

# **REPORT**

## **Eleventh Working Group Meeting of Representatives of RCA Member States**

**Sydney, 13-16 March 1989**



## TABLE OF CONTENTS

	<u>Page</u>
Inaugural Session	1
First Administrative Session	
. Election of Chairman	2
. Adoption of Agenda	2
. Draft RCA Annual Report	2
. Special Evaluation Review	3
. RCA Seminar	4
. Project Committees	5
First Technical Session - Regional Industrial Project	7
. Report by the UNDP Project Co-ordinator	7
. Mid-term Evaluation	8
. Regional Industrial Project - post 1991	9
Second Technical Session - Medical and Biological Applications of Nuclear Techniques	10
Third Technical Session: Food and Agriculture	14
Fourth Technical Session: Research Reactor and Energy Based Projects	16
Second Administrative Session	
. RCA Action Plan 1989-91	19
. RCA Cost Projections	20
. Other Business	20
. Acceptance of Report	20
Closing Session	20
Annex 1 List of Participants	
Annex 2 Welcoming address, Professor R.E. Collins, Chairman ANSTO	
Annex 3 Welcoming address Professor Noramly bin Muslim, DDG-TC	
Annex 4 Welcoming address Hon. Lionel Bowen MP, Deputy Prime Minister of Australia	
Annex 5 Agenda	
Annex 6 Draft RCA Annual Report - Comments by RCA Co-ordinator	
Annex 7 RCA Seminar - Draft Recommendations	
Annex 8 Report UNDP Project Co-ordinator	
<u>Annexes 9 - 25: Project Summary Reports</u>	
Annex 9 Use of Computers in Technetium -99m Imaging	
Annex 10 RIA Thyroid Related Hormones	
Annex 11 Diagnosis of Liver diseases	
Annex 12 Improvement of Cancer Therapy	
Annex 13 Radioaerosol Inhalation Imaging	
Annex 14 Toxic Elements in Foodstuffs	
Annex 15 Technetium -99m Generators	
Annex 16 Strengthening of Radiation Protection Infrastructure	
Annex 17 Radiation Sterilization Practices for Tissue Grafts	

Annex 18	Maintenance of Nuclear Medical Equipment
Annex 19	Food Irradiation Process Control and Acceptance
Annex 20	Improvement of Domestic Buffalo Production
Annex 21	Integrated Control of Tropical Plant Viruses
Annex 22	Improvement of Nitrogen Fixation
Annex 23	Research Reactor Utilization
Annex 24	Research Reactor Utilization: Recommendations Project Formulation Meeting
Annex 25	Energy and Nuclear Power Planning

Annexes 26 - 37: Country Statements

Annex 26	Australia
Annex 27	Bangladesh
Annex 28	China
Annex 29	India
Annex 30	Indonesia
Annex 31	Japan
Annex 32	Republic of Korea
Annex 33	Malaysia
Annex 34	Pakistan
Annex 35	Philippines
Annex 36	Thailand
Annex 37	Viet Nam
Annex 38	RCA Action Plan 1989-91
Annex 39	RCA Training Programme 1989-1991
Annex 40	RCA Budget and Budget Estimates
Annex 41	RCA Budgets 1988 - 1991



## **ELEVENTH RCA WORKING GROUP MEETING SYDNEY, 13-16 MARCH 1989**

The Eleventh RCA Working Group Meeting was held at the Hotel Lawson and hosted by the Australian Nuclear Science and Technology Organisation (ANSTO) and the Australian Government. It was attended by twenty delegates from twelve RCA Member States and three from the IAEA. All RCA Governments except Singapore and Sri Lanka were represented. A list of delegates is attached as Annex 1. The interim chairman was Mr Zhu Jiang, China.

### **1. INAUGURAL SESSION**

#### **1.1 Welcome on behalf of ANSTO**

Professor R E Collins, Chairman, welcomed delegates on behalf of ANSTO. He pointed out that Australia has had a long and happy association with RCA. ANSTO looks forward to maintaining and extending these links by contributing to the implementation of projects and providing training opportunities. He briefly outlined ANSTO's history, its mission and the challenges meeting the Organisation. He emphasised that the recently issued Strategic Plan makes clear ANSTO's commitment to strengthening its links with our neighbours in the Asia and Pacific Region based firmly on its expertise, particularly in training. Notes to Professor Collins' address are attached as Annex 2.

#### **1.2 Welcome on behalf of the IAEA**

The Deputy Director-General and Head of the Department of Technical Cooperation, Professor Noramly bin Muslim welcomed delegates on behalf of the IAEA. He thanked ANSTO and the Australian Government for hosting the Meeting, and for the excellent arrangements.

In his opening remarks he referred the underlying strengths of RCA which he attributed to (a) the high proportion of funds which are derived from UNDP and extra budgetary contributions, (b) the breadth of the resources base which includes UNDP and five donor countries, (c) the support provided by all RCA Member States, and (d) the commitment of major respected regional institutions to the RCA projects. The DDG pointed out that RCA is being used as model for a proposed regional arrangement for Africa and briefly alluded to some of the future challenges. The full text of the address is attached as Annex 3.

#### **1.3 Welcome on behalf of the Australian Government**

The Australian Government welcome was presented by Hon Lionel Bowen, MP, Deputy Prime Minister and Attorney-General. He pointed out that the Regional Cooperative Agreement highlights the integrated nature of the Asian and Pacific Region as it embraces the four major sub-regions of our part of the world: North Asia, South

Asia, South East Asia and the South Pacific. RCA epitomises the importance and value of an integrated and cooperative relationship amongst the peoples of the Region and provides evidence of the early recognition of the interdependence of countries of our Region.

Since the creation of RCA there have been other developments underlying the economic interdependence of the area. The Prime Minister, Mr Hawke has recently taken the perception a step further by suggesting the need for a more formal Regional intergovernmental mechanism which will enable a better capacity for policy analysis and consultation on economic issues. The Australian Government believes that RCA can be held up as a working example of how integration in the Asia and Pacific region can be made to work effectively.

Australia encourages the expansion of mutual assistance through more Member States joining the family of donor countries. The nature of RCA projects is important for the continued effectiveness of the agreement. They should meet identifiable development needs, should be technically and financially manageable and should advance the contribution of atomic energy to peace, health and prosperity. Australia sees the treaty on the non-proliferation of nuclear weapons and the safeguards regime which IAEA applies under that treaty as a most significant contribution to regional and indeed global peace and security.

Finally Mr Bowen welcomed all participants to Australia and wished them a successful meeting. Notes to the address are attached as Annex 4.

## **2. FIRST ADMINISTRATIVE SESSION**

### **2.1 Election of Chairman**

Dr D J Cook, Executive Director, ANSTO was nominated by Thailand, seconded by Vietnam and elected unanimously. Dr Cook thanked delegates for their support and remarked that the Meeting will further contribute to regional cooperation. It was an auspicious occasion for both ANSTO and the Australian Government.

### **2.2 Adoption of Agenda**

The draft Agenda (Annex 5) was adopted without amendment.

### **2.3 Draft RCA Annual Report, 1988**

The RCA Coordinator explained that the Annual Report was prepared pursuant to Article VII(4) of the RCA Agreement 1987. As agreed at the Working Group Meeting, Beijing, it covers the calendar year 1988. He summarised the highlights in Annex 6. Comments and amendments received from delegates by 30 June 1989 will be incorporated in the final version which will be tabled at the RCA General Conference Meeting.

The delegate from **Japan** asked that a section be included summarising the major achievements during the year in a form which could assist authorities in budget considerations. A glossary of abbreviations would also be useful. The delegate from **Australia** appreciated the listing of personnel involved in RCA activities.

## **2.4 Special Evaluation Review – Comparative Analysis of RCA and ARCAL**

Referring to Figure 10 of the above mentioned Report IAEA-SER-88/06, the delegate from **Japan** noted that in the period 1979-1988, ninety per cent of the TC administered RCA resources were invested in the Industrial Project. The RCA Coordinator pointed out that the CRP budgets were not included in the figure. In addition the statistic reflected the large equipment investments of the early 1980s. In 1988 the Industrial Project absorbed fifty-one per cent of RCA resources. The delegate from **India** was satisfied with the balance but emphasised that the importance of basic science should be properly reflected.

The delegate from **Bangladesh** suggested that the review should be periodically updated and noted the importance of the Footnote a/ mechanism in developing the ARCAL programme. The RCA Coordinator explained that projects approved by RCA Meetings for which funding is not available are submitted through the Department of Technical Cooperation for consideration as Regional Asian Footnote a/ projects. Examples include the Isotope Hydrology and Marine Science projects. The delegate from **Malaysia** advised against a direct comparison between RCA and ARCAL. There were large differences between the Regions particularly in the progress towards industrialisation. He valued the uniqueness and the sense of brotherhood within RCA. The delegate from **Japan** sought information on the progress towards regional cooperation in Africa. The DDG referred to comments in his Welcoming Remarks (Annex 2).

The DDG expressed concern that the contribution of developing countries in hosting project activities is not adequately reflected in RCA project statistics. This leads to an understatement of the extent of South-South cooperation. TC is looking into ways of fairly and acceptably recording these contributions. The DDG was supported amongst others by **India, Indonesia and Australia**.

The delegate from **India** enquired why ARCAL had not developed an Industrial Project. The DDG explained that ARCAL is not based on a formal intergovernmental agreement but on "Guidelines for Regional Cooperation" with Atomic Energy Establishments. These establishments are frequently small, are located within specialised ministries, and hence carry little influence with major finance and planning ministries. Endorsement for a UNDP project is therefore difficult to achieve. A similar problem exists with radiation protection.

The delegate from the **Republic of Korea** requested the Agency to keep the administrative arrangements of RCA and ARCAL under review and be prepared to revise the RCA Agreement in the future if it would lead to increased cooperation. He enquired why the TACF component of RCA funding was lower than that of ARCAL. On this theme, **Japan** suggested that TACF funds could be used to provide essential hardware and long term training. The DDG responded that the TACF was limited and should be used to catalyse the wider cooperation between RCA countries. He pointed out that unlike RCA, there were no natural donors within the ARCAL region.

The delegate from **Vietnam** appreciated the benefits which developing countries derived from CRPs and looked forward to their extension. The RCA Coordinator pointed out that CRPs were now being supported by Japan in the fields of Cancer, Liver and Radiation Protection and by the Department of Research and Isotopes in other fields.

In his summing up, the DDG expressed satisfaction with the progress of RCA. He referred in particular to the training programme and pointed out that a three year regional programme designed to complement the Inter-regional and National components had been prepared. He encouraged all Member States to sign the Revised Supplementary Agreement which committed signatories to the implementation of projects in conformity with IAEA safety standards.

### 1.5 RCA Seminar

A summary of the recommendations of the RCA Seminar and the actions undertaken by the Secretariat in response are attached as Annex 7.

The DDG reported that the DG generally supported the recommendations of the RCA Seminar. As DDG, he encouraged the move towards larger Regional projects. In this he was supported by **Malaysia** and **Australia**. The RCA Coordinator pointed out that the average annual budget of an RCA project was about \$140,000 which was comparable to the size of the UNDP Regional Asian projects. The delegate from **Bangladesh** cautioned that small budget projects relevant to many Member States could also have an important impact.

The delegate from **Pakistan** noted that this country's suggestion for an RCA Seminar was accepted and recommended that they should be held periodically. The **Republic of Korea** supports the Seminar recommendations but requested the Agency to prepare a paper outlining the different responsibilities of the Working Group Meeting, the General Conference Meeting and the Project Committees.

The delegate from **Malaysia** stated there was a preference for centres of excellence rather than regional centres within Member States. In response the RCA Coordinator explained that the IAEA only officially supported the following centres outside Vienna: the Tokyo office, the Toronto office, ICTP Trieste and the ILMR (Marine Laboratory) Monaco. Tokyo and Toronto support safeguards activities while

Trieste and Monaco support research and training. However, the Agency particularly appreciated the special contributions of Indonesia in hosting the Regional Industrial Project, of Malaysia in hosting the regional expert in NDT and of other Governments, in hosting regional activities.

The **Republic of Korea** recommended that non-RCA Member States participating in Regional Asian projects should be strongly encouraged to join RCA.

The delegate from **India** raised the question of Industrial Forums which had been suggested by Pakistan at the RCA Seminar. The UNDP Coordinator elaborated by quoting the following examples: (a) the Japan Atomic Industrial Forum (JAIF) in which the strength was with industry, (b) the Board of Radiation and Isotope Technology (BRIT) (India), in which the strength was with Government, and (c) the National Association of Radiation and Isotopes, NARI, India. The **Indian** delegate appreciated the clarification but pointed out that BRIT had statutory powers and was therefore not a forum in the normal sense.

The delegate from **China** commented on the Project Committees. He wished the Agency to investigate what could be done to ensure continuity in their work between one Working Group Meeting and the next. The RCA Coordinator conceded that ideally each RCA project should be supported by a separate Committee of experts. However the costs would be prohibitive. The delegate from **Japan** suggested that the only answer appeared to be extensive consultation between the Working Group delegation and its national experts. The delegate of the **Republic of Korea** reminded delegates of the role of meetings of National Coordinators in supporting projects.

## 1.6 Election of Chairpersons of Project Committees

RCA practice concerning Project Committees was outlined by Dr Cook as follows:

In accordance with Article VI of the RCA Agreement 1987, each RCA Project should be supported by a project committee. As set out in the Agreement, the responsibilities of the Committees include:

- to determine the details and to supervise the implementation of each cooperative project;
- to establish or amend portions of the cooperative project to be assigned to each Government subject to the consent of that Government;
- to review project implementation.

It was recognised at an early stage that neither the IAEA nor member governments could be expected to fund the seventeen Project Committee meetings needed to support the seventeen RCA projects currently operational. A decision was therefore made at the RCA General Conference meeting 1987 to reconstitute the Working Group Meeting as Project Committees for project discussions. For administrative convenience it was agreed to constitute three Project Committees concerning the major fields of activity, namely

- a) Medical and biological applications of nuclear techniques;
- b) Food and agriculture;
- c) Nuclear science and energy based projects.

The Regional Industrial Project was not included. Being an UNDP project, it is subject to other review procedures. On completion of their work, the Project Committees formally reported back to the Working Group Meeting.

The following committee Chairpersons were elected:

- a) Medical and biological applications of nuclear techniques.
 

Nominee	Dr John Morris Head Department of Nuclear Medicine Royal Prince Alfred Hospital Member ANSTO Board
Proposed	Japan
Seconded	Pakistan, Malaysia
- b) Nominee
 

Dr J F Easey A/Director Applications of Radioisotopes and Radiation Programme, ANSTO	
Proposed	Malaysia
Seconded	India
- c) Nominee
 

Mr D McCulloch Director Nuclear Technology Programme, ANSTO	
Proposed	Republic of Korea
Seconded	Indonesia

## 2. FIRST TECHNICAL SESSION

### Regional Industrial Project

#### 2.1 Report by the UNDP Project Coordinator

A full report of the Project Coordinator is attached as Annex 8. The verbal presentation was divided into three parts: (a) the project achievements, (b) the 1989 Work Plan, and (c) Project Coordination. The Project Coordinator highlighted the achievements in each sub-project with special reference to the recommendations of the National Coordinators Meetings. He welcomed the imminent participation of Vietnam in the project. Subject to a final procedural matter, UNDP will sign the amended Project Document and make an additional \$135,000 available to the Project.

In summarising project achievements, the UNDP Coordinator pointed to the successful conclusion of nine Regional Training Courses with 126 participants and revised project related investment estimates of \$6.15M in 1987. In 1988, \$3.2M investment in new facilities has been foreshadowed.

On the question of Project Coordination, the UNDP Coordinator explained that he is involved in some aspects of the TC Country Programme implementation. He has had discussions with UNIDO in the Philippines and in Bangladesh on future cooperation. He is of the view that the Regional Project can assist UNDP in identifying needs for support through the country IPF.

Finally the UNDP Project Coordinator thanked all Member States for welcoming him to his new post and for their continued cooperation.

In the general discussion, the delegate from **Japan** referred to his Government's large investment in the project. He noted of the commissioning of a Soviet-built liquid nitrogen generator supplied to BATAN under IAEA technical assistance, and enquired about progress towards industrial involvement in the Jakarta EB facility. In response, the UNDP/Project Coordinator referred to:

- (i) the contract between BATAN and the government owned wood product company (PERHUTANI) for the test production and evaluation of parquet flooring;
- (ii) the collaborative agreement between BATAN and the Ministry of Industry; and
- (iii) the offer by Indonesia for access to the accelerator by Regional organisations.

He also noted that 400 000 condoms had been produced using irradiated latex and distributed by the Family Planning Agency.

Referring to point (iii) above, the delegate from **Australia** suggested that information on the performance specification of the Jakarta EB accelerator and on indicative charges should be circulated. In the field of tracer applications, he commended the Project on the choice of Caustic Soda Mercury Electrolytic Plant for the demonstration of potential economic gains from tracer technology. On a cautionary note, the delegates from **Thailand** and **Japan** pointed out that the most modern electrolytic plants do not use mercury electrodes.

The delegate from the **Republic of Korea** informed the Meeting that plant management was happy with the Residence Time Distribution measurements in precalciners in the Ssang Yong cement factory (the largest in the world). The Company has requested follow up measurements. Similar investigations for other Korean cement industries will be undertaken by KAERI staff.

The delegate from **India** mentioned that image processing was a frontier area of R and D in many fields ranging from materials science to bio medicine. He felt that the Japanese NDT course on Image Processing was timely and offered to host a follow-up course.

The delegate from **Japan** informed the Meeting that Japanese industry was producing surgical gloves and other medical equipment from radiation-vulcanized natural rubber latex (RVNRL) by using the technology developed by UNDP Regional Industrial Project. The advantages of the RVNRL included (a) no toxic materials, (b) low modulus of elasticity, (c) no SO<sub>2</sub> production or burning, and (d) optical transparency. The delegate from **Vietnam** announced that his country had irradiated 400 kg latex which was being used in trial production runs. Problems with tropical conditions and sunshine in preservation of the products were encountered.

The delegate from **Thailand** supported the introduction of examinations in Regional Training Courses.

## 2.2 Mid-Term Evaluation

The UNDP Project Coordinator announced that the mid-term evaluation mission had been scheduled for October 1989 and would comprise an industrialist from Thailand, the Head, Evaluation Section, TC and a third expert from the region yet to be identified. In addition, it would be supported by a group of consultants who would assemble in Jakarta to discuss the evaluation with the team members at a half way point. The terms of reference of the Mission are attached as Annex 9.

A consensus was established on the following:

- (i) the terms of reference of the Evaluation Mission should be expanded to include recommended activities for Project beyond 1991.
- (ii) a group of consultants from the Region should be constituted to support the Evaluation Mission;



- (iii) if possible, national consultants should be identified to support the Evaluation;
- (iv) the Project Coordinator should be assisted in identifying information on status and national requirements for industrial development and technology transfer and themes for the Project beyond 1991.

### 2.3 Regional Industrial Project - post 1991

The Project Coordinator recommended that all sub-project activities of the Project could be extended and expanded at varying degrees in years beyond 1991. In addition, new activities, such as the field of termite studies, could be considered depending on requirements expressed by the participating countries. A suggested theme would be developing of regional self-sufficiency for industrial development and technology transfer. He also suggested that the content of the project may include national projects within the framework of a regional project.

The delegate from **Japan** referred to the forthcoming EAG on Future Trends and Developments in Radiation Chemistry, Takasaki RCRE. This will form a basis for Phase III deliberations. He stressed the importance of environmental protection and made reference to EB techniques for removing SO<sub>2</sub> and NO<sub>x</sub> compounds from flue gases. He drew delegates' attention to the IAEA Publication "Radiation for a Clean Environment".

The delegate from **Pakistan** stressed the need for an equitable distribution of project benefits to all Member States. He referred specifically to expert assignments and long term fellowship training. The RCA Coordinator informed delegates that almost without exception a common basis is used for recruitment of all international and regional Experts and Lecturers for RCA assignments, viz DSA at standard UN rates and a honorarium of \$300 per working week. All delegates could obtain a full status report of the project on request.

The delegate from the **Republic of Korea** supported a project in Stack Gas Treatment and would also like to broaden the scope of Surface Coating activities to include Magnetic Tapes. In response to a question from **Bangladesh**, the UNDP Project Coordinator explained that the 1990 Work Plan is tentative.

In summing up, the DDG informed delegates that the Agency was supporting Poland, and Czechoslovakia, and working with Spain on Stack Gas Treatment projects. He also noted that many Member States were interested in evaluation and that a TC funded Course designed to train evaluators has been scheduled for Pakistan.

The RCA Coordinator and Project Coordinator paid tribute to the work of Dr S M Rao who will be leaving the Project in May 1989 to return to India. A replacement will be sought. The timing and duration of the appointment will depend on budgetary considerations.

The Chairman thanked delegates for their informative discussion.

### **3. SECOND TECHNICAL SESSION : MEDICAL AND BIOLOGICAL APPLICATIONS OF NUCLEAR TECHNIQUES**

The Chairman of the Project Committee was Dr John Morris. In his opening remarks, Dr Morris said that he considered it a privilege to chair the session on behalf of Australian Nuclear Medicine and was pleased that ANSTO was underwriting this youngest medical field of specialisation. He saw a renaissance in Nuclear Medicine and believed RCA would play an important catalytic role in the Asian region. Projects would be introduced and discussed one by one.

#### **3.1 Use of Computers in Technetium 99m Imaging (Annex 9)**

In his opening remarks, the project expert Dr Brian Hutton, Royal Prince Alfred Hospital (RPAH) referred to the forthcoming ANSTO/RPAH Regional Training Course, April/May 1989. It will have three components, viz (a) a preliminary week for participants without computer experience, (b) a three week course, and (c) four week post course attachment. This will be followed up by expert visits.

**India, China and Vietnam** expressed interest in the project. In reply to an enquiry from **Japan**, the project expert explained that participants would have access to one of six computer systems. This would permit them to gain additional experience on systems such as they have at home and also assist them in evaluating different configurations. In response to a question from **India** it was explained that the course would cover all aspects of software and hardware with special emphasis on clinical applications. In response to the delegate from **Bangladesh** the expert explained that although the course was directed towards medical physicists, physicians were also being accepted.

In summing up, Dr Morris pointed out that, in contrast to NMR and CAT, nuclear medicine facilitated quantification and functional studies. Nuclear Medicine extends across Chemistry, Physics and Medicine. Computer studies are essential to physics. The project is funded by Australia.

#### **3.2 Radioimmunoassay of Thyroid Related Hormones (Annex 10)**

The delegate from **Pakistan** explained that his country was now self sufficient in T3, T4 RIA, and SS, TSH-IRMA and is supplying I-125 labelled MAb TSH to Burma and Bangladesh, for evaluation and comments and T4, T3 and MAb TSH to the July 1988 National Training Course in the Philippines. The **Republic of Korea** is actively involved and would appreciate more bulk reagents. In response to a query from **Japan**, the RCA Coordinator explained that RCA bulk reagents are now supplied on a cost free basis only to the most needy laboratories assessed on a case by case

basis. The project budget is rather large because of the need to fund the full time expert as well as group training and reagent supply. An extension to Hepatitis B is planned.

### **3.3 Imaging Procedures for the Diagnosis of Liver Diseases (Annex 11)**

The delegate from **Japan** and Project Expert, Dr S Kobayashi noted that Phase I of the project will culminate with the publication of an Atlas of Images which will shortly appear. Phase II is a continuation of Phase I in which radioisotope and ultrasound techniques will be compared. The advantage of ultrasound to developing countries is its wider availability because of the cheapness of the equipment. The basic aim of the project is to upgrade the standard of diagnosis. Between eight and ten countries are expected to participate.

**India, Republic of Korea, Pakistan, Indonesia, Thailand** (which already has a related country project), **China, Vietnam** and **Malaysia** all expressed interest. The **Republic of Korea** recommends the inclusion of SPECT studies and the use of cyclotron produced radionuclides.

Dr Morris strongly supported the use of nuclear medicine techniques to study liver diseases. Together with ultrasound they are superior to CT. Still better results are possible when combined with SPECT. The project is funded by Japan.

### **3.4 Improvement of Cancer Therapy (Annex 12)**

Dr S Kobayashi considered that Phase I was not entirely satisfactory because of the small number of participating countries. Phase II will concentrate on cancer of the cervix which is very prevalent in Asian countries. It will aim at upgrading treatment management by the use of PC techniques for dose distribution calculations and database development. The initial task will be the selection and evaluation of software. The project has arisen out of the successful Training Course on the Brachy-therapy of Uterine Cancer, Kuala Lumpur, October 1986.

In response to a query from **Vietnam**, the delegate from Japan advised that WHO had been consulted. **Bangladesh** expressed particular interest in the project. The project is funded by Japan.

The DDG referred to a successful related project in Egypt.

### **3.5 Inhalation Imaging for the Diagnosis of Respiratory Diseases (Annex 13)**

The delegate from **India** referred to the BARC supplied nebulisers and was pleased to note that, in a comparative evaluation, they were considered to be one of the best. A request has been received through TC to supply 12 countries in the Middle East region. The delegate from **Pakistan** referred to a system designed in his country which was also working well.

The Chairman, Dr Morris, acknowledged that lung investigations were expensive and hence the realisation that Tc-99m aerosols could simulate gas studies was important.

### **3.6 Nuclear Techniques for Toxic Elements in Foodstuffs (Annex 14)**

**Indonesia, India, Pakistan, Bangladesh and China** reported active participation in the project. Through the project, **Pakistan** was comparing populations in Islamabad/Rawalpindi with an industrial city and using the results to assist in framing legislation. The delegate from **Japan** noted that information from this project could be used in the CRP on Reference Asian Man. The delegate from **China** informed the Meeting of an IAEA/German supported national training course on trace elements in foodstuffs scheduled for Beijing.

### **3.7 The Development of Technetium-99m Generators for Low Power Research Reactors (Annex 15)**

The Australian project expert, Mr R Boyd, reminded delegates that Tc-99m is the most important isotope in Nuclear Medicine and it is the isotope principally responsible for the growth of nuclear medicine over the past 20 years. There is currently an annual production of \$300M. In a number of developing countries the lack of Tc-99m is a constraint on the growth of nuclear medicine. In countries with only low flux reactors, there is a temptation to follow developed countries in adopting the fission route. However this involves expensive reprocessing and advanced infrastructure. In this project, two alternative technologies, the gel generator and the sublimation generator were evaluated.

Support was expressed by **India, Malaysia, Pakistan, Bangladesh, China, Vietnam, Indonesia and Thailand**. In response to questions from the **Republic of Korea and Malaysia**, Mr Boyd explained that the Hungarian developed sublimation generator is the basis of technetium production in Hungary and that the quality of the product produced by both the sublimation and the gel generator systems is equal to that produced by conventional generators.

The delegate from **Japan** pointed out that his country imports Mo-99 target from U.S.A. Given that India and Indonesia have 100 MW and 30 MW reactors respectively, he enquired whether intra regional trade in target material would be feasible. The delegate from **Malaysia** commented that back up supply of technetium-99m is necessary to service a possible rapid expansion in Nuclear Medicine. The delegate from **China** expressed interest in regional trade in target materials.

### **3.8 Development of Radiation Protection Infrastructure (Annex 16)**

The Project was introduced by Mr J Button and Dr S Kobayashi. It comprised a brief history of the major project activities which have included:

November 1987	Project Formulation Meeting, Tokyo
March/April 1988	Regional Training Course "Development of Infrastructures for Ensuring Radiation Protection", Sydney
October 1988	Workshop "Personnel and Environmental Dosimetry Intercomparison Studies", Japan
October 1988	Project Formulation Meeting for CRP "Compilation of Anatomical, Physiological and Metabolic Characteristics of Reference Asian Man", Japan
February 1989	Expert Advisory Group Meeting, Japan

The future programme will include

16-27 October 1989	Regional Training Course on "Basic Techniques of Radiation Protection", Japan
9-12 October 1989	Regional Workshop on "Environmental Sampling and Radioactivity Measurements for Monitoring Purposes", India
1990	Regional training Course, Australia

The project was initiated by the Government of Japan. All RCA Member States are participating. Major funding is being provided by Japan, Australia and India with support from the IAEA.

Delegates from **Indonesia, Malaysia, India, Japan, Pakistan, China, Vitenam** and **Australia** all spoke in favour of the project. The DDG emphasised the importance placed by the IAEA on the project. RCA countries had a good reputation in radiation protection.

### **3.9 Radiation Sterilisation of Tissue Grafts (Annex 17)**

The delegate from **Japan** informed the Meeting of the forthcoming Expert Advisory Group Meeting on dosimetry intercomparison for industrial radiation processing and pointed out that, despite the difference in scale of the irradiation, the conclusions will be relevant to the tissue grafting project.

Delegates from **Pakistan** and **Indonesia** spoke highly of benefits received from the project. The delegate from **China** briefly summarised the Research Coordination Meeting and Regional Training Course on Radiation Sterilisation for Tissue Grafts, Tanjuan, 7-18 November 1988. The delegate from the **Republic of Korea** emphasised the need for more training in this field. The delegate from **India** informed the Meeting that a tissue bank has recently been established at the TATA Memorial Centre, Bombay.

### **3.10 Maintenance of Nuclear Medical Instruments (Annex 18)**

Delegates from **Malaysia**, **Indonesia**, **India** and **Pakistan** all emphasised the importance of the project. The delegate from **Vietnam** emphasised the importance of the spare parts component of project. The next Coordinated Research Meeting is to be held in Indonesia. Pakistan has submitted a project proposal to the Agency.

### **3.11 Concluding Comments by Committee Chairman**

In his concluding comments, the Committee Chairman alluded to exciting advances in Nuclear Medicine through access to short lived cyclotron isotopes, computer applications and other technological advances. The growing importance of short lived isotopes will impose a discipline which will further encourage the development of regional networks in nuclear medicine.

## **4. THIRD TECHNICAL SESSION : FOOD AND AGRICULTURE**

Chairman: Dr J F Easey.

### **4.1 Food Irradiation Process Control and Acceptance (RPFI Phase III, Annex 19)**

The **Malaysian** delegate pointed out that the recent Geneva conference was divided on the issue. For his country the principal issues were trade and consumer acceptance. The new Co-60 facility was being used principally for the irradiation of medical supplies. He welcomed the new food irradiation project. The delegate from **China** outlined his country's active programme towards introducing food irradiation technology.

The delegate from **Australia** said his country was pleased with the results of Regional Project for Food Irradiation Phase II (RPFI II) and that UNDP was to fund

Phase III. A parliamentary committee of enquiry on food irradiation reported last December and its recommendations are currently under review. He could not anticipate whether or not Australia would participate in Phase III.

The delegate from Japan noted that the Hokkaido potato irradiation was the first commercial food irradiator in the world. It is currently irradiating about 30000 tonnes of potatoes annually for potato chips. No other foodstuffs are irradiated. Japan funded Phase I. As with Phase II, Japan is prepared to contribute to Phase III through the acceptance of trainees at JAERI and through the provision of expert services.

Support for Phase III was also expressed by **India, Vietnam, Pakistan, Bangladesh, Indonesia, China, Republic of Korea and Thailand**. A number of Member States have approved individual food items for irradiation and these have been listed in the country statements. **Pakistan, Malaysia, Indonesia, Republic of Korea, Thailand, Australia and Japan** all stressed the importance of public acceptance. **China** announced that it will fund a regional workshop on the Commercialisation Food Irradiation 14-18 August, Shanghai Irradiation Centre, from its special contribution to RCA. UNDP New York has been informed of China's decision to support food irradiation as a donor.

In view of the importance of public acceptance, the delegate from **Japan** enquired whether the proposed harmonisation workshop scheduled for 1991 could be brought forward. The RCA Coordinator pointed out that the schedule could be varied in line with priorities provided cash flows were not altered. He further explained that the funds should become available towards the latter half of 1989.

The DDG-TC pointed out that the Agency had made a significant investment in food irradiation and had supported a pilot scale irradiator in Vietnam, and research irradiators in Bangladesh and Pakistan. Public reaction was therefore of concern. Of particular concern were some irrational and scientifically indefensible statements from individual scientists in some developed countries who use specious arguments to suggest inappropriate technology is being 'dumped' on developing countries.

#### **4.2 Nuclear Techniques to Improve Domestic Buffalo Production (Annex 20)**

The current phase of the project is drawing to a close. The delegate from **Malaysia** made the interesting point that with his country's development there is a gradual deflection in the buffalo population and an increase in the raising of cattle for meat.

### **4.3 Integrated Control of Tropical Plant Viruses with Nuclear Techniques (New Project, Annex 21)**

The RCA coordinator pointed out that the project was not yet funded. However it had been approved by the Agency's Committee for Contractual Scientific Services subject to the availability of funds. Interest in the project was expressed by **Pakistan, Vietnam, China, Indonesia, India, Bangladesh** and the **Republic of Korea**. Pakistan has problems with mung bean and black grain virus diseases, and **China** with soya bean, rice and peanuts; and **Indonesia** with groundnuts.

### **4.4 Improvement of Grain Legume Rhizobium Symbiosis in Fixed Atmospheric Nitrogen (Annex 22)**

Funding for the project has been foreshadowed by UNDP. The RCA Coordinator sought advice of the Working Group as to whether the project should be incorporated within RCA. He assured the delegate from **Bangladesh** that the decision would have no impact on the funding of other RCA projects.

**Malaysia** saw the project together with the increased use of area produced under the ASEAN cooperation concept as contributing to the substitution of fertiliser currently imported from Germany. **India, Pakistan, China, Indonesia, Republic of Korea, Bangladesh** and **Vietnam** also expressed support. **Pakistan** is willing to host a workshop under the new UNDP project.

The IAEA understands that it is the consensus of the Meeting that the programme should be incorporated into the RCA.

### **4.5 Concluding Comments by Meeting Chairman**

In his concluding comments, Dr Easey stressed the importance of nuclear techniques in the development of Agriculture. He reflected the feeling of the meeting when laying stress on the role of public opinion in the spread of some technologies, particularly Food Irradiation.

## **5. FOURTH TECHNICAL SESSION : RESEARCH REACTOR AND ENERGY BASED PROJECTS**

Chairman: Mr D McCulloch.

### **5.1 Research Reactor Utilisation (Annex 23)**

The project was introduced by Dr Ghazali who pointed out that the project was not new but could be seen as a continuation of the Indian funded project on "Basic Science using Research Reactors". His country put forward the proposal knowing that all but two RCA countries had research reactors, many of which were under-utilised. Malaysia was pleased to host the Project Formulation Meeting, KL, 6-9 March.



Mr McCulloch who had represented Australia at the meeting paid tribute to the speed and efficiency with which the project document was prepared and conveyed best wishes from the meeting Chairman, Dr Tajuddin. Mr McCulloch said that the need for a regional project relating to safe and effective research reactor operation and improved utilisation had been clearly acknowledged by the meeting. He read the eight meeting recommendations (Annex 24) and referred also to the draft proposal which stemmed from them. The draft proposal included a schedule of activities which could form the nucleus of a viable and fruitful project. He requested that the Meeting note the recommendations which would be submitted for endorsement at the RCA General Conference Meeting.

The DDG thanked the Malaysian Government for hosting the Research Reactor meeting. He was concerned that research reactors in many developing countries were under-utilised and in some cases, questions of their safety and performance had been raised. Over 30 reactors are more than 20 years old and so the question of ageing reactors is very topical. The widely discussed question of the so called 'greenhouse effect' may lead to a new trend towards nuclear power and hence to the need for research reactors for manpower training. For these and other reasons he strongly supports this proposed project.

The **Indian** delegate supported the project and found the KL recommendations reasonable. He noted that the Indian Philippines Agency project of 1963 onwards which was a forerunner of RCA was based on research reactors. The high flux reactors belonging to India and Indonesia provide a good basis for cooperation. India will support the project through a number of specific project activities.

The delegate from **Japan** believed that the project would be useful for many developing countries although he would refrain from official comment until his government had studied the KL document.

JAERI with four reactors would be in a good position to help if Japan decides to participate. However answers to the following questions were essential for the implementation of the Project. Why are research reactors not well used? Is it due to a lack of trained personnel; to a lack of instruments; or to the low power of many research reactors? Mr McCulloch suggested that Regional industry is not yet persuaded of the commercial benefits of research reactor applications.

