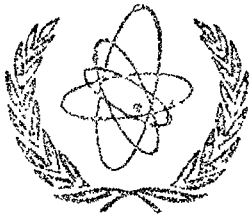


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ADVANCES IN THE APPLICATION OF NUCLEAR ENERGY FOR PEACEFUL PURPOSES

Information transmitted by Bangladesh

Note by the Director General

On 13 September the Director General received from Bangladesh material on the advances made in the year 1973-74 in applying nuclear energy for peaceful purposes. The material in question is reproduced below for the information of the General Conference.

GENERAL BACKGROUND

1. The Bangladesh Atomic Energy Commission was constituted in May 1973 as an autonomous organization responsible for undertaking peaceful uses of atomic energy in the country and discharging international obligations in this regard. The first task before the Commission was to make arrangements for formulation of policy, administration and operational control. The Commission then undertook the planning and formulation of its programmes and organized implementation both on a short-term and long-term basis. The main tasks of the Commission in 1973-74 were:

- (a) To prepare a Five-Year Development Plan on the basis of national needs and priorities and availability of resources;
- (b) To carry out programmes in nuclear agriculture and life sciences including nuclear medicine;
- (c) To undertake design of a research reactor;

- (d) To sustain research activities in nuclear sciences and allied fields;
- (e) To carry out programmes of exploration and exploitation of beach sand minerals;
- (f) To carry out programmes of development and prototype production of electronic and other scientific equipment;
- (g) To carry out atmospheric research and reception and analysis of cloud pictures sent by weather satellite for storm warning;
- (h) To further the progress of nuclear power generation in the country; and
- (i) To further the training of scientists and technologists in the country and abroad.

FIRST FIVE-YEAR DEVELOPMENT PLAN

2. The Commission prepared the first Five-Year Development Plan which included six on-going projects and several new projects to be completed during 1973-78.

On-going projects

- (a) Institute of Nuclear Agriculture at Mymensingh;
- (b) Irradiation and Pests Control Research Institute at Tongi, Dacca;
- (c) Pilot Plant for Exploration of Beach Sand Minerals at Cox's Bazar, Chittagong;
- (d) Electronics Laboratory, Dacca;
- (e) Extension Programme for Irratom Rice Varieties Nos 24 and 38; and
- (f) Rooppur Nuclear Power Project, Ishurdi, Pabna.

New projects

- (a) Institute of Nuclear Technology;
- (b) Four nuclear medical centres;
- (c) Institute of Electronics; and
- (d) Institute of Beach Sand Minerals.

AGRICULTURE AND LIFE SCIENCES

3. The Commission continued research and development to evolve high-yielding varieties of crops and investigate soil-plant relationship by using radiation and radioisotopes. The two high-yielding and early maturing rice varieties - Irratom 24 and 38 - after successful field trials, were distributed among a large number of farmers. Highly encouraging results led the Government to undertake extensive field trials for adopting them as national varieties.

4. The Commission also evolved varieties of jute, sugar-cane and tomato which showed remarkable results in the field. They were put under an extension programme. In addition, the Commission solved many peculiar problems relating to soil-plant relationship under various local conditions.

5. The Commission completed the Institute of Nuclear Agriculture in the campus of the Agricultural University at Mymensingh. This Institute is to receive assistance valued at about 5 million Swedish crowns from SIDA (the Swedish International Development Authority) and the IAEA in the form of equipment, expert services and training under an agreement to be signed shortly.

6. The Commission continued research in the field of food preservation and pest control and obtained encouraging results, specially in the area of inhibition of sprouting of potatoes and onions, preservation of fish, fruits, vegetables and stored grains. It was found that all major species of stored grain pests in the country were disinfested by ^{25}Kr . Rice stored and protected from reinfestation remained undamaged for 18 months in storage without any adverse effect on nutrients and organoleptic properties or toxic effects on animals feeding on the irradiated rice. Shelf life of some tropical fruits, such as bananas, was extended to 10-18 days and of potatoes and onions to ten months at room temperature. The marketing life of some local fish was extended up to 21 days, with quality remaining acceptable. In order to expand activities in these areas, the Commission has undertaken establishment of an Irradiation and Pest Control Research Institute at Tongi near Dacca.

