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PROGRESS IN PEACEFUL APPLICATIONS OF NUCLEAR ENERGY DURING THE YEAR 1966/1967

A statement by India

THE PROGRESS MADE BY INDIA IN THE PEACEFUL USES OF ATOMIC ENERGY DURING THE YEAR 1966/1967

During the year 1966/1967, India has made rapid strides in the peaceful applications of atomic energy. Some of the highlights of these developments are given below.

India's nuclear power programme continued to register satisfactory progress. Work on the 380-MW(e) Tarapur Atomic Power Station is proceeding according to plan. This Station, which is being built with United States assistance, is expected to go into commercial operation by October 1968. Similarly, work on the first 200-MW(e) unit of the Rajasthan Atomic Power Station has progressed according to schedule and the Station is expected to go into operation early in 1970. The construction of the second 200-MW(e) unit of the Rajasthan Station has commenced. This unit is expected to be in operation by the middle of 1972. Both units of the Station are being built with Canadian collaboration and assistance. Preliminary work on the Madras Atomic Power Station which will also produce 400 MW(e) has commenced. With the commissioning of these three nuclear power stations, India will generate more than a million kilowatts of electricity through atomic energy. In all these three stations, power costs will already be lower than what they would have been had power stations using conventional fossil fuels been built at these locations.

In executing these projects, ever-increasing emphasis has been laid on the maximum use of indigenous skills and materials. This can be readily seen from the fact that, whereas for the Tarapur Atomic Power Station about 66% of the cost was in foreign exchange, the corresponding figure for the first unit of the Madras Atomic Power Station will be only 20%.

The extraction of the plutonium which will be used in the second generation of power reactors is an extremely important aspect of India's nuclear power programme. The constructional and operational experience gained with the existing plutonium plant has been made use of in designing a new facility for handling irradiated fuel from nuclear power stations. Development work connected with the design of additional auxiliary facilities for processing the irradiated power reactor fuels and irradiated thorium has also progressed satisfactorily. An experimental station for developing fast breeder reactors will be set up adjacent to the Madras Atomic Power Station.

The extent and scope of the country-wide operations in respect of prospecting for atomic minerals was widened considerably. The Jaduguda Uranium Mill, which is capable of processing 1000 tons of uranium ore per day, is now complete, and the production of uranium concentrates has already commenced on a trial basis. A new mechanized plant to process minerals present in the beach sands of Kerala has been completed. This will produce considerable quantities of ilmenite, monazite, zircon and rutile. The capacity of the rare earth plant will also be expanded in the near future. The construction of a large heavy water plant has been decided upon and work on this plant will commence in the near future. Based on the experience gained in the construction and operation of the Uranium Metal Plant and the Fuel Fabrication Facility at Trombay, a fuel complex is now being set up at Hyderabad. This will consist of a large-capacity uranium metal plant and a fuel fabrication facility capable of meeting the country-wide power-reactor fuel requirements of the immediate future. The production of fuel for the first unit of the Rajasthan Atomic Power Station has already commenced. Considerable progress has also been made on methods of treating high-, medium- and low-level radioactive wastes.

It is expected that by about 1975 India will be in a position to set up single nuclear power units of about 600 MW(e) capacity. Studies recently conducted have indicated that in certain areas of India nuclear power and desalinated water from the sea can be produced at such economical rates that it would be possible to concentrate in these regions electricity-intensive industries for producing materials such as fertilizers, insecticides, caustic soda, chlorine and aluminium. It has been estimated that these very large stations would produce power and desalinated water at costs which are significantly lower than those prevailing at present. This would completely change the economic picture of regions where at present no industrial development is possible because of lack of power and water. In view of the importance of this concept, a special study aimed at assessing the technological and economic implications of such an agro-industrial complex has been undertaken by the Indian Atomic Energy Commission jointly with the United States Atomic Energy Commission. As projects of the type envisaged above would lead to a significant increase in man-power requirements, considerable accent has been laid on specialized training programmes in the field of atomic energy.