The project proposal was supported by **Australia, Republic of Korea, Thailand** (which is to host the first training course in Bangkok, Nov 1989), **China, Vietnam, Indonesia, Pakistan, Malaysia, India and Bangladesh.**

## 5.2 Basic Science using Research Reactors

The RCA Coordinator suggested that the Indian authorities might consider incorporating activities in this project under the wider project on Research Reactor utilisation. The **Indian** delegate undertook to study the proposal but pointed out that he saw merit in a project with a strong basic science component. India has supported two workshops under this project in 1989, viz

- (i) Radioisotope Production in Research Reactors, 9–20 January 1989,
- (ii) Neutron Activation Analysis for Minerals Resource Prospecting and Materials Characterisation, 6–24 February 1989.

During 1990, India is proposing two further regional training courses

- (i) Research Reactor Safety Principles,
- (ii) Isotope Techniques in Hydrology.

This project is funded by the Government of India.

## 5.3 Regional Training Course : Nuclear Power Project Planning and Implementation

The project is funded by the Republic of Korea. The first course in this series was held at KAERI, November 1988 and was highly praised by lecturers and participants. A second course in the series is planned 23 October to 10 November 1989.

### 5.3 Energy and Nuclear Power Planning (Annex 25)

WASP users workshops have been hosted by Indonesia (1987) and Malaysia (1988) and have found to be extremely useful. Subject to funding availability, the next workshop in the series will be hosted by China, September 1989.

A major Regional Training Course on Electric Systems Expansion Planning is jointly hosted by the Asia and Pacific Development Centre and the Malaysian Government scheduled for May/June 1989. It is to be jointly funded by the IAEA and the Asian Development Bank. The delegate from **Pakistan** offered to host a training course in the use of the PC Version of the WASP computer code in 1990 or 1991.

## 5.4 Concluding Comments

The Committee chairman thanked all delegates for their constructive contribution to the useful discussions on the important question of energy and nuclear power planning and on the proposed new project initiative directed to improving the effectiveness with which research reactors in RCA member states could be utilised to further national development objectives.

## 6. COUNTRY STATEMENTS

Control of the Meeting was handed back to Dr Cook who received the following statements:

Australia	Annex 26
Bangladesh	Annex 27
China	Annex 28
India	Annex 29
Indonesia	Annex 30
Japan	Annex 31
Republic of Korea	Annex 32
Malaysia	Annex 33
Pakistan	Annex 34
Philippines	Annex 35
Thailand	Annex 36
Vietnam	Annex 37

## 7. SECOND ADMINISTRATIVE SESSION

### 7.1 RCA Action Plan 1989-91

In introducing the RCA Action Plan 1989-91 (Annex 38) the RCA Coordinator pointed out that (a) UNDP projects were approved through the Fourth Planning Cycle 1987-91, (b) that TC projects were approved for the biennium 1989-90, and that (c) the period of approval of CRPs and extra-budgetary funded projects varied. The table should be used as a guide only.

In addition, a three year training programme (Annex 39) had been prepared. The DDG pointed out that the projection was needed to facilitate the orderly planning of the regional training programme which is assuming ever increasing importance, and noted its impact on IAEA budget deliberations. The delegate from **Indonesia** observed that his country was not scheduled to host a regional training course in 1989. The RCA Coordinator undertook to examine the regional distribution of training courses and noticed that the comment by Indonesia was in itself a good justification for publishing the three year projection. In response to a question from **Japan** the

RCA Coordinator pointed out that there were still some funds in the fellowship component of the Industrial Project. The Working Group Meeting was requested to note the training course projections and to present official reactions at the General Conference Meeting.

Although the value of small budget projects was accepted, the meeting agreed that the IAEA was generally correct in encouraging larger integrated regional projects.

## **7.2 RCA Cost Projections**

The RCA cost projections analysed by project are presented as Annex 40. The consolidated figures for 1989-91 are listed in Annex 41.

By way of introduction, the RCA Coordinator pointed out that only those funds administered through the IAEA's accounts are registered as cash contributions and explained the Agency's procedure for calculating 'in kind' contributions. He undertook to have contributions from all RCA donor countries recorded in the Annual Report. The UNDP Project Coordinator requested Member States to provide his office with estimates of 'in country' costs associated with the Industrial Project.

The delegate from **Australia** noted that his government's support for RCA was \$A228000 in 1987/88 and \$A1.2 M in 1988/89. Subject to on-going appropriations, support for RCA of approximately \$A1 M annually is expected.

## **7.3 Other Business**

The delegate from **Japan** requested the preparation of a brochure which could be used in supporting requests to funding agencies. This request was strongly supported by the DDG who pointed out that similar requests had been received from the USA, Sweden, Holland and France. The brochure should emphasise objectives, milestones and benefits of the project.

## **7.4 Presentation and Acceptance of the Meeting Report**

Delegates accepted the report as a fair record of the meeting subject to the inclusion of the suggested amendments. A draft will be circulated to Member States for endorsement prior to printing.

# **8. CLOSING SESSION**

## **8.1 Closing Remarks by ANSTO**

In his closing remarks, the Chairman, Dr Cook commented that the Working Group Meeting had reaffirmed and strengthened regional cooperation and he congratulated delegates on their forthright and open discussion. He reminded the meeting of the Deputy Prime Minister's observations in his keynote address on the

interdependence of countries within the region. He thanked all involved ANSTO staff and especially Ms J Henderson for their dedication and expressed gratitude for the opportunity to host the meeting and to show delegates part of Australia.

## **8.2 Official Closing by IAEA**

On behalf of RCA Member States and the IAEA Secretariat, the DDG expressed pleasure in congratulating the Meeting Chairman, the Committee Chairman, the ANSTO Secretariat and all staff on preparing for and conducting a very fine meeting. He foreshadowed that the recommendations of the Working Group Meeting would be considered by Member States and presented to the 1989 RCA General Conference Meeting for endorsement. He thanked Member States for their efforts in support of the project and especially Thailand for agreeing to host the next Working Group. Finally he thanked Dr Cook and through him ANSTO and the Australian Government for the generous hospitality which was appreciated by all delegates.



LIST OF PARTICIPANTS

AUSTRALIA

Dr. D. Cook  
Executive Director  
ANSTO

Dr. J. Easey  
A/Director  
Applications of Radioisotopes  
and Radiation Programme  
ANSTO

Mr. R. Crick  
Director, Nuclear Affairs Section  
Department of Foreign Affairs and Trade

Mr. D.B. Mc Culloch  
Director  
Nuclear Technology Programme  
ANSTO

Mr. J.G. Morris  
Head, Department of Nuclear Medicine  
Royal Prince Alfred Hospital  
Member, ANSTO Board

Mr. B. May  
South East Asia Branch  
Australian International Development  
Assistance Bureau

Ms. J. Henderson  
Technical Secretariat  
ANSTO

BANGLADESH

Dr. Mesbahul Karim  
Director, Training and International  
Affairs Division  
Bangladesh AEC

PEOPLE'S REPUBLIC  
OF CHINA

Mr. Zhu Jiang  
Senior Engineer Office of IAEA Affairs  
Ministry of Energy  
Beijing

INDIA

Dr. R. Chidambaram  
Director  
Physics Group  
BARC

INDONESIA

Dr. Nazir Abdullah  
Deputy Director General  
Basic Research and Application  
BATAN

JAPAN	Dr. Sadayoshi Kobayashi Director Safety Analysis Unit National Institute of Radiological Sciences
	Dr. Sueo Machi Director General Takasaki Radiation Chemistry Research Establishment JAERI
	Mr. Yutaka Yoshizawa Deputy Director Nuclear Energy Division Ministry of Foreign Affairs
	Mr. Kenji Yoshioka Chief of Section Research and International Affairs Division Science and Technology Agency
REPUBLIC OF KOREA	Mr. Hyuk Kim Assistant Director Nuclear Corporation Division Nuclear Safety and Co-operation Office Ministry of Science and Technology
	Dr. Jae Rok Kim Head, Isotope Department KAERI
MALAYSIA	Datuk Dr. Mohd. Ghazali bin Hj. Abdul Rahman Director General Nuclear Minister's Department PUSPATI Kompleks
PAKISTAN	Dr. Amin M. Hussain Head Bio-Sciences Pakistan AEC
PHILIPPINES	Consul Petronila Carbonell Philippine Trade Office, Sydney
THAILAND	Mr. Apichai Chvajarernpun Senior Nuclear Engineer OAEP Bangkok
VIET NAM	Professor Pham Zuy Hien Director Dalat Nuclear Research Institute



## ANNEX 2

NOTES ON THE ADDRESS OF WELCOME BY  
PROFESSOR R.E. COLLINS, CHAIRMAN,  
AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION (ANSTO)

On behalf of ANSTO, it gives me great pleasure to welcome all present to this opening session of the 11th IAEA Regional Co-operative Agreement Working Group Meeting. I am particularly honoured that the Deputy Prime Minister is able to be with us today.

ANSTO, and before it, the Australian Atomic Energy Commission (AAEC) has had a long and happy association with the RCA beginning with its involvement in earlier phases in projects on the application of radioisotopes in hydrology and sedimentology, and the application of nucleonic control systems to the mining industry. ANSTO has also provided training connected with RCA projects, and our technical experts have participated in evaluation missions and lectured at workshops and courses throughout the region. More recently, ANSTO was involved in Phase II of the Regional Project on Food Irradiation, which drew to a close last year.

Now ANSTO looks forward to playing its key role in implementation of the new package of Australian-funded activities under the RCA and associated United Nations

Development Programme projects in the areas of nuclear medicine, radiation protection, tracer technology, radiation processing, and nucleonic control systems. ANSTO's Training Centre will be progressing this package together with Royal Prince Alfred Hospital, the Polycure Company and the Julius Kruttschnitt Mineral Research Centre. Technical specialists from all these organisations will be at the Working Group Meeting and look forward to discussing our visitors' interests in their respective areas.

ANSTO, as you are aware, is Australia's national nuclear institute, having been formed in April 1987 out of the AAEC. You may also be aware that ANSTO has undergone considerable change in recent times, as the arrangements governing science and technology in Australia and nuclear S&T in particular have been altered. The AAEC, formed in the 1950's, was a creature of its time - designed to lead Australia into the nuclear age. At that time nuclear age meant nuclear power generation.

ANSTO too has aims, aspirations and strategies appropriate to today. The challenges relating to nuclear science and technology (NS&T) today are no less significant than those of the 1950s. There are many useful contributions that NS&T can make. There are hazards. Most alarmingly there is a lack of rational debate and balance in media coverage without which informed choices cannot be made.

Our R&D programmes have been restructured to maintain Australia's nuclear competence and to provide an effective base to support innovation and technological development and to ensure that industry, the Government and the community derive maximum benefit from nuclear science and associated technologies.

ANSTO has significant competence in a number of fields including advanced materials, biomedicine and health, nuclear physics, applications of radioisotopes and radiation technology, environmental science, electronics, risk assessment, digital and analogue computing, occupational health and safety, and education and training. Our recently-issued Strategic Plan makes clear ANSTO's commitment to strengthening its links with our neighbours in the Asia and Pacific Region, based firmly on our expertise, particularly in training. I know that the other organisations involved with ANSTO in the RCA share our views on this and I can assure you that the Board of ANSTO also share this commitment.

I welcome you all and wish you an enjoyable and fruitful meeting.



Hon. Lionel Bowen M.P.,

Deputy Prime Minister and Attorney General of Australia.

Professor Richard Collins,

Chairman, Australian Nuclear Science and Technology  
Organisation.

Distinguished delegates,

Ladies and Gentlemen,

On behalf of the Director-General of the International Atomic Energy Agency, I have the honour to welcome you all to the Eleventh Working Group Meeting of Representatives of RCA Member States. It is a great pleasure to be here in Sydney and absorb the atmosphere of challenge and opportunity presented by the fifth Continent. Australia is indeed a land of contrasts. On the one hand it is a very young country with only two centuries of continuously recorded history; on the other hand, its aboriginal people have one of the very oldest of all heritages which can be traced back some 40,000 years. Again, geographically it is one of the largest countries in the world; but its population density is one of the lowest. We already sense the welcome in your midst and are grateful for it. Even the three overseas delegates who studied in Western Australia are feeling at home on the Eastern sea board, especially as Dr. Cook, the Executive Director of ANSTO is also a graduate from the West.

In 1978, Australia became the first country to announce an extra-budgetary contribution to RCA. To me, this Meeting is tangible evidence of Australia's continued commitment not only to RCA and Technical Co-operation but to the whole of the Agency's programme. On behalf of the IAEA, I would like to express my gratitude to the Australian Government for this on-going support. The Agency is particularly grateful to Professor Collins, Chairman, to Dr. Cook, Executive Director and to the staff of ANSTO for the excellent arrangements which auger well for a very fruitful meeting. Thanks are also due to the Government officials and supporting personnel whose skill and dedication were crucial to the preparation of the Meeting.

Mr. Deputy Prime Minister, Mr. Chairman, distinguished Delegates, Ladies and Gentlemen,

I would like to use this opportunity to briefly comment on three aspects of RCA namely its underlying strength, its influence on other Regional arrangements and on the future.

Firstly, may I refer to the underlying strength of RCA. Between 1984 and 1989 the RCA budgets have been increasing at an average rate of almost 30 per cent per year or about four times the rate of growth of the overall technical assistance programme over the same period.

A special feature of RCA is that about 70 per cent of the funds are derived from UNDP and extra-budgetary sources. The comparable figure for the overall technical assistance programme is about 23 percent. Major contributions have been made by Australia and Japan. In addition, the developing countries India, China and the Republic of Korea are contributing substantially as donor countries and are thereby facilitating an expansion in the programme in a way that would not otherwise be possible. Almost all developing Member States are making an important investment in the programme by hosting projects and activities. My Department is currently investigating ways of recording these 'in country' contributions in a fair and acceptable manner.

I am pleased to foreshadow a likely broadening of the resources base in 1989. UNDP has made an 'in principle' decision to support two regional projects in the Food and Agriculture Sector and will therefore, for the first time be funding IAEA regional projects other than the Regional Industrial Project. In addition the Asian Development Bank is likely to contribute to the Regional Training Course in Electric Systems Expansion Planning jointly hosted by the Asian and Pacific Development Centre and the Malaysian Government.

Funding is essential, but does not, of itself, guarantee the quality of the programme. It is a key which enables access to a far greater resource - the intellectual wealth and experience of committed institutes. It is a special feature of RCA that many institutes are directly associated with individual projects. As examples may I cite the following:

ANSTO and Tracer Technology;

Royal Prince Alfred Hospital and Technetium-99m Imaging;

Julius Kruttschnitt Mineral Research Centre and Coal;

JAERI and both the Radiation Processing and Radiation Vulcanization Project;

National Institute of Radiological Sciences, Chiba and the Cancer, Liver and Radiation Protection Projects;

Japan Society of Non-Destructive Inspection and NDT;

Bhabha Atomic Research Centre and the Tracer, Radiation Protection and Nuclear Instrument Maintenance Projects;

BATAN Indonesia and Radiation Processing and Radiation Vulcanization;

KAERI and Energy and Nuclear Power Planning; and

Shanghai University of Science and Technology and Radiation Cross-linking.

I apologise for omissions in this list which is not complete. It simply illustrates an underlying strength which is unique to



RCA in its scale of application - the commitment of major, respected regional institutions to work with the Agency's Technical Officers and Technical Co-operation Department to augment and support projects for the benefit of the Region. In RCA almost 60 per cent of the projects directly benefit in this way. I would like to see this involvement even further increased and extended to other Regions.

Virtually all projects have made good progress. These will be reviewed in detail during the course of the Meeting. Two outstanding examples may be cited. The first is the applications of Nucleonic Control Systems to a range of industries including paper manufacturing, minerals recovery, steel and civil engineering. During the course of the project there has been two to five fold increase in the number of installed gauges spread over most developing countries. This reflects the willingness of regional industry to invest in modern technology. Although it is not possible to indentify the many complex factors leading to an industrial decision to invest in a new technology, it is clear that the IAEA organized training/demonstration activities have played an important catalytic role. I am pleased to announce that the IAEA has reached agreement with the Governments of Australia and Thailand for the establishment of a major training/demonstration facility for the application of nucleonic control systems to the coal mining and coal utilization industries.

The second example involves the development of radiation protection infrastructure. The proposal was made by Japan and very soon all Member States were involved with support coming from three donors. The speed with which the proposal was accepted attests to its timeliness and to the wisdom of those providing the key technical advice.

May I now focus briefly on my second theme, namely the development of other arrangements. RCA was the first such arrangement and other regions have benefitted from RCA experience. The Latin American ARCAL programme is also growing and will be strengthened by the recent appointment of an ARCAL Co-ordinator. My Department is currently discussing with African Member States the establishment of a regional programme in Africa. Substantial differences in each of the Regional Programmes are to be expected arising from differences in needs, history, administrative arrangements and macro economic factors.

Finally a word concerning the future. As I mentioned above, RCA has benefitted from a long period of steady growth. However, there is still much to be done in order to improve health and general services, increase agricultural production and improve the level of industrial output. Science including nuclear science is fundamental to these challenges. The Agency looks to this meeting to provide the primary technical advice which is the foundation to this programme.

In addition to the formal sessions, the Meeting provides the opportunity of renewing old friendship within the Region and making new ones. I listed previously some of the strengths of RCA. May I conclude by mentioning the most important; the understanding and good-will between the scientists and officials of the Region dedicated in partnership to the development of our region of the world.

Thank you!



ANNEX 4

Notes on a speech by Hon Lionel Bowen, MP, Deputy Prime Minister and Attorney General to the opening session of the Eleventh Working Group Meeting of the IAEA Regional Co-operative Agreement, Sydney, 13 March 1989.

IT IS NOTEWORTHY THAT REPRESENTATIVES OF THE MEMBER STATES OF THE REGIONAL CO-OPERATIVE AGREEMENT SHOULD MEET IN SYDNEY IN THE AFTERMATH OF OUR BICENTENNIAL YEAR.

1988 WAS FOR AUSTRALIA A YEAR OF CELEBRATION. IT MARKED THE TWO HUNDREDTH ANNIVERSARY OF EUROPEAN SETTLEMENT IN AUSTRALIA, WHICH BEGAN IN 1788 IN THIS VERY CITY OF SYDNEY. IT WAS AUSTRALIA'S TWO HUNDREDTH BIRTHDAY AS THE NATION WE KNOW TODAY.

AUSTRALIA AS A LAND, OF COURSE, IS MUCH OLDER. IT IS, IN FACT, THE OLDEST LAND MASS ON EARTH.

ITS ORIGINAL INHABITANTS, THE ABORIGINES, ALSO LONG PREDATE EUROPEAN SETTLEMENT. THEY HAVE INHABITED THE LAND FOR SOME 40,000 YEARS. THEIR TRADITIONS AND CULTURE HAVE BEEN RECOGNISED, RATHER BELATEDLY, AS AN INTEGRAL AND VITAL PART OF THE NATION, AUSTRALIA. I AM PLEASED THAT YOU WILL HAVE THE CHANCE TO SEE AND HEAR SOMETHING OF AUSTRALIAN ABORIGINAL CULTURE AT THIS EVENING'S RECEPTION.

ALTHOUGH AUSTRALIA'S BICENTENARY WAS ABOUT EUROPEAN SETTLEMENT, THE BICENTENNIAL YEAR WAS LARGELY ABOUT "LIVING TOGETHER". THAT CONCEPT RECOGNISED THE DIVERSITY OF ABORIGINAL AND ETHNIC CULTURES THAT MAKE UP AUSTRALIA TODAY. THE PROXIMITY OF OUR LOCATION HERE TO SYDNEY'S FAMOUS CHINATOWN WILL OFFER YOU THE OPPORTUNITY OF EXPERIENCING AN ASPECT OF OUR CULTURAL DIVERSITY.

THE IDEA OF LIVING TOGETHER ALSO UNDERLINED THE GEOGRAPHIC AND POLITICAL REALITY THAT AUSTRALIA IS PART OF THE ASIA PACIFIC REGION OF THE WORLD, WHICH IS INCREASINGLY CONTRIBUTING TO AUSTRALIA'S CULTURAL DIVERSITY.

THE REGIONAL CO-OPERATIVE AGREEMENT FOR AISA AND THE PACIFIC HIGHLIGHTS FOR US ALL THE INTEGRATED NATURE OF THE ASIA PACIFIC REGION. THE MEMBERS OF AGREEMENT EMBRACE FOUR MAJOR SUBREGIONS OF OUR PART OF THE WORLD; NORTH ASIA, SOUTH ASIA, SOUTH EAST ASIA, AND THE SOUTH PACIFIC.

RCA EPITOMISES THE IMPORTANCE AND VALUE OF AN INTEGRATED, CO-OPERATIVE RELATIONSHIP AMONGST THE PEOPLES OF THE REGION. IT PROVIDES EVIDENCE OF THE EARLY RECOGNITION OF THE INTERDEPENDENCE OF THE COUNTRIES OF OUR REGION.

SINCE THE CREATION OF RCA WE HAVE SEEN OTHER DEVELOPMENTS WHICH ALSO UNDERLINED THE CONOMIC INTERDEPENDENCE OF THE AREA - THOUGH IN SOME CASES EXTENDING THIS BEYOND THE SPECIFIC RCA AREA. THERE HAS BEEN THE CREATION OF THE PACIFIC ECONOMIC CO-OPERATION CONFERENCE, OF WHICH AUSTRALIA WAS CO-FOUNDER. THERE HAVE ALSO BEEN SEVERAL PROPOSALS RELATING TO REGIONAL ECONOMIC DEVELOPMENT, ALL OF WHICH HAVE SHARED THE PERCEPTION THAT THE COUNTRIES OF THE REGION ARE ESSENTIALLY INTERDEPENDENT AND THAT OUR ECONOMIC FUTURES ARE INTERLINKED.

THE PRIME MINISTER, MR HAWKE, HAS RECENTLY TAKEN THIS PERCEPTION A STEP FURTHER BY SUGGESTING THE NEED FOR A MORE FORMAL REGIONAL INTERGOVERNMENTAL MECHANISM WHICH WILL ENABLE US TO DEVELOP A BETTER CAPACITY FOR POLICY ANALYSIS AND CONSULTATION ON ECONOMIC ISSUES. THE OBJECTIVES OF SUCH A MECHANISM WOULD BE TO REINFORCE REGIONAL SUPPORT FOR THE MULTILATERAL TRADING SYSTEM, THROUGH THE CURRENT URUGUAY ROUND OF NEGOTIATIONS, AND TO PROMOTE CLOSE ECONOMIC INTEGRATION AMONGST REGIONAL COUNTRIES TAKING ADVANTAGE OF THE MANY ECONOMIC COMPLEMENTARITIES THAT EXIST.

WHEN YOU THINK ABOUT THE OBJECTIVES THAT ARE BEING SOUGHT IN ECONOMIC AND SOCIAL DEVELOPMENT THROUGH CLOSER REGIONAL CO-OPERATION, WE CAN HOLD UP THE RCA AS A WORKING EXAMPLE OF HOW INTEGRATION IN THE AISA PACIFIC REGION CAN BE MADE TO WORK EFFECTIVELY.

THE RCA PROVIDES AN EFFECTIVE MECHANISM UNDER WHICH REGIONAL STATES, FROM CHINA IN THE NORTH TO AUSTRALIA IN THE SOUTH, AND FROM JAPAN IN THE EAST TO PAKISTAN IN THE WEST, BAND TOGETHER IN A CO-OPERATIVE MANNER, CONTRIBUTING AND RECEIVING, OFTEN SIMULTANEOUSLY, IN A VARIETY OF PROJECTS AIMED AT THE PROMOTION OF GROWTH AND ECONOMIC DEVELOPMENT, PARTICULARLY IN THE DEVELOPING MEMBER STATES.

AUSTRALIA HAS MAINTAINED ITS FIRM SUPPORT FOR RCA SINCE JOINING IN 1977. WE EXPECT OUR CONTRIBUTIONS TO RCA PROJECTS TO AMOUNT TO SOME THREE MILLION DOLLARS OVER THE PERIOD UP TO 1991/92.

OUR CONTRIBUTION IS, OF COURSE, NOT SIMPLY A FINANCIAL ONE. AUSTRALIA HAS DEVELOPED OVER MANY YEARS A SOUND NUCLEAR SCIENCE AND TECHNOLOGY BASE BOTH IN RESEARCH AND IN MEDICAL, AGRICULTURAL AND INDUSTRIAL APPLICATIONS. WE DRAW ON THAT BASE IN OUR DEVELOPMENT ASSISTANCE PROGRAM AS WELL AS IN PURSUIT OF OUR COMMERCIAL INTERESTS.

ONE OF THE DEVELOPMENTS WITHIN RCA WHICH AUSTRALIA REGARDS AS IMPORTANT IN FURTHERING AN INTEGRATED REGIONAL APPROACH IS THE EXPANSION OF MUTUAL ASSISTANCE THROUGH MORE MEMBER STATES JOINING THE FAMILY OF DONOR COUNTRIES. PRINCIPAL DONOR COUNTRIES INCLUDE NOT ONLY AUSTRALIA, BUT NOTABLY JAPAN, AS WELL AS INDIA, KOREA AND CHINA. SUCH EXPANSION OF CONTRIBUTING COUNTRIES, EVEN IN SMALL WAYS, ENHANCES THE CO-OPERATIVE NATURE OF THE AGREEMENT.



THE NATURE OF PROJECTS APPROVED UNDER RCA WILL BE AN IMPORTANT INFLUENCE ON THE CONTINUED EFFECT OF THE AGREEMENT AS A VEHICLE OF REGIONAL CO-OPERATION AND INTEGRATION. IN OUR VIEW, PROJECTS SHOULD FIRST MEET IDENTIFIABLE DEVELOPMENT NEEDS OF MEMBER STATES. SECONDLY, THEY SHOULD BE IN FIELDS WHICH ARE TECHNICALLY AND FINANCIALLY MANAGEABLE WITHIN THE CO-OPERATIVE ARRANGMENTS OF RCA. THIRDLY, TO TAKE A CUE FROM THE IAEA STATUE, THEY SHOULD ADVANCE THE CONTRIBUTION OF ATOMIC ENERGY TO PEACE, HEALTH, AND PROSPERITY.

WHILE WE SUPPORT THE PEACEFUL USES OF NUCLEAR ENERGY, THE VERY MENTION OF "NUCLEAR" OFTEN CALLS INTO QUESTION, AT LEAST IN THE MINDS OF SOME, HOW THOSE PEACEFUL USES CAN BE ASSURED. PROVIDING SUCH ASSURANCE, OF COURSE, SHOULD BE A COMMON INTEREST AND COMMON GOAL OF ALL COUNTRIES IN THE REGION, PARTICULARLY SINCE WE ARE ALL COMMITTED TO NUCLEAR TECHNICAL CO-OPERATION IN THE IAEA AND IN RCA.

AUSTRALIA SEES THE TREATY OF THE NON-PROLIFERATION OF NUCLEAR WEAPONS AND THE SAFEGUARDS REGIME WHICH THE IAEA APPLIES UNDER THAT TREATY AS A MOST SIGNIFICANT CONTRIBUTION TO REGIONAL AND INDEED GLOBAL PEACE AND SECURITY.

FOR AUSTRALIA, MEMBERSHIP OF THE NPT AND ACCEPTANCE OF IAEA SAFEGUARDS UNDER THE NPT, ALONG WITH A BILATERAL NUCLEAR CO-OPERATION AGREEMENT ARE VITAL ELEMENTS IN OUR POLICY RELATING TO THE EXPORT OF AUSTRALIAN URANIUM.

THOSE ELEMENTS PROVIDE ASSURANCES TO BOTH THE INTERNATIONAL COMMUNITY AND THE AUSTRALIAN PEOPLE THAT AUSTRALIAN-SUPPLIED URANIUM WILL BE USED ONLY FOR PEACEFUL, NON-EXPLOSIVE PURPOSES. WE BELIEVE THAT SUCH ASSURANCES ABOUT ALL NUCLEAR PROGRAMS IN THE REGION WOULD GREATLY ENHANCE REGIONAL SECURITY AND PROSPERITY AND THE SCOPE FOR NUCLEAR TRACER AND CO-OPERATION.

THE ANNUAL WORKING GROUP MEETING OF RCA MEMBER STATES HOLDS THE KEY TO THE AGREEMENT'S SUCCESS AS AN INSTRUMENT WHICH CAN CONTINUE TO ADVANCE REGIONAL CO-OPERATION, INTEGRATION, AND NOT LEAST, HARMONY. YOUR REVIEW OF ITS OPERATION, YOUR ASSESSMENT OF PROJECT IMPLEMENTATION, YOUR ACCEPTANCE OF NEW PROJECTS, AND YOUR CONSIDERATION OF THE FUTURE DIRECTIONS OF RCA WILL ALL IMPINGE OF THE AGREEMENT'S ABILITY TO REMAIN AND GROW AS AN EFFECTIVE AND TRULY REGIONAL CO-OPERATIVE MECHANISM.

I SHOULD LIKE VERY WARMLY TO WELCOME YOU ALL TO SYDNEY, TO AUSTRALIA TO YOUR SOUTHERN NEIGHBOUR. I WISH ALL PARTICIPANTS A SUCCESSFUL MEETING.

I SHOULD LIKE ALSO TO COMMEND THE INTERNATIONAL ATOMIC ENERGY AGENCY FOR ITS ASSISTANCE IN MAKING RCA WORK SO EFFECTIVELY. THE AGENCY, WHILE NOT A PARTY TO RCA AS SUCH, HAS A VARIETY OF ROLES ASSIGNED TO IT BY THE AGREEMENT. RCA DEPENDS HEAVILY ON THE AGENCY'S CO-ORDINATION AS WELL AS ITS RESOURCES IN ONE FORM OR ANOTHER. WE SHOULD FEEL INDEBTED TO THE IAEA AND TO PROFESSOR NORAMLY FOR HIS SIGNIFICANT COMMITMENT TO THE EFFECTIVE OPERATION OF RCA.

FINALLY, I AM PLEASED TO DECLARE THE ELEVENTH WORKING GROUP  
MEETING OF RCA PARTICIPANTS OPEN.



ELEVENTH RCA WORKING GROUP MEETING

Sydney, 13-16 March 1989

Agenda

Monday, 13 March 1989

09:00 INAUGURAL SESSION

1. Introduction
2. Welcome on behalf of ANSTO, Professor R.E. Collins, Chairman
3. Welcome on behalf of IAEA - Professor Noramly bin Muslim, Deputy Director General - Department of Technical Co-operation
4. Welcome on behalf of the Australian Government. Hon. Lionel Bowen M.P. Deputy Prime Minister and Attorney General.

10:15 Coffee break

10:30 FIRST ADMINISTRATIVE SESSION

5. Election of Chairman and comments by chairman elect
6. Adoption of agenda
7. Draft RCA Annual Report, 1988
8. Special Evaluation Review (SER) - Comparative Analysis of RCA and ARCAL

12:30 Lunch

14:00 ADMINISTRATIVE SESSION (CONT)

9. RCA Seminar

10. Election of chairpersons of project committees (Article IV of RCA Agreement refers)

- a) Medical
- b) Agricultural
- c) Nuclear science and energy based projects

15:00 Coffee break

15:15 FIRST TECHNICAL SESSION

Regional Industrial Project

- 11. Report by UNDP Project Co-ordinator
- 12. Mid-term review (project evaluation)
- 13. Regional Industrial Project-post 1991

Tuesday, 14 March 1989

09:00 SECOND TECHNICAL SESSION

Medical and Biological Applications of Nuclear Techniques.

14. Constitution of Project Committee

15. Technical Assistance (TA) Projects.

15.1 'Use of Computers in Technetium -99m Imaging'.

15.2 'Radioimmunoassay of Thyroid Related Hormones'.

16. Co-ordinated Research Programme (CRP).

16.1 'Imaging Procedures for the Diagnosis of Liver Diseases' - Phase II.

16.2 'Improvement of Cancer Therapy' - Phase II.

16.3 'Inhalation Imaging for the Diagnosis of Respiratory Diseases'.

16.4 'Nuclear Techniques for Toxic Elements in Foodstuffs'.

16.5 'Development of Tc-99m Generators using Low Power Research Reactors'.

17. Projects with TA and CRP Components.

17.1 'Development of Radiation Protection Infrastructure'.

17.2 'Radiation Sterilization for Tissue Grafts'.

17.3 'Care and Maintenance of Nuclear Medical Instruments'.

18. New project proposals (if any)

19. Concluding comments by Chairperson

10:45 Coffee

11:00 THIRD TECHNICAL SESSION

Agricultural Projects

20. Constitution of the Project Committee

21. Technical Assistance Project.

21.1 'Food Irradiation Process Control and Acceptance'  
(RPFI III).

22. Co-ordinated Research Projects.

22.1 'Nuclear Techniques to Improve Domestic Buffalo  
Production'.

22.2 'Integrated Control of Tropical Plant Viruses with  
Nuclear Techniques' (NEW PROJECT).

23. New Project proposal 'Improvement of Grain-legume  
Rhizobium Symbiosis to Fix Atmospheric Nitrogen'.

24. Concluding comments by Chairperson.

12:30 Lunch

13:30 FOURTH TECHNICAL SESSION  
Research Reactor and Energy Based Projects

25. Constitution of the Project Committee

26. Research Reactor based Projects.

26.1 'Research Reactor Utilization' (NEW PROJECT).

26.2 'Basic Science using Research Reactors'.

27. Energy based Projects.

27.1 'Nuclear Power Project Planning and Implementation'  
(KAERI) Training Courses).

27.2 'Energy and Nuclear Power Planning'.



28. New Project (if any).

29. Concluding comments by Chairperson

14.45 Coffee break

15:00 COUNTRY STATEMENTS

30. Receipt of country statements.

Wednesday, 15 March 1989

Field visit

Thursday, 16 March 1989

09:00 SECOND ADMINISTRATIVE SESSION

31. RCA Action Plan 1989-1991.

32. RCA cost projections 1989.

33. Other business.

34. Presentation and acceptance of the meeting report.

10:00 Coffee break

11:00 CLOSING SESSION

35. Closing remarks by ANSTO.

36. Official closing by IAEA.

12:30 Lunch

14:00 Visit to ANSTO facilities.



DRAFT RCA ANNUAL REPORT 1988

The Annual Report is prepared pursuant to Article VII (4) of the RCA Agreement 1987. As agreed by the Working Group Meeting Beijing 1987, the RCA Annual report 1988 covers the calendar year 1988. It is presented in draft form to the Working Group Meeting. Agreed amendments are incorporated in the final version which is tabled at the RCA General Conference Meeting, September 1989 for formal acceptance.

The Annual Report currently comprises four major sections:

- . a brief summary of major RCA Meetings
- . comments on the administration of the RCA programme
- . a level summary of the technical programme
- . an analysis of RCA Resources.

The following highlights can be reported:

(1) the announcement by China at the Beijing Working Group Meeting to join the family of RCA Donor Countries.

(2) the in principle decision by UNDP to fund two new Regional Asian Projects viz:

- . Food Irradiation Control and Acceptance.
- . Improvement of Grain Legume Rhizobium Symbiosis to Fix Atmospheric Nitrogen.

(This is the first time UNDP has considered funding IAEA executed Regional Asian projects apart from the Industrial Project).

(3) the decision by the Asian Development Bank to partially fund the Regional Training Course "Electric Systems Expansion Planning, Kuala Lumpur, 15 May - 24 June 1989;

(4) the hosting by Indonesia of the first RCA Seminar Jakarta, June 1988;

(5) the appointment of Mr. Manoon Aramrattana, Thailand to succeed Mr. Ahmad Tajuddin-Ali, Malaysia as UNDP Co-ordinator of the Regional Industrial Project;

(6) new "in principle" or confirmed commitments to the following extra-budgetary funded projects:

- a) Australia: Nucleonic Control Systems - Coal, Tracer Technology in Industry; Use of Computers in Technetium - 99m Imaging; together with an augmentation of the project on the Radiation Induced Surface Coating of Wood Products; and a major training course within the framework of the Radiation Protection Project.

