REGIONAL CO-OPERATIVE AGREEMENT

INTERNATIONAL ATOMIC ENERGY AGENCY

REPORT

TENTH WORKING GROUP MEETING
OF
REPRESENTATIVES OF RCA MEMBER STATES

Chinese Academy of Agricultural Sciences
Beijing, China 11-14 April 1988

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The Tenth RCA Working Group Meeting was held at the Chinese Academy of Agricultural Sciences, Beijing, 11 to 14 April, 1988

1. INAUGURAL SESSION.

1.1 Welcome.

Delegates were officially welcomed by Mr. Peng Zhaosheng, Director, Bureau of Foreign Affairs, Ministry of Nuclear Industry. In his welcoming remarks, Mr. Peng noted that after 15 years, RCA was entering a new phase with an expanded programme in the fields of science, engineering, industry, agriculture and medicine. He commented that co-operation should be linked to the development of national economies so that it will result in economic and social benefits and considered RCA an excellent example of regional co-operation. Mr. Peng further noted that China is supporting RCA by hosting many activities and desires to further strengthen co-operation with other countries. The full text of Mr. Peng's address is attached as Annex 1.

1.2 Opening remarks by IAEA.

The Deputy Director General and Head, Department of Technical Co-operation, Mr. Noramly bin Muslim, welcomed delegates on behalf of the IAEA. He thanked the Chinese Government for hosting the meeting and the Ministry of Nuclear Industry and the Chinese Academy of Agricultural Sciences for the excellent arrangements. Mr. Noramly noted that the level of overseas representation was the highest at any Working Group Meeting, particularly in recent years. He commented that the RCA programme was continuing to expand despite the constraints of zero growth which were affecting much of the Agency's programme. This was, to a considerable extent due to the generosity of donor countries. Mr. Noramly informed delegates that he had recently accompanied the Director General to Thailand and Malaysia and had inspected a number of RCA projects. The Director General was favourably impressed. The full text of Mr. Noramly's speech is attached as Annex 2.

1.3 Keynote address.

The keynote address was presented by His Excellency, Dr. Huang Qitao, Vice Minister of Nuclear Industry on behalf of H.E. Dr. Jiang Xinxiong, Minister of Nuclear Industry. Minister Jiang, whose Ministry is responsible for all IAEA matters, including nuclear co-operation in the Region, welcomed all delegates to Beijing.

He reminded delegates that China acceded to RCA soon after she joined the Agency in 1984 and noted the impact this co-operation was making to the region. Although a developing country, China was anxious to contribute her share to regional co-operation. China is therefore prepared to provide $50,000 to support RCA activities.

China is a country of great ancestral achievement which is now entering a new era of science and technology. By the year 2000, China expects to have 5000 to 7000 MW of nuclear power, with another 5000 MW under construction. She looks forward to co-operation with developed and developing countries on the basis of mutual respect and equality. A spirit of sincerity is essential in international co-operation. The full text of Minister Jiang's address is attached as Annex 3.

1.4 Vote of thanks.

Mr. Li Yesha, Deputy Director, Division of International Organizations, Ministry of Nuclear Industry and Chairman of the Organization Committee offered a vote of thanks to the IAEA for choosing Beijing as the venue for the 10th RCA Working Group Meeting. He thanked the Deputy Director General, the RCA Co-ordinator and the UNDP Project Co-ordinator for their efforts in preparing the meeting. (Annex 4).

1.5 Election of Chairman.

As interim chairman, the DDG welcomed China into the family of donor countries. This was received with acclamation. Mr. Noramly congratulated China on the arrangements for the Meeting, and called for nominations for the meeting chairman.

Mr. Zhou Ping, Governor from China on the IAEA Board of Governors, and Vice Chairman, Nuclear Power Steering Committee, State Council, was nominated by Australia, seconded by Thailand and received unanimously.

In his opening remarks, the chairman reminded delegates that this was the first Working Group Meeting under the RCA Agreement 1987. It would be necessary to establish Project Committees to discuss those projects for which separate Project Committees could not be constituted. The chairman noted good progress in all projects, especially the Regional Industrial Project.

A list of delegates is attached as Annex 5. The Agenda (Annex 6) was accepted without amendment.

1.6 Draft RCA Annual Report.

The RCA Co-ordinator pointed out that the draft RCA Annual Report was prepared pursuant to Article VII (4) of the RCA Agreement. He invited delegates to comment on the accuracy and completeness of the report. The Annual Report, as amended, will be bound, circulated to Member States and tabled at the RCA General Conference Meeting.

Delegates made a number of specific points on the details of the report which were noted. In particular, reference to India's participation in the Industrial Project (Annex 3) was inadvertently omitted. Two views were expressed concerning the reporting interval. The first view was that the Annual Report should cover the calendar year preceding the Working Group Meeting. The advantage would be that the reporting period would coincide with the budget year allowing Member States to correlate activities and expenditures directly. The second view was that the reporting interval could broadly cover the period between Working Group Meetings. The advantage would be that the report would be somewhat more current when formally presented. The RCA Co-ordinator was requested to seek a consensus and report to the final session of the meeting.

1.7 RCA Seminar.

The RCA Co-ordinator outlined the aims and the status of arrangements for the RCA Seminar which will be held in Jakarta, 13 to 15 June, 1988.

The delegate from Indonesia pointed out that his country had been a party to RCA since its inception and felt that the time was now appropriate to review its aims and achievements. Indonesia was pleased to host the seminar. He also congratulated China on its decision to become a donor country to RCA.

The delegate from the Republic of Korea welcomed the Seminar and indicated that his government would actively participate. He felt that the RCA Questionnaire was well conceived.

The delegate from Japan noted that the previous review of RCA was at the Working Group Meeting, Kuala Lumpur five years ago. The current Seminar was therefore timely. He recommended that special reference should be made to the linkage between IAEA and other International Organizations such as FAO and WHO and enquired whether special lectures would be arranged.

The delegate from India supported the Seminar and stated that its agenda should have a good balance bewtween technical and policy issues. Bangladesh enquired whether there would be a role for countries outside RCA and other international organizations in the evaluation of RCA.

The delegate from Australia supported reviews of RCA on roughly a five year cycle. He detected some changes in direction within RCA and felt that the role of nuclear power in RCA should be subject to thorough

discussion because of the large commitment of resources that projects in this area would entail. The Seminar is likely to be of use to Australia, not least because of the opportunity it will provide to the Australian Aid Bureau AIDAB to assess and evaluate RCA activities.

Support for the Seminar was also expressed by China, Malaysia and Pakistan.

In his concluding remarks, the Deputy Director General informed the meeting that the Agency had been notified of ministerial representation at the Seminar.

1.8 Status of RCA projects.

The RCA Co-ordinator pointed out that under article II.2 of the RCA Agreement 1987, the Meeting of Representatives of RCA governments was required to approve the incorporation of projects into RCA. The IAEA Legal Division (ADLG) advised that, since RCA 1987 was a new agreement, the full programme should be submitted to the Working Group Meeting for approval. The document (Annex 7) together with the attached list of projects was tabled and accepted without dissent.

In response to a question from Malaysia it was explained that project documents would be prepared only for large projects with a TC component. In response to the Republic of Korea it was noted that the Meeting of Representatives (Article II, RCA 1987) refers both to the Working Group and to the General Conference RCA Meetings. In response to Japan it was noted that a Co-ordinated Research Programme must be approved by both the IAEA's Committee for Contractual Scientific Services and the RCA Meeting of Representatives for incorporation into RCA. In response to Indonesia it was explained that the official commencement date of the RCA project: Strengthening of Radiation Protection was 27 February, 1988 as stated in the 11 December, 1987 letter from the RCA Co-ordinator to national counterparts. However, ADLG agreed to this form of approval on a "once off" basis only.

2. FIRST TECHNICAL SESSION.

UNDP/RCA Regional Industrial Project.

The Regional Industrial Project was introduced by the Project Co-ordinator who spoke to the document (Annex 8). The attention of the delegates was directed first to general project issues, and then to each sub-project in turn.

2.1 General Issues.

Pakistan welcomed the increasing trend towards the appointment of local experts. In addition it recommended the establishment of a "Forum of Nuclear Techniques in Industry" in each RCA Member State to facilitate the transfer of nuclear technologies to appropriate industries. The Forums should be supported by project funds and meet annually. The delegate from India enquired whether the relative efficiencies of the various modalities of technology transfer (Executive Management Seminars, Training Courses, Workshops etc.) had been evaluated. In response to a question from Bangladesh the UNDP Co-ordinator indicated that all regional activities had been implemented. In financial terms, an 84 per cent implementation rate was achieved in 1987, the highest of any UNDP project implemented by the Agency.

2.2 Tracer Technology in Industry.

The Project Co-ordinator expressed his gratitude, on behalf of the Agency, to China for the Regional Training Course which had just been completed in Beijing.

The Republic of Korea is pleased with progress resulting from the tracer sub-project. There will be a major technical demonstration of the technology in the Ssang Yong Cement Plant, May 1988 and a National

EMS during 1989. Tracer technology is being increasingly accepted by industry in Malaysia. A demonstration in the Chemical Industry is being arranged. Malaysia would be prepared to accept observers from the Region.

Bangladesh would like to see announcements of projects supporting national activities in the UNDP Newsletter to facilitate participation by other countries in the Region. Project supported national activities announced in the Newsletter to facilitate participation of observers from the region. The delegate from India recommended that a technical report of each major tracer demonstration be prepared and distributed. This was supported by Indonesia. The Project Co-ordinator agreed with the suggestion and noted that a video recording was made of the Thai gas flow demonstration.

The delegate from Thailand expressed appreciation to Australia for funding the gas flow demonstration. Australia enquired whether regional observers would experience difficulties of access to private companies. The Project Co-ordinator felt that problems might arise in some cases. In addition, funding was always a consideration.

Tracer technology is recognized as being important in China. For instance, there are very extensive oil well applications. In 1986 there were 2500 oil well tests, in 1988, 4000 tests are expected.

2.3 Non-destructive Testing.

The delegate of Japan pointed out that his Government is participating actively in the NDT sub-project. He pointed out that since most RCA Member States have research reactors, neutron radiography should also receive project support. The Project Co-ordinator suggested that this matter should be referred to the forthcoming Natonal Co-ordinators Meeting, Daeduk. The Indian delegate said that BARC could help organize a course in neutron radiography and enquired whether there was any move towards standardizing NDT equipment in the Region. The Project

Co-ordinator said that an equipment survey had been made and would be discussed at the National Co-ordinator's Meeting.

Pakistan is actively participating by providing experts and supporting training courses (2 national and one regional in 1988). Although not very involved in Phase I, the Republic of Korea is actively participating in Phase II. In 1988 it is hosting the National Co-ordinators Meeting and a Regional Training Course.

China has been actively involved in the sub-project since 1985. China supports the inclusion of neutron radiography and moves towards the unification of certification of NDT personnel. In his concluding comments, the Project Co-ordinator noted the increasing number of countries hosting activities and supplying experts.

2.4 Radiation Technology.

The Project Co-ordinator noted that an industrial scale trial for the manufacture of condoms under the Radiation Vulcanization of Natural Rubber Latex sub-project had been successfully completed at Bandung, April 1988. He recommended that the Working Group extend the project, which was due to terminate 30 December 1988 to the completion date of Phase II of the Regional Industrial Project, 30 December 1991.

The Japanese delegate congratulated Indonesia on its contribution to the RVNRL sub-project. He was pleased to see the extent of technology transfer to industry and noted the interest in Thailand, Sri Lanka and Malaysia. The Indian delegate enquired whether the radiation process was more economic than conventional vulcanization. The Indonesian delegate replied that the process was probably more economic because there were no additives and considerable energy savings. However, the plant must be fully utilized.

Concerning the surface coating sub-project, Japan is to financially support the remodelling and upgrading of the Jakarta EB facility, and sees the application of the technology to a range of products in addition to wood. The delegate from China felt that because of the high capital cost of accelerators, UV technology may be suitable for developing countries. China is to hold national training courses on UV technology. China is also investigating the application of Co-60 techniques to cross-linking. The delegate from Japan suggested that EB and UV technologies for curing are complementary rather than competitive.

The Republic of Korea is involved in radiation sterilization and cross-linking. At present two EB accelerators are in commercial operation producing cross-linked wire and cable insulation.

A private company in Malaysia is producing parquet flooring using UV curing. A 200KCi Co-60 facility will be constructed soon and will be used for medical sterilization. Malaysia is organizing a National Radiation Chemistry Course 10-22 October 1988 to which regional participation is invited (subject to funding).

The Pakistan delegate announced that the Lahore facility for the sterilization of medical products commenced operation July 1987. His government is pleased to offer it as a regional RCA facility for on-the-job training when the regional courses are held.

The Project Co-ordinator announced that the project will be supporting an International Symposium on the Radiation Vulcanization of Natural Rubber Latex to be organized by JAERI, October/November 1989.

2.5 Nucleonic Control Systems.

Discussion on the Nucleonic Control System sub-project was seriously curtailed through lack of time. Reference was made to the civil engineering and coal activities founded respectively by Japan and Australia.

The delegate from China commented that the Beijing Nuclear Instrument Factory and the Institute of Atomic Energy could be used for the manufacture of appropriate NCS equipment.

2.6 Conclusion.

In conclusion all delegates paid tribute to the work of the Project Co-ordinator, Dr. Ahmad Tajuddin-Ali in developing the project over the past 3.5 years.

3. SECOND TECHNICAL SESSION.

3.1 Radioimmunoassay of Thyroid Related Hormones (Annex 9).

The delegate from Pakistan pointed out that his country can now produce standard internal QC material and tracers for T4, T3 supersensitive IRMA TSH. Pakistan will consider positively any proposals for making their materials available to the Region and for extending the Pakistan External Quality Assessment Scheme (PEQAS) to Member States.

India will also support the supply of RIA bulk reagents to the region. The Republic of Korea is participating actively in the project and welcomed the two-year extension to the project. The delegate from Bangladesh would like to see some more training courses.

The delegate from China stated that antisera for T3, T4 and TSH are freely available. The T3 and T4 antisera have been submitted to NETRIA (UK) through the IAEA for testing, and a good report was received. The reagents culd be made available to the region through the China Isotope Corporation. China is also producing a magnetisable particle linked 1st and 2nd antibody.

3.2 Asian Regional Project for Food Irradiation (Phase II and Proposed Phase III extension) (Annex 10 and 11).

The delegate from Japan pointed out that his country was the first to commercialize food irradiation for the inhibition of sprouting of potatoes. Further commercialization has not been possible because of an absence of consensus. Japan funded Phase I, but was only able to provide in kind support to Phase II. Phase III could be supported by the provision of training opportunities and experts.

Australia funded RPFI Phase II but will not be in a position to provide financial support for Phase III. There is currently considerable public debate on the technology in Australia. The Australia Consumers Association has recommended that approval to irradiated food be granted on an item-by-item basis at specific dose ranges and only in approved facilities. A further enquiry is currently being conducted by the House of Representatives Standing Committee on Environment, Recreation and the Arts.

India has approved the irradiation of spices and some sea products and supports the proposed Phase III, in particular, the exchange of information on protocols. The Republic of Korea has approved six items - potatoes, onions, chestnuts, garlic and fresh and dried mushrooms. It strongly supports Phase III because it recognizes the importance of public acceptance and the development of basic guidelines for trade in irradiated foods.

China also strongly supports Phase III and would look to the new extension to contribute to international harmonization leading to international trade in irradiated food. China sees public acceptance as a major problem. The results of some marketing trials of irradiated foods show the need for more communication on food irradiation.

Pakistan fully supports Phase III. Potatoes, onions, garlic and spices have been approved by the Advisory Committee on the Use of Radiation in Agriculture, Medicine and Industry. Final clearance from the Ministries of Health and Agriculture is awaited. Indonesia cleared spices, tubers and grains in December 1987 and fully supports Phase III. Bangladesh supports Phase III more so because construction of an irradiation facility is scheduled to start in 1988 and to be completed in 1989. Malaysia also accepts Phase III.

4. ELECTION OF PROJECT COMMITTEES

Project Committees are required under Article VI.1 of the RCA Agreement 1987. The functions are listed in Article VI.3. The 16th RCA General Conference Meeting agreed that the RCA Working Group should be empowered to convene Project Committees for those projects for which separate committees could not be funded (Annex 12). Three committees were convened:

Field: Medical and Biological Application of Nuclear Techniques

Chairman: Professor Wang Shizhen
President
Capital Nuclear Medical Centre
Chinese Academy of Medical Sciences

Nominated: Japan
Seconded: Bangladesh

Field: Food and Agriculture

Chairman: Professor Xu Guanren
Director General Emeritus
Institute for Applications of Atomic Energy

Chinese Academy of Agricultural Sciences.

Nominated: Malaysia
Seconded: Pakistan

Field: Basic Nuclear Sciences.

Chairman: Professor Sun Zuxun
Director General
Institute of Atomic Energy
Ministry of Nuclear Industry

Nominated: India
Seconded: Indonesia

5. THIRD TECHNICAL SESSION.

Medical and Biological Applications of Nuclear Techniques Chairman: Professor Wang Shizhen

5.1 Development of Radiation Protection Infrastructure (Annex 13).

India fully supports the project, and offers to fund a Workshop "Radioactivity Analysis and Environmental Monitoring Using Chemical Analysis and Spectroscopy", out of its special contribution to RCA. The workshop will be of 4 days duration and open to 12 participants from RCA Member States.

The Government of Japan fully supports the project and is co-operating with the Sydney Training Courses (see below) by sending a Japanese expert and is fully funding the following activities.

1) Workshop "Personal and Environmental Dosimetry Intercomparison Study" 17 to 21 October 1988.

2) Co-ordinated Research Programme, "Setting of Reference Man - Compilation of Physiological and Societal Parameters", to be initiated in 1988.

Australia regards this project as perhaps the most important of the RCA family. Australia is funding a Training Course: "Development of Infrastructures for Ensuring Radiation Protection".

There are 21 participants from 12 RCA Member States with lecturers from Japan and Australia. This is perhaps the first activity in which all 14 RCA Member States have participated.

The Republic of Korea supports the projects and is considering supporting a second regional workshop on Photon, Electron and Neutron Dosimetry in Radiotherapy at an appropriate time. Pakistan supports the projects through its Directorate of Nuclear Safety and Radiation Protection. Malaysia also expressed strong support.

5.2 Liver Imaging (Annex 14) and Cancer Therapy (Annex 15) Projects.

The Republic of Korea supports a second phase of both projects. India enquired whether some ultrasonic equipment could be provided to enable a hospital with a gamma camera to participate. The delegate from Japan pointed out that the ultra sound and isotope techniques are complementary and not competitive. The aim of Phase II of the liver project is to establish the limits of ultra sound for liver diagnosis so that only those patients requiring the more expensive procedures need be referred to the Nuclear Medical Departments. Indonesia supports a second Phase of both the liver and cancer project. Support was also expressed by the delegates from China and Bangladesh who pointed out that the clinical history and biochemical data are needed to

ensure the best diagnostic interpretation of images. Support was also expressed by Pakistan for Phase II of the Liver Imaging project.

Concerning the Cancer Therapy Project the delegate from Japan noted that there were only two or three participating countries despite the importance of cancer in the Region. He indicated that the present programme may not be properly meeting the needs of the Region, and therefore recommends the convening of a consultants meeting. Japan has in principle agreed to support a Phase II of both the Cancer and Liver projects. Japan would also like to see another traning course on brachytherapy of uterus cancer using the Ralstron unit along the lines of that hosted by the Malaysian Government in 1986. Japan expressed its willingness to support RCA Member States with their national programmes in these subject fields by sending and receiving experts for on the job training and information exchange. Malaysia is prepared to consider hosting the training course if approached by the IAEA.

Pakistan was not able to fully participate in the cancer project because the full set of equipment was not supplied by the Agency.

5.3 Co-ordinated Research Programmes.

a) Inhalation imaging for the diagnosis of respiratory diseases (Annex 16);
b) Development of technetium-99m generators (Annex 17);
c) Nuclear techniques for toxic elements in foodstuff (Annex 18); and
d) Immunodiagnosis of tuberculosis (Annex 19).

India is supporting the inhalation imaging project through the provision of aerosol units, and hopes the participating countries will be in a position to present some clinical data to the forthcoming IAEA/WHO International Symposium on the Application of Dynamic Functional Studies in Nuclear Medicine in Developing Countries, Vienna, August 1988. In India a Tc-99m gel generator system is being developed. Column generators with up to 500 mCi Tc-99m have been prepared, and these have

been found to have a satisfactory elution yield and provide a Tc-99m product of satisfactory quality. India is also supporting the toxic elements project by standardizing methods for toxic elements in wheat, flour, fish and wheat assay. India would like other Member States to join the tuberculosis project. BARC and other participating laboratories in this project have developed methods using monoclonal and polyclonal antibodies based radioassays for detection of tubercular antigen in patients of T.B. meningitis. BARC and other centres in India and abroad are engaged in the evaluation.

The delegate from Japan would like to see a list of publications from the Co-ordinated Research Programme in the Annual Report. He also sought information on the initiation of the tuberculosis project. The delegate from Bangladesh enquired how much technology development would be required in the tuberculosis project. Pakistan is concerned that it may not be possible to collect sufficient lung function data for the above-mentioned International Symposium since the aerosol equipment has not yet been received from the Agency. Good results for the toxic element project are being obtained.

5.4 Other Projects

a) Radiation Sterilization of Tissue Grafts (Annex 20);
b) Care and Maintenance of Nuclear Medical Equipment (New) (Annex 21); and
c) Use of Computers in Technetium-99m Imaging (New) (Annex 22).

Malaysia would like to see an integrated instrument maintenance project. Japan stressed the importance of the involvement of manufacturers in the instrument maintenance project.

The delegate from India announced that his Government has agreed to host a Project Formulation Meeting supporting the Instrument Maintenance Project at BARC during the week commencing 6 June 1988. In addition, India will host a 2 to 3 week workshop on Nuclear Medicine

Instrument Maintenance at BARC, funded from its special contribution to RCA. India is also in a position to provide irradiation equipment for the tissue graft project.

The delegate from China stated that instrument maintenance was a problem due to the lack of fully staffed maintenance and repair centers in many countries. China supports the technetium-99m computer project as it will facilitate co-operation between medical doctors and physicians involved with soft-ware development.

Australia has allocated about $200,000 for Technetium Imaging project commencing the next Australian financial year. Support for new projects (Care and Maintenance of Nuclear Medical Instruments and The Use of Computers in Tc-99m Imaging) was expressed by the Republic of Korea and Pakistan. Pakistan also reported excellent results with the tissue graft project with its application of 1000 amnimon grafts.

5.5 Concluding Comments by Committee Chairman.

In his concluding comments, Professor Wang pointed out that since 1986 a Nuclear Medicine Week has been designated in the United States, during which nuclear medicine was promoted by lectures, through the media and by opening nuclear medicine facilities.

In Europe, nuclear medicine societies have unified to form the European Association of Nuclear Medicine. Professor Wang believes this encouraging trend should be following in Asia and thanked the IAEA for its efforts.

6. FOURTH TECHNICAL SESSION.

Food and Agriculture Project Committee
Chairman: Professor Xu Guanren.

6.1 Co-ordinated Research Programmes.

a) Nuclear Techniques to Improve Domestic Buffalo Production (Annex 23);

b) Improvement of Grain Legumes (Annex 24); and

c) Semi-dwarf Mutants for Rice Improvement (Annex 25).

Pakistan reported excellent progress in the mutation breeding projects with 13 new varieties introduced. For instance, a cotton variety evolved by mutation breeding now covers 70 per cent of the cultivated area under cotton. India has distributed about 1000 tonnes certified seeds since 1985.

Indonesia has experienced excellent results in all these projects. For example, 50 kg of seeds from a new variety of soya bean are being used for further propagation.

The delegate from China pointed out that his country has been engaged in mutation breeding for over 20 years and has obtained excellent results. Biotechniques has recently been combined with mutation breeding.

6.2 New Projects.

a) Integrated Control of Tropical Plant Viruses with Nuclear Techniques (Annex 26);

b) Isotope Hydrology and Sedimentology (Annex 27), with a new proposal (Annex 28);

c) Nuclear Techniques to Study Marine Pollution (Annex 29); and

d) Soil Erosion (Annex 30).

Support for the tropical plant viruses project was expressed by the Republic of Korea, Pakistan, Malaysia, People's Republic of China, India and Bangladesh.

Support for the Isotope Hydrology project was expressed by the Republic of Korea, Pakistan, Bangladesh, Malaysia, India and Australia. Pakistan, India and Australia offered to provide in kind support for the Project.

The delegate from Australia suggested that the soil erosion proposal should be included within the Isotope Hydrology project.

Noting that the Marine Pollution project was proposed by the Monaco Lab, the Republic of Korea expressed strong interest in the project. The Monaco Lab, was requested to submit a detailed proposal for an RCA Co-operative project.

The delegate from Japan suggested that if the marine pollution project was dealing with effluents from nuclear power plants, it could be included within the project "Strengthening of Radiation Protection". India supported the project and suggested the following areas of research which may be included in the project:

1) the behaviour radionuclides in marine environmment;

ii) the remobilisation of pollutants from sediment; and

iii) input pollutants into the regional seas of the region.

7. FEATURE LECTURE

Nuclear Techniques in Agriculture.

Professor, Xu Guanren
Director General Emeritus
Institute for Applications of Atomic Energy
Chinese Academy of Agricutural Sciences.

In his lecture, Professor Xu presented a comprehensive review of the status of the applications of nuclear techniques to agriculture in China. Almost 20 application areas were discussed. A network for co-operation between institutes has been established. Activities of those institute have been classified as:

* Research
* Teaching and training
* Science and technology
* Extension and technical

The success of the Chinese programme already results from the integration of a wide range of nuclear techniques practised at a large number of institutes throughout the country.

The full text is attached as Annex 31. Professor Xu also introduced a new proposal on the application of nuclear techniques to aquaculture (Annex 32).

8. FIFTH TECHNICAL SESSION.

Nuclear Science and Energy Based Projects.

Chairman: Professor Sun Zuxun

8.1 Basic Science Using Research Reactors.

The delegate from India reported on the two BARC Workshops funded under his Government's special contribution to RCA (1987).

a) Operation and Maintenance of Research Reactors, and
b) Use of IBM Compatible Personal Computers for Laboratory Automation and Data Aquisition.

Both of these workshops were found to be very useful to the participants as gathered during the feedback sessions. He also announced the two activities scheduled under the 1988 programme viz.

a) Training Course on Radioisotope Production in Research Reactors, BARC, 9-20 January 1989.

b) Workshop on Neutron Activation Analysis for Minerals Resources Prospecting and Materials Characterization, BARC 6-24 February 1989.

The delegate from China expressed interest in the project, particularly:

* The application of cold neutron sources;
* the synergistic effects of X-rays and neutrons in radiation chemistry; and
* the use of power reactors for cobalt-60 production.

Japan imports its cobalt-60 from Canada because it cannot compete with the costs of CANDU produced isotope. The question is kept under review. The delegate from India stated that cobalt-60 is being produced in some of the nuclear power plants in his country. The Republic of Korea has 4 nuclear power plants including one CANDU and is interested in this question.

8.2. Energy and Nuclear Power Planning

The WASP Users Workshop, Jakarta, December 1987 was very successful. Subject to approval, a follow-up Workshop and a training Course are scheduled for Malaysia, 1988. Pakistan has offered to host a training course in 1989/1990 and the Republic of Korea would possibly consider funding the third WASP Users Workshop in 1989 if officially requested by the Agency with a detailed proposal.

8.3 Regional (RCA) Training Course:
Nuclear Power Planning and Implementation (Annex 33)

The course is being funded by the Republic of Korea from its special contribution to RCA. The delegate from Indonesia mentioned that although his country had no nuclear power plants, Indonesia was interested in participating. Bangladesh and Pakistan expressed support.

8.4 Concluding Statement by Committee Chairman.

Professor Sun expressed appreciation for the useful workshops at BARC. They provide an important vehicle for the exchange of information between RCA Member States.

He noted that the Agency's WASP and MAED codes are extremely useful and noted that the first WASP Users Workshop had been highly successful.

The Training Course of Nuclear Power Planning and Implementation will be very useful for a number of RCA Countries.

9. COUNTRY STATEMENTS.

The country statements are attached:

*	Australia	-	Annex 34
*	Bangladesh	-	Annex 35
*	China	-	Annex 36
*	India	-	Annex 37
*	Indonesia	-	Annex 38
*	Japan	-	Annex 39
*	Republic of Korea	-	Annex 40
*	Malaysia	-	Annex 41
*	Pakistan	-	Annex 42
*	Thailand	-	Annex 43

10. SUMMARY COMMENTS BY DEPUTY DIRECTOR GENERAL - TECHNICAL CO-OPERATION

Mr. Noramly reminded Member States that in requesting TC projects they must have the facilities and infrastructure to ensure safety. The accidents at Chernobyl, Morocco and Brazil have focused the attention of the IAEA on Radiation Protection as an area of highest priority. As the Director General commented, an accident anywhere is an accident everywhere.

The Deputy Director General noted that 12 out of the 14 RCA Member States have research reactors. Some facilities are under utilized and there is a lack of communication between them. Perhaps RCA could consider a project or the Quality Assurance of Radioisotopes, so that radioisotopes produced in one country would be readily accepted by another.

The Deputy Director General finally referred to the UNDP Regional Industrial Project. He mentioned that the Director General visited Thailand and Malaysia recently and was impressed by the impact of the Project on the private sector.

He paid tribute to the UNDP Co-ordinator, Dr. Ahmad Tajuddin-Ali who will soon be returning to Malaysia and expressed confidence that Member States would work closely with his successor designate who he announced to be Mr. Manoon Aramrattana of Thailand.

11. SEVENTH TECHNICAL SESSION

11.1 RCA Action Plan and Cost Projections.

The RCA Work Plan (Annex 44, 45) and the budgets (Annex 46) were accepted after the following clarifications:

11.1.1 Regional Asian Projects.

The Regional Asian Projects "RIA of Thyroid Related Hormones" (Burma and Democratic People's Republic of Korea) and "Radiation Sterilization of Tissue Grafts" (Burma and United Kingdom) involve the non-RCA countries shown in parenthesis. The Working Group Meeting endorsed their participation under Article VIII of RCA 1987. The delegate from Australia commented that eligible countries participating in such projects, should be encouraged to join RCA. The republic of Korea agreed that non-RCA countries should be encouraged to join RCA. Legal Divison's view of the role of non-RCA countries in RCA projects should be obtained. India sought a clear statement on the mechanism by which projects enter RCA through the TC route.

11.1.2 New Projects.

The Working Group Meeting recorded the following decisions.

11.1.2.1 Projects to be included within the RCA programme.

a) Use of Computers in Technetium 99m Imaging;
b) Regional Project on Food Irradiation (Phase III);
c) Integrated Control of Tropical Plant Viruses;
d) Archeological Investigations Using Nuclear Based Techniques; and
e) Isotope Hydrology and Sedimentology.

Project (a) is funded by Australia. Project (b) has been submitted to UNDP. Funding is being sought for the other projects.

The Working Group Meeting recommended that the new project proposal "Quantitative Assessment of Soil Erosion and Sedimentation" should be incorporated within the Isotope Hydrology and Sedimentology Project. Further, aspects of the proposed project "Use of Nuclear Techniques to Study Marine Pollution" concerned with discharges from nuclear facilities could be incorporated within the project "Strengthening of Radiation Protection".

11.1.2.2 Projects to be considered at the 1988 RCA General Conference Meeting.

a) CRP on the Applications of Nuclear Techniques for Agriculture in Asia and the Pacific;

b) Immunodiagnosis of Tuberculosis; and

d) Use of Nuclear Techniques to Study Marine Pollution.

11.2 Presentation of Meeting Report.

The draft Meeting Report was received with a number of ammendments. The RCA Co-ordinator was requested to circulate the ammended version to Member States for final approval.

11.3 Other business.

11.3.1 Annual Report.

The question of the reporting interval for the Annual Report was held over from the Inaugural Session (Session 1.6) to allow further consultations. The Working Group Meeting accepted that the reporting interval should be the calendar year. This would ensure that the reporting of activities would coincide with the Agency's financial year. The draft Annual Report would be circulated at the Working Group Meeting, and the final report table at the RCA General Conference Meeting for acceptance.

11.3.2 RCA Meeting of Representatives.

The Republic of Korea recommended that the Secretariat clarify the roles and relationships between:

a) the RCA Working Group Meeting;
b) the RCA General Conference Meetings; and
c) the Project Committee Meetings.

Japan supported the need for a statement on the different functions of (a) and (b). India suggested that the Secretariat might consider constituting the Project Committees as Standing Committees to allow specialist membership and facilitate continuity of their work. The RCA Co-ordinator saw merit in the suggestion but pointed out that there were insufficient funds for additional meetings.

11.3.3 National Co-ordinators Meetings.

At the suggestion of the Republic of Korea, the Secretariat undertook to circulate the reports of National Co-ordinators Meetings to Member States.

11.3.4 Project: Archeological Investigations Using Nuclear Techniques (Annex 44).

China supported the project, and noted that it had proposed another project in this field on the Preservation of Antique Objects by Gamma Radiation. The delegate from Japan pointed out that the technology required for the chinese proposal has been used in France from about 5 to 10 years and is likely to be useful for the Region. Another Japanese delegate pointed out that the proposals "Archeological Investigations using Nuclear Techniques" had been discussed at the 9th Working Group Meeting, Colombo, Sri Lanka and a Workshop (not a CRP as stated in the Background Documents) was recommended.

10. CLOSING SESSION.

The summary comments by the DDG-TC were presented following the Sixth Technical Session.

The RCA Co-ordinator, on behalf of the Agency, restricted comments to thanking those involved with hosting and organizing the Tenth RCA Working Group Meeting, especially the Government of the People's Republic of China, and the Meeting Chairman, Mr. Zhou Ping, Governor from China on the IAEA Board of Governors.

The Meeting was formally closed by the Chairman who congratulated delegates on their spirit of co-operation which made possible the recording of the many achievements over the past four days.

WELCOMING REMARKS

by Peng Zhaosheng
Director of Bureau of Foreign Affairs
Ministry of Nuclear Industry

Distinguished delegates,
Respected Deputy Director General Prof. Noramly,
Ladies and Gentlemen,

On the occassion of the opening session of the Tenth RCA Working Group Meeting, I wish to extend our warm welcome, on behalf of the sponsoring organization, the Ministry of Nuclear Industry to all the delegates from the RCA member states, to Deputy Director General Prof. Noramly and other officials from IAEA. While Spring has just arrived in our capital, we welcome you coming to review the past and look into the future of RCA.

This is the Tenth of its kind of the RCA Working Group Meeting. RCA activities have had a history of fifteen years. Having gone through three five-year period, RCA has now entered a new phase, whereas projects of technical cooperation have increased, the scope of cooperation has been enlarged, covering nearly all the applications of nuclear technology in such areas of national economy as science and engineering, industry, agriculture and medicine etc,. The forms of coopeartion have also been varified. The cooperative activities are closely linked with the development of the national economy in Member States, thus having achieved greater economic and social benefits. The IAEA has greatly commended the accomplishments of RCA and regards it as an example of regional coopeations. It is therefore our

duty to further extend the RCA and make our contributions to the social and economic development of its Member States.

For the last ten years, China has adopted the opening policy to develop her national economy. We hope to carry out wide-ranging and in-depth exchange and cooperation with all the countries in the world in the field of nuclear science and technology, in the spirit of helping supply each other's needs, mutual development and improvement.

We have arranged a mini exhibit of nuclear technology at this meeting. The purpose is to introduce to the delegates some products of our nuclear industry with the intention to promote exchanges with other countries in this field. We are displaying some products of both radio and stable isotopes, labelled compounds and radiaton processed products. What are on show here is only some selected samples of the applications of nuclear technology. It is our anticipation that through this mini exhibition, the cooperation and exchange in expertise, personnel, products, technology and equipment would be promoted rather than exchange in mere aspects of science and technology.

This meeting will touch upon many issues, involving some projects which have been ongoing for years, like food irradiation and radiation breeding. They also involve quite a number of new project proposals, like radiation protection, nuclear science and energy. We will carefully study every project proposal with great interest, and will actively participate in some of them.

China belongs to Asian & the Pacific Region and is a new member of the RCA. We ought to make greater contributions to

the RCA. For the past three years, China has not only actively participated in many cooperation projects, but also sponsored quite a number of RCA activities, such as executive management seminars, workshops, meetings & training courses on radiation-crosslinking,industrial application of isotope tracing, and non-destructive testing. We shall further strengthen our cooperations with other countries and continue our efforts to sponsor more activities of various kinds.

Finally may I once again extend our warm welcome to all delegates and give our sincere gratefulness to your attendance at this meeting. I wish the meeting success and wish all of you a pleasant stay in Beijing.

Thank you.

ANNEX 2

Tenth RCA Working Group Meeting
Beijing 11-14 April 1988 (As delivered on 11 April 1988)
Welcoming Remarks
Noramly bin Muslim
Deputy Director General
and Head of the Department of Technical
Co-operation

Distinguished Delegates, Ladies and Gentlemen

On behalf of the Director General of the International Atomic Energy Agency, it gives me great pleasure to welcome you to the Tenth RCA Working Group Meeting. I would, at the outset wish to thank the Government of the People's Republic of China for agreeing to host this meeting. In particular, the Agency is grateful to the Director, Division of International Organization, Ministry of Nuclear Technology, the Director, Chinese Academy of Agricultural Sciences and their staff for the excellent arrangements.

To be welcomed in another's country is always a privilege. For scientists and engineers, China is of special interest because of the great historical achievements of the Chinese people. We need only to think of the Great Wall, the only man made structure to be seen from the moon which was built some 2000 years ago. By the seventh century a great system of canals linking the Yangtse Valley with the Yellow River Valley in the north to Hangchow in the South had been constructed. Millions of labourers were involved in these and other irrigation schemes, in engineering feats which were comparable to the building of the pyramids in Egypt. The Chinese people invented paper by the second century and printing with moveable type by the 11th century. They were able to cast iron some 1500 years before Europeans and had mechanical clocks some 600 years before they were available in the West.

It is against this background of great historic achievement, that we hold this Tenth Working Group Meeting.

I would, on behalf of the Director General, also like to thank RCA Member States for their support. In addition to China, there are 21 delegates representing 9 RCA Member States and the IAEA. This is one of the highest levels of representation at a Working Group meeting, certainly in recent years. The quality of the arrangements and the level of participation auger well for a very good meeting.

There are many highlights to report since we last convened as a Working Group. The new RCA Agreement entered into force on schedule on 12 June 1987. All Member States have now acceded to the new agreement. Phase II of Regional Industrial Project officially commenced on First May 1987. During that year the IAEA Department of Nuclear Energy and

Safety became directly involved with the RCA programme for the first time.

I am pleased to report that the RCA programme is continuing to expand despite the constraints of zero-growth which are affecting most of the Agency's activities. The resources are expected to be 20 per cent greater in 1988 than in 1987. This expansion is due in part to the commencement of three new Technical Co-operation Regional Asian Projects and in part to the generosity of donor countries. In addition to UNDP, extra budgetary contributions are now being received from Japan, Australia, India and the Republic of Korea. In 1987, extra budgetary funding amounted to 71.5 per cent of the total. During the year, I was pleased to welcome the Republic of Korea into the family of RCA donors.

Resources are only one of the components underpinning the programme. Most important are the people involved. I would particularly wish to pay tribute to the work of Dr. V. K. Iya, former Director, Isotope Group, BARC who has recently retired. Over the years he played a major role in RCA. His advice and support have always been valued. We extend a sincere welcome to his successor Dr. R.G. Desphande. I understand also that Dr. Athorn Patumasootra, Secretary General, Office of Atomic Energy for Peace, Thailand and Dr. Terry Walker, Executive Director, Australian Nuclear Science and Technology Organization will also soon be retiring from their posts. The counsel and support of both will be sadly missed. Those, and others of our friends and colleagues have attended many of RCA Working Group and General Conference meetings. They have helped to forge the RCA tradition. This tradition is based, to a considerable extent, on the consistency of advice which the Agency has received from Member States over the past 15 years. It provides a firm basis for RCA's mission which is to contribute to the evolution of regional self sufficiency in nuclear science and technology and thereby to national development. The tradition extends further to include the willingness of RCA Member States to assist one another. Many examples abound including the readiness of China to make available facilities at the Shanghai Applied Radiation Institute and at this very fine Academy of Agricultural Sciences for the benefit of RCA.

I will not attempt here to highlight individual RCA projects. It suffices to say that most are making excellent progress. This is particularly so of the largest project, the UNDP/RCA Regional Industrial Project. It is therefore with regret that I inform you that Dr. Ahmad Tajuddin Ali, who has done so much to develop the project over the past three and a half years will soon be leaving the post to return to Malaysia. We wish him well.

