

THIRTY-FOURTH REPORT

STANDING COMMITTEE ON ENERGY (1995-96)

(TENTH LOK SABHA)

NUCLEAR POWER PROGRAMME— AN EVALUATION

DEPARTMENT OF ATOMIC ENERGY

Presented to Lok Sabha on 22 DEC 1995

Laid in Rajya Sabha on _____

22 DEC 1995



LOK SABHA SECRETARIAT
NEW DELHI

December, 1995/Agrahayana, 1917 (Saka)

C.E. No. 049

Price : Rs. 10.00

u
328.3657R
N5.34j3

PARLIAMENT LIBRARY
Central Govts Publications
Acc. No. DC.93590(4)
Date 4/2/96

© 1995 By LOK SABHA SECRETARIAT

Published under Rule 382 of the Rules of Procedure and Conduct of Business in Lok Sabha (Seventh Edition) and Printed by M/s. Jainco Art India, 1/21, Sarvapriya Vihar, New Delhi-110016.

CONTENTS

	PAGE
COMPOSITION OF THE COMMITTEE	(iii)
COMPOSITION OF THE SUB-COMMITTEE	(v)
INTRODUCTION	(vii)

PART I

PART A

BACKGROUND ANALYSIS

A. Introductory	1
B. Nuclear Power Programme of 1984	1
C. Consequences of Curtailing the Programme	2
D. Expenditure on Advance Procurement	3
E. Views of Experts	6

PART B

Recommendations and Conclusions of the Committee	9
--	---

PART II*

Minutes of the Sitzings of the Sub-Committee and Standing
Committee on Energy relating to the Subject

* Not printed. One cyclostyled copy laid on the Table of each House and 5 copies placed in Parliament Library.

COMPOSITION OF THE STANDING COMMITTEE
ON ENERGY (1995-96)

CHAIRMAN

Shri Jaswant Singh

MEMBERS

Lok Sabha

2. Shri Bhawani Lal Verma
3. Shri Murli Deora
4. Shri Motilal Singh
5. Shri Khelsai Singh
6. Shri Khelan Ram Jangde
7. Shri Parasram Bhardwaj
8. Shri S. Thota Subba Rao
9. Shri K.P. Reddaiah Yadav
10. Shri Shiv Charan Mathur
- *11. Dr. Krupasindhu Bhoi
12. Shri Dalbir Singh
- *13. Shri Vilas Muttemwar
14. Shri P.C. Chacko
15. Shri Arjun Singh Yadav
16. Shri Virender Singh
17. Shri Laxminarain Tripathi
18. Prof. Rita Verma
19. Shri Shankersinh Vaghela
20. Shri Haradhan Roy
21. Shri Anil Basu
22. Shri Keshari Lal
23. Shri Rajesh Kumar
24. Shri Vijay Kumar Yadav
25. Dr. Venkateswara D. Rao

26. Shri Chitta Basu
27. Shri Mohan Singh (Ferozpur)
28. Shrimati Dil Kumari Bhandari
29. Shrimati Lovely Anand
30. Shri B. Shankaranand

Rajya Sabha

31. Shri Parmeshwar Kumar Agarwalla
32. Shri M.M. Hashim
33. Shri Bhubaneswar Kalita
34. Shri Dipankar Mukherjee
- *35. Shri M. Rajasekara Murthy
36. Shrimati Ila Panda
- **37. Shri J.S. Raju
38. Shri T. Venkatram Reddy
39. Shri Rajni Ranjan Sahu
40. Shri Viren J. Shah
41. Dr. Naunihal Singh
42. Shrimati Kamla Sinha
43. Shri Joy Nadukkara

SECRETARIAT

1. Shri S.N. Mishra — *Additional Secretary*
2. Smt. Roli Srivastava — *Joint Secretary*
3. Shri G.R. Juneja — *Deputy Secretary*
4. Shri A. Louis Martin — *Under Secretary*

* Ceased to be a Member of the Committee consequent upon his appointment as Minister in the Union Council of Ministers w.e.f. 13.10.95.

