REPORT OF THE COMPTROLLER AND AUDITOR GENERAL OF INDIA

UNION GOVERNMENT
NO. 4 (COMMERCIAL) OF 1990

NATIONAL THERMAL POWER CORPORATION LIMITED

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PREFACE

The Audit Board in this case consisted of the following members:-

S/Shri

K.Tyagarajan	: Chairman, Audit Board & Ex-Officio Additional Deputy Comptroller and Auditor General (Commercial) from 1st April, 1988 to 31st December, 1989 and as Deputy Comptroller and Auditor General (Commercial) - cum -Chairman, Audit Board from 1st January 1990 to 30th April 1990.
A.C.Tiwari	:Chairman, Audit Board & Ex-officio Additional Deputy Comptroller and Auditor General (Commercial) from 1st May 1990 to 24th May 1990 and as Deputy Comptroller and Auditor General(Commercial) - cum - Chairman Audit Board from 25th May 1990 to date.
N.Sukumaran	: Member, Audit Board & Ex-Officio Director of Commercial Audit- III, New Delhi from 26th September 1986 to 24th August 1987.
Dharam Vir	: Member, Audit Board and Ex-Officio Director of Commercial Audit-III, New Delhi from 21st April 1988 to 16th January 1989.
S.Lakshminarayanan	: Member, Audit Board and Ex-officio Director of Commercial Audit-III, New Delhi from 17th January 1989 to 27th February 1990 and as Principal Director of Commercial Audit and Ex-Officio Member, Audit Board from 28th February 1990 to 18th March 1990.
Kanwal Nath	: Principal Director of Commercial Audit and Ex-Officio Member, Audit Board-III, New Delhi from 19th March 1990 to date.

Smt.A.Basu	: Member, Audit Board and Ex-officio Director of Commercial Audit-I, Calcutta up to 27th February 1990 and as Principal Director of Commercial Audit and Ex-Officio Member, Audit Board-I,Calcutta from 28th February 1990 to date.
K.S.Menon	: Assistant Comptroller and Auditor General (Commercial) and Member - Secretary, Audit Board from 2nd July 1990 to date.
J.L.Bagga	: Retired Deputy Chief Engineer (Thermal Construction Monitoring/ Commissioning), Central Electricity Authority.
H.R.Rao	:Retired Adviser (Power), Planning Commission up to 14th July1987.
*Ram Pratap	:Retired Chief Engineer, Central Electricity Authority from 6th November 1987 to date. (Appointed in place of Shri H.R.Rao)

2. The report was finalised by the Audit Board after taking into account the results of discussions held with the representatives of the Ministry and the Company at its meeting held on 8th September 1990.

3. The Comptroller and Auditor General of India wishes to place on record his appreciation of the work done by the Audit Board and, in particular, the contribution made by the non-official members.

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* Did not attend any meeting of the Audit Board.

OVERVIEW

I. The National Thermal Power Corporation Limited was incorporated in November 1975 for construction and operation of large pit-head thermal power stations with associated transmission system with a view to developing integrated multi-regional power system and to increase the availability of power rapidly to meet the growing power demand. In addition to Singrauli, Ramagundam and Korba Projects which have been fully commissioned, the Company was implementing 10 generating projects with a total capacity of 10487 MW. Further, the Company had also submitted Feasibility Reports for 12 Projects with a total capacity of 8768 MW which were under various stages of Government's approval.

(Paras 1.1., 1.2 and 5.1)

II. The Company's generation and transmission projects were to be financed by Government of India as equity and loans in the ratio 1 : 1; the latter also included international financial assistance from the World Bank, foreign governments and other international financing agencies. At the end of 1988-89 the Government of India's equity contribution was Rs.4414.61 crores; loans from Government of India stood at Rs.1876.00 crores while those from external agencies were Rs.1810.99 crores.

(Paras 4.1 to 4.3)

III.The Government's approval for various projects of the Company took much longer time than originally envisaged. In ten cases, the time taken for getting the Government's approval ranged between 4 and 15 months. The time taken for the Government's approval in the case of six projects was abnormally long i.e. Kahalgaon (58 months), Talcher (53 months), National Capital Thermal Power Project (NCTPP) (42 months), Farakka Stage-II (28 months), Vindhyachal (19 months) and Korba Stage-II (17 months). This was attributed mainly to procedural delays in techno-economic and environmental clearance from various agencies. Placement of orders for the main plant equipment after receipt of Government approval took an abnormal period of 41 months for Kawas Project, 30 months for Singrauli Stage-II, 26 months for Farakka Stage-I, 22 and 25 months for Ramagundam Stage-I & II and 24 months for Kahalgaon as against the normal stipulated period of 12 months. This was mainly on account of delay in tying up of finances and completion of the required formalities. This resulted in shifting the dates of orders for the main plant equipment and consequently the commissioning schedules of the projects. The total time gap between submission of the Feasibility Reports and the Zero dates was as high as 82 months in Kahalgaon, 58 months in

Talcher, 56 months in Kawas, 51 months in NCTPP, 40 and 46 months in Farakka Stage I & II, 37 months in Singrauli Stage-II and 31 months in Ramagundam Stage-II.

(Paras 5.3. to 5.5).

IV. The Company envisaged a commissioning schedule of 48 and 60 months for the first 200 MW and 500 MW units respectively from the Zero date i.e. the date of ordering the main plant equipment. For successive units a time gap of 8 and 12 months respectively was laid. Out of 21 units commissioned upto March 1989, 10 units were commissioned ahead of the commissioning schedule, 2 units were commissioned on schedule, while the commissioning of 9 units was delayed by 1 to 15 months. Commissioning of 3 units of 200 MW of Farakka Stage-I was delayed by 8, 13 and 15 months on account of extraordinary industrial relations, acute law and order situation in the area, delay in land acquisition, frequent interruptions in construction power supply from West Bengal State Electricity Board (WBSEB), inadequate mobilisation of resources by contractors for major works, etc.

(Paras 5.2 to 5.8).

V. On account of abnormal delays in the acquisition of land, the construction of Merry-go-round (MGR) system, ash disposal dykes, etc. at a number of projects got delayed and the Company had to make alternate arrangements for transportation of coal and disposal of ash, etc. as well as to extend the scheduled dates for completion of these works.

(Para 5.8.4.1).

VI. The Project site of NCTPP was changed from Muradnagar to Dadri due to land acquisition problem and non-receipt of environmental clearance, resulting in blocking of Company's funds to the extent of Rs.2.40 crores on land acquisition and construction of other facilities, etc. at the site.

(Paras 5.8.4.3 to 5.8.4.6).

VII. There was substantial cost over-run in almost all the projects completed and ongoing, so far. The project cost of Singrauli (2000 MW) increased from Rs.705.17 crores to Rs.1149.30 crores, Korba (2100 MW) from Rs.839.04 crores to Rs.1595.46 crores, Ramagundam (2100 MW) from Rs.889.90 crores to Rs.1616.92 crores and Farakka (1600MW) from Rs.1064.83 crores to Rs.1866.07 crores. In almost all the completed projects, (except Singrauli-I, 2 x 200 MW) the actual cost was more than even the revised approved cost. Actual cost over-runs were due to price escalation, variation in quantities, change in specifications of work and change in duties/taxes from time to time, etc. The approval of Public Investment Board (PIB) and other appropriate authorities for revised project costs was not obtained by the Company in several cases.

(Para 5.9).

VIII. The design of Stacker Reclaimer foundation

at Singrauli was prepared and approved without proper and adequate soil investigation. This resulted in problem of unpredictable settlement in both the tracks of the Stacker Reclaimer and avoidable extra expenditure of Rs.26.85 lakhs. The structural design of the coal crushing supporting structure was found to be grossly inadequate; the designs were not checked at the stage of approval. Consequently remedial measures at a cost of Rs.9.43 lakhs to the Company were necessitated. Although the Company had retained a consultant to oversee the work and the consultant was required to guarantee that the design engineering of the coal handling plant would meet the requirement of safe and efficient operation, no action was taken against the consultant despite the various defects which occurred in the coal handling plant.

(Paras 6.2.4 to 6.2.10).

IX. The Company had to incur an extra expenditure of Rs.29.06 lakhs for transportation of 3.66 lakh tonnes of coal by rail/road during September 1983 to November 1984 on account of delay in the commissioning of MGR system at Ramagundam project. The MGR system at Farakka was completed after a delay of 5 years. Owing to the delay in completion of MGR system at Farakka, the Company had to make alternate arrangements for transportation of coal by road/rail to meet the requirements of units I & II of Farakka commissioned in January 1986 and December 1986 respectively. A temporary railway siding alongwith approach road was constructed to facilitate loading of coal transported by road from Rajmahal coal mine into railway wagons for further transportation to Farakka. The transportation and handling charges were much in excess of the estimated transportation cost by MGR system. This resulted in an additional expenditure of Rs.8.34 crores for transportation of 12.52 lakh tonnes of coal upto March 1988.

(Paras 6.3.4 and 6.3.9).

X. Due to delay in the opening of the railway siding at Singrauli, the Company had to pay Rs.88.75 lakhs to Bharat Heavy Electricals Limited (BHEL) as additional transportation cost from Singrauli Railway Station to SSTPP, Shakti Nagar. Further, the Company had to incur extra transportation charges of Rs.16.96 lakhs on transportation of cement, etc.during 1983-84 and 1984-85 which could have been avoided had the railway siding been completed earlier.

(Para 6.4).

XI. Delay also occurred in the construction of associated transmission lines at Singrauli Stage-II, Korba Stage-II, Ramagundam Stage-I, Farakka Stage-I, Rihand Stage-I and Vindhyachal Stage-I due to delays in clearance and acquisition of forest lands, poor performance of contractors, law and order problems, etc. This resulted in cost over-run upto 240 per cent (in

1. INTRODUCTION

1.1. Electric power generating industry is the backbone of any country's economic growth and prosperity. The Electricity (Supply) Act, 1948 provided for establishment of organisations, namely, State Electricity Boards in the States to construct, own and operate power generating stations to increase the power availability rapidly, so as to meet the growing power demand of the country. Under the Act, the power development in the country was to be done through the State Electricity Boards and the role of Centre till 1975 was that of a co-ordinating agency only. In order to revitalise the power supply industry and augment and supplement the efforts made by the States, the Act was amended in 1976 to provide for setting up generating companies in the Central Sector also. Thus, the Centre became directly involved in power generation and transmission to augment and supplement the capacity being installed in the State Sector.

1.2 It was in this back-drop that National Thermal Power Corporation Limited (NTPC) was incorporated on 7th November 1975, with its Headquarters at Delhi. The Company set up Thermal Power generation stations at Singrauli, Korba, Ramagundam, Farakka, Vindhyachal, Rihand, Kahalgaon, Talcher and National Capital Thermal Power project at Dadri. The long-term plan of the Company for the period 1985-2000 envisaged a capacity of 27920 MW by 2000AD. In addition to the thermal power stations, the Company is setting up three gas-based projects. The Committee on Public Undertakings (COPU) examined the working of the Company vide their 92nd Report 1983-84 (Seventh Lok Sabha). The present report covers largely the working of the Company for the years 1984-85 to 1988-89.

2. OBJECTIVES

2.1 In pursuance of the directives issued by the Bureau of Public Enterprises (BPE) and the recommendations of the Committee on Public Undertakings (COPU) in its 92nd report (1983-84), the Company prepared its long-term primary objectives and sub-objectives.

2.2 The proposed long-term primary objectives of the Company are :

(1) to establish thermal power capacity and associated transmission systems within the prescribed time schedule, cost and reliability level and conforming to the National Energy Plan;

(2) to operate its power stations at base load with maximum performance efficiency and plant reliability;

(3) to build in-house capabilities so as to be self reliant in respect of technical expertise and develop a cadre of skilled manpower with the knowledge of the latest technology;

(4) to manage the financial operations of the Company in accordance with sound commercial practices and to generate returns as per Government guidelines;

(5) to develop and implement a well-knit personnel policy and a comprehensive personnel programme that will be result-oriented and to develop an organisational culture which motivates employees to contribute their best towards the achievement of organisational objectives; and

(6) to function as a responsible public sector undertaking bearing in mind its commitments to the society.

The approval of these objectives submitted to Government in January 1984 was awaited (September1990).

2.3 The extent to which the Company had been able to fulfil the above objectives is discussed in the succeeding paragraphs.

3.ORGANISATIONAL STRUCTURE

3.1 The Company is headed by a Chairman and Managing Director, assisted by Director (Operations), Director (Projects), Director (Technical), Director (Finance) and Director (Personnel). Four Executive Directors are in charge of the operations of the Company's projects in the Northern, Southern, Eastern and Western regions.

3.2 A chart showing the organisational structure is given in annexure I.

4.CAPITAL STRUCTURE

4.1 The Company's generation and transmission projects are to be financed by the Government of India as equity and loan in the ratio of 1:1. The first 50 per cent of the project cost is released as equity and the balance as interest-bearing long-term loans which also include the international financial assistance received by the Government of India under various loan/ credit agreements.

In addition to the above, the Government of India also permitted the Company from time to time to borrow funds from external commercial agencies viz. Standard Chartered Merchant Bank, U.K., (SCMB), and Skandinorviska Enskilda Banken, Sweden (SEB) and internal borrowings through issue of Power Bonds to finance some of the projects.

4.2 ***Authorised and Equity Capital***

The authorised capital of the Company increased from Rs.125 crores in 1976-77 to Rs.6,000 crores in 1988-89. Against this, the equity contribution by Government of India was Rs.4414.61 crores as on 31st March 1989.

4.3. ***Loans***

No loans were drawn by the Company till 1979-80. The position of outstanding loans from the Government of India as well as from the external commercial banks against Government of India's guarantee at the end of the five years ending 31st March 1989 is indicated below:-

(Rs. in lakhs)

Year	Government of India's loans	Loan from external Commercial Banks	Total
1984-85	96884.96	6351.06	103236.02
1985-86	135868.97	23052.97	158921.94
1986-87	165758.37	53845.31	219603.68
1987-88	136274.68	117149.16	253423.84
1988-89	187599.79	181098.92	368698.71

The above includes the International Development Agency (IDA)/International Bank For Reconstruction and Development (IBRD)/Organisation of Petroleum Exporting Countries (OPEC) assistance released by the Government of India against the actual expenditure incurred by the Company for the projects partly financed from external credits/assistance.

5. PROJECT COSTS AND IMPLEMENTATION

5.1 In accordance with Government of India's programme for establishing large coal pit-head thermal power stations and supply of power on a regional basis supplementing the efforts of the States in accelerating power development for meeting the growing needs of power in the Country, a Committee was set up by the Government of India in 1973 to select sites for large pit-head Super Thermal Power Stations (STPS). The Committee had identified several promising sites. Out of these sites, Singrauli, Korba, Neyveli, Ramagundam and Farakka were selected for the first phase of implementation of the programme of setting up pit-head thermal stations in the Central Sector. Out of these, four Super Thermal Power Stations (STPS) at Singrauli, Korba, Ramagundam and Farakka were to be owned, constructed and operated by the Company and the Neyveli Super Thermal Power Station was to be owned, constructed and operated by the Neyveli Lignite Corporation Limited. According to the Ministry of Energy, at present (August 1990) in addition to Singrauli, Ramagundam and Korba Projects which had been fully commissioned, the Company was implementing 10 generating projects with a total capacity of 10487 MW. Further, the Company submitted Feasibility Reports for 12 projects with a total capacity of 8768 MW which were under various stages of Government's approval.

So far as Farakka Project (FSTPP) is concerned, it has still to be fully commissioned.

5.2 The Company envisaged a commissioning schedule of 48 months for the first 200 MW unit and 60 months for the first 500 MW unit from the date of order for the main plant equipment. The time gap for commissioning of successive 200 MW units was scheduled as six months and that for 500 MW units as one year.

5.3 The time taken for technical clearance by Central Electricity Authority (CEA), project clearance by the Public Investment Board, approval of the Government and zero date for commencement of the commissioning schedule in respect of approved projects are given in the table below:

Project	Proposed capacity (MW)	Date of submission of Feasibility Report (FR)	Technical clearance by Central Electricity Authority	Clearance by Public Investment Board	Approval by the Govt.	Total time taken for approval (months) (6-3)	Zero date of project i.e.date of order for main plant equipment (8-6)	Total time gap between submission of F.R.and zero date (months) (8-3)
1	2	3	4	5	6	7	8	9.
Singrauli St.I	600	7/76	Already	11/76 (4)	12/76 (1)	5	2/78 (14)	19
(2000 MW) St.II	1400	12/78	Cleared	5/79 (5)	7/79 (2)	7	1/82 (30)	37
Korba St.I	1100	1/77	8/77(7)	11/77(3)	4/78 (5)	15	1/79 (9)	24
(2100 MW) St.II	1000	4/80	N.A.	3/81(11)	9/81 (6)	17	8/82(11)	28
Ramagundam St.I	1000	10/77	12/77(2)	1/78(1)	4/78 (3)	6	2/80(22)	28
(2100 MW) St.II	1000	3/81	3/81(0)	4/81(1)	9/81 (5)	6	10/83(25)	31
Farakka St.I	600	1/78	8/78(7)	1/79(5)	3/79 (2)	14	5/81(26)	40
(2100 MW) St.II	1000	5/82	10/83 (17)	4/84(6)	9/84 (5)	28	3/86 (18)	46
Vindhyachal	1260	11/80	11/81 (12)	12/81(1)	6/82 (6)	19	6/82 (0)	19
Rihand St. I (3000 MW)	1000	2/82	4/82 (2)	4/82(0)	6/82 (2)	4	8/82 (2)	6
Khalagaon St. I (2840 MW)	840	9/80	3/81 (6)	8/84(41)$	7/85(11)	58	7/87(24)	82
NCTPP St. I (1840 MW)	840	8/83	10/83 (2)	8/86(34)$	2/87 (6)	42	11/87(9)	51
Talcher St. I	1000	6/84	12/84 (6)	6/87(30)$	11/88(17)	53	4/89(5)	58
<u>Gas-based Projects.</u>								
Anta	430	9/85	10/85 (1)	12/85 (2)	10/86(10)	13	8/87(10)	23
Kawas	600	7/85	9/85 (2)	12/85 (3)	10/86(10)	15	3/90(41)	56
Auraiya	600	7/85	9/85 (2)	12/85 (3)	10/86(10)	15	9/87(11)	26

(Figures in brackets indciate number of months)

$ This includes time taken for pre-PIB clearance.

From the above table the following position emerges:

(i) The time taken by CEA for technical clearance of the projects ranged between one and seventeen months from the date of submission of feasibility report. In the case of Farakka stage-II and Vindhyachal projects the time taken was much more compared to others.

(ii) The time taken for getting PIB approval after technical clearance by CEA ranged between zero and fortyone months; and time taken for clearance in respect of Kahalgaon, National Capital Thermal Power Project (NCTPP) and Talcher project was far more compared to others.

(iii)Similarly, the time taken by Government, after PIB clearance, ranged between one and seventeen months; the time taken in the case of Talcher, Kahalgaon, Anta, Kawas and Auraiya was more compared to other projects.

(iv) The total time taken for approval of these projects ranged between four months and fiftyeight months; in the case of Kahalgaon, NCTPP, Talcher and Farakka stage-II the time taken was significantly longer compared to other projects.

(v) According to the Ministry of Energy, a period of 12 months was required between the date of approval of the project by the Government and the award of contract for main plant equipment (i.e. zero date). As against this, a period of 41 months in the case of Kawas gas project, 30 months in the case of Singrauli project Stage-II, 25 months in the case of Ramagundam project Stage-II, 22 months in the case of Ramagundam Stage-I, 26 months in the case of Farakka Stage-I, 18 months in the case of Farakka Stage II and 24 months in the case of Kahalgaon stage-I was taken. This resulted in the shifting of the zero dates and consequently the commissioning schedules of the projects.