I recently had the pleasure of accompanying the Director General on an official visit to Malaysia and Thailand during which he inspected a number of RCA projects. The Director General very much appreciated the opportunity of observing and viewing at close hand the ability of both countries to absorb and implement a number of technical co-operation projects. In particular he examined the activities of independent enterprises which are a result of and bear witness to successfully completed technical co-operation.

From my perspective, may I draw your attention to some developing trends in the management of RCA Projects.

Firstly, the Agency is endeavouring to maximize the use of both human and financial resources from the Region to support RCA projects. For instance, in 1987, about 87 per cent of experts recruited for RCA missions were from the region; of these, about 43 per cent were from developing countries. The Agency sees this trend in terms of a wider move towards Technical Co-operation between Developing Countries.

Secondly, those projects which are large enough to support a dedicated expert appear to have been particularly effective. They include the Radio-immunoassay project and two sub-projects of the Regional Industrial Project. This may be a significant factor when considering the optimum size of an RCA project.

Thirdly, every effort is being made to integrate related technical co-operation and co-ordinated research projects. Examples include the current projects "Strengthening of Radiation Protection", and the "Radiation Sterilization of Medical Products" and the new project "Maintenance of Nuclear Medical Instruments." All new larger or more complex RCA projects will be supported by formal documents. The first example was the Radiation Protection document.

And what of the future? In a dynamic programme, it is necessary to address questions which affect both, the shorter and the longer term. For instance, could we be doing more to encourage technical co-operation between developing countries? In this time of zero-growth, should RCA be interacting more with other UN Agencies and regional groupings? Is the Agency striking the correct balance between the regional and the country Technical Co-operation programme in Asia? The Agency is looking to this meeting and to the forthcoming RCA Seminar to address some of these questions.

I alluded in the beginning to the great historical scientific and engineering achievements of the Chinese people. The world of course is a very different place now. The wealth of scientific information is almost unbounded. The problem is to ensure that it is channelled in such a way to bring maximum benefit to the people we serve. Ultimately this is the mission of RCA and its programmes of technology transfer.

I wish you well in your important deliberation.

Thank you.

ANNEX 3

KEYNOTE ADDRESS

by Jiang Xinxiong
Minister of Nuclear Industry

Distinguished Delegates,
Respected Deputy Director-General Prof. Noramly,
Ladies and Gentlemen,

The Tenth RCA Working Group Meeting is inaugurated today here in Beijing. First of all, please allow me, on behalf of the Host Government and the Ministry of Nuclear Industry--the counterpart of IAEA in China, to extend our congratulation for the convention of this meeting and warmly welcome all the delegates of RCA Member States and the officials from IAEA to be present at this meeting. I am confident that by close cooperation of the participants, the meeting will surely fulfil its anticipated tasks and that results gained at this meeting will contribute to cooperation of nuclear science and technology in this region. May I wish the meeting every success.

Being abundant in natural resources, the Asian and Pacific region constituting about two fifth of the world's population, is an important area of the world. It comprises not only the developed but also developing countries. All countries are devoting themselves ambitiously to their own economic and social development, and have achieved noted success. Meanwhile, they are imbued with aspiraton for international cooperation and are willing to make concerted efforts to this end. This, I recognize, has laid a good foundation and created favourable

conditions for us to have a fruitful cooperation in nuclear field within this region. Hence, the cooperative areas have been continuously expanded and the cooperation further consolidated. With the completion of 15 years of cooperation in three phases and such cooperation being entered into the fourth five-year period, the cooperation in this period, just as things might go perfect, will surely achieve even greater success, thus making even more contributions to the economic and social development of various countries in this region.

As you are aware, China acceded to the RCA Agreement soon after she joined the International Atomic Energy Agency in 1984. This shows the fact that China attaches great importance to the cooperation in this region. For the last few years, China has participated successively in various projects under the programme and sopnsored a number of activities in our country, which implies our desire to countribute our own share to the regional cooperation. Although such a contribution is not significant in size, it certainly shows our sincerety in this regard. Frankly speaking, China is not so developed in economy and hence lacks financial resources. However, in order to strengthen the cooperation in this region, we shall continue to organize the agencies and institutions concerned to participate in or sponsor the projects under the RCA programme and is prepared to make financial contributions of 50,000 US $ next year for those activities which will be effected in China. In this connection, we welcome the interesting countries of the region to send their participants.

China is an ancient country, but a new Member State of the International Atomic Energy Agency. She is also new partner in the regional cooperation. Whereas recalling the historical development of science and technology in China, our ancestors once

made the outstanding contributions to the human civilization. After the founding of the People's Republic, the Chinese society has entered a new era in which we soon after began to undertake the development of nuclear science and technology. Over the past 30 years, China, by the diligence and wisdom of her people, has self-reliantly established a fairly complete system of nuclear industry ranging from geology, hydrometullurgy, enrichment, reactor engineering, reprocessing to nuclear science and technology. As China started to develop nuclear power plants rather late, it has now only 2 nuclear power plants under construction with scheduled operation from 1990 to 1993. The other two units with 600 MWe each have also been listed on the state plan. It is expected that some 5000-7000 MWe would be put into operation and about 5000 MWe would be under construction towards the year of 2000, and installed capacity would increase to 30,000 MWe by year of 2015. Besides, a great deal of research work have been performed on high temperature gas cooled reactor, fast breeder and fusion reactor. At the same time, nuclear physics, nuclear chemistry, radiation protection, environmental science as well as nuclear techniques have found extensive applications in industry, agriculture and medicine, etc., whereabouts research and development work is also conducted with significant results being achieved in this regard. We wish to intensify the cooperation and exchange with both developed and developing countries in these fields. We hold the view as always that international cooperation should be pursued on the bases of mutual respect, equality and mutual benefit, helping supply each other's needs and mutual improvement. Therefore, the spirit of sincerety is essential to the international cooperation. It is in such a spirit that China has participated in the multilaterial cooperation and developed the bilaterial relations.

The RCA is a defined example for regional cooperation, which has played the role in promoting the development of natinal economy in various countries within the Asian and Pacific Region, and to which the Member States have contributed their shares and from which they have been benefited a great deal. Today we gather together here in Beijing at the RCA Annual Working Group Meeting, reviewing its past operations, formulating the near-term cooperative projects and looking into the perspective of the development. I am confident that so long as we cooperate closely, the current meeting will be surely crowned with success and the cooperation in the Asian and Pacific Region will score a further development, thereby facilitating its contribution to intensifying the national economic and social development.

May I wish the sincere cooperatin ever grow and flourish and wish all of you to have a pleasent stay in Beijing.

Thank you.

ANNEX 4

VOTE OF THANKS

by Li Yesha
Chief of Division of Intern. Organizations
Ministry of Nuclear Industry

Distinguished Delegates,
Respected Deputy Director-General, Dr. Noramly bin Muslim,
Respected Vice-Minister, Mr. Huang Qitao,
Ladies and Gentlemen,

Allow me, on behalf of the Organizing Committee of the 10th RCA Working Group Meeting, to offer my vote of thanks to all of you. My thanks are particularly going to Prof. Noramly bin Muslim, Deputy Director-General of IAEA, Dr. Peter Airey, RCA Coordinator, Dr. Tajuddin-Ali, the UNDP Coordinator and all other technical staff of the Agency who are closely involved in the organization of this meeting and to the distinguished delegates of the RCA member states who came here to attend the current RCA Working Group Meeting. I wish the meeting be crowned with success, and all of you have an enjoyable and meaningful stay in Beijing in the next few days.

We would like to express our gratitude to the International Atomic Energy Agency and the Governments of the RCA member states for choosing Beijing as the venue for this meeting and for being honoured to us to host it.

We are most grateful to Mr. Huang Qitao, Vice-Minister of Nuclear Industry for his presence at this inaugural session, on behalf of the Minister of Nuclear Industry, at the time of his

busy schedule. Meanwhile we are also very much obliged that the relevant officials of Ministry of Foreign Affairs, Ministry of Foreign Economic Relations and Trade and the State Commission of Science and Technology have also been with us, looking into the status and prospects of RCA coopertion in the field of nuclear science and technology.

We specially owe the China Academy of Agricultural Sciences for providing us with this meeting place and some other logistic supports.

Well, as the meeting proceeds, any comments and suggestions that you may have concerning the operation and arrangements of the meeting will be greatly appreciated and responded to insofar as possible.

Lastly, I would like to thank the News Media and my colleagues in logistic arrangement for their work to this meeting.

Thank you!

DELEGATESS OF 10th RCA WORKING GROUP MEETING

11 - 14 April, 1988, Beijing, China

LIST OF PARTICIPANTS

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Department of Foreign Affairs and Trade

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CHINA

Mr. Zhou Ping
Governor from China on IAEA Board of Governors
Vice Chairman,
Nuclear Power Steering Committee
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Mr. Peng Zhaosheng
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RCA /UNDP Industrial Project
Center for the Application of Isotopes and Radiation

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State Science & Technology Commission

ANNEX 6

TENTH RCA WORKING GROUP MEETING

Beijing, 11-14 April 1988
Draft Agenda

Monday, 11 April 1988

09:00 INAUGURAL SESSION

A) Welcoming remarks (Mr.Peng Zhaosheng, Director , Bureau of Foreign Affairs, Ministry of Nuclear Industry)
b) Remarks by Deputy Director General, Technical Co-operation, IAEA (Mr. Noramly bin Muslim)
c) Keynote address (Mr. Jiang Xinxiong, Minister of Nuclear Industry)
d) Vote of thanks (Mr. Li Yesha, Deputy Director, Division of International Organizations, MNI)

10:30 Coffee break

e) Election of chairman and comments by chairman elect.
f) Adoption of Agenda.
g) Draft RCA Annual Report.
h) RCA Seminar.
i) Status of RCA projects under RCA Agreement 1987.

12:30 Lunch

14:00 FIRST TECHNICAL SESSION
(review of projects supported by separate project committees).
Regional Industrial Project.

15:30 Coffee break

SECOND TECHNICAL SESSION
(review of projects supported by separate project committees).

a) Radioimmunoassay of thyroid related hormones.
b) Regional project on Food Irradiation Phase II/ (include Phase III, NEW PROPOSAL).

18:30 Dinner hosted by China Governor of IAEA Board of Governors.

Tuesday, 12 April 1988

09:00 THIRD TECHNICAL SESSION
Medical projects.

a) Formulation of project committee in accordance with Article VI RCA Agreement 1987.

1) Development of Radiation Protection Infrasturcture.
2) Imaging procedures for the diagnosis of Liver diseases (include Phase II NEW PROPOSAL).
3) Improvement of cancer therapy (include Phase II NEW PROPOSAL).
4) Inhalation imaging for the diagnosis of respiratory diseases.
5) Radiation sterilization for tissue grafts.
6) Development of Tc-99m generators using low power research reactors.
7) Nuclear techniques for toxic elements in foodstuffs.
8) Care and maintenance of nuclear medical equipment (NEW PROJECT).
9) Immunodiagnosis of Tuberculosis (NEW PROJECT).
10) Use of Computers in Tc-99m Imaging (new project)

b) Concluding comments by committee chairman.

10:30 Coffee break

10:50 FOURTH TECHNICAL SESSION
Agriculture projects.

a) Formulation of a project committee.

1) Nuclear techniques to improve domestic buffalo production.
2) Integrated control of tropical plant viruses with nuclear techniques (NEW PROPOSAL).
3) Isotope hydrology and sedimentology (include Phase II NEW PROPOSAL).
4) Improvement of grain legume production.
5) Semi-dwarf mutants for rice improvement.
6) Other new project proposals.

b) Concluding comments by committee chairman.

c) Special lecture by Dr. Xu Guanren

12:30 Lunch

13:30 FIFTH TECHNICAL SESSION
Nuclear science and energy based projects.

a) Formulation of the project committee.

1) Basic science using research reactors - BARC Workshop.
2) Energy and Nuclear Power Planning.
3) Training Course on Nuclear Power Project Planning and Implementation (Republic of Korea funded).

b) Concluding comments by committee chairman.

14:30 Coffee break

14:50 SIXTH TECHNICAL SESSION
country statements.

18:30 Starting for acrobatic performance.

Wednesday, 13 April 1988

08:00 Starting for a visit to the Institute of Atomic Energy.
12:00 Lunch at the Institute
14:30 Visit to the Forbidden City

Thursday, 14 April 1988

09:00 SEVENTH TECHNICAL SESSION

a) RCA Action Plan for 1988 and cost projections for 1989.
b) Presentation and acceptance of the meeting report.

10:30 Coffee break

11:00 CLOSING SESSION

a) Closing remarks by IAEA
b) Official closing.

12:00 Lunch hosted by the Chairman of 10th WGM.

ANNEX 7

10th RCA Working Group Meeting, Beijing
Inaugural Session: Agenda Item (h)

STATUS OF PROJECTS UNDER THE RCA AGREEMENT 1987

SUMMARY

The Meeting of Representatives of RCA Member States at the Tenth Working Group Meeting, Beijing 11-14 April 1988 is invited to note the attached list of RCA Projects and in particular to approve the new projects listed as Category A below in accordance with Article II.2 of the RCA Agreement 1987.

The attached list of projects (Annex 1) can be classified into three categories:

Category A: new projects for which approval is requested under Article II.2 of the RCA Agreement 1987.

Category B: a project approved under Article II.2 of the RCA Agreement 1987.

Category C: those projects which were being implemented under the RCA Agreement 1972, Second Extension and which are therefore considered co-operative projects under the RCA Agreement 1987 in accordance with Article XIII.3.

Category A: New projects:

i) TC Project: Radiation Sterilization of Tissue Grafts;
ii) TC Project: Energy and Nuclear Power Planning;
iii) CRP/TC Project: Care and Maintenance of Nuclear Medical Equipment in Asia;
iv) CRP: Immunodiagnosis of Tuberculosis;
v) Use of Computers in Tc-99m Imaging;
vi) Project: Integrated Control of Tropical Plant Viruses with Nuclear Techniques.

Projects (i) to (iv) have been approved by the IAEA for implementation. Projects (v) and (vi) are outlined in the New Project Proposals section.

Category B: Project approved under the RCA Agreement 1987.

The project "Strengthening of Radiation Protection" was the subject of the 11 December 1987 communication from the RCA Co-ordinator to RCA National Counterparts. A copy is attached for easy reference. (Annex 2).

Category C: Other projects

The remaining projects in Annex 1 were implemented under the Second Extension of the RCA Agreement 1972, and are therefore considered co-operative projects under the RCA Agreement 1987 in accordance with Article XIII.3.

REQUEST

The Meeting of Representatives is requested to approve the new projects listed in Category A and to note current approvals for projects in Categories B and C.

P. Airey/RCA Co-ordinator
1 March 1988

RCA PROJECTS

Field	Project	Technical Officer	Funding[1]	Participation
Agriculture	Semi-dwarf Mutants for Rice Improvement in Asia and the Pacific [2]	M. Maluszynski	Reg.	BGD, IND, INS, MAL, PAK, PHI, ROK.
	Asian Regional Co-operative Project on Food Irradiation (Phase II)	P. Loaharanu	AUL	AUL, BGD, IND, INS, ROK, MAL, PAK, PHI, SRI, THA, VIE.
	Use of Nuclear Techniques to Improve Domestic Buffalo Production in Asia - Phase II	M. Jayasuria	Reg.	MAL, SRL, BGD, PAK, PHI, THA, JPN, AUL, VIE, INS.
	Improvement of Grain Legume	A. Micke	Reg.	INS, IND, PAK, BGD, SRL, ROK, THA, MAL, PHI
	Integrated Control of Tropical Plant Viruses with Nuclear Techniques	N. Murata	*	

*Funding being sought.

RCA PROJECTS

Field	Project	Technical Officer	Funding	Participation
Medical and Biological	Quantitative Evaluation of Nuclear Medical Procedures for Diagnosis of Liver Diseases	R. Ganatra	JPN	BGD, IND, JPN, PAK, PHI, THA, SIN, ROK, SRL, VIE.
	Improvement of Cancer Therapy in Asian Countries	Y. Skoropad	JPN	IND, THA, MAL, JPN
	Aerosol Inhalation Imaging for the Diagnosis of Respiratory Diseases in Developing Countries	R. Ganatra	IND/Reg	BGD, CPR, IND, INS, JPN ROK, PAK, PHI, SIN, THA.
	Development of Tc-99m Generators Using Low Power Research Reactors	H. Vera Ruiz	Reg	AUL, IND, INS, MAL, THA, VIE.
	Radiation Sterilization of Tissue Grafts	R. Mukherjee	TC	(3)
	Radioimmunoassay of Thyroid Related Hormones	R. Piyasena/ R. Ganatra	TC	BGD, BUR, CPR, DRK, IND, INS, MAL, PAK, PHI, ROK, SIN, SRL, THA, VIE
	Nuclear Techniques for Toxic Elements in Foodstuffs	E. Cortes Toro	Reg	AUL, BGD, CPR, IND, INS, JPN, MAL, PAK, THA
	Care and Maintenance of Nuclear Medical Equipment	A. Benini	Reg/TC	(3)
	Immunodiagnosis of Tuberculosis	J. Castelino	Reg	(3)
	Use of Computers in Tc-99m Imaging	G. Van Herk	AUL	(3)

RCA PROJECTS

Field	Project	Technical Officer	Funding	Participation
Industry	Regional UNDP Project for Asia and the Pacific (RCA) on Industrial Applications of Isotopes and Radiation Technology	P. Airey (Project Officer) A. Tajuddin-Ali (UNDP Project Co-ordinator)	UNDP TC, JPN, AUL	BGD, CPR, DRK*, INS, IND, ROK, MAL, PAK, PHI, SIN, SRL, THA, VIE*, AUL** JPN**
	Sub-projects:			
	- Tracer Technology in Industry	J. Guizerix, S.M. Rao (IAEA expert)		*Subject to UNDP Signature,
	- Non-Destructive Testing	R. Gilmour (IAEA expert)		**Donor Countries
	- Radiation Technology	V. Markovic		
	- Nucleonic Control Systems	S.M. Rao (IAEA expert)		

RCA PROJECTS

Field	Project	Technical Officer	Funding	Participation
Radiation Protection	Strengthening of Radiation Protection	P. Strohal	JPN, AUL	(3)
	Sub-project: - CRP: Setting of reference man for non-caucasians	P. Strohal	JPN	(3)
General	Basic Science Using Research Reactors	(4)	IND	
	Energy and Nuclear Power Planning	K. Schenk	TC	(3)

In addition, annual Workshops/Training Courses are being funded by the Republic of Korea.

B2.01 11 December 1987

Dear Ñ,

Please find enclosed a copy of the Project Document supporting the RCA Project: Strengthening of Radiation Protection. This document is an amended version of that issued on 23 October 1987 and is based on the recommendations of the Project Formulation Meeting, 17 to 20 November 1987, Tokyo, Japan.

Implementation of the project can only commence once it has been formally included within RCA. According to Article III. 2 of the 1987 RCA Agreement approval by the Meeting of Representatives is required. The Document was referred to the above-mentioned Project Formulation Meeting, which accepted, in principle, the contents of the attached Project Document. Having regard to the fact that delegates to the Project Formulation Meeting were authorized by their Governments to take decisions on matters related to the Project, the Agency will, for the purposes of this Project only, regard the acceptance of the Project by that Meeting as the approval required by Article III.2 of the 1987 RCA Agreements unless it hears otherwise from Governments Party to the Agreement by 27 February 1988.

A decision to join the Project does not imply a commitment to participate in all activities described in the Project Document. In fact it may not be possible to implement some activities due to changing priorities or lack of funding. It is expected that the Project Document will be revised at each Project Committee Meeting. Participating Member States are invited to commment on project elements or suggest new activities at any time. The Agency would welcome hearing of any offers to host project activities.

Under Article IV of the 1987 Agreement, RCA Member States may participate in projects by notifying the Agency of their intention to do so. This may be done by signing the attached form.

It would assist project administration if you could give this matter your early attention. Thank you for your co-operation.

Yours sincerely,

P. Airey
RCA Co-ordinator
Division of Technical Assistance
and Co-operation

To all RCA Co-ordinators

Notes

(1) Reg. - IAEA Regular Budget
TC - Technical Assistance and Co-operation Fund
AUL - Extra-budgetary support from Australia
JPN - Extra-budgetary support from Japan
IND - Extra-budgetary support from India

(2) Project activities complete apart from final reporting and evaluation.

(3) Participation to be finalized.

(4) Varies according to workshop/training course topic

TENTH RCA WORKING GROUP MEETING

Beijing, Peoples' Republic of China
11 - 14 April, 1988

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

Project Implementation Report
May 1987 - April 1988

Mr Chairman Sir,
Mr Deputy Director General,
Distinguished Delegates,
Ladies and Gentlemen.

It gives me great pleasure to report on the progress of the UNDP/IAEA Regional Project for Asia and The Pacific on Industrial Applications of Isotopes and Radiation Technology. This is the fourth consequtive RCA Working Group meeting I am previliged to attend to present the annual report.

Mr Chairman, sir:

As you are fully aware, this project covers a very wide scope indeed and we could spend the whole of this afternoon, or even longer, if we wish to go into all the details of the Project. However, there will be other occasions for this, such as at the forthcoming tripartite review meeting, to be held in Jakarta, Indonesia in June. What I propose to do in this Session, and with your permission Mr Chairman, is to present a brief overall review of the Project, then to spend say up to ten minutes each, reporting the activities of each of the four sub-projects. I suggest to pause in between these presentations to allow for questions that the distinguished delegates may wish to raise relating to the presentation.

I will start with some broad comments on the Project:

The first significant thing that happened since our last meeting in Colombo was, of course, the formal approval of UNDP for what we call Phase 2 of the Project. This in itself was not unexpected, but it did keep us waiting until the official start: 1 May 1987. The approved Project Document has been distributed to all participating countries soon after the approval.

The other significant event was the acceptance of UNDP of the participation of DPR Korea in the Project. This came in February this year, through the signing of the Project Budget

Revision, for which an additional US$135,000 was provided. I should also mention that in December 1986, Vietnam formally requested to join the Project. However, this is yet to be approved by UNDP.

On Project activities, I wish to report that during 1987, a total of seven regional training courses, two regional workshops and two regional executive management seminars were held. These were attended by 131 participants from all participating countries, ranging from 22 for Thailand to 6 for the Philippines, and no special treatment for Malaysia, only 14). This year we have just completed one regional training course held here inb Beijing, attended by 16 participants. Another nine regional events are scheduled for the rest of the year.

Also during 1987, the project provided direct support to 15 national NDT training courses, primarily through provision of experts and course materials and uniform documentation. It is estimated that at least 200 persons were trained through these courses. On the promotional side, the project sponsored eight national executive management seminars, attended in all by an estimated 150 participants.

To carry out these activities, no less than 40 short-term expert recruitments were made, primarily to lecture in regional and national training courses and seminars. Of these, only eight were from outside the region. The use of experts from participating countries, particularly for the NDT sub-project has increased significantly. Last year, out of a total of 23 experts, 7 were from countries participating in the project. For this year, for the targeted total of 26 experts, it is expected that 14 of them would be from participating countries. The number of countries supplying the experts increased from 1 in 1986, to 4 in 1987, to 6 or possibly 7 in 1988. This is indeed a healthy trend and contributes in my view, to what RCA is all about.

In my view, the level of activities of the Project has increased: we are reaching out to more people and more industries in the region. We have also made our best effort to tailor the content and 'quality' of these activities to meet the needs of the region, as voiced through Project Counterparts and Sub-project Coordinators, and also in a manner we consider most appropriate for achieving the objectives of the project. To help me do this, apart from the back-stopping support from Vienna, with the specific aim of providing technical back-up in the particular sub-projects, I am pleased that beginning May last year, two long-term experts were appointed. Mr R S Gilmour of Australia was appointed as the Project Expert for NDT and he is based in Kuala Lumpur, Malaysia. Dr S M Rao of India is appointed as the Project Expert for Tracers and NCS and he is based at the Project Office in Jakarta. The terms of both these experts have just been extended for another year to May 1989.

Mr Chairman, sir, I wish to end the first portion of my report at this point. I will next go into a little bit more detail in each of the sub-projects, but before doing so, perhaps I should pause for any questions or clarification on the broad aspects of the Project.

/rcawg1/April , 1988

TENTH RCA WORKING GROUP MEETING

Beijing, Peoples' Republic of China
11 - 14 April, 1988

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

Project Implementation Report
May 1987 - April 1988

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1. General

1.1: Formal UNDP Approval of Phase II

RAS/86/073 was formally approved for implementation on 1 May 1987. The Project document numbered RAS/86/073/1/B/18 dated 1 May 1987 has been circulated. Revision C of the budget, incorporating additional UNDP funding for the participation of Democratic Peoples' Republic of Korea, was signed on 26 February, 1988. The budget summary is shown in **Annex 1.**

1.2: Work Plans: 1987 and 1988

The As-implemented workplan for 1987 and the current workplan for 1988 are attached as **Annexes 2** and **3** respectively.

1.3: Project Performance Evaluation Report

The Project Performance Evaluation Report for the period 1 July 1987 to 29 February 1988 was submitted to UNDP on 11 March 1988. The report, which is being distributed to all participating countries, will be discussed at the first Tripartite Review Meeting for RAS/86/073, scheduled for 16 June, 1988.

Sub-project Activities

2. Tracer Technology

The level of activities of the sub-project has increased significantly, as a direct result of the appointment of a long-term expert for the sub-project. However, it is still too early to realise the output from efforts undertaken during Phase II. Among the success criteria is the increase in the number of experiments actually carried out in industry, performed by specialist teams from national laboratories, strengthened through project support. Two such experiments were carried out, one in Indonesia in December 1987, and the other in Thailand in

February 1988. Two more experiments are planned for the first half of 1988, one each in Bangladesh and the Republic of Korea. A significant private sector development is the establishment in 1986 of a private company in Malaysia to provide isotope application services to industry on commercial basis. So far, the company has carried out a number of contract jobs in Malaysia and Singapore, however the company declined to reveal the values of the contracts.

Tracer Demonstrations

The Project provided expert service to CAIR-BATAN in planning and carrying out a radiotracer study on the mixing efficiency of a cone mixer in the Triple Superphosphate Plant of PETROKIMIA at Gresik, East Java, Indonesia. The experiment was carried out during December 1987. Locally produced Lanthanum-140 was used as the tracer. Based on the results of the study, another experiment using Phosporous-32 labelled phosphoric acid is being planned to verify whether the reaction between the phosphate rock and the phosphoric acid is complete within the curing time presently allowed.

A demonstration experiment on the measurement of natural gas flow rate in a buried natural gas pipeline near Chonburi, Thailand was successfully carried out during 24 February to 1 March 1988. The pipeline belongs to the Petroleum Authority of Thailand (PTT) and the demonstration was carried out with technical assistance from the Isotope Division, ANSTO, Australia. Beside a number of Thai observers, foreign observers from Malaysia (2), Indonesia (2) and Bangladesh (1) were present for the demonstration.

The following two demonstrations are also planned to be carried out during May 1988:

a) Mercury Inventory in the Caustic Soda Plant at the Chittagong Chemical Complex, Bangladesh.
This demonstration will be carried out with the assistance of BARC, Bombay, India. It was originally planned for December 1987 but, at the request of our local counterpart, it is now scheduled for May 1988.

b) Residence Time Distribution in Precalcinators of a Cement Plant, Donghae, Republic of Korea.
The study will be carried out in 4 precalcinators of the Ssangyong Cement Plant during 16 - 20 May 1988, with the assistance of BARC, Bombay. The technical details of the demonstration have been worked out amongst all concerned: the Project, BARC and KAERI.

Second National Coordinators Meeting, Colombo.

The second meeting of National Coordinators for the Tracer Technology and NCS sub-projects was held in Colombo, Sri Lanka during 14 - 16 March 1988. The meeting reviewed the progress of the sub-projects and made recommendations for activities for the rest of 1988 and 1989.

Regional Training Course, Beijing

The third Regional Training-Demonstration Course on Tracer Technology in Industry in Beijing was held at the Institute of Atomic Energy Beijing, during 21 March to 9 April 1988. The course, attended by 16 participants from ten countries, included field demonstrations at the Dagong oilfields near Beijing.

3. Non-Destructive Testing (NDT)

The current status indicates that the immediate objectives of the sub-project are being met. The Project is assisting in the proper development of NDT infrastructure through:

- Establishment of national certification schemes
- Training of manpower
- Harmonisation of the above activities through provision of uniform documentation

All participating countries now have either NDT Societies, Associations or at least a national committee. The project trained 36 persons through regional courses in 1987 while an estimated 200 others were trained through national training courses supported by the Project.

A long-term expert has also been appointed since May 1987 for the NDT sub-project. The expert, based in Kuala Lumpur, Malaysia, has been extensively involved in the conduct of a number of national and regional courses on ultrasonics as well as the teach-the-teacher portion of the other regional courses. The project is also developing standard teaching manuals for use by participating countries in their national training courses. The first of these, for ultrasonics level 2, has been prepared by the expert. The second, for radiography level 2, is being prepared by another expert recruited on a short-term basis.

In providing support to national training courses, as well as in the conduct regional training courses, the project has, in the last couple of years, been able to utilise increasing number of experts from within the region, as shown in the following table:

Year	No. of Missions	Outside Region	AUL&JPN Experts	Project Expert	From Region
1986	10	4	5	-	1
1987	23	1	10	5	7[c]
1988[a]	26	-	7[b]	5	14[d]

Note: (a) = Projected
(b) = Including 1 from New Zealand
(c) = From 4 countries
(d) = From 7 countries
Project Expert: Mr R Gilmour (AUL)

Project support to national training programmes through provision of experts, training manuals and standard test pieces, documentation etc., are all geared towards achieving harmonisation of NDT certification schemes in the region.

Regional Workshops

During the period covered by this report two Regional Workshops on Non-Destructive Testing were conducted, the first was in Tokyo during 31 August - 4 September 1987 on "Non-Destructive Examination of Non-Metallic Materials" and the second in Kuala Lumpur during 12 - 16 October 1987 on "Qualification and Certification of NDT Personnel"

The Tokyo Workshop on NDE of Non-Metallic materials was attended by 12 participants from 10 member states of RCA. The workshop discussed special RT, UT and ET techniques as applied to the testing of concrete and ceramics as well as the application of PT and Computerised Tomography Techniques for non-metallic materials.

The Kuala Lumpur workshop went into the heart of the NDT sub-project which is to achive hormonisation among member states in the qualification and certification of NDT personnel, based mainly on the ISO Draft Standard DP9712 on the subject. The workshop was attended by 22 participants from all the member countries (except Bangladesh) reflecting the importance the Region attaches to this aspect of NDT. The Workshop made the following major recommendations :

a) Establishment of a model centre within the Region

for level 3 qualifying examination for subsequent certification by appropriate National Certifying Authority.

b) Developing common training manuals and guidelines for instructors as per IAEA TECDOC 407 for each of the NDT methods for levels 1 & 2.

c) Organisation of computer storage of questions on general NDT and on specific methods allowing for free exchange between member countries and for random selection of questions for examinations.

These recommendations will be discussed at the meeting of National Coordinators, 19 - 22 April at KAERI, in particular, those aspects related to the mode of implementation as well as budget implications.

Regional Training Courses

Three Regional Training Courses were conducted during the year:

1) Radiography Level 2 at Tiruchirapalli, India
2) Ultrasonics Level 2 at Daeduk, Rep of Korea
3) Surface Methods Level 2 at Bandung, Indonesia

The course on RT-2 was hosted by of Bharat Heavy Electricals (BHEL) during 10 - 28 August 1987 and was attended by 12 participants from 9 countries. Mr. Jim Thomson from Australia, Mr. Roy Gilmour, Project Expert and Mr. R.R. Wamorkar, BARC, India were lecturers at the RTC. Mr. S. Bhaskaran of BHEL was the Course Director.

The course on UT-2 was organised in the new premises of the Korea Advanced Energy Research Institute (KAERI) at Daeduk during 7 - 25 September 1987. It had 12 participants from 8 countries. Mr. Gilmour, Project Expert and Mr.Jamal-ud-din from Pakistan were lecturers at the course. Mr. Sung Ki Chae of KAERI was the Course Director.

The SM-2 Course in Bandung was organised at the Institute for R&D of Materials and Industrial Products (IRDMIP) during 5 - 23 October 1987. There were 12 participants from 9 member countries and 7 local observers. Mr. A. Murakoshi from Japan and Mr. Lee Jong-Po from the Republic of Korea were lecturers and Mr Suprapto, Director of IRDMIP was the Course Director.

National Training Courses

One of the necessary prerequisites for industrial progress is the availability of an adequate number of trained NDT personnel. The Project is particularly happy

that it was able to make a significant contribution in meeting this need as through a programme of support to national training courses as summarised in the following Table:

No	Course	C'try	Period	Expert provided: Name / Country	
1.	UT-2	SRL	6 - 17 Feb	Chandramouli	IND
2.	UT-2	PAK	11 - 30 Apr	Gilmour	IAEA
3.	SM-2	SRL	15 - 26 Jun	Joiner	AUL
4.	UT-1	BGD	18 Jul-13 Aug	Venkataraman	IND
5.	RT-2	INS	3 - 14 Aug	Terada, Y	JPN
6.	UT-3	CPR	14 - 25 Sep	Terada, K	JPN
7.	RT-2	IND	14 Sep-1 Oct	Baez	ARG
8.	RT-2	CPR	12 - 23 Oct	Ooka	JPN
9.	RT-2	INS	12 - 23 Oct	Martinez	PHI
10.	RT-2	PAK	18 Oct-4 Nov	Hemmy	AUL
11.	UT-3	ROK	19 - 31 Oct	Terada, K	JPN
12.	UT-2	PHI	19 Oct-6 Nov	Gilmour	IAEA
13.	UT-3	IND	23 Nov-11 Dec	Gilmour	IAEA
14.	UT-2	MAL	23 Nov-5 Dec	Pope	AUL
15.	RT-2	THA	28 Nov-8 Dec	Gillespie	AUL

Due to circumstances beyond the control of the organisers, the National Training Course on RT-2 proposed to be held in Dhaka during 15 November - 4 December 1987 could not be conducted.

4. Radiation Technology

The immediate objectives of the sub-project on the whole are being met. These are summarised below, together with a report on the activities carried out during this period:

4.1 Rubber

Although in principle, the technology for using radiation vulcanised latex (RVNRL) for the manufacture of condoms is demonstrated, the factory in Bandung, Indonesia is commited to using conventional process in order to meet the production target for the current year. Some refinement to the process and production line will be necessary if they were to use RVNRL. It is planned that this will be carried out during 1988/89. The second trial production of condoms from RVNRL was started last week at the factory in Bandung.

Indonesia is also planning to set up a factory to

produce surgical gloves from irradiated latex. A project proposal for such a factory at an estimated cost of US$21.5 million is awaiting government approval. A team from Japan visited Indonesia in March to discuss funding for the project. Another related development: CAIR-BATAN has shipped a further consignment of 5 tons of RVNRL to West Germany through the Indonesian company PTP XI for extended trials on production of low-toxicity products for baby use.

Interest in RVNRL technology has also been generated in Malaysia. The government has approved a budget of M$1.429 million (aproximately US$0.55 million) for 1988 for the national RVNRL research programme of the Rubber Research Institute of Malaysia. Prior to this, RVNRL was never a priority area in Malaysia.

Technology Development Programme

With the achievements in RVNRL technology through the fellowship programme carried out during 1986/7, the next step is for a programme of Test & Evaluation of the irradiated latex produced in CAIR-BATAN, Indonesia and TRCRE, Japan. Under this technology development programme, National Research Groups (NRG) will carry out the following tests:

China : Test production of medical products
India : Test production of rubber thread and adhesives
Malaysia : Evaluation of processability
Thailand : Test production of dipped products
Sri Lanka: Test production of dipped and non-dipped products

To carry out the above technology development programme, the first batch (each of about 200kg) of latex was shipped in December 1987 to the NRG's of India, Malaysia, Thailand and Sri Lanka from CAIR-BATAN, Jakarta. The consignment to China was despatch in March. A second batch of about 200 kg each, was shipped from TRCRE, Takasaki early last February to all five countries. The results of this Test and Evaluation programme will be discussed at the first meeting of the NRG leaders scheduled for 5-7 October 1988, at the Research Institute for Latex Industry, Kunming, China.

Design of Latex Irradiator

The Project has engaged an expert, Mr K. S. Aggarwal of BARC, India on a three-month assignment to design low-cost irradiators for latex. These designs are expected to be completed by early April and will be submitted to the NRGs for consideration at its meeting in October.

Expert Mission: Makuuchi

Project expert Dr K. Makuuchi of Japan undertook a short mission to India in March to discuss national research activities at the Rubber Research Institute of India at Kottayam, Kerala.

Project Extension

Activities for the rubber sub-project was continued into Phase 2 initially for a period of two years on the basis of the recommendation of the UNDP Evaluation Mission report. This extension expires at the end of 1988. In view of the tremendous progress that has been achieved in the last two years, and of the further activities planned to promote rvnrl, it is recommended here that the sub-project be continued to the end of Phase 2 and appropriate funding be secured for this purpose.

4.2 Curing Applications

Progress is being made in attracting interest from industry to use the pilot facility in Jakarta for production of electron-beam cured products for trial marketing. An agreement has been signed between CAIR-BATAN and a local wood-based company (PERHUTANI) to undertake trial production and testing of electron-beam/ultraviolet cured parquet flooring under actual conditions of use. Under the agreement, 400 sq.m of parquets will be treated for field tests. Out of this, 200 sq.m has already been laid in the corridor of the radiation processing laboratory of CAIR-BATAN while the rest will be sent to PERHUTANI for their independent evaluation. In the second stage of implementation of the agreement, 20,000 sq.m of parquets will be produced for trial marketing. This represents a full month of operation of the plant on single eight-hour shift per day.

Project has generated interest in curing technology through the series of EMS. There are a number of machines for ultra-violet curing for printing and packaging applications in many of the countries participating in the project, but during 1986/7 at least 3 lines have been installed one each in Pakistan, India and Malaysia specifically for curing of coatings on wood panels. In addition, a furniture company in Shanghai, China is also known to use the technology for commercial production of furniture items.

Another wide application of ultra-violet curing technology is in the printing industry for the curing of printing inks.

No electron beam machines have been purchased for the purpose of curing applications, which could be attributed to project initiatives. The machine installed in Singapore for curing of coatings on packaging materials is considered a result of direct commercial marketing.

National EMS: Shanghai, Colombo, Lahore

The Project organised National Executive Management Seminars on Radiation Curing Technology in Shanghai, Peoples' Republic of China, Colombo, Sri Lanka and in Lahore, Pakistan during October 1987. Prof. John L. Garnett (Australia), Dr. Joji Oka (Japan), Mr. Takashi Sasaki (Japan) and Dr. Josef Wendrinsky (Austria) were the lecturers at these seminars.

In Shanghai, the programme was held at the Shanghai Applied Radiation Institute (SARI) of the Shanghai University of Science and Technology (SUST).There were about 30 participants with good industrial representation. Prof Feng of SARI was effectively the Seminar Director. The Seminar showed that China is already well advanced in the field of radiation curing, but commercialisation of the technology is yet to be achieved. Rubber wood and gypsum appear to be good candidates for radiation curing commercialisation in China.

In Colombo, the Seminar was organised at the Hotel Ceylon Intercontinental under the overall supervision of our Sri Lanka National Counterpart, Dr. K.G. Dharmawardena. There were 30 participants, 10 of whom were from research institutes. There was considerable interest in radiation curing technology in Sri Lanka with most companies prefering to experiment with ultra-violet, before going in for EB machines. Main areas of interst in Sri Lanka are rubber wood, coconut wood, steel and paper coating and pressure-sensitive adhesives. The seminar indicated good industrial potential with possible interest in technology transfer in the near future.

In Lahore, the NEMS was held at the Institute of Nuclear Medicine and Oncology, Lahore (INMOL) and the programme Director was Mr. Qazi A. Kadir. There were 30 participants and 16 of them were from industry. The semiar opened with a lecture by Dr. Shamshad Ahmed from PINSTECH on the relevance of the EB/UV technology to the Pakistan industry, which provided a useful guide to the NEMS lecturers. As in Sri Lanka, the industries representatives indicated their preference for ultra-voilet technology, before going in for EB machines.

Modification of Jakarta E/B facility

Two experts from Japan, Mr T. Sasaki and Mr T. Takagi

were recruited by the Project to prepare specifications for the proposed modification to the pilot facility in Jakarta. Their mission was carried out during 25 February to 4 March 1988. Their recommendations have been received and actions are being taken to secure the necessary funding from the government of Japan for the purchase recommended additional equipment. A substantial portion of the modification works will be undertaken by BATAN.

In a related development, the electron beam facility in CAIR-BATAN is being provided with a liquid-nitrogen plant of Soviet make as part of the IAEA's bilateral assistance to Indonesia. This plant when operational later this year, is expected to make the process more commercially viable since at present, the cost of liquid nitrogen represents a major portion of the total cost of production.