- b) Japan: Within the framework of the Medical and Biological Applications of Nuclear Techniques: Phase II of both the Diagnosis of Liver Diseases project and the Improvement of Cancer Therapy project.

Within the framework of Radiation Protection; the CRP on Reference Asian Man and the Workshop series on Personnel and Environmental Dosimetry Intercomparison;

Within the framework of the Industrial Project; new activities in the fields of NDT, NCS Paper, Steel and Civil Engineering and Radiation Technology particularly in relation to surface coating and radiation vulcanization of rubber latex.

- c) India: Provision of extra-budgetary support for the following projects: Aerosol Inhalation Imaging (b) Basic Science Using Research Reactors (c) Maintenance of Nuclear Medical Instruments.
- d) Republic of Korea: Extra-budgetary support for Training Course on Nuclear Power Project Planning and Implementation.
- e) China: Extra-budgetary support for Regional Training course in the field of Radiation Cross-linking of Wire and Cable; and a Regional Workshop within the framework of the new Food Irradiation Project.

The following comments are pertinent to the highlights listed above:

- a) The projects and activities listed in (6) above are new and reflect increasing budgets. These amounted to \$1.78M in 1987, \$2.28M in 1988 and will probably exceed \$3.5M in 1989. The IAEA is extremely grateful for this support.
- b) The Deputy Director General and his staff are acutely aware of the contributions made by all developing Member States without which implementation of the projects would not be possible. He is looking into means of recording these "in country" contributions to the programme in a fair and acceptable manner.
- c) In line with TC policy, the average size of RCA projects is increasing. Between 1987 and 1988 the average annual budget per operating RCA project increased from \$105,000 to \$142,000. By comparison the average annual budget for a UNDP Regional Asian project during the fourth programming cycle is \$119,000.
- d) As mentioned by the DDG in his welcoming remarks, funding is essential, but should be seen as a key which allows access to a far greater resource; the intellectual wealth and experience of committed institutions of high standing in the developed and developing countries.

RCA SeminarDraft Recommendations**A. FIELD****PROGRAMME MANAGEMENT****a) Regional management:**

1. The move within RCA towards regional management should be further encouraged through the strengthening of existing mechanisms. In particular, the role and responsibilities of Project Committees, should be examined to ensure that they are contributing as effectively as possible to programme planning and review.
2. The 'de facto' regional role of a number of institutes in RCA and, in particular, of the Jakarta Regional Office of the UNDP/RCA Regional Industrial Project was recognized. This is in line with a growing IAEA interest in regional programming, and of the willingness of Member States to contribute to regional development. An appropriate official recognition by the IAEA of the regional role of selected institutes was recommended. Further, the IAEA was urged to accept, to the greatest extent possible, offers by Member States of access to facilities for the benefit of the regional programme.
3. It is recognized that the concept of regional networking encouraged by UNDP is an appropriate mechanism for international co-operation, and was recommended that it be applied more extensively to the RCA programme.

**b) Promotion:**

4. It was recommended that Asian experts should work together to promote the applications of nuclear techniques to industry. An appropriate mechanism might be through industrial forums. The importance of balancing the promotion of isotope applications with the development of radiation protection infrastructure was recognized.

c) Co-operation with other Agencies:

5. The IAEA was encouraged to continue to explore opportunities for co-operation with other UN Agencies and Regional Associations.

B. PROJECT MANAGEMENT

a) Project selection:

6. The concentration of resources and effort on large, multi-year projects was recommended.
7. The IAEA should explore the means of ensuring that the widest cross section of views possible is canvassed in establishing RCA project priorities.
8. In assessing project priorities, particular emphasis should be placed in reducing the technological gap between the developing and the industrialized countries.

b) New projects and project extensions:

9. The IAEA was requested to develop new project proposals in the following areas:
  - i) Research reactor utilization, and in particular the supply and utilization of radioisotopes and services;
  - ii) The application of radioisotopes and radiation to industry, to agriculture and to medicine. (The IAEA should seek support through the UNDP Regional Programme for Asia and the Pacific); and
  - iii) Radiation protection.



Some Member States supported a new project in the field of Nuclear Power. However a consensus was not reached on the question of whether such projects should be supported within the framework of RCA or through other avenues.

c) Project evaluation:

10. There should be a commitment to on-going project evaluation.

C. HUMAN RESOURCES DEVELOPMENT (HRD)

11. The importance of the training component in RCA projects was recognized. It was recommended that the Agency evaluate the education value of various HRD modalities (training courses, executive management seminars etc.) and explore the application of distance learning techniques.
12. The potential value of regional training centres should be recognized.

D. TECHNICAL CO-OPERATION AMONG DEVELOPING COUNTRIES (TCDC)

13. It was recommended that the IAEA support projects and activities leading to increased TCDC. RCA should, if appropriate, co-operate with other regions.
14. The IAEA should ensure, as far as possible, that the benefits of RCA projects flow to all RCA Member States.
15. Further efforts should be made to recruit experts from developing countries.
16. Consistent with the RCA Agreement, there should be as broad a resource base as possible for RCA projects.



REGIONAL UNDP/IAEA PROJECT ON INDUSTRIAL APPLICATIONS  
OF  
ISOTOPES AND RADIATION TECHNOLOGY  
FOR ASIA AND THE PACIFIC REGION (RAS/86/073)  
-----

REPORT OF THE PROJECT COORDINATOR  
(April - December 1988) \*)  
-----

1. Project Coordination

1.1. Tripartite Review Meeting

The First Tripartite Review Meeting (TPR) of the Phase-II was held in Jakarta, 16 June 1989. The following main issues were raised in the meeting :

- 1) To what extent the Project generated industrial investment.
- 2) To what extent balancing of assistance to meet varying levels of needs of different countries was made.
- 3) The status of participation of the Governments of Democratic People's Republic of Korea and Vietnam was commented.
- 4) What would be significant role of regional center ?
- 5) The difficulty in placing fellow from private industry to regional activities was commented.
- 6) The need to ensure equitable benefits from the Project to all participating countries was insisted

The major recommendation of the meeting was to commission a mid-term evaluation of the Project.

1.2. The Third Meeting of National Counterpart, Jakarta, 17 June 1989

The meeting was chaired by the RCA Coordinator and attended by 11 of 13 participating countries. It reviewed the technical aspects of the programme.

The discussion resulted the following recommendations :

- 1) The Project should implement proposed planned activities on low-cost NCS for Small Paper Mills as proposed by NCP, Japan.

-----  
\*) Presented at the Eleventh RCA Working Group Meeting, Sydney, Australia, 13-16 March 1989.

- 2) The Project should consider inclusion of NCS for Paper Mills designed by Shanghai Instrumentation Process Automatic Institute (SIPAI), Shanghai, China, into the proposed activities of low-cost NCS for Small Paper Mills.
- 3) All NCps should consider to establish of of National Industrial Forum.
- 4) The Project should explore possibility on the use of radiotracer for termite studies as proposed by Ncp Australia.

### 1.3. Mid-Term Evaluation Mission

A Mid-term Evaluation Mission is scheduled to commence in October 1989. The outputs of the mission expected before the next Tripartite Review Meeting are :

- (1) a in-depth mid term review of the Project elements to re-establish appropriateness of priority areas and/or target industries.
- (2) the identification of new possible project modalities.
- (3) the realization of the envisaged activities as outlined in the Project work plan for 1988/1989.

### 1.4. Project Coordination with UNDP

In 1988, the Project Coordinator's Office submitted 3 reports, as requested, to the UNDP Office, Jakarta, Indonesia. They are "Input for Paper on Networking for MAC-IV", "Summary of Investment under the Framework of the Project RAS/86/073" and "Inter-Country Programme Management Plan (ICPMP)".

## 2. Project Implementation in 1988

The project implementation reported here covers the period of April-December 1988. The activities were implemented according to the Work Plan for 1988 as outlined in Annex 1. There were two levels of activities implemented under the framework of the Project, i.e. project coordination meetings and project activities planned in accordance with designed mechanisms agreed by the coordination meetings. There were four coordination meetings and forty other events.

### 2.1. Project Coordination Meetings

The four coordination meetings organized in 1988 are the Second Meeting of National Coordinators for Tracer Technology and Nucleonic Control Systems (NCS), the Fourth

Meeting of National Coordinators for NDT, the Third Meeting of National Coordinators for Radiation Technology, and the First Meeting of National Research Group Leaders (NRG) on RVNRL Technology Development Programme (TDP). Major conclusions and recommendations from those meetings are as the following :

The Second Meeting of National Coordinators for Tracer Technology and NCS

1. The meeting reviewed and concluded on Technology transfer mechanisms for Tracer Technology derived from experience in Phase I of the Project (discussed at the First Meeting of the National Coordinators in 1986) to be used for the on-going activities in the Phase II. They are the following :
  - Meetings of National Coordinators and Expert Advisory Groups
  - Regional Training Courses
  - Industrial Demonstrations
  - National Executive Management Seminars of Expert Assistance
  - Overseas Fellowships
2. The meeting recommended that National Coordinators for NCS from Japan and Singapore should be identified and should attend the next meeting (scheduled for 1990).
3. Statistics of various types of NCS being used in each country were reported.
4. The meeting discussed and concluded work programme for Tracer Technology and NCS sub-projects in 1988-1989.

The Fourth Meeting of National Coordinators for Non-Destructive Testing (NDT)

1. The meeting concluded on coordination procedures among the Project Experts, Regional Experts, National Coordinators and/or Course Directors for both Regional and National Training Courses.
2. An Ad-hoc Regional Board of Examination Review was established comprising experts from Australia, India, Japan and IAEA. The Board would be examining a recommendation by participants to the Regional Workshop on Qualification and Certification of NDT Personnel, held in Malaysia in 1987, on setting up a model examination centre for levels 2 and 3 as a step forward to harmonizing of the Qualification and Certification of NDT Personnel Schemes.

3. The meeting discussed and concluded on implementation of work plan for 1988 and a tentative work plan for 1989.

#### The Third Meeting of National Coordinators for Radiation Technology

1. The meeting accepted the proposal for the development of the Regional Network for Calibration and Standardization of Industrial Process Control, and it is to be implemented starting last quarter of 1988 until 1991.
2. The meeting endorsed the TCDC concept by agreeing to make available one to two places at regional training courses conducted under the sub-project for candidate from outside the region.
3. The meeting recommended that each country initiate the introduction of national appropriate legislations for industrial sterilization practice, including industrial radiation sterilization.
4. The meeting recommended that a written examination at the end of each Regional Training Course under the sub-project be organized by the Course Director.

#### The First Meeting of National Research Group Leaders on RVNRL

1. National Research Groups (NRG) are established in six countries, namely Bangladesh, People's Republic of China, India, Indonesia, Malaysia, Sri Lanka and Thailand.
2. Irradiation cost of RVNRL, produced in the Region, was estimated US\$0.1/kg of RVNRL based on irradiators designed by the Project's Short-term Expert, Mr. K.S. Aggarwal of India.
3. A Coordinated National Technology Development Programme (CNTDP) was set up and to be coordinated by the Project Coordinator's Office. Results from the CNTDP will be selectively presented at the International Symposium on RVNRL in 1989, and at the next NRG Leaders Meeting.

### 2.2. The Main Project Events

#### Sub-Project 1 : Tracer Technology

There were totally 9 events implemented as compared to 7 in 1987. Highlight of the year were three industrial demonstrations, i.e. Thailand (gas-flow measurement in gas pipeline), Bangladesh (Mercury inventory in a caustic soda plant) and Republic of Korea (Residence time Distribution in

Precalcinators of a cement plant)); and a Regional Training Course on Tracer in Industry hosted by the People's Republic of China.

#### Sub-Project 2 : Non-Destructive Testing

There were totally 23 events implemented as compared to 20 in 1987. There were 4 Regional Training courses hosted by the Governments of People's Republic of China, Pakistan, India and Republic of Korea and 16 National Training courses in 8 countries. One specialized Regional Workshop was organized on Image Processing for NDT Techniques, Tokyo, 3-9 October 1989, which was funded by the extrabudgetary contribution from Japan.

In addition, a proposal on expansion of this sub-project was endorsed by the Seventeenth Meeting of RCA Representatives in Vienna, September 1988, and additional fundings is being sought.

#### Sub-Project 3 : Radiation Technology

There were totally 14 events implemented as compared to 10 in 1987. There were 3 regional Training Courses hosted by the Governments of the people's Republic of China and India, and 4 National Executive Management Seminars - two on Radiation Cross-linking Applications to Manufacturing of Wires and Cables (CPR and PAK) and two on Industrial Radiation Sterilization (PHI and INS).

Results from those events and other developments are the following :

##### Radiation Vulcanization of Natural Rubber Latex (RVNRL)

Following the successful production trial in 1988, 400,000 condoms were distributed by the Family Planning Agency of Indonesia for field experiments. The results will be finalized soon. Together with the experiment, condom packages were specially designed by CAIR-BATAN with indication of RVNRL being used for the condoms.

The third production trial is being planned in April 1989.

As a result of the First Meeting of National Research Group on RVNRL Technology Development Programme, a small scale TDP was conducted with cost-free assistance from TRCRE and CAIR-BATAN on shipment of RVNRL to participation countries, namely BGD, CPR, IND, INS, MAL, SRL, and THA.

### Radiation Curing

An Implementation Plan was agreed by the Government of Japan for funding of additional equipment to supplement the modification of the Electron Beam facility in Jakarta. A 50-litre liquid nitrogen plant (USSR design) was commissioned last December as part of a Technical Assistance provided by the IAEA in addition to that of the Project. The modification is to be completed by mid-May 1989, and a Regional Executive management Seminar and a Regional Training Course are planned for 1990.

The production of Electron beam cured parquet flooring trial marketing of PERHUTANI and CAIR-BATAN, a local wood-based company is at final stage. The final evaluation meeting between CAIR-BATAN and PERHUTANI is planned in March 1989.

After the modification and apart from activities under the Project, CAIR-BATAN agrees in principle to make the EB facility available to foreign users for experimental work if requested through the Project. It is advised that any one request for using of the facility should have sufficient work for at least one week and not more than one month. The users will have to bear a nominal charge to cover part of the operational expenses. CAIR-BATAN will advise of the charge to the Project in the near future. Interest of using of the facility have been indicated by potential users in Malaysia, Thailand and Bangladesh.

Following an expert mission to the Philippines, a UV lamp was recommended to be added to the pilot timber line of the Forest Products Institute. The facility will be used for regional activities later. The arrangement for installation is being finalized. UV curing of timber products and paper coatings are the main applications of this initiative.

### Radiation Cross-linking Applications to Wires and Cables

At the Third Meeting of National Coordinators for Radiation Technology, Jakarta, June 1988, The National Coordinator of people's Republic of China proposed to establish a Regional Training-demonstration Center for Radiation Cross-linking Applications at the Shanghai Applied Radiation Institute (SARI), University of Science and Technology, Shanghai, People's Republic of China. The proposal was endorsed in the meeting and recognized at the Tripartite Review Meeting, 16 June 1988.

A variable, 0.5 - 2.0 MeV, Electron Beam Facility was set up at Bhabha Atomic Research Centre, Bombay, India, for an intensive research and development of radiation cross-linking applications in India. The Project has the pleasure to train scientists from BARC in the past regional training



courses.

The Project has also been informed that there are at least two companies in republic of Korea expressed interests of installing EB machines in their production lines.

#### Radiation Sterilization

The importance of industrial radiation sterilization has been made known to industries and widely accepted in the Region as the results of series of regional training courses and national executive management seminars in the past years.

A recent achievement has been the committment to invest on an industrial radiation sterilization facility in Indonesia made by PT. Rubber Perkasa (glove factory).

As a result of NEMS conducted in Indonesia, december 1988, Rubber Perkasa (glove factory) in jakarta indicated a strong interest of investing on an industrial radiation sterilization facility. In addition to technical consultation with experts at the NEMS, the company staff together with CAIR-BATAN staff visited a newly build radiation sterilization facility at UTN, Malaysia, January 1989, after which the company was fully convinced of the viability of the technology and confident of its benefits. Negotiation between the company and foreign supplier for a turn-key facility is in the advanced stage. The investment would be about 2 million US Dollars.

New industrial radiation sterilization facilities have been planned and constructed in India. Two to three private firms are negotiating with BARC at an advanced stage to supply industrial gamma radiation sterilization facilities.

For completeness of accountability of investment made by both private companies and governments on radiation sterilization facilities, table 1 is a summary of information made available to the Project, up to now.

#### Radiation Engineering

A new initiative under this subject is the establishing of Regional Network on Calibration and Standardization of Industrial Process Control. An Expert Advisory Group meeting was organized in TRCRE, 20-24 February 1989.

Table 1. A Summary of Estimated Investment in Radiation Sterilization Facilities in the Region.

<u>Affiliation</u>	<u>Investment (M US\$)</u>	<u>Year</u>
1. ISOMED, BARC, India	UNDP assisted	
2. Radiation Service Division KAERI, Republic of Korea	UNDP assisted	
3. Ansell Co. Ltd. Malaysia	?	?
4. Kendall-Gammatron Co. Ltd Thailand	3.5	1983
5. PARAS (Pakistan Radiation Service), Pakistan	1.8	1989
6. Atomic Energy Research Establishment, Bangladesh	?	?
7. Beijing Radiation Center, China	?	?
8. Philippine Nuclear Research Institute, Philippines	?	1988
9. Nuclear Energy Unit, Malaysia	1.2	1989
10. Rubber Perkasa, Indonesia	4.0	1989
11. Co-60 Irradiation Facility Bangalore, India	?	?
12. Co-60 Irradiation Facility New Delhi, India	?	1988
13. Two Private Companies India	?	?

#### Sub-Project 4 : Nucleonic Control Systems

##### Paper Industry

As a result of the expert mission conducted in 1988, a low cost NCS for Small paper Machines was developed and introduced by the National Coordinator of Japan at the Tripartite Review meeting, June 1988. A series of activities was also proposed and endorsed by the meeting. The first Regional Workshop was planned for 1989.

##### Steel Industry

Regional EMS on the Use of NCS S1 held in Tokyo, 15-24 May 1989. Nu will be presented as a result of in 1988. Further consultant m identified at the REMS is encourage

steel  
lls in  
n, Dr.  
be and

## Civil Engineering

Regional Workshop on the Use of NCS in Civil Engineering will be held in Tokyo, Japan, 5-13 September 1989. Identification of needs of consultant missions is also encouraged.

## Coal

Various Regional Training Courses, Regional Workshop and Regional Executive Management Seminars will be held in Thailand in 1989.

## 4. Achievements

### Manpower Development

The Project has trained, through regional activities, government and industrial personnel in 1988 totally 126 persons of which 30% were from industries. The resources for the implementation were made available from UNDP, Government of Australia and Government of Japan. A summary is given in Annex 4.

### Investments

An output of the implementation is the indication of investments or commitment to invest made by private industries. A total of approximately 3.2 Million US Dollars has been indicated in 1988. The continued investments by private industries confirms effectiveness of the current implementation mechanisms within various sub-projects particularly those in sub-projects on Radiation Technology and Nucleonic Control Systems.

However, there have also been investments and benefits resulting from implementation of sub-projects on Tracer Technology and Non-destructive testing which is still unknown at time of this report.

The summary of investments made as a result of the Project is given in Annex 5.

## 5. Acknowledgements

The Project Coordinator would like, on behalf of the participating countries and his personal behalf, to thank the invaluable service of Dr. S.M. Rao, the long-term expert for Tracer Technology and NCS, whose contract ends mid-May 1989 as to his commitment to return to Bhabha Atomic Research Centre, India. His contributions in the last two years have been markedly evident and much appreciated in all participating countries. May his new capacity at BARC be progressive and satisfying. His continued contribution to the Project is, of course, always welcome.

## WORK PLAN

## UNDP REGIONAL INDUSTRIAL PROJECT

1988

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
<p>1.1. Sub-Project 3 Expert Mission - Irradiator Design (Aggarwal), Jakarta 11 Jan - 29 April</p> <p>1.2. Sub-Project 4 Expert Mission - NCS Paper, Colombo 25-29 January</p> <p>1.3. Sub-Project 1/4 Expert Rao 12 m/m, Jakarta</p> <p>1.4. Sub-Project 2 Expert Gilmour 12 m/m, Kuala Lumpur</p>	<p>2.1. Sub-Project 2 National TC - RT-2 Colombo, 1-12 Feb.</p> <p>2.2. Sub-Project 2 National TC - RT-2 Jakarta, 15-26 Feb.</p> <p>2.3. Sub-Project 1 Expert Demonstration Gas Flow Measurement Bangkok, 22 Feb - 3 March</p> <p>2.4. Sub-Project 1 Expert Mission (Morch), Pakistan 28 Feb - 10 March</p> <p>2.5. Sub-Project 2 National TC - UT-2 Manila, 8-26 Feb.</p> <p>2.6. Sub-Project 3 Experts - UV Facility Installation, Manila 25 Feb - 4 March</p> <p>2.7. Sub-Project 4 Exp Planning Mission, NCS - Coal, Bangkok 25-27 Feb.</p>	<p>3.1. Sub-Project 3 National EMS - Radia- tion Processing, Dhaka, 14-17 March</p> <p>3.2. Sub-Project 1 2nd Meeting of NC - Tracer, Colombo 14-16 March</p> <p>3.3. Sub-Project 1 National EMS - Tracer Colombo, 17-18 March</p> <p>3.4. Sub-Project 2 National TC - RT-2 Colombo, 7-18 March</p> <p>3.5. Sub-Project 2 National TC - RT-2 Kuala Lumpur, 14-26 March</p> <p>3.6. Sub-Project 2 Experts - Preparation of Text-books, Kuala Lumpur, 28 Mar - 15 Apr.</p> <p>3.7. Sub-Project 3 Expert Mission - Rubber (Makuuchi), Kottayam, 20-22 March</p> <p>3.8. Sub-Project 1 Regional TC - Tracer Beijing, 21 March - 9 April</p> <p>3.9. Sub-Project 2 National TC - SM-2 PAK, 27 March - 14 April</p>	<p>4.1. Sub-Project 2 4th NC Meeting - NDT Daeduk, 19-22 April</p> <p>4.2. 10th RCA Working Group Meeting Beijing, 11-15 April</p>	<p>5.1. Sub-Project 4 Regional EMS - Civil Engineering, Tokyo 24 May - 1 June</p> <p>5.2. Sub-Project 2 National TC - UT-2 Bangkok, 12-17 May</p> <p>5.3. Sub-Project 1 Expert Demonstration Cement Industry ROK, 16-20 May</p>	<p>6.1. Sub-Project 2 Regional TC - NDT SM-2, Shanghai 13 June - 8 July</p> <p>6.2. Sub-Project 3 National EMS - Rad. Cross-linking, Changchun, CPR; Lahore, PAK, 28 June - 6 July</p> <p>6.3. Sub-Project 3 3rd NC Meeting - Radiation Technology Jakarta, 8-10 June</p> <p>6.4. RCA Seminar Jakarta, 13-15 June</p> <p>6.5. TPR Meeting Jakarta, 16-17 June</p>

WORK PLAN

UNDP REGIONAL INDUSTRIAL PROJECT

1988

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
<p>7.1. Sub-Project 1 Demo Mercury Inventory Chittagong, Bangladesh 10-14 July</p> <p>7.2. Sub-Project 2 Regional TC - NDT, RT-2, Hyderabad, India 18 July - 6 August</p>	<p>8.1. Sub-Project 2 National TC - ET-2 Manila, Philippines 16 August - 2 Sept.</p>	<p>9.1. Sub-Project 3 Regional TC/Cross- linking, Shanghai &amp; Changchun, China 5 - 23 September</p> <p>9.2. Sub-Project 2 Regional TC - NDT, UT-2, Lahore, PAK 12-29 September</p> <p>9.3. 16th RCA Meeting, Vienna 22 September</p> <p>9.4. Sub-Project 3 RCM/Co-ord. RVNRL Kunming, China, P.R. 7-9 September</p> <p>9.5. Sub-Project 2 National TC - RT-2 Daeduk, Korea Rep. of 5-16 September</p> <p>9.6. Sub-Project 3 EXP Mission - RVNRL China, P. Rep., 10-18 September</p>	<p>10.1. Sub-Project 2 Regional Workshop - NPT Image Processing Tokyo, Japan 3-7 October</p> <p>10.2. Sub-Project 2 Regional TC - NDT Eddy Currents, Daeduk, Korea. Rep. 17 Oct. - 4 Nov.</p> <p>10.3. Sub-Project 3 EXP Mission - RVNRL Kuala Lumpur, MAL 17-28 October</p> <p>10.4. Sub-Project 2 National TC - UT-2 Kuala Lumpur, MAL 3-18 October</p> <p>10.5. Sub-Project 2 National TC - RT-2 China, People's Rep., 17 Oct - 4 Nov.</p> <p>10.6. Sub-Project 3 NWS - RVNRL Sri Lanka, 16 Oct.</p> <p>10.7. Sub-Project 3 National TC / Rad. Chemistry, K.L, MAL 17-28 October</p> <p>10.8. Sub-Project 4 EXP Mission/NCS Steel INS, PAK, 18-28 Oct.</p>	<p>11.1. Sub-Project 2 National TC - RT-3 Jakarta, Indonesia 2-25 November</p> <p>11.2. Sub-Project 2 National TC - RT-2 Bangkok, Thailand 10-25 November</p> <p>11.3. Sub-Project 3 Regional TC - Radiation Engineering Bombay, India 21 Nov. - 2 Dec.</p> <p>11.4. Sub-Project 1 National EMS Tracer Manila, Philippines 21 - 23 November</p> <p>11.5. Sub-Project 2 National TC - ET-2 Pakistan, 4-21 DEC. <del>27 Nov. - 15 Dec.</del></p> <p>11.6. Sub-Project 3 EXP Mission - Ind. Dosimetry, CPR, IND, PAK, THA, 28 Nov. - 9 Dec.</p> <p>11.7. Sub-Project 2 National TC - RT-2 Manila, Philippines 2-22 Nov.</p>	<p>12.1. Sub-Project 3 National EMS - Rad. Sterilization of Medical Products Manila, PII and Jakarta, Indonesia, 1-2 Dec, 7-8 Dec.</p> <p>12.2. Sub-Project 3 Regional TC - Rad. Sterilization/ Materials, Bombay, India, 5-16 Dec.</p> <p>12.3. Sub-Project 2 NS Radioisotope and Radiation Applicat. Jakarta, Indonesia, 7-8 December.</p>

WORK PLAN  
UNDP REGIONAL INDUSTRIAL PROJECT  
1989

March 1989

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1.1 Sub-Project 2 National Seminar Thailand, 26-28 Jan.	2.1 Sub-Project 2 National TC/UT-2 PAK, 11 Feb.-2 March	3.1 11th RCA WG Mtg. Sydney, 13-16 March 3.2 Sub-Project 2 Regional TC/UT-3 Manila, 6-24 March 3.3 Sub-Project 1 DEMO - Gas flow Malaysia, 7-8 March 3.4 Sub-Project 1 EXP-Tracer SRL, 6-10 March	4.1 Sub-Project 3 Expert-Irradiator Des. Malaysia, 3-14 April 4.2 Sub-Project 1 EXP-Tracer IND, SRL	5.1 Sub-Project 2 National TC/UT-2 THA, 29 May-10 June 5.2 Sub-Project 2 National TC/SM-2 Sri Lanka,	6.1 Sub-Project 1 EAG - Mtg of Managers Jakarta, 5-7 June 6.2 Sub-Project 2 National TC/UT-3 IND, 15 June-8 July 6.3 Sub-Project 2 National TC/RI-3 PHI, 26 June-14 July
1.2 Sub-Project 2 5th NCM Meeting Bkk, 31 Jan.-3 Feb.	2.2 Sub-Project 2 National TC/RI-2 SRL, 20 Feb.-4 March 2.3 Sub-Project 3 RTC Rad. Steril. Bkk, 13-24 Feb. 2.4 Sub-Project 1 EXP - Tracer Prep. Jakarta/Bandung 6 Feb.-3 March				
1.1 Requirement: no requirement	2.1 Requirement: Cost: \$4 000	3.1 Requirement: No requirement	4.1 Requirement: Cost: \$5 000	5.1 Requirement: Cost: \$4 000	6.1 Requirement: Cost: \$20 000
1.2 Requirement: Cost: \$20 000	2.2 Requirement: Country project	3.2 Requirement: Cost: \$28 000	4.2 Requirement: Cost: \$2 000	5.2 Requirement: Country Project	6.2 Requirement: Cost: \$4 000
	2.3 Requirement: Cost: \$40 000	3.3 Requirement: Cost: \$8 000			6.3 Requirement: Cost: \$4 000
	2.4 Requirement: Cost: \$5 000	3.4 Requirement: Cost: \$1 500			

WORK PLAN  
UNDP REGIONAL INDUSTRIAL PROJECT  
1989

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
7.1 Sub-Project 2 National TC/UT-2 DRK, 31 July-18 Aug.	8.1 Sub-Project 2 National TC/UT-2 INS, 23 Aug.-15 Sept.	9.1 Sub-Project 4 NEMS NCS Paper CPR,	10.1 Sub-Project 2 National TC/ET-2 INS, 4-17 Oct.	11.1 Sub-Project 2 RW NDT Test Pieces INS, 6-17 November	
7.2 Sub-Project 2 National TC NDI MAL 24 July-11 Aug.	9.2 Sub-Project 4 REMS Paper Bkk, 6-8 September	10.2 Sub-Project 2 NEMS Nucl. Install. CPR, 16-20 Oct.	11.2 Sub-Project 2 National TC/SM-2 MAL, 27 Nov.-9 Dec.		
7.3 Sub-Project 2 NDT Conference KL, 24-25 July	9.3 18th RCA/GC Mtg. IAEA, Vienna	10.3 Sub-Project 2 NTC Rad. Sterilization CPR,	11.3 Sub-Project 2 National TC/SM-2 THA, 2-17 November		
	9.4 Sub-Project 2 Regional TC/RT-3 KL, 4-22 Sept.	10.4 Sub-Project 2 National TC/UT-2 MAL, 9-24 October	11.4 Sub-Project 3 NTC Rad. Sterilization ROK, 30 Oct.-3 Nov.		
	9.5 Sub-Project 2 National TC/UT-2 BGD, 10-28 Sept.	10.5 Sub-Project 2 Regional TC/ET-2 PAK, 7-26 October	11.5 Sub-Project 2 NDT Conference INS 21-23 November		
	9.6 Sub-Project 2 National TC NDI MAL, 25-29 September	10.6 Sub-Project 1 RTC Tracer in Ind. KL, 9-27 October			
7.1 Requirement: Cost: \$4 000	8.1 Requirement: Cost: \$4 000	9.1 Requirement: Cost: \$15 000	10.1 Requirement: Cost: \$4 000	11.1 Requirement: Cost: \$28 000	
7.2 Requirement: Country Project	9.2 Requirement: Cost: \$28 000	9.2 Requirement: Cost: \$28 000	10.2 Requirement: Cost: \$15 000	11.2 Requirement: Country Project	
7.3 Requirement: Country Project	9.3 Requirement: No requirement	9.3 Requirement: No requirement	10.3 Requirement: Country Project	11.3 Requirement: Country Project	
	9.4 Requirement: Cost: \$28 000	9.4 Requirement: Cost: \$28 000	10.4 Requirement: No requirement	11.4 Requirement: Cost: \$12 000	
	9.5 Requirement: Cost: \$4 000	9.5 Requirement: Cost: \$4 000	10.5 Requirement: Cost: \$28 000	11.5 Requirement: Cost: \$15 000	
	9.6 Requirement: Country Project	9.6 Requirement: Country Project	10.6 Requirement: Cost: \$28 000		

WORK PLAN

March 1989

UNDP REGIONAL INDUSTRIAL PROJECT (Extrabudgetary funding)  
1989

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1.1 Sub-Project 4 EXP Mission Paper JPN 19 Jan.-1 Feb.	2.1 Sub-Project 3 EAG Calibr.+Standard. of process control Takasaki, 20-24 Feb.	3.1 Sub-Project 4 RW Small Paper Mills Tokyo, 14-20 March	4.1 Sub-Project 3 EAG New Dev.+ Trends in Rad.Chemistry Takasaki, 3-6 April	5.1 Sub-Project 2 RW Neutron Radiography Osaka, 15-19 May	6.1 Sub-Project 4 EXP (Paper, Civil Eng) various,
	2.2 Sub-Project 3 EXP Mission RVNRL VIE THA 20 Feb-1 March	3.2 Sub-Project 3 EXP Mission Curing Indonesia, 15 May-2 June	4.2 Sub-Project 1 Follows Sydney, April-Sept.	5.2 Sub-Project 3 EXP Mission Reg.Netw. various,	6.2 Sub-Project 3 EXP Mission Stack Gas IND, CPR THA MAL ROK
		3.3 Sub-Project 4 EXP Coalscan Comm. Thailand,	4.3 Sub-Project 1 DEMO Tracer Petrochem. Indonesia,	5.3 Sub-Project 4 REMS NCS Steel Tokyo, 17-24 May	6.3 Sub-Project 1 EXP Tracer Indonesia, 8-9 June
					6.4 Sub-Project 3 RTC X-Linking CPR,

1.1 Requirement: JPN: \$8 000	2.1 Requirement: JPN: \$20 000	3.1 Requirement: JPN: \$25 000	4.1 Requirement: JPN: \$40 000	5.1 Requirement: JPN: \$25 000	6.1 Requirement: JPN: \$5 000
	2.2 Requirement: JPN: \$10 000	3.2 Requirement: JPN: \$8 000	4.2 Requirement: AUL: \$45 000	5.2 Requirement: JPN: \$15 000	6.2 Requirement: JPN: \$12 000
		3.3 Requirement: AUL: \$20 000	4.3 Requirement: AUL: \$	5.3 Requirement: JPN: \$25 000	6.3 Requirement: AUL: \$
					6.4 Requirement: CPR: \$30 000



WORK PLAN

March 1989

UNDP REGIONAL INDUSTRIAL PROJECT (Extrabudgetary funding)

1989

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
7.1 Sub-Project 3 REMS Radiation Curing 10-12 July	8.1 Sub-Project 3 NEMS Civil Engineering ROK, THA, MAL/SIN	9.1 Sub-Project 4 REMS Civil Engineering Tokyo, 5-13 September	10.1 Sub-Project 2 RTC Non-Metallic Bkk or Tokyo, 2-6 Oct.	11.1 Sub-Project 3 RM Rad.Eng./EB Takasaki, 6-17 Nov.	12.1 Sub-Project 1 DEMO Tracer Petroleum Thailand,
7.2 Sub-Project 3 Int'l Symposium RVNRL Takasaki 31 July-4 Aug.	8.2 Sub-Project 4 REMS MCS Coal THA,	9.2 Sub-Project 1 EXP Tracer CPR,	10.2 Sub-Project 3 RTC Radiation Curing Sydney,	11.2 Sub-Project 4 REMS MCS Coal THA,	12.2 Sub-Project 1 DEMO Tracer Philippines,
7.3 Sub-Project 3 2nd Mtg. NRG Leaders on RVNRL Tokyo, 26-29 July	8.3 Sub-Project 4 RW MCS Coal THA,	9.3 Sub-Project 1 EXP Tracer Pakistan,	10.3 Sub-Project 3 EXP Rad. Curing Philippines,	11.3 Sub-Project 4 RTC MCS Coal THA,	12.3 Sub-Project 3 NEMS RVNRL THA, SRL 7-12 Dec.
				11.4 Sub-Project 4 RW MCS Coal THA,	
				11.5 Sub-Project 1 DEMO Tracer ROK,	
7.1 Requirement: JPN: \$25 000	8.1 Requirement: JPN: \$15 000	9.1 Requirement: JPN: \$25 000	10.1 Requirement: JPN: \$40 000	11.1 Requirement: JPN: \$40 000	12.1 Requirement: AUL: \$
7.2 Requirement: JPN: \$10 000	8.2 Requirement: AUL: \$33 000	9.2 Requirement: AUL: \$	10.2 Requirement: AUL: \$55 000	11.2 Requirement: AUL: \$70 000	12.2 Requirement: AUL: \$
7.3 Requirement: JPN: \$25 000	8.3 Requirement: combined with 8.2	9.3 Requirement: AUL: \$	10.3 Requirement: AUL: \$5 000	11.3 Requirement: combined with 11.2	12.3 Requirement: JPN: \$15 000
				11.4 Requirement: combined with 11.2	
				11.5 Requirement: AUL \$	

## SUMMARY OF PROJECT IMPLEMENTATION STATISTICS FOR 1988 (REGIONAL ACTIVITIES)

As of : 31 DECEMBER 1988

REMS/RW/RSM/RTC/SYMP.