(vi) The total time gap between submission of Feasibility Report and zero date ranged between six and eighty two months. In the case of Korba stage I&II, Ramagundam stage I&II and Auraiya projects the time gap was more than two years but less than three years. In the case of Farakka stage I&II, Singrauli stage II, NCTPP, Talcher and Kawas the time taken ranged between three to five years . In the case of Kahalgaon Stage-I the time gap was as long as about seven years. By that time some of the units of the projects should have been commissioned and started commercial generation.

5.4 The delays in approval of the projects were attributed by the Ministry of Energy (August 1990) mainly to various clearances to be obtained and procedures to be followed

viz. sanction from State Government for land and cooling water supply, coal linkage from Standing Linkage Committee (SLC)/Department of Coal, clearance of the project from environment and forest angle, appraisal of project by various Government agencies, compliance of the Electricity (Supply) Act 1948, techno-economic clearance by CEA, PIB clearance and clearance by Cabinet Committee on Economic Affairs.

5.5 The Ministry of Energy further stated in August 1990 that the main reason for the delay between Government's approval and award of contract for main plant equipment was the time taken for making bilateral and multilateral financing arrangements involving a number of foreign financiers, the World Bank and co-ordination between the Company, Government of India and the financing agencies.

The other factors responsible for the delay were the procedures as per the guidelines to be followed for placement of award for which a period of about 12 months was required from the date of approval of the project by the Government till the award of the contract for Main Plant Equipment. Sometimes, certain special requirements were also to be met with, such as appointment of consultants for review of specifications (wherever for instance new technology was involved) or requirement of pre-qualification of vendors, etc.

5.6 An analysis of the time taken for placing orders in the case of Singrauli-II, Ramagundam-I, Ramagundam-II, Farakka-I and Farakka-II Projects, however, indicated that Government's approval for opening of bids and placing of orders took more than the normal time of 12 months. (Annexure-II)

5.7 The Ministry attributed (August 1990) the delay in these cases to the following reasons:

i) Singrauli-II:
(30 months)

World Bank loan was signed in June 1980, nearly 11 months after the Government s approval. Being India's first coal-fired 500 MW unit, appointment of consultant for review of tender specifications before release of notice inviting tenders was a stipulation which delayed procurement by a further 6 months with another about 13 months taken for procurement.

ii) Ramagundam-I:
(22 months)

World Bank loan

agreement was signed in February 1979 nearly ten months after Government's approval. Additional time was also taken in award of work order due to longer time taken by the Bank for concurrence to bid documents and review and award recommendations by the Government since the Company was dealing with the particular foreign party for the first time.

iii) Ramagundam-II:
(25 months)

World Bank took three and a half months for concurrence to award recommendations. Thereafter, since the bidders had submitted an alternative proposal, this also took considerable time to obtain World Bank concurrence.

iv) Farakka-I:
(26 months)

The opening of tenders was deferred as the World Bank had insisted on written undertakings of beneficiaries for tariffs before loan/ project negotiations.

v) Farakka-II:
(18 months)

Additional time was taken to meet Bank's requirements for prequalification of bidders.

5.8. ***Time overrun***

5.8.1 Of the 21 units commissioned upto March 1989, 10 units (Singrauli VI, & VII, Korba IV, V & VI, Ramagundam I, II, III, IV & V) were commissioned ahead of the revised commissioning schedule, 2 units (Singrauli I&V) were commissioned on schedule; while commissioning of 9 units (Singrauli II, III & IV, Korba I, II and III, Farakka I, II & III) was delayed by 1 to 15 months.

5.8.2 The slippage of 8, 13 and 15 months in the commissioning of 200 MW units of Farakka Stage-I was attributed by the Management/Ministry of Energy (August 1990) to the following:

i) Extra-ordinary industrial relations and labour problems.

ii) Acute law and order situation both at the project site and near about areas.

iii) Problems in land acquisition mainly for coal handling plant, ash handling plant and Merry-go-round system which affected the progress of commissioning of the units.

iv) Frequent interruptions in construction power supply at site from West Bengal Electricity Board.

v) Inadequate mobilisation of resources by contractors for major works.

vi) The industrial relations and law and order situation both at the project site and nearby areas continued to affect the progress of the project. More than 3.5 lakh mandays were lost till October 1986 due to industrial unrest at Farakka. Frequent gheraos, go-slow tactics, strikes and other incidences of violence, were still going on. These factors would have a cumulative effect on the delays in commissioning of the subsequent units also.

5.8.3 The time overrun was also due to delay in acquisition of land. The delay in completion of projects and extra cost on account of these reasons is discussed in subsequent paragraphs.

5.8.4. ***Land***

5.8.4.1 The land required by the Super Thermal Power Projects of the Company for main power house, ash disposal dyke, Merry-go-round (MGR) system, township and other auxiliary sytems ranged between 4000 to 5500 acres for each of the projects except Ramagundam project where additional 4836 acres of land was required for the balancing reservoir and power canal. Due to non-availability of the required land in time, the construction of MGR system, ash disposal dyke, etc., at a number of projects got delayed and the Company had to make alternate arrangements for transportation of coal and disposal of ash, etc. as well as to extend the scheduled time for completion of these works.

5.8.4.2 Some of the important cases of delay in acquisition of land at the project sites are enumerated below:-

(i) Acquisition of land for ash disposal dyke at Korba project was delayed by 8 to 17 months, after award of the work to the contractor in May 1980. The Management attributed (October 1988) the delay in land acquisition to procedural delays on the part of the State Government and resistance of the land owners.

(ii) At Ramagundam, the acquisition of land started in 1979 and continued till January 1985. Part of the land required for MGR system was acquired in November 1983 and the MGR system which was to be commissioned within two and a half years from the date of award (December 1979) could be commissioned only in April 1984. The project was yet to acquire 79.33 acres of forest land and 12 acres of private land for the ash disposal dyke (part-II.) The Management stated (November 1988) as follows:-

"It is a fact that 380 acres of land handed over to Ramagundam Super Thermal Power Project (RSTPP) by the Government of Andhra Pradesh in 1979 and 1980 for ash dyke was forest land and was not known at the feasibility report stage. It is only in the month of August 1986, when the Forest Range Officer objected to the continuance of ash dyke works on the land, it was known to RSTPP and the Revenue Department that the land handed over in 1979 and 1980 was forest land. The clearance of the Government for proceeding with the ash dyke works has since been received (May 1988). As regards the 12 acres of private land, the award for acquisition of land along with the structures in favour of National Thermal Power Corporation (NTPC) has since been passed vide award No.126/87 dated 30.11.1987."

The Ministry of Energy stated (August 1990) that all the land required for ash dyke has been acquired and is available with NTPC including the 12 acres of private land.

(iii)At Farakka project, due to non-availability of sufficient land near the project site in Murshidabad District on the left bank of the canal, the Company had to acquire land for permanent township 14 kilometres away on the other side of the river in the Malda District and construct the township there, which involved wastage of time and inconvenience to the employees as well as avoidable cost to the Company for providing subsidised transport facilities, etc. (approx. Rs.6 lakhs per year). At Farakka, out of 1302 acres of land required for MGR System, requisite papers for land acquisition were submitted to the Bihar Government in October 1980 for 376.66 acres; in December 1980 for 41.86 acres and between July 1981 and October 1981 for 244.70 acres of land, i.e. 19 months and more after sanction of the Project (March 1979) and even after award of work for the MGR System (September 1980) to Indian Railway Construction Company Limited (IRCON). There was also delay on the part of the State Government to settle the dispute over ownership/ value of land and payment of compensation to the land owners as per Land Acquisition Act. The Project authorities could take possession of 322 acres of land upto December

1982, and total 1274 acres of land in piecemeal between 1982 and December 1986 leaving a balance of 28 acres of land, possession of which was taken in July 1987. As a result, the MGR System could be completed only in October 1987 i.e. after a delay of about five years.

(iv) At Vindhyachal Project, out of 1818 acres of land required for ash disposal dyke, only 793 acres of private land had been acquired upto August 1989; in addition, the possession of 502 acres of private land was expected to be taken soon (August 1990). The transfer of Government land required for Ash Dyke was also stated to be held up for non-finalisation of rates of compensation for Government land, so far.

(v) At Rihand project 2896 acres of land was required for ash dyke. No land had been acquired so far (August 1990) for the purpose as related land acquisition cases were pending with Supreme Court/ Ministry of Environment and Forests.

Ministry of Energy stated (August 1990) as under:

"NTPC is continuing to face considerable problem in the acquisition of land for ash dyke for Rihand STPP despite the land acquisition proceedings being started as early as mid-1986. NTPC in the land acquisition process has to depend on the State Government, Ministry of Environment and Forests (MOE&F), Government of India and the Supreme Court for finalisation of modalities of the compensation payment."

National Capital Thermal Power Project

5.8.4.3 The Department of Power constituted (May 1982) a committee with the representatives of the Company, Department of Coal, Department of Environment, Railway Board and CEA to select a suitable site for the National Capital Thermal Power Project to meet the growing power demand of Delhi. The committee examined various sites near Delhi and finally recommended a site near Muradnagar, District Ghaziabad (UP) about 45 KMs from Delhi. The representatives of Environment Department, however, recommended the site subject to detailed environment assessment to be done before environmental clearance. The techno-economic clearance was given by CEA in October, 1983 for this project. However, in December 1985 the Department of Environment declined to give clearance for the proposed site.

5.8.4.4. Meanwhile the Company had conducted the preliminary soil investigations and had applied to the State Authorities for taking action for acquisition of land at the site. A compensation of Rs.112.15 lakhs for 57.83

acres of land at Sarna Village (Rs.98.47 lakhs) and 21.47 acres of land at Khurrampur village (Rs.13.68 lakhs) was paid upto March 1987.

5.8.4.5 However, due to the problem of land acquisition and environmental non-clearance as well as the cost of laying 30 KM long railway line, an alternative site at Dadri about 26 KM from the original site, was considered suitable for which environmental clearance, was also given in January 1986.

5.8.4.6 In addition to the payment for land acquisition, the Company had also spent a sum of Rs.127.75 lakhs on soil investigation, construction of temporary buildings, storage sheds for cement, construction of roads, bridges, water supply and sewerage facilities, etc. Thus, the payments for land acquisition and expenditure on infra-structure thereon before obtaining environmental clearance has resulted in blocking of funds amounting to Rs.239.90 lakhs.

The Ministry of Energy stated (August 1990) that the infrastructure already established at Muradnagar site was being advantageously used/ proposed to be used by the Northern Region Transmission Lines office, Satellite Earth Station to link NTPC Corporate Office and the various sites, Central Transmission Lines Training Institute, etc. The District Authorities were also approached for denotification of unusable land measuring 21.47 acres in May 1986 alongwith the denotification of other lands for which payments were not made to the land owners and possession not taken. Possibilities were also explored for selling this land.The District Authorities informed that the land after denotification would be offered to the original land owners at the price at which it was originally acquired and on recovery from them, the amount would be refunded to the Company. Action for denotification of land with District Authorities was under active consideration.

5.9 *Cost Overrun*

5.9.1 The table below indicates the actual costs of completed Projects and latest costs of ongoing projects (excluding interest during construction and working capital margin) vis-a-vis original/revised approved costs, variances and causes thereof:-

(Rs. in crores)

Projects	Approved Cost (O)Original (R)Revised	Date of approval (Base date)	Actual/Latest cost (Base date)	Variance Total	Variance Percent	Variance due to Price escalation	Variance due to Change in scope	Variance due to Other Reasons
1	2	3	4	5	6	7	8	9
A. Completed Projects								
Singrauli (3x200MW)	(O)255.66	Dec.,1976(IQr.1976)	317.56 (IIIQr.1989)	61.90	24.21	40.33	30.30	(-) 9.13
	(R)288.17	Jan.1981 (IIIQr.1979)		29.39	10.20	15.60	28.47	(-) 14.68
	(R)305.85	Jan.1987(IIQr.1985)		11.71	3.83	(-) 1.10	17.56	(-) 4.75
Singrauli (2x200 MW)	(O)102.51	July,1979(IQr.1978)	118.11(IIIQr.1989)	15.60	15.22	19.05	5.03	(-) 8.48
	(R)122.37	Jan.1987(IIQr.1985)		(-) 4.26	(-) 3.48	7.13	(-) 4.12	(-) 7.27
Singrauli (2x500 MW)	(O)347.00	July,1979(IQr.1978)	713.63(IIIQr.1989)	366.63	105.66	207.76	117.49	41.38
	(R)631.74	Jan.1987(IIQr.1985)		81.89	12.96	21.13	74.46	(-) 13.70
Korba (3x200MW)	(O)266.55	April,1979(IQr.1976)	399.31 (IIQr.1989)	132.76	49.81	83.25	40.90	8.61
	(R)293.41	Jan.1981 (IQr.1979)		105.90	36.09	63.70	39.42	2.78
Ramagundam (3x200 MW)	(O)266.23	April,1978(IQr,1976)	552.37 (IVQr. 1988)	286.14	107.48	140.16	86.08	59.90
	(R)475.05	Sept.1983 (IQr.1982)		77.32	16.28	39.54	35.19	2.59
Farakka (3x200 MW)	(O)264.76	Aug.1979 (IQr.1976)	670.12(IIQr. 1989)	405.36	153.10	226.47	97.68	81.21
	(R)550.49	June, 1985(IIIQr.1983)		119.63	21.73	80.30	17.05	22.28
B. On-going Projects								
Farakka (2x500 MW)	(O)800.07	Sept.1984(IVQr.1983)	1195.95(IIQr.1989)	395.88	49.48	202.27	65.20	128.41
Korba (3x500 MW)	(O)572.49	Sept.1981(IQr.1979)	1196.15(IIQr.1989)	623.66	108.94	400.43	117.24	45.99
Ramagundam (3x500 MW)	(O)623.67	Sept.1981(IQr.1981)	1064.55(IVQr.1988)	440.88	70.69	350.60	60.26	30.02
Vindhyachal (6x200 MW)	(O)875.96	June,1982(IQr.1981)	1298.40(IQr.1989)	422.44	48.23	333.83	93.60	(-) 4.99
Rihand (2x500 MW)	(O)946.20	June,1982(IQr.1982)	1506.76(IVQr.1989)	560.56	59.24	457.12	90.81	12.63

NOTE: The figures within brackets in columns 3 & 4 indicate the base date for the original and revised cost estimates; base date indicates the date of preparation of estimates.

The following position emerges from the above table:

(i) There was a delay ranging from 3 months to 40 months (approx.) in approving the original cost estimates from the base date i.e. date of preparation of these estimates.

(ii) Cost overruns in respect of completed projects ranged between 15.22 per cent and 153.10 per cent compared to original approved costs and between 3.83 per cent and 36.09 per cent compared to the revised approved costs. Similarly, cost over - runs in respect of ongoing projects ranged between 48.23 per cent and 108.94 per cent compared to original approved costs.

(iii)Increase in cost was mainly on account of price escalation due to time over-run, changes in scope and other reasons.

(iv) In almost all the completed projects (except Singrauli I - 2 x 200MW) the actual cost was more than the revised approved costs.

(v) There were considerable delays in obtaining the approval of PIB to the increased revised costs. In some cases, the approval of PIB and other competent authorities had not been obtained so far (August 1990)

5.9.2 The Ministry of Energy *inter-alia* attributed (August 1990) the following reasons for cost overrun:

(i) **Price escalation** : The cost variation which falls under this category represents the price escalation from the base date of estimates approved by the Government to the commissioning dates of the respective projects. The normal gestation period of the coal - based thermal power plants set up by the NTPC has been found to vary from 5 to 8 years out of which 2 to 4 years elapse between initial estimates and zero date of the project. As a result, even before the zero date of the project, the project cost increases due to prevailing inflation. Further, during the design, construction and commissioning stages of the project, prices increase due to local inflation (pertaining to the country of origin).

(ii) **Change in Scope**: This represents the cost increase due to variation in quantities and the change in specifications of the items as a result of detailed engineering during implementation phases of the project which are inevitable because they are dependent on the actual site conditions, technology and the specific equipment finally chosen for the projects.

(iii)**Other reasons**: These comprise variation in customs duty based on the Government notifications from time to time, variation in cost of

engineering establishment, etc. as a result of increase in project cost and change in the provision of contingencies.

Delay in approving revised cost estimates

5.9.3 The Committee on Public Undertakings in its 92nd Report (1983-84) had observed that the time taken by the Government for approval of the revised cost estimates of projects ranged between 11 and 17 months. The Committee also desired that approval of the Government to the revised estimates in all cases should be given in reasonable time. It was noticed that the Government had taken 15 and 33 months in according approval to the revised cost estimates of Farakka-I and Singrauli-II Projects. The revised cost estimates of Korba and Ramagundam Projects submitted by the Company in May 1984 and September 1984 were approved by the Government only in August and November 1990 respectively.

5.9.4 The Ministry of Energy stated (August 1990) that the delay in approval of the revised cost estimates is primarily due to the stipulation that the price level of cost estimates put up to PIB shall not be more than six months old. This period of six months has been found to be too short, since the cost estimates have to be vetted by the various agencies like CEA, Planning Commission, Plan Finance Division, etc. During the process of approval, the price level of cost estimates becomes more than six months old necessitating the updating of the cost estimates. Every time the cost estimates are updated the same cycle is repeated, inspite of consistent follow-up. It is, therefore, true that on the basis of above procedure a long time has been taken in approving the revised cost estimates for Singrauli and Farakka Projects.

Cost over-run in completed projects

5.9.5 The table below indicates the cost overrun in the completed projects:

(Rs. in Crores)

	Singrauli 3x200MW	Singrauli 2x200MW	Korba 3x200MW	Ramagundam 3x200MW
(1) **Preliminary and Civil Works**				
Original approved cost	52.53	11.47	54.76	51.66
Revised Cost	134.34	16.84	106.96	151.14
Variance	81.81	5.37	52.20	99.48
Percentage	155.73	46.82	95.32	192.57
(2) **Mechanical Works**				
Original approved cost	141.65	70.43	135.96	149.01
Revised Cost	123.00	74.31	184.24	286.29
Variance	(-)18.65	3.88	48.28	137.28
Percentage	13.17	5.50	35.51	92.13
(3) **Electrical Works**				
Original approved cost	17.22	10.45	31.48	20.28
Revised Cost	30.69	20.75	47.51	54.88
Variance	13.47	10.30	16.03	34.60
Percentage	78.22	98.56	50.92	170.61
(4) **Engineering, Administration and Other Miscellaneous Items**				
Original approved cost	25.98	10.16	29.84	27.11
Revised cost	16.72	6.21	38.45	38.57
Variance	(-) 9.26	(-)3.95	8.61	11.46
Percentage	35.64	38.87	28.85	42.27

5.9.6 The cost overrun in the preliminary and civil works at Singrauli Stage-I and Ramagundam Stage-I were more than 100 percent which was attributed by the Ministry of Energy (August, 1990) to variation in the quantities of various items as a result of detailed engineering during implementation of the Project, apart from the normal price escalation during the gestation period of the projects.

5.9.7 The cost overrun in the case of mechanical works ranging between 5.50 and 92.13 per cent was attributed by the Ministry of Energy (August 1990) to payment of customs duty (Rs.75.68 crores) on the import of main plant equipment and spares from M/s.Ansaldo, Italy. The cost estimates in the feasibility report were based on indigenous equipment.

5.9.8 The cost overrun in the case of electrical works ranging between 50.92 and 170.61 per cent was attributed by the Ministry of Energy (August 1990) to general price escalation and variation in taxes and duties, inclusion of Computer Satellite Communication facilities not envisaged in the feasibility reports (Rs.6.08 crores, Rs.9.30 crores and Rs.9.32 crores at Singrauli(2 x 200MW), Korba and Ramagundam Projects respectively). The Satellite Communication System was conceived after the INSAT-IB was available commercially in 1983 as the introduction of the system was essential for better inter-project communications.

