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Minutes of a Special Meeting of the Indian Atomic Energy Commission

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Summary:

The Indian Atomic Energy Commission meets with the French High Commissioner for Atomic Energy Joliot-Curie to discuss nuclear cooperation between India and France.

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ATOMIC ENERGY COMMISSION
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of a Special Meeting of the Atomic Energy Commission held at 3 p.m. on Monday the 16th January, 1950, in the room of the Prime Minister, Jawaharlal Nehru, Ministry of External Affairs, Central Secretariat, South Block, New Delhi.

PRESENT: Jawaharlal Nehru, Prime Minister

Dr. H.J. Bhabha, D.Sc., F.R.S

Dr. K.S. Krishnan, D.Sc., F.R.S.

Dr. S.S. Bhanagar, O.B.E., D.Sc., F.R.S.

Prof. F. Joliot-Curie, High Commissioner for Atomic Energy in France was present by invitation.

1. The Prime Minister opened the Proceedings by saying that India's interest in atomic energy is solely for its peaceful uses. Quite apart from the fact that she had not the resources to make atomic bombs and use atomic energy for military purposes, she was not interested in its military use on principle. When he was in America, he had met a number of atomic scientists and he had told them that he was not interested in atomic bombs, but solely in the peaceful uses of atomic energy. To his question as to whether it could be used for power generation they had given various replies. Generally these opinions were that it would take some time before atomic energy could be used for power generation. He wished to ask Prof. Joliot-Curie his opinion of the prospects of harnessing atomic energy for power generation in the near future. The question resolved itself in three parts:

- a. The general scientific possibilities,
- b. The time within which the harnessing of atomic power could be achieved, and
- c. The price at which atomic power could be promoted in the future.

Prof. Joliot-Curie said that in France they had constructed a reactor of low power which had given them some experience of the problems involved in reactor construction, and that they were in charge of building a second reactor a capacity of between one and two thousand kilowatts which would give them still more information towards the end of 1950. Although there were still several technical problems to be solved, he could say from their present experience that the subject was full of promise. They already had numerical results which allowed one to foresee with considerable certainty that it might be possible to generate atomic energy at a price not perhaps as cheap as that of the cheapest hydro-electric power, but certainly at a price comparable with that of electricity generated from coal.

Dr. Bhabha enquired whether this referred only to natural hydro-electric power achieved without the construction of enormous dams. He wished to know how the price would compare with hydro-electric power generated from water storage achieved by the construction of large dams such as existed in certain places in India and are contemplated in the future. Prof. Joliot-Curie thought that it was a little early to be able to make such definite estimates of cost but considered that the price of atomic energy would in any case be comparable.

Prof. Joliot-Curie pointed out that atomic energy like energy from coal would be obtained from the using up of energy sources contained in the ground as for example uranium or coal, and were therefore capable of exhaustion in the long run. On the other hand hydro-electric power which essentially depended on the use of solar energy was inexhaustible as far as the human time scale was concerned. He thought the rapid extraction of fissile material from Uranium for the production of atomic weapons a wrong policy as it endangered the future of atomic power of atomic of the world. Prof. Joliot-Curie estimated that within five to ten years a central production

plant for atomic energy with a uranium reactor would be possible. In France, about twenty such centres would be necessary to double the present power production of France, each reactor generating about 200,000 kilowatts. The quantity of uranium required for all these centres would be about 4,000 tons but once this amount of uranium had been collected the annual replacement for the power production mentioned above would be extremely small, namely of the order of 30 tons of uranium per year (one kilogram of uranium liberates the same energy as roughly 3,000 tons of coal.) This would have important effects on the total amount of uranium required for a year's production whereas the amount of coal required for the same amount of energy would be enormously greater and imply a noticeable burden on the transport system.

The French Atomic Energy Commissariat expects to construct the first centre for generating 200,000 kilowatts in France within about seven years time. This would be an experimental centre and they would then be in a position to know whether the construction of further centres would be justified economically or not. Even if such centres were not justified economically in France they may well be justified in other countries, as for example India, where there are regions with no ready supplies of coal or hydro-electric power.

