NEACRP-L-248

NUCLEAR ENERGY AGENCY COMMITTEE ON REACTOR PHYSICS

SUMMARY RECORD OF THE TWENTY-THIRD MEETING

(TECHNICAL SESSIONS)

IDAHO FALLS, U.S.A.
22nd-26th September 1980

Compiled by

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TABLE OF CONTENTS

TECHNICAL SESSIONS

In producing the summaries of the different technical topics the Committee decided to continue the practice adopted in the previous meeting. A Comittee member was assigned to prepare a draft summary for each topic and these summaries were reviewed before the closing of the meeting. The topical summaries to be presented below are based on the drafts by the following Committee members: Till (1.1), Zolotar (1.2 and 2.3), Campbell (1.3), Askew (1.4), Silvennoinen (1.5), Hammer (2.1 and 2.2) and Hemmig (2.4). Technical papers are referred to by their number. A complete listing of all the papers presented in the meeting is given in Annex 4.

1. New Topics

1.1 Structural Materials, Reactivity Effects, and Shielding

Four papers were addressed to this topic. The first, A-405, described an interesting set of measurements in the fast critical assembly ZEBRA of activitions from fast reactor structural component and corrosion product materials. Activity buildup in the primary circuit causes maintenance difficulties so there is consequent interest in the ability of calculational procedures to predict such activitions.

The paper made two principal points. First, state-of-art measurement techniques now allow the use of the zero power facilities for measurements of this kind. Second, calculations predict such activations generally within 20% in the core region. The ability to calculate such activations in the axial blanket is somewhat less, but apparently not significantly so for the purposes for which the calculations are required. Thus, the consensus of the Committee was that the accuracies shown are satisfactory. It was noted, however, that the measurements test the cross section and flux calculations only, and do not bear on the issues of corrosion rates and deposition mechanisms, which are the other half of the design problem.

The second paper, A-406, described an on-going experimental program of null-reactivity measurements undertaken in a joint CEA/CNEN program to assess a wide variety of structural materials. The paper itself concentrated on the French series of measurements with ERMINE facility, but the subsequent discussion included a description of the Italian measurement series as well. In ERMINE, three basic lattices are being studied, a reference lattice, and two structural material-based lattices. One of the latter is primarily nickel and the other is primarily steel. In each of the latter two lattices individual structural materials in a sample are substituted, one-by-one, for the principal structural material in the zone. The program will be completed by the end of 1980, and calculational comparisons are expected early next year.

The Italian portion of the program, being carried out on RB2, will also finish in this time frame. They have a unique feature that provides some special interest. The zones are made up of microspheres of materials, giving, in effect, a homogeneous composition. As heterogeneity effects continue to raise questions in critical assembly measurements in general, the results of these measurements are awaited with some interest.

The third paper on this subject, A-407, was a note submitted by Brookhaven National Laboratory on ENDF/B Structural Data. The paper reviewed the differential data and discussed the ENDF/B Version-V evaluation for iron, nickel, and chromium. Relatively large shifts in the chromium and nickel (n, particle) cross sections were noted. Worths of iron, nickel, chromium, manganese, and molylodenum in fast spectra apparently remain inconsistent.

The final paper, A-408, gave comparisons of ENDF/B-IV and -V calculations with measurements in an all Fe/U-235 benchmark assembly on ZPR-9. The unit cell was a simple, 1-drawer cell with 1/16 in. plate of enriched uranium centered in 2 in. of Fe (with small amounts of stainless steel shims, drawer, and matrix tube). With ENDF/B-V data, the C/E on k-effective was 0.993, on increase of 0.46% from that obtained with ENDF/B-IV. Of the change observed in k-effective C/E, 0.37% was due to the change in iron cross sections -0.16% was due to change in U-235 cross sections, -0.13% was due to the change in fission spectrum of U-235, and 0.22% was due to all other cross sections. Comparison of the effective one group cross sections showed that the iron capture cross section was reduced by 12% by ENDF/B-V data. Corrections to the assembly k for streaming and other transport effects would bring its value very close to unity.

