Contribution ID: **244** Type: **oral**

Reactor Simulations for Safeguards with the MCNP Utility for Reactor Evolution Code

Wednesday, 22 October 2014 11:00 (20 minutes)

To tackle nuclear material proliferation, we conducted several proliferation scenarios using the MURE (MCNP Utility for Reactor Evolution) code. The MURE code, developed by CNRS laboratories, is a precision, open-source code written in C++ that automates the preparation and computation of successive MCNP (Monte Carlo N-Particle) calculations and solves the Bateman equations in between, for burnup or thermal-hydraulics purposes. In addition, MURE has been completed recently with a module for the CHaracterization of Radioactive Sources, called CHARS, which computes the emitted gamma, beta and alpha rays associated to any fuel composition.

Reactor simulations could allow knowing how plutonium or other material generation evolves inside reactors in terms of time and amount. The MURE code is appropriate for this purpose and can also provide knowledge on associated particle emissions.
Using MURE, we have both developed a cell simulation of a typical CANDU reactor and a detailed model of light water PWR core, which could be used to analyze the composition of fuel assemblies as a function of time or burnup. MURE is also able to provide, thanks to its extension MURE-CHARTS, the emitted gamma rays from fuel assemblies unloaded from the core at any burnup.
Diversion cases of Generation IV reactors have been also developed; a design of Very High Temperature Reactor (a Pebble Bed Reactor (PBR), loaded with UOx, PuOx and ThUOx fuels), and a Na-cooled Fast Breeder Reactor (FBR) (with depleted Uranium or Minor Actinides in the blanket). The loading of Protected Plutonium Production (P3) in the FBR was simulated.

The simulations of various reactor designs taking into account reactor physics constraints may bring valuable information to inspectors. At this symposium, we propose to show the results of these reactor simulations as examples of the potentiality of reactor simulations for safeguards.

Country or International Organization

France

Primary author: SHIBA, Tomooki (Subatech)

Co-author: FALLOT, Muriel (Subatech)

Presenter: SHIBA, Tomooki (Subatech)

Session Classification: New Trends in the Application of Statistical Methodologies for Safeguards