** Ceased to be a Member of the Committee consequent on his retirement from Rajya Sabha w.e.f. 24.7.95.

COMPOSITION OF SUB-COMMITTEE OF STANDING COMMITTEE
ON ENERGY (1994-95)

1. Shri Jaswant Singh — *Chairman*
2. Shri Parasram Bhardwaj
3. Shri Keshari Lal
4. Shri Mohan Singh
5. Shri Vilas Muttemwar
6. Prof. Rita Verma
7. Shri Viren J. Shah
- *8. Shri Matang Singh
- **9. Shri Bhubaneswar Kalita

* Ceased to be a Member of the Committee consequent upon his appointment as Minister in the Union Council of Ministers w.e.f. 10.2.1995.

** Nominated with effect from 25.7.1994.

INTRODUCTION

I, the Chairman, Standing Committee on Energy having been authorised by the Committee (1995-96) to present the Report on their behalf, present this Thirty-fourth Report on the subject, "Nuclear Power Programme—An Evaluation". The Committee had selected for examination the subject, "Energy-Fast Breeder Reactors—An Evaluation" and entrusted the task of examining the subject to a Sub-Committee of Standing Committee on Energy (1994-95). Subsequently, it was decided to change the title of the subject as "Nuclear Power Programme—An Evaluation"

2. The Sub-Committee held 4 sittings in all out of which 1 sitting was devoted to personal hearing of an expert and three sittings for in-house deliberations.

3. The Committee wish to express their thanks to the Department of Atomic Energy for placing before them the requisite material/Memorandum in connection with examination of the subject. The Committee also wish to thank Shri N. Srinivasan, former Chief Executive, Heavy Water Board, Department of Atomic Energy and Shri C.V. Sundaram, former Director, Indira Gandhi Centre for Atomic Research, Kalpakkam for submitting Memoranda containing their views.

4. The Committee also wish to thank, in particular, Dr. Raja Rammanna, former Chairman, Atomic Energy Commission, who appeared before the Sub-Committee for personal hearing and placed his considered views before them.

5. The Report was considered and adopted by the Standing Committee on Energy at their sitting held on 18th December, 1995.

6. The Committee place on record their appreciation for the work done by the Sub-Committee (1994-95) of Standing Committee on Energy.

NEW DELHI;
18 December, 1995
27 Agrahayana, 1917 (Saka)

JASWANT SINGH,
Chairman,
Standing Committee on Energy.

PART—A

BACKGROUND ANALYSIS

A. INTRODUCTORY

The Department of Atomic Energy have been pursuing a 3 stage Nuclear Power Programme. This programme is structured around natural uranium fuel based pressurised heavy water power reactors in the first stage; fast breeder reactors using plutonium based fuel for power generation and in addition producing nuclear fuel (plutonium and uranium 233)—thus maximising the use of natural uranium, in the second, and advanced power reactors using thorium fuel cycle in the third stage.

2. The Department have successfully achieved technical capability in the design, construction and operation of pressurised heavy water reactors (PHWRs). The programme of building of PHWRs has been indigenised, and the design of 220 MWe PHWR has been standardised. The 500 MWe capacity pressurised heavy water reactor is under development. With the successful operation of the Indian Fast Breeder Test Reactor (FBTR), goals have been set for the development of 5000 MWe Prototype Fast Breeder Reactor (PFBR).

B. NUCLEAR POWER PROGRAMME OF 1984

3. The Nuclear Power Profile prepared in 1984 by DAE envisaged a 10,000 MWe Pressurised Heavy Water Reactor Programme by the addition of twelve 220 MWe and ten 500 MWe units, beyond Kakrapar-2 to reach an installed capacity of 10,000 MWe by the turn of the century. In 1989, the plan was modified to eight 220 MWe and twelve 500 MWe beyond Kakrapar-2. After the Three Mile Island and Chernobyl accidents, detailed reviews were carried out here and follow up action taken. Elaborate procedures for safety and environmental clearance came into effect. At the same time, severe resource constraints were also then experienced. The target was therefore, scaled down in 1990, to a much lower goal of 5700 MWe to be achieved by the turn of the century. DAE's proposal for the Eighth Five Year Plan was based on commencing construction of Tarapur 3 & 4 (2k500 MWe) Rajasthan 5 & 6 (2k500 MWe), Kaiga-3 to 6 (4k220 MWe) and additionally the Kudankulam Project (2k1000 MWe), in terms of the Inter-Governmental Agreement between India and the erstwhile Soviet Union. Accordingly, an outlay of Rs. 14400 crores was proposed for the Eighth Five Year Plan period. Against this the approved outlay was just Rs. 4119 crores, whilst the budgetary support was limited to

