



**OAK RIDGE NATIONAL LABORATORY
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SUBJECT: Trip report for Working Party on Nuclear Criticality Safety Virtual Meetings
DATE: August 10, 2020
TO: Dr. Angela Chambers, Nuclear Criticality Safety Program Manager, National Nuclear Security Administration / NA-511
FROM: Dr. William A. Wieselquist, Dr. Kursat Bekar, Dr. Douglas G. Bowen, Dr. William J. Marshall
MEETING TITLE: WPNCS and Related Subgroup Meetings

MEETING LOCATION: Virtual meeting hosted from NEA Headquarters in Boulogne-Billancourt, France

MEETING DATES: July 6-10, 2020

ATTENDEES ON BEHALF OF NCSP: Will Wieselquist, Doug Bowen, Kursat Bekar, and B.J. Marshall

MEETING PURPOSE: The purpose of the meetings was to coordinate on-going work on a range of computational benchmark efforts related to various aspects of the analytical methods used in modeling and simulation codes for criticality safety analyses.

MEETING BENEFITS TO THE NCSP: Participation in the WPNCS and its subgroups allows software developers and users to maintain awareness of and participation in the latest developments related to modeling, simulation, validation, and analyses of criticality safety models. Leadership roles and participation in the groups also enhance the prestige of the NCSP and its laboratories on the international stage.

PURPOSE OF TRAVEL

The purpose of the meetings was to exchange information on various on-going computational benchmark problems related to various aspects of modeling and simulation relevant to criticality safety, to discuss the creation of new subgroups to generate and study new problems, and to exchange information on various national programs on nuclear criticality safety. This year's meetings were more limited in scope due to the limitations imposed by virtual meetings with each participant in their home time zone. A brief discussion of the subgroups that did meet is included below.

Role of Integral Experiment Uncertainties and Covariance Data in Criticality Safety Validation (SG-1)
Meeting: Wednesday, July 8, 2020

This subgroup has largely completed its mandate. The final report has been prepared and reviewed by subgroup members; a number of comments need to be resolved by the lead authors (Maik Stuke, GRS, and Axel Hoefler, Framatome) from the NEA publications department prior to finalization of the report. There was discussion of Axel leading preparing a proposal for a new SG to be proposed at next year's WPNCS meeting. This proposal would investigate a toy problem, applying a small number of correlated experiments in a sample validation.

ORNL attendees: Marshall and Bowen



The Effect of Temperature on the Neutron Multiplication Factor for PWR Fuel Assemblies (SG-3)

Meeting: Tuesday, July 7, 2020

This subgroup has largely completed its mandate. The final report has been prepared and was reviewed with the subgroup members at this meeting. Some discrepant results from last year's meeting have been resolved with the submitting organizations. It is expected that the final report will be published through NEA in the next year. There were no clear proposals for a new subgroup, although Mohamed Ouisloumen of Westinghouse proposed one about Doppler broadening methods. This subgroup would be more appropriate in the WPRS.

ORNL attendees: Marshall, Wieselquist, and Bowen

Statistical Tests for Diagnosing Fission Source Convergence and Undersampling in Monte Carlo Criticality Calculations (SG-6)

Meeting: Wednesday, July 8, 2020

This subgroup has largely completed its mandate. This subgroup mainly focused on the development and implementation of statistical tests for convergence that can be utilized in Monte Carlo codes to automatically detect source convergence. In the meeting, proposed tests and methods, and their results were reviewed one more time. In addition to this, the draft report was reviewed and decided to publish the final report through NEA late this year.

ORNL attendees: Bekar

Preservation of Expert Knowledge and Judgement Applied to Criticality Benchmarks (SG-8)

Meeting: Monday, July 6, 2020

This subgroup is just beginning its work. Will Wieselquist is the SG chair, and has led a small cadre of NCS practitioners including Isabelle Duhamel, Nicolas Leclaire, B.J. Marshall, Justin Clarity, John Bess, and Catherine Percher to pilot a rating system to be used for this subgroup. That rating system, and initial submissions from the focus group were discussed at the subgroup meeting. The subgroup members are going to provide feedback in the next few months before the rating system is sent to the entire NCS community. The results will be collected and presented to the ICSBEP TRG, with the idea that benchmark evaluations that are found to be deficient may be upgraded. Those that cannot be improved to meet current standard may be moved to the "unacceptable" category within the ICSBEP Handbook.

ORNL attendees: Wieselquist, Bekar, Bowen, and Marshall

Working Party on Nuclear Criticality Safety

Meeting: Thursday and Friday, July 9 and 10, 2020

The first order of business for the WPNCS was the election of a new chair. Stephane Evo, IRSN, was no longer able to serve as the WPNCS chair because of a change in his roles at IRSN. The new chair nominated and duly elected is Kotaro Tonoike of the Japan Atomic Energy Agency (JAEA). This was followed by discussion from the head of the NEA Nuclear Science Committee (NSC) about reorganization going on among the various expert groups coordinated by the NSC to harmonize and streamline operations and work. Each WPNCS subgroup provided a brief summary of activity over the past year. Most of the subgroups that did not have explicit meetings are in the progress of publishing a final



report. SG-7, On the definition of a benchmark on sensitivity/uncertainty analysis on used fuel inventory, has proposed a SNF assay benchmark to study the impact of nuclear data uncertainties on depleted isotopic compositions. Finally, the current plan is to resume in-person meetings next year at NEA Headquarters, but this will of course be contingent on developments with the COVID-19 pandemic.

Attendees: Bekar, Bowen, Marshall, and Wieselquist

Persons Contacted

NEA: Shuichi Tsuda, Tatiana Ivanova, Ian Hill

IRSN: Isabelle Duhamel, Ludyvine Jutier, Nicolas Leclaire

CEA: Coralie Carmouze,

GRS: Maik Stuke

ANSWERS Software Service: Paul Smith

Others: Dennis Mennerdahl, Axel Hoefler, Kotaro Tonoike, Michael Rising, Catherine Percher, John Bess, Sonny Gan, and others

Presentations, Chair Responsibilities, Etc.:

Dr. William Wieselquist is the chair of SG-8. As such, he ran the meeting, presenting the work done to pilot a rating system for benchmark evaluations. ORNL results were also included in the reports discussed in SG-1 and SG-3.

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