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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NOV 23 1964

*Peaceful
Uses
(Inscr. Ref.
India)*

Dear Mr. Ambassador:

In accordance with the arrangements agreed to at the meeting of the Committee on Nuclear Weapons Capabilities, the Commission has considered possible forms of cooperation with India in peaceful uses of atomic energy which might serve to offset the propaganda effects of the Chinese nuclear device by increasing the stature of India in the eyes of the less developed countries. I should like to emphasize that these ideas are being put forward for discussion without conclusion by the Commission that they necessarily merit going forward with. It goes without saying that many of these proposals would require legislative authorization and funding beyond the present limits of the budget of the Commission and other agencies.

It is our feeling that after discussions of these ideas by the interested agencies any ideas which merit further consideration might be taken up in discussions between the Commission and Dr. Homi J. Bhabha, Chairman of the Indian Atomic Energy Commission. As you know, the Commission has developed a rather close relationship with Dr. Bhabha over the years and we believe this relationship and channel of communication can serve a useful purpose in our becoming more aware of and perhaps influencing Indian plans in atomic energy. Dr. Bhabha is currently planning to visit the United States early in February for meetings of the Scientific Advisory Committee of the United Nations and the IAEA in New York but, if it appears that discussions of any of these ideas with the Indian Government should take place sooner than this, he could be invited to come earlier.

Sincerely yours,

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E.O. 12356, Sec. 3.4

NUJ 90-252

By *isap* NARA, Date 3-26-92

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John G. Palfrey
Commissioner

Ambassador Llewellyn E. Thompson
Acting Deputy Undersecretary of State
Department of State
Washington, D. C.

cc: Commissioner Palfrey (2)
Chairman Seaborg (2)
Commissioner Bunting
Commissioner Ramey
Commissioner Tapp
General Manager
Information affecting the
United States within the
Atomic Energy Act, Title 10, U.S.C.
ACMIA 723 and 724, the transmission or revelation
of which in any manner to an unauthorized person
is prohibited by law.

cc: Mr. Ruckelshaus, EOB ✓

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E.O. 12356, Sec. 3.4

Discussion Paper on Prospects for Intensifying
Peaceful Atomic Cooperation With India

NJ 90-252

By ~~SECRET~~ NARA, Date 3-26-92

A. Introduction - This paper has been prepared in response to a recommendation made by the Committee on Nuclear Weapons Capabilities*, that an urgent study should be undertaken within the United States Government on the feasibility and desirability of the U.S. offering to cooperate with India in one or more new projects regarding the peaceful uses of atomic energy which would "capture the imagination of Indians and Afro-Asians and conclusively demonstrate the advanced progress of Indian science". The Committee recommended that the proposed study should be designed to give the U.S. a basis for substantive talks with the Indians and that the U.S. should be prepared to discuss the full range of possibilities for cooperation. Moreover, as a basic assumption it was suggested that the United States would have to be prepared to contribute, as its share of the costs of a proposed project, a sum over and above current U.S. aid commitments to India.

At the outset it should be noted that there appear to be a number of areas in which new and close atomic cooperation with India would be feasible and a major factor in determining the final choice will, of course, be the preferences of the Indians themselves and the technical resources they are prepared to devote to an undertaking. With this in mind, the activities proposed in the following paragraphs are recommended as tentative possibilities that might be discussed in a wide ranging dialogue with the Indians on the subject of closer cooperation. In several instances which are noted, additional fund allocations and legislative authorizations would be required on the U.S. side to permit the ventures to be undertaken. It is not considered feasible, however, to come up with precise dollar estimates of the probable U.S. contribution until further detailed discussions are held, the scope of the projects are defined, and we have a firm idea of what the Indians themselves are prepared to contribute. Further, it is assumed that in reviewing these suggestions, the interested Agencies will wish to carefully consider the implications the activities proposed may have on our cooperative relations with other countries on the peaceful uses of atomic energy.

B. Cooperative Program on the Recycling of Plutonium - As will be the case with several other countries, it is anticipated that the Indian nuclear power program will result in the production of sizeable amounts of plutonium, as a by-product of power. Since the U.S. has a strong incentive to encourage India to put this plutonium to benign uses, it is recommended that the USAEC should offer to assist India to undertake an intensive development program devoted to recycling this material in the Indian nuclear power program.

While it is recognized that assistance in this area may enhance India's ability to handle plutonium for military as well as peaceful uses, it is

*As contained in the report on "The Indian Nuclear Problem".

