

**ESTIMATES COMMITTEE**  
**(1980-81)**

**THIRTEENTH REPORT**

**(SEVENTH LOK SABHA)**

**MINISTRY OF ENERGY**  
**(DEPARTMENT OF POWER)**

**POWER GENERATION—CENTRAL**  
**ELECTRICITY AUTHORITY.**



*Presented to Lok Sabha on. 29. April, 1981*

**LOK SABHA SECRETARIAT**  
**NEW DELHI**

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# ESTIMATES COMMITTEE

(1980-81)

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Shri H. G. Paranjpe—*Joint Secretary.*

Shri K. S. Bhalla—*Chief Financial Committee Officer.*

## INTRODUCTION

I, the Chairman of Estimates Committee, having been authorised by the Committee to submit the Report on their behalf, present this Thirteenth Report on Ministry of Energy (Deptt. of Power)—Power Generation Central Electricity Authority.

2. The Committee took evidence of the representatives of the Ministry of Energy (Deptt. of Power), the Central Electricity Authority, Deptt. of Coal, Ministry of Railways (Railway Board), Ministry of Industry, Bharat Heavy Electricals Ltd., Instrumentation Ltd., Kota Deptt. of Atomic Energy and Planning Commission etc. on 8, 9 and 27 January, 1981. The Committee wish to express their thanks to the Officers of these Ministries/Departments for placing before them the material and information which they desired in connection with the examination of the subject and giving evidence before them.

3. The Committee also wish to express their thanks to Shri Harbans Singh, Chairman, All India Power Engineers Federation, Dr. K. L. Rao, former Union Minister for Irrigation & Power, Federation of Indian Chambers of Commerce & Industry of India, Associated Chambers of Commerce & Industry of India and Dr. N. Tata Rao, Chairman, Andhra Pradesh State Electricity Board for furnishing memoranda to the Committee and also for giving evidence and making valuable suggestions.

4. The Committee also wish to express their thanks to all other institutions, associations, bodies, individuals and State Governments who furnished memoranda on the subject to the Committee.

5. The Report was considered and adopted by the Committee on 16 April, 1981.

6 For facility of reference, the recommendations|observations of the Committee have been printed in thick type in the body of the Report. A summary of the recommendation|observations is appended to the Report.

NEW DELHI:

April 20, 1981

Chaitra 30, 1903 (Saka)

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(S. B. P. PATTABHI RAMA RAO)

Chairman, . . .

Estimates Committee.

## GLOSSARY OF COMMONLY-USED TERMS IN THE POWER ENGINEERING

- KILOWATT (kw)** . . . . . This is a unit of power and is equal to about 1.33 Horse Power. One KW of Power can light up 25 Nos. of 40 watt lamps.
- MEGAWATT (MW)** . . . . . This is equal to 1000 KW. Megawatt—10W
- MILLION KW** . . . . . This is equal to 1000 MW.
- KILOWATT HOUR (KWhr)** . . . . . This is the quantity of electricity used if one KW of power is used for one hour One KW. hr. is also called "one Unit" in common parlance.
- MKWhr, MKWh, MU** . . . . . This is equal to one million Kilowatt hours. This is also sometime called one GWh, i.e. one gega or billion watt hours.
- During the year 1976-77 (upto 25-3-77) 87,600 Million KWh or 87.6 billion KW hrs been produced. The production of energy on 25-3-77 was 268 million KWh.
- VOLT (V)** . . . . . It is the unit of electrical pressure, which causes the current to flow. The standard pressure or voltage for domestic supply is 230 volts.
- KILOVOLT (KV)** . . . . . This is equal to 1000 volts.
- AMPERE (A)** . . . . . This is the unit of electric current. One Kilowatt heater, for example, takes about 4.4 amperes.
- VOLT AMPERE (VA)** . . . . . This is the product of voltage and current.
- KVA** . . . . . This is equal to 1000 volt amperes.
- MEGA VOLT AMPERE (MVA)** . . . . . This is equal to one million VA or 1000 KVA.
- POWER FACTOR (P.F.)** . . . . . This is the ratio of KW to KVA. All the current that flows through an appliance is not converted to useful power. Power Factor indicates the extent of current that is converted to useful power.
- FREQUENCY (MZ. Cycles)** . . . . . The number of times the direction of electricity changes per second is called frequency. The standard frequency in India is 50 cycles per second, and this frequency is same throughout the system.
- MAXIMUM DEMAND** . . . . . It is the highest average KW drawn over any 15 or 30 minutes period.

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<b>LOAD FACTOR (L.F.)</b>	. . . . .	Average load over a period <hr/> Peak load over the period
<b>DIVERSITY FACTOR</b>	. . . . .	The sum of maximum demands of different consumers <hr/> Simultaneous demand on the system
<b>CONNECTED LOAD</b>	. . . . .	The sum of the rated capacities for all the electricity consuming equipment installed by the consumers is called the 'Connected Load.' In many cases the maximum demand of the consumer will be much lower than the connected load.
<b>KWh/KW</b>	. . . . .	This means the number of units generated in the year per KW of Installed Capacity. <hr/> Total Energy generated in a year in Units <hr/> Total Installed Capacity in KW  (Theoretically, each KW of Installed Capacity can generate 8760 KWh in a year, but the ratio KWh/KW is generally less to account for maintenance and other shut downs of the generating plant.)
<b>POWER CUT</b>	. . . . .	Imposition of restriction on Maximum Demand in KW.
<b>ENERGY CUT</b>	. . . . .	Imposition of restriction on energy consumption in KWh.
<b>INSTALLED CAPACITY (MW)</b>	. . . . .	It is the name plate capacity of the Generator or the sum of the name-plate capacities of several generators in a power station or a system.
<b>PEAKING CAPACITY (MW)</b>	. . . . .	The maximum capacity available to the system for use at any time after allowing for shut down on maintenance or otherwise to meet the load demand of the system.
<b>CAPACITY ON BUS-BARS (MW)</b>	. . . . .	The capacity which can be transmitted from a generating station after consumption in the station auxiliaries.
<b>DERATING OF CAPACITY</b>	. . . . .	Decrease in the name-plate capacity of the generating unit due to age or defects in any its components.
<b>RETIREMENT OF CAPACITY</b>	. . . . .	Removal of installed capacity due to over-age or obsolescence.
<b>FIRM CAPACITY</b>	. . . . .	It is the capacity which is available at all times.
<b>BASE-LOAD STATION</b>	. . . . .	A generating station which is operated for all the 24 hours of the day at maximum load possible. Thermal stations of higher efficiency are generally designated as base-load stations.

<b>PEAKING STATION</b>	. A generating station which is operated for short time to meet the peak demand. Normally the storage type Hydro Stations with small storage reservoirs are operated as peaking stations.
<b>PLANT FACTOR</b>	. Average load on the generating unit or plant or system <hr/> Rated capacity of the generating unit or plant or system.
<b>AVAILABILITY FACTOR</b>	. Total hours a generator has worked during the year. <hr/> Total No. of hours in a year (=8760 hrs.)
<b>PLANNED OUTAGE</b>	. The shut down of a plant for planned maintenance.
<b>FORCED OUTAGE</b>	. The shut down of a plant due to unforeseen defect either in the plant or the system.
<b>PARTIAL OUTAGE</b>	. The outage of an auxiliary component of the generating set thereby reducing its capability.
<b>CAPITAL MAINTENANCE</b>	. Major repairs involving replacement of costly components of a plant.
<b>RESERVE SHUT-DOWN</b>	. The generating capacity in a power plant kept in reserve to meet the forced outage of any other plant.
<b>GROSS GENERATION</b>	. Total generation of energy at the generator terminals.
<b>NET GENERATOR</b>	. The energy available at the generating station busbars, after accounting for consumption in station auxiliaries and losses if any, for transmission to the system.
<b>SPINNING RESERVE</b>	. The capacity which is running and available on the generating station busbars to meet the variations of load demand or unforeseen outages of machines.
<b>ROLLING/ROTATING OF UNIT</b>	. A new generating unit on which trialsum has been successfully done but not connected to the system for commercial operation.
<b>SYNCHRONISING/COMMISSIONING OF UNIT</b>	. A new generating unit successfully connected to the system for commercial operation.
<b>ENERGY CONTENT OF A RESERVOIR</b>	. In a storage type hydro station the water stored in the reservoir represent electrical energy potential that can be harnessed.
<b>FULL RESERVOIR LEVEL (FRL)</b>	. Represents the maximum level of water that can be stored in a reservoir.
<b>MINIMUM DRAW-DOWN LEVEL (M.D.D.L)</b>	. Represents the minimum level upto which water can be drawn for power generation.



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## TRANSMISSION AND DISTRIBUTION

- EXTRA HIGH VOLTAGE LINES (E.H.V.)** Lines carrying bulk power at more than 33 KV. The maximum operating voltage at present in India is 220 KV. 400 KV lines are under erection.
- HIGH VOLTAGE LINES (H.V):** . . . Lines operating at voltages above 660 volts and upto 33 KV. These are generally used for distribution of power to industrial consumers.
- LOW AND MEDIUM VOLTAGE LINES (L.V.& M.V.)** Lines operating below 660 volts used to supply power to domestic and small commercial industrial consumers and agricultural pump sets.
- TIE-LINE** . . . . . It is a transmission line for interchange of power from one system to another.
- LOAD DESPATCH STATION** . . . . . A control centre from which the generation levels in various power stations are controlled. This enables optimum and economic utilisation of power and energy.
- POWER LINE CARRIER COMMUNICATION (P.L.C.C)** A telecommunication system using power lines for transmission of messages, commands signals, reading etc.
- SYNCHRONOUS CONDENSERS** . . . . . These are rotating machinery to improve power factor and to control voltage variations.
- STATIC CAPACITORS** . . . . . These are static equipments to improve power factor and to control voltages.
- CIRCUIT BREAKER** . . . . . This is a device to cut-off power automatically in case of any abnormalty on the transmission lines or over loads and defects in machinery.
- TRANSFORMER** . . . . . This is a device to transform the power from one voltage to another.

## CHAPTER I

### INTRODUCTORY

#### A—Importance of power in the economy

Power has become synonymous with progress in all fields of activities of the Nation. It is an essential pre-requisite for the progress of the country and economic generation of power should become a matter of utmost national priority. Moreover, in a developing country like ours, there is bound to be progressively rising demand for energy in all forms specially in sectors involving energy intensive processes.

1.2. Although the installed generation capacity of power has increased from 2300 MW in 1950 to 28480.63 MW on 31st March, 1980, the country is still suffering from acute power shortage and the power shortage has increased from about 10 per cent. in 1975-76 to 16.1 in 1976—80. While no official estimates are available regarding loss to economy due to power shortage and consequent power cuts, according to non-official estimate "loss of industrial production alone due to shortage of power on a rough reckoning is placed around 4000 crores in 1978-79 and 7000 crores in 1979-80."

#### B—National Policy on Power

1.3. An expert on Power has stated in his memorandum submitted to the Committee that "Planning of the power sector obviously could not have a proper direction in the absence of a well defined national policy. Planning of Power programmes throughout the entire period ever since the inception of planned development nearly thirty years ago has been dictated either by whims of important individuals or by compulsions dictated by exigencies of immediate needs. Any system of planning to be effective must be guided by a very well-defined policy, failing which even the best of efforts for planning and implementation could become ineffective."

1.4. In their 16th Report (1977-78) the Estimates Committee desired the Government to bring forward a White Paper on National power policy at the earliest to be placed before Parliament. In their reply Government had stated that the Planning Commission had constituted a Working Group to develop a perspective plan for the next 5 to 10 years. The Estimates Committee reiterated their recommendation for issue of a White Paper on Power policy in their 38th Report (1978-79). The Working Group of Energy Policy submitted its report in 1979.

1.5. Asked about the reasons for not placing a White Paper on Power policy before Parliament even after the submission of the report of the Working Group on Energy Policy, the Ministry have stated in a written reply that :—

“An exercise is presently being undertaken to draw up a 15 years perspective plan. Recently a high level Committee on Power set up by the Government under the Chairmanship of Shri V. G. Rajadhyaksha has submitted its report. Their recommendations are presently under consideration by the Government. Once the 15 years perspective plan mentioned above is ready and Government have taken decisions on the recommendations of the Committee on Power, it would be possible for the Government to formulate the components of a National Policy on Power.”

1.6. Asked as to how long the Government would take to produce a formal paper on power policy for being placed before the Parliament, the representative of the Ministry of Energy (Deptt. of Power) stated in his evidence that “It will take some months.”

1.7. The Committee regret that Government have not yet presented for consideration of Parliament a White Paper on Power Policy as recommended by Estimates Committee in their Sixteenth Report (1977-78) and reiterated in their 38th Report (1978-79).

1.8. Now that the Working Group on Energy Policy have submitted their Report (1979) and the Committee on Power headed by Shri V. G. Rajadhyaksha have also submitted their Report in September, 1980, Government should formulate a National Policy on Power without any further delay giving clearly their long-term projections for the development of power, share of different sources of power generation, viz. hydel, thermal, nuclear etc. as well as the role of Central Government and State Governments in the field of generation and distribution. The Committee further recommend that Government should present a White Paper on Power Policy to Parliament by the end of this year (if possible) to facilitate a national debate on the subject. (Serial No. 1)

#### C—Planning for Power Sector

1.9. In the planning process which started after independence, considerable emphasis has been placed on the development of power sector with

progressively higher and higher allocation of funds as is evident from the following:—

Plan Period	Investment in the Electricity Sector	
	(Rs. Crores)	As a percentage of total plan expenditure
Ist Plan . . . . .	320	16.3
IIInd Plan . . . . .	625	11.2
IIIrd Plan . . . . .	1334	15.6
Three Annual Plans . . . . .	1877	27.43
IV Plan . . . . .	2523	16.0
V Plan . . . . .	7294	18.6

1.10. However, there have been heavy shortfalls in the achievement of targets in each of the Five years Plan as shown below:—

*Target and Achievements—Additions to Generating Capacity.*

Plan	Target (MW)	Achievement (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
IV Plan (1969-74)	9260	4610	50.2
Period 1974-79 . . . . .	12500	10200	18.4

1.11. The main reasons for the shortfalls in achievements of targets in the earlier five year Plans have been delays in the supply of equipment by indigenous manufacturers, non-availability of raw materials like Steel, Coal, Cement etc. to the required extent, delay in the receipt of replacement parts from abroad and shortage of funds.

1.12. Asked about the projected capacity addition during the Sixth Five Year Plan, the Ministry of Energy (Deptt. of Power) have stated in a note furnished to the Committee in January, 1981 that:—

“The Working Group on Power (1980-85) at the time of submission of its Report had envisaged a capacity addition of 20263 MW as per details below:—

Type of Plant	1980-85	
	No. of Units	Capacity ( MW)
Hydro . . . . .	112 Units	5115 MW
Thermal . . . . .	95 Units	13988 MW
Nuclear . . . . .	5 Units	1160 MW
<b>TOTAL : . . . . .</b>	<b>212 Units</b>	<b>20263 MW</b>

According to the present indications based on recent Annual Plan discussions, the above Commission programme would get modified as follows:—

Hydro . . . . .	111 Units	5066 MW
Thermal . . . . .	94 Units	14068 MW
Nuclear . . . . .	3 Units	690 MW
<b>TOTAL . . . . .</b>	<b>208 Units</b>	<b>19824 MW</b>

1.13. Doubts have been expressed in certain quarters about the achievement of Sixth Plan targets for Power Sector. A leading Chamber has stated that “Targets being proposed by Government for the Sixth Plan are unrealistic. None of these targets will be achieved simply because we do not have sufficient resources in men, material and expertise.” Another leading organisation has stated “Given the existing organisations in power sector, resources, methods and management style it is improbable but not impossible to achieve the Sixth Plan target under the present conditions. Perhaps an optimistic 12,000 MW will be nearer reality.”

1.14. The Ministry of Energy (Deptt. of Power) were asked during evidence that since the maximum capacity addition achieved in any Five-Year Plan was about 10,000 MW, whether the target of about 20,000 MW capacity addition during Sixth Plan was realistic. The representative of the Deptt. of Power stated that "We feel that it is needed, it is absolutely necessary and it is realistic, not only from the requirement and demand point of view but even from the implementation point of view because all the projects which form the total of 20,000 megawatts are such where all the sanctions have been given and the work has started." He, however, added that "On the basis of the experience of the earlier years, the constraints have been identified, and most of them are such as can be controlled except that the funds needed by the projects are given to the executing agencies in time. All the projects which are under the State Electricity Boards are guided by the State Governments. It is the responsibility of the State Governments to provide adequate funds to them and if they do not do that, unfortunately, we are unable to exercise control there."

1.15. According to the information supplied by the Ministry (Jan., 1981) the position regarding the commissioning of power projects during the 6th Plan is as follows :—

(a) *Commissioning Programme during 1980-81.*

Programme of addition of 2637 MW had been envisaged for the year 1980-81.

Hydro . . . . .	7 units	407 MW
Thermal . . . . .	15 units	420 MW
Neuclear . . . . .	2 units	220 MW

A total capacity of 911 MW has already been commissioned (Jan. 1981).

Hydro . . . . .	5 units	271 MW
Thermal . . . . .	2 units	420 MW
Neuclear . . . . .	1 units	220 MW

An additional capacity of 936 MW is expected to be commissioned during the rest of the year 1980-81.

Hydro . . . . .	2 units	136 MW
Thermal . . . . .	8 units	800 MW
Nuclear . . . . .	..	Nil

In addition 3 units of gas turbines with a total capacity of 9 MW scheduled for commissioning in 1981-82 are expected to be commissioned during the current year. Thus, a total capacity of 1856 MW is expected to

be commissioned during the current year. Thus a total capacity of 1856 MW is expected to be commissioned during 1980-81.

(b) *Commissioning programme during 1981-82.*

1.16. In the year 1981-82 a capacity addition of 4087 MW has been envisaged in the Working Group report :—

Hydro	16 units	939 MW
Thermal	26 units	2913 MW
Nuclear	1 unit	235 MW

This programme would get modified due to anticipated slippage from 1980-81 and delays in projects scheduled for commissioning in 1981-82. According to the review carried out during plan discussions it is expected that the commissioning programme during 1981-82 would be:

Hydro	8 units	725 MW
Thermal	24 units	3069 MW
Nuclear	1 unit	235 MW
TOTAL		4029 MW

According to present indications based on the recent annual plan discussions Commissioning Programme during the years from 1980-81 to 1984-85 would be as follows:

	1980-81	1981-82	1982-83	1983-84	1984-85	Total 1980-85
Hydro	407	725	1365.5	1383.5	1185	5066
Thermal	1229	3069	3320.0	3040.0	3410	14068
Nuclear	220	235		235		690
TOTAL	1856	4029	4685.5	4658.5	4595	19824

1.17. From the written reply furnished by the Ministry (Jan., 1981), it is seen that the main reasons for delay in the commissioning of projects in 1980-81 and likely delay in 1981-82 are delays in the supply of equipment by indigenous manufacturers like BHEL, Instrumentation Limited, Koa, etc. late placement of orders, delay in civil works, bad geological conditions, labour trouble and inadequacy of funds.

1.18. Regarding steps to remove delays in commissioning of power projects, the Committee have been informed in a note by the Department of Power that:

“For speedier completion of the power projects, Thermal and Hydro Construction Monitoring Directorate, headed by Chief Engineers, were set up in the Central Electricity Authority. These Directorates closely monitor the progress of various activities of the projects under construction and render requisite assistance to the Project Authorities in getting the material in short supply. These Directorates also coordinate the equipment in the public sector. Senior Officers of the CEA also visit the sites and give guidance to expedite the commissioning of the units. As a result of the increased attention given to the monitoring of the power projects came down to 52 months during 1978-79 as against 70 months during 1974-75. It would, however, be relevant to mention that while the power planning is the responsibility of the Central Government, actual execution of the new schemes is under the control of the State Governments/State Electricity Boards who have the key role for earliest commissioning of the new projects.”

1.19. The Committee note that power development has been accorded high priority in all the Plans and that investments in the power sector has been on the increase in successive plans. But in all the Five Year Plans, there have been heavy shortfalls in achievements of planned target of capacity additions. The shortfall was 15.4 per cent in First Plan, 35.7 per cent in Second Plan, 33 per cent in Third Plan, 50.2 per cent in Fourth Plan and 18.4 per cent in Fifth Plan. These recurrent and growing shortfalls in achievement of targets of capacity addition compounded by low capacity utilisation of existing generation capacity has led to the present chronic power shortage situation resulting in serious and repeated losses in production in important sectors of economy.

1.20. The Sixth Five Year Plan envisages an addition of about 20,000 MW in the power generation capacity. According to the representative of the Ministry of Energy the target is not only needed and absolutely necessary but also realistic from the implementation point of view because work in respect of all the projects forming the total of 20,000 MW has started.

1.21. The Committee, however, regret to note that even in the First year of the Sixth Plan (1980-81), out of 22 hydro and thermal units targeted to be commissioned, 5 units will not be completed and will slip over to the next year. Similarly, during 1981-82, 10 units out of 42 are expected to slip over to the following year. What is disturbing is that many of the factors which were responsible for slippages in the earlier Five Year



Plans like delays in the supply of equipment by indigenous manufacturers, delays in civil works due to shortage of inputs like cement, steel etc. and inadequate funds are the ones which even now are holding up the timely commissioning of projects. And this is in spite of the claim made by the Secretary (Power) that they have identified the constraints responsible for shortfalls in earlier plans most of which can be controlled, and in spite of an elaborate monitoring system set-up in the Central Electricity Authority. From this, the Committee cannot but conclude that measures taken have not so far been effective in preventing the slippages in the commissioning of projects. The Committee would like to point out that if the target of capacity addition of 20,000 MW during Sixth Plan is to be achieved, Government would have taken more effective measures than taken hitherto in order to ensure timely commissioning of power projects from year to year so as no excuse is allowed to delay the project according to schedule. (Serial No. 2)

#### D—15 Years Power Plan

1.22. Planning for power in the country is being undertaken at present on five years basis as a part of Five Year Plans. It has been suggested in a memorandum that:—

“That gestation period of a thermal power station is 4 to 5 years and that of a hydro power station is 8 to 10 years. . . . Therefore, if for power generation schemes, a period of 5 years is adopted, it is evident that schemes sanctioned in any plan period will spill over into the next Five Year Plan and will yield benefits only after the middle of the next Five Year Plan. In fact this is one of the main reasons of the heavy slippages that are taking place in the commissioning of the new generation schemes. Therefore the power generation schemes should be planned for 15 years and this integrated 15 year Plan should be executed in three Five Year Plans in a phased manner.”

1.23 The Committee on Power headed by Shri V. G. Rajadhyaksha in their report submitted in September, 1980 has also recommended that:—

“With projects having gestation period of 10 years and more, the need for long term demand forecasting, covering periods of 15-20 years needs no further justification. Such forecasts should be prepared and updated every 3 years and should form the frame work for formulating 5 years plans. A time frame of this order will permit long gestation hydel and nuclear projects to be planned along with shorter gestation thermal

projects so that the generation mix, region-wise, is optimised. The absence of such a long term perspective has been one of the reasons for the neglect of hydel projects during the fast two decades.”

1.24. In this context, the Ministry of Energy (Department of Power) stated that:—

“It is true that a Power Plan should not be restricted to a five year perspective. The CEA, therefore, is already preparing the detailed plan for the five year period with a perspective of the next 5 years.

Government do consider it necessary to extend the perspective for the Power Plan to a 15 year period. The CEA have, therefore, been directed to prepare an integrated 15 year plan on which they have started work. This investment planning, however, is done by the planning Commission in five year cycles.”

1.25. Regarding the formulation of a fifteen years Power Plan, Secretary (Power) stated in his evidence before the Committee:—

“One of the most important decision which has not been taken and which we hope to pose to the Government is that our 15 years plan must be backed by the investment planning on 15 years basis. Unless investment planning is done on 15 years basis, our planning will not be realistic. . . . Immediately on finalisation of our detailed 15 years plan, we propose to approach the Government that investment planning in the case of power should also be on a longer term basis.”

1.26. As power projects have a long gestation period, the present pattern of 5 year plan is not suitable for power sector. The Committee take note of the conclusion reached by Rajyadhaksha Committee that absence of a long term perspective has been one of the reasons for the neglect of hydel projects during the last two decades. The Committee agree with expert opinion that power projects should be planned on the basis of a perspective of 15—20 years. The Committee appreciate that the Ministry of Energy have accepted the concept of long term plan for power sector and the Central Electricity Authority has started work on formulating a 15 year plan for power development.

1.27. The Committee note that investment planning for power sector is still being done by the Planning Commission in five year cycles. The

**Committee feel that until and unless the 15 years Power Plan as formulated by Ministry of Energy is backed by investment planning for a similar period, the planning would be unrealistic and unable to produce the desired results within the desired time frame.**

**The Committee are of the view that if the new strategy of long-term power perspective has to succeed, it is absolutely necessary to tie up the 15 years power plan not only with 15-years investment planning but also with long-term planning and development of all other inputs like coal, Steel, Cement, equipment and infrastructure like transport capacity so that funds and materials required for power projects become available at the right time and the projects are commissioned on Schedule. The Committee would like the Ministry of Energy to take up these matters with the Planning Commission and other concerned authorities and draw up a comprehensive plan covering all aspects well in time. (Serial No. 3)**

#### **(E)—Role of Central Government in Power Generation**

1.28. The subject of electricity is included in the concurrent list under the Indian Constitution with responsibilities both of the Centre and the States. The Central Government has been mainly responsible for laying down the legislation and policy in the field while the State Governments have been concerned primarily with the developmental activities and extending power supply to the ultimate consumers both in urban and rural areas. As in January 1981, out of a total capacity of about 30,000 MW in the country the capacity in the Central Sector, was 2196 MW. (excluding DVC) consisting of Hydro 120 MW, thermal 1216 MW and nuclear 860 MW. Including DVC, the total capacity was 3617.5 MW (Hydro 284, thermal 2535.5 and nuclear 860 MW).

1.29. It has been stated in a memorandum submitted to the Committee by a non-official organisation that:—

“Now a state has been reached when the growing power needs cannot be met by isolated efforts in the State sector and development must take place at regional level which would mean unified control of all power development in the region under a Regional Board and overall responsibility resting in a unified central authority like the Central Electricity Board. We are conscious of the constitutional complications and difficulties that such a proposition would entail, but we are convinced that no other approach will solve the problem.”

1.30. A leading expert on Power has stated in his memorandum that :—

“Generation and transmission should be the responsibility of the Central and distribution alone should have been entrusted to the State Governments or the State Electricity Boards.”

He has also suggested that:—

“The existing Electricity Supply Act of 1948 needs to be thoroughly revised to give more powers to the Centre for generation and transmission of power and to curtail the same to the extent required from the Electricity Boards and the State Governments. It is better to bring about these changes now than to refer them to a later date.”

1.31. The Committee on power headed by Shri V. G. Rajadhyaksha has examined the role of Centre in generation, and transmission and recommended that:—

“...If power planning is to be done in a way which minimises the cost of power to the consumer, it must be done on a regional rather than, as at present, on state-wise basis.”

The Rajadhyaksha Committee has further recommended that:

“.....power planning in the immediate future and onwards should be done with the objective of having about 45 of the entire generating capacity in the Central sector by the year 2000-01 AD as against 12.1 per cent today.”

1.32. The Committee also recommended that for relishing benefits from more Central generation and optimised regional planning and operation, the Centre should forthwith take steps to acquire the ownership and control of high tension transmission system connecting the Central projects to the State systems and transmission links of 220 KV and above together with their sub-stations which are required to ensure integrated operation of the regional grids.

1.33. Explaining the views of Government on the suggestion regarding unified control of all power development, the Ministry have stated that:—

“It is true that the growing needs of the power sector cannot be met by isolated efforts only in the State sector. This has been recognised by the Government of India. The National Thermal Power Corporation and National Hydro Power Corporation have taken up execution of a number of Thermal and Hydro Generation projects in the Central Sector. In course of future, the role of Central Sector in generation is likely to be enlarged.

Further the present as well as proposed nuclear power stations are being set up in the Central Sector. The generation from central stations would naturally supplement the generation in the State sector. As a further step in this direction, apart from

the transmission lines being executed in the Central sector as associated with Central generation schemes, taking up of integrated transmission regional grids/National Grid in the Central Sector, is also contemplated. Regional Electricity Boards at the regional level, the CEA, the NTPC and the NHPC at the Central level are already functioning. Depending upon the needs, further reorganisation/structural changes might be required in the power sector."

1.34. Speaking about the role of Central Government in power generation and transmission, Secretary (power) stated during evidence that:—

"This is a fact that in all countries where power is a nationalised subject, the total power system is controlled by one agency. The countries are UK, France and Italy apart from East European bloc. . . . Till five years earlier, hardly anything was being done in the Central Sector in generation. But when it was accepted as a policy that power generation is in the interest of the total economy and the Coal resources are located in a few states, the power stations supply power to states other than those in which they are located; Similar is the case with hydro potential. This led to the conclusion that we must entrust larger responsibility to the Centre with the result that it has started today 4 large power stations, . . . In addition to this, five new thermal stations in the Central Sector which are identified will be taken up in future."

He further stated that:—

"An announcement has been made in Parliament that the Centre is going to take major responsibility in owning and operating the National Grid."

