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Bhabha Centennary Special Issue

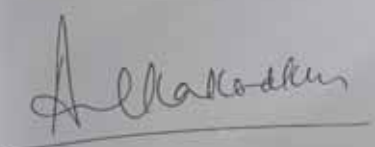
Dr. Homi Jehangir Bhabha and Jawaharlal Nehru,

The Architects of Atomic Energy Programme in India

Remembering Pandit Nehru and Dr. Bhabha

On October 30, 2008, Hon'ble Prime Minister Shri Manmohan Singh launched the Homi Bhabha Centenary year. Dr. Bhabha, the founder father of Atomic Energy programme in India was a great visionary besides being a scientist par excellence. It was only because of his conviction, hard work and strong capabilities in policy making and administration that India could draw a road map for development of atomic energy even before its independence. Another great personality to whom DAE owes a great a debt of gratitude is Pandit Jawaharlal Nehru because the policies charted out by Dr. Bhabha were fully supported by Pandit Nehru for implementation. Pandit Nehru had such high regards for places of scientific and technological excellence that he called them 'Temples of Modern India'. This combination of the two greats culminated into India emerging as an advanced country on the world map of atomic energy.

November 14th happens to be birth anniversary of Pandit Nehru therefore this issue of Nuclear India is being brought out as a tribute to Late Dr. Bhabha and Pandit Nehru. In fact, DAE had brought out a special issue of Nuclear India on Pandit Nehru and Dr. Bhabha in 1989 as part of the Nehru Centenary. The present issue is more or less a reproduction of that special issue being brought out in the birth centenary year of Dr. Homi Bhabha. I am sure that this issue will provide the readers glimpses of the intimate relationship they enjoyed. It will also bring out their personal qualities and the deep commitment they had to the development of science and technology in general and atomic energy in particular for the progress of the country.



Dr. Anil Kakodkar
Chairman, Atomic Energy Commission

Note on the Organisation of Atomic Research in India by H.J. Bhabha, Chairman, Board of Research on Atomic Energy

April 26, 1948

1. The Report submitted to you, Mr Prime Minister, on my return from Europe and America collected evidence which made it reasonable to believe that within the next couple of decades atomic energy would play an important part in the economy and the industry of countries and that, if India did not wish to fall even further behind the industrially advanced countries of the world, it would be necessary to take more energetic measures to develop this branch of science and appropriate larger sums for the purpose.

   An immediate objective should be the setting up of a small atomic pile. Resolution 1 of the last meeting of the Board of Research on Atomic Energy given in the appendix supports this proposal.

2. In that Report it was pointed out that the quickest and most desirable way of developing atomic energy in India would be to come to an agreement with the Governments or atomic energy agencies of one or more countries such as Great Britain, France and Norway. Such agreements would be on mutually advantageous terms involving the exchange of raw materials used in the generation of atomic energy and the pooling of scientific and technical information.

3. It must be clearly understood that the possession of sufficient quantities of uranium is a sine qua non for the generation of atomic energy. Thorium can only be used for this purpose after it has been treated in an atomic pile in such a way as to generate a particular variety of uranium in it. A pile cannot be started without uranium, or plutonium, which is a substance generated from uranium in a pile.

4. So far no large and concentrated deposits of uranium bearing minerals have been found in India, though the monazite sands of South India contain a fraction of a per cent of uranium. It is essential, therefore, that our immediate programme should include an extensive and intense search for sources of uranium. These geological surveys would take at least two years if carried out in any careful and exhaustive way, and it is possible that their result may be negative. In that case India would either have to depend on an agreement with a foreign power for the purchase of her uranium or go in for the much more costly process of extracting uranium from monazite. If, therefore, the Indian Government wishes to possess a pile in operating condition in India within a period of a few years, then an agreement with a foreign atomic energy agency is inevitable.

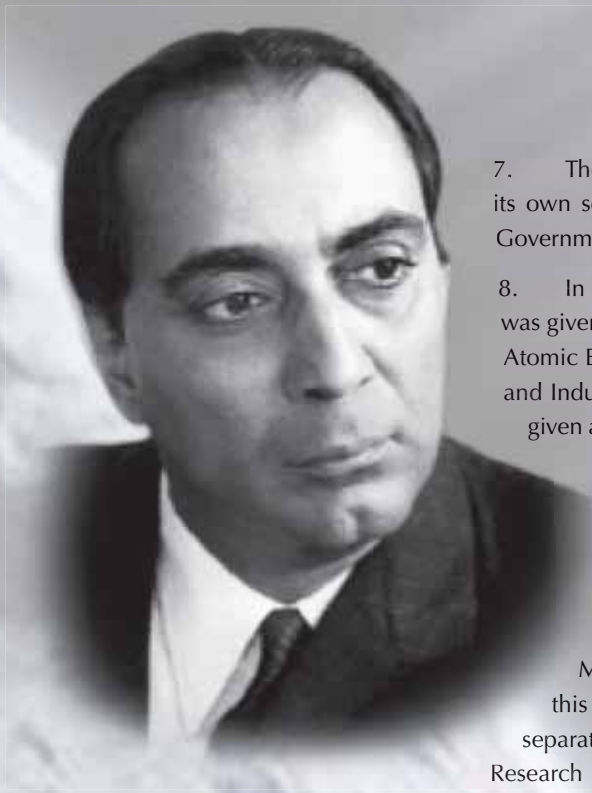
5. In deciding on the structure of the organisation which Government must set up in order to develop atomic energy and research on a bigger and more effective scale than hitherto the following two basic facts of the situation must be taken into account.

   (i) Absolute secrecy will have to be observed and ensured with respect to any secret information given to us by a foreign atomic energy agency.

   (ii) The paucity of the scientifically and technically trained personnel will require some of the top people to do more than one job at the same time. These two conditions by themselves practically determine the essential structure of the organisation.

6. Condition (i) requires that the development of atomic energy should be entrusted to a very small and high-powered body composed of say three people with executive power, and answerable directly to the Prime Minister without any intervening link. For brevity, this body may be referred to as the Atomic Energy Commission.

   The present Board of Research on Atomic Energy cannot be entrusted with this work since it is an advisory body which reports to the Governing Body of the Council of Scientific and Industrial Research, composed of 28 members including officials, scientists and industrialists. Secret matters cannot be dealt with under this organisations.



7. The same conditions of security require that the Atomic Energy Commission have its own secretariat independent of the secretariat of any other Ministry or Department of Government, including the envisaged Department of Scientific and Industrial Research.

8. In the chart of the proposed Department of Scientific and Industrial Research which was given to me by Sir S.S. Bhatnagar on your instructions, the present Board of Research on Atomic Energy Is shown as a part of this Department but not under the Council of Scientific and Industrial Research as at present. The reasons regarding security etc. which have been given above make this arrangement undesirable and I have, therefore, given in Appendix II a modification of this chart which only differs from the original chart given to me in having the Atomic Energy Commission directly under the Prime Minister and not as part of the Department of Scientific and Industrial Research, in my opinion, already expressed to you in a letter from Simla in June, 1947, it is desirable that the Department of Scientific and Industrial Research should be under the Prime Minister. I understand, however, that there is a possibility that it may be put under a Minister without portfolio who would be in charge of its day to day operation. Should this step become necessary through force of circumstances then it will be necessary to separate the Atomic Energy Commission from the Department of Scientific and Industrial Research if it is now made a part of that Department The Atomic Energy Commission whose work has important international implications must always be attached directly to the Prime Minister, and I am, therefore, strongly of the opinion that it should from the start be organised directly under the Prime Minister and not as a part of the Department of Scientific and Industrial Research. Full co-ordination of the activities of the Department of Scientific and Industrial Research would be ensured by the circumstance that the Director of Scientific and Industrial Research would be a member of the Commission and act as its Secretary for ordinary administrative purposes.

ADMINISTRATIVE MEASURES RECOMMENDED

9. In view of the above considerations It is desirable that Government should take the following steps immediately:-

(1) An Atomic Energy Commission should be set up directly under the Prime Minister. It should be a high powered body consisting of three scientists and composed as follows:

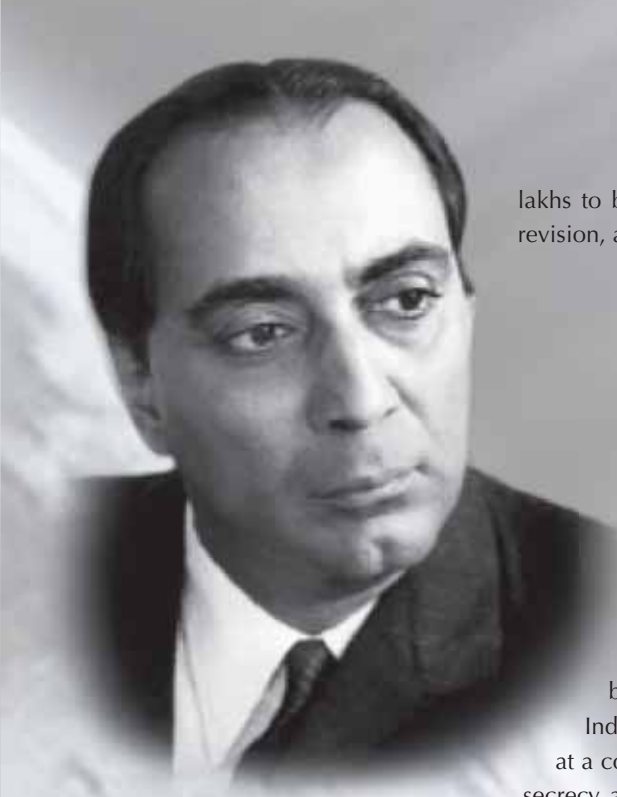
(i) Chairman

(ii) Director of Scientific and Industrial Research

(iii) One other eminent scientist (Sir K.S. Krishnan, FRS, is suggested)

(2) The Atomic Energy Commission should have its own independent secretariat.

(3) Government should decide on the sums of money that it wishes to allocate for the development of atomic energy within the next three years. A sum of approximately Rs. 50 lakhs will be required if it is decided to build a small pile while additional rupees thirty to forty lakhs will be required for other atomic research projects, both fundamental and applied. It should be noted that the estimate of Rs. 50 lakhs for a pile is based on the assumption that the heavy water and the uranium would be bought from a foreign agency. While the quantities of heavy water and uranium required are known, the price depends on political as much as economic factors. For example, it may be possible to buy heavy water cheaper from Norway if we could give her in return substances such as thorium which she may require Alternatively, the price may be much higher than that used in the estimates if there is nothing that Norway wishes to have in exchange. The same considerations apply to uranium. It is, therefore, necessary that Government should allocate at once the sum that may be required, between say eighty lakhs and one crore of rupees lo be spent within the next three to five years, and let final decisions wait till negotiations with foreign atomic energy agencies have been undertaken and their results known- The sum of rupees ninety



lakhs to be spent within the next four years, may oughly be allocated, subject to future revision, as follows:

1st year	...	Rs. 10 lakhs
2nd year	...	Rs. 20 lakhs
3rd year	...	Rs. 30 lakhs
4th year	...	Rs. 50 lakhs

(4) The exploratory talks which I have already had with the British, French and Norwegian atomic energy agencies indicated that the prospects of arriving at an arrangement of the desired sort were not unfavourable. These talks should be taken up again and the proposals discussed in greater detail. As suggested by Sir Stafford Cripps, it is desirable that these negotiations should be undertaken orally at first. These talks should only be restarted after the constitutional issues between India and England have settled, as for example, the question of whether India is to remain in the commonwealth or not. Only then will it be possible to arrive at a conclusive result one way or the other. The talks should be conducted in the utmost secrecy as certain other countries may not look on such agreements with favour. For this reason it would be amistake to send a mission to negotiate. The Chairman might be authorised by you' to continue his earlier talks till the terms of a possible agreement had become concrete. These could then be submitted to Government for their approval or amendments. Finally the agreements should be ratified directly by the two Governments concerned. I have been invited to the Solvay Conference in Brussels in early September, and thereafter to a Nuclear Physics Conference in Birmingham. This might provide an inconspicuous occasion for carrying out the talks.

(5) At the suggestion of Mr. D.N. Wadia, surveys for uranium and thorium are being organised by the Geological Survey of India under Dr. M.S. Krishnan. Secrecy with regard to the results of these surveys now requires that they should be organised directly under the Atomic Energy Commission and that Dr. M.S. Krishnan should be allocated whole-time to this work. It should be pursued energetically as soon as possible of any agreement being reached with a foreign atomic energy agency. Resolution 3 of the last meeting of the Board of Research on Atomic Energy, given in the Appendix, supports this proposal.

(6) It is necessary that fundamental atomic research and teaching should be fostered in the universities and research institutes. For this purpose atomic research may be defined as physical research on the nuclei of atoms and the elementary particles out of which they are made or which play a role in determining their properties, and biological or chemical research involving the use of radio-active nuclei or artificially made or separated stable nuclei- it therefore includes specifically research in nuclear physics and cosmic rays, and biological or chemical research using tracers, it is essential in order to avoid lack of co-ordination and unnecessarily duplication that all such grants should be made only by the proposed Department of Scientific and Industrial Research after the schemes have been submitted to the Atomic Energy Commission and been approved, or better still by the Atomic Energy Commission Itself.

(7) With the appointment of the Atomic Energy Commission there will be no further reason for the continued existence of the present Board of Research on Atomic Energy, and this should, therefore, be abolished. If, for some reason, it is not desired to abolish this Board immediately then it should be attached as an advisory body to the Atomic Energy Commission, with strictly limited scope of activity. For example, it might advise on the distribution of grants to the universities and research institutes mentioned under (6) above, but this work is hardly sufficient to justify the existence of a Board.

(8) The Joint Committee with Travancore could also be abolished as it was constituted at a time when the political relations between India and Travancore were different to what they are now. It should be replaced by a small committee under the Atomic Energy Commission consisting of the three members of the Commission and two members from Travancore.

(9) Government should explore immediately the possibilities of utilising cheap hydro-electric power in India for manufacturing heavy water, on the one hand for our own requirements in a pile, and on the other for sale to other countries. The selling price of heavy water is anything between $ 100,000 and $ 300,000 per ton. A factory should be set up for the purpose under the Defence Ministry and put under the same security measures as the armaments factories of that Ministry. The heavy

Continued on page 15

On improving standards of Universities :

Bhabha writes to Pandit Nehru

April 3, 1950

My dear Bhai

I am writing to bring to your notice a rather serious situation which has been developing for some time in our educational system. It has been observed by several people and I have observed it myself that the quality of the men and women who are being turned out by the universities has been gradually deteriorating since 1940.

This situation is due to several causes, one of the chief ones being that the universities are admitting far more people than they are capable of teaching adequately with their limitations of staff and equipment. But in addition to this, another important reason is that some of the best scientists have today been drawn away from the universities into our research institutes. A research institute must have some of the best workers in the country in order to function at all properly, With the present paucity of outstanding scientific workers in India the only solution is therefore to site research institutes in places where they can actively help in the work of a university. Not only should the members of research institutes be required to give a few advanced courses in their own subject to students of the university but conversely the universities should be required to appoint such outstanding research workers to the respective faculties, even if the research institutes themselves are not directly part of the university.

Since those who are outstanding research workers and have made important contributions to the progress of their subjects are also usually those who can teach it best to others, the separation of research from teaching can only be to the detriment of both. This situation is accentuated in India by the separation of most research institutes from the universities, the former being under one department of government while the latter are under another. Active cooperation between research institutes and universities could be furthered very greatly if both were under the same authority of the Central Government. On the other hand it would be quite easy to separate in the advanced stages of the teaching of say the arts from the sciences. A strong case could therefore be made for having the advanced teaching of science in the universities under the same department as research while leaving the teaching of science up to the university level to another department. In any case, it seems clear that the technological institutes and all research institutes, whether teaching is done at them or not, should be under the same department of Government.

Yours ever,

Homi Bhabha

The Hon'ble Jawaharlal Nehru,
Prime Minister,
External Affairs Department,
Central Secretariat,
NEW DELHI.

For closer co-operation between Universities and National Laboratories : Bhabha writes to Pandit Nehru

February 28, 1952

My dear Bhai,

I am writing to remind you of certain general proposals regarding the administration of higher scientific and technical education and research which I believe have met with your general approval in the past, but which have not been put into effect for various reasons. The present juncture after the elections may perhaps be a suitable moment for putting them into effect.

The separation of advanced scientific and technical teaching from research is not desirable. The reasons for this have been elaborated at somewhat greater length in the attached sheet which is an extract from a Note I submitted to the Planning Commission in September, 1950. Far closer co-operation could be established between the scientific departments of the universities and the national laboratories if the two were dealt with by the same Ministry. It is desirable that higher scientific education, meaning thereby scientific education at the university stage, should be dealt with by the same Ministry as deals with scientific research, whereas the pre-University scientific education could be dealt with by the Ministry of Education as at present. This would be a far more natural and logical division of functions between the two Ministries than the present one. In any case, the fact that the national laboratories, which are the best equipped and most up to date scientific laboratories in India, are under the Ministry of Natural Resources and Scientific Research while a number of other scientific institutions doing advanced teaching and research such as the Indian Institute of Science at Bangalore are under the Ministry of Education, is the cause of a considerable lack of coordination, unnecessary duplication, and waste. There seems no doubt that the natural place for the institutes of higher technology and science like the Indian Institute of Science is under the Ministry which deals with scientific research.

Yours sincerely,

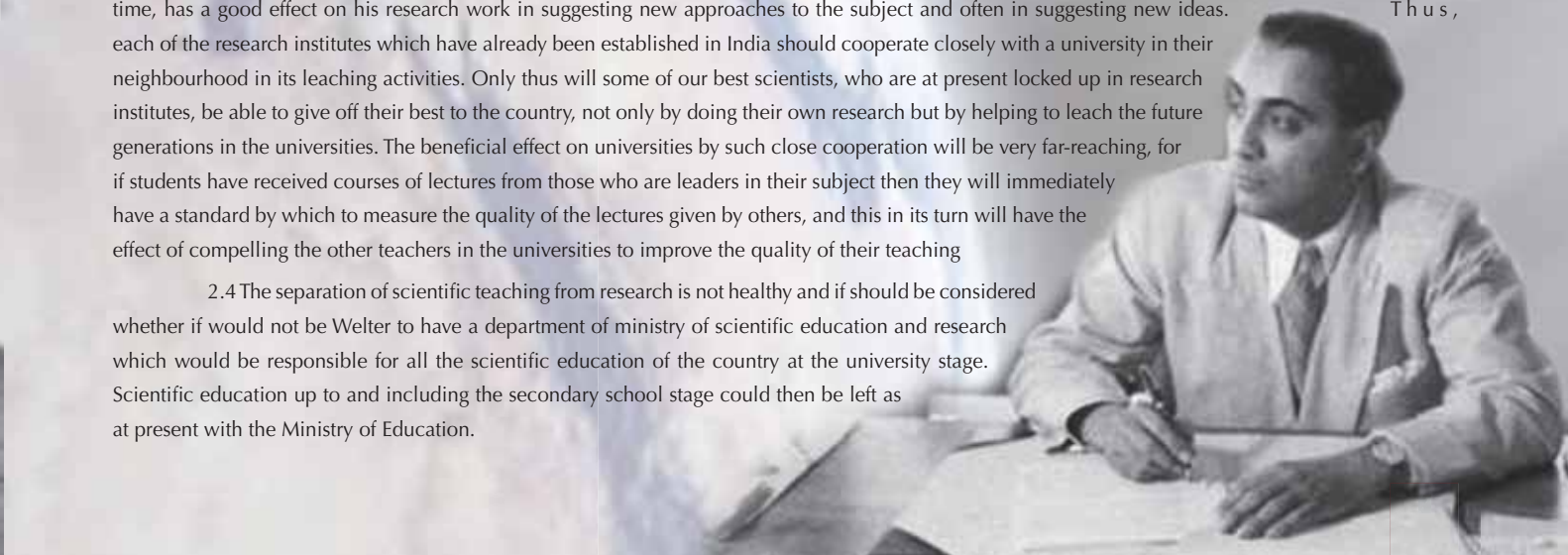
Homi Bhabha.