4.3 Cross-linking Applications

During 1987, three electron beam units were delivered to two major wire and cable manufacturers in the Republic of Korea. This significant development is a follow up of participation of two senior managers, one from each of the two companies, in the Project-sponsored Regional Training Course on Radiation Cross-linking of Wire and Cable Insulations held in Shanghai in 1985 and 1986. The Project also sponsored a National Executive Management Seminar on the same subject in Seoul in February 1987 at which many senior managers and engineers from both the companies attended. Actual figures on the investments have not been revealed, but is estimated at around US$5 million. These major developments in the Republic of Korea are without doubt direct outcome of the above Project initiatives.

In India, the National Insulated Cable Company is currently finalising their plans to purchase a electron beam unit for the cable manufacturing facility in Calcutta. This will be the first such unit in the country. An engineer from the company participated in the 1985 training course and many other engineers/managers took part in the national EMS held in Calcutta in early 1987.

An Expert Advisory Group (EAG) meeting was organised in Changchun, Peoples' Republic of China during 19-20 June 1987. The meeting was hosted by the Changchun Institute of Applied Chemistry and was attended by six experts from China, Japan, Republic of Korea and IAEA, Vienna. The EAG recommended two Regional Training Courses and two series of National Executive Management Seminars for 1988 and 1989.

4.4 Radiation Sterilization

Project activities have helped many countries

strengthen their infrastructure through increased trained manpower and in some cases in actual implementation of industrial projects. Among the new facilities that have been established during the course of the project are:

- Gammatron in Thailand. Total investment was US$3.5 million
- PARAS (Pakistan Radiation Services) in Lahore Pakistan. Operational in July 1987. Total investment was 32 million Pakistan rupees, half of it in foreign exchange.
- Beijing Radiation Centre. The facility is currently under construction.
- Philippine Nuclear Research Institute: Facility under construction
- Nuclear Energy Unit, Malaysia: Contract for construction of facility awarded. Estimated cost US$1.2 million
- Bangladesh: General purpose facility operational at AERE, Savar.

Facilities already operational at the start of the project are at BARC (India), KAERI (Republic of Korea) and Ansell (Malaysia). They continue to benefit from the Project through its training activities

An element of specialisation has been introduced into the design of regional courses under this sub-project. What used to be a single Regional Training Course on all aspects of medical product sterilisation has now been split into two, one with emphasis on sterility assurance and the second on compatibility of materials. From the feedback received, this division appears that to have been well received by the course participants.

The Regional Training Course was on Quality Control and Sterility Assurance was organised at the Office of Atomic Energy for Peace (OAEP), Bangkok, Thailand from 5 - 16 October 1987, with Prof. A. Tallentire (UK) and Ms Jindarom Chvajarernpun (THA) as the Course Director and Co-Director, respectively. Other international experts were Ms. K.M. Patel (India), Dr. D. Begg (UK), Dr. N.A. Halls (Ireland), Dr. J. Masefield (USA) and Dr. R. Mukherjee (IAEA). There were 16 participants in the course from 10 countries of the Region. The 'Gammatron' radiation sterilisation plant in Bangkok provided their facilities for practical demonstrations, to supplement those at OAEP.

The second course laid emphasis on the selection of compatible materials for radiation sterilisation. The course was organised at the Bhabha Atomic Research Centre, Bombay, India during 30 November - 11 December 1987. There were 12 participants and 1 observer representing 9 countries in the Region. Dr. N.G.S. Gopal was the Course Director. The

radiation sterilisation plant ISOMED in BARC and its R&D laboratory were used for practical demonstrations.

4.5 Radiation Engineering

A Regional Training Course on Radiation Engineering-Electron Beam Facilities was the first activity under this new sub-project. The course was held in Takasaki, Japan during 19-30 Octpber 1987. There were 10 participants from 8 countries. The Course Director was Mr. Kenzo Yoshida of the Takasaki Radiation Chemistry Reszearch Establishment. The RTC covered a wide range of topics including Radiation Physics, Radiation Processing, Industrial EB machines and their applications and Cost/Benefit analysis of EB Processing

5. Nucleonic Control System (NCS)

This sub-project has provided a number of significant outputs and activities are being continued at both regional and national levels, including one regional training course, two regional executive management seminars, and one national seminar in Republic of Korea.

National EMS in Republic of Korea

A National Executive Management Seminar on Nucleonic Control Systems was organised at Seoul, Pohang and Ulsan during 23-25 September 1987 by the Ministry of Science and Technology (MOST), Republic of Korea. This seminar was hosted by the Korea Radioisotope Association (KRIA) with support from the Project. Dr. Hiro Amano (Japan), Mr. John Dukes (USA) and Dr. S.M. Rao (IAEA) were the lecturers provided by the Project.

The seminar started in Seoul where there were nearly 80 participants, mostly engineers from industry. In the concluding panel discussion, which concentrated mainly on the cost effectiveness of NCS systems, it was revealed that 97 firms in the country are using NCS in their operations. The second part of the seminar was at the Pohang Iron and Steel Company, Pohang where there was a well coordinated discussion on many aspects of NCS. Attention was specially focussed on the checking of calibration of existing NCS systems. The final leg of the seminar was at the Yukong Oil Refinery, Ulsan where the main discussion was on rechecking the calibration of the nucleonic level and density gauges operating in the plant.

The status and summary of activities of the other specific areas of the sub-project are discussed below:

5.1 Paper

There are nine installations (seven in Thailand and two in the rest of the region) which are attributable to Project activities. These have been reported earlier, as output of initiatives taken during Phase I. There is no report of further investment during 1987. Two paper companies in Sri Lanka are currently conducting, with assistance from the Project, a feasibility study on the use of ncs at their respective mills. Bangladesh is also actively interested. Project is exploring possibilities of manufacture of low cost NCS in the Region.

Regional Training Course

A regional training course on the 'Use of Nucleonic Control Systems in Paper Industry' was organised at the Office of Atomic Energy for Peace, Bangkok during 9-20 November 1987. There were 11 participants from 8 countries. This was the sixth course conducted under the Project and all have been very successful considering the rapid increase of NCS in paper industry in the Region and the requests being received for expert help in this field.

Expert missions

An expert mission consisting of Mr. Chuichi Honma from Japan and Mr. Cherdchai Apisittikasem from Thailand accompanied by Mr. Masahito Kinoshita (Japan) as Coordinator visited Bangladesh, Indonesia and Thailand during 5-18 July 1987. The objectives of this mission were:

a) to assess the extent to which NCS could be useful for paper manufacturing,
b) to identify impediments to installation of NCS, and
c) to make recommendations for possible installation in the mills to be visited (in these countries).

Among the recommendations made was for the Project to explore the possibility of assembling a low-cost NCS within the Region.

Mr Cherdchai Apisittikasem undertook a further one-week mission to Sri Lanka during January 1988 to assess the feasibility of NCS application at the Embilipitiya Paper Mill. His report indicated that the mill will benefit from such an installation, with a pay-back period 2-3 years.

5.2 Steel

No investments could be directly attributed to Project activities as most mills are designed with ncs already included as package. However, the project through its training activities, assists in ensuring more efficient

utilization of these equipment.

A Regional Executive management Seminar on Nucleonic Control Systems in Steel Industry was organised in Tokyo, Japan during 26-30 October 1987. Six participants, one each from Bangladesh, India, Indonesia, Malaysia, Pakistan and Sri Lanka attended the Seminar. Ms. H. Mitsuishi of Japan Atomic Industrial Forum was the Coordinator of the Seminar. Mr. J.M. Vasishth of Bokaro Steel Plant, India attended on invitation and presented the experience at Bokaro where the Project installed a NCS during Phase I. Other discussion leaders were Mr Jun Miyoshi of Kawasaki Steel Corp., Mr Kazunori Masanobu of Toshiba Corporation and Dr Hiro Amano of Nittetsu Electrical Engineering and Construction Company Limited. Dr. Hiroshi Tominaga of JAERI and Prof. Yasuo Nozaka of Tokai University acted as moderators at the Seminar.

Judging the comments received from the participants, the seminar was considered to be highly successful.

5.3 Minerals

As reported previously, one significant recent output of the Project is the installation of an on-line analysis system at the Mamut Copper Mine in Sabah, Malaysia. It has been reported that a similar system has also been sold to one of the major mining corporations in India. Other smaller systems have also been installed in mines/mineral processing plants in India which reportedly are resulting in significant benefits to the owners.

5.4 Civil Engineering Applications

This is a new sub-project in Phase II and as a first step an expert mission visited four countries, Republic of Korea, Thailand, Malaysia and Singapore to evaluate the present status of application of nucleonic systems in civil construction industry and their future potential. They gave seminars at several places in the countries visited and had extensive discussion with civil construction engineers. Large interest in the application of nucleonic gauges for soil compaction control has been observed in all the countries, but the cost of the instruments and maintenance problems appear to be the main impediments to their wide application. The experts have recommended organisation of a Regional Seminar on the subject in Tokyo and this has now been scheduled for 24 May - 01 June 1988.

5.5 Coal

A Regional Executive Management Seminar was organised in Sydney and Perth, Australia during 28 September - 02

October 1987 with field viosits to coal mines in the Hunter Valley (NSW) and Muja power station and Griffin Mine in Western Australia. The participants had first-hand experience of the application of nucleonic ash monitors and appreciate the techno-economic advantages of the system. Prof. A.J. Lynch was the Seminar Director. There were 9 participants from 5 countries with large interest in coal mining and application. Feedeback from the EMS indicated keen interest in the technology from the Region.

A project planning mission visited Thailand at the end of February 1988 to finalise arrangements for the setting up of a training-demonstration facility at the Mae Moh Lignite mine, Lampang province, Thailand. The mine belongs to the Electricity Generating Authority of Thailand (EGAT). A series of trainingdemonstration courses and Executive Management Seminars are planned for the period ending December 1992. This whole activity will be funded through Australian extra-budgetary contribution to the Project.

6. Concluding Remarks

This will be the last occasion for me to participate at this meeting in the capacity of Project Coordinator. I would like to take this opportunity to express my thanks to all of you for the support you have given me over the last three years or so in implementing this project. The job has indeed been very interesting and has proved to be a very satisfying experience. I am especially indebted to my counterparts in the various participating countries, some of whom are present here, as well as the various sub-project coordinators, for without whose support it would not have been possible for me to carry out this task properly and to achieve, in my opinion, the very high implementation rate for activities under the project. I sincerely hope that the same, if not higher, level of support will be accorded to my successor when he takes over the job in July.

However, having said all that, there is still plenty for me to do between now and July. And for those of you who are coming to Jakarta in June, I look forward to welcome you there. Thank you.

/rcawg/April , 1988

Annex 1

Country: Asia and the Pacific
Project No.: RAS/86/073/C/01/18
Project Title: Support for Regional Co-operation in the Industrial Application of Isotope and Radiation Technology (Summary)

		Total		1987		1988		1989		1990		1991	
		m/m	US$	m/m	US$	m/m	US$	m/m	US$	m/m	US$	m/m	US$
10	PROJECT PERSONNEL												
11	Experts												
11-02	Advisory Group	3.0	25,000		-	3.0	25,000		-		-		-
11-03	Experts (NTC-Tracer)	8.4	41,400	7.4	32,400							1.0	9,000
11-04	Co-ord.Meetings(NDT)	3.3	21,400	3.3	21,400		-		-		-		-
11-05	Reg.Exp. NTC (NDT)	69.4	324,000	11.3	61,700	23.5	116,000	13.7	58,700	11.2	48,900	9.7	38,700
11-06	Curing	4.9	48,100	1.4	17,100	1.0	8,000	1.0	8,900	1.5	14,100		-
11-07	Cross-Linking	2.9	25,700	0.9	7,000		-	1.0	8,900		-	1.0	9,800
11-08	Rad.Sterilization	3.0	28,100		-		-	1.0	8,900	1.0	9,400	1.0	9,300
11-09	Rubber Vulcaniz.	7.3	68,800	0.8	17,300	2.5	17,900	2.0	16,900	1.0	8,000	1.0	8,000
11-10	Rad.Engineering	1.0	8,900		-		-	1.0	8,900		-		-
11-12	New Projects	1.5	13,690		-		-	1.0	8,180	0.5	5,510		-
11-13	Paper	3.0	26,940	0.5	3,400	1.0	7,000	0.5	5,250	0.5	5,510	0.5	5,780
11-14	Minerals	2.0	21,540		-	0.5	5,000	0.5	5,250	0.5	5,510	0.5	5,780
11-15	Consultants	1.5	16,540		-		-	0.5	5,250	0.5	5,510	0.5	5,780
11-16	Consultants (Tracer)	14.6	86,200	0.5	2,500	12.0	68,000	1.0	8,100	1.0	3,600		-
11-99	Sub-total	125.3	756,110	26.2	162,300	43.5	246,900	23.2	143,230	17.7	111,040	15.2	92,640
13	Admin.Support Personnel (Secretary)	36.0	25,200		-		-	12.0	8,400	12.0	3,400	12.0	8,400
15	Travel on Off. business		160,300		52,300		33,500		25,000		25,000		25,000
16	Other Costs (missions)		95,300		15,300		25,000		25,000		5,000		25,000
19	Component Total		1,037,910		230,400		305,400		201,630		149,440		151,040
30	TRAINING												
31	Indiv. Fellowships	70.4	199,400	10.0	27,500	15.0	42,000	30.4	88,200	15.0	41,700		-
32	Group Training		1,573,490		206,000		412,520		361,350		381,880		211,740
39	Component Total		1,772,890		233,500		454,520		449,550		423,580		211,740
40	EQUIPMENT		263,900		91,900		60,000		112,000		-		-
49	Component Total		263,900		91,900		60,000		112,000		-		-
59	Miscellaneous		60,300		10,200		8,000		25,000		8,000		9,100
99	GRAND TOTAL		3,135,000		566,000		827,920		788,180		581,020		371,880

Annex 2

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1988

February 1988

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1.1 Sub-Project 3 Expert Mission - Irradiator Design (Aggarwal) Jakarta 11 January - 8 April 1.2 Sub-Project 4 Expert Mission - NCS-Paper, Colombo 25-29 January 1.3 Sub-Project 1/4 Expert Rao 12m/m Jakarta 1.4 Sub-Project 2 Expert Gilmour 12m/m Kuala Lumpur	2.1 Sub-Project 2 National TC/RT-2 Colombo, 1-12 Feb. 2.2 Sub-Project 2 National TC/RT-2 Jakarta 2.3 Sub-Project 1 Expert Demonstration Gas Flow Measurement Bangkok 22 Feb-3 March 2.4 Sub-Project 1 Expert Mission (March) Pakistan 28 Feb-10 March 2.5 Sub-Project 2 National TC/UT-2 Manila, 8-26 Feb 2.6 Sub-Project 3 Experts - UV Facility Installation 25 Feb - 4 March	3.1 Sub-Project 3 National EMS - Radiation Processing, Dhaka 14-17 March 3.2 Sub-Project 1 2nd NC Mtg. Tracer Colombo, 14-16 March 3.3 Sub-Project 1 National EMS - Tracer Colombo, 17-18 March 3.4 Sub-Project 2 National TC/RT-2 Colombo, 17-18 March 3.5 Sub-Project 2 National TC/RT-2 K.L., 14-26 March 3.6 Sub-Project 2 Experts - Preparation of Text-books, K.L. 3.7 Sub-Project 3 Expert Mission-Rubber (Nakauchi) Kottayam 20-22 March 3.8 Sub-Project 1 Regional TC - Tracer Beijing 21 March-9 April 3.9 Sub-Project 2 National TC/SM-2 PAK, 27 March-14 April	4.1 Sub-Project 1 Expert Demonstration Cement Industry ROK, 11-16 April 4.2 Sub-Project 2 4th NC Mtg NDT Seoduk, 18-22 April 4.3 10th RCA Working Group Meeting Beijing, 11-15 April	5.1 Sub-Project 4 Regional EMS - Civil Engineering, Tokyo 24 May - 1 June 5.2 Sub-Project 2 National TC/UT-2 Bangkok, 2-14 May 5.3 Sub-Project 1 Expert Demonstration Mercury Inventory Dhaka	6.1 Sub-Project 2 Regional TC - NDT SM-2, Shanghai 13 June - 8 July 6.2 Sub-Project 3 National EMS - Rad. Crosslinking, Changch China, Lahore Pakist 28 June - 6 July 6.3 Sub-Project 3 3rd NC Mtg. Rad.Tech Jakarta, 6-8 June 6.4 RCA Seminar Jakarta 13-15 June 6.5 TPR Meeting Jakarta 16 June
1.1 Requirement: Cost: $9 900 1.2 Requirement: Cost: $4 000 1.3 Requirement: Cost: $40 000 2.4 Requirement: Cost: $40 000	2.1 Requirement: Country Project 2.2 Requirement: Cost: $4 000 2.3 Requirement: Australian Contrib. Cost: $20 000 2.4 Requirement: Cost: $3 500 2.5 Requirement: Mission by R. Gilmour 2.6 Requirement: Japanese Contribution	3.1 Requirement: Cost: $15 000 3.2 Requirement: Cost: $25 000 3.3 Requirement: connected with 3.2 3.4 Requirement: Country Project 3.5 Requirement: Cost: $4 000 3.6 Requirement: Cost: $2 000 3.7 Requirement: Japanese Contribution Cost: $5 000 3.8 Requirement: Cost: $28 000 3.9 Requirement: Japanese Contribution Cost: $4 000	4.1 Requirement: Australian Contribution 4.2 Requirement: Cost: $21 000 4.3 Requirement: No requirement	5.1 Requirement: Japanese Contribution Cost: $55 000 5.2 Requirement: Cost: $4 000 5.3 Requirement: Cost: $2 000	6.1 Requirement: Cost: $28 000 6.2 Requirement: Cost: $15 000 6.3 Requirement: Japanese Contrib. Cost: $33 000 6.4 Requirement: No requirement 6.5 Requirement: Cost: $25 000

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1988

February 1988

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
7.1 Sub-Project 2 Regional TC - NDT R-2 Hyderabad, India 4-22 July	8.1 Sub-Project 2 National TC/UT-2 Pyongyang, 2-20 Aug. 8.2 Sub-Project 2 National TC/ET-2 Manila	9.1 Sub-Project 3 Regional TC-Crosslinking Shanghai/Changchun China 5-23 September 9.2 Sub-Project 2 Regional TC - NDT UT-2 Lahore, 12-29 September 9.3 Sub-Project 1 Expert Demonstration Chemical Industry Malaysia 9.4 16th RCA Meeting Vienna 9.5 Sub-Project 3 Experts - Pilot Plant Modification Jakarta 9.6 Sub-Project 2 National TC/RT-2 China 2 weeks 9.7 Sub-Project 4 NCS Steel - Exp Mission	10.1 Sub-Project 2 Regional Workshop - NDT Image Proc., Tokyo 3-7 October 10.2 Sub-Project 2 Regional TC - NDT Eddy Currents, Daeduk 17 Oct. - 4 November 10.3 Sub-Project 3 RCM/Co-ordination RVNRL Jinning CPR 1 week 10.4 Sub-Project 2 National TC/UT-2 K.L. 3-15 October 10.5 Sub-Project 2 National TC/RT-2 Bangkok 3-15 Oct. 10.6 Sub-Project 2 National TC/RT-3 Jakarta 10.7 Sub-Project 2 National TC/RT-2 Manila 10.8 Sub-Project 3 National TC/Rad.Chem. K.L. 10-22 October	11.1 Sub-Project 3 Regional TC - Radiation Engineering, Bombay 2 weeks 11.2 Sub-Project 3 National EMS - Rad. Sterilization Med.Prod. Manila, Jakarta 11.3 Sub-Project 2 National TC/ET-2 PAK, 19 Nov.-1 Dec. 11.4 Sub-Project 1 National EMS Tracer Manila 11.5 Sub-Project 4 NCS Minerals - EMS	12.1 Sub-Project 3 Regional TC - Rad. Steril./Materials Bombay, 2 weeks 12.2 Sub-Project 4 Regional TC - Coal Australia 12.3 Sub-Project 3 Regional EMS - Rubber Jakarta
.1 Requirement: Cost: $28 000	8.1 Requirement: Cost: $4 000 8.2 Requirement: Cost: $4 000	9.1 Requirement: Cost: $28 000 9.2 Requirement: Cost: $28 000 9.3 Requirement: Cost: $20 000 9.4 Requirement: No requirement 9.5 Requirement: Japanese Contribution 9.6 Requirement: Japanese Contribution Cost: $4 000 9.7 Requirement: Japanese Contribution	10.1 Requirement: Japanese Contribution Cost: $35 000 10.2 Requirement: Cost: $28 000 10.3 Requirement: Japanese Contribution Cost: $15 000 10.4 Requirement: Cost: $4 000 10.5 Requirement: Japanese Contribution Cost: $4 000 10.6 Requirement: Cost: $4 000 10.7 Requirement: Cost: $4 000 10.8 Requirement: Cost: $4 000	11.1 Requirement: Cost: $28 000 11.2 Requirement: Cost: $15 000 11.3 Requirement: Cost: $4 000 11.4 Requirement: Cost: $15 000 11.5 Requirement: Cost: $15 000	12.1 Requirement: Cost: $28 000 12.2 Requirement: Australian Contrib. 12.3 Requirement: Cost: $28 000

Annex 3

June 1987

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1987

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1.1 Sub-Project 3 R&D Fellowships Jakarta (continued) 1.2 Sub-Project 3 Expert Mission Jakarta, (Makuuchi) January-April	2.1 Sub-Project 3 Expert Advisory Group Meeting on Rubber, Jakarta, 9-11 February 2.2 Sub-Project 3 National Executive Management Seminar Wire/Cable, Calcutta, Seoul, 5-11 February 2.3 Sub-Project 1 Senior Cons. Mission 21 Feb-7 March, China 2.4 Sub-Project 3 Rubber - Cons. Mission (Charlesby), Indonesia	3.1 Sub-Project 3 Expert Advisory Group Meeting - Radiation Curing, Jakarta 16-18 March 3.2 Sub-Project 3 National Executive Management Seminar - Radiation Curing Jakarta, 19-20 March	4.1 Sub-Project 2 3rd Nat. Co-ordinators Meeting, Bangladesh 30 March - 2 April 4.2 Sub-Project 2 National Training Course Pakistan (Gilmour) 12-30 April	5.1 Sub-Project 2 Expert Mission NDT 11 May - 31 December Kuala Lumpur (Gilmour) 5.2 Sub-Project 1/4 Expert Mission Tracer/ NCS (Rao) Jakarta 18 May - 31 December	6.1 Sub-Project 3 Expert Advisory Group Meeting - Wire/Cable Changchun (China) 19-20 June 6.2 Sub-Project 3 Nat. SM-2 TC 15-26 June Sri Lanka
1.1 Requirement: (1986) 1.2 Requirement: Japan Contribution (1986)	2.1 Requirement: Japan Contribution 3 experts Cost: $3 000 (1986) 2.2 Requirement: 4 SSA Cost: $12 000 2.3 Requirement: 2 SSA Cost: $8 800 2.4 Requirement: 1 SSA Cost: $7 250	3.1 Requirement: Cost: $18 000 3.2 Requirement: In connection with 3.1	4.1 Requirement: Cost: $25 000 4.2 Requirement: In connection with 5.2 (expert Gilmour)	5.1 Requirement: 1 SSA Cost: $50 000 5.2 Requirement: 1 SSA Cost: $45 000	6.1 Requirement: 5 SSA Cost: $8 100 6.2 Requirement: SRL/8/011

Amendments (February 1988)

1. Item 7.1 : Carried out 5-18 July 1987
2. Item 8.1 : Carried out 14-25 Sept 1987
3. Item 8.5 : Postponed to January 1988

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1987

June 1987

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
7.1 Sub-Project 4 Expert Mission (Paper) 1m/m	8.1 Sub-Project 4 Expert Mission (Civil Engineering 2 weeks)	9.1 Sub-Project 2 National RT-3 TC India, 14 Sept.-2 Oct.	10.1 Sub-Project 3 Regional Training Course Radiation Sterilization (Microbiological) Bangkok, 5-16 Oct.	11.1 Sub-Project 1 National Seminar Nuclear Technology 17-19 November Malaysia	12.1 Sub-Project 3 Reg. Training Course Radiation Sterilizat. (Materials) Bombay, 30 Nov-11 Dec.
7.2 Sub-Project 2 Nat. UT-1 TC 18 July-13 Aug. BGD	8.2 Sub-Project 2 Regional RT-11 TC India, 10-29 Aug.	9.2 Sub-Project 2 Nat. UT-3 TC 14-25 Sept., Shanghai	10.2 Sub-Project 3 Regional Training Course EB Engineering 19-30 October, Japan	11.2 Sub-Project 2 Nat. RT-2 TC BGD 14 Nov.-10 Dec.	
	8.3 Sub-Project 2 National TC RT-2 Indonesia 3-14 August	9.3 Sub-Project 3 National EMS Radiation Curing Pak., China, Sri Lanka 7-18 September	10.3 Sub-Project 2 Regional SM-II TC Indonesia, 5-23 Oct.	11.3 Sub-Project 2 National TC UT-2 Malaysia, 23 Nov.-5 Dec.	
	8.4 Sub-Project 2 Regional Workshop Special Applications Japan 31 Aug.-4 Sept.	9.4 Sub-Project 2 Regional UT-2 TC Republic of Korea 7-25 September	10.4 Sub-Project 2 Nat. UT-2 TC 19-30 Oct. Philippines	11.4 Sub-Project 2 National TC RT-2 Thailand, 23 Nov.-8 Dec.	
	8.5 Sub-Project 3 Expert Mission RYNRL (Irradiator Design) 3m/m Jakarta (2 weeks)	9.5 Sub-Project 3 Fellowship (Rubber) Takasaki 1 Sept.87 - 31 May 88	10.5 Sub-Project 2 National TC UT-3 Korea, 19-31 Oct.	11.5 Sub-Project 4 Regional TC Paper Thailand, 9-20 Nov.	
	8.6 Sub-Project 3 Expert Mission (Curing) UV lines 3m/m Jakarta	9.6 Sub-Project 4 EMS Coal Australia 24 Sept.-2 Oct.	10.6 Sub-Project 2 National TC RT-3 Pakistan, ~~11-29 Oct.~~ 18 Oct - 4 Nov	11.6 Sub-Project 2 National TC UT-3 Hyderabad, India 23 Nov.-11 Dec.	
		9.7 Sub-Project 4 Nat. EMS - MCS/Steel ROK September	10.7 Sub-Project 2 Nat. RT-2 TC 12-23 Oct. Shanghai		
			10.8 Sub-Project 2 Nat. RT-2 TC 12-23 Oct. Jakarta		
			10.9 Sub-Project 2 Rng. Workshop Qualific. and Certific. NDT pers. 12-16 Oct. Malaysia		
			10.10 Sub-Project 4 Regional EMS-Steel Japan 26-30 Oct.		

7.1 Requirement: Japan Contribution Cost: $8 000	8.1 Requirement: Japan Contribution 2 weeks 2 persons Cost: $10 000	9.1 Requirement: 1 SSA (Baez) Cost: $3 500	10.1 Requirement: Cost: $35 000	11.1 Requirement: 1 SSA (Rao) Cost: $3 000	12.1 Requirement: Cost: $35 000
7.2 Requirement: 1 SSA (Venkataraman) Cost: $3 500	8.2 Requirement: Cost: $32 000	9.2 Requirement: Japan Contribution 1 SSA Cost: $3 000	10.2 Requirement: Japan Contribution 12 participants Cost: $40 000	11.2 Requirement: 1 SSA (Wamorkar) Cost: $3 500	
	8.3 Requirement: Japan Contribution 1 SSA (JPN expert) Cost: $3 000	9.3 Requirement: Cost: $18 000	10.3 Requirement: Cost: $32 000	11.3 Requirement: 1 SSA (Pope) Cost: $3 500	
	8.4 Requirement: Japan Contribution 1 week 15 particip. Cost: $34 000	9.4 Requirement: Cost: $32 000	10.4 Requirement: 1 SSA (Gilmour) Cost: $3 500	11.4 Requirement: 1 SSA Cost: $3 500	
	8.5 Requirement: Japan Contribution Cost: $23 000	9.5 Requirement: Japan Contribution Cost: $15 000	10.5 Requirement: Japan Contribution 1 expert Cost: $3 000	11.5 Requirement: Cost: $32 000	
	8.6 Requirement: Japan Contribution Cost: $23 000	9.6 Requirement: Austr.Contrib.?UNDP Cost: $37 000	10.6 Requirement: 1 SSA (Hahnshaw) Cost: $3 500	11.6 Requirement: 1 SSA (Gilmour) Cost: $3 500	
		9.7 Requirement Cost: $10 000	10.7 Requirement: 1 SSA Cost: $3 500		
			10.8 Requirement: Japan Contribution Cost: $3 000		
			10.9 Requirement: Cost: $32 000		
			10.10 Requirement: Japan Contribution 3 days 10 persons Cost: $17 000		

Radioimmunoassay of Thyroid Related Hormones

Project Officer: R.D. Piyasena

Participant Member States:

Bangladesh, Burma, China, DPR Korea, India, Indonesia, Malaysia, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, Vietnam.

Over 50 laboratories in the above countries are included as user laboratories in the project which continues to enjoy 100% participation from invited member states.

Project Objectives:

The primary objective remains as set out at the inception of the project in 1986; i.e.to transfer the appropriate technology as would decrease costs and increase analytical quality of the radioimmunoassay (RIA) of the thyroid related hormones, T3,T4, and TSH.In a "two stage" approach, the initial emphasis was on the replacement of commercial "kit" methodology by "in house" systems together with the necessary training program designed towards providing familiarity with the analytical techniques,quality control procedures and modern computer based data processing (DP). The second stage stimulates the local production of RIA reagents and aims towards the acheivement of national or regional self sufficiency to a degree that would provide both scientific and economic advantages. The organisation of External Quality Assessment Schemes (EQAS) was also planned to follow,and to be dependent on, the establishment of satisfactory internal quality control (IQC) practises in user laboratories.

Major Activities in 1987:

The project may claim progress on all fronts and the achievement of the objectives set out under Stage 1 to a large extent. By the end of 1987, user laboratories have, a) familiarised themselves with and established the bulk reagent based assays; b) adopted standard RIA practises as insisted upon such as duplicate estimations and attention to IQC; c) introduced a computer based DP system for RIA and IQC results; and, d) made some progress,in many cases,towards indegenisation of reagent supplies.

Under the bulk reagent distribution scheme which was maintained to all countries - (except India and China) - to the end of 1987, approximately 500,000 RIA tubes of reagents were supplied at a cost to the project of about US $ 70,000/-. The reagents being sufficient for at least 160,000 patient specimens, the cost, per patient, works out to less than $0.50 as against a previous figure of $2.25 when commercial "kits" were used and good RIA practise and attention to IQC was seen more in the breach than in the observance. The assays have not only been made less expensive, but also, in most instances, more reliable. It is also clear,from hard data received, that "in house" methodology has resulted in an expansion of the work load and the actual clinical demand in the developing countries towards which the project is directed,is met to a greater extent than before. This is particularly so in the case of TSH where, in some countries, hundreds of patient specimens have been assayed in 1987, compared with none the previous year.

The training programme has also produced satisfactory rewards. The first regional course, held in Bangkok at the end of 1986 at a "train the trainers" level was attended by 17 participants from 12 countries. Nearly a hundred other workers have benefitted through follow up local training activities in their home countries with project asisstance by way of reagents and experts, to end of 1987, and other similar courses are planned for 1988.

Twenty six IBM PC XT compatible computers were distributed to selected laboratories that did not have a computerised DP possibility. In conjunction with this, a notable achievement was the introduction of a new RIA DP software package which will be distributed to user labs.

The project has been closely monitored and close contact with participants maintained also by means of a project newsletter sent out at 6 monthly intervals.

Local reagent production has been stimulated in 1987 to the extent that it now appears feasible that a regional reagent distribution scheme could be organised and regional (and in some cases national) self sufficiency in respect of at least the T3 and T4 reagents realised in 1988.

Proposed Activities for 1988:

The most important is the second meeting of national coordinators, planned for 3-5 February, in Bangkok. The meeting would serve to provide an objective evaluation of project activities and identify newer directions for the future.

The IAEA Project coordinator will carry out a follow up extended laboratory survey of all participant laboratories in order to make a personal assessment of progress made since the original survey in 1986.

Changes in project strategy on completion of Stage 1 will result in the reagent distribution scheme which, largely, has served it's purpose, being considerably run down and most laboratories being required to utilise their own resources to obtain the reagents needed. The Agency, however, will maintain some flexibility in this regard so that genuine economic constraints that may obtain in some cases would not prevent laboratories from continuing with the work initiated by the project.

The new RIA DP computer program will be distributed and any problems attendant upon it"s operation in any laboratory will be dealt with.

Emphasis, in 1988, will shift to the exploitation of the potential created within the region and efforts made to organise regional reagent production and distribution.

Nothwithstanding the above, the project intends, in 1988, to introduce into suitable laboratories some newer and more innovative methodology such as magnetisable particle based separation systems, especially as these now appear to be available from regional sources.

The training programme will continue but will concentrate more on reagent production and the establishment of EQAS on which a regional course is planned for 1988. A suitable computer program will be prepared. Support would be provided, as before, to national training activities.

The project will organise, in 1988, a clinical trial of "A strategy for in vitro thyroid function testing in developing countries" which emerged from a IAEA sponsored Coordinated Research Programme (CRP) which concluded in 1986. The recommendations made will be tested in at least 6 laboratories with good RIA performance and access to clinical material. This research activity will continue for 1 - 2 years, and the selected labs will receive higher priority in the introduction of newer methodology.

A regional training course on "Optimisation of Reagent Production Techniques" is also planned but no date for this has been fixed yet and it may be postponed for 1989.

RDPiyasena/as
1988-01-20

Second Phase of Asian Regional Co-operative Project on Food Irradiation (RPFI Phase II)

Project Officer: Paisan Loaharanu

Participating Member States: Australia, Bangladesh, India, Indonesia, Republic of Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam.

Project Objective: To co-ordinate pilot/commercial scale experiments on specific applications of food irradiation with direct participation of local food industry to facilitate the transfer of the technology. Emphasis will be given to the applications of food irradiation on

(a) disinfestation and decontamination of stored products;
(b) improvement of hygience and storage ability of processed seafood;
(c) insect disinfestation of fruits for quarantine purposes, and
(d) sprout inhibition of onions and potatoes.

Major Activities

1. Second RCM ON RPFI Phase II

The RCM was held at the Nuclear Energy Unit, Prime Minister's Office, Selangor, Malaysia on 5-6 October 1987. Ten participants from nine countries participating in the project attended. Major achievements were made in Bangladesh, Republic of Korea, Malaysia, Pakistan and Thailand where semi-commercial scale irradiation facilities either have been constructed or are being constructed. Effective technology transfer on food irradiation is being made in these countries in view of strong interest by local industry and liberal attitude of health authorities.

2. Third Meeting of the Project Committee of the RPFI Phase II.

The meeting was also held at the Nuclear Energy Unit from 7 to 9 October 1987. The meeting was informed of the reviewed mission consisted of Ms. P. Wills of Australia and Dr. J. Farkas of Hungary who visited Pakistan, Bangladesh, Philippines and Thailand from 6 September to 2 October 1987. The mission noted that all research work carried out under the scope of RPFI Phase II are being made under close collaboration with local industry, health and agricultural authorities. Significant progress has been made towards the establishment of large scale radiation facilities for demonstration or semi-commercial scale radiation treatment of foods. The meeting was also informed of progress on food irradiation in China where 5 large-scale irradiation facilities, mainly for food treatment, have recently been completed. Four more similar facilities are expected to be completed in 1988.

The Project Committee agreed that further collaboration on food irradiation under RCA should be continued as several countries in the region have made significant achievements in this field. The Agency was requested to look for a donor country to continue support activities of RPFI. Future programme on this project should include harmonization of regulations, elimination of international trade barriers, process control, acceptance and identification methods of irradiated food.

Proposed Activities 1988.

1. Third RCM on the RPFI Phase II

This final RCM under Phase II is tentatively planned to be held in Bangkok from 24 to 28 October 1988 in

conjunction with the ASEAN Food Conference scheduled there from 24 to 26 October 1988. The participants would also have an opportunity to visit a semi-commercial scale irradiator which is under construction and is expected to be completed by that time.

2. Fourth Meeting of the Project Committee of the RPFI Phase II

This meeting will be held in conjunction with the RCM stated above. In addition to reviewing the achievements made under the entire duration of RPFI Phase II, the Project Committee should consider the future plan of work under the next phase of RPFI. The Japanese Government has been approached for possible funding activities of the RPFI Phase III which places emphasis on "Process Control and Accptance of Irradiated Food." The role of electron accelerators for food processing will also be evaluated during the next phase of RPFI.

ANNEX 11

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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 RPFI 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 4m/m	34,000 4m/m	36,000 4m/m	
Total	142,000	164,000	171,000	35,000

GRAND TOTAL 512,000

P. Loaharanu/mae/1635
1987-01-20

ANNEX 12

The Administration of RCA Project Committees

1. Project Committees are to be established under Article VI of the Third Extension of the RCA Agreement. The functions of the Committees are:

(a) to determine details for the implementation of each co-operative project in accordance with its objectives;

(b) to establish and amend, as necessary, the portion of the co-operative project to be assigned to each participating Government, subject to the consent of that Government;

(c) to supervise the implementation of the co-operative project; and

(d) to make recommendations to the participating Governments and to the Agency with respect to the co-operative project, and to keep under review the implementation of such recommendations.

2. Ideally, Project Committees should comprise technical specialists from participating governments and should meet on an ad hoc basis, but at least once a year. However the IAEA is unable to fund separate meetings of the Project Committee. In addition, the Agency made a commitment at the 14th Meeting of Representatives, Vienna, 2 October 1986, that the administration of the committees would not place a significant financial burden on Member States.

3. It is therefore agreed that where resources are not available for separate meetings, the Project Committees meet in association with the annual Regional Meeting of Representatives (the RCA Working Group Meeting).

4. At present, delegates review all RCA projects and activities one by one. It is now agreed that separate Committees be constituted by the Working Group Meeting to cover the following project areas.

i) Medical and Biological Applications of Nuclear Techniques;

ii) Food and Agriculture;

iii) Industrial Applications of Isotopes and Radiation Technology;

iv) Nuclear Science and Technology.

The committees would meet consecutively, and elect their own chairman. The chairman would ensure that the Committee fulfilled the functions defined in Article VI (3) of the RCA Agreement. The RCA Co-ordinator would act as Secretary to all Committees. The Committees would formally report to the Working Group under whose auspices they were formed.

Strengthening of Radiation Protection.

Project Officer: P. Strohal

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

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 1987. Detailed plans for this Japanese initiated project were made at a Project Formulation Meeting, Tokyo, November 1987.

Major activities 1988:

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", 5 days during October - November 1988, Tokyo (Japanese funded).

iii) Co-ordinated Research Programme " Setting of Reference Man for non-Caucasions - Compilation of Physiological and Societal Parameters", (Japanese funded).

Details are attached.

ANNEX 14

Quantitative evaluation of nuclear medicine procedures for the diagnosis of liver diseases

Project officer: R. Ganatra

Participating member states:

Bangladesh, India, Japan, Republ. of Korea, Pakistan, Philippines, Thailand, Singapore, Sri Lanka, Vietnam.

Objectives:

The project has two aspects 1) Evaluation of the performance quality of the imaging instruments available in different countries of this region by R.O.C. (Receiver operating characteristics) analysis of images of IAEA/WHO designed transmission liver phantom, 2) Evaluation of interpretations of representative clinical liver images by various physicians of the participating countries on the bais of quantitative scores by R.O.C. analysis.

Major activities:

The third and final Research Coordination Meeting was held in October 1987 at Bangkok. During this programme, 282 evaluations of IAEA/WHO liver phantom images obtained from 93 institutions were analyzed to study the performance characteristics of the imaging instruments available in this region.

79 sets of interpretations for 116 clinical liver images from Japan and 40 sets of interpretations of 177 Asian liver images were analyzed by ROC (Receiver operating characteristics) curve methods through computer based data processing. Most of the countries were adept in picking out space occupying lesions in the liver but showed a marked diagnostic dissonance for diffuse liver diseases.

It is proposed to publish a liver imaging atlas comprising of about 100 images used in the present study.

Achievements of the programme:

i) Evaluation of the performance characteristics of the imaging instruments in this region by a new easily transportable transmission phantom developed by IAEA/WHO.

ii) Analysis of the interpretation of clinical liver images by physicians from different countries was an unique "transboundry" study of the effect of education, experience, disease prevalence and social nuances affecting the diagnostic interpretation of scintigraphic images.

iii) The project also adopted a new set of methods based on ROC analysis for its quantitative comparative computer-based evaluation.

iv) The proposed publication of the liver atlas from this region will also have an unique educational value for physicians using liver scintigraphy as a diagnostic tool, especially as the liver diseases are widely prevalent in most of the participating developing countries of Asia.

