PROGRAMME PROGRESS REPORT

January - June 1982

COMMISSION OF THE EUROPEAN COMMUNITIES
JOINT RESEARCH CENTRE
Ispra Establishment
Italy
Central Bureau for Nuclear Measurements
Geel Establishment
Belgium
Petten Establishment
The Netherlands
European Institute for Transuranium Elements
Karlsruhe Establishment
Federal Republic of Germany

Specific support for the Commission's sectoral activities

Informatics
Support to safeguards
Support to the Community Bureau of Reference
Training and education ◀
Utilization of research results
Provision of scientific and technical services

COMMUNICATION

Category **1.0**
Nr **4005**

Programme Progress Report - JRC Ispra
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SERVICE AND SUPPORT ACTIVITIES
Education and Training

Abstract

During the period November 1981-June 1982, 10 courses or Seminars of a total duration of 55 days, were held at JRC-Ispra as part of the Education and Training Programme.

Their subjects were related to three main areas:
Nuclear Science and Engineering (4 Courses), Energy Systems and Technology (2 Courses) and Radioprotection (4 Courses).
One of them was the first Ispra Course run especially for participants from developing countries.

An overall evaluation of these courses and of the progress of the education activity at Ispra to date is given.
Then follows a detailed report on each of the courses held during the period reported.

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INTRODUCTION

The "Education and Training" Programme has three main goals:

- to contribute to the dissemination of scientific and technical knowledge
- to contribute to exchanges and links between European scientific workers
- to help satisfy the demand for continuing education for scientific and technical staff

in scientific areas covered by the research programme of the JRC.
It is implemented by organizing at Ispra the so-called «Ispra Courses».
These consist of short courses and educational seminars designed for external participants with a scientific of technical background and some academic or professional experience. The courses should help them to specialize in a given field, or to deepen or widen their own expertise.
The need to train specialists from developing countries, explicity considered in the 1980-1983 programme decision, is progressively taken into account by the choice of appropriate subjects of courses and the organization of courses especially designed for them.
Teaching is provided by both JRC scientists and external specialists invited as guest lecturers. The Education and Training programme is provided with a manpower of 9 research-men and a specific budget allocation of 131.000 Ecu in 1982.
The registration fees paid by the participants also contribute to the financial resources of the programme.
The 1982 Programme of Courses, announced in autumn 1981, consisted of 16 Courses, lasting between 3 days and 3 weeks, in the following fields:

- Nuclear Science and Engineering	4 courses
- Energy Systems and Technology	4 courses
- Resources	1 course
- Health Physics/Fisica Sanitaria	5 courses
- Environment and Chemistry	2 courses

For further information, please contact the Programme Manager

EXECUTIVE SUMMARY

B. Henry

1 Courses held during the reporting period*

The following courses or seminars have been held:

Nuclear Science and Engineering

- "Mathematical and Statistical Methods in Nuclear Safeguards" Course, 5 days, (MMNS/81)
- "Multiphase Processes in LMFBR Safety Analysis": Seminar, 4 days (MPSA/82)
- "Operation Behaviour in Abnormal Conditions": Course, 3 days (OT/82)
- "Quality Assurance in Nuclear Plants": Workshop, 2 + 2 days (QA/A-B/82)

Energy Systems and Technology

- "Performances of Solar Energy Converters": Course, 3 + 3 days (PSEC/82)
- "National Energy Planning and Management in Developing Countries": Seminar, 10 days ES-e/82)

Health Physics/Fisica Sanitaria

—"Fondamenti di Radioprotezione": Course, 10 days (RP-A/82)
- "Radioprotezione negli Impianti Nucleari": Course, 10 days (RP-C/82)
- "Thermoluminescence Dosimetry": Course, 5 days (TLD/82)
- "Fondamenti di Sorveglianza Medica della Radioprotezione"**: Course, 10 days (RP-D/82)

Some relevant data on these courses or seminars are given in Table I, while a summary of the evaluation of the courses by the participants is given in Table II.
The two courses "Performance of Solar Energy Converters" and "Mathematical and Statistical Methods in Nuclear Safeguards" which concluded the year 1981 received a satisfactory response.

The former, a product of the experience gained with the European Solar Test Installation (E.S.T.I.) operated at Ispra, was an attempt to further specialize our courses on solar energy, as suggested by the experience of previous years. The latter marked a revival of the Ispra Courses in the field of nuclear safeguards. Unlike the courses held in the past, which were practically oriented, this one was characterized by a high theoretical content and the themes tackled were an incentive for a very active scientific discussion.

