

EIGHTY-SECOND REPORT
PUBLIC ACCOUNTS COMMITTEE
(1981-82)

(SEVENTH LOK SABHA)

BADARPUR THERMAL POWER PROJECT—STAGE—II

MINISTRY OF ENERGY
(DEPARTMENT OF POWER)



Presented in Lok Sabha on.....

Laid in Rajya Sabha on.....

LOK SABHA SECRETARIAT
NEW DELHI

March, 1982/Phalguna, 1903 (Saka)

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10	1	8	examines	examined
17	2	6	pløn	plant
44	2	17	ever	over
47	2	1	høe	have
49	2	2	effecting	affecting
54	1	5	cot	cost
90	2	3	under- takings	undertaking

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(1981-82)

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(iv)

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1. Shri H. G. Paranjpe—*Joint Secretary*
2. Shri D. C Pande—*Chief Financial Committee Officer*
3. Shri K. K. Sharma—*Senior Financial Committee Officer*

INTRODUCTION

I, the Chairman of the Public Accounts Committee as authorised by the Committee, do present on their behalf this Eighty-second Report of the Public Accounts Committee (Seventh Lok Sabha) on paragraph 12 of the Advance Report of the Comptroller and Auditor General of India for the year 1979-80, Union Government (Civil) relating to Badarpur Thermal Power Project—Stage II.

2. The Report of the Comptroller and Auditor General of India for the year 1979-80, Union Government (Civil) was laid on the Table of the House on 27 April, 1981.

3. In this Report the Committee have expressed concern over the heavy escalation in costs as well as delays in commissioning of the various units of the Badarpur Thermal Power Station. While the original sanctioned cost of Stage I (3 Units of 100 MW each) was Rs. 41.08 crores, the final anticipated cost is Rs. 64 crores. The position is still worse in respect of Stage II (one unit of 210 MW). As against the original estimated cost of Rs. 38.37 crores, the estimated expenditure now is Rs. 74.76 crores *i.e.* escalation of about 100 per cent. Commenting on the unsatisfactory performance of the Badarpur Thermal Power Station, the Committee have pointed out that the plant load factor of the power station was only 33 per cent in 1978-79, 34 per cent in 1979-80 and 46 per cent in 1980-81 which is much below the ideal level of performance fixed at 60 per cent. The Committee have also drawn attention to the large number of trippings in the power station, delays in timely overhauling and maintenance of the plant and equipment, delay in supply of spares by the manufacturers and supply of coal of poor quality to the power station.

4. The Committee have expressed the view that the failure to commission power projects as per targetted date is one of the factors responsible for the present power crisis in the country. They have recommended the appointment of a Monitoring Agency consisting of representatives of concerned Ministries/Departments to monitor the progress of various power projects in the country on a continuous basis.

5. The Committee have expressed concern at the heavy outstandings amounting to as much as Rs. 34.38 crores against the Delhi Electric Supply Undertaking for power supplied by the Badarpur Thermal Power

Station. They have recommended the appointment of a High Power Committee to look into the working of the Delhi Electric Supply Undertaking particularly its finances and have asked the Government to ensure that effective steps are taken to see that the arrears are cleared within a reasonable period of time.

6. The Public Accounts Committee (1981-82) examined the above paragraphs at their sitting held on 30 September 1981. The Committee considered and finalised this Report at their sitting held on 5 March 1982. The Minutes of the sittings of the Committee form Part II* of the Report.

7. A statement containing conclusions and recommendations of the Committee is appended to this Report (Appendix V). For facility of reference these have been printed in thick type in the body of the Report.

8. The Committee place on record their appreciation of the assistance rendered to them in the examination of these paragraphs by the Office of the Comptroller and Auditor General of India.

9. The Committee would also like to express their thanks to the officers of the Ministry of Energy (Deptt. of Power), Ministry of Industry (Deptt. of Heavy Industry and Deptt. of Industrial Development) etc. for the cooperation extended by them in giving information to the Committee.

NEW DELHI;

March 9, 1982

Phalgun 18, 1903 (*Saka*)

SATISH AGARWAL

Chairman

Public Accounts Committee.

*NOT printed. One cyclostyled copy laid on the Table of the House and five copies placed in the Parliament Library.

REPORT
CHAPTER I

Audit Paragraph

Badarpur Thermal Power Project Stage-II

1.1 Mention was made in paragraph 10 of the Advance Report of the Comptroller and Auditor General of India for the year 1976-77, Union Government (Civil) about stage I of the project and the operation of the power station during 1973-74 to 1976-77. It was also mentioned that stage II of the project comprising a fourth unit of 210 MW was taken up in June 1974 at an estimated cost of Rs. 38.37 crores.

1.2 *Revision of estimates and expenditure*

The estimated cost of stage II of the project was revised (May 1977) to Rs. 66.40 crores (gross); the Ministry stated (December 1979) that the increase was due to increase in the cost of:

- civil works of the power house building (Rs. 136 lakhs) because of increase in labour rates and cost of material since 1973 when original estimates were prepared and significant variations in the quantities of work due to changes in design;
- turbo-generator boiler, other associated equipment and erection charges on the basis of the rates actually quoted and accepted (Rs. 1,156 lakhs);
- fuel and ash handling system on the basis of orders actually placed and provision of additional unloading facilities (Rs. 172 lakhs)
- water supply and cooling system, provision of cooling towers (not originally provided for), cost of canal for supplying cooling water (during the closure of Agra Canal) and augmentation of the design of the water treatment plant (Rs. 414 lakhs);
- step up station on the basis of the cost actually reflected in the tenders (Rs. 415 lakhs);

—utilities like construction of essential number of staff quarters, community centre and school building (Rs. 1.35 lakhs); and

—purchase of special tools and plant, land, consultancy charges and payment of dearness allowance (Rs. 375 lakhs).

Expenditure incurred up to September 1980 was Rs. 68.76 crores (gross).

1.3 Commissioning

The scheduled date for commissioning of the fourth unit was 31st December, 1977. It was synchronised for operations from time to time, but had not been opened for commercial operations so far (September 1980). The reasons for delay, as stated by the project authorities (9/10th March, 1979), were as follows:

—delays in supply of main plant, equipment and materials by suppliers due to time taken in finalisation of engineering data, power shortage, difficulties in procurement of raw materials, delays on the part of the firms' auxiliary units, strikes/lock outs at manufacturers' works, etc.;

—discrepancies and manufacturing defects noticed in the boiler, turbo-generator and pumps supplied by firm 'A' (a public sector undertaking), during erection and pre-commissioning;

—delay in completion of certain civil works due to site problems or late release of construction drawings due to delay in furnishing of engineering design data by the various suppliers of the equipment; and

—inadequate supply of water due to the closure of Agra Canal from 30th July, 1978 to 17th October 1978 because of unprecedented heavy floods in that year.

1.4 The unit was synchronised jointly by firm 'A' and the project engineers for the first time on 2nd December 1978 as a pre-commissioning operation. It was closed down two days later for 'bearing inspection' and other routine checks. During inspection of bearings, a number of defects were noticed in equipment supplied by firm 'A'. The rectification of these defects, carrying out modification in the excitation system and repairs of condensate pumps, boiler feed pumps and ejectors took time as some bearings had to be sent to firm 'A's shops to undergo major repairs/replacement. The unit was synchronised for the second time on 25th February 1979 after various tests and checks and it operated for a few

months on a load of about 8 MW against the installed capacity of 210 MW and thereafter trimmed due to the tripping of station auxiliary transformer. The lubricating oil pump also did not work mechanically and the turbine came to a halt after the lubricating oil pump was started manually. Thus, it became essential to open up all the bearings and shafts again to examine their condition before commissioning of the unit. It was again synchronised on 2nd May, 1979, but tripped on 1st June, 1979 due to malfunctioning of axial shaft relay.

1.5 It was synchronised for the fourth time on 13th July 1979 and had been operating only intermittently since then on account of frequent trippings. It was shut down from 4th January 1980 for rectification of various defects and was synchronised on 13th March, 1980. During trial and pre-commissioning operations from 2nd December, 1978 to 30th April 1980, the unit generated a total of 311.52 million kilo-watt hours against its projected capacity of 1560 million kilo-watt hours, at 60 per cent load factor, which comes to 19.97 per cent during this period. Out of the total 12384 hours available during this period, the unit hardly worked for 2929 hours.

1.6 *Purchase of defective motors for cooling tower pumps*

In response to a tender enquiry for purchase of two 6.6 KV 420 R.P.M. 930 KW motors for cooling tower pumps, firm 'A' quoted Rs. 18.11 lakhs for the two motors on 27th May 1975, quotation being valid for 3 months. The department could not finalise the order within the validity period because of non-finalisation (till 13th November 1975) of specifications for pump head for which the motors were required as the specifications had to be determined on the basis of the height of the cooling towers which could be known only after the opening of tenders for the cooling towers on 27th September 1975 since the tenders for this supply were invited later. Firm 'A' did not agree to the extension of validity period and sent (13th November 1975) a revised offer for Rs. 19.44 lakhs, on the basis of which a contract was placed (16th December 1975) on firm 'A'. Had action to invite tenders for cooling towers been taken earlier, delay in finalisation of specifications of pump head and consequent extra expenditure of Rs. 1.49 lakhs (including excise duty and sales tax) would have been avoided.

1.7 According to the contract, the delivery date was 15th June 1978. In view of the urgency of works and also to relate it to the delivery of cooling tower pumps and the commissioning of the plant, firm 'A' was requested to revise the delivery date. It agreed to complete deliveries by December 1977 and suitable amendment to the contract was issued on 14th January, 1977. Firm 'A' failed to make the supplies within the agreed delivery of the two motors upto 30th June and 15th July 1978 respectively

subject to levy of liquidated damages. Firm 'A' delivered the two motors on 21st July and 6th October 1978 respectively. Although Rs. 1.19 lakhs were retrenched (September 1979) from firm 'A's bill towards liquidated damages, the amount had been kept under a deposit head and not credited to the final head of account so far (August 1980).

1.8 When the first motor was put on trial on 29th July 1978, it was found that it was drawing more current than rated full load current and was emitting an abnormal whistling sound. Firm 'A' was requested on 29th July and 31st July 1978 to rectify the defects or to replace the motor. The second motor was tried on 13th November 1978, but could not be commissioned due to leakage of oil from the lower bearing. This motor also made an abnormal whistling sound. Again firm 'A' was requested (17th November 1978) to rectify the defects or to replace the motor. The defect of leakage of oil was rectified by firm 'A', but the other defects persisted (30th September 1980). For bringing down the noise level, a silencer was fitted on motor No. 2 on 1st February 1980 and the motor was put on trial to observe the performance of the silencer. Even then, there was little improvement in the noise level; instead there was an increase in the vibrations in the motor. The silencer in the motor no. 1 had not been fixed so far (September 1980). Regarding drawal of more power by motors, a performance test on the cooling tower was conducted (7th October, 1979). The Ministry stated (December 1979) that the motor was drawing more current than rated full load current and that a performance test had been conducted and the results of the tests were being examined by the consultants (Central Electricity Authority), project authorities and firm 'A' to identify the precise defect and to take steps to rectify it. There had been no progress since then. Rupees 17.64 lakhs paid for the two motors (till October 1979) were thus, locked up (September 1980).

1.9 *Purchase of current transformers not conforming to specifications:*

Tenders were invited (February 1975) for the purchase of 6.6 KV switchgears with circuit breakers and current transformers for 210 MW unit; out of 4 tenders received (August 1975), the tender of firm 'B' which offered switchgears with breakers manufactured by another firm 'C', was the lowest. The offer of firm 'B' (general agents of firm 'C') was accepted and contract placed on it in October 1975.

1.10. The supplies from firm 'B' were received from May 1977 to December 1978. The following defects were mentioned by the project authorities in April 1980:

—The protection and metering current transformers totalling about 300 in number, as supplied by firm 'B' did not conform

to specifications in the contract in regard to their short time rating as sample inspection at source was waived (June 1977) by the project authorities.

—The three numbers differential current transformers at 6.6 KV side for differential protection of 25 MVA station transformer do not fulfil the basic technical requirement in regard to secondary resistance and knee point voltage.

1.11 The approximate cost of these transformers was Rs. 4 lakhs. Firm 'B' was asked in April 1980 to replace these current transformers as these did not conform to the specifications in the contract. Firm 'B' had, however, not replaced these transformers so far (July 1980).

1.12 *Idle Machinery*

An order for procurement of 3 tonne diesel fork lift truck with accessories (cost Rs. 1.39 lakhs inclusive of sales tax) was placed (December 1975) on firm 'D' against the Director General, Supplies and Disposals rate contract for handling stores when the procurement of plant and equipment and other materials for stores was at its peak. The truck with accessories was received on 26th September 1976 against scheduled date of 16 February 1976, but on visual inspection of the truck, certain parts were found missing or damaged. Firm 'D' was requested (29th September 1976) to depute a representative for inspection and verification of defects. These missing parts/defects were supplied/rectified by firm 'D' on 18 December 1976. The truck was commissioned on 6th April 1977, but it could not be utilised till 2nd December, 1979. The Ministry of Energy had stated (December 1979) that due to delay in the availability of the truck, it could not be put to use before December 1979 since most of the mechanical and electrical equipment had already been received and transferred to the erection sites with the help of one other fork lift truck available with the project. The truck worked for only 43 hours from 3rd December 1979 to 30th April 1980. The fork lift truck costing Rs. 1.39 lakhs purchased in September 1976 had, thus, remained practically unutilised.

Operation of power station

1.13 *Power Generation*

The fourth unit having not yet been commissioned for commercial operation, the results of operation of the first three units for the years 1977-78 to 1979-80 are given in Annexure (Reproduced in Appendix I) to this paragraph. When all the 3 units were in operation, the projected capacity of the station (at 60 per cent load factor) was 1497, 1445 and 1419

million kilowatt hours during 1977-78, 1978-79, and 1979-80 respectively. Briefly, the position of generation was as under:

Year	Projected capacity (60 p.c. (Load factor)	Actual generation percentage of (2) in brackets		Consumption within power station/percentage of (3) in brackets	Balance available for sale
				(In million hours)	(kilowatt)
1	2	3	4	5	
1977-78 . . .	1497	839.43(56.07)	115.28(13.75)	724.15	
1978-79 . . .	1445	1056.08(73.08)	139.05(13.16)	917.03	
1979-80 . . .	1419	1274.00(89.78)	181.00(14.19)	1093.00	

1.14 The percentage of generation of power to the projected capacity was low during 1977-78, 1978-79 and 1979-80 mainly because of shut down of boiler tube and turbine. The units actually operated for 10,656 hours during 1977-78, 15,068 hours during 1978-79 and 18,120 hours during 1979-80 against 26,280 hours available during each year.

1.15 The station had been supplying power to Delhi, Uttar Pradesh, Haryana, Punjab, Chandigarh, Himachal Pradesh and Rajasthan. The revenue earned and the cost of operation and maintenance (including depreciation at 3.4 per cent before/and after charging interest on capital) as worked out by the project authorities for 1977-78 to 1979-80 (see Appendix I) were as follows:

Year	Revenue earned	Cost of operation and maintenance				
		(before charging interest)	(after charging interest)	(before charging interest)	after charging interest]	
1	2	3	4	5	6	7
1977-78 . . .	₹ 1,425.91	₹ 1,373.53	1,790.34	(+)52.38	(-)364.43	
1978-79 . . .	2,011.72	₹ 2,021.81	2,427.57	(-)10.09	(-)415.85	
1979-80 . . .	2,745.57	2,656.18	₹ 3,119.41	(+)89.39	(-)373.84	

1.16 Cost of generation and rate of sale

Against the estimated cost of generation of 5.65 paise per unit in the project report, the cost of generation per unit as worked out by the project authorities and the rate of sale during 1977-78 to 1979-80 were as under:

Year	Cost of generation		Rate of sale
	(before charging interest)	(after charging interest)	
			In paise
1977-78	18.96	34.72	19.38 upto February 1978)
1978-79	22.05	36.47	*20.00 (upto March 1979) *21.12 (upto 16 July, 1979)
1979-80	24.30	28.54	*23.94 (from 17 July, 1979)

*Exclusive of excise duty at 1.8 paise per unit.

1.17 Consumption of fuel

During 1977-78 to 1979-80 the consumption of fuel per unit had been as under:

(Kg. -kilogram, ml.-millilitre)

(Total consumption/consumption per unit)

	Norms fixed per unit	1977-78	1978-79	1979-80
Coal	0.56 Rs.	471858 tonnes/ 0.56 kg. per unit	627723 tonnes/ 0.59 kg. per unit	772357 tonnes/ 0.61 kg. per unit
Heavy furnace oil	10.00 ml.	13060 kilolitres/ 15.55 ml. per unit	28527 kilolitres/ 27.03 ml. per unit	28679 kilolitres/ 22.51 ml. per unit

1.18 The high consumption of coal in 1978-79 and 1979-80 was stated by the project authorities to be due to removal of stages 12-13 of H.P. Rotor Blades of generating unit-I which commenced full lead operation after repairs in November 1978 and frequent tube and value leakages due to overdue overhaul of stage I generating units. The unusual increase in oil consumption was attributed to large number of trippings in all the generating units.

[Paragraph 12 of the Advance Report of the Comptroller and Auditor General of India for the year 1979-80, Union Government (Civil)]

GENESIS OF THE PROJECT

1.19 The Central Government undertook the construction of a thermal power station at Badarpur as a regional power station in 1967 to provide a major back up for the hydro power in the Northern region and to supplement availability of power for meeting the growing demand in Delhi as well as other constituents in the region. The project has been implemented in three stages. Stage I comprising of three units of 100 MW each and two units (Stage II and III each comprising one unit of 210 MW).

1.20 The execution of the project was initially looked after by Badarpur Thermal Power Project Construction Organisation under the Central Water and Power Commission (Now Central Electricity Authority) under the overall management and control of the Badarpur Thermal Project Control Board set up by the Ministry of Energy. The management of the Project has been entrusted to the National Thermal Power Corporation on agency basis from 1st April, 1978.

1.21 The Project at Badarpur was approved by the Planning Commission as a plan scheme in the Central sector. The location of the Power station at Badarpur was decided on the basis of its proximity to the load centres, ready availability of transmission facilities, suitable level site with good foundation condition and cooling water supply which is obtained from Agra Canal running close by the site.