Project : RAS/86/073

ACTIVITY	VENUE	DATE	NO. OF PARTICIPANTS		
			GOVT	INDT	TOTAL
Sub-Project 1 TRACER TECH.					
- RTC Tracer Appl. in Ind.	CPR	21 Mar.-9 Apr.	12	4	16
Sub-Project 2 NDT					
- RTC RT-2	IND	18 Jul.-6Aug.	9	3	12
- RTC UT-2	PAK	12-29 September	9	5	14
- RTC SM-2	CPR	13 Jun.-8 Jul.	9	5	14
- RTC ET-2	ROK	17 Oct.-4 Nov.	7	5	12
- RW Img. Proc.in NDT Tech.	JPN	3-7 October	10	2	12
Sub-Projet 3 RAD. TECH.					
- RTC X-Lnkg Appl.Wire&Cable	CPR	5-23 September	6	7	13
- RTC Rad.Engineering(gamma)	IND	21 Nov.-2 Dec.	9	-	9
- RTC Ind.Rad.Sterlzn(QC&CM)	IND	5-16 December	7	4	11
Sub-Project 4 NCS					
- REMS NCS in Civil Engr.	JPN	24 May-1 June	13	-	13
TOTAL (persons trained)			91	35	126

## SUMMARY OF INVESTMENTS MADE BY PRIVATE SECTOR

As of : 28 FEBRUARY 1989

Project : RAS/86/073

COMPANY	LOCATION	INVESTMENTS ( US \$ )	
		1987	1988
1. Pakistan Radiation Service	Lahore (PAK)	1,800,000 (PRs 32 M)	----
2. Lucky GoldStar Co. Ltd. (3 EB units)	Seoul (ROK)	4,100,000 (W3,000 M)	----
3. Dae Han Electric Co. (1 EB unit)	Seoul (ROK)	N.A.	----
4. Rubber PERKASA Co. (Co-60 Radiation Sterilization)	Jakarta (INS)	----	*2,000,000
5. Asia Kraft Co.	(THA)	250,000	----
6. Thai Development Paper Co. Ltd.	(THA)	----	800,000
7. Beijing Paper Mill No. 1	Beijing (CPR)	----	+100,000
8. Thai Union Paper Co. Ltd.	Samutprakarn (THA)	250,000	*100,000
9. Adamjee Paper and Board Co.	(PAK)	----	*100,000
10. Pakistan Paper Corporation	(PAK)	----	*100,000
11. Kajang Paper Mills	Kajang (MAL)	----	*100,000
T O T A L		6,150,000	3,200,000

NOTE : \* Estimated commitments to invest

+ The system manufactured in the country



Subject: RAS.6.016: Project summary 1988

Title: "Use of Computers in Technetium-99m Imaging"

Project Officer: G. van Herk

*(now left agency)*

Participating Member States: All 12 RCA member states; to date, all except China and Viet Nam have submitted candidates for the first Training Course

Project Objectives: Same as stated in: Project description, in Annex 22 of RCA report of 1987.

Major activities 1988: The assigned course director, Mr. Brian Hutton, came to Vienna in August. He attended the related Research Coordination Meetings to Establish Instrument Quality Control in Asia and Latin America, and discussed the plans with the present national coordinators and prospective participants. He drafted, in collaboration with the project officer, the course outline and prospectus. In addition, he wrote a report reviewing the achievements of the regional project RAS.4.006, on Quality Control of Nuclear Medicine Instruments, in its relation with the proposed training course. The first course became further specified and its final program accepted.

Proposed activities 1989: The first training course plus practical course attachment will be held in Sydney from 10 April to 26 May 1989. Follow-up expert missions to the participating countries are planned to take place, at least partly in 1989.

Reports:

- Prospectus and course outline of the training course.
- Report entitled: "Comments on the regional (RCA) project, RAS.6.016, based on assessment of the regional TC project RAS.6.004", by B. Hutton, 24 August 1988.

GvHerk/as/1677

Project No: RAS/6/011  
Project Title: Radioimmunoassay of Thyroid Related Hormones  
Project Officer: R.D. Piyasena

Operational since 1987, the project has participation from 14 countries in the Asia and Pacific Region. Within the framework of the overall objectives of reducing costs and improving analytical reliability in the RIA of thyroid related hormones, the project aimed towards improving sources of reagent supply, the introduction of steps necessary for the assurance of assay quality such as internal quality control (IQC) and external quality assessment (EQA), and stimulation of local reagent production to the point of maximal indigenisation of reagent supplies. [Ilust. ?]

The introduction of bulk reagent based methodology to about 100 participant laboratories in 1987 and 1988 together with insistence upon and monitoring of adherence to good RIA practice, resulted in costs being reduced from a previous figure of \$ 2.50 to \$0.50 per patient sample and the creation of an expanded RIA service of improved quality. Computer based data processing of RIA and IQC data, as further assurance of assay quality, was promoted and the equipment required - to include a program produced as a project activity - supplied. Necessary instruction was provided by means of a number of regional training courses followed up by national ones in most cases. Progress has been closely monitored by means of regular meetings of national coordinators and surveys of participant laboratories by the IAEA project coordinator to whom results are regularly reported.

Building on the basis of what has been achieved, the project, in 1989 and 1990, will focus on the establishment of an EQA scheme as the final arbitrator of assay quality, and on the intensification and organisation in a more formal way of local reagent production activities that would lead to a regional reagent distribution scheme. A regional EQAS has been fully planned with the assistance of international experts at a meeting held early in 1989 and will come into operation later in the year. Local reagent production has already progressed to a stage at which all reagents for the thyroxine (T4) and triiodothyronine (T3) assays are available in several countries and significant progress is being made towards production of reagents for TSH RIA to include the monoclonal antibodies, at regional centres. These activities will be formalised and structured on a most cost effective basis with due regard to sound manufacturing, quality control, and marketing or distribution techniques, at a training course planned for the latter half of 1989. This will be followed by the organisation of a regional reagent distribution scheme.

The project aims, during the next two years, not only to complete the transfer of the relevant technology but also to exploit the potential and resources that have been and will be made available, as a result of project activities, towards the creation of national or regional self sufficiency in all aspects of the RIA of thyroid hormones. It may be expected that this would enable the provision of a good quality service commensurate with the large clinical demand in the area in question, and also open up increased opportunities for research. It also remains possible that the human resource base and other infrastructural strengths that will remain when the project is concluded could be used in the future to expand on RIA as a diagnostic and investigative tool applied to other areas of public health concern.

Evaluation of nuclear medicine procedures  
for the diagnosis of liver diseases.  
Phase II

Project Officer: R. Ganatra

**Participating Member States:**

Applications for participation are invited for phase II. In phase I the participants were from Bangladesh, China, India, Japan, Korea, Pakistan, Philippines, Singapore, Thailand and Vietnam.

**Project Objectives:**

Phase I was concerned with the evaluation of the diagnostic efficacy of nuclear imaging of the liver, while Phase II will be concerned with an objective comparative evaluation of ultrasound and nuclear imaging for their effectiveness in the diagnosis of the liver disorders.

The objectives of the phase II can be briefly stated as follows:

- 1) Objective evaluation of liver scintigraphy and ultrasonography for the diagnosis of focal or diffuse diseases of the liver,
- 2) To determine the extent to which ultrasound imaging can complement nuclear imaging in hospitals in the developing countries with a large referral load of patients with liver diseases,
- 3) To establish the methodology of comparing these two imaging modalities in the context of a developing country,
- 4) To improve the general standard of diagnostic imaging in hospitals of the participating countries by enhancing the quality of images and upgrading their interpretations.

**Major Activities 1988:**

A consultants' meeting was held in Vienna in December 1988. Three scientists from Japan and one from Austria worked with the Agency staff and worked out a plan of action for the phase II programme.

**Proposed activities 1989.**

- 1) Establishment of a CRP in the RCA countries. (about 8 countries expected to participate. In addition, a Technical contract to Japan),

2. Distribution of commercially available ultrasound phantom to all the participants. This phantom will be used to identify the general performance characteristics of the ultrasound imaging device,

3. Obtaining images of ultrasound phantom and of nuclear medicine gamma camera Quality Control (QC) images on the instruments likely to be used in the studies,

4. The clinical studies will be restricted to the diagnosis of mass lesions and diffuse diseases of the liver,

5. Distribution of representative ultrasound and nuclear medicine images for interpretation. Images for this purpose will be provided by the Japanese group.

6. Preparatory meeting. To discuss collected information, analyze the phantom images, workshop of interpretation on representative images brought by the participants, explaining various proforma, distribution of the set of Japanese images and explaining the protocols for the collection of representative images from each country. The likely date for this meeting - first half of Sept '89.

**Publications/Major reports.**

Liver Imaging Atlas prepared at the end of Phase I is at present in print and likely to be published in 1989.

1989-01-23

R. Ganatra



A NEW CRP ON INTRODUCTION OF COMPUTERIZED DOSIMETRY AND DATABASE IN RADIO-  
THERAPY FOR CARCINOMA OF THE CERVIX IN ASIAN COUNTRIES (RCA)

Project Officer: F. Durosinmi-Etti

Participating Member States: These will be selected after the next project consultants' meeting. Member States in the RCA region that satisfy the criteria for inclusion will be eligible for participation.

Project objectives: The ultimate goal is to introduce the use of personal computers (PC) and adequate software into the radiation treatment planning and dosimetry in the radiotherapeutic management of cancer of the cervix, which is a common disease in this region. It is expected that disease control and survival data will be improved.

Major activities in 1988: A consultants' meeting which consisted of experts from Japan, India and Austria was held at the IAEA Headquarters in Vienna, from 7 to 9 December 1988, to consider the feasibility of this project and offered recommendations for the successful implementation. The project is expected to last for five years from its inception later this year.

Publications/major reports in 1988: A TECDOC on the last CRP on cancer therapy in Asian countries by the combination of treatment by conventional radiation and physical or chemical means is in press.



Radioaerosol inhalation imaging for the diagnosis  
of chronic respiratory diseases in the developing countries

Project officer: R. Ganatra

Participating Member States:

Bangladesh, Peoples Republic of China, India, Indonesia, Japan, Republic of Korea, Pakistan, Philippines, Singapore, Thailand.

Project Objectives:

Lung imaging is considered as one of the most useful investigation in Nuclear Medicine, invaluable in life-saving situations like pulmonary embolism. It is also of great help in the evaluation and management of chronic obstructive lung diseases. Lung imaging can be done in two ways: 1) perfusion imaging by injecting a radiopharmaceutical (RP) intravenously to visualise the vascular tree of the lungs and 2) ventilation imaging by inhaling radioactive gases to observe the air passages in the lungs. Both forms of imaging are necessary for an accurate evaluation of the lung function and a definite diagnosis of a lung disease. In developing countries lung imaging is done infrequently mostly because it is not possible to do ventilation studies as radioactive gases like Xenon are not readily available in these countries. Recently, it has become possible to do ventilation imaging by inhalation of radioactive aerosol particles.

The main objective of this project is to promote lung imaging in the developing countries by using radioaerosol inhalation imaging and to utilise this technique for evaluation of COPD.

Major activities 1988:

Bhabha Atomic Research Centre of India had designed and fabricated a radioaerosol generator which can be used for inhalation systems for use in this programme as their contribution to the RCA activities.

Each participant was provided with one of these nebulisers and explained the protocol of obtaining lung imaging. During this year, all participants have set up lung imaging studies in their hospitals. In some of the countries, lung imaging was done for the first time because of the availability of this new technique. All participants are at present using this technique for evaluation of patients with COPD.

At the first RCM which was held during this year most of the participants were quite enthusiastic with the results of their use of this new system. One of the senior participants in this CRP carried out a comparative study of various commercially available nebulisers and found that BARC nebuliser was one of the best.

Proposed Activities 1989:

It is proposed to use these aerosol devices for studying the clearance rates of radioaerosol from the lungs. Such clearance measurements show damage to the lung epithelial surface in quantitative terms offering a kind of an index of lung damage.

At the first RCM, the group decided to set up mucociliary clearance studies which show again in quantitative terms how far the initial defence barrier to respiratory infection is affected in various patients.

Current approval period for the project:

Till 1990

Publications/Major reports 1988/9.

Two presentations based on the work carried out in this CRP were presented at the International Symposium on "Dynamic functional studies " held at Vienna in August 1988 under the auspices of IAEA.

1989-01-23  
R. Ganatra

Project Title

CO-ORDINATED RESEARCH PROGRAMME ON NUCLEAR TECHNIQUES FOR TOXIC ELEMENTS IN FOODSTUFFS

Project Officer

Eduardo Cortes Toro

Participating Member States

Australia, Bangladesh, China, India, Indonesia, Japan, Malaysia, Pakistan, Thailand

Member States from outside the region which are contributing to the programme as "associate participants" are: Argentina, Brazil, The Netherlands

Project Objectives

The purpose of this CRP is to obtain comparative data on existing elemental concentrations of potentially toxic elements in foodstuffs in various Asian countries. The samples to be collected and analysed are foodstuffs which should be representative of the food most commonly consumed by each of the population groups selected for this study. The elements to be studied include the potentially most toxic trace elements (As, Cd, Hg, Pb, Se). Other elements of local importance or relevant to national monitoring programmes, such as Br, Cr, Cu, Fe, I, Mn, Sb, Tl, and Zn, as well as radionuclides could also be determined. It is expected that participants will use nuclear analytical techniques, such as neutron activation analysis (NAA), for the determination of these elements. These techniques should be supplemented by non-nuclear techniques when necessary. Emphasis is placed on analytical quality assurance.

The data collected will be used to compare actual concentrations of toxic elements in individual foodstuffs with maximum permissible concentrations, and actual dietary intakes with provisional tolerable intakes, as specified in national legislation and/or international guidelines.

An important supplementary purpose of the programme is to help establish analytical expertise for work of this kind in the individual countries. Such laboratories will then be able to offer analytical quality control services, and to provide validation support, for their own national food monitoring programmes.

Major Activities in 1988

The Second Research Co-ordination Meeting (RCM) for the programme took place during 12-22 April 1988 at the Institute for Application of

Atomic Energy, Chinese Academy for Agricultural Science, Beijing, People's Republic of China. The meeting was attended by all the participants from the region and three others from countries outside the RCA region, as well as by a number of local observers.

In 1987 the Agency organized an analytical quality control exercises to check the quality of the analytical chemistry procedures developed and being used at the participants' institutes and the results were discussed extensively at the 2nd RCM. A second analytical quality control was organized during 1988. The results are being submitted by the participants and will be evaluated shortly. Information exchange was promoted by distribution of relevant progress reports as well as four issues of special bibliographies created from the Agency's INIS database.

#### Proposed Activities for 1989

The Third Research Co-ordination Meeting will take place during the last quarter of this year. The exact date and place have not been decided yet. A third analytical quality control exercise will be organized by the Agency. The exchange of information will be emphasized as well as the exchange of samples to stress analytical quality control practices.

#### Current approval period for the project

The project was approved for the period 1985-1990. At present a review of the programme is being carried-out so as to enable that some research contracts and agreements be extended into a 4th year period.

#### Publications/Major reports

A report on the 2nd RCM was prepared and distributed to all participants. This report include the working papers, workshops presentations, a summary of the topics discussed and the conclusions of the meeting. Some participants have published relevant papers in international scientific journals on the research carried out within the framework of this CRP. A list of such publications will be available in the future.

Project Title: DEVELOPMENT OF  $^{99m}\text{Tc}$  GENERATORS USING LOW POWER RESEARCH REACTORS

Project Officer: H. Vera Ruiz  
Industrial Applications and Chemistry Section

Participating Member States: Australia, India, Indonesia, Malaysia, Thailand and Viet Nam

Dr. R. Boyd CF/3381  
Australia

to be appointed CF/3382  
India

Dr. A. Hanafiah Ws. RC/3412  
Indonesia

Dr. P. Prakongvong RC/3413  
Thailand

Dr. Le Van So RC/4337  
Viet Nam

Project description: The aim of this CRP is to develop an appropriate technology for the preparation of  $^{99m}\text{Tc}$  generator systems using medium to low specific activity  $(n,\gamma)$ -produced  $^{99}\text{Mo}$ . The research efforts are primarily directed toward the development of a simple, economical, compact and transportable generator system for safe use in the environment of a radiopharmaceutical unit of a hospital. The research protocol includes one or more of the following tasks:

- Optimisation of reactor production yields of the  $^{98}\text{Mo}$   $(n,\gamma)^{99}\text{Mo}$  reaction using only inexpensive molybdenum compounds in natural abundance.
- Assessment of the effects of increase neutron irradiation on the Mo targets and on the  $^{99m}\text{Tc}$  elution efficiencies, as well as physico-chemical characterisation of the Mo targets.
- Further assessment of the available generator technologies, particularly the solvent extraction and sublimation type.

- Searching for alternative and novel approaches and technologies that would produce a generator from  $(n,\gamma)^{99}\text{Mo}$  with performance characteristics similar to the fission  $^{99}\text{Mo}$ -based chromatographic generator.
- Thorough quality control tests through detailed investigations of the parameters indicative of the generator performance.

Major Activities  
(1988):

- The proposal to continue the CRP for two more years has been approved. Research has continued on the "low temperature sublimation generator" and "gel generator". Reports describing the results obtained during 1988 are due for the beginning of 1989.
- A regional training course on Radioisotope Production in Research Reactors, originally scheduled for 1988, was held during the month of January at BARC. It was attended by 12 participants from Bangladesh, China, India, Indonesia, Democratic Republic of Korea, Malaysia, Pakistan, Philippines, Thailand and Viet Nam.

Major activities  
proposed for 1989:

- The last co-ordination meeting will take place in Dalat City in December 1989.
- A summary report will be produced describing the achievements of the CRP.



Strengthening of Radiation Protection

Project Office: P. Strohal

Participating Member States: Australia, Bangladesh, China, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Viet Nam.

Project description: The project is a co-operative venture between RCA Member States designed to build up radiation protection infrastructure in a part of the world where rapid expansion in the application of nuclear techniques to both medicine and industry is confidently predicted. The project will comprise training courses, workshops and co-ordinated research programme. A complete description is provided in the 1 December 1987 Project Document which is available on request.

Major activities:

i) Regional Training Course "Development of Infrastructures for Ensuring Radiation Protection" Sydney, 28 March to 29 April (Australian funded).

ii) Regional Workshop: Personal and Environmental Dosimetry Intercomparison Study", Tokai, Japan 17-21 October 1988.

iii) Project Formulation Meeting for Co-ordinated Research Programme on "Compilation of Anatomical Physiological and Metabolic Characteristics for a Reference Asian Man" Mito City, Japan 17-21 October 1988.

Details are attached.

A full report of the November 1987 Tokyo Meeting establishing the project is available. An Expert Advisory Group Meeting to plan the next stage of the project has been arranged for Tokyo, February 1989. During the year it is expected that research contracts supporting the Reference Asian Man CRP will be led. In addition (1) an Indian funded Regional Workshop on Environmental Dosimetry and (2) a Japanese funded Regional Training Course on Radiation Protection, Tokai and Tokyo, Japan is planned.

COMPILATION OF ANATOMICAL, PHYSIOLOGICAL AND METABOLIC  
CHARACTERISTICS OF  
REFERENCE ASIAN MAN

Project Officer:

A.A. Moiseev

Participating Member States:

Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Viet Nam.

Project Objectives:

The purpose of the CRP is to obtain representative physical, physiological and societal data that are anatomical and metabolic, and food intake data in order to set up a Reference Man suitable to the specific conditions and status of each main region of Asia and the Pacific. This information is very important for different aspects of dosimetry (internal and external); it is central to the evaluation of dose factors (dose per unit intake factors), the calculation of different dose limits and reference (intervention, investigation and etc) levels, very useful for adequate dose assessment and planning of radiation treatment in radiation therapy.

Major Activities 1988:

The Project Formulation Meeting for the Co-ordinated Research Program on "Reference Asian Man" convened in Mito-City, Japan from 17 to 21 October 1988. Fifteen participants from 11 Member States (the participant from Bangladesh was absent from the meeting) attended the meeting. The purpose of the meeting was to discuss the IAEA proposal on this subject and to elaborate a detailed plan that will be carried out throughout the proposed five-years period of time. Research contracts and agreements were prepared and sent to the IAEA by most of the participating Member States.

Major Activities 1989

- Collection and compilation of age specific data on weight, height, body-build and other physical parameters of both male and female population of Asia and Pacific.
- Collection and compilation of data on different food items consumed by the individuals of different specific age and sex groups and estimation of daily intake of food and nutrients including data on elemental composition.

Title: CRP on radiation sterilization practices for tissue grafts in clinical use for Asia and the Pacific region (RCA)

Project officer: R.N. Mukherjee, RILS

Participating Member States: A total of twelve investigators participate in the CRP, including one each from the eleven RCA Member States (Australia, Bangladesh, China, India, Indonesia, Republic of Korea, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam) and one (non-RCA) from the United Kingdom, primarily serving the project through input and standardization of current know-how in the relevant fields. Upon recommendation of the CRP participants, attempts have been made to initiate possible participation by an expert investigator from Japan.

Project objectives: Health-care services to patients suffering from debilitating tissue losses need to undergo corrective/reconstructive surgery for their remedy and rehabilitation as a healthy individual with a nationally-productive life. The repair of tissue losses involves, among other medical supplies, the provision of specific items known as tissue allografts and/or xenografts. These graft implants are made of non-viable tissues, such as bone, cartilage, nerves, skin, chorion amnion, duramater, fascialata, among others. Following appropriate procurement of such tissues from human and/or animal sources, they need to be duly processed and sterilized by agents including radiation in accordance with a work protocol to result in finished products of desired quality to fulfill their clinical health-recovery objectives, i.e. cross-infection-risk-free use and regaining of function for the patient's damaged tissue/organ concerned.

As in other regions, the health-care systems of the developing RCA countries have a preponderance of such damaged-tissue-associated patients (e.g. traumatic accident victims including bone and other injuries, severe burns, diseases such as tuberculosis, leprosy, cancer, as well as congenital abnormalities). Unlike in many developed countries, however, such disability patients in developing countries often fail to obtain proper clinical services, the primary cause being local non-availability of sterile graft implants. The alternative commercially-available graft implants often prove too expensive for the patient in need to be able to afford. These circumstances have progressively led to the recognition by the national health authorities that an improved indigenous supply status for sterile tissue grafts made in the RCA countries does merit the highest priority in the regional programmes for upgrading of health care. This effort should entail (i) strengthening relevant local technical skills, capabilities and facilities in tissue procurement and sterile processing practices by radiation; (ii) development and implementation of specific radiation effects data for organic tissue components and sterility control adapted to the local conditions of microbial contamination, environment, and other socio-religious constraints, as appropriate; (iii) foster sharing and co-ordination of relevant regional expertise, resources, support facilities, and experiences in the framework of the RCA programme; (iv) liaison between clinical surgical experts and technical support radiation research personnel to improve graft quality in terms of scope for clinical welfare returns; and (v) promotion of setting up and monitoring the operation of tissue banking facilities for radiation-sterilized grafts, and a follow-up survey of clinical performance data on the already-utilized grafts. The RCA work programmes, including the CRP, are designed to attain the above project objectives.

Major activities in 1988:

(a) The Agency's RCA CRP in the subject field has supported and co-ordinated applied radiobiology research carried out in the ten RCA Member States (see remarks in this report under Participating Member States) pertaining to:

(i) investigations and data generation on the effects of sterilizing radiation doses on the organic species constituents of different grafts;

(ii) clinical significance assessment of those radiation effects on the grafts' constituents;

(iii) sterilizing radiation dose setting;

(iv) microbiological and sterility quality of grafts subjected to radiation processing;

(v) radiation suppression of immunogenicity of graft tissues;

(vi) steps in the protocol to help protect biogenic properties of grafts and thus potentially enhance their clinical value.

(b) A research co-ordination meeting (RCM) held in Taiyuan, China, reviewed and co-ordinated the results obtained so far and recommended a further work protocol for the RCA CRP.

(c) Experience sharing and co-ordination of clinical follow-up of nationally-made radiation-sterilized tissue grafts as has been implemented so far are enumerated:

(i) Thailand (bone, chorion amnion as dressing for burn wounds, pigskin dressings; dura and fascia);

(ii) China and the Philippines (bone, nerve, chorion and pigskin);

(iii) Indonesia, Pakistan and Bangladesh (chorion amnion dressings for treatment of burn wounds);

(iv) Australia (radiation sterilization feasibility for microvessels for surgery; collagenous pericardium for microvessel reconstruction).

(d) An Agency training course supported by TC and RCA, on radiation sterilization of tissue grafts for safe clinical use in health care was held in Taiyuan, China, from 7 to 18 November 1988. Fourteen participants representing ten TCA countries received training on radiation processing of tissue grafts for safe clinical applications, including guidelines for tissue procurement and banking operation of radiation-sterilized grafts.

Proposed activities in 1989: The following activities should comprise the 1989 programme for this RCA component:

(a) Continuation of radiation research and development activities under the CRP relating to the strengthening of local skills and capabilities for effective processing of tissue allo- and xenografts sterilized by  $^{60}\text{Co}$  gamma radiation, and their graft-related clinical quality assessment criteria.

(b) The RCA Workshop on "Radiation and nuclear techniques for sterilization and clinical quality control of tissue grafts in tissue banking", is planned to be held in Bangkok, Thailand, during November to help coincide and co-ordinate with the relevant topics of the International Orthopaedic Surgery Congress in 1989 in Bangkok.

(c) Following the establishment of a tissue bank in Bangkok, another tissue bank has been initiated in Taiyuan, China, under the RCA activity. Consolidation of the technical protocol and infrastructure of the tissue bank is underway to continue through 1989 with supervisory guidance by the Agency's Technical Officer.

Current approval period for the project: The tenure of the Agency's RCA CRP runs through 1990 when the project's progress is due for CCSS review and evaluation and further action.

Publications: Publication in a summarized form of the technical literature and practical hand-outs at the 1988 training course is under consideration.

RMukherjee/dw  
1989-01-26

Subject: Summary of the activities on Maintenance of Nuclear Equipment in Asia

Major activities in 1988:

In June (8-10) a project formulation meeting on maintenance of nuclear instruments was held in Bombay, at BARC. The list of the participants is enclosed. The meeting consisted of informal discussions and official presentations in order to find out needs and solutions to the problem of maintenance of nuclear equipment in RCA countries. All the points of the RAS/4/008 project were discussed and possible solutions were outlined.

A Coordinated Research Programme on "Care and Maintenance of Nuclear Medicine Equipment in Asia" started with 9 participating Asian countries (enclosed is also the list of participating institutes) with the aim to complete, update the inventory of equipment, to formulate preventive maintenance protocols and assess a network of maintenance services.

The project RAS.4.008 and the CRP were thought and supposed to work in collaboration from the beginning.

Major activities in 1989:

As a follow-up of the meeting in Bombay, Mr. Bairi, Head of the Electronics Division at BARC, is going to visit several countries in Asia with the aim to check the status of environmental conditions, and of the maintenance procedures locally, and to advise on the different problems which will arise in the various countries.

It is also suggested to request Mr. Patankar, the principal author of the computerized programme for maintenance of equipment (CMPM) to complete and to revise it (three weeks of expert time are foreseen).

In November the first Research Coordination Meeting will be held (probably in Indonesia) with the aim to discuss the work done so far, and to decide on the steps to be taken further.

The timing has been organized in order to allow both the RAS and the CRP to take advantages of the final report of Mr. Bairi and continue the collaboration.

For more details the report of the meeting at BARC and the information sheet on the Coordinated Research Programme, can be consulted.

ABenini/as/1677

3138F

ASIAN REGIONAL CO-OPERATIVE PROJECT ON FOOD IRRADIATION  
PROCESS CONTROL AND ACCEPTANCE  
(RPFI PHASE III)

I. Background

The Asian Regional Co-operative Project on Food Irradiation (RPFI) was initiated through financial support of the Japanese Government from 1980 to 1984. The first phase of RPFI put emphasis on research and development including pilot-scale testing of irradiation of selected food items of economic importance to the region, i.e. fishery products, tropical fruits (limit to mangoes), onions and spices. Twelve countries, i.e. Bangladesh, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam participated in this RPFI Phase I. Japan was the donor Government. At the completion of RPFI Phase I in 1984, it was concluded that technology of food irradiation had been sufficiently developed and that several countries in the region were ready to transfer it to local industry.

The second phase of the RPFI started in 1985 when the Australian Government agreed to provide financial support to and also participate in the project for three years. RPFI Phase II places emphasis on demonstrating techno-economic benefits of food irradiation technology to the region with particular reference to:

- (i) disinfestation and decontamination of stored food products;
- (ii) improvement of hygiene and storage ability of processed seafood;
- (iii) insect disinfestation of fruits for quarantine purposes; and
- (iv) sprout inhibition of root crops.

Twelve countries in the region, i.e. Australia, Bangladesh, China, India, Indonesia, Republic of Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam participated in RPFI Phase II; Australia as the donor Government until April 1988. Direct participation of the local industry is a precondition for work being carried out under the RPFI Phase II.

Based on encouraging results obtained from studies carried out under the RPFI both Phase I and II, large scale demonstration irradiators are being constructed in Bangladesh, Philippines, Thailand and Vietnam. A commercial irradiator each has recently been completed in the Republic of Korea and Pakistan although they will be used initially for sterilizing medical products.

At the Project Committee meeting of the RPFI Phase II convened in Kuala Lumpur, 7-9 October 1987, representatives of Governments party to the RPFI agreed that a number of countries in the region have already worked in close co-operation with the local industry and technology transfer in these countries is being effected. At the completion of funding to RPFI Phase II by the Australian Government in 1988, the impetus should not be lost as in the next few years the time would be ripe for technology transfer in most countries in the region. The Project Committee requested the Agency to approach certain donor Governments/organizations to provide support to the next phase of RPFI.

## **II. Objectives**

The major emphasis of Phase III of the RPFI is to assist national authorities and food industry in developing Member States party to the RCA to ensure proper process control when introducing irradiated food on a practical scale and to facilitate acceptance of irradiated food in trade. Special emphasis will be made on harmonizing regulations/legislations on food irradiation in the region based on the Codex General Standard for Irradiated Foods. The feasibility of using electron machine versus isotopic sources of irradiation for processing food will be evaluated. Active involvement of local food industry is a prerequisite for this Phase.

## **III. Proposed Work Plans**

### **1. Group Training**

- a. Workshop on Techno-Economic Feasibility of Using Electron vs. Isotopic sources of Radiation for Food Processing (1989)
- b. Workshop on Food Irradiation Process Control (1990).
- c. Workshop on Harmonization of National Regulations and Acceptance of Irradiated Foods (1991).

### **2. Proper Operation and Control of Food Irradiation Facilities.**

- a. Proper dosimetry techniques and dose assurance.
- b. Dose distribution in commercial packages/containers of food.
- c. Record keeping to ensure compliance with regulation.

### **3. Acceptance of Irradiated Foods.**

- a. Market testing of certain irradiated foods.
- b. Transportation trials and market developments to determine acceptance in potential importing countries.
- c. Economic evaluation of irradiation vs. conventional methods of food processing.



IV Budget

	1989	1990	1991	1992
Two-week workshop on techno-economic feasibility of electron vs isotopic sources for food processing. (Takasaki, Japan)	50,000			
Co-ordinated Research Programme on Proper Process Control and Acceptance of Irradiated Foods.	60,000	60,000	60,000	
Research Co-ordination Meeting on RPII Phase III		30,000	35,000	35,000
Group Training on Food Irradiation Process Control (Two Weeks)		40,000		
Workshop on Harmonization of National Regulations and Acceptance of Irradiated Foods			40,000	
Expert Services 12m/m	32,000 <u>4m/m</u>	34,000 <u>4m/m</u>	36,000 <u>4m/m</u>	<u>          </u>
Total	<u>142,000</u>	<u>164,000</u>	<u>171,000</u>	<u>35,000</u>
GRAND TOTAL				512,000 <del>512,000</del>

The Use of Nuclear Techniques to Improve Domestic Buffalo  
Production in Asia - Phase II

Project Officer: Dr. M.C.N. Jayasuriya

Participating

Member States: Malaysia, Sri Lanka, Bangladesh, Pakistan, Philippines,  
Thailand, Japan, Australia, Vietnam and Indonesia

Project:

Of the 140 million water buffaloes found in the world over 95 million are located in the Asian region. They are primarily used for meat and milk production and in recent years their importance as a source of draught power has also been recognized, particularly at the small-farm level. The Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture initiated a multidisciplinary coordinated research programme in 1978 with the aim of improving the productivity of the domestic buffalo in Asia. The project terminated in 1984 but in view of its success, the programme has been extended to Phase II. Similar to the previous programme, Phase II will also be directed towards improving the productivity of swamp and river buffaloes in the Asian Region but an integrated multidisciplinary approach to study the inter-relationship between nutrition, reproduction, disease status and managerial practices is being promoted.

Major activities - 1988

All Research Contracts and Agreements were renewed until the Final RCM scheduled for 1989.

Proposed activities - 1989

The Final RCM will be held at the Tropical Cattle Research Centre, CSIRO Division of Tropical Animal Production, Rockhampton, Australia, from 20-24 February 1989. All participants are expected to attend this meeting and present a summary of results of the work conducted over the past five years under the programme. The detailed written reports submitted by the Contract and Agreement holders will be refereed and edited by the Agency staff and published as a Panel Proceedings Series of the IAEA in 1990.

INTEGRATED CONTROL OF TROPICAL PLANT VIRUSES WITH NUCLEAR TECHNIQUES

Project Officer: N. Murata

Pre-project meeting:

Meetings were held on 21 and 24 August, in combination with the 5th International Congress of Plant Pathology, 20-27 August 1988, Kyoto, Japan. In addition, several discussions were held with participants of the Congress who are interested in the proposed project. Part of the expense was provided by the Japanese Government.

The main meeting on 21 August was held at the Hotel Ginkaku and was attended by 16 participants.

Main issues discussed were as follows:

1. The necessity of introducing modern techniques for indexing viruses, viroids and mycoplasma-like organisms was expressed by participants in relation to germplasm exchange, disease free propagation, and screening for disease resistance in breeding. Danger of carrying over pathogens in germplasm exchange exists not only in vegetatively propagated crops but also in many legume seeds.
2. Kinds of pathogens necessitating indexing methods were identified.
3. cDNA clones of virus and viroid genomes available in the institutions of participants were identified. Some of them are ready to be exchanged.
4. Strategy of promoting modern techniques were discussed. Co-operative research network composed by central institutions and field stations should be established. The relevance of "Regional" co-operation was especially emphasized.

The sub-group meeting held on 24 August (12:00 - 14:00) was attended by researchers who were unable to attend the main meeting because of another evening session. Besides the issues discussed at the main meeting the following major topics were taken up:

- co-operation with other international co-operative research activities
- a follow-up meeting to discuss the progress of research and realistic measures to promote research.

Detailed information gathered throughout the meetings was compiled in the background document and presented to the 17th General Conference Meeting of Representatives of RCA Member States, 22 September 1988, Vienna.

Co-ordinated Research Programme:

As a means to implement the project, a co-ordinated Research Programme under the title of "Control of Tropical Plant Viruses in Asia and the Pacific Region with the help of Nuclear Techniques" was proposed to the 189th CCSS of the IAEA and approved to be initiated subject to funds becoming available. The programme has been announced to some institutes of RCA Member States.

Objectives and scope:

1. To establish a regional network system to develop and use the modern virus/viroid indexing techniques using radioisotopes.
2. To develop new probes of plant viruses and viroids needed in the region through co-operative research.
3. To apply the new technology in germplasm exchange, pathogen-free propagation and screening for disease resistance in breeding in the developing countries of the region.

