January 17, 1950
Minutes of a Special Meeting of the Indian Atomic Energy Commission

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Summary:

Joliot-Curie, French High Commissioner for Atomic Energy, offers to share technical information with India on the purification of uranium, graphite reprocessing and designs of a low power reactor in exchange for India's export to France of thorium, beryllium and mineral oil for the manufacture of graphite.

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ATOMIC ENERGY COMMISSION

GOVERNMENT OF INDIA

MINUTES

of a Special Meeting of the Atomic Energy Commission held at 3 p.m. on the 17 th January, 1950, in the house of Dr. S.S. Bhatnagar, 4 York Place, New Delhi.

PRESENT: Dr. H.J. Bhabha, D.Sc., F.R.S (in the Chair)
Dr. K.S. Krishnan, D.Sc., F.R.S.
Dr. S.S. Bhanagar, O.B.E., D.Sc., F.R.S
Prof. Joliot-Curie, High Commissioner for Atomic Energy in France

The purpose of the meeting was to explore the possibility of cooperation between India and France in the sphere of atomic energy. Opening the meeting, Dr. Bhabha said that the Indian Atomic Energy would be glad to hear the views of Prof. Joliot-Curie on the possibilities of collaboration in atomic energy between India and France.

Prof. Joliot-Curie said that collaboration could be of different of closeness and could be discussed in stages. The following were the general lines along which he could recommend collaboration between the two countries to his Committee.

On her side France could:

1.(a) Give all information about the process for the purification of uranium to the degree necessary for use in an a reactor, with complete designs and blueprints of the plant, and all technical information about its operation.

(b) Give all information concerning the method of making pastilles (billets) of uranium oxide UO_2 suitable for use in an atomic reactor together with complete designs and blueprints of the plant including the ovens and all technical information about its operation. If desired, France could sell the ovens and other equipment necessary for this plant.

2.(a) Give all information about the process for the purification of uranium and the manufacture of pure uranium metal therefrom suitable for use in an atomic reactor with complete with complete designs and blueprints of the plant and all technical information about its operation.

(b) Give all information about the process for the production of the pure calcium required for the final stage of the process mentioned in (a) above, or supply the pure calcium necessary for the final stage of the process. Calcium of the required purity could be manufactured in India but it would involve a delay of between one and two years and it might be cheaper to buy the limited quantity of calcium required from France, at least at the beginning.

3. Undertake to purify in her own plants uranium compounds supplied by India and manufacture uranium into the form of pastilles or metal for use in an atomic reactor, as India might desire.

4.(a) Supply graphite of sufficient purity for use as a reflector on the outside of a reactor but not of sufficient purity for use as a moderator throughout the entire body of a reactor. The graphite mentioned above is of sufficient purity for use as a moderator in the external part of a reactor but not in the central core.

(b) Give all information about the process for making graphite of the desired purity from oil or coke of suitable purity, together with complete designs and blueprints of the plant and all technical information about its operation.

The difference between (a) and (b) above is a little more important than in the case of calcium because the pure graphite is made in an industrial plant which already treats large quantities of graphite for industry and the Commissariat has erected its own plant therein at considerable expense. It would therefore be cheaper for India to buy the graphite at least at the beginning.

5. Test the purity of materials made in India for use in reactors such as uranium, graphite, heavy water, beryllium, aluminium, etc. In the absence of an atomic reactor such materials can only be tested by an elaborate diffusion experiment involving not less than several tons of the material. If the material is then found not to be sufficiently pure the entire quantity has to be rejected. With an atomic reactor the purity of a few pounds of the substance can be tested thus enabling a check on the purity of the material from the very beginning and avoiding large scale waste and unnecessary expenditure.

6. Provide aluminium for the structural parts of a reactor.

7. Give all design details, blueprints and specifications of reactors working on metal or oxide together with all the necessary physical and chemical information regarding the properties of the materials employed in the construction of a reactor. The information mentioned above would include physical information such as the capture cross-sections for neutrons of different energies, the number of neutrons emitted per fission, etc. and such chemical information as the limits of contamination allowed vis-à-vis different elements present as impurities.

8. Collaborate in geological prospecting and mining operations. Prof. Joliot-Curie's remarks on the French method of prospecting are contained in Appendix 'A'.

Prof. Joliot-Curie added that they could collaborate in training Indian workers in the prospecting of radio-active minerals in France or Africa. They could also give all the apparatus required for the prospecting, for nuclear measurements, etc., if India desired not to lose time in constructing such apparatus herself.

Prof. Joliot-Curie then added a few general remarks. He said that they could supply the Indian Atomic Energy Commission forthwith with one copy of the special publications of the Commissariat on problems connected with atomic energy. Unfortunately, not more than one copy could be supplied as the stock was very limited.

Prof. Joliot-Curie said that the Commissariat preferred to carry out its industrial operations with the help of and in the midst of existing industry as far as possible in order to avoid the needless expense of duplicating plants. Special contracts were entered into with industry for the purpose. Such cooperation was in the interest of industry as well as of the Commissariat.

In return for some or all of the above assistance and cooperation, France would be interested to have from India in return:

1. Thorium either in the form salt or metal.
The interest of the Commissariat in thorium is not an immediate one and it could be utilised in France only in about three years' time.

2. Beryllium

3. Uranium
On the basis of present knowledge India will not be able to spare uranium for export but should intensive survey disclose large new sources of uranium then India might consider giving a small proportion to France on a quid pro quo basis. In this connection he mentioned that they had developed in France a process which allowed uranium to be extracted economically from an ore containing only 5 parts of uranium in 10,000

4. Mineral oil of animal origin sufficiently free from boron to make it suitable for the manufacture of

graphite for a reactor.

Prof. Joliot-Curie felt that the amounts of any or all of the materials mentioned above could only be determined at a later stage after a more detailed discussion. He felt that the first step was for both France and India to agree to the principle of collaboration along the general lines mentioned above. If this principle is accepted by both countries then the Commissariat would send someone to discuss with the Indian Atomic Energy Commission the relative value of the exchange. Dr. Bhabha said that the Indian Atomic Energy Commission would recommend to the Prime Minister that the principle of such cooperation should be accepted.

This was all the business.

H.J. Bhabha (CHAIRMAN)
K.S. Krishnan
S.S. Bhatnagar

The above is a correct record of the statements I made at the meeting.

[signed by Joliot-Curie]

APPENDIX 'A'

Prof. Joliot-Curie said that during three years they had made a great effort in France to develop specialists for geological prospecting. They had a special course where 20 to 40 young men were trained every year. They had come to the conclusion that the best method of prospecting was to form small self-contained teams each consisting of one geologist, three prospecting mineralogists, one scientist trained in simple physical and chemical measurements which could be made on the spot with portable equipment, and one topographist. Such teams could be sent to different parts of the world, as for example Africa, and could work in isolation for several months. The information supplied by all the teams is received at headquarters, which then chooses the most likely place for further drilling operations. The normal method is to make several deep holes about 1-2'' in diameter and about 100-200 meters in depth and keep the slugs taken out in a box in rows for further examination. Besides this a Geiger-Muller counter could be let down into the hole so that the radio-activity at each depth could be recorded immediately on a graph.