B. Commissioning of the Project

1.22 The Audit para points out that the scheduled dates of commissioning of the Fourth unit was 31st December, 1977. It was synchronised for operation from time to time, but had not been opened for commercial operation till September, 1980.

1.23 The Committee desired to have the original target dates of commissioning, actual dates of commissioning and actual dates of commercial operation of the various Units of the Badarpur Thermal Power Station (both in Stage I and Stage II) and the main reasons for delay in com-

missioning. In reply, the Ministry of Energy (Department of Power) have stated in a note as follows:

	Original target date of commissioning	Actual date of commissioning	Actual date of commercial operation
Unit-I	3/71	26-7-73	1-11-73
Unit-II	9/71	5-8-74	1-9-74
Unit-III	3/72	29-3-75	1-4-75
Unit-IV	12/77	2-12-78	17-3-80

(A) Stage—I

The main reasons for delay in commissioning are as under:—

1. The original target date of commissioning was based on the assumption that administrative approval and expenditure sanction would be received from the Government by 1966. The approval was actually received in June 1967 and the work on the project could start only in 1968. There was thus an initial delay of about one year in commencing the construction work.
2. The sub-soil conditions were somewhat different from those anticipated, resulting in considerable increase in the quantum of work involved in design and construction of foundation.
3. The major civil contractor could not adhere to the target date of completion due to shortage of required sections of steel. In a number of cases, the suppliers of the Main Plant and Equipment also sought extension in the delivery dates for reasons which were beyond their control.
4. There was a delay for about one year in the construction of Railway siding by the Northern Railway due to time taken in securing clearance from the Delhi Administration for the bridge on the Mathura Road. The work was further hampered due to scarcity of special steel items. The non-completion of the siding delayed the movement of the heavy components of the Plant and Equipment to site.

5. There was a general shortage of scarce materials like steel, cement, oxygen/Acetylene gasses etc.
6. Dislocation of traffic due to Pakistan war in 1971.

(B) *Stage-II*

The administrative approval and expenditure sanction for installation of one unit of 210 MW (Stage II) was accorded on 5-6-74. However, while providing the proposal the Cabinet had desired that the feasibility of reducing the period of completion of the Project from 5 to 4 years may be examined.

Against the revised schedule the first synchronisation of the unit was scheduled for December, 1977, but it could only be achieved in December 1978. The delay of the year in the unit synchronisation was mainly due to the following:—

1. Delay in completion of certain civil works due to late release of construction drawings which in turn was due to late receipt of Engineering data from various suppliers of main equipment or site problems like T. G. foundations as proper strata was not met at the design level and excavation had to be carried out to a deeper level.
2. Delayed and non-sequential supplies of equipment by BHEL e.g. FSSS panels, CT Pumps motors, Turbo-Supervisor panel. The last item was received late as April, 1978.
3. Delay in supply of control & instrumentation equipment by M/s. ILK.
4. Delay in supply of equipment and materials by various other suppliers due to labour troubles/lock-outs at manufacturer's works etc.
5. Discrepancies and defects were found in the Boiler & TG equipment during the erection and some of the equipment had to be sent back to BHEL works for modification while others were repaired at site thus consuming considerable time. Due to the above factors, the unit could be steam rolled for the first time on 17th July, 1978. The unit was rolled to its full speed on 29-7-1978 but had to be stopped due to high vibrations in the pilot excitor which had to be replaced with a new one. This could only be achieved in 1st week of October, 1978. In the meanwhile i.e. from 29-7-78 to 7-10-78 there was failure of

~~non-reversible ratchet mechanism~~ of the cooling tower pumps, failure of the shaft of CW Pump 4A and inadequate supply of DM water due to closure of Agra Canal from 30-7-78 to 7-10-78 because of unprecedented heavy floods in that year. On 7-10-78, the unit was again rolled but during the testing and trial operation, fire broke out in the generator field breaker panel on 10-10-78 thus completely burning the field breaker, its panel and damaging the cables and wiring of even adjacent panels. On receipt of field breakers and other equipment from BHEL, the unit was re-rolled and synchronised on 2-12-78.

The unit was stoped for bearing inspection on 4-12-78. From the period 4-12-78 to 25-2-79, a number of defects observed during the synchronisation were rectified e.g.

1. Modifications carried out in all the three condensate pumps.
2. Attending to main ejectors.
3. Attending to bearings of the barring gear which had failed a number of times in the previous rolling.
4. Improper functioning of Differential Pressure Regulator of Seal Oil System.
5. Rebabbling of bearings which were observed to damaged during bearing inspection.
6. Mechanical jamming of one of Boiler feed pumps. The normal time of 3 weeks for bearing inspection had to be extended to these defects. On 25-2-1979, the unit was re-synchronised but due to the failure of Station supply, the unit tripped immediately after its synchronisation because of mal-functioning of DC Oil Pump, when there was complete AC Failure. The bearing on inspection were found to be heavily damaged and extensive repair had to be carried out. After repairs the unit was again synchronised on 1st June, 1979.

From June, 1979 to 16-3-1980, there had been a number of failures/trippings e.g. unusual high rate of boiler tube failures/trippings, design deficiency of burner tilt mechanism, design deficiency in Scrapper Conveyer, insufficient matching of RUC Unit which resulted in delaying the declaration of the Unit on commercial operation. In view of the above, M/s. BHEL requested for a shut down for 5 to 6 weeks for carrying out modifications to remove design deficiencies from December, 1979. A shut down however, was given on 2-1-80 and this continued till 14-3-80 (app. 10 weeks) and the unit was started on 17-3-1980.

1.24 The Committee wanted to know the reasons for the delay in operation for commercial purposes and action taken thereon. The Committee in a written note have been informed the following:

"The reasons for delay in commissioning for commercial operation were examined by the Ministry and appropriate steps taken are indicated below:

- (i) In respect of deficiencies in boiler and its firing system, experts from the collaborators of M/s. BHEL viz. M/s. Combustion Engineers of U.S.A. were called to identify the deficiencies and considerable time was taken in rectifying these defects as also in introducing necessary modifications as to make the boiler operation more stable.
- (ii) Regarding boiler auxiliaries like PA Fan, BHEL's collaborators M/s. K.K.K. of West Germany were called and they carried out major modifications in order to stabilise the operation of fans.
- (iii) The failure of bearings on turbine was examined in detail by the supplier and suggestions of the supplier as well as Experts of Ministry of Energy were implemented to avoid any recurrence.
- (iv) The excessive vibrations problem in barring gear and pilot exciter of T. G. Set were got examined by Russian Experts and also Research and Development Wing of BHEL and necessary modifications/rectifications were carried out. The rectifications however, took quite a long time.
- (v) Several defective components of the equipments which were not behaving satisfactorily were got replaced at the instance of and effective pursuance at the level of the Ministry.

C. Increase in cost of the Project

1.25 The Audit Para has pointed out that Stage II of the Project comprising a fourth unit of 210 MW was taken up in June 1974 at an estimated cost of Rs. 38.37 crores. The estimated cost of Stage II of the project was revised to Rs. 66.40 crores in May, 1977. Expenditure incurred upto September 1980 was Rs. 68.76 crores.

1.26 When asked about the progressive total expenditure incurred on Stage II of the Power Station and the extra expenditure likely to be incur-

red, the Ministry of Energy (Department of Power) have informed the Committee as follows:

	Rs. in crores
Expenditure incurred upto September, 1980	68.76
Expenditure from October 1980 to March, 1981	2.21
Expenditure from April, 1981 to June, 1981	0.08
Progressive Total Expenditure upto June 1981	71.05
Further Expenditure anticipated on this Project	3.71
Total Estimated Expenditure	74.76

1.27 Asked about the main reasons for increase in cost, the Ministry have stated:

“Main reasons for the increase in the original estimated cost of Rs. 38.37 crores (gross) to the revised cost of Rs. 66.40 crores (gross):

- (i) *Increase in the cost of Civil Works of the Power House Building—Rs. 136 lakhs*—The original estimates were prepared in 1973 on the basis of the rates prevalent at that time. There has been some increase in labour rates and cost of material since then. Consequently, the contractors had tendered higher rates. There have also been some significant variations in the quantities of work (earth work in excavation, Cement Concrete etc.) due to design changes and modifications necessitated by the actual sub soil conditions at Badarpur.
- (ii) *Increase in the Cost of T. G. Boiler & other Associated Equipments—Rs. 1156 lakhs*—The equipment for 210 MW Unit has been indigenously manufactured for the first time in India. The main suppliers are M/s. BHEL, a Public Sector Undertaking. The original estimates were based on a rough indication given by them. The firm prices given at the time of placing orders were considerably higher. In respect of T.G. and Boiler equipment, the increase in the cost has been to the extent of over Rs. 8.35 crores. In respect of other related equipments, auxiliaries and erection charges, there has been escalation in the cost over the original estimates prepared in 1973 by about Rs. 3 crores.

- (iii) *Increase in the cost of Fuel & Ash Handling System:—Rs. 172 lakh.*—The main increase is in the cost of two Bull Dozers (.72.49 lakh). Civil Works relating thereto account for increase of Rs. 13 lakh. The revised estimates are based on the actual orders placed after invitation of tenders etc.

There was an increase of about Rs. 32 lakh in the cost of Fuel Oil facilities. Original arrangement was to unload 6 wagons supply of Fuel oil at a time while railways were supplying 40—50 wagons at a time. Accordingly, unloading facility had to be increased considerably. Further, the earlier arrangement was to unload low viscosity oil but M/s. Indian Oil Corporation were supplying high viscosity oil which requires heating arrangement and other related facilities, necessitating additional expenditure for such arrangement for quicker unloading.

- (iv) *Increase in the cost of Water Supply and Cooling System: Rs. 414 lakh.* The original estimates relating to Water Supply and Cooling System were provisional and the estimates were approved by the P.I.B. pending detailed examination of this aspect. These were assessed at the revised estimates stage. A 60 cusec Canal for supplying Cooling Water during the closure of Agra Canal was constructed at a cost of about Rs. 30 lakh. The provision of cooling Towers (Not originally anticipated) amounted to Rs. 138 lakh. Circulating water system and cooling water pumps have accounted for an increase in cost of Rs. 72 lakh. Due to higher pollution content of Agra Canal and higher make up water requirement, design of Water Treatment Plant had to be augmented involving additional cost of over Rs. 100 lakh. These and other escalations e.g. erection cost of Rs. 15 lakh, contingencies Rs. 12 lakh, spares Rs. 6 lakh, contributed to an increase of over Rs. 400 lakh in the original estimates.

- (v) *Increase in the cost of Step-up Station: Rs. 415 lakh.* The main increases are in respect of the following:—

- (i) Power Transformers (Rs. 86 lakh)
- (ii) 6.6 KV Switchgears (Rs. 89 lakh)
- (iii) 0.415 KV Auxiliary Switchgears (Rs. 45 lakh)
- (iv) Cables (Rs. 89 lakh)
- (v) Spares (Rs. 37 lakh)
- (vi) Erection charges (Rs. 45 lakh)

The revised estimates reflect the actual cost of the orders placed after invitation of tenders.

- (vi) Increase in the cost of Utilities: Rs. 135 lakh. The main increase is due to the provision for construction of essential number of staff quarters (Rs. 105 lakh) and some other amenities such as Community Centre, School Building, Shops, etc. (Rs. 20 lakh).
- (vii) Other increase: Rs. 375 lakh. Other increases mainly include purchases of special Tools & Plants (Rs. 57 lakh), increase in the cost of land (Rs. 20 lakh), consultancy charges (Rs. 43 lakh), increases in D.A. and other establishment charges (Rs. 84 lakh) maintenance during construction (Rs. 55 lakh) freight, handling etc. (Rs. 44 lakhs)."

1.28 The following reasons have been put forward by the Ministry for further increase in cost from Rs. 66.40 crores to Rs. 74.76 crores (gross).

- (i) Increase in the cost of Civil Works—Rs. 1.75 crores: This is mainly due to:
 - (a) increase in excavation and concreting work as proper strata was not met at the design level for T.G. foundation;
 - (b) extra quantities involved as per detailed engineering and site conditions; and
 - (c) increase in the cost of material and labour rates.
- (ii) Increase in the cost of Boiler & TG—Rs. 3.50 crores: In the first revised cost estimate sanctioned in May 1977 the prices of Boiler & T.G. were based on Batch II prices. The suppliers viz. M/s. BHEL pointed out that Boilers & T.G. set of Batch-II manufacture was meant for delivery to DVC but had been supplied to Badarpur for earlier commissioning of Unit-IV had been earmarked as the order for supply was given after the DVC had placed the order. The Ministry, therefore, decided in January, 1980 that the difference in the prices of sets of Batch-II and III would be borne by Badarpur. The difference in price of Batch-II and Batch-III amounting to Rs. 3.50 crores was accordingly paid to BHEL resulting in increase of Rs. 3.50 crores.
- (iii) Increase in the cost of Control and Instrumentation—Rs. 1.00 crore:—

The sanctioned revised estimate (May 1977) was based on the tentative prices indicated by M/s. ILK, when scope of sup-

plies was not finalised. The cost of control and Instrumentation has now been finalised and has increased by Rs. 1.00 crore.

(iv) Increase in the cost of Land—Rs. 0.80 crore:—

A provision of Rs. 25 lakh was made for 25 acres of land to be acquired @ Rs. 0.50 lakh per acre and development charges @ Rs. 0.50 lakh per acre. Now DDA has asked for the cost of land @ 3 lakh per acre. The development charges work out to Rs. 1.20 lakh per acre. Hence the cost has gone up by Rs. 80 lakh.

(v) Increase in the cost of erection, testing & Commissioning of Main Plant & Equipment—Rs. 1.20 crores:—While preparing the revised estimate (sanctioned in May 1980) no specific provision for testing and commissioning of Boiler & T.G. was made. The expenditure on this account was expected to be met out of the provision made under 'contingencies' of the works. Due to prolonged period of commissioning of the unit, there has been a net excess of Rs. 1.20 crores."

1.29 As regards Stage I of the Project, the Committee have been informed that the original sanctioned cost of the project was Rs. 41.08 crores, the revised sanctioned cost was Rs. 59.87 crores and the final anticipated cost is Rs. 64 crores. The Ministry of Energy (Deptt. of Power) have given the following reasons for the increase in cost:

"The report was prepared in 1965 whereas administrative approval and expenditure sanction had been accorded in June, 1967. The orders for plant & equipment were placed in 1968-69 & work could start in 1968. Due to this time lag, there had been a general increase in price of materials & labour rates.

- (a) Reasons for the increase of the original sanctioned cost of Rs. 41.08 crores to revised sanctioned cost of Rs. 59.87 crores are given in Appendix II.
- (b) Reasons for increase in the revised sanctioned cost and final anticipated cost *i.e.* from Rs. 59.87 crores to Rs. 64.00 crores are as follows:

The increase is mainly due to renovation cost of 3 units of 100 MW each which were manufactured indigenously by M/s. BHEL and many problems were experienced since commissioning of these units which were coming in the way of reliable operation of the units. In order to make opera-

tion of these units trouble free, a number of problems faced in the past were identified and accordingly a scheme for the renovation of the plant was prepared. A provision of Rs. 400 lakhs (details as given below) has been made for the renovation scheme.

S. No.	Description	Cost
		Rs. in lakh
1.	Convection Superheater	71.00
2.	Economiser	145.00
3.	Air pre-heater	52.00
4.	Excise duty & Sales Tax	21.00
5.	Erection cost	49.00
6.	Other items (drum gauge, glass, EP, FD Fan, Noise level Scot balancer, Automatic oil burner system)	19.00
7.	H.P. Valves	40.00
		397.00
	Say	400.00

The renovation was earlier anticipated to be completed by 1980-81 but it is now anticipated to be completed by 1981-82 as the shut down on all the three units were not possible due to overall power shortage in the region. In this connection, Secretary (Power), Ministry of Energy had also desired that this renovation cost may be met from the Capital Head. After taking into account the above cost (Rs. 400.00 lakhs) and also the compensation for land (Rs. 13 lakhs) already acquired from the Land Acquisition Collector, the revised cost comes to Rs. 64.00 crores."

1.30 The Committee pointed out that consequent on delay in the preparation of detailed designs and drawings, most of the works viz. construction of intake and discharge channel, manufacture, supply and fixing in position of precast RCC Columns, beams, wall panels etc., foundation of main power house building, auxiliary buildings and cooling water ducts, coal handling plan, ash pump house, water deaerator plant, supply and erection of low pressure piping, Ash pipeline etc. were delayed resulting in

extra/*ex-gratia* payments, amounting to Rs. 30.79 lakhs. The Committee wanted to know:—

- (a) To what extent could these payment have been avoided by better planning and coordination?
- (b) How did the quantities of fabrication of steel structurals increase from 4,800 tonnes to 6,400 resulting in revision of rates involving extra cost of Rs. 9.66 lakhs?
- (c) How was the first after treatment plant found inadequate resulting in procurment later of a second plant of the same design and capacity at an extra cost of Rs. 8.06 lakhs as compared to that of first one?

1.31 In reply, the Ministry of Energy (Department of Power) have stated as follows:—

- (a) The project works were carried out with proper planning, coordination and monitoring of the working was carried out at the highest level but these extra payments could not be avoided since most of the delays were beyond the control of the project and not attributable to the contractors/suppliers.
- (b) The estimate of 4800 tonnes of steel was made on the basis of preliminary design. 15 tender drawings were prepared indicating therein the requirement of steel for each part of power house. On the basis of actual loading of the equipment which was made available after the equipment orders were placed (for crane, T.G., Coal Handling boiler etc.) detailed designs were done. During execution of project some sections of steel were also not readily available and higher sections had to be used. The cumulative total of revised design and use of higher sections has resulted in increase in the quantum of steel. This could not have been avoided as the date to loading of indigenous equipment was not available at the time of preparation of Project Report.
- (c) The Water Treatment Plant installed at Badarpur for 1st Stage had 2 streams with design capacity of 25 Tonnes of DM Water per hour each. Allowing the time required for regenerating, the plant was expected to yield about 800 MT of Water per day.