In general discussion that followed the adequacy of the prediction of the neutronics effects of structural materials was discussed. It was first noted that integral measurements several years ago had displayed wide discrepancies between measurement and calculation programs, in data evaluation and adjustment activities, and finally in further, more definitive, integral measurements. Generally the result has been toward reduction in structural material capture cross sections, particularly in Fe. The situation appears to be improving, with improved agreement now being seen, as noted in the final paper. But much work is still going on. When this work is completed, overall assessments will be needed to make definitive statements on the overall adequancy of the structural material data.

1.2 Pressurized Transient Studies

Two papers were presented on this new discussion area. The first one, A-409, discussed Winfrith experience with the RETRAN system transient analysis code. Their initial goals were to familarize themselves with the code, assess its suitability for other United Kingdom users and to study ATWS conditions. While there were some initial difficulties, they found the code to be reasonable effective in ATWS analysis. They have compared results with Westinghouse and RINGHALS 3 predictions and got satisfactory agreement. The

assumptions in the codes are similar however. In the future they will carry out a range of sensitivity studies and will be looking at contingent failures. They have commissioning data for use in validation efforts and will also make use of the US experience.

The second paper A-410 was based on a set of reports published by EPRI giving both the core design and operating data (NP-563) and the reesults of transients and stability tests (NP-564) for the Peach Bottom Unit 2 BWR. In addition, they have published results of a RETRAN analysis (NP-1076-SR). The data is intended for use as a BWR transient benchmark and is available to potential users. RAMONA and MEKIN 3-D calculations have also been carried out under EPRI sponsorship and at least three other organizations have carried out their own analysis. In all cases the axial flux shift in the transient was underpredicted to at least some extent. Similar PWR experiments have been carried out this year at the ANO-2 reactor. Complete reports will be published this fall. Of most interest for reactor physics are the part length and full length control assembly drop measurements. This data may be appropriate for a calculational benchmark.

In additional discussion, Dr. Küsters mentioned that KWU has carried out and analyzed some PWR off-center rod drop experiments. Their conclusions are that transient coarse-mesh methods can agree well with the measurements.

The Committee agreed that discussions in this area should continue at future meetings. There was concern, however, as to where the boundary should be between NEACRP and other parallel international safety groups. It was generally felt that it was appropriate to pay some attention to both feedback effects and to the thermal-hydraulics itself as it affects neutronics. However, involvement in concerns of safety consequences of the transient analysis was considered outside the basic scope for the Committee.

1.3 Problems in the Interpretation and Analysis of Critical Experiments

Attention was drawn in paper L-245 to the need to validate predictions of heterogeneity effects in power reactor geometry, mainly arising from the sub-assembly wrapper and associated sodium. The authors predicts that, relative to the homogeneous model, their treatment of sub-assembly heterogeneity increases reactivity by 0.63%, reduces the maximum sodium void reactivity by 18% and increses the Doppler coefficient by 9.1%. Plans for studying the neutronics properties of fast reactors in realistic geometry in ZEBRA were outlined, partcularly aimed at the effects of radial and axial core distortions arising from energy releses.

Paper A-411 presented further evidence of an overprediction by more than 1% of the reactivity of fuel in pin-geometry relative to plate cells. The initial evidence arose from a fluz tilt induced in a large plate-geometry core in ZEBRA (BZB) by the introduction of a pin-fuelled section. In a later annular core (BZD) progressive replacement of plate fuel elements by pin elements suggests

a reactivity discrepancy of 1.4%. Other evidence stems from pin-fuelled lattices in PROTEUS and from PFR. It is thought that the error may arise from the heteregeneity treatment of plate cells using MURAL, and more direct evidence is being sought from a comparison in ZEBRA of a core of plate cells with a core fuelled mainly with pin cells. Members of the Committee agreed to calculate the plate and pin heterogeneity effects in these cores, details of which would be circulated by the UK. The results of this comparison, and the experimental evidence would be made available to the Committee. Experimental work in the US had shown no evidence of such an effect using a different modelling of plate heterogeneity from that in MURAL.

