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PROGRESS IN PEACEFUL APPLICATIONS OF NUCLEAR ENERGY DURING THE YEAR 1967/1968

Statements by India and Sweden received on 23 September 1968

INDIA

Progress made by India in the peaceful uses of atomic energy during 1967-68

1. India continued to make steady progress in the peaceful applications of atomic energy during the year 1967-68. A brief review of the developments is given below.

2. Work on the construction of the 380-MW(e) Tarapur Atomic Power Station continued and, in spite of certain unexpected difficulties, it is expected that the station will be in commercial operation by March-April, 1969. The construction of the two 200-MW(e) units in the Rajasthan Atomic Power Station is progressing as scheduled. Work on the first 200-MW(e) unit of the Madras Atomic Power Station has commenced. With the commissioning of these three stations, India will generate about 1000 MW(e) of nuclear power in the early seventies. A new unit designated as the Power Project Engineering Division has been created by the Atomic Energy Commission with responsibility for the design, construction and commissioning of the Madras Atomic Power Station. This unit is also responsible for the construction and commissioning of the Rajasthan Atomic Power Station. Plans are under active consideration for the setting up of additional nuclear power stations to provide a total of about 3000 MW(e) by 1980.

3. Simultaneously with these developments, a working group was constituted to study the technological and economic mplications of agro-industrial complexes around large low-cost nuclear energy centres. Such studies are of particular interest to India in relation to the potentialities of an agro-industrial complex in regions such as the Indo-Gangetic plain and Kutch-Saurashtra.

4. The Plutonium Plant operated continuously during the year. Plans are well under way to establish a reprocessing plant at Tarapur for treating irradiated fuels from the Tarapur and Rajasthan power reactors. The design of a pilot plant for treating thorium and thorium-oxide irradiated in the CIRUS reactors at Trombay, for the recovery of uranium-233, has been completed. The pilot plant is expected to be commissioned in the next few months.

5. To meet the fuel requirements of India's power reactor programme, a nuclear fuel complex consisting of a uranium-oxide plant, a zirconium plant and a ceramic fuel fabrication plant is being set up at Hyderabad. This complex will also have a special materials plant where high-purity materials required for India's electronics industry will be produced. Steps have further been initiated for the construction of a heavy-water plant near the Rajasthan Atomic Power Station. This plant will have an annual capacity of 100 tons of heavy water. Work on the uranium mine and the uranium mill at Jaduguda continued to register steady progress. The mine shaft is expected to be commissioned shortly and the mill is going through trial runs. Parallel with these developments, feasibility studies have been initiated on a fast test breeder reactor.

6. The large electronics complex set up at Hyderabad commenced production of a wide variety of nuclear instruments, control systems, computers and electronic components to cater for the increasing, countrywide demand for such types of equipment.

7. For the effective co-ordination and implementation of the above projects, a number of undertakings have been set up by the Government. One is the Uranium Corporation of India Limited, which is responsible for the development of the uranium mine and the operation of the uranium mill at Jaduguda. Another is the Electronics Corporation of India Limited, which is responsible for the operation of the electronics complex at Hyderabad. Another company set up by the Government much earlier, the Indian Rare Earths Limited, is at present engaged in an expansion programme for the increased production of ilmenite, monazite, rutile, zircon etc.

8. The Atomic Minerals Division of the Atomic Energy Commission continued its countrywide prospecting for uranium, thorium, beryllium and other minerals of interest to the atomic energy industry. This Division is currently engaged in a programme of introducing modern methods of survey and investigation and in strengthening the laboratory and other facilities essential for such a programme.

9. At the Bhabha Atomic Research Centre at Trombay, research and development work continued as in earlier years. A number of items of equipment such as radiography cameras, gamma chambers, nuclear data processing equipment, glass-working lathes and molecular centrifugal stills were developed. A process has been developed for the production of uranium oxide powder, sintering to a high density of the order of 10.8 g per cc. This oxide will be of great value in the production of ceramic fuel for reactors.

10. Two new laboratories were set up at the Bhabha Atomic Research Centre during the year under review. One is the Electronics Prototype Engineering Laboratory, which undertakes production engineering relating to the various types of electronic and allied equipment designed and developed in various laboratories of the Centre. The other is the Reliability Evaluation Laboratory, which tests, measures and evaluates the reliability of electronic components, instruments and systems. Facilities for the production of radioisotopes and labelled compounds were expanded and diversified and radioisotopes were exported to a number of countries.

