[Shri Naushir Bharucha]

power-hunger or power-starvation will be unknown.

Shri Jawaharlal Nehru: Mr. Speaker, Sir, in taking part in this discussion, I feel as if I was in a quandary. To begin with, the Department of Atomic Energy has produced a report which is a remarkably comprehensive report and says all that any Minister can say about it and much more, because a Minister, like many other Members, is rather ignorant of this subject and slightly apprehensive lest some questions be put to him which he cannot answer. So, there is this full report, and all the hon. Members who have spoken here have spoken not only in commendation and praise of the work of the Atomic Energy Department but have urged it and urged the Government to go ahead even at a faster pace in this direction. So, in view of this, what am I to say, Mr. Speaker? That is my difficulty.

It is a curious circumstance which strikes me often that here in India, we live in a variety of ages and centuries at the same time. Without any offence, I once said that we live in the cow-dung age in India, and I meant it in the sense that even now, the principal source of power in India is cow-dung. It is an extraordinary thing, but there it is. And at the same time, we are, if I may say so, among the more or less advanced countries in regard to the development of atomic energy. So, we span not only centuries but millenia in this.

I have no doubt that the attention we have paid to atomic energy has been right and very worth-while. It is worthwhile from the point of view of the practical advantages that are beginning to come to us and will come to us in greater measure. But it is worth-while from an even deeper point of view, one of longer perspective, because there can be no doubt that in this fast-changing world, a new age began with the bursting of the atom bomb at Hiroshima, at any rate, with this power coming into use. And ever since then,—it was only a few years ago—this has made considerable progress in both directions, both for destruction and for construction.

In that sense, therefore, this atomic energy is a real symbol of the modern world which Janus-like faces two ways, vast destruction and annihilation and great speed in construction and progress, all facing us at the same time, that is, the possibilities of both.

So far as we are concerned, we are determined not to go in for making atomic bombs and the like. But we are equally determined not to be left behind in this advance in the use of this new power. It is true that in the ultimate analysis, a country which has that power fully developed can use it for good purposes or evil purposes. And no declaration that I can make today will necessarily bind people in the future, but I do hope that we shall create an atmosphere in this country which will bind every Government in future, so that it may not use this power for evil purposes. But it is the symbol of the future, together with many other things. In past years, we rather slipped back in the development of science, technology and the like, and we are trying very laboriously to catch up. In this matter, let us not be left behind now. We should keep ourselves in the forefront from now onwards. Therefore, apart from the immediate use and good that it may bring us, from this very important future point of view, it is of the utmost importance that we should go ahead. We may calculate that a power station costs this much and that much, but there is something deeper than a power station; it is the future that we are trying to grasp and get hold of, and, therefore, we are trying to take advantage of it today. Therefore, it is something satisfying, and it is giving a measure of satisfaction that in this

matter we are keeping ahead, and that we are making regular progress.

The report itself gives a full account of this. Hon. Members have spoken and congratulated our Department, or rather the Head of that Department, Dr. Bhabha, quite rightly, but I would like to lay stress on this that our congratulations are due to a brilliant set of young scientists who are working there. No big work can come out of one or two or three men. The great work that the Atomic Energy Department has done, and is doing, is to pick out able scientists, young people, and to give them the requisite training and experience. So that we have built up now a very fine set of very young or youngish people. In fact, I remember some very eminent scientists, I think, from England or America or some foreign country, referring to this. When they all go there to Trombay, one of the remarks they make almost invariably is about the youth of the men there occupying very responsible positions. I wish in other departments of our activity we could have that youth also.

Many hon. Members who spoke gave us plenty of information, no doubt, from this Report or from some other reading. There is not much that I wish to say. But I would perhaps repeat some things. One is that India is now among the very few countries in the world which has developed the technique of fabricating fuel elements. It is known to all Members here, but I wish to repeat it. It is an important thing, an important achievement. In doing this, one of the results is that we are saving a considerable amount in foreign exchange. I have not got the exact figures. They vary; the more we do, the more we save. From the figures I have, I find that after having spent Rs. 81 lakhs for this fuel fabrication facility, of which Rs. 40 lakhs was foreign exchange, we are saving annually Rs. 45 lakhs in foreign exchange and could save more with bigger production.

Then so far as our *Apsara* is concerned, it is interesting to note how the level of operation has gone up annually from 17,840 kwh to 1 million kwh last year—in four years. Now it is known that the Canada-India Reactor achieved critically on July 10. This is going to be one of the biggest isotope producers in the world. ZERLINA has yet to come; it is being built.