The Hon'ble Jawaharlal Nehru,Prime Minister,
Ministry of External Affairs,
NEW DELHI.

Extract from a Note on Scientific Education and the Utilisation of Scientific Manpower submitted to the Planning Commission in September1950

2.3 Research should be an integral pail of a university's activity, and the number of staff in any subject should be such as to allow any member of the staff to devote at least half his time to research if he so desires. In general, only those who have contributed to the advance of a subject, have a deep enough insight into it to impart a sound knowledge of it to their students. Similarly, teaching, provided it does not take up the major part of a scientific worker's time, has a good effect on his research work in suggesting new approaches to the subject and often in suggesting new ideas. Thus, each of the research institutes which have already been established in India should cooperate closely with a university in their neighbourhood in its leaching activities. Only thus will some of our best scientists, who are at present locked up in research institutes, be able to give off their best to the country, not only by doing their own research but by helping to leach the future generations in the universities. The beneficial effect on universities by such close cooperation will be very far-reaching, for if students have received courses of lectures from those who are leaders in their subject then they will immediately have a standard by which to measure the quality of the lectures given by others, and this in its turn will have the effect of compelling the other teachers in the universities to improve the quality of their teaching

2.4 The separation of scientific teaching from research is not healthy and if should be considered whether if would not be Welter to have a department of ministry of scientific education and research which would be responsible for all the scientific education of the country at the university stage. Scientific education up to and including the secondary school stage could then be left as at present with the Ministry of Education.



AEC Chairman communicates his vision on atomic power generation to Prime Minister

July 11, 1954

In order to focus our minds on the job which the Department of Atomic Energy has to do, I have drafted a summary note on the subject, and I append it herewith. I have sent a copy of it to the Finance Minister and Sukthankar. This is meant to help us not only in the selection of staff for the Department, but also in deciding whom to make a member of the Atomic Energy Commission at some later stage. It occurred to me this morning, that if there is no objection to having a non- Indian, Dr Finch, F.R.S., the Director of the National Chemical Laboratory, would be a very useful member, as he is a chemist and has been associated with atomic energy work in Great Britain. But this is only for consideration in the future, and I assure that no change in the membership of the Atomic Energy Commission is contemplated immediately.

Homi J. Bhabha

Pandit Jawaharlal Nehru,
Prime Minister,
Government of India,
New Delhi

OBJECTIVE

Principal form - Generation of electricity by atomic energy.
Subsidiary form - Direct use of heat generated by atomic energy (as for example, for jet propulsion).

METHOD

To achieve the objective the following establishments and plants will have to be set up, and the activities mentioned below undertaken. They are given roughly in chronological sequence, though several steps will have to be undertaken together.

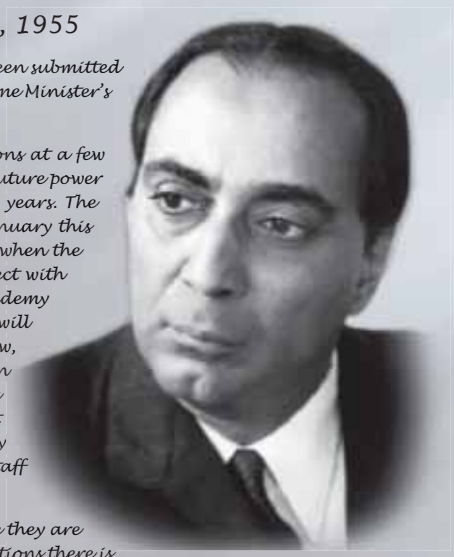
1. Atomic Energy Establishment, Trombay.
   Purpose - to obtain the scientific and technical knowledge for achieving the objective. Several research reactors and all the necessary laboratories will be located at the Establishment. The research and design of the breeder and power reactors to be located elsewhere, and of the necessary production plants, will be done here.
2. Survey, drilling and mining for atomic minerals, in particular, uranium.
3. Beneficiation plants (for raising the content of low grade uranium ore).
4. Uranium plant (for producing uranium of commercial purity from high grade or beneficiated uranium ore).
5. Uranium purification plant (for processing commercially pure uranium to atomic purity).
6. Plants for producing heavy water as a bye-product of fertilizer.
7. Plant for producing beryllia and beryllium metal from beryl.
8. Production of pure graphite for moderators.
9. Plant for enriching natural uranium.
10. Setting up of power reactors (for generating electricity).
11. Setting up of breeder reactors (for breeding plutonium from uranium and uranium 233 from thorium).
12. Plutonium extraction plant (for retreatment of uranium from a reactor to extract plutonium and remove fission products).
13. Setting up of special reactors (as for example, for the propulsion of ships and aircraft).

Subsidiary activities

(a) To train and develop the necessary scientific and technical staff. (The Atomic Energy Establishment alone will require about 600 scientists, and the number of scientific, technical and engineering staff in the plants will be several thousand).
(b) To support and finance research, especially in basic nuclear science, in the Universities and research institutes.
(c) To develop and promote the use of tracers in biology, medicine and industry.
(d) To set up plants to produce commercially and industrially useful materials obtained from minerals which come under the Atomic Energy Act, as for example, titanium, zirconium, etc.

AEC Chairman proposes Economic Study Wing in DAE

July 16, 1955



1. A copy of my paper on 'The role of atomic power in India and its immediate possibilities' which has been submitted for presentation at the Geneva Conference on the Peaceful Uses of Atomic Energy, is attached herewith for the Prime Minister's information. He will be interested in the striking figures revealed in Table V and at some of the Conclusions.

2. This preliminary study reveals that it would be economically feasible to set up atomic power stations at a few selected places in India remote from sources of coal, and that in order to build up stocks of fissile material for future power stations it is necessary to contemplate the setting up of at least one or two such stations during the next few years. The possibility of setting up an atomic power station in India was discussed by me with Sir Edwin Plowden in January this year, and it was agreed that this matter might be discussed more intensely again in the middle of next year when the British power station at Calder Hal! has gone into operation. We will also be having discussions on this subject with the Atomic Energy Commission and other industrial groups in the United States, and possibly also with the Academy of Sciences and the Government of the U.S.S.R. While no decision on the setting up of an atomic power station will be taken for at least a year, it is desirable that the economic aspects of the problem should be studied from now, and some of the links of thought initiated in my paper pursued further, It Is therefore recommended that an Economic Study Wing be established immediately in the Department of Atomic Energy to study the economic aspects of atomic energy, the location of power reactors, etc. No fresh expenditure will be involved for the present since Mr. S. Patuck, Administrative Officer in the Department of Atomic Energy, who has been put on special duty for collecting the information used in my paper, can now be placed on this job for an indefinite period. Other staff can be added in the economic study group when the need arises.

3. Such studies cannot be carried on profitably in the Planning Commission at the present stage, since they are intimately linked with the rather complex technology of atomic energy. Whereas in the case of coal burning stations there is essentially only one method of producing electric power, namely that of generating steam in a conventional boiler and using this steam to drive a turbine, in atomic energy there are at least hall a dozen basically different types of 'atomic boilers', which differ in the form in which the fuel is introduced, in the moderators used, in the fissile material generated and in the heat transfer system, Moreover, as the initial power stations will all serve the purpose not only of generating electricity, but also of producing fissile material for future reactors, either from uranium or thorium, the type of plant to be set up is determined not only by the economics of electricity generation but even more by their effectiveness in producing the fissile materials plutonium and uranium 233. It is clear therefore that the Planning Commission could only fruitfully come into the picture at a later stage when ail the preliminary technical studies have been completed in the Department of Atomic Energy.

4. According to the rules of the Geneva Conference no paper shall be released till it has actually been delivered at the Conference However, if the Prime Minister agrees, a copy of my paper will be forwarded confidentially to the Planning Commission for its information.

5. The approval of the Prime Minister is requested for the action proposed above.

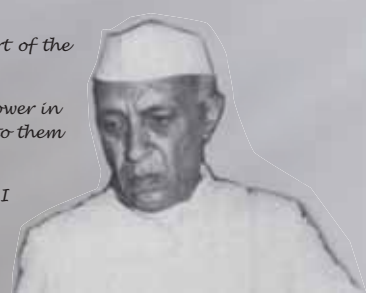
Prime Minister

Prime Minister agrees

July 16, 1955

My dear Homi,

I have received your note on the Economic Study Wing. I agree that this Wing should be started as a j part of the Department of Atomic Energy.



I have also received and read with interest your paper for the Geneva Conference entitled 'The role of atomic power in India and its immediate possibilities'. I am sending it on to the Planning Commission I have, however, made it clear to them that it should be treated as confidential for the present and till the Geneva Conference has considered it.

You told me that you were coming to Delhi. I forget what date you mentioned. Anyhow, whenever you come, I shall try to find time to discuss matters with you. I might mention, however, that Saturday and Sunday, 23rd and 24th July, are absolutely full up for me.

Ever yours,

Jawaharlal Nehru

Dr. H.J. Bhabha,

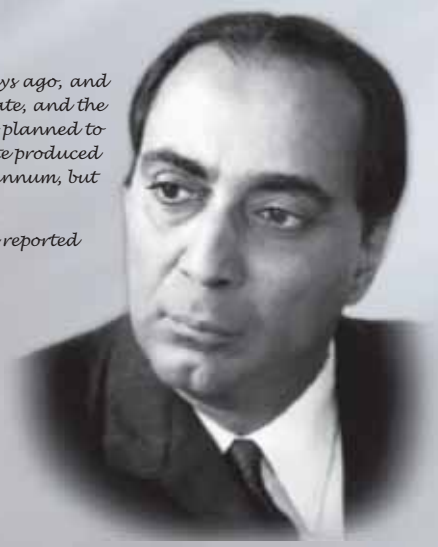
Secretary,

Department of Atomic Energy,

Apollo Pier Road, Bombay.

Chairman informs Prime Minister about commissioning of Thorium Plant

July 20, 1955



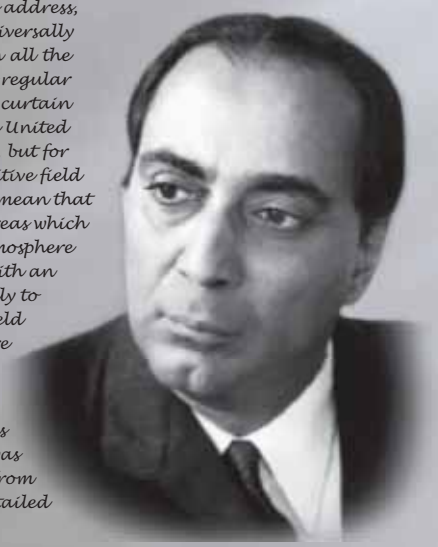
The construction of the thorium plant has been more or less completed. Trial runs were started about ten days ago, and have given very satisfactory results. The process has been tried out to the production of the first thorium sulphate, and the performance of the plant at every stage was better than planned. For example, the filtration process which was planned to take twelve hours was completed on two different occasions in two hours. The quality of the first thorium sulphate produced is also somewhat better than specification. The plant was planned to produce 260 ions of thorium sulphate per annum, but it appears now that it will be able to produce considerably more, possibly as much as 360 tons per annum.

2. The next stage of the process of production of thorium nitrate is being tried out, and the result will be reported to the Prime Minister as soon as the trial runs have been completed.

Prime Minister.

Dr. Bhabha reports to Pandit Nehru on the first International Conference on Peaceful Uses of Atomic Energy at Geneva

August 24,1955



My dear Bhai,

The Conference ended at 5 p.m. on Saturday the 20th August. I enclose herewith the text of my closing address, which picks out the highlights of the Conference and generally summarizes what I felt about it. I think it is universally accepted that the Conference was a notable success. What is so gratifying is the cordial atmosphere in which all the public and private discussions were carried out, entirely free from political bias or cold war hostility. Besides the regular sessions a number of informal meetings were held among scientists, including those from the so called iron curtain countries, at which scientific problems were discussed fully and freely. Full credit must be given to the USA. the United Kingdom, and the USSR for the immense amount of hitherto secret information which they freely made public, but for which the Conference could not have been the success it was. As far as scientific discussions in this highly sensitive field of atomic energy were concerned, all signs of the cold war appear to have disappeared This does not of course mean that there are no longer secrets being kept back in this field, but these are now either of an industrial nature or in areas which are rather close to weapons development. I am sure, however, that with the continuation of the present atmosphere these areas will shrink rapidly. One should take the opportunity of this excellent atmosphere to push forward with an enlarging of the areas of cooperation in this field, from which it may be possible in due course to pass gradually to a solution of the tougher problem of atomic armament. The essential thing Is that any future action in this field should be taken with tact and consideration, so as not to mar In any way the excellent psychological atmosphere which now exists

2. India made a good showing at the Conference, and many of our papers were very well received. For example, extracts from my paper on the role of atomic power 'in India were quoted by Sir John Cockcroft in his evening lecture A paper on a new method of surveying for uranium by Vohra, one of our young scientists, was specially reported in the New York Times' Interest was also aroused in our papers on the separation of hafnium from zirconium and on the measurement of diffusion length In beryllium oxide with a cascade generator. A detailed report of the Conference will be submitted after my return to India.

3. A good deal of the credit for the success of the Conference must also go to Mr Dag Hammarskjold, Secretary General of the United Nations, for the manner in which he presided over the meetings of the 7-Nation Advisory Committee which prepared the Conference. He is open minded and conciliatory in his approach and receptive to suggestions, while at the same time quick and decisive. I also find his general approach and manner of thinking sympathetic.

I hope you are well, and that things in India are progressing to your satisfaction.

Yours ever,

Homi Bhabha

Pandit Jawahadal Nehru
Prime Minister,
Government of India,
NEW DELHI.

Dr. Bhabha, President of the first Geneva Conference, reports to the United Nations

October 12, 1955

Mr. Chairman,

I wish to thank this Committee for having invited me to address it on the work of the International Conference on the Peaceful Uses of Atomic Energy at Geneva; of which I had the honour to be President. When I came to the United States a few days ago I did not expect to have to report on the Conference, and consequently I arrived without my notes and Conference papers. Fortunately, I have been able to make use of the facilities which are available here in the Secretariat, although the time at my disposal has been rather short for preparing an adequate report on a conference which covered so wide a field and dealt with so complicated a subject as atomic energy.

The Secretary-General in his Report on the Conference has already told you that it was attended by 1428 delegates from 73 nations, and 133-4 observers' It was covered by over 900 correspondents. No scientific conference of this magnitude and importance has ever been held at any place at any time. The formidable task of organising this conference fell to the Secretariat of the United Nations, and 738 members of its staff were directly engaged m this operation since its initiation in January. It is the opinion of many of the scientists who participated in the Conference that no other international organisation could have so successfully handled a conference of this magnitude. The sustained applause which greeted the reference to the work of the Secretariat in my closing speech is a sufficient indication of the extent to which everyone appreciated the fine job done by the Secretariat.

I know I voice the feelings of all members of the Advisory Committee when I say that the success of its work in organising the Conference was due in no small measure to the Secretary-General, Mr. Hammarskjold, who presided over its meetings. I am happy to have this opportunity of being able to express our appreciation.

The documentation of this Conference alone was a huge problem. 1067 scientific and technical papers were submitted, all of which are to be published in the proceedings. 450 of them were orally presented at the Conference. Some 16,000 pages of documents in one language only have been printed and distributed. The Conference proceedings are to be published within a few months as a permanent record of the work of the Conference and will cover no less than 16 volumes. This is an indication of the amount of scientific material which was brought forward at the Conference, material which it will take the participants many months to digest fully.

I would like to express our appreciation of the excellent work that was done by the Conference Secretary-General, Mr. Wait Whitman, his Deputy, Mr. Vavilov, and the staff of 20 scientific secretaries provided by thirteen countries' They had to handle and arrange the complex scientific material, assist the Chairmen of the various sessions, and will now have to supervise the publication of the Conference papers and proceedings. They identified themselves wholly with the spirit of the United Nations and did their work with an impartiality and an absence of national bias which has contributed substantially to the success of the Conference.

Most of the work of the Conference was of a highly specialised, and technical nature, intelligible, and of interest only to the specialists in the field. I will therefore content myself by summarising the results which are of wider interest.

A number of sessions of the Conference were devoted to estimating the present and future energy needs of the world and the energy requirements of individual countries, in discussing this subject, involving very large amounts of energy, it is convenient to use an appropriately large unit, and I shall here use a unit, denoted by 'Q', which is equal to a million million million British thermal units of energy, corresponding to the combustion of some thirty-three thousand million tons of coal. It is generally agreed that the world is consuming energy at the rate of 0.1.Q per annum today. In a paper submitted by the United Kingdom, it was assumed that the minimum rate of increase of energy consumption would be 2 per cent per annum, while in a paper prepared by the Secretariat of the United Nations a high rate of 3 1/2 per cent per annum was assumed, which could be attained under favourable conditions. The former assumption leads to a consumption of energy by 2,000 A.D., which is some 2 1/2 times the present consumption, while the higher rate leads to 5 1/2 times the present figure, it is difficult to project world energy requirements with any confidence beyond the end of this century.

World requirements of electricity are estimated to rise at an even faster rate, the minimum being 3.4 per cent per annum and the probable rate about 6 per cent per annum, leading to a rate of consumption of electricity in 2000 A.D, which would be between 9 and 19 times the present rate.