Future activities

It is a well known fact that referral for liver imaging is one of the largest in a nuclear medicine centre in a developing country. Most of the centres in the developing countries have usually only one imaging device and a largereferral of liver patients does not leave enough instrument time for other dynamic functional studies which can be done with this imaging instrument. It is a general feeling that some part of the liver imaging can easily be done by ultrasound imaging device thereby sparing the gamma camera for studies which cannot be done by other means.

The present study has shown that nuclear imaging interpretation was unanimously good for SOL in the liver but there was a great deal of diagnostic dissonance during the interpretation of diffuse liver disease. There is an instinctive belief that ultrasound will be as good as the nuclear imaging for the SOL but will be inferior in case of diffuse liver disorders. However, the present study has shown that for the diffuse diseases of the liver the nuclear imaging was also far from the ideal.

Study for objective comparative evaluation of both these modalities in different liver disorders is proposed to be organised by the Agency as a second phase of the present programme. This is by no means a simple task. It would be more challenging and daunting than the work undertaken for the present programme.

RGanatra/la
1988-01-20

ANNEX 15

IMPROVEMENT OF CANCER THERAPY IN ASIAN COUNTRIES BY THE COMBINATION OF TREATMENT BY CONVENTIONAL RADIATION AND PHYSICAL OR CHEMICAL MEANS

Project Officer: Y. Skoropad

Participating Member States: India, Japan, Thailand. A project from Pakistan failed to start because of the delay by the national authorities in purchasing hyperthermia equipment and was terminated in 1985. A project from Singapore was terminated in 1985 due to the difficulties in building up clinical material which resulted in very slow progress. A project from Sri Lanka was terminated in 1986 because of the death of the Chief Scientific Investigator. A project from Malaysia was terminated in 1987 because of the retirement of the Chief Scientific Investigator and the inability of his successor to attend the final research co-ordination meeting (RCM).

Project objectives: The programme aimed at clinical and radiobiological studies on the combination of conventional radiotherapy with chemical radio-modifiers and hyperthermia and was expected to improve the radiation therapy techniques especially in developing countries of South-east Asia and the Pacific region, and enrich the research skill of the scientists from the countries participating.

Major activities in 1987: Three agreement holders and two contractors completed their investigations according to the plans adopted. The project from Malaysia (Chief Scientific Investigator Dr. P. Singh) was successfully approaching its completion, but at the last moment Dr. P. Singh retired and neither he nor his successor could attend the final RCM and contribute to the final report to the IAEA. On the part of the Agency all was done (official letter of invitation was sent and air tickets and per diem arrangements made) to enable Dr. Lopez, who is Dr. Singh's successor, to attend the RCM, but he did not come. Therefore, the results of the investigations under the Malaysian project, which would have been very valuable for the results of the co-ordinated research programme (CRP), have not been reflected in the final report to the Agency and Malaysia has not been listed as a contributor.

From 23 to 26 November 1987 the final RCM was held at the Cancer Institute, Madras, India. It was the third RCM and the first two were held in Kyoto, Japan, from 12 to 15 December 1983, and in Vienna, Austria, from 1 to 5 September 1986.

Five participants and two observers discussed results of the investigations which were done from 1982 to 1987. It was stressed that the CRP was a very important tool towards achieving the goals of the study in a manner relevant to the needs of the developing countries participating in the Agency's CRP. Hyperthermia, hypoxic cell radiosensitizers in combination with radiation and chemotherapy, chemical sensitizers and sensitizers of hyperthermic response, comprised the main attempts in this direction under the present CRP.

A new CRP on a multimodal approach in treatment of uterine cancer using computerized dosimetry, which is planned to start in 1989, was discussed at the meeting and supported by the participants. Prof. Y. Onoyama, Department of Radiology, Osaka City University Medical School, Japan, strongly supported the new CRP and gave valuable recommendations on its design and implementation. Prof. T. Sugahara, Health Research Foundation, Kyoto, Japan, drew the attention of the participants to the necessity of studying Asian traditional medicines as chemical sensitizers for radiotherapy in Asian countries. This suggestion seems to be interesting from a scientific point of view, but requires a comprehensive preliminary study before being recommended for clinical trials. This sort of study (pharmacokinetics, toxicity, etc.) does not seem to be within the purview of an Agency activity.

Proposed activities in 1987: A consultants' meeting on a new CRP on a multimodal approach to treatment of uterine cancer using computerized dosimetry might be held during 1988 in Japan if funds are available. The goals of the meeting might be to discuss a treatment protocol and to design the new CRP.

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ANNEX 16

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

Project officer: R. Ganatra

Participating countries:

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

Project description:

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 Bhabha Atomic Research Centre of India has agreed to provide 12 instruments free of cost to the Agency for trial in the RCA countries. The Agency has formulated a Coordinated Research Programme on this theme and the above mentioned countries are participating in this programme.

A workshop was organised in November 1987 in Bombay. The technical specifications of BARC equipment were explained in detail to all the participants. Actual clinical use of this apparatus was demonstrated and each participant was given an opportunity to try out the apparatus by himself.

Future activities

Each participant is expected to receive the aerosol generator from India in the near future. Each is expected to study at least 50 patients of COPD in the coming year and report on the diagnostic usefulness of this technique. If the Indian experience is validated by others, a wide scale trial of the use of this equipment in different lung diseases will be considered.

RGanatra/la
1988-01-20

Development of 99mTc 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 Australia	CF/3381
Dr. R.S. Mani India	CF/3382
Dr. A. Hanafiah Ws. Indonesia	RC/3412
Dr. P. Prakongvong Thailand	RC/3413
Dr. Le Van So Viet Nam	RC/4337

Project description: The aim of this CRP is to develop an appropriate technology for the preparation of ^{99m}Tc generator systems using medium to low specific activity (n,γ)-produced ^{99}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}Mo $(n,\gamma)^{99}Mo$ 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}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 $(n,\gamma)^{99}Mo$ with performance characteristics similar to the fission ^{99}Mo-based chromatographic generator.

- Thorough quality control tests through detailed investigations of the parameters indicative of the generator performance.

Major Activities (1987):

- With the purpose to test further the low temperature sublimation generator developed in Hungary under the auspices of Research Contract No. 3361, an international independent evaluation of the generator performance was initiated by providing to several laboratories (India, Indonesia, Pakistan and Viet Nam) with a generator prototype.

- The results of this limited evaluation showed that the system still needs further development before it could be fully endorsed for use in the hospital. Work will continue as indicated below.

- A second research co-ordination meeting was held in Bandung, October 1987. This was a joint meeting between the European and Asian subgroups of the CRP. The CRP has produced results which are both scientifically significant and offer a promise of practical applications in the near future. In this regard the progress of the CRP may be regarded as being successful.

- The "gel generator" and the "low temperature sublimation generator" both of which are being developed under the auspices of this CRP, promise long term solutions to the difficulties existing in developing coutries of a reliable supply of ^{99m}Tc for medical use. The development of these technologies is not complete and their full potentials have to be further assessed. It is estimated that another 2 to 3 years would be needed to enable the participating groups to complete their work so that generators which can be operated in hospital radiopharmacies can be standardised.

- During the meeting it was unanimously agreed that the potential benefits to countries possessing only low flux reactors should be realistically viewed by the IAEA as a justification for supporting the notion, proposed by the participants, that the CRP be continued for a further 2 years in order to resolve the remaining technical and practical questions that have come to light during the last two years of research.

Major activities proposed for 1988:

- Continuation of the CRP for two more years. The research in the extension period will focus exclusively along the lines of the "low temperature sublimation generator" and "gel generator".

- Continuation of the international evaluation of the "low temperature sublimation generator".

- A regional training course will be organized at the Bhabha Atomic Research Center on Radioisotope Production in Research Reactors. Several aspects related to the development of the ^{99m}Tc generator systems investigated and developed under the CRP, will be reviewed.

NUCLEAR TECHNIQUES FOR TOXIC ELEMENTS IN FOODSTUFFS

Project Officer:

E. Cortes Toro

Participating Member States:

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

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

Project Objectives:

The purpose of the CRP is to obtain comparative data on existing elemental concentrations of potentially toxic elements in foodstuffs consumed by representative population groups in each of the countries concerned. The elements of interest include the potentially most toxic trace elements (As, Cd, Hg, Pb, Se) as well as some others of interest in national food monitoring programmes, (e.g. Br, Cr, Cu, Fe, I, Mn, Sb, Tl, and Zn) and some radionuclides. Nuclear analytical techniques, such as neutron activation analysis (NAA), are used for the determination of these elements, supplemented by non-nuclear techniques when necessary.

The data collected are being 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 in a better position to offer analytical quality control services, and to provide validation support, for their own national food monitoring programmes.

Major Activities 1987:

All existing research contracts and agreements were renewed. 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. A quality control exercise was carried out by means of three "blind" intercomparison samples. The results are still being evaluated.

Major Activities 1988:

Further quality control exercises will be performed. The second Research Co-ordination Meeting will take place in Beijing, People's Republic of China, from 19-22 April 1988.

ANNEX 19

Immunodiagnosis of Tuberculosis

Project Officer: J.B. Castelino

Participating Member States: India, Thailand (USA)

Project Objective: To develop a rapid, sensitive and specific diagnostic test for tuberculous meningitis for use at nuclear medicine centres (1987-88); to establish the selected system at other nuclear medicine centres in the Asia and Pacific Region (1989-91).

Major Activities 1987: The work plan format completed. This initially involves collection of cerebrospinal fluid (CSF) samples by the participants and the despatch of these to the Radiopharmaceutical Department of BARC, Trombay, where they will be coded and redistributed for assay and the results processed.

Major Activities 1988: The distribution of Coded CSF samples is scheduled in March. A RCM will be held at Bombay in November to review the results and select a suitable assay system for establishment at other centres.

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1988-01-22

ANNEX 20

CRP on radiation sterilization practices for tissue grafts in clinical use for Asia and the Pacific Region (RCA activity).

1. Project Officer: R.N. Mukherjee, RILS

2. Participating Member States: In the CRP are currently participating a total of twelve investigators, including one representative each from the ten RCA Member States and two non-RCA Member States (Burma and the United Kingdom) providing advanced relevant technical input and support services on specified aspects of the CRP topics. The currently participating RCA countries are: Australia, Bangladesh, China, India, Indonesia, South Korea, Pakistan, Philippines, Sri Lanka and Thailand. The earlier participation of Vietnam has now discontinued due to the lack of submission of a due progress report and formal application for contract renewal. It is, however, expected that the participation of Vietnam in this RCA CRP will be revived in the future, along with some other RCA countries not included so far.

3. Project Objectives: The overall broad objective of the CRP is to help upgrade the standard of health and of health-care services in the RCA countries through (i) a promotion of local "low-cost" availability of radiation-sterilized non-viable tissue allografts in great demand by the surgeons for diverse types of transplantation interventions in corrective and rehabilitative surgery on patients (grafts are currently imported against hard currencies); (ii) minimizing or eliminating as far as possible the attendant risks of debilitating and wasteful cross-infectious (nosocomial) diseases of patients clinically receiving such tissue graft transplants; (iii) improving local skill and capability under the scope of the existing national radiation sterilization technology for medical disposables by adding newer categories of health-care items, such as non-viable biological tissues procured as an indigenous resource, and setting up tissue banking of grafts; and (iv) fostering relevant technical information dissemination and co-ordination among the involved parties (e.g. medical personnel as end-users; awareness of the general public as tissue donors and graft recipients), encouraging biomedical researchers to develop locally-suited sterilization techniques and processes for tissue allografts and the national regulatory authorities to enforce sterility quality control criteria and clinical safety of the sterilized tissue allografts, to derive optimal regional and national health welfare returns for the RCA Member States.

4. Major Activities in 1987: The major programme implementation areas and actions during the past project year are listed below:

(a) Research on the radiation microbiological characterization of the tissue allografts for a validated radiation sterilization process carried out, reported and co-ordinated between the twelve investigating institutes under the CRP, including ten RCA Member States (as enumerated in item 3) Data will be reviewed in the forthcoming research co-ordination meeting (RCM) in China in 1988.

(b) Radiation effects on biomolecular components of specified tissues analysed, using relevant methods of radiobiology, radiation chemistry and analytical procedures. In order to preserve the allografts' clinically-significant features, research data were generated under the

CRP using radioisotopically-labelled residues; immunological status (mixed lymphocyte culture or MLC techniques); animal model experiments and radiographic studies for graft-based wound healing as applicable on tissue types (e.g. osteogenesis for bone allografts).

(c) Relatively advanced research centres in the RCA region having established capabilities for sterile allograft preparation freely provided samples of tissue allografts to the other lesser-advanced institutes of this RCA CRP to facilitate their own tissue graft radiation sterilization process development, research and standardization through sharing of technical expertise and experiences.

(d) Types of radiation-sterilized tissue allografts as developed and clinically tested in the health centres of the RCA countries include a wide range such as bone for osteogenic induction in losses due to TB, neoplasia and fractures (crushed and chips of cortical and cancellous bones); chorion amnion and dead cadavaric skin as burn wound dressing; cartilage, fascia lata, duramater, as stabilizing membrane scaffolds in various reparative surgery; nerve grafts in repairing peripheral sensory losses (e.g. lepromatous diseases and from traumatic accidents) and to a limited extent tricuspid heart-valve grafts from pig and human sources in animal model trial studies, so far.

(e) Even those RCA Member States having socio-religious restrictions (such as in the Islamic religion) have made excellent contributions through their successful efforts in the development and clinical application of radiation-sterilized chorion-amnion grafts as burn wound dressings which are in major demand (collected from childbirth cases in the Gynaecology and Obstetrics departments). The results achieved in Indonesia and Pakistan from hundreds of grafts in this field are commendable.

(f) Encouraging results have also been achieved by the CRP in the regional technical co-operation promotion of RCA countries in need. Trainees from the Philippines have been hosted in Thailand (the tissue bank in Bangkok) and three trainees from Sri Lanka and Bangladesh respectively have been hosted at the Clwyd research tissue bank in the United Kingdom which is one of the RCA CRP participants.

(g) A training course on the topic of tissue graft radiation sterilization for clinical applications, supported by the TC regular programme, is planned to be held in China during 1988, subject to approval by the Agency. In anticipation some necessary organizational matters have already been informally reviewed and acted upon between the Chinese host institute participating in the RCA CRP and the responsible Agency technical department.

5. Proposed activities in 1988: The following activities should comprise the 1988 programme of this RCA component:

(a) Continuation of radiation research and development activities relating to the local capability development in radiation-sterilized tissue allografts and their necessary physical, chemical and mechanical assessments as required to preserve the essential graft biogenic qualities involved. This should be covered by the work of the research contracts and agreements of the RCA CRP.

(b) Results achieved to date under the CRP will be reviewed, co-ordinated and disseminated through a Research Co-ordination Meeting (RCM) scheduled to be held in China in 1988. Preparations are underway satisfactorily.

(c) The RCM may coincide with the TC-sponsored RCA training course, if approved and held in China, to help impart added mutual benefits for the attainment of health and welfare goals for all the RCA Member States.

(d) Radiation chemistry studies should cover the necessary aspects of the regional needs for assessment of the locally-available plastic polymer formulations to satisfactorily provide the packaging materials for tissue allografts to be sterilized by radiation.

(e) Video films will be produced on the details of tissue procurement, the radiation sterilization process for tissue grafts and their clinical uses at the advanced tissue banks of the RCA countries.

RMukherjee/dw
1988-01-21

ANNEX 21

Proposal of a Coordinated Research Programme on "Research and development in the methods for basic care, preventive maintenance and operative control of nuclear medicine equipment in Asia"

1. INTRODUCTION

Control and maintenance of nuclear medical equipment in Asian countries has been managed in the framework of different projects: Coordinated Research Programme, national Technical Cooperation and interregional projects. A good coordination among the projects is essential for good results.

The previous CRP, recently concluded, was concentrated on power supply and air conditioning. The new proposed CRP will be concentrated on finding solutions to the following problems:

- inventory control
- protocols for preventive maintenance
- faults detection and limited spare parts supply.

An innovation is that the new CRP will involve mainly hospitals while the previous one was directed towards national nuclear research centres.

2. Background and Analysis of actual situation

The analysis of the status of equipment provided by the Agency or generally in use in developing countries are affected by the symptom of inadequate management namely:

- the basic equipment is in need of simple repair
- poor performance of equipment which is in use
- mis-use of equipment
- lack of any maintenance
- unsuitable environment
- inappropriate equipment
- inoperative equipment because of
    - (a) manufacturer's fault
    - (b) damage in transit
    - (c) damage at the customs
    - (d) lack of user experience
    - (e) lack of essential parts and accessories.

Waiting for a service agent is often ineffective because there are no sources of commercial servicing. But very often defects are simple and could be put right easily and cheaply.

A different and more effective approach would be that the bulk of the work should be done by less technically qualified staff, with only a small number of other staff who possess the higher qualification and expertise needed to manage the equipment. The technicians who are themselves users of equipment, can be trained in maintaining, and controlling procedures and checking environmental conditions. This last point is not least of importance, for good use of equipment appropriate conditions have to be

assured when the equipment is installed. If not done, this would be the first point to deal with. Assumed that the problem of the power supply and air conditioning have been "solved" at least in the laboratories included in previous research contracts with the Agency, the suggestion now made is to move to a second step of maintenance on equipment with particular attention to nuclear medical equipment operating in hospitals.

Computers for organizing maintenance and keeping up to date data concerning equipment have already been provided to the institutes included in the previous contracts. Its use can be improved with particular attention paid to medical equipment.

3. Scope of the proposed programme

Considering the background and the level reached, the next proposed goal is a strong intervention relating to equipment working in hospitals.

The steps to follow are:

- Completion and updating of the inventory of equipment provided under previous programmes (implementation of the use of computer facilities already provided);
- Formulation of preventive maintenance protocols to be followed by the technicians utilizing the equipment;
- Identification of minor breakdowns and cause of problems;
- Organization of maintenance provided by central laboratories (Atomic Research Centres or others);
- Better arrangement in the availability of very simple spare parts and electronic components needed.

The main element will be the improvement of maintenance and operational control of equipment and of environmental conditions at the level of hospitals and users of equipment. Connections with central laboratories must be confirmed and improved too, but better technical knowledge of users can solve many simple problems and get better quality in results.

Courses at the level of technicians in hospitals should be organized.

Collaboration among different projects of the IAEA dealing with medical aspects is foreseen, in particular as regards physics, quality control, dosimetry and radiation protection, since often the same hospital staff have to deal with all these problems.

The collaboration with other UN organizations dealing with the subject is very important in particular with WHO and UNIDO.

4. Participating institutes

The suggestion is to circulate this proposal to Atomic Research Centres and to some of the main hospitals and universities in Asian countries.

5. Action Plan

The following items must be taken up at the beginning:

- Prepare inventory of equipment including basic technical information on each of them with workload;
- List of persons in charge of controlling and maintaining equipment;
- Basic inventory of spare parts and tools necessary for preventive maintenance procedures.

Computers could be used as mentioned in paragraph 2.

6. Estimated Budget

The total duration will be three years. Eight proposals for contracts are expected.

US$5,000 for each institute accepted, per year is requested.

At least two research coordination meetings are foreseen during the duration of the programme. US$ 15,000 are necessary for each RCM.

7. Action requested to the Committee

The committee is asked to approve this proposed programme in prinicple and to consider proposals for research contracts from individual institutions. A provisional list of centres to which the proposal will be sent is attached.

NUCLEAR INSTRUMENT MAINTENANCE (RAS/4/008) G101 New

YEAR	Experts m/m	Experts CC$	Equipment CC$	Equipment NCC$	Fellowships m/m	Fellowships CC$	Group Training CC$	Subcontracts CC$	Subcontracts NCC$	Total CC$	Total NCC$	GRAND TOTAL
1988	7	50,400	15,000	0	0	0	0	0	0	65,400	0	65,400

Nuclear energy activities rely extensively on the use of electronic equipment for the detection of radiation and the processing of information obtained from electronic instruments. Within the framework of the Agency's technical co-operation programme, much equipment in support of nuclear activities has been provided to developing RCA Member States. In view of this fact, and the importance of properly functioning instruments for the execution of nuclear programmes, there is a need to ensure that a local capability exists for the maintenance and repair of equipment. The objective of this multi-year project is to strengthen infrastructures in nuclear instrument maintenance and repair through national and regional training efforts and to establish a modality for responding to urgent requests in connection with maintenance support which cannot be met from project budgets.

For 1988, the Agency is to make available expert services in instrument maintenance and repair and to establish a limited supply of spare parts. Co-ordinators in the participating countries will be invited to arrange national training activities which could be supported by Agency experts.

The project is seen as strengthening infrastructures in nuclear instrument maintenance and repair, furthering technical co-operation among developing countries by encouraging more advanced "resource" facilities to assist sister institutions in less advanced countries and promoting the safe and efficient application of nuclear techniques in the region of Asia and the Pacific.

ANNEX 22

Use of Computers in Technetium -99m Imaging

Project Officer: G. Van Herk

Project Description:

The aim of the project is to improve the quality of nuclear medicine practice by upgrading the technology and thereby increasing the diagnostic skills of nuclear medicine physicians in each country. The immediate objectives are:

a) to demonstrate and encourage more effective use of gamma camera/computer configurations already existing in hospitals within the Region;

b) to provide advanced training in the clinical applications of technetium -99m imaging as a diagnostic tool;

c) to provide an understanding of the value of technetium-99m imaging when used with a gamma camera/computer configuration; and

d) to demonstrate the diagnostic value and sensitivity of the gamma camera in making more accurate determinations of many disease processes in the vital organs and tissues of the body.

The project will be implemented through a programme of training courses, attachments and demonstrations.

ANNEX 23

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 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 - 1987:

(1) The 2nd Research Coordination Meeting was held at the Casuarina Hotel, Penang, Malaysia from 24-28 August. Fourteen Research Contract holders and six Research Agreement holders from 10 countries attended the meeting. The meeting was opened by the Hon. Deputy Minister of Education, Dr. Michael Toyat while the Vice-Chancellor, University Pertanian Malaysia, welcomed the participants.

At the end of 21 scientific paper presentations, group discussions were held to draft conclusions and recommendations for future research and prepare work plans for each individual contract holder to cover approximately 15-18 months, the period until the final RCM. The general consensus was that while the over all goals of the Coordinated Research peogramme remain in principle, as specified in the original programme proposals, future studies should continue to have an interdisciplinary approach within which disciplinary research in the areas of nutrition, reproduction and herd health could be accommodated. It was strongly felt that the emphasis should be on field-oriented research that has a potential for adoption by farm holders within the existing socio-economic structure.

(2) All fourteen research contracts and six research agreements were renewed during 1987.

Proposed activities - 1988:

(1) All contracts and agreements are due for the final renewal in 1988.

(2) The final Research Coordination Meeting is envisaged in early 1989 when the achievements of the Phase II would be published as a Panel Proceedings series of the IAEA. The host country for the Final RCM has not yet been identified.

ANNEX 24

Improvement of grain legume production in Asia

Project Officer: A. Micke

Participating Member States:

Bangladesh, India, Indonesia, Rep. of Korea, Malaysia, Pakistan, The Philippines, Sri Lanka, Thailand

Project Objectives:

The project was established in 1977 to promote the use of induced mutation techniques for developing improved cultivars of the various grain legume species that are important in the Region. In the meantime, we noted 10 cultivars of groundnut, 5 of pigeon pea, 6 of chickpea, 1 of hyazinth bean, 17 of soybean, 1 of lentil, 2 of lupine, 1 of common bean, 1 of pea, 1 of azuki bean, 2 of black gram, 6 of mungbean and 5 of cowpea, all developed by using induced mutations.

Project Status:

The research contracts under the project were terminated in 1986, some activities were supported further under IAEA TC Project RAS/5/015. The proceedings of the final research co-ordination meeting held in 1986, including a global review by the Project Officer on the use of induced mutations for grain legume improvement, are in press by IAEA and will be available to Member States in 1988.

SEMI-DWARF MUTANTS FOR RICE IMPROVEMENT IN ASIA AND THE PACIFIC REGION

Project Officer: M. Maluszynski

Participating Member States:
Bangladesh, India, Indonesia, Malaysia, Pakistan, The Philippines, Republic of Korea

Project objectives:

The Co-ordinated Research Programme was established to identify and make available by mutation breeding new sources of semi-dwarf plant type for lodging resistance in rice. Such sources would open possibilities for varietal improvement beyond the limits set by the presently used gene sources. To also make available in improved genotypes other desirable mutant genes such as those relating to earliness, plant architecture and resistance to various stress factors.

Project status:

This project has been completed. The final RCM was held in Hangzhou, People's Republic of China, July 1987. Breeders from participating Member States took part in this meeting and presented final reports which will be published in the TECDOC series of the Agency publications. This document should be available for breeders of participating Member States before September 1988.

ANNEX 26

RCA proposal 3129G:kw

Integrated Control of Tropical Plant Viruses with Nuclear Techniques

Project officer: N. MURATA

Background:

Plant diseases caused by viruses (and viroids) are prevalent in the tropics where (the vegetation and fauna are complex and) viruses and their insect vectors can survive all year round.

Take rice and legumes - both major crops in this region: (a) tungro virus, grassy stunt virus, ragged stunt virus, Penyakit merah, gall dwarf virus, yellow orange leaf virus, and transitory yellowing virus have been recognized as vicious pathogens of rice in Nepal, India, Indonesia, Malaysia and Thailand; (b) soybean mosaic virus, tobacco ring spot virus, yellow mosaic virus, soybean dwarf virus, bean yellow mosaic virus, soybean yellow mosaic virus, cowpea mild mottle virus, peanut mottle virus, black eye cowpea mosaic virus, cowpea stunt virus, clitoria yellow vein virus, Indonesian soybean dwarf virus, peanut mottle virus, mungbean yellow mosaic virus, and black gram mottle virus, have been found to affect the various leguminous crops.

In fruit trees, papaya ring spot is causing severe damage in some locations while citrus tristeza virus is a rather global problem. Other vegetatively propagated crops such as sugar cane also have problems, mosaic virus, etc.

Many of the pathogenic agents have not been well characterized. Some of the viruses have strains with different virulence, some show different interference (mutual inhibition) behaviours, some may cause more severe symptoms by synergism of two or more viruses.

Viruses are primarily a complex of nucleic acids (mostly RNA in plant viruses) and proteins, their study therefore needs approach with molecular biological tools. These techniques (which utilize radioisotopes in some crucial steps) are not yet readily available in many developing countries. Recently further innovative techiques, again using radioisotopes, have been developed in countries with advanced technical background: Identification of viruses with cDNMA probes is one example. Cross protection using mutated viruses is also among new developments.

Full control of plant viruses needs integrated measures. Identification of virus free stocks production and cross protection must be advanced together with breeding of crops for resistance in which mutation induction may also play an important role.

Objectives:

Circumstances described above lead us to propose a regional research and development programme directed to problems in Asia and the Pacific region. The programme objective is to promote the technology transfer and co-operative research among developing countries in this region to improve the measures of integrated control of plant viruses including the use of

nuclear techniques. Technology transfer will be undertaken by selective training, the provision of expert assistance and the support of appropriate fellowships. Components of the proposed research programme (subject to the adoption by the participating countries) may be as follows:

1. Identification of plant viruses and development of probes using nuclear techniques.
   After purification and careful characterization of the viruses, efficient probes for their identification will be parepared. The major tools will be
   (1) monoclonal antibodies for ELISA tests, and
   (2) cDNA probes.

2. Assay of plant viruses with radioisotope-labelled probes.
   The cDNA probes will be used for assaying the viruses in plant cells propagated in vitro or in vivo with or without inoculation. The technique will be applied to:
   (1) Cells in micropropagation, and
   (2) Populations of plants in the breeding programmes for improving virus resistance.

3. Cross protection.
   Mild-virulence strains of viruses will be induced from local strains and efficient cross-protecting strains will be selected. They will be characterized carefully for "safe and efficient" use. The steps of studies will be:
   (1) induction of mild virulent strains,
   (2) characterization of mild strains (including sequence analysis) and
   (3) testing effectiveness in cross protection.

4. Mutation breeding for virus resistance.
   Focussing on some specific crops, mutation breeding for virus resistance will be preformed. Special consideration will be given to the methods for:
   (1) Mutagenesis and handling of progenies
   (2) Screening for virus resistance.

Implementation: If approved, the project will be implemented through the Regional Co-operation Agreement.

ANNEX 27

ISOTOPE APPLICATIONS IN HYDROLOGY AND SEDIMENTOLOGY

Project Officer: Y. Yurtsever

Participating Member States: Australia, Bangladesh, Indonesia, Republic of Korea, Malaysia, Philippines, Sri Lanka, Thailand.

Project Description: The project has the overall objective of introducing and/or strengthening the capability of using environmental isotope applications in hydrology in the region. A number of field applications with environmental isotopes, both in hydrology and in sedimentology, have been undertaken within a Co-ordinated Research Programme. Low-level tritium counting facilities have been established in most of the countries involved in the programme.

Major Activities (1987): Most of the applied field investigations dealing with various hydrological problems are completed and overall data and results obtained have been compiled into final reports by a number of institutions. Advisory services on interpretation and evaluation of isotope data were provided to several countries in the region. A consultant mission for the purpose of a final review and check on the performance of analytical facilities established for low-level counting systems (for tritium) have been carried out in several Member States. Two consecutive meetings, entitled "An Executive Management Seminar on Isotope Techniques in Water Resources Development' and 'Workshop on Isotope Hydrology for Asia and Pacific' were held in Beijing, P.R. of China, from 15 to 26 June 1987 as a final activity within the scope of this project. The meetings provided a forum of discussions for overall presentations and a review of the results obtained from isotope field applications carried out, and for an exchange of experience among the participating Member States.

Major Activity Proposed for 1988: A publication compiling all the technical papers and working documents presented during the above-cited two meetings is envisaged to be made during 1988 by the 'Beijing Research Institute of Uranium Geology', with a financial contribution from the IAEA.

PROPOSAL FOR A REGIONAL PROJECT IN ASIA AND PACIFIC ON INTEGRATED USE OF ISOTOPE TECHNIQUES IN WATER RESOURCES

Background

A wide spectrum of hydrological problems encountered in the overall domain of water resources assessment, development and management often requires an integrated approach to achieve technically and economically feasible solutions.Continiuosly increasing demand of water for domestic,industrial and irrigation uses necessitates new resources to be developed adequately both interms of quantity and quality.Along with the development activities already undertaken in most of the Countries in the Region,easily accessible and available resources are being exhausted,necessitating use of water from more complex alternative sources involving difficult hydrological features.Furthermore, every development scheme,regardless of surface or groundwater sources,imposes additional hydrological constraints that requires careful investigations and engineering design to achieve a proper long-term management starategies.

The RCA programme in "Isotope Applications in Hydrology and Sedimentology" which was executed by the IAEA through the financial support provided by the Australian Government,during the period of 1980-1987, has already provided substantial impact on acquiring required capabilities in using isotope methodologies.Analytical capabilities for isotope applications (at least partly) in hydrology now exists in several Member States (India,Indonesia,P.R.of China,Pakistan,R.of Korea,Sri Lanka,Thailand) in the region.Number of field research on hydrological problems of highest priority were initiated in all the participating Countries which were supported from this programme.

This RCA programme is now concluded and two consecutive meetings marking the end of the project were held during June-1987 (in Beijing,P.R. of China).The overall results and achievements of the project were reviewed, discussed and elaborated.These meetings have also provided a forum of discussions on the future needs and requirements of the Member States as related to isotope applications envisaged within the scope of their future long-term activities in water resources sector.

As a result of these detailed deliberations,all of the Member States represented in the above cited meetings,have expressed the significant role isotope applications can play in solving practical hydrological problems encountered in water resources activities and the continued need for such a regional project to achieve the full impetus of the nuclear techniques through a cooperative effort in acquiring full capabilities in terms of trained man-power and complementary analytical fascilities.This proposal is, therefore, a follow-up to the already completed RCA programme in the Asia and Pacific Region to achieve the full scale technology transfer

in isotope applications in Hydrology and Sedimentology as an integral part of the investigations related to water resources assessment,development and management.

Scope and Objectives

The main objective of the proposal is to promote the technology transfer to the Member States in the Asia and Pacific Region for acquiring capabilities for routine applications of both artificial tracing and environmental isotope applications as an integral part of the hydrological and hydrogeological activities regularly being undertaken within the scope of the national programmes related to water resources.

The programme will give emphasis on the achievement of more efficient and closer link between the local expertise on isotope applications and the end-user institutions(those responsible in water resources activities) in each Country.It will provide on-the-job training through the applied field investigations on selected hydrological problems of specific interest to each participating Country.

Some of the major hydrological fields where isotope applications are most needed for the future programmes related to water resources (as delineated in the above cited meetings),from the end-users point of view, are as follows:

1) Isotope field applications related to origin,replenishment and regional flow characteristics of major groundwater basins.
2) Study of water and soil salinization processes.
   i)Sea water intrusion problems encountered in coastal aquifer systems,
   ii)Water salinization and water logging problems in irrigated areas.
3)Studies related to river water-groundwater hydraulic relationships as a basis for conjunctive use of surface and groundwater resources,
4)In-situ determination of aquifer characteristics as a basis for hydrology of waste-disposal sites,
5)Isotope applications in studies related to origin and circulation patterns of geo-thermal waters,
6)Study of sediment transport,erosion and sedimentation processes with the aid of isotope applications.

Furthermore the isotopic studies conducted in various urban regions have already proved very successful and similar studies concerning urban isotope hydrology at selected metropolitan areas are considered to be very desirable.

The regional project will be designed to include isotope field applications on selected specific areas in each Country to be conducted with the co-operation of the local water authorities and the isotope hydrology groups that are usually attached to national atomic energy establishments.The programme will include training activities along with the applied work and expert support will be provided as deemed necessary.Strengthening of the presently available analytical facilities with additional equipment,as appropriate,will be undertaken.

Work Plan

The project is envisaged to be of 4-years duration, starting in 1989.

1989: a) Preperatory missions to delineate and select specific problems and the scope of field investigations.

b) Planning Meeting to prepare detailed work plan and programme of implementation.

c) Compilation of available basic hydrological data on selected project areas.

1990: a) Field data collection, analyses of samples, evaluation of isotope and hydrological data.

b) Itinerant Training Course on Isotope Hydrology.

c) Provision of expert assistance and fellowships

1991: a) Project co-ordination meeting to review the results obtained and planning of future required field work.

b) Continiuation of field data collection, analyses of samples, evaluation of results.

c) Itinerant Training Course on Isotope Hydrology.

d) Provision of expert assistance.

1992: a) Continuation of field data collection, analyses of samples and evaluation of results.

b) Provision of expert assistance for overall final interpretations and evaluations.

c) Workshop on Isotope Hydrology to discuss the final results of isotope field applications.

Budget Estimates:

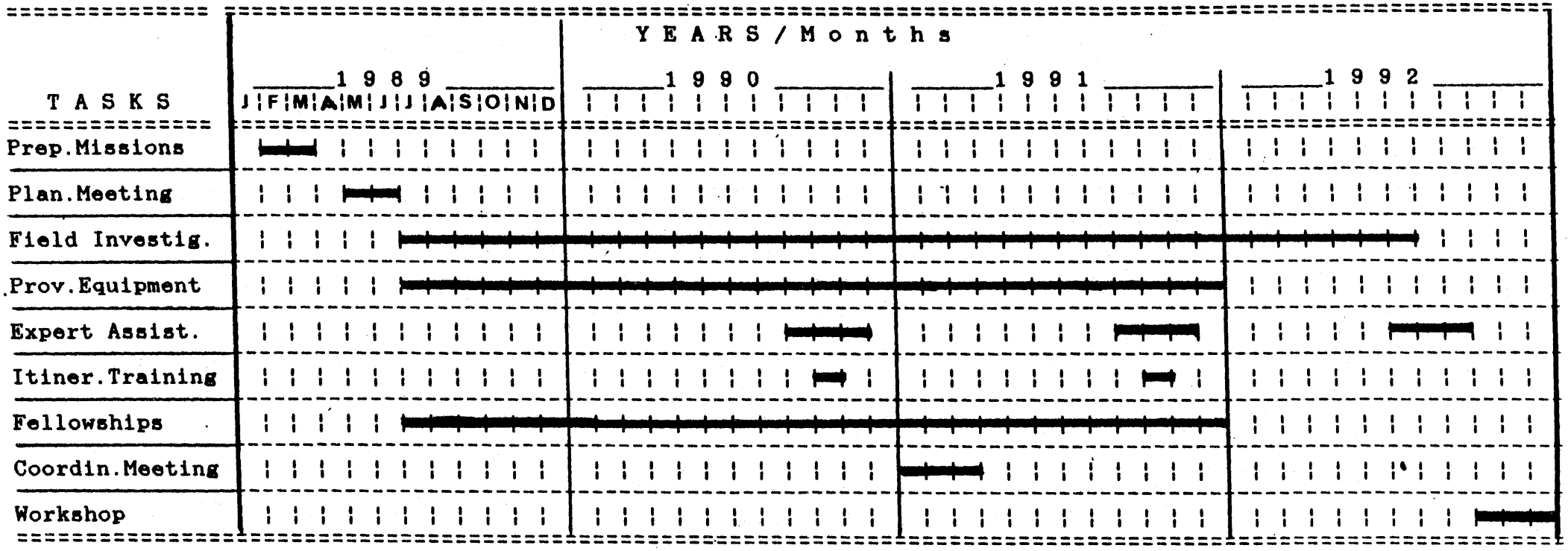
1989:	Preperatory missions. (1 m/m)	$ 10,000
	Planning Meeting	$ 20,000
	Equipment	$ 50,000
	Total	$ 80,000

1990:	Itinerant Training Course.....	$	30,000
	Equipment and analytical ser.	$	30,000
	Expert Services (3 m/m).....	$	25,000
	Fellowships	$	18,000
	Total	$	103,000

1991:	Project coordination meeting	$	30,000
	Itinerant Training Course	$	30,000
	Expert asisstance(3 m/m)	$	25,000
	Fellowships	$	18,000
	Total	$	103,000

1992:	Expert assistance (3 m/m)	$	25,000
	Workshop on Isotope Hydrology (Regional).....	$	40,000
	Total	$	65,000

PLAN OF IMPLEMENTATION



New Project Proposal: Use of Nuclear Techniques to Study Marime Pollution

The International Laboratory of Marine Radioactivity (ILMR) of the IAEA was established in 1961, well before the International agreement on sea waste dumping came into force and following the conclusion of a tripartite accord between the International Atomic Energy Agency (IAEA), the Government of Monaco and the Institute Oceanographique (Paris). Co-operation between the three groups continues with the adoption of a revised agreement with the government of Monaco which was signed in 1986.

During the past three decades international interest has motivated the need to manage and nurture one of our most valued resources - the oceans. In spite of this growing recognition, however, it is only during the past decade or so that international agreement has been reached on the control of dumping of wastes (including nuclear wastes) at sea.

The Laboratory in Monaco exists:

- to assist Member States with regard to marine radioactivity and environmental problems by training personnel, establishing co-ordinated research programmes and providing advice and assistance.

- to ensure the quality of the performance and comparability of studies of radioactive substances and other forms of pollution in the marine environment by national laboratories through interlaboratory comparisons, calibration and standardization of methodology; and

- to perform research on the occurrence and behaviour of radioactive substances and other forms of pollution in the marine environment.

The Laboratory proposes to join with countries through their chosen national laboratories in the Asia and Pacific Region in the conduct of efforts within the above subject areas.

ANNEX 30

RCA PROJECT TO ASSIST IN DEVELOPING MORE EFFECTIVE SOIL MANAGEMENT PRACTICES BY QUANTITATIVE ASSESSMENT OF SOIL EROSION & SEDIMENTATION.

Soil is one of the most valuable national treasures that every country possesses and therefore protecting this treasure by using most effective soil management practices is absolutely important. Up to now there was no technique available to measure soil erosion and sedimentation quantitatively and until significant damage is done to soil ,erosion goes unnoticed. For the first time, a method has now become available to obtain quantitative estimates of soil erosion and sedimentation at levels which are far lower even to be noticed by any other technique.

The method is based on an understanding of the amount of Caesium-137 and its distribution in a soil profile. This radionuclide in soil is derived from atmospheric weapon testing programmes in the past. All modern (post 1955) surface soils are labelled with extremely low levels of Caesium-137 as a result of the fallout from weapon tests.

Studies carried out at the Australian Atomic Energy Commission have shown that soil loss (tonnes/hectare/year) due to erosion bears a high degree of correlation to the Caesium loss when the latter is compared with a stable site. This is of tremendous significance to Soil Scientists. Soil erosion which is a matter of expression or dispute thereby becomes rather a measured residual input of Caesium -137 by the use of this technique. In developing countries where soil loss data are fragmentary, if indeed it exists, the Radio Caesium technique should allow a ranking of soil losses and hence an ability to assess land use and land management practices. These measurements can also be used to identify erosion sources and sinks, study their spatial and temporal responses, provide real data on sediment loss and assist in the proper measurement of sediment delivery rates and the construction of sediment budgets for catchments of varying size.