RESEARCH REACTOR

7. Bangladesh lacked a research reactor. The Commission, therefore, decided to establish its first research reactor during the country's Five-Year Plan period. A common 1-MW swimming-pool type reactor was chosen and several groups of nuclear engineers and reactor physicists undertook work on various aspects of the design and

construction of the reactor. It is hoped that this reactor will be set up by the Commission's own scientists and engineers, with hardware and consultation services from friendly countries. The reactor fuel and associated **materials and equipment** are expected to be procured through the IAEA. The Commission would need technical assistance from the IAEA and friendly countries.

8. At the initial stage the research reactor would be the core of the Institute of Nuclear Technology which would form part of an atomic energy complex proposed to be set up in the vicinity of Dacca.

RESEARCH IN NUCLEAR SCIENCE AND ALLIED FIELDS

9. Applied and fundamental research was continued in the fields of nuclear physics, solid state physics, nuclear chemistry, radiation chemistry, electronics, theoretical physics, technical physics and health **physics** at the Atomic Energy Centre, Dacca. Nuclear physics research was carried out, using the 3-MeV Van de Graaff machine, and a considerable volume of nuclear data was obtained. The Van de Graaff machine was provided with nanosecond pulsing and computer facilities which enabled the workers to obtain precision in nuclear data. The Van de Graaff machine was also used for doing some fundamental work on solid state physics.

10. Nuclear and radiation chemistry work was concentrated on the study of the chemistry of uranium, zirconium, thorium and radiation effects in materials. Technical physics work was related to the **maintenance** of the Van de Graaff machine and development of the associated technology, particularly magnetics. Theoretical physicists continued their work on different aspects of nuclear and solid state physics.

11. Health physics was concerned with radiation safety in the country, fall-out studies, selection of reactor sites and formulation of safety regulations.

12. Applied work on the industrial application of radioisotopes and gamma radiography and radioisotope hydrology was continued.

13. The Commission will undertake fault detection in gas pipes by means of gamma radiography and hydrological investigation with radioisotope techniques in collaboration with the Titas Gas Company and Water Development Board respectively.

EXPLORATION AND EXPLOITATION OF BEACH SAND MINERALS

14. The Commission undertook exploration of beach sand minerals in the Cox's Bazar - Teknaf coastal area. The findings were highly encouraging and the Commission decided to set up a pilot plant for exploitation of these minerals. This was done with assistance from Australia and the pilot plant is expected to be completed by the end of 1974. The valuable deposits discovered by the Commission have been estimated to have high potential in earning foreign exchange for the country. The Commission, therefore, for full exploitation of these minerals, has planned the establishment of an Institute of Beach Sand Minerals in the Cox's Bazar area and the setting up of commercial plants in due course.

DEVELOPMENT OF PROTOTYPE PRODUCTION OF ELECTRONIC AND OTHER SCIENTIFIC INSTRUMENTS

15. The object of this programme was to put the skills and facilities built up in the electronics laboratory at the Atomic Energy Centre, Dacca, to a very useful purpose, namely the development and small-scale production of electronic and scientific instruments for educational institutions and other research laboratories. Most of this work was carried out under specific contracts with the Bangladesh Equipment Development Bureau, University Grants Commission and other Government agencies. This programme will help the attainment of self-reliance in electronic and scientific instrumentation and at the same time save a considerable amount of foreign exchange.

SPACE AND ATMOSPHERIC RESEARCH

16. The Commission continued atmospheric research with a view to achieving a better understanding of cyclones, tornadoes, storms and atmospheric phenomena in general. An automatic pictures-receiving ground station continued to receive cloud pictures sent by weather satellite which were analysed in co-operation with the meteorological department for weather forecasts and storm warning.

17. In view of the peculiar situation and climatic conditions typical of the South-East Asia region, the Commission has been working on a proposal to establish a Regional Centre for Delta Studies which would include oceanography, atmospheric and other geophysical studies.