1.35. The Committee were informed by Secretary (power) that at present the generation in Central Sector is 7 per cent (12 per cent if DVC is included) of the total generation and by 1989-90, Central Share (excluding DVC) would be 21 per cent. Secretary (power) added that:—

"If the same trend continues, it would not be too optimistic to say that the Rajadhyaksha Committee's objective of 45 per cent ownership we will be able to achieve."

1.36. Similarly, in transmission lines, the Central share it was stated during evidence, would be 50 per cent by 1989-90.

Secretary (power) clarified that this figure of 45 per cent will be reached not by taking over any station from States but only by bigger share in the exploitation of new capacities. When asked about his views whether power should be a Central subject, Secretary (power) stated that "... this should be a Central subject and the constitutional amendment is necessary for that".

1.37. The Committee have considered the suggestions made by certain experts that generation and transmission of power should be the responsibility of the Central Government and only distribution should be entrusted to states and that power should be planned and developed, not at state levels, but at regional level under the unified control of a regional or Central authority. The Committee have also taken note of the recommendation made by Rajadhyaksha Committee on Power that the Central share in the generation capacity should be increased so as to reach the level of 45 per cent of total installed capacity by the end of the century and that the centre should acquire the ownership and control of high tension transmission circuits to ensure integrated operation of regional grids.

1.38. The Committee are informed that the Central Government's share in total power generation in the country is 12 per cent at present (including DVC). The NTPC and NHPC, the two Central Government undertakings in power sector, have already taken up execution of a number of thermal and hydro generation projects in the Central Sector and some more projects have been identified for execution by them. The Committee are informed that if this trend continues, the Centre would be able to achieve the objective laid down by Rajadhyaksha Committee of acquiring 45 per cent share in power generation by the end of the century. Similarly on transmission the Central share will reach 50 per cent by 1989-90.

1.39. The Committee agree with the view that for optimum utilisation of resources and minimising cost of power and for a balanced development of the country as a whole, the power planning should be done on a regional rather than on state-wise basis. (Serial No. 4)

1.40. The Committee do not agree with the view that the entire generation and transmission should be taken over by Centre. The Committee however, feel that the Central share in power generation should increase substantially and this aim should be achieved not by acquiring any existing power stations run by the States, but by progressively taking up more and more of new projects in Central sector. Power projects which are beyond the resources of States or are likely to become subjects of inter-State disputes, particularly hydro projects, should be taken up in Central Sector straightaway without loss of time. (Serial No. 5)

1.41. The Committee agree that in order to derive maximum benefits from increasing Central share in generation and regional planning and operation, it will be absolutely necessary for the centre to have under its ownership and control all inter-State and inter-regional high tension transmission lines together with their sub-stations. (Serial No. 6)

1.42. The question of transfer of "Power" from Concurrent List to Union List may be examined and if in the larger interest, it is considered necessary, Government should not hesitate to go in for a constitutional change. Then, the nature and structure of the organisation at the Centre for landing efficiently and economically the gigantic task of erecting operating and maintaining power stations all over the country would also have to be critically examined keeping in view the experience in this field. (Serial No. 7)

#### F—Role of Private Sector in Power Generation

1.43. The Department of Power have informed the Committee that the role of private sector as utility in the field of power generation is at present governed by the Industrial Policy Resolution of 1956 under which generation and distribution of electricity is included in Schedule 'A' of the Resolution, which lists industries in which all new units, save where their establishment in the private sector has already been approved, will be set up only by the State. This Resolution does not preclude the expansion of the existing privately owned units or the possibility of the State securing the cooperation of private enterprise in the establishment of new units when the national interest so required.

1.44. There are at present three major licences engaged in generation and distribution of electricity in Calcutta, Ahmedabad and Trombay (Bombay) and two small undertakings in West Bengal. In addition, there is Renusagar Power Supply Corporation which is a non-utility. There are also some private licences (29 in number as in March, 1979), which purchase and distribute electricity in licensed supply areas.

1.45. A number of non-official organisations representing trade and industry have stated that the private sector should be allowed to play its role in increasing power capacity in the country.

1.46. A leading organisation of Commerce and Industry has stated:—

“in view of the massive scale of power capacity build up that would be necessary, the consequent management problems would be so stupendous that it would not be possible to tackle them

under a monolithic system of public sector operation.—One idea worth considering is to encourage a consortium to private-sector companies to invest in this area.”

1.47. Disputing the capacity of private sector to invest in power sector, top expert on Power has however stated:—

“Power is a highly capital intensive industry Private Sector is not capable of making such large investments. There has been very little net addition to installed capacity by most of private licences.—Even where there has been investment, most of the institutions and international loans. Finances have been from public credit and term lending. Perhaps the only area where the private sector can play a role is in the process industries establishing captive power plants on a total energy system basis *i.e.*, providing both steam and power.”

1.48. A state Electricity Board has stated:—

“There is a misunderstanding that Private Sector can operate power plants better than public sector. This is not always true. The following figures of generation in Kwh/Kw per year for Maharashtra will make this point clear :—

	1976-77	1977-78	1978-79	1979-80
1. Tata's Bombay Power Station.	6027	6654	7115	6524
2. Parli Power Station	7893	7541	7992	7742
3. Nasik Power Station	7398	6435	5951	7075
4. Bhusawal Power station	7997	6178	6909	6392

1.49. The Committee on Power (Rajadhyaksha Committee) have also stated in their Report. (Sept., 1980):—

“The Committee is of the view that there is no compelling case for changing the policy in regard to private sector utilities. Government should as at present, consider proposals for expansion/construction of new private sector utilities on a case by case basis.”

1.50. The Department of Power have stated in a note (October, 1980) that:—

“The proposals of private utilities for setting up power generation plants are considered on their merits keeping in view the spirit



of the Industrial Policy Resolution. Presently, Tata Electric Companies have been permitted to set up a 500 MW unit as an expansion at their Trombay Thermal Power Plant. Similarly Calcutta Electric Supply Corporation have been permitted to establish a 240 MW Thermal Power Plant at Titagarh near Calcutta. The Ahmedabad Electric Supply Co. was permitted to establish one 110 MW Thermal Generating Unit at Ahmedabad which has since been commissioned."

1.51. As regards change in Government's policy regarding role of private sector in power generation, Department of Power have stated in a subsequent note (December, 1980) that:—

"Noting the fact that the Industrial Policy Resolution permits seeking the cooperation of the private sector, in the national interest, and recognising the need for attracting larger capital investment for power, the Minister for Energy had called upon the private sector to make concrete suggestions with a view to attracting private funds as an additionality for the power sector. A few proposals in a general sense have been made by different private sector organisations none of which indicate any significant additionality to resources for the power sector. They have been advised to make more detailed proposals and these will be examined by Government when received."

1.52. It has been stated in another note by Department of Power:—

"Government are prepared to consider proposals from the private sector for setting up power plants backed up with adequate proposals for funding these from funds not normally available to the power sector. Government, however, do not propose to allow the transmission and distribution of electricity to be dealt with other than by public sector utilities except by those private sector licencees which are already in existence."

1.53. Asked to state the policy of Government relating to the setting up of captive power plants by private sector units, the Department of Power have stated:—

"The existing policy of the Government in respect of captive power plants is that where in industries process steam is required or where waste heat is available, captive generation capacity

should be encouraged in accordance with the "total energy concept". Where industries require diesel generating sets, they are free to instal them as necessary. Import of such sets, however, would require to be processed in accordance with Government rules and procedures in force at that time.

Keeping in view the shortage of capacity, to meet the full power demand in the country and the need to insulate productive sectors like core industries of steel, fertilisers and aluminium: Government have recently been more sympathetic in considering proposals for setting up captive power plants based on coal in such units. As far as possible such captive generation is recommended to be based on coal.

The Government are discouraging use of oil or diesel as far as possible for power generation keeping in view the difficulties in obtaining these products."

1.54. Secretary (Power) stated in his evidence before the Committee (January, 1981):—

"We do not mind private sector stations. In fact we have been saying that those particular industries which are having captive power stations can have them larger than required but they will have to sell the extra power to the grid. There was a proposal from the industrialists of Madras who wanted permission to set up a common power station for all these industries which would be captive in one sense but they would have to develop their own distribution system because they were located away from each other. We said, let us receive this proposal and we will examine it. But even that proposal has not come so far."

1.55. In reply to Unstarred Question No. 4791 dated 24th March, 1979 in Lok Sabha, the Minister of State for Energy stated:—

"The Government of Bihar had intimated that two offers have been received one from the Tata Iron and Steel Company I.t.d., for the installation of 200 MW in Jamshedpur and another from the Bihar Caustic and Chemicals Ltd., for the installation of a 35 MW power station at Palamau. The proposals are for those to be set up in the Joint Sector by floating separate companies for the purpose. The proposals forwarded by the State Government lacked details and certain clarifications have

been sought from the Government of Bihar. The Clarifications have not yet been received. No decision has, therefore, been taken by the Government.

Besides the State Government of Bihar, the Government of Karnataka has intimated that M/s. Ballarpur Industries has proposed to finance the Dandeli Dam and Power House having a power potential of 30 MW at an estimated cost of Rs. 45 crores for their captive use for their caustic soda and chlorine Plant at Dandeli. No other State Government has intimated or any similar proposal received by them."

**1.56. Though Industrial Policy Resolution 1956, provides that all new power generation units are to be set up only in the State Sector, it does not preclude the expansion of the existing privately owned units or the possibility of the State securing the cooperation of private enterprises in the establishment of new units in the national interest. Suggestions to permit private sector to set up power units have been received by the Committee from non-official organisations. While examining these suggestions the Committee have not been impressed by the claim that private sector can operate power plants better than the public sector as there are a number of public sector plants which are running more efficiently than the private sector plants. Recognising the need for larger capital investment for power, Government, it is seen, have called upon private sector to make concrete suggestions for setting up power plants backed up with adequate proposals for funding these from funds not normally available to the power sector. Government have recently been more sympathetic towards proposals for setting up captive power plants based on coal in core industries.**

**1.57. The Committee feel that captive power plants in private sector should be allowed to be set up by Government liberally provided the private sector can raise resources of their own without approaching the public financial institutions.** (Serial No. 8)

**1.58 The Committee also feel that as an extension of the concept of captive power plant, Government may also view sympathetically and proposal for setting up power plants on cooperative basis which might serve cluster of industries situated in a compact area. Here too, the entrepreneurs of the proposal should be able to raise funds of their own. (Serial No. 9)**

**1.59. The Committee would not like the control on transmission and distribution of power generated from captive or cooperative power plants to be handed over to the private sector except to the extent to which it is necessary for them to supply power to the units for which the power plants are set up. Any surplus power generated by such plants should be fed into the national or regional grid. (Serial No. 10)**

**1.60. The Committee would suggest that a White paper setting down the Government policy in this regard in clear terms should be prepared and placed before Parliament at an early date. (Serial No. 11)**

## CHAPTER II

### THERMAL POWER

#### A—Utilisation of Capacity

2.1. Out of a total installed capacity of about 28490 MW in 1979-80, the share of thermal power was 16468 MW *i.e.*, about 58 per cent. Out of an expected addition of about 19,824 MW capacity in power generation during Sixth Plan period, 14068 MW is expected to be added by means of thermal units. Thus out of the expected total installed capacity of 48314 MW in 1984-85, the share of thermal stations will be about 30536 MW *i.e.*, about 66 per cent. Thus it is evident that not only thermal power enjoys a dominant position in the total power capacity, but the share of thermal power is expected to increase in the years to come.

2.2. The performance of thermal power stations has however, been showing a deteriorating trend in the last few years. Some of the indices which indicate a decline in the performance of thermal power station are as follow:—

- (a) The plant load factor, (the maximum attainable capacity utilisation) which was 56 per cent in 1976-77 has steadily declined to 50.8 per cent in 1977-78, 48.4 per cent in 1978-79 and to 45 per cent in 1979-80. This has further declined in 42.5 per cent during April—November, 1980.
- (b) The forced outage unavailability of thermal power stations has risen 13 per cent in 1976-77 to 18.76 per cent in 1979-80.
- (c) The long duration forced outages are assuming crises proportions. As compared to six units (520 MW) being involved in long duration outages in 1976-77, 88 units involving 46 outages and 3585 MW were involved in 1979-80.

2.3. It has been stated in the "Economic Survey" for 1980-81 that "The major problem appears to be in the thermal sector, where despite substantial additions to capacity in recent years, generation has failed to keep pace. The utilisation of capacity has declined from a peak of 55.3 per cent achieved in 1976-77 to 45.4 per cent in 1979-80. The Rajadhyaksha Committee has estimated that it should be possible to achieve a

58 per cent utilisation level under normal conditions of operation. This implies that thermal generation in 1979-80 could have been 30 per cent higher with the same level of capacity, if the utilisation of capacity had come up to expectations. This would have meant that total generation of power would have been 18 per cent higher, more than wiping out the estimated power deficit of 16 per cent in 1979-80."

2.4. According to a note furnished to the Committee (January 1981), the plant load factor in thermal power stations in different States during April—November, 1980, and comparative figures for the previous year are as follows:—

S. No.	State	Plant load Factor (%)	
		April- Nov., 79	April- Nov., 80
1.	Delhi	44.3	49.7
2.	Haryana	24.3	29.7
3.	J. & K.	4	1
4.	Rajasthan	66.1	56.1
5.	Punjab	28.2	37.8
6.	U.P.	42.8	36.5
	NORTHERN REGION	41.5	39.7
7.	Gujarat	45.6	46.3
8.	M.P.	52.6	51.2
9.	Maharashtra	55.6	53.0
	WESTERN REGION	51.6	50.4
10.	Andhra Pradesh	41.2	30.4
11.	Tamil Nadu	38.5	43.9
	SOUTHERN REGION	39.6	37.0
12.	Bihar	38.3	29.2
13.	D.V.C.	40.3	33.8
14.	Orissa	31.0	32.6
15.	West Bengal	43.9	42.9
	EASTERN REGION	40.5	36.3
16.	Assam	49.4	36.7
	N.E. REGION	49.4	36.7
	ALL INDIA	44.7	42.5

2.5. It is seen from the statement above that the plant load factor of thermal power stations has been highest in the States of Maharashtra and Madhya Pradesh. The Committee were informed during tours that these States had been able to attain a high level of performance by advance planning of preventive maintenance and by reducing periods of boiler overhauls and capital maintenance of turbines by employing modern practices thereby reducing outages of their thermal units. The other factor responsible for better performance was stated to be their having an elaborate system of classroom and in-plant training of high standard for their operators and engineers.

2.6. The Committee have been informed that "In planning for thermal power station, generally an output corresponding to 5350 kwh/kw (61 per cent plant load factor) is taken as the norm for generation of power from 3rd year of operation onwards."

2.7. The Rajadhyaksha Committee on Power which submitted its report in September, 1980 had expressed the view that taking into account international norms and the actual performance of thermal power stations in India, an 80 per cent plant availability is considered a reasonable norm in operating a thermal plant and that Plant load factor of 58 per cent should be considered a reasonable all India average norms for thermal stations but this will vary from system to system.

2.8. Explaining the reasons for the declining plant load factor and increasing forced outages etc., the Department of Power have stated in a note (December, 1980) furnished to the Committee:—

"The reasons for declining plant load factor, increased forced outages etc, are indicated below:

- (i) increasing proportion in the installed capacity of the main plant and equipment and auxiliaries manufactured indigenously for the first time which have been taking considerable time to stabilise and in most cases, have not come up to the desired performance level;
- (ii) Lack of Quality Assurance in manufacture, installation and commissioning.
- (iii) Inadequate standard of maintenance and lack of expertise built up in the country for longer units.
- (iv) Unsatisfactory performance of indigenous manufacturers in supply of spares in time and as per desired quality.

- (v) The variation between the coal parameters assumed in respect of various inputs in design-specifications stage and the parameters of coal actually supplied.
- (vi) Shortfall in generation due to backing down on account of non-availability/critical stocks of coal at thermal power stations.
- (vii) Higher partial unavailability of auxiliary equipment and other internal and external operational constraints like grid condition and load pattern etc., resulting in lower plant load factor.
- (viii) With the addition of capacity, the ability of the system to take up peak load increases but at the same time, non-utilisation during off back hours will also increase, thus adding to the idle capacity.
- (ix) Efforts to certain indigenous components/materials when suitable expertise is not available such as in electronic components.

2.9. Asked as to how the Plant Load factor of thermal power stations in India compared with that in other countries, the Ministry have stated in a written note as follows:—

“The following table based on the data given in Statistical Year Book of the United Nations gives the PLF of various countries for the year 1976.

Country	PLF %
U. S. A.	44.04
France	44.19
U. S. S. R.	55.57
Japan	49.99
West Germany	46.65
U- K.	40.22
Malaysia	57.89
Sri Lanka	32.59
Pakistan	55.52
Kenya	44.98
Zambia	63.67



Country	PLF%
Egypt	32.19
Spain	38.99
India	45.94
Italy	41.64
Australia	43.81
Canada	51.07

From the above information, it will be seen that the plant load factor in India is comparable to the plant load factors achieved in other countries.”

2.10. It has, however, been stated by the Committee on Power (Rajadhyaksha Committee) in their report that “In most of these countries there is virtually no power demand staggering and plant availability is over 80 per cent. The PLF is low, because in order to meet sharp peaks in demand daily, weekly and seasonally or to take care of unexpected and major breakdowns, considerable reserve capacity has to be provided which though available would be unutilised due to lack of load for most of the time. The reason for low plant load factor in India, however, is not due primarily to lack of demand but low plant availability as a result of which demands could not be met.”

2.11. An expert on Power has expressed the following view:—

“Planning in power sector should be such that we do not plan for more than 50 per cent utilisation factor to give the quality of supply that is needed———. To assume that every K.W. of installed capacity would produce 6000 units of energy per annum and to plan for the capacity requirement on this basis has been the greatest mistake which has been perpetuated plan after plan———Because of the inadequate attention paid to the planning of required capacity we have been flogging the overworked units and making that produce less energy than they would have produced with proper attention to the maintenance. And such maintenance is not possible unless adequate capacity is available in the system.”

2.12. Asked why there was no appreciable improvement in the plant load factor of thermal power units, although the reasons for declining plant load factor had been identified, Secretary (Power) stated before the Committee:—

“Starting with 1976-77 which statistically was our bastion, one of the reasons which was partly responsible was that less number of units were taken off for over haul. That we believe is not the right approach because in the subsequent year that leads to more break-downs. The most important contribution of that year was the level of discipline which was achieved in the country. . . . Still we believe that there are lots of things which we can do. We have already developed a detailed methodology for maximisation of generation. I have been going round the states along with my colleagues. They have appreciated in most of the cases and we have developed a monitoring system whether they are implementing this methodology or not. We do hope the results will come”.

2.12. Asked about the reactions of the Government to the suggestion that planning for power should not be done on the basis of more than 50 per cent utilisation, the chairman of the C.E.A. stated:—

“Our difficulty is that we are already facing power shortage. Power Industry is very much capital intensive industry. We are designing it presently at about 60 per cent P.L.F. If we do at 50 per cent, then we will be requiring about 25 per cent higher investment”.

**2.13. The Committee note with concern that the utilisation of capacity in Thermal Power Stations has been showing a deteriorating trend since 1976-77 and the Plan load factor of the thermal power stations declined from about 56 per cent in 1976-77 to 45.4 per cent in 1979-80. The Committee cannot but conclude that this deterioration in the utilisation of capacity in thermal power stations has been the major contributing factor to the power shortage experienced in the country during the last three years. If the generation had attained the level of 61 per cent as envisaged by the Central Electricity Authority or as stated in Economic Survey (1980-81), even 58 per cent as considered “reasonable” by Rajadhyaksha Committee on Power, the thermal generation in 1979-80 could have been 30 per cent higher with the same level of installed capacity and the total generation of power would have been 18 per cent higher which would have more than wiped out the estimated power deficit of 16 per cent experienced in 1979-80. What is still more disturbing is that inspite of the claim made by the Department that the reasons for low utilisation of capacity have been identified, methodology for maximising generation has been developed and the position is being continuously monitored, the Plant load factor of thermal power stations in the first 6 months of 1980-81 instead of showing improvement has further declined to 42.5 per cent. The Committee are**

afraid that if the downward trend in utilisation of capacity is not reversed, even the projected addition of about 20,000 MW capacity in 6th Five Year Plan, which would be mainly in thermal power sectors would not be able to solve the problem of power shortage in the country. Now when the detailed methodology for maximising power generation has been developed, all that is required to be done is a vigorous and sustained follow-up action to put the methodology into practice. The Committee would like to urge with all the emphasis at their command that the administrative and technical agencies all over India should be fully geared so as to keep each power station under observation with a view to preventing unscheduled outages and to mobilise all resources to bring each power station up to the ideal level of performance. (Serial No. 12)

2.14. The Committee note that when Plant Load Factor (PLF) in 1979-80 in some of the States was as low as 24 per cent to 38 per cent and all-India average was 44.7 per cent. Maharashtra and Madhya Pradesh, to take two examples, were able to achieve a capacity utilisation of 55.6 per cent and 52.6 per cent respectively, by employing modern methods of capital and preventive maintenance of equipment and by organising practical training of high standard for their operators and engineers. From the example of these two States the Committee cannot but conclude that the problem of low utilisation of capacity is not uncontrollable. The Committee have no doubt that if other States can be persuaded to take similar steps and it should not be difficult for the Centre to do so, the plant load factor can show substantial improvement all over the country. The Committee will like that the Centre should keep a watch over this and see that the utilisation aspect is not allowed to slip. (Serial No. 13)

2.15. The Ministry have claimed that the plant load factor of thermal power stations in India (which was 45.94 per cent in 1976) is comparable with that in many other countries (in the same year) like USA (44.04 per cent), France (44.19 per cent), USSR (55.57 per cent), Japan (49.99 per cent) and UK (40.22 per cent). The Committee would, like to point out that such a comparison would be erroneous. As pointed out by Rajadhyaksha Committee on Power, while in other countries, the plant load factor is now because of their policy to keep considerable reserve capacity to meet sharp peaks and unexpected breakdowns, which though available remain unutilised due to lack of load for most of the time, in India the low plant load factor is not due primarily to lack of demand but low plant availability as a result of which the demands for power cannot be met. The Committee would, therefore, like to caution the Government against any sense of complacency on this account. (Serial No. 14)

2.16. A suggestion has been made to the Committee that planning in power should be done on the basis of 50 per cent capacity utilisation so as

to have adequate spare capacity in reserve to provide for scheduled outages and unforeseen breakdowns or demands. The Committee also take note of the fact that power is a capital intensive industry and demand for power in the country is increasing rapidly and due to constraint of resources it has not been possible to provide adequate funds even for the capacity on the basis of 60 per cent utilisation factor. The Committee, therefore, feel that while planning on the basis of 50 per cent utilisation may be an ideal in the long run, it will perhaps not be a practicable proposition in the present situation in the country. (Serial No. 15)

#### B—Preventive and Capital Maintenance of Power Stations.

2.17. Many experts on power have expressed the view that one of the main reason responsible for deterioration in the plant load factor of thermal power stations during the last 3 years has been inadequate preventive maintenance and frequent failure to follow schedules of maintenance of major items of equipment such as boilers, turbines and generators eventually resulting in unplanned outages and lower plant availability. The position in regard to forced outage and plant availability can be seen from the following tables:—

	Percentages		
	Planned outages	Forced outages	Plant availability
1976-77	9.8	13.2	77.0
1977-78	13.4	14.2	72.4
1978-79	14.3	14.7	71.0
1979-80	12.3	18.8	68.0

2.18. It is stated that as compared to 6 units involving 520 MW being involved in forced long duration outages in 1976-77, in 1979-80, 88 units involving 46 outages and 3585 MW were involved in such outages.

2.19. The Rajadhyaksha Committee on Power (September, 1980) expressed concern at the increase in forced outages and delays in carrying out maintenance in these words:—

“It is quite evident that units are not taken out for maintenance when problems are noticed e.g. boiler leakages, but are continued to be run to augment power generation resulting in subsequent prolonged shut-downs.”

2.20. From the methodology of preventive and periodical maintenance adopted by Maharashtra State Electricity Board (MSEB), it is seen that:—

1. Capital overhaul and preventive maintenance is done by them regularly at prescribed intervals; separate schedule is drawn up for each station and rigidly followed in consultation with the engineers of the station.
2. Specialist teams equipped with their own tools, tackles and instruments have been constituted to carry out such jobs efficiently in the minimum time;
3. Bradma methodology and PERT charts are used to stick to schedules;
4. During the any long outages-planned or forced-opportunity is taken to inspect the entire equipment.
5. Periodical meetings for mutual discussions and exchange of ideas on maintenance and overhaul problems are held at various stations in rotation.
6. Data for all power stations is being documented for quick references.

2.21. The Committee were informed during tour that in the case of Madhya Pradesh also rigid and regular observance of preventive maintenance schedules was one of the most important factors responsible for high level of performance of thermal stations in the State.

2.22. The Ministry of Energy stated in a note (Dec., 1980) that:—

“For rationalisation of maintenance procedure an Expert Committee was formed as early as in 1974 under the Chairmanship of Member (Thermal), CEA (known as Kulkarni Committee). The Committee suggested rationalisation of maintenance procedures in large thermal stations on a scientific basis. The Committee’s recommendations circulated to all the Boards/Power System in 1975 were accepted by them as guideline for maintenance work.”

The Ministry added that:—

“All the State Electricity Boards were not yet following the suggestions of Kulkarni Committee *in toto*.”

2.23. Asked if the Central Electricity Authority had made any study of the methodology adopted by Maharashtra State Electricity Board for improving maintenance procedure techniques and circulated it to other State Electricity Boards, the Ministry of Energy (Deptt. of Power) stated:—

“The Committee appointed by the Government of India (Kulkarni Committee) had particularly recommended the use of modern tools, tackles, and diagnostic apparatus for signature analysis of the units. The modern system of record keeping for maintenance were also recommended by the Committee. All the State Electricity Boards have been asked to follow the recommendations made by this Committee. A number of State Electricity Boards are at present using Baker platforms or sky hoisters and Bradma system of preventive maintenance in their power stations.

In case of Maharashtra, which is one of our largest systems in thermal generation, the performance is much better than in a number of power stations in the country. In the case of 210 MW units based on their operation experience on other units MSEB had suggested a number of modifications to be made on the plant and equipment. In a number of cases, they actually participated in identifying the defects and showing ways and means of rectifying those defects. In the case of certain other State Electricity Boards, they have been pointing out the defects in the equipment but have not been participating in suggesting or implementing corrective action by themselves.”

The Ministry added that:—

“There are review teams of C.E.A. who periodically visit the various power stations and bring to the notice of the power station authorities any deficiencies noticed in the working of plant and equipment. These review teams also convey to the station authorities any better operation and maintenance practices which are seen elsewhere with the view of sharing experience.

The various Electricity Boards have also been asked to form betterment teams for short term and long term improvement with regard to the operation and maintenance of the units.”

2.24. Asked if the Roving team of CEA had visited all the power stations having poor generation, Secretary (Power) stated during evidence (January, 1981) that:—

“The roving team has so far visited 20 stations. It is standing team; it will cover more stations.”

He further stated that:—

“1979-80 was a year of bad drought and hydro generation was extremely low. On account of that, although it was not a scientific thing, still to make up the very big shortfall on account of low hydro generation, a number of thermal units were not overhauled.”

2.25. Asked if the decision not to overhaul the equipment in time was a correct one, Secretary (Power) stated that:—

“Overhauling is more important . . . . .we shall see that it does not happen next time.”

2.26. Asked about the States which were not following the recommendations of the Kulkarni Committee on maintenance, Secretary (Power) stated before the Committee that:—

“There is no State which does not accept or which has refused to accept. For example, the target date of Kulkarni Committee is 28 days. Most of them have not been able to achieve it. They are making an effort to achieve it.”

2.27. From the report (Sept., 1980) of Committee on Power (Rajadhyaksha Committee), it is seen that most of the recommendation made by Kulkarni Committee on maintenance practices remain as valid today as when they were made and little progress has been made in implementing them specially by the Boards which need them most. The Committee on Power have also stated that although there has been some reduction in the average period required to overhaul boilers and turbines, the quality of overhaul has not improved and a significant proportion of power stations showed a drop in availability after overhauling.

### *Seminars*

2.28. Asked about their views on the suggestion that there should be annual meetings of maintenance engineers where experience could be mutually exchanged, the Ministry of Energy (Deptt. of Power) stated that:

“It is always beneficial to have mutual exchange of experience with regard to operation and maintenance of power stations and it might be a welcome idea to have regular meetings I seminars.”

2.29. When asked about the steps proposed to be taken by the Ministry to translate this idea into action, Secretary (Power) stated during evidence (Jan., 1981) that eight workshops/seminars had been held since 1979 by Governments/Semi Government organisations to discuss problems of operation and maintenance. On a perusal of the subjects taken up at these workshops/seminars, it is seen that problems of maintenance or overhaul were not specifically discussed at these seminars.

2.30. One of the important reasons for deterioration in the plant load factor the maximum attainable capacity utilisation in thermal power stations during the last 3 years has been the increasing number of forced outages with longer durations resulting in lower plant availability, resulting from lack of proper and planned maintenance and timely overhaul of equipment in most of the thermal power stations.