Radio Caesium technique can provide a time integrated measure of soil losses since 1955. The ability to quantify soil losses, identify sediment sources and sinks and construct sediment budgets can be considered a significant achievement in soil science.

Application of the Radio Caesium technique in the determination of sedimentation rates in reservoirs and dams has been sufficiently developed by Australian workers to enable any country to use this technique in routine work. These results are not only of use to Engineers concerned with dam performances, but also to conservationists agriculturists and forest scientists as they are associated with problems within catchment areas.

Countries in the Asia and the Pacific Region are usually subject to tropical and monsoonal rainfall conditions with resulting difficulties in management of national soil resources. Introduction of this Radio Caesium Technique to these countries will bring about an invaluable contribution to the Soil Management in these countries.

Sri Lanka has already carried out a pilot project successfully and embarked on using the Radio Caesium Technique as a routine method in Soil Management. Several State run institutions including the Irrigation Department, Coconut Research Institute and Rubber Research Institute have already joined the Atomic Energy Authority to start work on this project and sites for the first phase of the project have already been selected.

Sri Lanka is pleased to propose the introduction of Radio Caesium technique to generate data necessary for developing more effective soil management practices in the Asia & the Pacific countries as a project under the RCA, as soil management is a common problem to all countries, particularly to countries which are subject to heavy monsoons and the use of this new found technique will enable the RCA countries to benefit through a new dimension in soil management.

Dr.Granville Dharmawardena,
SRI LANKA

ANNEX 31

APPLICATION OF NUCLEAR TECHNIQUE IN BIO-INDUSTRY IN CHINA

Xu Guanren

I. INTRODUCTION

By bio-industry I mean the industry developed principally on the basis of bio-sciences and bio-technology. It covers agriculture, animal husbandry, forestry, fishery and other related fields where living organisms play a part. By nuclear technique I refer to the technique associated with isotope and radiation occuring in nature or generated by artificial means.

In China the first Research Laboratory For Application Of Atomic Energy In Agriculture was founded in 1957 under the auspices of the Chinese Academy Of Agricultural Sciences. On the basis of this research laboratory, the Institute For Application Of Atomic Energy (IAAE, CAAS) was established in 1960. Now the IAAE, CAAS has seven departments and one research group, engaged in research work respectively on: mutation breeding and radiation genetics, radioecology and radiation protection, application of isotopes, biotechnology and physical techniques, utilization of neutrons, pest control and agricultural products preservation, agro-microbiology , scientific and technological information, and nuclear instrumentation.

Since the founding of the research laboratory, both research work and training courses have been carried on simultaneously, whereupon further development of nuclear technique for agricultural application has been promoted, and consequently more research institutes (IAAE) or laboratories have been established. Now we have 26 research institutes (or laboratories) located in different provinces (or autonomous regions) where upon a network for application of nuclear technique in bio-industry has been formed with IAAE, CAAS as its center.

In order to promote scientific and technological exchanges, the Chinese Society Of Nuclear-Agricultural Sciences (CSNAS) was organized in 1979. Before long, provincial (or regional) societies (SNAS) for the same purpose were organized. Now a network composed of 21 SNAS has been formed with CSNAS as its center.

Upon close co-operation between the two networks, remarkable achievements have been made in promoting agricultural research and agricultural development, which resulted in bumper economic benefits and significant social impact. It is expected that application of nuclear technique would make more contribution to the national "Spark Projects", High Technology Projects" and "Basic Research Projects" so as to promote the development of bio-industry in China.

II. PROFESSIONAL ACTIVITIES

Each institute, IAAE, and each sociey, SNAS, has its own goal and activities. Generally speaking, their activities can be distinguished as follows:

(1) Research Work

In early eighties the research work could be classified as: (a) mandated research projects organized and supported by the State Science And Technology Commission, (b) coordinated research projects initiated and supported by relevant ministries or provincial governments, (c) pioneer research projects initiated by research workers and supported by institutional funds, and (d) international research projects in which chinese researchers participate. Nowadays encouragement has been laid on research and development; a fifth category of research projects, i.e. "Contract Research Projects" has assumed vigorous growth.

(2) Teaching And Training Work

In China regular collegiate curriculums concerning application of nuclear technique in agriculture are offered by Beijing Agricultural University and Jilin Agricultural University at their Department of Agricultural Physics. Other universities also offer courses on isotope and radiation application, although they do not have a specified department for this purpose.

Training courses on special subjects are usually co-sponsored by IAAE and SNAS. From 1979 to 1982, 13 training courses were held concerning such jubjects as liquid scintillation technique, radioactive tracer technique, autoradiographic technique, mass spectrometric technique, etc. From 1983 to 1987, 21 training courses were held concerning such subjects as nuclear technique inveterinary madicine, nuclear technique in aquaculture, preservation of agricultural products by irradiation, etc. More training courses are expected to be held in 1988.

(3) Scientific And Technological Exchanges

National and regional symposia and seminars on different subjects have been held regularly since the founding of the CSNAS and local SNAS. From 1979 to 1982, 8 seminars were held on such themes as insect control by IST technique, nuclear technique in environmental science, nuclear technique in forestry, etc. From 1983 to 1987, 17 symposia were held on such themes as preservation of agricultural products by irradiation, nuclear instrumentation, mutation breeding of ornamental plants, plant breeding with in-vitro biotechnique, etc. The Third Plenary Conference Of CSNAS and The Symposium On Nuclear Technique For Bio-industry was held in Zhangsha from April 2nd to 7th, 1988; more than 300 abstracts of papers have been received.

Semi-international symposia have been held on certain subjects with foreign scientists participating, such as the symposium on plant breeding by inducing mutation and in-vitro biotechnique, symposium on preservation of food and agricultural products by irradiation, etc.

Mutual visiting of scientists have been more frequent in recent years. Chinese scientists have been invited to participate in international conference as consultants, and foreign scientists have been invited to be honorable consultants by chinese institutions. Some bilateral co-operative research projects are under way, while more projects are under negotiation.

(4) Extension Work And Technical Service

Two journals have been jointly edited by the Chinese Society of Nuclear-Agricultural Sciences and the Institute for Application of Atomic Energy, CAAS. The quarterly journal "Application of Atomic Energy in Agriculture" has been upgraded and assumed the new name "Acta Agriculturae Nucleatae Sinica" since December 1987. A new bimonthly journal "Henongxue" (the Bulletin of Nuclear-Agricultural Sciences" has been published since December 1987, which contains both original articles and articles in foreign language translated into chinese. This journal is also jointly edited by IAAE, CAAS and CSNAS. Besides, the Journal of Stable Isotope has been published since March 1987.

Popularization of the knowledge and significance of peaceful uses of nuclear technique is also a part of the CSNAS activities. Exibitions on nuclear technique and its application have been held once in 1984 and again 1987 in several cities.

Recently, some technical service centers have been set up by SNAS and IAAE to provide information, consultation and technical help to those who need them.

III. RECENT PROGRESS AND ACHIEVEMENTS

(1) Plant Breeding By Inducing Mutation And in-vitro Technique

Breeding of cultivated plants by inducing mutation has contributed a good deal of benefits to agricultural production in China. Since early sixties, about 200 varieties and strains have been obtained directly or indirectly through mutation breeding, including cereal crops, fibre crops, oil crops, sugar crops, vegetables, fruit trees, ornamental plants and many other plants of economic value. Many varieties have been widely grown in different parts of China, covering a total acreage more than 14 million hectars. The economic gain of growing these improved varieties is hundreds and thousands times as much as the funds invested to the research work. Certain attributes of the new strains are far beyond what one may expect from the conventional method of breeding. For

instance, the winter-hardy mutant of pearl could survive under 40 degrees Centigrade below zero; the chrysanthemum mutant are not sensitive to photo-periodism, hence able to bloom in any season; the walnut mutant bears 3-4 nuts instead of 1-2 nuts per capsule; the citrus mutant bears no seeds or few seeds instead of many seeds; the mulberry mutant bears pistilate flowers instead of staminate flowers; an so on.

Early work on mutation breeding aimed at selecting new strains of higher yield, better quality and stronger resistance to disease and pests. Recent work has laid more emphysis on upgrading the efficiency of mutation breeding, i.e. to get higher frequency of mutation, wider spectrum of mutation, better methods of screening and faster multiplication of the desirable materials.

The radiosensitivity of different plant species, the radiosensitivity of different organs or tissues of the same plant, and the radiosensitivity of a single cell at different stage in cell division cycle have been studied. This would enable the researchers to know what material is better to be treated and when to treat it.

The relative effectiveness of different mutagens for inducing mutation has been studied; for example: hard X-rays vs soft X-rays, ^{60}Co gamma ray s vs ^{137}Cs gamma ray, thermal neutron vs fast neutron, X-ray (or gamma ray) vs neutrons, neutrons vs electron beams, etc. This would enable the researchers to chose the proper mutagen and the adequate dose for inducing mutation.

The effect of simple irradiation and the effect of combined treatment (for example, radiation plus chemical mutagens, radiation plus scavengers, etc) on inducing mutation have been investigated. Comparison between chronic irradiation with low dose and acute irradiation with high dose in respect to radiation damage and inducing mutation has been conducted by growing the target material in gamma field and gamma green house. The effect of environmental factors, such as O_2, N_2, Ar, water content, low temperature (-196°C) , etc on the outcoming of inducing mutation have been studies. The purpose of these studies is to upgrade the efficiency of inducing mutation.

Morphological, anatomical, physiological and genetical studies have been made of the mutants so as to make adequate uses of the mutants either as a new strain or as a parental material for further hybridization. The iso-zymogram of mutant was compared with that of the original material. Certain specific bands were found to be associated with given mutant characteristics and were considered to be controlled by certain genes. By electrophoresis analysis, it has been able to predict whether a young seedling could develop into a dwarf plant in citrus plant.

A germplasm bank has been established at IAAE, CAAS to collect and preserve the mutant materials obtained throught China. It is planned that close collaboration between mutation breeding and genetic engineering should be established, so that the tutant bank could provide more valuable germplasm for genetic engineering use. Current trend also indicates that

more researchers are interested in breeding of vegetatively propagated plants and medical plants by inducing mutation and using in-vitro biotechnique.

(2) Stimulation Of Growth By Very Low Dose Irradiation

Attempts to stimulate growth and development with very low dose of neutrons and gamma rays have been demonstrated to be practical and beneficial in the case of tussah worm, Antheraea pernyi. The tussah worm hatched from the irradiated eggs appeared to have better adaptability and greater tolerance to environmental stress when they were reared in nature.

Very low dose of neutrons and gamma rays have also been used to treat the eggs of fish or fishlings, such as fresh water carp. The treated fishe grew faster and weighed heavier than the untreated control, when they were reared under similar environmental and feeding conditions. More interesting results were obtained with prawns. Low dose of fast neutron could stimulate the female prawns to lay eggs one or two days earlier than the control; the amount of eggs laid was double as much as the control; and the percentage of hatching eggs and the viability of the prawnlings were raised significantly; consequently, the yield was increased.

Seeds of oil-tea, Camellia meocapa Lu, after being soaked in warm water and irradiated with gamma ray at very low dose showed a higher percentage of germination, a better growth of seedling and a better development of root system than the untreated control. Irradiation of dry seeds of soybean with gamma ray at very low dose resulted in 10% increase in yield in an experimental plot covering 1.6 hectars.

What can be said at the present time is that low dose irradiation might serve as a new means to increase the yield of certain species of animals and plants at given environmental conditions. Yet the effect of low dose irradiation on growth and development remains to be an interesting problem deserving intensive study.

(3) Control Of Harmful Insects By Sterile-Insect-Technique

In China control of harmful insects by sterile-insect-technique was started in earlt sixties with corn borer. The proper stage of pupae and the adequate dose of gamma ray for irradiation were determined by a series of trials. The artificial diet for mass-rearing the insects was formulated and prepared with success. The non-stop flight distance was estimated to be less than 2 kilometer by labelling the insects with Sudan Blue. The mating behavour and the competitive ability of the irradiated insects as compared with the wild insects were found to be equal. The appropriate ratio of the irradiated insects to wild insects for releasing was found out by cage-releasing experiments. The adequate methods of transporting the treated insects and releasing them on a small island were practised. The population of the insects before releasing and after releasing on

the island was checked. The field trials indicated that the population of corn borer was remarkably reduced by using the sterile-insect-technique. More significant results could be obtained if more treated insects and more times of releasing were practised. Besides, genetical and cytological studies have been conducted with respect to the mechanism of male sterility and the inheritance of sterility. An important finding is that by treating the pupae at proper stage without separating the male pupae from the female pupae could give equally good results as treating the male pupae only. This would save much time and labour for handling the treatment.

Another insect which has received several years study was the parasitic fly, Exorista sorbillan Weid, of silk worm, Bombyx mori L. Irradiation of the pupae at an adequate dose resulted in 98-100% of the irradiated insects becoming sterile. When the irradiated insects were released on an island, the hatching percentage of eggs and the frequency of the parasite-damaged silk worms were reduced remarkably. The flight range of the sterile flies was estimated to 1-2 kilometer, after the flies were fed with ^{131}I-labelled KI-honey and released to fields.

The cabbage diamondback moth, Plutella xylostella L., has also been irradiated for the purpose of eradicating them. In the spring 1982 , when the irradiated insects were released at a proper ratio to the wild insects six times in succession, the effectiveness of controlling the insect in F_1 generation was 84%. In the autumn 1982, when the irradiated insects were released successively for ten times, the percentage of oval sterility in F_1 and F_2 was 79% and 82% respectively. The lifespan was prolonged for 4 days in F_1 generation and 12 days in F_2 generation; consequently, the number of generation in a year was reduced. The pupal stage was prolonged, the larval stage was shortened, so the duration allowing the insects to do actual damage was also shortened. By seccessive releasing of the irradiated insects, the effectiveness of controlling the insect was 81% in F_1 and 79% in F_2.

Recently the peach fruit borer, Carposia nipponensis Wais, has been chosen as a new target insect for study. The best period for irradiating the pupae of this species was 1-3 days before emergence. The female pupae were more susceptible to radiation sterilization than the male pupae. The percentage of egg sterility amounted to 96-98%. The mating ability and the competitiveness of the irradiated insects were not significantly different from the wild insects. Moreover, the vitality of F_1 larvae was weak; their growth and development were slow; and most of them died before they could bore into the apple fruits. A few of them might emerge from the fruit, but the adults of F_1 were more sterile than parental adults. The dispersal distance of this insect was estimated to be 225 meters. A coordinate research project is under way . It is hoped that control of peach fruit borer by SIT could be put into practical use in the near future.

(4) Preservation Of Agricultural Products By Irradiation

Preservation of agricultural products was started in 1958 as a coordinate program with many institutions of agriculture, food industry, public health, nuclear technology, etc. participating in the program. Since then, particularly in recent years, more and more items have been added to the list of preservation by irradiation. So far, seven items have got the clearance from the health authorities, namely: potato, onion, garlic, rice, peanut, mashrum and sausage. Many other items including grains, fllour, vegetables, fruits,

meats, eggs, sea food, and processed farm products have been studied or u under study. Before each item put into market, a series of experiments have to be made, such as: judging the quality of the item to be irradiated, chosing the adequate packing material, determing the effective dosage for irradiation, deciding whether any pre-treatment or post-treatment is necessary, evaluating the quality of the irradiated item, and comparing it with the untreated control, warranting the wholesomeness of the irradiated item with special attention to mutagenicity through animal tests, considering the acceptance by consumers, estimating the economic benefits on the basis of investment and market gains, considering the feasibility of multiple uses of the irradiation facilities, and so on.

With respect to construction of irradiation facilities, particular emphysis was laid on safety, automatic control system and even distribution of doses within the item to be irradiated. Now we have 50 irradiation facilities equipped with ^{60}Co rources from 3,000 to 50,000 Ci, mostly for irradiating agricultural products; 15 irradiation facilities equipped with ^{60}Co sources from 50,000 to 300,000 Ci primarily for multiple uses; and 8 larger irradiation plants equipped with ^{60}Co sources over 300,000 Ci are under construction.

So far as preservation of perishable agricultural products is concerned, they have to be irradiated immediately after harvest, otherwise their quality would deteriorate quickly. Therefore, to deploy the irradiation facilities in stationary plants or to deploy them in mobile trucks or vessels, that is a problem deserving deliberation. In China, there are many grand rivers, such as Yangtze River, Yellow River, Pearl River, etc., it seems advisable to build some sort of "irradiation ship" that could serve as an irradiator and at the same time a transportation vessel. Besides, various perishable fruits such as Litze, etc. are grown on hilly slopes, it seems desirable to irradiate the harvested fresh fruits in situ and transport them immediately after irradiation, so that the quality can be warranted. In this case, small mobile irradiation units seems preferable.

For quarantine purpose, irradiation has been considered and practised as a better means than fumigation with chemicals. China will certainly take this new measure into serious consideration.

(5) Preparation Of Irradiated Vaccine

It has been reported by the Joint FAO/IAEA Division of Isotope and Radiation Application of Atomic Energy for Food and Agricultural Development that an advantge of the irradiated vaccine was that whereas parasites attenuated by other method go back to being fully virulant when passed through normal cattle, irradiated parasites are not transmitted by tick victor and consequently cannot revert to virulence. Further more, by using "irradiated vaccine responsive" males and females in breeding program, strains of sheep can be produced which can be vaccinated against this parasite much more successfully than the offspring of non-selected animals.

In China, irradiated vaccine has been used to protect pigs from suffering asthma. It was found that the vaccinated pigs had 60-80% fewer parasites than the non-vaccinated animals. Several other irradiated vaccines have been prepared for trial.

(6) Synthesis Of Isotopically-labelled Compounds

To meet laboratory and field experimental needs, more than 50 species of radioisotopically-labelled compounds, mostly pesticides and fertilizers, labelled with ^{14}C, ^{32}P, ^{35}S, ^{45}Ca, ^{86}Rb, etc. and some antibodies labelled with ^{131}I, ^{125}I ,etc. have been synthesized or prepared by the Isotope Laboratory of IAAE, CAAS. All these products have specific activity and radiochemical yield comparable with the commercial products from abroad. Now a new Isotope Laboratory of IAAE, CAAS equipped with better facilities and instruments has been established in 1987. More species of radioisotopically labelled compounds will be synthesized and prepared, particularly those needed by diagnosis of diseases, by geneticaengineering, by hormonic studies, and by identifying the effective elements of the herbaceous medical plants.

Labelling of the stable isotope compounds is also a part of the work of the Isotope Laboratory of IAAE, CAAS. Most of the compounds labelled with ^{15}N are for nutrition, fertilizer, feeds and nitrogen-fixation studies. Some compounds labelled with ^{13}C and ^{18}O are for physiological studies.

A list of isotopically-labelled compounds for sale is available at the Isotope Laboratory, IAAE, CAAS. Orders from outside institutions are welcome. Since our work on labelling compounds are in its juvenile stage, co-operative research at home and abroad is very welcome.

(7) Tracer Technique in Nutrition, Fertilizer and Feeds Studies

In China, effective and economic application of fertilizers have been guided by experimental findings with radioactive and stable isotopes as tracers. Comparison has been made between single fertilizers applied separately and composite or mixed fertilizers applied simultaneously with respect to different soils and different crops. The rate of utilization of phosphorus from the mixed fertilizer composed with ammonium bicarbonate and calcium superphosphate was increased with increasing the contents of nitrogen. Comparison was also made between different methods of application, such as surface dressing, basal dressing, band dressing, drill dressing, and spraying with respect to the stage of growth and development of the cropplants. The rate of utilization of phosphorus by wheat and corn was higher when the fertilizer was applied to the whole layer of soil; application in bands was identical with the whole layer application; while drill application was the lowest in rate of utilization.

The requirement of nitrogenous fertilizers by nodulating plants and non-nodulating plants was compared. Nodulating plants need more soil-N and fertilizer-N than air-N before flowering, while after flowering, they need more air-N than soil-N and fertilizer-N. Inadequate application ofnitrogenous fertilizer would inhibit symbiotic nitrogen-fixation.

Denitrification is caused by various strains of bacteria which act in different ways according to the nature of enzyme they contain. Application of denitrification inhibitor has been practised which results in increasing the rate of utilization of nitrogenous fertilizers.

The effect of cultural methods , such as; covering the cotton seedlings with thin plastic film, interplanting of different crop plants, continuous culture of ratooning rice, etc., on the absorption and utilization of fertilizers has been studied. In case the measures are beneficial to crop production they are recommended for extension. For example, when the cotton seedlings were covered with plastic film and fertilizers are properly dressed, the yield of seed cotton amounted to 2472 kg/ha. Experiment with ratooning rice showed that the taller the first crop rice stubbles, the greater was the absorption of phosphorus and the higher was the yield of the ratooning rice.

The needs of micro-elements by plants were studied. By feeding the rape leaves with $H_3{}^{10}BO_3$ at different stages, a significant interaction between phosphorus and boron absorption in roots, stems, leaves, flowers, pods and seeds was found. When rape grew well, the P/B ratio in leaves was about 250. The absorption and utilization of ^{65}Zn by maise was found to be dependent on the content of effective P and Zn in the soil. When ^{86}Rb was used to estimate the absorption of K, the valueobtained was less than the actual absorption of K. The absorption of ^{59}Fe-ferric salts by citrus plants was different with different methods of application. The best method was foliage spraying. The rate of transfer of iron in organic form such as fulvic acid was bettwr than that in in inorganic form such as F_eSO_4.

(8) Tracer Technique In Soil Studies

The effect of various soil-agronomical properties on the availability of phosphate in different types of soils was studied by ^{32}P-labelled superphosphate. The relation of A value to soybean yield and soil properties was analysed through multiple regression. The A value at tillering stage of wheat and rice was significantly correlated with grain yield and it can be used to estimate the availability of soil phosphate. The amount of phosphorus in paddy soils was evaluated by the A value with ^{32}P as tracer. It was the heighest in meadow soil, lowest in planosols, and intermediate in alluvial soil. But the rate of utilization of phosphorus was the highest in alluvial soil and the lowest in meadow soil. Predication of phosphorus requirement of soil was studied by using rape as a plant indicator on two different types of soils in Sichun province. The P-absorption curve of soils and the P-concentration of equilibrium solution (EPC) were used to evaluate the P-requirement of these soils. When the EPC was 0.3 ppm, the requirement of these soils was roughly 68 mg/ kg soil. The increment of A-value was linearly correlated with the quantity of P-fertilizer applied previously.

The immobilization of soluble phosphate in soil was studied. Positive correlation was found between immobilization and the available F_e at the concentration of 4.64-65.72 ppm; negative correlation was found between immobilization and the pH vale ranging from 5.35 to 8.88. The movement and accumulation of salt in surface soil has been studied by adding ^{22}Na to the surface layer of the soil column. Decrease in radioactivity counted

an hour basis indicated the rate of downward diffusion. When ^{131}I and ^{60}Co was added to the surface soil, it was found that diffusion also took place in opposite direction. The rate of diffusion was correlated with the physical properties of the surface soil. The nutrient regime around the rhizosphere was studied by mixing ^{86}Rb with soil. The depletion of ^{86}Rb mainly occured in rhizosphere soil far from root tips. The accumulation of ^{86}Rb in the root tip and its adjacent part was primarily due to translocation of ^{86}Rb from other parts of the root system.

(9) Tracer Technique In Biological Nitrogen-fixation Study

Biological nitrogen-fixation has attracted more attention not only because it could supply new N-sources for plant growth, but also because it could save energy consumption required by production of nitrogenous fertilizers. In China, Azolla has been used as fooder or green manure. By using ^{15}N assay, it has been found that some strains of Azolla imbricata and A. filicloids could release ammonia and nitrogenous compounds into the medium during plant growth. Experimental results showed that about 5 kg N could be fixed within several days. The availability of Azolla-N was estimated to be 35-58% in the growing period of rice plant. Screening of better strains of Azolla that have higher capability of nitrogen-fixation and better tolerance to temperature stress is a part of our research project. Lately this project has been included in the FAO/IAEA coordinate research program on "Isopotic studies of Nitrogen-fixation and Nitrogen Cycling in Alloza and Blue-green Algae".

For the first time in China nitrogen-fixation has been discovered in the bacterium genus Alcaligenes. The IAAE, CAAS in collaboration with Guangdong Microbiology Institute hs isolated from rice roots a bacterial strain that resembles Alcaligenes faecalis A-15. By using ^{15}N, it was found that the effeciency of nitrogen-fixation is about 40 mg of nitrogen assimilated per gram of malic acid consumed. By using ^{13}C and ^{3}H as tracers, it has been shown that A. vaecalis A-15 is a chemoautotrophic bacterium containing hydrogen uptake enzyme (uptake hydrogenase). A. faecalis A-15 is associated with and accumulated on the surface of rice root; some of them even could enter root cells. About one third of the nitrogen fixed by A.faecalis could translocated rapidly into the roots and the leaves of rice plants.

Symbiotic nitrogen-fixation by Rhizobium and legume shows that certain species association has a higher capability of nitrogen-fixation than other species association. At least five factors could influence the rate of nitrogen-fixation, namely: genotype of the N-fixing bacterium, genotype of the host plant, application of N-fertilizer and P-fertilizer, environmental conditions and cropping system. At IAAE, CAAS the amount of N_2 fixed by Rhizobium in soybean at different stages of growth and the amount of nitrogen fixed by Rhizobium in various legumes were estimated from the A-value of the legumes. Comaprison were made between growth stages, between different species and between treatment with vs without nitrogenous fertilizers. It was found that nitrogen-fixation reached its maximum at the pod-filling stage, and symbiosis offered about 50% nitrogen required by the host plant. At earlier stage of growth, fertilizers are still needed.

(10) Tracer Technique In Physiological Study And Diagnosis of Animal Disease.

Radioimmunoassay (RIA) and related measuring technique have been used for physiological study and as diagnostic aids to identify and elucidate reproductive problems in animal husbandry. Competitive Protein-binding assay of milk progesterone labelled with ^{3}H was used to determine dairy cow's progesterone concentration after artificial insemination on 24th. day. The criteria for judging cow's conceiving versus not conceiving were set by the concentration of progesterone in whole milk. Concentration higher than 5ng/ml is a sign of conceiving, while concentration lower than 5ng/ml is a sign of not conceiving. The rate of successful diagnosis was 86.4% for conceiving and 94.2% for not conceiving.

The amount of plasma testosterone and 17-beta-estradiol of Qinchun bull was measured by RIA. The experimental results showed that the amount of testosterone and 17-beta-estradiol changed month by month. There were significant correlation between testosterone and body size, body weight, and semen quality. It was suggested that early selection for certain breeding characteristics could be made by measuring the level of plasma testosterone.

RIA can also be used to monitor the effects of treatments prescribed veterinarian to correct reproductive problems and to diagnose genital disorder. In China, lasar technique has been used to correct genital disorder of cows which causes infertility.

RIA has also been used in diagnosis of plant diseases. Solid phase RIA has been used to detect the presence of Xanthomonas oryzae and to estimate its quantity in seeds, leaves, stems, panicles and roots of rice plants.

Besides, throid disorder and kidney disorder of animals such pig, sheep, horse, etc. have been diagnosed by nuclear technique with remarkable accuracy.

(11) Pollution and Environmental Studies

Tracer technique has played an important role in pollution and environmental studies. Absorption, translocation and residual effects of agro-chemicals in biological materials and in soils have been studied. Migration and distribution of heavy metal pollutants particularly those in wastes have been monitored. The contents of uranium, thrium and radium in drinking water were determined by the solid fluorometric method, spectrophotometric method and liquid scintillation method. Air pollution by cadmium was simulated by using $^{115,115m}Cd$ as tracer in a tightly closed plastic chamber under strictly controlled conditions. Cadium could be absorbed by rice leave and accumulated in the rice grain. Micro radioautograph of leaf sheath cells showed that Cadnium was mainly accumulated in the conductive tissues of rice plants. Waste water containing TNT was

treated with the bacteria Cicrobacter, Bacilus, Escherichia, etc.,. It was found that TNT was reduced to a steady product 4-amino-2,6-dinitrotolune under neutral or acid condition. It was a water-soluble compound and was easy to excret from human and animal bodies.

Special attention has been paid to pesticides and their residues. Rediochemically labelled insectcides, fungicides, herbicides have been used to study their effects and their fate asconjugated residues or bond residues in soils and in plants. On the basis of these studies, regulations and guidelines have been prescribed and issued.for proper uses of pesticides. In view of the fact that target insects could build up resistance to pesticides, more effort has to be made to study the mechanism of resistance-building and to study new pesticide formulation.

Since China has began to build nuclear power plants, surveys are being made from radio-ecological point of view around the plants and their neiborhood.

(12) Neutron Activation And Other Usage

Neutrons generated from reactors (including thermal neutrons and fast neutrons) and fast neutrons generated from 14 MeV neutron generators have been used for multiple purposed, such as;;for inducing mutation, for stimulating growth and development of silkworm and fishes, and for activation analysis. The protein content of rice kernels at different developmental s stages was determined non-destructively by neutron activation analysis. The essential elements in living plants were also determined by this method. The silicon contents of various soil samples and those of the plants grown on such soils were determined by activation analysis. A negative correlation was found between the silicon contents in rice plants and the disease infection of rice blast. Application of silicon fertilizer in blast infection area was recommended. To evaluate rook phosphate of different origin as P-fertilizer, the rook phosphate was activitated in reactor and then applied to experimental plots, where different crop plants were grown. It was found that certain species can make better use of rock phosphate than other species under acidic soil conditions.

The living root system of plants has been studied in situ by neutron radiograph. Movements of living organism and non-living objects in ecological studies have been made through tagging the objects to be investigated by activable elements and then identifing them by activation analysis. By culturing Alcaligenes faecalis A-15 (a strain of N_2-fixing bacterium) and rice seedling in a medium containing $H_3{}^{10}BO_3$ and then irradiating the rice root hairs with thermal neutron, it was found that within root cells there appeared densely distributed alpha particle tracks, which indicated that A. faecalis had entered the root cells. This was further proved by electron microscopic observation.

(13) Innovation Of Instruments And Methods

Sometimes cerrain instruments are needed by researchers but they are not available at the market; so the researcher go anead to design one and assemble it by themselves. For example, the neutron probe for measuring soil moisture, the gamma probe for measuring soil density, the monitor for detecting underground water, the automatic control board for presetting time and dosage of irradiation, the device for taking radiograph of root system, the apparatus for irradiating seeds in liquid nitrogen, the instrument for measuring the movement of underground water, the field equipment for measuring photosynthetic rate with $^{14}CO_2$, the field equipment for measuring the transpiration with $^{3}H_2O$, and so on. Some nuclear instruments such as the dosimeter NYL-4 designed by IAAE, CAAS has been produced in commercial scale.

To upgrade the effeciency of researc work, innovation of methods and techniques have been practised. For example: The 14 MeV neutron flux near the accelerator target was measured by using small sulfur tablets covered with thin plexiglass membrane; an emulsifier OP-115 was used to improve the effeciency of counting ^{32}P Cerenkov radiation in water; a kind of plastic scintillation cup was devised for counting ^{32}P in plant samples, its counting effeciency was 1.5 times higher than that of Cerenkov method; A vacuum system for preparing biological samples was used to determine ^{13}C in biological materials by mass spectrometry; a simple apparatus was designed for measuring phosphorus content in soil and biological samples by using atomic absorption spectrometer;:the samples can be put automatically at the right position, so that less time is needed to operste and contamination can be avoided; A BASIC language microcomputer program was formulated for fitting the dose-effect curves on the basis of single-hit multiple-target model; a vacuum device was designed for detecting nitrogen in small samples containing only 0.4 mg N in soil or in plant material; a thermoluminescence meter was designed to study the direction and the rate of of transportation of ^{14}C-assimilates in living plants; a solid track detector of polycarbonate foil was used to determine the boron content in agricultural samples which were irradiated in the thermal column by counting the track density, after etching; the grain motion on the sorting machine was watched by labelling the grains with $^{60}CoCl_2$ solution and detected by a GM counter; an improved Dumas technique was developed for preparing gas samples for ^{15}N-analyzers; the precision of ^{15}N measurement is approximately 0.01% for ^{15}N abundance at less than 1% stom ^{15}N; an improved method of analyzing micro-quantity of ^{15}N in soil and plant samples by using 5 Å molecular sieve instead of CaO as absorbant in spectrum analysis was adopted; in the discharge tube ,the CO_2 and H_2O gases elvolved from the samples at 500°C can be removed easily by the 5 Å molecular sieve; the absorption effect was as good as with CaO. The innovation mentioned here is the achievement made by rearchers themselves.

(14) Dosimetric Studies

For estimating the absorbed dose of biological materials from 14 MeV neutrons, the photon mass energy absorption coefficients and the transfer

factor-f from exposure to absorbed dose in the range of 0.01 to 3 MeV, and the neutron kerma factor-kf within the range of 0.25 eV to 14.5 MeV, for rice, wheat, barley, cotton, corn, sorghum, soybean, peanut and other plant materials have been calculated and tabulated.

The dose absorbed by crop seeds irradiated in liquid nitrogen with gamma ray was monitored by TLD. An attenuation constant of liquid nitrogen was measured, and the absorbed dose was calculated from the attenuation constant. A modified ceric (Ce^{+4}) dosimeter was used to measure the absorbed dose ranging from 150 Gy to 40 kGy, the accuracy of determination at the calibrated point of 5 cm (H_2O) was better than $\pm 3.5\%$ and the reproducibility was better than $\pm 2.5\%$.

In order to standarize the measurement of absorbed dose for agricultural research a co-operative research project has been conducted. The methods of measuring absorbed dose by various agricultural materials have been studied. The transfer coefficients from the absorbed dose by water to the absorbed dose by agricultural materials have been studied. By using the standard Fricke dosimeter as transportable standards and using the specified water tank as phantom, the dosemeters used by different institutions were caliberated on the same standardbasis, so that the data obtained at different institutions can be comparable. A system of tracing the local dosage measurements to the national standards has been proposed and regulations on dose measurements have been suggested. The IDAS system will be adaped in China. Besides the Fericke dosimeter, alanine dosimeter, cerium/sulfate/cerium sulfite dosimeter, silver dichromate dosimeter, and potassium dichromate dosimeter have also been used for measuring dose of different range. Micr-dosimetry remains to be an important subject deserving intensive study.

OUTLOOK AND FUTURE PLAN

One of the most serious problems world-wide is the booming of human population versus shortage of food supply and malnutrition. One of the effective ways to overcome this menace is to develop bio-industry by making full uses of every possible living natural resources on land, in water and in the outer space. In China, nuclear technique can play its important role in three closely related fields, namely (1) the "the Spark Project" which is directly aimed at the augmentation of agricultural production in its broad sense, (2) "the High Technology Project" which includes biotechnology with special emphysis on agriculture, medicine and food, and (3) "the Basic Research Project" which mainly deals with foundamental research including life sciences and agricultural sciences.

To fit into the Spark Project, we shall continue to work hard in agricultural research and development, and make more efforts on aquculture and forestry.

To participate in the High Technology Project, we shall [illegible] associate our breeding work by inducing mutation with in-vitro culture technique and genetic engineering. For controlling disease and pests, our work should lay more emphysis on immunological studies.

To join the Basic Research Project, we shall do more fundamental research on such subjects as photosynthesis, nitrogen-fixation, etc.

Since application of nuclear technique for bio-industry is of international importance, it is our sincere hope that: (1) closer cooperation be built between IAEA, particular the Joint FAO/IAEA Division , with China; (2) regional cooperation in Asia and the Pacific region be further strengthened; (3) bilateral cooperation between China and friendly countries be worked out for mutual behefits; (4) Scientists, students and trainees from friendly countries are very welcome to chinese institutions which are open to those who are interested in teaching or in learning and training; (5) we are willing to send chinese experts, either as individual consultant or as consultation group, to those institutions abroad upon invitation; and (6) exchange of information including journals, bulleteins, books, etc. be practised more often than ever before.

I am confident that nuclear technique can be applied not only for bio-industry but also for other industries. It will make great contributions to the welfare of mankind as a whole.

May I wish all of you good health and great success in the years to come, and enjoy a very pleasant tour in China.

Thank you.

CPR-NP-6

ANNEX 32

A PROPOSED COORDINATE RESEARCH PROGRAM ON APPLICATION OF NUCLEAR TECHNIQUE FOR AQUACULTURE IN ASIA AND THE PACIFIC REGION

1. The Importance of The Study

The booming of human population versus shortage of food and malnutrition has been a serious problem world-wide. In view of the fact that fishes and many other organisms in water have a higher ratio of output over input in terms of calorie produced vs. consumed and their products have a higher protein content than cattle, pig, and many other domestic animals on land, augmentation of aquatic products for human consuming is very important and prospective.

2. The Purpose of The Study

So far, application of nuclear technique in agriculture, animal husbandry, food preservation, pest control, soil improvement, water management and many other fields has been proved to be very successful with remarkable economic and social benefits;;neverthless, few research work has been done on aquaculture by using nuclear technique. In compliance with the recommendations made by the consultants at the Consultant Meeting to Review the Training Activities At the Agency's Laboratories At Seibersdorf, which state that " consideration be given to establishing courses in aquaculture, which is becoming a major production activity in developing countries", the present proposal is to initiate a coordinate research program that many countries, particularly those in Asia and the Pacific region, could take part in. By so doing, the research workers would provide the training courses with useful information for preparing lecture notes and laboratory guides; and the trainees could have good opportunities to practise and develop what they have learned at the training courses.

3. The major subjects of the study

a. Ecological study: Emphysis will be laid on the behavior of certain species of fishes, prawns, crabs, etc. in natural environment, the optimal ecological conditions for aquaculture under intensive farming system, etc.

b. Physiological study: Emphysis will be laid on feeds and feeding, the environmental conditions in relation to growth and development, etc.

c. Genetical study: Emphysis will be laid on identification of sex and sorting out the desirable sex (this is because certain sex has a faster growth rate and better quality than the opposite sex), hybridization and hybrid vigor, polyploidy and productivity, etc.

d. Biotechniques for aquaculture and breeding of aquatic organisms.

e. Parasites and diseases control in aquaculture.

f. Preservation of aquatic products by irradiation. (This has been done under the coordinate program of preservation of food and farm products)

4. The Procedure of Planning The Study

Once the proposal accepted by the Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development, it is suggested that a Project-Planning Committee be formed under the supervision of the Joint FAO/IAEA Division with selected experts from UN member states participating in working out the details of research projects, according to the priority of needs and the competence of personel and research facilities.

After the concrete research projects are worked out, they will be announced by the Joint FAO/IAEA Division. Application for participation in the coordinate research program will be proceeded in the regular way.

5. The Role that China Could Play

In China, there exists a network for research on application of nuclear technique in agriculture, which is composed of 26 research institutes

located in different provinces. Besides, there are several research institutes specialized in studies of aquatic organisms, such as the Marine Biological Research Institute of Chinese Academy of Sciences (CAS) in Qingdao, the Institute of Aquatic Biological Sciences of CAS in Wuchang, the Research Institute of Aquaculture in Wuxi, the Liaoning Provincial Research Institute of Aquaculture in Dalian, etc. All these institutions are staffed with qualified research workers and well equipped with research facilities. Smaller research groups are already in existance, and larger research teams can be organized, to carry on the research projects under way and the research projects planned for the future. Chinese scientists are willing to be one of the initiators of the proposed coordinate research program and ploy an active part in the research work.

6. Remarks

This proposed coordinate research program is outlined by Dr. Xu Guanren, Director General Emeritus of the Institute for Application of Atomic Energy, Chinese Academy of Agricultural Sciences. Dr. Xu is a member of Academia Sinica and the Deputy Director of the Division of Biological Sciences, Academia Sinica. He is willing to join further discussion whenever the Joint FAO/IAEA Division asks for his presence.

ANNEX 33

PROSPECTUS

Title:	REGIONAL (RCA) TRAINING COURSE ON NUCLEAR POWER PROJECT PLANNING AND IMPLEMENTATION
Place:	KAERI Nuclear Training Centre, Daejon, Republic of Korea
Date:	7 - 25 November 1988
Deadline for nominations:	31 July 1988
Organizers:	The Government of the Republic of Korea, through Korea Advanced Energy Research Institute (KAERI) in co-operation with the International Atomic Energy Agency (IAEA), within the framework of the Regional Cooperative Agreement (RCA).
Language:	English
Participation:	The course will be open to 15 participants from IAEA Member States in the Asia and Pacific region as well as in other regions which have their own nuclear power programme or will have in the near future.
Participants' qualifications:	Senior and middle management professionals who work for the Governmental authority or utility responsible for nuclear energy matters and national industry likely to participate in a nuclear power project, and will be involved in the planning and inplementation of a nuclear power project. They should have a university education in science, engineering, economic or management and 3-5 years of relevant experience. Prior basic knowledge of nuclear technology and engineering would be helpful. Proficiency in English at a level sufficient to follow the lectures and to take part in the discussions is essential.

Purpose of course:

The purpose of the course is to provide participants with an overview of practical elements involved in planning and implementation of a nuclear power projects with emphasis on nuclear power project management from pre-project activities to plant operation.