The first semester of 1982 was very full, with 8 courses or seminars, extended over 12 weeks (55 days), nearly as many as in the whole of 1981. The domain of radioprotection was particularly well treated with four courses, all repeats of previous years. Three of them belong to series fo courses given in Italian covering the whole spectrum of radioprotection theory and practice: fundamentals, applications in industrial, medical and nuclear plant environment, and medical survey. The courses have been given since 1974 and the renewed interest from Italian external bodies in them already shown in 1980-81, has been further reinforced this year.
The course "Thermoluminescence Dosimetry" was a second repeat (previous issues in 1977 and 1979), again in cooperation with the University of Giessen, Germany. Again this year its specialized and advanced character seems to have been fully appreciated by the participants.

* November 81-June 82
** in Italian

Three events of this semester were related to nuclear safety and had the character of seminars or workshops rather than of actual courses. The Seminar "Multiphase Processes in LMFBR Safety Analysis" achieved its aim, to up date to one given in 1980, but did not however have as many participants. The decrease of LMFBR research in many European countries combined with the very advanced and specialized characteristics of the subject seems a reasonable explanation. The Workshop "Operator Behaviour in Abnormal Conditions" was also a repeat of the one held in 1981 where many registrations could not be accepted. There were only 12 external registrations this year. Perhaps, the renewed consideration of this aspect of operational safety, influenced by the Three Mile Island reactor accident, is already decreasing. The workshops on "Quality Assurance" were a new initiative, intended to bring together persons who deal with quality assurance problems during installation, commissioning and operation in nuclear reactors, and speakers having an extensive personal experience of these problems. The response in terms of participation has been encouraging. The participants seem to have better appreciated the programme content than its practical achievement in the lectures and discussion: many of them expected to find a direct solution to their own problems, which was obviously not always given.

2 Specific projects for Developing Countries (D.C.s.)

The centrepiece of the Education Programme in this semester was the Seminar "National Energy Planning and Management in Developing Countries". Previously planned for October 1981, it was postponed to May 1982 because of delays in the grant attribution process, framed within the cooperation agreements of the E.E.C. with D.C.s. (F.E.D. and others). This course was the first of those especially planned for developing countries in the 1980-1983 JRC programme. This first initiative was clearly welcomed by the invited countries: in spite of the fact that the cost of the participant grant was to be deducted from the credits open to them by the cooperation agreements, 18 among the FED, Mashreq and ASEAN countries delegated one participant. Moreover, 15 non-associated countries invited by the DG XVII also delegated one participant. Nearly all the participants were senior energy planning officials in their own countries, as expected. This seminar required an outstanding managerial effort, especially because of the complicated registration and grant attribution processes and the organization of an energy study tour in Europe after the 2 weeks lecture sessions in Ispra.
It is felt that this effort was rewarding and that a service of high quality was supplied by the JRC under the headings of energy cooperation between the EEC and the DCs.
The same Seminar in French is planned for October 1982. French speaking countries from the F.E.D. and Maghreb have been invited to send delegates.

Another event concerning D.C.s is the repeat planned for September 1982 of the "Remote Sensing for Land Use Inventories" Course, where applications of R.S. to land use in Mediterranean areas will be emphasized. Lastly a significant investment of time has been made in preliminary studies for an "Institute for Scientific Education and Cooperation" to be operated at Ispra, in view of the next JRC multiannual programme proposal.

3 Publication of Course Proceedings

Since the last progress report, seven books of preceedings have been issued and eight new projects of publication have been launched.
The present situation is as follows (details in Table III):
- 16 books issued
- 8 books in preparation

4 Cooperation with external organizations

Some of the reported courses have been organized in cooperation with external organizations, namely:
- Associazioné Italiana di Radioprotezione: RP-A/82 and RP-D/82
- Physikalisches Institut of the Justus Liebig Universität, Giessen: TLD/82

5 Conclusions

The Education activity at Ispra was important during the reported period from several points of view number and duration of courses held, level of participation, and the inauguration of courses for D.C.s. Experience with the "National Energy Planning and Management" Seminar shows that Ispra has a useful role to play in scientific and technical education for development, but more efficient operation should be sought, in particular through improved coordination with other D.G.s concerned.

Table I. Data on Ispra Courses held during the period November 81 - June 82

Course Reference	Date	New : N Repeated : R	Language	Duration (days)	Nr. of part. ext.	Nr. of part. ext. + int.	Nr. part. x days	Nr. of lecturers int.	Nr. of lecturers ext.	Nr. of lecturers total
PSEC-A/81[1]	11-13.11.81	N	English	3	20	22	66	4	5	9
PSEC-B/81[1]	16-18.11.81	N	English	3	38	40	120	6	5	11
MMNS/81[2]	30.11-4.12	N	English	5	31	37	185	5	7	12
RP-A/82[3]	15-26.3.82	R	Italian	10	39	42	420	6	8	14
MPSA/82[4]	29.3-2.4.	R	English	4	12	16	64	3	7	10
RP-C/82[3]	19-30.4.	R	Italian	10	21	25	250	9	8	17
ES-e/82[5]	3-26.5[a]	N	English	10[b]	33	33	330	2	21	23
TLD/82[6]	24-28.5	R	English	5	26	28	140	2	14	16
RP-D/82[7]	1-11.6	R	Italian	9	21	22	198	5	9	14
OT/82[8]	14-16.6	R	English	3	25	25	75	1	1	2
QA-A/82[9]	21-22.6	N	English	2	30	34	68	1	6	7
QA-B/82[9]	24-25.6	N	English	2	34	38	76	1	5	6