Rs. 617 crores only. Presently, due to continuing absence of financial support, beyond the projects under construction i.e. Kaiga-1 & 2 and Rajasthan 3 & 4, only one other 500 MWe unit is expected to be taken up. Thus, when completed what will be achieved is only a third of original, a capacity of only 3320 MWe, and that, too, by about 2004. Explaining the difficulties in mobilising funds by the Nuclear Power Corp. of India Ltd. (NPCIL), the Department of Atomic Energy stated, in a note, as under :

“The generating capacity base of NPCIL is small to generate any sizeable surpluses for funding future nuclear power projects. NPCIL has no access to overseas funding. When NPCIL was formed, it was envisaged that nuclear power projects will be funded based on a debt equity ratio of 1 : 1 with equity flowing initially. Presently, due to resources crunch, a debt equity ratio to 2 : 1 is now envisaged. There are also difficulties in mobilising significant market borrowings. Furthermore, the interest burden will increase if the quantum of borrowings increases and result in debt servicing problems for the Company.”

C. CONSEQUENCES OF CURTAILING THE PROGRAMME

4. The Committee desired to know the adverse consequences of abandoning the programme of 10,000 MW nuclear power by 2000 A.D. In reply the Department of Atomic Energy stated as under :

- (i) The Indian Nuclear Power Programme is largely based on Pressurised Heavy Water Reactor (PHWR) technology aimed at efficient utilisation of Uranium resources available in the country. The indigenously designed PHWRs of 220 MWe & 500 MWe capacities are a result of extensive research and dedicated design work for over three decades by the Scientists and Engineers of the Department. India in fact, is amongst the few countries that have developed comprehensive capability in the nuclear power, comprising of design, construction and operation of nuclear power plants. The necessary infrastructural facilities for uranium mining, fuel fabrication, fuel reprocessing, radioactive waste management and heavy water production etc. have been built and some of them augmented to suit the programme. These facilities which have been developed at great cost and effort will now remain under-utilised.
- (ii) The Indian Industry has lived upto the challenges of manufacturing sophisticated nuclear components. Public and Private Sector Industries participating in the programme, have

invested heavily commensurate with the envisaged plan to create/develop nuclear shops, technical skills and indigenous technology needed for the manufacture of such components. Curtailment of the programme has resulted in gross under-utilisation and consequent diversion of the facilities and skilled manpower. If immediate actions are not taken for continuing with the projects, revival at a later date would be difficult due to dissipation of technology and exodus of trained manpower.

- (iii) Unless the designs are projectised and implemented, there will be frustration and demoralisation amongst Engineers of the department as well as of consultants actively associated in the programme. In fact due to the prevailing uncertainties, young engineers specially trained in the field of stress analysis, piping and vessel design, process dynamics, instrumentation etc. have started leaving the department.
- (iv) It is also necessary to put to productive use the work and expenditure already incurred and the inevitable balance expenditure due on the already entered commitments based on advance procurement sanctions accorded by Government.
- (v) It is recognised that fossil fuels including coal are finite and for energy independence, it is essential to harness nuclear power. Also, for strategic and technical reasons, there is a need to develop a diversified energy resource base, for electricity generation. Nuclear Power is environmentally benign and does not lead to global warming, caused by green house effect in thermal power plants due to release of carbon dioxide to the atmosphere.
- (vi) The share of nuclear power which is only about 2.5% at present will shrink further if new projects are not taken up. If the indigenously developed technology is not implemented, the country will lag behind neighbouring countries like China and South Korea who have embarked on an ambitious nuclear power programme. China presently having an installed nuclear capacity of 2100 MWe, is planning a significant nuclear power development to 50,000 MWe by the year 2020. South Korea which has installed nuclear capacity of 7,220 MWe, is planning to expand installed nuclear capacity to 20,000 MWe by the year 2007.