To estimate the future role of nuclear power, estimates had to be made of world reserve of coal, lignite, oil and gas, and several papers dealt with this subject. Economic and technical questions are involved in the answer, for we are not concerned with the total physical quantities of these substances which are found under the surface of the earth, but to the amounts which are considered to be recoverable at reasonable costs. The figures will naturally be revised upwards as new deposits are discovered and improved techniques make possible the working of poorer deposits. However, actual experience during the last few decades shows that the estimates of reserves have been continuously revised downwards, as more detailed information proved earlier estimates to be over-optimistic. The results of all the various estimates can perhaps be best summarised in the statement that total world reserves of conventional fuel are equal in energy value very roughly to 100 Q. They may be much less, but not much more. Taken in conjunction with what has been said earlier about the rate of increase of fuel consumption in the world, this would lead one to the conclusion that, so far as the world as a whole is concerned, reserves in the ground of conventional fuels are more than adequate to meet the total world requirements of energy for well beyond the end of this century. However these reserves are very unevenly distributed throughout the world, and consequently some areas may find it difficult to obtain the energy they require at prices they can afford to pay. Among these are areas in which the production costs are already high, such as Europe; the densely populated areas of North Africa and Southern Asia, where resources are limited, and areas of Latin America which have only small resources of their own.

The cost of conventional fuels like coal have, moreover, been rising steadily. It was pointed out in one of the papers that the relative cost of coal measured in terms of the average price level has been rising continuously in many countries including the United States, the United Kingdom, France, Belgium and the Ruhr, the increase in relative cost being roughly of the order of 50 per cent between 1913 and 1953.This rise is due to the working of increasingly poor deposits, to the mining of more inaccessible deposits, and to the increasing cost of labour for coal mining, which is generally considered a hazardous and unpleasant occupation. In those countries where coal costs are already high, as in the United Kingdom, and the needs for energy are increasing rapidly, this makes the need for a new power source more urgent.

It was said earlier that world reserves of conventional fuels appear sufficient to meet the actual world energy requirements well beyond the end of this century. This statement, however, does not give a complete picture of the actual situation. It is generally realised that the standard of living is closely related to the per capita consumption of energy. This varies from 62.1 megawatt hours per annum per head for a highly industrialised country like the United States to 36.6 for the United Kingdom and 2.7 for India. There are large areas of the world where the per capita consumption of energy is very low. lf, for argument's sake, it is assumed that the per capita consumption of energy in the entire world were the same as in the United States today, and allowances were made for a doubling of the world population within the next hundred years, which is the least that we can expect, then the known reserves of conventional fuels would be exhausted in under a century. They show the absolute necessity of finding some new sources of energy if the light of our civilization is not to be extinguished because we have burnt out our fuel resources.

To illustrate how acute the energy problem is for some under-developed areas of the world, I quote some figures from a paper dealing with the energy problem in India. It was shown in this paper that the resources of hydro-electric power and conventional fuels in India are insufficient to enable it to reach a standard of living as high as the present U.S. level. Only a few figures are necessary to establish this fact. The total reserves of coal in India are roughly 40,000 million tons or roughly 110 tons of coal per head of population. The energy consumption of the United States is equivalent to the burning of some nine tons of coal per annum per head. Thus, India's coal resources would be insufficient to maintain a standard of living equal to the present U.S. standard for more than a decade. The total energy consumption in India is about a tenth that of the United States, and of this total some 75 per cent is contributed even today by the burning of agricultural waste. The total hydro-electric potential of India is estimated to be between 35 and 40 million kilowatts of installed capacity. The entire harnessing of this potential would yield only one-seventh as much energy as is already obtained today by burning agricultural waste. In many other areas of the world the energy problems are even more acute. These figures illustrate the ultimate necessity of finding a new source of energy in some parts of the world. They show in a striking manner that the presently known reserves of coal are insufficient to enable many under-developed countries of the world, which contain a major part of its population, to attain and maintain for long a standard of living equal to that of the industrially most advanced countries.

It is in this context that we turn to atomic energy. The Conference clearly shows that there will be no shortage of the atomic fuels uranium and thorium. To quote from a paper submitted to the Conference by Mr. Jesse Johnson of the U.S. Atomic Energy Committee "A nuclear power era will have abundant fuel resources. The problem will be the efficient and economic utilization of these nuclear

fuels... The world's energy resources in the form of nuclear fuels far exceed those of all other types of fuel. There are adequate resources of uranium and thorium for a long range expanding world power programme... as the nuclear power programme grows and the search for uranium is extended, more information will become available about the resources for the future. There is every reason to believe that these resources will be far larger than those we are considering today."

The important conclusion to be drawn from what has been said above is, first, that our civilization cannot continue indefinitely on the basis of the conventional fuels alone, and secondly, that uranium and thorium can support a progressively expanding world power programme for many centuries. Thus, even if the widespread use of atomic energy for peaceful purposes faces us with political and military problems, we have no option but to solve these problems.

Uranium is far more widely distributed throughout the world than was originally thought. Some 24 countries submitted papers on their uranium and thorium resources, and while some of them had very small quantities, the amounts required for initiating a research and development programme are so small that many nations could do so on their own. Resources of the producing nations of the West were estimated to be between one and two million tons of uranium producible at an average cost of $ 10.00 per pound of U3O8 in the form of high-grade concentrate. Modem techniques make possible the extraction of uranium from much poorer deposits, and it is estimated that the amount of uranium that can be obtained at a cost of between $ 10 00 and $ 30.00 per pound is probably several million tons. Methods of working low grade ores have been developed in many countries, as, for example, the US, Sweden and India. The most important development in this direction is the use of ion exchange resins. Thus, to quote Mr. Johnson again, "Uranium can no longer be considered a rare metal. There are extensive deposits throughout the world and there are processes of extracting the uranium." The important conclusion to be drawn is that no nation or group of nations has a monopoly of the atomic fuels, uranium and thorium, and is therefore in a position to impose its terms on others. The position here is quite different from what we find in the case of oil.

It was shown that we could expect to extract from a ton of uranium as much energy as we get from 10,000 tons of coal. This is without taking into account the new fissionable material which is produced in the fertile materials U-238 and thorium in the course of the power production. Breeding, which it was demonstrated should be possible in homogeneous reactors in thorium, and in fast reactors in uranium also, would make a ton of uranium yield as much energy as between one and three million tons of coal. To quote Mr Johnson again, "The location of nuclear power plants will not be determined by the availability of a local fuel supply. Nuclear fuel can be transported by air to any part of the world and transportation costs will have no measurable effect upon the cost of power." For the first time, as far as power resources are concerned, mankind is in a position to be liberated from the uneven and capricious distribution of fuel sources by nature.

Papers were read on the atomic power station of five thousand kilowatts which has now been in operation for some time in the USSR, and on the design and operating experience of a prototype boiling water reactor in the United States with a power output of 3,500 kilowatts. The first large atomic power station to go into operation with a capacity of 50,000 kilowatts will probably be the one now under construction at Calder Hall in the United Kingdom, Many other prototype power stations are being planned and built in several parts of the world. Firm costs of atomic power will not be available till we have gained experience during the next ten years from the operation of these power stations, but sufficient is known to us to be able to conclude that in certain areas, and in special circumstances, electric power from atomic energy could be competitive with that from conventional sources such as coal and oil even today.

In connection with power costs f quote the estimate of costs given by Dr. Zinn for a prototype boiling water reactor with an electrical output of 3,500 kilowatts. The total capital costs of this small experimental power station was $ 550,000., or approximately $ 160 per kilowatt of installed capacity, while the cost of power, assuming an 80% utilization factor, worked out at between 30 and 35 mills per unit of electricity. The capital cost and the cost of electric power from a diesel electric plant of the same size are comparable. It emerged at the Conference that there are many places in the world, especially in the under-developed areas, where large blocks of power may not be immediately utilizable, and where power at this cost would be acceptable. Moreover, an atomic plant would have the great advantage that it would be possible to establish it in relatively inaccessible locations or at places far from resources of coal or oil.

An estimate of the cost of power from a large atomic power station of the Calder Hall type was given in one of the papers. It showed that the capital cost would be 50 to 100 per cent higher than the cost of a conventional power station of the same size. The cost of electricity from such a power station worked out at 7 to 9 mills per unit, which is comparable with the cost of power from a conventional station in regions where costs are high. In this connection it is important to note that a conventional power station, if located far from the source of fuel, would impose a considerable load on the transport system, and if the transport system is already loaded to capacity, involve an additional capital expenditure on an expansion of the transport system.

The Calder Hall type of power station demonstrates the feasibility of generating power from natural uranium, while at the same time converting some of the inert U-238 to plutonium. A conversion factor, defined as the amount of plutonium produced to the amount of uranium 235 consumed, of 80 percent was considered to be practicable. The extraction of plutonium from uranium is relatively easier than the separation of the fissile U-235 from natural uranium. A widespread atomic power industry, with large power reactors working on natural uranium, which, as has been indicated above, would produce considerable amounts of fissile material, would therefore place in the hands of nations having such reactors and the chemical plants to treat the used fuels, considerable amounts of fissile material from which the making of atomic bombs would be a relatively easy step.

Papers were also communicated at the Conference describing in general terms two fast neutron reactors that are being built, and prototype power stations based on them. Any one such reactor may be estimated to require several hundred kilograms of concentrated fissile material, depending upon its size, that is, enough fissile material to make many atomic bombs. This and the previous examples illustrate the close connection there is between the peaceful and military applications of atomic energy, and the safeguards that will be necessary to ensure against misuse. As I said, in my opening address to the Conference, "A widespread atomic power industry in the world will necessitate an international society in which the major states have agreed to maintain peace."

Another remarkable feature which the Conference brought to light was the parallel work which has been done in secrecy till now in several countries, For example, no less than five countries had independently developed the same techniques for the extraction of uranium from certain ores. The sessions on the fission process are particularly significant from this point of view. Cross-sections for the fission process in uranium 233, uranium 235, and plutonium 239, had been measured independently in France, the United Kingdom, the Soviet Union and the United States, with remarkable agreement between themselves. The scientists concerned gathered after (he meeting in a non-scheduled session to draw up a table of their results and were able to agree on what they described as an "Agreed international value," This point is so important that I would like to quote some of the figures as an example: For the fission cross-section in plutonium 239, the United Kingdom scientists gave a figure of 702, the USSR figure was 715, the USA figure was 740, and the figure from France was 760, the agreed international value being 729. Since fission crosssections are crucial in the design of atomic reactors, and for higher energies are relevant to calculations regarding the critical mass in atomic weapons, this example shows the unreality of the belief that security can be insured by secrecy, or the ability to develop atomic reactors and weapons is the monopoly of any single nation or group of nations.

The sessions on biology and medicine have shown the great importance of isotopes in the study of the phenomena of life. The discussions indicated that all countries were alive to the direct biological hazards of radiation and that safe tolerance doses have been established, On the other hand, the discussion of the genetical effects of radiation clearly showed that we have not yet enough knowledge on which to base definite conclusions, and that a concerted and massive research effort on this problem is required, before we can be quite sure that no suffering will be caused to future generations. There is no cause for alarm, but till the matter has been fully studied and understood, it would be wise, wherever possible, not to permit people to be subjected to more than about a tenth of the dose considered safe at present. While there was a difference of opinion among scientists on this and several other subjects, it is important to note that the difference showed no national pattern.

This Conference arose out of the bold initiative of President Esienhower. It is generally recognized that it succeeded beyond all hopes and expectations. Its success was due to man/factors. In the first place, it came at a time when international tensions had relaxed and there was a propitious international atmosphere created by the Summit Talks at Geneva, it may have made Its own modest contribution to a further improvement of the International atmosphere. Secondly, its success was due to the spirit and the manner in which all the delegates played their part, and the goodwill and determination of the participating nations to cooperate in this great venture.

It was clear from the beginning that the scientific and technical contributions of all countries could not be the same. I wish to record particularly the debt that this Conference owed to those very few countries most advanced in the field, which so whole-heartedly and generously placed before this Conference the knowledge which they had gained during the last decade through such strenuous efforts and at such great cost. Knowledge once given cannot be taken back, and in organizing this Conference the nations of the world have taken an Irreversible step forward a step from which there is no retreat. Progress however requires one step to be followed by another, and then still another, so that the new trend set in motion at the Conference should continue and develop without any loss of momentum. It is therefore gratifying to note that it is generally agreed that this Conference should be followed in due course by others of the same type. In addition to such periodical conferences, which may cover the entire field, or important parts of the field of atomic energy, and which could only be held at intervals of 2 to 4 years, it may also be desirable to hold conferences of more limited scope covering specialised topics; so that the contacts and cooperation between scientists in the field of atomic energy so well established at Geneva may continue and grow. The success of this Conference demonstrates that when the nations of the world agree the scientists of the world can do their part.

Continued from page 5

water produced should be at the disposal of the Atomic Energy Commission for use or sale. Resolution 2 of the last meeting of the Board of Research on Atomic Energy given in the Appendix supports this proposal.

(10) Further steps will emerge in due course when the measures indicated above have already been implemented. It should be noted that although the administrative measures mentioned above require the allocation of considerable funds, they do not require their immediate expenditure. These measures could, therefore, be implemented immediately without incurring any large financial expenditure. They are the least steps that Government must take in order to develop atomic energy in a reasonable time and are independent of an agreement with a foreign atomic energy agency being reached, though the time that would be required to set up a pile would clearly depend on a satisfactory agreement.

APPENDIX 1

Resolutions passed at the Second Meeting of the Board of Research on Atomic Energy held in Bombay on the 9th and 10th April, 1948.

1. Resolved

that in view of the future importance of atomic energy for industry, the steps that are being taken by the small as well as the large countries to develop It, and the fact that India possesses large resources and conditions suitable for the generation and use of atomic energy, the Government be recommended to set up a small atomic pile for experimental purposes as soon as possible, and allocate for the purpose a sum of rupees fifty lakhs. A further sum of rupees thirty lakhs should be allocated for capital equipment and for fundamental research in atomic physics.

2. Resolved

that in view of the high price of heavy water, the increasing International demand for it, the need of India herself to possess considerable quantities of heavy water for her own atomic programme, and the availability of cheap hydro-electric power in the country, Government be recommended to investigate as soon as possible the feasibility of producing heavy water in India and lo take steps for setting up a plant for the same as soon as possible.

3. Resolved

that in view of the desirability of keeping secret the results of all surveys concerning minerals connected with the generation of atomic energy and mentioned in the Atomic Energy Bill the survey units which have been formed under Dr. M.S. Krishnan should be organised under the Board of Research on Atomic Energy and report direct to that Board.

Bhabha advises Prime Minister on SAC to the Cabinet

January 12, 1956

We record the following as our agreed recommendation to the Prime Minister:

1. It is desirable that the Government appoint as soon as possible a Scientific Advisory Committee to the Cabinet with the following terms of reference:

   i) To advise the Cabinet

      (a) in the formulation and implementation of the Government's scientific policy

      (b) on the coordination of scientific work between the various Ministries of Government, and between Government and semi-governmental and non-governmental scientific institutions in the country, including the scientific and technical departments of the universities

      (c) on scientific and technical cooperation with other countries, and with international scientific and technical organisations

      (d) on such matters as may be referred to it.

   ii) To place before the Cabinet such proposals and advice as may improve and develop scientific and technical work in the country.

   Under the terms of reference i)(a)the Committee will advise the Cabinet interalia on such matters as the policy regarding scientific and technical education and research, scientific man-power, the terms and conditions of service of scientific and technical personnel, and the policy regarding the procedures to be followed in running scientific institutions and laboratories.

   Under the terms of reference i)(c)the Committee will advise the Cabinet interalia on the constitution of National Committees in various subjects and their functions, and on the policies to be followed in relation to international scientific bodies, etc.

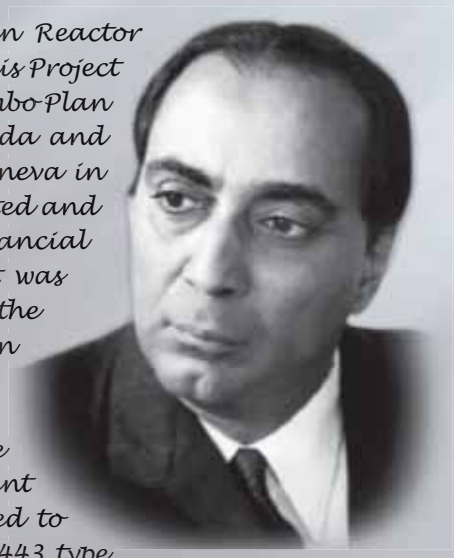
2. The Prime Minister should be the Chairman of the Committee, which should meet in general three to four times a year. The Committee should not be in any Ministry of Government, and should be attached to the Cabinet Secretariat. The Cabinet Secretary should be a member of the Committee, and preferably its Secretary, so that the decisions of the Committee can be sent out to the various Ministries for implementation over his signature. All other members of the Committee should be eminent scientists or engineers who are connected with the implementation of various aspects of Government's scientific policy. It is for consideration by the Prime Minister whether any other Ministers should be members of the Committee. The Committee will draw up its own rules of procedure.

Proposed List of Scientific Members

1. Dr. H.J. Bhabha, F.R.S., Chairman, Atomic Energy Commission, and Secretary, Department of Atomic Energy
2. Dr. V.R. Khanolkar, Director, Indian Cancer Research Centre
3. Dr. D.S. Kothari, Scientific Adviser to the Ministry of Defence
4. Dr. K.S. Krishnan F.R.S., Director, National Physical Laboratory
5. Professor P.C. Mahalanobis, F.R.S., Statistical Adviser to the Cabinet
6. Dr. B.P. Pal Director, Indian Agricultural Research Institute
7. Dr. C.S. Pandit, Secretary, Indian Council of Medical Research
8. Dr. M.S. Thacker, Director of Scientific and Industrial Research

Mode of dealing with the Canadian-Indian Reactor Project

April 16, 1956



Certain points need to be clarified regarding the Canadian-Indian Reactor Project, and how it is to be handled at the Inter-Governmental level. This Project is not a normal Colombo Plan project. In fact it started outside the Colombo Plan in the course of correspondence between the Prime Ministers of Canada and India, and was brought to fruition in the course of discussions in Geneva in August last year between the scientists of Atomic Energy of Canada Limited and of this Department. The approval of the Government of India to the financial commitments involved was obtained directly through your orders- it was made clear to me by the Secretary of the Department of Finance of the Canadian Government, when I visited Ottawa last year, that the Canadian financial allocation for this plan would be outside the normal Colombo Plan funds and this has been stated in the correspondence on the file. Moreover, about half the cost of the entire project is being borne by the Government of India as part of its normal expenditure on the development of atomic energy- it will be recalled that it had already been decided to spend a sum of approximately Rs. 3 crores on a reactor of the British E443 type which had nothing whatsoever to do with the Colombo Plan, when the offer of the NRX Reactor came from Canada, it was decided to go in for the NRX Reactor instead of the E443 Reactor, because this is a much more powerful research tool. It is, therefore, desirable that the Prime Minister should record a decision that while this Project has been put within the Colombo Plan framework for certain reasons of convenience, it is not and should not be treated as a normal Colombo Plan Project.