Course Coordinators:

(1) G. Beghi, New Energies Programme (2) F. Argentesi, Information Analysis and Handling Division (3) A. Benco, Radioprotection Division (4) A.V. Jones, Information Analysis and Handling Division (5) H. Neu/D. Bain, Systems Analysis Division (6) M. Oberhofer, Radioprotection Division (7) M. Giubileo, Medical Service (8) R. Misenta, Systems Analysis Division (9) R. Matfield, Super Sara Division.

NOTES:

(a) Including the Energy study??? in Europe

(b) Duration of the Ispra session, without the ???

Table II. Summary of the Evaluation of the Courses by the participants [a]

	No. particip.	No. answers	Programme content (1)	Programme content (2)	Programme achievement (1)	Programme achievement (2)	Organization (1)	Organization (2)	Logistic (1)	Logistic (2)	Comprehensive appreciation (1)	Comprehensive appreciation (2)
PSEC-A-81 -B/81	40	35	7	7,5	7	7,2	9	8,7	8	8,5	8	7,9
MMNS/81	37	32	7	6,9	7	6,9	8	8,3	8-9	8,2	7	6,7
RP-A/82	42	36	8	7,3	6	6,4	8	7,7	8	8,5	7	6,9
MPSA/82	16	7	8	7,6	7	7,6	7	7,9	9	8,5	8	7,9
RP-C/82	25	22	8	7,8	7	7,7	8	8,2	10	8,5	8	7,6
ES-e/82	33	30	7-8	7,4	7	7,2	8	8,0	8	7,9	8	7,4
TLD/82	28	22	8	8,0	8	7,9	8	8,5	8	8,4	8	8,2
RP-D/82	22	20	8	7,7	8	7,5	8	8,6	8	8,2	8	7,8
OT/82	25	22	8	6,9	7	7,5	9	7,8	9	8,3	8	7,7
QA/82	38	28	7	6,8	6	6,6	8	7,7	8	8,0	7	7,1
												7,52 average

(1) most frequent vote

(2) average vote

(a) Participants are invited to give a vote between 0 (min. vote) and 10 (max. vote) on each one of the following aspects of the course: programme content, programme achievement, organization, logistic, general appreciation. The scale of the vote is qualified as follows: 0 - 1: very bad — 2 - 3: bad — 4 - 5: poor — 6: fair — 7 -8: good — 9 - 10: excellent

