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## POWER DEVELOPMENT

### (b) NUCLEAR POWER

#### Progress report by the Director General

#### INTRODUCTION

1. This progress report is intended to give the General Conference a synopsis of what the Agency has done during the past year to further the development of nuclear power [ 1 ] within the framework of various resolutions of the Conference, and particularly Resolution GC(V)/RES/109 on international co-operation for developing nuclear power projects. It is divided into two parts dealing respectively with assistance towards the development of nuclear power plans which the Agency has rendered to certain technically less advanced Member States, and with the collection and dissemination of technical and economic information on power reactors for the potential benefit of all Members.

#### ASSISTANCE TO INDIVIDUAL MEMBERS

##### A United Nations Special Fund project for the Philippines

2. It may be recalled that the nuclear power survey mission which the Agency sent to the Philippines in October 1960 reported that, in view of the shortage of indigenous energy resources and the growing power demand in that country, nuclear power might compete favourably with conventional power in the Luzon Grid by the late 1960's [ 2 ].

3. The Government of the Philippines, after due consideration of the mission's report, expressed the desire to undertake a detailed analysis of the possibilities of introducing nuclear power into the Luzon Grid; and the Agency was approached to help prepare a request to the United Nations Special Fund for assistance in this undertaking. In October 1962 a member of the Agency's staff, accompanied by a consultant on conventional power, visited the Philippines and assisted the authorities to draft their request to the Special Fund for a Pre-investment Study on Power, including Nuclear Power, in Luzon.

4. This request was submitted to the Special Fund last December; in June the Governing Council of the Special Fund approved it and the Agency has been designated the Executing Agency to carry out the project.

[ 1 ] A paper on the co-ordination of power development activities at the international level is before the Conference as document GC(VII)/229.

[ 2 ] Prospects of Nuclear Power in the Philippines, Technical Reports Series No. 3 (STI/DOC/10/3), Chapter XI, page 76.

5. The Special Fund will contribute \$477 500 to cover the cost of experts, fellowships, equipment, sub-contracts and other related expenses. The Government will contribute \$223 000 in the form of services of staff, equipment and local facilities and make a payment of an additional \$39 000 to the Special Fund towards local operating costs. Execution of the project is expected to begin in October 1963 and will be completed in about two years.

6. The project will help determine whether or not it is technically feasible and economically desirable to supply nuclear power to the Luzon Grid during 1965-1975 to meet part of the growing demand for power from it. The study to be made will deal with the relative economics of the different ways of meeting the load growth of the Luzon Grid, first by taking into account evaluations of the extra contributions that could be obtained from indigenous conventional sources of energy and then the possibility of using nuclear power to supplement them. The main elements of the study will be:

- (a) An appraisal of indigenous conventional energy resources (coal, geothermal, hydro, oil and gas) that could contribute more power to the Grid;
- (b) A detailed power market survey, which will take account of the latest economic and industrial development plans and the impact of rural electrification schemes;
- (c) Detailed cost estimates of and economic comparisons between the various types of conventional and nuclear plants suitable for increasing the capacity of the Grid;
- (d) The preparation of a power development programme for the Grid covering the period 1965-1975, including determination of the size and nature of the new generating units required and of the timing of their installation; and
- (e) Related studies such as those of the development of the electric power industry in Luzon, of the financial implications of building new stations and of the suitability of certain sites for nuclear plants.

The project will also involve the training of a number of scientists, engineers and other professional persons from the Philippines in various specialized subjects such as nuclear power technology, the making of load surveys and the comparative evaluation of conventional and nuclear power plants from both the technical and economic standpoints.

7. In carrying out the project, the Agency is seeking close collaboration with the United Nations, as well as with other international organizations; it is already expected that a part of the work of appraising indigenous energy resources [ 3 ] will be sub-contracted to the United Nations. A water resources survey at present being made under a bilateral arrangement between the Government of the Philippines and the United States Bureau of Reclamation will also contribute data useful for the project.

8. The Director General attaches great significance to the project; it will not only help the Government to make an objective appraisal of the prospects of nuclear power for the Philippines, but will also contribute towards evolving methods of general applicability for assessing the feasibility of introducing nuclear power into other developing countries.

#### Power reactor project for Pakistan

9. At the request of the Government of Pakistan the Agency sent in November 1962 an advisory mission of five experts on reactor safety to review the safety aspects of the research reactor at the Pakistan Institute of Technology near Rawalpindi. The mission also made a preliminary assessment of some of the sites that were being considered for a

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[ 3 ] See paragraph 6(a) above.

50 MW(e) nuclear power plant in East Pakistan. [ 4 ] It is understood that the Government found this assessment helpful in choosing the site at Roopur (about 90 miles north-west of Dacca) for the proposed reactor.

10. In June 1963 the Government requested the Agency to assist the Atomic Energy Commission in outlining the basic parameters for this power reactor and by commenting on the draft of the invitation to be sent to reactor manufacturers to bid for its construction. In July a Pakistani engineer visited the Agency to hold detailed discussions on the subject with technical staff in the Secretariat.

11. Pakistan has further requested the Agency's assistance in analysing and evaluating the bids received. The Secretariat plans to meet this request, if necessary with the help of outside consultants.