6. CONTRACTS/AGREEMENTS

6.1 Contracts which have to adhere to IDA procurement procedure, those involving long period of delivery of equipments and those involving specialised engineering knowledge are categorised as `A' category contracts and are entered into by `Contracts Services Division' of the Corporate Office. All other procurement contracts pertaining to the projects are categorised as `B' type contracts and are normally entered into by General Managers of the respective projects. The orders are placed after the tenders received have been technically, commercially and financially evaluated by the appropriate committees constituted for this purpose. Certain irregularities noticed in the award and execution of important contracts are discussed in the succeeding paragraphs.

6.2 *Construction of Coal Handling Plant at Singrauli Super Thermal Power Project*

6.2.1. The Company awarded (August 1978) the work of design, manufacture, erection, testing and commissioning of Coal Handling Plant (CHP) of 1200 TPH capacity for the first stage (5 x 200 MW) of Singrauli Super Thermal Power Project to M/s Tata Robins Frazer (TRF) on a turn-key basis at a total cost of Rs.12.27 crores.

6.2.2. The Company had separately appointed M/s Development Consultants Private Limited (DCPL) as a consultant in December 1977 at a cost of Rs.9.75 lakhs for the work. The scope of services to be provided by the consultant included *inter-alia* pre-contract engineering and preparation of final tender documents, and post-contract engineering including approval of supplier's data and drawings; the consultant was to guarantee that the design and engineering of the CHP would meet the requirements of safe and efficient operations. The financial over-all responsibility of the consultant was, however, limited to 10 per cent of the fees payable.

6.2.3 The CHP was commissioned in April 1982 and the performance guarantee tests for the main CHP (including stacker-reclaimers), were carried out in February/March 1983. During the operation of the CHP, the Company faced various problems with regard to the stacker reclaimer track foundations and coal crushing supporting structure as discussed below:

Stacker-Reclaimer track foundations

6.2.4. According to the tender documents for the CHP the soil consisted mainly of fine to medium sand with silt and kankar and hard rock in different bore heads. The stacker reclaimer rail track

foundation was designed and constructed (by TRF) as flexible foundation consisting of pre-cast RCC sleeper blocks supported on 500 mm thick ballast packing. After commissioning of stacker reclaimers in April and November 1982, the foundation was found to be subject to the problem of unpredictable settlement in both the tracks right from the commissioning stage. This was initially attributed by the management to slushy conditions created at the toe of the retaining wall due to leakage from a fire water line then under installation and commissioning and absence of proper drainage system in coal stack yard. Remedial measures were undertaken through another agency at a cost of Rs.11.5 lakhs in 1982-83 without consulting DCPL. As the remedial measures did not prove successful, further soil investigation was got conducted through Asia Foundations & Construction Limited (AFCON) in March 1985. The fresh soil investigation report showed that the soil was weak in nature and consisted mainly of loose sandy clay having low bearing capacity of 0.5 kg/cm^2 as against 2.5 to 3.0 kg/cm^2 which had been adopted for design of the flexible foundation. The flexible foundation was designed based on accepted principle used for designing railway line foundations. However, due to slow movement of stacker reclaimer machine on tracks, higher wheel loads, less number of wheels and also due to stationary condition of the machines for a considerable period, the soil did not behave in an elastic manner and settlement was taking place. The Company ultimately (March 1986) came to the conclusion that the present type of foundation which had been constructed at an assessed cost of Rs.15.35 lakhs was not suitable and decided (May 1986) to provide pile foundation.

6.2.5 The work of dismantling the existing foundation including removal and stack piling of RCC sleepers and installation of vertical pile caps and footings, etc., and fixing of rail tracks was awarded to Simplex Concrete Piles (India) Private Limited (which had initially designed the foundation for TRF) at a cost of Rs.99.25 lakhs in January 1987 to be completed by July 1989. The work is still in progress. Extra expenditure incurred so far (March 1990) due to defective design was Rs.26.85 lakhs. The Company had not taken any action against TRF or DCPL the consultant.

Coal Crushing Supporting Structure

6.2.6 In October 1985, the Company noticed loosening of foundation bolts and failure of certain bracing members of elevated steel foundation of coal crushers. These deficiencies resulted in reduced

availability of coal to crushing plant. The then Chairman and Managing Director of the Company observed (December 1985) that the original structural design was grossly inadequate and that designs were also not checked at the approval stage and the situation had been aggravated by allowing excavation of a tunnel adjacent to the crusher building column foundation exposing the same to the very bottom.

6.2.7 The Company engaged (January 1986) the services of Structural Engineering Research Centre (SERC), Madras at a fee of Rs.0.30 lakh to analyse the problem and suggest remedies for the crusher foundations. Based on the recommendations of SERC, the Company imported vibration isolation system support for the existing four crushers at a cost of Rs.9.13 lakhs (including Rs.1.03 lakhs on supervision of installation through another firm GERB of Germany). The equipment was installed between July 1986 and May 1987.

6.2.8 The contractor viz., TRF declined (February 1986) to bear any portion of the cost of repairs on the grounds that:-

- the designs were based on the approved and available codes at the time of design;

- the designs were vetted and approved by the Company and its consultant;

- the supporting structures had got damaged due to non-observance of accepted industrial practices in the maintenance and operation of CHP, modifications made by the Company to equipment after installation and feeding of over-sized material, coal and other foreign materials; and

- the title of the plant had already passed on to the Company

6.2.9 However, they carried out modification work on the crushers for which cement and steel were provided by the Company. The cost of cement and steel supplied was not worked out by the Company.

6.2.10 The Ministry of Energy stated (August 1990) that the gurantee of the consultant for design and engineering was applicable for the basic system design. The failure of the equipment caused by ingress of extraneous material could not be attributed to the consultant. The contractor submitted drawings and documents for Company's approval and these were checked for general

conformity to the specifications regarding equipment, general arrangements, functional and performance requirements, lay-out, etc.

Thus, the failure of the Company to check the drawings properly resulted in an avoidable extra expenditure of Rs.9.43 lakhs (including Rs.0.30 lakh paid to SERC)

6.3 ***Coal Transportation System***

6.3.1 The Company decided to construct Merry-Go-Round (MGR) rail transportation systems using specially developed bottom discharge wagons to be owned and operated by it for expeditious and efficient handling of large quantities of coal. Simultaneously, Coal India Limited and Singareni Collieries Limited were also persuaded to develop rapid loading system so that the wagons could be loaded while still in motion to economise the loading costs.

6.3.2 The consultancy and co-ordination for MGR system was entrusted to Rail India Technical and Economic Services (RITES), a Government of India Undertaking, for all the projects.

6.3.3 The construction work of MGR System for Singrauli, Korba and Ramagundam Projects was entrusted to Indian Railway Construction Company Limited (IRCON), another Government of India Undertaking, in December 1979 on cost plus 10 per cent basis.

6.3.4 The MGR system at Ramagundam Project could not be commissioned on scheduled dates and was actually commissioned in April 1984 (22 months after the scheduled date i.e June 1982). The project had to incur an extra expenditure of Rs.29.06 lakhs for transportation of 3.66 lakh tonnes of coal by rail/road during September 1983 to November 1984.

6.3.5 Similarly, the construction of MGR System at Farakka Project was also awarded to IRCON on the same terms and conditions in September 1980, with the scheduled date of commissioning in December 1982. The work was completed in October 1987 i.e. after a delay of about 5 years.

6.3.6 The main factors responsible for time over-run in the case of Farakka MGR were as under:-

i) Land disputes

ii) Non-availability of required land for construction of MGR in time. Out of 1302 acres of land, 1274 acres were made available piecemeal to IRCON between December 1982 and December 1986; the balance, 28 acres, was acquired in July 1987.

iii) Slow progress by the sub-contractors of IRCON

iv) Inadequate mobilisation - the manpower deployed was not sufficient in certain sections where hard rock excavation was involved.

v) Unsatisfactory performance of sub-contractors engaged by IRCON and consequential off-loading of work.

The Management stated (October 1988) as under:

"The delay in obtaining physical possession of complete land was due to non-payment of compensation in full by the respective State Governments and also disputes in ownership/value of land. Some peculiar political problems in Bihar State also contributed to the delay in acquisition of land. Valuation of the land was revised by State Government with the result that some additional compensation had to be paid which contributed to further delay in obtaining physical possession. In certain stretches of land even the State Government felt helplessness due to land being used for religious purposes..... During the construction work in MGR there were numerous hold-ups due to resistance from local people".

6.3.7 In this connection, it is mentioned that out of 1302 acres of land required for MGR, papers for acquisition of 663.22 acres of land were submitted by the Company to the Government of Bihar between October 1980 and October 1981 i.e. 19 months or more after sanction of the project in March 1979.

6.3.8 The latest anticipated cost of MGR system at Farakka was Rs.75.38 crores (1st Quarter 1990) as against DPR estimate of Rs.41.17 crores (1983) and original estimates of Rs.28.88 crores (1978). The upward revision of the cost estimates was attributed by the Ministry of Energy (August 1990) to the following factors:-

i) The cost estimates for the MGR System provided in the FR as well as DPR were based on the estimates furnished by RITES who were the consultants to NTPC and were the only consultancy organisation of the Railways for this type of work. The execution of the MGR system (excluding wagons, locos etc.) being a highly specialised job was also entrusted by NTPC to IRCON which is the only construction organisation of the Railways for undertaking such type of works. Considering the fact that MGR System for Farakka STPP is the longest Railway system in NTPC (88 Kms), variations in quantities of certain items of work during the actual execution were likely to creep in.

ii)Variation in quantities encountered during execution and the general price escalation e.g.

- increase in massive rock cutting in the track laying areas which was not envisaged at the DPR stage;

- conservative estimates of the quantity/cost of permanent way materials;

- increase in the total number of bridges and culverts from 147 to 280 during the actual implementation of the project. This resulted because of a major flood in the MGR area, which not only contributed to huge cost in repair work to breaches but also to additional bridges/culverts; and

- one additional loco and 16 additional wagons were also included subsequently which were considered necessary for effective operation of MGR System.

6.3.9 Owing to delay in completion of MGR System, the Company had to make alternate arrangements for transportation of coal by road/rail to meet the requirements of units I and II of Farakka commissioned in January 1986 and December 1986 respectively. A sum of Rs.2.87 lakhs was spent for construction of a temporary railway siding along with approach road at Pirpainti to facilitate loading of coal transported by road from Rajmahal coal mine into rail wagons for further transportation to Farakka. The transport and handling charges were much in excess of the estimated transportation cost by MGR system. Because of undue delay in the completion of MGR system at Farakka, 12.52 lakh tonnes of coal had to be transported by rail and road at a cost of Rs.13.35 crores as against the cost which would have been incurred by using the MGR system, namely, Rs.5.01 crores (12.52 lakh tonnes x Rs.40 per tonne). This has resulted in an additional expenditure of Rs.8.34 crores for the transportation of 12.52 lakh tonnes of coal upto March 1988.

The Ministry of Energy *inter-alia* stated (August 1990) as under:-

"For the period ending March 1987 FSTPP has generated energy valued at Rs.20.70 crores and this included additional expenditure on transportation of coal recovered through fuel price adjustment clause and hence NTPC did not suffer financial loss."

6.3.10 The Ministry's reply is not tenable as the additional transportation cost of coal due to non-completion of MGR system in time was passed

on by the Company to the State Electricity Boards as fuel price adjustment which, in turn, had resulted in extra cost to the consumers.

6.4. ***Delayed formation of Railway Siding and Exchange Yard facilities at Singrauli Super Thermal Power Project***

6.4.1 As per terms of the contracts entered into between the Company and Bharat Heavy Electricals Limited (BHEL) for supply of main plant equipment for SSTPP, the railway siding at the project site was to be made available to BHEL within the dates specified in those contracts or the actual commencement of despatch of equipment, whichever was later. As per contract, the railway siding was to be made available by 1st June 1979. In case the railway siding was not available as indicated in the contracts, increase in cost due to alternate means of transportation and impact on contract schedule, if any, was to be reimbursed by the Company to BHEL.

6.4.2 However, discussions with RITES (Consultants) were held only in February 1983 regarding formation of railway siding and exchange yard facilities. Further discussions were held between NTPC, Railways, RITES and IRCON on 4th May 1983 and it was decided to construct one line immediately out of the three lines envisaged in the approved plan. Accordingly, a letter was issued on 20th May 1983 to IRCON for construction of the single line.

6.4.3 The Railways submitted a detailed estimate of Rs.2.31 crores in November 1983 for Company's private siding with a request to accept the estimate immediately so that the work on the remaining two lines could be taken up on priority basis. However, the estimate was approved by the Company on 30th June 1984 i.e., after 7 months of its submission by the Railways. As the Railways considered the acceptance of their estimates a pre-requisite for giving connection to SSTPP siding, the delay in acceptance of the estimates resulted in delay in opening of the siding. The siding was opened for goods traffic in May 1985. Due to delay in the opening of the railway siding, the Company had to pay Rs.88.75 lakhs to BHEL as additional transportation cost from Singrauli Railway Station to SSTPP, Shaktinagar. Further, on transportation of cement, etc., SSTPP had to incur extra transportation charges of Rs.16.96 lakhs during 1983-84 and 1984-85 which could have been avoided had the railway siding been completed earlier.

The Ministry of Energy *inter-alia* stated (August 1990) as under:-

"Railway siding

of NTPC would have been meaningful only on the completion of Railway line of Eastern Railway connecting Karela Road and Shaktinagar Stations. When the planning of SSTPP was being done, the expectation NTPC had (as indicated by Railways) was that the line connecting Karela Road with Shaktinagar would be ready in a time frame enabling use of Shaktinagar Station as the point for Railway siding for movement of plant and equipment and other construction material to the site of SSTPP. NTPC accordingly planned the schedule of construction of exchange yard and private siding facility and also incorporated this in the terms and conditions of the contract entered into with the BHEL that the private siding would be available by June 1979. In reality, however, the line between Shaktinagar and Karela Road (the construction of which was the responsibility of Eastern Railway only) did not materialise as originaly indicated bv Railways not-withstanding constant pursuing of the matter by NTPC with Railways thereby leaving no option with NTPC but to reschedule their plans of railway siding at Shaktinagar."

6.4.4 In this connection, it may be again mentioned that although as per the contract with the BHEL, the railway siding was to be made available to the BHEL by the Company on 1st June 1979, discussions with RITES (consultant) regarding formation of railway siding and exchange yard facilities were held only in February 1983 i.e. by that time the two units of 200 MW had already been commissioned at Singrauli and all the major equipment for subsequent 200 MW units had also been received at site.

6.5 *Coal Handling Plant at Farakka project*

6.5.1 The contract for supply and erection of Coal Handling Plant (CHP) was awarded (March 1982) to Garden Reach Shipbuilders and Engineers Limited (GRSE) at a contract price of Rs.31.50 crores (increased to Rs.32.06 crores in April 1982). The entire work including successful trial operation was to be completed within two and a half years (i.e., by October 1984).

The installation of CHP is still in progress even after expiry of a period of about 6 years from the scheduled date of completion of the work. Meanwhile, the original estimated cost of Rs.11.33 crores (1978) went up to Rs.54.33 crores in the Annual Plan 1988-89.

6.5.2 The main reasons for abnormal delay in execution of the work are discussed below:-

i) The construction schedule for the track hopper, conveyors and transfer points was finalised in 1982 itself with the starting date of track hopper as December 1982 and completion in May 1984. However, this schedule could not be adhered to due to collapse of excavation on account of massive upheaval of soil in the track hopper area, necessitating detailed investigation and remedial measures.

ii) The drawings had to be revised and modified keeping in view the unstable soil conditions.

iii) The drawings were delayed by GRSE.

iv) The civil work for track hopper (scheduled to be completed by August 1983) though started from December 1982 could not be completed due to land slide (May 1983) along the north side of the track hopper; the deep-well pumps were installed only in May 1984 for pumping of underground water/slush from the stretch of the track hopper which was flooded in the monsoon (September 1983).

v) Delay in release of some work fronts by the Project authorities.

vi) Delay in structural steel works due to lock-out for about three months by the sub-contractors (EMC).

vii) Insufficient mobilisation of resources by GRSE.

viii) Delay in despatch of critical materials by GRSE.

6.5.3 In order to expedite the completion of the CHP, a Task Force was formed in April 1986 by the Corporate Centre of the Company. The civil work

of the CHP was completed in March 1988. The Ministry of Energy stated (August 1990) that the job of CHP was almost complete except for stacker and reclaimer set 2 which was likely to be commissioned on arrival of MVT (West German) experts. Commissioning of automatic coal sampling unit was also expected after the arrival of missing parts to be arranged by GRSE through M/s Rambey Engineering (Australia).

6.5.4 The original estimated cost of Rs.11.33 crores (1978) for CHP increased to Rs.35.33 crores in 1983 based on the contractual price for the plant including price adjustment as stipulated in the contract. Analysis of increase in cost estimates revealed that apart from price variation (Rs.11.00 crores), there was change in scope (Rs.10.00 crores), mainly due to increase in design capacity of CHP from 1200 TPH to 1600 TPH for each stream of flow. As per Annual plan for 1988-89 the capital cost of CHP was Rs.54.33 crores.

The Ministry of Energy *inter-alia* stated (August 1990) that the increase in the capacity of the CHP was necessitated owing to variance in the calorific value of the coal and number of hours of operating experience as compared to those indicated in the feasibility report.

6.5.5 On account of considerable delay in commissioning of the CHP, the first generating unit (200 MW) of the project, though synchronised in January 1986 could be put to operation with coal firing only in April 1986 by installing a contingency coal handling plant, at a cost of Rs.49.00 lakhs. During January 1986 to March 1986, generation from the unit was only 0.24 million units valuing Rs.1.25 lakhs for which 1031 KL oil valuing Rs.34.00 lakhs was consumed. High consumption of oil was attributed to trial operation of auxiliary systems, etc., when the unit consumed oil without generating power.

6.5.6 Coal feeding and crushing with the contingency arrangements (providing two conveyors and two crushers each of 125 TPH capacity with the output around 1600 tonnes per day) were considered the major constraint in running Unit-I over 100 MW load. This was due to the fact that during monsoons, the contingency CHP was not able to crush sufficient wet coal to the desired level.

6.5.7 In view of further delay in completion of the main CHP, an additional capital expenditure of Rs.10.00 lakhs was incurred (March 1986) for creating additional facilities for the existing contingency plant.

6.6 *Ash Handling System at Farakka Project*

6.6.1 In the feasibility report for Farakka STPP (1978),an ash handling system was envisaged at an estimated cost of Rs.5.97 crores.Construction of Ash Bunds for disposal of both bottom and fly ash was awarded (November 1983) to National Projects Construction Corporation Limited (NPCC) at a cost of Rs.4.00 crores. The scheduled date of completion was 22 months from the letter of award, i.e. by September 1985. Other civil works relating to pump house, pile line pedestals, etc. (Rs.1.94 crores) were also awarded (June 1983) to National Projects Construction Corporation Limited (NPCC) for completion by December 1984.

6.6.2 For Bottom Ash Bund, the first set of construction drawings for earth work, sand filling, boulder pitching, etc,covering a length of 1.97 KMs (out of 4.28 KMs) adjacent to plant area was released in June 1984. The construction drawings for the balance length (2.31KM) required for Botton Ash Bund were released in January 1985 i.e after a delay of 14 months from the date of award of work. There was delay of another six months in finalising the drawings for concreting work of the bund (July 1985). The delay was attributed to land acquisition problems as a result of which detailed soil investigation of the area was not possible. The work for Bottom Ash Bund eventually was started by the NPCC only in February 1985 (i.e., on expiry of 15 months from the award of the work) after:

- obtaining the first set of drawings in June 1984; and

- end of monsoon and harvesting in the land for which compensation was not paid earlier.

The work was completed in February 1987. Besides the main factors mentioned above, the delay was also attributed to inadequate mobilisation of resources by the contractor and labour problem. On account of these reasons mentioned, the other connected civil work of the Ash Handling System was also delayed and could be completed only in June 1988.