Annex III

ISPRA COURSES

Proceeding already published

Title	Editor(s)	Abbreviation/ Date of the course	Year of publication	Publisher
* Advances in Composite Materials	G. PIATTI	none/ 25-29.10.1976	1978	Applied Science Publishers London (U.K.)
* Advanced Seminar on Remote Sensing Applications in Agriculture and Hydrology	G. FRAYSSE	A: 21-29.11.77 B: 30-11-2.12.77 RS/A-B/77	1980	A.A. Balkema, Rotterdam (NL)
* Biological Aspects of Freshwater Pollution	O. RAVERA	FWP/78 5-9.6.1978	1979	Pergamon Press, Oxford (UK)
* Advanced Course on Structural Dynamics	J. DONEA	SD/78 9-13.10.1978	1980	Applied Science Publishers London (UK)
* Creep of Engineering Materials and Structures	G. BERNASCONI G. PIATTI	CR/78 6-10.11.1978	1979	Applied Science Publishers London (UK)
* Advanced Seminar on Fracture Mechanics	H. LARSSON	FM/79 2-6.4.1979	1980	Applied Science Publishers London (UK)
* Solar Thermal Power Generation	G. GRETZ	STPG/79 3-7.9.1979	1980	Elsevier Sequoia, Lausanne (CH)
* Thermoluminescence Dosimetry	M. OBERHOFER	TLD/79 12-16.11.1979	1981	Adam Hilger, London (UK)
* Energy Storage and Transportation: Perspectives for new Technologies	G. BEGHI	EST/79 22-26.10.1979	1981	Reidel, Dordrecht (NL)
* Application of Remote Sensing to Production Forecasting in Agricolture	A. BERG	RS/79 15-19.10.1979	1981	A.A. Balkema, Rotterdam (NL)
* Design and Technology of Solar Heating and Cooling Systems for Buildings	E. ARANOVITCH	DTSH/79 11-15.6.1979	1981	Elsevier Sequoia, Lausanne (CH)
* Engineering Aspects of Thermonuclear Fusion Technology	G.P. CASINI	FT/80 23-27.6.1980	1981	Harwood Academic Publishers, Paris (F)
* Plasma Physics for Thermonuclear Fusion Reactors	G.P. CASINI	IPP/79	1981	Harwood Academic Publishers, Paris (F)
* Safety Problems related to Sodium handling	H. KOTTOWSKI	SaSo/80 12-14.11.1980	1981	Harwood Academic Publishers, Paris (F)
* Application of Mass Spectrometry to Trace Analysis	S. FACCHETTI	MS/80 29.9. - 3.10.1980	1982	Elsevier Scientific Publishing, Amsterdam (NL)
* Thermal Energy Storage	G. BEGHI	TES/81 1-5.6.1981	1982	Reidel, Dordrecht (NL)
* Programming for Software Sharing	H.J. HELMS	PSS/79 17-28.9.81		Reidel Dordrecht, (NL)
* Mathematical and Statistical Methods in Nuclear Safeguards	F. ARGENTESI	MMNS/81 30.11 - 4.12.1981		Harwood Academic Publishers Paris (F)
* Performance of Solar Energy Converters (Part A + B)	G. BEGHI	PSEC/A-B/81 11-13.11/16-18.11.81		Reidel, Dordrecht (NL)
* Advanced Seminar on Fracture Mechanics	H. LARSSON	ASFM/81 19-23.10.1981		Applied Science Publishers London (UK)

Proceeding under Publication

Title	Editor(s)	Abbreviation/ Date of the course	Year of publication	Publisher
* Analytical Techniques for Heavy Metals in Biological Fluids	S. FACCHETTI	HMB/81 22-26.6.1981		Elsevier Scientific Publishing, Amsterdam (NL)
* Multiphase Processes in LMFBR Safety Analysis	A.V. JONES	MPSA/82 29.3-2.4.82		Harwood Academic Publishers, Paris (F)
* National Energy Planning and Management in Developing Countries	H. NEU (et al.)	ES-e/82 3-26.5.1982		Reidel, Dordrecht (NL)
* Workshops on Quality Assurance in Nuclear Plants	R. MATFIELD	QA/A-B/82 21-22.6/24-25.6.82		Applied Science Publishers, London (UK) or Harwood Academic Publishers, Paris (F)

PROJECTS

Reports on Individual Courses

Performance of Solar Energy Converters — PSEC/A-B/82

November 11th-18th, 1981

Course coordinator: G. Beghi, New Energies Programme

Two main factors influencing the actual cost of the useful energy obtained from the conversion of solar energy into heat or electricity are: (i) the conversion efficiency (ii) the durability of the conversion system.
The Course was designed to give updaten information on these two factors, for the more developed technologies for solar energy conversion: thermal collectors and photovoltaic cells.
Because of the different characteristics of these two technologies, the Course was subdivided into two Parts: Part A - Thermal Collectors (11th-13th November 1981) and Part B - Photovoltaic Cells (16th-18th November 1981), the participants being given the opportunity to attend only one, or both parts according to the personal interest or involvement. It was the first Ispra Course organized on the specific subject of measurements of performance, following other courses on more general subjects in the field of Solar Energy. This opportunity was also given by the recent entering into full operation of the ESTI (European Solar Test Installation) at the JRC-Ispra.

Structure of the Course. For each part (A and B mentioned above), the same general scheme was followed:

- definition of basic solar radiation data, and related measurements
- description of the technology, and state of the art
- procedures for measurements of performance, including the use of solar simulators
- problems of durability and ageing, in different environmental conditions, and qualification testing
- practical demonstrations of measurements, in the Ispra laboratories, using simulators and ageing test facilities

The use of thermal collectors and photovoltaic cells and modules in different systems was described, referring to the experience of some projects in which the E.C. Commission is participating.
The variety of origins of the lecturers, most of them well known specialists in their specific field, was appreciated; six lecturers were from the Commission.
The visit to the Ispra laboratories, with all the testing facilities, was an important part of the programme, giving the Participants the opportunity to attend practical measurements.

Participants. Therewere 22 participants in Part A - Thermal Collectors while in Part B - Photovoltaic Cells there were 40 participants. The number of people attending both Parts was rather limited (8).
Most of them were from EC countries (a majority Italian, and other from Belgium, France, Germany, Greece, The Netherlands) but there were participants from other European Countries (Yugoslavia, Spain, Sweden, Switzerland) and also non-European (Cameroun, Iraq, Kenya and Turkey).
In both courses about 60% of the participants came from public research bodies, and about 30% from private companies.