2. If this decision is taken, then it is clear that the Project will have to be handled by the Department of Atomic Energy, not only at the technical level but at the Inter-Governmental level, and the Agreement will have to be signed on behalf of India as the Secretary of this Department. This would be in line with the Agreement with the United States Atomic Energy Commission for the purchase of heavy water for this same reactor which was recently signed by me on behalf of India on your instructions,

3. Unless the action proposed above is taken, all Inter-Governmental correspondence will have to be routed through the Department of Economic Affairs of the Ministry of Finance. The Canadian-Indian Reactor is a highly technical project, and this Department has been in continual touch with Atomic Energy of Canada Limited from the very beginning about a host of technical details concerning the design of the reactor, the cooling system, the choice and training of staff, etc. There is clearly no advantage in routing all this correspondence through the Department of Economic Affairs. Indeed it will only slow down the entire process.

Homi J. Bhabha

Prime Minister

Architects for Atomic Energy Establishment

June 18, 1956

A site of some 1200 acres has been acquired for the Atomic Energy Establishment at Trombay, which is bounded on one side by Trombay Hill and on the other by the waters of the Bombay Harbour. The main site is virgin and has no buildings on it. The Establishment will have 23 large and small buildings on it for laboratories, library, administration, workshops, etc., as shown on the attached sheet (this does not include atomic reactors). It is estimated that these buildings will cost between Rs 2 and Rs 3 crores, and a sum of Rs 3 crores has been provided for the purpose in the Second Five Year Plan of this Department. The above unique circumstances present an opportunity for developing an architectural project which is not only functional and efficient but of architectural significance, reflecting the developments of the age we live in. There is indeed an obligation on the Department to do the best it can and to see that this opportunity is not missed.

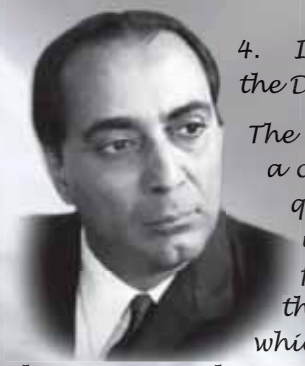
2. Accordingly, this Department put up the proposal that the following five well known architectural firms be invited to prepare a site plan showing the location and grouping of the various laboratories and buildings and also to suggest the general architectural concept which will run through the entire architecture:

1. Mr. D.S. Bajpai
2. Messrs Bhuta and Associates
3. Messrs Kanvinde and Rai
4. Mr Rustom B.J. Patel
5. Messrs Polk and Stein

It is proposed to pay each architect or firm an honorarium of Rs 3,000 for the time and labour spent. The architect or firm whose proposal is accepted will receive a prize of Rs 10,000. However, in view of the magnitude of the project, it is likely that each of the above firms will be entrusted with the designing of at least one of the buildings of the Establishment on the lines decided on by the Department, and in that case the honorarium of Rs 3,000 will be merged in the fees. The only additional expenditure involved in this proposal is the prize of Rs 10,000 which should not be merged, since this would otherwise place the winning architect on the same footing as the others. Thus, the minimum expenditure involved in this proposal is Rs 10,000 and the maximum Rs 22,000 (in the unlikely event of none of the buildings being given to the other four architectural firms which do not win the competition). The Indian Institute of Architects has laid down that for designing work involving the preparation of preliminary sketch designs to indicate the architect's interpretation of the client's instructions a charge of up to 1% of the estimated cost of the project may be made. On a project of Rs.3 crores 1% would amount to Rs 3 lakhs, and the expenditure proposed is therefore exceedingly modest, being well below 1/10th of this and probably as low as 1/30th of 1%.

3. The Ministry of Finance have turned down the proposal (without it being seen by the Finance Secretary, who is on leave) on the following grounds:

> "3. We have not hitherto dealt with a similar proposal. The architects are usually paid fees at a certain percentage of the expenditure. Generally the procedure followed is that a number of architects are called upon to submit the plans, designs, etc. Just as tenders are called for a work. From the plans, designs etc. submitted by different architects the Department chooses the best. Just as no honorarium is paid to a tenderer no honorarium is paid to an architect also. I have ascertained that no such honorarium is paid by the C.P.W.D. Similarly no prize is also given to the architect whose plan and design are accepted, as the successful architect will be remunerated by the fees fixed for the purpose.



4. In the circumstances we regret we cannot accept either of the proposals made by the DAE."

The comparison between, asking a number of architects to submit designs with a calling of tenders by contractors is clearly misconceived. The tenderer merely quotes for work he offers to do in future, while the architect actually does work in submitting preliminary designs and is therefore entitled to receive payment for it. Moreover, anyone who has any experience of intellectual activity knows that the conception of an architectural project is the most important part of it in which the architect's real merit is shown, whereas the working up and execution of the designs can often be left to juniors and subordinates, t consider it wrong to exploit or compel professional men to do work without legitimate payment, and the Department should not set a bad example in this regard. It is said in the Finance Ministry's note that no such honorarium is paid by C.P.W.D. This may be one of the reasons why C.P.W.D. work is architecturally so insignificant. The general tendency in India today to employ civil engineers instead of architects or to under-estimate the role of architects is also probably one of the causes why architecture, which was one of the glories of Indian civilization In the past, has now sunk into complete insignificance, and why hardly a reference, if any at all, is found to modern Indian architecture in any international books on architecture,

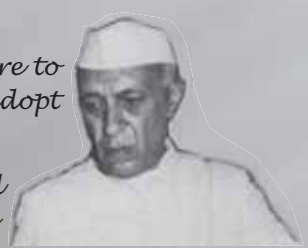
4. As it is desired that the layout of the entire site and the preliminary designs indicating the general architectural concept should be ready before the end of July, it is necessary that this preliminary work should be entrusted to the five architectural firms immediately. I am, therefore, placing this proposal before the Prime Minister, so that if he approves, we will proceed on the lines indicated in Paragraph 2, involving an expenditure not exceeding Rs 22,000 and probably in the neighbourhood of Rs 10,000. The papers will then be sent back to the Finance Ministry for ex-post facto sanction.

H.J. Bhabha,

Prime Minister

June 19, 1956

Nehru's identical views



I have read this note. I think there is much truth in what Dr. Bhabha says. If we are to have any improvement in our present low level of architecture, we shall have to adopt other methods than those of the Central P.W.D.

2. Recently, the Buddha Jayanti Committee decided to put up some memorial in Delhi to celebrate the Jayanti. The Committee asked for designs from architects all over the world and offered three prizes. I think the first prize was rupees ten thousand, the second five thousand and. probably, the third three thousand (I am not quite sure about the figures). They appointed assessors. The assessors selected the first three prizes. As a matter of fact, when we saw these recommended designs, we did not approve of any of them. The designs were good in many ways and were original, but they were much loo ambitious, and we wanted a much simpler one. Nevertheless, we had to pay these prizes. I merely mention this to indicate that prizes were offered for the best design to be chosen and even for those that we did not choose.

3. I do not think that the proposal of Dr. Bhabha involves any marked additional expenditure considering the size of the project, It is likely to result in much better buildings, I would, therefore, approve of it.

J. Nehru
19.6.1956.

Dr Homi Bhabha

In view of para 4 of my note and para 3 of P.M.'s minute, we may proceed with the architects as proposed in para 2 of my note. They may be informed accordingly.

The file may then be sent back to the Finance Ministry with the request that the matter be reconsidered for the reasons explained in para 3 of my note, and bearing in mind the comments made by the P.M.

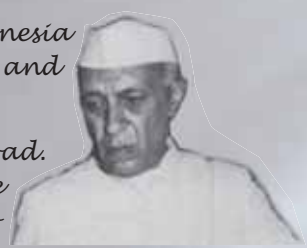
H.J. Bhabha

21.6.56

Prime Minister to Dr. Bhabha about International Conference

New Delhi July 29, 1956

My dear Homi,



I met your Atomic Energy guests from Burma, Egypt, Ceylon, and Indonesia yesterday and had a talk with them. They appeared to be satisfied with their visit and the work they had done at your Conference.

I have just received a paper containing your programme for your visit abroad. This shows that you will be in Austria on the 9th to the 11th and then for some weeks on leave. Would it not be possible or desirable for you to pay a brief visit to Yugoslavia from Austria? You will be quite near and it wilt be easy to go there. You have wanted to visit Yugoslavia for some time past.

I have not yet seen your note about the composition of the Indian delegation to the international. Conference to consider the draft statute of the International Atomic Energy Agency. I shall await that. Meanwhile, the question that arises is as to how far this Conference will consider political questions or purely technical and scientific ones. I find that some of the other major countries are sending non-technical people as leaders of their delegations. It would probably be advisable for you and your scientific colleagues not to get mixed up too much with the political aspects.

Perhaps I might be seeing you on the 1st August in Poona. That will have to be rather late at night, because I am engaged the whole day.

Yours sincerely,

Jawaharlal Nehru

Dr. Homi J. Bhabha,

Secretary, Department of Atomic Energy,

New Delhi.

Bhabha writes to Nehru on Government Rules

July 31, 1956

Our scientists who have built the Swimming Pool Reactor at Trombay have worked exceedingly hard and long on bringing it to completion, in the face of heavy odds and numerous unforeseen difficulties.

2. During the last few days they have invariably worked till late at night, and on several occasions right through the night. Trombay is about an hours drive from the Fort, and our canteen at Trombay has not commenced operation. The loading of the reactor is a difficult operation, and a mistake may seriously set the project back. It is clear that, in the circumstances, everything should be done which should relieve the physical strain. I have, therefore, ordered:

(a) that two cars should be put at their disposal on a 24-hour basis, which win take them from their residence to the place of work at Trombay and back at any time they consider best from the point of view of their work, and

(b) that lunch and dinner supplied by an appropriate restaurant shall be provided for them at Trombay in the reactor building.

3. Both (a) and (b) are not permitted by Government regulations, and I therefore wish to have the Prime Minister's approval for the action taken. Incidentally, this provides an example of the way in which the present rules and regulations of Government are not really suited for executive work which is to be done at speed and under pressure. I have put up a separate note to the Prime Minister requesting his orders on the manner in which the Atomic Energy Establishment is to be set up.

Prime Minister

Add-on to above

Since the above was written, the group worked upto 3 a.m. on Tuesday morning. Our group of scientists concerned, Mr. Allardice and I started again at noon on Tuesday (yesterday) and worked continuously through the night till 7 a.m. this morning. It would be unreasonable to try and apply Govt. rules to groups & departments which work like this. The result will only be to reduce output and enthusiasm.

H.J. Bhabha

1.8.56

Prime Minister agrees

August 1, 1956

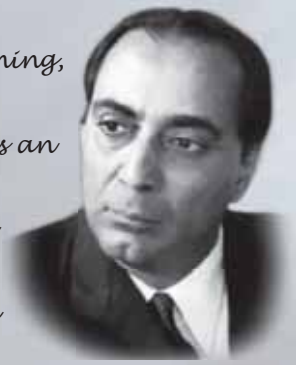
I agree.

J. Nehru

1.8.56

India's first atomic reactor becomes critical : Bhabha writes to Nehru

August 4, 1956



My Dear Bhai,

I send you with this letter a copy of the press note which I released this evening, with the photograph of the reactor. You saw it the other day.

When I got home at seven this evening, my mother told me that there was an announcement on the subject from you.

I conveyed your congratulations to our young men. They richly deserved them, as they worked with real devotion and enthusiasm.

I had had to delay my departure by a day, due to the starting up of the reactor. I am now leaving on the evening of Monday the 6th August.

Au revoir

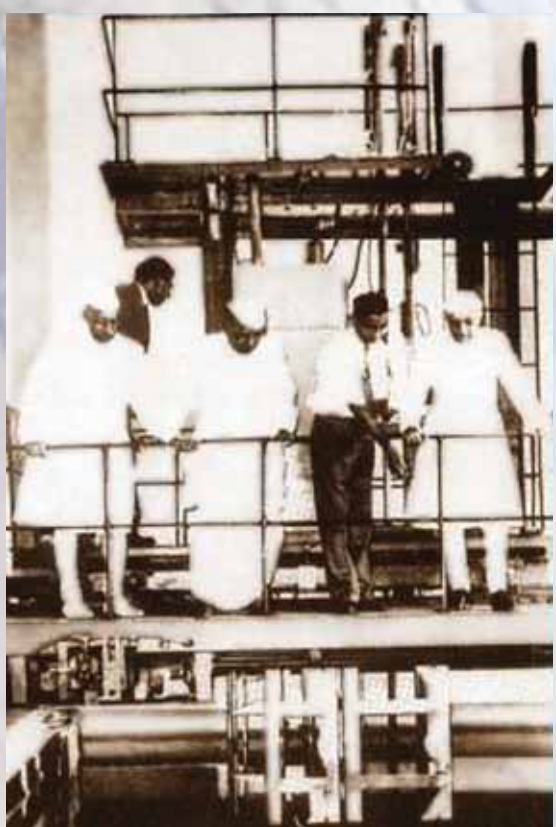
Yours ever

Homi Bhabha

Pandit Jawahartal Nehru
Prime Minister,
Government of India,
NEW DELHI.

P.S. After the above was dictated, I received your telegram yesterday evening. Thank you very much for it. I am circulating it to our young men. I am sure it will spur them to greater efforts.

Homi



Nehru watching APSARA during his visit on January 20, 1957

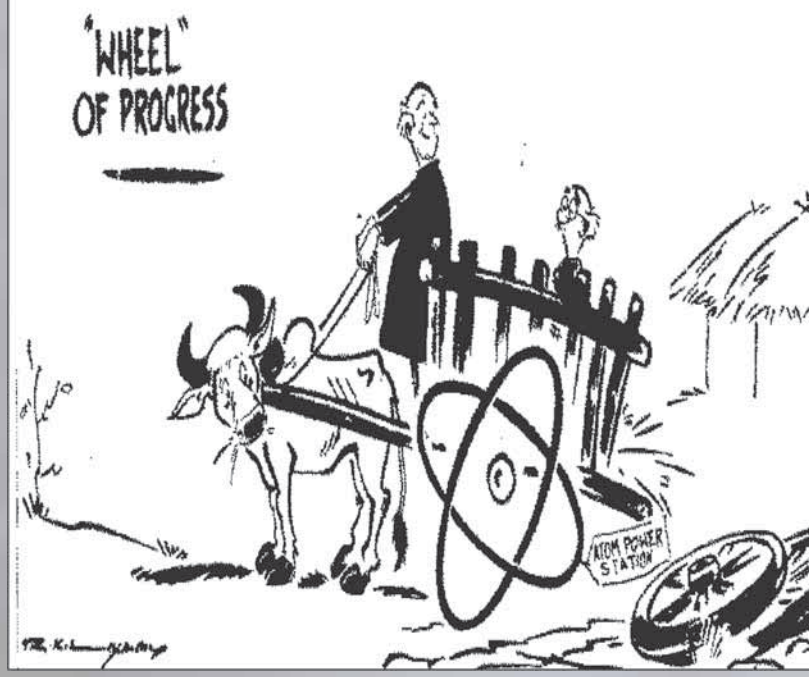
APSARA Reactor

PRESS NOTE

August 4, 1956

India's First Atomic Reactor

At 3.45 this afternoon, August the 4th, India's first atomic reactor went into operation, or to use the technical phrase, became critical. This means that the reactor released atomic energy for the first time through a self-sustaining chain reaction. The loading of the enriched uranium fuel elements started on Sunday evening. The first trial run was started on Monday evening.



Cartoon by R. K. Laxman showing Nehru Piloting India in to the Atomic Age

The decision to build this reactor was taken by the Atomic Energy Commission at its meeting on March 15, 1955. Various different designs for the shape of the pod and the experimental facilities were discussed by a committee consisting of Mr. Prasad, Dr. Ramanna, Mr. Rao and Dr. Singwi. Two possible designs for the pool were considered, one in which the reactor moves horizontally in a rectangular tank, and the other in which it moves in a vertical cylindrical well. The possibility of combining horizontal and vertical movements were also considered. It was finally decided to adopt the design with horizontal motion, as this provided the diverse experimental facilities which were needed for this reactor.

The basic design was finally frozen in July 1955. The Reactor Control Division, under Mr. A.S. Rao, has designed and built the entire control system, while engineering drawings for the reactor were prepared by the Engineering Division under Mr. N.B. Prasad, which also supervised its construction. The reactor is the result of the joint effort of some fifty scientists and engineers of the Atomic Energy Establishment.

The reactor, which is housed m a hall 100 feet long, 50 feet wide and 70 feet high, is of the swimming pool type, and consists of a rectangular concrete tank 28 feet x 10 feet and 28 feet deep, with massive concrete walls SVz feet thick, The reactor is immersed in this pool of water, hence the description 'swimming pool type'.

The core of the reactor is approximately a cube of two feet side, which is suspended by a rigid frame from a trolley above, which moves on rails mounted on the sides of the pool. The core consists of from 25 to 30 fuel elements containing the fissile material uranium 235 in the form of a sandwich. Each thin plate of uranium 235 aluminium alloy is sandwiched between two plates of aluminium. The fuel elements can be removed or placed in position by long aluminium rods operated from the trolley above.

When in operation, the fuel elements generate heat through fission, and are cooled by the water, which also acts as a 'moderator' for slowing down neutrons, and provides the necessary protection to the personnel against radiation. The reactor is provided with a number of automatic safety devices, which shut it down in a fraction of a second if one of a number of danger signs appears. For example, it will shut down if the electric power fails, or excessive heat is generated, or certain instruments fail. The reactor is of a type described as inherently safe Even if all the automatic controls were to fail, and the reactor were to run away, the excessive generation of heat would convert the water into steam, and the reactor would automatically shut down, because there would be no water left to slow down the neutrons.

The concrete shield is pierced by a number of holes, known as experimental channels, which extend towards the core of the reactor, Neutrons flow down these channels from the core, to be used for experiments. In these experimental channels materials can be placed for irradiation and later studied for the effects of radiation. Radio-isotopes can also be produced.

In addition to the experimental channels, there is, at one end of the reactor, an opening 6 feet square, known as the thermal column, filled with graphite blocks of nuclear purity, which contain less than half a part per million of boron. At the other end of the reactor, facilities have been provided for shielding experiments. At this point the 8 foot thick concrete shield is replaced by a two inch aluminium wall behind which the concrete blocks are mounted on heavy trolleys. When the protective properties of some material is to be tested, the blocks are replaced by this material and the reactor is moved against the aluminium wall. The information so obtained is of use in designing shielding materials for more advanced types of reactors.

The fuel elements for the reactor have been provided by the United Kingdom under an agreement signed in October last year between the United Kingdom Atomic Energy Authority and the Department of Atomic Energy. The fuel elements were flown out in separate batches, a few at a time, and were stored in separate rooms for safety, till they were loaded into the reactor.