Nature of course:

The course will comprise lectures, panel discussions, small group workshops, and demonstrations of full scale nuclear simulator and compact nuclear simulator. A scientific visit to nuclear power plants will also be included.

Outline of course:

The following areas will be covered:

- Overview of nuclear power project
- Feasibility study
- Siting and environmental survey
- Public acceptance
- Manpower requirements
- Bid preparations
- Evaluation of bidding documents
- Contract
- Technology transfer
- Design and engineering
- Codes and standards
- Quality assurance / quality control
- Safety analysis, licensing and regulation
- Construction and its management
- Commissioning, operation and maintenance
- Management and disposal of radioactive waste
- International agreement and framework
- Demonstration on a compact nuclear simulator
- Scientific visit (NPP site)

Application procedure:

Nominations should be submitted in duplicate on the standard IAEA application forms for training courses.
Completed forms should be endorsed by and returned through the official channels established (the Ministry of Foreign Affairs, the National Atomic Energy Authority, or the Office of the United Nations Development Programme) ; They must be received by the International Atomic Energy Agency, P.O. Box 100, A-1400 Vienna, Austria, by 31 July 1988. Nominations received after that date or applications sent directly by individuals or by private institutions cannot be considered.

It is suggested that advance information of the nominations be submitted by telex with the following short information: name, age, academic background, present position and address, to enable the IAEA to make preliminary evaluation of the candidates.

Administrative and financial arrangements:

Nominating Governments will be informed in due course of the candidates selected and at that time be given full details of the procedure to be followed with regard to administrative and financial matters.

The Government of the Republic of Korea will, out of their extra-budgetary contribution to RCA, defray the cost of the participants' roundtrip air travel from their home countries to Seoul and back.

During their attendance at the course, the participants will be provided by the Government of the Republic of Korea, with a stipend sufficient to cover the cost of their accommodation, food and incidentals.

The organizers of the course do not accept liability for the payment of any costs or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the course, and it is clearly understood that each Government, in nominating participants, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

IAEA REGIONAL TRAINING COURSE ON
NUCLEAR POWER PROJECT PLANNING & IMPLEMENTATION

7-25 Nov. 1988, Daejeon, KAERI/NTC, R.O.K.

Contents	Lecture Unit	Source of Lecturer
1. General Information and Overview of Nuclear Power Project		
1.1 Status and trends of nuclear power in the world	1	IAEA
o Status of world nuclear power generation o Technical and economic performance of NPP o Advanced nuclear power systems & international co-operation		
1.2 Energy resources and alternatives in Korea	1	Poong-Eil Juhn Director Nucl. Policy Div. KAERI
o Reserves of energy resources o Energy utilization technology o Energy economics o Energy utilization pattern o Energy alternatives in Korea		
1.3 Status and trends of nuclear power in Korea	1	Wan-Yong Chon Special Advisor KEPCO
o Early Korean efforts in nuclear science & technology o Beginning of full-fledged nuclear era in Korea: Kori-1 o Kori-2 and Wolsong-1 turn-key approach o Formation of Korean nuclear industries o The Power Group centered around KEPCO o Subsequent nuclear power plants construction via component approach o Review of localization efforts up until 1986 o KNU Nos. 11 & 12 (Yonggwang 3 & 4) Project and its implications o Philosophy of nuclear regulations in Korea o Advanced reactor studies including safe passive systems for power and district heating o The status of nuclear waste disposal		
1.4 Overview of nuclear power plant systems and safety aspects	1	Young-Soo Eun Head Reg. Res. Dept. NSC, KAERI
o Classification of power reactor types o Description of PWR, PHWR and BWR systems o Advanced and developed reactor types o Safety aspects of nuclear power plant		
1.5 Overview of nuclear fuel cycle and sources of supply	1	Chang-Saeng Lim Sr. Vice President KAERI
o Elements of the nuclear fuel cycle o Fuel cycles for different power reactor o The market for fuel cycle materials and services		
1.6 Discussion of module 1	1	IAEAO KEPCO, KAERI

2. Nuclear Power Project Planning (Pre-Project Programme Oriented Activities)

2.1 Feasibility study of the first nuclear power project o Subject to be studies in general o Korean experiences - Feasibility study undertaken by Korean organizations - Feasibility study undertaken by foreign engineering firms	1	Chang-Tong Choi General Manager Power Planning Dep KEPCO
2.2 Energy options and electric system analysis o Energy survey and long term power system plan o Prospect of available energy resources - Domestic energy resources - Foreign energy resources o Long-term load forecast o Considerations for introduction of first nuclear unit - Size of national electric system - Unit size to be adopted based on economic and technical feasibility	1	Chang-Tong Choi General Manager Power Planning Dep KEPCO
2.3 Overview of pre-project activities and schedule of nuclear power project o Determinations of project definition o Factors to be considered for defining the project approach o Legislation and system of regulation o Siting consideration o Manpower development o division of responsibility among domestic organizations o Commercial arrangements for process o Korean experience	1	Chang-Tong Choi General Manager Power Planning Dep KEPCO
2.4 Organizational requirements, responsibility and authorities o Organizational structure for new project among nuclear industries - Utility, A/E, Equipment supplier o Role of NSSS supplier - NSSS system design - Component design and manufacturing	1	Byung-Koo Kim General Manager NSSS Div. KAERI
2.5 Discussion of module 2.1-4	1	KEPCO KAERI
2.6 NPP site characteristics and requirements o Introduction o Requirements and regulatory guides o Site characterization o Case histories in Korea	1	Kun-Shin Yoon Civil Eng. Dept. KOPEC

2.7 Environmental considerations o Non-radiological effects of nuclear power o Radiological effects of nuclear power o Environmental monitoring program during operation o Environmental monitoring program in emergency	1	Jeong-Ho Lee Head Environmental Safety Res. Dept. KAERI
2.8 Manpower requirements o Overall manpower requirements of a nuclear power project o Qualification of nuclear manpower o Manpower requirements in developing countries o Manpower development planning in developing countries	1	IAEA
2.9 Public relations and public acceptance o Public information o Public relations o Public acceptance	1	Chang-Kun Lee Vice President KAERI
2.10 Schedule control and planning o Function and responsibilities of planning and scheduling as a part of project control o Network-based approach to planning and scheduling o Various types of schedules and their appropriate utilization o Developing, monitoring and managing method of the project schedule	1	Jong-So Choi Manager Project Standar. & control Sys. Dep KEPCO
2.11 Discussion of module 2.6-2.10	1	KEPCO KOPEC
3. Nuclear Power Project Implementation I (Pre-Construction Stage)		
3.1 The NPP acquisition. Turnkey and split package approach o Tasks, scope and schedule, organization and staffing o Definition of contractual approach o Turnkey contracts o Split and multiple package approach	1	IAEA
3.2 Bid preparation o Types and scope of bid specification o Biding documents and division of responsibility o Technical and licensing requirements o Limiting bidders and bid data	1	IAEA
3.3 Financial and legal bid specifications o Financial bid specifications o Legal bid specifications	1	IAEA
3.4 Discussion of module 3.1-3.3	1	IAEA

3.5 Technical bid evaluation o Scope of the evaluation o Evaluation method o Evaluation approach o Implementing the technical bid evaluation work	1	IAEA
3.6 Economic evaluation of bid o Cost evaluation and estimation o Economic and financial framework o Price adjustment o Terms and schedule of payments	1	IAEA
3.7 Contract terms and conditions o Definitions o Major items for contract terms and conditions	1	IAEA
3.8 Discussion of module 3.5-3.7	1	IAEA
3.9 Negotiating and contracting o Difference between turnkey contract and non-turnkey contract o Analytical skills involved in negotiating and contracting	1	IAEA
3.10 The selection of suppliers o The selection of suppliers	1	IAEA
3.11 Local participation & technology transfer - worldwide experience (suppliers approach) o Worldwide experience of local participation o Worldwide experience of technology transfer	1	IAEA
3.12 Discussion of module 3.9-3.11	1	IAEA
3.13 Local participation & technology transfer - Korean experience (owner's approach) o Technical self-reliance of nuclear power plants - The lessons learned from preceding plants in Korea - The chronology of nuclear power projects - Localization o Basic strategy to achieve technical self-reliance	1	Yong-Taek Park Project Manager NPP Const. Dept. KEPCO

3.14 Korean experience of NSSS localization o Joint design participation o Technology transfer participation o ALWR development participation	1	Byung-Koo Kim General Manager NSSS Div. KAERI
3.15 International agreements & framework (bilateral & tripartite agreements) o Bilateral co-operation o Regional co-operation o IAEA technical co-operation activities o International safeguards	1	IAEA
3.16 Discussion of module 3.13-3.15	1	IAEA KEPCO KAERI
4. Nuclear Power Project Implementation II (Construction Stage)		
4.1 Overall project management o The lessons learned from preceding plants in Korea - The chronology of nuclear power projects - Project management experiences o Implementation of Yonggwang NPP, unit 3 & 4 - Policy - Implementing plan	1	Young-Taek Park Project manager NPP Const. Dept. KEPCO
4.2 Design and engineering o Overview of design and engineering o Organization and staffing o Phases of design and engineering o Methods and operation in design and engineering	1	Kee-Young Nam Principal Engineer Mechanical Dept. KOPEC
4.3 Equipment and component manufacture o MFG requirements in equipment specification - Welding, NDE and test requirements - Inspection and other requirements o Introduction of ASS'Y sequence - Reactor vessel, steam generator, pressurizer - Primary piping	1	Hae-Soo Kim Deputy Manager NSSS Design Dept. KHIC
4.4 Codes and standards o ASME code introduction o IAEA code introduction o ANSI/ASME NQA-A introduction o Korea atomic energy law o QA program establishment & implementation	1	Gil-Hwan Cho Section Chief QA Sys. Dept. KHIC

4.5 Discussion of module 4.1-4.4	1	KEPCO KOPEC KHIC
4.6 QA/QC activities o Necessity of QA in nuclear power plant o Regulatory requirements of QA in Korea o Application of QA program requirements o Establishment of QA/QC program o Classification of quality class o Major QA activities in engineering, procurement, manufacturing, construction and operation phase	1	Y. J. Rim Assis. Manager QA Office KEPCO
4.7 Safety analysis, licensing and regulation o Lisensing and authorization o Review of safety analysis reports o Regulatory review and assessment o Safety related regulations and guides o Inspection and enforcement	1	Young-Soo Eun Head Reg. Res. Dept. NSC, KAERI
4.8 Construction and site management o Business scope of construction company o Organization o Plan and schedule control (product control) o Manpower control o Quality control and material control o Tools and equipment control	1	In-Hwan Cha Director HECC
4.9 Construction experience of NPP in Korea o History of NPP in Korea o Peculiarity between chemical and nuclear power project o Security and aseismatic construction o Policy of quality assurance	1	Young-Jin Lee Director HECC
4.10 Discussion of module 4.6-4.9	1	KEPCO KAERI HECC
5. Overview of Plant Operation		
5.1 Commissioning, operation & maintenance o Commissioning - Overall startup program - Construction phase startup schedule - Startup administration program - Major startup test, plant performance test o Operation - Basic policy for nuclear power program - Related organization, operation program management - Enhancement of safety, human performance problem - Emergency operation, surveillance program, - Operational experience	1	Kyoo-Kun Koh Deputy Manager Kori NPP # 3 & 4 KEPCO

COUNTRY STATEMENT - AUSTRALIA
TENTH RCA WORKING GROUP MEETING, BEIJING
11-14 APRIL 1988

Australia is pleased with the continued progress made by RCA over the past year. It was with particular satisfaction that we were able to become party to the new RCA agreement which entered into effect in June 1987. Reflecting the priority we attach to the further development of nuclear technical co-operation among countries of the Asia and Pacific region Australia will continue as a strong supporter of 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, while new project proposals have undergone appraisal for possible Australian funding. Following is an outline of progress in each of the RCA activities in which Australia has been participating.

Regional Project on Food Irradiation (RPFI)

RPFI Phase II, which was sponsored by Australia, is nearing completion. The final research co-ordination meeting and the fourth Project Committee meeting are now planned for 24-28 October in Bangkok in conjunction with the ASEAN Food Conference there on 24-26 October.

RPFI II has been judged a success. Work carried out under the research contracts has proceeded satisfactorily. The third Project Committee meeting held in Malaysia in October 1987 was able to consider the results of the evaluation mission which visited Bangladesh, Pakistan, the Philippines and Thailand in September/October. The mission found that, in general, researchers had co-operated well with their departments of health and agriculture and with private industry. Also, significant progress had been made towards the establishment of large-scale radiation facilities for demonstration or semi-commercial treatment of foods.

Australia's domestic policies towards food irradiation are at present the subject of an enquiry by a Parliamentary Standing Committee. The report of the Committee is expected to be available later this year. A recent report by the Australian Consumers' Association (ACA) recommended that approval to irradiate food be granted on an item by item basis at specific dose ranges and only in approved facilities.

Strengthening of Radiation Protection Project

Australia was represented at a project formulation meeting held in Tokyo and is contributing the first activity to take place under this project - a training course on Radiation

Protection Infrastructure, which is being held in Sydney at the present time. This course, jointly funded with the IAEA, is being held in conjunction with two major radiation protection conferences, also being held in Sydney. We are happy to welcome 21 participants from 12 RCA countries at this course, which we hope will be the first of several activities Australia may be able to fund under this project.

UNDP Industrial Project Sub-Project on Tracer Technology

Continuing on from its funding of Phase I of the UNDP Industrial Project, Australia will provide assistance in several areas of Phase II. In the area of tracers we have sent two experts to Thailand in February and March to demonstrate to technologists from government and industry in Bangladesh, Indonesia, Malaysia and Thailand the use of radioactive tracer techniques in flow measurement in natural gas pipelines. The technique can also be used for the in-line calibration of conventional metering devices. It is intended that these demonstrations be the first part of a new three-year contribution to an expected total value of $A334,000 to this project, which will involve demonstration of and training in tracer techniques.

UNDP Industrial Project Sub-Project on Nucleonic Control Systems in the Coal Industry

It is intended that Australia will be making substantial contributions in excess of one million Australian dollars over a five year period in the area of nucleonic control systems in the coal industry, an area of particular Australian expertise. Coal is an important source of energy in the RCA area, several countries being large producers of coal and other countries being large importers. Coal producers could gain great economic rewards from using ash gauges for quality control in mines, and all consumers can benefit from using coal-ash gauges in blending systems to provide a controlled feed to furnaces, for example in electricity generating plants.

The first activity under this project was an executive management seminar on this subject successfully held in Sydney and Perth in September/October 1987, and attended by participants from China, India, Indonesia, ROK, Malaysia, Pakistan and Thailand.

It is intended to set up a demonstration project in the coal blending system of the Mae Moh lignite mine in Thailand. Training courses would be offered at the demonstration unit and in Bangkok or Chiang Mai. A planning mission to Thailand to define the scope of the exercise was undertaken in February.

UNDP Industrial Project Sub-Project on Radiation Processing

Australia will continue its contribution on the radiation processing of surface coatings of products such as timber and paper, and has approval to undertake demonstrations and courses utilising a commercial production line which is already in operation in Sydney. It is hoped in the longer term to develop a proposal to assist in the establishment of a new demonstration line in a RCA country. Subject to annual budgetary approvals, we expect to provide funding of $A78,000 in 1988/89, $A46,000 in 1989/90, and $A84,000 in 1990/91. Detailed planning discussions are underway.

Medical and Biological Applications of Nuclear Techniques

Over the next three years Australia will be offering training through ANSTO, the Australian School of Nuclear Technology and the Royal Prince Alfred Hospital, Sydney on the use of Technetium-99 imaging to determine abnormalities in a wide range of body organs. This training will help optimise the use of equipment already existing in regional countries. Subject to annual budgetary approvals, funding is expected to be $A140,000 in 1988/89, $A6,000 in 1989/90 and $A121,000 in 1990/91.

Australia continues to make available experts to the RCA including for the RCA project areas such as:

- The UNDP Industrial Project Sub-Project on Non-Destructive Testing ($A22,000 of extra-budgetary funding was provided during 1987)

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

- The Development of Tc-99m Generators Using Low Power Research Reactors

- Nuclear Techniques for Toxic Elements in Foodstuffs.

Australia welcomes the opportunity to participate in the RCA Seminar in Jakarta in June this year and congratulates the Secretariat and the host Government, Indonesia for bringing to fruition an idea first proposed two years ago. We hope that the Seminar will serve to consolidate the impact of the RCA on the social, economic and technological development of member States by a thorough review of all aspects of RCA activities and of the broad objectives for the future direction of the RCA.

Next year Australia has the pleasure of hosting the Eleventh RCA Working Group Meeting in Sydney on 13-17 March. We look forward to welcoming you all.

COUNTRY STATEMENT - BANGLADESH
TENTH RCA WORKING GROUP MEETING
BEIJING 11-14 APRIL, 1988

Mr. Chairman,

Bangladesh is very happy to participate in the 10th Working Group Meeting of RCA members which is being held in Beijing. Planning, implementation and evaluation of projects in the very first year of thrid extension period is very significant. The success of third extension and the future of this cooperative effort will depend very much on the (1) fruitful application of the findings of the past (2) discontinuation of unsuccessful efforts and (3) identification of useful projects for this extended period and for future. We are happy to note that IAEA has already taken steps in this direction by offering a forum for the purpose in the forthcoming seminar in Jakarta. I belive deliberations in this meeting will have a definite role to play in fullfiling the objectives of the seminar.

While giving approval to the third extension of RCA agreement Bangladesh Government reviewed the progress made in the region and was convinced that continuation of the agreement would bring more benefit to Bangladesh and also to the region. We, therefore, would like to thank IAEA through the good offices of Deputy Director General, Department of Technical Cooperation, RCA coordinator and Project Coordinator RCA's Industrial Project. We also congratulate them for very ably managing such diversified projects.

I. FOOD AND AGRICULTURE

Progress made in four projects in this sector is summarised below:

Semi-dwarf mutants for rice imporvement

Bangladesh has evaluated the semi-dwarf mutants as being parents in cross-breeding and provided alternate gene sources for semi-dwarfness with different plant architecture and selection of promising mutants. These have resulted into the release of a semi-dwarf variety named BINASAIL in 1987. It is a low input variety specially suited for marginal and poor farmers. The added advantage of growing this variety is that it can be transplanted very late in the season specially after floods when existing varieties are not suitable for cultivation. This variety yields at par with the mother variety- NIZERSAIL and is tolerant to lodging. This new variety has kept up the grain quality of mother variety which is very popular amongst fine quality rice verieties.

Grain Legume

As a follow-up of the Grain Legume Project, mutants of mungbean, chickpea and grasspea have been developed and these are under advanced trials. Some more varieties are expected to be released out of these.

Improvement of Domestic Buffalo Production in Asia-Phase II.

Department of Animal Nutrition of Bangladesh Agriculture University conducted research to investigate the effect of different methods of incorporating urea in straw based ration on feed digestibility and growth rate of buffalo heifers and to study the effect of supplementation of fibrous residues with rice polishing on performances of young buffaloes. Positive results have have obtained and investigators sugggested to use the findings to the village level farmers.

RPFI-Phase II Project under RCA

Bangladesh has been actively participating in the Asian Regional Co-operative Project on Food Irradiation (RPFI) phase II under the RCA programme. The second phase of the project is aimed at transfer of technology to local industry and has been financed by the Australian Government for 3 years starting from 1985. Twelve Member States including Bangladesh have been awarded research contract (4217/AG) which are now entering the 3rd year of operation. On its part Bangladesh has been working on the commercialization, storage and transportation studies of irradiated dried fish, fishery products and oions under the RPFI-II research contract. Bangladesh has so far participated in the two RCM and 3 projects committee meetings, under the phase II.

Semi-commercial demonstration trials of irradiation preservation of dried fish and onions in co-operation with local traders and industry counterparts have been conducted. Suitable packaging materials for commercial handling, storage and transportation of dried fish through control of reinfestation in already radiation disinfested product have been selected. Suitable storage facilities for 8-10 months' storage of irradiated onions at ambient condition have been developed and demonstrated to the prospective commercial entrepreneurs. In-country and inter-country transportation studies of irradiated products were performed with satisfactory results. Test marketing of irradiated products in two major cities of Bangladesh was satisfactorily conducted covering the entire lean period.

Semi-commercial level storage and marketing trials in collaboration with local industries are being undertaken to obtain information related to commercial performances of the irradiated products. Efforts will be made to make some

headway on identification of irradiation treatment and processing quality.

Studies on insect disinfestation and preservation of food and agricultural products by irradiation will be made on the following arears in the forthcoming years (1988-1990):

(1) Insect disinfestation, economic feasibility and the efficacy of radiation packaged food and agricultural products in comparison to traditional method of perservation.

(2) Selection and standardization of size, shape and durability of insect resistant packages for storing food and agricultural products (rice, pulses, oil seeds and tobacco leaves) after disinfestation by radiation.

(3) Transportation studies of irradiated food and agricultural products outside Bangladesh.

For the implementation and subsequent commercial operation of the Gamma Irradiator Plant to be supplied by V/O. TECHSNABEXPORT of Moscow under contract no. 54-06-80001 dated 1.3.85, BAEC has, together with BEXIMCO, formed a joint venture company namely Gammatech Ltd. Under this company country's first commercial multipurpose irradiator is under construction and is likely to be functional in 1989 for treatment of food and medical products.

II. MEDICAL AND BIOLOGICAL PROJECTS

NuclearTechnieques for the Diagnosis of Tropical parasitic Diseases:

The project for the Diagnosis of Tropical Parasitic Diseases is aimed to develop effective diagnostic methods for malaria and philariasis antigen level detection. Most of the steps in this project have recently been worked out and in vitro culturing of plasmodium would be started soon.

The samples of body fluids were collected from the patients suffering from malaria and philariasis. These samples were sent to participating laboratories in Bombay, Geneva and Lille. We received the results of our samples which were sent to Dr. A.M. Samual, Bombay for the analysis of samples. In absence of some rare chemicals, samples could not be studied in our laboratories and thus the techniques for assay could not be established.

Inspite of several modifications in the assay procedure, the results have been unsatisfactory. The very high nonspecific binding properties of the MAb preculudes

its usefulness in routine assay procedures. In view of the above mentioned problems encountered with MAb for phi lariasis no further attempts have been made to ask for and evaluate MAb in malaria.

The project was closed in 1987 but we intend to participate in the seminars and symposia in order to establish the Immunoradiometric assay(IRMA) in our Institute for diagnosis of malaria and philariasis infected patients.

Imaging Procedures for the diagnosis of Liver Diseases

Bangladesh participated in the last RCM held in Bangkok from October 5-7 1987 where analyses of liver images received by each member state were discussed.

Bangladesh received 165 such liver images of several countries and seven physicians took part in the interpretation of these images. Interpretation of liver images in the absence of the full clinical history and biochemical data was difficult and therefore, scores were low. It was suggested that all liver interpretation in the laboratory should be done together with full clinical information of the patient.

None from Bangladesh could attend the RCM held in Lahore. Therefore, we could not contribute liver images from patients in the meeting. Subsequently we made 15 images from patients and sent them to Dr. Tateno in June 1987.

We think the project was very interesting and gave chances of fruitful excercises with phantom and patient images. Discussions in various coordination meetings were very useful and generated many new ideas for getting optimum liver images and their proper interpretation.

The proposed Atlas of Liver Images is likely to be an useful contribution of the project.

Radioimmunoassay of Thyroid Related Hormones:

Out of five Nuclear Medicine Centres, who are associated with this project, only Institute of Nuclear Medicine (INM) in Dhaka is working on the project and Nuclear Medicine Centre at Chittagong is ready to start work. Three other centres may start this work shortly.

During 1987 INM has received NETRIA bulk reagents in 6 consignments and all of these have been used in the Institute of Nuclear Medicine (INM) in Dhaka. At present we are localy producing the following reagents: (a) T_3 and T_4 hormone free sera (b) Internal Quality Control (IQC) sera and (c) standards for T_3 and T_4 RIA assays. In future we have a plan to have our own labelled T_3, T_4 and TSH and the second antibody. We need training to improve the techniques

to prepare the bulk standard and to produce the second antibody.

Monoclonal Antibodies For Immuno-scintigraphy:

Institute of Nuclear Medicine (INM) in Dhaka is well equiped with two gamma cameras (computerised), one rectilinear scanner, uptake systems and ultrasonogram. Radioimmuoassay (RIA) laboratory is also well established with the labeling facilities as well as with the data processing system. In the Institute we have experienced and trained manpower of physicians, physicists and radiopharmacists. These personnel are acquainted with theoretical knowledge of monoclonal antibodies in relation to lebeling of monoclonal antibody with different radioisotopes as well as pharmacokinetics of the labelled monoclonal antibodies. The Institute receives a good number of brain and liver malignant cancer patients and there are also a good number of breast and rectal cancer patients who report in different Medical College Hospitals in the country. In this Institute in-vivo kits like sulfur colloid, MDP, DTP Glucoheptonate etc labelled with Tc-99m are being used which are not specific to tumor. We, therefore, feel that there are opportunities to apply the monoclonal antibodies for immunoscintigraphy and therapy with the prsent facilities at INM in terms of equipment and manpower.

Aerosol Inhalation Imaging for the Diagnosis of Respiratory Diseases:

Chronic obstructive pulmonary disease (COPD) is a common problem in Bangladesh. This leads to increased morbidity in the absence of specific treatment due to lack of proper diagnosis.

Radioaerosol inhalation study would provide an excellent method for early diagnosis of COPD leading to effective management of the patient before irreversible damage sets in.

The Institute of Nuclear Medicine in Dhaka provides good facilities for this research project. Bangladesh is therefore, participating in this project. Bangladesh participated in the workshop that was held in Bombay to discuss the technical details of the radioaerosol inhalation study. The Radioaerosol Nebulizer Generator invented by the BARC workers was demonstrated to the participatns. We have received one such generator for the research project.

Radiation sterilization of skin and bone grafts of human and animal origin

In collaboration with IAEA, we have initiated a research programme on 'Tissue Banking' for the preservation of human and animal tissues for utilization in

rehabilitative surgery. Research work is in progress for the preservation of human amnion membranes which could be utilizd for biological dressings of burn patients. The following work have been done on the project during the period January to December, 1987.

(i) Comparative study of the structure and radiation sensitivity (UV) of the isolated radio-resistant bacteria (MN-1) from amnion membrane with known radio-resistant one -- Bacillus pumilus (B.P.).

(ii) Cytological study of the effect of different intensity of UV radiation on freshly delivered amnion membrane.

(iii) Study of the effect of UV radiation on microbial contaminants in amnion membrane (Oven dried 40 $\pm 2^{o}$C).

(iv) Preparation of sterile (UV treated) amnion membrance grafts.

Summary of the progress of work is as follows:-

1. Procedures have been developed for making amnion grafts.

2. Oven dried (40 $\pm 2^{o}$C) amnion membrances could be sterilized with UV utilization as burnt dressings.

3. UV sterilized amnion membrane grafts have been supplied to the Hospital (DMCH) for the treatment of burnt patients.

Progress of work would be expedited on receipt of equipment expected from IAEA.

Toxic Elements in Foodstuffs

The investigations for the estimation of toxic and essential trace elements as required by the project protocal (Hg, Cd, Cu, Fe, Se, As, Pb, and G) in rice, wheat vegetations, fish, milk, egg and drinking water were carried out in order to find out if there is any potential health hazards from these foodstuffs and drinking water.

Cereals and vegetables were analysed by XRF method & validated by PIXE method. For cereals and vegetables except As, no other toxic elements were found. These were much below the permissible limit.

In the present study, 5 sweet water fish samples were analysed using the external beam proton PIXE method. The

level of As was found above the detection limit of the method only in prawn, which is 25.2 ug/g (dry weight basis). The maximum permissible limit of As in fish is 3 ug/g.

Human milk, cow milk and formula milk samples and egg yolk were analyzed using XRF and PIXE methods. No toxic element, except Pb in two egg yolk, was found in any of the samnples analyzed. The level of Pb was found to be 1.70 & 16.9 mg/kg in these two yolk samples and the latter value is much higher than the maximum permissible value of 1-5 mg/kg for food in general excluding fish & vegetables.

Cd was detected only in the Dhaka City water supplied from the overhead tank after lifting with deep-tube-well and the range was 1.03-1.58 ug/L while the range of Zn was found to be 18-3800 ug/L with the mean of 181 ug/L for 24 samples. Application of electrothermal method, hydride generation technique of AAS as well as 57 Co X-ray source excited XRF method for some specific elements would be made in near future. the application of neutron activation analysis will be utilized whenever the reactor time becomes available and a gamma detector expected from the agency is obtained.

III. UNDP (RCA) REGIONAL INDUSTRIAL PROJECT

Tracer Technology in Industry:

The IAEA/UNDP/RCA Sub-Project on Tracer Technology in Industry although 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- 2 February, 1986. The earlier participation in the programme was limited only to training of a technical person through the first Regional Training Course organized in the Bhabha Atomic Research Centre (BARC), Bombay, India, in 1983.

Since the first EMS held in 1986, efforts have been made to develop and demonstrate a mechanism of transfering the technology of radiotracer methodology to some selected industries in Bangladesh.

As a programme strategy, it is required that an established host laboratory under the National Atomic Energy Authority is identified, which will communicate with the local industries for introducing the technology of radiotracer methodlogies. In the Bangladesh Atomic Energy Commission (BAEC), a Tracer Group consisting of 4 scientists has been formed in the Chemistry Division of Atomic Energy Centre, Dhaka (AECD).

The Tracer Group in the AECD is reasonably equipped with both nuclear and chemical equipment for analytical measurements. Some field equipment are, however, to be added

for field demonstration experiments as recommended by the field mission expert Dr. S.M. Rao. The possibility of local supply of some tracers, e.g. ^{82}Br, is also there in the Radioisotope Production Division of the Institute of Nuclear Science and Technology (INST), AERE, Savar, where a 3MW Triga MK II reactor is now in operation.

Two target industries have been selected for tracer technology projects and five tracer technology projects have been identified which can be implemented in the target industries. The implementation of two of these projects, Mercury Inventory and Gas Flowmeter Calibration, has already been planned. The demonstration experiment on mercury inventroy would be executed in the Chittagong Chemical Complex (CCC) in next May. Mr. R.L. Ajmera, Isotope Division, BARC, has been contacted as the field expert for this experiment.

One engineer from the Titas Gas Co. has participated in the demonstration experiment of flowmeter(FM) calibration, recently held in Thailand. His responsibility would be to calibrate FMs in his organization with assistance from the tracer group in the BAEC. IAEA assistance may be required here.

The other projects would require further field studies before implementation is planned. This field study is expected to be carried out towards the end of 1988. The selected industries in this regard are:

- Ghorashal and Polash Fertilizer Factory (BCIC)
- Chatak Cement Factory (BCIC), Sylhet
- Titas Gas Transmission and Distribution Co. Ltd.

The Executive Managements of these industrial units except the Cement Factory, have been contacted. The management would gladly accept the technology if they are convinced of the economic benefits of the technology and the radiation safety aspects are ensured.

NDT Services

Under IAEA Project No. BGD/8/006 for 1986 on the Development of Non-Destructive Testing, Mr. R.F. Vogl, an IAEA Expert, undertook an expert mission in June-July 1987 at Atomic Energy Centre (AEC), Dhaka.

The objectives of this expert mission were:

i) To assist in setting up NDT Laboratory at AEC, Dhaka.

ii) To conduct training of NDT personnel in the use of NDT techniques:

iii) To assist local counterpart in setting up standard training programme in basic NDT technique and advise on qualification and certification schemes for NDT personnel.

Under IAEA Project No. BGD/8/006 for 1987 on Development of Non-Destructive Testing. BAEC has received the following equipment:

(1) Gamma Ray Projector (1 unit),

(2) Some Radiographic Testing accessories,

(3) Ultrasonic flaw detector (1 unit), and

(4) Ultrasonic Thickness Gauge (1 unit).

BAEC hosted the Third Meeting of National Co-ordinators for NDT subproject in Dhaka from 30 March to 2 April, 1987. The NDT National Co-ordinators of Australia, Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Sri Lanka, Thailand and also Deputy Project Manager of Latin American NDT Project and UNDP Project Co-ordinator attended this Meeting. Main outcome of the meeting was "The Meeting reviewed the status of the Project, discussed and finalised the work programme for 1987 and also planned for the activities for 1988".

Four NDT Personnel of different organisations in Bangladesh attended RCA Regional NDT training courses and workshops in 1987 (Japan, India, Korea & Indonesia).

The NDT Personnel Certification Committee in active collaboration with BAEC organised one four week National Training course on UT-I from 1 to 27 August, 1987 in BAEC. 16 participants from 8 organisations attended this training course. Mr. R.S. Gilmour, of Australia, an UNDP/IAEA/RCA Project Expert on NDT, Mr. L. Venkataraman of Atomic Fuel Division of Bhaba Atomic Research Centre (BARC), Bombay, India assisted this course as IAEA Experts. This training course was designed on the basis of IAEA's syllabus TECDOC 407, Canadian Manuals and ISO Standard N35-E.

Invitations from IAEA for participation in the RCA Regional NDT Training Courses (1988) on RT-2 in India, UT-2 in Pakistan, SM-2 in China and ET-2 in Korea have been received. BAEC is taking necessary action for nominating suitable candidates for these training courses.

The NDT Personnel Certification Committee in active collaboration with BAEC has decided to organise one UT-I and one RT-I National training courses in 1988 at BAEC. The local resource personnel on UT & RT will organise these training courses. No IAEA assistance in terms of expert will

be required. Some materials and accessories may be required. RCA Project Co-ordinator has already been informed.

The NDT Personnel Certification Committee in collaboration with BAEC has planned to organise one UT-2 and one SM-I National training courses for local NDT practitioners for 1989. IAEA will be requested to provide experts, equipment and materials for these training courses.

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 organisations as and when requested for.

A few private and public sector organisations have also NDT facilities and offer NDT services to their own installations and other organisations. Most of the NDT personnel of these organisations have been trained in National and Regional NDT training courses under UNDP/IAEA/ Regional NDT Sub-proejct.

Present Status of Radiation Processing in Bangladesh

It has been identified that the following types of radiation processing technology has good possibilities in Bangladesh:

- Sterilization of medical products
- Curing of surface Coatings
- Vulcanization of Natural Rubber latex
- Cross-linking of wires and cables.

In the field of sterilization of medical products the following studies have been successfully done:

- Survey of the extent of contamination in the various locally manufactured medical products
- Radio sensitivities of the commonly available microbes
- Dose required for the sterilization of the relevant medical products
- Quality assurance of the sterilized medical products and
- Survey of sterilized products needed in Bangladesh

Some local manufacturers of medical proucts have utilized the existing Co-60 source of BAEC to sterilize a limited quantity of their medical products and sold in the market.

Bangladesh Atomic Energy Commission and Bangladesh Export Import Company (BEXIMCO) have entered into a joint venture in the name of Gammatech Limited for commercial utilization of radiation processing in the country. A 200,000 Ci cobalt-60 source supplied by IAEA would be installed in the port city of Chittagong mainly for the preservation of food items and the sterilization of medical products. BAEC would also use this project for its R&D proejct for vulcanization of natural rubber latex. This multipurpose plant is scheduled to go into production from early next year.

In the field of fibre-polymer composite the R&D work on the following products has been done.

- Jute plastic graft co-polymer
- wood plastic composite
- Hard-board plastic composite

The wood plastic composite has been developed by both radiation co-polymerization and tharmal catalytic copolymerization methods. The composites developed were found to have better dimensional stability, moisture resistance, fungus/insect resistance and weather durability.

The research facilities for the curing of surface coating is being developed through the assistance of IAEA. The research facilities of the vulcanization of natural rubber latex is expected to be established within next two years.

During 14-17 March, 1988, an executive management seminar was held in Dhaka on the Industrial Application of Radiation Processing. In this seminar about 92 participamts from 29 Pulic and Private Sector Organizations/Firms participated. These representatives have now understood the avenues of furthering the collaborative work. However some of them would need direct participation by visiting countries where practical application of radiation processing techniques have been demonstrated.

Nulear Control System

(a) Paper: Earlier Bangladesh suggested that the application of NCS would be effective in four different phases:

Phase-I - Increasing the awareness about NCS and building up of manpwer:- In this respect the three member IAEA

Consultant Mission headed by Mr. Homna of Japan suggested in their preliminary report that Government of Bangladesh should provide NCS training courses to mill personnel who are directly in charge of this specific project and BAEC should form one group of members to study the paper technology and application of NCS to paper industry in order to transfer this knowledge to mill personnel. We may, therefore, select one person from each of the 4 mills and train them locally and as well as in Regional Training Courses when organized under RCA programme and also strengthen existing 2 member BAEC team.

Phase-II - Fasibility study for introduction of NCS:- A preliminary feasibility study was carried out in 1986-87 by the local engineers of BAEC & BCIC. The said Mission suggested that Government of Bangladesh may take the feasibility report into cognizance and followup action are initiated.

Phase-III - Acquisition of NCS from abroad, installation, commissioning, test run service needs etc.:

The Mission suggested that Government of Bangladesh should subsidize to instal NCs in paper industry as training and demonstration unit.

In this respect BAEC will try to convince BCIC to procure its first NCS in one of the mills. BAEC, however, feels that a medium/small size paper mill may be chosen by the RCA for installation of NCS and be used as a training/ demonstration station.

Phase-IV - Developmet, fabrication, adaptation and assembling of NCS instrumentation.

This phase would be discussed at an appropriate time.

(b) Application of NCS in the field of Civil Engineering:

Bangladesh is participating in the programme. One Engineer is going to attend the forthcoming Executive Management Seminar on use of Nucleonic Instrumental Technique in Civil Engineering in Tokyo, Japan from 24 May to 1st June 1988.

IV. NUCLEAR TECHNOLOGY BASED PROJECTS

Basic Science using research reactors:

(a) Bangladesh participated in the workshop on the operation and Maintenance of Research Reactors held at BARC, Bombay during 16 Nov. to 4 Dec. 1987.

(b) Bangladesh participated in the workshop on IBM compatible PC's for laboratory automation held at BARC, Bombay during 23 Nov -11 Dec. 1987.

Bangladesh would like to participate in future actvities in the above programme.

Bangladesh would also like to participate in the neutron beam experiments using research reactors if such programmes as proposed by Pakistan during 9th Working Group Meeting in Columbo are taken up under RCA.

In Bangladesh Neutron beam experiments have been planned using two of the beam ports of the TRIGA reactor.

For R&D work in the field of neutron scattering, which is a very powerful tool for both fundamental and applied research in materials science and solid state physics, BAEC is trying to procure a triple-axis spectrometer through the IAEA.

It will be really worth a while if Bangladesh can join the regional collaboration programme on neutron scattering comprising some of the South East Asian countries. In fact, Dr. V. Dimic, an IAEA expert also recommended that Banladesh should joing the programme.

The R&D work in Neutron Radiography, a new NDT technique for analysis and testing of materials is expected to start very soon using the tangential beam port of the TRIGA reactor. This program can be taken up as an independent collaborative programme of the South East Asian countries or as a part of the UNDP/IAEA/RCA industrial project on NDT. Dr. Dimic recommended a collaborative programme on dynamic imaging method.

Maintenance of Nuclear Instruments:

The previous IAEA/RCA Project on the "Maintenance of Nuclear Instruments" in Bangladesh which was going on for the last six years has been successfully concluded last year. The project concentrated mainly on the measures of good power and environmental conditioning on a few Pilot Laboratories. Emphasis was given mainly on the preventive measures like quality control of the instruments. It was carried out by less qualified technical people, the users and operators for examples. The highly qualified technical people were associated with the tedious task of corrective maintenance. A database software for the Computerized Maintenance of Preventive Matinenance (CMPM) has already been developed with the help of IAEA Staff Member Mr. A.M. Patanker and is presently awaiting full implementation of the same.

The new IAEA/RCA Project Proposal of a Coordinated Research Programme on "Care and Maintenance of Nuclear Medicine Equipment in Asia", may be concentrated mainly on inventory control, protocols for preventive maintenance and faults detection and limited spare parts supply. This new Coordinated Research Programme will involve mainly hospitals with particular attention to nuclear medical equipment. IAEA has already supplied us an IBM-PC, Model 5151 for organizing maintenance and keeping up to date data concerning equipment. If the said project is approved by IAEA, then we have the required manpower and technical accessories to cope up with the project, which is definitely worth participation

V. STRENGTHENING OF RADIATION PROTECTION:

In order to strengthen the nuclear safety and radiation protection activities in the country Bangladesh Atomic Energy Commission has recently set-up a new division namely, "Nuclear Safety & Radiation Protection Division". An Act/Ordinance is also under active consideration of the government for promulgation to give legal coverage of the activities. Dr. M.A. Rab Molla, Director of the Nuclear Safety & Radiation Protection Division is currently in Australia participating RCA training course on the "Development of infrastructure for ensuring radiation protection".