Basic techniques to index some pathogens within the region have already been developed. First of all, strategy of how to extend these techniques while strengthening radioisotope research in developing countries of the region should be sought.

New probes will be developed through regional co-operation. Targets of probe development will be identified at the Research Co-ordination Meeting and co-operative research will be initiated to this end.

Standardization of an assay system will be one of the major tasks. For the pathogens for which basic technology has been established, an indexing method should be standardized and its application to practical areas related to crop propagation and breeding should be attempted.

## REGIONAL PROJECT SUMMARY

Project Title: Improvement of grain-legume-Rhizobium symbiosis to fix atmospheric nitrogen.

Estimated Duration: Four years

UNDP + Cost-Sharing Budget: \$880,000 + 300,000 (IAEA)

<u>Cost per annum (UNDP)</u>		<u>IAEA (4 years)</u>	
a) 24 contracts at \$6,000 each =	\$144,000	Fellowships =	\$100,000
b) Research Co-ordination Meeting =	45,000	Isotopic analyses =	100,000
c) Isotopic analyses, mutagenesis, etc. =	20,000	Other services =	100,000
d) Consultants =	6,000	Total =	\$300,000
	(215,000 x 4)		=====
e) Workshop (only once)	20,000		
Total =	\$880,000		
	=====		

Development problem to be addressed (including cause and evidence)

- 1) To increase yield of grain legumes.
- 2) Sustain these high yields through symbiotic nitrogen fixation rather than depending on costly nitrogen fertilizers.

Special considerations (WID, private sector, NGO/grass-roots, TCDC, pre-investment)

TCDC, involving 24 participants from 12 countries/institutes working on a common problem, exchanging ideas, information, legume and Rhizobium germplasm. Annual meetings as a forum for detailed TCDC discussions. Each institute will have a plant breeding contractor working with a microbiologist contractor.

Immediate objectives (three maximum) and major outputs

- 1) Increased legume yields through breeding and selection.
- 2) Attainment of these high yields through inexpensive biological nitrogen fixation rather than through application of costly and environmentally hazardous N fertilizers.

Regional rationale (promotion of regional cooperation; pre-eminence of regional rather than national scope)

- 1) Importance of grain legumes in Asia.
- 2) Low yields in Asia.
- 3) Promotion of regional co-operation.

Implementation strategy (include description of related country, regional projects)

Co-ordinated Research Programme approach, in which participants from established institutes in different countries, and with adequate infrastructure are selected to work on a common objective, using well-defined, and similar strategies to achieve the desired goal. The participants are designated as contractors and each receives a grant of \$6,000 to cover part of the direct cost of carrying out the experiments, and also acts as an inducement. No salary is however paid.

Recipients and beneficiaries

Plant breeders, agronomists, soil microbiologists and plant physiologists in established institutes in Asia.

Participating country commitments

To pay salaries of participants, field workers, laboratory assistants, etc., and bear substantial portion (60%- 80%) of cost of routine analyses.



RCA PROJECT PROPOSAL  
-----

1. Project Title: RESEARCH REACTOR UTILIZATION  
-----

2. Scope and Objectives:  
-----

All RCA member countries, with the exception of Singapore and Sri Lanka, already have at least one research reactor in operation each. These research reactors were, in most cases, the main justification for the establishment of nuclear research centres in the respective countries, especially among the developing countries.

However, subsequent utilization of the research reactors is generally biased towards irradiation activities, such as radioisotope production. Activities in areas of direct utilization of these reactors, such as neutron beam utilization, or in enhancing operations, maintenance and management capabilities towards optimising utilization potential are carried out at a much smaller extent.

The latter activities involve a higher degree of sophistication, compared to current research reactor utilization patterns in the developing member countries, and require better exchange and comparison of experience between research reactor operations and management personnel. Since most of the member countries have only one research reactor each, it is realised that collaborative effort on a regional scale between research reactor facilities will be greatly beneficial in promoting these activities.

It is intended that the proposed project will promote collaboration among member countries in the areas of research reactor operation and maintenance, management, and developmental research, towards optimising their utilization potential, as well as in promoting direct utilization, especially in areas where there exist common problems.

3. Current Situation:  
-----

To assist in the development of the proposed project, data already available to the IAEA Research Reactor Data Base (RRDB) through their annual questionnaires and through information obtained during visits by the Agency's nuclear safety and radiation protection teams to member countries could be utilised to establish the current situation.

4. Project Components:  
-----

The proposed project is intended to concentrate on the development and enhancement of necessary manpower skills to meet the stated objectives, particularly in the development and enhancement of research reactor operation capabilities and in promoting direct utilization of research reactors. The following seven classes of activities are envisaged:

- a). Project coordination and planning meetings, to identify, formulate, and coordinate the implementation of the projects;



- b). Exchange of information and experience directly related to research reactor operations and maintenance, management, and utilization with an aim to identifying areas for collaborative research;
- c). Training courses and workshops to disseminate up-to-date information at advanced level;
- d). Coordinated research in related areas of common interest;
- e). Seminars and symposia to provide an opportunity to present research results and a forum to discuss common problems;
- f). Expert assignments for addressing specific technical problems and supporting training programmes;
- g). Review and evaluation of the progress of the project in terms of milestones to be defined.

These seven classes of activities is intended to be applied to two principal areas:

- a). Enhancing reactor operations, maintenance, management and developmental capabilities towards optimising the utilization potential of the reactors; and,
- b). Promoting direct utilization of the reactors, especially in research areas where there need to be close cooperation and understanding between the users and operators of the research reactors.

#### 4.1. Training Courses and Workshops. -----

The programme of training is expected to cover the following general areas:

- . Research reactor operations and maintenance;
- . Research reactor instrumentation and interfacing;
- . Research reactor diagnostic software development;
- . In-core reactor fuel management;
- . Research reactor physics calculations;
- . In-core dosimetry and flux optimisation;
- . Neutron beam utilization;
- . Research reactor neutronic and thermal-hydraulics;
- . Environmental impacts of research reactor operation, with emphasis on atmospheric dispersion modelling;
- . Research reactor system reliability analysis;
- . Other topics to be decided by the project coordination and planning meetings.

#### 4.2. Coordinated Research Programme. -----

The following topics are suggested as useful topics for coordinated research programmes:

##### 4.2.1. Enhancing Reactor Operation Capabilities. -----

##### a). Reactor Data Acquisition and Interfacing. -----

As the research reactor ages, there is a need to upgrade the instrumentation and control system to improve its operational reliability and safety. The proposed coordinated research programme will principally involve the development of PC-based

on-line reactor monitoring, diagnosis and control capabilities to enhance operation and maintenance capabilities, in line with general international development in instrumentation and control techniques. Areas of research should include hardware development for data acquisition and interfacing, and in the development of on-line diagnostic softwares. Eventually, it is hoped that this project will lead to the development of PC-based research reactor expert systems.

b). In-core Reactor Fuel Management.

The enhancement of fuel management capabilities, including fuel burn-up measurement capabilities, will ensure optimal utilization leading to a less frequent need to acquire new fuel elements. The emphasis should be on the development of PC-based fuel management codes and nuclear data libraries since few facilities in the region have access to mainframe computers.

c). Reactor Physics Calculations and In-core Dosimetry.

To enhance utilization of the reactors, particularly for radioisotope production, and to ensure the optimal utilization of reactor fuel, coordinated research effort in the development of in-core dosimetry techniques is proposed. The development of PC-based softwares for flux and activation calculations should also be included. Other related activities in reactor physics calculations such as spectrum unfolding are also suggested to be included in this coordinated research programme.

d). Neutronic and Thermal-Hydraulics Studies.  
-----

The development of neutronic and thermal-hydraulic analysis capabilities will enable the reactor operations and maintenance personnel in member countries to better understand the characteristics of their reactors. The enhanced understanding will allow better diagnosis of problems which may arise with respect to cooling effectiveness and reactor control, among others. The emphasis in the proposed coordinated research programme should also be in the development of PC-based computer codes.

e). Environmental Impacts of Research Reactor Operation.  
-----

With the generally increased awareness among the public on the possible effects of reactor operation on the environment following the Chernobyl accident, even though research reactors are of a different scale of magnitude, the need to provide better evidence on the safety of research reactors becomes more pertinent. In this respect, collaborative effort in the development of suitable codes and the determination of relevant parameters required in atmospheric dispersion modelling, among others, should be established. This is also intended to include inter-comparison of environmental monitoring data among research reactor facilities.

f). Research Reactor System Reliability Analysis.

The development of capabilities in system reliability analyses for research reactors, in the short term, can lead to a more objective and qualitative identification of critical spare parts which, consequently, will lead to a more efficient and effective schedule for spare part procurement. In the long run, it can be used to develop the necessary core manpower required for a nuclear power programme. Even if such a programme do not eventually materialise, the technique can be usefully applied in wide range of other industrial activities involving a high degree of operational safety and reliability. As in the other areas of coordinated research, the development of PC-based system reliability codes should be emphasised.

4.2.2. Promoting Direct Utilization of Research Reactors.

a). Neutron Beam Research and Utilization.

In promoting the utilization of research reactors, one particular problem has been in neutron beam utilization. The proposed coordinated research programme is intended to include neutron diffraction, scattering, radiography and spectrometry studies. The emphasis should be in developing the applications of these techniques to support scientific and industrial research and development efforts in the respective countries. Since the general level of development of the developing member countries are almost similar, the problems encountered in developing and promoting neutron beam utilization are also expected to be similar and will be particularly suited to collaborative effort.

b). Neutron Transmutation Doping.  
-----

Since industrial growth in a number of the developing member countries has been strongly based on the electronics industries, the proposed coordinated research programme in neutron transmutation doping (NTD) is particularly suited to increase local content in electronics products. The emphasis is intended to be on the development of appropriate facilities in the reactor for NTD activities.

4.3. Seminars and Symposia.  
-----

These will be on topics identified at the coordination meetings. The First Asian Symposium on Research Reactors (ASRR-1) was held at Rikkyo University, Tokyo in November 1986 while ASRR-2 will be held at BATAN, Jakarta in May 1989. It is intended that the proposed project will collaborate in organising future Asian Symposium on Research Reactors (ASRR), or possibly have the series of symposia be incorporated into the project.

5. Organizational Structure.  
-----

The project is intended to be administered as an RCA project through the IAEA. The initial direction of the project shall be determined to a large extent by the proposed Project Formulation Meeting expected to be convened at the commencement of the project. The project shall be coordinated by the Project Coordination Meetings which will convene at regular intervals, and which will also established the detailed work plans.

6. Resources.  
-----

The proposed project is planned as a 5 year cooperative venture between the IAEA and RCA Member States. The detailed plans for funding and resource allocation are to be determined during the course of formulating the project.

7. Project Implementation.  
-----

The proposed schedule for the project is attached. Detailed planning of the schedule is expected to be established by the Project Formulation and Project Coordination Meetings.

8. Project Milestones.  
-----

Three broad classes of project milestones are envisaged:

8.1. Administrative Milestones.  
-----

Administrative milestones are a measure of the extent to which formal elements of the programme, i.e. training courses, workshops, and research programmes, have been implemented.

8.2. Milestones Describing Increases in Levels  
of Research Reactor Operation Capabilities.  
-----

The establishment of these milestones will be based on the level of achievement sought at the conclusion of the project and the percentage attainment of the defined achievement level at key points throughout the project. These can be described in terms of the increases in levels of capabilities, such as the PC-based softwares developed, reactor fuel utilization rates, or other

quantitative research reactor performance indicators, as appropriate.

8.3. Milestones Describing Increases in Levels  
of Direct Utilization of Research Reactors.  
-----

The establishment of these milestones will also be based on the level of achievement sought at the conclusion of the project and the percentage attainment of the defined achievement levels at key points throughout the project. These can be described in terms of the increase in number and types of experiments or facilities developed which directly utilizes the research reactors, or in terms of output of neutron transmutation doped silicon, as appropriate.

9. Evaluation.  
-----

Project milestones agreed at the Project Formulation Meeting and, if necessary, revised at the Project Coordination Meetings shall form the basis for evaluation. A Final Project Review shall assess and comment on the need for further project activities in the area of research reactor utilization.

10. Concluding Comment.  
-----

The proposed project is seen as a cooperative venture between RCA Member States designed to optimise the utilization of research reactors in their respective countries and to enhance their operational safety and efficiency. This will ensure that the role of research reactors in supporting the already rapid



expansion in the application of nuclear techniques in medicine, industry and agriculture in the region is maintained and enhanced. The project is also designed to establish collaborative links between research reactor operations personnel in the region which, consequently, will lead to the development of mutual support capabilities.

Such an eventuality will be in the spirit of technical cooperation among developing countries, which is one of the primary aims of RCA activities.

PROPOSED PROJECT SCHEDULE FOR RESEARCH REACTOR UTILIZATION.  
-----

Commencement of Project: Early 1989

Project Duration: Five years.

Year 1 (1989):  
-----

1. Project Formulation Meeting (early 1989).
2. Second Asian Symposium on Research Reactors (ASRR-2) (in May).
3. Regional Courses and Workshops:
  - a). Research Reactor Operations and Maintenance.
  - b). Research Reactor Physics Calculations.
  - c). Use of Small Computers in Research Reactor Operations.

Year 2 (1990):  
-----

1. Project Coordination Meeting.
2. Regional Courses and Workshops:
  - a). Technology and Use of Low Power Research Reactors.
  - b). Thermal-Hydraulic Calculations for Research Reactors.
  - c). Experimental Reactor Physics.
  - d). Neutron Beam Research and Utilization.

Year 3 (1991):  
-----

1. Regional Courses and Workshops:
  - a). Environmental Impact Assessment of Research Reactors.
  - b). Radioisotope Production in Low Power Research Reactors.
  - c). Biological Applications of Research Reactors.
  - d). Research Reactor Interfacing Using Small Computers.
2. Third Asian Symposium on Research Reactors (ASRR-3)

Year 4 (1992):

-----

1. Project Coordination Meeting.
2. Regional Courses and Workshops:
  - a). Advanced Reactor Physics Calculations.
  - b). Applied Neutron Scattering.
  - c). Analysis of Research Reactor Cores for Use of LEU Fuel.
  - d). Reliability Analysis for Research Reactors.

Year 5 (1993):

-----

1. Regional Courses and Workshops:
  - a). Research Reactor Diagnosis Using Small Computers.
  - b). Advanced Thermal-Hydraulics Analysis for Research Reactors.
  - c). Research Reactor Operations and Maintenance.
  - d). Technology and Use of Low Power Research reactors.
2. Fourth Asian Symposium on Research Reactors (ASRR-4).
3. Project Evaluation Meeting.



**RCA PROJECT FORMULATION MEETING  
RESEARCH REACTOR UTILIZATION**

**6 - 9 MARCH 1989**

**KUALA LUMPUR**

*Organised by:*

**The International Atomic Energy Agency (IAEA)**

*in cooperation with:*

**The Nuclear Energy Unit (UTN)  
Prime Minister's Department  
Malaysia**

## 9. Recommendation

1. The meeting agreed on the need for a regional project on research reactor utilization and recommended that the Agency take steps to establish the project entitled Regional (RCA) Project on Research Reactor Utilization
2. Recognizing the benefit of networking in the management of regional project, the meeting recommended that the Agency investigate the possibility of funding inter alia an umbrella project to facilitate the annual meeting of the project counterparts. The meeting is to formulate, modify and approve the ongoing activities.
3. The meeting recommended that the Agency make its best endeavour to seek extra budgetary support for funding activities to be conducted under this project.
4. In carrying out the activities, the meeting recommended that the following modalities common to most regional projects be used:
  - i. Training courses and workshops;
  - ii. Seminar and symposiums;
  - iii. Expert assignments;
  - iv. Coordinated research programmes;
  - v. Sharing of equipment available within the region;
  - vi. Training fellowships;
  - vii. Exchange of technical personnel.

5. The meeting recommended that the Regional Training Course for Research Reactor Operations (Bangkok, November, 1989) as well as other approved regional activities related to research reactors be incorporated into the project. It also recommended that the project include the following related activities:

- i. The Second Asian Symposium on Research Reactors (Jakarta, May 1989) and beyond;
- ii. Interregional Training Course on LEU Core Conversion / (Sydney, <sup>May</sup> ~~February~~ 1990); and,
- iii. International Neutron Scattering Symposium (Bombay, 1991).

6. The meeting acknowledge with gratitude the Indian support to RCA in the field of basic science using research reactors. The meeting noted the statement made by the Indian delegate of the possibility of conducting the following activities:

- i. training workshops on research reactor safety principles;
- ii. training workshop on the development of man-machine interface and advance control room design.

The meeting also recommended that these activities be incorporated into the regional project.

7. The meeting recommended a series of activities categorise as follows:

i. research reactor operation and management:

- reactor operator training and requalification;
- reactor physics applications and fuel management;
- modernization of reactor instrumentation;
- use of personal computers;
- time sharing of reactor facilities and equipment;
- safety and reliability analysis;

ii. research reactor utilization:

- utilization of neutron beam;
- in-core experiments;
- engineering design of in-core experimental rigs;
- teaching and educational use of research reactors;
- assistance in accreditation of laboratories  
(in respect to neutron activation analysis  
and isotope production)

8. The meeting recommended that the Agency prepare a project document based on the recommendations of this meeting for endorsement of member states.



## ENERGY AND NUCLEAR POWER PLANNING

Project Officer:

K.F. Schenk

Participating Member States:

Australia, Bangladesh, China, India, Indonesia, Republic of Korea, Japan, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam.

The training course in the Republic of Korea was also attended by participants outside RCA: Argentina, Morocco, Turkey, Syria.

Project Objectives:

To foster regional co-operation and exchange of information in energy and nuclear power planning and, in particular, to promote exchange of information and experience and to stimulate collaboration among RCA countries in the use of the IAEA's WASP/MAED models as sound methodologies for energy and electricity planning, including nuclear power planning.

Major Activities 1988:

1. RCA WASP/MAED Users' Workshop held in Kuala Lumpur during 5 - 9 December 1988. The Workshop was attended by 23 participants from 10 RCA developing Member States. Participants strongly felt that the workshops should be continued and the regional training course on Electric System Expansion Planning should be held as planned.
2. Regional (RCA) Training Course on Nuclear Power Project Planning and Implementation held in Daejeon, Republic of Korea, 7 - 25 November 1988. The regional course was organized by KAERI (Korea Advanced Energy Research Institute) and funded by the Republic of Korea's extra budgetary contribution to RCA. The training course was attended by 17 participants from 9 RCA developing countries as well as Argentina, Morocco, Syria and Turkey.

Major Activities in 1989:

1. Regional (RCA) training course on Electric System Expansion Planning in Malaysia, 15 May - 23 June 1989.
2. RCA WASP/MAED Workshop, China, September 1989.

Current Approval Period for this Project: 1990

Publications/Major Reports 1988/89:

1. "Experience with WASP Among IAEA Member States, participating in the Regional Co-operative Agreement (RCA) in Asia and the Pacific Region," IAEA TECDOC-474.
2. Forty papers presented at the Regional (RCA) Training Course in Nuclear Power Planning.



COUNTRY STATEMENT - AUSTRALIA

ELEVENTH RCA WORKING GROUP MEETING, SYDNEY

13-16 MARCH 1989

Australia is pleased with the continued progress made by RCA over the past year. We acknowledge the RCA as the most useful vehicle for nuclear technical cooperation in the Asia and Pacific Region. We will continue to strongly support the RCA and the activities undertaken under its umbrella.

Over the past year progress has been recorded in a number of projects supported by Australia, and we are now beginning to implement the new projects being funded by Australia. Following is an outline of progress in each of the RCA activities in which Australia has been involved.

UNDP Regional Industrial Project

Australian interest in all four sub-project areas continued as follows.

(a) Tracer Technology

In early 1988 the new Australian sub-project in tracer technology began with the successful demonstration by two experts in Thailand of the use of radioactive tracer techniques in flow measurement in natural gas pipelines. The next step in the sub-project will be taken in mid-1989 when the first extended training program at the Australian Nuclear Science & Technology Organisation (ANSTO) on the use of tracer techniques gets underway. The Republic of Korea, Pakistan and Thailand will be represented in this program.

(b) Non-destructive Testing

Australia continued to provide to the Regional Industrial Project an expert in non-destructive testing.

(c) Radiation Processing

Australia plans to run the first training course in the new sub-project on radiation processing of surface coatings in the latter part of 1989. This will involve a commercial production line in operation in Sydney. A longer term aim of support in this area is to develop a proposal to assist in the establishment of a new demonstration line in a developing RCA country.

(d) Nucleonic Control Systems

A planning mission to Thailand in early 1988 enabled definition of the scope of the Australian sub-project which aims to facilitate the use of nucleonic control systems in the coal industry. Arrangements are now being finalised to establish a demonstration project in the coal blending system of the Mae Moh lignite mine in Thailand. Experts from the Julius Kruttschnitt Mineral Research Centre at the University of Queensland will set up the demonstration unit and will be involved in training centred on the unit.

Medical and Biological Applications of Nuclear Techniques

Australian participation continued in a number of projects :

- Nuclear techniques for toxic elements in foodstuffs
  - . We believe that this work has demonstrated the use of nuclear techniques and multi-instrumental analyses in monitoring toxic/essential trace elements in foodstuffs, and the wider value of nutritional and health-related environmental research to both developed and developing countries
- Development of Tc-99m generators using low power research reactors
  - . In our opinion, these studies have shown that techniques do exist to make technetium more readily available to developing countries where the source of activation is restricted to a low flux nuclear reactor
- Radiation sterilisation for tissue grafts
  - . Australian specialists were pleased to participate in this important work, and are continuing studies to help lay the guidelines for use of human pericardium as a biological tissue graft and a material used for surgical reinforcement in cardiovascular surgery.

Australia was represented at the formulation meeting for the major new RCA project on the Development of Radiation Protection Infrastructure. A highly successful training course was mounted by ANSTO in March/April 1988 in which all fourteen RCA members were involved. Australia has since been represented at two meetings to consider the future direction of this important project. We are now looking to develop a proposal for a further training course in 1990.

The first course under our sub-project on the Use of Computers in Technetium-99m Imaging will be run in Sydney by ANSTO and the Royal Prince Alfred Hospital on 3 April to 26 May. Thirteen participants are expected from eleven RCA countries. The purpose of the course is to provide participants with advanced training and practical experience in the application of computer techniques for processing and analysis of gamma camera images.

#### Agricultural Projects

Phase II of the Regional Project on Food Irradiation (RPFI II) funded by Australia drew to a successful close at the end of 1988. The final project committee and research coordination meetings in October were attended by representatives of ten participating countries. They presented technical papers reviewing research, technology transfer to industry and marketing trials in their countries.

Australian experts continued to participate in the project on Nuclear Techniques to Improve Domestic Buffalo Production. They consider that this work has contributed greatly to the accumulation of knowledge about the domestic water buffalo's reproductive efficiency. Data generated pointed clearly to the fact that progesterone radioimmunoassay has helped substantially to shed light on basic reproductive and environmental factors which affect that efficiency.

#### Research Reactor and Energy Based Projects

Australia recognises the potential value of the project on research reactor utilisation and took a constructive role at the recent project formulation meeting. The project has aspects to it which clearly relate to important research and development needs in member countries, and Australia will be looking to cooperate with other member states in the implementation of this project. We should like to discuss further with relevant member states suitable aspects of the project which we might be able to support.



COUNTRY STATEMENT - BANGLADESH  
ELEVENTH RCA WORKING GROUP MEETING  
SYDNEY 13-16 MARCH 1989

MR CHAIRMAN

Bangladesh is very happy to participate in the 11th Working Group Meeting of RCA Member Countries which is being held in Sydney, Australia. We are happy to note that this meeting is being hosted by Australia which has always taken keen interest in most of the RCA projects and has been a donor Member Country since joining this cooperative agreement.

Sydney is good luck for all of us who are participating in this eleventh working group meeting because here we are better equipped with all those ideas and recommendations which the Jakarta Seminar provided us. We believe these will guide us for better formulation of future RCA programs. In the past the working group pointed out and suggested several improvements for program management and project management. These included human resources development, more cooperation among developing countries and so on. It is gratifying to note that through a well organised RCA seminar last year it has been possible to present a set of recommendations considering most of the points raised by member Countries in earlier Working Group Meetings.

Strengthening of existing mechanisms such as the role and responsibilities of Project Committees towards regional management and an appropriate official recognition by the IAEA of the regional role of selected institutes are positive recommendations in program management.

While selecting projects (i) concentration of resources and effort on large, multi-year projects; (ii) ensuring that the widest cross section of views is canvassed in establishing RCA project priorities and (iii) in putting emphasis into reducing the technological gap between the developing and the industrialised countries are worthwhile recommendations for better project selection and management. We believe that recognition of the potential value of regional training centres will be a positive step in furthering the development

of human resources in the region.

The Government of Bangladesh particularly asked this delegation to express our appreciation for organising the RCA Seminar in Jakarta and endorses the recommendations of the Seminar.

Mr Chairman, now I would like to present very briefly some of the project activities undertaken since the 10th Working Group Meeting in Beijing.

1. UNDP (RCA) REGIONAL INDUSTRIAL PROJECT

Tracer Technology in Industry

The IAEA/UNDP/RCA Sub-Project on Tracer Technology in Industry has entered into the second phase (1987-1991). In Bangladesh, it was initiated only in 1986 by holding the first Executive Management Seminar (EMS) in Dhaka during 31 January to 2 February 1986. The earlier participation in the program was limited only to training of a technical person through the first Regional Training Course organised in the Bhaba Atomic Research Centre (BARC), Bombay, India in 1983. Before implementation of a demonstration experiment in 1988 a tracer group consisting of four scientists was formed. The group, with the assistance of IAEA field mission experts selected two target industries for tracer technology projects and so far five tracer technology projects have been identified which can be implemented in the target industries. First success of the project was recorded only in July 1988 when the demonstration experiment on mercury inventory was executed in the Chittagong Chemical Complex (CCC). Dr S M Rao of IAEA and Mr R L Ajmera of Isotope Division of BARC were present as experts for the demonstration. For the second tracer technology project one engineer from the Titas Gas Company, who participated in the demonstration experiment of flowmeter (FM) calibration in Thailand, would be responsible to calibrate FMs in his organisation with the assistance from the tracer group in the BAEC. The other projects would require further field studies before implementation is planned.



### Radiation Technology

- a) With the assistance of IAEA, BAEC along with one local private company (BEXIMCO) is going to install one 1,20,000 curie Co-60- multi-purpose gamma plant by 1989. At that time BAEC expects to arrange a national training course in Radiation Sterilisation with the assistance of RCA. At present the research group on 'Sterilisation' is engaged in the following R&D activities: development of biological dosimeters, up-to-date validation of microbiological data of local medical products and development of a method for using local perspex as dosimeter.
- b) The research facilities for the curing of surface coatings are being developed in the Institute of Nuclear Science and Technology with the assistance of IAEA through its Technical Assistance Program No. BGD/8/008 started January 1988. Equipment so far received from IAEA includes (i) Hardness and Adhesion Tester (ii) Mini U V Radiation Facility (ii) Tensile Strength Tester. The technical personnel for this project are being trained. R&D work in this field would be concentrated in testing the suitability of imported formulations for surface coatings of local wood products and ceramics.
- c) BAEC has planned to develop process for producing rubberised jute and coin product using RVNR. BAEC is also interested in developing a process for using agricultural wastes like jute caddies and rice husking mill ash as the filler and reinforcing agents in radiation vulcanised latex and rubber products. IAEA has sanctioned a pre-project assistance through its technical assistance program No. BGD/89/90/07. A National Research Group has been formed for performing research in RVNRL. This group includes scientists of BAEC and other research institutes in Dhaka. BAEC is planning to organise a NTC for imparting training to the members of this group through the expert assistance of RCA.

### Non-Destructive Testing

BAEC has been rendering valuable NDT services using radiography, ultrasonic, liquid penetrant and magnetic particle testing techniques to various industries. In addition to rendering NDT field services, BAEC offers repair services of NDT equipment owned by different organisations and also offers consultancy and expert services to other organisation as and when requested. A few private and public sector organisations have also NDT facilities and offer NDT services to their own installations and other organisations. All these have been possible because of organised training of a number of personnel of BAEC and other organisations on different levels in national and regional training courses under the auspices of RCA/UNDP/IAEA Industrial Project. Level-1 and Level 11, courses are conducted by BAEC under the supervision of National Personnel Certification Committee. For RT Level 11 courses in 1988 Bangladesh required expert services of Dr R R Wamorkan of BARC, India.

The timetable of the course contained the coverage of topics meeting more than the minimum requirement of 150 draft DP9712. Eleven participants took part in the course and eight of them passed. Dr Wamorkan and ten other scientists delivered lectures in the course. One mid-term test and a final examination was conducted.

During 1989 Bangladesh has planned three national training courses one each in UT-I, SM-I and UT-2 for which no external assistance would be required. One executive management seminar will also be conducted in December 1989.

Nucleonic Control System (NCS) - Paper

Realising the fact that NCS has played a very important role in modernising and increasing the productivity as well as quality of paper produced in paper mills, and considering the success of NCS in some RCA Member countries, Bangladesh has participated in the program in order to get the benefit of NCS in paper mills. Bangladesh's action plan was divided into four phases. Increasing the awareness about NCS (phase I), training of manpower (phase II) and feasibility study (phase III). These phases have already been completed but the fourth phase of the plan i.e. installation, commissioning and testing of an NCS in one of the paper mills of Bangladesh has not materialised as yet. The main reason was the high cost of an NCS for small paper mills. RCA has given us a solution by offering a low cost NCS. Despite our effort the response from the paper industry of Bangladesh is not yet positive. However, we are trying to convince them in many ways to install at least one NCS.

2. MEDICAL AND BIOLOGICAL APPLICATIONS OF NUCLEAR TECHNIQUES

Bangladesh participated in a number of medical and biological projects. Last year it concentrated on the project Radioimmunoassay of Thyroid Related <sup>Hormones,</sup> / Radiation Sterilisation Practices for Tissue Grafts in Clinical Use, Care and Maintenance of Nuclear Medical Equipment and Nuclear Techniques for Toxic Elements in Foodstuffs and Lung Imaging Using the Aerosol. Bangladesh will continue to participate in applications of nuclear medicine procedures for the diagnosis of liver diseases, in Radioaerosol inhalation imaging for the diagnosis of chronic respiratory diseases, in the use of computers in Technetium-99m imaging and the development of Technetium-99m generators

using low power research reactors.

Bangladesh was initially behind the schedule in the project, radioimmunoassay of thyroid related hormones as it could not attend the first national coordinator meeting in 1986 and two training courses on bulk reagents production and data processing in RIA in 1987. However, with the completion of the National Training Course in March 1989 which was attended by IAEA experts, the project will now be implemented in all five peripheral nuclear medicine centres in Bangladesh.

To implement the project the IAEA supplied  $T_3$ ,  $T_4$ , TSH bulk reagents. Bulk reagents had been in use in the Institute of Nuclear Medicine, Dhaka and also has started to produce the local reagents such as a) hormone-free serum b) internal quality control (IQC) sera and c) standard  $T_3$  and  $T_4$ . The results were presented in the second meeting of National Coordinators in Bangkok in February 1988. The results were evaluated by experts and as well as by the IAEA project coordinator. Bangladesh entered into the clinical trial 'Strategy for in-vitro thyroid function testing in developing countries' and the 'External quality assessment scheme (EQAS)' of thyroid related hormones.

### 3. FOOD AND AGRICULTURE

With the success in our participation in phase 11 on the Regional Project on Food Irradiation, Bangladesh is willing to participate in the next major undertaking which is going to be an Asian Regional Cooperative Project on Food Irradiation Process Control and Acceptance.

With some successes in conducting research to investigate the

effect of different methods of incorporating urea in straw-based ration on food digestibility and growth rate of buffalo heifers and to study the effect of supplementation of fibrous residues with rice polishing on performance of young buffaloes. Bangladesh would like to continue the project and is eagerly waiting for the outcome of the final RCM to be held in 1989.

As regards the proposed project on the 'Integrated Control of Tropical Plant Viruses with Nuclear Techniques', Bangladesh considers that the project which is to establish and develop a regional network system to develop and use the modern virus techniques using radioisotopes will be a useful endeavour.

#### 4. RADIATION PROTECTION

Bangladesh is actively participating in the CRP 'Compilation of Anatomical, Physiological and Metabolic Characteristics of reference Asian Man'. Bangladesh participated in the Regional Training Course on Development of Infrastructure for Ensuring Radiation Protection held in Sydney in April 1988. Due to natural calamity Bangladesh coordinator could not participate in the Project Formulation Meeting of the CRP held in Mito City, Japan in October 1988 but it submitted a summarised report. In this report the whole population of Bangladesh of both sexes was classified into seven groups and accordingly some basic data on food consumption and human physique have been collected. Meanwhile the draft report of the said CRP formulation meeting has been received. On the basis of the recommendations of this report a number of studies have been planned on priority basis. During the first year of the study, the data on (i) physical parameters of the human body, (ii)

data on food consumption and (iii) data on mass of internal organs have to be collected.

##### 5. BASIC SCIENCES AND ENERGY PLANNING

Bangladesh participated in the two Regional Training Courses in BARC, India. Courses on Radioisotope Production in Research Reactors and on Neutron Activation Analysis for Mineral Resources Prospecting and Characterisation were very useful for Bangladesh.

During an RCA seminar in Jakarta, member countries emphasised taking up more intensive program on research reactor utilisation. It was specifically mentioned during the seminar that research around research reactors must be duly geared up towards optimising utilisation potential which in turn will help build up capabilities for handling the establishment of power reactors. We appreciate initiatives taken by the Government of Malaysia in presenting a proposal on 'Research Reactor Utilisation' for consideration of RCA. In the proposal

Malaysia has very rightfully pointed out that activities in areas of direct utilisation of research reactors, such as neutron beam utilisation, or in enhancing operations, maintenance and management capabilities are carried out to a much smaller extent and these activities involve a higher degree of sophistication, and require better exchange and comparison of experience between research reactor operations and management personnel.

Bangladesh has a project on research reactor utilisation supported by IAEA technical assistance program. Under this

program it was possible to give them operators' licence, install radioisotope production facilities, supply neutron scattering facilities and receive expert services in various aspects of research reactor utilisation, operations and maintenance. Bangladesh would be very happy to participate in the proposed RCA program.





COUNTRY STATEMENT OF  
THE PEOPLE'S REPUBLIC OF CHINA  
AT THE 11TH RCA WORKING GROUP MEETING  
SYDNEY, AUSTRALIA 13-16 MARCH 1989

Your excellencies, Mr. Chairman, Distinguished Delegates, Ladies and Gentlemen,

It is a privilege and pleasure for me to be here to participate in this very important 11th RCA Working Group Meeting. On behalf of the Chinese delegation, I would like to join others to congratulate you on your election as chairman of this meeting, and my delegation is fully convinced that your leadership will bring this meeting to a successful conclusion.

Looking at the successful past of the RCA, we believe that it will further continue to play a more important role in promoting the peaceful uses of nuclear science and technology in industry, agriculture, medicine and others in this region.

Now, I would like to discuss the activities under the RCA carried out during last year and will be arranged next year in China.

I. UNDP/RCA Regional Project on the Industrial Applications of Isotopes and Radiation Technology

China is an active member of RCA Industrial Project and is keenly participating in the programmes under this project.

1. Tracer Application in Industry

The third Regional Training Course on Tracer Technology in Industry was conducted in Beijing, from 21 March - 9 April 1988. There are lectures, laboratory practicals and field demonstrations, 16 participants was attended.

2. Non-Destructive Testing

The 4th National Conference on NDT was held in Wuhan from 10-14 May 1988. Based on reports on the conference, the total amounts of personnel involved in NDT have recently increased to around 100,000. The participants came from nearly all provinces and 25 industrial sectors of the country, and presented 183 papers. Now the Chinese NDT society has been playing an active role in many areas of NDT activities.

In recent 1 or 2 years, following meeting or other activities will be scheduled in China, Application of microcomputer in UT, Reliability of UT, Acceptable Quality level for china made X-ray Film, Application of Novel RT Technique in Field Services, Standardization of ET, Use of NDT in Composite Materials, NDT for Non-Metallic, Measurement of Residual Stress.