6.6.3 For the work of Fly Ash Bund over a length of 7 KM (about 10 KMs away from the plant area), the construction drawings covering 6KM, were released in December 1983. The work had not been started as yet (August 1990). The main reasons for the delay attributed by the management were as follows:-

i) Lack of initiative on the part of the contractor. The joint pre-work plan was taken up only in May 1984.

ii) Resistance from the local people demanding employment with the Company/ sub-contractors of NPCC at abnormally high rates.

The matter was taken up at the Corporate level for termination of the agreement with NPCC and appointment of another agency for the work. Accordingly, another agency (M/s Tarapore and Company) was appointed in February 1988 and the work was commenced in May 1988. The date of completion of work as envisaged by the Management was March 1990. The Ministry of Energy stated (August 1990) as under:-

i) M/s Tarapore and Company had stopped the work from June 1989 due to monsoon. The work was to be resumed from October 1989 after monsoon. Despite repeated persuasion from various levels of NTPC they have not yet resumed the work. The main reasons for not resuming the work were (i) the dispute of labour deployed; (ii) the buying of ash pipe line also could not be completed due to non-completion of the bund and non- availability of RCC pedestals. RCC Pedestals were broken by the local population and the reinforcement steel had been taken out and stolen. Fresh plain cement concrete pedestals had been designed and the work was in progress and was likely to be completed by December 1990.

6.6.4 The mechanical work of Ash Handling System (i.e. pumping and piping system, etc.) was awarded (July 1983) to Mahendra Spicers Limited at a price of Rs.8.87 crores. The work was scheduled to be completed by November 1985. This was yet to be fully completed.

Ministry of Energy stated (August 1990) as under:-

"As the fly ash pond work could not be started laying of pipe lines to fly ash pond has been kept under hold to avoid likely pilferage of pipe lines although pedestals for fly ash pipelines upto fly ash pond were completed. Bottom ash pipe-line work could not be fully completed as pedestals over bottom ash dyke could not be taken up fully for non-completion of dyke

which has since been completed in February 1987."

As the fly ash disposal system could not be implemented, so far, both bottom ash and fly ash slurry were deposited in one sump for discharge with the help of bottom ash pumps to the bottom ash bund. This resulted in problem of suction and also frequent chocking of pipeline of bottom ash pump house. Heavy ash/clinker accumulation inside the furnace caused frequent break-down of scrapper conveyor and clinker grinders and consequential low level operation of the plant.

6.6.5 As a result of delays at the various stages, the original estimates (1978) of Rs.5.97 crores for Ash Handling System were revised (1983) to Rs.15.58 crores. The increase was mainly due to change in price level (Rs.4.49 crores) and new scheme for disposal of fly ash and bottom ash in separate areas (Rs.4.48 crores) which was not contemplated in the Feasibility Report of 1978.

As per Annual Plan 1988-89 of the Company, the estimated revised cost of the entire system was Rs.26.44 crores compared with the original cost of Rs.5.97 crores (1978).

6.7 *New Bridge over Feeder Canal (Farakka Project)*

6.7.1 As the existing narrow single lane rail-cum-road bridge over the Feeder Canal was inadequate for the employees to come to the plant from the township on the other side and also for transportation of materials, construction of a new bridge over the canal was envisaged in the Detailed Project Report. Construction of the new bridge was undertaken by Farakka Barrage Project Authority (FBPA) as a deposit work on behalf of the Company for which a sum of Rs.16 lakhs was deposited (March 1980) by the latter. No formal agreement, however, was executed with FBPA. Tenders for the work were invited by FBPA in August 1980 and formal work order was placed (March 1981) by FBPA on Ruby Construction Company for Rs.1.02 crores for completion of the work within two years. In March 1985, FBPA informed FSTPP that:-

i) Ruby Construction Company had completely stopped the work since May 1984 on the ground of non-payment of their dues.

ii) FBPA had rejected all the claims of the firm.

iii) The matter had been referred to the Arbitrator and the

arbitration proceedings were in progress.

iv) Effort to appoint some new agency for the work had failed on account of stay order of the court obtained by the firm.

6.7.2 At the time of suspension (May 1984), the progress of work was insignificant and it was contemplated that almost two years would be required to complete the work. On vacation of stay it was decided (December 1988) to award the residual work to a new agency (M/s Jain Associates, Calcutta) in February 1989 at an accepted value of Rs.141.75 lakhs.

The Ministry of Energy stated (August 1990) as under:-

"The arbitration in favour of M/s Ruby Construction, the earlier agency for bridge construction over feeder canal has been awarded at a value of Rs.33.61 lakhs which has been paid by FBP authorities. So far, the contractors (M/s Jain Associates) did not mobilise properly. In the review meeting dated 12.1.1990 with FBP authorities, it was indicated by them that the party has now established at site and mobilisation to take up the work is in advanced stage".

Thus even after a period of about ten years, the bridge could not be completed. Further, as against the originally awarded contract value of Rs.1.02 crores the revised cost had gone upto Rs.1.42 crores as awarded to another contractor in February, 1989. Thus, apart from increase in the cost by Rs.40 lakhs, Rs.33.61 lakhs was also awarded to the original contractor by the arbitrator thereby resulting in a total extra expenditure of Rs.73.61 lakhs (approx.). The financial impact of delay in construction of bridge on the completion and operation of generating units could not be quantified.

7. TRANSMISSION AND DISTRIBUTION OF POWER

7.1 The power generated at the Super Thermal Power Stations is evacuated over a system of extra-high-voltage (EHV) tranmission lines to major load centres in State grids. The transmission lines which have been constructed by the Company form part of integrated regional grids and are ultimately to pave the way for evolution of a national power grid.

7.2 The details of the transmission system associated with various projects, route length of lines scheduled and actual/anticipated dates of completion are given in annexure III. It would be seen therefrom that the delay in completion of certain lines ranged between two months and thirty months.

7.3 The reasons for delay in commissioning of transmission lines were as follows:-

Project	Particulars of Transmission lines	Reasons for delay
Singrauli Stage II	Lucknow-Muradabad MuradnagarLine	The line was originally awarded by UPSEB and the ownership/execution was handed over to the Company subsequently. The progress was considerably delayed due to poor performance of contractors and finalisation of modalities of transfer of ownership of the lines.
	Singrauli-Lucknow Singrauli-Kanpur line	Diversion of corridor near Singrauli in Central Coal Fields Limited (CCL) and Special Areas Development Authority (SADA) land areas as well as problems in forest clearance.

	Singrauli-Kanpur-II Singrauli-Lucknow line	Forest clearance was received from Ministry of Environment and Forests after 38 months from the date of submission of forest clearance proposals to the local forest authorities in the case of Singrauli-Kanpur-II line and 16 months in the case of Singrauli -Lucknow line.
Korba Stage-I (Phase I).	Bhilai-Koradi line	Delay in giving clearance for forest land.
Korba Stage II	Korba-Bhilai III Line	Approval for the forest clearance from Ministry of Environment and Forrests took 36 months from the date of initial submission of proposals. Delay of 10 months on the part of the contractor (HGEC) in submitting performance guarantee in the required proforma. Poor performance of the contractor as a result of which the work had to be off-loaded by the Company. In the meantime the contractor entered

		into litigation causing a delay of 14 months. Even after off-loading, taking over of materials from M/s HGEC and reconcilation of tower parts i.e. identification of missing members to make complete towers and fabrication of the same by the new contractor (Tata Exports) took about 8 months due to non-co-operation of M/s HGEC.
Vindhyachal Stage I	Vindhyachal-Korba line	Forest clearance took 25 months from initial submission of proposal to local forest authorities for 80 Km stretch of the line.
	Vindhyachal-Jabalpur line	-Delay of more than 12 months in supply of complete towers by M/s Technopromexport(TPE), USSR for commencement of tower erection. -Forest clearance took 21 months from the date of submission of proposal to local forest authorities. Even after receipt of forest clearance there was a delay of 4 to 5 months in actual commencement of tree cutting by the State Forest Department.

-As per requirement of Ministry of Environment and Forests the line had to be re-routed due to which increased quantity of materials was to be ordered on Soviet Suppliers. Further, the re-survey of 80 Kms of re-routed portion had to be got done which caused a delay of about 5 months.

-Delays in material supplies and forest clearance resulted in rates of contractor becoming un-workable. Due to this the contractor (TOCO) expressed their inability to carry out the work as per Company's requirement. Consequently the work had to be off-loaded to 3 parties (M/s R&C, M/s SPIC and IRCON).

-Foreseeing delay in completion of the line it was decided that Vindhyachal Singrauli double circuit (D/C) tie line sanctioned for HVDC back-to-back operation may be completed and got ready for energising to provide out-let for VSTPP. For energising this line, a temporary single circuit line (2 Kms.) connecting Vindhyachal-Jabalpur Feeder I bay to the nearest tower of Vindhyachal-Singrauli double circuit line is being constructed at a cost of Rs.19 lakhs. The temporary line will be dismantled on completion of

	Vindhyachal-Jabalpur line. According to the management the cost of material which can be recovered shall be approx. Rs.11 lakhs and the balance of Rs.8 lakhs towards cost of foundation, stubs, erection/dismantling charges cannot be recovered.
Nagarjunasagar-Cuddapah line	Late receipt of forest clearance.
Cuddapah-Bangalore Line	- Change in Bangalore switchyard site from Neelangala to Somanhalli by KEB. -Delay in approval of forest clearance -Delay of about 15-17 months on the part of contractor (M/s Bhanu Construction Company-BCC) in completion of tower testing mainly due to delay in getting tower design vetted by their associates in America. The contractor went into financial crisis due to steep hike in steel prices during the interim period. Because of very poor progress, part of the stringing work had to be off-loaded to another party.
Cuddapah-Madras line	The delay in Cuddapah-Bangalore line due to financial crisis of M/s BCC had effect on this line also. The contractor (BCC)

		was not capable of deploying adequate resources on both the lines due to financial crisis. Due to very slow progress a portion of the work had to be off-loaded to another contractor (M/s. Tata Exports).
	Hyderabad-Nagarjunasagar, Cuddapah and Bangalore sub-stations.	Delay in decision making regarding ownership of all 400 KV sub-stations in Southern Region which were associated with Ramagundam Super Thermal Power Project. As per original proposal, the 400 KV sub-stations in Southern States were under the scope of respective SEBs which were subsequently decided to be owned and executed by NTPC in April, 1982 after considerable deliberations among CEA and SEBs.
Farakka	Durgapur and Farraka-Jeerhat lines	Serious theft of line material, law and order problem and right of way bottleneck.

7.4. ***Associated Transmission System***

7.4.1 The Associated Transmission System for Farakka Project as envisaged in the Detailed Project Report and approved (March 1979) by the Government of India provided construction of only high voltage tranmission lines upto load centre of WBSEB at Jeerhat and Durgapur (NTPC). Major constraint in utilization of power, i.e. limitation in transformation/transmission capacity at and beyond Waria in DVC system was not consid-

ered. The 400 KV link line from Durgapur (NTPC) to Bidhannagar (WBSEB) and 220 KV link line from Durgapur (NTPC) to Waria (DVC) were sanctioned only in 1985-86.

7.4.2 Notwithstanding four generating units in central sector with an installed capacity of 568 MW (FSTPP-2 x 200 MW and NHPC 2 x 84 MW) having been in operation and other 3 units (1 of FSTPP and 2 of Chukha Project) scheduled to be commissioned within June-September 1987, progress of work for inter-connected operation beyond Durgapur (NTPC) was still not encouraging. A task force was set up (May 1986) by CEA to look into the transmission bottlenecks in the Eastern Region for evacuation of power from Central Sector. The matter was also being reviewed in Eastern Region Electricity Board (EREB) meetings to formulate new links for outlet of power. Consequently the following tie-lines (220 KV) were commissioned.

- Farakka-Malda
- Purulia - Bidhannagar (Durgapur)
- Purulia - Waria (Durgapur)

The Ministry of Energy stated (August 1990) as under:-

"It is clarified that NTPC has completed its scope of tranmission work associated with Stage I of the Project (FSTPP). WBSEB was to execute its 400 KV Bidhannagar sub-station in order to facilitate termination of NTPC's Durgapur (NTPC)-Bidhannagar 400 KV link. This sub-station could not be constructed by WBSEB for various reasons. Hence, a contingency solution was worked out by CEA in consultation with WBSEB, DVC and NTPC and was executed by WBSEB and DVC.....".

7.4.3 There were inordinate delays even in completion of transmission channel from Farakka to Jeerhat and Durgapur. Till February 1987 (when Farakka-Jeerhat 400 KV line was put to operation), the transmission line charged at 200 KV level was the only outlet of Farakka power and NHPC transformer of 315 MVA was used for the purpose. The 400 KV Farakka-Durgapur line was completed and commissioned in March, 1987.

The Ministry of Energy stated (August, 1990) as under:-

"....Since WBSEB's 400 KV sub-station at Jeerhat was not ready, this line was charged at 220 KV using NHPC's 315 KVA 400/220 KV transformer and Farakka power was evacuated, although this line was delayed with respect to its original schedule due to serious thefts of line ma-

terial, law and order problem and right of way bottleneck."

Due to evacuation problem and also because of constraints in transmission lines, FSTPP has been advised to maintain generation at low level (for average supply of 180 MW) as against the availability of 290 MW net round the clock. Loss in generation suffered so far by the project has not been assessed.

The Ministry of Energy *inter-alia* stated (August 1990) as under:-

> "Growth in system demand in this region has been low because of various socio-economic reasons. Due to this, the power demand has been lower than expected as the generation in the region has also been low. It is quite likely that States have imposed certain restrictions and power cuts and restoring which keep the load demand suppressed....."

7.4.4 The FSTPP also suffered loss for frequent backing down of its generation at the instance of central load despatch centre of WBSEB. During April, 1986 to January, 1989 loss of generation due to backing down was 148.7 million units valuing Rs.780 lakhs (approx.).

The Ministry of Energy stated (August 1990) as under:-

> ".....With commissioning of Farakka-Jeerhat, Farakka-Durgapur (NTPC), Farakka-Malda (National Hydroelectric Power Corporation Limited) links and inter connection of Bidhannagar and Waria with Durgapur (NTPC), the entire transmission for Farakka is available and no generation loss is expected on this account. However, in an interconnected system, every generating station has to operate as instructed by the coordinating authority, like EREB in this case and stations are quite often required to back down generation depending upon the load generation balance obtainable in a system at any given time."

7.4.5 Although the constituents of EREB were advised to draw their share from Central Sector even at the cost of their respective own generation, the evacuation problem of FSTPP may not be eased without:

- Considerable strengthening of the inter-connected operation of the power system in the region by early completion of the on-going schemes as well as new links considered necessary for outlet of power.

- Immediate construction of 400 KV line from Farakka to Bihar-Sharif (projected for the expansion stage of FSTPP-

1990-92) for power evacuation of first stage units.

- Substantial growth of system demand of the constituents through extensive rural electrification/more availability of power to the industrial sector and consideration of the resultant power deficit in the operation coordination committee meeting at EREB in fixing generation schedule of the power plants.

- Effective monitoring and controlling by EREB to ensure full co-operation of the constituents in absorption of Central Sector Power.

7.4.6 It would, thus, be seen that due to delays in construction of transmission lines and stabilising distribution systems, in Eastern Region, there was significant under-utilisation of generation capacity and consequent loss which could not be assessed.

7.5 ***Project estimates***

7.5.1 The table below indicates, the original approved cost [excluding interest during construction (IDC)], the revised estimated cost (excluding IDC) and the reasons for cost overrun of transmission system.

(Rupees in crores)

Name of the Project (Transmission Line)	Original Approved Cost	Revised cost (Excl. IDC)	Variation			Total	Percentage of variation
			Price change	Physical change	Others		
Singrauli 600 MW	31.64	34.64	2.74	-	0.26	3.00	(9.48)
Singrauli 1400 MW	154.59	215.76	13.73	30.61	16.83	61.17	(39.57)
Korba 600 MW	47.26	52.44	1.07	3.47	0.64	5.18	(10.96)
Korba 1500 MW	96.87	194.90	24.07	59.74	14.22	98.03	(101.20)
Ramagundam 600 MW	45.44	154.70	20.72	78.87	9.67	109.26	(240.45)
Ramagundam 1500 MW	115.21	149.80	25.61	2.40	6.58	34.59	(30.02)
Farakka 600 MW	29.24	68.55	10.68	27.11	1.52	39.31	(134.44)
Farakka 1000 MW	128.87	168.23	7.46	29.94	1.96	39.36	(30.54)
Vindhyachal 1260 MW	187.89	289.17	68.31	10.62	22.35	101.28	(53.90)
Rihand 400 KV/A/C	239.87	438.80	65.74	114.75	18.44	198.93	(82.93)
HVDC System N.A.	333.88	585.70	48.01	78.40	125.41	251.82	(75.42)

7.5.2.1 From the above table, the following position emerges:

(i) There were generally wide variations between original approved cost and the revised cost which indicate that the original estimates were not prepared realistically.

(ii) Apart from price varia-

tion, physical changes also contributed to a great extent to the variations.

(iii)The approval of PIB and other competent authorities for revised cost as required under extant Government orders had not been obtained in many cases.

The Ministry *inter-alia* stated (August, 1990) as under:-

(i) Substantial physical changes during the implementation of the project were mainly due to change in the scheme resulting in addition and deletion of transmission lines and sub-stations. These were basically carried out at the instance of the CEA based on the over-all load flow studies done by them and these were beyond the control of the Company. Some amount of physical changes were attributed to changes in the length of transmission lines as a result of final route survey/alignment of the line during execution.

(ii) As regards changes in the prices, these were stated to be beyond the control of the Company. As per extant instructions of Government of India, cost estimates of projects were framed on current prices prevailing at the time of preparing estimates and no provision for escalation in prices during the period of execution was being made in the estimates.

7.5.2.2 While it is recognised that the extant orders of the Government do not allow for inclusion of any element of increase in prices, the economic/internal rate of return, a vital consideration in approving the project, gets substantially distorted as a result of such excessive time/cost over-runs. It may, therefore, be considered by the Government whether this aspect should not be fully taken into account while approving the project. Similarly, based on the actual past experience of executing projects, whether the Company/Government should not *ab-initio* fix a realistic time frame for completion of future projects.

7.5.3 Some salient aspects noticed by Audit in the transmission and distribution system of the power generated by various Super Thermal Power Projects are discussed in the succeeding paragraphs.

Singrauli

7.5.3.1 In order to evacuate power generated by SSTPP, the UPSEB sub-stations were to be extended for getting Singrauli power. Before formation of the Company, the UPSEB had already procured the material for construction of bays and after the Company emerged on the scene, only the question of ownership had to be decided. It was jointly decided by the Company, UPSEB and CEA that

the equipment already purchased by UPSEB for construction of bays should be paid for by the Company as it would cut short the contracting and procurement time and the equipment could be readily available to evacuate power. As the details of the individual items of equipment were not available, it was decided (1981) that an amount of Rs.5.80 crores may be advanced to UPSEB and the latter would submit its account in due course.

7.5.3.2 In addition to an advance of Rs.5.80 crores given in 1981, a further advance of Rs.0.47 crore was also given to UPSEB in 1984-85. Against these advances, an amount of Rs.4.82 crores was adjusted upto 31st March 1989 and the balance amount of Rs.1.45 crores remained to be recovered/adjusted.

The Ministry of Energy stated (August 1990) that bills for Rs.0.63 crore submitted by UPSEB were under scrutiny and that UPSEB had been informed to refund Rs.0.82 crore provisionally.

7.5.3.3 In a meeting held in March 1985 between the representatives of the Company and UPSEB it was agreed that the Company would pay a lumpsum amount of Rs.449.28 lakhs for the cost of common facilities created by UPSEB in various switch yards as Company's share of the cost. Whereas the above amount has been agreed to be paid, the modalities of the joint ownership were yet (September 1989) to be worked out.