Paper A-412 reviewed the problems which demand particular attention when using small driven test zones in thermal reactor studies. These were illustrated by their PWR test zones in EOLE and MINERVA. The sophisticated core calculations required to give confidence in the results are outlined, the major benefit from the experimental technique being cheapness and versatility.

Papers A-413, A-415, and A-416 discussed recent fast reactor experimental work in the US. Particular points which arose from these papers are:

- A least squares fit over some 45 different large-zone sodium-void experiments, mainly in ZPPR cores, showed that the reference methods (uncorrected for transport and mesh effects) required correction factors of 0.88 in the leakage term and 0.87 in the non-leakage term to produce the best fit. ENDF/B-IV was used together with ENDF/B-V]-effective values. (These are some 2 or 3% lower than ENDF/B-IV values mainly due to revised U-238 data.)

- Experiments in the large conventional ZPPR-10 cores of the JUPITER programme led to k_{eff} C/F values of around 0.984 based on ENDF/B-IV data and corrected for mesh and transport effects. As in previous large ZPPR cores U-235 fission is consistently overpredicted by 2 and 3% in the outer core regions, relative to the center, Pu-239 fission and U-238 capture show simular trends. Reaction rate C/E-values area as expected, with C/E values for U-238 capture/Pu-239 fission of 1.07 to 1.09, U-238 fission/Pu-239 fission of 0.91 to 0.97, and U-235 fission/Pu-239 fission of 1.02 to 1.03.

- Measurements of]-eff by two different techniques in two Pu-239/U-238 cores led to consistent C/E's of 0.96 $\pm$ 0.025. The C/E value for two U-235 enriched cores (without U-238) by the more accurate noise technique was 1.00 $\pm$ 0.025. It is deduced from this work that the central fuel worth discrepancy of about 15% (using ENDF/B-IV data and Keepin's]-eff values) would be reduced by only 4% due to]-eff errors. It was also noted that the ENDF/B-V value of]-eff for Pu-239/U-238 fuelled assemblies is about 2% lower than the ENDF/V-IV value. This would imply]-eff C/E values of about 0.94 from these experiments.

1.4 Methods of Utilization of Information from Operating Reactors

The papers presented covered a wide range of information from different reactor types.

On fast reactors, paper A-417 described the range of measurements taken on JOYO during both startup and periodic characterization testing. Noise analysis had been succeesfully used as a diagnostic tool to identify malfunctions in the pump of one of the coolant loops. It was intended to compare the test results with a dynamic models of the plant using an on-line process computer, the detailed physics behavior of the core being included from more extensive of-line calculations. Paper A-419 described the further development and testing in PHENIX of a reactivity balance meter intended for SUPER PHENIX. The model allows for feedback effects due to burnup, and of neptunium, pressure, inlet and other temperatures which are treated independently. It was anticipated that reactivity could be determined to within 5×10^{-5}.

Papers A-421 and A-422 summarized the improvements made to simulation models of a BWR core using information from the operating reactor. Changes in the resonance integral of Pu-239 and in energy per-fission had been deduced from diverse measurements, including gamma scanning and destructive analysis of discharged fuel for which results were given. In contrast, the thermal hydraulic model improvements had been introduced mainly on the basis of out-of-pile studies.

During the startup phase of the CAORSO reactor a number of additional measurements, including noise analysis, were made which proved to be of value. The data on the performance and burnup of the gadolinium rods had been provided by the vendors. It was commented that Muhleberg has some burned up fuel and will be undertaking experiments to check the accuracy of preditions of gadolinum. Further data from operating BWRs were included in paper A-423. A great deal of detailed information has been collected with a view to benchmarking reactor models, and a fuller set of data was available in EPRI reports. In addition, isotopic compositions were available for rods which had been gamma scanned, and the results would be published by the end of 1980. Comparisons with the SIMULATE code shows generally good agreement but with overprediction of the axial power shape at the top of the core.