2.31. The Committee note that Kulkarni committee appointed by the Central Government (1974) had made a number of recommendations for streamlining and rationalising maintenance procedures in large thermal stations on a scientific basis but their recommendations, though accepted by State Electricity Boards, are not being followed by them in toto. According to Rajadhyaksha Committee, the recommendations made by the Kulkarni Committee are as valid today as when they were made. Since efficiency in power sector is as much the concern of the Centre as that of the States, the Central Electricity Authority would do well to find out the difficulties of the State Electricity Boards in adopting the modern maintenance procedures in their thermal Stations recommended by the Kulkarni Committee and render them every possible help to overcome the difficulties. The Committee would like to be informed of the progress made on this point, State-wise. (Serial No. 16)

2.32. The Committee would also like the Central Electricity Authority to impress upon the State Electricity Boards that while adhering to time schedules for preventive maintenance and overhaul, the quality and standard of maintenance should not be ignored. (Serial No. 17)

2.33. The Committee have been informed by Maharashtra and Madhya Pradesh state Electricity Boards that they had been able to achieve a high level of performance in their Thermal Power Stations only due to systematic planning and observance of preventive and capital maintenance schedules. The Committee would like to suggest that the maintenance procedures and practices adopted by the Maharashtra and Madhya Pradesh State Electricity Boards which have been found to have yielded good results should be widely publicised and circulated by CEA for the benefit of State Electricity Boards in other States. (Serial No. 18)

2.34. A Roving Team of Central Electricity Authority is stated to have so far visited 20 Power Stations and brought to the notice of the State authorities deficiencies in the working of the plant and equipment and the modern maintenance procedures followed elsewhere. The Committee would like that a time bound programme should be prepared by the Central Electricity Authority for the visits of this Team to all the power stations whose performance is below the all India level. The Central Electricity Authority should not only keep a watch on the actual implementation of



the suggestions made by the Roving Team but also help the SEBs where necessary, in their implementation. (Serial No. 19)

2.35. The Ministry of Energy, it is seen, appreciate the usefulness of mutual exchange of experience with regard to the problems of maintenance of power stations and would welcome the idea of having regular meetings and seminars for the purpose. The Committee however find that though seminars have been arranged by Government and semi-government organisations to discuss various aspects of power generation and equipment, the problems of maintenance and overhaul of power units have not been discussed specifically at such seminar. The Committee feel that CEA should take initiative to inspire State Electricity Boards to hold meeting of their respective power engineers on a regular basis to enable them to exchange information and experience about the maintenance problems in power stations, Such meetings should also be held by C.E.A. at national level with adequate preparations and results of deliberations circulated to all the State Electricity Boards. (Serial No. 20)

2.36. The Committee are informed that in order to make up for shortfall in hydro-generation in 1979-80 because of severe drought conditions, a number of thermal stations, which were due for overhaul, were not taken up for overhaul that year. It was admittedly a wrong and short-sighted decision. The Committee would like the CEA to ensure, through a system of regular monitoring and liaison with the State Electricity Boards, that maintenance and overhaul schedules, on which depend the health of a plant and its availability for maximum generation, are not disregarded in their anxiety to temporarily tide over a difficult situation. (Serial No. 21)

2.37. It will be immensely helpful to power stations and State Electricity Boards if detailed data about the age, condition, weak points of each power unit, defects developed by it in the past and repairs carried out from time to time, and other aspects requiring special attention is collected and analysed in a scientific manner and kept handy for reference purposes not only for drawing up future maintenance programmes but also for carrying out repairs in times of breakdowns. The Committee would like the CEA to draw up a detailed scheme for setting up data banks on these lines in the State Electricity Boards and urge the Boards to give it a concrete shape. (Serial No. 22)

### C—Super Thermal Power Stations

2.38. In order to utilize optimally the identified coal resources of the country and to generate power at least cost, the Government have decided to establish large thermal power stations at the pitheads and to transmit power to load centres, wherever such projects are economically advantageous.

2.39. The following four Super Thermal Power Projects are presently being executed in the country in the Central Sector by the National Thermal Power Corporation which is a Government of India Undertaking.

Name of the Project.	Installed capacity as approved (MW)	Ultimate capacity planned (MW)
1. Singrauli (U. P.) . . . . .	2000	2000
2. Korba (M. P.) . . . . .	1100	2100
3. Ramagundam (A. P.) . . . . .	1100	2100
4. Farakka (West Bengal) . . . . .	600	2100

2.40. In addition, the Neyveli Lignite Corporation, which is also a Government of India undertaking, is presently constructing in the Central Sector the second phase of the Neyveli thermal power project which involves an addition of capacity of 630MW to the existing capacity of 600 MW at Neyveli in Tamilnadu. The ultimate capacity envisaged for the second phase is 1470 MW.

2.41. The expected dates of commissioning of the various units of the four super thermal power projects and the three units of the second phase of the Neyveli Thermal Power Project—(Neyveli Second Power Station—NSPS) being constructed by the Neyveli Lignite Corporation are given below:

(1) *Singrauli*

(Capacity 2000 MW) . . . . .	1st 200 MW Unit	DEC. 81
	2nd 200 MW Unit	AUG. 82
	3rd 200 MW Unit	FEB. 83
	4th 200 MW Unit	AUG. 83
	5th 200 MW Unit	FEB. 84
	1st 500 MW Unit	1986-87
	2nd 500 MW Unit	1987-88

(2) Korba (1100 MW) . . . . .	1st 200 MW Unit	JAN. 83
	2nd 200 MW Unit	JULY 83
	3rd 200 MW Unit	JAN. 84
	1st 500 MW Unit	1986-87

(3) Ramagundam (1100 MW) . . . . .	1st 200 MW Unit	FEB. 84
	2nd 200 MW Unit	AUG. 84
	3rd 200 MW Unit	FEB. 85
	1st 500 MW Unit	1987-88

(4) Farakka (600 MW)	1st 200 MW Unit	DEC. 84
	2nd 200 MW Unit	JULY 85
	3rd 200 MW Unit	DEC. 85
(5) Neyveli Second Power Station (630 MW)	Original date of commissioning as envisaged in the detailed project report	Revised date of commissioning
	1st 210 MW Unit	April '83 June 1984
	2nd 210 MW Unit	Oct. '83 Dec. 1984
	3rd 210 MW Unit	April '84 June, 1985

The Committee have been informed that proposal for setting up of more super thermal power stations at the following places are under examination:—

Pench (M.P.)	Feasibility reports are under techno-economic examination in the CEA
Waidhan (M.P.)	
Kahalgauon (Bihar)	
Talchar (Orissa)	
Singrauli (UP) Second Stn.	
Manuguru (A.P.)	Feasibility reports are under preparation.

2.43. It has also been stated in reply to Unstarred Question No. 1034 in Lok Sabha on 24-2-1981 that:—

“The Minister for Energy has accepted, in principle, the need to set up a super thermal power station at Chandrapur in Maharashtra in the Central Sector, subject to the coal being capable of being developed and being available for such a station. The study in respect of coal availability is in progress”.

While a number of non-officials have welcomed the concept of locating thermal power stations near pitheads, some doubts have been expressed by certain experts about this policy. A non-official expert has *inter-alia* in his memorandum that studies have revealed that even if the coal contained 50 per cent of inert matter, it pays to transport it to load centres to generate electric power than to generate power at the pitheads and transport it by EHTAC HTDC power lines.

2.44. Another expert has stated that another important consideration is that India is a predominantly agricultural country and there are very few locations with large industrial concentrations. The impact of this on the super thermal power stations would be that it would command very large areas requiring large transmission lines with unavoidable losses. This must be carefully studied before finalising the size of the super thermal stations as well as its locations.

2.45. Asked if Government had made any studies to ascertain the comparative economics of locating thermal power stations at pitheads and locating them at load centres, Secretary (Power) stated in his evidence before the Committee that techno-economic viability study had to be done for each project individually because the length of distance might change the result. If the coal transportation distance was not very long, the transmission of power might become costlier than the transportation of coal.

2.46. Secretary (Power) added that another reason for giving preference to pithead generation is that locating a power station at pithead will solve the problem of low supply of coal because of transportation difficulty as is being experienced at present.

Secretary (Power) agreed in principle that where the resources of coal and water were available and the land was also available, the pithead generation was to be preferred. However, for the balanced power system, some power stations away from the pitheads might also have to be set up for technical reasons.

2.48. In the note on Relative economics of transportation of coal vs. transportation of electrical energy, furnished by the Ministry after evidence, it is stated:

“The cost of power transmission at the receiving end works to 4.01 P/unit and 2.21 P/unit as compared to the cost of coal transportation at 4.94 P/unit and 2.57 P/unit for a distance of 1000 KM and 500 KM respectively. The additional cost of energy on account of transmission losses would be 0.62 paise and 0.30 paise respectively for 1000 KM and 500 KM. Even if this is taken into account the transmission of power would still be economical. This cost comparison is based on the cost of the 400 KV line @ 6.4 lakhs/ckt km. The cost of lines as per the latest estimates based on the tenders opened for the associated transmission lines of Korba is below Rs. 6 lakhs/ckt. km. With the reduction in the Capital Cost of the transmission lines, the operating cost for transmission of power will come down further”.

2.49. From the schedule of commissioning of the Super Thermal Power Stations, it is seen that the commissioning date of Neyveli Second Power Station has been revised from April, 1983 to June, 1984. The original date of commissioning were computed on the assumption that the first unit would be commissioned in 42 months from the date of placement of orders for the major equipment and the other units would follow at intervals of six months. The placement of orders was expected to be completed in October, 1979. However, the letter of intent for steam boilers was issued

in October, 1980 while that for the turbo generators is yet to be issued. The revised commissioning schedule indicated was on the assumption that the letter of intent for the TG sets would be issued by the middle of January, 1981.

2.50. Asked about the delay in placing the orders for steam boilers and turbo generators, the representative of the Department of coal stated in his evidence (January, 1981) before the Committee that the project was to be developed on the basis of concessional assistance from KFW of W. Germany. According to the guidelines laid down by the firm from W. Germany, global tenders were invited for both steam generators and turbines. These were techno-economically evaluated by the consultants. At this stage, the principal indigenous manufacturer (BHEL) who had earlier not responded to the tender came up with a packet offer to supply the equipment (turbo-generators) and asked for preference from indigenous point of view. The matter had not yet been resolved. It was to be considered at inter-ministerial level.

Secretary (Power) stated that:—

“The question is tied today to the question whether we take the financial assistance from Germany in which case we may have to import the equipment, or we do not take the assistance and do without the assistance and place the order on the indigenous manufacturer.”

2.51. He added that the matter was now beyond the Ministry of Energy

2.52. Regarding the progress of 4 Super Thermal Power Stations (Singrauli, Korba, Farakka and Ramagundan) being set up in the Central Sector, Secretary (Power) informed the Committee during evidence that the work in these projects was progressing according to schedule and he was confident that these projects would be completed in time.

2.53. During their visit to the Korba Thermal Power Station in January 1981 the Study Group of Estimates Committee were informed that the work at site was going according to schedule and in certain fields the project was six months ahead of schedule. The Project Authorities were sure that the commissioning of the first stage of the Project would not be delayed.

2.54. The Committee have been informed in a note that:—

“The NTPC had taken up the challenge of commissioning its 200 MW units within a period of 48 months a commissioning cycle which is much shorter than what had been achieved at other sites in the country. This had been made possible by

the introduction of an integrated projects management and control system (IPMCS), aimed at integrating the efforts of all functions to meet the ambitious time schedules, maintain quality and control project costs.”

### *500 MW Generating Sets.*

2.55. It is seen that it is proposed to instal 500 MW generating sets in some of the Super Thermal Stations at a later stage. Singrauli will have two 500 MW sets to be commissioned in 1986-87 and 1987-88, Korba will have one to be commissioned in 1986-87 and Ramagundan one to be commissioned in 1986-87.

2.56. Doubts have been expressed by a number of experts and others about the advisability of introducing 500 MW generating sets in the power stations in the country. It has been stated in one of the Memorandum submitted to the Committee:—

“The impacts of sudden outages will be much more serious if the thermal projects start using 500 MW units. For instance, if one of our future 500 MW units causes a sudden outage, it will be impossible to bridge the gap and will probably either bring total darkness for one full State or even larger area.”

Another organisation has stated that:—

“In respect of 500 MW units, we do not think that we have as yet either the technology, capacity to manufacture or the necessary expertise to instal, operate and maintain them efficiently.”

An eminent expert on Power stated in his evidence before the Committee:—

“I had an opportunity last year of attending the International Conferences—one in Paris and the other in Munich. In both these conferences we had some papers about the performance of various sizes of units all over the world with particular reference to their availability. I was intrigued by the fact that according to these papers, the availability of the units beyond 300 MW each was poorer when compared to the availability of units of 300 MW and below.”

He further stated that:—

“I have been repeatedly telling that highest priority should be given to the availability of the units and that efficiency should come later. . . . . What is the use of having a very efficient unit if its availability is very poor.”

2.57. Asked about the relative economics of introduction of 500 MW generating sets, the Ministry of Energy (Deptt. of Power) stated in a written note that:—

“The Committee for selection of Inter-mediate Unit Size of Thermal Generating Units which submitted its report in March, 1978 has in its report, *inter-alia*, strongly recommended the incorporation of the maximum possible number of 500 MW units in the thermal generation programme by the year 1983-84, in the regions where they are found to be acceptable, even by resorting to higher imports of components and materials. The principal reason for making this recommendation was to reduce the number of thermal units to be commissioned during the time frame 1978—84 and to make the task of additions to thermal generating capacity more manageable.

A thermal generating unit of 500 MW rating has several cost advantages over the other smaller units of rating of 200 MW and less on account of economies of scale. With increasing rating there is more efficient use of material and consequential reduction in mandays for manufacture; the cost of main plant, therefore, goes down. This also applies to auxiliary equipment whose number goes down for same output. In addition, improved heat ratings, lower auxiliary consumption, lower capital cost on account of substantial reduction in building volume per kwh and reduction in operational staff/MW of capacity installed, also enable several cost advantages.

On an approximation, it can be stated that an overall saving between 10 per cent to 15 per cent in terms of cost would accrue as a result of adopting 500 MW units depending upon the type of the units and the size of the alternatives foregone.”

2.58. Asked if the impact of sudden outages of 500 MW units on the entire system had been examined, the Ministry stated that:—

“Studies on the impact of sudden outage of 500 MW units have been carried out by the Central Electricity Authority through dynamic stability studies. These studies indicate that there will be no stability problem if the transmission systems planned are implemented.”

2.59. The Ministry were also asked if India had the necessary expertise to instal, operate and maintain these 500 MW sets efficiently. In reply, the Department of Power stated in a note that:—

“Adequate preparatory action has been initiated to ensure that well trained staff is available for the operation and maintenance of

500 MW units. The 500 MW set being installed at Trombay by Tata Electric Companies would also provide training facilities for installation of 500 MW units at STPS Stations and for an exchange of information and know-how. Training is also being imparted abroad to personnel for design, erection, operation and maintenance of 500 MW units. The NTPC and the Power Engineers' Training Society also propose to train operators by installing 500 MW simulators."

2.60. Secretary (Power) was asked during evidence about the countries in which 500 MW sets had been installed and whether conditions in these countries were identical to these in India. He was also asked if the Ministry were aware of the experience of foreign countries in the matter and also of the papers read at the International Seminars. In reply, he stated:

"These are large number of countries which have not only got 500 MW units but even bigger than 500 units—all European countries, America, Canada, Japan. Even three countries in Asia who are far too small compared to us, are installing 500 MW units.—The main condition is that one 500 MW unit's size should not be more than 5 to 6 per cent of the total system size.—In our case also we have to far decided about the establishment of 500 MW units in three regional grids. About the eastern grid which is comparatively smaller at present, we have not taken a decision only because of the size of the grid.—The actual point of installation of 500 MW will be when the size of the grid become big."

2.61. Regarding the experience in other countries, he stated:

"Today there is no problem in U.K. for 500 MW. 15 years ago, U.K. went in for 500 MW. They were to manufacture on the basis of their knowledge. They had a lot of troubles. It was mainly a manufacturing problem. Most of the manufacturers in that country had to re-do the design. Now they have added up beyond 500 MW—610 MW units. These are giving very good results."

As regards views expressed at the International Seminar, he stated:—

"In a seminar of this type, one individual might have expressed his opinion. We are not aware of a well known opinion. Whenever a new series is developed and tried in a country, initially the results are not good."

2.62. In order to utilise optimally the coal resources of the country and to generate power at least cost, the Government have decided



to set up in the Central Sector large thermal power stations (popularly called Super Thermal Power Stations) at pitheads and to transmit power to load centres. Five such power Stations are already under erection at Singarauli (UP), Korba (MP), Ramagundam (AP), Farakka (WB) and Neyvelli (TN) and Feasibility Reports in respect of 7 more Super Thermal Power Stations (Pench & Moidhan in (HP), Kahalgaoon (Bihar), Talcher (Orissa), Singarauli (Second Station, UP), Mangura (AP) and Chendrapur Power (Maharashtra) are either under examination or under preparation. The Committee take note of the result of study of relative economics of transmission of coal vs. transmission of electrical energy which shows that transmission of power would be more economical over a distance of 500 Km and 1000 km. Besides being cost effective, pithead location of power stations would also lead to greater efficiency in power generation since the problem of low availability of coal because of transport difficulties will not be there. The Committee therefore, welcome the Government decision to set up Super Thermal Power Stations (STPS) at pithead as a step in the right direction. The Committee would like that the techno-economic feasibility reports of new Super Thermal Power Stations should be finalised and cleared expeditiously. (Serial No. 23)

2.63. The Committee also welcome the decision of the Government to set up these Power Stations in the Central Sector to meet the requirements of the concerned regions and not merely of the States in which they are located. This is a positive step in the right direction of regional planning for power as recommended by the Rajadhyaksha Committee and also by this Committee in earlier Chapter. These power stations being the property of the nation as a whole, the Committee hope that distribution of power from these Power Stations would be done in the most equitable manner so as to ensure that the really needy States in each region receive optimum benefits from the Super Thermal Station in that region. (Serial No. 24)

2.64. The Committee are concerned at the delay that has already taken place in placement of orders for major equipment for Neyvelli Second Power Station resulting in postponing the date of commissioning of its three units by more than a year in each case. At the decision about placement of orders for the equipment has not even now been taken there is likelihood of further delay in the commissioning of projects. It is seen that the decision in the matter hinges on whether the equipment has to be imported or indigenously purchased which in turn is linked with the sources of finance for this

project. The Committee recommend that decision in the matter should be taken without any further delay and all possible efforts made to avoid any further delay in the erection and commissioning of the projects at Neyveli Second Power Station.

(Serial No. 25)

2.65. The Committee are glad to note that the work on the 4 Super Thermal Power Stations at Singrauli, Korba, Farakka and Ramagundam is progressing according to schedule and in the case of Korba in certain fields the work is progressing ahead of schedule. The Committee hope that all the units in the Super Thermal Power Stations will be commissioned by target dates and the Centre would be able to give a lead to the State Electricity Boards in this regard.

(Serial No. 26)

2.66. The Committee note that this has been made possible by the introduction of an integrated project management and control system aimed at integrating the efforts of all functions to meet the ambitious time schedules, maintain quality and control project costs. The Committee would expect the CEA to persuade the State Electricity Boards to adopt the integrated project management and control system of the NTPC which has shown results in their projects.

(Serial No. 27)

2.67. It is noted that 3 of the Power Stations viz. Singrauli, Korba and Ramagundam will be having 500 MW generating States at later stages in 1986-87 and 1987-88. A number of experts and non-officials have expressed doubts about the desirability of introducing 500 MW generating sets on the ground that India does not still have adequate technical capacity or expertise to manufacture, instal or operate these sets and that the impact of sudden outage of anyone of these sets on the entire system could be so severe as to plunge a whole State into darkness and what the country should prefer at the present juncture is availability rather than efficiency. It is also stated that the experience of other countries has shown that the availability of bigger generation sets was poorer than that of smaller sets. Secretary (Power) has stated in his evidence that all preparatory action has been taken to ensure that well trained technical staff are available for the operation and maintenance of 500 MW sets and that these sets will be introduced only in bigger grids in which they will not constitute more than 5 to 6 per cent of the total system size and the impact of outage would not create any stability problem. The Committee however, feel that the opinions expressed by experts who are quite eminent in the field merit a more dispassionate consideration. The Committee are therefore, of the opinion that it would

be prudent to consider the question of introduction of 500 MW sets in the power system in greater depths in the light of the level of technical development achieved here and the experience of foreign countries identically placed before taking a final decision.

(Serial No. 28)

#### D—Availability of Spare Parts

2.68. Non-availability of essential spares is another major cause of the poor availability of generating capacity in the power stations. The Ministry of Energy (Deptt. of Power) has stated in a note that one of the reasons for declining plant load factor and increased forced outages has been the “unsatisfactory performance of indigenous manufacturers in supply of spares in time and as per desired quality.

2.69 A State Government has stated in a note submitted to the Committee:—

“The supply of spares by BHEL has been poor and quite a few orders remain outstanding for very long periods even with items for short service life. Though such items can be got manufactured indigenously by other parties, the necessary manufacturing drawing are not made available by BHEL.”

It has further been suggested in the note that:—

“The spares which are required frequently should be manufactured and stocked in a systematic manner by BHEL to enable the Electricity Boards even to lift off the shelf. Similar for imported equipments, it is necessary that some provision is made for long-term availability even when a collaboration is changed at least for such spares which may be required for regular replacement.”

Some other State Electricity Boards have also expressed difficulties about availability of spare parts from the manufacturers.

2.70. It has, however, been stated in the Background Papers for Power Ministers Conference (June, 1980) that:—

“It has been reported that orders are not being placed on BHEL, ILK and other manufacturers sufficiently in advance for manufacturing spare parts. As lead time in some of the items is considerable, it is essential that proper planning should be done and orders should be placed well in advance. . . . Ready availability of spare parts will pay the cost of storage many times over.”

2.71. The Rajadhyaksha Committee on Power have emphasised that manufacturers must give the highest priority to the manufacture of spares and

even let the regular output be curtailed, if necessary. The CEA should, through its operations wing, ensure that SEBs place orders sufficiently in advance for them to be built into the manufacturers production programme and should monitor their production. The Committee have also recommended that a common pool of major spares should be formed for equipment of similar design and capacity and the CEA, with the help of utilities and manufacturers, should take steps to organise their production.

2.72. It has been stated in a note furnished by the Maharashtra State Electricity Board that one of the steps taken for the improvement of performance of power stations is the spare parts management. Continuous process for the development of spare parts indigenously and to develop several sources is in hand. Sources for spares for the electronic and electrical equipment have also been identified so that dependence on import or a few makers is minimised.

2.73. Dealing with the question of spares, Secretary (Power) stated in evidence before the Committee (Jan., 1981):—

“It is on record that most of the State Electricity Boards have been complaining about the timely receipt of spare parts. In the matter of spare parts, there has been an improvement... Even now we do feel that there is a lot to be done.”

Secretary (Power) further stated that:—

“We requested BHEL and the Instrumentation Ltd., Kote to classify spares in terms of delivery periods on the basis of 3 months, 6 months, 12 months, 18 months and like that. We have also asked, in each case, to give us prices also which they can revise from time to time on account of inflationary trends. Once we have these lists, it is our responsibility to place orders on them in time. These catalogues were to be supplied to us by 31 December, 1980. In some cases, they have been supplied. For 200 MW, they have still not been supplied. We hope, they will be supplied soon.”

2.74. Secretary (Power) added that probably there was a need for diverting more capacity for manufacturing spares than what had been done.

2.75. The Chairman, of the Bharat Heavy Electricals Ltd. stated (Jan., 1981):—

“When the equipment was ordered, at that time, we did not co-ordinate the supply of spares. The spares must be an integral part of the order of the equipment itself. That will largely take care of the question of initial spares. Secondly we did not have much experience. Three years' period is not much to determine the full requirements of spares. We

have now got some experience. We are creating a lot of ancillaries where we are having quality control."

2.76. The Chairman, Instrumentation Ltd., Kota, stated (Jan., 1981):

"Previously, the spares were being dealt with other major equipment. Now, I have created a separate organisation so that one man is constantly chasing the spares side. We have set aside 10 per cent of our capacity for spares manufacture. We have also located certain ancillaries for making spares so that the capacity to make spares is augmented. This has resulted in a decided improvement and further improvement will be there in the next six months to one year."

2.77. Asked if it was possible to find alternative sources of supply of spares, Secretary (Power) stated:—

"It was decided that certain spares which are comparatively simple, the drawings would be handed over to the customers, the power stations and each power station has got a small workshop where they can get ancillaries around them and on the basis of these drawings, they can get these fabricated there."

Secretary (Power) further stated:—

"There are a number of spares which a manufacturer does not manufacture himself. It is a purchase item for him. In all these cases, the specifications will be given by the main manufacturers to the power stations and we will procure them directly from the original manufacturers."

**2.78. Delay in the timely availability of spares of requisite quality has been one of the reasons for the poor performance of Thermal Power Stations in the country.**

**A major reason for non-availability of spares could have been that the major indigenous manufacturers in their eagerness to meet the target dates for the supply of equipment of Power Stations have not been given adequate attention to the manufacture of spares and their quality. The State Electricity Boards have also not been placing orders of spares with the manufacturers sufficiently in advance. For the solution of the problem of spares both the manufacturers as well as the State Electricity Boards will have to make a cooperative endeavour, the former by sparing adequate capacity for the manufacture of spares and the later by placing orders in time.**

**2.79. The Committee, therefore, recommend that the indigenous manufacturers should give due priority to the manufacture of spares**

and should have separate department under a high ranking officer to supervise the manufacture and supply of spares.

(Serial No. 29)

2.80. The State Electricity Boards should also assess their requirements of spares well in time and place orders with indigenous manufacturers sufficiently in advance so as to give adequate notice to the manufacturers to meet their requirements without delay. Now that the catalogues of different spares have been prepared by the manufacturers except in the case of 200 MW which are also expected to be prepared shortly along with the time required for delivery, the State Electricity Boards would be themselves to blame if they do not place orders for spares with the manufacturers in time.

(Serial No. 30)

2.81. The Committee further recommend that Central Electricity Authority should monitor the placing of orders for spares by the State Electricity Boards and the supply of spares by manufacturers and if a tany stage delay on the part of the manufacturers in the supply of spares is apprehended, the matter should be taken up by CEA with the highest authority in order to ensure timely supply of the spares.

(Serial No. 31)

2.82. The Committee note that Maharashtra State Electricity Board have taken steps for the development of some spare parts either in their own workshops or with some local suppliers so that the dependence on the manufacturers of equipment for the supply of spares may be minimised. The Committee recommend that the other State Electricity Boards may also be advised to emulate the example of Maharashtra State Electricity Board in the matter and try to manufacture maximum number of spares either in their workshop or make arrangements to precur the same from the reliable local suppliers.

(Serial No. 32)

2.83. To enable the SEBs to have spares manufactured locally it is necessary that manufacturers viz. Bharat Heavy Electricals Ltd., and Instrumentation Limited Kota should make the drawings and specifications of spares aavailable to the State Electricity Boards. The Committee would expect the CEA to assist the SEBs in getting drawings and specifications of such spares from the manufacturers as early as possible.

(Serial No. 33)

2.84. The Committee also feel that each State Electricity Board who have a number of thermal power stations under their control

should be encouraged advised and assisted to start a "Spares banks" where all the spares which are frequently required can be stored for ready availability.

(Serial No. 34)

2.85. The Committee have no doubt that with progressive decentralisation and better coordination and with the CEA playing the role of a mentor as well as a monitor, the position of spare parts availability would ease and improve to the satisfaction of SEBs.

(Serial No. 35)

### E—Supply of Coal to thermal power stations

2.86. Coal is the basic fuel for the country's thermal stations and thermal plants consume about 30 per cent of the total coal produced in the country. The availability and quality of coal play important role in the operation of the thermal power stations.

2.87. A number of State Electricity Boards have complained about non-availability of requisite amount of coal as well as about the poor quality of coal supplied to the thermal power stations and this has been stated to be a major factor contributing to low generation and low plant load factor.

#### *Quality of Coal*

2.88. To a query if the quality of coal supplied was satisfactory, the Department of Power stated in a note submitted to the Committee (October, 1980) that:—

"The quality of Coal supplied to different thermal power stations in the country has been deteriorating over the last few years. A number of power stations have been repeatedly complaining of operational problems due to supply of improper quality of coal such as high ash and low calorific value, presence of extraneous materials etc.—Coal containing higher percentage of inherent ash can be tolerated to some extent but the extraneous material present in coal such as free ash is causing havoc in the coal handling plants, coal pulverisers of the power stations."

2.89. Asked about the steps being taken for improving the quality of coal supplied to the thermal power stations, the Department of coal stated in a note :—

"Coal India have also conducted an exercise to pinpoint the collieries from where oversize coal and bad quality coal is being supplied. Necessary action is now being taken to eliminate the supply of bad quality coal and oversize coal. In most

of the mines the Coal Handling plants are either under erection or are being planned. With the provision of these plants, it would be possible for these mines to crush the coal to the required size and also pick out the extraneous material from coal on picking belts to a large extent."