7.5.3.4 The commissioning of the Lucknow-Moradabad -Murad Nagar-Panipat (LMMP) line was envisaged to be completed by December 1984. The line was commissioned in May 1986. UPSEB had claimed a payment of over-run charges for the period beyond December 1984 at the rate of Rs.5 lakhs per month. It was agreed (April 1987) that Company would pay a lump sum amount of Rs.32 lakhs against UPSEB's claim for time over-run charges in full and final settlement, in addition to the amount of consultancy-cum-construction management charges.

The Ministry of Energy attributed the delay in completion of LMMP lines to the following reasons:-

i) Delay in approval of survey work.

ii) Frequent changes in supervision agency.

iii) Increase in quantum of work after actual survey.

iv) Stoppage of work due to heavy rains.

v) River crossing (R/C) foundations were completed only in November 1985 by

M/s AFCONS due to delay in finalisation of R/C locations, soil investigation, developing of foundation design and its award and heavy flood during execution of pile foundation.

7.5.4 ***Southern region***

7.5.4.1 The work of construction of the Cuddapah-Bangalore 400 KV Transmission Line (230 circuit Kms) associated with Ramagundam Super Thermal Power Project, was awarded to M/s Bhanu Construction Company, Hyderabad (BCC) on 31st March 1982 at a total contract price of Rs.366.72 lakhs. The stringing of the line was to be completed by 1st September 1984 and successful completion of site testing and commissioning by 1st January 1985.

7.5.4.2 As the progress of work by BCC was not satisfactory, the Company (NTPC) offloaded the work of stringing 130 KMs of the line and tower erection in 30 KMs at the risk and cost of BCC to ensure timely completion of line. The extra cost on account of offloading the work was Rs.13.25 lakhs which was to be recovered from BCC.

7.5.4.3 The work was to be completed by BCC by 1st September 1984, but was actually completed in June 1986.Extension of time was, however, given by the Company upto January 1986. A sum of Rs.30 lakhs was paid to BCC on account of price variation for the extended period. Thus, the Company incurred an extra expenditure of Rs.43.25 lakhs (including Rs.13.25 lakhs which was not recovered from BCC) on this work.

7.5.4.4 The Ministry of Energy *inter-alia* stated (August 1990) that this contract was placed on BCC as a development contract and at the time of placement of award the Company had a price advantage of Rs.59.9 lakhs as compared to the next technically qualified acceptable bidder (L2)..... The additional amounts which became payable to M/s Bhanu Construction Company as per contractual terms were still much lower than the difference between the contractual price awarded to him and that quoted by L2.

The reply of the Ministry is not very relevant, because the performance of the contractor has to be judged with reference to the terms of contract entered with it and not with reference to any other bidder whose offer was not accepted.

8. *PERFORMANCE OF GENERATING UNITS*

8.1 *Capacity Utilisation*

8.1.1 The generation of power by various projects of the Company during the Sixth Five Year Plan compared to the envisaged capacity utilisation of 2500 KWH/KW/Yr. during the first six months and 4000 KWH/KW/Yr during the next six months and, thereafter 5500 KWH/KW/Yr as furnished by Management is given in annexure IV.

8.1.2. It may be seen therefrom that generation was less than the envisaged capacity in Singrauli II, Korba III and Ramagundam II units. Generation was affected in the first year of operation of Singrauli II and Korba III due to the hydrogen leakage. Due to the grid restrictions and burner modification, generation of Unit II of Ramagundam was affected during the first year. During second year of operation in Singrauli III, IV and V, the units were under shut down for generator modifcation by BHEL.

8.1.3 The Ministry of Energy *inter-alia* stated (August 1990) that the Company brought about shut - downs appropriate within the frame of operational planning to carry out necessary modifications/rectification by the manufacturers at their own cost. Such shut - downs being for fairly considerable periods, they naturally resulted in loss of generation leading to performance below norms in that period. Though defects in some units surfaced beyond warranty period, the modifications were carried out by the manufacturers at their own cost.

8.2 *Budgetted and actual generation*

8.2.1 The budgetted and actual generation of power, auxiliary consumption, energy sent out and plant load factor for the five years ending 31st March 1989 are given below:

Sl. No.	Particulars	1984-85		1985-86		1986-87		1987-88		1988-89	
		Budgetted	Actual	Budgetted	Actual	Budgetted	Actual	Budgetted	Actual	Budgetted	Actual
1.	SINGRAULI										
i)	Installed capacity(MW)	-	1000	-	1000	-	1000	-	1500	-	2000
ii)	Generation of power (MU)										
	Unit I	1272	1129	1328	1526	1072	1138.14	1465	1525.55	NA	1394.73
	Unit II	971	1356	961	1325	1082	884.40	1472	1434.21	NA	1413.70
	Unit III	548	595	1391	1577	1378	1534.79	1257	1298.78	NA	1320.69
	Unit IV	1276	1300	780	876	1387	1710.13	1186	1578.30	NA	1276.59
	Unit V	848	820	1387	1025	1397	1562.49	1490	1517.48	NA	1131.03

	Unit VI	-	-	-	-	-	-	1638	2615.84	NA	3029.63
	Unit VII	-	-	-	-	-	-	-	-	NA	2823.77
	Total	4915	5200	5847	6329	6316	6829.95	8508	9970.16	12030	12390.14
iii)	Auxiliary Consumption (MU)	485	483	551	556	648	607.00	812	824.17	1029	981.24
iv)	Energy sent out (MU)	4430	4717	5296	5773	5668	6222.95	7696	9145.99	11001	11408.81
v)	Plant load factor (Percentage)	59.05	61.41	66.75	72.25	72.10	77.91	70.41	82.51	70.10	72.20
vi)	Non-availability (Percentage)										
	Planned		12.08		12.13		18.60		7.64		NA
	Forced		18.13		10.84		1.94		4.79		NA
	Total		30.21		22.97		20.54		12.43		14.78
2.	KORBA										
i)	Installed capacity(MW)	-	600	-	600	-	600	-	1100	-	1100
ii)	Generation of power (MU)										
	Unit I	1022	1052	1019	1120	1226	1637.61	1230	1276.22	NA	869.36
	Unit II	1087	1285	984	1261	1226	1342.36	1320	1495.88	NA	1291.65
	Unit III	868	364	1416	1724	1228	1468.06	1275	1379.08	NA	1581.57
	Unit IV	-	-	-	-	-	-	740	136.36	NA	3444.95
	Total	2977	2701	3419	4105	3680	4448.03	4565	4287.54	7165	7181.53
iii)	Auxiliary Consumption (MU)	315	303	342	374	384	380.00	459	390.18	609	544.48
iv)	Energy sent out (MU)	2662	2398	3077	3731	3296	4068.03	4106	3897.36	6556	6643.40
v)	Plant load factor (Percentage)	59.98	54.41	65.00	78.10	70.00	84.62	67.79	75.99	60.62	74.59
vi)	Non-availability (Percentage)										
	Planned		5.00		16.23		10.95		11.70		NA
	Forced		31.84		2.57		2.40		4.54		NA
	Total		36.84		18.80		13.35		16.24		15.89
3.	RAMAGUNDAM										
i)	Installed capacity(MW)	-	400	-	600	-	600	-	600	-	1100
ii)	Generation of power (MU)										
	Unit I	1086	869	1190	1173	1190	1512.91	1349	1532.85	NA	791.24
	Unit II	405	478	1190	1344	1085	1274.91	999	1203.33	NA	1439.06
	Unit III	67	-	1027	1224	1144	1517.87	1207	1334.06	NA	1594.18
	Unit IV	-	-	-	-	-	-	-	-	NA	1279.91
	Total	1558	1347	3287	3740	3419	4305.49	3555	4070.24	4858	5104.39
iii)	Auxiliary Consumption (MU)	194	154	392	391	371	433.00	379	427.78	510	512.00

iv)	Energy sent out (MU)	1364	1193	2895	2349	3048	3872.49	3176	3642.46	4348	4992.40
v)	Plant load factor (Percentage)	56.16	54.40	64.30	73.16	65.05	81.92	67.45	77.23	68.73	72.22
vi)	Non-availability (Percentage)										
	Planned		27.26		20.62		11.21		15.99		NA
	Forced		8.34		2.23		2.26		1.00		NA
	Total		35.60		22.85		13.47		16.99		18.92

8.2.2.It will be seen from the above table that Singrauli project had generally exceeded the targets in generation of power and export of energy during the past five years. In Korba project, the targets for generation of power were exceeded in 1985-86, 1986-87 and 1988-89, while there was shortfall in 1984-85 and 1987-88. The shortfall in 1987-88 was attributed to delay in start of commercial production in Unit IV owing to failure of FD fan blade. There was also shortfall in export of energy during 1984-85 and 1987-88. In Ramagundam project there was low wind box pressure problem as a result of which the project could not achieve full generation during initial years. The project, however, exceeded the targets from 1985-86 onwards.

8.2.3 It would, however, be seen that, by and large, actual generation exceeded the targets in most of the years. Similarly, the plant load factor in all the projects exceeded the minimum norm of 63 per cent envisaged in the project reports during 1985-86 to 1987-88.

Outages

8.2.4 Non-availability of plants due to forced outages during 1984-85 to 1987-88 were 18, 11, 2 & 5 per cent at Singrauli, 32, 3, 2, and 5 per cent at Korba and 8, 2, 2 and 1 per cent at Ramagundam.

8.2.5. The Ministry of Energy stated (August 1990) that forced outages were, *inter alia,* due to the problem of synchronised functioning to the expected level of the various sub-systems of a unit and the design of machine/equipment of each power plant to varying degrees. It was also stated that barring Singrauli the forced outages were much less than the all India figures.

8.3 *Fuel Consumption*

8.3.1. The Company fixed norms for consumption of coal and oil by the various generating projects based on the

station heat rate and calorific value. The norms fixed vis-a-vis the actual consumption of coal and oil by the various projects during 1984-85to 1988-89 are given in annexure V.

8.3.2 The consumption of coal was generally slightly higher than the norms in the case of Singrauli and Ramagundam projects. The consumption of oil was lower than the norms at Singrauli and Korba in all the five years. At Ramagundam the oil consumption was more than the norms in 1984-85 and 1985-86. The higher oil consumption at Ramagundam was attributed by the Ministry of Energy (August 1990) to the generic problem of low wind box pressure

8.4 *Problems in Farakka project*

8.4.1 The first unit of 200 MW at Farakka was commissioned in January 1986, the second unit in December 1986 and the third unit in August 1987. The Farakka project faced several problems in generation in the initial stages due to various reasons such as delay in commissioning coal handling plant, serious labour problems leading to difficulties in coal handling and heavy floods, generator gas leakage and delay in conducting performance gurantee tests in Units I&II. Consequently, the generation of power had not stabilised till November 1986 in Unit I. Unit III, although synchronised in August 1987, could start generation only in March 1988 due to abnormal delay in completion of balance work by BHEL. Units I & II started commercial production with effect from 1.11.1986 and 1.10.1987 respectively. However, the performance guarantee test was carried out in respect of 17 packages out of total 23 packages up to 31st March 1990, and the balance was in progress.

8.4.2 The performance of project was badly affected as a result of these problems and the following factors in Unit I:-

i) Outages during the period of April 1986 to January 1987 constituted 24 per cent and there were 103 trippings (approx). The frequent outages were attributed to the various problems in the main plant and the auxiliaries.

ii) The utilisation of the capacity of the unit was far from satisfactory (39 per cent) due to various constraints. The constraints affecting the generation were (a) considerable clinker formation inside the furnace and subsequent choking of bottom ash hopper, (b) occasional break-down of clinker grinders and scrapper conveyor for handling huge quantity of ash and clinker, (c) choking of the bottom ash slurry channel due to huge clinkers and subsequent non-availability of bot-

tom ash slurry pumps for suction, (d) problem of coal crushing and feeding with contingency coal handling plant, (e) non-availability of the proper combination of coal mills and (f) problem of ID Fan.

The problem of ash clinker accumulation was mainly on account of the limitation of the present ash handling system.

iii) Another area of serious concern which affected the sustained generation was the problem with evacuation of power. The problem of generation ceiling/frequent load restrictions imposed by Eastern Region Electricity Board (EREB) is likely to aggravate with the coming up of more units of first stage of FSTPP.

iv) The average coal and oil consumption per KWh was 0.86 Kg/KWH and 75.5 ml/kwh respectively, as against the DPR norms of 0.69 kg/Kwh coal and 15 Ml/kwh oil. The norm of 0.69 kg/kwh was based on a calorific value of 3400 Kcal/kg whereas coal actually received had a calorific value of 2,800 kcal/kg only, which resulted in higher consumption of coal.

v) As regards oil, it was noticed that oil flow meters were not in operation and, therefore, the actual consumption of oil was recorded in the daily plant report through oil tank level gauge (difference of oil level in meter between two consecutive dates x 314 KL) and on the days when oil was filled in the tank, through burner hours of the oil guns in service (one hour burner running requires 1 KL of oil). The consumption of oil in Unit II was based on derived figures, as neither records of daily consumption of oil/burner hours run were maintained, nor separate oil tank was used. The quantity shown in consumption for a month was only a derived figure by deduction of consumption of Unit I and closing stock from opening stock and receipt relating to the month. Thus, due to defective system of oil measurement, wastage. spillage, or loss, if any, otherwise could have got recorded as consumption.

The management attributed (August 1987) high consumption of oil to the following factors:

a) Problem in the contingency coal handling plant.

b) Unusually heavy rains and floods during September/ October 1986 affecting coal handling and feeding operations.

c) Operation of auxiliary boiler for supply of auxiliary steam which was otherwise expected from the running unit, operating at a high load.

d) Frequent trippings of Farakka-Jeerhat line causing

unit trippings.

It was also stated that the quantity of oil consumed was an aggregate for the period April 1986 to January 1987 for Unit I and June 1986 to January 1987 for Unit II when various commissioning activities were in progress. In the absence of any improved method of measurement, the method adopted was the only way out, and detailed measurement was not considered feasible. In fact, computation on the basis of burner hours running is feasible only when the unit is in normal running condition.

vi) The records of the project revealed that the oil had spilled from the fuel oil plant and carried by rain water into track hopper tunnels and trenches connected with coal handling plant. The oil layer was stated to be about 3" to 4" thick; the work for removal of spilled oil was taken up in November 1986. Failure of anti-syphonic device in the oil tank and malfunctioning of the tank level indicators were primary reasons for non-detection of the spillage. The exact quantity of spillage was not suceptible of determination as it was spread over a large area on flood waters. The Management, however, stated (October 1988) that a separate Committee investigated spillage of oil and assessed the quantum of spillage at 150 KL valuing Rs.4.91 lakhs.

9. COSTING SYSTEM AND COST OF PRODUCTION

9.1 *Costing System*

9.1.1. The Company formed a Committee (December 1983) to finalise a Cost Accounting System. The Committee formulated a costing system based on absorption costing principles. The structure of the cost accounting system is based on the responsibility centres which are of three types as detailed blow:

(i) Investment centre: - Each Super Thermal Power Station and Tranmission Line System is considered as an investment centre.

(ii) Profit centre: -Each Geneating Unit and Transmission Line is conisdered as profit centre.

(iii)Cost centre: - Cost centres are identified on the basis consistent with responsibility structure and easy identification of cost for the cost centre.

The principal control parametres are return on investment for investment centres, profit to sales ratio for profit centres and cost per unit of output for cost centres.

9.1.2 The above Cost Accounting System was under the process of implementation with the aid of computer and all input formats for collection of cost data, cost centrewise were being standardised (May 1987). At present, the cost of generation is being compiled from the financial accounts. The cost of generation is divided into fixed cost and variable cost. The costs of coal and oil used for generation are treated as variable cost and all other costs are treated as fixed cost. Fixed costs account for about 40 per cent of total generation cost.

9.2 *Cost of Production*

9.2.1. The generation data, fixed cost, variable cost and variances, etc. are given in annexures VI to XI.

9.2.2 It will be seen from the data given in the annexures that the norms of generation and actual generation of power in Singrauli, Korba and Ramagundam compare well. The cost of generation and tariff also compare well in these projects. However, the reasons for variances in cost of generation, wherever the cost exceeded the norms are discussed in the subsequent paragraphs.

9.2.3. *Fixed cost variance*

The fixed costs in all the projects were less than the DPR norms except at Ramagundam in 1984-85. The main reason for the variance was less interest liability on loans as the Government had releasd 50 per cent of the cost of project as equity first and released interest - bearing loans at a later date. Similarly, the depreciation as envisaged in the DPR was based

on the total anticipated cost of construction of the project. But actually the auxiliary and sub-systems were not capitalised at Singrauli and Korba projects and as such the depreciation was charged less. However, the operation and maintenance expenses in all the projects were more than the DPR estimates because of long preventive maintenance schedules and lesser generation at Singrauli and Korba due to hydrogen leakage which required shut down of the units for rectification of the defects as well as on account of teething troubles during stabilisation of new units commissioned in 1983-84 and 1984-85.

The fixed costs were more than the norms at Ramagundam in 1984-85 due to actual generation being less than the norms on account of the fact that the units were declared commercial during the course of the year.

Management stated that after commissioning of 500MW units the actual PLF will come down and will be near the PLF of 62.79 as envisaged in the DPR, keeping in view the entire life of the plant.

9.2.4. ***Variable Cost Variance***

Coal cost was more than the DPR estimates in all the projects during all these years; the reasons for variance in coal costs were price escalation in the coal costs and higher consumption of coal due to poor quality of coal having lesser calorific value than that envisaged in the DPR.

Oil cost in all the projects was generally less than the DPR estimates.

9.2.5 ***Total Cost Variance***

The total cost of generation was more than the DPR estimates at Singrauli (1988-89), Korba (1984-85 and 1988-89) and Ramagundam 1984-85, and 1987-88 and 1988-89) mainly due to higher coal cost.

9.2.6 ***Tariff Rate Variance***

The variance in tariff rates was on account of fuel price adjustments as per the formula prescribed for recovery of fuel price escalations.

9.2.7. ***Return per unit sold***

The variance in return per unit sold was the net effect of variances in the generation costs and tariff variances. The return per unit was more than the DPR. estimates in all the projects except at Ramagundam in 1984-85 because of lower PLF (54.4 per cent).

10. MATERIAL MANAGEMENT AND INVENTORY CONTROL

10.1 Inventory Management System Manual and Stores Management System Manual were brought out by the Company in October 1989 and November 1989 respectively. Two more manuals-Purchase Management System Manual and Transport Management System Manual were under finalisation (August 1990).

Inventory Status

10.2 The table below gives the over-all inventory status of various projects at the close of the years 1984-85 to 1988-89:-

(Rs. in lakhs)

Project	1984-85			1985-86			1986-87			1987-88			1988-89		
	Consumption	Closing stock	Closing stock in No. of months consumption	Consumption	Closing stock	Closing stock in No. of months consumption	Consumption	Closing stock	Closing stock in No. of months consumption	Consumption	Closing stock	Closing stock in No. of months consumption.	Consumption	Closing stock	Closing stock in No. of months consumption
Singrauli	9951.09	3016.84	3.64	2730.62	3591.06	15.78	2542.46	5644.18	26.64	2158.23	7689.60	42.75	26348.58	7600.51	3.46
Korba	6395.60	3351.15	6.29	3682.87	4512.17	14.70	3368.61	5210.87	18.56	2596.82	4876.20	22.53	4470.69	6313.15	16.94
Ramagundam	7654.82	3342.30	5.24	2737.83	3916.74	17.17	2380.36	5022.16	25.31	9267.40	5444.80	7.05	3531.67	6478.46	22.01
Farakka	1342.07	581.87	5.20	1359.80	1626.80	14.36	NA	NA	-	1170.55	2244.33	23.00	3723.71	5408.17	17.42
Vindhyachal	813.47	556.97	8.22	NA	NA	NA	3089.46	972.14	3.77	1438.17	1038.10	8.54	3605.61	1482.31	3.17
Rihand	1418.30	292.56	2.47	2628.35	694.20	3.17	2137.84	895.21	4.98	1797.00	717.96	4.79	3137.13	856.95	3.25
	27575.35	11141.69	4.85	13139.47	14340.97	13.10	13538.73	17744.56	15.73	18448.17	22010.99	14.32	46837.39	28139.55	7.20

10.3 From the data given in the above table, the following position emerges:-

- The inventory in the case of Singrauli, Korba and Farakka projects was high and was generally showing an increasing trend from 1985-86 to 1987-88.