D. EXPENDITURE ON ADVANCE PROCUREMENT

5. The Department of Atomic Energy informed the Committee, in a note that partial Financial sanctions totalling about Rs. 1511 crores

were accorded by Government of India between 1986 and 1991 for advance procurement of long delivery and critical equipment required for six units of 500 MWe and four units of 220 MWe units. This was in line with the Nuclear Power Profile of the Department of Atomic Energy which envisaged setting up of 10000 MWe of nuclear power capacity as part of the first stage nuclear power programme.

6. The above six 500 MWe units were to be set up at Tarapur, Maharashtra (2k500 MWe) and Rawatbhata, Rajasthan (4k500 MWe). The four 220 MWe units were to be set up at Kaiga in Karnataka (Kaiga-3 to 6). The various site clearances required for these projects have been obtained. Projects financial sanctions in respect of Tarapur-3 & 4 (2k500 MWe) was also accorded in January 1991. However, commencement of construction of Main Plant civil works is not taken up due to non-availability of funds. In respect of projects on which advance actions have been taken, the proposals for projects financial sanctions have been kept in abeyance due to non-availability of funds.

7. The details of advance procurement sanctions accorded by the Government of India are as follows :

Date of sanction	Amount (Rs. in crores)
6.2.86	161.77
6.7.88	382.35
6.7.88	784.85
24.1.91	182.04
	<hr/> 1511.01

8. The DAE have stated that as against the above approvals, expenditure to the tune of about Rs. 1366 crores has already been incurred, as of March 1995, with break up as given below :

	Expenditure as of March 1995 (Rs. in crores)
Tarapur-3 & 4 (2k500 MWe)	802
Rajasthan-5 to 8 (4k500 MWe)	265
Kaiga-3 to 6 (4k220 MWe)	299
Total	1366

9. In addition to the above expenditure, more commitments are stated to be in the pipeline, based on the purchase orders, already placed.

10. Pointing out that the expenditure on advance procurement should normally have been funded as equity in the form of Government budgetary support, the DAE have stated that due to reduced Government budgetary support, equity received towards advance procurement is only Rs. 710 crores and the balance amount of Rs. 656 crores has been spent out of borrowings at varying interest rates upto 17%. The interest paid on this borrowing upto March 1995 works out to Rs. 262 crores which is included in the expenditure given above.

11. The materials procured are kept under long term storage and preservation as the projects could not be commenced. Efforts are also in hand for disposing some of the items. But due to the special nature of these items, the scope for disposal is very limited.

12. Asked about the details of the expenditure incurred on advance procurement of critical long delivery items which remain unutilised, the Department of Atomic Energy stated in a written reply:—

“An expenditure of Rs. 1366 crores (including interest burden of Rs. 262.18 crores) has been incurred, towards advance procurement of critical long delivery items, designs and some infrastructural facilities. Out of this, about Rs. 60 crores have been spent towards land acquisition, site infrastructure and design consultancy.”

13. Pointing out that purchase orders placed for the programme are in pipeline as commitments the Committee enquired about the monetary quantum and implications of such commitments. In a written reply the DAE stated as follows:—

“Based on the sanctions totalling to Rs. 1511.01 crores accorded by the Government for advance procurement of materials and equipment, Purchase orders/Work orders were issued from 1986 onwards amounting to Rs. 1376.82 crores. Taking into account F.E. variation, escalation, duties & taxes upto the expected delivery/completion period, the balance commitments to be honoured are estimated at Rs. 950 crores. Attempts are on hand to short close/cancel the orders placed, limiting the supplies required for only two reactor units (out of 10 units) which may somewhat reduce the balance commitments, depending on the success of negotiations with the suppliers.”

14. The Committee observed that advance procurement, without equity, has resulted in an avoidable interest expenditure of Rs. 262

crores. Reacting to this observation, DAE explained in a written reply:—

“At the project sanction stage, the financial planning was passed on 1 : 1 debt equity ratio, with equity from Government flowing in the beginning. However, subsequently there was change in the Government policy and debt equity ratio was change from 1 : 1 to 2 : 1. Also the flow of the required equity from the Government was considerably reduced. This resulted in NPCIL having to meet the above borrowings at interest rates ranging from 12 to 17% per annum. This resulted in the interest burden. To mitigate additional burden of debt on the borrowings already spent on advance procurement, efforts are on hand to divert/dispose off the items procured beyond 2 reactor units. However, since these materials and equipments are specific to nuclear power plants of PHWR type, only scrap value can be salvaged.”

