

NUCLEAR ENERGY AGENCY COMMITTEE ON REACTOR PHYSICS

SUMMARY RECORD OF THE TWENTY-SECOND MEETING (TECHNICAL SESSIONS)

OECD, PARIS
1st-5th October 1979

Compiled by
P. SILVENNOINEN

This document contains information of a preliminary or private nature and must be used with discretion. Its contents may not be quoted, abstracted, reproduced, transmitted to libraries or societies or formally referred to without the explicit permission of the originator.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
NUCLEAR ENERGY AGENCY
38, boulevard Suchet, 75016 PARIS

89180001

NUCLEAR ENERGY AGENCY COMMITTEE
ON REACTOR PHYSICS

SUMMARY RECORD OF THE TWENTY-SECOND MEETING
OECD Headquarters, Château de la Muette, Paris

(Technical Sessions)

Compiled by

P. SILVENNOINEN

OECD Nuclear Energy Agency
38 Boulevard Suchet, 75016 PARIS

CONTENTS

	<u>Page</u>
1. New Topics	1
1.1 Isotopic correlations for fuel exposure history determinations	1
1.2 Criticality problems in fuel storage and transportation	2
1.3 Blankets : neutron deep-penetration problems	3
1.4 Miscellaneous topics	3
2. Topics carried over from previous meetings	5
2.1 Heterogeneous cores, including safety related problems	5
2.2 Power peaking	7
2.3 Fuel cycles	8
3. National programmes	9
4. Benchmarks	9
4.1 Review of conclusions from the LMFBR benchmark	9
4.2 Hydrogen entry benchmark	10
4.3 Multi-dimensional kinetics benchmark	10
4.4 Proposal for noise analysis benchmark	10
5. General	11
5.1 Highlights of recent meetings of interest to NEACRP	11
5.2 Specialists' meetings planned or proposed	11
5.3 NEACRP book on the status of fast reactor physics	12
Annex 1 List of Participants	13
Annex 2 Draft letter to IAEA	14

TECHNICAL SESSIONS

The Committee adopted a new procedure for establishing the summary record of the discussions on the technical topics. For each substantive topic one committee member was assigned to summarize the sense of the Committee, these summaries were discussed later in the meeting and the scientific secretary was asked to include the summaries in this summary record. The summaries were produced by the following members: Küsters (items 1.1 and 4.1 below), Martinelli (1.2), Maienschein (1.3), Rief (1.4), Campbell (2.1), Askew (2.2) and Duret (2.3).

1. New topics

1.1. Isotopic correlations for fuel exposure history determinations

The isotopic correlation technique is used frequently in the chemical analysis of spent fuel and it relates isotopic ratios (concentrations, activities) as Pu/U, Cs-137 or other ratios of actinides and fission products with burn-up (or depletion) or to each other. Much experimental evidence is available; some of these correlations are linear over a wide range of burn-up, but it has to be stated clearly that there is no physical reason for linearity. The assumption of linearity can lead to erroneous conclusions, especially if linearity is used for interpolation and extrapolation of experimental results.

The field of application can be manifold:

- Consistency checks of analytical data obtained by isotope dilution techniques on active feed solution samples from the reprocessing plant.
- Independent checks on burn-up determination.
- Determination of the Pu content in the dissolution process.
- Dynamic inventory determination in a reprocessing plant.
- Non-destructive determination of Pu content and burn-up of spent fuel.
- Verification of the analytical data by safeguards inspectors.
- Check and location of fuel failures by means of fission product monitoring.

The most important application of isotopic correlation might be in the field of safeguards. The present uncertainty of chemical and physical measurements of the content of fissile material in spent fuel is about 1 % and it is unlikely that it can be improved much further to an accuracy which would be needed to get a reliable detection of diverted material (less than 0.1 %). It was felt that isotopic correlations cannot by themselves be a replacement of the usual measurements in safeguards applications, but that many independent correlations might narrow the uncertainty margin and that possible systematic errors in the chemical determination of the fissile content can be eliminated.