Paper A-423 also contains somewhat less detailed operational data for the Zion PWR. Here the gamma scan data were on an assembly average basis. Paper A-420 describes the design of experiments aimed at checking to $\pm 10\%$ the Doppler coefficient in an operating PWR. It was concluded that rod drop measurements were to be preferred to the more usual technique of power perturbation by small movements of a control rod and that best results would be observed by measurement early in the cycle when the moderator temperature coefficient was smallest. Fuel temperature was the biggest contribution to uncertainty.

Paper A-418 addressed the problems of an automatic route for the progressive adjustment of the few group constants used in a rector simulation so as to fit information about reactivity and power distribution from operating reactors. A mathematical technique for fitting was described and applied to data from the 100MW(e) SGHW reactor. The fitting was applied to successive core states and it was shown then there was evidence that the required data changes persisted in time. There was thus a good likelihood that the position would be further improved by a learning procedure including time. Paper A-423 described a mini-computer system intended to track the performance of a plant and to compare it with the predictions of a 3-D nodal model which could be updated in five minute intervals. EPRI had a joint program with Hitachi on a simple adaptive note to improving the model, but the nodal code parameters have not varied automatically. The system was used for BWR plant but it was intended to extend the model and to apply it to PWRs.

The Committee noted that valuable information was now becoming available from operating reactors, and was beginning to have an important bearing on improving models and data for such reactors. In particular, it appeared that adaptive methods would become an important area of methods development.

It was the first time that such data have been made available to NEACRP, and the presentations had, in consequence, been rather diverse. It was agreed that it would be valuable to continue to consider information of this kind at the Committee, but that its future items would be specified in more detail on the agenda so as to focus discussion on more specific topics.

1.5 Miscellaneous

Paper A-424 considered a small PWR model problem that had been analyzed by diffusion theory and by a number of transport theory methods including Monte Carlo. The work was intended for verifying the consistency of the proven methods in use at Winfrith.

Paper A-426 described the status of work at Cadarache on the sensitivity of determining actinide build-up. As an application of the French code PESTE, the sensitivity of the build-up of Pu-238, Am-241, Am-243, Cm-242, and Cm-244 had been studied for the major contributing isotopes. The paper identified the nuclear data that are important in the build-up of the isotopes considered and concluded in particular that only few if any integral experiments are avilable to check and improve the Am- and Cm- build-up related data. Irradiation experiments in Phenix are expected to improve the situation.

Martinelli had compiled a comprehensive survey of the activities of the International Working Group on Reactor Radiation Measurements (A-427). This group was established by IAEA in 1967 but now it appears unlikely that the WG will be reconvened, since IAEA does not seem to consider IWGRRM activities a primary issue in first priority programmes (technical assistance and safety guidance to developing

countries). The areas of activity of the group have included standardization of neutron measurements, characterization of benchmark neutron fields, intercomparison of spectrum unfolding techniques and assessment of spectrum sensitive irradiation exposure indices. There is still a project underway (REAL-50) with the aim to arrive at a realistic value for the uncertainty in integral radiation damage parameters such as the displacement rate derived from calculations using unfolded spectra.

Paper A-428 considered the treatment of internal voids in diffusion theory. The method was applied to analyze the streaming of neutrons through the hodoscope slot in TREAT reactor at ANL-West. The method employes transfer matrices that correlate the entering and outgoing currents across the slot.

2. Topics Carried over from Previous Meetings

2.1 Heteregenous Cores

Four papers, A-429, 430, 431 and 432, concerning the heterogeneous core design studies were presented and a comment on the UK BIZET program devoted to heteroegneous configurations was given. Following conclusions were drawn by the Committee:

- The possibility of going from a homogeneous core to a heterogeneous one through a single intermediate loading, if assessed by complimentary mechanical and thermohydraulic studies, confirms the flexibility of the heterogeneous concept. This flexibility would allow to load successively in the same vessel - withoud moving the control rod mechanisms - a homogeneous core and a heterogeneous one with a high fertile to fissile ratio providing a high breeding gain.