The completion of the reactor was delayed by several unexpected difficulties. The special paint with which the sides of the pool have to be painted was brought out on a cargo boat, which was two months late in arriving. Finally when it reached Bombay Harbour, the paint could not be unloaded for ten days because of congestion in the Port and Stormy weather. When the fuel elements came to be loaded in the reactor a few days ago, it was found that they would not fit because they had got slightly deformed in transit, and had to be straightened out. Considerable delays were also caused by the fact that the building to house the reactor was not ready on time. Despite ail this, it has taken just about a year to design and build the reactor.

The loading of the fuel dements started on Monday evening and was continued till 1 a.m. The first trial run was started on Tuesday evening with the loading of more uranium fuel elements. The neutron flux gradually rose, but by 7 a.m. on Wednesday morning the reactor had not yet become critical. The scientists worked on Thursday to change the disposition of the fuel elements and the control rods, and the second run was started at 5 p.m. on the 3rd. The team worked right through the night, but by 10 a.m. no chain reaction had been achieved. A further rearrangement of the fuel elements was carried out, and at 3.45 this afternoon the reactor became critical. The scientists and engineers had worked without a break for nearly 24 hours.

As soon as the reactor had reached criticality, Dr. Bhabha telephoned the information to the Prime Minister, who is also the Minister for Atomic Energy. The Prime Minister asked Dr. Bhabha to convey his congratulations to all concerned.

To mark the successful completion of the Project, Dr. Bhabha sent the following message to Sir Edwin Plowden, the Chairman of the United Kingdom Atomic Energy Authority and Sir John Cockcroft, Director of the Atomic Energy Research Establishment at Harwell.

"Our Swimming Pool Reactor reached criticality on August 4 and is operating satisfactorily. On behalf of the Department of Atomic Energy I have pleasure in thanking the United Kingdom Atomic Energy Authority for supplying the enriched uranium fuel elements for this reactor and for the friendly cooperation of their scientists at Harwell. We hope that the successful completion of this project merely marks the beginning of a steadily growing collaboration between the Authority and the Department in Developing the peaceful uses o1 atomic energy to the mutual benefit of both."

In reply the following cable was received from Sri Edwin Plowden and Sri John Cockcroft.

"We send our congratulations on the successful completion and operation of India's first reactor

The work of both our countries on the peaceful uses of atomic energy will gain yet further in importance as time goes by. We too hope and expect that as it does so the fruitful collaboration that there has been on your first reactor will continue and increase."

The reactor will be used for training personnel for the bigger and more complicated reactors, which are to come, for experiments in physics and for making radioactive isotopes for research in agriculture, industry and medicine. India will make the facilities of this reactor available to scientists of countries in this region and beyond.

Homi Bhabha with the British physicist Cockcroft

'Very happy returns of the day' : Dr. Bhabha to Pandit Nehru

November 14, 1956

IMMEDIATE STATE

PANDIT JAWAHARLAL NEHRU

PRIME MINISTER

NEW DELHI

VERY HAPPY RETURNS OF THE DAY AND MANY YEARS OF GOOD HEALTH TO ENABLE YOU TO FULFIL YOUR ASPIRATIONS TO LEAD THIS COUNTRY FIRMLY ON TO THE ROAD OF PROGRESS AND TO SEE THE ESTABLISHING OF A SECURE PEACE IN THE WORLD

HOMI BHABHA

Prime Minister replies

November 17, 1956

I am deeply grateful to you for your kind and generous message of good wishes on the occasion of my birthday anniversary. The affection and goodwill that I have received are overwhelming and I do not know how I can adequately thank my friends for them or live upto them.

Jawaharlal Nehru

New Delhi
November 17, 1956

Significance of the Atomic Revolution*

January 20, 1957

Speech of Pandit Nehru at the opening of the Atomic Energy Establishment and naming of the first Swimming Pool Reactor, APSARA, at Trombay. Bombay, on January 20, 1957

Both the Governor and Dr. Bhabha have expressed their thanks to the representatives of various countries and their Atomic Energy Establishments who have come here from far distances. I should like to add my own feelings of gratitude to them for they have come from long distances at relatively short notice. Some of them connected with their own big Atomic Energy Establishments will no doubt ind this 'small fry' because they are used to something much bigger. But I have no doubt they will appreciate that in the conditions that exist in India and Asia the work that has been done here has some significance.

We are told and I am prepared to believe it on Dr. Bhabha's word that this is the first atomic energy reactor in Asia, except for possibly the Soviet Union. In that sense, this does represent a certain historic moment in India and, if I may say so, in Asia. Nothing has been happening particularly today or now and this is only a ceremony a formal ceremony for inauguration of something which really has been happening and going on. Nevertheless, it is a recognition of what has been going on and what is likely to take place in the future. And, therefore, it has a considerable importance.

We in India, and in a greater or lesser degree in other countries in Asia, are involved and have given a great deal of thought to the scientific and industrial development, to raising the standard of living of the people naturally, that is our major task. And almost everything that we do, our Five Year Plans and the rest, revolve round that single question. Some people may think that this development of atomic energy is not directly related to that, at any rate in the present. Well, perhaps not!

Few things that we do produce results immediately. Dr. Bhabha has given you some figures showing how important it is for India and for most other countries to develop this. In any event, whether we like it or not, it is quite inevitable that we do it, just as it became inevitable when the Industrial Revolution came to the world, that it should go ahead whether people liked it or not. So this Atomic Revolution, if I may call it so, has something in the nature of inevitability about it. Either you go ahead with it or you succumb and others go ahead, and you fall back and gradually drag yourself along in the trail of others. Well, that of course is not good enough and we should like every country to contribute its quota, some more, some less. I said just now that this moment has a certain historic significance. I am rather used sometimes to thinking in terms of historical perspective. I cannot look very far ahead because the change in things and the tempo of events is very rapid nowadays. Indeed, in my lifetime, much has happened which few people dreamt of. I am not sure that much that has happened in the name of progress is very admirable. Sometimes doubts arise. And yet whether it is admirable or not it is inevitable, and one should be able to make it admirable by giving it the right turn.

As I stand before you here, with this Swimming Pool Reactor behind me and in front of you, I have in front of me the Island of Elephanta, not far away, which represents something that happened about 1300 years ago. It still exists and people go to see it, even the distinguished scientists who have come for this function. Because presumably it represented and represents something of lasting value and significance. Well, 1300 years or so lie in between these works in the Island of Elephanta, and this Swimming Pool Reactor which represents this middle of the 20th century. Both, I take it, have their place and any person who ignores either of them misses an important element of life. I do not suppose humanity can live on reactors alone. Presumably, they want something else, too. Certainly, they cannot live on Elephanta alone; something else is wanted. So, in a sense, it is the combination of Elephanta and the Swimming Pool Reactor odd as it may seem that might produce a proper balance in life. Not Elephanta as it is but something that it may represent the artistic values and cultural traditions which have lasted.

I am happy to be here not because I know very much about atomic energy or reactor in spite of numerous attempts Dr. Bhabha and Dr. Krishnan have made to educate me. But, without understanding the intricacies of these mysteries, at any rate, I hope I have some conception of the broad consequences of these things and of the importance in this world of ours of the release of this great power.

In the old days, the men of religion talked about the mysteries. In Greece, there were the mysteries in Greece and elsewhere and the high priests who apparently knew about these mysteries exercised a great amount of influence on the common people who did not understand them. In every country that was so. The high priests in those days possibly dominated the thinking of many countries with their mysterious functions and ceremonials and rituals.

Now we have these mysteries which these high priests of science flourish before us, not only flourish but threaten us with; and at any rate make us either full of wonder or full of fear. Whatever it is, we have got these new mysteries of science, and of the higher mathematics, which are unveiling various aspects of the physical world to us. No one knows where this will go to. Some

* ***Courtesy: 'Jawaharlal Nehru on Science and Society' Edited by Professor Baldev Singh***

people may be frightened of this but in the ultimate analysis one should never be frightened of the truth whatever it may be. You cannot suppress truth; you cannot suppress the desire of man to discover, to progress, to find out, to unravel even though it may sometimes land him in very dangerous situations. You cannot stop the progress of the human mind or humanity. If by chance it takes the wrong turn well, it suffers the consequences. Therefore, it is no good Saying, "Stop this business." You cannot stop it. Certainly, it is good saying that this business has to be organised in such a way as to bring good to the world and not evil. That one can understand and one can try for. And I believe people in every country in the world, and more especially those countries which are advanced in the art and science of atomic energy development, realise this. Even they cannot possess this tremendous power which is ever growing without also realising that things as they are today make a war, in which these atomic weapons are used, out of the question. A global war in which this kind of what is called a strategic use of atomic weapons is made, is out of the question. Some people daily with the idea of what is called the tactical use of these weapons. Well, I do not know much about these matters, but it seems to me a little dangerous to play about in this way when you realise that the bigger use of it must be forbidden because it will bring disaster to everybody. Hence, the importance of the talks that go on from time to time of controlling the use of this great power. You have to think in larger terms of disarmament. It is a very difficult subject. I know, and this is no occasion for me to talk about it. But I believe that in spite of the apparent and real difficulties, people's minds and the minds of those who control the destinies of nations are beginning more and more to take what I may venture to say a 'realistic' view of this situation. And let us hope that they will arrive at some decision which will put an end to this terrible fear that these weapons might be used. Indeed, this itself will be helpful in controlling the use of any weapons of large-scale destruction.

So far as India's development of atomic energy is concerned, we are at the beginning of this journey, although I believe we have done rather well in the last few years. I can say so without hesitation because other people have endorsed it. It is not I or what the Governor might say. And I should like to congratulate those responsible Dr. Bhabha, Dr. Krishnan of the Atomic Energy Commission and even more than these leaders, all the young men and women in our Atomic Energy Establishment who are working here and doing such good work. It is really when I see them and talk to them and see not only their enthusiasm but their informed enthusiasm, their trained minds, that I realise what very good material we have got. And the future becomes much more assured not because of these buildings we put up of cement and steel but because of the human material that one sees doing this work. So, I should like on this occasion specially to congratulate them on the work they have done, because it is really their work, the result of their work which you see here. We are not of course in the slightest degree reluctant to take advice or help from other countries. We are grateful to them for that help, which they have given and which we hope to get in future because of their longer experience and other facilities. But, it is certainly to be remembered by us that this thing that you see, this Swimming Pool Reactor in front of you, is the work practically entirely of our young Indian scientists and builders- Having said that, I should like, as Dr. Bhabha has done, to express my gratitude to the countries which are advanced in atomic energy work and who have been generously helping us. Indeed, we have received help from any number of them. Presently, you would see what is called the Canada-India Reactor which is being built an imposing and forbidding sight which is due to the generous help of the Canadian Government. You have learnt of the continuous help we have had from the Atomic Energy Establishments of the United Kingdom, of the United States, and of the co-operation we had with France. With the Soviet Union also there has been co-operation in this matter which, no doubt, will develop in future. So, I should like to express my gratitude to all these countries.

We have built this Atomic Energy Establishment here not only to help ourselves but as a centre where we can store such knowledge and experience as we possess, and that this establishment might offer these to people of other countries of Asia or round about. And I believe some have expressed their willingness to take advantage of this. But I should welcome the association in these training facilities of people from countries which do not possess them, more especially in Asia and may be in parts of Africa. So, I should like to express my happiness today. But with that happiness, whenever one thinks of atomic energy, it is quite impossible not to think of the possibility of this development taking a malevolent and evil turn, to which I referred.

No man can prophesy the future. But, I should like to say on behalf of my Government and myself and I think that I can say with some assurance on behalf of any future Government of India that whatever might happen, whatever the circumstances, we shall never use this atomic energy for evil purposes. There is no condition attached to circumstances, because once we attach any condition, nobody knows what the conditions might be and the value of such an assurance does not take us very far. Now, I have had my say and I gladly formally declare this Atomic Energy Establishment Open. But one thing more. It has been suggested that we should give a suitable name to the Swimming Pool Reactor- In the course of the afternoon here, while we were having tea, this

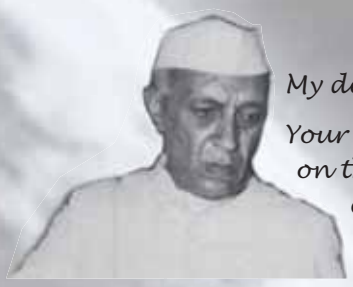
important subject was discussed. Dr. Krishnan from the fund of his knowledge of Sanskrit lore suggested various names. Dr- Bhabha pondered over it; the Governor who is also a Sanskrit scholar, was consulted, and so we thought this was an appropriate moment to name this particular Swimming Pool Reactor, It may be that when you hear the name we are suggesting it may surprise you a little. But, on further thought, you will see how very appropriate it is. The name really belongs to a beautiful damsel. The name we suggest for it is APSARA which, you know, means a celestial damsel or a water nymph. This is Swimming Pool Reactor and APSARA is specially connected with water. Therefore, it is appropriate. So, I am sure with your approval, I name this Swimming Pool Reactor APSARA.

Pandit Nehru Inaugurating AEET

Pandit Nehru and Dr. Bhabha at the Inaugural of AEET

Meeting of the Committee for Atomic Energy

March 12, 1958



PRIME MINISTER'S HOUSE
NEW DELHI

My dear Homi,

Your letter of March 11. It is true that I am going to Bombay on the 27th and returning on the 28th. I have already fixed up the morning of the 28th and I do not see how I can fnd time lo visit Colaba on that occasion.

It would be good if you addressed our M.Ps. when you come here. I am trying to arrange a meeting of the Committee for Atomic Energy at 5 p.m. on the 20th March. At 6 p.m. you can address all the M.Ps.

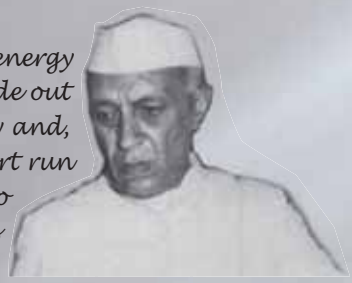
Yours sincerely,
Jawaharlal Nehru

Dr. Homi J. Bhabha,
Secretary,
Department of Atomic Energy,
New Delhi.

Nehru confides with Bhabha

July 30, 1958

My Dear Homi



Thank you for your letter of July 29th and your note on the contribution of atomic energy to a power programme in India. I have read the marked passages in the note. You have made out a very good case for the development of a power programme from the use of atomic energy and, for my part, I believe that this is desirable. But, however desirable in the long run, the short run cannot be ignored. We are, as you know, in a terrible fix about our foreign exchange and to some extent even our internal resources. We are trying to raise very large sums of money as loans in countries broad. This is difficult enough, and I do not know if we shall get them. Even if we get them, we have to pay a heavy interest on them for many years. Thus, we shall have to carry a great burden for the next seven to ten years.

We do not want our third Five Year Plan to be cut down, as that would be most unfortunate. But we are hard put to it to find out where we will get the resources for it. Only today, we were discussing at some length the absolute necessity of spreading primary and compulsory education to ail our children. We cannot fulfil the directions given in our Constitution which are that by 1961, every boy and girl up to the age of fourteen should have free and compulsory education. This is utterly beyond our reach during this period. So, we are thinking of increasing the period by five years, to 1966, and reducing the age limit to eleven. Even after doing this, we require a minimum additional sum of Rs. 350 crores.

This is just one item I have mentioned to you. It has been a frustrating experience to go and ask for money from other countries. They enquire: are you going to be equally ambitious in your third Five Year Plan and then come again for loans in the big way? It is clear that we cannot repeat this performance of asking for big loans.

I am mentioning this to you to point out the very real difficulties we have to face.

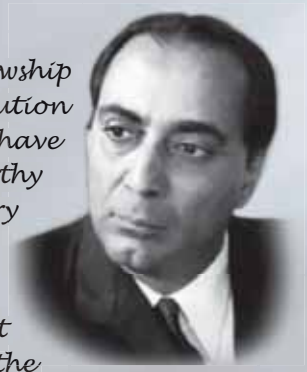
You say that you will be coming to Delhi in a few days' time, but do not mention the date. I shall certainly attend the meeting of the Planning Commission when this matter is discussed, provided I am in Delhi. As the proposed Summit Conference is not likely to materialise, I expect to be here. I am going out of Delhi, however, on the 1st and 2nd August.

Dr. Homi J. Bhabha,
Secretary,
Department of Atomic Energy.

Yours sincerely,
Jawaharial Nehru

'This is the Highest token of our regard for you' Chairman invites Prime Minister to accept an honorary fellowship of TIFR

July 31 1958



My dear Bhai,

Under its Rules and Bye-Laws the Council may confer the Honorary Fellowship of the institute on eminent scholars in recognition of their distinguished contribution to knowledge in subjects in which the Institute is interested, or on persons who have rendered eminent service to the Institute, or on persons who have made a noteworthy and lasting contribution to the cause of fundamental research in India. Honorary Fellows enjoy such privileges as may be decided by the Council from time to time.

It is with the greatest pleasure that I write to say that the Council has asked me to invite you to accept an Honorary Fellowship of the institute. This is the highest token of our regard for you and for your noteworthy and lasting contribution to the cause of fundamental research in India, which it is in our power to offer. I hope very much that you will be able to accept it.

The privileges of an Honorary Fellow are given on the attached sheet.

Yours ever,
Homi Bhabha

Shri Jawaharlal Nehru,
Prime Minister,
NEW DELHI

Privileges of an Honorary Fellow:

1. Free access to the Institute, in particular to its Library and public rooms, consistently with the prevailing Rules and Bye-laws.
2. The option of being in residence at the Institute for one month every year, a sum not exceeding Rs. 1,500 being payable towards the expenses of such residence, without reference to the income of the Fellow.

'I have little choice in the matter' Nehru

August 3, 1958

PRIME MINISTER'S HOUSE
NEW DELHI

My dear Homi,

Your letter of July 31. Since the Tata Institute of Fundamental Research, no doubt at your instance, has done me the honour to invite me to accept an Honorary Fellowship of the Institute, I have little choice in the matter. If you so wish it, I shall accept it.

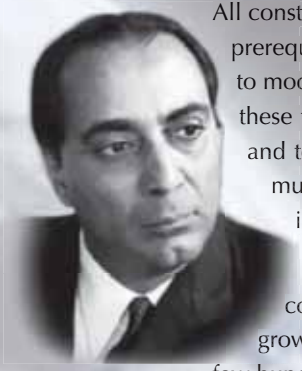
Ever yours,

Jawaharlal Nehru

Dr. Homi J. Bhabha,
Director,
Tata Institute of Fundamental Research,
Apollo Pier Road,
Bombay - 1.

Bhabha's speech at the Sixth international Conference on Planned Parenthood

February 14, 1959



All constructive activities are, or should be, aimed ultimately at promoting the welfare and happiness of people. A prerequisite of this general aim is the provision of minimum physical conditions of life for the people according to modern standards of food, housing and health. The standards that we have come to consider as necessary in these three respects today can only be achieved on the basis of a widespread application of modern science and technology. Anyone who is concerned with providing a base for the physical necessities of modern life must automatically enquire what population he has to provide for, and he is, therefore, brought face to face immediately with the problem of population, and in some case of population growth.