89180004

A validation and improvement of the at present mainly empirical approach of isotopic correlations can be based only on a thorough check of reactor physics calculations with experiments and on a complete understanding of the sensitivity of the correlations to possible influences from the in-pile performance and out-of-pile conditions of reactor fuel. The special purpose of application is important in these sensitivity studies. NEACRP felt that the theoretical exploration of the isotopic correlation technique at present has not gone so far as to resolve the various conditions for a reliable application for various purposes. A reliable uncertainty margin of the various measurements is strongly required.

As an ultimate aim it is to be discovered what type of correlations are insensitive to local in-pile effects, and what type is even insensitive to reactor types (e.g. BWR, PWR). It has to be validated what approximation to a rigorous reactor physics calculation is adequate for the various application areas in order to have a fast and sufficiently accurate theoretical method to make the isotopic correlation technique a valuable tool in fuel cycle analysis.

1.2. Criticality problems in fuel storage and transportation

The subject spans a wide variety of activities in out-of-pile fuel studies, a common feature being the interest in validation - and possibly standardization - of relatively simple methods. A large number of soundly based guidelines for criticality safety limits and controls are available in the open literature.

Safety-oriented criticality calculations of heterogeneous systems were contributed by Belgium, the Netherlands, France and Japan: these studies are encouraged and supported by utilities, in view of the economic incentive related to the optimization of the fuel quantities that can be stored in a single pool.

The performances of diffusion, transport and broad-group, few-history Monte Carlo codes have been intercompared and compared with experiments and "exact" Monte Carlo solutions. No large discrepancies have been observed in the results yielded by different approximate methods. Still, the treatment of strong heterogeneities or complicated geometries is a problem in standard methods, and the group-Monte Carlo approach is much favoured in some countries. KENO IV is of particularly wide usage.

Critical experiments with test regions of $k_{\infty} \approx 1$ have been carried out in France and others are planned in the near future. Comparisons with calculations could be made on the basis of simpler subcritical measurements, but it was agreed that critical experiments are more suitable to supply additional information in the code validation phase.

C/E values for heterogeneous arrays are sometimes difficult to assess: experiments and the optimization of adequate calculational schemes are still in progress. It was suggested, however, that accuracies of about 0.5 % should be well within reach for well-defined systems. For accident situations calculations will be much less precise. The implementation at Oak Ridge of the modular system SCALE for

criticality and shielding calculations of shipping containers, was reported by the U.S. It is anticipated that NRC will make it available on request. Need for standardization in this area was recognized, and SCALE is a significant step in this direction. The addition of heat transfer and structural integrity modules - which is planned - would provide a reference integrated package able to handle any problem envisageable in fuel transportation.

1.3. Blankets: neutron deep-penetration problems

This subject includes a number of related but separate topics. These include

- calculation of U-238 fission rates through the blanket,
- calculation of gamma-ray heat generation through the blanket and blanket-shield interface,
- location of reactivity - control monitors,
- prediction of starting fluxes for shielding calculations and
- study of alternative shielding materials.

It was generally agreed that transport calculations or transport-corrected calculations can give adequate accuracy for U-238 fission rates, with a value of $\pm 3\%$ (1 σ) suggested by Campbell for MOZART or BIZET assemblies using S₄ or S₈. There remains a desire for simpler methods of calculation and the use of a modified diffusion coefficient is pursued in France. Gamma-ray heating may be well handled by sophisticated methods but is handled less well by design methods and further study is required.

The response of remotely-located reactivity monitors depends strongly upon control rod positions, etc. However, it was observed widely that results from the modified source-multiplication technique can be interpreted adequately using diffusion theory even to shutdown levels of the order of 25 \$ subcritical.

For deep penetration of neutrons into shielding materials, the source term may be obtained from diffusion theory or from the discrete-ordinates calculations used to predict the attenuation. Interest was expressed in examining alternative shielding materials, especially graphite and borated graphite. The reduced shield weight could greatly impact reactor seismic problems.

Measurement programs continue in several countries and further results may be anticipated. Therefore, the Committee will retain this subject for the next meeting.

1.4. Miscellaneous topics

Campbell presented three papers by M.C.G. Hall on uncertainty analysis and data adjustment in iron and sodium deep penetration problems. A status report on the NEA collaborative programme on uncertainty analysis and shielding benchmark experiments was presented by Rief.