15. The Department of Atomic Energy pleaded that it is essential that Government backs up the programme by providing necessary budgetary support so that the expenditure incurred on these projects are put to productive use.

E. VIEWS OF EXPERTS

16. The Sub-Committee on Standing Committee on Energy had a personal hearing to elicit the views of Dr. Raja Ramanna, former Chairman, Atomic Energy Commission. Asked about his views on the abandonment of nuclear power programme of 10,000 MW by 2000 A.D. Dr. Ramanna stated:—

“This is a question which has come about because the Government has not been able to provide for the 10,000 MW programme. I accept the policy was to have the programme going and that is why the ‘go ahead and place orders’ signal was given. It seems that the Planning Commission is now not supporting the power programme to the extent required.....We should go ahead with the 10,000 MW programme, the only part that should be deleted is ‘at the end of the century’ and replace by 2010. This programme should be supported because it (Pressurised Heavy Water Reactor) is the one technology in which we have mastered and which is modern and it has already helped a lot.”

17. In a memorandum furnished to the Committee another expert, Shri N. Srinivasan held the following views:—

“Shortage of funds bordering on total neglect has characterised the approach to nuclear power on the part of the Government.

The stretching of the schedule to match the flow of funds has escalated costs to the extent that they do not reflect the true costs but avoidably inflated ones. This leads to an adverse assessment of the economics of nuclear power. The absence of a long term committed plan has discouraged industry regarding future participation which again will be reflected in higher costs of the future products. In fact some large manufacturers of equipment had set up shops for nuclear components and have had to shift them for other applications. In the absence of a committed continuous programme the technology built under heavy odds over four decades will be irretrievably lost."

18. Regarding nuclear power programmes, Shri Srinivasan made the following suggestions:—

- There is need to draw up a plan for the next twenty five years integrating nuclear power with the national needs as well as the needs to maintain an optimum pace to keep this valuable technology alive—and improving all the time—and availing of the benefits of repeat ordering of major components. It is entirely feasible to build up a nuclear power capacity of 20,000 MWe by 2020, representing 10% of the capacity at that time. This will require a will to pursue the programme backed by good planning from now and a sensible method of funding.
- Sites must be identified for setting up future stations and their character must be preserved till constructions starts.
- The associated capacities as for fuel, heavy water, reprocessing and waste management should also be planned.
- Intensive exploration of uranium of reasonably good grade is essential for a long term plan.
- The design and associated development work for a Prototype Fast Reactor for construction within the next 20 years should be given high priority.
- If nuclear power programme withers either due to lack of action on the above aspects or due to poor funding, not only will the future generations be denied this potential source of power but the standing of the country as advanced in this area of technological development will be damaged. India no longer can be considered among the most advanced in nuclear technology. Many have overtaken India in the absorption,

development and exploitation of this technology. This situation has also to be reversed, which is possible only through a strong nuclear power programme.

19. Outlining the projection of future nuclear power programme yet another expert, Shri C.V. Sundaram, former Director, Indira Gandhi Centre for Atomic Research stated in a Memorandum as follows:—

“A possible projection—with a sufficient content of challenge and ambition—will be that nuclear power generation in the country should be increased to a proportion of 10 to 15% of total electricity generation in the first half of the next century. A capacity of 10 to 15,000 MWe based on PHWRs should be achieved by the period 2015 to 2020. This capacity will provide adequate plutonium supply for series construction of fast breeder reactors commencing from 2020 onwards. In the second quarter of the next century, the contribution from the fast breeder reactors can be steadily stepped up. The implementation of such a programme will provide the essential experience and confidence for flexible energy planning in the second half of the next century.”

RECOMMENDATIONS AND CONCLUSIONS
OF THE COMMITTEE

1. A programme was drawn by the Government in 1984 to achieve 10,000 MW nuclear power by the year 2000 A.D. by addition of twelve 220 MW and ten 500 MW units. It is observed that accordingly financial sanction totalling about Rs. 1511 crores was accorded by the Government in 1986 and 1991, for advance procurement of critical long delivery equipments. This was in line with the programme of achieving a target of 10,000 MW by 2000 A.D. The Committee are greatly disappointed to note that this was pruned in 1990 to a revised target of 5700 MW by the turn of the century. That even this was further scaled down and a capacity of just 3320 MW is now expected to be achieved by the extended time frame of 2004, is a matter that the Committee view with great disquiet. It is obvious from these successive downward revisions that unacceptable ad-hocism has ruled the Nuclear Power Programme of the Government. It is evident that no serious thought appears to have been given to Financial Planning before launching the programme. What is even more worrisome is that the synergetic consequences of cutting down this programme, appear to have not been sufficiently recognised. That this curtailment of the Nuclear Power Programme is accompanied by very grave consequences is brought out in the succeeding paragraphs.