- The closing stock of inventory in number of months' consumption during 1987-88 was as high as 42.75 months in Singrauli Project.

- The overall inventory increased from 4.85 months' consumption in 1984-85 to 15.73 months' consumption in 1986-87 and decreased to 14.32 months' consumption in 1987-88. It further decreased to 7.20 months' consumption in 1988-89. However, inventory accumlation in Ramagundam showed a substantial increase from 7.05 months' consumption in 1987-88 to 22.01 months' consumption in 1988-89.

10.4 The Ministry while stating (August 1990) that the measurement of inventory in terms of consumption bulked on all stores was not very rational, attributed the following factors for the upward trend.

(i) Having regard to uncertainties in availability of steel and such items of critical needs for construction, larger quantities were, as a matter of policy, held in stock.

(ii) Along with main plant, mandatory spares were obtained for reasons of prudence.

(iii) In regard to recommended spares, the Company had in the initial stages, when experience was being gained, decided not to take chances in these areas to avoid shutdown, thus, affecting generation of power.

(iv) When a project was at the completion stage O&M spares were also added.

(v) Holding spares helped the Company in times of serious threats to break - down of the system and saved losses in generation of power:

10.5 ***Norms for inventory holding***

The tentative norms for inventory holding fixed by the Management in June, 1984 were reviewed by the Management in June 1986 taking into account the nature of item/group of items, market availability and remote locations of the projects. The following revised norms for inventory holding were proposed to be fixed:

	Items	Months Consumption
	Construction Stores	
i)	Cement	1-1/2
ii)	Steel	9
iii)	Others (viz. pipe, pipe fittings, cables, etc.)	6
	Operation & Maintenance Stores	
i)	Coal	1-1/2
ii)	Spares (excluding insurance spares)	12
iii)	Loose tools	6
iv)	Chemicals, Gases & Explosives	3
v)	Oils & Lubricants	3
vi)	Stores other than spares (Consumables & general stores)	6
vii)	Scrap	6 months' arisings

10.6 The table below gives the inventory in number of months' consumption at Singrauli, Korba and Ramagundam projects at the close of 1987-88:-

(Rs. in lakhs)

Items	Singrauli		Korba		Ramagundam	
	Value	Inventory in No. of months' consumption	Value	Inventory in No. of months' consumption	Value	Inventory in No. of months' consumption
Construction Stores						
Ferrous metals	288.14	10	912.3	10	1368.96	20
Cement	-	-	6.11	0.2	17.90	15
Others	177.00	19	455.23	31	335.81	45
O&M Stores						
Spares	6254.28	65	3131.58	60	2406.7	65
Loose tools	20.10	34	21.70	23	8.8	57
General and consumable stores	166.52	15	203.61	20	150.86	19

10.7 It would be seen from the above table that the inventory of construction stores in all the three projects; (except cement in Singrauli and Korba) as well as operation and maintenance stores in these projects were substantially higher than the revised norms proposed.

10.8 The Ministry of Energy *inter-alia* stated (August 1990) as under:

(i) So far as the projects were in construction phase, initially adequate supplies of construction materials (viz. steel, cement, cables, pipes, pipe fittings, etc.) were made available to the projects to take care of uncertainties in market availability and also to ensure smooth running of construction work so as to avoid huge time/cost over-runs due to non-availability of construction materials and this advance planned action was bound to increase the inventory in the initial years.

ii) ***Construction Stores***

The inventory of ferrous metals at Ramagundam was apparently higher because of ta-

pering in construction activities of the project of such a mammoth size of 2100 MW ultimate installed capacity and these ferrous metals were subsequently consumed at other projects. Similar was the case in respect of cement held at Ramagundam. As regards other construction materials, though NTPC had proposed norms of 6 months, because of a vast number of construction items that go into the mammoth project execution within the time the value of this inventory held at Singrauli, Korba and Ramagundam became necessary.

iii) ***Spares***

The extent of spares holding at Singrauli, Korba and Ramagundam during 1987-88 vis-a-vis norms was not comparable because of NTPC's policy of procuring initial 3 years' spares requirement from the original equipment manufacturers for smooth operation.

iv) ***General and consumable spares***:

Singrauli, Korba and Ramagundam were being advised to identify the non-moving items in this category and declare the same surplus for resorting to inter-plant transfers during 1990-91.

v) No doubt the inventory position in the cases referred to has been higher than the proposed norms, but this was solely to ensure that the project completion did not suffer for want of materials. Efforts are now under way to tighten the situation.

10.9 The reply of the Ministry does not adequately explain why the actual inventory holding was higher in many cases than the revised norms which were proposed to be fixed after taking into account the relevant factors in June 1986.

10.10 ***Non-moving items***

10.10.1 The Company analysed (September 1987) for the first time the movement pattern of various spares/stores items held at its various projects on the basis of computer reports. As a result of this analysis, it was observed that as on 31.3.1987, 18454 items (21 per cent of total items) of stores/spares valuing Rs.1079.42 lakhs (7 per cent of total value) had not moved for more than 12 months. The projectwise details of total items of stores/spares and unmoved items is given below:-

(Rs. in lakhs)

Project	Total items of Stores/spares		Unmoved items valuing Upto Rs.10,000		Over Rs.10,000		Total	
	No.	Value	No.	Value	No.	Value	No.	Value
Singrauli	30542	4573.56	2945	44.90	318	221.32	3263	266.22
Rihand	3757	895.22	1096	9.58	64	101.75	1160	111.33
Ramagundam	23324	4546.91	6773	64.59	292	287.00	7065	351.59
Korba	24667	5210.88	5226	62.32	391	224.15	5617	286.47
Vindhyachal	4393	910.33	1247	15.92	102	47.89	1349	63.81
	86683	16136.90	17287	197.31	1167	882.11	18454	1079.42

10.10.2 The Ministry stated (August 1990) that the existing policy of NTPC is that the items are declared non-moving if these have not been consumed for 5 years in case of spares.

10.11 ***Physical verification of stores, spares, etc.***

10.11.1 The physical stock verification was being done at the various projects only on a selective basis. In this process a number of high value items remained uncovered. The existing system of physical stock verification did not serve the intended purpose as the extent of coverage of physical verification in financial terms was not adequate.

10.11.2 The Ministry of Energy stated (August 1990) as under:

"A policy view has been taken that NTPC system of physical stock verification will be as under:-

i) 100 per cent stock verification of 'X' class items (i.e. items having inventory holding over Rs.1 lakh) atleast once during the financial year.

ii) At least 50 per cent stock verification of 'Y' class items (i.e. items having inventory holding over Rs.10,000/- and upto Rs.1 lakh) once during the financial year.

iii) At least 25 per cent

stock verification of 'Z' class items (i.e. items having inventory holding upto Rs.10,000/-), once during the financial year."

10.12. A review of purchase orders revealed delays in placing orders, and consequent extra expenditure. These cases are discussed in the subsequent paragraphs.

Delay in placing order

10.12.1 In view of the unsatisfactory performance of Weir Boiler Feed Pumps installed at Singrauli Super Thermal Power Project, the management decided to procure additional spares for such a pump installed at Korba Super Thermal Power Project. Accordingly, the Operation Services Division obtained quotations for boiler feed pump and boiler feed water booster pump spares from M/s. Weir Pumps Limited, U.K. The quotation was received through the Indian Agents M/s Menon Associates. While forwarding the same (March 1983) the Corporate office directed the project to initiate procurement action for the same as the offer was valid till the end of March 1983. The value of spares for boiler feed pump (23 items) and booster pump (24 items) was £2,22,589.35 and £30,601.83 equivalent to Rs.35.17 lakhs and Rs.4.84 lakhs respectively.

10.12.2 The supplier M/s Weir Pumps Limited, was requested (March 1983) to supply the break-up of the quoted price viz., basic price of spares, packing, forwarding, freight charges, etc., together with the copies of previous invoices for the earlier supply of pump equipments to facilitate formalities of obtaining import licence. Since the information received through the Indian agent in March 1983 was not sufficient, certain clarifications were sought in June 1983. The suppliers while furnishing clarifications (July 1983) indicated an upward revision of prices. The revised offer was valid for 180 days with effect from 6th July 1983. As the spares were considered vital, the Central Electricity Authority was approached in November 1983 for arranging an import licence. Simultaneously, order was also placed on M/s Weir Pumps Limited, for supply of 47 items of spares with the stipulation that the import licence will be made available within the validity period. The total value of the spares was Rs.82.11 lakhs. As the import licence could not be obtained and the firm order not placed within the stipulated period of six months, the Indian agent of the supplier informed about a further upward revision of prices, first in March 1984 and again in October 1984.

10.12.3 At this stage, the Indian agent M/s Menon Associates volunteered to supply (November 1984) these spares

against their import licence received for stock and sale of spares. This proposal was approved by the Company and orders placed in December 1984. The supply of 47 items of spares was to be completed by the end of September 1985. Accordingly, the supplies were made in May and August 1985 at a total cost of Rs.119.56 lakhs.

10.12.4 Thus, due to delay in placing the firm order, the Company had to incur an extra expenditure of Rs.37.45 lakhs.

The Ministry of Energy stated (August 1990) that as per the import policy of Government of India, spares worth more than 2 per cent of the equipment could not be imported. Import licence could not, therefore, be issued. The Corporation had no alternative but to explore the possibility of procuring these spares within the country and ultimately it was possible to obtain them at rates which were 56 per cent cheaper than those quoted by BHEL.

It is, however, not clear how the private Indian agents were allowed to import whereas, the Government Company was denied this facility.

Excess Procurement of Cables

10.12.5 Anticipating delay in receipt of cables valuing Rs.291.77 lakhs required for use in raw water and water treatment plant stage I (3 x 200 MW) ordered on M/s Gold Star Cables Company Limited, Korea in January 1981, Korba project decided to procure indigenously cables of 3 x 400MM^2, 3 x 150MM^2, 1 x 800MM^2 and 3 x 185MM^2. Accordingly orders for procurement of cables valuing Rs.57.32 lakhs were placed on M/s Industrial Cables (India) Limited, Rajpura in July 1981.

10.12.6. The Indian firm supplied the cables between September and December 1981 as against August 1981 which was the scheduled date of delivery.The supplies of cables ordered on foreign firm were received during the period February 1982 to January 1983 as against delivery schedule of July 1981 to November 1982.

10.12.7 Out of the cables valuing Rs.348.09 lakhs received from both the sources, cables valuing Rs.263.81 lakhs could only be utilised and cables worth Rs.85.28 lakhs were lying in stock (March 1989) resulting in blocking up of funds.

10.12.8 The Ministry of Energy inter-alia stated (August 1990) as under:-

> "i) ...Cables worth Rs.14.31 lakhs have already been utilised and the remaining cables will also be put to use.
>
> ii) Cables worth Rs.24.14 lakhs have

been kept reserved against emergency requirement of O&M on permanent basis for 3 x 200 MW and 3 x 500 MW. Balance cables have been taken into consideration by NTPC Corporate Centre against various cables required for other projects of NTPC and the cables stocks are gradually getting depleted with the requirement of other project sites of NTPC".

The precise need for keeping the cables on a permanent basis is not clear.

Insurance Claims

10.12.9 Against the purchase orders placed by the Company for procurement of spares required for their main boiler of SSTPP, BHEL Tiruchirappalli supplied the spares in one consignment on 21st February 1983. The consignment was received/unloaded by the Singrauli Project on 9th April 1983. Since the consignment was found in broken condition, only book delivery was taken at that time and open delivery was taken on 29th February 1984.

10.12.10 A claim was lodged with the underwriters on 26th March 1984 for Rs.8.33 lakhs as well as with the Railways, supported by open delivery certificate. The supplier was informed of the shortage only in November 1984, i.e., after a lapse of nine months from the date of taking open delivery of the consignment, for making good the shortages.

10.12.11 The Ministry stated (August 1990) as follows:-

> " The claim was settled by our underwriters at Rs.4,16,633.88 (i.e. 50 per cent of the claimed amount). We have again requested our underwriters to re-open the case based on requisite documents and settle claim for the balance amount of Rs.4,16,633.88."

The matter was still under consideration (August 1990).

11. FINANCIAL POSITION AND WORKING RESULTS

11.1 *Financial position*

The financial position of the Company during the years 1984-85 to 1988-89 is given below :

(Rs. in lakhs)

		1984-85	1985-86	1986-87	1987-88	1988-89
A.	Liabilities					
a)	Paid up capital (including share capital deposit)	2086,73.38	2767,50.37	3358,41.37	4046,33.63	441461.02
b)	Reserves and Surplus	140,14.88	323,10.18	546,27.88	851,09.85	119062.40
c)	Borrowings from:					
	i) Banks (cash credit)	398.71	20,29.33	0.17	45,40.65	1503.37
	ii) Secured Bonds	—	—	163,37.18	593,02.58	103274.31
	iii) Unsecured bonds	—	163,37.18	429,96.93	439,69.91	15000.00
	iv) Govt. of India	968,84.96	1358,68.97	1657,58.37	1362,74.68	187599.79
	v) Unit Trust of India	—	—	—	100,00.00	10000.00
	vi) Consortium	53,35.93	184,00.88	401,38.39	557,06.65	60711.48
	vii) Skandinorviska Enskilda Banken	10,15.13	46,52.09	137,06.92	229,68.55	25723.60
	viii) Loan from Japan bank	—	—	—	384,73.96	94663.84
d)	Trade dues and other current liabilities (including provisions)	308,09.71	389,10.13	577,75.33	801,39.74	87804.04
		3571,32.70	5252,59.13	727,182.54	9411,20.20	1146804.20
B.	Assets					
a)	Gross Block	1336,32.01	1604,70.53	2068,89.71	3050,80.24	4478,48.81
	Less Depreciation	47,39.90	90,31.27	141,55.95	206,86.39	306,82.81
	Net Fixed Assets	1288,72.11	1514.39.26	1927,33.76	2843,93.85	4171,63.00
b)	Capital work in progress	1131,48.83	2091,64.89	3479,77.18	4079,57.60	4636,49.32
c)	Construction Stores and Advances	839,47.68	1015,28.71	950,42.73	1139,06.66	1049,67.00
d)	Investments	0.05	0.12	0.12	0.12	1.76
e)	Current Assets, Loans & Advances	309,78.53	629,34.15	912,70.97	1346,94.00	1588,40.77
f)	Misc. expenditure	1,85.50	1,92.00	1,57.78	1,67.97	1,82.35
		3571,32.70	5252,59.13	7271,82.54	9411,20.20	11468,04.20

Capital employed	1295,75.66	1754,63.28	2262,29.40	3389,48.11	4881,99.73
Net worth	2225,02.76	3088,68.55	3903,11.47	4895,75.51	5603,41.07
Debt equity Ratio	0.49:1	0.57:1	0.71:1	0.76:1	0.89:1

NOTE: i) Capital employed represents net fixed assets plus working capital.
ii) Net worth represents paid up capital plus reserves and surplus less intangible assets.

11.2 *Working results :*

The working results of the company for the last 5 years ended 31st March, 1989 are given below :

(Rs. in lakhs)

	1984-85	1985-86	1986-87	1987-88	1988-89
Sales	322,53.16	511,25.64	629,09.89	837,72.28	1245,32.50
Other income	4,20.40	6,98.55	7,49.60	15,20.68	11,62.73
Profit for the year	90,36.99	178,06.00	206,52.50	266,23.00	339,83.62
Add/Less prior period adjustments (income/expenditure)	(-) 2,83.09	4,98.25	5,33.97	36,17.01	9,01.57
Profit for the year before tax	87,53.90	183,04.25	211,86.47	302,40.01	330,82.05
Less Tax Provision	NIL	8.84	6.02	NIL	NIL
Profit after tax	87,53.90	182,95.41	211,80.45	302,40.01	330,82.05
Percentage of profit before tax to sales	27.14	35.80	33.67	36.09	26.19
Percentage of profit before tax to capital employed	6.76	10.43	9.36	8.92	6.78
Percentage of profit after tax to capital employed	4.20	6.61	6.31	7.47	7.49

11.3 The Company has been earning profits in all the five years from 1984-85 to 1988-89 as may be seen from the above data. The capital employed and the net worth have also increased during this period. However, the percentage of profit before tax to sales decreased during 1986-87 and 1988-89 and the percentage of profit before tax to capital employed decreased during the years 1986-87 to 1988-89.

11.4 It may, however, be relevant to mention that despite continuous profits earned by the Company during this period, no dividend has been paid to the Government on the Government's equity holding since inception.

11.5. ***Sundry Debtors***

11.5.1 The outstanding dues from the State Electricity Boards for energy sales were Rs.438.52 crores as on 31st March, 1989; as against Rs.323.69 crores as on 31st March, 1988. Against the average billing of Rs.72 crores (approx) the Company had revolving letters of credit worth Rs.30.25 crores only. Kerala, West Bengal, Bihar and Orissa State Electricity Boards have not opened the letters of credit (June, 1989). The table below indicates the age-wise analysis of Sundry debtors as on 31.3.1989:

(Rs. in Crores)

Project/SEBs	Net outstanding as on 31.3.89	Age-wise analysis of Debtors			
		less than 3 months	3to6 months	6to12 months	More than 12 months
Singrauli					
UPSEB	96.42	23.52	23.04	41.52	8.34
RSEB	48.27	26.21	21.17	-	0.89
DESU	40.91	8.10	1.93	9.93	20.95
PSEB	5.50	5.50	-	-	-
HSEB	35.14	12.47	10.27	10.74	1.66

HPSEB	5.87	1.83	-	4.04	-
J&K	2.23	2.22	0.01	-	-
DVC	1.76	1.76	-	-	-
BSEB	2.74	2.49	0.25	-	-
TOTAL (A):	238.84	84.10	56.67	66.23	31.84
Korba					
MPEB	48.65	36.86	2.82	2.68	6.29
MSEB	20.69	8.56	0.13	0.76	11.24
GEB	11.40	8.74	0.45	0.61	1.60
TOTAL (B):	80.74	54.16	3.40	4.05	19.13
Ramagundam					
APSEB	4.97	0.04	3.94	0.99	-
KEB	13.03	9.76	0.64	0.48	2.15
TNEB	39.75	26.11	8.81	3.21	1.62
KSEB	2.65	-	-	-	2.65
TOTAL (C):	60.40	35.91	13.39	4.68	6.42
Farakka					
WBSEB	12.23	5.69	3.80	2.74	-
DVC	1.64	1.64	-	-	-

BSEB	26.91	11.33	7.76	7.82	-
OSEB	17.51	1.62	0.88	9.14	5.87
SIKKIM	0.25	0.25	-	-	-
TOTAL (D):	58.54	20.53	12.44	19.70	5.87
Grand Total(A+B+C+D)	438.52	194.70	85.90	94.66	63.26
Percentage:		44.40	19.59	21.59	14.42

11.5.2 It will be seen that 14.42 per cent dues were more than one year old and 21.59 per cent were more than six months but less than one year old. The main defaulters for more than six months were UP-SEB (Rs.49.86 crores); DESU (Rs.30.88 crores); HSEB (Rs.12.40 crores); and HPSEB (Rs.4.04 crores) in the North-ern Region; MPEB (Rs.8.97 crores); MSEB (Rs.12.00 crores) and GEB (Rs.2.21 crores) in the Western Region; APSEB (Rs.0.99 crore); KEB (Rs.2.63 crores); TNEB (Rs.4.83 crores) and KSEB (Rs.2.65 crores) in Southern Region and WBSEB (Rs.2.74 crores); BSEB (Rs.7.82 crores) and OSEB (Rs.15.01 crores) in Eastern Region. Reasons for accumulation of arrears against UPSEB (one of the main defaulters) were non-raising of the amount of letter of credit opened in 1982-83 and non-payment of supplementary bills.