It could be shown that substantial progress in achieving the objectives identified by the 1973 NEACRP had been made. In particular, 6 shielding benchmarks were performed or were close to completion, new methods for multidimensional sensitivity analysis and for data adjustment applicable to large numbers of energy groups and simultaneously to several experiments have been developed and tested. Unfortunately, the compilation of a new data request list for shielding is hampered by the lack of uncertainty assignments for the available data files.

In an attempt to overcome these difficulties, M.C.G. Hall constructed out of the ORNL 15 group covariance matrix by polynomial interpolations in a "backward" approach a coarse variance-covariance matrix for the 100 group EURLIB structure. With this he could meet the target accuracy for certain iron quantities in the analysis of a generic sodium cooled FBR design. He also obtained promising results in a data adjustment calculation of ASPIS.

On the basis of these recent achievements, the NEACRP was asked to sponsor a specialist meeting on shielding benchmark analysis and related topics in Spring 1980. The proposal got general approval; the Committee recommended, however, to confine the proposed agenda as much as possible and to hold the meeting in late 1980, to give participants more time for preparing the meeting. In a further proposal it was suggested (F. Maienschein) and agreed that participants should receive 6 months prior to the meeting detailed information on the different benchmark experiments, in particular ASPIS and EURACOS, to allow them to test their methods. It was also understood that it might be possible to obtain ENDF/B5 co-variance files for a few selected materials in the frame of this action. The meeting will be organized in Paris by P. Hammer in collaboration with J. Butler, H. Rief and G. Hehm, together with a Japanese and a U.S. corresponding member to be nominated by Hirota and Maienschein, respectively.

Debrue summarized the status of the work in the Dutch Nuclear Data Project (NEACRP-A-392). The RCN-2 evaluation of neutron cross sections for fission products is now completed for 43 nuclides. From this evaluation, 26 group capture cross sections have been evaluated, including covariance matrices, with adjustment to fit STEK and CFRMF integral data. Some of the results have been used in ENDF/BV. An intercomparison with CARNIVAL-IV adjusted cross sections was made; the agreement appeared to be very satisfactory. Recent work devoted to the contribution of (n,p) and (n, α) reactions to fission product cross sections will be presented at the NEANDC specialists meeting in Bologna (December 1979). According to request in the DEBENE fast reactor programme, neutron cross sections for nuclides in the primary cooling circuit are also being evaluated (Zn-64, Cr-50, Fe-54).

2. Topics carried over from previous meetings

2.1. Heterogeneous cores, including safety related problems

(In view of the fact that International Symposium on Fast Reactor Physics had been held at Aix-en-Provence the week before the NEACRP meeting this summary was intended to cover the topic as a whole).

The interest in heterogenous fast reactor cores stems from the ability of such cores to improve the performance of fast reactors. In particular they offer the prospect of:

- much lower reactivity gain on loss of sodium,
- improved breeding characteristics,
- reduced radiation damage.

On the other hand, the disadvantages of this type of system lie in:

- the reduced Doppler coefficient of reactivity,
- problems relating to the thermal cycling of the above core structure due to the presence of blanket regions within the core.

Until the Aix meeting little experimental evidence was available to substantiate the claims for heterogeneous core performance. Even now, safety studies for heterogeneous cores remain to be completed so that the overall effects of reduced sodium void reactivity on the one hand and reduced Doppler reactivity on the other remain to be evaluated. The lack of safety related results is probably due to the need to extend some of the safety codes to deal properly with the detailed description of the core with the added complication of internal breeder regions.

Turning to the experimental validation of cores of heterogeneous designs, there were at Aix valuable contributions from Japan, the U.K./ Debene BIZET programme in Zebra, the U.S. ZPPR programme, and from the French Pre-Racine programme in Mazurca. Of these programmes, only the BIZET programme had as its objective the study of the properties of reactors approaching the size of a commercial station; the other studies were of a more fundamental type or related to smaller systems. Even so the BIZET programme had not attempted to mock-up the design of heterogeneous fast reactor favoured at present by the U.K. and German design companies PNC and Interatom. Instead it had studied separately the properties of a core with

- distributed islands of fertile material within a large fissile zone, and
- a re-arrangement of these islands to create a large central breeder zone surrounded by fissile material.