One of the things to which I should like to draw special attention is the Electronics Division of the Trombay establishment. We are building big electrical plants, electronics and all that. But the Trombay establishment really as a side issue—it is not actually a side issue; it is a very important issue, but still it is one of the aspects of its work—has built up a very big Electronics Division which is producing all kinds of electronic instruments etc. And electronics definitely is a part of the future, for which we are working.

Then a question was asked about training—I forget which hon. Member raised it. Training is being given. Apart from the fact that we are helping numerous Universities, schools etc., and we are specially helping the Meghnad Saha Institute of Nuclear Physics, there is a proposal in the Third Plan for two Inter-University Atomic Centres, one in North India and one in the South. We felt that confining it to one University would not be so advantageous as making it in a sense available to Universities in a particular region.

The fact of the matter is we have neither the resources to have these reactors everywhere nor, till now, have we got the trained personnel for that. This difficulty has pursued us in the past in regard to any high-class research. Though, usually, our universities may have one, two or three very fine and able men—they do good work—yet they are spread out, one here, two there or three somewhere else; while nowadays this big scale research requires a team of high-class men, we seldom have that team in

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one place. And, one of the reasons why the Trombay establishment has done exceedingly good work is because a big team works there. If all these very persons were spread out in all the universities of India the result would not have been so good although the men were the same. Therefore, instead of spreading out in different universities, we want to have, to begin with, two centres, one in the north and one in the south, inter-university centres where the universities in that region would have access to go and work. I do not know where they would be situate—maybe in some university or near it. But, anyhow, they would be opened.

These, presumably, will have reactors and the like and other facilities and a team of people drawn from those universities will work there. All that because we want the universities to give all this basic training and even some higher training. But, at the present moment, the real high-class training is being given at Trombay itself.

I think some hon. Members have mentioned, and I repeat it, that 200 graduate scientists and engineers a year are being trained there and we are training not only our own people but people from other parts of Asia and elsewhere.

Thus, all these various developments are taking place. But the attention of most people, I suppose, is attracted to these atomic power stations that are being built or are going to be built. Shri Bharucha, evidently, wants this part of the programme to be expanded considerably and speeded up. I would very much like to do so. Though I do think we should go fast, we should go on sound foundations. Therefore, we have decided to provide one power station; and we are considering the establishment of two more similar nuclear power stations, initially with an installed capacity of 150 mega watts, each capable of doing double shift. I hope that we shall be able to do this.

People may calculate the advantages of having a power station—a conventional power station and atomic energy station—calculate the cost etc. Even from that point of view, I feel it is advantageous to have atomic power and I shall give some figures. But, apart from that, it is something far more than this business of cost. It is, as I just said, keeping a grip on the future. It is difficult to describe it. But I feel it strongly that by a these means we are getting a grip on the future. By and large I say in a humility and without an element of criticism of other people that, broadly, our outlook in India—not of individuals, not of my hon. friends in this House, but broadly our outlook is not scientific. It is rather static. We calculate everything from things as they are not realising that we live in a world where nothing remains what it is, that everything changes the next moment. We read about it; but we are not emotionally or intellectually conscious of this changing world. The result is that we do not see in this atomic energy work just the reflection of the changing world and the way this really stretches itself out into the future, and makes our position securer than it might otherwise be. That apart—I think it was referred to by some hon. Members—one very important factor about these stations is that they have a dual purpose: producing power on the one hand and plutonium on the other. Plutonium is of the greatest importance as it is not available from outside as a commercial commodity. Its production is essential in order to enable the country to set up breeder power stations using thorium which we have in ample measure. From all these points of view it becomes very important for us to build up these power stations.

About the cost of it, there is some misapprehension. From time to time some kind of a leading article appears in the newspapers dealing with the cost and saying that it is an uneconomo-

mic proposition to build up these atomic stations. Well, The country has to go the farthest with the United States, United Kingdom and the Soviet Union. I have not got any particulars about the Soviet Union. But here is the British Government's White Paper on the Nuclear Power Programme to which they are committed. Let me correct a mistake in people's minds who think that they had given up this power programme or have reduced it. Nothing of the kind. The fact of the matter is that they are going ahead but for the moment they have got large quantities of coal and oil and there has been an abundance of oil and coal being produced in Sahara and elsewhere and they are trying to use them. Anyhow, I shall just quote a few sentences about costs. The cost of electricity has gone down. That is true. But it says:

> "The nuclear costs in which capital charges are the major element are falling even faster in stations designed today."

The way things are going down is surprisingly fast.

