# MAKING SPECIAL NUCLEAR MATERIALS AVAILABLE

It was always envisaged that the Agency would be able to help with the provision of the basic materials required for nuclear energy. Advances in atomic power have stimulated interest. Services through which fuels, and sometimes other materials and equipment, can be transferred from supplying to requesting countries, are outlined below by Ole Pedersen, of the IAEA Division of Nuclear Power and Reactors

Remarkable advances in nuclear power during recent years have brought about a revival in the uranium market. An increasing number of sales is taking place, prices of natural uranium on the open market have begun to turn upwards, and there is a growing demand for enriched uranium. As a consequence, there has also been a revival of prospecting activity. The geological environment in which uranium occurs is now better understood. It is therefore likely that the uranium mining industry will follow the example of other mining industries extracting industrial raw materials by maintaining "proved reserves" corresponding to 10 -15 years or more of annual demand.

The present interest in uranium, and particularly in special fissionable materials (uranium enriched in the isotopes 235 or 233, uranium 233 itself, or plutonium) has given rise to enquiries about the possibilities of the Agency making them available. The basis for the Agency's function in the transfer of nuclear fuel is laid down in the Statute, particularly in Article IX (Supplying of Materials), XI (Agency Projects), XII (Agency safeguards) and XIII (Reimbursement of Members). These aspects were of great interest when the Statute was drafted. One of the main functions foreseen for the Agency was that of a broker, arranging and supervising transactions involving the transfer of nuclear fuel from one Member State to another when requests were submitted.

## MATERIALS AVAILABLE

Fuel transfers can be arranged from any Member State wishing to supply it with the Agency as an intermediary. Belgium, Canada, Ceylon, Czechoslovakia, India, Portugal and the South Africa offered in 1958 various types of uranium and thorium ore concentrates. Three other Member States, USSR, UK and USA, offered to make special fissionable material available as shown below:

| State | Material | Quantity (kg) |
|---|---|---|
| USSR | U-235 contained in enriched uranium | 50 |
| UK | U-235 contained in enriched uranium | 20 |
| USA | U-235 contained in enriched uranium | 5.070 |
| | U-233 | 0.5 |
| | Plutonium | 3.0 |

(Natural uranium consists mainly of U-238, which is not fissionable, and about 0.7 per cent of U-235, the fissionable part which is responsible for the chain reaction. Uranium in which the content of U-235 has been increased by different processes is called enriched uranium. Plutonium is formed in U-238 during the operation of a reactor and can be separated by chemical methods. U-233 can be formed by nuclear reactions with thorium, and element which thus becomes of importance in nuclear developments).

In order to ensure that special fissionable material could be secured through the Agency, it was decided to enter into general supply agreements with those Governments willing to provide it. Such agreements were concluded with USSR, UK and USA setting out terms and conditions.

Each of the agreements relates primarily to the enriched uranium that the Government had offered to make available, though the United States also undertook to assist the Agency in obtaining source and reactor materials. Each Government offered to make the uranium available in any enrichment up to 20 %, but both the United Kingdom and the United States agreements provided that "the parties may agree to higher enrichment with respect to uranium to be used in research reactors, materials testing reactors or for research purposes".

The provisions regarding prices are as follows:

(i) USSR Agreement:
"The Government undertakes to base prices on a scale of charges corresponding to the lowest international prices in effect at the time of delivery for enriched uranium hexafluoride and for uranium compounds according to their percentage content of uranium-235".

(ii) United Kingdom Agreement:
"The material shall be supplied at a price and on conditions which are not less favourable than the most favourable price and conditions which the United Kingdom Atomic Energy Authority are offering or are prepared to offer, at the date of the contract in question, to any other customer outside the United Kingdom for the supply of similar material".

(iii) United States Agreement:
"The United States undertakes to make special nuclear material available to the Agency at the United States Atomic Energy Commission's

published charges applicable to the domestic United States distribution of such material in effect at the time, . . . .".

The Agency does not keep stocks fuel of its own, and specific supply agreements are concluded whenever material is needed for the service. When a request is approved and a project agreement drawn up, a corresponding agreement is initiated simultaneously with a supplying State. Every agreement with a receiving State is matched with a corresponding agreement with a supplying State.

These agreements contain the specific terms and conditions for supply of the material. Normally material is supplied on the same terms and conditions, including price, under which they are received.

There is no private international commerce in special fissionable materials. All arrangements for their supply go through governmental channels, either as a direct arrangement between the exporting and importing countries or using the Agency as an intermediary. When the Agency is assisting, it arranges separate agreements with the supplying and receiving States, thus obviating the need for a direct bilateral agreement between the supplier and recipient.