11. Work was successfully continued in the plant mutation breeding programme. A number of new radiation-induced mutants with improved agronomic characteristics were obtained. The food irradiation and processing laboratory was substantially completed and two cobalt-60 irradiators, one of 27 800 Ci for free-flowing materials such as grain flour and spices and the other of 100 000 Ci for pre-packaged foods, were installed.

12. The Seismic Array at Gouribidanur, which has been set up for the study of underground nuclear explosions, was brought up to its full complement of 20 seismographs extending over an area of 25 km x 25 km. The analysis of fall-out debris from nuclear explosions was continued.

13. At the Tata Institute of Fundamental Research, an on-line data processor has been designed and built. It has now been installed as a computational facility for the processing of experimental results. Large plastic balloons of volumes as high as 85 000 m^3 are now being routinely made at the Institute for high-altitude cosmic ray studies. All the electronics units necessary for the large cylindrical radio telescope to be set up at Ootacamund have been designed and built. The development of micro-electronic integrated circuits and micro-wave test equipment is now in progress.

14. Experimental investigations on cancer were continued at the Tata Memorial Centre. A project is now in progress in which chemotherapy and radiotherapy are employed together in treating certain forms of cancer.

15. Steps have been initiated to make and install a variable energy cyclotron near Calcutta. This cyclotron will serve as a national facility for research in nuclear physics and for controlled, direct irradiation of biological and agricultural products. Because of its high beam intensity, the cyclotron can produce a variety of isotopes which cannot be produced in nuclear reactors. This facility will be of great help to workers in Indian universities and in research establishments.

16. The Department of Atomic Energy continued to provide financial and other forms of assistance to a number of universities and institutions in India, which are engaged in research and development work in the field of atomic energy.

SWEDEN

Nuclear energy development in Sweden during 1967-1968

1. The Swedish nuclear programme is making rapid progress. In 1969 the Marviken boiling heavy-water reactor (140 MW(e)) will be ready for operation with saturated steam. At present different systems of the station are being tested with light water, and heavy water is expected to be introduced into the reactor early in 1969. The Oskarshamn boiling light-water reactor (400 MW(e)) is due for commissioning during 1970.

2. In July 1968 the Swedish State Power Board ordered two reactors for the Ringhals nuclear power station on the Swedish west coast. The first reactor due to go into operation in 1973 will be built by ASEA; this is a boiling light-water reactor with an output of 760 MW(e). English Electric will manufacture the turbine. The second reactor is a pressurized light-water reactor designed by Westinghouse with an output of 809 MW(e). Components for this reactor will be delivered by the Swedish industrial group, Monitor, and the reactor will start operation in 1974. For this second plant the ASEA subsidiary, Stal-Laval, will deliver the turbine.

3. ASEA and the Swedish Government have decided to form a joint company, Aktiebolaget ASEA-ATOM, for independent industrial and commercial activities in the nuclear field. ASEA-ATOM will engage in the development, production and sale of nuclear reactors based on thermal reactor systems, components for such reactors, and nuclear fuel. The company will take over deliveries from AB Atomenergi and ASEA, including the first reactor for the Ringhals station. ASEA-ATOM will recruit its staff mainly from ASEA and AB Atomenergi. The new company will take over the fuel element plant of AB Atomenergi in Stockholm and the ASEA nuclear laboratory, as well as ASEA's fuel element plant.

4. As a result of the creation of ASEA-ATOM the activity of AB Atomenergi will in future be more centred upon research and development in the nuclear field and the work will be concentrated in the Studsvik research station, where already about 800 people are working. It is foreseen that the large thermal reactor programme in Sweden will continue to make considerable demands on the development resources of the Company but that a growing part of future development will relate to fast reactors.

5. During the year AB Atomenergi's uranium mill at Ranstad has operated at 3/7 of full capacity (120 metric tons per year of uranium). The experience gained so far has been very good from the technical point of view and has also confirmed the cost analysis made during the pre-project stage. An economic and technical study is now being made for a plant having a capacity of about 500 metric tons per year.

6. For a couple of years efforts have been made to increase co-operation in the nuclear field between Denmark, Finland, Norway and Sweden. A report has now been published by the Nordic Contact Committee for Atomic Energy Questions regarding the possibility of extended nuclear power co-operation between the Nordic countries. The Committee stresses the need for an investigation of the role which nuclear power will play in the future supply of energy in the Nordic countries. A close collaboration between utilities and industries engaged in nuclear energy work is recommended. Furthermore, the Committee indicates the advantages of a rational co-operation between the Nordic nuclear research stations. Finally, the Governments are reminded that co-operation between governmental bodies in handling the safety of nuclear power stations is of common interest to all the Nordic countries.