- Simplified methods (nodal method for spatial calculations taking into account only the first harmonic, point kinetics approximations) are not sufficient for evaluating local parameters related to transient situations of heterogeneous cores.

- As far as safety is concerned, the comparison of homogeneous and heterogeneous concepts which is still in progress and does not lead to clear conclusions:

  (i) the accident situation to be accounted for is not clearly identified, and the preliminary conclusions made depend strongly on the accidential sequence used,

  (ii) for a given sequence, if the duration of sodium boiling is longer for the heterogeneous core than for the homogeneous one it must not be neglected that the accumulated energy can be significantly higher,

(iii) concerning the sodium-void effect, it is not yet clearly demonstrated that a low sodium void will improve the safety characteristics of the heterogeneous concept with regard to the homogeneous one.

The preliminary results of the BIZET program analysis indicate that the diffusion theory - which gives satisfactory results for conventional cores - is not sufficient for analyzing the fission rate distribution in heterogeneous configurations nor for sodium void effects.

2.2 Neutron Deep Penetration Studies

Blanket studies performed by CEA-CNEN and by UK were described. The theoretical studies of CEA-CNEN are supported by a specific program developed on TAPIRO. A systematic analysis of previous experiments performed at ZEBRA was made in the UK study.

Both contributions confirm the necessity of

- calculating the flux distribution through the blanket with transport theory,
- taking into account the blanket heterogeneity during the cross section preparation, and
- describing appropriately the spectrum effect on the self-shielding factor at core/blanket and blanket/shielding interfaces.

2.3 Core instrumentation

The single paper, A-434, discussed measurements in several reactors which were intended to assess the uncertainties inherent in on-line determining of the LWR core power distributions. In BWRs, gamma scan measurements have been compared with process computer power determinations in two reactors. With conventional thermal detectors, errors exist which can be minimized with the use of new gamma detectors. However, the current process computer power location introduces other errors. In PWRs similar comparisons have been utilized which show that either fuel type or location dependencies exist.

Further discussion showed an international interest in the subject. However, the consensus was that currently the subject is not sufficiently defined for a specialists' meeting. Thus, the NEACRP Specialists' Meeting on In-Core Instrumentation tentatively scheduled for the 2nd half of 1981 was deferred and will be discussed again at the next NEACRP meeting.

2.4 Out-of-Pile Criticality Problems

Paper L-246 compared calculations using the Keno-II Monte Carlo code and ANISN ID transport code with six CEA and six Battelle (PNL) experiments. K_{eff} calculations using the Hansen-Roach 16 group cross sections agreed well with PNL experiments but were approximately 1.5% low for the CEA experiments. Published details of the CEA experiments were not sufficient to determine the reasons for the discrepancies. The French representatives confirmed that any futher information needed would be made available. The Committee noted probable limitations on the use of the H-R cross sections outside the range of available experiments. Paper L-247 explored the criticality conditions for the design of annular tanks containing Pu-H_2O solutions as a function of Pu concetration, tank dimensions, wall thickness, absorber, and reflector conditions using the ANISN code with H-R cross sections. Paper A-435 noted large discrepancies in an intercomparison of calculations on a dry 8% Pu-mixed oxide water reflected sphere, recent interest in the effect of misting or condensation effects on fuel element storage arrays, the listing of papers presented at the ANS topical meeting on Criticality Safety, April 1980, and the efforts planned on CSNI benchmark calculations.

The value of further calculational comparisons were discussed by the Committee along with the possibility that advanced reprocessing applications might require further criticality experiments of reactivity monitoring.

3. National Programmes

The national reports prepared for NEACRP were presented and discussed. They are consolidated in NEACRP-L-244.

4. Benchmarks

4.1 LMFBR Benchmark

The final document (ANL-80-78, NEACRP-L-243) of the original LMFBR benchmark has been released. The Committee discussed a proposal prepared by Hammer for a further international LMFBR benchmark dealing with burn-up calculations on the same fast reactor core as the first benchmark. The proposal given in NEACRP-A-439 was approved by the Committee with the understanding that if there are any difficulties with the simplified heavy isotope chains proposed, participants could use their standard method.