It has been further stated:—

"According to the reports available, Gujarat State Electricity Board and Maharashtra State Electricity Boards have posted their men for supervision and loading operations in Western Coal-fields Ltd., It is essential that other Electricity Boards also take steps to immediately post their men to supervise the quality of loading in ECL, BCCL and CCL."

2.90. Asked if any improvement in the quality of coal supplied to the thermal power stations has been noticed as a result of these measures, the representative of the Department of Power stated in his evidence before the Committee:—

"With more and more mechanised mining being resorted to in the country, the chances of stone and shale getting mixed become more, Loading is also getting mechanised. The ultimate solution is that every coalmine must have an elaborate coal handling plant including crushing and screening so that shale and stone will get separated and will not mix with the coal. In power Ministers' Conference an interim decision was taken that till the coal handling plant is commissioned in any mine, we should have a loading representative on the spot so that some sort of check is exercised and the Coal Department will put extra labour to handpick the shale and stone to the extent possible."

2.91. He further stated that apart from Maharashtra and Gujarat, other State Electricity Boards had also started sending their representatives and this has led to some improvement, but it was not enough.

2.92. The representative of the Deptt. of Coal stated before the Committee:—

"It is only in open cast mines this problem has arisen. A programme to instal coal handling plant in the open cast mines has been taken in hand. 84 coal handling plants have already been installed and others are under installation. We expect that by 1984-85 all these open cast mines will have these plants. Even now, 50 per cent coal is handled in the coal handling plants."



2.93. Asked if the coal supplied to the thermal power stations is of low quality and contain high ash content, Secretary (Power) stated:—

“It is so, but it will have to be so because most of our coal in India is of lower grade and of higher ash content. All the same that is our national resource and we have got to use it.”

#### *Demand & Supply*

2.94 As regards the demand and actual supply of coal to thermal power stations during the last 5 years, the Ministry of Energy (Deptt. of Coal) have furnished the following statement:—

Year	Allocation	Actual supply	Percent- age of supply to Demand.
(in thousand tonnes.)			
1975-76	30,389	35,317	83.31
1976-77	31,125	26,792	86.08
1977-78	34,690	28,271	81.49
1978-79	38,842	29,657	76.35
1979-80	42,860	33,264	77.61

2.95 It has been stated by the Department of Power in a note that:—

“As per the usual norms, all power stations situated beyond, 300 kms. distance from the coal mine should keep a minimum stock of 4-6 weeks, those within 350 kms. a stock of 3 weeks and pithead power houses a stock of 2 weeks. In case of thermal power stations where the offtake of coal is by means other than the rail i.e. by conveyer belt road etc. the power stations are able to maintain sufficient coal stocks. In the case of pithead stations, no difficulty is envisaged in maintaining the stock to the desired level. However, in the case of thermal power stations, which get supply of coal by rail, most of the power stations have not been able to get enough coal supplies to maintain coal stocks as per norms, for the last 2 to 3 years.”

2.96 As regards the position of supply of coal to thermal power stations during 1980-81, the Deptt. of Power have stated (December, 1980):—

“The coal receipts which had averaged to 3038 wagons per day in April, 1980 had increased to 3215 wagons per day in May,

1980. However, the receipts of wagons declined from June, 1980 onwards and came to 2480 wagons per day in September, 1980. The matter was taken up by the Minister of Energy with Minister of Railways for increased supply of wagons for movement of coal to thermal power stations to a level of about 4000 wagons per day. The supply of wagons improved to a level of about 2800 wagons per day in October, 1980."

It has further been stated:—

"The position regarding daily supplies and stocks is being closely monitored by Central Electricity Authority, Deptt. of Power and the Railway Board. The Cabinet Secretariat also monitors the coal supplies to the Power Stations. As a result of these efforts, coal supplies to the Power Stations in December, 1980 has somewhat improved but the movement is still not upto the desired level."

2.97 The Ministry of Railways have intimated in a note submitted in March, 1981 that daily loading of Coal for power stations during 1980 has been as follows:—

January, 1980	2913 wagons
February, 1980	3323 wagons
March, 1980	3287 wagons
April, 1980	3299 wagons
May, 1980	3197 wagons
June, 1980	3195 wagons
July, 1980	2905 wagons
August, 1980	2526 wagons
September, 1980	2683 wagons
October, 1980	3059 wagons
November, 1980	3197 wagons
December, 1980	3533 wagons

2.98 It has been stated in a written note furnished to the Committee (March, 1981):—

"In an Inter-ministerial meeting between the Railways and Departments of Coal and Energy held on 10 and 11 February, 1981, it was agreed that movement of coal to thermal power houses would be stepped upto about 4,100 wagons a day to help maximisation of generation of power and also to build up stock to a satisfactory level. It was possible to achieve a daily average loading of 3970 wagons for power houses during the month of February, 1981."

2.99 Asked about the reasons for the demands on thermal power stations for coal not being met in full, the representative of the Department of Coal stated in evidence (Jan., 1981):—

“We had at the beginning of the current year, total coal demand assessed by the Planning Commission at 119 million tonnes. At that point, there was a stock of 14 MT at the pitheads and production target of 113 MT was drawn up for the year. In the current year our production is 7 per cent more than last year. The pithead stocks are also more than 14 million tonnes and they have been increasing. We can meet the demand in full except certain types of coking coal for the steel plants or steam grade coal from Raniganj etc. Because of the movement constraints, we had to make sale of coal free of restrictions. I give an offer of 10,000 wagons of coal per day and if they move that and we still feel that there is a some shortage of coal, I guarantee on behalf of the Ministry of Energy that we will raise this. The constrain is not of coal, but of movement.”

2.100 The representative of the Ministry of Railways (Railway Board) stated:—

“We must understand that the coal has to come to the railway siding for movement. We are interested in the stock at the rail head. It is not available. It may be available near the pithead. The other point is we have given an assurance that whatever is offered, it will be moved by the Railways. . . . . But as I have said the offer has to be increased and if the coal India increases the offer, we will move.”

2.101 Secretary (Power) stated in his evidence before the Committee:—

“We have been promised 3,900 wagons per day. Once that target is achieved the problem will not exist.”

2.102 Asked whether the Department of Power had intimated their requirement of Coal for the next 15 years and whether the Deptt. of Coal had prepared any perspective plan for the production of requisite amount of coal, the Committee were informed in a note (December, 1980) that:—

“The Working Group on Coal and Lignite set up by the Planning Commission has assessed the following year-wise coal requirements for power sector for the period 1980-81 to 1989-90.

<i>Year</i>	<i>Requirements in Million tonnes for power Sector</i>
1980-81	40.12
1981-82	38.09
1982-83	56.50

<i>Year</i>	<i>Requirements in Million tonnes for power Sector</i>
1983-84	66.15
1984-85	76.42
1985-86	87.07
1986-87	97.62
1987-88	104.96
1988-89	110.07
1989-90	112.06

Coal India Ltd., and Singareni Collieries Co. have drawn up production programme for Sixth Plan (1980-85) and Seventh Plan. The production figures are being finalised in consultation with the Planning Commission."

2.103. Asked if the Ministry of Railways were aware of the quantity of Coal which they would be required to transport for thermal power stations during the next 15 years and if so whether steps have been taken to create the necessary capacity for the same, the Ministry of Railways stated (December, 1980) that:—

"The Ministry of Railways have not been advised of the quantity of Coal that would require to be transported for the Thermal Power Stations during the next 15 years. The Railways had, however, made out long-term forecasts of freight traffic some time back for their corporate Plan for the period 1974—89. Though such forecasts had been made out for 8 principal commodities separately, coal estimates were on aggregate basis and for different users separately."

It has further been stated that:—

"The Ministry of Railways through their Annual Plans and Five Year Plans approach the Planning Commission for necessary investment for acquisition of wagons, development of requisite line capacity and other infrastructure facilities required not only for the movement of coal but for other commodities also.— In the current Sixth Five Years Plan, the Working Group on Railways had projected a need-based requirement of about 11,800 crores. The Planning Commission, however, have indicated the possibility of earmarking of only Rs. 5,000 crores. This will imply that in case the traffic materialises according to the forecast of the Working Group, the Railways will not be in a position to cater to this traffic as the required capacity

would not be developed within the availability of meagre capacity being provided.”

2.104. In a subsequent note (March, 1981) the Committee have been informed by the Ministry of Railways that against the requirement of Rs. 11,817 crores as estimated by the Working Group, the allocation made by the Planning Commission for the Railways during Sixth Plan is Rs. 5,100 crores.

2.105. As regards the impact of cuts in plan allocations on the capacity of Railways to meet the traffic needs during Sixth Plan with particular reference to transportation of Coal to thermal power stations, the Ministry of Railways (Railway Board) have stated in a note (March, 1981) that :—

“The cuts in the allocation will limit the Railways freight traffic transportation capacity to about 260 MT as against the requirements of 309 MT as per the VI plan document. So far as the transport of coal is concerned against the projected demand of 116.7 MT in 1984-85, the Railways may be able to carry only 90.7MT of coal, hopefully on best efficiency norms. The movement of coal to power houses would be arranged on priority.”

#### *Transportation of Coal through Slurry Pipeline*

2.106. The Committee were informed in a note by the Department of Power that:—

“In view of the increasing requirement of coal for the proposed thermal power stations in the country and the consequential pressure on rail transportation for movement of coal to power stations, the question of adopting of alternative system for transportation of coal from coal mines to the power stations has been under the consideration of the Government for some time. The Gujarat State Electricity Board had commissioned Engineers India Limited to prepare a feasibility study for slurry transportation of coal of Wanakbori, Ukai and Narmada( Proposed) thermal power stations. EIL have submitted a report on the feasibility study for the transportation of 10 million tonnes of coal per annum with a potential to handle upto 15 percent additional quantity. It is learnt that the report has also considered comparative cost of transportation of coal by rail, slurry pipelines and pit-heads generation with transmission by extra high voltage system etc., In the mean time, a USA firm also submitted a preliminary report on the transportation of coal through pipeline in the slurry form to thermal stations and other industrial consumers., This report has examined the feasibility of coal transportation through pipelines in three

areas viz. (i) Singrauli coal fields to Western States, (ii) Singrauli coal fields to Northern States and (iii) Singrauli coal fields to Southern States.”

It has been further stated in the note that:—

“In order to examine the relative economics of slurry pipelines transport of coal vis-a-vis other alternatives, the Planning Commission have set up in October, 1980 a Working Group comprising of representatives from the Planning Commission, CEA. Department of Coal and Central Mines Planning and Development Institute to select a suitable segment for undertaking a techno-economic feasibility study for pipeline transportation of coal in slurry form, to recommend suitable agency for undertaking the techno-economic feasibility study and give their recommendations on such feasibility report when submitted by the agency. This matter can be considered further on receipt of the report of this Working Group.”

2.107. Asked about the main findings of the studies and the action taken on these studies, Secretary (Power) stated in his evidence (Jan., 1981) before the Committee:—

“It is a fact that one American firm came here. But the proposal they gave was a very sketchy one. It was more a commercial proposal. . . . Engineers India have been commissioned to start a study. So far they have not submitted the feasibility report, they have submitted a pre-feasibility report. But they have to undertake a more detailed study. Even if assistance from outside is necessary, it would be provided to them.”

#### *Transportation of Coal by Coastal Shipping*

2.108. The Committee on Power (Rajadhyaksha Committee) had recommended that “The concept of unit trains and coal movement by sea and inland water transport have to be seriously pursued.”

2.109. Asked if Government had examined the feasibility of movement of coal by sea and inland water transport, the representative of the Deptt. of Power stated during evidence that:—

“The Ministry of Shipping and Transport had undertaken a study in 1975 and they had asked a consultancy firm to study whether it is feasible to transport coal by shipping to coastal power stations located in the country. They were asked to identify all possible alternative systems. On the basis of this study, certain locations were studied. Tuticorin is one such location where the movement of coal is being undertaken by ships.”

It was further stated that:—

“There were several alternatives suggested. The basic data is available. But, at present, this kind of investment which will have to impinge on harbour development, enhancement of port facilities, building up of new and different types of barges and other ocean going vessels is not possible. So, the Ministry of Shipping and Transport feel that immediate stepping up of coastal shipping may not be possible.”

**2.110. Coal is the basic fuel for the Thermal Power Stations in the country and availability of requisite quantity and quality of coal is vital for the efficient working of Thermal Power Stations.**

**2.111. The Committee have received complaints from State Electricity Boards regarding persistent deterioration in the quality of coal supplied for Thermal Power Stations, which is stated to be a major constraint in the proper functioning of Power Stations. While higher ash content in the coal, it is stated, can and has to be tolerated to an extent, the extraneous matters like stones and shales in the coal and over-size coal which are present mostly in coal coming from open cast mines play havoc to power stations equipment and create operational problems in the thermal stations.**

**2.112. The Committee note that in order to eliminate extraneous matters in coal and pulverise the coal to proper size a programme of installing coal handling plants has been drawn up by Coal India Ltd. Eighty four such plants have been installed and more are under way. By 1984-85 all open cast mines are expected to be equipped with coal handling plants. The Committee urge that the problem of extraneous matters in coal and oversize coal should be tackled on a priority basis by installing coal handling plants in all open cast mines as are linked with power stations, according to a time-bound programme. Till coal handling plants are installed in such mines, coal authorities should ensure by engaging extra labour that extraneous matters are manually removed from coal to the extent possible before it is despatched to Thermal Power Stations. In the future, whenever a mine is taken up for development for the purpose of supplying coal to thermal stations, it should be ensured that coal handling plant is installed there before it is commissioned.** (Serial No. 36)

**2.113. It is note that the Maharashtra and Gujarat State Electricity Boards and certain other Boards have deputed their representatives in the collieries to supervise loading of coal with a view to keep out shale, stones and over-size coal as far as possible. The Committee recommend that other State Electricity Boards should also be advised to follow suit and depute their representatives to exercise check over the quality of coal**

at the loading stage. The Committee hope that the representatives of the State Electricity Boards deputed at coal mines will be given full cooperation by coal authorities to enable them to keep an effective watch over the quality of coal intended for power stations. (Serial No. 37)

2.114. The Committee are concerned to note that the supply of coal to the Thermal Power Stations has been deteriorating over the last 3 years. From a supply of 86 per cent of the demand in 1976-77, coal supplies to power stations came down to 76.35 per cent in 1978-79 and 77.61 per cent in 1979-80, with the result that Power Stations have not been able to maintain even minimum coal stocks as per norms and power generation has suffered in the process. Against the background of coal shortages in the past the report of a 7 per cent increase in coal production in the current year with comfortable pitheads stocks of more than 14 million tonnes should have brought tremendous relief but for the controversy between the Department of Coal and the Railways over the latter's capacity to transport coal and the former's capacity to offer adequate coal for transportation. Department of Coal claim to have enough coal to meet the requirements of power stations in full but it appears all the coal is not available at railway sidings where it should be brought if it has to be carried by Railways. Railways claim to have the capacity to carry all the coal that may be offered at rail heads. From this the Committee cannot help feeling that there is lack of coordination between the Department of Coal and the Ministry of Railways and the main problem is that of moving coal from pithead to rail heads.

2.115. The Committee regret to observe that because of lack of co-ordination between coal producers and Railways, power generation in the country is suffering with the consequent loss to the entire economy. Now, that the Cabinet Committee on infrastructure is supervising the problem of movement of coal, the Committee feel that a permanent solution to this problem should be found out at the earliest so that Thermal Power Stations in the country do not suffer for want of coal. (Serial No. 38)

2.116. The Committee note that against a daily requirement of about 3,900 wagons for Thermal Power Stations the supply was as low as 2,526 wagons in August, 1980 and only marginally increased to 2,683 wagons in September, 1980. However, the Committee are glad that there has been considerable improvement in supply of coal to Thermal Power Stations during the last four months and in February, 1981, coal movement was stepped upto 3,970 wagons a day as against/requirement of 4,100 wagons. The Committee hope that Railways will continue their endeavour to improve loading of wagons further and will be able to reach the target of 4,100 wagons per day for the thermal power stations at the earliest. (Serial No. 39)



2.117. It is proposed to add about 20,000 MW power capacity in the country during the 6th Five Year Plan and another 30,000 MW during the 7th Five Year Plan. During the 6th Plan more than 70 per cent capacity addition will be in the Thermal Power Stations. The requirement of coal in the country for the Power Sector is estimated to increase from 42.12 million tonnes in 1980-81 to 112.06 million tones in 1989-90. It is a stupendous task particularly in view of the fact that coal production in the country has remained more or less stagnant during the last 3 years. The Committee therefore, urge that the Deptt. of Coal should formulate a detailed plan with yearly targets to step up coal production and take concerted measures from now on to increase the coal output so as to meet in full the requirements of the Thermal Power Stations in the Five Year Plans. It should be ensured that the production of coal every year matches with the requirements and that shortage of coal should not prove to be a constraint in the achievement of power targets in the Five Year Plans. (Serial No. 40)

2.118. The Committee are concerned to note that although with the installation of more and more Thermal Power Stations in the 6th Five Year Plan the Railways would be required to move increasing amount of coal, the Railways, it is stated will not be in a position to cater to the anticipated traffic as the required capacity would not develop "because of inadequate allotment of funds for railways during the 6th Five Year Plan." The Committee feel that as adequate capacity in the Railways is an essential pre-requisite for the efficient working of Power sector as well as of other key sectors it will be disastrous if the freight capacity of Railways does not keep pace with the demand. The Committee feel that this is an aspect which should be taken serious note of now, rather than later, and not only by Railways but also Deptts. of Power and Coal and reviewed jointly by them in consultation with the Planning Commission to make sure that the Railways are allotted adequate funds to develop transportation capacity to the desired level and the development programmes keep pace with the growing requirements. (Serial No. 41)

2.119. The Committee find that Railways have not so far been informed of the quantity of coal that will be required to be transported by them for thermal power stations during the next 15 years. This should be done at the earliest. (Serial No. 42)

2.120. In view of the increasing requirement of coal for Thermal Power Stations and pressure on rail transportation for movement of coal, the question of adoption of alternate systems for transportation of coal has assumed great importance. It is stated that working group of Planning Commission have been appointed (Oct. 1980) to undertake a techno-economic feasibility study for pipeline transportation of coal in slurry form.

The Ministry of Shipping & Transport which had earlier undertaken a study into the feasibility of movement of coal by sea have expressed their inability to step up coastal shipping because of lack of resources. The Committee feel that alternate means of transport of coal will have to be found out before long if power and other key sectors of economy depending upon coal have to be insured against vagaries of rail transportation which is reaching saturation point on a number of sections. The Committee would suggest that feasibility of organising alternate systems of coal transport (including coastal shipping) should be explored with a long term perspective in view and an integrated long-term approach evolved to deal with the problem before it becomes too acute for the Railways to handle it alone. (Serial No. 43)

#### F. Badarpur Thermal Power Station

2.121. Badarpur Thermal Power Station is a power station in the Central Sector which was set up to meet the growing demand of power in the Union Territory of Delhi as well as other States in the Northern Region of the country. The Station designed and engineered by the erstwhile Central Water & Power Commission is being managed by the National Thermal Power Corporation since 1st April, 1978.

2.122. Stage I of the Power Station has 3 units of 100 MW which were commissioned in July, 1973, August 1974 and March, 1975 respectively. All plant and equipment for these units are of indigenous make, the major items being supplied by Bharat Heavy Electricals Limited. Stage II consists of one unit of 210 MW which was put into commercial operation from 17.3.1980. Stage III of the project consists of an additional unit of 210 MW. This unit is expected to be commissioned during 1981.

2.123. The management of Badarpur Thermal Power Station was transferred to the National Thermal Power Corporation on 1st April, 1978.

*Performance from 1977-78 to 1979-80.*

2.124. The performance of the three 100 MW units in the Power Station during the last 3 years has been as follows:—

	1977-78	1978-79	1979-80
1. Installed Capacity (MW)	300	300	300
2. Derated Capacity (MW)	285	275	275
3. Generation (Million Units)	830.93	1055.35	1275
4. Outages (in hours) (in percentage)	15611 (59)	11212 (43)	8226 (31)
5. Overall Plant Utilisation Factor (%)	33.62	43.80	52.80

### *Performance during 1980-81*

2.125. During the period April to November, 1980 the performance of these units has been as follows:—

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1. Derated Capacity	275M
2. Generation in Million Units	825.00
3. Overall Plant Utilisation Factor (%)	59.88

2.126. As regards the 210 MW Unit in Stage II it has been stated by the Deptt. of Power that:—

“This unit was put into commercial operation on 17th March, 1980 after overcoming enormous teething trouble and rectifying some of the design defects which needed modifications in plant and equipment.....Although this unit has already been taken on commercial operation, design modifications need to be carried out by the manufacturer to remove major operational constraints.”

#### *Trippings in Badarpur Power Station*

2.127. It is seen from the material furnished to the Committee that there were a total of 108 trippings in the various units of Badarpur Thermal Power Station in 1977-78, 199 trippings in 1978-79 and 260 trippings in 1979-80. Out of these only 4,9 and 5 trippings were planned and all other were forced trippings. It was further stated that the number of trippings had been increasing from 1977-78 mainly due to non-overhaul/annual maintenance or delayed overhauling.

2.128. Asked if it was not a shortsighted decision to postpone maintenance and overhauling, Secretary (Power) stated in his evidence before the Committee that it was not entirely correct that tripping were only on account of postponement of maintenance. There had been difficulties in the Northern Grid system which were resulting in voltage conditions being such that there were a lot of trippings. The problem had been taken up by the Central Electricity Authority. One or two lines had been energised and now the system was much better which led to more stable operation.

2.129. Secretary (Power), however agreed that overhauling was more important and it would be, ensured that in future the annual overhauling/maintenance was not postponed.

2.130. The Committee are constrained to observe that performance of the Badarpur Thermal Power Station during the last 3 years has not been fully satisfactory. The Plant Load Factor in 1977-78 and 1978-79 was as low as 23.62 per cent and 43.80 per cent. If in 1979-80 P.L.F. improved to 52.80 per cent, (though this was lower than the level of performance achieved by a number of Thermal Power Stations in Maharashtra and Madhya Pradesh and even that of Indraprastha Power Station in Delhi, the quality of power supply turned poor in as much as the station had as many as 260 tripping in this year (1979-80) as compared to 108 in 1977-78. The Committee feel that the reasons for poor performance of this Power Station should be clearly identified and action taken forthwith to improve the quality of power supply and capacity utilisation of the station. (Serial No. 44)

2.131. The number of trippings in the Badarpur Power Station during the last 3 years have increased from 108 in 1977-78 to 260 in 1979-80. The reasons for the trippings are stated to be mainly delayed overhauling or non-overhauling annual maintenance difficulties in the Northern grid system. The Committee feel that atleast the power plants in the Central Sector should have adhered to the annual maintenance/overhaul schedule.

The trippings could then have been reduced to the minimum. It is a short-sighted approach to delay or postpone overhauling or periodical maintenance just on considerations of expediency in this regard of long term consequence. The Committee expect that in future the annual overhauling maintenance will not be delayed or postponed beyond a safe limit.

(Serial No. 45)

2.132. The Committee are disappointed to note that although the 210 MW unit in the Badarpur Power Station was put into commercial operation hardly a year ago, after overcoming teething troubles and rectifying design deficiencies it has started showing major operational constraints requiring further design modifications. The Committee recommend that the authorities should arrange to have necessary modifications made in this power plant at the earliest so as to make it operationally efficient and reliable. (Serial No. 46)

2.133. The Committee also recommend that in the next 210 MW unit which is under erection, steps should be taken right now to ensure that there are no design deficiencies when it is put into commercial operation.

**2.134. The Centre is poised to play a big role in power sector in the years to come. Badarpur Power Station is perhaps the first thermal station being run and managed by the central sector. The Committee feel that the central agency charged with the responsibility of running Badarpur Power Station should spare no effort to operate this power station as a model of efficiency, in order to inspire confidence about its capacity to manage bigger units that are coming up elsewhere.**

1070:

**(Serial No. 47)**

## CHAPTER III HYDEL POWER

### A—Importance and present position.

3.1 The total installed capacity in the power sector and the installed hydro capacity during the last years and at present is as follows:—

Year	Total Installed capacity (MW)	Installe hydro d capacit (MW) y
1975-76	. 20117.06	8463.60
1976-77	. 21468.71	9024.90
1977-78	. 23668.71	10020.22
1978-79	. 26690.71	10832.22
1979-80	. 28489.71	11381.22
As on 28-2-81	. 29704.83	11790.97

Thus the share of hydro power in total installed capacity has come down from 42 per cent in 1975-76 to 39.7 per cent in 1980-81.

3.2 According to the present indications a capacity of 19666 MW is expected to be commissioned during the Sixth Plan period out of which 4768 MW will be in hydro power units. Thus by the end of the Sixth Plan (1984-85), out of the total installed capacity of 48155.71 MW, the share of hydro power is likely to be 16149.22 MW i.e. about 34 per cent.

3.3 A top level expert has stated in his memorandum to the Committee:—

“The falling share of hydro power is a matter of serious concern since hydro power requires the least amount of foreign exchange, the technology for its development is well established in India, the machines are simple and reliable, it is the cheapest source of peaking power and is a renewable source of energy besides being pollution free”.

3.4 Another expert has stated in his memorandum:—

“It is necessary that we give the highest possible priority for the development of our vast and renewable sources of energy viz.

the hydel potential. We have about 1,00,000 MW of hydel potential of which hardly 11 per cent has been developed hereto) . . . . . Because, of the rising costs of coal and oil used in the conventional thermal stations, a lot more initial investment on the execution of hydel projects is justified. With the presently available transmission technology, it is possible to develop the available hydro potential even at the remotest corners of the country and transmit the available energy economically over long distances”.

3.5. He stated in his evidence before the Committee:—

———If we waste our available resources of coal now for its mere calorific value, future generations will be blaming us for our indiscriminate use of coal for power generation”.

3.6 He further stated:—

“Long gestation periods in the case of hydel projects will not have any relevance if we start work on a number of projects at the same time or at short intervals so that they may materialise year after year instead of taking up work on hydel projects at irregular intervals”.

3.7 In a note on “Strategy and Policy for Power Development” submitted to the Committee, the Department of Power have stated that:—

“Under conditions obtaining in our country, hydro power constitutes the cheapest source of electricity production in most locations. In view of this, and in view of the fact that hydro is a regenerative source of energy, development of hydro power is given high priority and hydro projects are taken up whenever feasibility of the schemes has been established”.

According to reply to Unstarred Question No. 2154 in Lok Sabha dated 3 March, 1971, the present average cost of power generation in the country from different sources is as follows:—

---

(i) thermal	. 25 to 35 paise/Kwh.
(ii) hydro	. 12 to 15 paise/Kwh.
(iii) diesel	. around 100 paise/Kwh.
(iv) nuclear	. 16 to 17 paise/Kwh. for already commissioned units (Tarapur and RAPP—I) and 30 to 35 paise/Kwh. for new projects.

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In para 2.57 of their Sixteenth Report, the Estimates Committee (1977-78) had observed that—

“The Committee cannot but express their deep disappointment that the progress in harnessing the hydro-electric potential in the country should have been so slow. The Committee hope that in the new perspective plan for development of power, hydro-electric power development would find its due place and government would take concerted measures to step up the development of hydro-electric potential in the various States of the country”.

3.9. Regarding hydro-electric potential in the country and potential so far developed, the Department of Power have stated in a note submitted in October 1980 that:—

“The Central Electricity Authority has now taken up the reassessment of the hydro-electric potential in the country. — As a first step a quick reassessment of hydro-electric potential based on the information available from various agencies in the States and the Centre has been done. The tentative results of the re-assessment exercise which is still incomplete indicate that the total hydro-electric potential is equivalent to 396.3 TWH of annual energy generation. The hydro-electric potential which has already been developed till the end of March, 1980 is about 41 TWH which is about 10.4 per cent of the total available potential”.

3.10. The position regarding status of development of hydro-electric potential in each region is as follows:—

*Hydro Electric Potential—Status of Development*

Region	Energy potential as per recent re-assessment (TWH)	Energy potential developed upto March, 1980 (TWH)	Energy potential under development (TWH)
Northern	147.39	13.48	9.3 <sup>8</sup>
Western	36.95	6.28	1.71
Southern	68.30	17.98	13.1
Eastern	33.81	3.07	4.5
North-Eastern	105.87	0.35	1.64
<b>TOTAL</b>	<b>396.32</b>	<b>41.16</b>	<b>30.46</b>

3.11. Asked as to why inspite of “high priority” stated to have been accorded to hydrel-power, the hydro power actually developed and the share



of hydro power in the Sixth Plan do not reflect the "high priority" in actual practice, the Department of Power stated in a note:—

"Development of hydro power has been receiving priority which was manifest till fourth Plan period. Due to compulsion of resources, thermal projects having a shorter gestation period have come to have a greater share in the recent past. Attention is being given to take up a number of hydro-lectric projects which if resources do not form a handicap would result in addition of nearly a total of 15,000 MW of hydro electric capacity in the five year period 1985—90 as compared with the expectation of nearly 5,115 MW addition in the 1980—85 capacity".

3.12. Asked why in the North-Eastern regions, only 0.35 per cent of the hydro electric potential had been developed so far, the Ministry stated:

"In the north-eastern region, the major part of the large potential comprises of a few large schemes with advance geo-technical problems of the Himalayan region. So far the hydro-electric projects being taken up they are meant for only meeting the intra-regional loads and have met the greater part of the needs of the region. The pace of exploitation of major projects has been tied to some extent with the geo-technical problems, besides the financial aspects".