11.5.3 MSEB had deducted an amount of Rs.6.26 crores dur-ing the period March 1986 to August 1986 on the ground that the power was dumped on them (i.e. the power supplied was in excess of the agreed quota) by Korba Super Thermal Power Project (KSTPP):

The Ministry of Energy stated (August 1990) that withholding of power supply dues on account of so called dumping of power is a unilat-eral action on the part of MSEB and is not based on any provision of the power supply agreement with them. This mat-ter has been taken up with MSEB in order to resolve the issue. WREB has also been asked to release this payment.

11.5.4 The Company negoti-ates its monthly bills against the revolving letters of credit opened by the State Electricity Boards and allows a rebate of one per cent on the net amount of energy bills negotiated, i.e. excluding the amount of electricity duty, etc. For the balance amount, if any, the Company presents

supplementary bills to the State Electricity Boards which are payable within one month. In case of default the Company is entitled to recover surcharge ranging from 1.5 per cent to 2 per cent per month as specified in the agreements, from the State Electricity Boards. However, a sum of Rs.132 crores was due as on 31.3.88 on this account from the defaulting State Electricity Boards (Singrauli Rs.95.90 crores; Korba Rs.19.34 crores; Ramagundam Rs.14.11 crores and Farakka Rs.2.65 crores). The State Electricity Boards have not paid any surcharge bills so far and the matter is yet to be settled.

11.5.5 The Company stated that for recovery of outstanding dues, Government of India had taken a decision to adjust dues more than two months old from Central Assistance to respective States gradually. In pursuance of this decision, outstanding of more than two months duration from State Electricity Boards had been recovered in six monthly instalments.

However, the Sundry Debtors stood at Rs.602.57 crores as on 31st March 1989 as against Rs.410.54 crores on 31st March 1988. The Sundry debtors represented 5.72 months' sales in 1988-89 as compared to 5.81 months' sales in 1987-88.

It was again decided by Government of India in June 1990 that 25 per cent of the overdues as on a predetermined date may, in the first instance, be adjusted against the Central Assistance.

11.5.6 In view of the mounting outstandings against SEBs, the World Bank Appraisal Team had suggested that better financial incentives should be given to SEBs to pay Company's energy bills in time. Accordingly, the following proposal was put up to the Board of Directors in their meeting held on 9th December 1988:-

(a) Rebate of one and half per cent on ad-hoc advance payment to be adjusted against current month's energy bills made by Bulk Power Customers on 1st of the month (next Bank working day if 1st happens to be a holiday).

(b) Rebate of half percent on payments made through LC on presentation of energy bills to Bank (as per existing provisions in agreements).

(c) Rebate of half per cent on payments by 10th day of presentation of energy bill (next Bank working day if 10th happens to be a Bank holiday).

The Board of Directors while agreeing with the proposal desired that instead of making general rule such rebates could be given to Electricity Boards on case to case basis as an incentive to ob-

tain prompt payments. The Board, therefore, authorised CMD to take decision in this regard on case to case basis keeping the parameters as contained in the proposal put up to the Board.

11.5.7 The Ministry of Energy stated (August 1990) that the Company has been making substantial efforts now for recovery of dues.

12. HUMAN RESOURCES DEVELOPMENT

12.1 The Company has endeavoured to develop a well conceived multi - faceted Human Resource Development (HRD) strategy in order to :

- develop a result oriented personnel programme and an organisational culture which motivates employees to contribute their best towards achievement of organisational objectives;

- utilise capabilities of employees to achieve professional excellence and organisational goals.

The major components where stress was laid by the Company included - human resource planning; man power acquisition; training and development; employees development schemes; performance appraisal and career planning; human resource information system and generation and construction incentive scheme.

12.2 The Ministry of Energy informed (October 1990) that for power generation utilities in the country Man- MW ratio averages about 4:1 to 5:1, while in the advanced countries it is in the range of 0.6:1 to 0.7:1..... Right from the initial years of NTPC, a lot of emphasis has been given on human resources planning, which has resulted in a Man-MW Ratio of about 1.2:1 for a 2000 MW Power Station. Efforts are on to rationalise the man power norms further so as to achieve a Man-MW Ratio of 1:1 in the coming years.

12.3 ***Manpower***

The total man-power of the Company at the end of March 1989 was 20682 including trainees but excluding daily rated workers. The table given below indicates the growth of man-power:

Period	Number of Employees
Upto 1984-85	13,810
Additions	
1985-86	1,256
1986-87	2,085
1987-88	1,882
1988-89	1,849
TOTAL	20,682

13. INTERNAL AUDIT

13.1 The Internal Audit group is headed by a General Manager who directly reports to the Director (Finance).

Although the activities of the Company had increased many-fold during the past five years, the actual strength of the Internal Audit Department, which remained more or less constant till 1986-87, was inadequate and not commensurate with the operations of the Company's construction and generating units located at various places in the country. In the year 1987-88 the Internal Audit Department of the Company was decentralised and offices opened in Singrauli, Ramagundam and Nagpur.

13.2 The Ministry of Energy *inter-alia* stated (August 1990) that whenever the in-house strength was found deficient, external agencies were appointed to conduct internal audit.

13.3 The Ministry, further, stated that in the year 1987-88, with a view to cope with the increasing activities of the Company, another measure was adopted i.e. audit of units at Singrauli, Ramagundam and Nagpur were decentralised. Later on, one additional unit was also started at Eastern Region Transmission Line, Patna by posting two executives. The Internal Audit Unit functioning in Singrauli was also entrusted with the audit of nearby projects, i.e. Rihand and Vindhyachal.

13.4 The Internal Audit department covered only a few departments at Corporate Office during the last six years (8,6,10,3,5 and 10 Departments in 1982-83, 1983-84, 1984-85, 1985-86, 1986-87 and 1987-88 respectively). The Statutory Auditors in their reports for the years 1984-85, 1985-86, 1986-87, 1987-88 and 1988-89 had specifically pointed out that the Internal Audit System was not adequate and commensurate with the size and nature of transactions of the Company. The activities of the Company and projects during the last three years ending March, 1989 had increased considerably but the Company had not strengthened the Internal Audit Department. The outside agencies did not bring out any area of major deficiencies in the system or in the execution of works or defects in the procedure. Their reports were confined mainly to financial transactions, clearance of advances given to contractors/suppliers, etc. Thus, no important suggestions to improve the efficiency of the working of the projects or Corporate Centre were given by the Internal Audit Department. The Management themselves pointed out that the performance of one external agency entrusted with the audit of Farakka STPP for 1984-85 was not upto the mark; still they were re-appointed for the audit for the year 1985-86.

14. OTHER TOPICS OF INTEREST

14.1 *Procurement of coal from Central Coalfields limited (CCL) and Northern Coalfields Limited (NCL).*

14.1.1 The first unit of 200 MW of Singrauli Super Thermal Power Project (SSTPP) was scheduled to be completed in February 1982 but no advance action was taken by the Company to enter into a running contract for procurement of coal, except the discussions held in January 1982 with Central Coalfields Limited (CCL) regarding the terms of initial supply of 25,000 tonnes of coal. These discussions were mainly regarding joint sampling and billing. Subsequently, in February 1982, CCL maintained that in addition to the price, the purchaser would have to pay additional transportation charges also for the initial supplies of 25,000 tonnes of coal as may be agreed to later on.

14.1.2 Since the terms and conditions were left unsettled at the time of obtaining initial supplies of coal, CCL was in an advantageous position of determining terms. It was, therefore, decided (March 1982) that when the CCL claimed handling, transportation and loading charges, the Company would pay the transportation charges under protest after disallowing a sum equal to surface transportation charges from such bills and CCL might accept the payment under protest. Further, in the situation of non-settlement of fair rates for additional charges to be levied by the CCL on account of special temporary loading complex established for supplying coal, the Company would refer the matter jointly to the Secretary (Coal) and the Secretary (Power) for their final decision.

14.1.3 No final settlement, however, could be reached on the above issues till March 1985, when a formal agreement was drawn up between the Company and the CCL (effective from April 1985) about further supplies of coal. As a result, the claims of the CCL amounting to Rs.84.86 crores on 31st March 1989 pertaining to the period March 1982 to November 1985 have not been cleared and the SSTPP has been showing them under contingent liability.

14.1.4 The Ministry of Energy *inter-alia* stated (August 1990) that a formal agreement for supply of coal was drawn only in March 1985 (effective from April 1985) whereas supplies were received from February 1982 to March 1985. The SSTPP was showing Rs.812.04 lakhs as on 31st March 1990 under contingent liability on account of dispute relating to charges on account of loading/breaking and transportation, etc. The

claimed amount of Rs.7673.76 lakhs on account of main CHP charges was not tenable and, hence, had been disallowed. The Ministry also stated that though as a healthy practice, the agreement should be signed before commencement of coal supplies, inspite of concerted efforts of NTPC, the CCL could not be brought to sign the agreement in time. NTPC had no control over the billing by CCL which in some cases was beyond the provisions of coal price notification. In fact, the CCL continued to bill the above amount even after signing of the agreement in March 1985 and the matter was still un-resolved.

14.2 ***Procurement of 50 Tonne Tower Crane***

14.2.1 A 50 tonne tower crane was procured at RSTPP Ramagundam at a cost of Rs.80.25 lakhs alongwith spares worth Rs.10.70 lakhs for Stage I from Jessop & Company under the main plant equipment package with M/s Ansaldo, Italy. A sum of Rs.8.47 lakhs was spent on foundation and track laying, etc. for the crane.

14.2.2 The crane was commissioned in August 1982, 16 months after the scheduled date of commissioning in April 1981. By that time ceiling beams for all the three boilers for stage-I had already been erected. Hence, the height of the crane was restricted to 73 metres only and the load test of the crane at the full height of 103 metres could not be conducted. The crane was utilised for erection of boiler auxiliaries from September 1982 to February 1984.

14.2.3 As the crane was no longer required for construction of the units of 500 MW and its height also could not be raised to 103 metres due to space constraints, in a meeting (April 1984) between the Company and supplier it was decided to dismantle and re-erect the crane at some new project site to the full height of 103 metres and conduct the load test. The supplier agreed to conduct the tests within a period of two years from 11th April 1984 at the new site where the tower crane would be erected. The Company agreed to bear the cost of erection upto the height of 73 metres. Dismantling of the crane was completed in February 1986 at a cost of Rs.23.00 lakhs; besides Rs.2.35 lakhs were spent for packing, treatment and transportation of the dismantled parts to the Company's stores.

14.2.4 The orders for procurement of similar cranes for the projects at Farakka and Korba were also placed by the Company on BHEL (the main supplier) who procured the same from Jessop & Company. The crane supplied at Korba collapsed during installation and the advance of Rs.69.08 lakhs

already paid was recovered from the bills of BHEL (supplier of S.G.Package) later on. However, a sum of Rs.30.00 lakhs spent by the Company on foundation and laying of tracks, etc. for the said crane is still outstanding and no settlement has been reached, so far (August 1990).

14.2.5 The order for supply and erection of such crane at Farakka Project was cancelled (July 1982). Thus, the construction and erection of equipment for Stage I at Korba, Ramagundam and Farakka Projects was done without the help of the crane. As such, an amount of Rs.90.95 lakhs incurred on the procurement of the crane at Ramagundam was blocked for more than 5 years and an unproductive expenditure of Rs.30.00 lakhs at Korba project was incurred.

14.2.6 The Management stated (October 1988) as under:

> "Since the tower crane could not be erected to its full height of 103 metres while resolving the various issues of contracts with M/s. Ansaldo for closing of these contracts, it was decided in January/February 1987 that a suitable rebate from M/s. Ansaldo might be taken towards non-erection of crane beyond 73 metres upto 103 metres height. Accordingly, an amount of Rs.1,94,500 + US$ 5269.24 was deducted from payments due to M/s. Ansaldo."

The Management further clarified (November 1988) that the amount of recovery from M/s. Ansaldo was determined on pro-rata tonnage basis as applicable to SG package, for erection portion and informed that tower panels have since been shifted to Kahalgaon STPP where it (crane) will be re-erected and utilised for erection of main plant structure.

14.2.7 The Ministry of Energy *inter-alia* stated (August 1990) as under:-

i) The tower crane is being erected progressively at Kahalgaon in line with the requirements of erection of Boiler structures. It has already been erectd upto a height of 50 metres. When the height of 103 metres is reached the required tests will be carried out before acceptance .

ii) As regards recovery of Rs.30 lakhs from BHEL relating to tower crane at Korba, the matter was discussed with BHEL who had made a claim of Rs.120 lakhs against NTPC because of non-availability of tower crane. NTPC has also made certain counter claims.

This matter is still under dispute. When all the pending issues in regard to 3x200MW SG and TG packages including this are decided, the dues from the BHEL will be recovered.

14.3. ***Defective clause in the Memorandum of Understanding with the State Electricity Boards and consequent loss of revenue***

14.3.1. As per the Memorandum of Understanding between the Company and the State Electricity Boards of Madhya Pradesh, Maharashtra, Gujarat and Goa for sale of power from the KSTPP, the price of energy was subject to fuel price adjustment. As per Clause 3(X) of the Memorandum of Understanding, for every increase/decrease of Re.1.00 per tonne in the monthly average aggregate delivered cost of coal of Grade 'F' received at Korba STPP over that as on 1st March, 1983, a fuel price adjustment of 0.08117 paise per unit shall be made for increase or rebate allowed for decrease.

14.3.2 Korba Station had been receiving superior grades of coal also which had the effect of higher impact on fuel surcharge. The project, therefore, preferred claim for fuel surcharge amounting to Rs.685.15 lakhs relating to the years 1983-84, 1984-85 and 1985-86 based on the difference in price pertaining to Grade 'F' coal and the average price for the actual grades of coal received from month to month. The claim was not admitted by MPSEB, MSEB and GSEB as fuel surcharge was to be regulated based on the prices of Grade `F' coal only as per the Memorandum of Understanding. After considering the provision, the Company decided to abide strictly by the terms of the Memorandum of Understanding and withdrew the disputed claims of Rs.6.40 crores as on 31st March 1986. The balance amount of Rs.45.00 lakhs was considered payable by the Electricity Boards. But this amount had also not been paid by the Electricity Boards and as such credit notes had been issued to them.

14.3.3 Tariff for power supply from Ramagundam STPS provided for fuel price adjustments on the basis of calorific value of coal which automatically took into account variations in quality and, hence, there was no similar dispute regarding fuel surcharge. In case of Singrauli, quality variations in coal supplies had not been significant, and, hence, no similar claim had been made.

14.3.4. Thus, due to defective clauses in the Memorandum of Understanding in respect of Korba power supply, the Company could not recover fuel surcharge of Rs.6.85 crores.

14.3.5 The Ministry of Energy *inter-alia* stated (August 1990) that while framing various clauses of agreement for power supply to SEBs Grade-F Coal was considered to be consumed by the Power Station at Korba, based on the declared grade to be supplied from linked mine at Gevra. Experience of power utilities as well as the Company was that generally supply of coal was at the declared grade and there was a slippage of a grade or two below the declared grade. Supply of coal above the declared grade was a rare occurrence in power utilities and it had not happened in other NTPC Power Station except at Korba.

It was also stated that having experienced such a situation at Korba (receipt of higher grade of coal than declared grade), NTPC thereafter, in all other tariff agreements, took the precaution of linking the fuel price adjustment clause with GCV of coal rather than with the coal grade. The method of calculating Fuel Price Adjustment (FPA) has already been changed in subsequent agreements in order to take care of even this rare contingency.

(A.C. TIWARI)
Deputy Comptroller and Auditor-General
(Commercial) -cum- Chairman, Audit Board

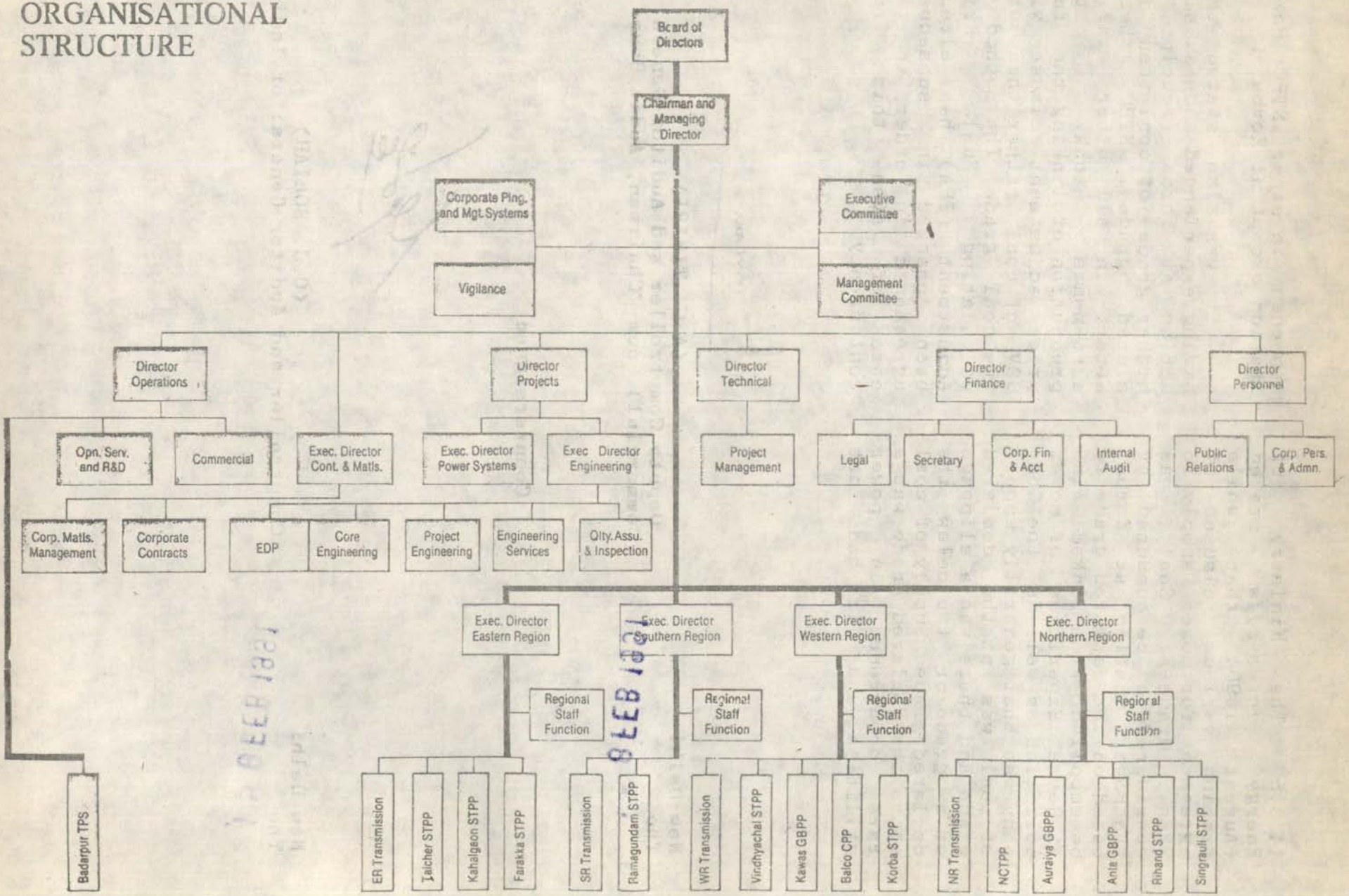
New Delhi
The 8 FEB 1991

Countersigned

(C.G. SOMIAH)
Comptroller and Auditor-General of India

New Delhi
The 8 FEB 1991

ORGANISATIONAL STRUCTURE



ANNEXURE II (PARA 5.6)

DELAY IN PLACING ORDERS FOR MAIN PLANT EQUIPMENT

Project	Date of Govt. approval	Date of approving of bid specifications	Date of notice Inviting tenders (NIT)	Date of bid opening	Date of sending award recommendations to World Bank	Date of approval by World Bank	Date of award	Total time taken in placing letter of Award (months)
Singrauli - II	July 1979	September 1979 (2)	December 1980 (15)	April 1981 (4)	November 1981 (7)	January 1982 (2)	January 1982(0)	30
Ramagundam-I	April 1978	August 1978 (4)	December 1978 (4)	May 1979(5)	December 1979 (7)	December 1979 (0)	February 1980 (2)	22
Ramagundam-II	September 1981	(x)April 1982	March 1982 (6)	August 1982 (5)	January 1983(5)	August 1983(7)	October 1983(2)	25
Farakka-I	March 1979	(x)December 1979	September 1979(6)	May 1980 (8)	February 1981(9)	May 1981 (3)	May 1981 (0)	26
Farakka-II	September 1984	February 1985(5)	March 1985 (1)	June 1985 (3)	January 1986(7)	January 1986 (0)	March 1986(2)	18

Note: Figures in brackets indicate number of months taken

(x) NIT was issued by the Company in anticipation of World Bank approval of bid specifications.