The other uses of such central reactors would be for producing artificial radio-active elements like plutonium from natural uranium or uranium 233 from thorium which could be in their turn be used for building reactors of smaller size. Such reactors could be built, for example, into ships and would completely alter the economics of shipping. The fuel which a ship would have to carry would be of an entirely negligible tonnage thus increasing the useful carrying capacity of a ship. Secondly, a ship would have to refuel but seldom.

Other uses of atomic energy would be for making radio-active tracer elements. These had a great role to play in research in chemistry, bio-chemistry, metallurgy and even in industry. As a rather romantic speculation for the future he mentioned that the high density of ionization produced by the absorption of the radiation emitted by a large quantity of radio-active substance could correspond to a temperature of some several tens of thousands of degrees and might enable unusual and new chemical compounds to be produced in chemistry.

Coming next to the question of atomic bombs he pointed out that their uses were not purely destructive but that they could be used for constructive purposes as for example in changing the geography of land in order to enable peaceful and beneficial projects to be realized. He gave the example of the possibility of removing small mountains and diverting the courses of rivers. To a question from Dr. Bhabha as to whether the atomic bomb had in fact been so used in Russia as reported in the papers, Prof. Joliot-Curie replied in the affirmative.

In conclusion, Prof. Joliot-Curie said that it was important that every great nation should take its place in developing and using atomic energy and not leave it to a few highly industrialized nations to do it. In this way every country would be able to participate in developing new techniques and taking out patents which could then be exchanged against the patents of other countries. It seemed to him necessary that a country like India should make an important effort, despite its many other important occupations, to develop atomic energy in the country.

2. The policy of the Indian Atomic Energy Commission as contained in Appendix 'A' was then placed before Prof. Joliot-Curie and the Prime Minister enquired whether he had any observations to make about this general policy or about the scientific work in this connection which he had seen going on in various laboratories in India. Prof. Joliot-Curie said that he had visited the nuclear physics laboratories at Bombay and at Calcutta. His impression was that the laboratories at Bombay were organized on the

right lines and had the necessary qualities required for successful work in atomic energy. This was not so at Calcutta. In particular, cleanliness and thoroughness was absolutely essential for research in nuclear physics and even more so in atomic energy and this he found lacking at Calcutta. Nevertheless, he had found young workers of good potential quality at Calcutta who might have done good research in another environment. They lacked good and proper direction by an expert on the subject. He had found that the method and spirit of work were on the proper lines at Bombay, in particular at the Tata Institute of Fundamental Research, and the people concerned were competent.

In his opinion the scale of operations in India is not yet large enough at present to develop atomic energy in a reasonably short time. Larger sums of money will be required to bring the effort up to the appropriate level.

Prof. Joliot-Curie said that he was strongly of the view that in countries like India or France where there was a great limitation of specialists, both scientists and technicians, it was necessary to establish only one centre for atomic energy and concentrate in it not only the most qualified scientists, but engineers with the requisite knowledge of chemical, mechanical and electrical techniques. This centre should have a character both scientific and industrial. After a time, when the requisite personnel had been developed in sufficient numbers and more scientific means were available, another centre could be established, and then several. But concentration at the beginning was absolutely essential if the effort was not to be frittered away and dissipated. In a rich country like the United States the problem is entirely different. An establishment for atomic energy should be independent of university laboratories since its character and purposes were different but there should be a close liaison between them. In particular one should continue to support fundamental research in the universities in the lines which were of interest to them.

3. Next Prof. Joliot-Curie proceeded to explain the organization of atomic energy development in France. The organization of atomic energy is determined by a special law which was passed for the purpose. In France the Atomic Energy Commissariat works directly under the responsibility of the Prime Minister. The Commissariat has a High Commissioner who solely is responsible for the scientific, technical and industrial policy and work of the Commission while an Administrator General is responsible for the administration and the finances. The High Commissioner and the Administrator General work in close collaboration industrial and financial matters. As regards international questions concerning atomic energy and the law requires that the High Commissioner should be consulted for advice to Government and as regards financial matters the Administrator General also.

The purpose of having the Commissariat organized directly under the responsibility of the Prime Minister is that in this way the proper priorities can be given for its operations by the different ministries for obtaining materials, foreign exchange, etc., as also facilitates and even priorities for operations connected with industry both private and State owned. Its organization under the presidentship of the Prime Minister gives the Commissariat the prestige and importance necessary in order for it to accomplish its new and difficult task with rapidity. At this point the Prime Minister observed that the Prime Minister of a country may change from time to time and this may therefore produce a lack of continuity in the policy of the Commissariat. Prof. Joliot-Curie replied that since the Commissariat's inception he had worked under no less than seven Prime Ministers but that nevertheless the policy of the Commissariat had continued without change. This was because the objectives of the Commissariat were well defined and considered to be of great importance and utility for the country.