The participations of the related scientists/engineers of the Commission in the future training courses/workshops (particularly those mentioned in Annexures III, IV, V, VII and X of the RCA project - Strengthening of Radiation Pretection, Project Documents - on December 1, 1987) are likely to contribute positively in strengthening of the radiation proetection activities in the country.

VI. NEW PROJECT PROPOSALS

Out of the following 9 new projects proposed Bangladesh would like to participate in serial nos. 1,3,4,5,7 and 9.

1. Use of computers in Technetium-99m Imaging
2. Use of Nuclear Techniques to study Marine Pollution
3. Integrated Conrol of Tropical Plant Viruses with Nuclear techniques
4. More effective Soil Management Practices by quantitative assessment of soil erosion and sedimentation.
5. Asian Regional Co-operative project on Food Irradiation Process Control and Acceptance - RPFI Phase III.
6. Archaelogical investigations using nuclear based techniques.
7. Integrated use of isotope techniques in water resources.
8. Improvement of cancer therapy (Phase II).
9. Immunodiagnosis of tuberculosis.

COUNTRY STATEMENT

The People's Republic of China
The 10th RCA Working Group Meeting
11-14 April 1988, Beijing, China

The RCA Working Group, since its formation in 1979, has had nine meetings in the Member States successively. Now we are getting together here in Beijing for the 10th Working Group Meeting.

In last year, the new RCA agreement entered into force and, it is the first time that the RCA programme involves not only isotope and nuclear technique application, but also nuclear power and radiation protection; the phase II of the UNDP/RCA Regional Industrial Project officially commenced; some projects have entered a new phase. China actively participated in and sponsored many RCA activities and progress made in various projects in China is detailed below:

1. Tracer Application in Industry

Tracer application in industry has advanced in many aspects. In petroleum industry, a good example is that well-time number of water injection wells measured with tracer technique was increasing from about 2,500 in 1986 to about 4,000 by the end of 1987. The production of the tracer ^{131}Ba labelled microsphere (trade name ^{131}Ba-GTP) will be extended by the Insitute of Atomic Energy. One project, namely isotope tracer technique in the oil field development to search for the potential production zone, is underway at Dagang oil field and the Agency intends to give it some support.

During last three weeks, the Third UNDP/IAEA /RCA Training Demonstration on the use of tracer technology in industry was held at the Institute of Atomic Energy, Dagang

oil field and Beijing Experiment Chemical Plant as well. 16 participants from various countries were well trained with the knowledge and information of this field.

2. Non-Destructive Testing (NDT)

From 1987 up to now, industrial sector, the Chinese NDT Society and its 26 local societies arranged many activities for national harmonization among ministries and industrial sectors in NDT personnel training, qualification and certification. More than 60 NDT training courses in every technique for level 2 have also been organized. Among the participants, 2130 persons got their certificates. At the same time, the State Commission of Machinary Industry and the Ministry of Labour & Personnel have also held a total of four training seminars for level 3 personnel on RT and UT. For the training of level 1 personnel, 696 technical persons have got certificates by passing examination. Two national Training Courses on UT and RT were hosted by SRIM and SNERDI respectively under UNDP/IAEA/RCA supports.

On our schedule, the 4th Chinese National Conference on NDT will be held this year and many seminars or workshops on UT, RT, MT, NDT on Non-Metallic Materials and laser-holography are being organized. We hope that regional and international harmonization and acceptance of qualification and certification for NDT personnel could be promoted and suggest, under the UNDP/IAEA Project, some small-scale seminar or other activities orriented to new techniques or application in new fields be held, such as NDTtechnique for reactor fuel elements, eddy current testing in industrial application and its data processing, application of computer for NDT, etc.

We are very interested in organizing some of above mentioned seminars, particularly its first one.

3. Radiation Technology, Radiation Vulcanization of Natural Rubber Latex (RVNRL)

According to the programme of test & evaluation of irradiated latex produced in CAIR-BATAN, Indonesia and TRCRE, Japan and China will do some tests of medical products this year. The first meeting of the National Research Groups (NRG) leaders scheduled 5-7 October 1988 will be hosted by Research Institute of Rubber Latex Industry at Kunming, China.

Radiation Curing

From 7-9 Sept. 1987, the National Executive Managemant Seminar on Radiation Curing Technology was convened at Shanghai and hosted by Shanghai Applied Radiation Insitute (SARI) of Shanghai University of Science and Technology (SUST). The seminar showed that China is already well advanced in this field, but commercialization of the technology is yet to be achieved. Now the EBcuring facilities in SARI/SUST have finished the pilot testing.

Radiation Crosslinking

In 1987, an Expert Advisory Group (EAG) Meeting of Radiation Crosslinking was hosted by Changchun Institute of Applied Chemistry in Changchun, China, 19-20 June. The EAG recommended two Regional Training Courses and several National Executive Management Seminars for 1988 and 1989. From 15 to 18 June, a Research Coordination Meeting on Radiation Immobilization of Bioactive Materials was convened at Beijing University.

In 1988, a National Executive Management Seminar on Radiation Crosslinking and a Regional Training Course on the same title will be held in June and September at Changchun, and Shanghai/Changchun respectively.

Radiation Sterilization

In 1987, Chinese participants attained to the Regional Training Courses on Quality Control and Sterility Assurance, and on the selection of compatible materials for radiation sterilization. A National

Training Course was organized by the Beijing Radiation Center. The Beijing Radiation Sterilization Center will be completed in this year.

4. Nucleonic Control System

In China, some universities, institutes and instrument factories produced many kinds of radioisotope instrumrnts incl. nuclear gauges (such as level gauges, thickness gauges, density gauges, moisture gauges etc.) They are used in paper industry, petroleum, chemical, and iron and steel industries, mineral proccessing, and many others. We are very interested in the NCS application in coal industry, civil engineering and other industrial sectors. We would like to welcome technical transfer or co-operation in this field.

5. Isotope Hydrology

The Executive Management Seminar on Isotope Techniques in Water Resources Development and following Regional Workshop on Isotope Hydrology for Asia and the Pacific were held at Beijing from 15-26 June 1987. Some thirty Chinese participants attended the seminar. This is the final activities within the project funded by Australia. The proceeding of the seminar and workshop will be published by us with the Agency's support. The presented papers cover the areas of water resources development hydrology and sedimentology, such as natural and artificial radioisotope application in surface and underground water exploration, studying the seepage under dam foundation, ground water movement, streamflow measurement in big rivers, sediment transport in harbours, basins and navigation channels etc.

We support the new proposal for the regional project on integrated use of isotope techniques in water resources in Asia and the Pacific Region.

6. Food and Agriculture

In January 1988, the National Seminar on Food Irradiation Development in China was convened at Beijing with support of the

Agency. More than 80 papers was contributed. Now in China, more than 10 Radiation Centers have been set up, almost all these multipurpose radiation facilities are used for radiation sterilization, food radiation preservation and radiation chemical products. In recent two years we did some marketing trials for irradiated foods in hundreds tonnes level, public acceptance is OK, some economic benefits have been got. We'd like exchange information with RCAmember states in this regard, we can now offer 3 kinds design of radiation facilities projects. Hopefully, the 1988 Geneva Food Irradiation Conference and the RPFI Phase III could achieve their goal.

In 1987, three Research Coordination Meetings of Agriculture were convened in China, namely radiation disinfestation meeting, semi-dwarf mutants of rice improvement meeting, and azola nitrogen fixation meeting. We have participated some work on improvement of domestic buffalo and grain legume. The second Research Coordination Meeting on Nuclear Techniques for Toxic Elements in Foodstuffs is scheduled in Beijing, only a few days later (19-22 April).

7. Medical and Biological Application of Nuclear Techniques

We have participated the projects on radiommunoassay of thyroid hormones, radiation sterilization of biological tissue grafts, radioaerosol imaging for diagnosis respiratory diseases and are interested in such projects as: quantitative evaluation of nuclear medical procedures for the diagnosis of liver diseases, improvement of cancer therapy, computers and imaging in nuclear medicine, care and maintenance of nuclear medicine instruments, and development of Tc^{99m} generators using low power research reactors. While putting into clinic use pratice domesticly, we can offer some RIA products for thyroid related hormorces, such as antiserum and other reagents, some radiation sterilized tissue grafts and also produce ^{99m}Tc using molybenum target or fission molybdenum.

8. Others

As to energy and nuclear power planning, we have participated in the WASP user workshop, and do some work on WASP program.

China became a participating member state of the strengthening of radiation protection project in 1987, some Chinese participated in the Regional Workshop on photon, electron and neutron dosimetry in radiotherapy. We are also interested in the personal and environmental dosimetry inter-comparison study and in setting of reference man.

9. New Project Proposals

We support many new project proposals delivered by other countries, and we would like also to put forward the following new project proposals for consideration.

a) Radiopharmacy Quality Control
b) Application of Nuclear Technique for Agriculture
c) Development on the Preservation of Antique Objects by Gamma Radiation Technology, Another Application of Nuclear Techniques in Archaeology
d) The production of monoclonal antibodies related to HBV and the Spread of SPRIA in Asia-Pacific Region
e) Studies on Diagnosis of Pseudorabies in Swine Using Radiolabelled DNA Probe and Monoclonal Antibody Techniques
f) Early Pregnancy diagnosis in diary cows based on hair progesterone analysis using radioimmunossay and enzyme immunoassay
g) Production of monoclonal antibodies to rice bacterial diseases
h) Application of Nuclear Instrument-Computer Controlled System in Iron Ore Proccessing Plant

The Asia-Pacific Region, with about 40% of the world population and rich in natural resources, occupies an extremely important strategic position in international community and the

world economy. We are convinced that the Asia-Pacific Region has broad prospects in its future development and will have an increasingly important and far-reaching influence in the world. The past years witnessed fruitful cooperation between Asia-Pacific countries has been achieved. It is our hope that such cooperation both bilateral and multilateral, will bear richer fruit in the years to come.

May I conclude by saying that China will continue to host some RCA activities in 1989, with the financial support of the Chinese Government and arrange proper seminar or training course with Chinese financial contribution.

Thank you!

10th WORKING GROUP MEETING OF RCA MEMBER STATES
COUNTRY STATEMENT - INDIA

Beijing, China
April 11 - 14, 1988

India is very happy to participate in the 10th Working Group meeting of the RCA member states which is being held in Beijing. We are happy to note that this meeting is being hosted by China, which has, in the short span of time since joining the RCA, very actively participated in the various programmes under the RCA. We welcome this opportunity to discuss projects of mutual interest in the field of nuclear science & technology with scientists of this region so that RCA can make meaningful contribution to regional cooperation in the application of nuclear techniques in medicine, agriculture and basic sciences in the member states. RCA is now in its third extension and is entering into a phase of rapid growth. As a founder member of RCA, India has taken keen interest in the various activities of RCA and has actively participated in many of them. Besides, India has, over the years, provided special assistance through its extra-budgetary contribution to the RCA.

During the last year, a major impetus to the nuclear research effort in India was provided by the continuous, full-power operation (100 MW) of the research reactor Dhruva at Trombay. The initial teething troubles experienced in the operation of this reactor, which is of a totally indigenous design, were successfully overcome by Indian scientists and engineers through ingeneous solutions and the reactor is now operating at full power (100 MW). In the process, considerable experience has been gained which will enable us to meet similar challenges in the future. Besides providing a powerful tool for research in nuclear sciences, Dhruva will go a long way in achieving a high degree of self-sufficiency in the production

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of radioisotopes used in medicine, industry, agriculture & research in the country. In the area of nuclear power an important step was taken recently by constituting the Nuclear Power Corporation under the Department of Atomic Energy, which has been vested with the responsibility for the design, construction and operation of nuclear power plants in the country on a commercial basis. This has been possible because of about 2 decades of experience in the safe & reliable operation of nuclear reactors and developing completely indigenous capability in all areas of the nuclear fuel cycle. The new corporate structure for the nuclear power programme will enable greater operational flexibility and prompt execution of the projects, thereby helping to achieve the targets set for nuclear power generation in the country.

During 1987 India actively participated in all the sub-projects of the IAEA/UNDP/RCA Industrial Project on Applications of Radioisotopes and Radiation Technology. In the sub-project on radiation processing, a Regional Training Course on sterilisation of medical products with special emphasis on materials compatibility was held at Bombay during November 1987. The course, attended by 12 participants from the RCA countries provided the participants with detailed information on materials suitable for radiation sterilisation and the tests to be carried out on various materials for confirming their suitability for radiation treatment. In another Regional Training Course on microbiological aspects of radiation sterilisation held at Bangkok, India provided an expert for organising practical demonstrations. The National Executive Management Seminar (NEMS) on cross linking of wire & cable organised at Calcutta was attended by a large number of participants and evoked keen interest in the industrial use of E. B. irradiation technology. One batch of radiation vulcanised natural latex (RVNL) received from the pilot plant operating at Jakarta is being evaluated at the laboratories of the Rubber Board at Kottayam in India. The project investigator from India participated in the Expert Advisory Group meeting on RVNL held at Jakarta during February 1987. In the sub-project on NDT, a Regional

Training Course on Radiography (Level 2), organised in August 1987, was attended by 9 participants from the region and 3 local participants. In the sub-project on tracer technology, India will provide experts and equipment to demonstrate the use of tracer techniques in chlor-alkali industry in Bangladesh and cement industry in Korea. India provided experts to give lectures at NEMS held in other countries.

During 1987 two workshops were organised at BARC under India's special assistance to RCA. The 3 week's workshop on Operation & Maintenance of Research Reactors was attended by 9 participants from RCA countries and 12 participants from India. The workshop comprising of lectures, demonstrations, and special seminars on subjects of topical interest, covered operational aspects of research reactors and auxilliary systems and areas such as reactor physics, reactor chemistry, health physics aspects etc. The workshop was extremely useful to the participants as gathered during the feed-back sessions. Another 3 week's workshop on the use of IBM Compatible Personal Computers for Laboratory Automation & Data Acquisition was organised at BARC during November-December 1987, which was attended by 11 participants from 8 RCA countries and equal number from India. In addition to formal lectures on hardware architecture and interfacing technique the workshop had adequate demonstrations of PC based instrumentation and related project work.

India is participating in a number of projects in the field of medical & biological sciences under the RCA. India hosted a workshop on Radioaerosol Inhalation Imaging for the Diagnosis of Respiratory Diseases in the developing countries, which was attended by 8 scientists from the region. BARC has indigenously developed an aerosol generator and inhalation apparatus (IGIA) using Tc-99m, which has been in use for 10 years at the Radiation Medicine Centre, BARC for clinical diagnosis. At the workshop, the IGIA was demonstrated in clinical applications and each participant was familiarised thoroughly with the

use of the apparatus. BARC has supplied this apparatus free of cost to all participants, which will be used by them for clinical work in their own countries. We hope that the participants of this project will be able to present their experience with the aerosol technique and exchange ideas with other international experts in this field during the forthcoming International Symposium on Dynamic Functional Studies. In the project on Imaging Procedures for the Diagnosis of Liver Diseases, a specialist from India has served as the Editor of Atlas of Liver Imaging being prepared by the Agency.

India is actively participating in the project on development of Tc-99m generators using low power research reactors and has developed titanium molybdate gel system which has been found satisfactory for making generators with activity upto 500 mCi per generator. The Tc-99m yield from this generator system is quite high. The eluted Tc-99m has satisfactory chemical & radiochemical purity and can be used for the preparation of Tc-99m labelled compounds using commercially available cold kits.

India is participating in the project on Evaluation of Analytical Methods for the Determination of Toxic Elements in Environmental Samples. Neutron activation analysis & DCP emission spectrometry are being evaluated for this purpose and the analytical procedures have been standardised. These methods will be applied to items of stable food like wheat flour, rice and fish protein samples as also for the analysis of intercomparison samples to obtain a comparative evaluation of the two methods and validation of analytical methodology which could then be used for similar programmes at national level.

India has an active programme in the industrial applications of radiation technology. The second medical products radiation sterilisation plant in the country will be shortly commissioned at Bangalore in South India and will offer irradiation service to manufacturers

of medical products and hospitals located in and around Bangalore. The radiation plant for hygienisation of sewage is also expected to be operational during the current year and will provide useful data for the evaluation of gamma irradiation process for safe disposal of municipal sewage sludge. An electron accelerator is being set up at BARC for R & D work relating to the use of electron beam irradiation technology for industrial products and processes. Work on cross-linking of wires & cables, curing of paints etc. will be initiated using this facility.

We propose that India's contribution to RCA for 1989 be used for organising regional workshops on the following subjects :

1) Personnel and Environmental Dosimetry Intercomparison Study

or

Radioactivity Analysis & Environmental Monitoring using Chemical Analysis & Spectroscopy

The workshops could be of 4 days duration for 12 participants.from RCA member states.

2) Workshop on Nuclear Medicine Instruments Maintenance

India has expressed the view at the earlier Working Group meetings that RCA Projects should be extended to encourage regional collaboration in research & development for nuclear power, including mineral prospecting, power planning, reactor safety and health and waste management aspects. We earnestly hope that more such projects will be formulated under the RCA in future. We would be happy to share our experience in this area with other RCA member states and assist them in the area of manpower training.

In conclusion we wish to reiterate our faith in RCA as a means of promoting regional co-operation in different aspects of applications of nuclear energy in the RCA member states. We welcome the opportunity to discuss the various issues relating to RCA and the future plans for RCA, at the IAEA-RCA seminar scheduled to be held at Jakarta during June 1988.

Annex 38

Country Statement of Indonesia
0th Working Group Meeting of RCA Member States
Beijing, People's Republic of China
11-14 April 1988

Mr. Chai

It ne great pleasure and honour to represent Indonesia for the first t: an RCA Working Group Meeting. As one of the original particip n the meetings and discussions on the founding of RCA, which bn the initiative of the then Director of Bhabha Atomic Researche Dr. Raja Ramanna, I have found indeed a great personal statisfathat RCA is very much alive and still flowering, like the flowers :ly in bloom in Beijing. Although initially confined to a few topiated to nuclear science and technology, RCA programmes now cover maas of agricultural, industrial and medical applications of direct re to the development needs of the less developed countries.

Ind participates in almost all of RCA activities being discussehis 10th Working Group Meeting. I would like to highlight some of activities which we have found to be significant, including activitih are national but which have no doubt been stimulated or encouragprevious RCA activities. Hopefully the true significance of the ls of RCA could then be brought to light. However I shall not repose aspects which have been touched upon by the RCA Co-ordinid the UNDP Project Co-ordinator.

Industrilications

The-owned oil and gas company Pertamina has recently decided to utililear techniques. To this end, 48 foremen have participated in a tr course on radiation protection and tracer applications organizeBATAN, the National Atomic Energy Agency of Indonesia. About 5(will be trained later this year. BATAN will also train Pertaminersonnel who will be directly engaged with nuclear applicatthe first of which will be flow-rate measurements and tank calibrat

BATAN has also been commissioned by Pertamina to assist in the evaluation of geothermal resources for power generation, through the analyses of O-18, D, H-3 and C-14 in hot spring water samples from Java Island. For the information of delegates, geothermal power plants of 140 MW capacity have so far been installed in Java and the total potential in Indonesia has been estimated to be as much as 10,000 MW.

The number of nucleonic control systems installed has increased considerably in recent years, from 11 in 1982 to 48 in 1986. The number is expected to continue to increase in the future.

In the field of gamma radiography the number of radiographers and operators have now reached 340 and 375 respectively, out of a total number of participants in training courses of 521 and 490. In a related development, in 1985 the Government established the National Standardization Council to unify standards hitherto issued by different Ministries and Agencies. In line with the recommendations of the RCA NDT Project, a national committee was set up last year to formulate a national scheme for certification and qualification.

Food Irradiation

Food irradiation has been a research topic at BATAN for more than 20 years. Much work has been done on delay of ripening, disinfestation and eradication of insects, and on related topics such as packaging. Efforts since 1983 to convince the Health Ministry to give clearance for certain food items bore fruit in December 1987 when the Government decreed that spices, grain and tubers were cleared for irradiation. It remains to be seen whether commercial applications will be taken up by private entrepreneurs. In this respect, continuation of phase III of the RCA Food Irradiation Project will be crucial to the commercial implementation of food irradiation. Further efforts will be made to obtain clearance for dried fish.

Radioimmunoassay

1987 saw successful participation by Indonesia in this project. Attempts have also been made to produce reagents locally, and these compare favourably with the quality of imported products. Some obstacles remain which are institutional in character, but these we hope could be eliminated in the near future.

A joint research programme on endemic goitre is under way bilaterally in Central Java which may reveal interesting results on the prevalence and the possible causes of endemic goitre. Should further studies be required on a national basis, then these should certainly make use of the experience obtained through the RCA project.

Energy and Nuclear Power Planning

The WASP Users Workshop signified an important new addition to RCA activities. The exchange of information was deemed extremely useful by all participants and Energy & Nuclear Power Planning will be further enhanced.

These are only a few of the RCA and related activities which have developed during the past year. Many of these activities have a great potential for wide and commercial application. It is appropriate and opportune therefore to organize the RCA Seminar at this point of time, when almost 16 years have elapsed since RCA's beginnings. Indonesia is honoured and pleased to be host country for the Seminar. We wish every success, for the forthcoming Seminar and I should like to express the hope that the Seminar will produce the right document to guide the future work of RCA in successfully utilizing nuclear techniques for the benefit of Member countries.

In this respect, allow me to offer to all Member countries who are active participants to RCA to consider the use of the new nuclear research facilities which are currently under construction by BATAN at

Serpong near Jakarta, for purposes for which RCA has been set up, namely to enhance nuclear co-operation for the benefit and welfare of our peoples. These facilities include a 30 NW multipurpose reactor, a fuel fabrication facility, a radiometallurgy laboratory, a radioisotope production facility, an engineering and safety installation, a radwaste treatment facility, a nucleo-mechanoelectronic facility and facilities for neutron-beam research. These facilities will be operational by 1991 and the stage of construction will be open for your inspection during the RCA Seminar in June. We sincerely hope that suitable RCA projects could be developed to make full use of these facilities on the basis of mutual co-operation and mutual benefit.

Lastly I would like to join other delegates in thanking the Government of the People's Repubic of China for acting as gracious hosts to the 10th RCA Working Group Meeting, and to you, Mr. Chairman, for being an excellent and able Chairman.

Thank you.

Country Statement (Annual Report 1987)

Japan

April, 1988

Mr. Chairman, distinguished delegates,

Japan is very happy to participate in the 10th Working Group Meeting of the RCA member states, hosted by the People's Republic of China, a country which has a long and illustrious history and which has made significant advances in the field of nuclear energy in recent years.

As you are aware, Japan is actively associated with the RCA program since its participation in 1978 as it strongly believes that RCA provides excellent opportunities for the promotion of peaceful uses of nuclear energy and it will contribute to the economic development and prosperity in the region, bringing about scientific, technological and social benefits for each member state.

Japan is promoting the cooperative activities within the framework of RCA with particular emphasis on the transfer of technical skills and on the development of human resources. It will continue to support two large RCA projects, namely the UNDP Industrial Project, and the Medical and Biological Project. I am also pleased to

inform that Japan notified to the Agency in January its participation in the new RCA project on "Strengthening of Radiation Protection".

With regard to this new RCA program, I am pleased to report that a project formulation meeting was successfully held in Tokyo last November with the participation of ten RCA member states. At the meeting, the present status in each member state concerning radiation protection practice, man-power and other relevant problems were reviewed with regard to the application of nuclear techniques in industrial and biomedical fields. Possible ways and means to strengthen the radiation protection capabilities in each country through international cooperation were discussed and a framework of this new project was agreed upon. Japan will endeavour to support the project technically and financially as stated in the Project Document. Japan is pleased to support, in particular, firstly the training course to be hosted by the Australian Government, secondly a workshop for "Personnal and Environmental Dosimetry Intercomparison Study" to be convened in Japan sometime in October and thirdly, a CRP on "Setting of Referenceman and its Related Problems". In this regard, Japan will invite the other participating countries to this project for their active contribution in order that we may see a successful outcome of the project.

In respect of project implementation, we have noticed that the number of the projects under the RCA scheme has been increasing in recent years. This can be taken as a reflection of an eagerness to achievement as much as possible under the RCA. However, in view of effectuating through and effective execution of the projects under the present financial circumstances, I would like to suggest that the projects be selected and the less active and less essential on going projects could be reviewed and abandoned if justified to do so.

In this year, we will have several opportunities including this meeting to discuss about the RCA activities, such as the RCA Seminar, the Tripartite Review Meeting in June and the Meeting of Representatives in September. I am convinced that the regional cooperation under RCA shall be further strengthened and enhanced through these occasions. We must make good use of them in order to address whatever problems we may have at hand and to bring together ideas and suggestions so that the most practicable and constructive solutions may be found.

It is also my strong conviction that we shall continue to see the spirit of cooperations and understanding which distinguishes this regional cooperative undertaking as an outstanding example of a collective endeavour so active results that are real and useful in the field of nuclear cooperation.

Report on RCA activities in 1987

A. UNDP Industrial Project

After the successful conclusion of Phase I, Phase II has started in 1987, for which Japan sponsors the sub-projects on the radiation processing, non-destructive testing and nuclear control systems for paper, civil engineering and mineral processing.

1. Radiation Processing

In the Phase II of Sub-project "Rediation Processing", Japan actively participated in four activities, such as radiation vulcanization of natural rubber latex, radiation curing of surface coating of wood products, radiation crosslinking of wire and cable, and radiation engineering. This sub-project has been successfully implemented in 1987.

(1) Radiation vulcanization of natural rubber

In February in 1987, the 3rd Expert Advisory Group Meeting was held in Indonesia where Japanese experts participated in drawing the implementation plan of Phase II of the project. Based on this plan, a scientist from Sri Lanka has carried out, in the Japan Atomic Energy Research Institute (JAERI), the research and development activities on radiation vulcanization of natural rubber latex for 6 months to develop improved technology.

Rubber latex was vulcanized to be used for test production of condoms by the Family Planning Coordination Board of Indonesia in March 1987 with the cooperation of the Japanese expert stayed at BATAN for 3 months from January 1987. This project will be further implemented with the active participation of the Japanese Government aiming at the transfer of the technology to industries in RCA member states. Our Government is delighted to learn that as much as 3 tons of radiation vulcanied rubber has been produced for commercial production of condoms by the Family Planning Coordination Board of Indonesia.

(2) Radiation curing of surface coating of wood products

The EAG meeting was held in Indonesia with the participation of Japanese experts to set down plans for modifing the BATAN demonstration plant of radiation curing. Two Japanese experts also worked to prepare detailed design of the modified demonstration plant.

Japanese experts gave lectures at the Executive Management Seminar in Indonesia (March 1987), China, Sri Lanka and Pakistan (Sept. 1987). These seminars were effective in encouraging industries to use this technology in commercial production of surface coated wood products in these countries.

(3) Radiation crosslinking of wire

Wire industries in Japan have extensive experience in commercial production of radiation crosslinked wire, which can be transferred to other RCA countries. Two experts from Japan attended the EAG meeting in China to set down the implementation plan of this project in June 1987.

(4) Radiation engineering

This activity was initiated in the Phase II to provide basic technology for radiation application in industry. The first training course of radiation engineering was held in Japan, organized by JAERI in October 1987 for 2 weeks with the 10 participants.

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 Bangladesh in March 1987 to formulate the project plan for 1987 and 1988.

(2) An expert participated in the National Training Course in Indonesia in August 1987.

(3) The Japanese Society for Non-Destructive Inspection (JSNDI) hosted a workshop on NDT for non-metalic material in Tokyo in August 1987.

(4) An expert participated in the National Training Course of NDT in China in October 1987.

(5) An expert participated in the Regional Training Course of NDT in Indonesia in October 1987.

(6) An expert participated in the Regional Workship in Malaysia in October 1987.

(7) An expert participated in the National Training Course of NDT in Korea in December 1987.

3. Nucleonic Control Systems

(1) Two Japanese experts visited Bangladesh, Indonesia and Thainland as members of the consultant mission for the NCS in paper industry in July 1987 to promote technology transfer.

(2) Two Japanese experts visited Korea, Thailand, Malaysia and Singapore for the preparation of a new project in the application of NCS for civil engineering in September 1987.

(3) The Japan Atomic Industrial Forum conducted the Executive Management Seminar on NCS in the steel industry in October 1987.

B. Medical and Biological Application Project

Japan has been particularly interested in promoting application of nuclear techniques in the medical and biological field, since these deal with the problem of health which are of common interest to all RCA member states. Among several subjects in the field, emphasis has

so far been placed on radiation therapy of malignant disease and nuclear modicine.

1. Radiation therapy

With regard to radiation therapy, a coordinated research program (CRP) on "Improvement of cancer therapy by combination with chemical and physical means" which started in 1983 has been concluded in 1987. This CRP is expected to be followed by a new CRP which will have well-defined objectives to deal with the specified needs of the member states in the field of cancer therapy. In this regard, it seems to be most desirable to hold a consultant meeting before finalizing a specific subject for this particular CRP. With regard to the training program in this subject area, Japan would like to support the program of a training course on brachitherapy of uterus cancer useing RALSTRON, which was once hosted by the Malaysian Government in 1986 with quite a successful results. This program activity is well justified in view of the increased number of RCA member states which have now acquired, and started using RALSTRON in their national anti-cancer campaign (Malaysia, Philippines, Thailand, Sri Lanka, Korea, etc.)

2. Nuclear Medicine

With regard to nuclear medicine, a CRP on "Quantitative evaluation of nuclear medicine procedures for the diagnosis of liver diseases" was concluded last

year with a remarkably fruitful result. Japan is pleased to support and initiation of another CRP in this area, namely a crp on "Exact title".

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 1987, a course was convened on nuclear medicine. A workship meeting for two weeks' duration is planned to be held in August 1988 on the general field of medical and biological applications of radiations and radio isotopes, inviting senior scientists who would represent such subject areas as radiation biology and bionucleonics, nuclear medicine, radiotherapy, and radiation protection including environmental sciences.

ANNEX 40

STATEMENT OF THE REPUBLIC OF KOREA

THE 10th WORKING GROUP MEETING OF RCA MEMBER STATES

BEIJING, THE PEOPLE'S REPUBLIC OF CHINA (APRIL 11-14, 1988)

Mr. Chairman;

The Republic of Korea is very happy to participate in the 10th Working Group Meeting of RCA Member States. On behalf of the Korean delegation, I would like to join the previous speakers in extending my heartfelt congratulations on your election as Chairman of this RCA Working Group Meeting. My delegation is fully convinced that your leadership will bring this meeting to a successful conclusion.

My delegation also wants to express its sincere gratitude to the Government of the People's Republic of China for the excellent arrangements prepared for this meeting.

Mr. Chairman;

It is well recognized by all Member States that the RCA has made great contributions over the past 15 years to the development and applications of nuclear technology in the Asian and Pacific Region, though somewhat restricted to radioisotope applications.

The Republic of Korea is pleased to note that it has greatly benefited by the RCA projects since its inception, and wishes to express its warm appreciation to the Agency and all RCA Member States for their cooperation and assistance in RCA activities.

It is our firm conviction that the RCA has been an effective vehicle in accelerating applications of nuclear technology among Member States. Korea takes pleasure in emphasizing that it will continue to actively support RCA activities in the future.

Mr. Chairman;

The Republic of Korea strongly believes that the benefits of nuclear technology for power and other peaceful uses should be fully available to any country which has demonstrated a firm commitment to non-proliferation and has scrupulously abided by it. We have the sincere desire to share with RCA Member States our experiences and technology in nuclear applications accumulated over the past 25 years.

In keeping with this, Korea had the pleasure of hosting the RCA Regional Workshop on Photon, Electron, and Neutron Dosimetry in Radiotherapy last June under our full financial support. We also hosted the RCA Regional Training Course on Non-destructive Testing at the Korea Advanced Energy Research Institute.

Meanwhile, I am happy to report that Korea will host the RCA Regional Training Course on Nuclear Power Project Planning and Implementation this coming November for three weeks under full financial support of the Korean Government. As the 12th largest nuclear energy producing country in the world, the purpose of this course is to share with RCA and other IAEA Member States our experiences in nuclear power planning and implementation. The training will be open to about 15 candidates, providing participants with an overview of practical elements involved in planning and implementation of nuclear power projects, with emphasis on nuclear power project management from pre-project activities to plant operation.

Mr. Chairman;

At this time, Korea would like to briefly make a few comments on RCA's 1987 and future activities.

First of all, we are pleased to recall the major events of 1987 — the new RCA Agreement entered into force in June, and Phase II of the UNDP/RCA Regional Industrial Project officially commenced in May. It should also be mentioned that the Republic of Korea joined Japan, Australia and India in becoming a donor country. We also wish to note with satisfaction that the new long-term project, Strenghtening of Radiation Protection, was launched in 1987 under the main support of the Japanese Government in response to anticipated increases of radiation exposure to workers and the general public, utilizing applications of nuclear technology in medicine, industry and agriculture.

Among the RCA activities planned for 1988, Korea particularly wishes to indicate with pleasure the RCA Seminar to be held this coming June in Indonesia. We feel that the Seminar is timely and most appropriate for futher effective operation of the RCA instrument, taking into account that the new RCA has entered a new phase after fifteen years of operation. Korea will actively participate in the Seminar for its successful outcome.

Mr. Chairman;

Concerning the existing RCA technical projects, we will comment on them at the Technical Sessions, introducing our main activities and also suggestions for the future.

Concluding my statement, I would like to stress that Korea will continue to support the RCA technical assistance and cooperation projects. We also look forward to our modern research and training facilities being used for IAEA/RCA Regional activities.

Thank you.

COUNTRY STATEMENT BY MALAYSIA

10TH WORKING GROUP MEETING OF RCA-MEMBER STATES,
Beijing, People's Republic of China
11-14 April 1988

Mr. Chairman,

It is an honour for Malaysia to participate in the 10th. Working Group meeting of the RCA Member States here in Beijing, People's Republic of China. Malaysia has been associated with RCA activities since its inception and has maintained active participation in the various RCA activities over the past years. The country also believes that RCA has served a very useful purpose in promoting and strengthening regional cooperation among member states in various field of nuclear science and technology. Malaysia concluded the third extension of the RCA agreement with the IAEA on 13 November last year.

Briefly here are the activities and the progress of some of the projects which Malaysia are participating:

1. Regional Industrial Project:

   a) Tracer Technology

      In Malaysia, the utilization of tracer and sealed-source of radioisotopes in natural and engineered system and their related fields is now picking up. Concerted efforts in promoting the application of nuclear techniques in the country are being carried out by the Nuclear Energy Unit, including programme of visit, management seminar and demonstration on tracer and sealed-source application at various industries and government institutions. The various industrial surveys indicated that the potential for the application of tracer and sealed-source of radioisotopes in Malaysia is considerable, in particular, the oil/gas/petroleum, cement, petrochemical, chemical, paper and steel industries. Under the RCA/UNDP project, last year, Malaysia received the service of the regional expert who participated in our National Seminar on the application of Nuclear Techniques in Industries and mini seminar and demonstration on tracer and sealed-source

of radioisotopes applications in oil/gas/chemical industries. This year, 2 participants from Malaysia took part in the national training demonstration on gas-flow measurement in Bangkok while another 2 participants attended the regional training course on industrial tracer applications in the People's Republic of China.

b) Non-Destructive Testing

Last year, Malaysia formed a national committee of NDT comprising of representatives from various governmental research institutions and private companies. Malaysia also hosted the RCA/UNDP Regional Workshop on Qualification and Certification of NDT personnel on 12-16 October last year as well as sending participants to the various NDT courses organised under the project. Under the national qualification and certification scheme for the NDT personnel, three national courses will be conducted this year. They are Radiography Testing (Level I), Radiography (Level II) and surface method (Level I - liquid magnetic particle and penetrant). Malaysia provided a lecturer for the national training course on neutron radiography at BATAN, Indonesia in February 1988 and will provide another lecturer for the regional training course on ultrasonic (level 2) in Lahore, Pakistan in September this year.

c) Radiation Technology

Under the sub-project Radiation Vulcanization of natural Rubber Latex, Malaysia received two consignments each of 200 litres of irradiated latex from BATAN and TRCRE. The latex has been analysed for mechanical properties and processeability. A national research group on radiation processing of natural rubber was established last year with the overall objective to develop knowhow on all techno-economically viable aspects of radiation techniques in rubber and latex processing and technology.

A new radiation technology centre consisting of a 200 KCi Co-60 source and associated laboratories will be constructed

at the Nuclear Energy Unit very soon. The centre is expected to be operational towards the end of this year. The facility will be used mainly for sterilization of medical products, food irradiation and research activities. It is expected that other facilities such as the Electron Beam Machine will also be made available at the centre in the near future.

Malaysia will also organise a national training course on Radiation Chemistry with the assistance from IAEA towards the end of this year. The purpose of the training course is to provide information on the basic techniques used in radiation research and fundamental principles and knowledge of radiation chemistry of water, aqueous systems, organic systems and polymers. The training course is intended to complement the application-oriented training courses organised within the RCA/UNDP project.

d) Nucleonic Control System in Industries (steel, paper, mining and civil engineering)

The use of NCS in industries in Malaysia is still in its early stage. However, through the promotional programme which was initiated by the Nuclear Energy Unit in cooperation with the IAEA (RCA/UNDP industrial project), it is found that the number of industries interested to install the system has increased.

Briefly, there are two paper mills and 2 mineral industries which have installed the system. Others are looking positively to install the system in their industries. In the field of civil engineering, a small number of government and private civil engineering sectors have used nuclear gauges for measuring density and moisture content of soil and soil agregate. As for the Regional EMS on civil Engineering, which will be held in Tokyo on May 1988, IAEA have awarded two places for Malaysia to participate.

2. Medical Projects:

a) Development of Radiation Protection Infrastructure

The visit of the RAPAT mission to the country in 1985 was most welcome. The mission identified the overall requirement for radiation protection in the country. Based on its recommendation, a national radiation protection programme was launched involving two main institutions namely the Nuclear Energy Unit (UTN) and the Atomic Energy Licensing (AELB). Malaysia participated in the project formulation meeting in Tokyo last year and has officially informed the IAEA of its acceptance of the project document. Malaysia also sent two participants to the first training course under the project in Australia. With regards to the research activities, Malaysia participate in both CRP's i.e in 'The study of Environmental Dose Measurement' and 'Setting of Reference Man and its Related Problems - Compilation of Physiological and Sociatal Parameters'.

b) Maintenance of Nuclear and Related Equipment in Medicine

Malaysia participated actively in the earlier RCA project on maintenance of nuclear instruments. We are very happy to note that a new RCA project on 'maintenance of nuclear and related equipment in medicine' was approved and will be implemented this year. Malaysia will participate in the project formulation meeting in India this year.

The maintenance of all kinds in nuclear instrument in Malaysia presents numerous difficulties. Quality equipment often lies idle because it has become unserviceable through lack of or poor maintenance. There are several reasons for such a situation such as:

i) lack of suitably qualified maintenance personnel,
ii) inadequate technical support from local suppliers representing the manufacturers,
iii) lack of supply of spare parts in the local market,
iv) wide variety of nuclear equipment,
v) no in-house capabilities for repair or servicing in most institutions.

The Nuclear Energy Unit plans to rectify this state of affairs by establishing a project on the 'Development of training on the maintenance of nuclear instrument'. One important task for this project will be the training of staff in order to achieve a higher level of efficiency, reliability and quality of work.

3. Agriculture Project:

a) Food Irradiation

In Malaysia, no item pertaining to irradiated food has been cleared for consumption under the food Act 1985. Activities pertaining to importation, exportation, processing and others of irradiated food require the approval by the Director General of Health. However, R&D activities on food irradiation are still being carried out by the various research institutions. Research activities in this area include work on export-oriented commodities such as black and white pepper, cocoa bean and such commodities as fruits, vegetables, animal feed, sea-food and others.

Under the RPFI phase II project, Malaysia concluded two new research contracts with the IAEA:

i) Food product technology: incorporation of irradiated spices into meat product.
ii) Multipurpose facilities for food and site specific.

A project committee meeting of the RPFI phase II was held in Malaysia in October last year.

New Project Proposals

Malaysia strongly supports the following projects to be included in the new RCA programme:

a) Integrated control of tropical plant viruses with nuclear technique.
b) Asian Regional cooperation project on food irradiation process control and acceptance.
c) Integrated use of isotope technique in water recources.
d) Use of computers in Technitium - 99 m Imaging.

In conclusion, Malaysia wishes to express its satisfaction with the implementation of the various RCA activities so far. We are looking forward to the RCA Seminar in Jakarta in June this year during which RCA activities, its role and its future will be discussed and reviewed.

COUNTRY STATEMENT - PAKISTAN FOR 10TH RCA WORKING GROUP MEETING, BEIJING, PEOPLES REPUBLIC OF CHINA, APRIL 11 - 14, 1988.

The Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA) is a valuable link between the IAEA Member States of South East Asia and the Pacific. RCA has completed 15 years of its successful existence and it has now been extended for the 4th time for another period of 5 years. Looking at the benefits attained and the performance of the RCA, we believe that it will further continue to play a very useful role in promoting peaceful uses of nuclear techniques in industry, agriculture, biology and medicine.