In 1988, two NDT training courses were conducted with IAEA support. 'The Regional Course on NDT SM-2' was organized from 13 June-8 July in Shanghai, 14 participants, from 9 countries attended the course. 'The National Training Course on NDT RT-2' was run from 17 October-3 November 1988, also in Shanghai. Additionally, a seminar on 'the Training Qualification and Certification of NDT Personnel in the field of Nuclear Fuel Elements' was organized from 7-10 Nov. 1988 in Chengdu, Sichuan Province.

In 1989, a national seminar on NDT Techniques for Nuclear Installations is planned to be held from 16-20 October, at Shanghai. The Shanghai NDT Center of China National Nuclear Corporation will be the host of this meeting.

### 3. Radiation Technology Radiation Crosslinking

'The National Executive Management Seminar on Radiation Crosslinking Applications in Wire and Cable Industry' was organized in Changchung, China from 28-30 June last year, more than 30 participants attended. Recent status on this subject in China and this region was discussed. The 4th Regional Training Course on the same title was organized from 5-23 September 1988 in Shanghai and Changchun. This is the last one of this series course.

In 1989, a Regional Training Course on Formulation Technology for Radiation Crosslinking applications has been scheduled from 18-29 September in Shanghai. Shanghai Applied Radiation Institute, Shanghai University of Science and Technology (SARI/SUST) will organise this course. This course will be a Chinese Extra Budgetary Contribution.

### Radiation Vulcanization of Natural Rubber Latex (RVNRL)

The 'first meeting on National Research Group Leaders on Technology Development Programme for RVNRL' has been convened in Kunming Yunnan Province, China from 7-9 September, 1988. The Research Institute of Latex Industry was the host institution, 35 participants was attended. Many achievements have been discussed, hope more success in next few years.

### Radiation Sterilization of Medical Products

A 'National Training Course on Radiation Sterilization of Medical Supplies (Microbiology)' has been scheduled in November 1989 at Beijing, Beijing Radiation Center will be the host institution. In recent years, almost all the Gamma Irradiation Facilities in China do radiation Sterilization as their main task.

### Radiation Curing

Last year there is no activities in this field, but we are very interested in this item. In 1989 we welcome IAEA expert mission on leather radiation processing to visit China.

### 4. Nucleonic Control System

The application of Nuclear Control System in Chinese industry are more popular in recent year. for example, in paper industry over 80 sets of NCS are running today.

In 1989, A 'National EMS Seminar on NCS application in paper industry' will be scheduled in Beijing.

### II. Nuclear Agriculture

'Improvement of grain-legume-Rhizobium to fix atmosphere nitrogen'.

Soybean was originated from China. Now it is cropped all over the country. Total yield is about 8 million tons per year, except soybean, the other grain-legume such as pea, cowpea, mungbean, broad bean are also of importance. However, the yield of soybean or others per ha is rather low, so, we are very interesting on this project.

'Integrated control of tropical plant viruses with nuclear techniques', we strongly hope some of our institutes could participate this CRP, and together with other countries to found and establish some techniques including nuclear techniques to protect plant against virus diseases.

The use of nuclear techniques to improve domestic buffalo production in Asia'. we are interested on the final RCM of phase II of this CRP.

The second FAO/IAEA RCM on the use of isotopes in studies of pesticide residues in rice-fish ecosystem was convened at yaan, Sichuan Province, from 10-14 October 1988.

The Research Coordination Meeting on the 'Radiation-Induced F-1 Sterility in Lepidoptera for Area-Wide Control' will be convened in Beijing, from 22-26 May 1989, The Institute for Application of Atomic Energy in Agriculture/Chinese Academy of Agricultural Sciences (IAEA/CAAS) will be the host institution.

#### Food Irradiation Preservation

Studies of food irradiation in China have dated back to 1958. Up to now, China has approved 8 kinds of food for irradiation preservation unconditionally, including potatoes, onions, garlic, peanut, grain, mushroom, sausage and apple, and several other kinds of food are being tested.

In January 1988, a 'National Seminar on food irradiation development in China' was convened in Beijing, Sponsored by the Ministry of Nuclear Industry.

In September 1988, Chinese National Coordination Committee on Food Irradiation (NCCFI) was established. The members of NCCFI are, State Science & Technology Commission (SSTC), China National Nuclear Corporation

(CNNC, formerly the Ministry of Nuclear Industry MNI), Ministry of Public Health (MPH), Ministry of Agriculture (MOA), Ministry of Light Industry (MLI), Chinese Academy, China Import & Export Commodities Inspection Bureau, China Food Industry Technical Development Corporation, and others.

From 7-11 November 1988, a 'National training course on Food Irradiation' was held in Shanghai.

China actively participated the Genva International Food Irradiation Conference, last December, 1988.

In recent years China has proceeded some market testing on irradiated foods, including sweet potato spirit (Hantanye, 10000 tonne), sausage (200T), apple (250T), potato (450T), onion (850T), garlic (2000T) and others. and positive results have been obtained.

In 1989, A 'workshop on Commercialization of Food Irradiation' will be held in Shanghai, from 14-18 August. Shanghai Irradiation Centre will be the host for the workshop. This workshop will be an activity under Chinese Financial Contribution.

In China, 70 Gamma Radiation Facilities have been established with (Design capacity above 10 KCi each). and there are more than ten facilities with design capacity above 100 KCi each.

Beijing, Shanghai, Nanjing, Jinan, Tianjin, Zhengzhou, Lanzhou, Chengdu, Hangzhou, Daqing, Shenzhen and others.

All the facilities are for multipurpose. The main tasks are radiation sterilization of medical products, radiation processing of polymer materials, and irradiation preservation.

### III. Medical and Biological Applications of Nuclear Techniques

In China, there are 556 nuclear medicine departments with 4000 staff. The estimated number of hospitals using nuclear techniques far exceeds one thousand and the number of total procedures performed per year is estimated to be well over 10 million. A system on training, research and academic exchange for nuclear medicine has been established in China.

We are very interested in the following title for medical and biological applications of nuclear techniques,

Use of computers in Technetium-99m imaging.

Radioimmunoassay of thyroid related hormones.

Imaging procedures for diagnosis of Liver diseases.

Improvement of Cancer therapy. Inhalation imaging for diagnosis

respiratory diseases.

Nuclear techniques for toxic elements in foodstuffs.

Development of Tc-99m generators.

Development of radiation protection infrastructure.

Compilation of anatomical, metabolic and physiological characteristics of reference Asian man.

Radiation sterilization for tissue grafts.

Care and maintenance of nuclear medical instruments.

Some regional or national activities were held or be held in China as follows,

The second Research Coordination Meeting on Nuclear Techniques for Toxic Elements in Foodstuffs was convened in Beijing, from 19-22 April, 1988.

The Research Coordination Meeting and Regional Training Course on Radiation Sterilization for Tissue Grafts were convened in Taiyuan, from 7-18 November 1988.

Research Coordination Meeting on Radiation Control for Food-borne Diseases will be possibly arranged in Hangzhou, from 7-11 August 1989.

A Regional Training Course on Radiation Dosimetry will be arranged in Shanghai October 1989.

#### IV. Nuclear Science and Energy based Projects

##### 1. Research Reactor Utilization

The first Chinese research reactor was built in Beijing in 1958. After 30 years efforts, China developed and built different kinds of research reactors by her own efforts, including low and medium flux research reactors, a High Flux Engineering Test Reactor, Miniature Neutron Source Reactor, and so on. Now, China has the capability to design and to build different kinds of research reactors, and to produce several kinds of fuel elements for reactors. There are many research and development work on research reactor utilization in China, including radioisotope production, neutron transmutation doping (NTD) of silicon, neutron activation analysis, neutron scattering, neutron radiography, irradiation effect study and so on. Recently, China has done following development in research reactors,

The conversion from HEU fuel element to LEU fuel element,

The development of pulsed reactor (UZrH Reactor), a prototype

pulsed reactor has been built in SWCR. China has accumulated many experience in the field of development 2) Utilization of research reactors and is willing to share our experience with our RCA member states.

There are many possibilities for technical transfer, providing products and technical service in this area.

We hope the cooperation among RCA member states will get great success.

## 2, Energy and Nuclear Power Planning

China is just embarking a nuclear power programme. The first Nuclear Power Plant (NPP) in Qinshan, 300 MW PWR will be connected into grid at the end of 1990. The second NPP, Daya Bay NPP with 2 units of 900 MW PWR is under construction and scheduled to put into operation in 1992 and 1993. Another 2x600 MW PWR Project in Qinshan have been approved by national authorities and the feasibility study is on-going.

RCA activities in the area of Nuclear Power Planning and implettation for example RCA traing Course held by South Korea last year are welcome and necessary for the countries which have had or plan to formulate nuclear power programme.

In addition, China will host the third WASP users workshop from 4-8 Sept. 1989 in Beijing. WASP has been widely used in China since it was introduced to China in 1986.

We are convinced that the Technical cooperation among Developping Countries (TCDC) is beneficial for all the countries concerned. For this, we would like to organize regional training courses and other regional activities; provide experts for nuclear agriculture, nuclear medicine, radiation technotgoy, Non-destructive testing, research reactor utilization and many other areas; provid Miniature Neutron Source Reactor ( MNSR ) , 15N labelled coumpounds, RIA kits and reagents, gamma radiation facilities, NDT equipment, some accelerator devices, radiation processing products and many others to other countries.

In China, some national research, training and domonstration centers have already ben established , we hope these centers could serve as regional

centres in agriculture, nuclear medicine, radioisotope production and industrial application, radiation technology application and other areas.

In summary, China will continue to be an active participant in RCA and intends, as far as tight budgeting circumstances allow, to continue its support. China looks forward to further extension and expansion of RCA activities in the very near future.

Before concluding, Mr. Chairman, I wish to express our gratitude and appreciation to the Government of Australia, to the Australian Nuclear Science and Technology Organization (ANSTO) and Australian Colleagues for hosting this important meeting and hospitality extended to us. I also would like to express my heartfelt appreciation to IAEA, the Deputy Director-General, RCA Coordinator, UNDP project coordinator and all project officers who contributed for the success of the regional RCA projects.

Thank you, Mr. Chairman.





COUNTRY STATEMENT - INDIA  
ELEVENTH RCA WORKING GROUP MEETING, SYDNEY  
13-16 MARCH 1989

(R.Chidambaram, Director, Physics Group, BARC,  
Bombay-400 085, India)

Introduction:

India takes pleasure in continuing its close cooperation with the RCA member states and to participate in the 11th Working Group meeting. We are grateful to our kind hosts Australia for inviting us to their beautiful country. As a founder member, we are very happy to see the continuous growth in the RCA activities and we have actively participated in as many of them as possible. India has also, over the years, provided special assistance through its extra-budgetary contribution to the RCA.

The indigenously-designed and built 100 MW research reactor DHRUVA has been working very well at full power for more than a year. Apart from the production of the many isotopes needed for industry, medicine and agriculture, DHRUVA is one of the high-flux reactors in the world for neutron beam research.

The nuclear power projections in India anticipate 10,000 MW of nuclear power based on indigenous technology by the year 2000, which would be about 10% of the total installed electrical capacity in India at that time (against a little under 3% now). These shall be based on 235 MWe and 500 MWe PHWRs.

2. UNDP Regional Industrial Project:

India has been supporting this important project and will continue to do so strongly in the future. It has provided several experts as required under the three sub-projects:

- (i) Tracer Applications,
- (ii) Radiation Processing, and
- (iii) Non-destructive Testing.

The activities of these experts have involved, among other things, preparation of the design of a low-cost gamma irradiator for radiation vulcanization of rubber latex and carrying out demonstration experiments of industrial applications of radiotracers in Korea and Bangladesh. In all these three sub-projects India has organised regional training courses.

In this context, I would like to refer to the successful Regional Workshop on Image Processing for NDT held at Tokyo in October 1988. There is considerable activity in the field of Image Processing in India and two Workshops have been organised in the Bhabha Atomic Research Centre in the last three months - one in the field of Materials Science and the other in Bio-medical Engineering. Image Processing is a frontier area of R&D for materials quality assurance and we shall be happy to organise a Workshop/Training course in this area in India in the future. In this context, it is perhaps worthwhile mentioning that we have designed and shall commission shortly a mini-pool neutron source reactor KAMINI based on U-233 fuel for examination by neutron radiography of the irradiated fuel of the fast breeder test reactor FBTR at the Indira Gandhi Centre for Atomic Research in Kalpakkam.

I should also mention about the recent commissioning of the second Radiation Sterilization Plant 'RASHMI' in India in the premises of the Kidwai Memorial Institute of Oncology in Bangalore. This is of totally indigenous design and fabrication and shall cater to the needs of the hospitals and industries in South India for disposable medical products.

### 3. Medical and Biological Applications of Nuclear Techniques

The Radiation Medicine Centre in BARC was one of the participating laboratories for the Phase-I Project on the evaluation of nuclear medicine procedures for the diagnosis of liver diseases. The Liver Imaging Atlas was prepared and edited by an Indian expert at the end of Phase-I and is likely to be published in 1989. India would be happy to participate in Phase-II of the Project which, I understand, also involves comparison with ultrasonic imaging techniques.

India has supplied BARC - designed radioaerosol generator system to the various participating laboratories in the CRP on "Radioaerosol Inhalation Imaging for the Diagnosis of Chronic Respiratory Diseases in Developing Countries". I am very happy to see from the draft RCA Annual Report that "a senior participant in the CRP carried out a comparative study of various nebulisers and found that the BARC

nebuliser is one of the best". In addition, India has also agreed to supply modified aerosol generator systems for performing mucociliary clearance studies. We also received a communication recently from the Division of Technical Assistance and Cooperation, IAEA, saying that "the Agency has received a request from the Middle East and Europe Section of TC for aerosol inhalation unit". The proposal, I understand, is to distribute the equipment to 12 countries in this region while holding a workshop in Middle East countries and for the visit of some Indian experts for providing training in the use of the equipment for clinical studies.

The development of "radiation protection infrastructure" is an important area related to the public perception of safety in nuclear power reactor operation. We are hosting a Workshop on "Environmental Sampling and Measurements of Radioactivity for Monitoring Purposes" from 9-12 October, 1989, in India. The safety aspects in the industrial applications of radiation sources are also very important and we would like to suggest an RCA Training Course in this field in India in the future, emphasising radiation protection principles, radiation measurements and calibration, management of radiation emergencies in industrial institutions using radiation sources and regulatory aspects of radiation protection.

The project on 'Care and Maintenance of Nuclear Medical Equipment' is also in a very relevant area and a project formulation meeting in this connection was held in BARC in June 1988. The project has both a CRP and a TA component.

#### 4. Agricultural Projects

We are interested in taking part in the RPFI III project dealing with "Food Irradiation Process Control and Acceptance". Our Government has cleared the irradiation process for spices, onions and frozen seafood for export purposes. In the near future we will be undertaking the techno-economic feasibility and consumer acceptance studies on two of these products, viz. onions and spices. The same type of studies with spices involving importing countries could perhaps be taken up under RPFI III. I may mention here that the fabrication in BARC of a mobile (onion) irradiator for demonstration trials on the process is nearing completion. We shall also be happy to undertake the responsibility of conducting one of the workshops in India under the RPFI III project. The new projects relating to the 'integrated control of tropical plant viruses with nuclear techniques' is good and we would like to participate in this programme.

## 5. Research Reactor and Energy Based Projects

As I mentioned earlier, the 100 MW Dhruva reactor has been operating at full power for more than a year and since then has been extensively used for a number of experiments on neutron scattering from condensed materials. A set of sophisticated computer-controlled instruments were installed before the reactor went to power and several more are in the process of installation now. By the time this programme is completed, Dhruva will have a complement of more than 10 neutron spectrometers of different types functioning on thermal, cold and hot neutron beam lines. We are considering it a National Facility and are inviting project proposals in neutron scattering from universities and research institutions in India; we shall be happy to consider similar project proposals from scientists in the RCA member states. The latter could be in the context of the Malaysian proposal for a new project on "Research Reactor Utilization" which we support though we feel that the scope of the project should be restricted to make it more effective. In this context, I may mention that we have felt that India could host an international conference on Neutron Scattering in early 1991 and a number of international scientists have very warmly responded to this idea. It is understood that the IAEA is also considering the possibility of holding an International Neutron Scattering Conference in 1991 and we have proposed that this could be the same meeting as the one we are planning in India. Subject to the IAEA Conference becoming a reality, we feel it would be a good idea to hold an RCA Workshop preceding/following this meeting at BARC. I am happy to recall, as stated in the 'Background Documents' circulated to the Eleventh RCA Working Group Meeting, that "the origins of RCA can be traced back to the 1963 India-Phillipines-Agency Project" which related to neutron scattering.

Under the programme "Basic Science using Research Reactors", we have recently hosted two Regional Training Courses in BARC, viz.,

- a) on Radioisotope production in Research Reactors from 9-20 January 1989; and
- b) on Neutron Activation Analysis for Mineral Resource Prospecting and Materials Characterisation from 6-24 February 1989.

The latter was a second course with the main theme of neutron activation analysis; the first one was conducted in February 1985, which covered general aspects with a small component on trace elements in environment and health.

We propose that India's contribution to RCA for 1990 be used for organising regional Training Courses in the following topics:

(a) On "Research Reactor Safety Principles".

The course would highlight management responsibilities covering those of designers, constructors and operators; importance of defence in depth, accident prevention and accident mitigation; general technical principles covering engineering code requirements, quality assurance, human factors, safety assessment and verification, radiation protection and operating experience feedback; specific principles covering siting, design, manufacturing and construction, commissioning, operation, accident management and emergency preparedness.

(b) On "Isotope Techniques in Hydrology"

The course would include lectures with appropriate practicals in lab and field to cover basic principles of groundwater hydrology and geochemistry and details of isotope techniques in hydrology. The latter would include applications of environmental isotopes including stable isotopes D and O-18; artificial radiotracer applications covering surface water studies, e.g. sediment transport leakage from dams and reservoirs; groundwater studies - single well and multiple well techniques, nuclear well logging, safety aspects, etc; interpretation of isotope data using statistical and modelling techniques. The course would also include general material relating to surface water and ground water like water balance of lakes, reservoirs, percolation tanks etc., salination and sea water intrusion, groundwater flow dynamics, etc.

I have already mentioned about our readiness to host on a future date Regional Workshops on "Image Processing in NDT" and "Neutron Scattering" and a Training Course on "Safety Aspects in the Industrial Applications of Radiation Sources". There is another area which, I think, needs some attention, viz. information technology. For fields related to Nuclear Science and Technology, the International Nuclear Information System (INIS) of IAEA provides an excellent data base. There are two components to this - the inputting of data and the utilisation of output products which range from the printed ATOMINDEX through magnetic tapes to compact optical discs. India provides a substantial input to INIS and has also participated in the recent evaluation of the INIS trial CD-ROM product. We feel that regional cooperation in this field of information technology could be useful. India would be willing to consider operating in India a Regional INIS Centre. This would include assistance in inputting na-

tional data into INIS to some RCA member states if they so desire and telephone/satellite access to the data-base.

In conclusion, we wish to reaffirm our faith in RCA as a very effective instrument of cooperation in various areas of nuclear science and technology. And please allow me once again to thank our hosts Australia for their kind hospitality and their efforts towards arranging the Eleventh RCA Working Group Meeting.

.....oOo.....

COUNTRY STATEMENT - INDONESIA  
ELEVENTH RCA WORKING GROUP MEETING, SYDNEY  
13-16 MARCH 1989

Mr. Chairman,

It is my great pleasure to participate for the first time in this Eleventh RCA Working Group Meeting here in Sydney. First of all my delegation wishes to express its gratitude to the Government of Australia for hosting this important RCA Working Group Meeting and for the excellent arrangements prepared.

As you are aware, Indonesia has been associated with RCA activities since its inception in 1972 and has maintained active participation in almost all RCA projects. My country acknowledges the effectiveness of cooperation and mutual understanding among member countries in the Region and has gained benefits from its participation. Positive results and highlights have been achieved in various RCA activities. These are reflected in various aspects of life as a realization in the transfer of nuclear science and technology among member countries in the Region.

It is worthwhile to recall that the question of funding the activities in the framework of RCA is still a central issue in our regional cooperation. My country believes that a great deal of funds has been achieved through the contribution of the IAEA and supplemented by funds from donor countries. In more recent years funds obtained from the UNDP are considerably obvious. We are of the opinion that RCA member countries should continue to support the idea that UNDP be the main contributor of funds for future RCA activities. Meanwhile, other potential areas such as food and

agriculture, medicine, nuclear and radiation safety and basic science and energy should also be given priority as the industrial project.

At the occasion my delegation would like to extend its brief report on some highlights obtained of RCA activities in Indonesia during the last year period, as follows:

#### Radiation Sterilization of Medical Products

A National Executive Management Seminar on Radiation Sterilization of Medical Product was held on 7-8 December 1988 in Jakarta. About 60 executive managers from various private industries in Java were participated at the NEMS. Four lecturers were provided by the IAEA and one from BATAN. A positive response recently emerged from the NEMS is, that one private industry in Jakarta is planning to establish an irradiation facility for radiation sterilization of medical products. Some preparations are being initiated with the assistance of the National Atomic Energy Agency (BATAN).

#### Radiation Vulcanization of Natural Rubber Latex.

A special training for personnels of private industries in using RVNRL for producing of surgical gloves is being conducted at the Centre for the Application of Isotopes and Radiation (CAIR) Jartaka. Currently, a considerable increasing demand for RVNRL is observed. In the framework of collaboration with the National Family Planning Board (BKKBN), about 400,000 pieces of condoms have been produced using irradiated latex that was stored for about 6 - 7 months. Those condoms seem to have considerable physical charateristics that meet a standard qualification. A public acceptance test on the condoms from RVNRL is being conducted in Surabaya and its vicinity. About one ton of rubber latex will be irradiated again next April 1989.

About 200 kg sample of RVNRL each has been supplied to six member countries in the Region, namely People Republic of China, India, Sri Lanka, Malaysia, Thailand, and Japan to be used for research and development.

#### Surface Coating of Wood

In collaboration with a government owned forestry body named PERHUTANI, about 400 square meters of irradiated parquet flooring have been produced for technical, feasibility, and economic evaluations. This collaboration is one of the follow-up obtained from the National Executive Management Seminar (NEMS) on



Radiation Curing Coating of Wood Products in Jakarta, in 1987.

It seems that the technology for surface coating of parquet flooring could have a good economic future, although the current production cost is not reasonable. A good quality and less expensive monomers are the current main constraints in the promotion of this technology.

A programme for modification of EB machine at CAIR is being conducted. A reverse roll coater is expecting to arrive this month from Japan. Supplemented to the EB machine a Liquid Nitrogen Generator has been established through IAEA technical assistance. The current output is about 20-25 litres liquid nitrogen per hour, however, it is less than the actual capacity of the generator.

#### Tracer Techniques

Investigation on leakage of the cooling tower at PUSRI Fertilizer Plant in Palembang was carried out. Similar work will be conducted also at the Asean Fertilizer Plant in Aceh, Sumatra.

A NEMS on Tracer Techniques for Industry will be held next June 1989 at PT. Kujang fertilizer Plant in Cikampek, West Java. Training Courses on tracer techniques for technicians of oil industry in the country are still being carried out by BATAN.

#### Miscellaneous

We are pleased to announce that all facilities of BATAN will be available to be used for RCA activities i.e. a group as well as individual training, seminar, scientific visit, and research.

Last but not delegation strongly supports the new proposed projects and is eager to participate in all RCA future activities.

Thank you.

Sydney, 15 March 1989.



COUNTRY STATEMENT - JAPAN  
ELEVENTH RCA WORKING GROUP MEETING, SYDNEY  
13-16 MARCH 1989

Mr. Chairman, distinguished delegates,

My delegation wishes to express its deepest gratitude to the Government of Australia for having hosted this important meeting with excellent arrangements as well as its hospitality extended to us all. I wish to join other delegates to congratulate the success of this meeting.

Japan has vigorously associated itself with RCA activities since its participation in 1978 and has made financial and technical contributions required for RCA projects, which involves transfer of technical experiences and contributions to the developments of participating countries.

RCA provides excellent opportunities for the promotion of peaceful uses of nuclear energy. It has achieved remarkable progress and gained substantial strength in the past 17 years. I also wish to take this opportunity to thank the DDG, RCA Co-ordinator and Project Co-ordinator for UNDP Industrial Project for their concerted effort to implement RCA programs.

Last year, further new developments were observed; the new project, "Strengthening of Radiation Protection", started successfully. We had a opportunity to discuss the present and future activities of RCA at the RCA Seminar held in Jakarta last June. The views exchanged at the Seminar are extremely useful in furthering our considerations on how to develop cooperation under the framework of RCA. Japan will remain a firm supporter of RCA activities and an active participant in its programs. Japan's contribution to RCA activities during last year is detailed in the document to be distributed as an attachment to my statement.

Before concluding my remarks, I wish to briefly refer to the present status of RCA projects; while RCA projects have been increasing in recent years, a number of projects approved at the past Meetings of Representatives remain to be implemented. To avoid such a situation, my delegation wishes to suggest that a project proposal be carefully studied before submitted for approval at the Meeting of Representatives, availability of resources for implementation being fully taken into account.

## Report on RCA activities in 1988

### A. UNDP Industrial Project

#### 1. Radiation Processing

In the Sub-project "Radiation Processing", Japan actively participated in four major activities, namely radiation vulcanization of natural rubber latex, radiation curing of surface coating of wood products, radiation crosslinking of wire and cable, and radiation engineering. The National Coordinator Meeting was held in Indonesia in June 1988 in which Japanese experts participated to review outcome and prepare work plan of the project. This sub-project has been successfully implemented in 1988.

##### (1) Radiation vulcanization of natural rubber latex

An expert of Japan Atomic Energy Research Institute (JAERI) visited India (Feb.-Mar. 1988), China (Sept. 1988), Vietnam, Thailand and Bangladesh (Feb. 1989) to give advice on their preparation of R&D plan and to provide up-to-date technical data. It is a remarkable result of this project that the natural rubber latex vulcanized by radiation was used for commercial production of condoms in Indonesia and gloves used at nuclear facilities in Japan. Transfer of this technology to industries in other RCA countries will be further promoted by active contribution of Japanese experts.

(2) Radiation curing of surface coating of wood products

Based on the conclusion of Expert Advisory Group Meeting, Japanese experts worked for the preparation of detailed design to modify the BATAN demonstration plant of radiation curing in Feb.-Mar. 1988. The modified plant with partial cash contribution of Japanese Government will be completed and installed in May in 1989. Japan hopes that the modified plant will be successfully operated and will be useful for transfer of this technology to RCA member states.

(3) Radiation crosslinking of wire

Since Japanese industries have extensive experience in radiation crosslinking of wire insulator, Japanese experts made contribution for the training course held in China in September 1988.

(4) Radiation sterilization of medical products

In order to improve quality control of radiation sterilized medical products, an expert of JAERI visited China, Pakistan, India and Thailand to observe facilities and exchange informations in Nov.-Dec. 1988. The Expert Advisory Group Meeting of dosimetry standard and process control of radiation sterilization of medical products to formulate work plan of the project in February 1989 in Japan.

(5) Others

Japanese experts gave lectures at National Executive Management Seminar in Bangladesh (Mar. 1988) and at Training Course in Malaysia (Oct. 1988) for the application of radiation technology.

The Expert Advisory Group Meeting will be held in Japan organized by JAERI in April 1989 to discuss future trend and development of radiation chemistry applications which will be useful for planning future activities of RCA. National Co-ordinators Meeting of this sub-project, Training Course of Radiation Engineering and National Research Group Leaders Meeting of Radiation Vulcanized Natural Rubber Latex in cooperation with international symposium on the same topics will be also held in Japan in 1989.

2. Non Destructive Testing (NDT)

NDT is the largest sub-project in Phase II in which Japan actively participates.

The implementation of this sub-project during the past one year is described as follows:

- (1) An expert participated in the 3rd National Coordinators Meeting held in Korea in April 1988 to formulate the project plan for 1988 and 1989.
- (2) An expert participated in the National Training Course in China in October 1988.

(3) The Japanese Society for Non-Destructive Inspection (JSNDI) hosted a Regional Workshop on Image Processing techniques for NDT in Tokyo in October 1988.

(4) An expert participated in the National Training Course of NDT in Thailand in November 1988.

### 3. Nucleonic Control Systems

(1) The Japan Atomic Industrial Forum conducted the Regional Executive Management Seminar on the Use of Nucleonic Instrumental Techniques in Civil Engineering in June 1988.

(2) A Japanese expert visited Indonesia and Pakistan to implement a follow-up program of the Executive Management Seminar on NCS in the steel industry in 1987.

(3) Two Japanese experts visited Pakistan, Malaysia, Thailand and China as members of a mission on small paper mills for the NCS.

(4) The Japan Atomic Industrial Forum will conduct "the Regional Workshop on the use of Low-Cost NCS in Small Paper Industry" in 14-20 March, 1989.

### B. Medical and Biological Application Projects

#### 1. Radiation therapy

A coordinated research program (CRP) on "Improvement of cancer therapy by combination with chemical and physical means" was concluded in 1987. A consultant



meeting was held in 1988 to develop a framework of a new CRP in this subject area in response to the specific needs and requests from the radiotherapy institutions of the region. The consultant meeting recommended to initiate a CRP on "Introduction of computerized dosimetry and data base in radiation therapy for carcinoma of the cervix in Asian countries". This CRP aims principally at development and introduction of computer softwares for treatment planning in radiotherapy of cervix cancer, which is expected to contribute to the improvement of radiotherapy performances in member states to a great extent. Japan would like to suggest this CRP and to encourage initiatives of the Agency in coordinating available resources to the efficient and effective implementation of this CRP.

With regard to the training program in this subject area, Japan would like to support a training course on brachytherapy of uterus cancer using RALSTRON as a follow-up of the one that was hosted by the Malaysian Government in 1986 with quite successful results. This program is well-justified in view of the increasing number of RCA member states where this modality is in practice in their national campaign against uterus cancer (Malaysia, Pakistan, Philippines, Thailand, Sri Lanka, Korea etc.).

## 2. Nuclear Medicine

With regard to nuclear medicine, a CRP on "Quantitative evaluation of nuclear medicine procedure for the diagnosis of liver diseases" was concluded in 1987 with a remarkably fruitful result. Japan is pleased to support the Phase II of this CRP.

The objectives and framework of the second phase of the said CRP were elaborated by consultant meeting which was held in Vienna in December 1988. It was recommended that the second phase should be titled as "Evaluation of imaging procedures for the diagnosis of the liver diseases". Its main aim is to evaluate objectively the performance of liver scintigraphy and ultrasonography in the diagnosis of the liver diseases. It is expected through this CRP that the general standard of diagnostic imaging in hospitals of the participating countries will be improved by enhancing the quality of images and upgrading their interpretations.

## 3. Others

In support of the RCA program, the Government of Japan has been conducting a series of JICA group training courses on medical and biological application of radiation and isotopes, inviting each year about 10 to 12 experts from RCA countries. In 1988, a workshop meeting for two weeks' duration was held to formulate a strategy for the future training courses inviting senior scientists from RCA member states. According to the conclusion of the

workshop, a training course will be held this year in the field of radiation biology with emphasis on its application to radiation protection and radiotherapy.

#### C. Strengthening of Radiation Protection

According to the schedule of project as set out in the Project Document which was approved in 1988 by participating member states, a series of activities took place in 1988 in this project area as follows:

1. A training course on "Strengthening of radiation protection infrastructure" hosted by Australia, with which Japan cooperated in terms of expert assignment.
2. A workshop on "Intercomparison of personnel and environmental dosimetry" hosted by Japan, with which Australia and India cooperated by sending experts.
3. First research coordination meeting of a CRP on "Compilation of anatomical, physiological and metabolic characteristics for a Reference Asian Man" hosted by Japan.
4. An expert advisory group meeting was convened in February this year in Tokyo whereby programs for 1989 were coordinated. As a result, it is expected that a training course on "Basic techniques in radiation protection" will be held from 16 to 27, October 1989 in Tokai, Japan and a workshop on "Environmental sampling and measurements of radioactivity for monitoring purposes" will be held from 9 to 12, October at Kalpakkam, India.



STATEMENT OF THE REPUBLIC OF KOREA  
THE 11TH WORKING GROUP MEETING OF RCA MEMBER STATES  
SYDNEY, AUSTRALIA, MAR 13-16, 1989

Mr. Chairman,

It has been my sincere pleasure to participate in the 11th Working Group Meeting of RCA Member States and to have this opportunity to present the statement of the Republic of Korea.

Over the last four days, I feel we have had very meaningful and fruitful discussions under your excellent leadership and active cooperation of all RCA member states, though naturally the time is too brief to discuss so many agenda items in depth. I would like to point out that these successes reflect the commitment of our RCA member states in cooperation for peaceful uses of nuclear technology.

Mr. Chairman,

Without question, RCA is widely recognized as an important vehicle for nuclear cooperation among member countries of the Asian and Pacific Region, greatly contributing to the development and applications of nuclear technology in a broad spectrum covering medicine, biology, and agriculture as well as other industries.

In particular, I wish to note that RCA cooperation has recently been expanded to nuclear power applications such as research reactor utilization and nuclear power planning and implementation.

Korea believes this is a most important area for further RCA cooperation, taking into account that six member states - China, India, Japan, Pakistan, the Philippines and Korea - have commercial nuclear power plants in operation or under construction, and that several other countries are likely to introduce nuclear power programs early in the next century.

With this in mind, Korea hosted the RCA Regional Training Course on Nuclear **Power** Project Planning and Implementation last November for three weeks under our full financial support to share with RCA Member States our unique experience and technology in nuclear power accumulated over the past 20 years.

In addition, I am happy to report that Korea will also host and financially support again this Training Course this coming October, providing about 20 participants with an overview of practical elements, problems and constraints involved in planning and implementation of nuclear power projects from pre-project activities to plant operation.

Mr. Chairman,

With your permission, the Korean delegation would like to make a few comments on the pending RCA issues and cooperation activities.

First, I wish to offer my heartfelt appreciation for making the Special Evaluation Review on the comparative analysis of RCA and ARCAL. This Review has many implications for reinforcing RCA cooperation and its legal framework, as well as designating its future direction.

As we are aware, one of the most prominent distinctions between RCA and ARCAL is the fact that the RCA is a formal inter-governmental agreement, while ARCAL is simply guidelines for regional cooperation arrangements.

In this regard, Korea requests IAEA to continue comparing and analyzing the advantages and disadvantages in the long term and to present the revisions for the draft RCA Agreement in the future, if needed, to seek a desirable direction for increasing RCA cooperation.

Mr. Chairman,

Concerning the role of non-RCA countries in RCA projects, Korea would like to stress that there should be some differentiation between RCA and non-RCA countries to maintain the existing legal RCA framework.

In our opinion, the most desirable solution to this problem would be to have non-RCA states participating in RCA projects enter into the RCA Agreement. In this regard, Korea suggests that IAEA take appropriate action so that non-RCA member states presently participating in RCA projects can enter into the RCA Agreement.

Turning to the roles and responsibilities of the RCA Working Group, General Conference and Project Committee Meetings, we fully recognize the importance and necessity for clarification and institutionalization on the roles and responsibilities of the three meetings. It is incumbent upon us now to clarify and institutionalize their roles and responsibilities for effective formulation and implementation of RCA cooperation programs.

In this vein, Korea wishes to suggest that IAEA first prepare a draft document on this **question** and report on it at the next RCA meeting for discussion. We believe that the document would provide a solid foundation for consultation among RCA member states to find desirable directions on the roles and responsibilities of the three meetings.

With regard to the RCA technical programs, I do not wish to exhaust our limited time by repeating our main activities, positions and suggestions for the future. Rather, I have attached it to our country statement.



Mr. Chairman,

In closing my statement, I would like to express my sincere gratitude to the Government of Australia for the excellent arrangements prepared for this meeting.

Thank you.