3.13. Secretary (Power) informed the Committee in evidence that North-eastern region had a hydro-potential of 20,000 MW, which was much more than the region's requirement.

3.14. Asked whether giving more importance to thermal power stations was not at variance with the considered views of Government to give "high priority" to hydro power, Secretary (Power) stated in his evidence before the Committee:—

"A large amount of hydel power capacity has been sanctioned. In most of the states they do not put money in that at all. The delays are occurring.... There is shortage of capacity in hydel sector. Everybody tries to have thermal units."

3.15. Asked if Government had formulated any long term plan for development of hydro-electric potential in the country, Secretary (Power) stated:—

"For 3,500 MW schemes, which have been cleared by the Central Electricity Authority, Planning Commission has not given the approval. There are schemes not only investigated, but fully investigated and cleared technically and economically, but not sanctioned by the Planning Commission."

3.16. Asked about the share of hydro-power in the total installed capacity now and the expected capacity by 1984-85, Secretary (Power) stated:

“Presently, it is 39 per cent and by 1984-85, it will be 34 per cent. In 1989-90 we want to increase it from 34 to 40 or so. It is all before the Planning Commission and we are doing our best to increase it.”

3.17. Asked if Government had any plans to set up hydel projects in the Central Sector, the Department of Power stated in a note (March, 1981):—

“The following projects are currently under execution in the Central Sector:

- |  |   |                 |
|--|---|-----------------|
| 1. Loktak HE Project in Manipur (3x35 MW)      | } | Through NHPC    |
| 2. Baira Siul HE Project in H.P. (3x60 MW)     |   |                 |
| 3. Salal HE Project in J&K (3x115 MW)          |   |                 |
| 4. Devighat HE Project in Nepal (3x4, 6 MW)    |   |                 |
| 5. Kopili HE Project in Assam (2x50 + 2x25 MW) |   | Through NEEPCO. |

The following projects have recently been taken up in the Central Sector and have been entrusted to N.H.P.C. for execution:

- |   |   |         |
|---|---|---------|
| 1. Koel-Karo HE Project in Bihar (710 MW) | } | 2180 MW |
| 2. Dul-Hasti HE Project in J&K (380 MW)   |   |         |
| 3. Kol dam HE Project in H.P. (600 MW)    |   |         |
| 4. Uni HE Project in J&K (4x120 MW)       |   |         |

It has also been decided to take up the investigation and execution of the following projects in the Central Sector through N.W.P.C.:

- |  |   |          |
|--|---|----------|
| 1. Parvathi HE Project in H.P. (1900 MW)       | } | 4070 MW. |
| 2. Chamera HE Project in H.P. (640 MW)         |   |          |
| 3. Dholiganga HE Project in U.P. (900 MW)      |   |          |
| 4. Goriganga HE Project in U.P. (450 MW)       |   |          |
| 5. Eastern Ramganga HE Project in U.P. (80 MW) |   |          |
| 6. Tanakpur HE Project in U.P. (100 MW)        |   |          |

Although the proposals for taking up a few more projects in the Central Sector are under discussion with the various State Governments, no final agreement has so far been reached in this respect”.

3.18. It has been stated in reply to unstarred Question No. 2942 dated 10.3.1981 in Lok Sabha that “In principle the Government have decided to induct foreign technology in selected areas, with a view to expediting the commissioning of hydel projects. However, no final agreement has been arrived at regarding the specific and selective areas for such involvement.”

3.19. Although hydro power has been admitted to be the cheapest source of energy and is replenishable and pollution free, the Committee regret to note that adequate attention has not been given to the development of power from hydel resources. Hardly 11 per cent of the vast hydel potential estimated to be about 1 lakh MW has so far been developed. What is causing concern to the Committee is that the share of hydro power in the total installed capacity in the country is on the decline, in that the share of hydro power in the total installed capacity has come down from 42 per cent in 1975-76 to 39 per cent in 1980-81, and will go down further to 34 per cent in 1984-85. This development is clearly inconsistent with the policy of the Government to give "high priority" to development of hydro power. For this the Committee cannot but hold the Central Electricity Authority responsible in spite of the States preference for thermal power since the Central Electricity Authority having been vested with statutory power to coordinate the activities of State Electricity Boards could and should have corrected the imbalance at the planning stage.

3.20. In view of the need to conserve coal for future generations and in view of the fact that hydro-power is a perennial, regenerative pollution-free and the cheapest source of energy that can be transmitted to any part of India through regional and national grids, the Committee cannot over-emphasize the desirability of giving hydro-power development the "high priority" in actual practice. The Committee would expect that at least hereafter the Central Electricity Authority should ensure that the development of new power capacity conforms to the policy of "high priority" being given to hydro-power. (Serial No. 48)

3.21. The Committee agree with the view expressed by a power expert that long-gestation factor of hydro-power development can be taken care of by adopting a long term strategy of taking up a number of hydro-power projects in quick succession and so planning their execution that they become available for service one after the other according to a well-thought out time frame. ( Serial No. 49)

3.22. The Committee regret that although large amount of hydro power capacity has been sanctioned and cleared by the Central Electricity Authority, the apex body in techno-economic field, it has been held up for want of approval by the Planning Commission. Seeing the tardy development of hydro-power in the past, the Committee would recommend that fully investigated and techno-economically cleared hydro-projects should be given highest priority at all levels, including the Planning Commission. The Committee would like the CEA to pursue the matter with the Planning Commission and apprise the Committee of the outcome. (Serial No. 50)

3.23. The Committee are unhappy to note that although the North-Eastern region has vast potential for hydro-power, only 0.3 per cent of this potential has been exploited so far. The Committee appreciate that there are geotechnical problems in the region. Even so an attainment of mere 0.3 per cent of potential for hydro power in this region is too low. The Committee attach great importance to the exploitation of untapped hydro-power potential in North-eastern region. They would urge that, in the interest of the economic development of the North-eastern region, no effort should be spared in mobilising all available technical and other inputs with a view to overcome all constraints in the way of development of hydro-potential in that region expeditiously. (Serial No. 51)

3.24. The Committee note that the Government have decided in principle to induct foreign technology in selected areas of hydel power generation. It is unfortunate that even after an experience of nearly a quarter of a century in designing, execution and operating hydel projects like Bhakra project, the country has not been self-reliant in this branch of expertise. The Central Electricity Authority should have been alive to the areas of weakness and taken steps long ago to fill the technological gaps in hydel power generation. The Committee cannot but express their unhappiness at this state of helplessness in which the country finds itself today in this vital field. The Committee would like the Government to take stock of the situation and if import of foreign technology is unavoidable in the national interest, it may be imported without delay, but in selecting foreign technology, it should be ensured that the latest and the most dependable technology is imported to put an end to the problems in this field at the earliest. (Serial No. 52)

3.25. At present 5 hydro power projects with a capacity of 794 MW are under execution in the Central sector and another 4 projects with a capacity of 2100 MW have recently been taken up in the Central sector. Besides, investigation and execution of 6 other projects (4070 MW) have been taken up in the Central sector. The Committee would like Government to ensure that execution of the nine projects under implementation is regularly monitored at the highest level with a view to avoiding any slippage and completing them in accordance with a time-bound programme. The Committee would like to be apprised of the programme of their execution. The Committee would also like that in order to instill a sense of urgency to the investigation of new projects decided to be taken up in Central sector, a definite programme should be formulated for carrying out investigations of the projects and progress watched. (Serial No. 53)

## **B—Inter-State Water Disputes**

3.26. A large number of hydel projects have been held up for long periods due to Inter-State disputes. The disputes relate to questions of availability and utilisation of water, submergence of land due to the construction of dams, share in the power benefits, share in water and the alike. Thus it becomes necessary that the inter-state issues are resolved before the work on the projects commence.

3.27. It is noted from the reply to Starred Question No. 375 in Rajya Sabha on 16-3-1981 that because of inter-state disputes, fifteen hydro-electric projects/multi-purpose projects are pending clearance. Out of these, 2 Projects viz. Thein and Mukerian in Punjab have been cleared by the Central Electricity Authority but are awaiting clearance from the Planning Commission. 13 Projects are pending clearance from the Central Electricity Authority. Out of these, 5 projects are in Tamil Nadu, 3 in Kerala, 2 in Uttar Pradesh and one each in Punjab, Haryana and Madhya Pradesh.

3.28. Many of these projects have been pending for long periods. An instance is that of Thein Project in Punjab. The project report was prepared by the Government in Punjab in 1964 at an estimated cost of Rs. 69.63 crores, but it was only in 1977 that it was decided that the construction of dam could start immediately and the construction work was started by the Government of Punjab in 1978. The construction of the project is likely to take 8 years. The projects has, however, not been cleared by the Planning Commission so far.

3.29. The Committee on Power headed by Shri V.G. Rajadhyaksha (September, 1980) has made the following observations/recommendations on delay in the execution of Hydel Power Projects due to inter-site disputes:—

“A major cause of delay in implementing hydel projects is the time taken to resolve inter-state disputes. A number of projects, the generation and energy potential of which totals upto 4000 MW of capacity and 12 TWH of energy annually some of them formulated nearly 15 years ago, have been awaiting clearance for want of settlement of such disputes. Even though there are legislative provisions under the Inter-State Water Disputes Act (1956) and the Rivers Boards Act (1956) laying down detailed procedures for settling the disputes, these disputes have remained unresolved for years. For example, the Narmada River Valley Problem could be resolved only

after two decades of protracted negotiations during which time colossal quantities of energy has been wasted.”

The Rajadhyaksha Committee also felt that:—

“It is necessary to evolve some mechanism that can help resolve inter-state water disputes expeditiously. With the growing involvement of the Centre in Major projects including hydel projects, problems between the Centre and the States are also likely to arise.”

3.30. The Rajadhaksha Committee have suggested that:—

“To resolve these problems, it will be necessary to impose in the national interest, if necessary, by suitable legislative amendments an upper limit on the time taken for such negotiations. If the parties to the disputes cannot reach a mutually acceptable settlement in, say, three months, it should become mandatory that such disputes automatically stand referred to an arbitrator to be appointed by the Central Government. Such an arbitrator would be required to deliver his findings within a certain prescribed time limit, say, three months. The legislation should also ensure that the findings of the arbitrator become binding on the parties concerned and be made non-justiceable, if necessary, by a constitutional amendment. Another possibility is to declare water a national resource and give the Central Government overriding powers to allocate water and power between States, decide location and heights of dams, lower and upper riparian rights etc. Unless some such drastic measures are taken, it will not be possible to develop the hydro electric potential of the nation speedily.”

3.31. In their Sixteenth Report, the Estimates Committee (1977-78) had expressed their dismay at the helplessness exhibited by the Central Government so far in the whole affair of inter-state river water disputes and the indifference shown by the State authorities concerned in a matter which had a vital hearing on the economic well-being of the people of the area. The Committee had desired Government to give this matter their most serious consideration. The Committee had also desired Government to evolve very early a framework of a broad policy in regard to these disputes, based on justice and keeping in view the economic interests of the people so that amicable solution could be found to these problems without delay and a major bottleneck standing in the way of development of hydel projects and economic prosperity of the regions and welfare of the people could be removed.

3.32. The representative of the Department of Power was asked during evidence if it was not possible to find a remedy to this problem of hydro-power projects being held up for long periods due to inter State disputes. Secretary (Power) stated:—

“I think these problems will not be solved till the time water is declared as a national resource as Coal. There are beautiful projects of national interest, of interest to the whole country, that have been delayed for 15 years. There can be a directive that when the Centre exploits that resource, due consideration must be given by way of some additional benefits to the State in which it is located.”

3.33. Asked if compulsory arbitration could not help in solving the problem, Secretary Power) stated:—

“That is a matter of detail, you can appoint an arbitrator and say it should be completed within six months. There are tribunals which have taken 10 years.”

3.34. A major hurdle in the way of development of hydro power in the country is that a number of projects, fifteen, to be precise, as on March 1981 with a generation potential of about 4000 MW have been held up because of inter-State disputes. Some of these projects have been held up for more than 15 years. It is highly unfortunate that at a time when country badly needed power for national reconstruction and development, colossal quantities of energy should have been allowed to be wasted because of inter-state disputes and the disputes should have remained unresolved for years even though there are legislative provisions under Inter-State Water Disputes Act, 1956 and the Rivers Boards Act, 1956, laying down detailed procedures for setting such disputes. Seeing the inordinately long time— as much as 20 years taken to resolve Narmada River Valley problem, the Committee cannot help feeling that the existing procedures have failed to deliver the goods and a new approach has got to be evolved if the country has to be saved from colossal loss that results from such disputes.

3.35. The Committee feel that national interest demands a more drastic approach to the problem than adopted in the past. Either the legislative measures already existing should be given strong enough teeth to deal with the river water disputes within a prescribed time limit through arbitration or otherwise, without any right to any party to prolong the dispute through the device of appeals or reviews to higher authorities; or through constitutional amendment, if necessary, water may be declared as a national resource, to

be exploited by the Centre with due consideration being shown to the State or States in which the resource lies. The Committee would urge that the matter should be considered at the highest level without delay with a view to finding a speedy and abiding solution to the chronic problem.

(Serial No. 54)

3.36. The Committee would also recommend that as a stop gap arrangement, to be arrived at in consultation with the State Governments, a power project which is held up because of inter-state dispute, should be taken up by the Centre without delay subject to the condition that the power and water from such project could be shared among the disputing States according to the decision that may ultimately be taken by the tribunal or arbitrator that may be appointed in the matter. This approach would atleast allow the intervening period to be utilised towards the execution of the project and translating it into a reality by the time the dispute is resolved.

(Serial No. 55)

#### c—Mini Hydel Projects

3.37. A number of experts on power have emphasised the need for exploiting the available hydro potential from small schemes simultaneously with the bigger schemes. The need for such mini hydel projects is all the more in rural and remote areas which are far away from major power projects or regular power grids.

3.38. An expert on power has stated in his memorandum to the committee:—

“Considering fuel costs, it would be worthwhile for the Government to consider the development of bulb type mini hydro turbines with heads from 2M and 35M and sizes from 200 to 1000KW. There are a large number of hydro sites in India where these units could be installed to meet rural needs. Their construction and gestation period is also very small. These will avoid transmission and distribution networks, major civil works, transport of fuel etc.”

3.39. The committee on Power headed by Shri V. G. Rajadhyaksha have stated in their report that:—

“There are compelling reasons for the country to take a hard look at exploiting the available small hydro potential simultaneously with the bigger schemes. Although the CEA is presently engaged in reassessing the available hydro resources in the various river basins, no systematic study has been undertaken of the



small hydro potential available on canal falls using low head "bulb" type turbines, irrigation outlets and small hill streams and rivers."

3.40. It has recommended by the Committee that:—

"Measures for reducing the cost of small hydel projects should be examined and that in States where the potential for micro hydel projects exists, the State Electricity Boards should have a separate division quite distinct from the major project group, for planning and executing such projects."

3.41. Asked about the policy of Government regarding the mini-hydel power projects, the Department of Power stated in a note (Dec. 1980):—

"As regards mini-hydro power plants, it may be stated that at present 60 such hydel schemes are in operation and 26 more schemes are under construction. However, the cost of generation in the mini and micro hydel electric projects is more than the cost of large and medium hydro-electric projects. Further indigenous manufacturers do not have as yet sufficient facilities for manufacture of special type of generating equipment and turbines required for small projects. Manufacturing industries would also have to go in for standardisation of mini-hydro generating units to make it more economical. For the present, the Government is installing such mini-hydro plants in remote areas which cannot be served adequately from the regular power grid."

3.42. Regarding the development of bulb type mini-hydro turbines, it has been stated by the Deptt. of Power in a written reply:—

The bulb type mini hydro turbines are frequently economical for canal drops and the choice of installation is a matter of technical feasibility and economic viability. Such two projects viz. Western Yamuna Canal (6×8 MW) in Haryana and Lower Mettur (8×15 MW) in Tamil Nadu have already been sanctioned for execution in the recent past. The hydro electric projects where such installations exist are at Kosi (4×5 MW) and Gandak Western Canal (3×5 MW) Power Houses.

Possibility of manufacture of bulb type mini hydro turbines is being examined by Messrs BHEL, although they have not yet come up with manufacturing of this type.

Specific cost of small schemes (per KW) is substantially higher than the specific cost in case of large/medium schemes, being Rs. 8,000 to Rs. 14,000/KW against Rs. 5,000 to Rs. 7,000/KW for large/medium schemes (based on completed schemes)."

3.43. The representative of the Department of Power was asked during evidence if any systematic study had been made of the small hydro power potential available in the country. In reply, Secretary (Power) stated:—

“On a large scale a study has already been made and we have come to the conclusion that 5000 MW capacity is possible through smaller units. Out of this 1600 MW has been identified as individual projects. Out of these 1600 MW, about 100 MW is under execution. . . . We have to find a way out to make them cheaper. One important area where it can be made cheaper is by standardising the equipment in three or four standard sizes, so that every time a new design is not necessary. The larger industry is not interested in these small units. We have posed this suggestion to the smaller manufacturing organisations in the private sector, but so far we have not been able to get adequate response.”

3.44. In reply to Unstarred Question No. 2110 dt. 3-3-1981 in Lok Sabha, it has been stated by the Minister of State for Energy that:—

“Government attaches great importance to the installation of mini/small hydel units utilising low heads, generally available at the irrigation canal falls etc. This is an activity that would have to be undertaken by the respective States in which the potential exists. The Ministry of Energy has advised the States to explore the possibilities in this regard, and has also offered to make available to them the services of experts, and any other technical assistance that may be required. Presently, the following low head mini/small schemes are under execution in the country:—

Name of the Scheme	Installed capacity (MW)	State	Expected date of commissioning
1. Western Yamuna Canal	48 MW	Haryana	1984-85
2. Anoopgarh	9 MW	Rajasthan	VII Plan
3. Lower Mattur	120 MW	Tamil Nadu	VII Plan
4. UBDC St. III	45 MW	Punjab	VII Plan
5. Dhansiri	19.95 MW	Assam	VII Plan

At present, the total generating capacity of such schemes in operation in the country is about 300 MW.”

3.45. The Committee note that although there is a potential of 5000 MW in Mini Hydrel projects in the country, of which 300 MW capacity has been exploited and 1000 MW capacity is under execution, no systematic study of the small hydrel potential available in the country is stated to have been undertaken so far. The Committee feel that in view of the fact that mini hydrel projects have a short gestation period, save on transmission and distribution networks, major civil works, and transportation of fuel and can meet the power needs of remote and rural areas in the country situated away from regular grid, a systematic and detailed study of small hydro potential available on canal falls, irrigation outlets and small hill streams and rivers should be undertaken expeditiously and a comprehensive plan to exploit small hydro potential should be drawn up for implementation.

(Serial No. 56)

3.46. Some of the reasons why mini hydrel projects have not been developed in the country are stated to be the high cost of generation in these projects, non-availability of equipment from indigenous sources and non-standardisation of equipment and lack of interest among indigenous manufacturers in the manufacture of requisite type of generating equipment and turbines for small projects. The Committee feel that the problems of setting up mini and micro hydrel projects which can prove to be very useful to meet the local needs of remote and rural areas, should be examined by the Central Electricity Authority in collaboration with manufacturers of power equipment in public and private sectors, with a view to standardising the equipment for mini projects and encouraging their manufacture so as to make them more economical.

(Serial No. 57)

3.47. While the Committee are glad that Central Government attaches great importance to the installation of small hydrel projects this activity will have to be undertaken by the State Governments concerned. The Central Government should impress upon the State Governments concerned the usefulness of mini and micro hydrel projects and organise technical and consultancy services to help the States take up construction of small hydrel projects at the most suitable sites.

(Serial No. 57)

## CHAPTER IV

### NUCLEAR POWER

4.1. In view of present energy constraints, development of nuclear power has assumed greater importance. In India against a total installed capacity of about 30,000 MW, the share of nuclear power is only 860 MW as in March, 1981. (2 units of 210 MW each in Tarapur and 2 units of 220 MW each in Kota). A number of experts have expressed the view that Nuclear Power should contribute at least 10 to 15 per cent of the total power generated in the country. The Sixth Plan envisages additional generation of 690 MW by nuclear power stations.

4.2. Asked about the constraints in the development of nuclear power in the country, it has been stated in a note (Oct., 1980) by the Deptt. of Atomic Energy (DAE):—

At present, the following constraints impede the progress of nuclear power programme in varying degrees:—

- (i) inability of the industrial infrastructure in the country to cope up with faster programme.
- (ii) Difficulties encountered in indigenisation of manufacture and fabrication of certain equipment.
- (iii) Inadequacy of the transportation system for handling large and heavy pieces of equipment.
- (iv) Need to redesign the reactor units to make them more economical and to adapt them to the capabilities of Indian manufactures.
- (v) Shortage of heavy water.

4.3. According to the Deptt. of Atomic Energy the following steps have been taken and will continue to be taken to overcome these constraints:—

- (i) There has been a progressive improvement in the capability of the Indian industry to handle manufacture of nuclear equipment and components. There are close contacts between the engineers and scientists of the Department and the engineers of the manufacturers.

- (ii) Indigenisation efforts of some of the Indian industries have been commendable. It is hoped, that these efforts will continue, with the close association of DAE scientists and engineers.
- (iii) The Department has set up a senior inter-disciplinary group to liaise with the State Governments for upgradation of the highways which are likely to be required for movement of over-dimensional consignments (ODCs).
- (iv) The Department has redesigned the reactor units on the basis of the experience gained in the Rajasthan and the Madras atomic power projects as well as taking into account factors required by stricter and more stringent safety requirements. These redesigned units will be installed at the Narora Atomic Power Project. This standard design will now be adopted without much modification in all the future reactor of 235 MW capacity.
- (v) The country has to be self reliant in heavy water, although imports to an extent may be possible. The two new heavy water plants at Tuticorin and Baroda are in production and their performance is being progressively improved. The Department has also developed its own process and this process is being tried in a plant coming up at Rawatbhata. With the experience and confidence gained so far, a major expansion of the heavy water programmes is being planned.

4.4. Asked about the details of the plan for the expansion of the nuclear power programme, the Deptt. of Atomic Energy have stated in a note:—

“The Government has a well-defined policy regarding the utilisation of nuclear energy for power generation. In the first stage, natural uranium fuelled pressurised heavy water reactors are being set up, to be followed by fast breeder reactors in the second stage.—During 1980-81 to 1984-85 the second unit at Kota (220 MW) and the units (235 MW each) at Kalpakam would be in commercial operation. The two units under construction at Narora (235 MW each) are expected to be commissioned during the next Five Year Plan period.”

4.5. It has further been stated in the note that:—

“The Department of Atomic Energy had proposed initiation of work on ten units of 235 MWs each during the Sixth Plan period. The Planning Commission has accepted, in principle, a start on Six reactors during the current Plan period, details of which are yet to be worked out.

The Department has proposed commencement of work on 500 MW reactor and has proposed taking up at least twelve units in a phased manner during the Seventh and Eighth Five Year Plans. It is also proposed to construct one or two fast reactors of about 500 MW size during the nineties. If all these projects are sanctioned, the installed nuclear capacity by the year 2000 will be about 10,000 MW.

4.6. Asked if the indigenous industry was in a position to fabricate the entire requirements of a nuclear power plant, the Department of Atomic Energy stated in a note that:—

“Right from the inception of the nuclear power programmes, indigenisation has been one of the main objectives. Beginning with the nuclear units at Kalpakkam, nuclear power plants are already being set up with the most of the nuclear and conventional equipment manufactured in the country. Except for the fuel for the Tarapur units, fuel for the other power reactors is also made in the country. Even though for the units at Rajasthan, heavy water has been imported, the future programme envisages self reliance in this area also. The following list shows the progress achieved in reducing the import content:—

Project	Import Content (cost-wise)
RAPP—1	45%
RAPP—2	30%
MAPP—1&2	12%
NAPP—1&2	10%”

4.7. An expert on Power has suggested in his memorandum to the Committee:—

“There is an urgent need for bringing about changes in the nuclear power set up.— The present situation with respect to having design and development, construction of power plants, inspection and certification and operation and maintenance as well as supply of fuel etc. under one agency—the Atomic Energy Commission—is ~~unprecedented in the world~~. There is an urgent need to separate these functions.”

4.8. The Committee on Power headed by Shri V. S. Rajadhyaksha have also stated in its report that there should be an independent body, outside the Department of Atomic Energy, to lay down and monitor observance of minimum standards for siting, design, construction, operation, maintenance and safety of nuclear plants on the lines of the Nuclear Regulatory Commission.

4.9. Asked about their views regarding the suggestion for having separate agencies to perform separate functions in the field of nuclear power, the Department of Atomic Energy have stated in a note that:—

“The very nature and technology of nuclear energy generation requires a total integrated approach covering research and development and the materia's production programme especially in developing countries.

The nuclear power generation technology being highly sophisticated and more complicated than conventional forms of power generation, relies heavily on research. The nuclear power generation in India originally started only as research project at the Bhabha Atomic Research Centre, which has later been developed for exploitation on a larger scale by putting up reactor units which could generate power upto 235 MW. The research and development activities on the one hand and the construction and operation of the power projects and plants on the other, are only complementary to one another in the field of nuclear power generation and cannot be exclusive.”

4.10. It has further been stated by the Deptt.:—

“Since all the agencies connected with the supply of inputs come under one roof namely the Department of Atomic Energy and the Atomic Energy Commission, it has not only been possible to coordinate the activities of these agencies effectively but also plan suitable programmes for their expansion to meet the needs of those projects under construction and operation as well as those which are proposed to be set up in the future. Since even the technology associated with production of heavy water and fabrication of auxillary units is sophisticated these auxillary units also depend a great deal on research and development in which they are being helped by Bhabha Atomic Research Centre.”

#### *Sites for Nuclear Power Stations.*

4.11. An expert had suggested in his evidence before the Committee that nuclear power stations should be located in areas which are far away from hydel as well as coal sources. He had stated that nuclear stations

should have been located at Ropar and that Narora being closer to coal mines should have been given a thermal power station.

4.12. Asked about the factors which are taken into account while deciding the location of nuclear power stations, Secretary (Power) stated in this evidence before the Committee:—

“Our information is that Ropar as an atomic station was objected to on defence considerations. When the nuclear power station is set up at Narora, from that Punjab will get its share.” The witness added that “In fact, from all Central Stations, share is given to all the States in that region. There are going to be more nuclear stations in the northern region. This question will come up again definitely.”

4.13. The representative of the Department of Atomic Energy stated:—

“When we looked at the site for Narora, we had also taken a look at a number of other sites in the Northern region including Punjab. There are certain aspects which relate to engineering like foundation requirements, seismic disturbances, availability of cooling water, transmission loss, population distribution and land used pattern. We give a grading to the different sites based on these factors. On such a compilation being made, Narore come to be first. Those who had the defence angle in mind took the view which Secretary (Power) mentioned.

The witness added that “Ropar also fulfils criterion of remoteness. But when we made an evaluation of the foundation conditions and we did not economic comparisons, Ropar at that time did not over-rate Narora.”

4.14. Asked about the views of the Department of Atomic Energy on the suggestion that nuclear Power stations should be set up at places far away from hydel and coal sources, the representative of the Deptt. stated that “We are in fact, following exactly this principle as would be illustrated from the fact that Tarapur Rajasthan, Kalpakkam are very long distances away from coal mines.

4.15. Elaborating this point the witness stated that while applying the principle of remoteness from coal & hydel sources (which they accepted), the Department had also to see if the hydel capacity in an area if already developed fully, could meet the requirement of area.

4.16. Asked about the steps taken to avoid environmental hazards as a result of setting up of nuclear power stations, Secretary (Power) stated:—

“The general consensus of the scientific world is—public opinion may be different because fear complex is there that the hazards from nuclear stations are far less than what is happening out



of coal based stations. This is getting accepted that our future is not dependent on coal because coal is going to finish one day. With the 10 per cent growth rate, Indian coal is not going to last more than 70 to 80 years."

4.17. The installed capacity of nuclear power station in the country is only 860 MW (E) as against a total installed capacity of about 30,000 MW in the power sector. Its share at present is obviously insignificant (less than 3 per cent). The Committee feel that in view of the high growth rate of power demand and limited coal reserves and uneven spread of hydel sources, Government should pay increasing attention to the development of nuclear power stations and allocate a bigger share to nuclear power in the future programmes for power development. The Committee hope that in the 15 years power Plan being formulated by the Central Electricity Authority the need to step up the role of nuclear power stations will be given due attention. (Serial No. 59)

4.18. The Committee are aware of the constraints that are coming in the way of development of nuclear power on a large scale. These constraints are mainly of technology, inadequacy of industrial infrastructure and manufacturing capacity in the country and shortage of heavy water. The Committee are glad to note that considerable strides have been made in overcoming these constraints and the country is rapidly advancing towards self reliance in the fields of technology as well as equipment manufacture. The Committee would urge that every possible assistance should be provided to our scientists and indigenous industries to fill the gaps in technology and industrial capability and capacity so as to enable the country to embark upon a programme for nuclear power development on a larger scale and at faster pace than in the past. (Serial No. 60)

4.19. An integrated picture of the nuclear power potential and the available capacity in the country to exploit the potential is very necessary for planned development of this resource of energy. The Committee would suggest that a joint survey of the nuclear power potential, technical manpower and industrial capacity in this field should be undertaken by the Government to have a sound base to formulate realistic programmes for setting up nuclear power stations in coming years. (Serial No. 61)

4.20. There is great weight in the suggestion made by a power expert that nuclear power stations should be set up at places which are far away from coal stocks and hydel sources. The Committee are glad to note that Government have been following this criterion in the selection of sites for such stations in the past. The Committee hope that the nuclear power stations to be set up hereafter will be located at the most suitable sites and will be selected on merits in the light of the aforesaid criterion. (Serial No.

