thermal efficiency, peak fuel temperature, fuel burnup, neutron flux distribution, reactivity, and power distribution. Overall, the neutronic analysis of the SMART modular reactor fuel using the DeCART2D computer code provides valuable insights into the behavior of the reactor fuel and can inform the design and operation of the SMART reactor. The findings can also contribute to the development of advanced fuel designs for small modular reactors, with potential applications in both existing and future nuclear power plants.

Speaker Bio

Primary authors: Mr ATIAHALLAH, Abdulelah (King Abdullah City for Atomic and Renewable Energy (KACARE)); Mr ALSHIKH, Saud (King Abdullah City for Atomic and Renewable Energy (KACARE))

Co-authors: Mr AL TAYEB, Abdulrahman (King Abdullah City for Atomic and Renewable Energy (KACARE)); Mr BAFARJ, Essam (King Saud University)

Presenter: Mr ALSHIKH, Saud (King Abdullah City for Atomic and Renewable Energy (KACARE))

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