ANNEXURE III (Para 7.2)

Line	Name	Line length (CKTKMS)	Scheduled date of completion (as committed to/approved by Govt.)	Actual/anti-pated date of comple-tion	Delay (in months)
1		2	3	4	5
I.	**Singrauli Stage-I**				
1.	Singrauli OBRA 400 KV S/C	57	Alongwith 3x200 MW Unit (i.e.02/82 to 02/83)	2/82	NIL
2.	Singrauli-Kanpur I 400 KV S/C	455	-do-	11/82	NIL
II	**Singrauli Stage -II**				
1.	Singrauli-Lucknow 400 KV S/C	402	3/85	1/86	10
2.	Lucknow-Moradabad 400 KV S/C	332	12/84	2/86	14
3.	Moradabad Moradnagar 400 KV S/C	132	12/84	3/86	15
4.	Moradnagar-Panipat 400 KV S/C	86	12/84	7/84	NIL
5.	Singrauli-Kanpur II 400 KV S/C	384	3/86	2/87	11

6.	Kanpur-Agra 400 KV S/C	241	3/86	5/86	2
7.	Agra - Jaipur 400 KV S/C	259	3/86	5/86	2
III.	**Korba Stage I Phase I**				
1.	Korba (NTPC) Korba (MSEB) 400 KV S/C	14	Alongwith 3x200 MW Units (i.e. 1/83 to 1/84)	10/82	NIL
2.	Korba-Bhilai I 400 KV S/C	211	-do-	10/82	NIL
3.	Korba-Bhilai II 400 KV S/C	192	-do-	6/83	NIL
4.	Bhilai-Koradi 400KV S/C	272	-do-	4/84	3
IV	**Korba Stage I/ Phase II**				
1.	Koradi-Satpura 400 KV S/C	149	Alongwith 1x500 MW (i.e.8/87)	11/86	NIL
2.	Satpura-Indore 400KV S/C	293	-do-	12/86	NIL
3.	Indore-Asoj 288 400 KV S/C		-do-	12/86	NIL
V.	**Korba Stage II**				
1.	Korba-Bhilai III 400 KV S/C	211	Alongwith 2x500 MW (i.e. 8/88 to 8/89)	1/90	17
2.	Bhilai - Chandrapur 400 KV S/C	686	-do-	2/89	NIL
VI.	**Ramagundam**				

	Stage I/Phase I				
1.	Ramagundam-Hyderabad 400 KV S/C	188	Alongwith 3x200 MW Units (i.e. 2/84)	6/83	NIL
2.	Hyderabad-Nagarjunsagar 400 KV S/C	155	8/84	7/84	NIL
3.	Nagarjunsagar-Cuddapah I 400 KV S/C	318	2/85	6/85	4
4.	Cuddapah-Bangalore 400 KV S/C	241	-do-	6/86	16
5.	Cuddapah-Madras 400 KV S/C	230	2/85	3/87	25
6.	Hyderabad Sub-station		2/84	9/84	7
7.	Nagarjunsagar Sub-station		2/85	8/85	6
8.	Cuddapah Sub-station		2/85	12/85	10
9.	Bangalore Sub-station		2/85	5/86	15
VII	**Farraka Stage I**				
1.	Farraka Jeerhat I 400 KV S/C	237	Alongwith 3x200 MW (i.e. 5/85)	7/85	2
2.	Farakka Durgapur I 400 KV S/C	150	5/86	2/87	9

VIII	**Rihand Stage I**				
1.	Rihand Singrauli 400 KV S/C	82	6/87	2/88	8
2.	Rihand-Kanpur 400 KV S/C	466	6/87	10/88	16
3.	Kanpur-Ballabhgarh 400 KV S/C	414	12/87	9/88	9
4.	Ballabhgarh Jaipur 400 KV S/C	282	6/88	3/88	NIL
5.	Dadri-Malerkotla 400 KV S/C	352	3/92	3/92	NIL
6.	Ballabhgarh Dadri 400 KV D/C	107	4/90	6/90	2
7.	Dadri-Mandola 400 KV D/C	92	4/90	6/90	2
8.	Rihand-Dadri 500 KV HVDC	815	6/88	7/90	25
9.	Bipole Terminals	Pole I Pole II	6/88 12/88	12/90 3/91	30 27 (anticipated)
IX	**Vindhyachal Stage I**				
1.	Vindhyachal-Korba 400 KV S/C	215	Alongwith 6x210 MW Units (i.e. 6/87)	3/88	9
2.	Vindhyachal-Jabalpur 400 KV D/C	718	12/87	7/89	19
3.	Jabalpur-Itarsi 400 KV D/C	464	12/88	6/90	18

4.	Itarsi-Indore 400 KV S/C	207	6/89	6/89.	NIL
5.	Indore-Asoj II 400 KV S/C	273	12/89	2/89	NIL

Annexure IV. (Para 8.1.1)

Actual Utilisation of Capacity

	First 6 months	Next 6 months	Second Yr.
Singrauli			
I	4056	5143	7335
II	1742	1257	6874
III	4220	3755	2877
IV	5465	5884	3851
V	2611	5047	4872
Korba			
I	2843	5915	5344
II	4345	5859	5733
III	3701	967	8539
Ramagundam			
I	3181	4255	4591
II	1815	3768	7609
III	2873	5849	7541

ANNEXURE V
(Para 8.3.1)

Particulars	Units	Norms for Consumption	Actual consumption 1984-85	1985-86	1986-87	1987-88	1988-89
Coal Consumption							
Singrauli							
Average calorific value of coal	Kcal/kg	4940	4503	4381	4417	4138	4129
Specific coal consumption	Kg/kwh	0.532	0.561	0.569	0.564	0.597	0.597
Heat input of coal	Kcal/Kwh	2556.75	2523	2516	2508	2470	2463
Korba							
Average calorific value of coal	Kcal/Kg	3500	3388	3476	3433	3423	3427
Specific coal consumption	Kg/Kwh	0.731	0.796	0.676	0.682	0.692	0.694
Heat input of coal	Kcal/Kwh	-	2612	2385	2355	2369	2378
Ramagundam							
Average calorific value of coal	Kcal/Kg	4170	4325	4179	3904	4242	4084
Specific coal consumption	Kg/Kwh	0.560	0.592	0.570	0.591	0.567	0.593
Heat input of coal	Kcal/Kwh	2347.5	2602	2405	2498	2443	2400
Oil consumption							
Singrauli							
Average calorific value of oil	Kcal/Kg	10800	10800	10800	10800	10800	10400
Specific oil consumption	ml/Kwh	12 for (84-85) and 6.5 for (85-86 onwards)	3.28	2.14	1.45	1.47	1.02
Heat input of oil	Kcal/Kwh	68.25	34	23	-	14	11
Korba							
Average calorific value of oil	Kcal/Kg	-	10270	10270	10270	NA	10495
Specific oil consumption	ml/kwh	12	7.74	0.88	1.35	1.88	1.85
Heat input of oil	Kcal/Kwh	-	80	19	NA	NA	17.55
Ramagundam							
Average calorific value of oil	Kcal/Kg	-	10958	10924	NA	NA	9449
Specific oil consumption	ml/kwh	5	7.23	1.99	1.91	0.91	1.32
Heat input of oil	Kcal/Kwh	-	79	22	NA	NA	37

ANNEXURE VI (Para 9.2.1)

APPLICABLE NORMS OF GENERATION AND ACTUAL GENERATION

SINGRAULI S.T.P.S.

	1984-85		1985-86		1986-87		1987-88		1988-89	
	No. of Hrs	Genera-tion (MU)	No. of Hrs	Genera-tion (MU)	No. of Hrs	Genera-tion (MU)	No.of Hrs	Genera-tion (MU)	No. of Hrs	Genera-tion (MU)
Total for the year - Norms	4986	4819.70	5500	5500	5500	5500	5304	7000	5238	10029.00
Actual Generation (Commercial)		5199.79		6239.40		6829.95		9970.16		12390.14
Variance		380.09(F)		829.40(F)		1329.95(F)		2970.16(F)		2361.14(F)
Auxiliary consumption (Actual)		480.98		556.09		607.39		824.17		981.24
Norms at 10% of Generation		519.98		632.94		682.99		997.02		1239.01
Variance		39(F)		76.85(F)		75.60(F)		172.85(F)		257.77(F)
Plant Load Factor(%) - Actual		61.41		72.25		77.97		82.51		72.70
PLF as per norms (%)		56.92		62.78		62.78		60.55		59.79
Variance(Percentage)		4.49(F)		9.47(F)		15.19(F)		21.96(F)		12.91(F)

MU = Million Units.

F = Favourable variance

ANNEXURE VII (Para 9.2.1)

KORBA S.T.P.S.

	1984-85		1985-86		1986-87		1987-88		1988-89	
	No. of Hrs	Generation (MU)	No. of Hrs	Generation (MU)	No. of Hrs	Generation (MU)	No.of Hrs	Generation (MU)	No. of Hrs	Generation (MU)
Total for the year - Norms	4572	2590	5500	3300	5500	3300	5459	3467	5250	5550
Actual Generation (Commercial)		2700.84		4104.83		4448.03		4287.54		7187.54
Variance		110.84(F)		804.83(F)		1148.03(F)		820.54(F)		1637.54(F)
Auxiliary consumption (Actual)		303.03		374.79		380.25		390.17		544.48
Norms at 10% of Generation		270.08		410.48		444.80		428.75		718.75
Variance		32.95(A)		35.69(F)		64.55(F)		38.58(F)		174.27(F)
Plant Load Factor(%) - Actual		54.41		78.10		84.62		75.99		74.59
PLF as per norms (%)		52.19		62.78		62.78		62.32		59.93
Variance(Percentage)		2.22(F)		15.32(F)		21.84(F)		13.67(F)		14.66(F)

MU = Million Units.
F = Favourable variance
A = Adverse variance

ANNEXURE VIII (Para 9.2.1)

RAMAGUNDAM S.T.P.S.

	1984-85		1985-86		1986-87		1987-88		1988-89	
	No. of Hrs	Genera-tion (MU)	No. of Hrs	Genera-tion (MU)	No. of Hrs	Genera-tion (MU)	No.of Hrs	Genera-tion (MU)	No. of Hrs	Genera-tion (MU)
Total for the year - Norms	4119	1164.65	5037	2939.16	5500	3300	5500	3300	5250	4018.75
Actual Generation (Commercial)		1347.28		3739.89		4305.49		4070.24		5104.40
Variance		182.63(F)		800.73(F)		1005.49(F)		770.24(F)		1085.65(F)
Auxiliary consumption (Actual)		154.24		391.16		432.50		427.84		505.37
Norms at 10% of Generation		134.73		373.99		430.55		407.02		510.44
Variance		19.51(A)		17.17(A)		1.95(A)		20.82(A)		5.07(F)
Plant Load Factor(%) - Actual		54.40		73.16		81.92		77.23		72.22
PLF as per norms (%)		47.02		57.50		62.78		62.78		59.93
Variance(Percentage)		7.38(F)		15.66(F)		19.14(F)		14.45(F)		12.29(F)

MU = Million Units.
F = Favourable variance
A = Adverse variance

ANNEXURE IX (Para 9.2.1)

SINGRAULI S T P S

COST AND TARIFF - ACTUAL AND VARIANCE

Cost/Tariff (Paise/KWH)	Norms	Actuals					Variance				
		1984-85	1985-86	1986-87	1987-88	1988-89	1984-85	1985-86	1986-87	1987-88	1988-89
A. FIXED COST											
I Interest	5.64	4.27	3.68	3.16	3.50	3.54	1.37(F)	1.96(F)	2.48(F)	2.14(F)	2.10(F)
II Depreciation	3.96	2.24	2.22	2.11	1.48	2.11	1.72(F)	1.74(F)	1.85(F)	2.48(F)	1.85(F)
III O&M Expenses	2.48	3.55	3.90	4.41	3.85	3.79	1.07(A)	1.42(A)	1.93(A)	1.37(A)	1.31(A)
Total	12.08	10.06	9.80	9.68	8.83	9.44	2.02(F)	2.28(F)	2.40(F)	3.25(F)	2.64(F)
B. VARIABLE COST											
I Coal	11.16	13.70	14.41	15.73	16.94	20.08	2.54(A)	3.25(A)	4.57(A)	5.78(A)	8.92(A)
II Oil	3.24	1.17	0.84	0.59	0.70	0.41	2.07(F)	2.40(F)	2.65(F)	2.54(F)	2.83(F)
Total	14.40	14.87	15.25	16.32	17.64	20.49	0.47(A)	0.85(A)	1.92(A)	3.24(A)	6.09(A)
Total Cost (A+B)	26.48	24.93	25.05	26.00	26.47	29.93	1.55(F)	1.43(F)	0.48(F)	0.01(F)	3.45(A)
C. Tariff rate for units sent out (Paise/KWH)	34.50	36.29	34.69	36.60	37.76	45.51	1.79(F)	0.19(F)	2.10(F)	3.26(F)	11.01(F)
D. Return per unit sent out (Piase/KWH)	8.02	11.36	9.64	10.60	11.29	15.58	3.34(F)	1.62(F)	2.58(F)	3.27(F)	7.56(F)

NOTE: F indicates favourable variance
A indicates adverse variance

ANNEXURE X (Para 9.2.1)

KORBA S.T.P.

COST AND TARIFF - ACTUAL AND VARIANCE

Cost/Tariff (Paise/KWH)	Norms	Actuals					Variance				
		1984-85	1985-86	1986-87	1987-88	1988-89	1984-85	1985-86	1986-87	1987-88	1988-89
A. FIXED COST											
I Interest	7.72	6.08	4.49	4.12	4.95	5.75	1.64(F)	3.23(F)	3.60(F)	2.77(F)	1.97(F)
II Depreciation	4.74	3.34	2.93	2.74	2.94	3.50	1.40(F)	1.81(F)	2.00(F)	1.80(F)	1.24(F)
III O&M Expenses	2.82	3.86	3.90	4.72	4.39	4.19	1.04(A)	1.08(A)	1.90(A)	1.57(A)	1.37(A)
Total	15.28	13.28	11.32	11.58	12.28	13.44	2.00(F)	3.96(F)	3.70(F)	3.00(F)	1.84(F)
B. VARIABLE COST											
I Coal	7.58	10.68	9.65	10.38	11.59	13.95	3.10(A)	2.07(A)	2.80(A)	4.01(A)	6.37(A)
II Oil	3.22	2.58	0.68	0.51	0.85	0.77	0.64(F)	2.54(F)	2.71(F)	2.37(F)	2.45(F)
Total	10.80	13.26	10.33	10.89	12.44	14.72	2.46(A)	0.47(F)	0.09(A)	1.64(A)	3.92(A)
Total Cost (A+B)	26.08	26.54	21.65	22.47	24.72	28.16	0.46(A)	4.43(F)	3.61(F)	1.36(F)	2.08(A)
C. Tariff rate for units sent out (Paise/KWH)	34.50	35.45	36.24	37.53	38.74	40.98	0.95(F)	1.74(F)	3.03(F)	4.24(F)	6.48(F)
D. Return per unit sent out (Piase/KWH)	8.42	8.91	14.59	15.06	14.02	12.83	0.49(F)	6.17(F)	6.64(F)	5.60(F)	4.41(F)

NOTE: F indicates favourable variance
A indicates adverse variance

ANNEXURE XI (Para 9.2.1)

RAMAGUNDAM S.T.P.P.

COST AND TARIFF - ACTUAL AND VARIANCE

Cost/Tariff (Paise/KWH)	Norms	Actuals					Variance				
		1984-85	1985-86	1986-87	1987-88	1988-89	1984-85	1985-86	1986-87	1987-88	1988-89
A. FIXED COST											
I Interest	8.62	8.28	3.08	5.30	6.97	6.74	0.34(F)	5.54(F)	3.32(F)	1.65(F)	1.88(F)
II Depreciation	5.36	5.23	3.18	3.67	3.97	3.25	0.13(F)	2.18(F)	1.69(F)	1.39(F)	2.11(F)
III O&M Expenses	3.20	5.69	4.12	4.33	4.36	4.28	2.49(A)	0.92(A)	1.13(A)	1.16(A)	1.08(A)
Total	17.18	19.20	10.38	13.30	15.30	14.27	2.02(A)	6.80(F)	3.88(F)	1.38(F)	2.91(F)
B. VARIABLE COST											
I Coal	13.20	16.87	19.73	19.45	20.00	22.34	3.67(A)	6.53(A)	6.25(A)	6.80(A)	9.34(A)
II Oil	3.22	2.56	0.78	0.82	0.39	0.61	0.66(F)	2.44(F)	2.40(F)	2.83(F)	2.61(F)
Total	16.42	19.43	20.51	20.27	20.39	23.15	3.01(A)	4.09(A)	3.85(A)	3.97(A)	6.73(A)
Total Cost (A+B)	33.60	38.63	30.89	33.57	35.69	37.42	5.03(A)	2.71(F)	0.03(F)	2.09(A)	3.82(A)
C. Tariff rate for units sent out (Paise/KWH)	43.00	43.01	44.62	45.69	45.92	48.75	0.01(F)	1.62(F)	2.69(F)	2.92(F)	5.75(F)
D. Return per unit sent out (Paise/KWH)	9.40	4.38	13.73	12.12	10.23	11.33	5.02(A)	4.33(F)	2.72(F)	0.83(F)	1.93(F)

NOTE: F Indicates favourable variance
A Indicates adverse variance

ERRATA

Page	Column	Reference	For	Read
6	-	2nd column 5th line in table	1000	1100
6	-	Note in brackets	indciate	indicate
8	2	9th line	Government's approval for	approval of bid specifications,
26	2	1st line	originaly	originally
29	1	11th line from bottom	Botton	Bottom
31	1	13th line	chocking	choking
35	-	3rd column 7th line	reconcilation	reconciliation
39	2	19th line from bottom	315 MVA	315 KVA
46		Figure against total - Korba Project under 1988-89.	7181.53	7187.53
46		Figure against Unit 1 of Ramagundam under 1985-86	1190	1130
46		Figures against Unit II of Ramangundam under 1985-86	1190 1344	1130 1343
46		Figure against Unit II of Ramagundam under 1986-87	1274.91	1274.71
48	1	18th line	1984-85 and 1985-86	1984-85
51	1	17th line	Tranmission	Transmission
51	1	21st line	Geneating	Generating
52	2	18th line	Read bracket after Ramagundam	
57	1	15th line	the time the	the time and the
75	2	2nd line	Station	Stations
76			Read this page as Annexure I (Para 3.2)	
83		2nd line	Actual utilisation of Capacity	Actual utilisation of Capacity (in KWH/KW/Yr)
85		Actual generation (Comml.) 1985-86	6239.40	6329.40