In order to leave an adequate time for preparing the comparison document for the next NEACRP meeting, all participants are requested to mail their results to Dr. Hammer by April 1981.

4.2 Multidimensional Kinetics Benchmark

Appreciating the difficulties in getting experimental results the Committee asked Dr. Zolotar to find out wherher operating data from Peach Botton were available for a NEACRP benchmark. If so, Zolotar and Küsters will prepare a draft proposal. While the Committee felt that this should be done early enough to permit a discussion at the next NEACRP meeting it was emphasized that even a delayed proposal would be welcome. Zolotar and Küsters will distribute the draft proposal to the members as soon as possible.

4.3 Noise Analysis Benchmark

In connection with preparations for SMORN III Dr. Hirota had prepared the specifications for a noise analysis benchmark (NEACRP-A-436). The benchmark involves a comparison of analyses of synthesized BWR noise data, operating PWR noise data, and FBR noise data from Phénix. The source noise data as well as the reporting format will be sent to the participants in January 1981. An application form must be sent to Dr. Hirota by the end of 1980. The SMORN III meeting will be held in October 1981, c.f. item 5.2.

5. General

5.1 Highlights of Recent Meetings of Interest to NEACRP

- International Conference on Nuclear Waste Transmutation (Austin, Texas, July 1980)

  The Meeting had concluded that actinide partitioning and transmutation are technically feasible. However, given the low rates of fissioning in LWRs and assuming highly reliable burial alternatives, risk-benefit considerations do not justify implementation of partitioning-transmutation in LWRs. Incentives where FBRs provide good fissioning rates and/or the reliability of burial is questioned have not been closely examined.

- 2nd Technical Meeting on the Nuclear Transmutation of Actinides (Ispra, April 1980)

  The subject area of this meeting was overlapping that of the Austing meeting. The basic conclusions were very much the same. Furthermore, it was concluded that the presence of by-product actinides would not raise severe reactor physics problems. In view of the existing ICRP figures for ingestion of radionuclides, the long term radiological risk would be reduced only marginally because the risk from disposing of the actinides in an underground repository is assessed to be small.

- Calculation of 3-Dimensional Rating Distributions (Paris, November 1979)

  Coarse mesh methods have been demonstrated to yield accuracies of ±2 per cent for relative assembly power. Interpretation of the in-core measurements are expected to have an error of the same order. Not much information is available on how to extract pin ratings from the full core calculations. There is an increasing interest in the development of adaptive models that aim to a better prediction capability by means of systematic adaptation of the codes to agree with the measurements.

5.2 Specialists' meetings planned or proposed

- 3rd Specialists' Meeting on Reactor Noise (SMORN III), October 26-30, 1981, Tokyo

  The Japanese authorities had approached NEA proposing that the date of the meeting would be postponed until March 1982. Since some members express a preference for the date originally proposed, the Committee recommends that the original date is held to unless it is impossible for the host to arrange the meeting. The final information sheet and call for papers would be generally distributed as soon as possible. A draft was available as NEACRP-A-404.

- NEANDC Specialists' Meeting on the Capture Cross Section of Important Reactor Materials, tentatively planned for April 1981, Argonne

  The programme of the meeting is being written up. Only fast reactor materials are considered. The expected date is in April 1981. Attendance will be limited to some 25 participants including 10 participants from outside the US.

- Specialists' Meeting on Nuclear Data and Benchmarks for Reactor Shielding, October 27-29, 1980, Paris

  A participation of about 40 scientists is expected at this meeting. Reports on a number of iron shielding benchmark experiments and the associated nuclear data analysis will be presented. The Committee discussed the strong interest of scientists involved in such work for the cross section uncertainty matrices prepared for the US evaluation in the ENDF/B-V file. Benchmark experimental data from Euratom and the UK has been made freely available, but no agreement on the release of the ENDF/B-V files has yet been reached.