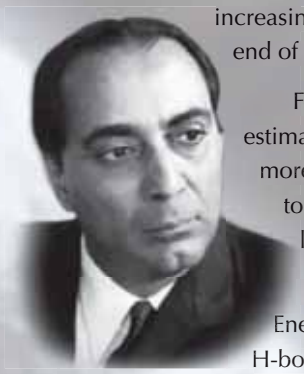
One of the basic facts of biological history is that the human species, since its first emergence, has continuously multiplied and spread itself over the surface of the globe, but there are many facts about the growth of the human race which we do not understand. It is estimated that the population of the world was a few hundred million in 1 A.D. It may have been less than 300 million. There appears to have been no remarkable increase till about the middle of the 17th century. Thereafter, the population appears to have increased rapidly in parts of the world as remote from each other as Europe and China, it is estimated to have reached 1500 million in 1900, some 2000 million in 1930, and over 2700 million in 1956. It is expected that it will be between 3500 and 5000 million by the end of the century. A growth rate of 1.6% per annum corresponds to a doubling period of under 70 years.

We have to ask ourselves how long the world can support such an increase in the world population without facing a crisis in the supply of essential materials. So far, industrialisation has proceeded on the basis that most of the materials needed for it are available on demand. This state of affairs will not continue indefinitely. Professor A.M. Bateman has pointed out "that the rise of the industrial age has so accelerated the demand for minerals that the world has dug, and consumed, more of its mineral resources within the period embraced by the two World Wars than in all preceding history. This Insatiable demand for minerals to feed the hungry man of modern Industry has made sources of supply that we used to think were adequate, now look relatively trivial, and sources capable of meeting large demand are yearly becoming fewer and fewer. It is now realized that adequate supplies in large quantities are concentrated in relatively few places on the globe and in relatively fewer hands. The small deposits of yesteryear will not feed the enlarged industry of today." It is estimated that the known reserves of a number of metals used in industry will not last more than a couple of decades at their present rate of consumption. The industrialisation of large new areas of the world will aggravate the situation still further. The present industrial level of the United States and Europe can only be maintained by a far-reaching import of minerals from countries of the Commonwealth and the African colonies of several European nations. These minerals will be less freely available when the vast populations of Asia and Africa become industrialised and need these minerals for themselves.

The day is not far off when some of the minerals we take for granted will become hard to obtain and we will be forced to fall back on substitutes, as for example, the substitution of copper by aluminium for making electrical conductors. We will also be forced to make greater use of synthetic substitutes, such as plastics. It is even conceivable that our food, including the carbohydrates, proteins, enzymes, and vitamins may one day become the products of the chemical industry, just as in most industrialized countries artificial fertilizer produced by the chemical industry has replaced natural fertilizer in agriculture almost entirely. All this may be possible as long as we have energy available in abundance. An abundant availability of energy is the key to industrialization and will be increasingly so as we have to depend on artificial products and substitutes. In a very real sense, energy is the great prime mover which makes possible the multitude of actions on which our daily life depends, and indeed which makes possible life itself.

We have, therefore, to consider what energy resources are available to us in the world. In discussing the world consumption of energy, it is convenient to adopt an appropriately large unit, denoted by Q, which is equal to a million million million British thermal units of energy corresponding to the combustion of some 33,000 million tons of coal. It is estimated that in the 18 1/2 centuries after Christ, some 9Q of energy were consumed, corresponding to an average rate of under half a Q per century. But the actual rate in 1850 was probably about Id per century. The rate continued to increase rapidly, and it appears that by 1950 roughly another 5Q may have been consumed, while the rate had risen to 10Q per century, the per capita utilisation of energy has been increasing in the world as a whole during the last 90 years or so at some 2.2% per annum compounded, while the present rate is about 3%. For some highly industrialised countries the rate of increase has been as high as 4%.

The total economically recoverable world resources of coal, oil, gas, and oil shale are estimated to be equivalent in energy value to under 100Q. Some have put the figure under 40Q. It is probable that at the rate at which the world consumption of energy is



increasing, these reserves will be exhausted in under a century. The continuation of our civilisation beyond the end of this century therefore requires a new source of energy.

Fortunately, the knowledge of how to utilise atomic energy in a practical way has come just in time. It is estimated that the world reserves of uranium and thorium are equal in energy value to well over 1700Q, that is more than 17 times our total reserves of the fossil fuels, coal, oil, and gas. They are, therefore, quite sufficient to provide energy for the world for several centuries with any increased population and high standard of living that we can foresee.

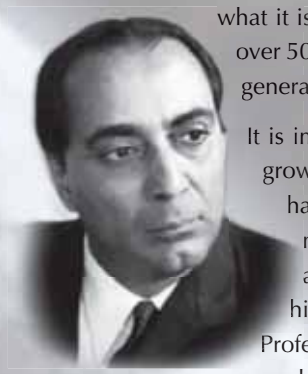
In my Presidential Address to the First International Conference on the Peaceful Uses of Atomic Energy I said "It is well known that atomic energy can also be obtained by a fusion process, as in the H-bomb, and there is no basic scientific knowledge in our possession today to show that it is impossible for us to obtain this energy from the fusion process in a controlled manner. ... ... I venture to predict that a method will be found for liberating fusion energy in a controlled manner within the next two decades. When that happens, the energy problems of the world will truly have been solved for ever, for the fuel will be as plentiful as the heavy hydrogen in the oceans." Since then the scientific and technical effort and financial resources that are being put to a solution of this problem have been increased manyfold, and many distinguished scientists who were somewhat sceptical in 1955 have now come to the view that the problem might well be solved within a couple of decades. It appears, therefore, that from the point of view of the world as a whole the progress of science and technology will be able to meet any challenge for the supply of energy that a growth in population can throw.

This seemingly optimistic conclusion is not, however, what we are primarily concerned with. Those who live in the under-industrialised areas of Asia and Africa have to ask ourselves what improvement in the standard of living we can make in our own generation and what we can expect for our children and grand-children. Let us take India again as an example. A plot of the population figures after 1920 on a logarithmic scale shows that they lie fairly well on a straight line, the slope corresponding to a growth rate of, about 1.3% per annum. This rate corresponds roughly to a doubling of the population every 50 years. With this rate of growth the population should be roughly 550 million in 1985 and some 680 million in A.D. 2000.

If, on the contrary, we assume that the population will increase annually by 5.3 million, as in 1956, irrespective of the actual population at the time, then the total population would be 540 million by 1985, and some 620 million by A.D. 2000. On this assumption the growth rate would have fallen from the present 1.3% to about 1% per annum by 1985, and correspondingly lower by A.D. 2000. Even the assumption of a growth rate of 1% per annum from 1960 onwards leads to a population of some 512 million in 1985, and nearly 600 million by A.D. 2000. Despite the increasing efforts that are being made to popularise and promote family planning, it seems very doubtful whether it will be possible to reduce the growth rate to 1% by 1960. One should remember In this connection that the growth rate is the result of the differences between a birth rate of nearly 4.0% and a death rate, including infant mortality of 2.7%. In Japan, where the growth rate is 1.05% per annum, the birth rate is 1.85% and the death rate 0.80%. A rise in the standard of living and improvement in public health are likely to reduce the death rate considerably during the next few years, with the result that a corresponding reduction of the birth rate will be necessary in order to maintain the overall growth rate at its present values, let alone reduce it.

The above considerations seem to indicate that a population of 500 million in India by 1985, and 600 million by A.D. 2000, is at least that we can expect. These figures are probably very optimistic underestimates. Now let us see the impact of this population growth on our power problem, I take again electrical power for consideration, as the per capita installed electrical capacity is accepted as a very good index of the general standard of living of a country.

The installed electrical generating capacity in India Increased from 1.7 to 3.4 million kilowatts during the period of the First Five Year Plan, 1951-1956. It is planned to double it once more from 3.5 to 6-9 million kilowatts by the end of the Second Five Year Plan, March 1961. In the highly industrialised countries the generating capacity usually doubles itself every 10 years. The growth of generating capacity in India during the next 30 years has, therefore, been estimated by the Planning Commission on the basis that the increase during the subsequent five-year periods will correspond to doubling periods of 6, 8, and 10 years respectively. On this basis the generating capacity should be 50 million kilowatts by 1986 and 140 million kilowatts by the end of the century. This last figure is much greater than the total generating capacity of the United States today, and yet with the minimum expected population of 600 million by the end of the century It corresponds to only .23 kilowatts per head of population, which is about a third of the present per capita installed electrical capacity of the United States, if we could hold the population constant at the present figure of 400 million, the per capita capacity and correspondingly the standard of living in the country at the end of the century would be more than double



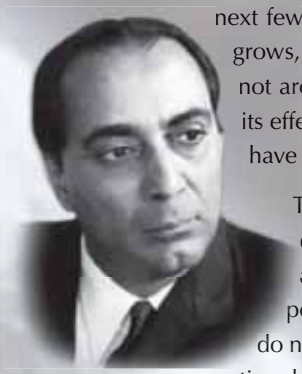
what it is likely to be under present expectations. Similarly, 50 million kilowatts by 1986 with a population of over 500 million will only give us 1/10 of a kilowatt per head, or less than 1/7th the present per capita electrical generating capacity of the United States.

It is important to realize, however, that our increase in population will not wipe out the effect of industrial growth and prevent a rise in the standard of living. It will only make the rise less rapid. As Professor Blackett has pointed out, 300 years ago, the pre-industrial countries of Europe had a real income a head of not much more than 1/10th of what it is today. In the last half-century their wealth has increased at a rough average of nearly 2% a head every year, thus doubling in rather less than 40 years. This huge and historically rapid rise in individual wealth was accompanied by a very large rise in population. To quote Professor Blackett "In a typical pre-industrial country, three-quarters or more of the population may be engaged in agriculture, and wealth tends to remain constant or rises but slowly, Savings and gross investments are low, some 5 per cent or less of the national income, that is, only about enough to maintain a static economy by paying for the depreciation of existing wealth. After take-off, savings and gross investment rise till some 15 per cent of the national income is available for gross investment, leaving around 10 per cent for net new productive investment. On the average in the West today such new investment results in a rise of gross income of about 3 per cent a year. Allowing for the population rise of some 1 per cent, this gives an increase of wealth a head around 2 per cent a year." The picture in India is something similar. With careful national planning we might expect the total national income to increase at nearly 5% per annum. Allowing for an increase in the population of 1.3% per annum, the rise in the standard of living is reduced to 3.7% per annum. Thus, the standard of living will rise despite an increase in population. But how slowly, how desperately slowly. Even with the very great efforts that we are making, the standard of living will double itself every 20 years, so that to reach the present standard of living of Western Europe will take us well over 60 years. On the other hand, if the population were to be kept constant, a doubling of the standard of living could be achieved in about 14 years, and the present standard of living of Western Europe reached in about 45 years instead of 65.

To quote Professor Blackett once more "It is clear that the population problem looms especially large to those who are pessimistic about the possibility of rapidly increasing material wealth, including food. Historically the population of Europe in the nineteenth century rose faster than that of Asia, but no population or food problem arose because wealth, including food, rose much faster, The population of the U.S.A. today is rising faster than that of India. As we have seen, the rise of population in such countries as those of South-East Asia does add, in a defined and calculable way, to the cost and burden of achieving economic progress. However, it is a not uncommon error among Westerners to assume implicitly that no marked economic and agricultural progress in these countries is possible, and so to be led to view them wearing social spectacles through which little can be seen but millions of brown babies," We have seen what could be achieved if the population growth were arrested and what will be achieved if She population continues to grow at its present rate. It is important, however, lo analyse the growth rate in India of 1.3% per annum is the result of a birth rate of nearly 4% and a death rate of a little over 2.7%. On the other hand, the death rate in the United Kingdom, France and Western Germany is less than 1.2%, that is less than hail of ours. The first result of an improvement in the standard of living and health will be a reduction in the death rate, with the result that the net growth rate will increase above 1.3%. There are indications of this already. Thus, most energetic birth-control measures will be necessary in order to keep down the growth rate to its present figure.

It is important to distinguish the approaches to family planning from the point of view of the individual and from a national point of view. The individual who wishes to plan his family wants to do it with some certainty. He aims at planning the periods between two successive children and the methods he employs must, therefore, be capable of being used with a considerable degree of certainty. From the national point of view on the other hand, the problem is a purely statistical one. If the birth rate in India for example were reduced by one-third from 4% to 2.7%, the net growth rate would fall to zero. What is, therefore, required from a national point of view is not a measure which will prevent conception, but one which will reduce the probability of conception by 30%. We have here to find the scientific answer to the problem of developing some substance which, when taken with one's food, would reduce the probability of conception by about 30%.

There are already oral contraceptives known, but they are relatively expensive and require to be used systematically and precisely. Even if they were to be available at an economic figure the problem of getting every villager in over 600 thousand villages in India to use them systematically would be quite enormous. If, on the other hand, some substance could be developed, which, when mixed with an ingredient of one's dally diet such as rice, grain, or salt, would have the effect of reducing the chance of conception by about 30%, the problem would be immediately solved. I have no doubt there are many who will hold up their hands In horror at this suggestion. But lei them face reality. The effect of family planning measures on the present lines is likely to be negligible during the



next few years as far as arresting the growth of the population as a whole is concerned and as the population grows, so also does the problem of family planning on a nationwide scale. The method I have suggested should not arouse violent opposition, since the measure is not such as to prevent anyone from having children, and its effect would only be to reduce the number of children, for example to four when a family would otherwise have had six, and to about two when a family might otherwise have had three.

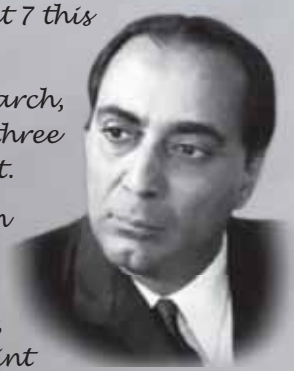
There are not many countries in the world which have a democratically elected government which is determined to raise the standard of living of the people in a short time by conscious planning, it is this aim which has made the Government of India of late so aware of the need to control the growth of population in order to raise the standard of living faster. The situation in India, is, therefore, unique, and I do not know if a sufficient scientific effort has been placed on solving the problem of population control on a national basis, which is thus posed. The research effort in the world has gone so far in meeting the problems posed by an individual's desire for family planning, and as we have seen, this requires an entirely different approach. If this analysis is correct, then I would humbly submit that what is required today in India is the creation of a strong institute under the Ministry of Health for doing research into the problems posed by the need to control population on a national scale. There are, no doubt, many able scientific workers in the country who could be brought together in such an institute, where their combined effort might assist in an earlier solution of the problem. I would, however, suggest that this should not prevent really outstanding research workers from other countries being also brought to this institute to strengthen the effort still further. A great scientist is more concerned with the scope for fruitful and pioneering work than with material considerations, provided these are not inadequate, and the opportunity of finding the solution to a problem of such magnitude as that posed in India, offers a challenge, which many outstanding research workers would be eager to accept. We have here a chance of solving a problem which Is of great importance alike to India and the rest of Asia.

Bhabha's statistical approach to population and standard of living

February 20, 1959

My dear Bhai,

I returned rather late from Bhakra yesterday evening, and left for Bombay at 7 this morning: so I am very sorry to have missed seeing you.



As you are aware I expect to come up for a couple of days in the first week of March, and I could address the Parliamentary Committee then. There are also two or three matters which I would like to put before you when we meet. They are not very urgent.

I send you herewith a copy of the speech I made when opening the First Session of the Sixth International Conference on Planned Parenthood on February 15, 1959. Most of the portions dealing with population and world resources of energy are known to you, but you may be interested to see the passages relating to minerals, as also the last paragraph on a statistical approach to the problem. This last point appears to have appealed to a number of people, and VXRV. Rao, who spoke last in the morning session that day, supported it very strongly.

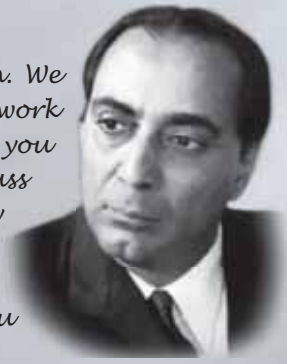
Yours ever,

H.J. Bhabha.

Shri Jawaharlal Nehru,
Prime Minister,
NEW DELHI.

'H.B.' to 'Dear Bhai'

February 28, 1959



My dear Bhai,

We are looking forward to your visit to Trombay and Colaba on the 9th. We are treating this as a purely business trip to enable you to see the progress of work which is under your charge. We also propose to take the opportunity to acquaint you with various scientific and organisational patterns that we follow, and to discuss our problems with you. I hope the lunch at Trombay will afford an opportunity for you to meet and talk lo some of our outstanding young scientists. All this, of course, will hardly be possible if you come accompanied by other VIPs, and I hope, therefore, that some advance indication will be given from your end of how you would like this visit to be arranged.

Would it be possible for me to return to Delhi with you on the 11th? I have to be in Delhi for a couple of days for some meetings.

Yours ever

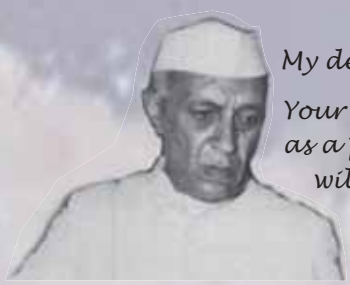
Homi Bhabha

Shri Jawaharlal Nehru,
Prime Minister,
Government of India,
NEW DELHI

March 2,1959

... and to 'Dear Homi'

PRIME MINISTER'S HOUSE
NEW DELHI



My dear Homi,

Your letter of February 28. I am glad you are treating my visit to Trombay and Colaba as a purely business one. I do not know if any VIPs might accompany me there. No one will come from Delhi. Perhaps the Governor or the Chief Minister might go with me. You can find that out from them.

You can certainly travel to Delhi with me on the 11th March.

Yours sincerely,

Jawaharlal Nehru

Dr. H.J. Bhabha,
Secretary,
Department of Atomic Energy,
Bombay

'We will be able to make satisfactory fuel elements' Chairman informs Prime Minister

June 1, 1959

The attached note from the Head of the Metallurgy Division is being sent herewith to the Prime Minister for his information.

2. At the end of January, the first ingots of atomically pure metallic uranium were cast. In order to turn this uranium ingot into a fuel element for a reactor, three essential steps have to be gone through. The ingot has to be melted and cast under vacuum into a billet of the proper shape. The billet has then to be rolled into a. rod. These two steps have now been satisfactorily accomplished. The final step is the cladding of the uranium billet in a can of aluminium or some other suitable metal.

3. Although the building for the Fuel Element Facility \s not yet ready, and even full supply of power has not been obtained, the scientific staff has worked with great enthusiasm and drive. On the last day the complicated rolling operations were started at 4 p.m., and the scientific staff worked right through the night till the final bar emerged at about 11 a.m. next morning.