> "In the long run we shall, therefore, need increasing supplies of nuclear power. In about ten years' time it should be cheaper to generate a base load in nuclear stations than in conventional stations provided that we achieve the technological progress that is expected. To secure this we must continue to build nuclear stations on an adequate scale."

The point to remember is that you have to carry on to achieve something. You cannot wait for America or Russia or somebody else to achieve it and then try to imitate the benefits of that. We can get the benefits but we are lagging behind and not relying on ourselves and we are not training our scientists to do that first-class work but make them imitate what others do. Therefore, we have to build up in order to keep in front all the time. The moment we give it up and wait for a better opportunity when say, the United States, has perhaps made some further improvement and then take advantage of it, we have lost the foothold. We can get it back but we have lost that time. The British White Paper says:

> "In these circumstances, the Government has decided, in agreement with the parties concerned that the national interest would best be served by continuing, for the time being, to place orders for nuclear station at the rate of roughly one every year."

Then here is an interesting lecture given by Mr. Christopher Hinton at the recent Royal Society's Tercentenary Celebrations. This shows again how the cost goes down. There is a chart here and the stations in U.K. are mentioned. At Berkely the cost was £ 160 per KW, at Bradwell, £ 159; at the third station about £ 133 at the fourth about £ 123 and at the fifth, about £ 110. Every new one makes it cheaper. It goes on because of experience gained and technological progress. There is also an interesting diagram here. May I also say that India is very favourably situated so far as costs are concerned—more favourably situated than England or America? The difference here between conventional and other things will be greater because of the distances for coal or other elements to be transported here for conventional use. According to this chart, the nuclear costs and the conventional costs are both falling. A coal fire plant and a nuclear plant are shown here. In the case of the coal fire plant the costs fall gently whereas in the case of the nuclear plant the costs fall much more rapidly. For a 75 per cent load factor the two lines cross in 1966 and then the costs of atomic energy go down and it becomes less and less expensive as compared to coal.

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My point is, it is generally admitted now in other countries where conditions are less advantageous than in India from this point of view that nuclear power stations are becoming and will soon become definitely economic propositions and cheaper, three or four years later, than conventional ones. In India, as I said, which is a big country with long distances, far from coal, far from hydro-electric works and other things, it is even more necessary. Also, inspite of an apparently large supply of coal in India, the supplies are not really large enough for the future so far as we know and we have to protect the future. Therefore, there is no doubt that we should lay the foundations for this and go ahead from now on. If we start a power station now it will be four years before it is ready, and if we do not take steps now for the second and third stations progressively, then we are thrown out, in the future we will be left rather far behind.

Now, as you perhaps know, we have decided to have the first power station on the west coast of India between Ahmedabad and Bombay. This place was chosen entirely from the point of various facilities. The place chosen is a place called Tarapore which is in Maharashtra but near Gujarat border, not far from i (*Interruption*). It is totally immaterial whether it is in Maharashtra or Gujarat, because it will supply in equal measure power to both. That has been settled and, in fact, the power distribution will be controlled by a committee or something like that where Gujarat, Maharashtra and the Atomic Energy Department will all jointly be represented. It is a very important plant, but it is not a kind of a plant which gives employment to very large numbers of people. It gives employment to some very able people but not large numbers.

Shri Kalika Singh: And the second power station between Delhi and Bhakra?

Shri Jawaharlal Nehru: That I do not know.

Shri Mukerjee said something about the disposal of atomic or radio-active waste. As a matter of fact, this is a matter which is one of great concern. I am not quite sure whether the scientists know what to do about it. It is a great nuisance. One does not know where to put it. Wherever it goes it is a nuisance. Anyhow, the International Atomic Energy Agency at Vienna have set up a number of panels on the disposal of radio-active waste and handling and transport of radio-active material etc. Indian scientists have been invited to be members of all these panels, and one Indian scientists, Mr. Sethna, was a chairman of one of these panels on the transport of large radio-active sources.

About training, I want to say one other thing. We are starting at Trombay refresher courses for scientists in universities to come and have refresher courses in atomic energy, etc.

17 hrs.

I think there is really nothing more that I can say. It is all given in the books that have been supplied. Some hon. Members probably know as much or even more than I do about it. I am grateful for the appreciation shown by hon. Members for the work of this Department. I think this atomic energy Department may well be said to be unique in that respect, because no other department of the Government of India has had this unanimous appreciation.

Shri D. C. Sharma: Sir, I do not want to add to what has already been said. I think this has been a very refreshing debate. It has been all ligh and it has engendered no heat. I think everyone of us is the wiser for this debate.

One point I would like to tell the hon. Prime Minister, who is in charge