- ENS/ANS Topical Meeting on Numerical Methods for the Solution of Nuclear Engineering Problems, April 27-29, 1981, Munich

  The programme of the meeting will be finalized at the programme committee meeting in early October 1980. The topics cover both traditional areas such as radiation transport and integral transport theory as well as more specific areas such as coarse mesh methods, methods for power distribution control; use of parallel microprocessors, etc.

- Design Features Affecting Dynamic Behaviour of Fast Reactor Core, to be organized by the International Working Group on Fast Reactors, Spring 1981, Rome

  The Committee members are requested to comment on the proposed subject area to their respective national members of the working group. Comments should reach the Italian working group member by the end of October 1980. The Committee felt that as far as this topic is concerned there has not been much new input from reactor physics since the Aix meeting in 1979. There are safety related studies underway but it is not expected that results would be available by the date proposed.

- NEACRP Specialists' Meeting on In Core-Measurements, 1982

  Following correspondence with IAEA during 1980, the Committee found that it could take the lead in the organization of a specialists' meeting in 1982. The topic of the meeting would be restricted to the interpretation of 'in-core' measurements. Although there is a significant amount of work in progress, the Committee preferred to defer the meeting until at least 1982 to allow memebers to define more precisely the appropriate scope of a specialists' meeting. The matter will be discussed at the next Committee meeting again.

5.3 NEACRP Book on Fast Reactor Physics

Küsters and Hammer will complete their chapters by the end of 1980. The members are still invited to also comment to Campbell and Till on the two other chapters. As the editor, Richmond is expected to devote only a minimum effort in the substance of the book. Johnston will make arrangements with the OECD printing office for publication late in 1981.

ANNEX 1

LIST PARTICIPANTS

Delegates

For Canada	Dr. M. Duret	(Vice Chairman)
For Japan	Dr. J. Hirota	
	Dr. T. Inoue	
For the USA	Dr. P. Hemmig	
	Dr. B.A. Zolotar	
	Dr. C. Till	(Chairman)
For the countries of the European Comminities 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. 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)
	Dr. T. Skardhamar	(Norway)
Nuclear Energy Agency	Dr. P. Johnston	(Secretary)
For technical sessions only	Dr. M.J. Lineberry	

Apologies for absence were received from Dr. Bustraan (Netherlands). Following a well-established rotation, the Scandinavian countires were represented by Mr. Skardhamar from Norway.

Annex 2

NEACRP
Documents Presented at the 23rd Meeting
Argonne National Laboratory, Idaho Falls, Idaho, USA
September 22-26, 1980

"L" DOCUMENT NO.

NEACRP-L-243	LMFBR Intercomparison Benchmark Report	
L-244	Reactor Physics Activity Reports	
	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Euratom, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, USA, USSR, UK	
L-245	Fuel Pin and Subassembly Heterogeneity Effect on Neutronics Properties of a Fast Power Reactor	T. Kamei, T. Yoshida
L-246	Validation of KENO-II ANISN and Hansen-Roach Cross-Section Set on Plutonium Solution Systems	T. Matsumoto, M. Takami, R. Yumoto
L-247	Calculational Investigations on Designing Methods of Fuel Thicknesses of Annular Tanks for Plutonium Solutions	T. Matsumoto, R. Yumoto

"A" DOCUMENT NO.

NEACRP-A-400	An Assessment of the Accuracy Requirements on Higher Actinide Nuclear Data for Fast Reactors	B.H. Patrick, M.G. Sowerby
A-402	NEA Data Bank Activity Report	
A-403	Progress Report on Belgian Contribution to the USNRC Neutron Transport Theory Blind Test in a LWR Pressure Vessel Benchmark	A. Fabry
A-404	Information Sheet for SMORN III	
A-405	Integral Studies of Fast Reactor Component Activation in ZEBRA	J.E. Sanders, W.H. Taylor
A-406	Experimental Study of Structural Materials Capture in Fast Breeder Spectra	M. Darrouzet, F. Lyon, G. Rimpault, L. Martin Deidier