However, the yield had been of the order of 600 to 750 Tonnes per day at its optimum capacity due to following reasons:—

- (i) The Total cation load on the plant as envisaged at the design stage was 289 ppm against which the average analysis of raw water showed a cation load of 350 ppm, when raw water was fed from Agra Canal. In case of water from tube-well, the cation load was as high as 585 ppm, which was almost double the design value.
- (ii) The conductivity as specified in the design was of the order of 1 ppm of total dissolved solid which was approximately equal to 2 micromho per cm. As against this, the specified boiler water conductivity was 0.6 micromho per cm. This requirement reduced the capacity by atleast 10 per cent.
- (iii) The original specification did not indicate any organic matter in the water. The KMNO_4 number of raw water at present being fed from Agra Canal was of the order of 9.2 and the tubewell water had KMNO_4 no. of about 5.8. Due to the organic fouling, the capacity of the DM plant was considerably reduced. Brine washing had to be resorted to almost 3 times a month for which atleast 12 hours time was lost per brine washing process.
- (iv) For re-generation, Anion Water was required for regenerating the second stream. This also reduces the output by 10 per cent. Further some allowance had to be given for breakdown of various rotary machinery connected with the water treatment plant which also affect the generating capacity of the plant. The make-up water requirement of each boiler was assumed at 3 per cent of 420 Tonnes per hour per boiler in the original specifications. This norm was based on the experience of imported boilers. However, in actual practice the make-up had been found to be on the higher side. In view of the above, it was quite evident that the capacity of water treatment plant was inadequate because even with 4 per cent make-up, the requirement for 3x100 MW boilers would be 1200 MT per day against the maximum available 750 Tonnes on the existing water treatment plant. Therefore, action was taken to augment the plant by adding 2 streams at a cost of Rs. 8.06 lakhs from the original suppliers as an extension work. The matter of awarding work to other reputed firms was also discussed informally with other firms but it was felt that the best

course of achieving the augmentation would be to add 2 identical streams to the existing water treatment plant. These streams could be accommodated in the existing building and such action would obviate the necessity of fresh design, drawings approval etc. Since output of the original plant was found inadequate, it was necessary that the augmentation desired should be able to produce DM Water at the earliest to meet the requirement of other boilers. The suppliers are M/s. Ion Exchange (India), Ltd., Bombay."

1.32 When asked if all the details relating to civil works construction cost of equipment etc. were included in the feasibility report and the estimates of the project were prepared realistically, the representative of the Ministry of Energy (Department of Power) stated before the Committee:

"Based on whatever information was available at that time, the estimates were prepared. This 100 MW unit proposed to be installed at Badarpur was among the first units to be manufactured indigenously and certain data regarding the physical parameters at that time suffered from this limitation."

The witness further stated:

"The initial estimate was very defective. The capital cost of the project itself was not accurately estimated. As I mentioned, it was based on certain incomplete data available at that time. The actual investment has turned out to be double."

1.33 The Committee wanted to know if there was a single power project—hydel or thermal—executed since independence which has been completed within the approved estimates and stipulated target date. In reply, Secretary (Department of Power) stated before the Committee:

"I would not differ from you at all. It has been our unfortunate experience that time and cost over runs are there on the projects. The cost escalation is there, but the order of escalation has also been of a high order. Initially in the planning this cost escalation is not taken into account. Actually, it is bad planning."

1.34 It is seen from the Plan documents that the targets and achievements in respect of additions to Generating Capacity in the Five Year Plans have been as follows:

Plan	Target MW	Achieve- ment MW	Percentage shortfall
Ist Plan (1951—56)	1300	1100	15.4
IIInd Plan (1956—61)	3500	2250	35.7
IIIrd Plan (1961—66)	7040	4715	33.0
Three Annual Plans (1966—69)	5430	4381	19.3
IVth Plan (1969—74)	9260	4610	50.2
Vth Plan (1974—79)	12500	10200	18.4

1.35 During 1980-81 (i.e. first year of Sixth Five Year Plan), a target of adding 2,687 MW in generating capacity was fixed against which only 1,643 MW capacity was commissioned and 180 MW rolled, showing a slippage of 32 per cent. For 1981-82, a target of 3,212 MW has been fixed but the total capacity likely to be added is only 2,500 MW.

1.36 Badarpur Thermal Power Station has been set up as a regional power station in the central sector to supplement the availability of power for meeting the growing demand in Delhi as well as other States in the northern region. The construction of this power station started in 1967 and the project has been implemented in three stages, Stage I comprising of three units of 100 MW each and Stages II and III each comprising one unit of 210 MW.

1.37 The Committee are concerned to note that there have been delays in commissioning as well as heavy escalation in the cost of the various units of the Badarpur Thermal Power Station set up so far. Unit I was originally targeted for commissioning in March 1971 but the same was commissioned only in July 1973. Similarly, Unit II which was scheduled to be commissioned in September 1971 was commissioned in August, 1974 and Unit III was commissioned in March 1975 against the target date of March 1972. The position in respect of Unit IV is still worse, as while the unit was commissioned in December 1978 against the target date of December, 1977, the same could be put on commercial operation only in March 1980 due to the various defects and deficiencies noticed in the equipment supplied to the power project and the time taken in rectifying the same.

1.38 The Committee note that the delays in commissioning Units I, II and III (Stage I) were mainly due to the delay in issue of administrative and expenditure sanction, defective preparation of feasibility report in respect of sub-soil conditions, delay in the completion of civil works and shortage of scarce materials like steel, cement etc. The delay in completion of Unit IV (Stage II) of the project was due to delays in completion of civil works, non-sequential supply of equipment by BHEL and delay in supply of control and instrumentation equipment by M/s. Instrumentation Limited, Kota. Moreover, due to discrepancies and defects found in the Boiler and Turbo Generator equipment, a number of modifications and repairs had to be carried out thus consuming considerable time. The Committee feel that these delays could have been avoided if the project authorities had been more careful in planning the execution of works and taken steps to ensure that the works were executed expeditiously. They would like to express their serious concern on these delays in a vital sector like power.

1.39 The Committee note that there has been heavy escalation in costs in both stage I and Stage II of the Project. While the original sanctioned cost of Stage I of the project was Rs. 41.08 crores, the same was subsequently revised to Rs. 59.87 crores and the final anticipated cost is Rs. 64 crores. The escalation of cost in respect of Stage II is still more as is evident from the fact that against the original estimated cost of Rs. 38.37 crores, the total estimated expenditure is Rs. 74.76 crores i.e. an escalation of about 100 per cent. What is more surprising is that several works which had to be taken up subsequently were either not included in the original estimate or the quantities of work had to be considerably increased. It has been admitted by the representative of the Ministry of Energy (Department of Power) in evidence before the Committee that the initial estimate was defective, the capital cost of the project itself was not accurately estimated and the same was based on incomplete data. The Committee are unhappy that the project reports were prepared on the basis of unrealistic estimates and incomplete data. They have a feeling that in many cases project estimates are deliberately kept low with a view to obtaining early sanction fully realising that once the project is

sanctioned and work on the same is started, there would be no alternative for the Government but to continue with the work inspite of escalation in the costs of the project. The Committee would therefore like to emphasise the need to prepare project reports and estimates more realistically taking into account all relevant data and factors so that subsequent revisions and resultant escalations in costs could be obviated.

1.40 What is most disturbing is that the time and cost over-runs has not been a peculiar feature in Badarpur Thermal Power Station but is a common feature of the power projects taken in hand since independence. This is borne out from the fact that when during evidence, the Committee desired to know if there was a single power project—hydel or thermal—completed since independence within the approved estimates and stipulated target date, the representative of the Department of Power failed to cite a single such case and admitted that “it has been our unfortunate experience that time and cost over-runs are there on the projects” and that order of escalation had also been of a high order.

1.41 The Committee note that in none of the Five Year Plans, the target of achieving additional generating capacity has been fulfilled. While the shortfall in the First Five Year Plan was 15.4 per cent and in the second and third plans, the same was 35.7 per cent and 33 per cent respectively, the shortfall was as high as 50.2 per cent in Fourth Five Year Plan. The shortfall was 18.4 per cent in the Fifth Plan period. Such shortfall is continuing in the Sixth Plan also as is evident from the fact that during 1980-81 against a target of 2,687 MW in generating capacity only 1643 MW capacity was commissioned and 180 MW rolled showing a slippage of 38.9 per cent. Even in 1981-82, against a target of 3,212 MW only 2,300 MW is expected to be added even according to the most optimistic estimates. This is a clear failure of planning process and present system of monitoring of projects.

1.42 The Committee have no doubt that this failure to commission power projects as per target date is one of the factors responsible for the present power crisis in the country which is a serious bottleneck in economic development. According to calculations of the Department of Power, one year's delay in commissioning 1 MW of Power results in a loss of Rs. 1.78 crores to the economy. Thus the colossal loss to the country as a result of these slippages can well be imagined. There is a tendency on the part of the Ministries and the executing agencies concerned to blame each other for such slippage. The Committee strongly feel that this state of affairs should not be allowed to continue any longer and some firm and effective measures should be taken to overcome such deficiencies.

1.43 The Committee need hardly point out that it is proposed to add 19,666 MW of generating capacity during the Sixth Five Year Plan period which is by all reckoning a challenging task and requires sustained efforts by all concerned and close monitoring. The Committee, therefore, recommend that Government should appoint a Monitoring agency consisting among others of representatives of the Department of Power/Central Electricity Authority, Department of Heavy Industry/BHEL & ILK, Planning Commission, Ministry of Finance and Railways to monitor the progress of power projects in the country on a continuous basis and to initiate corrective measures at the earliest in implementation of power projects.

1.44 The Committee further recommend that the performance of State Electricity Boards in the field of execution of power projects according to targets should be taken into account while sanctioning new power projects.

CHAPTER II

PERFORMANCE OF THE BADARPUR THERMAL POWER STATION

2.1 According to Audit Para, the position of generation of power in Badarpur Thermal Power Station (Stage I) in 1977-78, 1978-79 and 1979-80 was as under:

Year	Projected capacity (60% load factor)	Actual generation (percentage of (2) in brackets)	Consumption within the power station/percentage of (3) in brackets	Balance available for sale
1	2	3	4	5
(In million kilowatt-hours)				
1977-78	1497	839.43(56.07)	115.28(13.75)	724.15
1978-79	1445	1056.08(73.08)	139.05(13.16)	917.03
1979-80	1419	1274.00(89.78)	181.00(14.19)	1093.00

It has also been stated in the Audit Para that the Units actually operated for 10,656 hours during 1977-78, 15,068 hours during 1978-79 and 18,120 hours during 1979-80 against 26,280 hours available each year.

2.2 According to information furnished by the Ministry of Energy (Department of Power), the performance of stage I of the Badarpur Thermal Power Station has been as follows:

Stage I Units	1977-78	1978-79	1979-80
1. Installed Capacity (MW)	300	300	300
2. Derated Capacity (MW)	285	275	275
3. Generation in MUs	839.43	1055.35	1274
4. Plant Load Factor (%)	33.62	43.80	52.80

2.3 After assuring commissioning of Unit No. IV with effect from 2.12.1978, the performance of the Power Station (Stage I & II) has been as follows:

"Stage I & II	1978-79	1979-80	1980-81
1 Installed Capacity (MW)	510	510	510
2 Derated Capacity (MW)	510	510	510
3 Generation in MUs	1056.08	1532.33	2054.97
4. Plant Load Factor (%)	33	34	46"

2.4 In reply to Unstarred Question No. 1254 dated 25.8.1981 in Lok Sabha, it has been stated:

- "(a) The performance of Badarpur Thermal Power Station has not been satisfactory but there has been a progressive improvement in its performance over the last three years.
- (b) The plant load factor during 1977-78 and 1978-79 was low due to high outage rate (forced and planned continued) resulting in low operating availability during these years.
- (c) The Plant Load Factor of Badarpur Power Station during 1979-80 was lower than I.P. Station and also a number of other power stations in the country.
- (d) The reasons for somewhat unsatisfactory performance of Badarpur Power Station have been identified and necessary steps have been taken to improve both the quality of power supply as also the capacity utilisation of the plant."

2.5 The Committee desired to be furnished with the reasons for the unsatisfactory performance of the Badarpur Thermal Power Station. In reply, the Ministry of Energy (Department of Power) have stated as follows:

- "(a) The major constraints in achieving better performance of the Station are given below:

STAGE—I

1977-78

- (i) Damage to turbine H.P. Rotor of Unit-II during January, 1977 and recommissioned in January, 1978, thus it remained out of services for ten months during 1977-78.

- (ii) L.P. Rotor of Unit-III developed a bend on 16.4.77 this was replaced with Unit-II rotor, which was already out of service. This was recommissioned on 29.6.77.
- (iii) H.P. Rotor of Unit-I got damaged on 31.1.78 and recommissioned on 20.7.78. Thus it remained out of service for two months during 1977-78.
- (iv) Boiler tube failures on three units occurred fifteen times which accounted for a loss of about 62 days.

1978-79

- (i) Unit-I remained out of service due to damage of its H.P. Rotor during January, 1978. It was recommissioned on 20th July, 1978, thus it remained out for about 4 months during 78-79. Although the unit was synchronised on 20.7.78, but it could not be brought on full load till first week of December, 1978 due to high turbine bearing vibration.
- (ii) Shortage of cooling water.
- (iii) Illegal strike by staff from 25.10.78 to 4.11.78.
- (iv) More number of Boiler tube failures on Unit-III as compared to Unit I&II as certain modifications were yet to be carried out on this unit similar to those already done on Unit-I&II.
- (v) More number of trippings leading to more outages.

1979-80

- (i) Due to prevailing grid condition at that time it was not found possible to take Unit-II out for overhauling. Thus, as a result of overdue overhauling, there had been excessive tube failures and availability of various auxiliary system, particularly P.C. Feeder, burners etc. had also been poor.
- (ii) Coal and oil shortage contributed to a loss of generation of 81 MUs.

1980-81

- (i) Unit-II was under shut down for 114 days for Capital Maintenance and for replacement of Economiser, Superheater under the Renovation Programme.

- (ii) When Unit-II was started it gave repeated trouble of failure of Turbine M.O.P. thrust bearing.
- (iii) Frequent tube failures on Unit-I.
- (vi) There has been partial loss on account of trouble in coal handling plant.

Stage—II

1979-80

- (i) Frequent Boiler tube failures.
- (ii) Unit after commissioning could not be stabilised due to various problems, hence unit was taken under shut down for nearly two months (January, 80 to February, 80) for modification work in Boiler.

1980-81

- (i) Frequent Boiler tube leakages.
- (ii) Failure of boiler auxiliaries such as Scrapper Conveyor, P.A. Fan impeller cap etc.
- (iii) Failure of Turbine Auxiliaries such as C.W. Pumps, S.O.P. etc.
- (iv) High number of trippings on account of abnormal furnace vacuum and flame failure.

2.6 Asked about the action taken to improve the performance of the three units and also reduce the consumption of oil, the Ministry of Energy (Department of Power) in a note furnished to the Committee have brought out:

“During the course of operation certain manufacturing and erection defects were observed which led to breakdowns of 100 MW Units. This has been the main handicap in achieving generation at the rate of 60 per cent projected capacity. To overcome the above mentioned problems various following steps have been taken from time to time to reduce the number of breakdowns and optimise generation from these units.

I. Renovation Programme

100 MW sets installed at Badarpur, being the first such sets manufactured by BHEL in India were giving lot of problems since

its commissioning as mentioned above. As per the recommendations of the Committee set up by the Ministry of Energy a renovation programme covering major modifications and replacements of Superheater, economiser, airpreheaters etc. of Boilers and other associated auxiliary systems has been undertaken. Some of the minor items of work have been completed.

- (a) The major modifications *i.e.* replacement of Superheaters, economisers and lower blocks of air-preheaters on Unit-II have already been completed during 1979-80. Its damaged rotor has also been replaced to bring to its original capacity of 100 MW.
- (b) Major modifications on Unit-I have been planned during the next overhauling commencing from August, 1981 to October, 1981. A new set of blades have been procured to replace the blades of old rotor of Unit-I. This will enable restoration of reduced capacity of 100 MW.
- (c) Major renovation works on Unit-III have been planned during overhauling in 1982-83.

II. Implementation of VGB Recommendations

The recommendations of VGB Experts have been undertaken. Some of the recommendations have already been completed for which a team of VGB Technicians had been to Badarpur from January, 1980 to April, 1980 for carrying out the rectification and modifications. A few of the remaining ones are in the process of implementation.

III. Improvement in Supplies of major inputs and spares.

(a) Coal

In order to exercise control over quality/and for persuading the supplies from linked collieries for required quantities a Coal Monitoring Cell has already been established with an Executive as its Incharge.

(b) Circulating Water : Canal :

Water for cooling purposes is taken from Agra Canal through a channel in the Power Station. Due to number of years of operation the capacity of this channel had reduced considerably by accumulated mud in the channel resulting into insufficient water supply when all the units were operating simultaneously. The

channel has been desilted with the help of dredgers during 1979-80. Further during rainy seasons when Agra canal is closed the cooling water is now drawn from a separate 60 cusecs channel. Modifications of raw water system from Agra Canal has also been undertaken which is under final stage of completion.

(c) *Spare part cell :*

A spare parts development cell has been developed for reclamation of spares used in the units and manufacture of some of the spares in the power station workshop or through suitable vendors so as to minimise the dependence on indigenous suppliers which usually require a delivery period not less than 1 to 2 years. A separate valves repair shop has also been established.

The outcome of above mentioned steps have resulted in improved performance of 100 MW units as is observed from the figures given below:

PERFORMANCE OF 3×100 MW GENERATING UNITS DURING
1978-79, 1979-80 & 1980-81

	1978-79	1979-80	1980-81
1. Generation (M. Us)	1055.35	1274	1279.72
2. Outage (in hours)	11212	8226	8112
3. Overall utilisation factor (%) or load factor	43.80	52.74	53.13 57.56*
4. Consumption of furnace oil	27.03	22.51	14.08

*Overall utilisation factor excluding three months of renovation period of Unit-II.

It will be observed from above data that a much higher generation as well as lower figures of outage have been achieved as a result of the various above stated steps. Keeping in view the upward trend of performance of these units during 1979-80 and 1980-81 it is expected that on completion of above stated major modifications of all the units the performance of the station will further improve."

