Contribution ID: **108** Type: **Poster**

Modeling of advanced nuclear fuel cycles incorporating hybrid fission/fusion devices.

Monday, 5 June 2017 13:40 (2 hours)

Two of the main cited flaws of nuclear fission power to label it as a non-sustainable energy source are linked to the nuclear fuel cycle: one is the fuel availability, and the other is the radioactive spent fuel legacy. The incorporation of fast neutron systems to the fuel cycle can help reduce this two problems, by breeding additional fissile material (thus extending the nuclear resource's lifetime) and by eliminating minor actinides present in the spent fuel that contribute to reducing its radiotoxicity by many orders of magnitude (thus greatly reducing the spent fuel legacy issue). Traditionally, the fission community has explored this alternative via fast breeder reactor designs and their incorporation into the fuel cycle, but the use of fusion-based fast neutron sources needs consideration as well. Jointly, UT Austin and IPN have developed a nuclear fuel cycle modeling platform, which can perform detailed neutronic calculations of both thermal fission and fast fission/fusion systems, and allows material exchange between them at the end of each burn cycle. A Compact Fusion Neutron Source (CFNS), a simplified spherical tokamak design developed at the University of Texas at Austin, generates the neutrons in the fission/fusion device. The CFNS has around it an annular space where zones that contains fresh fertile material can breed fissile material, while other zones may contain spent fuel material that can be "rejuvenated"(i.e. breed additional fissile material) and reduce its radiotoxicity by destroying the minor actinides with fast neutrons. Results from the use of this platform to analyze the self-sufficiency of Th/U and U/Pu fuel cycles with and without reprocessing stages, in particular with regard to neutron economy in the hybrid system, will be presented in this paper.

Eligible for student paper award?

No

Author: Mr SALAZAR-CRAVIOTO, Humberto (CICATA Queretaro - IPN)

Co-authors: Prof. NIETO-PEREZ, Martin (CICATA Queretaro - IPN); Prof. MAHAJAN, Swadesh (IFS - University of Texas at Austin); Prof. VALANJU, Prashant (IFS - University of Texas at Austin); Prof. RAMOS, Gonzalo (CICATA Queretaro - IPN)

Presenter: Prof. NIETO-PEREZ, Martin (CICATA Queretaro - IPN)

Session Classification: M.POS: Poster Session M

Track Classification: Neutronics and multiphysics simulation