2. The Committee observe with grave disquiet that critical long delivery items, procured in advance, at a cost of Rs. 1366 crores, remain unutilised consequent upon this pruning of the Country's Nuclear Power Programme. It is shocking to note that a considerable proportion (almost 50%) of expenditure on this count has actually been incurred out of borrowings. This has an in-built and an escalating interest burden, which, as of March, 95 stood at Rs. 262 crores. Though efforts have been made to divert/dispose off the items, it has been stated that only scrap value can now be salvaged, as these equipments are specific to Nuclear Power Plants. And, this is not all: Purchase orders which are in the pipeline, as commitments, are estimated to cost another Rs. 950 crores. The Committee simply cannot accept such irresponsible handling of a programme of such critical and strategic importance to the Country. The Committee recommend a more detailed and urgent investigation of this whole matter with a view to affixing responsibilities. A minimum of Rs. 2300 Crores, plus continuing and mounting interest burden have been lost by the Country.

3. Another fallout of scaling down the Nuclear Power Programme is that infrastructural facilities for uranium mining, fuel fabrication, fuel reprocessing, radioactive waste management and heavy water production etc. developed at great cost and effort will now remain either under-utilised, or totally unutilised. The costs of these cannot be computed.

4. The Committee have been informed by DAE that Public and Private Sector Industries participating in the programme, have invested heavily, commensurate with the envisaged plan to create/develop nuclear shops, technical skills and indigenous technology needed for the manufacture of such components. Curtailment of the programme will thus result in gross under-utilisation, also consequent diversion of the facilities and skilled manpower. It has been pointed out that unless immediate actions are not taken for continuing with the projects, revival at the later date would be difficult due to dissipation of technology and exodus of trained manpower. The Committee view the situation with grave concern and dismay. The Committee agree with the view expressed by an expert (Shri N. Srinivasan) that "in the absence of a committed continuous programme, the technology built under heavy odds over four decades will be irretrievably lost." The Committee consider it their duty to report this in unambiguous terms to the Parliament.

5. The Committee note that an outlay of Rs. 14,400 crores was proposed for the Eighth Five Year Plan Period. Against this the approved outlay was only Rs. 4119 crores, with a budgetary support of a mere Rs. 619 crores. The Committee have been informed that the resource generating capacity of the Nuclear Power Corporation of India Limited (NPCIL) is small; generating any sizeable surplus for funding Nuclear Power Projects extremely doubtful, and mobilising significant borrowings difficult. Another constraint of NPCIL is that it has no access to overseas funding. In the circumstances, the neglect of the Nuclear Power Programme by the Government can simply not be condoned. The Committee have grave doubts that it would be possible to achieve even the greatly truncated capacity of 3320 MW by 2004. The Committee therefore, urge the Government to review its policy in its entirety, and to provide the required funding to DAE, urgently.

6. The Committee observe that if our indigenously developed technology is not implemented, the country will suffer a grave and near irreparable damage. The Committee emphasise that fossil fuels including coal are finite and for energy independence, it is essential to harness nuclear power. Also, for strategic and technical reasons, there is a need to develop a diversified energy resource base, for

electricity generation. By neglecting the field of Nuclear power the Government is guilty of having compromised the goal of energy independence for the country.

7. Having examined the far reaching consequences of curtailment of Nuclear Power Programme prepared by DAE in 1984 and the need to develop diversified energy resource for strategic and technical reasons, the Committee feel strongly that the Government must re-examine and modify its policy in respect of Nuclear Power Programme of the country, and adopt a committed programme, with committed, enhanced funding.

NEW DELHI;
18 December, 1995
27 Agrahayana, 1917 (Saka)

JASWANT SINGH,
Chairman,
Standing Committee on Energy.