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Application of the GIF PR&PP Methodology to a Fast Reactor System for a Diversion Scenario

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The Generation IV International Forum Proliferation Resistance and Physical Protection Working Group has developed a methodology for the PR&PP evaluation of the next generation Nuclear Energy Systems. Following this methodology the main objective of this work is not only to apply the methodology, but to show an example of how the results could be used by
designers to improve the PR of the system. In this study, a hypothetical and commercial sodium-cooled fast nuclear reactor system (SFR) was used as the target for the application of the methodology. The design is based on the layout of the Japanese Sodium Fast Reactor with a safeguards design based on the safeguards approach of the prototype Monju. In this paper, the attention was focused on a diversion scenario involving the SFR. Moreover, the present work will focus within the reactor site.
The methodology was first applied to the SFR to check if this system meets the target of PR as described in the GIF goal; secondly, a comparison between the SFR and a reference system was performed to evaluate if and
how it would be possible to improve the PR&PP of the SFR. As a reference system, a light water reactor (LWR), based on the layout of the European Pressurized Water Reactor with an open fuel cycle, was taken. The comparison was implemented according to the following example development target: achieving proliferation resistance to material diversion similar or superior to domestic and international advanced LWR. Three main actions were performed: implement the evaluation methodology based on its assumptions; characterize the PR&PP for the nuclear energy system applying the methodology to the SFR; and identify recommendations for
system designers through comparing the SFR with the reference system.

Country or International Organization

Italy

Primary author: ROSSI, Fabiana (University of Bologna)

Presenter: ROSSI, Fabiana (University of Bologna)

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