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believed, on balance, that the benefits of such a program would greatly offset any inherent risks. As noted, the stimulation of plutonium recycle technology in India would help to develop a strong competitive and peaceful demand for the plutonium to be produced in the Indian program. Such a program also would be timely from a technical standpoint since the perfection of the use of plutonium as a fuel is a logical and important step in the progression of reactor technology, and India, like many other countries, has indicated that it hopes to ultimately recycle the plutonium it produces. Further, more aggressive U.S. assistance to India in this field would enhance the attractiveness of reactors of U.S. design by accelerating the date by which India could replace at least a part of its need for enriched uranium with plutonium of domestic origin.

It is proposed that the cooperative program be centered on a development of plutonium fuels for use in the Tarapur station and possibly the Rajasthan station as well. As an initial step, a joint U.S.-Indian study would be undertaken to identify the type of joint plutonium recycle program that might be most advantageous from the standpoint of the USAEC and the Indian AEC. Following this initial study, the following types of activities in support of the Indian program could be considered.

- (1) The development of an intensive U.S.-Indian information exchange including the training of Indian personnel in pertinent U.S. facilities. (This type of activity is an extension of current practice and could be initiated immediately, if so desired.)
- (2) The fabrication, at USAEC expense, of a limited number of plutonium fuel elements for insertion on a test basis in the Tarapur and/or Rajasthan reactors during their initial phases of operation.
- (3) The provision of special assistance to India in the construction and operation in India of critical plutonium lattice experiments designed to test out the characteristics of the plutonium fuels prior to large-scale insertion of such fuels in the Tarapur or Indian CANDU reactors. (This could take the form of USAEC assumption of responsibility for some of the fuel fabrication costs, the lease or loan by the AEC of some of the plutonium that might be required, and the long-term assignment of U.S. personnel to Trombay.)
- (4) The extension of special assistance to the Indian AEC (similar to that noted under #3 above) associated with the insertion of full plutonium cores in the Tarapur and/or Rajasthan reactors.

It is assumed that to the greatest extent practicable, Indian produced plutonium would be used for these purposes with the U.S. supplying the required make-up.

The activities described in paragraphs 2, 3 and 4 would represent special forms of assistance that generally have not yet extended by the USAEC to other countries. As a general concept, however, it is expected that the Commission may wish to intensify its assistance to foreign countries in the

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*One point: more plut
now - good
capability.*

field of plutonium recycle since many countries besides India have a similar incentive to use their produced plutonium. The passage of special Congressional authorization and the provision of additional funds to the AEC reactor development program also would be required to permit such a program to proceed.

C. Thorium Reactor - India has some of the largest deposits of thorium in the world and the utilization of thorium for the generation of nuclear power is, therefore, of great interest to the Indian AEC. One of the aims of the Indian program is to study the fuel cycle of pressurized reactors and heavy water moderated organic cooled reactors using an initial fuel charge of plutonium and thorium. It is recommended that an intensive U.S.-Indian joint program on thorium utilization be developed in recognition of India's special interests in this area.

As has been separately reported, the USAEC and the Indian AEC already have agreed, in principle (in an exchange of letters between Dr. Bhabha and Commissioner Ramey), that it would be desirable for the U.S. and India to cooperate more closely in the field of thorium utilization and the subject is scheduled to be discussed in detail with Dr. Bhabha when he visits the U.S. next February. As a result of these forthcoming discussions, it is expected that the USAEC and the Indian AEC will initiate a concerted and systematic exchange of information in this field and that they each may elect to assign personnel on a long-term basis to each others' facilities. Depending on the character of the Indian research program as it evolves, the USAEC also may wish to consider more significant support of the Indian program.