The favoured PNC and Interatom design comprises a combination of these concepts with a fairly large central breeder region. Power flattening in the single enrichment fissile annulus is achieved by interrupted rings of fertile material or "islands".

89180008

The FCA programme in Japan had had as its main objective a basic physics study of the properties of a core with a central blanket zone of varying thickness from 20 cm to 40 cm, surrounded by fissile material axially and radially.

The U.S. contribution presented the analysis of the multiring core characteristics of the CRBR but with more refined analytical methods.

In the French Pre-Racine programme, a central breeder zone had been studied with the emphasis on sodium voiding characteristics relative to those of a conventional design. A feature of the work was the influence of the Pu-240 content of the fuel on sodium voiding in the range from 8 to 18 %.

The detailed analyses of the BIZET results are not yet complete but the following general conclusions can be drawn from the heterogeneous core studies reported:

- Introduction of relatively thin blanket regions - such as the FCA central blanket or the "island" core of BIZET or the multirings of the ZPPR core causes the sodium voiding reactivity to increase in the blanket regions, and to decrease in the core by approximately the same amount. Thus, if such blanket regions are assumed not to lose sodium, then there is a small but useful reduction in sodium voiding reactivity brought about by their presence.
- To effect a substantial reduction in sodium voiding reactivity, it is necessary to introduce a relatively large breeder region such as the large central island of the BZD BIZET core. The leakage of neutrons into this blanket region significantly enhances the negative contribution to sodium voiding reactivity.
- The BIZET work had shown that if this central blanket region is too large, the annular core becomes neutronically de-coupled and undesirably sensitive in its power distribution to small perturbations in the core, such as control rod movements or changes in material composition. For this reason a core with reduced central breeder size had also been studied in the BIZET programme which showed improved power stability, yet retained most of the desired reduced sodium voiding characteristics.
- The properties of heterogeneous cores are not at this stage predicted with the same accuracy as conventional cores, and many of the analyses have pointed to the increased importance of transport corrections to diffusion solutions and the need to improve the prediction of neutron streaming from both pin and plate cells.
- The Pre-Racine work has shown that the sodium voiding reactivity increases with Pu-240 content but the variation is well predicted using Carnival-IV data.
- The interaction effects of control rods are significantly more pronounced in the central breeder heterogeneous design than in conventional cores, but these effects have not proved difficult to predict by diffusion theory.

- Plutonium build up in the central blanket regions has only a very small effect on the sodium voiding performance.
- Predictions of the gamma-ray contribution to internal breeder power in heterogeneous cores by Monte Carlo methods are in good agreement with the TLD measurements carried out in the BIZET programme.

At the Aix meeting, a paper describing the aims of the Racine programme in MAZURCA was presented. One of the main features of this programme is the experimental parametric study of the influence of the position and size of breeder rings on such properties as the radial power form factor and sodium voiding reactivity.

In the design-study papers of the Aix meeting, the range of objectives sought in heterogeneous designs became evident. The Interatom paper had been seeking a design with low voiding characteristics which had been achieved by the relatively large central breeder region surrounded by a fissile region with broken rings or islands of fertile material. In the U.S. work, which had been aiming at cores with less than $2\frac{1}{2}$ \$ sodium voiding reactivity, the size of the central breeder island objective may be more easily attained. A general objective in the French programme has been to improve the in-pile fuel inventory. Those designers whose principal interest lay in improved breeding characteristics - and these were mainly in Russian contributions - mention the advantages of high density fuel (carbide, metal) in the breeder regions. Attention was drawn to the need to minimize the fissile loading to achieve low uranium ore consumption, which may be a more useful measure of overall breeding performance.

The overall impression, however, was that the presently favoured designs for heterogeneous cores were not very dissimilar and only varied in the size of the central breeder region and in the number and arrangement of the relatively thin surrounding breeder regions.

There was general agreement that there is little interest in axially heterogeneous cores of the "parfait" design.