Trippings in the Power Station

2.7 The Committee were informed that the number of trippings in the Power Station were on the increase. There were 109 trippings in 1977-78, 199 in 1978-79, 260 in 1979-80 and 170 in 1980-81. Out of these only 18 trippings were planned and all others were forced trippings.

2.8 The Committee desired to be furnished with the reasons for these trippings, the reasons for the increase in the number of trippings and corrective measures taken in the matter. In reply, the Ministry of Energy (Department of Power) have furnished a note which is at Appendix III.

2.9 The main reasons for increase in trippings during 1978-79 are stated to be increase in number of grid disturbances, trippings on boiler level protection and electrical equipments. As regards 1979-80 the increase in tripping was mainly due to increase in boiler tube failures, boiler auxiliaries failures (such as PA fans, FD fans, Miling system, PC feeders, etc.) and trippings on boiler drum level protection. The Ministry have added that as a result of introduction of tripping analysis reports, regular preventive maintenance, and such other similar steps it has been possible to minimise trippings. The trippings during 1980-81 have come down to 173 as compared to 260 nos. during 1979-80.

Delay in overhauling and maintenance

2.10 Asked if the annual maintenance and overhauling of the Badarpur Thermal Power Station was being carried out during the last three years as per schedule, the Ministry of Energy (Department of Power) have stated:

“The overhauls at Badarpur Thermal Power Station have not been carried out on schedule.”

2.11 The Ministry have also furnished a statement showing reasons for Advanced/Delayed overhauling of units since commissioning (Appendix IV).

2.12 The Committee enquired how far this deviation from scheduled maintenance and overhauling was responsible for the poor performance of the Badarpur Thermal Power Station. The Ministry of Energy (Department of Power) in a note have indicated:

“The overhauls at Badarpur Thermal Power Station could not be carried out on schedule as detailed and to an extent, it is responsible for reduced generation at the Badarpur Thermal Power Station. The exact effect of such postponement cannot be quantified. However, the delay in overhauling results

in higher wear and tear rate; higher forced outages due to breakdown of wearing parts; longer time taken to attend the breakdowns and partial availability of auxiliaries etc.”

2.13 The Committee have been informed that the power station has not adhered to the time limit laid down by the Kulkarni Committee for the overhauling and maintenance of Plant. In this connection the Ministry of Energy (Department of Power) in a note have stated:

“The time limit laid down in Kulkarni Committee report is for annual overhaul of a unit, particularly boiler to a period of about 28/30 days, for turbine overhaul ordinarily 6-8 weeks have been indicated. In case of Badarpur Thermal Power Station the time limit as laid down above could not be adhered to as the following renovation work was also undertaken during overhauls.

- (1) Modifications and renovation works including replacement of Economiser/lower block of air preheater and convection S.H.
- (2) Damages in the main transformer and turbine rotor including their repair at BHEL Works.”

2.14 Asked about the steps taken to adopt modern techniques for overhauling and maintenance as have been adopted by some State Electricity Boards like Maharashtra and Madhya Pradesh in respect of the Thermal Power Stations under their control, the Ministry of Energy (Department of Power) have stated:

“The overhauling and maintenance at Badarpur Thermal Power Station is being done by adopting modern techniques. Some of them are enumerated as below:

- (a) A separate group for planning of maintenance/overhauls has been set up.
- (b) Preventive maintenance schedules are followed as per the norms to avoid breakdowns.
- (c) On-line condition monitoring of rotating machines is done with the help of modern instruments like IRD-308/350. This is done to check the unbalance/misalignment. For checking the bearing and gear deterioration, another instrument Model IRD-810 is being procured. The practice adopted by Maharashtra and Madhya Pradesh and the techniques adopted by them will also be studied for further action.”

Report of the West German Team of Experts

2.15 The Committee enquired if a West German Team of Experts had visited Badarpur Thermal Power Station and the Team had made a number of recommendations. The Committee also desired to know the number of recommendations which have since been implemented. In reply, the representative of the Ministry of Energy (Department of Power) stated before the Committee:

“It is a fact that a Team of Experts from an organisation called VGB, which is an association of thermal power stations in Germany paid several visits to this country, first in 1977, again in 1978 and then a follow up visit in 1979 and so on As far as the recommendations of the Team to improve the power situation are concerned, they looked at the different power stations. They made 172 recommendations out of which 80 have been implemented. Sixty-five are yet to be implemented. The balance were considered unacceptable. In the first visit of 1977, they had identified 143 problems, out of these 143, we have already accepted 72 recommendations. We have yet to implement 60 recommendations. It is a question of getting spares and also getting tenders etc. We could not get the spares. As soon as we get the things, we will implement the recommendations.”

2.16 In a subsequent note furnished to the Committee, the Ministry of Energy (Department of Power) have stated:

“Out of total 276 recommendations, 160 have been implemented while 25 were not found acceptable, comments are awaited from VGB on 14 and the balance of 77 recommendations are yet to be implemented/pending implementation due to reasons mainly falling under following categories.

- (i) Require change to technology, total design and layout.
- (ii) Awaiting procurement of material and equipments.
- (iii) To be implemented during overhauls.”

Details of the number of recommendations received implemented etc. are given below:

VGB RECOMMENDATIONS

Sl. No.	Year	Total No. of recommendations	Implemented			Not found suitable	Comments awaited from VGB	Yet to be implemented
			1978	1979	1980-81			
1.	1977	Nil						
2.	1978	102	54	21	..	10	3	14
3.	1979	17 Special	..	..	5	8	1	3
4.	1980-81	145	..	..	77	3	9	56
		12	..	..	3	4	1	3
		276	54	21	85	25	14	77
			160					

2.17 The Committee are concerned to note that the performance of the Badarpur Thermal Power Station has not been satisfactory as is evident from the fact that the plant load factor (percentage of utilisation) was only 33 per cent in 1978-79, 34 per cent in 1979-80 and 46 per cent in 1980-81. Even in the case of Stage I Unit which were commissioned by the year 1975, the plant load factor had been only 33.62 per cent, 43.80 per cent and 52.80 per cent during the years 1977-78, 1978-79 and 1979-80 respectively. Thus, the plant load factor has been much less than the ideal level of performance fixed at 60 per cent and also the level of utilisation achieved in a number of power stations in private sector as well as in other States like Maharashtra and Gujarat. The Committee would like to point out that Badarpur Thermal Power Station is the first regional thermal power station set up in the Central sector and since a number of power stations are now being set up in the Central sector, Badarpur Thermal Power Station should function as a model of efficiency. The Committee therefore expect that the performance of the Badarpur Thermal Power Station will be kept under constant watch and corrective measures taken to achieve utilisation level of at least 60 p.c. load factor.

2.18 In this connection, the Committee would like to express their

serious concern at the low capacity utilisation in all the thermal power stations in the country as a whole. The plant load factor of thermal power stations in the country which was 56 per cent in 1976-77 has been showing a deteriorating trend and the same declined to 45.4 per cent in 1979-80 and 44.9 per cent between April and November, 1981. The Committee have no doubt that if this trend of deterioration in the capacity utilisation in the power plants is not reversed, the country will continue to suffer from chronic shortage of power even after adding the targeted capacity of 19,666 MW in the Sixth Plan. The Committee would like to emphasise that a detailed methodology to maximise power generation in the country should be worked out and follow up action taken expeditiously so that the utilisation of the power stations in the country reaches the optimum level of performance at 60 per cent as prescribed by the Central Electricity Authority.

2.19 The Committee are constrained to observe that not only the utilisation of capacity in the Badarpur Thermal Power Station is unsatisfactory but the generation of power is also highly uncertain as is evident from the fact that there were as many as 108, 199, 260 and 173 trippings in the power station during 1977-78, 1978-79, 1979-80 and 1980-81 respectively. As a result of these trippings, large areas of the capital and neighbouring States were plunged into darkness disrupting economic activity. The Committee cannot but express their deep concern at this large number of trippings. Since the reasons for these trippings have already been identified as given in the statements furnished to the Committee, concrete measures should be taken to do away with the trippings. The Committee should be informed of the action taken in this regard at an early date.

2.20 The Committee note that the overhauling and maintenance of the plant and equipment at the Badarpur Thermal Power Station has not been carried out as per prescribed time schedule. They have no doubt that this delay has contributed to the frequent trippings in the power station and reduced generation. The Committee would like to point out that the postponement of overhauling of equipment to meet immediate demand is a shortsighted policy as it may cause serious damage

to equipment resulting in closure of power station for long periods and higher forced outages. They, therefore, recommend that in future the authorities of the power station should adhere to the scheduled dates of overhauling and maintenance.

2.21 The Committee note that a Team of West German Experts had visited some thermal power stations in the country including Badarpur Thermal Power Station thrice viz. in 1977, 1979 and 1980-81 and the Team had made a number of recommendations to improve the performance of Badarpur Thermal Power Station. However, out of 276 recommendations made by the Team, only 160 have so far been implemented. Twenty-five recommendations have been found unacceptable and 77 recommendations are yet to be implemented. On 14 recommendations further comments of the team are awaited. The Committee would like to be informed of the specific action taken on the recommendations of the team which have been accepted.

CHAPTER III

EQUIPMENT FOR THE BADARPUR THERMAL POWER STATION

A Supply of Equipment by M/s BHEL & Instrumentation Ltd.

3.1 It has been stated in the Audit Para that the scheduled date for commissioning of the fourth unit was 31 December, 1977. It was synchronised for operation from time to time but had not been opened for commercial operation till September 1980. One of the reasons for delay as given in the Audit Para is discrepancies and manufacturing defects noticed in the boilers, turbo-generator and pumps supplied by firm 'A' (M/s BHEL) during erection and pre-commissioning. The Committee desired to be furnished with the detail of discrepancies and manufacturing defects actually detected the follow-up action taken in the matter and the time taken by the supplier to rectify the defects. In reply, the Ministry of Energy (Department of Power) have stated in a note as follows:

“There were a number of defects and discrepancies found in the Boiler & Turbo-generator equipments during erection. Some of the equipments had to be sent back to BHEL workshop for modification and rectification of the defects while others were repaired at site thus consuming considerable time. It may, however, be mentioned that no pumps have been supplied by M/s. BHEL.

Details of some of the major defects noticed in the material supplied by BHEL i.e. Boiler and Turbo-generator materials and time taken to rectify these are as under:

1. Defects noticed in Turbo-generator equipment:

For the defects/discrepancies noticed during erection, some of them had been sent to Hardwar while some had been rectified at site. The details of

the defects and time taken are as under:—

(i) *Equipment which were sent to Hardwar:*

Sl. No.	Name of Equipment	Time taken for repair
1.	Blow holes in the foundation frame of L.P.C.	31-3-77 to 17-4-77
2.	Faulty calibration of Dynamometers	7-4-77- to 22-4-77
3.	Bearing No. 5 (Loose babbiting).	18-4-77 to 15-8-77
4.	Trunion plates of generator	13-6-77 to 20-6-77
5.	Reabearing housing of Generator was leaking	18-10-77 to 17-11-77
6.	Wrong steam path clearance to Turbine	13-11-77 to 15-12-77
7.	Defective gland steam cooler	7-3-77 to 3-4-78

(ii) *Equipment repaired at Site:*

1.	Blow holes in FBP sole plate	17-4-77 to 22-4-77
2.	More clearance in LPC right side transverse key	26-5-77 to 30-5-77
3.	Vertical key coming in from of LPC	10-6-77 to 16-6-77
4.	Position of ameterizer	One week.
5.	Coupling holes of LP & IP rotor flange not matching	23-5-77 to 11-6-78
6.	Cross over pipes not matching	10 days.

II. *Defects experience in Boiler Erection*

Some of the major defects noticed during Boiler Erection are as under:—

1. There was mismatching of the column pieces. Certain rectification had to be done at site.
2. The holes in the gusset plate were not matching with the holes in the column pieces. Certain new gusset plates were required to be fabricated at site for proper erection.
3. Structural member were fouling at certain in places with the burner panel P.C. piping bends near burner panels and ducting to Economiser near the outlet of the air pre-heater.
4. All the down comer bends were not of the desired angles and modifications had to be done at site by adding additional pieces.
5. Economiser hanger tubes were fouling with its own suspensions. Additional bends had be introduced in 67 tubes to facilitate erection.

6. There was a difference upto $\times 8$ mm between the stubs fitted on the drum and the adjustment had to be done at site.
7. The 'U' bolts for fixing the drum were not matching with the drum and additional edges had to be given at certain places.
8. Almost all the bends in the H.P. piping are not of required angle as specified. Difficulties were experienced in aligning the pipe lines.
9. No key ways have been cut in the coupling of both the P.A. fans.
10. Coupling was unbalanced.
11. The shock bars supplied were not of requirement. Suitable modification had to be done in shock bar before it could be used.
12. The holes provided in the air pre-heater housing for fixing drive were not matching with the base frame of the drive unit. Suitable modifications had to be done at site.
13. The balancing of one no. ID fan had to be done at site."

3.2 The Committee wanted to know the dates on which order were placed for supply of main plant, equipment and materials, the stipulated dates of supply, actual dates of delivery and the reasons for delay in each case. In reply, the Ministry of Energy (Department of Power) have stated in a note:

"(a) The orders for Main Plant & Equipment and materials were placed as under:

- | | | |
|---|-----------|---------------------|
| (i) Boiler & Turbo-generator (Letter of intent) | | 11/73 |
| (ii) Control & instrumentation (Letter of intent) | | 1/74 |
| (iii) Other mechanical and electrical equipments | | 1974-75 and 1975-76 |

(b) The original stipulated dates and actual dates of delivery are as follows:—

Item	Original stipulated date	Actual date of supplies
Boiler	8/76	Major supplies completed by 7/78
Turbo-generator	9/76	
C & I	8/77	1978-79
Other mechanical & electrical equipment	1977-78	1978-79

Main reasons for delay as intimated by the suppliers are as follows:

(i) T.G. and Boiler:

- (a) Delays in engineering and finalisation of the same between the consultants and the supplier.
- (b) Power cuts and strikes at the subvendor's works.
- (c) Delay in shipment, receipt and clearance of imported components.
- (d) Railway restrictions in booking from time to time.

(ii) Control & Instrumentation:

- (a) Delays in engineering and finalisation of the same between the consultants and the supplier.
- (b) Power cuts and strikes at the manufacturers and subvendor's works.
- (c) Delays in shipment, receipt and clearance of imported components.

(iii) Other Electrical & Mechanical Equipments

- (a) Delayed finalisation of drawings.
- (b) Non-availability of indigenous and imported raw materials by the suppliers in time.
- (c) Power cuts, strikes, lock-outs at the manufacturers' and subvendor's works.
- (d) Dislocation of normal working due to floods and cyclones.
- (e) Railway restrictions on booking and transport—action delays."

3.3 The Committee wanted to know the checks exercised by the project authorities while accepting the equipment from suppliers to ensure that the equipment was of requisite quality and free from defects. The Ministry of Energy (Department of Power) in a note have stated:

"The defects in Boiler and T.G. equipment were mostly of such a nature which could only be elected during erection, commissioning and initial operation of the unit."

3.4 Asked about the follow up action taken by the Ministry of Energy to get the defects in the equipment rectified, the Ministry have stated:

"As soon as the discrepancies and defects in the equipment were noticed, it was immediately brought to the notice of BHEL at various levels who then rectified the defects free of cost partly at site and partly at their works."

3.5 Asked about the time taken by BHEL to rectify the defects, it has been stated in the note:

"Delay in the supply of equipment and rectification of defects during erection resulted in shifting of commissioning from December, 1977 to July 1978 when the Unit was first rolled. It had to be stopped due to high vibration in pilot excitor which had to be replaced with a new one."

3.6. The Committee wanted to have the views of the Department of Heavy Industry regarding the defects in the equipment supplied by BHEL. In reply, it has been stated in a note:

"The defects that have been reported pertain mostly to the first lot of sets supplied by BHEL. BHEL had no operational experience of 200/210 MW sets as the first set was put on commercial load only in May, 1978. The problems faced in all the 13 sets that were commissioned upto March 1980 were examined station by station by a team of BHEL experts together with the experts of CEA and the Electricity Boards. Various complaints were listed and analysed. Specialists from BHEL collaborators also went around various sites where 200/210 MW sets are working to have first-hand knowledge of the problems faced by the users. All the works to be carried out on the 13 sets were identified and a time-bound programme to attend to them was drawn. These improvements have also been incorporated in the subsequent sets. After incorporation of these improvements, there has been considerable increase in the average generation per day from these stations."

3.7 The Committee enquired if it was a fact that the boilers and other equipment supplied by BHEL were mostly found to be defective. In reply, Chairman, BHEL stated before the Committee:

"Initially BHEL supplied boilers of Czech design and certain deficiencies were found in them. Subsequently we took up collaboration with Combustion Engineering. Those boilers have been behaving far better. When we took up Czech collaboration, at that time no other collaborations were available. When they were operated in Indian conditions, the actual quality of coal very much varied from the specification. That is happening even now because the coal which actually gets burnt has higher ash content and its quality is not in accordance with original specifications. The basic cause of troubles in the boilers has been due to this very important factor. The Combustion Engineering Boilers which we have adopted now for 200 MW are giving uninterrupted power supply and

these boilers have come to stay. In the earlier boiler whenever some deficiencies were noticed, they made design modification and after that there has been some improvement."

3.8 To a query from the Committee if the higher ash content was the only factor contributing to the poor performance of the boilers, the witness replied:

"That is the chief problem. There were other minor modifications that were needed. The mill design had to be changed. We did it. We are continuously improving upon all factors. The main problem is, at the time of designing the boiler if we know what coal is going to be supplied, the boiler will be designed according to that. But in actual practice, the coal that is supplied is different from the specifications given at the time of design of boilers. Even with imported boilers this problem is there. It is not peculiar to BHEL boilers. In Santaldih and Bandel the position is the same. Out of our experience gained from earlier mistakes, we have now designed the 200 MW boilers with improvements and these 200 MW boilers are working very satisfactorily in Vijayawada and other places where they have been installed. As I said, the wide variation between the actual coal supplied and the quality originally specified at the time of boiler design is the most important factors which is responsible."