4.21. The Committee have taken note of the recommendation of the Committee on Power (Rajadhyaksha Committee) that there should be an independent body outside the Department of Atomic Energy to lay down and monitor observation of minimum standards for siting, design, construction, operation, maintenance and safety of nuclear power plants, and the reply of the Department of Atomic Energy that the research and development activities on the one hand and the construction and operation of the power projects and plants on the other are only complementary to one another in the field of nuclear power generation and cannot be mutually exclusive. The Committee would like that this aspect should be dispassionately examined by the Government in the larger interest of future nuclear power development in the country. (Serial No. 63)

## CHAPTER V

### *Non-Conventional Sources of Energy*

The Committee have been informed by the Ministry of Energy that Government of India attaches considerable importance to the development of new energy sources. The P&D activities are aimed at larger utilisation of renewable energy sources. The P&D programmes on Solar energy, fuel from bio-gass etc. are funded through the aegis of Department of Science & Technology. The Department of Power have undertaken for the funding of P&D activities for the development of tidal power and establishment of geo-thermal potential in promising locations.'

5.2 The present position in regard to the efforts directed towards investigation, development and exploitation of new and renewable sources of energy is as follows:—

#### *Solar*

5.3 Considerable scientific and technological capacities and expertise have already been generated in the country towards development and utilisation of Solar energy. Various solar thermal and solar photovoltaic products, devices and systems have been developed for a wide variety of applications such as water heating, crop drying, desalination, refrigeration, water pumping, community lighting, radio and televisions. Government is giving particular emphasis to reduction in costs, improvement and efficiency, demonstration and field trial and commercialisation of economically viable technologies already developed leading to wider utilisation of Solar energy. The activities are aimed on large scale demonstration and field testing and applications having potential. Efforts will be made to perfect the technologies relating to collection, conversion and utilisation.

#### *Bio-Gas*

5.4 Considerable research and development work has been done in the development of bio-gas digestors and about 80,000 bio-gas plants have been installed in the country. The programme in the future envisages continuing research for bringing down the cost of bio-gas plants, improvement in construction methods suitable for adoption in rural areas and increasing the fermentation characteristics of bio-gas digestors. A major thrust is proposed to be given for development of family and community size bio-gas plants and 20 such prototype plants are proposed to be set up in the near

future. About 1 million family size and 100 community type bio-gas units are proposed to be set up during the Sixth Plan.

### *Wind Power*

5.5 In the area of wind energy utilisation, P&D projects have been sponsored. Efforts are continuing to evolve cost effective designs suitable for pumping applications in Indian conditions. An integrated rural project for development of wind mills has been taken at Ghazipur in U.P. with the cooperation of the Netherlands Government with the object of introducing wind as an alternative means for ground water pumping for agricultural irrigation purposes.

### *Geo-Thermal*

5.6 Keeping in view the presently assessed geo-thermal potential, two pilot investigation projects in the Parbati and Puga Valleys to make a detailed assessment of geo-thermal potential, are under implementation in this country. From the present indications of geo-thermal potential in the Parbati Valley, there does not seem to be potential for generating electric power because of the comparatively lower temperature of the geo-thermal steam. The investigations in the Puga Valley have not reached the stage to assess the potential in a reliable manner. The research and development efforts in geo-thermal prospecting and development are also being directed to utilise the heat energy for other purposes like cold storage plants, and other industrial applications. Further, investigations for geo-thermal energy are also being directed to locate promising hydro-thermal reservoirs which may have a future potential for power generation.

### *Ocean Thermal Energy Conversion*

5.7. Ocean Thermal Energy Conversion (OTEC) is a method of converting the continuously renewable store of solar energy in the sea into electricity. In an O.T.E.C. plants, the warm surface of sea at a temperature of about 27°C vapourises a working fluid like ammonia or freon (R-22) from liquid state to gaseous state. The vapour is used to run a turbine and a generator. The exhaust vapour is cooled and converted to liquid state by cold water at a temperature of about 7°C drawn from a depth of 1000m. in the sea. Hence the temperature difference available between the warm surface water and cold water at a depth of 1000m. in the sea is used to generate electricity via an evaporation and condensation cycle.

5.8. The Tamil Nadu Electricity Board held discussions with General Electric of USA on the feasibility of establishing a 25 MW pilot plant in one of the possible locations. The preliminary cost studies indicate that the cost of the plant may be between 2200 and 5000 US Dollars per KW. M/s. General Electric of USA also agreed to carry out the detailed engineering

for the pilot project at a cost of Rs. 100 crores. The project itself will be costlier relative to the present cost of hydro and thermal, the cost per KW being of the order of Rs. 40,000 in view of the huge cost for the structures to be erected in the sea and corrosion problems to be met.

5.9. Asked about the views of Govt. of India in regard to implementation of this scheme in the Central Sector, the Minister of Energy stated in reply to Unstarred Question No. 2834 dated 10-3-1981 in Lok Sabha:—

“The Tamil Nadu Electricity Board had sent a proposal from the General Electric of U.S.A. for the investigation and design of a 25 MW Ocean Thermal Energy Conversion (OTEC) plant. The estimated cost to perform six-months preliminary design phase has been indicated as U.S. \$3,73,400. As the P&D in respect of the Ocean Thermal Power Conversion techniques is still at a very preliminary stage and no actual installation of even 1 MW OTEC Plant has been made anywhere in the world, the offer of the U.S. experts to make preliminary design of a 25 MW OTEC Plant was not considered worthwhile for taking up at this stage especially as it involved outflow of free foreign exchange.”

#### *Tidal Waves*

5.10. Government have approved a proposal for taking up investigations and studies in the Gulf of Kutch, Gujarat to establish the feasibility for generating energy from tidal waves at an estimated cost of about Rs. 2.18 crores. The project envisages utilisation of foreign technical assistance in areas where sufficient expertise is not available within the country. Since there is an agreement between the Central Electricity Authority and the Electric De France (EDF), Paris for collaborative efforts in the field of power development, the possibility of securing assistance of French experts to assist in the planning of the professed investigations is being explored.

#### *Commission for Additional Sources of Energy*

5.11. Realising the necessity to have institutional arrangements for a well-coordinated approach in the area of new and renewable sources of energy in order to accelerate the pace towards achieving the goal of energy self-sufficiency, the Government has decided to establish a Commission for Additional Sources of Energy (CASE) with full executive and financial powers. The commission has Secretary, Deptt. of Science and Technology as Chairman, Secretary, Deptt. of Power, Secretary, Deptt. of Expenditure and Director General of Indian Council of Agriculture Research and Chairman, Khadi & Village Industries Commission as members and Adviser in the Deptt. of Science and Technology as Secretary.

5.12. The Commission shall be responsible for:—

- (a) formulation policies and programmes for development of new and renewable sources of energy;
- (b) coordinating and intensifying research and development activities in new and renewable sources of energy;
- (c) ensuring implementation of Government's policies in regard to all matters concerning new and renewable sources of energy; and
- (d) preparing the budget of the Commission.

5.13. From the broad list of responsibilities of the Commission, it is seen that the Commission will plan, initiate, financially support, monitor and undertake integrated national research and development programme involving government laboratories, public and private sector companies and academic institutions, for the development of appropriate technology for harnessing solar energy and wind energy, development of bio-mass and bio-conversion technology, and decentralised energy systems and other new areas in this field.

5.14. The Commission will also function as national agency for international cooperation in the field of new and renewable energy sources. It will *inter alia* also interface research and development with production and will function as a data bank on all aspects of new and renewable energy and will advise Government on import of technology in this field.

**5.15. The Committee cannot over-emphasize the importance of attaining self-sufficiency in energy as early as possible. Besides making all out efforts to expand energy supply from conventional sources—hydro, coal and nuclear. There is need to explore and develop new and renewable energy sources to supplement the energy supply available from conventional sources, if energy needs of the country, have to be met fully. The Committee are informed that considerable research and development efforts are being made to develop non-conventional sources of energy. The Committee welcome the decision of Government to set up a Commission for Additional Sources of Energy for organising a well-coordinated and integrated research and development programme for harnessing alternate sources of energy like solar, wind, and bio-mass. The Committee hope that the institutional mechanism now set up by the Government will identify the energy potential from all types of renewable sources, including geothermal tidal wave, ocean thermal energy and initiate major and sustained efforts for rapid development of these renewable sources of energy. (Serial No. 64)**

## CHAPTER VI

### POWER EQUIPMENT

#### A. *Quality*

6.1. The main indigenous supplier of equipment for power sector in the country is Bharat Heavy Electricals Ltd. (BHEL) which has been supplying turbo-generators, boilers and associated auxiliaries for thermal power stations as well as turbines and generators etc. for hydro-electric power stations. Boilers are also supplied by Associated Vickers Babcock (AVB) a private company located at Durgpur in West Bengal. In addition a number of other equipments like Control and Instrumentation, Coal handling plant, ash handling plant, electric switchgear etc. are procured from other public and private sector companies.

6.2. A number of State Electricity Boards Officials have brought to the Committee's notice the unsatisfactory performance of the equipment supplied by indigenous manufacturers of power equipment which is stated to be the main factor contributing to the poor performance of power stations in the country.

6.3. An expert on Power has stated in his memorandum that the sets supplied by BHEL have many design/manufacturing defects with the result that the availability as well as the output of these sets is very poor. A State Electricity Board has identified 32 design manufacturing defects in the sets supplied and these defects, it is stated, have been accepted by BHEL as well as their foreign collaborators.

6.4. A State Electricity Board has stated that 94.38 per cent of the operational hours lost in a power unit were attributable to equipment failure, design defects and deficiencies. The percentage in respect of two other units was 85.23 per cent and 87.28 per cent.

6.5. A leading organisation of Trade & Industry has stated that since 1973-74, quality of indigenous power plant machines had progressively come under serious and severe criticism by most electricity boards and other agencies. Unless significant, consistent and lasting improvements are achieved in the quality of power plant and auxiliaries, the problem of low capacity utilisation cannot be solved.

6.6 The Deptt. of Power have stated that reports received from various State Electricity Boards have indicated that some parts of the indigenous

equipments supplied by BHEL and Instrumentation Ltd., Kota (ILK) and other suppliers have not been functioning very satisfactorily resulting in higher rate of forced outages and lower generation to some extent.

6.7. Elaborating the point further, the Department of Power have stated in a note to the 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 complained about the poor quality of the BHEL equipment. The defects reported by S Bs 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.”

6.8. As regards remedial measures, the Department of Power have stated in a note (Dec. 1980):—

“In the first instance, these defects/deficiencies were identified in respect of 100/110/120 MW Units. Based on the information, a programme of Project Renovation was drawn out for various units in the above sizes. ————Some of the works (under this programme) are still being carried out.

In the meantime, a number of 200 MW units of indigenous manufacture were commissioned. These units also presented a number of teething troubles and a number of equipment deficiencies in design, manufacture, erection and commissioning were identified. ————It was found necessary to form composite teams coordinated by a single agency for stabilisation of the 200 MW units. This work is now being coordinated by CEA and in the first instance, stabilisation work of 13 units had been taken up. A Central Team comprising engineers of CEA, BHEL & ILK has been visiting various sites where these units were installed and have prepared action plans after detailed discussions with the Project authorities. A time-bound programme has been prepared for their implementation———. It is expected that all these stations will be capable of giving their rated output by June, 1981.

In the case of 110/120 MW units, a considerable amount of renovation work is still required to be carried out before these units are capable of giving their rated out-put.”

6.9. The Chairman, Bharat Heavy Electricals Ltd. stated before the Committee (9 Jan., 1981):—

“The first 200 MW was commissioned in December, 1977 and it started working in May, 1978. So our oldest 200 MW is not more than 3 years old. 13 sets are working, some of which



have come last year. Yesterday you heard that after 4 years, the load factor is 50 per cent. From December, the load factor is 55 per cent. The first 200 MW was produced 3 years after 100 MW was produced. No other country has produced 200 MW after 3 years.——— But unless the sets run, how can you put things right?

The witness, however, stated that "it cannot be denied that there were defects (in certain equipment supplied by BHEL) but modifications and improvements are being made continuously."

### *Remedial Measures*

6.10. In a subsequent note (February, 1981) furnished by (Deptt. of Power) to the Committee about the steps taken by indigenous manufacturers of power equipment for the effecting improvements in the equipments it has been stated:—

"BHEL has set up the Power Projects Technical Services Group, as a part of the Power Projects Services Division, for purpose of monitoring the performance of power stations and attending to the problems therein.

The steps taken include monitoring of the working of power stations and analysis of forced outages and other problems in order to determine their cause; discussions with the concerned State Electricity Boards to evolve an agreed programme for modifications and rectifications, including time schedule for doing the work; association of Central Electricity Authority and the Instrumentation Ltd., Kota, so as to ensure that a co-ordinated total plan for stabilising sets was implemented; and priority manufacturing of required components and parts for fulfilling the programme.

6.11. In a subsequent note furnished to the Committee (March, 1981), it has been stated:—

"Of the 13 sets which had been commissioned upto March 31, 1980, the rectification of the initially identified problems has been completed on 8 of these sets. The rest of the sets, would be rectified as soon as shut-downs are given. The performance of these sets, after rectification work has been quite satisfactory, as would be seen from the following data:—

	(in GWH)			
	(Oct. 80	Nov. 80	Dec. 80	1st fortnight of Jan. 81
Average daily energy generation by 13 sets	17.81	32.43	35.23	36.47

On the basis of the experience gained from these sets, subsequent sets being manufactured by BHEL are being modified at the manufacturing/erection stages, to prevent similar problems arising in future. It is expected that all sets which would be commissioned from 1981-82 onwards would not have these teething problems."

### *Linkage between Users & Manufacturers*

6.12. Dealing with the causes of poor performance of indigenous equipment, the Rajadhyaksha Committee have stated in their report that:—

"One obvious lacuna in this respect appears to be absence of effective linkages between users and manufacturers. The Committee feels that there is urgent need for close inter-action between the CEA, NHPC NTPC and their consultants on the one hand and BHEL, ILK and other indigenous manufacturers on the other, in order to speedily incorporate in the design of the equipment, the operational experience gained from the first few units of a particular design which has gone in line. The Committee recommends the setting up of a formal consultative machinery comprising senior representatives of the various concerned agencies viz. the manufacturers, consultants/designers and the users to ensure that the experience gained from the units in operation is regularly fed back and incorporated into the design and manufacture of the new units. Such a consultative machinery should function preferably under the Chairmanship of Member (Thermal) of C.E.A." (p. 130).

6.13. On being asked whether a committee consisting of representatives of manufacturers, users and Central Government agencies in this field should not be set up to advise on modifications to be made in the designs of new equipment to be manufactured in the country, the Chairman, BHEL stated that:—

"At present there is a Committee consisting of representatives of Instrumentation Ltd., Kota, BHEL, plus the collaborators also, so that the best of the brains is there. We are going from site to site, and whatever good things are coming out, they are being standardised in the form of standard modifications. All these things are being effectively done to the satisfaction of the customers; we are getting the certificate from the customers."

*Quality Control*

6.14. The Department of Power have informed the Committee that although various State Electricity Boards carry out inspection of the equipment during manufacture and erection, the same has not so far been satisfactory and inspection of plant and equipment manufactured by ILK/BHEL has not been carried out to the desired extent.

6.15. Asked if the indigenous suppliers of power equipment are contractually bound to honour the quality assurance standards and make good the loss and compensate the purchasers of power equipment in the event of poor quality of equipment or defects in designs etc., the Department of Power stated (Dec., 1980):—

“Any reputable supplier of plant and equipment has to have a detailed programme of quality assurance control and testing of the equipment manufactured by him. The equipment delivered by them is covered by guarantee for proper design and manufacture etc. for a particular period. In case of failure of the equipment during the guarantee period on account of defective supply or workmanship or design, it has to be replaced by the supplier. The supplier, however, is not required to compensate the purchaser for the loss suffered by him on account of defective equipment. He is only liable to pay liquidated damages for delayed supplies or penalties on account of non-fulfilment of specified efficiency etc.

NTPC have developed a comprehensive quality assurance documentation for quality control of the equipment during manufacture, erection and commissioning in respect of the Super Thermal Power Stations being set up by them. BHEL have also been advised to prepare their quality assurance documentation and circulate the same to the State Electricity Boards for their information. In addition, a draft Model Contract is being finalised by C.E.A. providing for specific provisions regarding quality assurance programme between the manufacturer and the State Electricity Boards. This draft contract would be circulated to all the State Electricity Boards for their guidance.”

Secretary (Power) stated during evidence (Jan., 1981) that as at present, the contracts between the manufacturers and buyers were not defined and each side found some reasons to blame the other for delay in the supply of equipment and for any defect.

*Diversifications of Production Facilities*

6.16. The Committee on Power headed by Shri V. G. Rajadhaksha has also stated in their Report that:—

“The Committee’s attention has been drawn to the deep concern amongst many State Electricity Boards that BHEL’s monopolistic position gives it disproportionate strength in fixing prices and makes it somewhat indifferent to customer complaints regarding delivery schedules, quality and after sales service. While several of the complaints about BHEL’s performance do not bear scrutiny, the Committee is of the view that there is a case today for setting one or more facilities either in the public or private sector to produce equipment which is today BHEL’s exclusive preserve to that competition is festered. In order to derive the benefit of standardisation the foreign collaborations could be the same as BHEL’s.

While at one time the power equipment market was too small to sustain two manufacturers and the decision taken nearly a decade ago to merge Heavy Electricals (India) Limited with BHEL was correct in order to derive the economics of scale, the market today is much larger and is growing rapidly. BHEL is also getting to a size at which, in the India milieu, further rapid growth may make its managerial structure unwieldy and sluggish. The growth in BHEL should come by more intensive use of its existing and planned production facilities. There are also risks in putting all the power engineering facilities in one company as any natural or man-made causes such as go-slows or stoppage of production would give a severe set-back to the economy.

If despite these arguments a decision is taken to confine further growth to BHEL, then in order to resolve customer-supplier problems it is recommended that BHEL, whose main task is to feed the power utility industry, should come under the administrative control of the Department of Power.”

6.17. Secretary (Power) stated before the Committee:—

“We certainly feel that the natural process of competition is the only method to improve things and that is built up in any economy only by having at least two, if not more, organisations doing the same size of equipment. We would suggest it should be based on different collaborations and the total capacity of the

organisations should be 30 to 40 percent higher than what the country requires. There can be an argument that the additional capacity would mean blocking of funds, but that, I do not think, would be big loss to the economy compared to the cumulative loss in bad operation."

6.18. Defects in the indigenous power equipment have been reported by almost all the State Electricity Boards (SEBs) and certain defects identified jointly by CEA, BHEL and SEBs have also been accepted by BHEL. The Department of Power have stated that poor performance of power equipment supplied by BHEL and ILK have resulted in high rate of forced outages and lower generation.

6.19. The Committee are informed that out of 16,200 MW sets manufactured so far indigenously, 13 sets commissioned upto the end of March, 1980 have been taken up for stabilisation work by a Central Team of engineers of Central Electricity Authority and indigenous manufacturers viz. BHEL and ILK and the defects had been rectified in 8 of them by March, 1981; the remaining sets were expected to be renovated by June, 1981. The performance of the renovated sets is stated to have shown marked improvement since then. The Committee recommend that the Central team should prepare a time-bound programme for rectifying the manufacturing defects and design deficiencies in all the indigenous sets of not only of 200/210 MW capacity but also of 110/120 MW capacity, on which renovation work was taken up but has not yet been completed.

(S. No. 65)

6.20. The Committee take note of the measures taken by BHEL for monitoring the working of power stations, analysing forced outages and other problems and holding consultation with SEBs and CEA etc. in order to draw up the implement coordinated plans for stabilising the indigenous sets. The Committee welcome these measures and hope that CEA will so arrange that the SEBs draw the maximum benefit from these measures in the interest of improving performance of their indigenous sets. (S. No. 66)

6.21. The Committee also recommend that while entering into foreign collaboration agreement the indigenous manufacturers viz. BHEL, ILK etc. should make sure that the design of the equipment for which the agreement is being made suits Indian conditions. (Serial No. 67)

6.22. The Committee are informed that on the basis of the experience gained in carrying out renovation of the 13 sets already identified for the purpose, subsequent sets under manufacture by BHEL are being modified at the manufacturing/erection stages to prevent similar problems arising in future. The Committee feel that, as suggested by Rajadhyaksha Committee, the ideal arrangement to bring about improvement in the design and

production quality of power equipment would be to have a consultative forum where the representatives of manufacturers, users and executing agencies like NTPC and NHPC together with the representatives of Central Electricity Authority could meet and discuss design and operational problems of power equipment in the light of their experience to enable the manufacturers to incorporate changes in the design and manufacture of new equipment. The Committee suggest that the system of consultative machinery on these lines should be introduced at an early date in the larger interest of producing quality equipment in the country. (Serial No. 68)

6.23. The Committee are surprised to note that at present there is no contractual obligation on the manufacturers to ensure that the equipment supplied to power units gives trouble free service. Such an obligation is a normal feature of any commercial transaction. The Committee are informed that CEA are now finalising draft of a Model Contract providing for specific provisions regarding quality assurance programme between the manufacturers and the State Electricity Boards and, after finalisation, the draft will be circulated to all the State Electricity Boards for their guidance. BHEL have also been advised to prepare their quality assurance documentation and circulate it to SEBs for their information. The Committee hope that the Model Contract will be finalised at an early date and State Electricity Boards advised to execute a formal contract on the standard lines for each transaction and enforce it to ensure timely supply of equipment of guaranteed quality and design. (Serial No. 69)

6.24. The Department of Power have informed the Committee that although various State Electricity Boards carry out inspection of power equipment during manufacture and erection, the inspection has not been carried out to the desired extent. The Committee feel that inspection of power plant and equipment is a highly specialised job and it is doubtful if all the Electricity Boards would be in a position to set up an inspection cell in their organisation capable of conducting rigorous inspection of a satisfactory nature. The Committee would, therefore, suggest that Central Electricity Authority should take stock of the expertise and facilities available in the various State Electricity Boards and evolve a joint mechanism in consultation with the Boards for conducting quality inspection during manufacture and erection of power equipment. If such a mechanism is not evolved, the inspection by State Electricity Boards may continue to be unsatisfactory with consequent effect on generation efficiency. (Serial No. 70)

6.25. Many State Electricity Boards are stated to have held BHEL's monopolistic position as a reason for unsatisfactory quality of power equipment manufactured by them. The Rajadhyaksha Committee on Power have made out a case for setting up one or more facilities either in the public or

private sector to produce power equipment to foster competition with BHEL. Secretary (Power) has also emphasized the need for having atleast two, if not more, organisations to produce power equipment in order to improve the situation by the natural process of competition. While the Rajadhyaksha Committee have suggested that the foreign collaborations in the new manufacturing units could be the same as BHEL's Secretary (Power), feels that the new units should be based on different collaborations. The Estimates Committee have gone into this matter. They feel that another unit to be set up in public sector would not only bring about improvement in quality through competition but would also accelerate the pace of production to meet the expanding needs of power sector. The Committee recommend that this aspect may be examined critically and dispassionately. (Serial No. 71)

### B—Delay in Supply of Equipments

6.26. It is seen from the material furnished to the Committee that there have been slippages in the commissioning of a number of power projects and many of the on-going power projects are behind schedules. In many cases, the slippages have been attributed to delays in the supply of equipment by main equipment supplier viz. Bharat Heavy Electricals Ltd. (BHEL) and Instrumentation Ltd., Kota (ILK). Some of such units where the delays have been attributed to the delays in the supply of equipment are Faridabad Unit-3, Obra Unit 12-13, Tanda Units 1,2,3 & 4, Badarpur Stage-III (Unit 5), Santaldih etc.

6.27. It has been stated in the Report of the Committee on Power (Rajadhyaksha Committee):—

“In practice, a problem which has frequently occurred is the bunching of orders when manufacturers are asked to supply equipment for a number of projects at about the same time. While the plant capacity of BHEL, therefore, may appear to be adequate to fulfil the generation programme during the next decade, past experience shows that there have been slippages ranging from 18 to 24 months in fulfilling supply contracts. BHEL has tried to make up these gaps by substantial imports of components and equipments during the past few years.

On the other hand, there have also been cases in which equipment supplied by BHEL has been lying in crates for years at the site because the SEBs were not ready to start erection. Any general conclusion that all project delays have been on account of late deliveries by BHEL cannot, therefore, be supported.”

6.28. Explaining the reasons for delays in the supply of equipment to power stations by BHEL, the Department of Power have stated in a note (December, 1980):—

“The reasons for delays in supply of equipment by BHEL could be broadly classified under the following:—

- (1) Inadequate manufacturing capacity for critical piping and pressure parts,
- (2) Powers cuts in Tamil Nadu,
- (3) Shortage of wagons for despatch of materials,
- (4) Delay in finalising of engineering details for piping by Project authorities.
- (5) Delay in the receipt of imported as well as indigenous components and raw materials.”

6.29. Asked whether in view of projected increase of 20,000 MW in installed power capacity during Sixth Plan and 30,000 MW during Seventh Plan, BHEL and ILK had the necessary capacity to meet the additional requirements of power equipment, the Department of Power stated in a note (December, 1980) that:—

“The Government’s general policy in the matter is that the indigenous production should be able to meet as much of the requirement as possible and selective imports could be resorted to, wherever considered necessary. In the case of projects for which foreign agencies like World Bank IDA are providing the funds, the equipment for the projects would be procured in accordance with the procedure laid down in the agreement signed with the financing agency and in that process some of the equipment to be installed might be imported. . . . As far as ILK is concerned, it may be mentioned that for manufacturing of control and instrumentation equipment there are other manufacturers in the field.”

6.30. Asked if BHEL and ILK have the necessary expertise to manufacture all types of equipment, the Deptt. stated:—

“BHEL and ILK have the necessary expertise to manufacture most of the equipment required for the country’s power programme. However, BHEL is yet to acquire the technology for Lignite Fire Boilers and bulb turbines for hydro projects.”



6.31. Regarding the capacity of BHEL to meet the requirements of power sector, Chariman, BHEL stated before the Committee (Jan., 1981):—

“At present we have orders to fulfil our capacity upto 1981-82. In Hyderabad Unit, we don't have enough orders, although we can manufacture 6 sets of 120/110 MW every year. At present, we are short of orders. In 1982-83, we have got firm orders for 7 members of 200 MW. We expect to get orders for 3 more units which include Wanakbori which is controversial. . . Even if we get orders for 200 MW set more, we can supply it. By 1983-84, our expansion programme will be completed and we will be in a position to supply 11 units of 210 MW and 3 sets of 500 MW but we have got order for one set of 200 MW and we are expecting orders for 8 more sets. For 500 MW we don't have any firm order but we are anticipating order for 2 sets. Even then, we can manufacture 3 more units of 200 MW in the same year. In 1984-85 we have capacity for 11 units of 200 MW and 3 units of 500 MW, but we don't have any order's at present. . . All these matters are under study and there is perfect coordination with the CEA and the Ministry of Power.”

6.32. Asked about the requirements of power equipment during 1980—85 and whether BHEL had adequate capacity to supply the same, Secretary (Power) stated before the Committee:—

“For the period 1980—85, the number of units to be commissioned is 200 MW units—43, 120 MW units—2, 110 MW units—18 and 60 MW units—5. They are all committed for timely delivery. There have been some cases of slippage in the past, but for the future I cannot say anything.”

Secretary (Power) also stated (Jan., 1981):—

“In my view the capacity is what is produced and not what is written on paper. Last year and this year also I believe, only 6 turbines will roll out of our shops which mean 1200 MW. We may increase it later on but if you expect that from 1200 MW we will go to 2500 MW in two years, I would have reservations. In order to assist development of capacity, we are even preparing a fifteen year plan so that the industry knows our future requirements.” . . . . .

6.33. Chairman, BHEL, however, stated:—

“From 1981-82 up to 1986-87, the total of firm orders available with me for delivery is only 18 for 200 MW.”