2.2. Power peaking

The only paper on the agenda, Power peaking and its design margin in JOYO, was presented by Dr. Inoue. The paper included comparisons between experiment and theory. Askew drew attention to data on both channel to channel power prediction (± 2 % RMS) and ring to ring power as determined by PIE on AGR fuel.

Several members expressed disappointment that lack of publication prevented a full appreciation of the state of the art on power peaking and on associated problems. This was especially unfortunate because of the important role of power peaking margins in operational safety studies.

In-core measurements were a potential component of such assessments. One paper on gamma thermometry was presented by Bouchard. To date, the neutron component of heating of the thermometer had not been determined. The paper showed the lag to be expected following power changes in the reactor due to the large delayed contribution to gamma flux. Askew said that self-powered detectors were being studied in the SGHWR.

In discussion, the point was made that some additional information was expected to be provided in contributions to the specialists meeting on 3-D rating distributions to be held in November 1979. The problems of relating peak pin powers to measurements in the assembly would also be discussed. In view of this, it was proposed that the topic be raised again in the 1980 meeting to allow further time for contributions and for the results of the specialists meeting to be evaluated.

The suggested specialists meeting in in-core instrumentation should therefore be postponed until 1981 so that a better appreciation of the significance of the problem, and a more precise definition of the scope of the meeting, would be possible.

2.3. Fuel cycles

Several fuel cycles papers were described briefly to the participants. In general, they fell into two categories, those dealing with different reactor design and operating characteristics and those dealing with reactor strategies (scenarios) using various reactor types.

The possibility of using only a single enrichment for equilibrium operation of FBR's inward radial shuffling of fuel has been investigated by M. Cabrillat for two and three region cores. In this study it was found that this shuffling scheme cannot provide simultaneously a good power form factor and a maximum DPA lower than the present limits. However, 3 region cores provide more uniform discharge burnup distributions, better form factors and higher breeding gains than 2 region cores.

From the operation over a period of ten years of the Venus reactor in Belgium which contains a core of mixed oxide fuel, it is possible to deduce from the reactivity changes associated with decay of Pu-241 and growth of Am-241 the half-life of Pu-241 and the effective cross section of Am-241 in a typical PWR spectrum. The Japanese have made similar measurements.

The use of thorium fuel in a typical fast breeder reactor is of interest to INFCE studies. France (and many other countries) have studied this possibility. Their results in common with others show that although using thorium leads to a lower void coefficients and lower fission product absorption, the breeding gain is significantly reduced and the doubling time increased. A number of improvements can be made but the large reduction in breeding gain is most significant if the breeder is to produce fissile material.

Some fuel management methods to reduce uranium consumption in LWR's have been investigated in Norway and it appeared feasible to expect reductions in fuel costs and mined uranium requirements of from 20-30 %. This estimate appears somewhat higher than other estimates.

A rather complete report on some American studies for INFCE, covering design and performance characteristics of a variety of fast breeder reactors as well as reactor strategies involving these and other reactor types optimized to minimize uranium consumption, was provided to participants.

A report on the long term uranium supply and demand situation in Canada suggested that development of advanced fuel cycle technology is urgently required.

3. National programmes

The national reports prepared for NEACRP were presented and discussed. They will be compiled as NEACRP-L-231.

4. Benchmarks

4.1. Review of conclusions from the LMFBR benchmark

A draft of the proceedings of the ANL Specialists' Meeting had been distributed prior to the NEACRP meeting. Among the discrepancies of major concern are the

- prediction of radial power distribution
- control rod worth calculations.

To clarify the situation an analysis of the fission rate measurements on ZPPR has been made at ANL resulting in a 1 % statistical uncertainty. Calculations of the radial fission rate distribution indicated a C/E difference of 2-4 % on the basis of ENDF/B-IV data. The U.K. experience on the large all-plutonium assembly BIZET confirmed the adequacy of the U.K. FDS data in calculating the radial fission rate distribution; no large differences with the German KFK-INR were observed in these experiments.

Therefore, at the present time there is no resolution available to the paradoxical situation where participants whose solutions disagree on the benchmark calculation have each obtained good agreement with experiments on smaller criticals. Hammer said that the differences may not principally be a matter of larger cores but that the data sets were adjusted for different enrichments than those in the benchmark case.