3.9 The Chairman, National Thermal Power Corporation stated:

"The coal that we are now getting is of a lower calorific value than the coal for which boilers were designed. Earlier we were getting coal from almost 40 to 50 collieries. Recently, we had a lot of interaction. As a result of that, now, for Badarpur we have limited coal supply to almost 8 or 9 collieries from Jharia. Moreover, we are getting ROM coal."

3.10 Clarifying the position further, Chairman, Central Electricity Authority stated:

"The boiler can take plus or minus 10 per cent variation only. What is happening in our power stations is that we have not been able to maintain uniformity in the quality of coal. Sometimes, we get 50 to 55 per cent of ash content and at other times, we get 30 to 35 per cent ash content."

3.11 The Committee drew the attention of the Chairman, BHEL to a note submitted by the Department of Power to the Estimates Committee (Dec. 1980):

"So far 16 nos. 200/210 MW sets have been installed in different States in the country. Every State Electricity Board has com-

plained about the poor quality of the BHEL equipment. The defects reported by SEBs have been from time to time brought to the notice of the Quality Assurance Wing of the BHEL. The various defects have been jointly identified by CEA, BHEL and concerned Boards and have been accepted by BHEL."

The Committee also drew the attention of the Chairman, BHEL to para 4.27 of the 16th Report of the Committee on Public Undertakings (1980-81):

"The Committee agree that some price has to be paid for indigenisation of power equipment, but they feel that the country has already paid a heavy price and that the time has come for the indigenous units to stabilise and give a good account of themselves."

3.12 Explaining the position, Chairman, BHEL stated during evidence:

"My submission is that during the nine months, the criticism against BHEL has lessened. The Chairman has told me that the level of confidence has very much increased. The Chairman, Central Electricity Authority quoted the figures. The figures speak for themselves.

It has been mentioned in the EC Report that the Central Electricity Authority, BHEL and others joined hands, studied and found out the defects and the results are before the Committee.

The Committee can see for themselves how the improvement came about. In July last year, first 13—200/210 MW Units generated daily average of 14.4 million units. In May, 1981 same Units were generating 36.2 million Units per day.

This has been made possible by coordinated approach and identification of problems. The problems have been resolved. I would submit to the Committee that at first when the sets ran, there were troubles. But, after identification of the problems the performance of the sets improved for the last ten months or so. It is an achievement."

3.13 The Committee wanted to have the views of the Department of Power regarding the quality, timely supply and performance of equipment supplied by BHEL and ILK. In reply, Secretary (Power) stated before the Committee:

"I would submit that while we certainly appreciate the efforts being made by BHEL or Instrumentation Ltd., Kota, as far as the customer is concerned—our customer is Badarpur or N.T.P.C.—We are not in a position to say that they are fully satisfied

with the equipment which has been supplied. We are aware that whenever any new equipment is taken up for manufacture—a new range of equipment—we concede that there is a learning process. . . . We have looked at the performance of 60 MW set or 100 or 210 MW sets. The opinion is almost unanimous that much more needs to be done. No doubt both BHEL and the I.L. Kota entered into a collaboration with the manufacturers with vast experience and repute. I think that one lesson which we have now learnt is that the designs which were prepared or considered suitable for use in a certain country require extensive adaptation and modification when used in a different country. I would also say just as there was collaboration with the USSR and Czechoslovakia there is now collaboration with the Combustion Engineering and KWK. We have yet to see whether the collaborations with KWK will show a similar kind of learning process. It has to be seen. There is a new collaboration for a turbogenerators with KWK of Germany. These are yet to be commissioned and they have not yet started operating. Our effort over the last three or four years has been after having got these equipments, to identify the deficiencies and to initiate a time bound programme for making improvements. I must make one other submission also at this stage. Unfortunately, so far strict contracting procedures between the customer and the supplier have not yet become a normal practice.”

3.14 When asked why there were no formal contracts regarding supply of equipment, the witness replied:

“I would say that partly there has been a default on the part of the Electricity Boards also. For the first time, it is the National Thermal Power Corporation which has initiated a strict contracting procedure. In spite of the fact that there might be only one supplier for a certain range of equipments, they have introduced in their contracts not only strict procedures for equipments delivery schedule but also penalties for the default in timely supplies or penalties for default in performance. What is also important is the procedure for the quality assurance during the process of manufacture. To my mind, this is of great importance in situation where we have virtually one manufacturer. I may be forgiven if I say that there is a feeling among the various customers, I include in them the State Electricity Boards and the NTPC—that the internal quality control procedure of BHEL ever the years was not adequate. I am now glad to say that in the last few months, the BHEL has certainly taken measures to improve the internal quality control procedures. I feel that today we are faced with a situation where

because we have adapted the designs without adequate proving in the climate in which we are to operate in a very broad sense, I used the word 'climate' and we have learnt this by experience and, it is for this reason that my predecessor had submitted to the Estimates Committee that we would evolve model contracts. Any such contract would imply obligations on the part of both the parties. Let me not give this impression that the faults are only of BHEL or I.L. Kota but there have also been faults on the part of Electricity Boards. We have been impressing on the Electricity Boards that their project management procedures should undergo a radical change. Otherwise even for the contracts they might have entered into they might find themselves in a situation wherein we would not be able to enforce any kind of penalty because there are serious failures on the part of the customers also. We are hoping that we will be able to finalise model contract very soon and make available to the electricity boards. Sir, as far as NTPC is concerned this procedure is already in vogue there."

Equipments supplied by Instrumentation Ltd., Kota

3.15 It has been brought to the notice of the Committee that the control equipment supplied to the Badarpur Thermal Power Station by M/s. Instrumentation Ltd. Kota has developed several defects and this has adversely affected the functioning of the power station. Asked whether the position stated above was correct, the Ministry of Energy (Department of Power) have replied in the affirmative and have brought out:

"The following shortcomings have been noticed:

- (i) The control equipment requires calibration frequently.
- (ii) The working of the control equipment being voltage based gets affected by the induction pick-up.
- (iii) In thermal load control system there is no provision of feed back to help stable operation under changing load condition. Further the load sharing by variators do not remain uniform. This involves frequent calibration and adjustment.
- (iv) Due to improper working of the control system the power station performance gets affected."

3.16 The Committee wanted to know the reasons for the development of defects in the control equipment supplied. The Committee also queried whether equipment itself was defective or it was because of some deficiency

in the operation of the equipment. The Ministry of Energy (Department of Power) in a written reply have stated:

“The control system and the final control element appears to be inadequately designed. Because of this and the working of the control equipment being voltage-based, the control loops could not be commissioned satisfactorily and work consistently.”

3.17 Regarding the defects noticed in the control equipment supplied to the Badarpur Thermal Power Station, Chairman, Instrumentation Ltd. Kota stated before the Committee:

“Regarding the defects particularly with regard to these 210 MW stations, I would like to state that as mentioned by the CMD, BHEL, initially when the sets were commissioned there were a number of defects. Then we set up a joint team of BHEL and ourselves and we went into the defects for rectification and the results have already been mentioned. The only thing I would like to mention is that in case of instrumentation, what happens is that there are certain instrumentation control loops which can be commissioned only when the whole set is commissioned. For instance, the automatic loops will function and will be able to be commissioned and tuned only when the other inputs are ready. Unless those inputs are all right, the control equipment will not function. Unless all the inputs are there together and made to work as a system, the thing does not work. I would like to mention that no specific defects of design as such in any instruments have been mentioned and no specific deficiencies in the quality of instruments as such have been mentioned. What has been mentioned is commissioning or tuning adjustments mostly of the control loops. It has been now tried out and successfully done in most of the power stations as a result of joint team efforts because instrumentation comes at the time of the total system getting commissioned.”

3.18 Asked when the equipment was supplied to Badarpur Power Station and when the defects were brought to its notice, the witness replied:

“The equipment was supplied in 1978-79. The unit was synchronised in December, 1978. Operation started in March, 1980. Now from the time of synchronisation onwards, we have been getting reports. I have got a series of reports here sent as a result of meetings held when these defects or deficiencies have been brought out. All the defects which have been pointed out in those reports have subsequently been rectified.”

3.19. Boiler and Turbo-generator equipment for the Badarpur Thermal Power Station-Stage II was supplied by M/s. Bharat Heavy Electricals Ltd. Although the equipment was to be supplied by August/September, 1976, the major supplies were completed by April, 1978 only. During erection stage, a number of defects and deficiencies were found in the boilers and equipments and some of the equipments had to be sent back to BHEL workshop for modification and rectifications of the defects while some defects were repaired at site with the result that the unit could be put to commercial operation from March, 1980 only. The Committee cannot, but express their deep anguish at this.

3.20 The Committee has taken note of the statements made by the representative of the Ministry of Energy (Department of Power) before the Committee that "one lesson which we have now learnt is that the designs which were prepared or considered suitable for use in a certain country require extensive adaptation and modification when used in a different country" and that "there is a feeling among the various customers-I include in them the State Electricity Boards and NTPC—that the internal quality control procedure of BHEL over the years was not adequate".

The Committee have further taken note of the statement made by the representative of Department of Heavy Industry that they have now entered into a foreign collaboration and the performance of the new units based on this collaboration is better. The Committee would not like to make any detailed comment on the subject as the Committee on Public Undertakings is making a detailed examination of BHEL. They, however, hope that the equipment supplied by the indigenous manufacturers to the power Stations in future would be free from all defects and deficiencies so as to satisfy the technical needs and requirements of the power stations.

CHAPTER IV

PROBLEMS OF THE POWER STATION

A-Supply of Spares

4.1. The Committee were informed that considerable difficulties were being faced by the Power Station in obtaining spares from M/s. BHEL Ltd. and M/s. Instrumentation Ltd., Kota. Orders for spares placed in 1976 have not yet been fulfilled. This had adversely affected the overhauling and rectification programme of the Power Station.

4.2. When asked about the action taken on the recommendations made by the German Team of Experts, the Committee were informed that some of the recommendations could not be implemented due to non-receipt of the required spare parts from BHEL. It was further stated that there were 172 orders placed on BHEL and these had been only partly executed.

4.3. The Committee wanted to know from the Chairman, NTPC if any advance planning was being done in regard to procurement of spares, Chairman, NTPC replied:

“We do plan in advance. Some of our orders with BHEL are as old as 1975 or 1976. The 1975 order contained 43 items out of which 7 items are still pending. Out of 27 items for boiler spares in the 1976 order, 6 are pending.”

4.4. Chairman, BHEL stated before the Committee:

“Generally, we have taken one year to supply. That is, orders placed in 1980-81 will be completed by 1981-82. We have given our delivery period for various orders. . . . We started about 9 months ago on this problem and we made a special drive. Against our target of Rs. 48 crores, we did production of Rs. 65 crores. It is not my impression that orders are lying with us for the last 7 years unless these orders have become obsolete and fresh orders were placed. . . . We are actually aware of the problem.”

4.5. Chairman, Instrumentation Ltd., Kota stated:

“We have received orders from Badarpur and a fair amount of spares have been supplied. My people have been going and meeting them periodically regularly and we have ensured that no critical item from our side are pending. We are having constant liaison with them.”

4.6. Asked about the time taken in supply spares after receiving the orders, the witness stated:

“It depends on the spares concerned. If it is to be imported and if it is of Russian origin, it takes 2 to 3 years. But if they are indigenous, normally from 6 months to 1 year, we supply.”

4.7. Secretary, Power stated before the Committee:

“As you rightly pointed out, this has been a problem effecting not only Badarpur but also practically every electricity board in the country. There are defaults of three kinds, as far as timely supplies of spares are concerned. One is that there has been poor planning by the Electricity Boards. Many of the spares require 18 to 24 months for manufacture. Secondly, BHEL supplies have not been able to commensurate with the capacity or ability to supply the spares. There are problems with imported spares particularly with Russia. There has been and continues to be difficulties in getting spares from Russia. Last year this problem of spares was discussed in one of the conferences with the Electricity Boards' Chairman. Two or three decisions were taken then. One was that the BHEL should make available drawings of the simple items to the Electricity Boards so that they can either make them in their own workshops or get them made locally. They should also give a clear schedule of delivery of different items. The third recommendation was that the BHEL should earmark 20 per cent of the manufacturing capacity for the production of spares. Since this decision, some improvement in the availability of spares is noticeable. But we are still a long way to go.”

4.8 The Committee desired to be furnished with a statement giving details of orders placed with BHEL/Instrumentation Ltd., Kota for spares etc. for Badarpur Thermal Power Station, spares since received and the orders still pending. In reply, the following statement has been furnished:

“STATEMENT SHOWING POSITION OF ORDERS STILL PENDING WITH

	I.L.K.	B.H.E.L.
1. No. of orders placed.	61 Nos	402
2. No. of orders executed.	15	231
3. No of orders pending (part supply)	15	45
4. No. of orders pending (All items)	31	126”

4.9. The Committee note that renovation/modification programme in the Badarpur Thermal Power Station has suffered because of non-supply of spares by indigenous manufacturers viz. M/s. BHEL and U.K. It has also been brought to the notice of the Committee that some of the recommendations of the West German Team of Experts could not be implemented because the requisite spares were not available from the indigenous manufacturers. From the statement furnished by the Ministry of Energy (Department of Power), it is seen that out of 402 orders placed with M/s. BHEL between 1977 and 1981, only 231 orders were executed, 45 orders were partly executed and 126 orders were not executed. The position is still worse in respect of M/s. Instrumentation Ltd., Kota as out of 61 orders placed, only 15 orders were executed, 15 were partly executed and 31 orders were not executed till the end of 1981. Some of the orders placed as early as 1975 or 1976 are still pending. The Committee fail to understand how the power stations can run efficiently if the requisite spares are not available in time. They would like to express their deep concern over such abnormal delays in supply of spares and expect that prompt necessary action would be taken in this regard.

(b) Quality of coal supplied to the Power Station

4.10. One of the reasons for the unsatisfactory performance of the thermal power stations in the country is stated to be the poor quality of coal supplied to these power stations. These complaints relate to higher ash content as well as mixture of extraneous matter such as stones, shales etc. affecting the performance of the equipment.

4.11 Regarding the problem of quality of coal, Secretary (Power) stated before the Committee:

“I would only submit that when people talk of the problem of coal in power stations it is not merely the question of ash which is relevant. Certain kinds of problems have arisen in a number of power stations because the size of coal which is supplied has been beyond what the coal handling equipment in the power stations is designed. This has been a complaint in a number of power stations and this has been taken up with the coal companies and a programme of installing coal handling equipment at the mine heads has been taken on hand. What the coal handling plants would do is to carry out the work of crushing and screening which will ensure that when the coal reaches the power stations it is not over-sized beyond the capacity of the coal handling equipment at the power stations. There are also other kinds of problems as far as use of coal in power stations is concerned. One problem arises during the monsoon months. This was a problem faced in Badarpur

also this year because coal comes in wagons in a highly moist and wet condition and if it contains dust, it becomes very sticky and it becomes extremely difficult for the coal handling equipment to unload the coal within the power stations and to utilise the coal. Therefore when we talk of the problem of coal in power stations, I submit it is not merely the ash content.

One other point which I have forgotten to mention is that another problem which is common in a number of power stations is the admixture of non-coal matter in coal i.e. shale and stone. This obviously creates problems in the power stations. The coalcrushers at mine head would of course help partly to eliminate non-coal matter. Our experts are examining the measures to eliminate this non-coal matter in the coal through some mechanical equipment. This is also being examined thoroughly."

4.12. The witness further stated:

"We are not washing coal for the power stations in this country. There are studies currently underway, in regard to the feasibility of washing the coal for power stations. The economics of the process of washing is something which requires a very close look. This is being examined separately."

4.13. The Committee desired to know the reasons why poor quality of coal containing extraneous matter was being supplied to the power stations. In reply, Secretary (Power) stated:

"First of all, let me explain why the problem of stone and shale has become a little more pronounced in the last few years compared to earlier period. If you see the pattern of coal production in the country, you will find that the production of coal from open cast mines is rising very sharply. Traditionally bulk of coal production has come from underground mining where stones and shales could easily be segregated by the minor. Today a large number of electricity boards are supplied coal from open cast mines where the method of mining is such that the shovels cannot separate shale and stones from coal. This is one of the reasons. And again, let me say that a number of power stations in the country get ROM coal. We are now trying to improve matters by introducing coal handling plants at the coal mines where crushing will be done."

It will eliminate shale and stones to a substantial extent. Secondly, even in mechanised mining, certainly it is possible to improve or to minimise the presence of stones if some care and

supervision is exercised. Measures have now been introduced for taking samples either at the coal mines or at the receiving end. Power stations used to receive coal from a number of collieries. We have now tried to identify and eliminate those mines from where we get bad coal. The last point which is under consideration is to introduce crushers at the power stations. This will again help eliminate shale and stones."

4.14 It was brought to the notice of the Committee that a lot of diverted coal is being supplied to the Badarpur Thermal Power Station and this coal is not suitable for the equipment in the Power Station. The Committee desired to have the figures of total coal supplied to the Power station during the last three years, the amount of diverted coal received and the percentage of diverted coal to total quantity of coal received. In reply, the following figures have been furnished:

(Figures in lakh M. Ts)

	1979-80	1980-81	1981-82 (upto August 1981)
1. Coal booked to BTPS and received	7.06	9.26	3.37
2. Coal diverted to BPTPS	2.86	4.08	2.36
	9.92	13.34	5.73
Percentage of diverted coal to total quantity of coal received	28.83	30.58	41.19

4.15 The Committee note that one of the reasons for the poor performance of the thermal power stations in the country is the supply of coal of poor quality. The coal supplied has not only a excessively high ash content but it also contains extraneous matter like stones and shales which damages the equipment and adversely affects the working of the power stations. The Committee regret to note that no solution to this problem has so far been found. They recommend that this problem should be tackled on a priority basis and for this purpose a package of measures should be undertaken without delay. One such measure could be to post special Inspection Teams at the Collieries to check the coal being loaded for the power stations and special staff be deployed to segregate extraneous matter from the coal. Moreover, a time-bound programme for installing coal handling plants in the open cast mines should be undertaken so that oversized coal may not get mixed up.

4.16. The Committee note that studies in regard to washing of coal are being undertaken. While realising that washing of coal will lead to increase in costs, the Committee feel that the ultimate increase in power generation would more than offset any such increase in cost. The Committee recommend that the matter may be examined and a decision in regard to desirability of washing of coal before supply to power stations be taken expeditiously.