6.34. The following Table shows BHEL's production capacity up to 1988-89 (as communicated by Deptt. of Heavy Industry).

**BHEL Production Capacity (Dec., 1980)**

(Figures in MW)			
Year	Thermal	Hydro	Total
<b>1979-84 :</b>			
1979-80 . . . . .	2280	950	3230
1980-81 . . . . .	2430	950	3380
1981-82 . . . . .	2430	950	3380
1982-83 . . . . .	3220	1100	4320
1983-84 . . . . .	4220	1350	5570
	14580	5300	19880
<b>NETT</b>	13230	4700	17930
<b>1984-89 :</b>			
1984-85 . . . . .	4220	1500	5720
1985-86 . . . . .	4220	1500	5720
1986-87 . . . . .	4220	1500	5720
1987-88 . . . . .	4220	1500	5720
1988-89 . . . . .	4220	1500	5720
	21100	7500	28600
<b>NETT</b>	19100	6750	25850

6.35. From a statement furnished by Deptt. of Power showing the thermal equipment manufactured by BHEL since 1976-77 and the orders for thermal equipment outstanding at the end of the year, the following picture emerges:—

Year	Manufacture during the year (MW in round figures)	Orders outstanding at the end of the year (MW in round figures)
1976-77 . . . . .	800	5200
1977-78 . . . . .	1600	5700
1978-79 . . . . .	1600	6700
1979-80 . . . . .	1500	5900
1980-81 . . . . .	2400	4500

At the end of 1980-81, orders for 54 hydropower sets were also pending with BHEL, as against a total production of 69 such sets during the last 5 years (1976—81).

6.36. In a subsequent note furnished to the Committee Deptt. of Power intimated (March 1981) that the position regarding placement of orders for power equipment with BHEL for the next five years was as follow:—

(Position as on 20-1-81)

	Thermal MW	Hydro MW	Total MW
Total eqpt. regd. for the power plan 30—85 as per Report of Working Group on Power Dev. 1980—81 to 1984—85 (Aug. '80)	15148	5115	20263
Orders Recd. by BHEL	12912	4374	17286
Eqpt. supplied before plan period	5740	2419	8159
Eqpt. to be supplied during the plan period for the power plan 1980—85	7172	1955	9127
Eqpt. for which orders are yet to be placed	840	500	1340
Eqpt. for which orders have been placed on foreign supplier	1396	204	1600*

\*In addition, equipment totalling to 37 MW (small Hydro sets) to be arranged indigenously

6.37. During his evidence, Chairman, BHEL referred to huge outstandings against the State Electricity Boards for orders already executed. According to a statement furnished to the Committee, the total outstandings at the end of January, 1981 were Rs. 101.1 crores. Chairman, BHEL stated that:—

“While nobody pays us interest on overdue payments, I have to pay 15 per cent interest to the bank, if I take money from them.”

6.38. Secretary (Power) Stated:—

“We entirely agree that every supplier, whether in the public or private sector must receive payment in time. First, we must accept this philosophy that it has to be purely a commercial relationship. But unfortunately, we have not developed proper contract specifications, scope of supply etc. For example, and when the pieces are being delivered, the payments have to be made and should be made if they are in right sequence.”

6.39. Asked if Planning Commission could not pay directly to the BHEL, the representative of the Planning Commission stated:—

“Between the State Governments and BHEL there have been certainly some difficulties. Initially we used to have meetings with the Ministry of Finance, each Electricity Board and have this problem settled. We did it in the case of a State in 1975, we have Rs. 45 crores directly after cutting it from the Central assistance, but we cannot do it always without the concurrence of the State Government.”

6.40. The commissioning of a number of power projects has been delayed because of delayed supply of equipment by indigenous manufacturers, particularly BHEL. One of the reasons for delays in the supply of equipment by BHEL is stated to be inadequate manufacturing capacity for critical piping and pressure parts, though according to Rajadhyaksha Committee the plant capacity of BHEL appeared to be adequate to fulfil the generation programme during the next decade. Taking into consideration the projected increase in installed capacity of 20,000 MW in Sixth Plan and 30,000 MW in Seventh Plan, the country would require on an average power equipment of about 5,000 MW every year. The present production capacity of BHEL is about 3,400 MW per annum up to 1981-82, and it is likely to be 4,000 MW in 1982-83, 5,570 MW in 1983-84 and 5,720 MW during 1984-85 to 1988-89.

Secretary (Power) stated during evidence that during each of the years 1979-80 and 1980-81 only 1200 MW equipment rolled out of BHEL works. But the actual production of thermal equipment during 1977-78, 1978-79 and 1979-80 was between 1500 to 1600 MW; in 1980-81, it rose to 2400 MW; leaving orders to the extent of 4500 MW (Thermal) outstanding. As regards hydro sets it is seen that BHEL has outstanding orders for 54 Hydro sets at the end of 1980-81 as against a total production of 69 sets during the last five years (1976—81).

6.41. However, Committee cannot but agree with the observation of Secretary (Power) that “the capacity is what is produced and not what is written on paper”. It is rather difficult to imagine that BHEL will be able to step up its net production to 5,000 MW per year in the near future which is the estimated requirement for the Sixth and Seventh Plans.

6.42. After going into the whole matter, the Committee cannot help feeling that it would be rather risky if the country depends only on BHEL for the supply of entire equipment required indigenously for the execution of power plan during the period 1980—90. The Committee would suggest that a critical review of the actual production vis-a-vis installed capacity in BHEL should be undertaken immediately by the Department of Power

In consultation with BHEL and other connected organisations to determine whether, in the light of past experience, BHEL can be relied upon to deliver the equipment on schedule to keep pace with the plan. It would, in the Committee's opinion, be better to err on the right side and provide for slightly higher manufacturing capacity in the country than the actual need and it would be preferable to set up another unit in public sector. In this connection, the Committee would like to draw attention to their recommendation on the subject earlier in this chapter. (Serial No. 72)

6.43. BHEL is stated to be deficient in technology for lignite fire boilers and bulb turbines for hydro projects. It is also stated to be short of capacity for critical piping and pressure parts. The Committee would recommend that the areas in which BHEL lacks technology or capacity should receive urgent attention of the Government. (Serial No. 73)

6.44. The Rajadhyaksha Committee have pointed out that a problem which has frequently occurred is the bunching of orders when manufacturers are asked to supply equipment for a number of projects at the same time. This should not be a problem difficult of solution if a proper planning is made by the CEA, Central Public Sector Undertakings in the field of power and State Electricity Boards. The Committee would expect the Ministry to impress upon all these agencies the need for a proper planning to avoid bunching of orders. (Serial No. 74)

6.45. The Committee note that Bharat Heavy Electricals Ltd. is facing difficulty in getting payments from State Electricity Boards and the outstanding amount as at the end of January, 1981 was Rs. 101.1 crores. Secretary, (Power) has stated that the model contract being prepared by them will take care of these details viz. that the equipment is delivered in right sequence and the payment is made promptly. The Committee would like the Department of Power and CEA to look into this genuine difficulty of BHEL and evolve an arrangement which will enable BHEL to receive payment for the equipment supplied to SEBs and other agencies without delay. (Serial No. 75)

## CHAPTER BII

### CENTRAL ELECTRICITY AUTHORITY

#### A—Role and Functions

7.1. The Central Electricity Authority (CEA) is a statutory organisation constituted under Section 3 of the Electricity (Supply) Act, 1948. It came into existence in 1951 as a part-time body and continued with this *status quo* upto 1974. During this period, most of its functions were discharged by the Central Water and Power Commission and its predecessor organisations. With the creation of a separate Department of Power and the bifurcation of the Water and Power Wings of the Central Water and Power Commission, the Central Electricity Authority became a full-time body in 1974. Administratively, the Central Electricity Authority is under the Department of Power.

7.2. The CEA is vested with a number of statutory responsibilities of which some of the principal responsibilities are to:—

- (i) develop a sound, adequate and uniform national power policy, formulate short-term and perspective plans for power development and the activities of the planning agencies in relation to the control and utilisation of national power resources;
- (ii) Advise any State Government, Board . . . . . on such matters as will enable such Government, Board to operate and maintain the power system under its ownership or control in an improved manner . . . . .”
- (iii) Advise the Central Government on any matter on which its advise is sought or make recommendation to that Government if in the opinion of the authority the recommendation would help in improving generation and the utilisation of electricity.

7.3. Under the Electricity (Supply) Act, 148, the CEA is required to carry out techno-economic appraisal of power projects costing more than Rs. 1 crore. Apart from the statutory responsibilities, the function of providing Consultancy services in the fields of planning, design, and operation of power plants and power systems has developed on CEA.

7.4. The views expressed by some of the State Governments/State Electricity Boards on the functioning of CEA are as follows:

“CEA has been performing only functions which are only minor. CEA should play a more positive role in the formulation of the energy policy in the 15 Year Power Plan planning, setting up of Super Thermal Power Stations and the national grid, planning of the manpower and its training etc. This can be done if CEA is manned by suitable and adequate number of persons with suitable specialisation, field experience and foresight enabling them to take quick decisions and also given adequate power.”

“It is felt that the projects submitted by the State are being sanctioned so late that the demand of electricity has since long over-shot the availability.”

“The CEA may scrutinise project proposals with a more pragmatic approach and accord techno-economic clearances within a time-frame. The procedural requirement and norms of Project Reports may be further rationalised and enumerated to save time.”

“While efforts have been made by CEA to fulfil some of the functions, it has been observed that generally in the working of the CEA, States have not been allowed due participation or taken into confidence and effective policy and implementation measures are not drawn out with the help of the representatives from the SEBs which results in poor implementation.”

“In practice it is found that the CEA is unable to get things done and clearance issued quickly. The fact that new power stations have problems of plant availability and maintenance problems would also point to a technical inadequacy. The fact that in the past power planning was inadequate leading to inadequate investment and delay in investment in the sector would also indicate to a certain extent inadequacy on the part of the CEA. The CEA should be strengthened to fulfil the role expected of it and it should ensure that power planning and provision of plant and machinery is adequate both in quality and quantity.”

7.5. In the course of discussions during tour the representative of a State Government and State Electricity Board stated that the cadre in the CEA had grown centrally and the officers there did not have adequate field experience. It would have been better if more officers had been

taken from States on deputation to give practical bias to the handling of problems by CEA. There was a certain percentage of posts in CEA filled by drawing officers from States on deputation. This percentage should go up. Even existing percentage was not filled up fully. A study should be made as to why even the existing percentage of posts reserved for State officers was not being filled up.

7.6. As regards the competence of CEA to give guidance to States it was stated that the States did not depend on CEA for guidance in times of difficulty as CEA was not considered competent enough to guide them.

7.7. It has been stated by an Expert on Power that central Electricity Authority should concentrate on matters of policy, maintenance techniques etc. instead of being an appendage to the Ministry of Energy (Department of Power). CEA should act essentially as a policy making body and should not concern itself with design consultancy work etc.

7.8. Another expert on power has stated that CEA should be the national body for policy formulation, planning and coordination in the field of power development. CEA should also play an important role in the quality assurance of Power Stations.

#### *National Power Policy*

7.9. On being asked if the CEA has since formulated a national power policy, the Department of Power stated in a note (December, 1980):—

“————the policy for power development has followed an evolutionary process. The national power policy flows out of the various techno-economic studies that are carried out from time to time by the CEA in connection with resource assessment, plan formulation techno-economic appraisal of projects, planning for hydro and thermal power development, planning of transmission systems, planning of rural electrification programme etc. These normally get incorporated in the discharge of responsibilities by the CEA and the Department of Power.”

7.10. Asked whether the Central Electricity Authority had been able to play an effective role in the field of formulation of policies, planning, research and development and coordination, Secretary (Power) stated before the Committee:—

“So far as division of responsibility is concerned the responsibility of policy making is that of Government and that is discharged by the Ministry for the Government. The Central Electricity Authority is the planning body. It is an advisory



body to the Government and it has also got certain statutory functions——.”

As regards the total gamut of responsibility of CEA with regard to planning, research and development, coordination etc., this issue has been gone into in a very great detail by the Committee of Power (Sept., 1980). It has already submitted a voluminous Report. All these recommendations, at present, are under examination. We have not taken a final view on that because they may need some amount of restructuring of CEA also.”

7.11. When during evidence attention of Secretary (Power) was invited to Section 3(1)(i) of the Electricity (Supply) Act 1948 which cast the responsibility to “develop a sound, adequate and uniform national power policy” on CEA, and to his stand that policy planning is the function of the Ministry, Secretary (Power) stated:—

“A bit of overlapping will always be there. And this Act was amended in 1976. The words added were and particularly coordinate the activities of planning agencies. . . . .”

7.12. The Committee pointed out that 1976 amendment added certain responsibilities; it did not take any responsibility away. When the Committee asked whether it would not be proper that planning should be done by CEA, the witness replied that “It is completely done by them.” When the Committee expressed a fear that planning done by the CEA was further scrutinised by the Ministry, Secretary (Power) stated that “Planning is a continuous exercise there is a lot of to and fro movement.” When he was asked to reply with special reference to “Power Planning (Policy)”, Secretary (Power) stated:—

“The policy is laid down by the CEA, the plan is finalised by the CEA.———We have to involve the Planning Commission and others. There are lots of meetings. Supposing they come out with a plan on which lots of objections are raised, it would become infructuous. We have to have a document which has the support of all concerned.”

7.13. The Committee on Power (Rajadhyaksha Committee) have stated in their Report:—

“The CEA has recently begun to make efforts to strengthen the staff and widen its sphere of influence and has set up a good system for monitoring the performance of thermal generating stations. It has, however, a long way to go before it can be

said to be playing the kind of critical role that it was set up to perform. It is hamstrung by the rigidities of Government procedures in filling posts, sanctioning studies and is finding it difficult to get good men either permanently or on deputation. In short, as matters stand today, there are, largely on account of the past shortcomings of the C.E.A., no well conceived, coherent, comprehensive and agreed policies for the development of the power industry in all its aspects."

*Status of C.E.A.*

7.14. Central Electricity Authority is an attached office of the Department of Power (Ministry of Energy). The 'order', dated 19 April 1975, declaring the office of the Central Electricity Authority as an 'attached office' was issued by the Ministry of Energy/Deptt. of in following terms by an Under Secretary to the Government of India:—

"It has been decided to declare the office of the Central Electricity Authority as an Attached Office of the Central Government under the Ministry of Energy (Deptt. of Power) with effect from the 11th October, 1974."

7.15. Section 3(6) of the Electricity (Supply) Act, 1948 lays down that:—

"The Authority (CEA) may appoint a Secretary and such other officers and servants as it considers necessary for the performance of its functions under this Act on such terms, as to salary, remuneration, fee, allowance, pension, leave and gratuity, as the Authority may, in consultation with the Central Government, fix."

Section 4A(1) provides that:—

"In the discharge of its functions, the Authority shall be guided by such directions in matters of policy involving public interest as the Central Government may give to it in writing."

7.16. Asked if it is not anomalous to call a statutory organisation to be an attached office under the Deptt. of the Government", Secretary (Power) stated before the Committee:—

"It is not CEA which is the attached office. It is the office of the CEA. This is an office order issued in 1975 vetted by the Ministry of Finance. Basically what they mean is that they are going to deal with clerical strength and various office administration problem. They would be on the concept of an

attached office, as far as pay scale etc. working are concerned.——When we say C.E.A., it is a body of five to six full-time members and a few part-time members. It is that body which is C.E.A.”

7.17. Secretary (Power) added that “It (CEA) is an independent organisation. This is working very smoothly.”

7.18. Asked whether the Central Electricity Authority as at present constituted, had been able to mobilise the best available talent to be able to provide leadership to the State Electricity Boards in technical matters and whether the State Electricity Boards to look C.E.A. for advice and guidance in technical and managerial matters, Secretary (Power) stated:—

“.....the real problem has been in finding good people from State Electricity Boards. We do want to have people with good field experience. That is why a certain number of posts have been kept reserved for people who come on deputation.....But when people are selected, they have not been showing much enthusiasm except a few individuals who might be belonging to Delhi area.....Housing is a big problem. They are not able to get a house with 15 per cent of HRA given by the Govt. of India.....So the people refuse to come and most of the posts are lying vacant. We try to make *ad hoc* arrangements from within our own organisation. The purpose for which posts have been reserved has not been achieved.”

7.19. The Committee pointed out that some State Electricity Boards have said that CEA, as an apex body, should have a repository of experts and whenever they need a particular expert, CEA should be able to make available the services by the expert. Secretary (Power) stated that “in principle, we do agree to that. But only upto a point. For every little thing, you cannot go on spoon-feeding them and give guidance.....As regards pooling of experts at the level of the Central apex body,——— for example, at the level of Chief Engineer, we have kept 50 per cent posts to be filled in by people from the State Electricity Boards. The intention is that we get better people with more field experience so that they would be more helpful to them. But due to housing problem in Delhi, they refuse to come here. We are not able to achieve that purpose.”

7.20 As regards the SEBs looking to CEA for guidance, Secretary (Power) added (Jan., 1981):—

“We do guide them to the extent possible. We have improved the total power generation in India from 42 per cent to 48 per

cent. From November/December last year, we have been able to improve power generation to the extent of 20 per cent over the period of previous year. It has been achieved by Central efforts.———If somebody approaches them in 100 cases, he gets guidance in 90 cases, in 5 cases his views are rejected and in five cases his views are not totally agreed to, that may happen, but not otherwise.”

*Techno-economic approved to Power Schemes.*

7.21. Under the Electricity (Supply) Act, 1948, CEA is required to carry out techno-economic appraisal of power projects costing more than Rs. 1 crore. Asked how many power projects were received for techno-economic appraisal during 1979-80, the number of schemes techno-economic approved was given during 1979-80 and the maximum and minimum period taken, the Deptt. of Power stated in a note (Oct., 1980):

“60 power schemes comprising of 27 hydro, 11 thermal and 22 transmission and distribution schemes were received by CEA during 1979-80. Of these, 15 schemes (2 Hydro, 2 thermal and 11 Transmission and Distribution schemes have already been techno-economically appraised and accorded approval by the CEA. The remaining 45 Schemes are in various stages of examination.

The time taken by CEA for techno-economic appraisal and clearance of 56 schemes for which approval was accorded during 1979-80 reckoned from the date of receipt of first project is as under:—

- 6 months and under—10 schemes.
- 7 months to 1 year—15 schemes.
- 1 year to 2 years—15 schemes.
- more than 2 years—16 schemes.

A few schemes have been cleared in a period of two three months and a few have taken 4 to 7 years. The schemes which have been techno-economically appraised and cleared for short-duration were well formulated ones with adequate investigation and studies. The schemes which took longer periods for techno-economic appraisal required further investigations and studies and preparation of revised project reports and estimates. In a few cases, certain other aspects like inter-State problem, agency for construction etc. required resolution.”

7.22. Asked if any period has been fixed by CEA to appraise and approve such schemes, the Deptt. of Power stated in a note that:—

“CEA has not fixed any period for techno-economic appraisal and approval of schemes. The time taken varies from scheme to scheme depending on the nature of scheme, the techno-economic soundness of the proposal and the detail in which the project report has been prepared.”

7.23. Regarding time taken for clearance of projects by CEA, Secretary (Power) stated during evidence:—

“If the feasibility report is a document well-prepared containing all the relevant data, then we will be able to clear the thermal scheme in 3 to 6 months and the hydro scheme in about 6 to 12 months.”

7.24. The witness added that in regard to thermal schemes, a standard had been evolved and there was no problem. But in hydro “our experience is that we still get very inadequate, very sketchy reports. The CEA is wondering whether it has to educate them on the form in which this feasibility report is to be made. There are cases which are continuing for years together.”

**7.25. The Central Electricity Authority (CEA) is a statutory body set up under the Electricity (Supply) Act 1948, inter alia, to develop a sound, adequate and uniform national power policy, formulate plans for power development and coordinate the activities of planning agencies in relation to the control and utilisation of national power resources. It is expected to be the main adviser to the Central Government as well as to the State Electricity Boards and other organisations engaged in the generation, distribution and transmission of power in the country. But the reports reaching the Committee from SEBs and non-official circles suggest that the CEA is merely an appendage to the Department of Power; it has not played any major role in policy formulation; it has failed in the field of planning as well as implementation it lacks technical adequacies and adequate powers and has not cared to take States into confidence or allowed them due participation in the formulation of policy or implementation plans.**

**7.26 From the contradictory statements made by the Ministry of Energy (Deptt. of Power) before the Committee, it is obvious that a confusion prevails in the Ministry about the role of the CEA in the formulation of national power policy; and on wonder, because of this confusion. CEA has, as stated by a State Electricity Board, not played a positive role in the formulation of energy policy. While initially, giving evidence, Secretary**

(Power) took a position that responsibility of policy making is that of the Ministry and the CEA is only a "Planning body", but when his attention was drawn to the statutory provisions, he agreed that "the policy is laid down by CEA". The Committee would like the Department of Power not to confuse the role of the CEA in this regard and arrogate to themselves a function which the Electricity (Supply) Act 1948 has clearly assigned to CEA. One of the most important functions of CEA, under section 3 of the Act, is to "develop a sound, adequate and uniform national power policy" and it should be allowed to perform this function without any obstacle. In this task the involvement of Planning Commission, Deptt. of Power and States and other organisations is, of course, essential and should be brought about.

(Serial No. 76Q)

7.27. The Central Electricity Authority is a statutory organisation with powers to appoint a Secretary and such other officers and staff as it considers necessary for the performance of its functions, on such salary, remuneration, allowances etc. as the Authority may in consultation with the Central Government, fix [Sec. 3(6)]. But, the Committee are surprised to find that the "Office of the CEA] has been declared to be an "Attached Office of the Government of India" under the Department of Power under an Order (dated 19 April, 1975) issued by an Under Secretary of the Ministry without reforming to the source of authority under which he issued that order. This shows that CEA has, as alleged been virtually made an appendage to the Ministry. In an attempt to clarify the position Secretary (Power) in his evidence stated that "It is not CEA which is the attached office. It is the office of the CEA". This is nothing but legal quibbling as it is difficult to imagine how "CEA" can exist or function without its "Office". The Electricity (Supply) Act envisaged CEA as an apex organisation in the power sector to act as an adviser and consultant to the Central and State Governments and a planning and coordinating body of all India standing. In this scheme set out in the Act the Central Government's role and powers vis-a-vis the Central Electricity Authority have also been clearly set down. After considering all these matters the Committee are of the view that the Ministry of Energy have no authority to declare a statutory body like CEA, as "Attached Office" under the Department of Power. The Committee would like that the opinion of the Ministry of Law be taken in the matter, if necessary, and the CEA given its rightful status which is essential if it has to discharge the onerous responsibilities assigned to it under the Act.

(Serial No. 77)

7.28. A State Electricity Board has stated that the officers of the CEA have grown centrally and lack field experience. Secretary (Power) has admitted that even though a certain percentage of posts including posts of

the level of Chief Engineer reserved for officers of the SEBs to induct people with field experience in CEA, CEA has failed to draw experienced people from States because of unattractive terms of service like HRA etc. The Rajadhyaksha Committee have also observed that CEA is hamstrung by the rigidities of Government procedures and is finding it difficult to get good men either permanently or on deputation. Against this background, if the SEBs do not consider CEA competent enough to guide them; it is not unnatural. The Rajadhyaksha Committee have recommended that in order to attract able officers for SEBs etc. terms and conditions of service of CEA officers should be substantially improved and their pay scales delinked from those of other Central technical services. The Committee feel that unattractive pay scales and allowances are partly the result of declaring CEA as an "Attached Office" of the Government of India and for this the Department of Power are themselves to blame. Now when this deficiency has been forcefully highlighted by SEBs and Rajadhyaksha Committee and admitted by Department of Power, the Committee expect that the Department will look into this matter seriously and immediately and take measures necessary to attract and induct the best available talent in the CEA so that the CEA becomes the repository of experts to whom State Electricity Boards can look for guidance.

(Serial No. 78)

7.29. One of the statutory functions entrusted to the Central Electricity Authority is to carry out techno economic appraisal of power projects costing Rs. 1 crore. While according to the Secretary (Power), the feasibility report containing all the relevant data in respect of a thermal power scheme is expected to take 3 to 6 months for approval and the hydro scheme about 6 to 12 months, it has been admitted by him that some of the schemes have taken 4 to 7 years because the data furnished was not complete. The Committee feel that at the present juncture when there is imperative need to speed up the capacity addition to meet the growing power demand in the country, it is necessary that the techno-economic appraisal of the schemes should be completed without delay. A large number of State Governments have also represented to the Committee that quite a long time is taken by the Central Electricity Authority in clearing the project and there are a large number of projects pending with the CEA for approval. The delay in according techno-economic approval is stated to have held up a number of projects sponsored by the States. The Committee find that while the States think that CEA is taking too long a time in giving approval to their projects, the CEA attributes delay in approvals to the incomplete data furnished by States in the project reports. The Committee are unhappy at this kind of shifting of blame for delays on each other. The Committee would like CEA not only to lay down in clear terms guidelines for preparation of project reports which they appear to have done in the case of thermal projects but not hydel projects, but also

take initiative to "indicate to" the SERs the manner of preparing comprehensive project reports giving complete data to avoid any delay at the techno-economic approval stage. (Serial No. 79)

~~... B—Organisational set-up in the C.E.A.~~ The Committee strongly feel that CEA also have a responsibility to clear all projects referred to them within a time schedule. No projects should as far as possible, remain pending more than 2 years. All objections and the additional information required with reference to any project should be communicated to the States concerned in one lot and not piece-meal. Where any data in a project report is found wanting the CEA should sit down with the representatives of the SEBs and help them fill the gap with a view to according techno-economic approval to the project without further delay. All those projects which are at present pending with the CEA for over two years should be cleared within six months and in any case before one year. The Committee would like to be apprised of the progress in the clearance of the pending project together with the reasons for delay in the case of pending project within 6 months.

7.30. The Electricity (Supply) Act, 1948 has laid down that the Central Electricity Authority shall consist of not more than 14 members of whom not more than 8 members shall be full time members appointed by the Government. Of the full time members, one will be Chairman.

7.31. The Committee have been informed by the Deptt. of Power in a note (Oct., 1980) that taking into consideration, the present work being undertaken by the CEA, it has been functionally divided under Six Wings as follow:—

1. Planning Wing
2. Hydro Wing
3. Thermal Wing
4. Power Systems Wing
5. Operations & Monitoring Wing
6. Economic and Commercial Wing.

7.32. Each wing is under the charge of a full-time member. The work of these full-time members is coordinated by the Chairman.

7.33. It has been stated in a subsequent note by the Deptt. of Power (Dec., 1980):—

"The present sanctioned strength of the Central Electricity Authority is a Chairman and 6 members. At present, Chairman and 4 members namely Members Hydro Electric/Power Systems/Operations/Economic & Commercial are in position. The Chairman and members in position possess the requisite qualifications to perform effectively the functions prescribed in the Electricity (Supply) Act, 1948."



7.34. Asked why CEA, which is charged with the responsibility of playing a leading role in the field of power development in the country, did not have full complement of members, Secretary (Power) stated before the Committee (Jan., 1981):—

“Out of the two posts that are vacant, for one even orders were issued and the man was to join. But he got heart attack and now, he is having second thoughts. So, we are thinking of another person. For the second post of Member, Planning, which was created in 1979 we have not been able to find a suitable person because it is a multi-disciplinary type of function.”

7.35. The Committee were informed (Jan., 1981) that one of these two posts was created last year and the second fell vacant about 10 months back on retirement.

7.36. Asked if the emoluments and service conditions for these posts were not suitable to attract the right type of candidates, Secretary (Power) replied:—

“To some extent, yes. Although in salary he may be getting Rs. 200 extra, he does not get certain type of facilities which he would be getting in the State Electricity Boards. . . . The whole issue has been studied by the Committee of Power chaired by Shri Rajadhyaksha. These recommendations are under examination. Let us hope we will be able to find some solution.”

7.37. Asked if C.E.A. was facing any difficulty in working in the absence of these two top men, Secretary (Power) stated that this was something which could not be quantified. He added that the CEA's work had not suffered on this account.

7.38. The Committee on Power (Rajadhaksha Committee) have recommended in their Report that:—

- “1. The Committee would recommend the continuation of all 5 members except the member for “Operation” monitoring. With the creation of 5 REAs (Regional Electricity Authority), detailed information would be flowing in daily from all agencies connected with power generation and supply through the REAs to the Board and putting together these 5 Reports could be left to the Member (Systems) in the CEA. The Committee would, however, recommend the creation of three new posts—Member (Planning), Member (Research & Development), and Member (Personnel) as these are all grossly neglected areas and they need the concentrated full-time attention of someone of the status of a member. The 5 Chairmen of the REA's should be *ex-officio* part-time members.
2. There should be at least two Chief Engineers under each member looking after the major areas of responsibility and the rest could report directly to the member.

3. There has been a tendency to involve the Chairman and member in every conceivable Board and Technical Committee. These responsibilities take away so much of their time that they find it difficult to get on with their substantive jobs. In most cases it may be appropriate to depute the Chief Engineers who are functional heads to represent the C.E.A.
  
4. The Committee recommends that in order to attract able officers from the SEBs and later on from the REAs (Regional Electricity Authority) and REGCs (Regional Electricity Generating Corporations) to the CEA, both on deputation and absorption, the terms and conditions of service of SEA officers should be substantially improved. For this, delinking of the CEA and the REA pay scales from the other Central technical services is necessary. Taking into account that the REAs and particularly the CEA in its new role will be a high level organisation, contributing to policy making at the national level, such differentiation would be fully justified."

7.39. From the details of organisational set up and functions of various wings of the C.E.A. furnished by the Deptt. of Power, it is seen that there is a Directorate of Planning Wing which carries out techno-economic appraisals of all power schemes costing more than Rs. 1 crore. Similarly there is a Directorate in Hydro-electric Wing and also in Thermal Wing which carry out techno-economic appraisals. There is a Directorate in Planning Wing for coordinating, monitoring and reviewing progress of power scheme. There are identical Directorates in Hydro-electric, thermal wings doing monitoring work. There are similar Directorates in Power Systems Wing for operations also. In fact in Hydro-electric wing alone, two Directorates *viz.* Planning and Construction Directorates are doing monitoring work of one kind or the other.