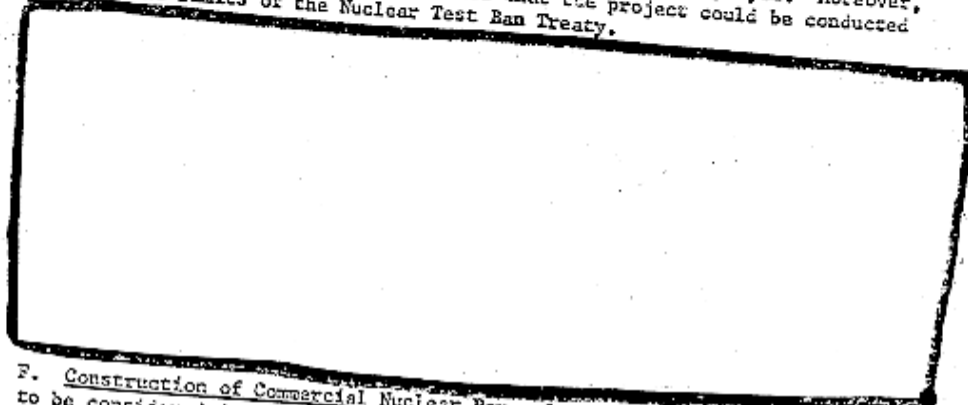
D. Joint Nuclear Desalting Project - Discussions in the IAEA panel on desalting have revealed that there are certain areas in India, of insufficient water supply, that might be promising sites for dual purpose power desalting plants. Indian authorities have suggested, for example, that there might be merit in locating a dual purpose plant at the Port of Kandla in the North-western portion of Gujarat State, as well as a dual purpose plant near the city of Madras on the Southeastern coast. Other areas that have been noted as possibly having needs, in time, for dual purpose plants are the State of Kerala and the city of Calcutta.

In view of these considerations, it is recommended that the U.S. offer to assist India in the performance of a comprehensive nation-wide study of the economic and technical feasibility of locating dual purpose power and desalting projects in selected regions of India. One-half of the cost of these initial studies would be borne by the United States with India assuming the balance. Depending on the results, the U.S. and India might then agree to jointly undertake detailed engineering studies leading to the construction of specific projects.

E. Project Plowshare - In the past, there have been some expressions of interest on the part of officials of the USAID, the Department of State and

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the World Bank regarding the role nuclear excavation might play in solving some of India's basic river problems. While this interest has not been particularly active, and no action has been taken by the AEC on the matter, there might be merit in our holding conversations with Dr. Bhabha on the current status of Project Plovers and the role it could play in helping India solve some of its basic development problems. If appropriate, these preliminary conversations could be followed by some joint U.S.-Indian "in depth" evaluations of the more promising applications. It is assumed, of course, that if any actual application in India materialized from such a study, U.S. devices, under sole U.S. control, would be employed. Moreover, the parties would have to be satisfied that the project could be conducted within the limits of the Nuclear Test Ban Treaty.



F. Construction of Commercial Nuclear Power Stations - A logical possibility to be considered is whether the U.S. should now offer to extend India additional assistance in the construction of nuclear power stations beyond the aid already scheduled for Tarapur. Dr. Bhabha has recently observed that nuclear power promises to be competitive in "roughly two-thirds to three-fourths of the country". While assistance in construction of another nuclear power station would not necessarily result in a series of plaudits for Indian science, it would serve as one additional and dramatic manifestation of the role the peaceful atom can play in Indian development.

The U.S. might wish to offer immediate financial assistance to another large-scale power reactor (along the lines of assistance already being extended to the Tarapur station) if the project involved is sound from an economic standpoint and if it merits priority and support in terms of the other major capital demands in India. In keeping with the assumptions noted in the Introduction, it is assumed this aid would have to be regarded as an additional amount of assistance over and above the other U.S. aid already slated for India. The project most likely to qualify for such aid would be the Indian third nuclear power station which is scheduled to be located in the area of Madras. This station will have a rating of 400 MWe and work is

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As of late, there has been a great deal of speculation (due to remarks made by Dr. Bhabha) that India might elect to embark on Plowshare device development program as a "cover" and rationalization for a nuclear weapons program. This appears to be a highly remote possibility due to technical and economic considerations as well as the recent statements made by Mr. Shastri disavowing any intention on the part of the Indian Government to embark on a nuclear weapons program. If, however, there is any truth to this rumor, then it is believed an aggressive program of U.S. assistance to India in this area would deter, rather than encourage, India from embarking on such a program. In particular, if the United States was able to demonstrate convincingly that it would be prepared, in time, to execute bona fide Plowshare applications in India, it could help deter India from embarking on an independent device development program of its own.

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scheduled to begin in 1965 with completion by 1970. If, as noted above, a dual purpose plant appears attractive for Madras, it might be possible to combine our assistance to this project with a cooperative program on desalting.

It is assumed that the assistance that would be required would be a USAID loan to cover the dollar costs as well as an arrangement under which the USAEC (as in the case of Tarapur) would provide the initial enriched uranium fuel charge on the basis of deferred payment. As a condition to the aid, IAEA safeguards would, of course, have to be applicable. The USAID will have to make the basic decision as to whether such special assistance in support of an additional power reactor in India is feasible.