General Evaluation. Due to the particular characteristics of the Course, involving theoretical considerations, practical aspects and demonstrations in the laboratory it was difficult to achieve the correct balance and it was interesting to check the results with the participants.
As a general appreciation of the Course, the answers were largely satisfactory (excellent or good for 11 answers out of a total of 14 for Part A, for 33 answers out of a total of 35 for Part B). Also the balance between the theoretical aspects and the practical demonstrations was considered good by about 50% of the participants to Part A, and by more than 75% for Part B. An interest in more direct participation in practical exercises was shown by some participants in Part A (Thermal Collectors) because of their own professional involvement: the number of participants, even if divided into groups, was a problem for these laboratory exercises.

The number of participants was large, if we consider that in this period there are many courses in the general field of solar technologies.
This fact points out that the specific problem of methods for measurements is felt to be particularly important; these aspects must be considered for future Ispra Courses.

Multiphase Processes in LMFBR Safety Analysis — MPSA/82

March, 29th-April 2nd, 1982

Course Coordinator: A.V. Jones, Data Analysis and Handling Division

Introduction. This Seminar was designed to follow up the successful and well attended event with the same title which took place in 1980. It was built around those fast reactor safety activities of the J.R.C. which concern the development of whole-core accidents. The objective was to provide an up-to-date survey of the field at a level suitable for specialists.

The participants. It was somewhat disappointing to note that there were only twelve external inscriptions upon this occasion. The explanation based on personal inquiries seems to be that project-oriented work is on the increase in France and Germany, while in the other EC countries there is a heavy recession which makes organisations less willing to spend scarce funds upon courses given abroad. However several lecturers stayed over to hear the other talks and this contributed to the very active discussions. In general the participants seemed well prepared for the seminar, and made active and constructive contributions to the discussion sessions.

The lectures and other components of the Seminar. The Seminar began with lectures introducing whole-core accident sequences* and the capabilities of the codes used for the calculation of whole-core events*. The introductory session continued with a lecture on the possible immediate consequences of loss of core geometry, a survey of the post-disassembly phase*, and an account of the available codes for the calculation of primary containment loading and the salient features of the loading process*.
The second stage of the Seminar was concerned with the physics of multiphase flow and the numerical and mathematical problems associated with the modelling of such flows. Particular emphasis was placed upon the SIMMER code, and the provoking comments of the lecturer about it stimulated a great deal of discussion regarding the significance and applicability of such codes. The presentations concerning general multiphase flows continued with a critical survey of the models employed for the calculation of heat transfer and phase change rates in multiphase situations. More research seems called for this area.

The third stage of the Seminar was directed more towards fast reactor applications. Simplified but illuminating models of the core expansion process and of the expansion of a sodium vapour bubble including aerosol transport were presented. There was a stimulating lecture upon the transition phase and its calculation and a lecture was also given upon the interface between the core bubble and the sodium pool* where much of the physics governing the effective work potential of the post-disassembly expansion takes place. A major feature of this stage of the seminar was the emphasis upon experiments, with illustrated descriptions and analysis of the Upper Structure Dynamics experiment and a variety of interesting experiments involving both hydrodynamic and thermal effects in the UK and France.
As a relief from the succession of lectures and to show the participants something of JRC activities in the multiphase flow area two laboratory visits were organized, to the sodium thermohydraulics facilities and to the FARO UO_2 interaction rig. The latter especially excited a good deal of interest and remarks.
The Seminar was so organised that there was ample time between lectures for questions and discussion, which was well-employed in general, and it concluded with a panel session in which four lecturers debated the question of "where do we go from here and how?" and defended their viewpoints both against each other and against those of the other participants. A very lively session took place, leading to viewpoints which were gratifying similar without being anodyne. Much emphasis was placed upon the need for more experiments, especially in transition phase studies, and upon the need for experiments using reactor materials and conditions. In the post-disassembly phase area the chief uncertainties seemed to be centred around the phenomenon of entrainment, which the available codes were quite unable to simulate as presently constructed.

* Indicates that the lecturer was a member of the JRC.

General Evaluation. The incisive questions and animated debates of the panel session left the organiser in no doubt that the seminar had achieved its aim, and the responses to the questionnaires distributed after the seminar in general supported this expression. The reasons for this appear to have been the quality of the lectures and the fact that participants were mostly fully prepared for the kind of Advanced Seminar which they received.
All participants were complimentary about the general organization of the seminar. From the lecturers point of view the availability of a film projector with a stop-frame facility would have been helpful.

Conclusions. One may conclude that despite that low attendance the seminar achieved its objectives, and a successor upon a related topic may be contemplated in two years time.