The French Atomic Energy Law itself makes explicit and special provision for a special financial procedure different from that obtaining in the other departments of Government. In the usual procedure the budget of each department is voted at the beginning of the year under each head separately and reallocation of monies from one head to another is not possible without very great difficulty. On the contrary,

every year the Prime Minister, namely the President of the Commissariat of Atomic Energy, presents to the Assembly a total budget to be devoted for the development of atomic energy in the ensuing year. This sum is fixed on the basis of a report by the High Commissioner and the Administrator General after the Prime Minister has had discussions with them and with anyone else he chooses. Once this sum has been voted the Commission can spend it without further financial sanction and has the power of re-allocating sums from one head to another as the occasion may demand. The Committee of Financial Control, consisting of such personnel as may be decided upon by the Prime Minister and the Minister of Finance, then audits the expenditure of the Commission after it has taken place but not before, and submits each year a report on the finances of the Commission. Experience in France shows that this procedure in the case of atomic energy has resulted in the greatest possible speed of action and in the maximum economy, since delays of operation inevitably give rise to inefficiency and unnecessary expenditure.

4. The Prime Minister then asked Prof. Joliot-Curie in what form he thought cooperation between France and India was possible. Prof. Joliot-Curie said that in certain raw materials, India had much greater means than the French Union and that we also had the scientists and the means for constructing atomic reactors. He was strongly of the opinion that the thorium should be kept by India for her own use and not sold abroad on a commercial basis except in limited quantities in return for special concessions in the field of atomic energy. This applied equally to all materials of importance in atomic energy, such as uranium, beryllium, etc.

Prof. Joliot-Curie felt that France would be in a position to make available to India information on the purification of uranium in the form of oxide or metal for use in a reactor together with the details of plant design, operation, etc. If closer cooperation could be established then she could also make available the design details of a low power reactor or even a reactor of about a thousand kilowatts. This would effect an enormous saving in effort and time for India. In return, India might be able to give in exchange such materials as thorium and beryllium or even other materials unconnected with atomic energy which she might be in a position to export and which France required.

They could also establish close collaboration between the scientists of the two countries in the domain of atomic energy.

Any arrangements which might be formulated would have to be considered by the Atomic Energy Committee consisting of the Prime Minister of France, the High Commissioner for Atomic Energy and the Administrator General and the three other Commissioners before final ratification of the proposal. The agreement would have to be signed between the two Governments in the usual manner.

The Prime Minister asked the Indian Atomic Energy Commission to have a further meeting with Prof. Joliot-Curie to investigate the general lines along which cooperation could be established between India and France and to set up proposals again for his consideration.

This was all the business.

Jawaharlal Nehru

H.J. Bhabha

K.S. Krishnan

S.S. Bhatnagar

The above is a correct record of the views I expressed.

[signed by Joliot-Curie]

APPENDIX 'A'

It was resolved at the first meeting of the Atomic Energy Commission held on the 20th August 1948 over which the Hon'ble Prime Minister, Jawaharlal Nehru, presided that the general policy of the Indian Atomic Energy Commission should be on the following lines:

1. With a view to its future industrial and economic importance for India steps should be taken to set up a small pile as soon as possible. This pile would be used for making radio-active tracer elements for biological, chemical and metallurgical research, for testing materials like graphite and beryllium which might be used in a larger pile, and for training scientific personnel.
2. The cyclotron in Calcutta should be made to work and be used for training people. Another small machine might possibly be bought later. Attempts to construct large machines should be postponed for the time being.
3. As regards fundamental work in physics the main support should be given to cosmic rays where energies are available for nuclear research beyond the capacity of any machine. On the biological and chemical side research should be fostered using tracer elements which would ultimately be made in the Indian pile.
4. Steps should be taken for processing monazite to thorium nitrate and ultimately to thorium metal, and also for extracting the uranium from the monazite. The possibilities of making heavy water, beryllium metal and pure graphite should be investigated.