4. I have little doubt now that we will be able to make satisfactory fuel elements. There are hardly five countries in the world which make their own fuel elements today.

Dr. H.J. Bhabha, Director
dated: 1.6.59

In my letter No. MET(25)/59/565 dated 27th May 1959, I had reported the successful vacuum melting and casting of an uranium billet. Another step forward has now been taken of rolling the billet to give a rod measuring about 11-ft. in length x 1.5 inches in diameter. The operation was completed on Saturday, 30th May 1959 in the morning. The finished dimensions of the CIR uranium fuel rod are 10-ft. 2 7/8 inches x 1.36 inches diameter.

2. The billet has been rolled in the alpha temperature range as required. Visual examination does not show the presence of any defects. I might add that in the absence of full power load, make-shift arrangements had to be improvised, the credit for which goes to my colleagues in the Faggots Project who displayed remarkable team work and ingenuity.

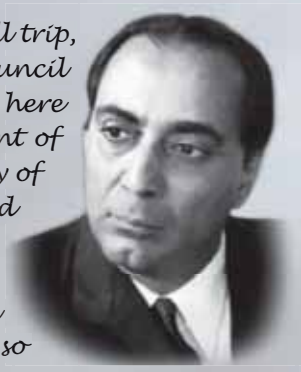
Brahrn Prakash
Head, Metallurgy Division

Very good
H.J. Bhabha
1/6/59

Bhabha writes to Nehru about the honour at Cambridge

July 2, 1959

My dear Bhai,



I returned from Europe on Tuesday the 23rd June after a brief but very full trip, and, after a few days in Bombay, came here to Bangalore for a meeting of the Council of the Indian Institute of Science, which took place last Monday. I propose to stay here for nearly four weeks, so as to do some scientific work without an undue amount of interruption. (I am revising the last chapter of my book on 'Algebra for the Theory of the Elementary Particles', which I am writing for the Oxford University Press, and hope to get a good part of this work done before I leave). A few important files will, of course, be sent on here, as on previous occasions, and there is a direct telephone connection in my room: 71422. I see from the papers that you are expected here in Bangalore on the 27th, and I shall, therefore, arrange to leave after your visit, so as to be able to see you here.

While in England, I had a second meeting with Mr Nelson, Managing Director of the English Electric Company, and have got confirmatory information regarding the manufacture of hydro turbines, which is very relevant to the phasing of this part of the Bhopal project. I am submitting a note on this matter to the Planning Commission separately, and you will, of course, receive a copy of it

I enjoyed the two days I spent in Cambridge in connection with the conferment of an honorary degree of Doctor of Science on me. The ceremony was as usual. Among the other recipients of honorary degrees (of Laws, Literature, Science, and Music) were Dr. Vivian Puchs who led the recent expedition across the South Pole, Le Corbusier, the sculptor Henry Moore, the composer Mr Benjamin Brittan, and Mr Louis Clarke, one time Curator of the Fitz William Museum. The citations were as usual read out in Latin by the Public Orator, but for the first time a crib with the English translation was distributed to the audience. There was a very large luncheon in the hall of Trinity College immediately after the conferment, at the end of which Lord Tedder, Chancellor of the University, made a speech referring to ail those on whom a degree had been conferred. I had been asked to reply to his speech on behalf of all the recipients of honorary degrees, and I enclose herewith a copy of my speech. (The text published in the India House bulletin had some mistakes and omissions in it). Being an after lunch speech, it included a certain number of humorous topical references which may be lost if one is not aware of the local incidents to which they allude. For example, the last paragraph refers to an undergraduate prank which was narrated to me by the Vice-Chancellor, Lord Adrian. One morning the authorities of the University found to their surprise an entire automobile on the roof of the Senate House. How it had been put there overnight is still something of a mystery, in view of the enormous trouble which had to be taken to get it down again without damaging the Senate House.

I stayed in Cambridge at the Master's Lodge in Trinity as the guest of Lord Adrian. This was evidently a particularly good year for roses. I have never seen such profusion of beautiful roses, as was to be found in his garden at the back adjoining the river. The two days in Cambridge, although very hectic, were most refreshing. I sometimes wish I could spend 3 to 4 months there in quiet study and contemplation. I hope some of the scientific laboratories and establishments we are building today will have a beauty of their own, which will have its due affect on those who work there. I think both Trombay and the Tata Institute of Fundamental Research will be architecturally, and botanically beautiful, when they are completed.

I look forward to seeing you again,

Yours ever
Homi Bhabha

Shri Jawaharlal Nehru
Prime Minister,
NEW DELHI

Nehru's affection to Homi

My dear Homi,

So you are back after collecting more honours! I liked your speech at the Cambridge Luncheon. I am glad you are staying at Bangalore to do some quiet work.

It is true that I am going to Mysore on the 26th July to attend a conference on Community Development. Probably I shall be there for three days, that is, upto the 28th. But I do not intend staying at Bangalore at all, though presumably I shall have to pass it. Anyhow I hope to meet you.

Yours ever,

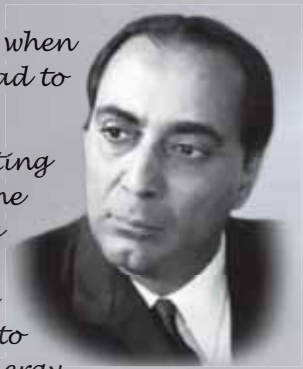
Jawaharlal Nehru

Dr. Homi J. Bhabha,
West End Hotel,
Bangalore.

December 1, 1959

Bhabha writes to Prime Minister after return from America

My Dear Bhai,



I returned from abroad on Saturday and will report to you on the visit when we meet next week. The visit to America was quite successful and will probably lead to something very useful for the development of our programme in due course.

One of the Commissioners of the U.S. Atomic Energy Commission is visiting India from the 5th to the 13th in connection with the U.S. atomic pavilion at the World Agricultural Fair in Delhi. I am meeting him first in Calcutta, then taking him to Jamshedpur for a day, then to Trombay, and finally to Delhi. I expect to arrive in Delhi on the morning of the 10th and shall remain there till 'two days after President Eisenhower's departure, so that I may have an opportunity to talk to you and discuss various matters. I also want to visit the pavilion of the Atomic Energy Department at the World Agricultural Fair before it opens to see that everything is in order. We have quite a large exhibit there concerned primarily with the use of isotopes in agriculture and biology. The public will also be able to see some isotopes being actually produced in glass boxes by remote handling equipment through a large glass window. The isotopes and the workers handling them are in a small laboratory' which is completely sealed from the public, so that there can be no danger of contamination.

Enquiries came about the next meeting of the Informal Consultative Committee of the Parliament for the Department of Atomic Energy, and I suggested any time on the 15th and 16th of December as a suitable date, subject to your approval. All concerned would naturally be happy if you were to come, but, knowing how busy you are. I do not think it is necessary for you to do so at the expense of other important business, unless you would like to.

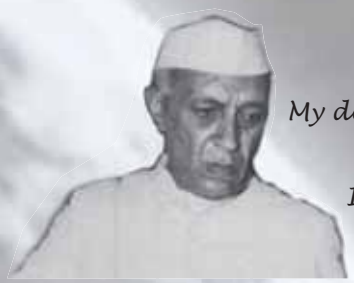
I look forward to seeing you again.

Yours affectionately
H.J. Bhabha

Shri Jawaharlal Nehru.
Prime Minister,
Government of India,
NEW DELHI.

Nehru fondly replies

December 2, 1959



PRIME MINISTER'S HOUSE
NEW DELHI
December 2, 1959

My dear Homi,

I have your letter of the 1st December. Welcome back after your labours abroad. I am glad that your visit to America was successful.

During President Eisenhower's visit to Delhi, I shall of course be heavily occupied. Afterwards I hope to meet you here.

As for a meeting of the Informal Consultative Committee of Parliament for the Department of Atomic Energy, I am prepared to have it on the 15th December at 5 p.m. or on the 17th December at 5 p.m. I shall try to attend it. Otherwise, any time can be fixed. Of course, it is not absolutely necessary for me to come, but I should like to be present, if possible.

Yours affectionately
Jawaharlal Nehru

Dr. H.J. Bhabha.
Atomic Energy Commission,
Apollo Pier Road,
Bombay-1.

Bhabha honoured at the Tercentenary celebrations of the Royal Society, London

August 1, 1960

My dear Bhai,

I returned to India yesterday after a 12-day halt in London for the Tercentenary Celebrations of the Royal Society and a 2-day halt in Paris.

The Royal Society Tercentenary Celebrations were organised on a lavish scale and were attended by some of the top scientists of the world, not only from the Commonwealth but from Europe, USA. USSR and other countries. Professor Niels Bohr was there with his wife and has sent you his regards. A number of special lectures were arranged on the occasion by some of the leading scientists who reviewed the developments in their respective fields I attended two in other lines than my own and found them most stimulating, It is remarkable how by dint of Immense hard work by many outstanding people one has now been able largely to reconstruct the chemical structure of the biological molecules of which living substances are made, such as myoglobin and DNA, the substance which enters into the structure of cells which carry the sum total of our genetic heritage.

The scientific exhibition which normally accompanies every conversazione was this time on a. much bigger scale and occupied the entire top floor of the Royal Academy building next door. The biological exhibits were extremely interesting.

I took Nan with me to the opening exhibition by the British Government at Lancaster House and the final banquet at Grosvenor House, where Macmillan made an excellent speech. I was very glad she was able to come. She also told me that she was present at the ceremony in the Festival Hall where honorary degrees of Doctor of Science were conferred by the University of London on six people, including King Gustaf VI Adolf of Sweden. Professor DW Bronk, President of the National Academy of Sciences of the USA, Sir M Burnet, a very famous biologist. Professor G, Charles de Hevesy, the first man to use radio-isotopes in biological investigations, Sir T. Merton, and myself. The function was organised on a grand scale, and the degrees were conferred by the Chancellor of the University, the

Queen Mother. The Festival Hall was quite packed. I attach herewith the citation which was read out by the Public Orator when the degree was conferred on me, as you may be interested to see it. The citation indicates what the informed and expert opinion outside India is of our studies of the powder problem in India.

I am coming to Delhi on the 7th for the meeting of the Consultative Committee for this Department which will be followed by a debate on the 9th. Will you please let me know if you require any special material for the debate? I shall have a summary of points prepared for your use in any case. I would also like to take some of your time on this occasion to discuss matters concerning this Department about which I am not very happy. They can be straightened out without much difficulty, but I would like you to know the position.

Yours affectionately

Homi

Shri Jawaharlal Nehru
Prime Minister,
Government of India.
NEW DELHI

Bhabha admitted to the Degree of Doctor of Science, honoris causa

Your Majesty and Chancellor, I present Professor Homi Jehangir Bhabha.

The emergence of India as a great modem nation may be seen in a variety of ways, but nowhere more convincingly than in her ability to produce the men who are now developing her natural resources. In Professor Bhabha, the Director and Professor of Theoretical Physics at the Tata Institute of Fundamental Research in Bombay, India has a nuclear physicist of world-wide reputation. In the 1930's, while still a young man, he made some major contributions to the theoretical explanation of cosmic ray showers. Later he gave his attention to some of the most abstract problems of fundamental physics relating to the general properties of space-time, and he has also attacked the problem of fading an explanation of fundamental particles.

But alongside this brilliant theoretical work he has given much time and thought to the practical application ofthe ever-increasing knowledge which twentieth-century physicists have made available. As Secretary of the Government of India Department of Atomic Energy, which he has built up since the war, and as Chairman of his country's Atomic Energy Commission, he has proved himself a brilliant organiser, and to Mr Nehru in particular an invaluable adviser on all scientific problems. When the first great International Conference on the Peaceful Uses of Atomic Energy was held at Geneva in 1955, he was a natural indeed, almost the Inevitable choice for Chairman. His own report to the conference on the natural resources of India and on her energy requirements for the next few decades was a masterpiece of lucid exposition and informed prediction.

For those of us who try to follow, faint yet pursuing (and often more faint than pursuing) the esoteric researches of the modem physicist, it is reassuring to know that Professor Bhabha is also a man of the highest culture, who draws and paints with distinction, who is a great lover of music and of dancing, and who elected to read for his Bachelor of Arts degree at Cambridge before he took off intellectually into outer space to investigate the remote and complicated behaviour of the cosmic rays.

I request you, Chancellor, by the authority of the Senate, to admit Homi Jehangir Bhabha to the Degree of Doctor of Science, honoris causa.

Nehru expresses happiness

August 3, 1960

PRIME MINISTER'S HOUSE

NEW DELHI

August 3, 1960

My dear Homi,

Thank you for your letter of August 1st. We read about and were happy at the honour done you in London.

I shall meet you when you come here, of course. The debate on Atomic Energy has been postponed to the 10th August as on the 8th and 9th, the Lok Sabha will be discussing the general strike. I hope that will suit you. Unfortunately, just on those days, 7th to the 9th, the Prime Minister of Nepal is coming here, and he will take up some time. But, of course, I shall find time to meet you and you can coach me for the debate.

Yours,

Jawaharlal

Dr. H.J. Bhabha,
Secretary,
Atomic Energy Department.

Nobel Laureate Niels Bohr's letter to Prime Minister

February 10, 1960

Gl. Carlsberg,

Copenhagen.

February 10, 1960

H.E. Shri Jawaharlal Nehru,

Prime Minister of India.

My dear Prime Minister,

Our visit to India was to my wife and myself a powerful and most inspiring experience and we do not know how to thank you for the great kindness you personally extended to us during the unforgetful days we spent with you and your family in your home in Delhi.

During our travels in India we were both enchanted by the marvellous historical monuments which speak so strongly of what art can give if there is a true human culture behind. The spirit of the Indian people which through the ages have been able to assimilate so many different cultural movements made us, indeed, in a deep sense feet at home in your country.

Through my contact with the Indian academic institutions I was also deeply impressed by the enthusiasm shared by the leading scientists as well as by the students. I greatly admired the foresight with which the endeavours for promoting the welfare of the people on the basis of the progress of science and technology were planned under your leadership. I feel, indeed, confident that these endeavours will not only be of great benefit for India, but will even come to serve as a help and encouragement for other peoples faced with similar problems.

All what I learned, and specially from my talks with you which will always be some of my most treasured remembrance, reaffirmed my expectations of the role which your country is called

to play in the creation of that brotherhood between nations which is necessary for the future of mankind. In this great cause the closest possible international collaboration will surely be of a decisive importance, and here in Denmark we shall be happy if in any field, even in a most modest way, advice and assistance might be given from our small country.

As regards atomic energy I talked with Dr. Bhabha about the possibilities for such collaboration and we are looking forward to a visit from him in Denmark in the spring, when we will go thoroughly into technical matters. I was also most interested in what I learned from Prof. Mahalanobis and Professor Kabir as regards planning of other important issues, and I am very pleased that Prof. Thacker, who has such a responsible position in the Secretariat of the Scientific and Industrial Research, will come to Denmark this summer for discussions and mutual information of how such research is being prepared in the various countries.

We had a good journey back from India, and had the pleasure on our arrival in Copenhagen to meet and talk with your Vice-President, Dr. Radhakrishnan, who at our University gave a most beautiful talk, received with great interest and enthusiasm. A few days after my return I had to go to Geneva to participate in the inauguration of the gigantic proton accelerator built by the European Organisation for Nuclear Research, and the completion of which has been a great encouragement in showing what even smaller countries can accomplish in common by proper sharing of scientific and technological knowledge.

In Geneva, I met my friend Mr. Shepard Stone, who as adviser to the Ford Foundation takes a deep and active interest in international cooperation with a view to promoting common human understanding and mutual help between peoples as regards the problems with which humanity is confronted. We had a long talk about my experiences in India, and I was happy to learn that he will himself visit your country in a very near future.

With the kindest regards from my wife and me, and our warmest wishes for you and your family and for all progress of the great human cause, to which you have devoted your life.

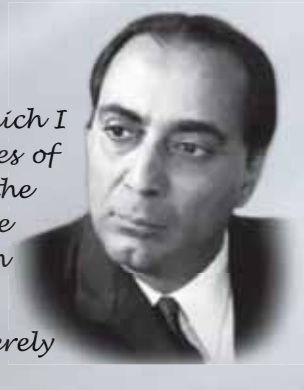
Most respectfully and gratefully,

Niels Bohr.

P.S. As a greeting from our country and as a small token of our gratitude my wife and I are sending you a silver bowl made by the Danish artist George Jenson, which we hope you may like.

Dr. Bhabha with Danish physicist Neils Bohr

Nehru & Bhabha - intimate friends



My dear Bhai, January 28, 1961

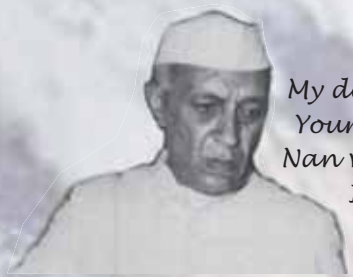
This is to remind you that you have agreed to attend the buffet supper which I am giving as Chairman of the Atomic Energy Commission for the representatives of foreign Governments attending the inauguration at Trombay. The supper is at the Ashoka Hotel at 8.45 p.m. on Sunday the 29lh January (tomorrow). There will be roughly 35 foreign representatives present, plus about an equal number of Indian invitees.

I have also sent separate invitations to Nan, Indu, and Betty. I am merely mentioning this, in case they have gone astray.

Yours affectionately

Homi Bhabha

Shri Jawaharlal Nehru
Prime Minister,
Government of India.
NEW DELHI



January 28, 1961

PRIME MINISTER'S HOUSE
NEW DELHI

My dear Homi,
Your letter. I shall come to Supper tomorrow at the Ashoka Hotel. So I think will Indu. Nan will not be here as she is accompanying Queen Elizabeth to Agra. About Betty I am not sure, She has not been too well. I suppose she will come if she is well enough.

Yours sincerely,
Jawaharlal Nehru

Dr. Homi Bhabha,
Ashoka Hotel,
New Delhi.

October 21, 1961

Nehru invites Bhabha to join National Integration Conference

My Dear Homi,

You must know that we held a National Integration Conference at the end of last month. You had been invited to this also, but of course, could not come. This conference decided to have a Council consisting of the Prime Minister, the Union Home Minister, all chief Ministers of States and a number of other people. Among these are supposed to be three scientists and educationists, Kothari, as Chairman of the University Grants Commission, is one of the persons selected. I should like you to join this Council

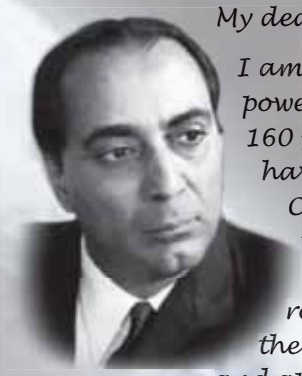
I do not know if it is possible for you to send me an answer soon. I shall presume your agreement and announce your name after three or four days.