National Energy Planning and Management — ES-e/82

May 3rd-26th, 1982

Seminar Co-ordinators: H. Neu, D. Bain, Systems Analysis Division

This management training seminar and visits programme was sponsored by DG VIII and DG XVII as part of the Communities commitment to scientific and technical co-operation with developing countries. This was the first occasion on which Ispra Courses had run a programme specifically designed for developing country participants. It was also the first time that energy planning and management had been treated in the Ispra Courses framework, although elements of the subject area have been covered in previous energy-related courses.

Participation. This Seminar was in English. A similar Seminar in French will take place in October this year.33 participants from 24 countries (Africa, Carribean, Pacific, America, Mediterranean, South America, South Asia and China) took part in the Seminar and joined in the visits programme. It was originally intended that there would be some 50 participants but last-minute difficulties with grant attribution procedures led to several cancellations.
Most participants were nominated by their own governments, with a few invited directly by DG XVII. In the event the professional level of most of the participants were very high. Several of the smaller countries were represented by their senior energy planning officials and the representatives of the larger countries included senior decision makers and utility managers.
It had been anticipated that the pooled knowledge and experience of the participants themselves would provide one of the most important inputs to the programme. In the event this expectation was more than justified.

Programme Structure. The programme consisted of three parts:

- a two-week seminar, consisting of lectures, workshops, round table discussions and debates, held at Ispra;
- a ten-day energy study tour, visiting important installations and projects in Italy, France, United Kingdom and the Netherlands;
- a three-day information, briefing and concluding session at Commission head quarters in Brussels.

Seminar structure and philosophy. Being the first of its kind the programme was held against a complex background composed of many uncertainties. There was no prior knowledge of the professional background, the existing knowledge levels or the views about energy problems of the participants. There were no precise guidelines as to which, or what combination, of the rich variety of European approaches, models and techniques were most appropriate to the needs of individual countries. There was not even a consensus as to what exactly were the energy problems of participating countries.
In the light of this it was decided to make the seminar session highly interactive, relying very much on the participants themselves to define the shape of the learning experience. A distinguished group of internationally established lecturers was assembled, as an information input to be drawn on and processed by participants in the light of their own knowledge and experience. The workshops were seen as a central and vital part of the whole programme and, to ensure their success, two skilled facilitators from the International Institute for Environment and Development (IIED, London) were present during the two weeks.
Participants were randomly assigned to one of three working groups, which met throughout the seminar. (It had been intended to reorganise them after the first week, but the participants themselves requested continuity of membership). Working groups were completely autonomous with no outsiders (including the organisers and the workshop facilitators) having the right to participate in their meetings

unless specifically invited. They were assigned the tasks of (a) evaluating lectures and (b) framing recommendations for future energy training programmes. Their recommendations were incorporated in the "executive summary" of the seminar prepared by IIED, London.
The lecture programme full into two main parts, with the first week devoted to an intensive examination of the energy "problematique", viewed from a variety of standpoints (physicist, engineer, economist etc), and the second week concentrating on tools, techniques and instutional frameworks for energy management and planning.

Energy Study Tour. The energy study tour should give participants an insight into the current "state-of-the-art" in a variety of established and innovative energy projects.
A theme deliberately avoided was that of exposing participants to exotic or immature technologies designed specifically for developing countries.
During the two-week seminar at Ispra visits were made to the research projects underway at the Ispra Establishment and to an agricultural complex using the TOTEM (Total Energy Module) system for converting biogas to electricity and heat, near Fossano in Piemonte.
The tour proper started with a visit to the EURELIOS 1 Mwe power station at Adrano in Sicily. The other energy projects visited were a geothermal power station at Larderello in Tuscany, the headquarters of Electricité de France in Paris, the EDF Training School at "Les Mureaux", the North of Scotland Hydro-Electric Board control centre and research laboratories at Pitlochry in Scotland, photo-voltaic cell development at the univerity of Dundee, wave power machines at the National Engineering Laboratory, East Kilbride, and at Edinburgh University, the Netherlands wind energy test centre at ECN Petten, a popular exhibition of alternative energy options at Hook of Holland and the University of Delft's tip-vane windmill experiment site. There was also a seminar in Amsterdam on the Eindhoven Wood Stove Project.

Session in Brussels. The first two days in Brussels, organized by DG VIII and DG XVII, took the form of general information on European Communities policies, followed by more detailed discussions of funding possibilities and procedures relating to energy aid programmes. The morning of the third day was devoted to a summing up session, most of which was occupied by a detailed discussion of the IIED draft report.