## Views on RCA Technical Programs

### 1. UNDP/RCA Regional Industrial Project

#### 1-1 Tracer Technology in Industry

- o In Korea, a tracer demonstration on the determination of residence time distribution the 4 pre-calcinators of the SSang Yong Cement Plant was carried out by KAERI in May of 1988 under the assistance of experts and equipment provided by IAEA.
- o Being satisfied with the results, Ssang Yong, one of the largest in the world in production capacity, desires to carry out further experiments for the other 3 precalcinators.
- o The tracer demonstrations are now well known to the Korean cement industry, and we feel it would be more efficient than having EMS, from a practical point of view. The Korean cement industry is now at a mature stage, and as they normally manage huge facilities under feasible working conditions, much potential applicability of radio-tracers is expected.
- o The KAERI tracer team is presently attempting to identify a target industry for one additional tracer demonstration under the IAEA expert assistance. In this connection, we would like to recall that Korea requested the second demonstration to be executed in 1990 rather than 1989.

## 1-2 Non-Destructive Testing

- o It is noteworthy to mention that In 1988, Korea hosted the 4th National Coordinators Meeting, one ET-2 Regional Training Course, and an RT-2 National Training Course.
- o Concerning future NDT activities, we hope to host a seminar in 1990 on "NDT for Nuclear Power Plants" or "NDT for Petrochemical Plant Maintenance", in place of a national training course. In this regard, it would be highly appreciated if IAEA dispatches the required experts. Detailed information will be forwarded through diplomatic channels soon.

## 1-3 Radiation Processing

- o In Korea, the fields of radiation sterilization and cross-linking of wire and cable are very active in domestic industries.
- o Concerning the surface coating, we would like to recommend the broadening of the scope of radiation curing on various materials such as iron plate, and magnetic and adhesive tape.
- o An NTC on the radiation sterilization of medical products will be held at KAERI on November 7th and 8th of this year.

#### 1-4 Nucleonic Control System

- o The number of nucleonic control systems is increasing in line with the industrial growth in Korea.
- o Korean civil engineers are mostly aware of the principles and significance of NCS in civil engineering applications and expressed their opinions on the usefulness of RI loaded equipment in civil engineering practice.
- o Under this situation, we have a plan to hold an EMS on civil engineering applications in late 1989.
- o The details will be notified officially to IAEA after discussions with the organizations concerned.

## 2. Technical Assistance Projects and Coordinated Research Programs

### 2-1 Imaging Procedures for the Diagnosis of Liver Diseases - Phase II

- o Phase I of this project proved useful in improving our capability in the diagnosis of liver diseases using nuclear imaging procedures.
- o Korea hopes that this will be extended to include an inter-comparison of ultrasound and spect study with nuclear static images. In this regard, Korea fully supports Phase II of this project and will actively participate in it.

### 2-2 Improvement of Cancer Therapy-Phase II

(Introduction of Computerized Dosimetry and Database in Radio-therapy for Carcinoma of the Cervix)

- o We were very interested in Phase I of this RCA project, but unfortunately lost the opportunity to participate in it.
- o Concerning the Phase II, we strongly desire to share our experiences and technologies in this area with our RCA member states through participation. In this line, it is hoped that this project will be implemented soon.

### 2-3 Food Irradiation

- o I would like to stress that consumer acceptance is very important in order to expand the commercialization of food irradiation. This general acceptance can only be achieved when honest information reaches all concerned.
- o Korea strongly supports Phase III of Food Irradiation and hopes to participate in it.

### 2-4 Integrated Control of Tropical Plant Viruses with Nuclear Technology

- o As plant virus diseases in Korea are fairly serious as related to the productivity of crops and vegetables, this new project proposal is very timely and desirable for us.
- o The Agricultural Sciences Institute in Korea is, therefore, very interested and anxious to participate in this project. The Institute has already been involved in the rice black-streaked dwarf virus RNA and synthesized CNA since 1987.
- o In this context, Korea strongly supports this project as an RCA cooperative program and will actively participate in it. If available, IAEA Fellowships and Expert Services would be appreciated for the most successful results.

## 2-5 Improvement of Grain Legum Rhizobium Symbiosis to Fix Atmospheric Nitrogen

- o Leguminous crops have recently become more important as food and feed crops in the Republic of Korea. Soybeans are cultivated on about 200,000 hectares with an annual production of 250,000 metric tons. The high cost of nitrogen-based chemical fertilizer is a problem in agricultural production, along with other pollution problems. Leguminous plants can meet their nitrogen requirement in two ways by biological fixing  $N_2$  in symbiosis with rhizobia or by absorbing it from the soil. The means of biological fixing  $N_2$  in the air is very important to alleviate the high cost of chemical fertilizers as well as soil pollution. Plant breeders must first select the  $N_2$  fixing supportive traits legumes.

- o KEARI has carried out research on soybean mutation breeding since 1965 and selected the promising mutant line which was released to farmers in 1977 under the mutation research project coordinated with IAEA. About 3,500 lines of soybean germplasm were collected from 1965, with KAERI having evaluated their agronomic traits. "Bangsa-kong", which was selected from gamma-irradiated soybean, is the most popular soybean cultivar released by KAERI in Korea.
- o In conclusion, strongly support this new RCA project, and hopes to participate in it. In this regard, we are happy to learn that UNDP foreshadowed funding for this project.



## 2-6 Research Reactor Utilization

- o Korea operates two research reactors in KAERI, TRIGA Mark II and III, with the former solely dedicated to student training and the latter to furnish a primary facility for training of personnel in isotope production and basic research. These reactors are, however, expected to be decommissioned around 1994.
- o In order to support the nuclear power development and application programs, a new research reactor, Korean Multi-purpose Research Reactor (KMRR), is currently being constructed with an extensively upgraded design.
- o We are sure that the RCA project on Research Reactor Utilization will provide a good collaboration opportunity to enhance our capabilities on research reactor operations and utilization.
- o In this vein, it is our strong hope that this RCA project will be implemented as planned. Korea wishes to share our experiences on research reactor utilization with other RCA member states through this project.



COUNTRY STATEMENT - MALAYSIA  
ELEVENTH WORKING GROUP MEETING OF  
REGIONAL COOPERATIVE AGREEMENT (RCA)  
Sydney, Australia.  
13 - 16 March 1989.

### Introduction

Since its inception seventeen years ago, RCA has prospered and deserves every praise especially through its activities implemented over the past years which have strengthened cooperation among member states in the region. It has become a subject of envy and prompted the formation of similar regional cooperations.

Since the Beijing meeting, the Nuclear Energy Unit is witnessing development of support facilities for research. The Cobalt-60 facility with its initial 200,000 Curies being designed to handle up to 2 million Curies, was commissioned at the Nuclear Energy Unit (UTN). This facility will no doubt boost our research capabilities particularly in the area of radiation processing and medical products sterilization. A green house complex is under construction and will be ready by the end of the year. Buildings to house radiation processing laboratories will be built next year. Research fund under the Integrated Research on Priority Areas (IRPA), a special allocation to fund research activities to support national industrial development programme, was made available to the Unit. The fund was set up last year.

### Regional Industrial Project

#### (a) Tracer Technology

This year Malaysia will host the Fourth, Regional Training Demonstration on the Use of Tracer Technology in Industry which will be held in Kuala Lumpur from 9 to 27 October 1989. The industry, in particular the oil/gas/petroleum, cement, petrochemical, chemical, paper and steel, has now the confidence on the technology. It is envisaged, through a comprehensive promotional programme, the utilization of tracer technology in industry will be widely used.

b) Non Destructive Testing

Under the National Qualification and Certification Scheme for NDT Personnel are six national training courses to be conducted this year. This scheme, which was formally established in 1986, is under the jurisdiction of the National Industrial Training and Trade Certification Board of the Ministry of Labour. Three national trade standards in the field of NDT have been established namely radiography, ultrasonic, and magnetic particles. The trade standard for penetrant is expected to be adopted by the middle of this year.

A two days National Conference on NDT will be held on 24 July 1989 in conjunction with the inauguration of the Malaysian NDT Society. Malaysia will also host the Regional Training Course on Radiographic Testing Level III from 4 to 22 September 1989 in Kuala Lumpur.

The Fifth National Coordinators Meeting will be held in early 1990.

c) Radiation Technology

The national training course on Radiation Chemistry and Its Applications was held at UTN from 17 - 28 October 1988. A promotional seminar on the use of Cobalt-60 will also be organised in conjunction with the sterilization services to be provided by UTN in its endeavour to maximize the utilization of the Cobalt-60 facility. The facility will enhance our research capabilities. Additional facilities comprising of laboratories and one electron beam machine will be constructed in the 1989/1990 period. The contribution by Japan is appreciated.

Malaysia places high priority on Natural Rubber Vulcanization research. A national project under the joint effort of UTN and the Rubber Research Institute of Malaysia (RRIM) and the National University of Malaysia has been approved under IRPA. Malaysia is planning to built a special purpose irradiation facility to accommodate this subject. An expert under regional project for this purpose is very much appreciated. We are also looking forward to the Symposium in Takasaki later this year.

d) Nucleonic Control System in Industry

An expert mission on low-cost NCS in small paper industry was in Malaysia last January. Two experts from Japan together with an IAEA expert, Dr. S.M. Rao, visited a potential company in order to introduce the new system. The system is tailored to the needs of the small paper industry. The company visited has indicated an interest to install the system. A senior engineer from the company has been accepted to attend the workshop in Tokyo this week.

**Project Formulation Meeting on Research  
Reactor Utilization, 6-9 March, 1989**

The meeting was held in Kuala Lumpur last week and well attended by delegates from all RCA member states except Singapore and Sri Lanka. The meeting discussed broadly the items outlined in the meeting documents with the intention to develop a multi-year plan for the implementation of the project. Country reports which reflect the status of research reactor utilization in member states were also distributed as background materials.

The meeting agreed to name the project as the REGIONAL (RCA) PROJECT ON RESEARCH REACTOR UTILIZATION. It is also noted that the project will also cover aspects on reactor operation and management. A five-year plan (1989-1993) was formulated and consists of possible activities covering topics such as operator training, reactor interfacing, instrumentation, reactor physics application and fuel management and safety. Other topics on beam applications, in-core experiments, training and education were also included. The meeting endorsed series of recommendations and formulated a draft project document.

**Other Activities**

Malaysia hosted the Regional Training Course on Advance Methodologies on the Application of Isotope in Hydrology between 31 October - 25 November 1988, in Kuala Lumpur.

On medical related activity, Malaysia is taking part in the Care and Maintenance of Nuclear Medical Instrumentations Project. For the project on Nuclear Techniques for Toxic Elements in Foodstuffs, longer period is necessary to analyse many more food samples in order to established comprehensive baseline data.

Malaysia is ready to embark into the production of isotopes for medical purposes. Arrangement for certification is in the final stage while clinical trial is in progress. This is made possible with the assistance from IAEA (RCA) and through the bilateral agreement with the Government of Australia (ANSTO).

With regard to Energy based projects, a regional training course on Electric System Expansion will be held at the APDC, Kuala Lumpur between 15 May and 23 June 1989. Last year a Regional Workshop for WASP and MAED Users was held.

A Regional Training Course on Soil-Plant Relationships with special emphasis on Trees will be held in November 1989 for the duration of five weeks.

COUNTRY STATEMENT - PAKISTAN  
FOR  
11TH RCA WORKING GROUP MEETING,  
SYDNEY, AUSTRALIA, MARCH 13-16, 1989

Pakistan is very happy to participate in the 11th Working Group Meeting of RCA Member States being held at Sydney, Australia. RCA is a valuable link between the IAEA Member States of South East Asia and the Pacific. Pakistan has been associated with RCA activities since its inception and is glad to acknowledge that it has greatly benefited by the RCA projects.

Looking at the performance of the RCA, we believe that it will continue to play a very useful role in promoting peaceful uses of nuclear techniques in industry, agriculture, biology and medicine. Pakistan wishes to express its warm appreciation to the Agency and all the RCA Member States for their cooperation and assistance in RCA activities.

I would now like to discuss the activities carried out during 1988 under the RCA.

A. UNDP/RCA REGIONAL PROJECT ON INDUSTRIAL APPLICATIONS  
OF ISOTOPES AND RADIATION TECHNOLOGY

Pakistan is participating in the Phase-II of this Industrial Project and the progress achieved during last year in the sub-projects is given below:

1. Non-Destructive Testing (NDT) Sub-Project

A Level-2 course of Surface Methods was organized by the NDT Laboratory at Islamabad for 3 weeks from March to April, 1988. Out of 12 participants who attended the course, 10 were awarded Level-2 certificates. A Level-1 course on Radiographic Testing was organized by the NDT Laboratory in July, 1988 in which 10 participants took part. A UNDP/IAEA/RCA regional

Training Course on Level-2 Ultrasonic Testing was organized at Lahore in September, 1988 in which 15 participants from various countries of the region participated. Out of these, 6 participants qualified and were awarded the certificates. A Level-2 course on Eddy Current Testing was organized by the NDT Laboratory at Islamabad for 3 weeks in November/December, 1988 in which 12 participants took part and all of them qualified. Three persons from Pakistan participated in various Training Courses and Workshops in the field of NDT organized under the RCA Programme. The National Coordinator of NDT sub-project participated in the 4th Meeting of the National Coordinators at KAERI, Republic of Korea in April, 1988. He also participated in the 5th Meeting of National Coordinators at Bangkok, Thailand from 31 January to 4 February, 1989. The National Coordinator also acted as an IAEA/RCA expert for conducting the Level-2 course in Radiographic Testing in Malaysia from 15 March to 18 April, 1988.

## 2. Radiotracer Applications Sub-Project

The National Coordinator for Tracer Techniques Applications visited various industries in the country alongwith an IAEA expert in connection with exploration of possibilities of Radiotracer Applications in National Industries. To solve the problem of 840 nucleonic gauges installed in the Steel Mill, the National Coordinator alongwith an IAEA expert from Japan visited the Mill and suggested the methods to replace the depleted sources or change the circuitry of the sensors to make them more sensitive. The National Coordinator participated in the regional training course on the Use of Tracer Technology in industry held in China in April, 1988. He also participated in the Coordinators Meeting held at Colombo, Sri Lanka. The work for establishing the Radiotracer Laboratory at PINSTECH has been completed which would help the national industry in the field of radiotracer technology.

## 3. Radiation Processing Technology Sub-Project

An Executive Management Seminar on "Radiation Crosslinking Application in Wire and Cable" was held at Lahore in July, 1988 in which many persons from wire and cable industries participated. The utilization of the commercial plant for sterilization of medical products at Lahore is increasing and will attain full capacity soon. A senior Scientist from Pakistan participated



in the Experts Advisory Meeting on Radiation Sterilization of Medical Products, held at Takasaki, Japan from 20-23 February, 1989. Efforts would be made to request RCA for providing 3-6 months training fellowships in High Dose Measurements.

B. MEDICAL AND BIOLOGICAL APPLICATIONS OF NUCLEAR TECHNIQUES

1. Radioimmunoassay of Thyroid Related Hormones

Pakistan has achieved self-sufficiency as regards production of immunoassay reagents for T4, T3 RIA and S.S. TSH IRMA. Transfer of technology has thus taken place successfully with the help of the Agency. 1-125 labelled Monoclonal Ab TSH, standards preparation for the S.S. TSH assay and for the use of these materials for in-house assay procedures was introduced. Four Medical Centres in the country have introduced regular use of these materials in place of imported kits or reagents. IQC and EQAS methods complementary to one another are in practice and are being strengthened. Work is in progress for raising T4/T3 antibodies. Pakistan has provided samples of 1-125 labelled MAb TSH to Burma and Bangladesh for their evaluation and comments. Radiolabelled tracers for T4, T3 and MAb TSH were also provided to the Philippines for their use in a national training course held at Manila in July, 1988 alongwith the expert services of the National Coordinator. The National Coordinator of the project (RAS-6/011) participated in RCM, held at Bangkok in February, 1988 and presented country report. It will be a useful collaboration to share the scientific outputs and activity of Pakistan External Quality Assessment Scheme (PEQAS) for thyroid related hormones with other member state laboratories in the region.

2. Imaging Procedures for the Diagnosis of Liver Diseases (Phase-II)

A 3-year study on Imaging Procedures for the Diagnosis of Liver

Diseases was completed in 1987 under the RCA programme. Pakistan has submitted a research contract proposal to the Agency for participating in Phase-II of this project. Pakistan is keenly awaiting the Atlas of Liver Images of the RCA countries collected from the region.

### 3. Inhalation Imaging For The Diagnosis of Respiratory Diseases

Due to late receipt of radioaerosol inhalation equipment and vacuum pressure pump, the actual work on the project was started in June, 1988. In two months time, 37 patients-studies were completed and results presented by the Principal Investigator in the Research Coordination Meeting held in Vienna in August, 1988. Following the manual of BARC system, a problem was encountered resulting in the deposition of large particles in the trachea with poor visualization of lung fields. This was overcome by modifying the technique. Pakistan had designed an aerosol system at PINSTECH which was already been used before receiving the BARC system. This locally designed instrument has worked very well and the results of studies were also presented in the Coordination Meeting. For the current year, a target of 50 patients-studies for inhalation imaging in Chronic Obstructive Pulmonary Diseases has been kept and also 10 cases for mucociliary function would be studied using Tc-99m serum albumin.

### 4. Nuclear Techniques For Toxic Elements in Foodstuffs

The first two years of the project were devoted towards the methodological development for precise and accurate elemental determinations using NAA and ASS techniques and their application for studying their distribution levels in integrated diets of the inhabitants of Rawalpindi/Islamabad areas. Presently, studies are being conducted to determine the levels of toxic elements in summer mixed human diet of a highly industrialized city where the level of intake of the inhabitants of the city may be higher. The data will help to ascertain the concentration levels of toxic elements and micronutrients in the diet. Such data may also help to identify sources of pollution and aid in framing legislation in

order to effectively control their release into the environment. A proposal has been submitted to the Agency for the renewal of the research contract for 1989-90. The Principal Investigator of the project attended the 2nd Research Coordination Meeting at Beijing, Peoples Republic of China in April, 1988 in which he presented a comprehensive report. Two research papers from this project have been submitted for publication.

5. Development of Tc-99m Generator Using Low Power Research Reactors

Pakistan has submitted a research contract proposal on "Development of Tc-99m Generators Using Low Power Research Reactors" to the Agency in December, 1988 for consideration and award of research contract.

6. Development of Radiation Protection Infrastructure

One scientist from Pakistan participated in the Project Formulation Meeting of Coordinated Research Programme on "Compilation of Anatomical, Physiological and Metabolic Characteristics for a Reference Asian man", held in Japan in October, 1988. Pakistan has submitted a research contract proposal along these lines to the Agency in December, 1988 for consideration and award of research contract.

7. Radiation Sterilization of Biological Tissue Grafts

During the preceeding year, clinical trials of sterilized membranes were continued and research paper on the observations in few cases was published. Studies were also carried out to investigate the angiogenic and bacteriostatic effects of freeze-dried radiation-sterilized amniotic membranes

as a biological dressing in burns. The preliminary results have shown that there was stimulation of exuberant granulation tissue in the area covered by amnion compared to that in the control area of the burn. The number of capillaries per high power field was appreciably higher than those in the control area while the bacterial counts were considerably lower. The clinical trials have shown that single application of sterilized amnion to the donor area in case of skin grafts was enough as a post-operative dressing and led to complete healing of the donor area in 5 to 8 days. The Principal Investigator of the project attended the Research Coordination Meeting at Taiyuan, Peoples Republic of China in November, 1988. A proposal is being submitted to the Agency for establishing a tissue bank under the IAEA regular programme of technical assistance.

#### 8. Care and Maintenance of Nuclear Medicine Instruments

A research project was initiated in December, 1986 and during this period many steps were taken to improve the impact of this programme on quality control work at all the national Nuclear Medical Centres. These include imparting on-the-job training to the respective contact persons, organizing an IAEA/UNDP/PAEC National Workshop on "Quality Assurance in Nuclear Medicine Instruments" in October, 1987 at Lahore, setting-up a Pilot Laboratory at INMOL Lahore which is equipped with suitable phantoms and radiation sources, arranging the visit of an IAEA expert in 1988 to some Medical Centres in the country to review the progress, solve some immediate problems and render further assistance and advise. The evaluation of quality control results reveal a marked improvement in the operational status of nuclear medicine instruments available at various Institutes in Pakistan. This coordinated research study has also helped in the prompt repair and maintenance of Nuclear Medicine Instruments in the respective participating Centres.

The National Coordinator participated in the Project Formulation Meeting on Maintenance of Nuclear Medicine Instruments in Bombay in June, 1988. A Project proposal has been submitted to the Agency in August, 1988 on "Care

and Maintenance of Nuclear Medicine Equipment in Asia" for consideration and award of research contract.

### C. AGRICULTURAL PROJECT

#### 1. Regional Project on Food Irradiation

Commercial trials on Irradiation Preservation of Onions were conducted on both the winter and summer crops and post-irradiation storage was carried out in a specially designed shed under ambient conditions. Radiation treatment significantly reduced losses occurring due to sprouting, rottage and dehydration. The internal quality of irradiated onions remained good throughout the storage period of 6 months. This project has ended in November, 1988 and the Principal Investigator participated in the final Research Coordination Meeting and Project Committee Meeting of RPFI Phase-II at Bangkok, Thailand from October 31 to November 4, 1988 and presented papers in both the meetings.

### D. RESEARCH REACTOR AND ENERGY BASED PROJECTS

#### 1. Research Reactor Utilization

Pakistan is participating in the RCA Project proposal on Research Reactor Utilization and a senior Scientist will be attending the Project Formulation Meeting to be held at Kuala Lumpur, Malaysia from March 6-9, 1989.

#### 2. Nuclear Power Project Planning and Implementation

One senior Engineer participated in the RCA Regional Training Course

on Nuclear Power Project Planning and Implementation, held at Daejon, Republic of Korea from 7-25 November, 1988.

3. Energy and Nuclear Power Planning

Pakistan participated in the 2nd WASP/MAED Users Workshop held at Kuala Lumpur, Malaysia from 5-9 December, 1988. This activity is viewed by us as very useful for the exchange of information on nuclear power planning among the countries of the region. During the 10th RCA Working Group Meeting, Pakistan had offered to host an IAEA/RCA Training Course in the Use of PC Version of WASP Computer Code in 1989 or 1990. It was later learnt that the Agency had already planned the 1989 course in Malaysia while Republic of Korea too had expressed interest for holding the course in 1990. Accordingly, Pakistan would now like to renew its offer for holding such a training course in the autumn of 1990 or 1991.

E. NEW PROJECT PROPOSALS

1. Food Irradiation Process Control and Acceptance (RPFI-III)

Pakistan is interested to participate in the Asian Regional Cooperative Project on Food Irradiation Process Control and Acceptance (RPFI Phase-III). Previously Nuclear Institute For Food and Agriculture (NIFA) Peshawar completed two IAEA research contracts on potatoes and onions and have developed good package of technology for the preservation of these food materials on large scale. NIFA Peshawar will be interested to carry out studies on radiation preservation of spices, dry fruits, cereal grains and vegetables on commercial scale, market testing of these irradiated foods, transportation trials and market developments to determine acceptance, and economic evaluation of irradiation technology.

2. Integrated Control of Tropical Plant Viruses with Nuclear Techniques

Pakistan is interested to participate in this RCA Project. The crops which are of interest to us are mungbean and black gram.

3. Improvement of Grain Legume - Rhizobium Symbiosis to Fix Atmospheric Nitrogen

Pakistan is interested to participate in this UNDP/IAEA/RCA Project. Work on Biological Nitrogen Fixation (BNF) and specially on legume-Rhizobium symbiosis is going on at the Nuclear Institute For Agriculture and Biology (NIAB) Faisalabad. Previously this group was involved in two IAEA Coordinated Research Programmes related to (a) Quantification of nitrogen fixation in food legumes using N-15 methodologies and (b) Improvement of legume genotypes for high nitrogen fixation potential. The legumes of interest for the BNF group are mungbean, chickpea, lentils and soybean. The BNF laboratories at NIAB Faisalabad are adequately equipped to undertake all the related studies on BNF. It is, therefore, proposed that in addition to participation in this project, NIAB Faisalabad can also host regional training/workshop on BNF and N-15 methodologies under the auspices of UNDP/RCA.

F. OTHER COMMENTS

1. Pakistan is happy to note that its idea of RCA Seminar was accepted and the Seminar was held in Indonesia in June, 1988. The experience gained from this Seminar will greatly benefit the regional activities. Pakistan, therefore, suggests regular organization of such Seminars at appropriate time during the currency of the Industrial Project.

2. Pakistan is happy to note that its idea of establishing "Forum of Nuclear Techniques in Industry" in each RCA Member States has been accepted in the first RCA Seminar held in Indonesia in June, 1988. This Forum will help in promoting a possible interaction or overlapping of different types of industries involved in the Industrial Project. It will also help in promoting the cause of nuclear technique application in industries as a whole.

3. Pakistan welcomes the increasing contribution of the region in the provision of experts and the utilization of project resources for the benefits of RCA Member States. It will be useful if expenditure of funds, provision of experts (man/months), assignments as consultants and other assignments of the project be prepared by the Project Office and provided to RCA Member States. Such an information will support the efforts which the Project is making for an equitable distribution of its benefits to the Member States.

4. Pakistan reiterates its offer of sharing the experience of R&D in the field of Agriculture and Biology at NIAB Faisalabad with scientists of RCA Member States. NIAB Faisalabad can be used as a Regional Centre.

5. Pakistan has extensive experience in the field of Nuclear Medicine and is running 9 Nuclear Medical Centres throughout the country. We reiterate our offer to share this experience with RCA Member States.

6. Our commercial plant for sterilization of medical products (PARAS) at Lahore can be offered as a regional facility for on-the-job training when regional courses in the field of Radiation Technology are held there.

7. Pakistan would welcome any effort in the field of Material Science and Technology connected with the industrial application with particular reference to the regional requirements.



8. Pakistan supports the application of nuclear techniques in Civil Engineering and would utilize the training facilities in this field.

In conclusion, Pakistan wishes to express its satisfaction with the implementation of various RCA activities so far. Pakistan fully supports RCA activities and has great desire to further promote regional cooperation in peaceful uses of nuclear energy. On behalf of Pakistan, I would like to thank the Government of Australia for hosting the 11th RCA Working Group Meeting and we look forward to continued cooperation under RCA.



COUNTRY STATEMENT OF THE PHILIPPINES  
11TH WORKING GROUP MEETING OF RCA MEMBER STATES  
SYDNEY, AUSTRALIA  
13-16 MARCH 1989

Mr. Chairman, distinguished delegates,

The Philippines is pleased to participate in the 11th Working Group Meeting of the RCA member states which is being held in Sydney, Australia. We are happy to note that this meeting is being hosted by Australia, which has, over the years provided special assistance through its extra-budgetary contribution to the RCA and has played an active role in its activities. As a founder member, the Philippines takes keen interest and actively participates in the projects of the RCA. It has always taken the view that the role of nuclear science and technology in national development becomes even more effective when undertaken in the context of regional cooperation.

PROJECT PARTICIPATION

The Philippines as a signatory to the RCA agreement is participating in the following activities:

1. Regional Industrial Project
  - 1.1 Tracer Technology in Industry
  - 1.2 Non-Destructive Testing
  - 1.3 Radiation Technology
  - 1.4 Nucleonic Control Systems
2. Medical and Biological Applications
  - 2.1 Use of Computers in Tc-99m Imaging
  - 2.2 Radioimmunoassay of Thyroid Related Hormones
  - 2.3 Inhalation Imaging for Diagnosis of Respiratory Diseases
  - 2.4 Development of Radiation Protection Infrastructure
  - 2.5 Compilation of Anatomical, Metabolic and Physiological Characteristics of Reference Asian Man
  - 2.6 Radiation Sterilization for Tissue Grafts
  - 2.7 Care and Maintenance of Nuclear Medical Instruments
3. Agricultural Projects
  - 3.1 Nuclear Techniques to Improve Domestic Buffalo Production
  - 3.2 Second Phase of Asian Regional Co-operative Project on Food Irradiation (RPFI Phase II)
4. Research Reactor and Energy Based Projects
  - 4.1 Research Reactor-based Projects
    - a. Research Reactor Utilization

It also expects to participate in the following projects:

1. Medical and Biological Applications:
  - 1.1 Imaging Procedures for Diagnosis of Liver Diseases (Phase II)
  - 1.2 Improvement of Cancer Therapy (Phase II)
2. Agricultural Projects
  - 2.1 Food Irradiation Process Control and Acceptance (RPFI Phase III)

#### STATUS OF PROJECTS

##### 1. Regional UNDP Industrial Project

###### 1.1 Tracer Technology in Industry

A National Executive Management Seminar (NEMS) on Tracer Technology in Industry was held on 21-23 November 1988. Nineteen (19) participants representing different sectors of industry and government institutions attended the seminar which also included a demonstration experiment on catalytic flow measurement at the Bataan Refinery.

###### 1.2 Non-Destructive Testing

The two key activities under this sub-project are the conduct of NDI training courses and the program for qualification and certification of NDI personnel.

From 1986, when the first national training course was conducted using a standard syllabus, to the present (end of 1988) there were ten (10) training courses with a total of 69 participants. Of this number, 32 were trained in 1988. The courses are UF 1 and 2, ET 2, and RT 2 and 3.

For 1989, one Regional Training Course, three (3) national training courses and one (1) workshop for middle managers are scheduled.

Discussions are being held with a state university offering technical courses, to develop a 3-year technician course on NDI which might be initially offered this June 1989. A feature of this course is a built-in on-the job training with industry participation.

With regards to qualification and certification, we wish to note that the Philippines has already adopted a national

standard (PNS 146:1987) which is ISO-based. The first certificate examination was held in September-October 1988. The next certification examinations are scheduled in April and September 1989.

Future activities include the continuation of NDT training courses, specialized NDT seminars/workshop for specific industries, the continuation of the qualification and certification examinations and the establishment of a code of practice for NDT practitioners.

### 1.3 Radiation Technology

Professor J.L. Barnett of Australia undertook a mission to the Philippines on 6-8 June 1988, to evaluate the feasibility of installing a UV-lamp as demonstration curing unit for wood products at the Forest Products Research and Development Institute (FPRDI). He favorably recommended the addition of a UV lamp to the existing heat curing line (after the necessary modifications) of the FPRDI.

A national Executive Management Seminar on Radiation Sterilization was organized by the Philippine Nuclear Research Institute and held on 1-2 December 1988. There were 23 participants representing industries, hospitals, research institutions and government agencies.

### 1.4 Nucleonic Control Systems

A Regional Executive Management Seminar is being programmed for 1990. Negotiations for Philex Mining to co-sponsor the seminar will target mining industries which are installing or seriously considering acquiring nucleonic control systems.

## 2. Medical and Biological Applications

### 2.1 Use of Computers in Technetium-99m Imaging

The Philippines is participating in the first training course which will be held in Australia this April.

### 2.2 Radioimmunoassay of Thyroid Related Hormones

The technology on the radioimmunoassay of thyroid related hormones and on increasing assay reliability using bulk reagents and computer data processing of assay and internal quality control results are being transferred to assayists, medical doctors, and technologists in the various hospitals in some parts of the country through the conduct of national training courses, seminars, and workshops.

### 2.3 Inhalation Imaging for the Diagnosis of Respiratory Diseases

The Philippines participated in the first research coordinated meeting (RCM). Based on the work carried out in the project the Philippine participant made a presentation at the International Symposium on "Dynamic functional studies" held at Vienna in August 1988 under the auspices of IAEA.

### 2.4 Development of Radiation Protection Infrastructure

The major activities of this project were the conduct of (1) Regional Training Course "Development of Infrastructures for Ensuring Radiation Protection " 28 March to 29 April 1988, (2) Regional Workshop: Personal and Environmental Dosimetry Intercomparison Study", Tokai, Japan, 17-21 October 1988 and (3) Project Formulation Meeting for Co-ordinated Research Program on "Compilation of Anatomical, Physiological and Metabolic Characteristics for a Reference Asian Man, Mito City, Japan, 17-21 October 1988. The Philippines participated in all these three activities. The award of a research contract that will support the Reference Asian Man CRP is being awaited.

### 2.6 Radiation Sterilization for Tissue Grafts

The project involves the use of gamma radiation for the sterilization of bone grafts, dura mater, and other tissues. It is a collaborative study between the Philippine General Hospital, the National Orthopedic Hospital and the Philippine Nuclear Research Institute. The purpose of the project is to explore the possibilities of using radiation for the sterilization of bone and tissue grafts and the use of these grafts in reconstructive surgery. The amnions are used as burn dressing. These activities are preparatory for the establishment of a bone and tissue bank in the Philippines.

For the year 1988, the following grafts were prepared and processed at the PNRI: 143 pieces of cortical bones, 3 pieces dura mater, 2 pieces femoral head, 245 pieces amnion grafts.

The usage of these bone allografts have been quite selective in the different orthopedic centers. Infection is still the most dreaded complication in this type of surgery. The grafts are also being used in tumors and spine surgery. Results on the use of bone and tissue grafts have been promising and doctors have reported no occurrence of infection with their use.

### 2.7 Care and Maintenance of Nuclear Medical Instruments

Although the Philippines was unable to participate in the project formulation meeting, it is a participant in the coordinated research program.

### 3. Agricultural Projects

#### 3.1 Nuclear Techniques to Improve Domestic Buffalo Production

The two Philippine research contractors attended the final RCM held at the Tropical Cattle Research Centre, CSIRO Division of Tropical Animal Production, Rockhampton, Australia, from 20-24 February 1989.

In the "Pilot village study to improve Philippine swamp buffalo production using nuclear techniques", the presence of the research team in the project area has been a plus factor in the village study, and the farmers are gradually accepting scientific methods such as rectal palpation, artificial insemination, and blood and fecal sampling for laboratory analyses. This includes the measurement of progesterone by radioimmunoassay for a proper assessment of the reproductive status of their animals. The direct and indirect benefits derived from improved carabao production through a practical management scheme are recognized.

#### 3.2 Second Phase of Asian Regional Co-operative Project on Food Irradiation (RPFI Phase II)

The Philippines participated in the final RCM under Phase II held in Bangkok from 31 October to 4 November 1988.

Research and development efforts were directed on the following commodities: onions, garlic, mangoes, copra, coffee beans, dessicated coconut, spices, and prawns. These commodities were chosen on the basis of two criteria, (1) commodities that are available in commercial quantities, and (2) commodities that command a high market potential.

The toxicological safety of locally irradiated foodstuffs (mango and smoked fish) were established by using inexpensive but highly sensitive short-term mutagenicity assays.

Marketing trials of irradiated onions and garlic were conducted by the FDC and PNRI and the relevant industries to evaluate consumer reaction and product saleability. Post storage behavior of the commodities was also determined. Studies have shown that irradiated products sold faster than their respective controls and consumers have accepted the products as presented.

Towards promoting public acceptance, a 15-minute documentary film on food irradiation featuring onions, garlic, mangoes, and shrimps was prepared. This film footage will be included to make a longer film together with those of other ASEAN countries.

Efforts are also being exerted to amend the Philippine Food and Drugs Act to include irradiation as a process of food preservation. This move will help facilitate the clearance of some food commodities which may soon be cleared for human consumption.

A demonstration facility with a 30,000 Curie Cobalt-60 source is expected to be completed and commissioned by mid 1989. This facility will accelerate research and development activities in food and medical products sterilization.

#### 4. Research Reactor and Energy Based Projects

##### 4.1. Research Reactor-based Projects

##### 4.1.1 Research Reactor Utilization

The Philippines participated in the Project Formulation Meeting held at Kuala Lumpur, Malaysia, 6-9 March 1989 where the initial direction of the project was discussed.

The project is very timely in view of the completion of the upgrading of the Philippine Research Reactor into a TRIGA-type reactor with a 3-megawatt capacity.

##### 4.1.2 Basic Science using Research Reactor

The Philippines continues to participate in this project through attendance in the training courses and the workshops held under this project.

#### 4.2 Energy and Nuclear Power Planning

##### 4.2.1 Energy and Nuclear Power Planning

The Philippines participated in the WASP /MAEL Users Workshop, Kuala Lumpur, 5-9 December 1988. It hopes to participate in the Training Course on Electric Systems Expansion in May 1989.