Pakistan feels great pleasure in participating in the RCA activities and we are happy that this 10th Working Group Meeting of RCA Member States is being held in Peoples Republic of China, the friendship of which we greatly cherish. Though China is a new comer to the RCA, it has been actively participating and contributing to the activities of the RCA.

I would now like to discuss the activities carried out during 1987 under the RCA.

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

Pakistan has greatly benefited from the participation in Phase-I of the Industrial Project. We are also participating in the Phase-II of this Project and the progress achieved during last year in the sub-projects is given below:

1. Non-Destructive Testing (NDT)

The training courses for the certification of NDT personnel has been initiated on the guidelines (ISO/TC/135; N35-E) recommended by RCA. Three other training courses namely UT-1, UT-2 and RT-2 were also held during 1987 and 32 persons were certified. Two of our scientists visited South Korea and Malaysia as RCA experts. During 1987 our scientists went to China, Indonesia and South Korea for participating in the Regional Training Courses. One scientist participated in Regional Workshop on NDT Examination of Non-Metallic Materials held in Tokyo from 31st August to 4th September 1987, while one participated in the Regional Workshop on Qualification and Certification of NDT Personnel held in Malaysia from October 12-16, 1987. From the four courses planned for 1988, SM-2 is being held from 27 March to 14 April, 1988, while regional course on UT-2 will be held from September 12-29, 1988 and ET-2 from November 27 to December 15, 1988.

2. Tracer Technology

The recommendations of the UNDP/RCA Meeting of National Coordinators for Industrial Tracer Application, held at Lahore, Pakistan, from December 1-4, 1986 were submitted to the IAEA. The Agency has agreed to the proposal for survey of different industries to explore the possibilities of radiotracer application and has appointed an expert to help local scientists. An overview and tabulated informations about "Industrial Radiotracer Applications and "Radioisotopes Instruments" highlighting the sensitivity of radiotracer techniques were prepared and supplied to various concerne industries.A questionnaire about the use of radioisotopes instruments and topics of interest to local industry has been devised and distributed to the related industries.

3. Radiation Processing Technology

(a) Radiation Curing

A National Executive Management Seminar on "Radiation Curing Technology" was organized at Lahore from 19-21 Sept, 1987.

More than fifty participants from various organizations and local industries of wood, paper, paper board, chip board, paints, steel and packaging industry participated. One of our scientists attended the RCA Training Course on "Radiatiion Engineering - Electron Beam Facilities" at Takasaki, Japan from 19-30 October, 1987 where papers on "Status and Potential for Accelerator Applications in Curing Technology in Pakistan" were presented.

(b) Radiation Sterilization

Two of our scientists attended the RCA Training Course on "Quality Control and Quality Assurance of Medical Products" held at Bangkok, Thailand from 5-16 October,1987.

(c) Radiation Crosslinking

Efforts are underway to set up a laboratory for R & D work in radiation crosslinking application to wire and cables. With the assistance of RCA, a Seminar will be held at Lahore, Pakistan from July 4-5, 1988 to acquaint the local industry with the advantages of radiation process over the continuous vulcanization (CV) procedure. Technical papers and reports will be presented for the benefit of the industry.

4. RCA Forum on Nuclear Techniques in Industry

In order to increase the use of Nuclear Techniques in Industry and to foster better links between scientists and industries, it is suggested that RCA-UNDP-IAEA project on "Industrial use of Radioisotopes" should support a "Forum on Nuclear Techniques in Industry" in each RCA Member State. Such a body should hold regular conferences every year, where the representatives of the relevant industries and the relevant experienced scientists get together and discuss the ways and means of increasing the use of Nuclear Techniques in Industry for the economic benefits of the Industry. Such conferences should be supported by the funds of this project. Annual regularity in these meetings, it is hoped, will greatly enhance the use of Nuclear Techniques in Industry.

B. FOOD AND AGRICULTURE BASED PROJECTS.

PAEC has established 3 Agricultural Centres where research is conducted on the evolution of food and cash crops using nuclear techniques. So far a number of high yielding, disease-resistant, insect-resistant and better quality varieties of wheat, rice, cotton, chickpea and mungbean have been released for general cultivation in the country. In addition, preservation of food products by irradiation and economic utilization of salt-affected lands have been thoroughly investigated. The Commission is also establishing a National Institute for Biotechnology and Genetic Engineering which would carry out R & D and pilot scale studies in agriculture, health, energy and industry.

1. Regional Project for Food Irradiation, Phase-II.

The project on "Commercial trials on Radiation Preservation of Onions under Tropical Conditions" is in its third and last year of execution. Preservation of onions by irradiation on commercial scale revealed that irradiation treatment with 0.1 kGy and subsequent storage at ambient conditions under shade after packing in wooden crates extended the shelf life of onions upto 6 months as compared to low temperature storage ($20^{\circ}C$) at which the bulbs could be stored for 4 months only. Irradiation processing significantly reduced losses due to sprouting, rottage and dehyderation without affecting consumer acceptability. The cost of irradiation was estimated about Rs.48 per ton. The Principal Investigator of this project attended the Project Committee Meeting of RPFI - Phase-II, held at Kuala Lumpur, Malaysia in October 1987.

2. Semi - Dwarf Mutants for Rice Improvement.

Thirty single plants were selected on the basis of reduced height from the segregating generation (M_2) originating from Basmati 370 seed irradiated at 150 to 250 Gray. Nine elite semi-dwarf mutants, namely DM-16-5-1, DM16-5-2, DM-107-4, DM-24, DM-25,DM-2 DM-28, DM-38 and DM-179-1 were evaluated for different agronomic traits. Reduction in plant height of the mutants was accompanied by a corresponding reduction in peduncle length, length of each of 6 internodes and panicle length as compared to the parent

variety Basmati 370. The mutants also scored higher values of harvest index and outyielded Basmati 370. Genetic studies on semi-dwarf mutants were undertaken to find out the genetic control of plant height in a 6 x 6 diallel set of crosses. The analysis revealed a complementary type of gene interaction. Of all the mutants, DM-15-11 possessed maximum number of recessive alleles. The project is now completed and the Principal Investigator of this project attended the final meeting of the project held at Hangzhou, Peoples Republic of China, from 6-10 July, 1987.

3. Use of Induced Mutations for Improvement of Grain Legume Production.

A number of blight resistant mutants of chickpea have been selected. A promising blight resistant mutant CM-88 has been extensively evaluated in multilocational yield trails. The mutant outyielded the parent variety and several other entries. Twenty wilt resistant mutants have also been induced in blight resistant lines to combine resistance against both the diseases. The project is completed and the Principal Investigator of this project attended its final meeting held at Pullman, Washington, USA from 1-5 July,1986.

C. MEDICAL AND BIOLOGICAL APPLICATIONS OF NUCLEAR TECHNIQUES.

Pakistan Atomic Energy Commission is using nuclear techniques for public health care services very effectively by operating 9 Medical Centres in the country and is providing diagnostic and treatment facilities for cancer and allied diseases. The Nuclear Medical Centres are functioning in close cooperation with major teaching hospitals in the country. Pakistan is participating in the following medical and biological projects under the RCA:

1. Imaging Procedures for the Diagnosis of Liver Diseases.

The project was started in October, 1984 and has been completed in October, 1987; 7 PAEC Medical Centres participated in this study. In September, 1986, 177 liver images from 7 participating countries of the region were received and interpreted by 11 nuclear Physicians belonging to 5 Nuclear Medical Centres of Pakistan and results submitted to NIRS in early 1987. In the 2nd Research Coordination Meeting held at Lahore, it was decided that the Agency will publish an "Atlas" on liver images originated from this region. The Principal Investigator from Pakistan was nominated as a member of the expert panel for selection of suitable images for the "Atlas" at the 3rd and final Research Coordination Meeting held at Bangkok, Thailand in October, 1987.

2. Photon, Electron and Neutron Dosimetry

Two scientists from Pakistan participated in the Workshop on Photon, Electron and Neutron Dosimetry in Radiotherapy, held at Seoul, Republic of Korea, from June 8-19, 1987. A research project proposal on this aspect is being submitted to the Agency for funding.

3. Nuclear Techniques For The Diagnosis of Tropical Parasitic Diseases.

The project started in August 1983 and has been completed in September 1986. Hyperimmune and IgG normal sera were prepared, purified and labelled with I-125. Malarial parasite cultures were procured and it is planned to obtain monoclonal malarial antibody from Thailand to standardize the solid phase RIA (SPRIA) for malarial antigens.

4. Radioaerosol Inhalation Imaging For The Diagnosis of Respiratory Diseases in the Developing Countries.

At the first meeting of this new project held at Bombay in November, 1987, it was decided that each participating Institute will receive aerosol equipment from the Agency and try to complete 50 patient studies before August, 1988. So far, we have not received the equipment nor any further information from the Agency regarding despatch of the equipment. However, a slightly different type of aerosol equipment, designed and fabricated by PAEC, is being used for some patient studies. It will, however, be prefered if studies are carried out on the equipment to be supplied by the IAEA so that the images obtained may be comparable to other laboratories of the region.

5. Low Temperature Sublimation ^{99m}Tc Generator.

Low temperature sublimation ^{99m}Tc generator reached Pakistan in January, 1987 and its operation and handling was demonstrated by IAEA expert. Since then the generator has been under test for the purpose of its evaluation. About 45 useful sublimations have so far been made. The product quality was thoroughly checked after which 9 sublimations were used on actual patient studies in two hospitals. Radiochemical purity of the sublimated ^{99m}Tc using instant thin layer chromatography was found to be more than 96% and the radionuclide purity of the product with respect to gamma emission was almost 100%. After the decay of the product radionuclide, a B-impurity of long half life has been detected.

During the period of evaluation over half a curie of ^{99m}Tc has been obtained with this low temperature sublimation ^{99m}Tc generator with very low reacter availability. The system also worked smoothly without any maintenance problems. The users at the Medical Centres compared sublimated and fission based ^{99m}Tc and have obtained comparable and satisfactory results. The technique has, therefore, yielded very encouraging results and has a good promise.

6. Radiation Sterilization of Biological Tissue Grafts.

Over one thousand samples of amniotic membrane have been preserved after collection by freeze drying, packaging and irradiation at 25 kGy. There were no significant changes in the samples upto one year. The colour of the membrane remained unchanged although there was slight discolouration in the polyethylene bags. Sterility of the membranes was maintained for one year. There were no significant differences in NMR patterns between fresh, freeze dried and radiation sterilized amniotic membranes. A clinical trial of the amniotic membranes is being carried out at the Burns Unit of the Department of Plastic Surgery, Civil Hospital, Karachi.A research project on Radiation Sterilization Practices for Tissue Grafts and Tissue Banking is being submitted to the Agency for funding.

7. Radioimmunoassay of Thyroid Related Hormones.

Pakistan has achieved capability to produce standards, Internal Quality Control (IQC) materials and Tracers for T4, T3 and for super-sensitive (S.S) IRMA TSH. Locally prepared reagents are used for routine diagnostic services provided to the patients. During the second meeting of the National Coordinators held at Bangkok from 3-5 February, 1988, interest was shown to make available INMOL Tracers specially the I-125 labelled monoclonal anti-TSH for S.S. IRMA to the Member States. Similarly PEQAS (Pakistan External Quality Assessment Scheme) for thyroid related hormones operative in the country since 1986 was very much appreciated and regional extension of this scheme to Member States was considered. Pakistan will consider positively such proposals and will extend its maximum cooperation to the programme to stimulate the activities under the project.

8. Determination of Toxic Elements in Pakistani Foodstuffs.

The project was initiated in 1985 to measure the toxic and essential elements in foods and from these to assess the adequacy and safety of the diet for the inhabitants of Rawalpindi/ Islamabad. In the first year of the project, three types of mixed diets were prepared according to the monthly income and food habits of residents. Twenty-one elements were measured by NAA and AAS techniques. Nineteen elements were measured under two irradiations and three cooling period conditions. Three elements namely Ni, Cd, and Pb were determined by AAS.

D. NUCLEAR TECHNOLOGY BASED PROJECTS

1. Basic Science Using Research Reactors.

Pakistan has been participating in Basic Science using Research Reactors and would continue to support this activity under the RCA programme.

2. Nuclear Medicine Instrumentation

The research project on "National Quality Control Programme for Nuclear Medicine Instruments" has been initiated since Dec, 1986. The aim of this project is to attain the acceptance standards of efficiency and reliability in various nuclear medicine investigations and also to establish a "Nucleus" for electronics repair and maintenance of nuclear medicine instruments at different levels.

During the initial stages of the project, there were six collaborating Institutes but now thirteen Institutes have joined this National Network. Pakistan participated in the second Research Coordination Meeting of Coordinated Research Programme (CRP) on establishing national programmes and investigating their impact on the performance of quality control of nuclear medicine instruments

in Asia, held at Bangkok, Thailand, from February 16-17, 1987. A National Workshop on "Quality Control of Nuclear Medicine Instruments", sponsored by the IAEA, was held at Lahore from October 17-22, 1987. Twenty five participants from collaborating Nuclear Medical Centres were trained in the quality control techniques. The first phase of the project was useful in creating quality control in nuclear medicine instruments.

3. WASP User's Workshop

One of the engineers from PAEC attended the first RCA WASP User's Workshop held at Jakarta, Indonesia from December 7-11, 1987 and presented a paper entitled "Application of WASP Model for Power Generation Planning Studies in Pakistan". This workshop provided an excellent opportunity to WASP users from various countries in the region to share their experience.

It is understood that the IAEA/RCA plans to conduct training courses for the developing countries in the use of PC version of WASP-III computer code during 1988, 1989 and 1990. PAEC is considering to host one such course in Pakistan either in 1989 or 1990.

4. Development of Infrastructures for Ensuring Radiation Protection.

Radiation Protection is a very important aspect of the application of radiation in agriculture, medicine, industry and energy. Pakistan is keen to participate in this project and one of its scientists is now attending a training course at Sydney, Australia from 28th March to 29th April, 1988.

E. GENERAL REMARKS

a) Pakistan is happy to note that the ideas on RCA Phase-I Seminar are being realized and the Seminar will be held in June, 1988.

b) We note with satisfaction that the experts for RCA activities are being selected from among the Member States in the region as far as possible on grounds of merit. Pakistan has already sent two experts in the field of NDT.

c) Pakistan offered NIAB Faisalabad as a Regional Centre where scientists of the RCA countries can share the experience of our R&D in the field of Agriculture and Biology.

d) 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.

e) 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.

f) We suggest that RCA-UNDP-IAEA project on "Industrial uses of Radioisotopes" support a Forum on Nuclear Techniques in Industry, through project funds, in each RCA Member State. Such Forums would help regular interaction of relevant industries and scientists for economic benefits of the Industry and would enhance the use of nuclear techniques in Industry.

Pakistan fully supports RCA activities and has great desire to further promote regional cooperation in peaceful uses

of nuclear energy. It is hoped that the RCA would establish regional centres in those Member States which have the expertise but no such centres have been established.

Pakistan looks forward to continued cooperation with RCA.

ANNEX 43

COUNTRY STATEMENT OF THAILAND

10 th WORKING GROUP MEETING OF RCA MEMBER STATES

BEIJING, PEOPLE'S REPUBLIC OF CHINA

11 - 14 April 1988

Mr. Chairman:

It is my great pleasure to participate in the Tenth RCA Working Group Meeting here in Beijing. I would like to take this opportunity to state the RCA activities in Thailand. Thailand has been associated with the RCA project from its beginning and has participated in almost all of its activities. In the past year, there were several activities in which our participation has been substantive and actively contributed to RCA. They are as follows.

1. UNDP Regional Industrial Project

1.1 The Government of Thailand is grateful to the International Atomic Energy Agency (IAEA) and the Government of Australia for selecting Thailand as the training center on the Use of Nucleonic Control System in Coal Industry. Preliminary negotiation among the technical staff of the Office of Atomic Energy for Peace (OAEP), Electricity Generating Authority of Thailand (EGAT) and IAEA's experts was carried out during 25-27 February 1988. The proposed implementation plan was thoroughly discussed, and a revision of the plan was proposed which partially met the EGAT's basic but crucial requirements. However, the formal acceptance of the proposal by OAEP is subject to formal agreement to the final implementation plan by EGAT management.

1.2 The Government of Thailand has been both as receipient and contributor to various projects under the Agreement. Major contributions have been hosting of numbers of regional training courses and demonstration in industry. They are Regional Training Course on Industrial Sterilization-Quality Control and Sterility Assurance, Regional Training Course on the Use of Nucleonic Control System in Paper Industry and Field Demonstration of Gas Flow Measurement in Gas Pipeline Using Tracer Technique. They all went well and were successful.

1.3 In addition, a Thai expert on nucleonic control system in paper industry was provided for short-term IAEA's expert assignments to other Participating Counties, which mark a good example of TCDC derived from the Project.

2. Food and Agriculture

The final RCM on the RPFI Phase II is planned to be held in Thailand during 24-28 October 1988.

3. Medical and Biological Applications of Nuclear Technique

The Research Coordination Meeting of Project on Radioimmunoassay of Thyroid Related Hormones (RAS/6/011) was held in Thailand in 1987.

As for the new projects, the Government of Thailand welcomes all new projects and new proposals, particularly projects on Food Irradiation Phase III, Integrated use of Isotope Techniques in Water Resources and Cares and Maintenance of Nuclear Medical Equipments.

I would like to take generous note of thanks to the Government of Australia for her extra contribution to the UNDP Regional Industrial Project, particularly the trust she placed on the Government of Thailand for trainings and demonstrations of the Use of Nucleonic Control System in Coal Industry.

Furthermore, we are also grateful to her offer being host of the eleventh RCA Working Group Meeting in Australia. In this connection, the Government of Thailand wishes to convey to this meeting that she cordially invites all delegates of RCA Member States to the Twelfth RCA Working Group Meeting in Bangkok in 1990.

Finally, on behalf of the Government of Thailand, I wish to thank all donor countries for their kind contributions to sustain and enhance activities under RCA. Particularly for this meeting, I would like to sincerely thank the Government of People's Rebublic of China for the facilities and hospitality rendered to us through out this meeting. Once again we are very much grateful to the Agency for all its continually supports from which RCA has progressed up to now and is progressing for the benefits of Asia and Pacific Region.

Thank you, Mr. Chairman.

ANNEX 44

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1987

August 1987

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1.1 Sub-Project 3 R&D Fellowships Jakarta (continued) 1.2 Sub-Project 3 Expert Mission Jakarta, (Makuuchi) January-April	2.1 Sub-Project 3 Expert Advisory Group Meeting on Rubber, Jakarta, 9-11 February 2.2 Sub-Project 3 National Executive Management Seminar Wire/Cable, Calcutta, Seoul, 5-11 February 2.3 Sub-Project 1 Senior Cons. Mission 21 Feb-7 March, China 2.4 Sub-Project 3 Rubber - Cons. Mission (Charlesby), Indonesia	3.1 Sub-Project 3 Expert Advisory Group Meeting - Radiation Curing, Jakarta 16-18 March 3.2 Sub-Project 3 National Executive Management Seminar - Radiation Curing Jakarta, 19-20 March	4.1 Sub-Project 2 3rd Nat. Co-ordinators Meeting, Bangladesh 30 March - 2 April 4.2 Sub-Project 2 National Training Course Pakistan (Gilmour) 12-30 April	5.1 Sub-Project 2 Expert Mission NDT 11 May - 31 December Kuala Lumpur (Gilmour) 5.2 Sub-Project 1/4 Expert Mission Tracer/ NCS (Rao) Jakarta 18 May - 31 December	6.1 Sub-Project 3 Expert Advisory Group Meeting - Wire/Cable Changchun (China) 19-20 June 6.2 Sub-Project 3 Nat. SM-2 TC 15-26 June Sri Lanka
1.1 Requirement: (1986) 1.2 Requirement: Japan Contribution (1986)	2.1 Requirement: Japan Contribution 3 experts Cost: $3 000 (1986) 2.2 Requirement: 4 SSA Cost: $12 000 2.3 Requirement: 2 SSA Cost: $8 800 2.4 Requirement: 1 SSA Cost: $7 250	3.1 Requirement: Cost: $18 000 3.2 Requirement: in connection with 3.1	4.1 Requirement: Cost: $25 000 4.2 Requirement: in connection with 5.2 (expert Gilmour)	5.1 Requirement: 1 SSA Cost: $50 000 5.2 Requirement: 1 SSA Cost: $45 000	6.1 Requirement: 5 SSA Cost: $8 100 6.2 Requirement: SRL/8/011

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1987

August 1987

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
7.1 Sub-Project 4 Expert Mission (Paper) 1m/m	8.1 Sub-Project 4 Expert Mission (Civil Engineering 14-25 Sept.	9.1 Sub-Project 2 National RT-3 TC India, 14 Sept.-2 Oct.	10.1 Sub-Project 3 Regional Training Course Radiation Sterilization (Microbiological) Bangkok, 5-16 Oct.	11.1 Sub-Project 2 National Training Course UT-3 23 Nov.-11 Dec. Hyderabad, India	12.1 Sub-Project 3 Reg. Training Course Radiation Sterilizat. (Materials) Bombay, 30 Nov-11 Dec.
7.2 Sub-Project 2 Nat. UT-1 TC 1-27 August BGD	8.2 Sub-Project 2 Regional RT-11 TC India, 10-28 Aug.	9.2 Sub-Project 2 Nat. UT-3 TC 14-25 Sept., Shanghai	10.2 Sub-Project 3 Regional Training Course EB Engineering 19-30 October, Japan	11.2 Sub-Project 2 Nat. RT-2 TC BGD 14 Nov.-10 Dec.	
	8.3 Sub-Project 2 National TC RT-2 Indonesia 3-14 August	9.3 Sub-Project 3 National EMS Radiation Curing Pak., China, Sri Lanka 9-21 September	10.3 Sub-Project 2 Regional SM-11 TC Indonesia, 5-23 Oct.	11.3 Sub-Project 2 National TC UT-2 Malaysia, 23 Nov.-5 Dec.	
	8.4 Sub-Project 2 Regional Workshop Special Applications Japan 31 Aug.-4 Sept.	9.4 Sub-Project 2 Regional UT-2 TC Republic of Korea 7-25 September	10.4 Sub-Project 2 Nat. UT-2 TC 19-30 Oct. Philippines	11.4 Sub-Project 2 National TC RT-2 Thailand, 23 Nov.-8 Dec.	
	8.5 Sub-Project 3 Expert Mission RVNRL (Irradiator Design) 3m/m Jakarta (2 weeks)	9.5 Sub-Project 3 Fellowship (Rubber) Takasaki 1 Sept.87 - 31 May 88	10.5 Sub-Project 2 National TC UT-3 Korea, 19-31 Oct.	11.5 Sub-Project 4 Regional TC Paper Thailand, 9-20 Nov.	
	8.6 Sub-Project 3 Expert Mission (Curing) UV lines 3m/m Jakarta	9.6 Sub-Project 4 EMS Coal Australia 28 Sept.-2 Oct.	10.6 Sub-Project 2 National TC RT-2 PAK, 18 Oct.-4 Nov.	11.6 Sub-Project 2 National TC UT-3 Hyderabad, India 23 Nov.-11 Dec.	
		9.7 Sub-Project 4 Nat. EMS - NCS/Steel ROK 23-25September	10.7 Sub-Project 2 Nat. RT-2 TC 12-23 Oct. Shanghai		
			10.8 Sub-Project 2 Nat. RT-2 TC 12-23 Oct. Jakarta		
			10.9 Sub-Project 2 Reg. Workshop Qualific. and Certific. NDT pers. 12-16 Oct. Malaysia		
			10.10 Sub-Project 4 Regional EMS-Steel Japan 26-30 Oct.		
7.1 Requirement: Japan Contribution Cost: $8 000	8.1 Requirement: Japan Contribution 2 weeks 2 persons Cost: $10 000	9.1 Requirement: 1 SSA (Baez) Cost: $3 500	10.1 Requirement: Cost: $35 000	11.1 Requirement: 1 SSA (Gilmour) Cost: $3 500	12.1 Requirement: Cost: $35 000
7.2 Requirement: 1 SSA (Venkataraman) Cost: $3 500	8.2 Requirement: Cost: $32 000	9.2 Requirement: Japan Contribution 1 SSA Cost: $3 000	10.2 Requirement: Japan Contribution 12 participants Cost: $40 000	11.2 Requirement: 1 SSA (Wamorkar) BGD/8/006	
	8.3 Requirement: Japan Contribution 1 SSA (JPN expert) Cost: $3 000	9.3 Requirement: Cost: $18 000	10.3 Requirement: Cost: $32 000	11.3 Requirement: 1 SSA (Pope) MAL/8/006	
	8.4 Requirement: Japan Contribution 1 week 15 particip. Cost: $34 000	9.4 Requirement: Cost: $32 000	10.4 Requirement: 1 SSA (Gilmour) Cost: $3 500	11.4 Requirement: 1 SSA Cost: $3 500	
	8.5 Requirement: Japan Contribution Cost: $23 000	9.5 Requirement: Japan Contribution Cost: $15 000	10.5 Requirement: Japan Contribution 1 expert Cost: $3 000	11.5 Requirement: Cost: $32 000	
	8.6 Requirement: Japan Contribution Cost: $23 000	9.6 Requirement: Austr.Contrib./UNDP Cost: $37 000	10.6 Requirement: 1 SSA (Hayward) Cost: $3 500		
		9.7 Requirement Cost: $10 000	10.7 Requirement: 1 SSA Cost: $3 500		
			10.8 Requirement: Japan Contribution Cost: $3 000		
			10.9 Requirement: Cost: $32 000		
			10.10 Requirement: Japan Contribution 3 days 10 persons Cost: $17 000		

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1988

April 1988

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1.1 Sub-Project 3 Expert Mission - Irradiator Design (Aggarwal) Jakarta 11 January - 8 April	2.1 Sub-Project 2 National TC/RT-2 Colombo, 1-12 Feb.	3.1 Sub-Project 3 National EMS - Radiation Processing, Dhaka 14-17 March	4.1 Sub-Project 2 4th NC Mtg NDT. Daeduk, 19-22 April	5.1 Sub-Project 4 Regional EMS - Civil Engineering, Tokyo 24 May - 1 June	6.1 Sub-Project 2 Regional TC - NDT SM-2, Shanghai 13 June - 8 July
1.2 Sub-Project 4 Expert Mission - NCS-Paper, Colombo 25-29 January	2.2 Sub-Project 2 National TC/RT-2 Jakarta	3.2 Sub-Project 1 2nd NC Mtg. Tracer Colombo, 14-16 March	4.3 10th RCA Working Group Meeting Beijing, 11-15 April	5.2 Sub-Project 2 National TC/UT-2 Bangkok, 2-14 May	6.2 Sub-Project 3 National EMS - Rad. Crosslinking,Changchu China, Lahore Pakista 28 June - 6 July
1.3 Sub-Project 1/4 Expert Rao 12m/m Jakarta	2.3 Sub-Project 1 Expert Demonstration Gas Flow Measurement Bangkok 22 Feb-3 March	3.3 Sub-Project 1 National EMS - Tracer Colombo, 17-18 March		5.3 Sub-Project 1 Expert Demonstration Cement Industry ROK, 16-20 May	6.3 Sub-Project 3 3rd NC Mtg. Rad.Tech. Jakarta, 8-10 June
1.4 Sub-Project 2 Expert Gilmour 12m/m Kuala Lumpur	2.4 Sub-Project 1 Expert Mission (Morch) Pakistan 28 Feb-10 March	3.4 Sub-Project 2 National TC/RT-2 Colombo, 17-18 March			6.4 RCA Seminar Jakarta, 13-15 June
	2.5 Sub-Project 2 National TC/UT-2 Manila, 8-26 Feb	3.5 Sub-Project 2 National TC/RT-2 K.L., 14-26 March			6.5 TPR Meeting Jakarta, 16-17 June
	2.6 Sub-Project 3 Experts - UV Facility Installation 25 Feb - 4 March	3.6 Sub-Project 2 Experts - Preparation of Text-books, K.L.			6.7 Sub-Project 1 Expert Demonstration Mercury Inventory Dhaka, 26-30 June
		3.7 Sub-Project 3 Expert Mission-Rubber (Makuuchi) Kottayam 20-22 March			
		3.8 Sub-Project 1 Regional TC - Tracer Beijing 21 March-9 April			
		3.9 Sub-Project 2 National TC/SM-2 PAK, 27 March-14 April			
1.1 Requirement: Cost: $9 900	2.1 Requirement: Country Project	3.1 Requirement: Cost: $15 000	4.1 Requirement: Cost: $21 000	5.1 Requirement: Japanese Contribution Cost: $55 000	6.1 Requirement: Cost: $28 000
1.2 Requirement: Cost: $4 000	2.2 Requirement: Cost: $4 000	3.2 Requirement: Cost: $25 000	4.2 Requirement: No requirement	5.2 Requirement: Cost: $4 000	6.2 Requirement: Cost: $15 000
1.3 Requirement: Cost: $40 000	2.3 Requirement: Australian Contrib. Cost: $20 000	3.3 Requirement: connected with 3.2		5.3 Requirement: Cost: $2 000	6.3 Requirement: Japanese Contrib. Cost: $33 000
2.4 Requirement: Cost: $40 000	2.4 Requirement: Cost: $3 500	3.4 Requirement: Country Project			6.4 Requirement: No requirement
	2.5 Requirement: Mission by R. Gilmour	3.5 Requirement: Cost: $4 000			6.5 Requirement: Cost: $25 000
	2.6 Requirement: Japanese Contribution	3.6 Requirement: Cost: $2 000			6.6 Requirement: Cost: $2 000
		3.7 Requirement: Japanese Contribution Cost: $5 000			
		3.8 Requirement: Cost: $28 000			
		3.9 Requirement: Japanese Contribution Cost: $4 000			

WORK PLAN
UNDP REGIONAL INDUSTRIAL PROJECT
1988

April 198

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
7.1 Sub-Project 2 Regional TC - NDT R-2 Hyderabad, India 4-22 July	8.1 Sub-Project 2 National TC/UT-2 Pyongyang, 2-20 Aug. 8.2 Sub-Project 2 National TC/ET-2 Manila	9.1 Sub-Project 3 Regional TC-Crosslinking Shanghai/Changchun China 5-23 September 9.2 Sub-Project 2 Regional TC - NDT UT-2 Lahore, 12-29 September 9.3 Sub-Project 1 Expert Demonstration Chemical Industry Malaysia 9.4 16th RCA Meeting Vienna 9.5 Sub-Project 3 Experts - Pilot Plant Modification Jakarta 9.6 Sub-Project 2 National TC/RT-2 China 2 weeks 9.7 Sub-Project 4 NCS Steel - Exp Mission 9.8 Sub-Project 3 RCM/Co-ord. RVNRL Kunming, CPR 7-9 September	10.1 Sub-Project 2 Regional Workshop - NDT Image Proc., Tokyo 3-7 October 10.2 Sub-Project 2 Regional TC - NDT Eddy Currents, Daeduk 17 Oct. - 4 November 10.3 Sub-Project 3 Expert Mission RVNRL K.L. 17-28 October 10.4 Sub-Project 2 National TC/UT-2 K.L. 3-15 October 10.5 Sub-Project 2 National TC/RT-2 Bangkok 3-15 Oct. 10.6 Sub-Project 2 National TC/RT-3 Jakarta 10.7 Sub-Project 2 National TC/RT-2 Manila 10.8 Sub-Project 3 National TC/Rad.Chem. K.L. 17-28 October	11.1 Sub-Project 3 Regional TC - Radiation Engineering, Bombay 21 Nov.-2 Dec. 11.2 Sub-Project 3 National EMS - Rad. Sterilization Med.Prod. Manila, Jakarta 30 Nov.-7 Dec. 11.3 Sub-Project 2 National TC/ET-2 PAK, 19 Nov.-1 Dec. 11.4 Sub-Project 1 National EMS Tracer Manila 11.5 Sub-Project 4 NCS Minerals - EMS	12.1 Sub-Project 3 Regional TC - Rad. Steril./Materials Bombay, 5-16 Dec. 12.2 Sub-Project 4 Regional TC - Coal Thailand, 13-23 Dec. 12.3 Sub-Project 4 Regional EMS - Coal Thailand, 8-9 Dec.
7.1 Requirement: Cost: $28 000	8.1 Requirement: Cost: $4 000 8.2 Requirement: Cost: $4 000	9.1 Requirement: Cost: $28 000 9.2 Requirement: Cost: $28 000 9.3 Requirement: Cost: $20 000 9.4 Requirement: No requirement 9.5 Requirement: Japanese Contribution 9.6 Requirement: Japanese Contribution Cost: $4 000 9.7 Requirement: Japanese Contribution 9.8 Requirement: Japanese Contribution Cost: $15 000	10.1 Requirement: Japanese Contribution Cost: $35 000 10.2 Requirement: Cost: $28 000 10.3 Requirement: Japanese Contribution Cost: $3 000 10.4 Requirement: Cost: $4 000 10.5 Requirement: Japanese Contribution Cost: $4 000 10.6 Requirement: Cost: $4 000 10.7 Requirement: Cost: $4 000 10.8 Requirement: Cost: $4 000	11.1 Requirement: Cost: $28 000 11.2 Requirement: Cost: $15 000 11.3 Requirement: Cost: $4 000 11.4 Requirement: Cost: $15 000 11.5 Requirement: Cost: $15 000	12.1 Requirement: Cost: $28 000 12.2 Requirement: Australian Contrib. 12.3 Requirement: Australian Contrib. Cost: $28 000

RCA ACTION PLAN 1987

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1987				Regional Industrial Project, Phase II 1 May					LIVER: RCM 5-8 Bangkok	AEROSOL IMAGE: Workshop 9-12 Nov. BARC	
	NUC.INST. Expert Mission BGD, SRL								RPFI-II RCM 5-9 Oct. Proj. Comm. 7-9, Kuala Lumpur	RIA: Nat. TC ROK 2-13	ENERGY PLAN; Workshop WASP Users 7-11 Jakarta
TC GENERATOR: evaluation sublimation generators commenced		RIA: Regional TC Data Processing 2-20, Jakarta			DOSIMETRY: Workshop - Dosimetry in Radio-therapy 6-19, Seoul			RPFI-II Exp. Mission PAK, BGD, THA, ROK		NUCLEAR SC: Workshop Res. Reactors 16 Nov.-4 Dec. BARC	1c GENERATOR RCM late 87
		TC GENERATOR: Expert Mission BDG VIE,INS, PAK			ISOT.HYD. Water Res. Devt 15-17 Workshop, Isot. Hyd. 18-26 Beijing	RICE: RCM Hangzhou CPR		RCA General Conf. Mtg 23 Sept.		NUCLEAR SC: Workshop; Use of PC Computers 23 Nov-11 Dec, BARC	
ISOT. HYD. Expert Mission INS,SRL, MAL THA, ROK, 18 Jan - 19 Feb		RCA Working Group Mtg 23-26 Colombo			ISOT. HYD Expert Mission MAL, THA		BUFFALO: RCM 24-28, Penang			RADN PROTN: Project Formulation Mtg, Tokyo	LIVER- Publ. of Liver Dec. 87 - Feb. 1988
										CANCER: RCM 27-29, Madras	
1988	RIA Mtg Nat. Co-ord 3-5, Singapore (tentative)	FOOD TOXIC ELE: RCM CPR	RADN PROT Regional TC, Sydney	TISSUE BANK Expert Mission PHI, BGD		TISSUE BANK Regional TC Course Taiyuan, CPR		RADN PROTN Proj. Comm. Experts (to be scheduled)	AEROSL IMAGE RCM-Late 88	ENERGY PLAN Workshop 88	

RCA ACTION PLAN 1988

JANUARY	FEBRUARY	MARCH	APRIL MAY	JUNE	JULY AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1988	LIVER: Editing Atlas of Liver Images Jan-Feb	RIA: Commence Clinical trial: Strategy for in vitro thyroid function testing.	RADN.PROT Regional TC Devt. Infra-structure Sydney 28 March - - 29 Apr.	RCA Sem. 13-15 June Jakarta	RIA: Nat. Training Course Manila 4-15 July Bandung 11-22 July		RADN. PROT. Workshop Personal & Environmen-tal Dosimetry Tokai Japan 17-21 Oct.	Isot. HYD Regional TC Kuala Lumpur 31 Oct.- 25 Nov.	
							RADN. PROT RCM Setting of Reference Man 17 Oct.		
	RIA: Mtg Nat. Coord. Bangkok 3-5 Feb.		FOOD/TOXIC ELEM: RCM China 19-22 April	NUC.INSTR. Project Formulat. Mtg. BARC 8-10 June		RCA. GEN CONF. Mtg 22 Sept.	RPFI - II RCM Bangkok 24-28 Oct. RPFI - II Project Cttee Mtg with RCM	RTC NUC POWER PLANNING Daejon ROK 7-26 Nov.	
			RCA WG.Mtg 11-14 April Bejing China			LIVER: Phase II Consult. Meeting (subject to approval)			ENERGY PLAN WASP/MAED Workshop Kuala Lumpur 5-10 Dec.
						RIA: National Training Course Kandy		TISSUE GRAFT RCM China TISSUE GRAFT Regional Workshop China 7-18 November IMMUNO-DIAGNOSIS TB. RCM Bombay	
							RIA: Nat. Training Course Dhaka	RIA: Nat. Training Course Seoul 9-20 November	

RCA BUDGET AND BUDGET ESTIMATES (March 1988)

No	Project/Activities	Source	1988 US$K	1989* US$K
1.	UNDP Regional Industrial Project	UNDP(1)	758	788
		TC(2)	86.4	90
		JPN(3)	293	293
		AUL(4)	250	250
2.	Strengthening of Radiation Protection	JPN	116.9	117
		AUL	98	tba
		TC	50	-
3.	Nuclear Techniques to improve buffalo production	Reg(5)	65	65
4.	Regional Project on food irradiation (phase II)	AUL	35	-
5.	Hydrology and Sedimentology	TC	80(6)	-
6.	Imaging procedures for diagnosis of liver diseases	JPN	100	100
7.	Improvement of cancer therapy	JPN	40	44
8.	Radioaersol imaging for diagnosis respiratory diseases	IND(7)	10	-
		Reg	50	46
9.	Tc-99m generator for low power reactors	Reg	24	24
10.	Radiation sterilization of biological tissue grafts	Reg	57	57
		TC	81.6	114.1
11.	Radioimmunoassay of thyroid hormones	TC	224.3	197.5
12.	Computers and Imaging in Nuclear Med.	AUL	55	73
13.	Nuclear techniques for toxic elements in foodstuffs	Reg	42	42
14.	Immunodiagnosis of Tuberculosis	Reg	32	47
15.	Two BARC Workshops	IND	40	50
		TC	10	18
16.	Care and Maintenance of nuclear med. instruments	Reg	40	40
		TC	65.4	65
17.	Workshops/TC funded by Republic of Korea	ROK(8)	40	40
		TC	20	20
18.	Energy and nuclear power planning	TC	48	88

*1989 figures are estimates only. In particular they do not imply commitments by donor countries.

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.

6) Regional Training Course: Advance Methodology of Isotope Applications in Hydrology, Kuala Lumpur. (related activity)

7) Extra-budgetary contribution from Government of India.

8) Extra-budgetary contribution from the Republic of Korea.

ARCHAEOLOGICAL INVESTIGATIIONS USING NUCLEAR BASED TECHNIQUES

- A proposal under RCA programme (introduced at the RCA Working Group Meeting, March 1987, Colombo)

The long historic and cultural relations among the countries of this region are well-known. The developments, over the years, in nuclear based and related measurement techniques, provide a powerful means of investigating the archaeological artefacts and works of art. These investigations can help establish provenance, authenticity and also study the movement of arts/artists and crafts/craftsmen to understand the evolution of the cultural horizons.

The programme of work would involve selection of suitable specimens, measurements to generate the data and the interpretation to provide definitive inferences regarding the problem.

- The types of samples can be potsherds, metallic objects (including bronzes, icons), painting, coins, glass etc. The emphasis will be on non-destructive examination.
- The measurements envisaged are (i) compositional aspects including trace elements in the bulk and near surface, (ii) Stored (energy) information, (iii) physical measurements including structural and magnetic.
- The techniques of interest include neutron activation, XRF, ion beam analysis (RBS,PIXE) for compositional aspect;thermoluminescence, ESR for stored energy/chronology related measurements and X-ray diffraction and other standard physical measurements for the 'structural' aspects.
- The interpretation component would involve the development and application of chemometrics such as multivariate analysis,to provide grouping/classification (supervised learning) and to help extract 'features' on samples about which not much is known (unsupervised learning); the former would require some authentic samples to develop the criteria for grouping/classification.

It was suggested at the meeting at Colombo that one way of initiating this programme could be through a co-ordinated research programme which could then evolve into a project of appropriate dimensions depending on the involvement of the participants and success of the first phase.

Agency staff had mentioned the desirability of discussing with UNESCO in view of the overlapping interest.