Yours sincerely,

Jawaharlal Nehru

Dr. H.J. Bhabha.

Problems of CIRUS solved: Bhabha reports to Nehru



My dear Bhai, January 9, 1962

I am glad to inform you that CIR operated for the first time for over ten hours at a power level of 30.000 kilowatts on the 4th and 5th of this month with a charge of 160 fuel rods only. Had we had the full charge of 192 fuel rods the operation would have corresponded to the maximum rated power of 40,000 kilowatts. When the Canadians handed over the reactor at the end of 1960 it could not be taken up to a power above 17 megawatts, and a number of difficulties, such as, growth of algae in the primary system, corrosion, pressure drop in the rods, rupturing of rods, etc., impeded its operation even at a relatively low power level. Since then the reactor has been furnished with an entirety new charge fabricated at Trombay and apart from a thorough clean up of the primary system a great many improvements have been made on it. It was first taken up to a power level of 20,000 kilowatts several times during the first few days of this month, and its trouble free operation at 30.000 kilowatts now establishes that all problems connected with its operation have been overcome by our staff. In overcoming these difficulties,' the staff of the Reactor Operations Division were helped in an important way by the staff of the other Divisions, as for example the Analytical Chemistry, Radiochemistry, Metallurgy and Biology Divisions. Unless the work of the Establishment covered all these other fields, we would not have been able to overcome the difficulties on our own. The scientific staff of the Establishment, and especially that of the Reactor Operations Division, have put up a very creditable performance.

Shri Jawaharlal Nehru,

Prime Minister,

NEW DELHI.

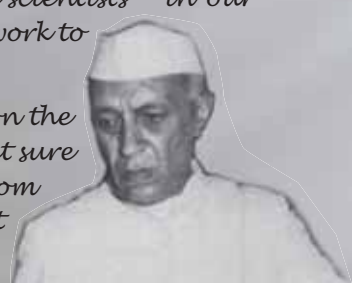
Prime Minister's appreciation

January 10, 1962

My dear Homi.

Your letter of January 9th. I am glad to learn of the success obtained by the scientists in our Atomic Energy Establishment at Trombay. Please convey my appreciation of their work to them.

I have your letter about my programme for my visit to the Tata Institute on the 15th. I would like to spend as much time as possible at the Institute but I am not yet sure when I shall be reaching Bombay. I shall be travelling by a rather slow plane from Gorakhpur that day. I shall try to be at the Institute by 3 p.m. But perhaps I might be a few minutes late.



Yours affectionately,

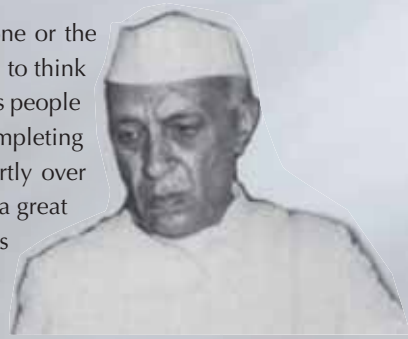
Jawaharlal

Dr. Homi Bhabha,
Director,
Tala Institute of Fundamental Research.
Apollo Pier Road,
Bombay.

Inaugurating CIRUS

Opportunities for Scientific Work and Promise of the Future*

Speech of Pandit Jawaharlal Nehru at the inauguration of the new buildings of the Tata Institute of Fundamental Research at Colaba, Bombay on January 15, 1962



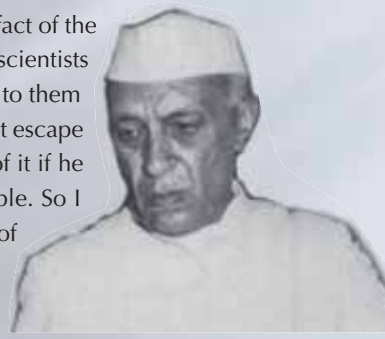
You had been told that a little more than eight years ago I was invited here to lay the foundation-stone or the corner-stone of this structure, it is so long ago that I had almost forgotten that I had done it. And I began to think of another instance which happened in Delhi when the foundation-stone was laid and after a few months people discovered that somebody had stolen it. (Laughter). Normally speaking, a delay of eight years in completing this structure seems rather excessive. But coming here once In-between and today, going around partly over this building, my original impulse to criticise the delay was considerably modified because it has been a great effort to put this up as it has been done. There have been difficulties and anyhow the result achieved is something very much worthwhile. So I am happy to be here today to associate myself again with this function in this Institute.

The previous speakers so far have referred to the growth of scientific work in India in the last few years. They have referred to that pioneer. Jamshedji Tata[1], who, at a time when few people, certainly in India thought about this, encouraged this kind of work both in science and technology and heavy industry. A man who could look ahead and whose traditions have been followed by those who have followed him, who have come after him. And therefore the Institute is appropriately named after the house of Tata. Now, in these years much has happened and many big laboratories have been put up in India and I believe they are doing good work. But there Is one aspect of that work which sometimes is not perhaps as good as it might be. Although so far as that matter is concerned, here in Bombay under Dr. Bhabha's[2] guidance we do not suffer from that partial disability. I have found going about and generally keeping in touch with these developments, that we really have a very fine lot of younger scientists

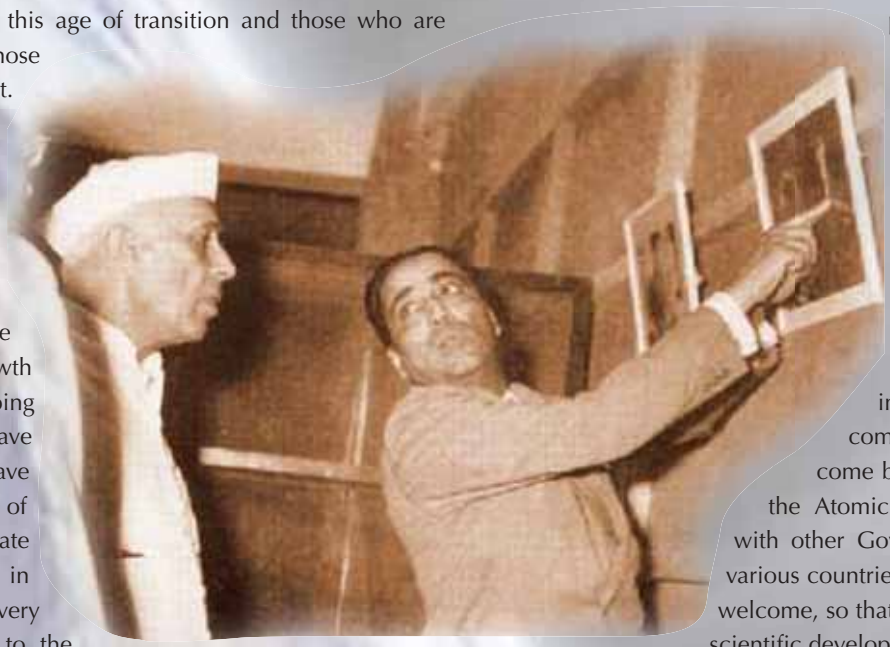
in India. But I am not quite sure that in many places in India they have got all the opportunities that they should have to do their work and to develop. Now that does not apply either to this Institute or to the Atomic Energy Establishment at Trombay. Because, here one among the many virtues and qualities that Dr Bhabha possesses, of which we have heard praises a little while ago, one is that he not only encourages people to do their best work but has built up very fine groups of able and brilliant young scientists in these two establishments, it is really meeting these young people who have already distinguished themselves and who I am quite sure will distinguish themselves still more in future it is meeting them and finding out what they have been doing that I have felt so hopeful, optimistic, about the future of science in India. 1 would like this example of Dr. Bhabha, that is, to build up these groups of young scientists wherever there is an opportunity in India, to give them worthwhile work to do and opportunities, to be followed all over this country. It is true that previously the opportunities were perhaps not adequate. Now with these well-equipped magnificent structures, the opportunities are there and therefore it is easier to provide these to the young people to do good work. Anyhow, I am quite sure that in the future good work will be done by the younger scientists who, as I have just said, I have found to have quite unusual capacity.

Just before the start of this meeting. Dr. Bhabha was good enough to take me round this building and show me some of the work that is being done here, Because this building has been functioning for some time, it is not quite correct to say that I have

come to inaugurate it. I went over this building and saw it. And I looked wise and understanding, but the fact of the matter is that I could not understand much of the things that I saw. We are now entering into an age of the scientists beginning to function like the high priests of the old who looked after sacred mysteries. We all bow down to them in reverence and awe and sometimes in a little fear, as to what they might be up to. But anyhow, one cannot escape science and the scientists in this age. And perhaps the scientist might and I say might make a better job of it if he has a chance in future than the politician I am not sure of course, but I put it to you that might be possible. So I am prepared to take the risk because anyhow it is a risk living in these days and dealing with politicians of my own tribe.



But one does feel that these new discoveries 'tremendous discoveries coming one after the other, that we live perhaps at a time, when the nature of our knowledge of the physical world and all that flows from it may change, affecting even the human beings. They may gradually get into another phase, work themselves up in another phase of existence. I am sorry I speak in a confused way because my mind is not clear except that I feel that we are gradually getting out through science and the discoveries of science from the very gross and purely material way of looking at the world. Science itself is, although very material, goes on hinting at something which is much less material, And one does not quite know what this future may bring, provided always of course that science itself does not help humanity to commit suicide.



So we live in this age of transition and those who are pessimistic may take a pessimistic view of those world; those who are optimistic may do that. Both are possible. And anyhow the scientist has a very important part to play, and it is important I think that we should encourage him to play that. And therefore the growth of science in India is very welcome to me. And in so far as I am concerned, I believe that the Government of India will encourage this growth of science in the future as it has been doing in the past. A number of eminent scientists have come here from abroad, I am happy they have come because it has been a pleasure and privilege of the Atomic Energy Department and elsewhere to cooperate with other Governments and other eminent scientists in various countries. And therefore their coming here today is very welcome, so that we might strengthen the bonds that tie us to the scientific developments elsewhere.

I do not know that I need take your time any more. It has been a great pleasure to me and something like an exhilarating experience to come here from time to time and to see the growth in our scientific work whether on the other side of Trombay or here or some other parts of India. They take me out of the normal rut in which I live. It is rather depressing. So I am grateful to Dr. Bhabha for this opportunity given to me to come here to associate myself with this ceremony and to meet many eminent people. Now I am supposed to inaugurate this and to formally declare this open. I do so with great pleasure.

**** Director, Tata Institute of Fundamental Research. Bombay***

1. Mr. Jamshedji Tata, Chairman, Tata sons and founder of the House of Tatas, Bombay

2. Dr. Homi J. Bhabha, Chairman, Atomic Energy Commission and Director, Tata Institute of Fundamental Research. Bombay.

Bhabha checks a point with Nehru

September 5, 1962

My dear Bhai,

At the conning General Conference of the International Atomic Energy Agency to be held in Vienna from the 18th of September it is not unlikely that the East European countries will again raise the question of the admission of Communist China. I presume our attitude remains the same as before, namely that whatever our differences with China, the non-admission of a major country of this importance can only limit the effectiveness of an international organisation. I thought I should check this point with you before I leave.

Yours affectionately,

Homi Bhabha

Shri Jawaharlal Nehru,
Prime Minister,
New Delhi,

Nehru clarifies

September 6, 1962

PRIME MINISTER'S HOUSE
NEW DELHI
September 6, 1962

My dear Homi,

Your letter of September 5th.

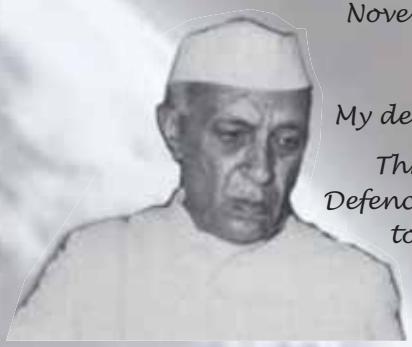
We are still of opinion that the People's Government of China should be accepted as a member of the United Nations. But we do not want to propose this ourselves for obvious reasons. We shall, however, support any proposal to this effect that is made by any other country.

Yours sincerely,

Jawaharlal Nehru

Dr. H.J. Bhabha,
Secretary,
Department of Atomic Energy.

Nehru invites Bhabha to join National Defence Council



November 8, 1962

PRIME MINISTER'S HOUSE

NEW DELHI

My dear Homi,

Through an inadvertence, your name was left out of the list for the National Defence Council. We wanted to put this in. I have now asked the Cabinet Secretary to rectify this omission. We would particularly like to have your help in that Council.

Your sincerely,

Jawaharlal Nehru

Dr. H.J. Bhabha,
Secretary,
Atomic Energy Department.

November 10, 1962

My dear Bhai.

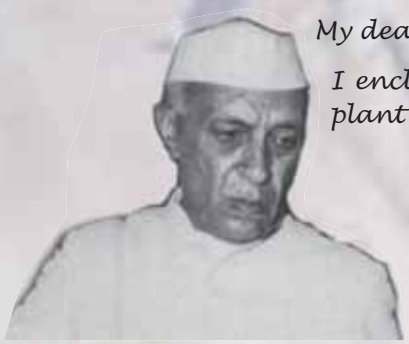
Thank you for your letter No. 1885-PMH/62 of November 8, 1962, informing me that my name has been added to the membership of the National Defence Council. As you know, my services are always at your disposal.

Yours affectionately,
Homi Bhabha

Shri Jawaharlal Nehru,
Prime Minister,
New Delhi.

June 27, 1962

Nehru forwards Karnataka's claim for nuclear power station



My dear Homi,

I enclose a letter from H.C. Dasappa, M.P., about the location of a nuclear power plant in the South.

Yours sincerely

Jawaharlal Nehru

Dr. H.J. Bhabha,
Secretary,
Atomic Energy Department

June 26,1962

My Dear Panditji

Subject: Location of a nuclear power plant in the South

I gather that one of the nuclear power stations will be established in South India and a Location Select Committee has also been appointed lo find out which would be the best site available. The Committee, no doubt, will make its own recommendation having regard to the suitability of the location. I learn one of the sites most suitable for the location of the atomic plant is what is known as the Sangam site near Mekedot in Kanakapura Taluk, Bangalore District. That is virtually on the banks of the Cauvery river. I have had no time to go very much into the technical aspects of the location, but I am given to understand that from all points that would be the best site.

I am not sure when exactly the nuclear power plan] is contemplated to be put in the South. Since the matter is under the active consideration of the Government. I thought I should lose no time in pointing out the claims of the above "Sangam" site I am only anxious that the most advantageous site must be found for the nuclear power plant and that it should be a complete success. I may add that Mysore State is one of the earliest lo take to electricity. They may not know the technical know-how of a nuclear plant, but I am sure their general familiarity with electricity will be an added advantage for the project.

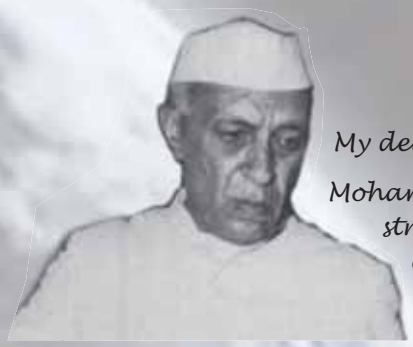
I will be most grateful to you for the claims of "Sangam" site being considered for the location of the nuclear power station in the South

With regards,
Yours Sincerely,
H.C. Dasappa

Shri Jawaharlal Nehru,
Prime Master,
New Delhi.

Work commences at Kaiga, Karnataka

Rajasthan requests for nuclear power station



PRIME MINISTER'S HOUSE

NEW DELHI

June 29, 1960

My dear Homi,

Mohanlal Sukhadia, Chief Minister of Rajasthan, came to see me today and again stressed the great need in Rajasthan for power. He hoped very much that one of our atomic power stations would be placed somewhere in Rajasthan, perhaps near the U.P. border. He was anxious that I should convey this to you, so I am writing to you. Probably he will write to you at greater length.

Yours affectionately,

Jawaharlal Nehru

Dr. H.J. Bhabha,
Chairman, Atomic Energy Commission,
Bombay.

October 3, 1963

My dear Homi,

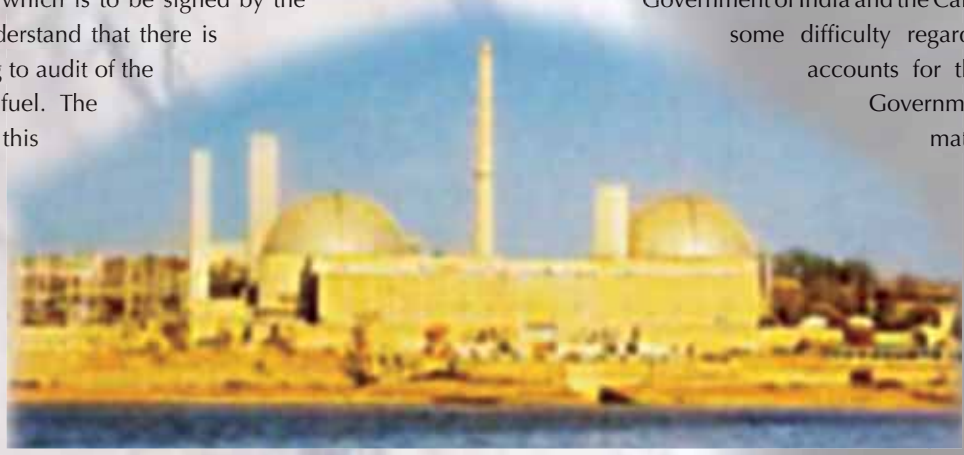
I enclose a copy of a letter from the Chief Minister of Rajasthan to me. I am replying to him that we are taking necessary steps in regard to the Rana Pratap Sagar atomic power plant.

Yours affectionately,
Jawaharlal Nehru,

Dr. H.J. Bhabha,
Chairman,
Atomic Energy Commission,
Bombay.

Copy of letter from the Chief Minister of Rajasthan to the Prime Minister, dated 28th September 1963.

I have been intimating to you our anxiety for expediting the work relating to the establishment of the Atomic Power Plant near Rana Pratap Sagar. Our anxiety is due to the fact that the sources for hydel power in Rajasthan are very limited. Coal has also to be supplied to Rajasthan from a long distance. The Atomic Power Plant will fill up, to a great extent, the gap existing between the supply of power and the demand for it expected in the coming years. I am sure that Atomic Energy Commission must be doing their best to make this Plant function at the earliest. I understand that perhaps there is some difficulty in finalising the draft of the agreement which is to be signed by the Government of India and the Canadian Government. I am given to understand that there is some difficulty regarding our accepting the clause relating to audit of the accounts for the preparation and use of uranium fuel. The Government of India would take a decision in this matter keeping in view the wider aspects of our policy. However, my purpose in writing to you is only to express my anxiety and hope that this difficulty should be sorted out at the earliest so that this technical formality may not stand in the way of expeditious execution of the Project.



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