

Recommendations from the sub-group on (a) discrepancies between existing libraries and (b) a list of nuclides to be studied using TAGS

1) Some initial efforts have been made to identify the major differences in the mean energies to be found in the JENDL-FPDD-2000 and JEFF-3.1 decay data libraries as a function of cooling time. Furthermore, calculations and assessments are being undertaken to recognise those nuclides that contribute the greatest uncertainties to the decay heat as a function of cooling time.

Further assessment work is required to understand more precisely the nature of individual discrepancies in the JENDL-FPDD-2000 and JEFF-3.1 libraries as a means of improving the accuracy of specific decay data libraries. Some discrepancies imply seriously inadequate decay schemes. These assessment exercises will aid in the elimination of particular inadequacies (due to an inadequate dataset). While new evaluations will also be needed under those circumstances, this exercise will identify those nuclides requiring new measurements (by TAGS) – see 2) below for a preliminary list.

Action: on Bersillon/Yoshida/Kellett/Sonzogni to liaise closely, understand and possibly resolve some of the discrepancies between libraries. This information would need to be fed into the current list of proposed TAGS measurements – see 2) below. Action to be completed by May 2006 (before the next WPEC meeting).

2) List of nuclides for TAGS measurements: this list needs to be refined further, and will require input from the required detailed analysis of discrepancies and decay heat uncertainties. We expect some of the listed radionuclides to drop out, and others to take their place (see 1) above). We estimate the list to be ~80% correct.

35-Br-87
37-Rb-92
38-Sr-89, -96, -97
39-Y-96
41-Nb-98, -101, -102
43-Tc-102, [-104, -105]*
52-Te-135
55-Cs-142
56-Ba-145
57-La-143, -145

* Based on analysis of missing decay heat.

Action: Following the re-assessment of the above list of nuclei, Henriksson, on behalf of Yoshida, to introduce requests for the required measurements for these nuclei into the High Priority Request List (HRPL – OECD/NEA).

3) Mean energies are already available from three different sources:

JENDL-FPDD-2000
JEFF-3.1

INL TAGS (and other experiments?)

A detailed comparison needs to be undertaken of these ~48 nuclides with respect to mean energies. The differences would need to be tabulated and explained. Separate sets of decay heat calculations should also be compared.

Action: Sonzogni to contact Greenwood (INL) by the end of January 2006 to obtain the raw TAGS data; if available and permitted, Tain will undertake re-analysis of these data.

Action: Kellett/Yoshida to undertake the above detailed comparison by the end of March 2006.

4) Benchmark experiments: differences between decay heat benchmark experiments can be of the order of 15%. Some effort should be made to understand the cause and validity of such significant differences, e.g. 400 – 10000s in U-235 gamma decay heat component.

Action: Yoshida to determine whether there are any additional measurements of decay heat available from Japan, by the end of January 2006.

Action: Robert Mills (Nexia Solutions) to provide participants with a comprehensive list of decay heat measurements and make a suitable comparison of equivalent datasets, by the end of January 2006.

Working group “Experimental Setup” (JLT, BR, WG, HH, AA)

We believe that accurate measurements of the average beta and gamma energies of the decay of fission fragments can be made with the use of the total absorption gamma spectroscopy technique. Measurements of ground state to ground state transitions are also essential. In order to make systematic measurements of these quantities it would be best to setup a facility at a particular particle accelerator where sufficient beam time could be devoted to the measurements. Such a facility should consist of a suitable target/ion-source, a mass separator of sufficient resolution, a sample transport system, and a total absorption spectrometer with associated equipment. In addition there should be a setup for measurements for the same decays with high resolution gamma ray and internal conversion detectors. In addition for some particular cases use should be made of existing experimental facilities. In order to exploit this facility and thus fulfil the task, it would be necessary to form collaboration with sufficient manpower and resources (an additional benefit of this systematic approach would be the production of highly skilled manpower).

Action: Gelletly/Tain/Rubio/Algora to:

- a) undertake TAGS measurements of a small number of key nuclides (e.g. 43-Tc-102, 56-Ba-145, 57-La-143, -145) at existing facilities,
- b) contact laboratories where a programme of measurements might be undertaken, by the end of January 2006,
- c) convene a meeting of representatives from industry, laboratory managers and experimenters to resolve manpower and resource issues, by mid-2006.

Working group “Library of TAGS Data” (JLT, BR, WG, HH, AA)

Data derived from TAGS should be collected and recorded so that proper use can be made of the results of such measurements. Present databases are not suitable for this purpose because of their format. Hence we recommend that a new database should be set up for this purpose and incorporate all previous measurements (e.g. Greenwood *et al.*). The contents of this new international database should be made widely available, and should not be restricted to decay heat applications. The format of the database needs to be flexible enough to contain information on beta intensities for discrete energy (real or pseudo) levels and averages over energy ranges.

Action: Henriksson/Sonzogni/Tain to organise the inclusion of the Greenwood et al data (in the first instance) into an appropriate database.