

## Conclusions and Recommendations of the 2<sup>nd</sup> NJOY User Group Meeting - 9 April 1992

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### Quality Assurance / Verification & Validation (QA + V&V)

NJOY has been chosen as the first code for a pilot project on QA + V&V by the NEA Nuclear Science Committee, because of its importance in processing the bulk of the newly released evaluated nuclear data libraries. The working party on advanced computing (WPAC) is in charge of defining the rules representing the least common denominator among those established in the different member countries for QA + V&V.

In preparation for the first WPAC meeting (26-27 May 1992) a thorough discussion concerning this topic was held at the 2nd NJOY User Group meeting (9 April 1992).

In developing and maintaining NJOY several basic quality assurance principles have been introduced:

1. standard-format computerized history of changes with the possibility of re-generating exact older versions at any time.
2. clear version identification (coded and displayed in the output)
3. computer independent maintenance procedure - using a common error/change reporting format
4. result plotting capability for visual verification
5. detailed documentation of changes and their effect
6. source protection (read-only for all files)
7. detailed program documentation.

The detailed documentation needs however to be completed (3/4 complete) and funds for ensuring that this is indeed completed should be ensured.

It was recognised that because NJOY represents a development over more than 15 years it cannot be subject to strict quality assurance principles set up today. The cost of applying strict QA principles would be immense. In addition 15 years of development, intensive use, feedback from users and the cumulative experience entitles NJOY to a "grand-father" exemption or forgiveness of these strict rules. Nevertheless, the intent of QA will be followed and the strategy will be to attack the known deficiencies.

### Present Status - Versions

The generally adopted version for processing JEF-2 data is NJOY-89.62. A consistent use of the same version by everybody in the data benchmarking phase has been recognised to be essential in order to reach clear conclusions on their quality and deficiencies. NJOY-89.62 has however several problems in that some nuclides cannot be processed at all and some not correctly. A more recent release, identified as NJOY-91.13, was used to verify to what extent the remaining problems were resolved. This investigation led to some further modifications and corrections. NJOY has now been frozen to version NJOY-91.38 (15 May 1992).

Compared to NJOY-89.62

- it contains, in addition to new features and modules, all corrections known and which have been validated. The new features are in addition backwards compatible.
- All corrections with physics implications have been documented in a separate paper.
- These corrections do not affect nuclides processed correctly with NJOY-89.62 but only those for which problems had been identified.
- Some further corrections were submitted to the main author. They have not been included because they have not been validated.
- It was recognised that some evaluations stretch the interpretation of the ENDF-6 format beyond what was originally meant. The discussion whether NJOY should simply process correctly correct evaluations or whether it should be forgiving to some format misuse or generous interpretation was concluded by the author with the statement that the goal one should aim at is that NJOY always reproduces what the evaluator wanted to do.

Further discussion concerned additional interface modules required for processing group cross section libraries from NJOY to data sets directly useable in specific projects. The status and QA procedures for two major modules presented during the seminar (7-8 April), namely TRANSX-2.0 and NSLINK (including MILER) were described.

TRANSX-2.0 can be used only with NJOY-91 but has several interesting features which facilitate the use of newly processed data by the nuclear engineer. For instance it can produce coupled sets of data involving as projectiles neutrons, photons and charged particles. It prepares mixtures of isotopes, collapses in energy by using a general flux calculator, carries out spatial collapse to compute cell-averaged cross sections, computes self shielding for homogeneous and simple heterogeneous systems etc. etc. All these features make TRANSX-2.0 an attractive new module which one can anticipate will be widely used.

NSLINK transfers NJOY output to the AMPX system which is also widely used. This is of particular importance with the forthcoming release of AMPX-77.

### Recommendations

The NJOY User Group recommends on the basis of this analysis that the working group on processing, reporting to the International Evaluation Cooperation (IEC) working party, and the JEF-2 Scientific Coordination Group adopt NJOY-91.38 as the official version for processing ENDF-6 based evaluated data libraries at their next meeting.