NUCLEAR POWER

18. Considering the overall prospects for nuclear power in the country, it was decided to establish a nuclear power station at Rooppur in the western zone of the

country. The decision was based on the findings of the large number of reports and feasibility studies etc. prepared by the IAEA and international consulting firms. In 1969, the erstwhile Pakistan Government sanctioned a 200-MW power plant but due to various reasons the project was not implemented. A site for the nuclear power plant was acquired and a housing colony and other common services were partially completed. After liberation, the Government of Bangladesh constituted a working group consisting of senior-level experts from associated Government Departments. This group made a thorough study of the energy requirements of the country and recommended the establishment of a 200-MW nuclear power station at an early date.

19. Bangladesh along with 14 other developing countries participated in the market survey undertaken by the IAEA^{1/}. This survey was under review for Bangladesh. The Middle East war created the energy crisis and this put nuclear power in a new perspective. In view of this situation the Commission welcomed the IAEA's decision to undertake a more detailed study to up-date the market survey report published last year. One of our senior engineers was deputed to the IAEA for the purpose. The Commission took special care to apprise the Government of the situation up to date and the Government decided to implement the nuclear power project on a priority basis. The Commission has been engaged in building up an effective contractor-engineering organization to shoulder the responsibility of construction and other activities related to the implementation of the power project.

SCIENTIFIC AND TECHNICAL FACILITIES

20. The Commission has the following establishments in the country:

- (a) Atomic Energy Centre, Dacca;
- (b) Electronics Laboratory, Dacca;
- (c) Institute of Nuclear Agriculture, Mymensingh;
- (d) Irradiation and Pest Control Research Institute, Tongi, Dacca
(partially complete);
- (e) Nuclear Mineral Centre, Chittagong;
- (f) Beach Sand Mineral Pilot Plant, Cox's Bazar, (under construction);
- (g) Atomic Energy Medical Centre, Dacca;

^{1/} See document GC(XVII)/506.

- (h) Atomic Energy Medical Centre, Chittagong;
- (i) Atomic Energy Medical Centre, Rajshahi;
- (j) Space and Atmospheric Research Centre, Dacca; and
- (k) Rooppur Nuclear Power Project, Rooppur, Pabna.

These establishments possess a wide range of equipment for research and development and for field work. The major equipment includes a 3-MeV Van de Graaff accelerator with nanosecond pulsing and other associated equipment, an IBM 1620 computer, a 5000-curie source, a whole body counter, etc.

TRAINING

21. The Commission took special care to provide training to young scientists, engineers and technicians in nuclear science and technology both at home and abroad. The Commission's Training Institute offered basic nuclear orientation as well as specialized courses in solid state physics, nuclear physics, nuclear medicine, geology and scientific instrumentation.

22. Under the different technical assistance programmes a number of personnel were sent for training abroad; the Agency was a major donor of fellowship awards. A number of research contracts in different fields were also awarded by the Agency to undertake nuclear research in the country.

INTERNATIONAL RELATIONS

23. The Commission has been keenly interested in developing international co-operation in the field of atomic energy. It was felt that such co-operation particularly in the region of Middle East, South and South-East Asia would be of immense benefit to the development of science and technology. Bangladesh took an active part in radiation preservation of fish and fishery products under the Regional Co-operation Agreement for Research and Development and Training related to Nuclear Science and Technology.

24. The Commission established bilateral links with organizations in other countries. In particular, agreements have been entered into between the Commission and India, Australia and Sweden respectively. Negotiations proceeded during the year between the Commission and organizations in other countries for co-operative programmes in various aspects of peaceful uses of atomic energy.

25. Bangladesh took part in the nuclear data programme of the International Nuclear Data Committee. Programmes and progress reports in this respect were regularly sent to the Nuclear Data Section of the IAEA for circulation by the Agency to Member States. Bangladesh was also taking part in the International Nuclear Information System (INIS) programme of the Agency. A national network of scientific information sources in the country was being organized.

MEMBERSHIP

26. Mr. Md. Yusuf, a former Member of the Pakistan Atomic Energy Commission, has joined the Commission as one of the full-time Members.

STAFF

27. The number of staff in the Commission on 30 June 1974 was about 900. The Commission wishes to express its appreciation of the contribution made by the staff to the progress described in this report. The Commission also appreciates the constructive role played by the Scientists' and Engineers' Associations and the Staff Unions in implementing its programmes.