4.17. It has been brought to the notice of the Committee that although for supply of coal, Badarpur Thermal Power Station is linked to Jharia coal mines, a lot of coal from other coal mines is being diverted to Badarpur Thermal Power Station. This has adversely affected the performance of the Power Station as this coal is not suitable for the equipment installed at Badarpur. What is a matter of concern is that the percentage of such diverted coal is on the increase. While the percentage of such diverted coal was 28.83 per cent in 1979-80, the same increased to 30.58 per cent in 1980-81 and was as high as 41.19 per cent between April-August, 1981. This is a matter of deep concern. When the position regarding supply of coal to various power stations is stated to be improving, the Committee fail to understand why it should be necessary to supply coal to Badarpur Thermal Power Station from the coal mines to which it is not linked. The Committee recommend that this matter should be looked into and corrective measures taken urgently.

(c) *Outstanding of Badarpur Thermal Power Station*

4.18. It was brought to the notice of the Committee by the Badarpur Power Station authorities that large amounts were outstanding against the State Electricity Boards to whom the Power Station was supplying electricity. This had adversely affected their ways and means position. The dues against DESU alone amounted to Rs. 34.38 crores. At present the Badarpur Power Station was supplying power costing Rs. 4.5 crores every month to DESU against which DESU was paying Rs. 2.5 crores on an average every month. No interest was being charged against these outstandings.

4.19 Secretary (Power) stated before the Committee:

"I can only submit that of late the arrears have gone up further. The position if anything is worse. We have had a series of meetings with DESU and the Home Ministry. The position broadly appears to be that even the current dues, month by month, they are not able to cope up, let alone to clear the arrears."

4.20 The representative of DESU stated before the Committee:

“There are two or three reasons which are preventing DESU from discharging its financial commitments. Firstly, DESU tariff has not been changed since April 1979 and in these 2½ years, the cost has gone up by 2½ times. Secondly, many local bodies are not clearing their obligations towards DESU. The NDMC itself owe us about Rs. 10 crores. Unless DESU is permitted to revise the tariff, our position is going to become worse in the matter of clearing arrears.”

4.21 The witness further stated:

“The average rate of purchase from Badarpur is 34.5 paise per unit. After adding our transmission cost, administrative expenses etc., it comes to 51 paise per unit. The pooled cost taking all consumers together comes to 41 paise per unit. We are losing 10 paise per unit. . . . The Haryana State Electricity Board owes Rs. 17 crores.”

4.22 Asked if interest was being charged on outstandings, the witness replied:

“According to our existing practice we do not charge any interest from Government undertakings, nor do they charge interest from us.”

4.23 The Committee are concerned to learn that heavy dues were outstanding against Delhi Electricity Supply Undertaking and other State Electricity Boards in respect of electricity supplied by Badarpur Thermal Power Station. The outstandings against DESU alone amount to Rs. 34.38 crores. What is still more disturbing is that these outstandings are on the increase as is brought out by the fact that against electricity worth Rs. 4½ crores being supplied every month, only Rs. 2½ crores are realised. The Delhi Electricity Supply Undertaking have, on their part, stated that they are suffering a loss of 10 paise per unit as they are not being allowed to increase their rates and further they have large outstandings against New Delhi Municipal Committee and other public sector undertakings. The Committee are concerned at this grave irregularity which has been allowed to continue with considerable consequences for the financial health of Badarpur Power Station. The Committee therefore, strongly recommend to the Central Government to appoint a high powered committee to look into the working of the DESU and particularly its finances and effective step taken to see that the arrears are cleared within reasonable period of time, and in no case the delay extends to more than 6 months. The Committee should be apprised of the steps taken in this regard.

4.24 The Committee have been informed that no interest is being charged by Badarpur Thermal Power Station against their outstandings. The Committee feel that as a commercial undertaking, Badarpur Thermal Power Station should charge interest on the outstandings from the parties. It can be expected that the liability for payment of interest on outstandings dues will prompt the concerned parties to clear their dues in time.

CHAPTER V

OTHER IRREGULARITIES POINTED OUT BY AUDIT

A—Purchase of defective motors for cooling tower pumps

5.1 The Audit Para points out that in response to a fender enquiry for purchase of two motors for cooling tower pumps, M/s. BHEL quoted Rs. 18.11 lakhs for the two motors on 27 May, 1975 quotation being valid for 3 months. The Department could not finalise the order within the validity period because of non-finalisation of specifications of pump heads for which the motors were required as the specifications had to be determined on the basis of height of cooling towers which could be known only after the opening of the tenders for the cooling towers on 27 September 1975 since the tenders for this supply were invited later. Hence revised offer of BHEL for Rs. 19.44 lakhs was subsequently accepted. The delivery of motors was delayed. These motors when put to use have been found to be defective as they are drawing more current and emitting abnormal sound.

5.2 The Committee wanted to know whether the defects in the motors had since been removed. Regarding the drawing of more current than the rated full load current M/s. BHEL opined that over current was only marginal and should not affect the functioning of the motors. Regarding the abnormal sound the performance of the imported electromagnetic wedges on motor No. 1 is being watched.

5.3. The Committee enquired why tenders for the cooling towers were not invited earlier than September, 1975. In reply, the Ministry have stated:

“The administrative approval and expenditure sanction for the installation of one unit of 210 MW (Stage-II) was given on 5th June, 1974. The original cost estimate of the project did not provide for cooling tower as the viability of the cooling tower or to have by-pass canal were being studied with a view to find out the most economical and reliable means of providing cooling water. A decision for providing cooling towers was taken in the 28th meeting of the Standing Committee of the BTPCB held on 7th December, 1974. After that, draft specifications were prepared by CEA in February, 1975. The

specifications were finalised by CEA on 24th May, 1975 after obtaining the comments of the Project. Tender enquiry for cooling towers was floated in the press on 18th July, 1975 with opening date as 30th August, 1975. In view of no response the opening date was extended upto 27th September, 1975. The tenders were opened on 27-9-1975. In view of this, the tenders for cooling towers could not be invited earlier.

It was known that height of Cooling Tower will be necessary to determine specification of the head of the pumps. However, it was not possible to wait for finalisation of the tender of Cooling Towers before initiating action for procurement of pumps & motor. The delivery period is 30 months for the supply of cooling water pumps motor compared to the time for construction of Cooling Towers of 18th Months. It was, therefore, necessary to initiate action for procurement of cooling water pumps & Motors ahead of the finalisation of tenders for Cooling Towers on the basis of tentative data. The press tender enquiry for Cooling Water pumps was, therefore, issued in January 1975.

The tenders for Cooling Towers were finalised on the 13th November, 1975. The specifications for the pump head could, therefore, be finalised only after 13th November, 1975 as these were dependent on the corresponding specifications of the Cooling Towers."

5.4 As regards delay in the delivery of the motors, the Department of Power have informed that as per clause 17 of the agreement with BHEL, compensation was to be levied @ 1 2 per cent per week of the delayed portion subject to a maximum of 5 per cent of the price of unit equipment. This worked out to Rs. 1.19 lakhs. An amount of Rs. 1.19 lakhs as compensation for the liquidated damages was levied on the firm on 8th January, 1980. This amount was initially deducted provisionally from the claim of the supplier and has finally been adjusted in November, 1980 accounts.

5.5 Asked about the action taken against the firm for supplying the defective motors, it has been stated that an amount of Rs. 1.81 lakhs has not been released to BHEL.

5.6 The Committee note that tenders for cooling tower pumps for the power station were invited on 27 May 1975. M/s. Bharat Heavy Electricals Ltd. gave quotation for Rs. 18.11 lakhs with a validity period of three months. However, the quotation of the firm could not be accepted as the height of cooling towers was not determined by that time. The tenders for cooling towers were invited later and were opened on 27 September 1975.

The result was that a revised offer of the firm for the same equipment for Rs. 19.4 lakhs was accepted resulting in an extra expenditure of Rs. 1.49 lakhs (including excise duty and sales tax). Although this extra expenditure was incurred, the motors were not delivered within the agreed delivery period and when delivered were found to be defective. The performance of the motors has not yet stabilised. The Committee would like to express their concern at this situation. They would like to be informed of the reasons for the delay in the supply of motors and for defective working and also the action taken.

B—Purchase of Current Transformers not conforming to specification

5.7 It has been stated in the Audit Para that in February 1975 tenders were invited for the purchase of 6.6 KV switchgears with circuit breakers and current transformers for 210 MW unit. Out of 4 tenders received, the tender of firm 'B' (M/s. Parry & Co. Ltd., New Delhi) which offered switchgears with breakers manufactured by another firm 'C' (M/s. Kirloskar Systems Ltd., Bangalore) was the lowest. The offer of firm 'B' was accepted and contract placed on it in October, 1975. The supplies from firm 'B' were received from May, 1977 to December, 1978. However, certain defects in the transformers were noticed by project authorities. The sample inspection at source was waived. The approximate cost of these transformers was Rs. 4 lakhs. Firm 'B' was asked in April, 1980 to replace these current transformers as these did not conform to the specifications in the contract but the firm had not replaced these transformers till July, 1980.

5.8 The Committee enquired whether the defective current transformers had been replaced by the firm 'B' (M/s. Parry & Co. Ltd., New Delhi) and whether any deduction in rate had been allowed for the defective transformers. In reply, the Ministry of Energy (Deptt. of Power) in a note furnished to the Committee have stated:

“The Project did not purchase any current transformers separately. The current transformers in question are part of 6.6 KV switchgear purchased from M/s. Parry & Co., for Unit No. IV of 210 MW at Badarpur. The total cost for the order of switchgear was for Rs. 86.54 lakh, out of which about Rs. 4 lakhs was for current transformers. The current transformers as supplied by the firm conformed to our original specifications and the supplies were effected by the firm accordingly. The amendment in the specification of CTs did not involve any financial implication as the value of the contract remained unchanged after issue of the amendment. The firm did not

agree to change these current transformers stating that the CTs supplied are as per the original specification and are technically feasible for the Badarpur system. The technical aspect of the matter was then reviewed by the Engineering Wing of NTPC, who stated that CTs as originally provided in contract are technically acceptable for the Badarpur System."

5.9 The Ministry of Energy (Department of Power) have also informed the Committee that the inspection of 6.6 KV switchgear, panels was waived in June 1977 to ensure timely delivery of the panels at site.

5.10 The Committee desired to know the original specifications in the tender for the purchase of current transformers. The Ministry of Energy (Deptt. of Power) in a note furnished to the Committee have stated:

"The original specification of the current transformers as incorporated in the 6.6 KV switchgear A/T (30-10-1975) was as under:

The short time current and time rating will be more than the fault clearing time of the associated circuit breaker and that of back up protection."

5.11. The Committee further enquired whether any changes were made therein either unilaterally or in consultation with firm 'B'. In reply, the Ministry have stated:

"An amendment was issued to the A/T by the project on 2 August, 1976 as under:

"The short time current and time rating and dynamic rating shall be the same as that of associated circuit breaker and in case of design limitations the short time rating shall not be less than clearance time on back up protection of respective feeder."

This amendment was made to cater for severest possible fault conditions but it was a unilateral action on the part of the Project and was not in consultation with the supplier. Hence the supplier never agreed to replace the C.T.s."

5.12. The Committee note that transformers were purchased from M/s. Parry & Co. Ltd. New Delhi as part of 6.6 KV switchgear for unit IV of 210 MW at Badarpur. The sample inspection of the equipment was waived with the result that the same were subsequently found to be not in conformity with the specifications in regard to their short time rating. In view of the contention of the firm that the transformers were as per specification, the Committee cannot but reach at the conclusion that the original

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Specification given in the contract was not properly prepared and adequate care to check the equipment was not exercised by the Project authorities, while accepting these transformers. The Committee would like this matter to be examined thoroughly so as to fix responsibility for the lapse.

(c) Cost of Generation

5.13 It is seen from the Audit para, that while in the Project Report the cost of generation was estimated to be 5.65 paise per unit, the actual cost after charging interest was 24.72 paise per unit in 1977-78, 26.47 paise per unit in 1978-79 and 28.54 paise per unit in 1979-80.

5.14 The Committee wanted to know the reasons for increase in cost of generation in the 3 units. The Ministry of Energy (Department of Power) in a note furnished to the Committee have intimated:

“The cost of generation per unit based on revised estimates and 60 per cent load factor of the station worked out to 12.17 paise. The energy actually sent out is, however, less than that generated as some energy (10.5 per cent as per Project Report) is consumed in BTPS itself in auxiliaries and due to step up losses. After allowing for such consumption of electricity the cost per unit sent out came out to 13.60 paise as per the Revised Project estimates. The cost of generation indicated by Audit in the paragraph represents the cost per unit sent out. Even after the revision of the Project Report, there have been further increases in the cost of coal, oil, consumables, spares and other expenses.

The increase in cost of generation (excluding excise duty) during three years is mainly due to the following:

I. Increase due to increase in Coal Cost:

The figure of coal cost assumed in the Revised Project Estimates was Rs. 115/MT including railway freight. The coal cost per unit sent out thus worked out to 7.71 P/KWH. The coal cost including railway freight went up progressively to Rs. 180MT upto 1979-80 giving the cost of 12.73 P/KWH sent out.

II. Increase due to increase in the Price of Furnace Oil

The price of furnace oil was assumed at the rate of Rs. 650/KL in the Revised Project Report which gave the unit cost of 0.97 P/KWH sent out. This also went up progressively and the average furnace oil cost during 1979-80 was Rs. 1224.86/KL giving the cost of furnace oil @ 1.83 P/KWH sent out.

III. Increase due to higher rate of consumption of Furnace Oil

Due to the coal being of low volatile matter and part load operation owing to partial availability of auxiliaries, the consumption of oil which was assumed at 14.88 ML/KWH sent out in the Revised Project Report went up to 26.24 ML/KWH. It increased the cost of per KWH sent out by 1.39 paise on account of higher consumption of oil.

IV. Increase in Expenses other than Fuel Cost

There were also increases in the operation and maintenance cost due to increases in prices of spares, chemicals, lubricants, consumables and wage escalation. There were also higher rate of auxiliary consumption and increase in cost due to lower capacity utilisation. Due to all these factors, the cost of inputs (other than the fuel cost) which was provided @ 4.92 P/KWH sent out in the Revised Project Report, went up to 10.79 P/KWH.

5.15 The Committee desired to know the reasons for increase in cost of power generation at Badarpur Power Station, Secretary, Ministry of Energy (Deptt. of Power) stated during evidence:

“The coal cost was taken at 2.8 paise per unit. Now it has become 12.7 paise per unit. The cost of oil, somehow or other, was not taken into account in the original price. It includes increases on 3-4 major items like depreciation, interest and operation and maintenance expenses. In addition, the central excise duty of 18 paise is now being levied. Part of the price increase in the cost of generation of power has been on account of increase in the prices of inputs. But we must accept that part of the increase because the consumption of coal and oil per unit has turned out to be much higher than anticipated. The tariff was revised from May 1981. This was based on certain norms which we adopted.”

5.16 During their visit to Badarpur Thermal Power Station, the Committee were informed that excessive consumption of furnace oil by the 210 MW Unit supplied by BHEL is mainly responsible for increase in the cost of production. The Committee wanted to know the steps taken or proposed to be taken to reduce the consumption of furnace oil. The Ministry of Energy (Department of Power) have furnished the following statement in this regard:

**REASON FOR EXCESSIVE CONSUMPTION OF FURNACE OIL BY
210 MW UNIT AND THE STEPS TAKEN/OR PROPOSED TO BE
TAKEN TO REDUCE OIL CONSUMPTION**

Sl. No.	Reason	Steps taken or proposed to be taken to reduce oil consumption
(i)	Frequent outage of milling system due to entry of broken pieces of crusher hammer thus necessitating the use of oil support even at quite higher load.	(i)(a) The crusher hammers are breaking mainly due to supply of poor quality of coal containing large sized coal, shale and stones. The matter has been taken up with BCCL & CCI. to supply coal of good quality, there is also a proposal to install a promar crusher to exclude extraneous material such as shale, stone etc.
(ii)	Necessity of oil support even at higher load due to unreliable operation of flame scanners.	(b) USE OF FORGED STEEL HAMMER Orders have been placed for forged hammers. This will be used on trial basis first. If found suitable after trial the same will be ordered for future use. This is under study and recommendations of B.E.I. for flame stablisation will be implemented to see if it can improve its working.

5.17 The Committee asked for a comparative statement of oil consumption in Badarpur Thermal Power Station and other power stations in the country which are using indigenous equipment. The Ministry of Energy (Deptt. of Power) have furnished the following statement:

(a) Operation of 100/110 MW	(ML/KWH)		
	78-79	79-80	80-81
Badarpur 3 x 100	27.01	22.51	14.33
Panipat 2 x 110 . . . . .	..	135	96.6
Bhatinda 4 x 60	31.60	28	18.2
(b) Operation of 200/210 MW (Furnace Oil plus High Speed Diesel) :			
	----- 1980-81 ML/KWH -----		
1. Tuticorin (2 x 210)	78.4		
2. Badarpur (1 x 210)	58.15		
3. Obra (3 x 200)	58.00		

4. Vijayawada (2 × 210)	. . . . .	58.00
5. Ukai (2 × 200)	. . . . .	58.00
6. Nasik (1 × 210)	. . . . .	52.00
7. Koradi (1 × 200)	. . . . .	34.2
8. Bhusaval (1 × 210)	. . . . .	34.00

5.18 The Ministry of Energy (Department of Power) have furnished the following information regarding the oil consumption in Badarpur Thermal Power Station and the extent to which the high consumption of oil and rise in cost of oil has effected the cost of production:

“While fixing the tariff with effect from 1-10-74, the Government had provided oil consumption at the rate of 12.68 ML/Kwh generated at the then prevailing prices of furnace oil of Rs. 650/Klt. The tariff did not provide for any escalation clause to cover the increases in the price of furnace oil from time to time. The actual consumption of furnace oil and the average price at which oil was procured during last three years was as under:

generation	Rate of consumption per KWH	Average rate of procurement		Difference over standard adopted for tariff		
		Value (Paise)	Rs. per KL	Price increase Paise	Excess consumption Paise	Total Paise
(a) As per tariff fixed— w.e.f. 1-10-74	12.68	0.824	650.00	..	..	..
(b) as per Actuals 78-79 St. I	27.01	2.83	1046.86	0.50	1.51	2.01
79-80 St. I	22.51	2.76	1224.86	0.73	1.21	1.94
St. II— (from 17-3-80)	94.34	13.16	1394.70	0.94	11.40	12.34
80-81 St. I	14.33	2.57	1796.22	1.45	0.30	1.75
St. II	56.71	10.19	1796.71	1.45	7.29	9.37”

5.19. The Committee note that as per the Project Report of the Badarpur Thermal Power Station, the cost of generation of electricity was estimated at 5.65 paise per unit. Even in the revised estimate the cost of

generation was estimated to be 12.17 paise per unit. However, the cost of generation was as high as 28.54 paise per unit in 1979-80. This increase is stated to be mainly due to the increase in the prices of coal and furnace oil and higher rate of consumption of coal and furnace oil.