Evaluation. A formal evaluation was made of both the seminar and the visits programme. Participant satisfaction in both cases was with a few exceptions high. Satisfaction with organizational and logistic features was particularly marked.
The majority of participants found the visits programme about the right length (although there was a strong minority who felt it was too long). Most felt that the choice of visits was balanced and that travel arrangements were excellent. Individual comments were highly positive, with phrases such as "enriching" and "a rewarding experience" typical.
The two weeks at Ispra had the character of a "training seminar", and were designed as a mixture of elements of a proper "seminar" (to exchange information between people of the same professional background and level of knowledge) and a training course (to impart established knowledge). Participants recommended separation in the future of the two aspects. Seminars should be given on selected issues in energy and development with a well-balanced group of participants, and a clearly defined output target. The topics should be relevant to the practicalities of development assistance (e.g. why projects failed, practical decision making in developing countries, implementation of renewable energy systems). Topics of the second week of the Ispra Seminar could be the subject of training courses (e.g. economic evaluation and shadowpricing, collection of statistical data particularly from rural areas, energy balances, energy modelling in the real context of a developing country).

Fundamentals of Medical Surveillance of radioprotection* RP-D/82

June 1st-11th, 1982

Course Coordinator: M. Giubileo, Medical Service

The Commission is interested in radioprotection both because of its involvement in research (operation of the JRC) and its regulatory activity (Community directives).

* held in Italian

On the other hand, the Ispra Establishment has the expertise and the infrastructure suitable to make education and training in this subject possible. For these reasons the Ispra Courses in radioprotection, generally intended for the training of engineers and technicians, have been held for several years. The first course for medical doctors concerned in radioprotection was held in 1980.
Like the first course, this course was designed to present the principles of radioprotection and the basic physical, biological, clinical and hygiene principles necessary for the "approved medical practitioner' to carry out his work. It was however designed especially for graduates in medicine who had specialised in occupational medicine, radiology or nuclear medicine.
Twentytwo participants registered in the Course most of them were medical doctors, interested in radioprotection in connection with their various professional situations (academic teaching, occupational medicine, radiology, nuclear medicine, consultancy in public bodies).
The Italian Ministry of the Interior also sent some engineers of the Central Technical Service (involved with Civil Protection, including nuclear) and the administration of USL** responsible for the area where the Caorso Nuclear Power Plant is located was also represented. Finally some employees of the J.R.C. Ispra attended parts of the Course which interested them directly. It can be said that the course advertisement efficiently reached the potential candidates.
The Course was divided into three parts:

- elements of physics, radiobiology, radiopathology, health physics and dosimetry (non-medical material which is fundamental in radioprotection): 22 hours;
- an analytical description of the duties of doctors responsible for radioprotection of workers and the public, with an outline of technical procedures, scientific criteria and the legal context: 18 hours;
- visits to specialized departments (dosimetry, whole-body counting, radiotoxicology and decontamination) and demonstrations on operative equipment (instrumentation and medical records): 5 hours.

Unlike the 1980 Course (which lasted for five days) this course was spread over nine days. This allowed us to fill out the programme (especially for professional subjects of a wider interest), to make guided visits to some of the important installations of the Establishment (Cyclotron, LMA, ESSOR complex: 4 hours) and to hold some panel discussions on important items and topical subjects of medical interest (3 hours).

Of the 40 hours of lectures, 18 were given by J.R.C. Ispra staff and the others by 9 external lecturers. 24 sets of lecture notes were distributed, of which 12 were new or updated.
It is felt that the Course achieved its aim of presenting the basics of medical radioprotection, both in using the various abilities of the lecturers expert in their fields and in profiting from the infrastructure and the characteristics of our Establishment. The participants showed favourable reactions: their remarks at the end of the Course showed among other things the diversity of professional backgrounds and of individual academic levels while they confirm that it would be useful and appreciated if more time were given to replies to questions and group discussions.
In conclusion, the Course was followed with regularity and keenness. There was an atmosphere of commitment, interest and participation throughout the two weeks.
It is probable that other medical doctors would be interested in such a course. A repeat in Autumn 1983 or Spring 1984 might be contemplated.

Operator behaviour in Adverse Stress Condition — OT/82

June 14th-16th, 1982

Course Coordinator: R. Misenta, System Analysis Division

Introduction. This workshop has already been held in 1981. Because of the large interest encountered - 54 inscriptions, with a limitation to 35 participants - it was decided to repeat it in 1982.
The main purpose of these workshops was to give interested staff members of European organizations an opportunity to acquaint themselves with an approach to understanding and improving operator performance in both high and low stress conditions.
Both workshops were given by Thomas O. Sargent, director of the Consultant Service, the Sargent Groups Inc., Hartford, Connecticut (USA)

** Unione Sanitaria Locale (Local Health Union)

Participants. For reasons unknown the this year's. Workshop encountered appreciably less interest than that of last year. Of the 25 participants,

- 19 came from 5 EC member states (D, F, I, UK, B)
- 6 from 3 other states (CH, Yugoslavia, Taiwan)

The participants were from the following fields or organizations:

- Nuclear Power Plants (NPP)	5
- NPP-manufacturers	5
- Regulating Authorities	4
- Research groups or institutes	5
- Electricity generating boards	5
- Others	1

The group "Staff members of Nuclear Power Plants" comprises operation engineers, operation managers and training managers. The other participants were mainly on the level of group leaders or heads of division. All were well prepared for this workshop.