Apart from the nuclear power projects and their immediate ancilliary facilities, significant progress was registered in a number of other areas. On the basis of processes and techniques developed indigenously at the Bhabha Atomic Research Centre, a large electronics complex is now coming up at Hyderabad. This complex has undertaken commercial-scale production of electronic control systems and computers aimed at satisfying a substantial fraction of the overall requirements of the country.

The Bhabha Atomic Research Centre has continued to develop a number of instruments and processes with a view to increasing to the maximum extent possible the proportion of Indian equipment and techniques used in the field of atomic energy. Developments during the year included:

(a) Production of high-purity materials;
(b) Extraction of rare elements;
(c) Development of special materials for transistor technology;
(d) Production of special alloys;
(e) Successful development of flow-sheets for the exploitation of by-products in uranium ore such as copper, nickel and molybdenum minerals; and
(f) Development of a D.C. plasma gun capable of operating at a power level of 60 kV and producing temperatures ranging between 5000 and 30 000°C.

The Seismic Array Station which was set up at Gouribidnur for conducting studies on underground nuclear tests continued to operate satisfactorily. This array is now being extended to a 20-element array and the necessary instruments for this purpose are being developed. Studies on atmospheric fall-out from nuclear weapon tests were continued, and methods of increased precision have been developed for the detection and estimation of fall-out products. Among the many special-purpose instruments designed and constructed were a 1024-channel pulse-height analyser and a transistorized automatic data-logging system for the meteorological tower at the Tarapur Atomic Power Station site.

The production of isotopes and labelled compunds was considerably expanded and isotopes were exported to a number of countries in Europe, Africa and Asia. The first high-specific-activity cobalt source (of a strength of 1800 curies) to be fabricated at Trombay was installed in a cobalt cancer therapy unit. The country-wide radiation protection programme gained considerable momentum and it now covers nearly 12 000 workers all over the country. This is an index of the growing use of radiation sources throughout the country.

The development of radiation preservation processes for perishables such as fruits, vegetables, fish and milk products was continued. Two pilot-scale cobalt-60 food irradiators have just been installed with Canadian assistance. One is a large package irradiator and the other is a portable one which can handle grains and other free-flowing materials. These irradiators, along with the associated analytical, research and processing facilities, will provide considerable impetus to this programme. Following these initial efforts, a production-scale irradiation facility will be designed for installation and use in one of the grain storage centres in the country.

Yields trials on promising rice and groundnut mutants have established the higher yield capabilities of these mutants. A large-scale project to expand further the use of radiation in agriculture has been jointly proposed by the Indian Council of Agricultural Research and the Indian Department of Atomic Energy. It is hoped that this project will be assisted by funds from the United Nations Development Programme. The Agency has assisted considerably in formulating and crystallizing this project.

Three scientists from Afghanistan received training in the safe handling of radioisotopes and in radiochemical techniques. This was a prelude to the setting up of an isotope dispensing centre at Kabul by scientists of the Bhabha Atomic Research Centre. Two scientists from Saudi Arabia were trained in radiation monitoring techniques. A number of other scientists from abroad came to work in the Bhabha Atomic Research Centre under bilateral arrangements and fellowship programmes.

Work at the Tata Institute of Fundamental Research in various areas such as particle physics, computer development and research, nuclear magnetic resonance, cosmic rays, radioactive dating, radio-astronomy and molecular biology was continued.

At the Saha Institute in Calcutta, a technical physics group has been formed to develop technical know-how and research equipment. In conjunction with other units of the Institute, this group is helping to develop some of the costly and scarce equipment required by research workers. The Department of Atomic Energy continues to provide financial and other forms of assistance to the Saha Institute and a number of other institutions all over the country to promote research and development work in the field of atomic energy.

At the Tata Memorial Centre studies on the body distribution of cancer among Indians have been undertaken and new methods of treatment of cancer of the gullet, cheek and tongue are under investigation. Significant progress has also been made in a project to evaluate the use of phosphorus-32 in the early diagnosis of cancer in the nose and throat.