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ADVANCES IN THE APPLICATION OF NUCLEAR ENERGY FOR PEACEFUL PURPOSES

Information received from Pakistan

The Director General has received a communication, dated 13 September 1980, from the Pakistan Atomic Energy Commission, Islamabad, enclosing the following material on the nuclear programme of Pakistan with the request that it be circulated for the information of the General Conference.

NUCLEAR PROGRAMME OF PAKISTAN

1. The national nuclear programme of Pakistan is aimed at developing nuclear energy for power generation and utilizing nuclear radiation technology for enhancing food production, improving public health and increasing industrial output. These goals have been vigorously pursued by the Pakistan Atomic Energy Commission (PAEC) during the past several years.
2. Following is a brief review of activities of the Commission during the last year.

Nuclear Power Generation

3. While poor in indigenous sources, Pakistan needs tremendous energy inputs for meeting its developmental needs. It is among the poorest countries in the world in terms both of energy resources and of per capita consumption of energy. It has been estimated that per capita consumption of energy in Pakistan will increase fourfold by the end of this century. Over the same period the electrical energy consumption would grow even faster, from the present 200 kWh to 800 kWh.

This would require a total installed capacity of 27 000 MW by that time. It is one of the most seriously affected countries in terms of energy imports and spends 55% of its foreign exchange on oil imports; that is why nuclear energy has a special significance and considerable potential in Pakistan.

Karachi Nuclear Power Plant

4. The Commission's first nuclear power plant, KANUPP (of 137 MW(e) capacity), was inaugurated at Karachi in 1972. This plant is run and maintained by Pakistani technicians and is now meeting 25% of the electricity needs of Karachi. During the year under review it was thoroughly overhauled. The entire maintenance and overhauling was done by Pakistani engineers and technicians.
5. Pakistan has started the local manufacture of fuel based on indigenous supplies of uranium; such fuel has already been fed into the plant and its performance is being carefully watched.
6. The successful operation of KANUPP has given the country valuable experience for setting up more similar plants. A much larger plant, of 500 MW(e) capacity, is being set up on the bank of the River Indus, at Chashma, in the near future. The project has been approved by the Government and preliminary investigations have been completed and some basic support facilities at site provided.

Agriculture

7. Although Pakistan is an agricultural country, it has to import considerable quantities of food grains every year to meet its requirements. The main problems in agriculture in Pakistan are low yield per acre and destruction by pests, insects and post harvest losses. Since nuclear radiation techniques have been found quite effective in overcoming some major problems in agriculture, PAEC has set up three agricultural research centres in the country where nuclear techniques are employed to improve agricultural output. These centres are at Faisalabad (Punjab), Tandojam (Sind) and Tarnab (near Peshawar, in the Frontier Province). The centre at Tarnab has only recently started functioning partially. Research is being carried out at these centres to evolve new, high-yielding and disease-resistant varieties of main crops. Research is also being carried out on the commercial storage of food grains by disinfestation by nuclear irradiation and efficient utilization of water and fertilizer.

8. The research work progressed satisfactorily at these centres during the year under review. Field trials of a new variety of rice evolved earlier by the Nuclear Institute of Agriculture and Biology (NIAB) at Faisalabad, called Kashmir Basmati, continued in the Swat, Malakand and Hazara areas of the North-West Frontier Province. The variety has already shown good results in Azad Kashmir, where its yield was 30% higher than the local varieties. The triticale (a cross of wheat and rye) evolved at NIAB has better grain which lends itself easily to bread-making. Triticale is being developed as a crop suitable for barani (rain-fed) areas, where it has given yields 10-15% higher than wheat. Trials conducted at 28 locations proved successful, and the seed is being multiplied. Field trials for new varieties of mung bean and chick pea also continued at various locations. The results are quite encouraging.

9. NIAB was also able to develop a method for utilizing saline and saline-sodic lands. It is based on a plant succession system starting with a highly salt-resistant grass called Kallar grass.

Medicine

10. The six nuclear medicine centres set up by the Commission in different parts of the country are providing diagnostic and treatment facilities to patients suffering from various malignant and other non-conventional diseases. There was an increase of about 40% in the number of patients registered at these centres during the year under review. The construction of the seventh nuclear medicine centre has just started at Islamabad. When completed, in about three years' time, at a cost of over \$3 million, it will be the country's most modern and largest nuclear medicine centre, having most modern facilities for diagnosis and treatment, including facilities for indoor treatment.

Manpower Training

11. Pakistan needs trained manpower to maintain and run its nuclear establishments in the power, agriculture and medicine sectors. In order to meet this demand, the Commission has established a Centre for Nuclear Studies, which gives post-graduate training to graduate engineers and scientists in various nuclear engineering subjects. A Nuclear Power Training Centre, at Karachi, is training technicians and operators in plant maintenance and operation. The Centre has capacity for training 200 technicians a year. In addition, the Commission has been holding special courses for various industrial workers in the latest industrial techniques, such as industrial radiography and ultrasonic testing, and in medical physics and basic physics.

Uranium Exploration

12. The programme for the prospection, exploration and mining of uranium was stepped up in the year under review, and new areas with promising anomalies were discovered and primary drilling work done. The existence of economic and exploitable deposits was confirmed at some locations. Also, the available facilities for ore processing and milling were improved.

International Conferences

13. During the year under review, the Commission participated in many international conferences and, with the co-operation of the International Centre for Theoretical Physics, Trieste, arranged the Fifth International Summer College on Physics and Contemporary Needs from 14 June to 2 July 1980 at Nathiagali. The College was attended by 50 prominent world scientists, including two Nobel Laureates; about 100 Pakistani engineers and scientists also attended.