On the discrepancy in control rod worth calculations the discussion concentrated first on theoretical methods used. As was presented by the U.K., the proper description of flux perturbation in control rods was able to remove the observed discrepancy with increasing B-10 content. Because neither Na nor B data had been adjusted in the "adjusted group sets", there is a need to look in more detail into the precision of these data. Some experiments with far-off C/E values might also indicate some experimental errors.

It was also seen from the contributions that there are differences to be expected by applying different processing codes to the same data file.

The topic of control rod worth discrepancy in the benchmark solutions will be followed up by the Committee.

In a further contribution from Germany on the k_{eff} discrepancy between adjusted and non-adjusted sets, it was shown that small differences from adjusted and non-adjusted data are all of the same sign and are accumulating.

In the discussion which followed it was felt that improvements in differential data measurements to that accuracy which is needed to resolve the situation are hardly to be expected in the near future. In predicting the physics characteristics of a fast reactor, bias factors derived from experience in critical assemblies or adjusted data sets can be used for project work. But at the same time it is essential to maintain nonadjusted data files and group data sets for further improvements to be included.

The Committee expressed its appreciation to ANL for the excellent analysis of the results of LMFBR benchmark.

4.2. Hydrogen entry benchmark

It is not likely that substantial efforts would be devoted at either Karlsruhe or Argonne to the steam entry problems of GGFR's. The review by Kiefhaber should be distributed within NEACRP.

4.3. Multi-dimensional kinetics benchmark

Benchmark cases will be set up by Küsters for both LWR and FBR. He will distribute the proposal for comments within next few (~3) months and take appropriate contacts with IAEA in order to see whether non-OECD countries would be willing to participate. To ensure wide participation even from the industrial groups Küsters had already been in contact with KWU on the LWR case.

4.4. Proposal for noise analysis benchmark

This benchmark would be combined with the SMORN-III meeting. Hirota introduced the paper NEACRP-A-384 which was prepared by the Japanese preparatory committee for SMORN-III. The objective of the proposed benchmark is mainly to compare various methods of noise analysis. The test noise data would be distributed a few months before the meeting.

The Committee found the Japanese proposal acceptable and understood that the organizing committee of SMORN-III would pursue the matter further. It was, however, recognized (Bouchard) that the data treatment is only one of the problems but that for the most part the other problems lie aside reactor physics.

5. General

5.1. Highlights of recent meetings of interest to NEACRP

- International Symposium on Fast Reactor Physics (Aix-en-Provence, September 1979)

Hammer summarized the main topics of interest. The conference had dealt with the following areas:

- a) conventional fast cores: design studies and associated experimental programmes
- b) operation of fast power reactors
- c) burnup studies
- d) heterogeneous cores: optimization studies and experimental programmes
- e) calculational methods.

Heterogeneous cores had by far been the most important of these topics. The work on optimizing these cores aims to improved doubling time on one hand and to improved safety characteristics on the other hand. The Committee had a special discussion on heterogeneous cores under the item 2.1 of the technical sessions.

- Nuclear Data of Higher Pu and Am Isotopes for Reactor Applications (Brookhaven, November 1978)

Johnston reported about the meeting referring to the summary prepared by R.E. Chrien. The meeting had surveyed recent results from several measurement programmes. Over the past three years both measurements and evaluations represent a considerable advance on the knowledge of the higher actinides and of their fission cross sections in particular. The meeting had made recommendations concerning the immediate needs of improved cross sections and resonance parameters.

- Transactinide Nuclear Data (Cadache, May 1979)

Bouchard gave the highlights of the meeting which had discussed co-ordinated research programmes and comparison of evaluated data. The two working groups had separately discussed a) decay data and b) neutron data. It was pointed out that over the last four years the number of evaluations has doubled and that the experimental data base has essentially been changed for Pu-240, Pu-242 and Am-242.

5.2. Specialists' meetings planned or proposed

- Third specialists' meeting on reactor noise (SMORN III), October 1981, Tokyo

The meeting will be oriented to applications with one or two sessions on theoretical methods. The organizing committee will

be most likely chaired by Kuroda (Japan). Following other members were nominated by NEACRP: Booth (USA), Bouchard (France), Cox (U.K.), Edelmann (Germany) and Pacilio (Italy). Debrue will inform to the secretariat the name of a Dutch representative.