G. Cooperation on an Advanced Prototype Reactor to be Located in India - The U.S. generally has avoided encouraging the less technically advanced countries from undertaking the construction of experimental reactors of advanced design on the theory that only proven nuclear concepts capable of making an immediate economic contribution should be promoted in such areas. It is believed that this should continue to be our posture in our discussions with India at the present time. However, should the Indians elect to proceed with a prototype of unique technical interest to the USAEC (and to assume the major share of the costs) then it is proposed that the U.S. should consider providing such assistance as appears appropriate. The Indians are known to be preparing a conceptual design report on a 90 MW(t) "plutonium oxide enriched natural oxide fueled organic cooled prototype power reactor." Further, they apparently are collaborating with Sweden (as we are) in the field of heavy water moderated-nuclear superheat reactors. If concrete projects in these last two areas materialize, special U.S. assistance in the form of the lease or loan of special nuclear material, the award of research contracts or the assignment of U.S. personnel may be indicated.

H. Radioisotopes - The Indians are performing a substantial amount of work in the field of radioisotopes although our contacts with them in this field appear to be limited. An intensification of the Indian program in this area, as well as of our collaboration with that program undoubtedly would have an overall beneficial effect on the development of Indian agriculture, medicine and industry. Two areas in particular where our cooperation might be strengthened are food irradiation and the use of irradiation for grain deinfestation. This could be achieved by more intensive training of Indian scientists in U.S. facilities, the development of a more intensive information exchange, and the provision of help to the Indians to design, construct and operate first, a research irradiator (costing from \$30,000 to \$50,000) and ultimately a pilot production irradiator (at an approximate cost of \$750,000). Additional funds would have to be made available to the USAEC for these latter purposes.

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I. Fostering Trombay as a Regional Center - It is believed that there would be substantial political and technical merit to our fostering the idea that the Trombay research establishment should be used increasingly as a regional training center to help serve the needs of the countries in Southern Asia. This would serve to highlight the peaceful orientation of the Indian program and would result in beneficial contributions being made to the neighboring programs. Some modest steps in this direction have already been taken and the Indians with the help of the IAEA are holding a regional course in December on the use of research reactors in the production of isotopes. Additional courses in areas related to research reactor utilization might be profitably held in the future. Other activities that might be encouraged are the assignment of scientists from neighboring countries for training in Trombay as well as the use of Indian experts as technical advisers in the region.

For the time being, it is believed this concept should be fostered on a day-to-day basis by our working primarily with the IAEA on an informal basis. The more formal designation of Trombay as an "IAEA regional center" also merits consideration but it undoubtedly would take some time to bring about. Such a formal designation would involve (a) getting the other countries in the area to support the concept and pledge a nominal amount of financial assistance to the center, and (b) then approval by the IAEA Board of Governors. Given the general scarcity of funds and ambitions other countries (such as Japan and the Philippines) may have to establish regional centers, this designation may be somewhat difficult to achieve.

J. International Scientific Conference to be Held at Trombay - It is recommended that consideration be given to the possibility of holding a broad international conference at Trombay following the next General Conference of the IAEA which is to be held in Tokyo. This meeting could be arranged on a joint basis between the U.S. and India or possibly under the sponsorship of the IAEA. The virtue of holding such a conference in India after the IAEA General Conference would be that it would serve to draw to India the atomic leaders of many countries and make them all aware of the advanced status of the Indian program. The publicity given to the conference also would serve to dramatize and highlight the advanced status of the Indian program in the eyes of its neighbors. While the Indians already achieved such a status, to some degree and are, as noted, already planning to hold a regional meeting on reactor utilization, a broader meeting would be even more helpful in fostering this image.

The AEC staff thus is now exploring the question of what the technical scope of such a conference might be, bearing in mind the plans other countries, notably Japan, may have to convene meetings after the IAEA General Conference.

K. Possible Assignment of AEC Scientific Representative - Lastly, it is recommended that the U.S. give careful consideration to the possibility of assigning an AEC Scientific Representative to India to follow the Indian program in detail as well as some other programs in the area (Australia, Pakistan, Iran, etc.). It is believed that the assignment of such an

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individual would be highly beneficial in strengthening our collaborative ties with the Indian AEC, on a day-to-day basis, and in helping to identify other areas of promising mutual cooperation.

It is recognized, of course, that the presentation of this proposal to the Indians could contain an element of risk if the Indians thought we were making such a proposal for intelligence purposes. It is recommended, therefore, that such a proposal should only be made if it is accompanied by a broad intensification of our cooperation (along the lines of some of the proposals noted above) and that it should not be pressed if the Indians have an apparent adverse sensitivity to the assignment.

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