



SUBJECT: Report on Foreign Travel to Paris, France (virtual)
DATE: July 21, 2021
TO: Dr. Angela Chambers, Nuclear Criticality Safety Program Manager, National Nuclear Security Administration / NA-511
FROM: Michael Rising

MEETING TITLE: OECD/NEA Working Party on Nuclear Criticality Safety (WPNCS) Subgroup (SG) Meetings

MEETING LOCATION: Paris, France (virtual)

MEETING DATES: July 5-9, 2021

ATTENDEES ON BEHALF OF NCSP: Michael Rising, Bobbi Riedel, Jennifer Alwin

MEETING PURPOSE: Exchange technical information on nuclear criticality safety analysis techniques, benchmarks and validation, and Monte Carlo analytic methods.

MEETING BENEFITS TO THE NCSP

LANL has been an active participant in these international meetings for over 15 years, and that there have been very significant benefits from that participation. International collaboration is a very effective means of peer review for new ideas and approaches to computational methods. The interchange of new ideas both for what works and for what doesn't work can save substantial amounts of development time, lead to better understanding of novel approaches, and improve the quality of advanced methods. These benefits are especially true for the OECD-NEA-WPNCS meetings due to a common focus on implementing new methods that benefit the end users – nuclear criticality safety practitioners.

PURPOSE OF TRAVEL

2021 OECD/NEA WPNCS meetings were held virtually. No physical travel required.

Persons Contacted at OECD/NEA WPNCS virtual meetings in Paris, FR

Julie-Fiona Martin – OECD/NEA WPNCS Secretariat

William Wieselquist – ORNL, SG-8 Coordinator

John Bess – INL, SG-8 Monitory, US Country Report Coordinator

Axel Hoefer – Framatome GmbH, SG Coordinator for newly proposed SG

Maik Stuke - BGZ Gesellschaft für Zwischenlagerung mbH, SG Monitor for newly proposed SG

Presentations, Chair Responsibilities, Etc.:



During the entire July 5-9, 2021 WPNCS meetings, only two sessions were attended and are reported on here.

Subgroup 8, meeting #2, July 5, 2021

SG 8, entitled *Preservation of Expert Knowledge and Judgement Applied to Criticality Benchmarks*, included a primary presentation by the SG coordinator Will Wieselquist, some discussion on current and upcoming efforts to conclude this work, and a presentation by Michael Rising on related work done at LANL.

Will Wieselquist presented the latest status and updates from the previous SG meeting. The *beta* form version 1.0, used to rank and collect expert knowledge for each benchmark in the ICSBEP handbook, presented at the last SG meeting and at the ANS Winter meeting, had been updated to incorporate feedback from the SG members and community. Some of these changes included a few language changes to the rankings, a couple of options to categorize why a benchmark may be ranked as questionable (effectively related to bias or uncertainty), and an additional description field to separate comments. With these changes, a new *beta* form was ready for further discussion and feedback, which occurred during the subsequent discussions.

In the discussions that followed the coordinator status update, the SG members discussed a few details to try and narrow in on a final version of the form fields that would be used to gather expert knowledge on the benchmarks in the ICSBEP. This discussion led to a few subtle changes to make the form more useful and simpler to use for the community. The latter part of the discussions mentioned organizing some informal meetings to begin populating the database of expert judgement initially targeting specific volumes of the ICSBEP handbook (I, II, IV). John Bess agreed to put together a list of experts that could potentially contribute evaluations of these various volumes.

The final presentation in the session was given by Michael Rising on behalf of Nicholas Thompson (LANL). The presentation entitled *Questionable Benchmarks*, with LANL authors Nicholas Thompson, Michael Rising, Denise Neudecker, Jesson Hutchinson, A. (Skip) Kahler, Alex Clark, Michael Herman, Jennifer Alwin, Michael Grosskopf, Wim Haeck, Scott Vander Wiel, and Theresa Cutler, described an effort at LANL to quantitatively assess benchmark quality with the assistance of expert judgement. Several quantitative methods were described along with some examples of how these quantitatively flagged questionable benchmarks were then reviewed by experts. The final product of this effort, driven by a separate non-NCSP machine learning project aimed at improving nuclear data through targeted experiment design, is a ~80 page LANL report with tables of benchmark quality metrics and expert comments on why the benchmarks may be lacking for various reasons. The effort is ongoing and these methods and select results will be published in a journal in the coming months.

Informal Discussion on Proposed SG on Bias and Uncertainties, July 6, 2021

Details of a new SG, led by coordinator Axel Hoefer and monitored by Maik Stuke, was discussed by a large group of interested participants. This newly proposed SG, born out of the previous expert group (EG) on uncertainty analysis for criticality safety assessment (UACSA) phase V, has a comparatively small scope for the study on the influence of bias and correlation in the assessment of calculational bias and upper subcritical limit calculations. A toy model was defined with known benchmark biases, nuclear data sensitivities, and benchmark-benchmark correlations, so that one could completely calculate an application bias without having to compute any of the other terms. This focused SG will then be able to



deliver results comparing various methodologies, so that 1) the impact of benchmark-benchmark correlations will be better understood, and 2) recommendations can be made to the broader nuclear criticality safety community regarding the methods associated with computing calculational bias.

Overall, the group of potential participants were satisfied with the scope of the work as well as the parameters defined in the proposed simple benchmark problem. A few comments regarding investigations into benchmark-benchmark correlation thresholds and benchmark-nuclear data correlations were made, but were correctly left out of the scope of the proposed activities due to concerns about growing the scope of the proposed SG too large (an issue with the previous EG UACSA V activities).

Both Michael Rising and Bobbi Riedel expressed interest in participating in this newly proposed SG if it is approved to continue. This will allow LANL to make comparisons of these bias/uncertainty/correlation methods as they relate to the Whisper code use in computing the calculational margin for upper subcritical safety assessments.

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