5.20 The Committee have, in an earlier chapter already stressed the need for improving the quality of coal supplied to the power station. They hope that with the improvement in the quality of coal, the consumption of furnace oil will also come down thus reducing the cost of generation. The Committee would like that all efforts should be made to reduce the cost of generation in the plant and for this the factors contributing to the escalation in the cost of generation should be identified and corrective measures should urgently taken in this regard.

NEW DELHI;
March 9, 1982
Phalguna 18, 1903 (S)

SATISH AGARWAL
Chairman
Public Accounts Committee.

APPENDIX—I

(Vide paragraph 1-13 and 1-15)

	1977-78	1978-79	1979-80
1. Dates of commissioning:			
Unit I	26th July 1973		
Unit II	5th August 1974		
Unit III	29th March 1975		
2. Installed capacity (million Kilo-watt-hours)	2496	2409	2365
3. Plant factor (per cent)	33·62	43·80	53·87
4. Projected capacity at 60% load factor (million Kilowatt hours)	1497	1445	1419
5. Total hours available:			
Unit I	8760	8760	8760
Unit II	8760	8760	8760
Unit III	8760	8760	8760
6. Actual hours operated:			
Unit I	5616	3237	6132
Unit II	1123	6552	6686
Unit III	3917	5279	5302
7. Energy generated (million Kilowatt-hours)	839·43	1056·08	1274·00
8. Percentage of generation to projected capacity	56·07	73·08	89·78
9. Consumption in station auxiliaries (million Kilowatt-hours)	115·28	139·05	181·00
10. Percentage of consumption of units generated	13·75	13·16	14·19
11. Energy sold (million Kilowatt-hours)	724·15	917·03	1093·00
	(Rupees in lakhs)		
12. Revenue earned	1425·91	2011·72	2745·57
13. Operation and maintenance expenses			
(a) Fuel	798·28	1197·38	1741·09
(b) other operation and maintenance	370·21	459·95	520·02
(c) excise duty	6·75	166·19	196·78
(d) depreciation at 3·4 per cent	198·29	198·29	198·29
Total (a) + (b) + (c) + (d)	3731·53	2021·81	2656·18

14. Profit (+)/Loss(—) before charging interest	.	.	(+)52.38	(—)10.09	(+)89.39
15. Interest on capital at 5.5 per cent for 1977-79, 5.63 per cent for 1978-79, 5.8 per cent for 1979-80	.	.	416.81	405.76	463.28
16. Profit (+)/Loss (—) after charging interest.	.	.	(—)364.43	(—)415.85	(—)373.84

APPENDIX II

(Vide Para of 1.29)

DETAILS OF VARIATION BETWEEN ORIGINAL ESTIMATE AND THE REVISED ESTIMATE

Sl. No.	Description of items	Provision in the original B.E.	Total revised cost	Variation	Remarks
1	2	3	4	5	6
1.	Work	(Rs. in lakh)			
1.1	Preliminary expenses such as preparation of lay out plans & other preliminary studies	10.00	6.26	(-) 3.74	
1.2	Land	35.50	66.37	(+) 30.87	Due to increase in cost of land acquisition, the area acquired (about 678 acres) was also considerably more than what was originally contemplated (412 acres).
1.3	Telephone, temporary power and lighting system	5.00	22.56	(+) 17.56	The original provision of Rs. 5 lakh was <i>ad hoc</i> . There has been increase in numbers of transformers, length of cables and distribution lines, No. of telephones and substantial increase in the period for which these services are required.
1.4	Buildings				
1.4.1	Temporary buildings & Structures	17.00	36.97	(+) 18.87	(i) The original estimates were prepared in 1965 as per then prevalent rates and the Delhi schedule of rates of 1962. The rates have since substantially gone up due to increase in labour rate and cost of material. Consequently most of the contractors have tendered higher rates.

(1)	(2)	(3)	(4)	(5)	(6)					
1.4.2 Main Power House Building and Auxiliary structures . . .	460.60	772.78	(+)	312.18	(ii) The quantity of structural steel and miscellaneous steel work has increased due to changes in design, use of higher sections of steel on account of the non-availability of some designed sections and for non-availability of some designed sections and for meeting certain essential additional requirements. (iii) At the time of actual execution of works, there were considerable changes in the excavations to be carried out, on account of rocks having been met at levels other than anticipated and in the case of a number of foundations, including that of boiler foundations, there was a considerable increase in the quantity of earth works, consequently of concreting work involved and re-inforcement steel work.					
1.4.3 Permanent residential Non-residential buildings . . .	68.79	91.54	(+)	22.75						
1.5 Power Stations Equipment & step-up Station Equipment										
1.5.1 Procurement	}									
1.5.2 Spares for two years operation						2199.26	3837.27	(+)	1638.01	The original estimates were prepared on the basis of the landed cost of comparable imported plant and equipment ruling at that time. The actual cost of the indigenous plant and equipment, procured mainly from BHEL worked out to be substantially more than the original estimated cost. The erection charges were also considerably more than what was originally assumed in the estimates. The increased costs are mainly attributable to all-round escalation.
1.5.3 Erection						274.91	388.71	(+)	113.80	

1.7 **COMMUNICATION:**

1.7.1	Roads	10.00	9.61	(—)	0.39	
1.7.2	Railway	300.00	145.50	(—)	154.50	The provision has been reduced due to some changes in the lay out of the marshalling yard, changes in the designs of culverts and bridges and the inclusion of the cost of levelling work of the Railway tracks inside the power station area against other works. Non-provision of residential quarters for the Railway staff as per the original estimates.

1.8 **SPECIAL TOOLS AND PLANTS**

1.8.1	Gross Expenditure	227.45	105.66	(—)	121.79	Due to economy effected in the purchase of special T & P and also a number of erection contracts having been awarded to the various contractors instead of departmental execution envisaged earlier, the provision has been reduced.
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1.10	Preparation of drawings, Project Report, designs and engineering charges	50.00	103.03	(+)	53.03	Considerable changes/modifications have been made in designs to suit the site conditions. Further there has been considerable enhancement in Pay & D. etc.
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1.13	Maintenance during construction	16.50	77.12	(+)	60.62	(i) Delay in commissioning by 6 months; (ii) Increase in the cost of consumable & (iii) Escalation in the wage rates.
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1.14	Miscellaneous	10.00	19.49	(+)	9.49	Inclusion of new items of works.
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Total of I works: §

3685.01 5682.77 (+) 1997.76

(1)	(2)	(3)	(4)	(5)	(6)
2.	Establishment required during construction	226.54	236.03	(+) 9.49	Enhanced rate of pay & D. A.
3.	Ordinary Tools and Plants	45.21	43.57	(-) 1.64	
4.	Audit & Accounts Charges	37.30	25.00	(-) 12.30	
5.	Contingencies @3% on total estimated cost including lump sum provision	114.72	..	(-) 114.72	
..					
		4108.78	5987.87	(+) 1878.59	

APPENDIX III

(Vide Paragraph 2.8)

Statement showing reasons of Trippings Occurred in 1977-78, 1978-79 and 1979-80 and the Corrective measures taken.

Sl. No.	Reasons	No. of trippings	Corrective measures taken
1	2	3	4
1977-78			
1.	<i>Boiler Tube failure</i>	6	100 MW installed at Badarpur, being the first such sets manufactured by M/s. BHEL were giving lot of problem since its commissioning. As per the recommendation of the Committee set up by the Ministry of Energy a renovation programme covering major modifications and replacement of superheater, economiser and air pre-heater were drawn. Accordingly, renovation of Unit-II was carried out during its annual overhauling from September, 80 to November, 1980. In this shut down convection superheater-I and economiser-I & II were replaced with unproved design and better materials. Similarly the renovation of Unit I is programmed during its overhaul to be commissioned from February 1982 to April 1982. Renovation of Unit-III is programmed from July 1982 to September 1982. The renovation programme will improve its availability and utilisation.
2	<i>Failure of Boiler Aux.</i>	6	To minimise mill fan erosion, the cyclone dust separator length was increased. Forced bearing cooling system was adopted. Burners have been modified. Basalt lining bends have been changed in Unit-II & III during 1980 and 1976 respectively.
	(Milling system specially mill fan. Impeller casing etc. of mill were getting frequently eroded. Failure of bearings was frequent due to faulty of bearing cooling system. Primary air & fuel switch boxes of coal burners were getting eroded frequently. Leakage in Valves flange etc.)		

1	2	3	4
3. <i>Turbine</i>	(Turbine vibration in Unit-I, failure of thrust pad in -1 Trouble in governing system Unit-I. Bending of L.P. rotor in Unit-III. High axial shift in Unit-III.	6	Turbine vibration in Unit-I was due to failure of H. P. blades which were remained under shut down for six months afterwards. Failure of thrust pad and high axial shift were due to salt deposits in blades. This was because of defects in drum internal which were rectified latter on.
4 <i>Turbine Aux.</i>	(Leakage in balancing, chamber and seal, condenser tube leakage and other leakage in various valves and flanges.	7	Preventive maintenance carried out.
5 <i>Electrical Failure :</i>	Exciter and generator failure in Unit-III.	3	All these were due to manufacturing defects which were rectified.
6 Grid disturbance		12	A under frequency relay has now been provided to isolate BTPS from grid under disturbance.
7. <i>Tripping on Protection :</i>			
	(i) Drum Level	9	
	(ii) Low condenser vacuum	8	
	(iii) B. F. P.	4	A system of analysing each of the tripping and mal-operation with remedial measures had been introduced during 1978. Tripping reports are circulated and implemented.
	(iv) ID/FD/PA Fan	10	
	(v) Electrical potection	10	
	(vi) C & I mal functioning	4	
8. Misc. /Coal Shortage/Agra Canal closure/Laboures trouple/ planned etc.		14	In order to exercise control over quality and persuing the supplies from the linked colliery for required quality a coal monitoring cell has already been established. Desilation of intake channel is being done to increase flow of cooling water. Labour relation has improved.
TOTAL :		109	

1978-79

1. <i>Boiler Tube Failure</i>	16	As given in 1977-78 (Serial No. 1)
2. <i>Failure of Boiler Aux.</i> (Valve/line connecting flange leakage/coal pipe leakages etc.)	9	Bends have been replaced with basalt lining. Preventive mtc. of valves are now being carried out.
3 <i>Failure of Turbine Aux.</i> (Various leakages in condensate, Feed and Main Steam lines.)	15	Leakages were attended and Preventive Maintenance are carried out.
4. <i>Turbine</i> (When Unit-I turbine was commissioned during July 1978 after removing two H.P. stages it gave repeated problem of vibration.)	6	The vibration was brought down by balancing afterwards.
5. <i>Grid disturbance</i> (Because of general shortage of power generation as compared to load demand in the Northern Region, voltage conditions around Delhi area had been poor. As such, whenever there was slight jerk in the system, the incoming breaker of the station section used to get-over loaded and there was failure of station supply; thus affecting both the running units, which were dependent upon the station supply.)	35	A under frequency relay has now been provided to isolate BTPS from grid under disturbance.
6. <i>Electrical</i> : (i) Flash over terminal of high capacity motor. (ii) Failure of switchgear under low voltage conditions.	41	Periodical checking of terminal boxes are being carried out under Preventive Maintenance system.

1	2	3	4
7 Tripping on Protection :			
	(i) <i>Drum level</i> (System jerk/Partial fire out/furnace instability/auto feed flow regulation failure)		} A system of analysing each of the tripping and mal-operation with remedial measures had been introduced.
	(ii) <i>Low condenser vacuum</i> (Shortage of cooling water; Dip in voltage due to grid disturbance causing tripping of C.W. Pumps or condensate pumps on over-load.)	20	
	(iii) <i>Boiler Feed Pump</i>	8	} Tripping reports are circulated and implemented.
	(iv) <i>I.D./F.D./PA Fan</i>	3	
	(v) <i>Main steam temperature higher/low</i>	7	
	(vi) <i>C & I (Malfunctioning of relays)</i>	2	
8	<i>Coal Handling Plant trouble/Coal Shortage/Agra Canal/Labourers trouble/Planned Maintenance.</i>	21	In order to exercise control over quality and persuading the supplies from the lined colliery for required quality a Coal monitoring cell has already been established. Desiltation of intake channel is being done to increase flow of cooling water. Labour relation has improved.
TOTAL		199	

74

1979-80

1. Boiler Tube leakage

(Due to prevailing grid condition at that time, it was not found possible to take Unit—II out for overhauling. Thus as a result of overhauling there had been excessive tube failure.)

28

As given in Sl. 1 in 1977-78.

2. <i>Boiler Aux.</i>		
(Due to long overdue maintenance in Unit—II there had been outages of P.C. Feeders/burners).	11	These were attended during overhaul, September 1980,
3. <i>Main Turbine</i>		
(Abnormal top/bottom temperature difference in Unit—I).	2	This was due to passing of NRV in spindle leak offline, which was attended afterwards.
4. <i>Turbine Aux.</i>	10	
(Condenser tube leakage, various valves leakages due to long overdue overhauling of Unit-II).		Source of failures got rectified during overhaul september, 1980.
5. <i>Electrical</i>	47	
(Premature failure of carbon brushes of Main exciter/ flash over/ Bus failure/malfunctioning of relays related to Electrical protection).		Frequent failures of carbon brushes was obviated by installing of better quality and also sliprings were polished.
6. <i>Coal Handling Plant :</i>	7	
		New conveyor motors were installed as we noticed frequent loosening of end coils of earlier motors.
7. <i>Gird disturbance</i>	16	
		A frequency relay now had been provided to silate, BTPS from grid under disturbed condition.
8. <i>Tripping on protection :</i>	48	
(i) <i>Drum level</i>		
(Due to heavy passing in feed regulating station valves in Unit—I)		A few of these valves have been replaced and rest will be replaced during Capital Maintenance February, 1982.
(ii) <i>Low condenser vacuum :</i>	21	
(Overload trippings of C.W. & condensate pumps/ condenser checking/system jerk).		Now condenser cleaning is being done periodically.

1	2	3	4
(iii) <i>Tripping of Boiler Feed Pumps</i> : (This is also because of passing in Feed regulating station valves).	10	Same as in Sl. No. 8(i).	
(iv) <i>Low/High steam perature</i> : (Low steam temperature tripping is affected by the passing in feed regulating station valves at low load.)	16	Same as in Sl. No. 8(i) ;	
(v) <i>I.D./F.D./PA Fan</i>	12		
9. <i>C & I.</i>			
Mal-functioning of relays & instruments).	18	Preventive maintenance is being carried out to avoid mal functioning.	
10. <i>Miscellaneous</i> : (Low system demand/Fire/Oil shortage/Planned maintenance)	14		
TOTAL :	260		

APPENDIX IV

(Vide Paragraph 2.11)

Statement showing reasons of advanced/delayed overhauling of units since Commissioning

Overhaul	Unit-I	Unit-II	Unit-III
1. Planned Hours of Run before overhaul.	Commissioned in July, 1973 1-9-75 to 15-10-75 12081 hrs.	August 1974 15-10-75 to 1-75 Deferred to July, 1976 13297 hrs.	March, 1975 September-October, 76 Deferred to July, 1977.
Actually done	31-8-75 to 4-1-76	2-8-76 to 2-76	21-4-77 to 29-6-77.
Reasons for advance/delay	Unexpected failure of main transformer, un-planned shut down was utilised for overhauling of unit and major modifications of convection Superheater.	Due to shortage of power in Northern Grid and non-receipt of modification material for Boiler.	Due to shortage of power in Northern Grid and breakdown of Unit-II on 8-1-77 as its Turbine HP Rotor got damaged. However, due to development of bow in L.P. Rotor of Unit-III it had to be taken out for repairs of Turbine.
2. Next overhaul due .	January, 1977	October, 1977	June, 1978.
Hours of run before overhaul.	14,067	Boiler not done	Boiler not done.
Overhaul actually done.	31-1-78 to 20-7-78	8-1-77 to 27-1-78	7-1-78 to 23-3-78.
Reasons for delay.	Could not be done in planned manner due to failure of Unit-II Rotor in Jan. 1977 and non-availability of spares ordered in 75.	There was damage in HP Rotor in Jan.77 and it was brought back on the bar in Jan. 78 after the Rotor was received from BHEL Hardwar duly replaced.	There was breakdown in main exciter and generators rotor and stator.