#### RCA Role

The desirability for cooperation among Asian countries in the utilization of nuclear energy cannot be overemphasized. The role of the RCA in forging networks of cooperation in the various



areas of application of nuclear energy remains as a primary one. Transfer of technologies which are relevant to the economic and industrial capability of a member state should be accelerated. The trend towards increased common activities on a regional basis, however, must be carefully evaluated vis-a-vis technical assistance on an individual country basis.



COUNTRY STATEMENT FROM THAILAND  
11 th RCA WORKING GROUP MEETING  
SYDNEY, AUSTRALIA  
MARCH 13 - 16, 1989

---

Mr. Chairman,

It is my great pleasure to participate in this Eleventh RCA Working Group Meeting here in Sydney, where opportunity for discussions, consultations and decisions are made available again to all delegates from all RCA Member States. RCA has served very useful purposes in promoting and strengthening technical co-operation and human resources development among member states in the various fields of nuclear science and technology. Thailand has also gained benefit in all of its activities.

In the past year, there were several activities in our participation. Progress made in various activities in Thailand is summarized as follows.

Summary of Activities under RCA Project in Thailand in 1988-1989

1. UNDP Regional Industrial Project

1.1 Tracer Technology

The Thai permanent tracer group and laboratory have been set for developing tracer work in industrial application. One scientist in the tracer group will be trained in Australia for 6 months by Australian's contribution through the Project. After training, the field demonstration of tracer application in petroleum industry will be carried out by that well-trained scientist and experts. It has been planned to be carried out by the end of 1989.

### 1.2 Non-Destructive Testing (NDT)

The NDT technology has been introduced to Thailand since 1969, the activities have been growing up rapidly. At present, more than twenty private sectors routinely use NDT by their own personnel. Those personnel were trained under the Project. In 1988, Thailand conducted 7 national training courses: 1 general NDT, 2 UT-1, 1 UT-2, 2 RT-1 and 1 RT-2, there were totally 110 participants attending the Courses. The Fifth Meeting of National Coordinators was held in Bangkok from January 31 to February 3, 1989. One national seminar was organized with 200 participants on January 26-28, 1989. The other 9 national training courses have been planned to be held in 1989.

### 1.3 Radiation Technology

A National Research Group (NRG) on Radiation Vulcanization of Natural Rubber Latex (RVNRL) was established among members of 7 government institutes and 1 rubber industry. Selection of a suitable locally produced natural rubber latex for irradiation has been done. NRG continues the national R&D programme on "Technological Development of Natural Rubber Latex Products by Radiation Vulcanization" and also joins the Coordinated Technical Development Programme (TDP) under RCA Industrial Project Phase II. The Regional Training Course on Industrial Radiation Sterilization-Quality Control and Sterility Assurance had been carried out in Bangkok for 2 weeks during 13-24 February 1989. There were 14 participants from RCA member countries and 3 local observers attending the course. The course was focussed on radiation microbiology and quality control techniques including a theoretical part, practical exercises, classroom exercises, discussion and tutorial session.

#### 1.4 Nucleonic Control System (NCS)

Thailand was selected to be the training and demonstration center on the use of nucleonic control system in coal industry. Two series of regional training course, regional workshop and regional executive management seminar on the use of nucleonic control system in coal industry will be held in Bangkok and Chiang Mai each year from 1989-1992. In the field of civil engineering, Thailand plans to organize one national seminar in August 1989. For the utilization of NCS in the small and medium paper industries, Thailand also supports the project of low cost NCS paper initiated by the UNDP Industrial Project and the Government of Japan.

### 2. Medical and Biological Applications of Nuclear Technique

#### 2.1 Radioimmunoassay of Thyroid Related Hormone

A Regional Training on External Quality Assessment Schemes for Radioimmunoassay of Thyroid Related Hormones was organized at Faculty of Medicine, Chulalongkorn University, Bangkok from 9-13 January, 1989. Sixteen participants from member countries and ten local observers participated the course. During the training period, there were the lectures, report presentation and discussion. Thailand is one of three countries that was selected to be the External Quality Assessment Centers of the Region.

#### 2.2 Nuclear Techniques for Toxic Elements in Foodstuff

Analytical Techniques were developed in connection with neutron activation analysis, ion-exchange chromatography and direct combustion technique and flame atomic absorption spectrophotometry technique. The toxic elements in 99 samples of vegetables and meats such as arsenic, cadmium, mercury, selenium, copper, zinc, bromine,

cobalt, iron, manganese and lead were analysed by those techniques. The experiment on analysis of toxic element in fruits and drinking water is planned to be done in 1989.

### 2.3 Care and Maintenance of Nuclear Medical Instruments

The research project of "Care and Maintenance of Nuclear Medical Instruments" has been initiated and the first research coordination meeting was held in Bombay during 8-10 June, 1988. Thailand also supports the project. The activities in Thailand under the project is still in the stage where data of nuclear medical instruments in various institutes are being collected. Thailand plans to organized the training course on the use and maintenance of nuclear medical instruments with the experts provided by the project.

### 2.4 Development of Tc-99m Generators Using Low Power Research Reactors

The gel-type of Tc-99m generator using Zirconium polymolybdate as the target material was developed. Several batches of Zirconium polymolybdate were prepared and tested for chemical and physical properties. The prepared Zirconium polymolybdate was irradiated in TRIGA MK III Research Reactor for production of Mo-99/Tc-99m and used for performance studies of the generator system design under the Project. The result will be presented to the next RCM in Viet Nam, December 1989.

## 3. Food and Agriculture

### 3.1 Food Irradiation Process Control and Acceptance (RPFI III)

The final Research Coordination Meeting on Regional Project on Food Irradiation Phase II was organized in Bangkok during October

31 - November 4, 1988. Pilot scale storage tests were carried out in cooperation with commercial onions traders in the years 1987-1988 to evaluate the efficacy of irradiation for sprout inhibition of onions under actual commercial storage conditions. Slightly over 800 tons of onions were irradiated 10-50 days after harvest at doses of 74-130 Gy and stored up to 6 months in a commercial cold storage at 1-10° C and 70-90 % relative humidity. Quality evaluation and marketing trials of stored onions were conducted during 5-6 months' storage period. Irradiated onions were put on for sale by onions traders through normal marketing channel in Bangkok. Customers were found to purchase irradiated onions without any hesitation even at a price of a little higher than prevailing price. Pilot scale storage and marketing trials of irradiated dried fish, mung bean and rice in collaboration with local industry/traders aiming towards the transfer of food irradiation technology will be conducted. Technology transfer to private sectors and public is being continued. The Canadian Institute Development Agency contributed multipurpose irradiation facility with 450 KCi Co-60 is expected to be finished in May 1989. This facility will support the food irradiation project in Thailand and the Region.

#### 4. The new projects

As for the new project proposals, Thailand welcomes and supports all new project proposals, particularly project on Research Reactor Utilization.

I would like to take generous note of thanks to the Government of Australia for her extra contributions to the UNDP Regional Industrial Project, particularly the trust she placed on Thailand for trainings and demonstrations on the Use of Nucleonic

Control System in Coal Industry, and the six month training fellowship in Australia for Thai scientist in Tracer Technology Sub-project. For this meeting, I would like to repeat my sincere thank to the Government of Australia for hosting this meeting.

Finally, on behalf of the Royal Thai Government, I wish to cordially invite all delegates to the Twelfth RCA Working Group Meeting in Bangkok next year. We are looking forward to seeing you all.

Thank you.



COUNTRY STATEMENT - VIET NAM  
ELEVENTH RCA WORKING GROUP MEETING, SYDNEY  
13-16 MARCH 1989

On behalf of the National Atomic Energy Institute of Vietnam - the highest national office for activities in the fields of application of atomic energy - I wish to convey today our warmest salutations to the Chairman of the Meeting, the Deputy Director General of the IAEA and all the RCA member state delegations of the Asian and Pacific region here present.

First of all, permit me to express my particular satisfaction to observe in recent time the appearance of new prospects for establishing closer and better relations among the countries in our region. And I am confident that our present conference taking place in Australia would not fail to contribute actively to the spirit of mutual understanding and cooperation among our countries in the use of atomic energy for peace and progress.

Our country fully supports the activities within the framework of RCA and wishes to exchange and share the experience with other countries in the fields of application of atomic energy and nuclear techniques. Our efforts during recent years in the training of personal and specialists, in the establishment of research and experimental facilities, has provided us with the possibilities to take an active part in the multi-faceted activities of RCA during the forthcoming years. Our greatest concern at the present time is for nuclear techniques to be recognized and accepted by the society for widespread application in health, agriculture, industry, survey and exploitation of natural resources, etc.... on the standpoint of economic profitability and social development. This is our definite purpose, and our hope is that the cooperation within the framework of RCA and under the sponsorship of the IAEA, UNDP and other advanced countries, would help us to attain quickly our goal of social recognition of nuclear techniques.

The absolute majority of current RCA project are of practical importance for our economic development requirements and suited for Vietnamese participation. Our special interest is for the "UNDP Regional Industrial Project", and we wish to be able to participate officially in this project at an early time. Investigations carried out on the laboratory scale, and furthermore on a semi-production scale in the fields of sterilization of medical supplies and natural rubber vulcanization have produced good results. Recent technico-economical feasibility studies for the establishment of an irradiation plant in Ho Chi Minh city to answer to the above needs have shown that radiation technology is readily acceptable in Vietnam. We are expecting financial and technical help from the IAEA and UNDP for the construction of this irradiation plant in Ho Chi Minh city as soon as possible. Many enterprises in Ho Chi Minh city also expecting the birth of this plant, and have promised suitable financial and technical support.

Concerning other RCA projects of application of nuclear techniques in industry, civil engineering, etc... we also wish to have active participation.

Our country has succeeded in the reconstruction of the former Dalat nuclear research reactor, increasing its nominal power from 250 kw to 500 kw, and enlarging the experimental and research facilities around the reactor since 1984. We support Malaysia's initiative on the project for utilization of research reactors, and the decisions taken recently by the Project Formulation Meeting on this initiative. Without mentioning the more sophisticated, multi-functional and high power reactors as installed in advanced countries, the research reactors in our region are mostly of low power type, so that the problem of full and efficient exploitation of these reactors is of importance in the national economy and is a matter of great concern. We strongly support the scope and objectives of this Project and express our confidence in its successful implementation.

We will be greatly beneficial in participating in the RCA Project on " Strengthening of Radiation Protection ". Apart from the Co-ordinated Research Programme on " The Reference Asian Man " we would support other cooperative efforts in environmental and personal dosimetry and any Intercomparison programme to be organized in this relation.

With the assistance of the IAEA and based on the encouraging results, obtained from the research activities in the field of food preservation, a pilot-scale irradiator is now under construction in Hanoi and will be commissioned this year. We highly appreciate the financial support for the phase III of the RCA project on food irradiation with the emphasis on the process control of the irradiation facilities and the measures for facilitating the acceptance of irradiated foods.

In the field of medical and biological applications of nuclear techniques we are now actively participating in nine projects and Co-ordinated research programmes. We express our wish to be included in the CRP on " Nuclear techniques for toxic elements in food-stuffs " and in the third analytical quality control exercise will be organized this year. We are interested also in participating in the Project RAS.6.O16 " Use of computers in technetium-99m imaging " and we will be very pleasant to welcome an expert mission to Vietnam as is planned to other participating countries in 1989.

Finally, it is likely that all RCA countries will be greatly beneficial from the cooperation in implementing two new project proposals on " Control of tropical plant viruses " and " Improvement of grain-legume Rhizobium Symbiosis to fix atmospheric nitrogen ".

We are definitely supporting these proposals and our agricultural institutions are ready to participate in their implementation.

## RCA ACTION PLAN 1989-91 (January 1989)

No	Project/Activities	1989	1990	1991
1.	UNDP Regional Industrial Project	X	X	X
2.	Strengthening of Radiation Protection Infrastructure	X	X	X
3.	Nuclear Techniques to Improve Buffalo Production	X		
4.	Food Irradiation Process Control and Acceptance	(X)	(X)	(X)*
5.	Improvement of Grain-Legume Nitrogen Fixation	(X)	(X)	(X)*
6.	Imaging Procedures for Diagnosis of Liver Diseases (phase II)	X	X	X
7.	Improvement of Cancer Therapy (phase II)	X	X	X
8.	Radioaerosol Imaging for Diagnosis Respiratory Diseases	X	X	
9.	Tc-99m Generator for Low Power Reactors	X		
10.	Radiation Sterilization of Biological Tissue Grafts	X	X	
11.	Radioimmunoassay of Thyroid Hormones	X	X	
12.	Computers and Imaging in Nuclear Med.	X	X	X
13.	Nuclear Techniques for Toxic Elements in Foodstuffs	X	X	
14.	Basic Science using Research Reactors	X	X	X
15.	Care and Maintenance of Nuclear Med. Instruments	X	X	X
16.	Energy and Nuclear Power Planning	X	X	
17.	Project supporting TCDC	X	X	

\*submitted to UNDP but not yet approved.



RCA WORKING GROUP MEETING, SYDNEY 13-16 MARCH 1989

RCA AND REGIONAL ASIAN PROGRAMME  
OF  
HUMAN RESOURCES DEVELOPMENT  
1989 - 1991

Attached is the projected three year 1989-1991 regional training programme for Asia. The 1989 programme is approved. The 1990 programme can be assessed with some degree of certainty because a substantial number of the activities are incorporated within the UNDP projects and the approved 1989-1990 TC programme. There is considerable uncertainty surrounding the 1991 projections.



P. Airey

RCA Co-ordinator

RCA AND REGIONAL ASIA PROGRAMME  
OF  
HUMAN RESOURCES DEVELOPMENT

PART 1.	<u>1989 PROGRAMME</u>	Page
1.1	Regional Industrial Project	
1.1.1	Regional Training Courses, Workshops and Seminars	1
1.1.2	National Training Courses	4
1.2	RCA and Regional Asia Regular Programme	5
PART 2.	<u>1990 PROGRAMME</u>	
2.1	Regional Industrial Project	
2.1.1	Seminars	7
2.1.2	Regional Training Courses and Workshops	9
2.1.3	National Training Courses	10
2.2	RCA and Regional Asia Regular Programme	11
PART 3.	<u>1991 PROGRAMME</u>	
3.1	Regional Industrial Project	
3.1.1	Seminars	12
3.1.2	Regional Training Courses and Workshops	13
3.1.3	National Training Courses	14
3.2	RCA and Regional Asia Regular Programme	15

---

 TRAINING COURSES AND SEMINARS WITHIN THE FRAMEWORK OF THE UNDP REGIONAL INDUSTRIAL PROJECT
 

---

1 9 8 9

---

- |    |                  |  |               |          |
|----|------------------|--|---------------|----------|
| 1) | 13 - 24 February | Regional Training Course on<br>Industrial RADIATION<br>STERILIZATION - Quality Control<br>and Sterility Assurance<br><br>BANGKOK, Thailand | RAS-8.061-048 | Markovic |
| 2) | 6 - 24 March     | Regional Training Course on NDT -<br>ULTRASONICS TESTING, Level 3<br><br>MANILA, Philippines   | RAS-8.061-050 | Markovic |
| 3) | 15 - 19 May      | Regional Workshop on<br>NEUTRON RADIOGRAPHY<br><br>OSAKA, Japan  | RAS-8.062-010 | Markovic |
| 4) | 17 - 24 May      | Regional Executive Management<br>Seminar on Nucleonic Control<br>Systems in the STEEL INDUSTRY<br><br>TOKYO, Japan                         | RAS-8.062-011 | Mani     |
| 5) | July             | Regional Executive Management<br>Seminar on RADIATION CURING<br><br>Indonesia  | RAS-8.062-018 | Markovic |
| 6) | August           | National Executive Management<br>Seminars in CIVIL ENGINEERING<br><br>Rep of Korea<br>Thailand<br>Malaysia <u>or</u> Singapore             | RAS-8.062-013 | Mani     |
| 7) | August           | Regional Executive Management<br>Seminar on Nucleonic Control<br>Systems in the COAL INDUSTRY<br><br>Thailand                              | RAS-8.064-004 | Mani     |
| 8) | August           | Regional Workshop on Nucleonic<br>Control Systems in the COAL<br>INDUSTRY<br><br>MAE MOH, Thailand<br>CHIANG MAI, Thailand                 | RAS-8.064-005 | Mani     |

- |     |                   |   |               |          |
|-----|-------------------|---|---------------|----------|
| 9)  | 4 - 22 September  | Regional Training Course on NDT - RADIOGRAPHY, Level 3<br>KUALA LUMPUR, Malaysia  | RAS-8.061-053 | Markovic |
| 10) | 5 - 13 September  | Regional Executive Management Seminar on the Use of Nucleonic Instrument Techniques in CIVIL ENGINEERING<br>TOKYO, Japan      | RAS-8.062-014 | Mani     |
| 11) | 18 - 29 September | Regional Training Course on Formulation Technology for RADIATION CROSSLINKING Applications<br>SHANGHAI, China                 | RAS-8.062-012 | Markovic |
| 12) | September         | Regional Executive Management Seminar on Nucleonic Control Systems in the PAPER INDUSTRY<br>BANGKOK, Thailand                 | RAS-8.061-055 | Mani     |
| 13) | September         | National Executive Management Seminar in Nucleonic Control Systems in the PAPER INDUSTRY<br>China                             | RAS-8.061-056 | Mani     |
| 14) | 2 - 6 October     | Regional Training Course on Non Destructive Examination on NON-METALLIC Materials<br>BANGKOK, Thailand <u>or</u> TOKYO, Japan | RAS-8.062-017 | Markovic |
| 15) | 7 - 26 October    | Regional Training Course on NDT - EDDY CURRENT, Level 2<br>ISLAMABAD, Pakistan  | RAS-8.061-051 | Markovic |
| 16) | 9 - 27 October    | Regional Training Course on TRACER Technology in Industry<br>KUALA LUMPUR, Malaysia   | RAS-8.061-049 | Mani     |
| 17) | 16 - 20 October   | National Executive Management Seminar on NDT - NUCLEAR INSTALLATIONS<br>China   | RAS-8.061.058 | Markovic |
| 18) | October           | Regional Training Course on RADIATION CURING<br>SYDNEY, Australia   | RAS-8.064-003 | Markovic |



19)	6 - 17 November	Regional Workshop on the Fabrication of NDT TEST PIECES BANDUNG, Indonesia	RAS-8.061-059	Markovic
20)	6 - 17 November	Regional Workshop on RADIATION ENGINEERING - Electron Beam Facilities TAKASAKI, Japan	RAS-8.062-015	Markovic
21)	13 - 14 November	Regional Executive Management Seminar on Nucleonic Control Systems in the COAL INDUSTRY MAE MOH, Thailand	RAS-8.064-006	Mani
22)	November	Regional Training Course on Nucleonic Control Systems in the COAL INDUSTRY BANGKOK, Thailand MAE MOH, Thailand CHIANG MAI, Thailand	RAS-8.064-001	Mani
23)	November	Regional Workshop on Nucleonic Control Systems in the COAL INDUSTRY MAE MOH, Thailand CHIANG MAI, Thailand	RAS-8.064-002	Mani
24)	7 - 8 December	National Executive Management Seminar on Radiation Vulcanication of Natural RUBBER Latex Thailand	RAS-8.062-019	Markovic

1.1.2.

NATIONAL TRAINING COURSES WITHIN THE FRAMEWORK OF THE UNDP REGIONAL INDUSTRIAL PROJECT

---

1 9 8 9

---

1)	11 February - 2 March	National Training Course on NDT, ULTRASONIC TESTING, Level 2 ISLAMABAD, Pakistan	RAS-8.061-060	Markovic
2)	15 - 30 May	National Training Course on NDT, ULTRASONIC TESTING, Level 2 BANGKOK, Thailand	RAS-8.061-062	Markovic
3)	19 - 30 June	National Training Course on NDT, ULTRASONIC TESTING, Level 3 HYDERABAD, India	RAS-8.061-046	Markovic
4)	26 June - 14 July	National Training Course on NDT, RADIOGRAPHIC TESTING, Level 3 Philippines	RAS-8.061-064	Markovic
5)	3 - 11 July	National Training Course on NDT, ULTRASONIC TESTING, Level 2 DPR Korea	RAS-8.061-037	Markovic
6)	23 August - 15 September	National Training Course on NDT, ULTRASONIC TESTING, Level 2 Indonesia	RAS-8.061-066	Markovic
7)	10 - 28 September	National Training Course on NDT, ULTRASONIC TESTING, Level 2 Bangladesh	RAS-8.061-063	Markovic
8)	4 - 17 October	National Training Course on NDT, EDDY CURRENT, Level 2 Indonesia	RAS-8.061-068	Markovic
9)	9 - 21 October	National Training Course on NDT, ULTRASONIC TESTING, Level 2 KUALA LUMPUR, Malaysia	RAS-8.061-069	Markovic
10)	30 October - 3 November	National Training Course on RADIATION STERILIZATION Korea, Rep of	RAS-8.061-065	Markovic

1.2.

RCA AND REGIONAL ASIA TRAINING COURSE PROGRAMME

1 9 8 9

---

1) 9 - 13 January	Regional (RCA) Training Course on External QUALITY ASSESSMENT Schemes for the Radioimmunoassay of Thyroid Hormones  BANGKOK, Thailand	RAS-6.011-002	Piyasena
2) 9 - 20 January	Regional (RCA) Training Course on Radioisotope Production in RESEARCH REACTORS  BOMBAY, India	RAS-8.062-005	Vera Ruiz
3) 6 - 24 February	Regional (RCA) Training Course on NEUTRON ACTIVATION ANALYSIS for Mineral Resources Prospecting and Materials Characterization  BOMBAY, India	RAS-8.062-006	Rosenberg
4) 10 April - 10 May	Regional (RCA) Training Course on the Use of Computers in TECHNETIUM 99m Imaging  SYDNEY, Australia	RAS-6.016-001	Van Herk
5) 15 May - 13 June	Regional (RCA) Training Course on Electric System EXPANSION PLANNING  KUALA LUMPUR, Malaysia	RAS-0.013-002	Schenk
6) 9 - 12 October	Regional (RCA) Workshop on Enviromental Sampling and Measurements of RADIOACTIVITY for Monitoring Purposes  KALPAKKAM, India	RAS-8.062-020	Strohal
7) October / November  2 weeks	Regional (RCA) Training Course on RADIATION PROTECTION  TOKYO and TOKAI, Japan	RAS-9.006-002	Strohal

8)	30 October - 9 December	Regional Training Course on the Use of Isotopes and Nuclear Techniques in SOIL/PLANT Relationships with Special Emphasis on Trees  KUALA LUMPUR, Malaysia	RAS-5.018-001	Danso Li Yesha
9)	9 October - 4 November	Regional Training Course on Radiation DOSIMETRY  SHANGHAI, China	RAS-6.015-001	Haider Li Yesha
10)	October 2 weeks	Regional (RCA) Training Course on Optimization of PRODUCTION TECHNIQUES for RIA Reagents and the Organization of Reagent Distribution Schemes  Thailand <u>or</u> China	RAS-6.011-003	Piyasena
11)	October	Regional Training Course on RADIOTHERAPY for Medical Physicists  Korea, Rep of	RAS-6.017-001	
12)	27 November - 22 December	Regional Training Course on RESEARCH REACTOR OPERATOR Training  BANGKOK, Thailand	RAS-4.009-001	Muranaka
13)	November	Regional (PCA) Workshop on Clinical Application of Radiation Sterilized TISSUE ALLIGRAFTS including Quality Control Criteria  BANGKOK, Thailand		Mukherjee
( 14)		Regional (PCA) Training Course on NUCLEAR POWER PROJECT PLANNING and Implementation  DAEJON; Rep of Korea	RAS-0.013-003	Calori
15)	15 December - January 1990	Regional Workshop on Nuclear Instrument Maintenance  BOMBAY, India		Benini

REGIONAL INDUSTRIAL PROJECT

2.1.1. SEMINARS

1990

1. Executive Management Seminar on Tracer Technology  
no date  
US\$20,000  
Participants: 14  
Republic of Korea
2. Executive Mangement Seminar on Tracer Technology  
No date  
US\$ 20,000  
Participants: 14  
Pakistan, Thailand Malaysia
3. Executive Management Seminar on NDT  
no date  
US\$ 20,000  
Participants: 14  
no location
4. Executive Management Seminar on NDT  
no date  
US\$ 20,000  
Participants: 14  
No location
5. Executive Management Seminar on NDT  
no date  
US\$ 20,000  
Participants: 14  
No location
6. Executive Management Seminar on Radiation Curing  
no date  
US\$ 20,000  
Participants: 14  
Thailand
7. Executive Management Seminar: Radiation Sterilization  
no date  
US\$ 20,000  
Participants: 14  
Thailand
8. Executive Management Seminar: Radiation Vulcanization of Natural Rubber Latex  
no date  
US\$ 20,000  
Participants: 14  
Thailand
9. Executive Management Seminar: Radiation Engineering  
no date  
US\$ 20,000  
Participants: 14  
Pakistan

1990 continued

10. Executive Management Seminar: NCS Minerals

no date

US\$ 20,000

Participants: 14

Thailand

11. Executive Management Seminar: Civil Engineering

no date

US\$ 20,000

Participants: 14

Thailand

2.1.2. REGIONAL TRAINING COURSES

1990

1. Training Course on Non-Destructive Testing

no date  
US\$ 30,000  
Participants: 14  
Pakistan

2.-6. Training Course on Non-Destructive Testing

no date  
US\$ 30,000  
Participants: 14  
no location

7. Training Course: Radiation Curing

no date  
US\$ 30,000  
Participants: 14  
Thailand

8. Training Course: Radiation Sterilization

no date  
US\$ 30,000  
Participants: 14  
Thailand

9. Training Course: Radiation Engineering

no date  
US\$ 30,000  
Participants: 14  
Pakistan

10. Training Course on NCS Mineral

no date  
US\$ 30,000  
Participants: 14  
Philippines

11. Training Course on NCS Paper

no date  
US\$ 30,000  
Participants: 14  
Thailand

### 2.1.3. NATIONAL TRAINING COURSES

1990

#### National Training Courses on NDT

1. no date  
US\$ 5,000  
Participants: 1 lecturer  
Philippines
2. no date  
US\$ 5,000  
Participants: 1 lecturer  
Philippines
- 3.-6. no date  
US\$ 5,000  
Participants: 1 lecturer  
Malaysia
- 7.-9. no date  
US\$ 5,000  
Participants: 1 lecturer  
Republic of Korea
- 10.-15. no date  
US\$ 5,000  
Participants: 1 lecturer  
Thailand
- 16.-19. no date  
US\$ 5,000  
Participants: 1 lecturer  
Bangladesh
20. no date  
US\$ 5,000  
Participants: 1 lecturer  
Indonesia
- 21.-23. no date  
US\$ 5,000  
Participants: 1 lecturer  
no location
24. National Training Course in Radiation Technology  
no date  
US\$ 5,000  
Participants: 3 lecturers  
Malaysia
25. National Training Course in Nucleonic Control Systems  
no date  
US\$ 5,000  
Participants: 2 lecturers  
Pakistan



2.2. RCA AND REGIONAL ASIA REGULAR PROGRAMME

1990

- |     |   |           |
|-----|---|-----------|
| 1.  | Regional (RCA) Training Course in field of RIA of Thyroid Hormones  | Piyasena  |
| 2.  | Regional (RCA) Training Course/Workshop in the field of Research Reactor Utilization                            | Muranaka  |
| 3.  | Regional (RCA) Training Course/Workshop in the field of Radiation Sterilization of Tissue Grafts                | Mukherjee |
| 4.  | Regional (RCA) Training Course in field of Nuclear Power Project Planning and Implementation (or related topic) | Calori    |
| 5.  | Regional (RCA) Training Course in field of Radiation Protection Infrastructure Development (I)                  | Strohal   |
| 6.  | Regional (RCA) Workshop on Intercomparison of Personnel Dosimeters, Tokai Mura, Japan, 22-26 October            | Strohal   |
| 7.  | Regional (RCA) Training Course on Food Irradiation Process Control and Acceptance                               | Loaharanu |
| 8.  | Regional (RCA) Workshop on Nuclear Instrument Maintenance   | Benini    |
| 9.  | Regional Training Course: Photon, Electron Neutron Dosimetry  | Haider    |
| 10. | Regional RCA) Training Course in field of Animal Health on Reproduction   | Dargie    |
| 11. | Regional Training Course: Mutation Breeding   | Micke     |
| 12. | Regional Training Course: Preparation and Control of Radiopharmaceuticals                                       | Vera Ruiz |

REGIONAL INDUSTRIAL PROJECT

3.1.1. SEMINARS

1991

1. Executive Management Seminar on NDT

no date

US\$ 21,000

Participants: 14

no location

2. Executive Mangement Seminar on NDT

no date

US\$ 21,000

Participants: 14

no location

3. Executive Management Seminar on NDT

no date

US\$ 21,000

Participants: 14

no location

4. Executive Management Seminar on Radiation Sterilization

no date

US\$ 21,000

Participants: 14

Pakistan

3.1.2. REGIONAL TRAINING COURSES

1991

1. Training Course in Tracer Technology

no date  
US\$ 32,000  
Participants: 14  
no location

2.-3. Training Course on NDT

no date  
US\$ 32,000  
Participants: 14  
no location

4. Training Course: Radiation Crosslinking

no date  
US\$ 32,000  
Participants: 14  
Pakistan

5.-6. Training Course in Nucleonic Control Systems

no date  
US\$ 32,000  
Participants: 14  
no location

3.1.3. NATIONAL TRAINING COURSES

1991

1. National Training Course in Tracer Technology  
no date  
US\$ 5,000  
Participants: 2 lecturers  
Pakistan

National Training Courses on NDT

- 2.-4. no date  
US\$ 5,000  
Participants: 1 lecturer  
Philippines
- 5.-9. no date  
US\$ 5,000  
Participants: 1 lecturer  
Malaysia
10. no date  
US\$ 5,000  
Participants: 1 lecturer  
Republic of Korea
11. no date  
US\$ 5,000  
Participants: 1 lecturer  
Pakistan
- 12.-14. no date  
US\$ 5,000  
Participants: 1 lecturer  
Bangladesh
15. National Training Course: Radiation Crosslinking  
no date  
US\$ 5,000  
Participants: 3 lecturers  
Pakistan
16. National Training Course in Nucleonic Control Systems  
no date  
US\$ 5,000  
Participants: 2 lecturers  
Malaysia

3.2. RCA AND REGIONAL ASIA REGULAR PROGRAMME

1991

- |     |   |           |
|-----|---|-----------|
| 1.  | Regional (RCA) Training Course in RIA   | Piyasena  |
| 2.  | Regional (RCA) Training Course in field of Research Reactor Utilization                               | Muranaka  |
| 3.  | Regional (RCA) Training Course in the use of Computers in Tc-99m Imaging                              |           |
| 4.  | Regional (RCA) WASP Users Workshop  |           |
| 5.  | Regional (RCA) Training Course in Electric Systems Expansion Planning                                 |           |
| 6.  | Regional (RCA) Training Course in field related to Nuclear Project Planning and Implementation        | Calori    |
| 7.  | Regional (RCA) Training Course in the field of the Development of Radiation Protection Infrastructure | Strohal   |
| 8.  | Regional (RCA) Workshop on Personnel and Environmental Dosimetry                                      | Strohal   |
| 9.  | Regional (RCA) Training Course/Workshop on Food Irradiation Process Control and Acceptance            | Loaharanu |
| 10. | Regional (RCA) Workshop on Nuclear Instrument Maintenance   | Benini    |
| 11. | Regional Training Course on Entymology  | Lindquist |
| 12. | Regional Training Course on Determination of Radionuclides in Food and Environmental Samples          |           |



## RCA BUDGET AND BUDGET ESTIMATES (May 1989)

No	Project/Activities	Source	1988 US\$K	1989* US\$K
1.	UNDP Regional Industrial Project	UNDP <sup>(1)</sup>	748	788
		TC <sup>(2)</sup>	86.4	120.3
		JPN <sup>(3)</sup>	293	366
		AUL <sup>(4)</sup>	35.2	606
		CPR		25
2.	Strengthening of Radiation Protection	JPN	117	160
		AUL	101	tba**
		IND	-	25
		TC	50	9
3.	Nuclear Techniques to improve buffalo production	Reg <sup>(5)</sup>	44.5	70
4.	Regional Project on food irradiation (phase II) (phase III) Workshop	AUL	49	-
		UNDP		142***
		CPR <sup>(6)</sup>		25
5.	Improvement of Grain Legume	UNDP		220***
6.	Imaging procedures for diagnosis of liver diseases (phase II)	JPN	19	
		JPN		tba**
7.	Improvement of cancer therapy (phase II)	JPN	5	44
		JPN		tba**
8.	Radioaerosol imaging for diagnosis respiratory diseases	IND <sup>(7)</sup>	10	18+
		Reg	56	28.5
9.	Tc-99m generator for low power reactors	Reg	9	
10.	Radiation sterilization of biological tissue grafts	Reg	57	57
		TC	81.6	96.3
11.	Radioimmunoassay of thyroid hormones	TC	224.3	186.5
12.	Computers and Imaging in Nuclear Med.	AUL	5	112
13.	Nuclear techniques for toxic elements in foodstuffs	Reg	52	34
14.	BARC Workshops	IND	40	25
		TC	10	-
15.	Care and Maintenance of nuclear med. instruments	Reg	30	40
		TC	55	71.7
16.	Workshops/TC funded by Republic of Korea	ROK <sup>(8)</sup>	40	50
		TC	20	-
17.	Energy and nuclear power planning	TC	48	200++
18.	Project supporting TCDC	TC	-	48.6

\*1989 figures are estimates only. In particular they do not imply commitments by donor countries.

\*\*to be announced.

\*\*\* submitted to UNDP but not yet approved.

+for 12 aerosol inhalation units

++100 000 from the Asian Development Bank

### Notes

- 1) United Nations Development Programme.
- 2) Technical Assistance and Co-operation Fund.
- 3) Extra-Budgetary contribution from Japan. The 1989 figures have been made available as a basis for planning and are subject to final approval.
- 4) Extra-budgetary contribution from Australia. The 1989 figures have been made available as a basis for planning and are subject to final approval.
- 5) IAEA Regular Budget.
- 7) Extra-budgetary contribution from the Government of India.
- 8) Extra-budgetary contribution from the Republic of Korea.
- 6) Extra-budgetary contribution from the Government of China.



RCA Budgets 1988-1991 <sup>(1)</sup>

	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
UNDP				
. Industrial Project <sup>(2)</sup>	748 100	788 200	581 000	371 000
. Food Irradiation <sup>(3)</sup>		142 000	164 000	171 000
. Nitrogen Fixation Project <sup>(3)</sup>		220 000	220 000	220 000
Extra-budgetary				
. Australia	135 200	718 000	800 000 <sup>*</sup>	800 000
. Japan	478 900	551 900	551 900 <sup>+</sup>	551 900
. India <sup>(4) (5)</sup>	50 000	68 000	50 000	50 000
. Rep. of Korea <sup>(4)</sup>	50 000	50 000	50 000	50 000
. China <sup>(4)</sup>		50 000	50 000	50 000
Asian Development Bank <sup>(6)</sup>		100 000		
TACF	457 700	615 500	541 550	
Regular Budget	248 500	249 000		
In-kind	227 000			

<sup>\*</sup> Based on a statement of the Australian delegation to the Eleventh Working Group Meeting Sydney. Not all funds have been committed.

<sup>+</sup> The Government of Japan has made no public statement on its target contributions to RCA post 1989. In these circumstances the IAEA has assumed maintenance of the 1989 funding level. It should be noted however that the Japanese extra-budgetary contribution to RCA has increased steadily over the years.

(1) Not included within this budget are the following:

- a) 'in country' costs met by developing Member States in hosting project activities,
- b) one Regional Asian project and four regional courses which are not part of the RCA programme.

(2) Approved UNDP budget subject to minor on-going revisions.

(3) Subject to final approval. It will clearly not be possible to implement a full programme in 1989.

(4) These funds are used for air fares and allowances of participants from developing RCA countries to training activities. They are calculated on the basis of best available information.

(5) The funds are in support of the Regional (RCA) Training Course: Electric Systems Expansion Planning, Kuala Lumpur, 15 May to 24 June 1989.