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ADVANCES IN THE APPLICATION OF NUCLEAR ENERGY FOR PEACEFUL PURPOSES

Information transmitted by the United Kingdom of Great Britain and Northern Ireland

Note by the Director General

On 4 September the Director General received from the United Kingdom of Great Britain and Northern Ireland 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.

INTRODUCTION

1. The steady growth of world-wide interest in nuclear power which successive sessions of the General Conference of the IAEA have seen, received special impetus during the past year from the sudden large increase in oil prices. The consequent reappraisal of national fuel policies has resulted in a new world-wide awareness of the finite nature of economically recoverable fossil fuel reserves and of their progressive exhaustion as energy demand accelerates. Perhaps for the first time the economics of power generation have swung decisively in favour of nuclear plant. In the United Kingdom, as elsewhere, the year has been marked by a number of important decisions and developments in the nuclear field. These are summarized in the following notes which it is hoped will provide a convenient conspectus for those who wish to be informed of recent progress in the peaceful uses of nuclear energy.

2. Since the last session of the General Conference Her Majesty's Government have reached decisions on nuclear reactor systems, and reorganization of the nuclear design and construction industry has gone ahead; the new company, the National Nuclear Corporation (NNC), should shortly be fully operational.

NUCLEAR POWER PROGRAMME

3. The Electricity Boards will build the Steam Generating Heavy Water Reactor (SGHWR) for their next nuclear power stations. This is a realistic decision which has been widely welcomed within the United Kingdom. To quote from the Government's report to Parliament:

> "The SGHWR offers substantial advantages. In the Government's judgment it will provide power reliably and we can proceed to order it quickly. We must maintain public confidence in nuclear power. The Chief Inspector of Nuclear Installations advises that there should be no fundamental difficulties in giving SGHWR safety clearance. Reliability and the confidence we can have in a system are of particular importance if we are to realise the economic benefits of nuclear power. SGHWR offers particular scope for British nuclear technology and we should exploit it. The 100 megawatt (MW) prototype at Winfrith has now been operating successfully for 6 years and is designed to reproduce the operating conditions of a commercial unit. Canadian experience with their commercial heavy water pressure tube system - CANDU - is also successful at a reactor size of about 500 MW."

4. We are approaching the expansion of the SGHWR programme prudently. We have confidence in the technology but we know from others' experience as well as our own that the process of moving forward from a prototype to a commercial size and design and a developed industrial capability is complex. The Government have therefore decided that the prudent approach is for the initial programme to be relatively modest - up to 4000 MW(e) over the next four years - and that we should start with reactor units of 600-660 MW(e). Our aim thereafter will be to build up SGHWR orders as quickly as progress allows. We believe this approach will provide a sound base for the proper planning and establishment of a strong industrial capability, and an increasing role for nuclear power in the United Kingdom.

5. The decision opens the way for further co-operation between the United Kingdom and Canada in the nuclear field. Both Governments welcome this and the responsible organizations have started discussions.

6. Three other aspects of the Government's decisions will provide us with the necessary flexibility to adapt policy in the light of future developments. First, United Kingdom nuclear organizations will be pursuing the prospects of our participation in the further international development of the High Temperature Reactor (HTR). Second, as the Government have made clear, their decision against any commitment to the Light Water Reactor (LWR) does not imply any judgement about the technical doubts expressed by some on the safety of the system. The Nuclear Installations Inspectorate will be carrying through to conclusions their examination of the generic safety issues of the LWR. Third, we shall maintain our effort on the Fast Reactor and will be pursuing urgently the prospects for further international co-operation, covering development and the start of commercial ordering.

7. The United Kingdom is fortunately placed with major fossil reserves and expects some further orders for new fossil-fuelled plant in the period of the initial SGHWR programme. In the later 1970s our nuclear options will widen; we shall in particular be able to step up the SGHWR programme, given satisfactory initial experience.

FAST REACTORS

8. During the year, an important landmark in the United Kingdom programme was reached with the completion and start-up of the Prototype Fast Reactor (PFR) at Dounreay. Commissioning, to work the plant up to full power operation to supply 250 MW(e) of electricity to the grid, is proceeding; the commissioning programme is designed to secure as much information as possible from the industrial scale plant.

9. The main task at present is to support design work for the first commercial fast reactor station making full use of the experience gained from the PFR. The development of oxide fuel is progressing very satisfactorily and good progress has also been made on fast reactor technology, in which the United Kingdom maintains a leading position. The aim is to press forward the development programme toward commercial use of sodium cooled fast reactors in collaboration with other countries, particularly on safety aspects. The safety aspects of fast reactors have always been an important part of the United Kingdom's programme and the definition of the main design features of the large commercial reactors has allowed the programme to be extended to cover work on safety

principles specific to the commercial design. It is recognized that European countries have much to gain by collaboration in the fast reactor field, particularly in the matter of safety. The United Kingdom Atomic Energy Authority have participated in the work of the European Community's Fast Reactor Co-ordinating Committee and have agreements for exchange of information and use of facilities with the Federal Republic of Germany, the Benelux countries and France; valuable technical exchanges have also been held with Japan, the United States and the Soviet Union.

10. An International Conference on Fast Reactor Power Stations, organized by the British Nuclear Energy Society, was held in London in March 1974. Operational experience with the three completed large Prototype Fast Reactor power stations in France, the Soviet Union and the United Kingdom was described and papers were also presented on plants planned or under construction in other countries. Taking advantage of the presence at the Conference of members of the Agency's International Working Group on Fast Reactors, the United Kingdom acted as host for the Working Group's annual meeting which was held at the Atomic Energy Establishment, Winfrith, shortly after the Conference.

REPROCESSING

11. The main chemical reprocessing plant at the Windscale Works of British Nuclear Fuels Ltd. has operated very successfully during the past year, as it has since it was commissioned in 1964. This plant will continue to reprocess the irradiated fuel from the Magnox reactors which were developed from the Calder Hall prototype and constituted the first phase of the British nuclear generating programme. Fuel from a number of overseas reactors also continues to be reprocessed in this plant at Windscale.

12. To deal with the fuel arising from the new Advanced Gas-Cooled Reactors, a prototype plant has been designed and constructed to pre-treat the new oxide fuels, so that they may also be reprocessed in the main chemical complex. The pre-treatment or head-end plant was also designed to accept fuel from LWRs and the SGHWR. It is therefore able to handle the fuel arising from the SGHWR system which constitutes the first stage of the recently announced third phase of the British nuclear generating programme.

13. The continued expansion of nuclear generation both in Britain and other parts of Europe will necessitate an extension at Windscale of the facilities required for the reprocessing of oxide fuels. Development work to define precisely the plant requirements is at present being undertaken and plans are being prepared for the construction of a plant based on this work. Preliminary site preparation is likely to start within the next year, leading to a major construction effort in order to bring the plant into operation in the early 1980s.

14. The existing plant at Dounreay, which for a number of years has successfully processed the enriched uranium fuel from the experimental Dounreay Fast Reactor and a number of Materials Testing Reactors, is being modified to reprocess the plutonium fuel from the Prototype Fast Reactor. Thus valuable information and experience have already been gained of processes and equipment which will be relevant to the commercial plants to be built in the future for fast reactor fuel reprocessing.