**ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT**

**NUCLEAR ENERGY AGENCY**

**Nuclear Science Committee**

**Working Party on Nuclear Criticality Safety**

**2nd Meeting of the Expert Group on**

 **Advanced Monte Carlo Techniques for Criticality Safety Assessment (EG AMCT)**

**17 September 2012, 10:00 – 18:00**

**NEA Headquarters (Room B), Issy-les-Moulineaux, France**

Summary Record

 **Introduction & Welcome**

**Franco Michel-Sendis**, NEA Secretariat to the WPNCS, opened the meeting and welcomed the participants, (see the list of participants in Annex 1). There were 30 registered participants.

 **Approval of the agenda**

With a few minor modifications and two extra presentations by B. Kiedrowski, and one by B. Rearden, the agenda was approved (Annex 2).

 **Election of Chair and Review of Mandate**

The first action of the meeting was to formally elect the new chair of the Expert Group. The candidate proposed was Mr. Joachim Miss of IRSN. No other candidate proposals were received. All seconded the proposal and Mr. Miss is formally elected chairman of the Expert Group.

Miss presented his proposal to renew activities and rethink the scope of the Expert Group. Highlights of his comments are:

* *The EG aims at issuing recommendations to practitioners for using the improved methodology in their work, and to guide its employment.* This implies finding a way to have a more important participation of practitioners within the EG.
* Different codes and tools are used to perform Criticalitu Safety Assessments
* CS studies are mainly perform with MC codes - but not only
* New MC developments often performed for reactor applications. Not for criticality.
* Different practices/learning in different countries.
* Different codes sequences: deterministic(generation of homogenized MG constant/Self shield.) - MC, deterministic(standards), depletion-MC, depletion-deterministic…
* New techniques to improve MC issues are often only available in codes developments versions. It is therefore difficult for “standard users” to participate to these benchmarks.
* By experience it is today difficult to maintain activities for a group only focused on MC codes usage (for criticality issues); it would be more difficult to maintain 2 groups

Miss therefore proposed to consider this and extend the scope of the group, elaborate activities towards users (more than developers) while still gathering developers and users. The scope he proposes is to focus on Criticality codes and their best practices to assist CS studies, with the inclusion of deterministic codes as well.

A discussion followed were expert group participants expressed that, whilst these proposals are valid points, the expert group itself should focus on Monte Carlo techniques exclusively, pointing out to the larger WPNCS as the better suited framework in which to address some of the issues mentioned.

The group discussed and accepted to include the following modifications to the scope of the mandate:

**Scope**

*Under the guidance of the Working Party on Nuclear Criticality Safety (WPNCS) the Expert Group will perform specific tasks associated with the transfer of new Monte Carlo technology to criticality safety practitioners. These activities will be selected from (but are not limited to) the following list:*

* *Analysis of sub-critical experiments.*
* *Transient suppression (ie, convergence acceleration).*
* *Convergence of adjoint calculations for criticality.*
* *Tests for adequate population size.*
* *Under-prediction of statistical uncertainties for tallies.*
* *Uncertainties propagation with Monte Carlo codes*
* *Surrogate based techniques*
	+ *Algorithm-assisted assessment in criticality safety (Mathematical methods to identify penalysing parameters and their range that guaranty sub-criticality of systems…)*
	+ *Optimizations*
	+ *Uses of Metamodels*
* *Tools to support evaluation of the hazard in CSA*
* *Random geometry (particles in solution, TRISO fuel, etc.).*
* *Geometric perturbations (eg, tolerances, absorber reactivity worth, ...).*
* *Monte Carlo perturbation theory - review methodology and, if necessary, revisit benchmarks.*
* *Monte Carlo depletion - (Burn-up credit) methodology, approximations, review, benchmark.*

These changes were formally approved at the WPNCS meeting held later that week.

 **Presentations**

*All presentations are available under the working area section of the EGAMCT at* [*http://www.oecd-nea.org/download/egamct/*](http://www.oecd-nea.org/download/egamct/)

Presentations were given by:

* Y. Richet on *Parametric benchmarking on Monte Carlo depletion convergence and on Algorith Assisted criticality safety assessments;*
* C. Dieudonné on *Acceleration of Monte Carlo burnup simulations with correlated sampling method. First results with TRIPOLI-4;*
* T. Viitanen on behalf of the SERPENT team, gave a presentation on the latest SERPENT developments;
* B. Cochet gave an overview of MORET 5 capabilities;
* A. Jinaphanhpresented preliminary results for the *DRAGON-DONJON-MORET5 hybride approach*;
* W. Haeck presented his own *Monte Carlo Depletion Calculations Using VESTA 2.1*, the code he develops at IRSN;
* B. Kiedrowski gave two presentations, on *new MCNP developments on Fission Matrix calculations* and on *On-the-fly neutron Doppler broadening for MCNP*.
* B. Rearden presented the latests development in the SCALE code including the restructuring of SCALE functionalities into a modern framework called Shift.

 **Identification of initial activities/studies**

Although the general scope of potential activities to consider under this Expert Group was defined, the specifics of an initial benchmark remained to be discussed. It was decided specifications for a first benchmark grouping main Monte Carlo codes would be issued in the month to follow by ORNL/IRSN. The exercice would first aim at trying to quantify the effect of undersampling biases in Monte Carlo reaction rate estimators as applied for burnup credit in PWRs.

 *Note : Specifications of this benchmark (Phase I) can be found at the working area section of the EGAMCT at* [*http://www.oecd-nea.org/download/egamct/*](http://www.oecd-nea.org/download/egamct/)

 **Date and place of the next meeting**

The next EGAMCT meeting will be held in conjunction with the 2013 meetings of the Working Party on Nuclear Criticality Safety (WPNCS). More precise details will be circulated to EG participants as they become available.

Action List from EGAMCT 2012 meeting

Action on Rearden, Miss – *To submit specification of the first EGAMCT benchmark to NEA for distribution to the group including a template for submission of formatted results.*

Action on T.S. – *To set up a working area for the EGAMCT under the EGAMCT webpage*

ANNEX 1

 **AMCT-2012 (Participants EG AMCT meeting 17.09.2012 )**

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ANNEX 2

**ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT**

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**PROPOSED AGENDA**

|  |  |  |
| --- | --- | --- |
| **Time** | **Topic** | **Presenter** |
| 10h0010h15 | 1. Welcome and approval of the agenda
 | *NEA Secretariat* |
| 10h1511h15 | 2) Election of new Chair of the EGAMCT3) Review of Mandate, proposed modifications to mandate and discussion  | *All* |
| 11h1512h45 | 4) Presentations:* 1. "Acceleration of Monte Carlo burnup simulations with correlated sampling method. First results with TRIPOLI-4"
	2. Latest SERPENT developments
	3. Overview of MORET 5 capabilities
 | *C. Dieudonné* *T. Viitanen* *B. Cochet*  |
| 12h45 -14h15 | Lunch |  |
| 14h1515h45 | d) First results for the DRAGON-DONJON-MORET5 hybride approach.e) Parametric benchmarking on Monte Carlo depletion convergencef) Monte Carlo Depletion Calculations Using VESTA 2.1 | *A. Jinaphanh**Y. Richet**W. Haeck* |
| 15h45 - 16h05 | Tea break |  |
| 16h05 - 17h30 | 5) Identification of activities/studies and first proposals | *All* |
| 17h30- 18h00 | 6) Any other business (next meeting) Adjourn | *All* |