# WPEC Subgroup Proposal

## Title

"Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files"

## Justification for a Subgroup

Subgroup 33 has succeeded in providing a deeper understanding of nuclear data adjustment methods and of their application. In fact, the findings and conclusions of Subgroup 33 on "Methods and issues for the combined use of integral experiments and covariance data" have pointed out that the statistical adjustments methodologies in use worldwide for different reactor analysis and design purposes are essentially equivalent and that they can provide a powerful tool for nuclear data improvement if used in appropriate manner. In fact it has been indicated that the associated sensitivity analysis requires careful use of existing methods and that the choice of specific integral experiments of different types (critical masses but also reaction rates, reactivity coefficients and irradiation experiments) and sensitive to different energy neutron spectra, is of high relevance to avoid as much as possible compensating effects in the adjustments. Finally, it has been pointed out the crucial role of the covariance data used, both those associated to the nuclear data and those associated to the integral experiments. As a result, the role for cross section adjustment is more and more perceived as that of providing useful feedback to evaluators and differential measurement experimentalists in order to improve the knowledge of neutron cross sections to be used in a wider range of applications. This new role for cross section adjustment requires tackling and solving a new series of issues: definition of criteria to assess the reliability and robustness of an adjustment; requisites to assure the quantitative validity of the covariance data; criteria to alert for inconsistency between differential and integral data; definition of consistent approaches to use both adjusted data and a-posteriori covariance data to improve quantitatively nuclear data files; provide methods and define conditions to generalize the results of an adjustment in order to evaluate the extrapolability of the results of an adjustment to a different range of applications (e.g. different reactor systems) for which the adjustment was not initially intended; suggest guidelines to enlarge the experimental data base in order to meet needs that were identified by the cross section adjustment.

WPEC can offer the ideal frame for an international activity aiming to a common set of practices and methods to improve nuclear data files.

## Subgroup Monitors

R. McKnight, M. Ishikawa

## Subgroup Coordinators

G. Palmiotti, M. Salvatores

## Subgroup Participants (Proposal, to be completed by individual organizations)

The data projects will identify appropriate participants from their community. There is the need of an enlarged participation (i.e. with a wider participation of evaluators, nuclear data experimentalists, reactor core designers).

**Definition of the project and of proposed activities**

It is proposed as a mandate for this new WPEC subgroup to provide criteria and practical approaches to use effectively the results of sensitivity analyses and cross section adjustments for feedback to evaluators and differential measurement experimentalists in order to improve the knowledge of neutron cross sections, uncertainties, and correlations to be used in a wide range of applications.

**Relevance to Evaluated Data Files**

This activity is of particular relevance to the foreseen objective to improve future data files using synergies from different nuclear data projects. In particular, a good coordination and communication with the new CIELO initiative (if approved) will be established with cross-participation between the two groups. Testing and feedback on the new internationally agreed evaluations will be most important. Specific feedback between the adjustment work and CIELO (or, more generally, nuclear data evaluation projects) can evolve as the two activities progress (see working methods below).

Moreover, communication with other NSC data related activities should continue (in particular as previously done within Subgroup 33 for the case of UACSA)

**Working method**

1. Review issues and summarize findings on methodologies used to provide feedback to evaluated data files (e.g. reactor physics experiment accuracies, adjustment methodologies etc.).

2. Select and define test cases for application. Test cases should be selected among existing or ongoing international projects for large scale adjustments. The type of data that should be made available (in principle adjustment results, sensitivity coefficients; integral experiment information) will be defined on a case by case basis. Examples of results that can be made available for this exercise are:

   a) The JAEA large scale adjustment for fast reactor application;

   b) Similar results from the nuclear data adjustment project performed by INL, ANL, BNL, and LANL based on ENDF/B-VII.0;

   c) Results from the application of the consistent method of nuclear parameters adjustment (assimilation) underway between INL and BNL;

   d) CEA adjustment of nuclear parameters based on integral experiments;

   e) A specific case of interest for examination within the Subgroup is represented by simple ICSBEP benchmarks, such as GODIVA/JEZEBEL etc that have been used implicitly in different evaluation projects. In order to insure the convergence of calculation and experimental values for these experiments, big compensating effects among different isotopes of each library have resulted in the past and the new subgroup should provide indications on the most appropriate modifications to the different isotope cross sections, in order to insure consistency with a wider set of integral experiments.

3. On the basis of the test results and analysis, recommend a possible general methodology, including traps and pitfalls to be avoided, and practices for providing feedback to evaluators both on nuclear data and on associated covariance data (in the energy range ~10MeV-~100 eV), based on specific examples of priority isotopes, possibly related to the priority issues treated in the CIELO initiative when approved.

4. Actual feedback will be provided to evaluation projects (and, possibly, to the CIELO initiative) on the specific examples indicated under point 3.

**Time-Schedule and Deliverables**

It is anticipated that the experts of this SG could complete and document the activities (mandate) listed above within 3 years.

Date Deliverables

May-June 2013: Review and approval of subgroup proposal by WPEC and NSC;

May-June 2013: Initiate subgroup activities (short ½ a day co-ordination meeting could be organized in May 2013 in conjunction with WPEC meeting).

Summer or Fall 2013: Actual kick-off workshop/meeting

November, 2014: Draft report of subgroup activities on methodologies and preliminary results of test cases analysis;

November, 2015: Preliminary feedback to evaluation projects

June 2016: Final deliverable, which will include: a) agreed criteria for assessing robustness and reliability of a cross adjustment, b) criteria for the selection of integral experiments, c) an approach for validating a-priori covariance data, d) recommendations for the use of a-posteriori covariance data, e) a methodology and guidelines for providing feedback in order to improve neutron cross sections and associated covariance data in current evaluated nuclear data files, and f) practical applications to specific isotopes of priority interest for applications.