Lectures and experimental exercises. The workshop consisted of lectures about the psychological aspects of operator, or more generally, human behaviour in adverse stress conditions and of experimental exercises.
The lectures treated the following themes:

- Psychological aspects of human behaviour and of information processing
- The influence of high stress on human behaviour
- Tracking, the development of a mindset
- Emergency management
- Groups in adverse stress

The experimental exercises were mainly stress-reducing exercises.

General evaluation. The evaluation of the 22 questionnaires filled in by the participants, gave the following results:

- **the programme** (structure, content, etc.) was considered "fair" or better by 20 of 22 respondents
- **the achievement** (quality of lectures and practicals, fulfilment of the programme) was considered "good" or better by 18 of 22 respondents
- **the general appreciation** of the course was classified as "good" or better by 24 of 26 respondents.

The course structure (theoretical development, aspects, exercises and total duration) was considered as "balanced" by half of the respondents. The "practical aspects" only were judged "balanced" by 9, "insufficient" by 8 respondents. Also the logistic aspects which are the responsibility of the Secretariat Ispra-Courses were considered as "good" or better by 17 and of 22 respondents.

Conclusions. The evaluation of the questionnaires indicated that the workshop was appreciated by the participants. A somewhat surprising fact was the low number of 25 participants compared to 54 registrations in the workshop of last year. In addition it is striking that there were no participants from German utilities or power plants, or from the CEGB. The need to repeat this workshop in the Ispra Courses framework must be carefully and critically evaluated.
The earliest date for possible at would be autumn 1984.

"Quality Assurance in Nuclear Plants" QA/A-B/82

June, 21-22th/24-25th, 1982

Workshop Coordinator: R. Matfield, SuperSara Project

The objective of the Workshop was to provide a forum of two groups of persons:

a) one group who had experience of quality assurance problems during the Installation and Operation phases of a nuclear power plant.
b) and a second group who were to face these problems in the future

The Workshop was divided into two parts: Part A discussed problems arising during installation and commissioning and Part B considered problems during operation.
Each part had six lectures on the first day with the second day devoted to discussion.
The discussion for Part A was divided into the following topics:

- QA organization
- standards
- audits
- documentation
- QA requirements
- the positive and negative aspects of QA

considered from the view point of the Owner, Main Contractor, Sub-Contractor and Licensing Authority.
This format was not fully successful because it did not allow the discussion to focus on particular questions and speakers generalized too much.
For the Part B discussions, the participants were asked to state specific problems that they wished to solve. This produced 12 questions and the day was therefore divided into 12 appropriate sessions. This method was successful and produced much better discussions.
The following conclusions have been reached:

a) there is a need to provide an open forum for the free discussion of QA problems in nuclear power plants as no such forum appears to exist.
b) the discussions should be concentrated on specific problems of particular interest to the participants
c) it is important to obtain speakers who can talk frankly about the mistakes they made in the past and not philosophise on QA principles.

It is the intention to offer these Workshops for 1983 based upon the above conclusions and the many useful suggestions made by the Workshop participants.

Mathematical and Statistical Methods in Nuclear Safeguards — MMNS/82

30th November-4 December, 1981

Course Coordinator: F. Argentesi

This Ispra course held on November 30th-December 4th, 1981 was intended to present the state of the art in an area subject to significant dynamic evolution.
Mathematical models and statistical techniques involved in important safeguards topics, such as measurement, MUF analysis and verification were treated in a systematic way. The latest results of ongoing research were also given.
The course, intended for applied scientists, was also attended by people involved in service (IAEA and EURATOM). Because of this audience profile the lectures devoted to topics closer to applications were followed with great interest.
Specifically the lecture of A. Rota: The nature and function of safeguards accounting and verification data was an excellent introduction to the entire course. Of remarkable educational level was also the lecture of C. Bennet: Introduction to Decision analysis. The presentations of J. Shipley and A. Woods were very professional.
As a general result we can say that the course was stimulating and valuable educationally for the majority of the attendants. Certainly some topics involving a great degree of novelty were difficult for the audience but we believe in their stimulating effect.
As the coherent set of lectures consistently developed three major safeguards domains, it was decided to edit the lectures as a monograph on Mathematical and Statistical Methods in Nuclear Safeguards.
This monograph will be ready before the end of 1982.

List of Contributors

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