## TYPES OF PROJECT

As would be expected, reactors and research work connected with them provide the main reasons for fuel requirements. For reactors built to supply power, to assist research, to provide training or to produce radioactive isotopes, substantial quantities would be needed. (The general term "reactors" includes critical or subcritical assembles, usually for training or research).

The Agency can also, if required, undertake arrangements for transfer of a reactor or assembly, as well as of the associated non-nuclear materials, equipment or services.

Research projects usually call for minor quantities of nuclear materials, and whereas for a reactor the safeguards controls to prevent possible diversion to military use would be applied, the amounts for research work would normally be well below the limit at which control is necessary.

## PROCEDURES

The procedures for consideration and implementation of requests for source and fissionable materials are set out in the Statute. Requests can be made at any time during the year and must be considered by the Board of Governors. Information needed includes an exact description of the material needed, such as quantity, isotopic composition, purity and physical form. Acceptable variations should be given in case the exact type is not available. The proposed use should also be described and the location of the research establishment or laboratory given. If health and safety standards to be applied vary from those drawn up by the Agency, details should be provided. For

reactor projects there should be a description of design, associated facilities for use or storage, funds and technical personnel available, and an evaluation of siting and hazards.

In choosing a supplier the wishes of the applicant are taken into consideration. Most major requests have involved orders of fuel elements for a particular reactor, and the type of fuel elements is therefore determined by the design of the reactor. If the requesting State does not express a preference, enquiries are addressed to Member States likely to have the material available.

## AGREEMENTS

Before an approved request can be implemented, at least two agreements have to be completed. One of these, between the supplying States, the Agency and the receiving State, is the supply agreement setting out also terms and conditions. There is also a project agreement between the receiving State and the Agency, to cover points laid down in the Statute. One requirement is that the material must be subject to Agency safeguards to ensure peaceful usage.

The main elements of these agreements are standard provisions, variations being primarily due to specific circumstances. Negotiations for them begin as soon as the necessary information has been made available by the requesting State. Normal practice is for the agreements to be presented to the Board of Governors at the same time as the request for material.

## DELIVERIES

Up to 31 March 1967 the following materials had been delivered through the Agency:

| Supplying State | Material | Quantity |
|---|---|---|
| Canada | Natural uranium | 3 048 kg |
| France | Plutonium | 17 g |
| Sweden | Natural uranium | 9 kg |
| USSR | U-235 contained in enriched uranium | 3 025 g |
| UK | U-235 contained in enriched uranium | 2 g |
| | Plutonium | small research quantity |
| USA | U-235 contained in enriched uranium | 76 501 g |
| | U-233 | small research quantity |
| | Plutonium | 440 g |
| | Thorium | small research quantity |

It should be noted that the enriched uranium supplied is measured in quantities of the isotope Uranium-235 only. Since this isotope is contained in uranium of various enrichments, the total quantity of material supplied is much larger. Altogether 49 deliveries of special fissionable and source material had taken place to 15 countries by the end of March 1967, and 10 deliveries to 5 countries were under implementation.

The figures include material supplied free of charge by the United States. The United States Atomic Energy Commission is permitted to distribute to the Agency up to $50 000 worth of special fissionable material free of charge "to assist and encourage research on peaceful uses (of atomic energy) or for medical purposes". The practice has been for the US representative to the General Conference to announce whether the decision has been taken for the ensuing year. Recommendations for allocations have then been formulated by the Agency as a result of requests, and finally the USAEC has decided which of the projects recommended and signed during the year should be eligible for the gift. Gifts made so far under the US offer have totalled $350 000 to ten countries.

The fuel material offered has so far been sufficient to meet demands. A routine procedure for dealing with requests for nuclear fuel has been well established. Full account is taken of the fact that timely supply is of considerable importance for the efficient and economical operation of the installations for which the fuel is needed. The Agency is in a good position to deal with future requests.

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# BRAZILIAN REACTORS UNDER SAFEGUARDS

Three nuclear reactors in Brazil have been placed under Agency safeguards against diversion to military use. They are used for research purposes under a bilateral treaty with the USA, and are located at Rio de Janeiro, Sao Paulo and Belo Horizonte.

The accompanying photograph shows the signing of the agreement, transferring to the Agency the administration of safeguards for the installations, by (left to right); Verne B. Lewis, US Resident Representative to IAEA, Dr. Sigvard Eklund, Director General and Hélio F.S. Bittencourt, Resident Representative for Brazil.