NEACRP-A-407	Note on ENDF/B Structural Data	P.F. Rose, M. Divadeenam, A. Prince
A-408	Measurements and Calculations for the ^{235}U/Fe Benchmark Assembly on ZPR-9	R.D. McKnight, D.C. Wade
A-409	Winfrith Experiment of RETRAN for PWR Pressurized Transients with Particular Emphasis on ATWS	S.R. Kinnersly
A-410	Pressurized Transient Studies	B.A. Zolotar
A-411	Further Studies of Heterogeneity Problems of Plate and Pin Cells in ZEBRA	J.M. Stevenson
A-412	Some Problems Related to the Small Zone Experiment Analysis	A. Santamarina
A-413	Recent Developments in Predicting Sodium Void Reactivities	C.L. Beck, M.J. Lineberry
A-414	ZPPR Studies of Control Rod Worths in Large Homogeneous LMFBRs	H.F. McFarlane, P.J. Collins, G.L. Grasseschi, H.A. Harper
A-415	Experiment Studies of 6000-Litre LMFBR Cores at ZPPR	S.G. Carpenter, P.J. Collins, C.L. Beck, J.M. Gasidlo, R.W. Goin, R.E. Kaiser, D.W. Maddison, D.N. Olsen
A-416	A Comparison of Effective Beta Measurements on Plutonium- and Uranium-Fueled Fast Critical Assemblies	E.F. Bennett
A-417	Utilization of Information from Operating Reactor JOYO	S. Tamura
A-418	A Review of the Principles of Correlation Procedures and the Delilah Method of Correlation, with Application to the Winfrith SGHW Reactor	A.N. Buckler
A-419	Reactivity Balance Meter: Feed-Back Effects Measurements at Phenix	J.C. Gauthier
A-420	Measurement of Doppler and Thermal Exchange Coefficients in a PWR by Analyzing the Dynamic Response After a Rod Drop	P. Bernard
A-421	Experience-to-Theory Feedback in the Development and Application of Core Performance Evaluation Methods	S. Felici, P. Peroni

NEACRP-A-422	Special Tests at CAORSO Start-up for BWR Simulator Methods Verification	S. Grifoni
A-423	Methods of Utilization of Information from Operating Reactors	B.A. Zolotar
A-424	The Analysis by Several Neutron Transport Methods of a Small PWR Model Problem	M.J. Halsall
A-425	Summary of the Second Technical Meeting on the Nuclear Transmutation of Actinides	W. Hage
A-426	Application of Sensitivities to Actinide Build-up Problems	J.C. Estiot, G. Palmiotti, M. Salvatores
A-427	A Survey of IWGRRM Activities	R. Martinelli
A-428	Treatment of Internal Rectangular Voids in Diffusion Theory	E.M. Gelbard, R.M. Lell, C.H. Adams
A-429	Preliminary Neutronic Studies of the Compatibility Problems Between the Heterogeneous and Homogeneous Core	J.C. Cabrillat
A-430	Flux Tilting in Fast Reactor Systems: Considerations of System Geometry and Composition on Eigenvalue Separation	Y. Orechwa
A-431	Neutronic and Thermal-Hydraulic Space-Time Effects in Large Homogeneous and Heterogeneous LMFBRs	Y. Orechwa
A-432	A Study on the Potential Safety Advantage of Heterogeneous LMFBRs (II)	K. Miyagi, H. Laziwara, I. Komatsu, K. Susuki, K. Aoki, I. Ohtake, T. Inoue, T. Yokoyama
A-433	Blanket Studies at CEA: Status of the Art	M. Salvatores
A-434	Core Instrumentation	B.A. Zolotar
A-435	Notes on Out-of-Pile Criticality Problems	P. Hemmig
A-436	Framework of Reactor Noise Analysis Benchmark Tests for SMORN III	Japanese Preparatory Committee of SMORN-III
A-437	Nuclear Data Needs for the Analysis of Generation and Burn-up of Actinide Isotopes in Nuclear Reactors	H. Küsters
A-438	Comments on the Draft Proceedings of the NEACRP/IAEA Meeting on the International Comparison Calculations.	R.D. McKnight