- Specialists Meeting on 3-D Rating Distributions, November 26-28, 1979, Paris

Askew has been in charge of organizing this meeting. Some 20 papers will be given at the meeting. The Committee was pleased with the number of contributions on operating experience. The reproduction of the proceedings will be supervised by Johnston and these will be sold as an NEA publication.

- ANS/ENS Topical Meeting on Numerical Methods, April 27-29, 1981, Munich

NEACRP will co-operate in organizing this meeting and proposed that Küsters will be on the paper selection committee. The technical program committee is chaired by Dr. Wagner, KWU, and will have its first meeting in San Francisco in November 1979.

- Specialists' Meeting on In-core Measurements

NEACRP will discuss this topic at its next meeting in the light of the experience from the meeting on 3-D rating distributions and after Bouchard has checked whether there would be overlap with the work of International Working Group on Power Plant Instrumentation and Control. The Meeting is likely to be held during the second half of 1981. A letter to IAEA was drafted by the Committee (see Annex 2).

5.3. NEACRP book on the status of fast reactor physics

The remaining two chapters (1 and 2) should be completed by Küsters and the French (Barré, Bouchard, Hammer) by the end of 1979. Thereafter the members would have some 3 months to comment on these chapters. The other two chapters (Campbell, Till) are available in a draft form and await members' comments. Till is the committee member following the remaining steps in the production.

The Committee wished that Richmond would continue as the editor. Fall-back positions (NEA editing, professional separate editor) were found less desirable. It is estimated that the book could come out during 1981.

LIST OF PARTICIPANTS

Delegates:

For Canada Dr. M. Duret (Vice Chairman)
 For Japan Dr. J. Hirota
 Dr. T. Inoue

For the United States of America:

Dr. P. Hemmig
 Dr. F. Maienschein
 Dr. C. Till (Chairman)

For the countries of the European Communities and
the European Commission acting together:

Dr. J. Bouchard (France)
 Dr. P. Hammer (France)
 Dr. H. Küsters (F.R. of Germany)
 Dr. R. Martinelli (Italy)
 Dr. J. Debrue (Belgium)
 Dr. J. Askew (United Kingdom)
 Dr. G. Campbell (United Kingdom)
 Dr. H. Rief (CEC)

For the other European countries of OECD:

Dr. P. Silvennoinen (Finland)
 (Scientific Secretary)
 Dr. P. Wydler (Switzerland)
 Dr. G. Velarde (Spain)

Nuclear Energy Agency:

Mr. J. Rosén
 Mr. P. Johnston (Secretary)
 Dr. D. Johnson

Observers:

Dr. E. Fort (NEANDC)

For technical sessions only:

Dr. Y. Kazanskij (IAEA)
 Dr. Esimenko (IAEA)

According to a well-established rotation the Belgian participant was representing the three BeNeLux countries and the Finnish participant was representing Denmark, Finland, Norway and Sweden.

Apologies for absence were received from Dr. Khodarev, an IAEA observer.

A draft letter to John B. Dee, IAEA

Proposed Specialists Meeting on Inreactor Measurements

(I refer to your letter to J.Y. Barré dated 12th March, 1979.)

The NEACRP considered the topic of inreactor measurements at its October 1979 meeting. It was clear from the papers submitted and from the discussion that significant work on the topic was in progress in a number of member countries, but was, in several cases, still at an early stage.

The Committee noted that many of the issues related to the importance of such measurements and achievable accuracies would be raised in contributions to the specialists meeting on the calculation of 3-dimensional ratings in operating reactors, to be held on 26th-28th November, 1979. Comparison between such calculations and measurements are featured in a number of the papers submitted for this meeting.

Bearing in mind the importance of defining closely the scope of a new specialists meeting if it is to attract the highest quality of contribution, the Committee decided to schedule the meeting for the second half of 1981 and to discuss the topic again, and decide upon the location and topics to be covered, at its 1980 meeting. We trust that this will continue to be of interest to IAEA, and shall be seeking your co-sponsorship once the details are decided.