Overhaul	Unit-I	Unit-II	Unit-III
3. Next overhaul due.	July, 1979	January, 1979	March, 1979
Hours of Run before overhaul.	18,262 (2nd overhaul to August 1981)	18,232 (1st overhaul to 2nd overhaul)	25,591 (1st overhaul)
Actually done	Planned in July, 1981 Deferred to Nov, 1981	10-8-80 to 3-12-80	4-9-79 to 8-12-79
Reasons for delay	<p>Overhaul was postponed till Dec., 80 due to Unit-III overhaul which was already overdue. However it could not be done in December, 1980.</p> <p>(i) Non-availability of spares. Order placed in Dec., 1979.</p> <p>(ii) Chairman, CEA decided to postpone the overhaul till July, 1981 due to erection of E. P. of I. P. Station, DESU.</p> <p>(iii) Further it has been postponed to October, 81 keeping in view system demand and overhauling of units at DESU.</p> <p>(iv) Further postponed to February 82 due to demand of Rabi Crop Irrigation.</p>	<p>(i) Acute shortage of Power in the Grid.</p> <p>(ii) Non-availability of Boiler modification materials and spares from BHEL.</p> <p>(iii) Non-availability of the HP Rotor to bring the unit on full load which had to be imported from U.S.S.R.</p>	<p>(i) Non-availability of Boiler modification materials and spares from BHEL.</p> <p>(ii) Unit-I was already under shut down since January, 1978 and could be brought back on full derated load by Nov, 78. From Nov, 1978 onwards the power position was acute. NREB prevailed upon not to take overhaul till September, 1979 due to system demand and the breakdown of R.A.P.S. Kota.</p>

APPENDIX V

Conclusions/Recommendations

Sl. No	Para No.	Ministry concerned	Recommendations
1	2	3	4
1.	1.36	Ministry of Energy (Deptt. of Power)	<p>Badarpur Thermal Power Station has been set up as a regional power station in the central sector to supplement the availability of power for meeting the growing demand in Delhi as well as other States in the northern region. The construction of this power station started in 1967 and the project has been implemented in three stages. Stage I comprising of three units of 100 MW each and Stages II and III each comprising one unit of 210 MW.</p>
2.	1.37	-do-	<p>The Committee are concerned to note that there have been delays in commissioning as well as heavy escalation in the cost of the various units of the Badarpur Thermal Power Station set up so far. Unit I was originally targeted for commissioning in March 1971 but the same was commissioned only in July 1973. Similarly, Unit II which was scheduled to be commissioned in September 1971 was commissioned in August, 1974 and Unit III was commissioned in March 1975 against the target date of March 1972. The position in respect of Unit IV is still worse, as while the unit was commissioned in December 1978 against the target date of December, 1977, the same could be put on commercial operation only in</p>

1

2

3

4

March 1980 due to the various defects and deficiencies noticed in the equipment supplied to the power project and the time taken in rectifying the same.

3.

1.38

Ministry of Energy
(Deptt. of Power)

The Committee note that the delays in commissioning Units I, II and III (Stage I) were mainly due to the delay in issue of administrative and expenditure sanction, defective preparation of feasibility report in respect of sub-soil conditions, delay in the completion of civil works and shortage of scarce materials like steel, cement etc. The delay in completion of Unit IV (Stage II) of the project was due to delays in completion of civil works, non-sequential supply of equipment by BHEL and delay in supply of control and instrumentation equipment by M/s. Instrumentation Limited, Kota. Moreover, due to discrepancies and defects found in the Boiler and Turbo Generator equipment, a number of modifications and repairs had to be carried out thus consuming considerable time. The Committee feel that these delays could have been avoided if the project authorities had been more careful in planning the execution of works and taken steps to ensure that the works were executed expeditiously. They would like to express their serious concern on these delays in a vital sector like power.

88

4.

1.39

-do-

The Committee note that there has been heavy escalation in costs in both stage I and Stage II of the Project. While the original sanctioned cost of Stage I of the project was Rs. 41.08 crores, the same was subsequently revised to Rs. 59.87 crores and the final anticipated cost is Rs. 64

crores. The escalation of cost in respect of Stage II is still more as is evident from the fact that against the original estimated cost of Rs. 38.37 crores, the total estimated expenditure is Rs. 74.76 crores i.e. an escalation of about 100 percent. What is more surprising is that several works which had to be taken up subsequently were either not included in the original estimate or the quantities of work had to be considerably increased. It has been admitted by the representative of the Ministry of Energy (Department of Power) in evidence before the Committee that the initial estimate was defective, the capital cost of the project itself was not accurately estimated and the same was based on incomplete data. The Committee are unhappy that the project reports were prepared on the basis of unrealistic estimates and incomplete data. They have a feeling that in many cases project estimates are deliberately kept low with a view to obtaining early sanction fully realising that once the project is sanctioned and work on the same is started, there would be no alternative for the Government but to continue with the work in spite of escalation in the costs of the project. The Committee would therefore like to emphasise the need to prepare project reports and estimates more realistically taking into account all relevant data and factors so that subsequent revisions and resultant escalations in costs could be obviated.

5.

I.40

-do-

What is most disturbing is that the time and cost over-runs has not been a peculiar feature in Badarpur Thermal Power Station but is a common feature of the power projects taken in hand since independence. This is borne out from the fact that when during evidence, the Committee desired to know if there was a single power project—hydel or thermal—completed since independence within the approved estimates and stipulated

target date, the representative of the Department of Power failed to cite a single such case and admitted that "it has been our unfortunate experience that time and cost over-runs are there on the projects" and that order of escalation had also been of a high order.

6. 1.41 Ministry of Energy
(Deptt. of Power)

The Committee note that in none of the Five Year Plans, the target of achieving additional generating capacity has been fulfilled. While the shortfall in the First Five Year Plan was 15.4 per cent and in the second and third plans, the same was 35.7 per cent and 33 per cent respectively, the shortfall was as high as 50.2 per cent in Fourth Five Year Plan. The shortfall was 18.4 per cent in the Fifth Plan period. Such shortfall is continuing in the Sixth Plan also as is evident from the fact that during 1980-81 against a target of 2,687 MW in generating capacity only 1643 MW capacity was commissioned and 180 MW rolled showing a slippage of 38.9 per cent. Even in 1981-82, against a target of 3,212 MW only 2,300 MW is expected to be added even according to the most optimistic estimates. This is a clear failure of planning process and present system of monitoring of projects.

7. 1.42 -do-

The Committee have no doubt that this failure to commission power projects as per target date is one of the factors responsible for the present power crisis in the country which is a serious bottleneck in economic development. According to calculations of the Department of Power, one year's delay in commissioning 1 MW of power results in a loss of Rs. 1.78 crores to the economy. Thus the colossal loss to the country as a result of these slippages can well be imagined. There is a tendency on

the part of the Ministries and the executing agencies concerned to blame each other for such slippage. The Committee strongly feel that this state of affairs should not be allowed to continue any longer and some firm and effective measures should be taken to overcome such deficiencies.

8 1.43 -dc-

The Committee need hardly point out that it is proposed to add 19,666 MW of generating capacity during the Sixth Five Year Plan period which is by all reckoning a challenging task and requires sustained efforts by all concerned and close monitoring. The Committee, therefore, recommend that Government should appoint a Monitoring Agency consisting among others of representatives of the Department of Power/Central Electricity Authority, Department of Heavy Industry/BHEL & ILK, Planning Commission, Ministry of Finance and Railways to monitor the progress of power projects in the country on a continuous basis and to initiate corrective measures at the earliest in implementation of power projects.

9 1.44 -do-

The Committee further recommend that the performance of State Electricity Boards in the field of execution of power projects according to targets should be taken into account while sanctioning new power projects.

10 2.17 -do-

The Committee are concerned to note that the performance of the Badarpur Thermal Power Station has not been satisfactory as is evident from the fact that the plant load factor (percentage of utilisation) was only 33 per cent in 1978-79, 34 per cent in 1979-80 and 46 per cent in 1980-81. Even in the case of Stage I Unit which were commissioned by the year 1975, the plant load factor had been only 33.62 per cent, 43.80 per cent and 52.80 per cent. during the years 1977-78, 1978-79 and 1979-

80 respectively. Thus, the plant load factor has been much less than the ideal level of performance fixed at 60 per cent and also the level of utilisation achieved in a number of power stations in private sector as well as in other States like Maharashtra and Gujarat. The Committee would like to point out that Badarpur Thermal Power Station is the first regional thermal power station set up in the Central sector and since a number of power stations are now being set up in the Central sector, Badarpur Thermal Power Station should function as a model of efficiency. The Committee therefore expect that the performance of the Badarpur Thermal Power Station will be kept under constant watch and corrective measures taken to achieve utilisation level of at least 60 p.c. load factor.

In this connection, the Committee would like to express their serious concern at the low capacity utilisation in all the thermal power stations in the country as a whole. The plant load factor of thermal power stations in the country which was 56 per cent in 1976-77 has been showing a deteriorating trend and the same declined to 45.4 per cent in 1979-80 and 44.9 per cent between April and November, 1981. The Committee have no doubt that if this trend of deterioration in the capacity utilisation in the power plants is not reversed, the country will continue to suffer from chronic shortage of power even after adding the targetted capacity of 19,666 MW in the Sixth Plan. The Committee would like to emphasise that a detailed methodology to maximise power generation in the country should be worked out and follow up action taken expeditiously so that the utilisation of the power stations in the country reaches the optimum

level of performance at 60 per cent as prescribed by the Central Electricity Authority.

12

2.19

-do-

The Committee are constrained to observe that not only the utilisation of capacity in the Badarpur Thermal Power Station is unsatisfactory but the generation of power is also highly uncertain as is evident from the fact that there were as many as 108, 199, 260 and 173 trippings in the power station during 1977-78, 1978-79, 1979-80 and 1980-81 respectively. As a result of these trippings, large areas of the capital and neighbouring States were plunged into darkness disrupting economic activity. The Committee cannot but express their deep concern at this large number of trippings. Since the reasons for these trippings have already been identified as given in the statements furnished to the Committee, concrete measures should be taken to do away with the trippings. The Committee should be informed of the action taken in this regard at an early date.

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13

2.20

-do-

The Committee note that the overhauling and maintenance of the plant and equipment at the Badarpur Thermal Power Station has not been carried out as per prescribed time schedule. They have no doubt that this delay has contributed to the frequent trippings in the power station and reduced generation. The Committee would like to point out that the postponement of overhauling of equipment to meet immediate demand is a shortsighted policy as it may cause serious damage to equipment resulting in closure of power station for long periods and higher forced outages. They, therefore, recommend that in future the authorities of the power station should adhere to the scheduled dates of overhauling and maintenance.

1	2	3	4
14	2.21	Ministry of Energy (Deptt. of Power)	<p>The Committee note that a Team of West German Experts had visited some thermal power stations in the country including Badarpur Thermal Power Station thrice viz. in 1977, 1979 and 1980-81 and the Team had made a number of recommendations to improve the performance of Badarpur Thermal Power Station. However, out of 276 recommendations made by the Team, only 160 have so far been implemented. Twenty-five recommendations have been found unacceptable and 77 recommendations are yet to be implemented. On 14 recommendations further comments of the Team are awaited. The Committee would like to be informed of the specific action taken on the recommendations of the Team which have been accepted.</p>
15	3.19	-do-	<p>Boiler and Turbo-generator equipment for the Badarpur Thermal Power Station—Stage II was supplied by M/s. Bharat Heavy Electricals Ltd. Although the equipment was to be supplied by August/September, 1976, the major supplies were completed by April, 1978 only. During erection stage, a number of defects and deficiencies were found in the boilers and equipments and some of the equipments had to be sent back to BHEL workshop for modification and rectifications of the defects while some defects were repaired at site with the result that the unit could be put to commercial operation from March, 1980 only. The Committee cannot, but express their deep anguish at this.</p>
16	3.20	-do-	<p>The Committee have taken note of the statements made by the representative of the Ministry of Energy (Department of Power) before</p>

the Committee that "one lesson which we have now learnt is that the designs which were prepared or considered suitable for use in a certain country require extensive adaptation and modification when used in a different country" and that "there is a feeling among the various customers—I include in them the State Electricity Boards and NTPC—that the internal quality control procedure of BHEL over the years was not adequate".

The Committee have further taken note of the statement made by the representative of Department of Heavy Industry that they have now entered into a foreign collaboration and the performance of the new units based on this collaboration is better. The Committee would not like to make any detailed comment on the subject as the Committee on Public Undertakings is making a detailed examination of BHEL. They, however, hope that the equipment supplied by the indigenous manufacturers to the power stations in future would be free from all defects and deficiencies so as to satisfy the technical needs and requirements of the power stations.

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4.9

-do-

The Committee note that renovation/modification programme in the Badarpur Thermal Power Station has suffered because of non-supply of spares by indigenous manufacturers viz. M/s. BHEL and ILK. It has also been brought to the notice of the Committee that some of the recommendations of the West German Team of Experts could not be implemented because the requisite spares were not available from the indigenous manufacturers. From the statement furnished by the Ministry of Energy (Department of Power), it is seen that out of 402 orders placed with M/s. BHEL between 1977 and 1981, only 231 orders were executed, 45 orders were partly executed and 126 orders were not executed. The position is still worse in respect of M/s. Instrumentation Ltd., Kota as

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			<p>out of 61 orders placed, only 15 orders were executed, 15 were partly executed and 31 orders were not executed till the end of 1981. Some of the orders placed as early as 1975 or 1976 are still pending. The Committee fail to understand how the power stations can run efficiently if the requisite spares are not available in time. They would like to express their deep concern over such abnormal delays in supply of spares and expect that prompt necessary action would be taken in this regard.</p>
18	4.15	Ministry of Energy (Deptt. of Power)	<p>The Committee note that one of the reasons for the poor performance of the thermal power stations in the country is the supply of coal of poor quality. The coal supplied has not only a excessively high ash content but it also contains extraneous matter like stones and shales which damages the equipment and adversely affects the working of the power stations. The Committee regret to note that no solution to this problem has so far been found. They recommend that this problem should be tackled on a priority basis and for this purpose a package of measures should be undertaken without delay. One such measure could be to post special Inspection Teams at the Collieries to check the coal being loaded for the power stations and special staff be deployed to segregate extraneous matter from the coal. Moreover, a time-bound programme for installing coal handling plants in the open cast mines should be undertaken so that oversized coal may not get mixed up.</p>
19	4.16	-do-	<p>The Committee note that studies in regard to washing of coal are being undertaken. While realising that washing of coal will lead to in-</p>

crease in costs, the Committee feel that the ultimate increase in power generation would more than offset any such increase in cost. The Committee recommend that the matter may be examined and a decision in regard to desirability of washing of coal before supply to power stations be taken expeditiously.

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4.17

Ministry of Energy
[Deptt. of Power]

It has been brought to the notice of the Committee that although for supply of coal, Badarpur Thermal Power Station is linked to Jharia coal mines, a lot of coal from other coal mines is being diverted to Badarpur Thermal Power Station. This has adversely affected the performance of the Power Station as this coal is not suitable for the equipment installed at Badarpur. What is a matter of concern is that the percentage of such diverted coal is on the increase. While the percentage of such diverted coal was 28.83 per cent in 1979-80, the same increased to 30.58 per cent in 1980-81 and was as high as 41.19 per cent between April-August, 1981. This is a matter of deep concern. When the position regarding supply of coal to various power stations is stated to be improving, the Committee fail to understand why it should be necessary to supply coal to Badarpur Thermal Power Station from the coal mines to which it is not linked. The Committee recommend that this matter should be looked into and corrective measures taken urgently.

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4.23

-do-

The Committee are concerned to learn that heavy dues were outstanding against Delhi Electricity Supply Undertaking and other State Electricity Boards in respect of electricity supplied by Badarpur Thermal Power Station. The outstandings against DESU alone amount to Rs. 34.38 crores. What is still more disturbing is that these outstandings are on the increase as is brought out by the fact that against electricity

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worth Rs. 4½ crores being supplied every month, only Rs. 2½ crores are realised. The Delhi Electricity Supply Undertaking have on their part, stated that they are suffering a loss of 10 paise per unit as they are not being allowed to increase their rates and further they have large outstandings against New Delhi Municipal Committee and other public sector undertakings. The Committee are concerned at this grave irregularity which has been allowed to continue with considerable consequences for the financial health of Badarpur Power Station. The Committee therefore, strongly recommend to the Central Government to appoint a high powered committee to look into the working of the DESU and particularly its finances and effective step taken to see that the arrears are cleared within reasonable period of time, and in no case the delay extends to more than 6 months. The Committee should be apprised of the steps taken in this regard.

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4.24

Ministry of Energy
(Deptt. of Power)

The Committee have been informed that no interest is being charged by Badarpur Thermal Power Station against their outstandings. The Committee feel that as a Commercial Undertakings, Badarpur Thermal Power Station should charge interest on the outstandings from the parties. It can be expected that the liability for payment of interest on outstandings dues will prompt the concerned parties to clear their dues in time.

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5.6

-do-

The Committee note that tenders for cooling tower pumps for the power station were invited on 27 May 1975. M/s. Bharat Heavy Electricals Ltd. gave quotation for Rs. 18.11 lakhs with a validity period of

three months. However, the quotation of the firm could not be accepted as the height of cooling towers was not determined by that time. The tenders for cooling towers were invited later and were opened on 27 September 1975. The result was that a revised offer of the firm for the same equipment for Rs. 19.44 lakhs was accepted resulting in an extra expenditure of Rs. 1.49 lakhs (including excise duty and sales tax). Although this extra expenditure was incurred, the motors were not delivered within the agreed delivery period and when delivered were found to be defective. The performance of the motors has not yet stabilised. The Committee would like to express their concern at this situation. They would like to be informed of the reasons for the delay in the supply of motors and for defective working and also the action taken.

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5.12

-do-

The Committee note that transformers were purchased from M/s. Parry & Co. Ltd. New Delhi as part of 6.6 KV switchgear for unit IV of 210 MW at Badarpur. The sample inspection of the equipment was waived with the result that the same were subsequently found to be not in conformity with the specifications in regard to their short time rating. In view of the contention of the firm that the transformers were as per specification, the Committee cannot but reach at the conclusion that the original specification given in the contract was not properly prepared and adequate care to check the equipment was not exercised by the Project authorities, while accepting these transformers. The Committee would like this matter to be examined thoroughly so as to fix responsibility for the lapse.

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25	5.19	Ministry of Energy [Deptt. of Power]	<p>The Committee note that as per the Project Report of the Badarpur Thermal Power Station, the cost of generation of electricity was estimated at 5.65 paise per unit. Even in the revised estimate the cost of generation was estimated to be 12.17 paise per unit. However, the cost of generation was as high as 28.54 paise per unit in 1979-80. This increase is stated to be mainly due to the increase in the prices of coal and furnace oil and higher rate of consumption of coal and furnace oil. The Committee have, in an earlier chapter already stressed the need for improving the quality of coal supplied to the power station. They hope that with the improvement in the quality of coal, the consumption of furnace oil will also come down thus reducing the cost of generation. The Committee would like that all efforts should be made to reduce the cost of generation in the plant and for this the factors contributing to the escalation in the cost of generation should be identified and corrective measures should be urgently taken in this regard.</p>

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