12. It is worthy of note that this is the first time that a Government has approached the Agency for help in outlining the preliminary specifications for a nuclear power plant, for advice on the calling for bids for its construction and for assistance with the evaluation of the bids received. This work is of some significance in the Agency's activities to promote the introduction of nuclear power, and it is to be hoped that other Member States desirous of introducing nuclear power will also find it profitable to seek similar assistance from the Agency.

#### Nuclear power in Thailand

13. At the request of the Thai Atomic Energy Commission for Peace, the Agency sent a mission to Thailand in December 1962 to assess the economic and technical feasibility of installing a nuclear power station in that country. The mission consisted of a nuclear power economist, a nuclear engineer and a conventional power expert; it obtained information from the Thai electric power authorities, the National Economic Development Board and other bodies and visited the north-eastern region of the country to which it had been asked to pay special attention. In its report, which is now being reviewed by the Thai authorities, the mission concluded that, although economic considerations indicated that construction of a nuclear power station should not be envisaged for the immediate future, full advantage should be taken of the experimental nuclear reactor in Bangkok to train scientists and engineers in nuclear technology in anticipation of the introduction of nuclear power in Thailand in due course.

### COLLECTION AND DISSEMINATION OF INFORMATION

#### General

14. During the past year the Secretariat has continued to study and review developments in the economics and technology of power reactors with the object of making the latest information readily available to Member States. Some of the work that has been done is outlined below.

#### Information on power reactor projects

15. Canada, the United Kingdom of Great Britain and Northern Ireland and the United States of America have given the Agency facilities for obtaining information on some of their power reactor projects. Two members of the Secretariat have visited seven power

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[ 4 ] This task was a sequel to assistance the Agency had given to the Pakistan Atomic Energy Commission earlier in the year - see document GC(VI)/192, para. 3(b).

reactor projects in the United States [ 5 ] and one project in Canada [ 6 ] this year; another three staff members have paid a visit to a power reactor in the United Kingdom [ 7 ] .

16. During these visits the staff members held discussions with officials of the respective national energy commissions and with designers, builders and operators of reactors to collect the latest information on such subjects as basic design, safety aspects, construction, fuel cycles, start-up, costs, training of staff, operating experience and the integration of nuclear plants into existing electrical networks. A summary of the information gathered on these visits and from the study of recently published literature is being provided to the General Conference in document GC(VII)/INF/62.

17. Last year the Board of Governors and the Director General pointed out to the Conference that the value of the information thus being continually collected by the Agency in this way would be enhanced if it could be obtained from a larger group of Member States, and the Director General reported that he was looking into the possibilities of making suitable arrangements to that end [ 8 ] . He is hopeful of some success, but nevertheless wishes to take this opportunity to invite the Governments of those other Member States that have already acquired or are now in the process of acquiring experience in operating power reactors to share that knowledge with other States, and specially with those that are still at the earlier stage of considering the introduction of nuclear power.

#### Conference on Operating Experience with Power Reactors

18. In June 1963 a Conference on Operating Experience with Power Reactors was held in Vienna, in which some 250 scientists and engineers from 20 countries took part. Recent technological, economic and administrative information gained from the operation of power reactors was presented and discussed [ 9 ] .

#### The desalting of water

19. The potential importance of reactors for the dual purpose of desalting of sea or brackish water and generating power was emphasized in the discussions of a group of experts convened by the Director General last March in connection with a request made by the Government of Tunisia for the Agency's assistance in studying its water development problems. Further information on this subject is to be found in document INFCIRC/45.

#### The economics of nuclear power

20. During the year under review plans have been announced for the construction of a sizeable number of nuclear power stations. In the United States alone it has been proposed to install 2135 MW of additional nuclear-powered generating capacity, an amount that exceeds the aggregate capacity of all nuclear power plants hitherto planned for that country.

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[ 5 ] Bonus, Elk River, Experimental Gas-Cooled Reactor, Hallam Nuclear Power Facility, Pathfinder, Peach-Bottom and Piqua Nuclear Power Facility.

[ 6 ] The Nuclear Power Demonstration Project near Des Joachims, Ontario.

[ 7 ] The Bradwell nuclear power station.

[ 8 ] GC(VI)/192, para. 6.

[ 9 ] The proceedings of the Conference will be published before the end of the year as document STI/PUB/76.

21. The growing share of total power production that nuclear power stations are taking makes it important to improve the methods of assessing the economic implications of introducing nuclear power into complex electrical grids. A Panel on the Economic Aspects of the Integration of Nuclear Power Stations in Electric Power Systems was accordingly convened in April. It concluded that although a simple comparison of the cost of generating electricity in conventional and nuclear stations of equal capacity might sometimes provide the information initially needed for planning purposes, that information should not be regarded as truly indicative of the economic merits of either station. It was most desirable therefore to make a detailed analysis of the economics of the nuclear and conventional power plants in terms of their effect on the grid as a whole. The Panel's findings will be reflected in a paper on nuclear power costs which is at present being prepared for the information of the General Conference [ 10 ] .

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[ 10 ] To be issued as document GC(VII)/INF/63.