Asked if this did not indicate duplication or even triplication of similar functions in various wings of CEA, the Deptt. of power stated in a written note:—

"Techno-economic appraisal of power schemes is a specialised work requiring complete knowledge of the technical aspects of the scheme as well as economy involved in proper selection of material, size and type of equipment, sites etc. In view of this techno-economic appraisal is essentially to be carried out by in the concerned specialised wings and coordinated by one of the Directorate in the same wing. Coordination Directorate in the Planning Wing views the power schemes in the context

of overall planning on a national scale keeping in view the mix of existing as well as on going thermal, hydro and nuclear power schemes.

In the same manner construction monitoring of thermal, hydro and transmission and distribution schemes is carried out in the respective wings where personnel with specialised knowledge in their fields is available."

It has further been stated:—

"There has been considerable expansion in the functions and responsibilities of the CEA Distribution and re-distribution of functions of the different Directorates of the CEA is a continuous affairs. Recently, the Rajadhyaksha Committee which examined the organisation and functioning of the CEA has made some recommendations on the reorganisation of the CEA. These recommendations are being looked into and necessary action no doubt will be taken for reorganizing and rationalising the distribution of work among the different Directorates of CEA.

#### *Staff Strength of CEA.*

7.41. In reply to question Secretary (Power) informed the Committee during evidence that the Staff Inspection Unit of the Ministry of Finance had been studying the structure and staff strength of CEA. They had recently submitted their views with regard to two wings. Their report had not yet been completed.

#### *Timely Completion of Power Schemes . .*

7.42. One of the statutory responsibilities of CEA is to assist in the timely completion of schemes sanctioned under chapter V of the Electricity (Supply) Act, 1948. It is, however, noted that between 1975-76 and 1979-80, out of a total of 51 new thermal units and 65 new hydro units sanctioned, only one thermal generating unit and two hydro generating units were completed according to original schedule.

7.43. Asked if it did not indicate that CEA has failed to discharge the aforesaid responsibility, the Deputt. of Power stated in a note that:—

"For speedier completion of power projects, Thermal and Hydro Construction Monitoring Directorates, headed by Chief Engineers, were set up in the CEA. These Directorate closely monitor the progress of various activities of the projects under construction and render requisite assistance to the Project authorities in getting the material in start supply.———  
Senior Officers of the CEA also visit the sites and give guidance

to expedite the commissioning of the units.———It would, however, be relevant to mention that while the power planning is the responsibility of the Central Government, actual execution of the new schemes is under the control of the State Govts./State Electricity Boards who have the key role for earliest commissioning of the new projects.”

**7.44. The sanctioned strength of the Central Electricity Authority is a Chairman and 6 Members but at present the Chairman and 4 Members are in position and the posts of Member (Thermal) and Member (Planning) have been lying vacant for nearly a year at a time when thermal generation and Power planning are at a critical stage. It is difficult to accept Secretary (Power)'s view that CEA's work has not suffered on this account. The principal reason why CEA has not been able to draw suitable candidates for these posts is that the salary and conditions of service are not sufficiently attractive. The Committee are unable to appreciate why this deficiency was not removed when it was already known to the Department of Power. The Committee cannot but hold Department of Power responsible for lack of planning and casual attitude for this State of affairs and would urge them to take urgent steps to fill the vacancies without delay.**

(Serial No. 80)

**7.45. The Committee take note of the suggestions made by Rajadhyaksha Committee to re-structure and strengthen the CEA by creation of certain new posts and re-organise the system of work and control in the CEA. They would like the Department of Power to take final decision in the matter expeditiously in the larger interest of efficient working of power sector.**

(Serial No. 81)

**7.46. There is a Directorate in planning wing of the CEA for monitoring the progress of power schemes. There are identical Directorates in Hydro-electric wing, Thermal wing and Power system wing doing monitoring work. In fact in Hydro-electric wing alone, Planning and Construction Directorates are both doing monitoring work of one kind or the other. Similarly there is duplication of arrangements in regard to techno-economic appraisal in various wings of CEA. Despite the denial of duplication of work, it appears to the Committee that there is overlapping of work and the allocation of work among various wings can be rationalised and economies effected without loss of efficiency. The Committee would expect the Staff Inspection Unit of the Ministry of Finance, which is making a study into the structure and staff strength of CEA, to look into the matter and make recommendations for a scientific allocation of work among various wings with a view to avoiding duplication of work. (Serial No. 82)**

7.47. One of the statutory responsibilities of CEA is to assist in the timely completion of power schemes. It is seen that out of 51 thermal schemes sanctioned during the last five years, only one scheme was completed in time; and out of 65 hydro schemes, only 2 were executed on schedule. From this the Committee are constrained to conclude that completed in time; and out of 65 hydro schemes, only 2 were executed bility. (Serail No. 83)

## CHAPTER VIII

### MISCELLANEOUS

#### A—Training of Staff in Power Sector

8.1. Availability of adequate number of trained personnel for operation and maintenance of power stations and Transmission and Distribution is vital to the efficiency of operations of the power system and the reliability of supply. It has, however, been admitted by Government that “The training of personnel for Thermal Power Stations has been relatively neglected in the past. With the introduction of units of higher rating of 120 MW and 210 MW involving sophisticated technology, the training of operating and maintenance personnel acquires critical significance. However, very few Boards have full-time training Departments under officers of a sufficiently high level for systematic level induction and in-service training programme for their personnel.”

8.2. Asked if the technical level of technical personnel maintaining and operating power stations is adequate keeping in view the progressive sophistication of power equipment, the Deptt. of Power have stated in a note:—

“While some of the personnel are adequately trained for the jobs being handled by them, others would need further training to improve their skills for proper operation and maintenance of the generating units. For training of operation and maintenance personnel for thermal power stations, a Power Engineers Training Society has recently been set up to look after the training needs of the country in the power sector adequately.”

8.3. As regards the functioning of the Society, the Deptt. of Power have stated in a note that:—

“Earlier four Regional Thermal Power Stations Training Institutes were set up at Neyvelli, Durgapur, New Delhi and Nagpur in the years 1965, 1968, 1974 and 1975 respectively under the CEA for training of engineers and supervisors of thermal power stations. The Power Engineers Training Society was set up to function as the apex national body for planning the training requirements for the power sector in the country by coordinating the training programmes of the various Electricity Boards/ Undertakings and supplementing the same with its own training activities. The society was registered in March, 1979. The

four Regional Thermal Power Stations Training Institutes were transferred to the Society w.e.f. 1-1-1980.”

8.4. Thermal Training Institutes of the Society are running the following regular training programmes:—

- (1) Induction level training course in operation to Graduate Engineers joining thermal power stations.
- (2) Induction level training course in operation to Operators joining thermal power stations.
- (3) Advanced level training course for operators who have worked for a few years in power stations.”

8.5. These training Institutes, when fully developed would be able to train 400 operators and 200 engineers annually.

8.6 From a statement furnished by the Deptt. showing the number of persons trained by the Thermal Power Training Institutes, it is seen that, from the date of inception till 1979-80, 1144 Engineers and 1348 operators had been trained in these Institutes.

8.7 It has been stated in a memorandum submitted to the Committee:—

“The MSEB has a separate training department under a Chief Engineer for classroom and in-plant training which is proving to be extremely useful. In fact the NTPC has recently deputed 30 Engineers for classroom and in-plant training which is proving to be extremely useful. Other States should also follow suit and send its existing operating Engineers for training in the Four Training Institutes set up by the CEA and for freshly recruited Graduate Engineers they should have their own Training Department.”

8.8 The Rajadhyaksha Committee on Power have made a number of recommendations regarding training of operational and maintenance personnel. Some of the important recommendations are:—

1. A special group should be appointed by the Deptt. of Power to study the short-coming in the operations of the four Regional Power Station Personnel Training Institutes and recommend measures for using them fully.
2. Additional training Institutes to cater to the expected gap between demand and supply of engineers, technicians and operators should be started.
3. Operator/training courses should be augmented to cater to training staff for maintenance work.

4. Short term courses in specific areas *e.g.* power station chemistry, maintenance planning techniques, currently being conducted by the CEA, should be held more frequently.
5. SEBs and other utility operators should train personnel for 1½ years prior to their being required for operating a plant by being taught the critical principles and then given practical training in the manufacturers works and his test facilities and in such operating stations as are using his equipment.
6. The CEA and REA should assume the responsibility for arranging tests for operators of power plant and issuing certificates of competency on a national basis. A similar practice should be adopted with regard to maintenance personnel. Only such certified personnel should be permitted to operate and maintain power plants.

**8.9. Availability of adequate number of trained personnel for operation and maintenance of power stations and transmission and distribution work is vital to the efficiency of operation of the power system and reliability of power supply. However, as admitted by the Government, the training of personnel for thermal power stations has been relatively neglected in the past and with the introduction of more sophisticated technology, the training of power personnel acquires "critical" significance.**

**8.10. The Committee feel that a person employed to operate and maintain the power stations or transmission and distribution systems should not only be suitably qualified but also adequately trained before he is put on the job. For this purpose it should be necessary that when a power station is to be taken up for erection the engineers and other technical staff required for erection, operation and maintenance should be recruited well in advance, and given practical training both with the manufacturers of the equipment and in power stations so that technically competent persons of the required disciplines are available to take up responsibility and handle the work of erection, operation and maintenance, as the case may be, at the appropriate time. (Serial No. 84)**

**8.11. The Committee are informed that the Power Engineers Training Society has been set up to function as the apex national body for planning the training requirements for the power sector in the country by coordinating the training programmes of the various Electricity Boards/Undertakings and supplementing them with its own training activities. The Society has four Training Institutes working under it which have trained only 1144 Engineers and 1348 operators since their inception in 1965, 1968, 1974 and 1975. Not all the State Electricity Boards have full**



fledged Training Departments. The Committee would suggest that the Power Engineers Training Society should take stock of the training needs of all kinds of the entire power sector in the country vis-a-vis training facilities already available and not only augment the training facilities to meet the growing requirements in full in accordance with a comprehensive plan to be drawn up in consultation with the State Electricity Boards but also help the States in upgrading the existing training facilities to high standard consistent with the requirements. In doing so, the Committee would expect that duplication of facilities will be avoided and requirements of each region will be taken care of. The Committee would like the CEA to liaise between the Society and the Boards to bring about coordinated development and optimum utilisation of training facilities. (Serial No. 85)

8.12. In the Committee's opinion, training should not be a one-time operation. After a thorough training in the beginning, refresher courses and courses in new technology, well before its introduction, should be held for serving engineers and technicians to keep their efficiency at optimum level. (Serial No. 86)

8.13. The Central Electricity Authority should ensure that training requirement of all those Electricity Boards which do not have well-established training facilities of their own are met by the Institutes run by the Power Engineers Society or the neighbouring SEBs having such facilities till the time they set up their own independent training Institutes.

(Serial No. 87)

8.14. The Estimates Committee expect that the Government would examine the recommendations made by the Rajadhyaksha Committee on Power regarding training of Engineers and operators expeditiously and take an early decision thereon. They would like to be apprised of the Government decisions in this regard and the follow-up action taken in pursuance thereof. (Serial No. 88)

#### **B—All India Service of Power Engineers**

8.15. An expert on Power has suggested the creation of an All India Service of Power Engineers to provide necessary mobility to the best available talent from place to place to man the most important installations.

8.16. Asked about the views of Government on the subject, Secretary (Power) stated before the Committee:

“Fundamentally this is a subject under the Ministry of Home Affairs. They are working on it. They have obtained our views. The

Minister for Energy has recently sent a paper to all the Chief Ministers seeking their support for this service and also drawing attention to a number of points. Five areas have been identified which have to be sorted out."

8.17. The Rajadhyaksha Committee on Power in their Report have stated that while the concept of an All India Service of Power Engineers should not be accepted in its entirety, there should be a common entrance examination at the class I level for all utilities and Regional Electricity Authority at the State, Regional and National level. The Rajadhyaksha Committee have also recommended that an All India pool of senior Engineers should be formed on the basis of selection from officers at the level of Superintending Engineers and above. This pool should be the normal source of filling posts of Chief Engineers, Members, Directors and Chairman of SEB's CEA, Regional Electricity Authorities and Regional Electricity Generating Corporations. Selection to this pool should be done by a Standing Empanelment Committee. The CEA should fix guidelines for categorising posts, lay down minimum terms and conditions of pay, perquisites and other facilities and standardise recruitment rules and promotional policies.

8.18. Power system is no longer the exclusive concern of a State. Regional planning and inter-dependence have added a new dimension and before long the power system, no matter where it is located, will assume national proportions. In view of these developments, the Committee feel that the creation of an all-India pool of senior engineers of the level of Superintending Engineers and above, through the establishment of an All-India service of Power Engineers or otherwise, will be necessary to provide for mobility of power experts and handle the power problems across the State frontiers. (Serial No. 89)

#### C—Power Cuts

8.19. Normally, the availability of power should match with the demand on system. However, whenever the availability of power is less than the actual demand, power cut are imposed by the States to meet the situation.

8.20. A leading Organisation of Commerce and Industry has stated:—

"To say the least, power cuts in the past have been arbitrary, un-planned and inequitable, resulting in not only loss in production but also damage to equipment. While some States like Maharashtra have been able to plan power cuts in consultation with the major consumers, in many other States, cuts are applied abruptly. It is a sad commentary on the performance of the power sector that although the installed capacity in many States is adequate to meet the peak demand, power cuts often extend well into the off-peaks hours as well."

8.21. Asked if it was a fact that in many States, power cuts were not planned and announced in advance Secretary (Power) stated before the Committee:—

“In most of the States, the cuts have been planned. But sometimes some unexpected problems arise. In a case of major breakdown, this is something which cannot be planned.”

8.22. He further stated:—

“We had planned that all the industries should work on a staggering basis. . . . . We are insisting on all the States that this staggering must be done. . . . . But sometimes they are not in a position to do it because of popular pressures.”

8.23. Asked if the views of major consumers were taken into account while planning power cuts or ordering load shedding, Secretary (Power) Stated:—

“In every State Electricity Board, there is a consultative machinery. But in some of the States that is not very effective. . . . . It is a part of Electricity Supply Act. These are on the pattern of the ‘Railway users’ Consultative Committee, in which the major consumers’ interests, both agricultural and industrial, is looked into.”

8.24. On being asked whether the Consultative Committee laid down guidelines for staggering of load and power cuts. The witness stated that “It will evolve guidelines if it is a proper and good Committee and it will meet the priorities.”

8.25. Secretary (Power), however admitted that these Committee were not generally functioning well.

8.26. It has been brought to the notice of the Committee that while in some of the States, power cuts are imposed after consulting major consumers, in some other States the cuts are unplanned, arbitrary and abrupt. The Committee feel that while in certain situation such as sudden breakdowns, unplanned power cuts may not be unavoidable altogether, as far as possible, the power cuts should be planned and announced in advance. The Committee would expect the CEA to impress upon the State Electricity Boards the need to plan and notify power cuts in advance to enable the industries, agriculturists and householders to regulate their operations accordingly and thus minimise the loss. (Serial No. 90)

8.27. As laid down in the Electricity (Supply) Act, there is to be a consultative machinery of consumers in every State Electricity Board.

These bodies, it is stated by Secretary (Power), are generally not functioning well. If these bodies can be activated, they can play a very useful role in the matter of planning of power cuts and laying down general guidelines for the guidance of SEBs and thus protect Consumers' interests. The Committee would like CEA to take up this matter, with SEBs and persuade them to activate these bodies in their as well as consumers' interests.

(Serial No. 91)

#### D—Cost of Power Generation

8.28. The Deptt. of Power have furnished a statement giving the average cost of generation in different states which is as follows:—

S. No.	Name of State Electricity Board	Hydro	1979-80	
			Thermal	Atomic
1.	Andhra Pradesh . . . . .	6.9	24.95	..
2.	Assam . . . . .	..	16.72	..
3.	Bihar . . . . .	16.5	22.5	..
4.	Gujarat . . . . .	*3.43	20.46	16.06
5.	Haryana . . . . .	5.3	31.43	..
6.	Himachal Pradesh . . . . .	11.1	..	..
7.	Karnataka . . . . .	*6.27	..	..
8.	Kerala . . . . .	*5.29	..	..
9.	Madhya Pradesh . . . . .	*5.31	*12.98	..
10.	Maharashtra . . . . .	*4.89	*16.87	..
11.	Orissa . . . . .	*5.45	*18.61	..
12.	Punjab . . . . .	*2.8	*27.8	..
13.	Rajasthan . . . . .	*5.31	*12.6	..
14.	Tamil Nadu . . . . .	*5.47	*32.07	..
15.	U.P. . . . .	10.61	22.59	..
16.	West Bengal . . . . .	*26.16	*11.89	..
17.	J&K . . . . .	15.92	103	..
18.	Meghalaya . . . . .	11.45**		

Where information for the year 1979-80 is not available, figures for 1978-79 have been given.

8.29. Asked whether the Central Electricity Authority had worked out the standard costs of power generation in respect of schemes approved by it, the Deptt. of Power stated in a note (October, 1980):—

“The cost of power generation varies from scheme to scheme and is dependent on its fixed costs, variable costs like cost of fuel and its transportation and several other operating parameters. It is, therefore, not practicable to lay down any standard cost of power generation for any region. However, CEA examines the cost of power generation for each of the schemes and accords techno-economic approval on its own merits. Efforts are made by SEA to suggest economies in expenditure to the extent feasible while considering the cost estimates at the time of techno-economic appraisal.”

8.30. Asked if the Ministry had given any thought to the unusually high cost of generation in certain states, Secretary (Power) stated in evidence:—

“If I compare the cost of generation of a scheme which was initiated 20 years ago against another scheme which is to be implemented today, the cost is bound to be higher. The cost of equipment would have become probably five times more now than before. Particularly from that station, the cost of generation is bound to be high.———It would also depend, for instance, on the facility for transportation for coal. The vicinity or the closeness of the pit-head would reduce the cost of transportation.———Norms are there for utilisation, norms will not be on the basis of cost of operation.”

8.31. It is seen that the cost of generation differs from State to state and there is a wide gap in the cost of power in different states. In the cases of hydro-power the cost ranges from 2.8 paise per unit in Punjab to 21.16 paise per unit in West Bengal. Similarly in the case of thermal power, the cost of generation varies from 11.89 paise in West Bengal to 32.07 paise in Tamil Nadu. While it is true that the power stations set up earlier and located near the pitheads are able to generate power at a lower cost, it cannot be denied that high cost of power is also attributable to low operating efficiencies, high capital cost of projects due to long delays in construction and high overheads and heavy overstaffing (which is evident from the fact that expenditure on salaries varies within the country from 12 per cent to 40 per cent of the total income of the SEBs as broughtout by Rajadhyaksha Committee—page 10). And all these factors cannot be said to be beyond the control of State Electricity Boards. The Committee, therefore, feel that CEA would do well to bring

**it home to State Electricity Boards that the cost of production is controllable and can be brought down to some extent if certain capital and running costs are taken proper care of. (Serial No. 92).**

### **E—National Grid**

8.32. Explaining the policy of Government in regard to the development of a National Grid, the Department of Power have stated in a note:—

The development of the National Power Grid is an evolutionary process. As for the National Power Grid transmission lines cutting across the State and regional boundaries are essential. From 4th Plan onwards 100 per cent loan assistance is being advanced to States for construction of these lines. This has considerably helped in early construction of the inter-State/regional transmission lines. In the first instance, integration of the State Power system into Regional Power Grids is being carried out. At present Northern, Southern, Western and Eastern regions are functioning in this manner providing exchange of power and energy between various States.

8.33. The Department added:—

“400 KV transmission networks are also being constructed as part of the Central Generation Projects including the pit-head Super Thermal Power Stations in the Central sector. These networks, cutting across the State boundaries, along with the 400 KV inter-State and Inter-Regional Power Lines would form part of the National Grid”.

8.34. It has further been stated in the note:—

“Development of National Power Grid requires not only a strong transmission network connecting the State Power Systems into Regional Grids and Regional Grids into a National Grid, but also adequate load despatch system operation, control and communication facilities. These are being progressively developed. It is expected that by the end of Sixth Five Year Plan, Regional Grids with permanent load despatch facilities at the Regional and State levels would become operational”.

8.35. Asked if Government have formulated any time-bound programme for providing all the requisite facilities for the functioning of a National Grid, Department of Power have stated in a note:—

“There is no time bound programme for providing all facilities for the National Grid because such a grid is, and will continue to

be, an evolutionary process involving more and more integration of the various transmission networks in the country. After Regional Load Despatch Centres start functioning and sufficient experience is gained in operation of the regional grids, a plan for establishing the National Load Despatch Centre would be formulated.

### *Transmission Voltage*

8.36. The Department of Power have informed the Committee that till recently the highest transmission voltage in the country was 220 KV. With a view to effectively meeting the power transmission requirements and strengthening the systems to facilities integrated operation, 400 KV was introduced as the next higher voltage for power transmission in India. The first 400 KV line in the country was commissioned in December, 1977 between Obra and Sultanpur in U.P.

8.37. In this connection it has been stated in a memorandum furnished by a State Government:—

“The greatest mistake in the power sector is the adoption of 400 KV for our National Grid. 500 KV would have been more advantageous, and we should have learnt by the experience of other countries which regretted their choice of 400 KV instead of 500 KV”.

8.38. It has also been suggested by an expert on power that:—

“We should soon establish the already delayed national grid and the voltage for this should be 500 KV. instead of 400 KV. We have already done two or three 400 KV lines and it is worthwhile examining immediately whether we should not construct the remaining EHT lines at 500 KV instead of 400 KV”.

8.39. Asked to state the views of Government on the suggestion for providing 500 KV transmission lines instead of 400 KV for the National Grid, Secretary (Power) stated before the Committee:—

“This is again a matter of opinion. But in 1971 when the decision was taken as to what voltage should be adopted in the country. naturally we wanted to go in something which was more proven. Most of the countries were following at that time 400 KV pattern. This was accepted by us also. Now, if we want to change, then it is not a question of study and planning. It takes longer period than the construction of the line itself.

Secondly, when we adopted 400 KV, the manufacturing industry had gone into collaboration over the last decade for 400 KV equipment. If we want to change this, the whole industry has to change over. The National Grid is a continuous thing. It will go on growing from year to year. We have started studied on a long term basis on higher voltage levels for adoption at a future date but the major portion of the lines are going to be of 400 KV".

### *Transmission Towers*

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8.40. It has been brought to the Committee's notice that transmissions towers from Singrauli to Delhi and other sectors are being constructed for one circuit only. This, an expert has stated, will prove to be a big blunder. Any expansion of circuits in the future will not only be much more expensive due to inflation but also lead to occupation of more agricultural land which could be put to better use. In foreign countries they were having towers for six circuits. In India, the minimum they should provide for is towards which may today have one circuit but which may be capable of taking two circuits".

8.41. Asked to state the factual position and Government's views in the matter, Secretary (Power) stated before the Committee that:—

"The factual position is that when a line is being erected and if expansion under that is in the form of second or third circuit and if it is going to take some years for completion of the work, then, we instal normally, single circuit lines. A double circuit line would need an extra capital of about 20 per cent. Even if we do not put the second circuit for a number of years, initially, some capital is required for investment.———With the money which we have at present, we can start doing a thing on a long-term basis. This may be better. We can invest 20 per cent extra and use it later. But, we are in a position to do that because of financial constraint at present. Otherwise, technically speaking, we can solve the problem."

8.42. Asked if the necessary changes could be introduced subsequently, Secretary (Power)) replied that the same tower could not be modified. It had to be pre-planned in the beginning itself. This type of special construction was costlier than the single circuit.

8.43. Asked if 20 per cent investment made now would not yield better results in future, Secretary (Power) agreed with the view but he stated that at present they were not able to find adequate funds even for the basic minimum necessities.



8.44. The Chairman of the SEA stated:—

“We have a programme of investment of about Rs. 1000 crores on 400 KV lines. For 500 KV transmission lines additional expenditure would be of the order of Rs. 200 crores. Apart from the economics of it which have been explained by the Secretary, there are other technical reasons also. If it is a question of comparing power flow from point to point, even today we are not opposed to a double circuit lines. Where two circuits of lines are required, we are constructing on different alignments so that we are able to feed a large number of sub-stations in a wide area. That is a very big advantage. Otherwise, heavy expenditure would be involved”.

8.45. In order to transmit power to each and every part of the country and to transfer power from surplus areas to deficit States it is necessary to have a national grid with transmission lines cutting across the State and regional boundaries. At present the integration of State power systems into regional power grids is being carried out. By the end of Sixth Five Year Plan, regional grids with permanent load facilities at the regional and State levels would become operational. There is at present no time bound programme for providing all facilities for the National Grid as this is stated to be an evolutionary process. The Committee are unable to appreciate as to why, if regional grids can be fitted within a time-frame, time-bound programme cannot be drawn up for completing the National Grid. The Committee are afraid that the theory of “evolutionary process” adopted by the Department of Power would bring in leisurely attitude in the execution of the National Grid and would delay it further to the detriment of national interest. The Committee would like that just as a programme for establishing the regional grid with by the end of the Sixth Five Year Plan had been formulated, a time bound programme for completing the various stages of the national grid should also be laid down and progress monitored with a view to making the national grid a reality by a target date. (Serial No. 93)

8.46. There are certain parts of India like Andaman and Nicobar and Lakshadweep Islands which being far removed from the mainland, cannot look to the regional grids or the proposed national grid for help in times of power shortage or power breakdown there. The Committee, therefore, feel that these Islands will have to be made self-reliant to meet the power demand even at peak periods on their own. (Serial No. 94)

8.47. To enable them to do so, the CEA should arrange to build up adequate reserve stocks of diesel, coal and spare parts in these islands to keep their power stations running even in the event of temporary and

unavoidable delays in the movement of these inputs by ships. (Serial No. 95)

8.48. The Committee would also like to suggest that the power planning in the case of Andamans and Nicobar Island, Lakshadweep Island and such other islands should be done keeping in mind the imperative need to keep the power capacity always ahead of demand to ensure progressive growth of economy of these islands. (Serial No. 96)

8.49. The Committee feel that criteria to judge the viability and techno-economic feasibility of power projects in these Islands cannot be the same as for the rest of the country for obvious reasons. Apart, from other considerations, national security will be an additional factor which will have to be given due weight while planning and approving new power systems there. (Serial No. 97)

8.50. In order to have a judicious combination of thermal and hydro power which will give the power systems in these islands stability, the CEA should explore the feasibility of exploiting micro and mini hydel potential on irrigation channels and small streams and rivers in the islands. The study which the Committee have recommended earlier in this Report to assess the small hydel potential in the various parts of the country should also be made in Andamans and Nicobar Islands (e.g. on Kalpong River in Andamans), Lakshadweep Islands and other such islands. (Serial No. 98)

8.51. The Committee feel that remote areas such as North Eastern region also require special attention in the matter of build up of adequate reserves of inputs like coal, diesel, spare parts etc. to keep the power stations there working without interruption and it should be ensured that power stations in such areas do not suffer because of shortage of these inputs in the event of sudden and unforeseen transport bottlenecks.

(Serial No. 99)

8.52. It has been opined by a State Electricity Board and a Power expert that the 400 KV transmission lines which are at present being laid for the proposed national grid would not be adequate and these lines should be of 500 KV. It has been admitted by Secretary Power) that the national grid is a continuous thing and will grow on from year to year, and studies have been undertaken on a long term basis on high voltage level for adoption on a future date. The Committee would like the Government to consider the matter from all points of view and take a decision on merits in the larger interest of the efficiency of National Grid system. They expect that the studies into the high voltage level for adoption in the future would be completed expeditiously and the on-going and new programmes of transmission lines would be reviewed in the light of the studies.

(Serial No. 100)

8.53. According to an expert, construction of transmission towers for single circuit as is being done at present, would prove to be a big blunder

as any expansion of circuits in future would not only be much more expensive but also lead to occupation of more agricultural land which could otherwise be put to better use. From the statement of Secretary (Power) it is seen that construction of towers having facilities for two circuits would require an extra expenditure of 20 per cent. The Committee would like the Department of Power to compare the extra cost of 20 per cent now with the estimated expenditure likely to be incurred later on providing extra circuits and see whether it would not be far-sightedness to go in straight-away for towers which should have provision for taking 2 or more circuits, depending on the future needs, but which may at present have one circuit as is required now. (Serial No. 105)

#### F—Load Frequency Controllers.

8.54. It was brought to the notice of the Committee that the States in the Northern region were not agreeable to the installation of Load Frequency Control (LFC) in their Regional Load Despatch Centres (RLDC).

8.55. It has been stated in the minutes of the 48th meeting of North Region Electricity Board (PSEB) held on 5th and 6th Feb., 1979:—

“The members from PSEB (Punjab State Electricity Board) RSEB (Rajasthan State Electricity Board), HPSEB (Himachal Pradesh State Electricity Board) BBMS (Bhakra Beas Management Board) had strongly expressed that in their expressed view it was premature to introduce the LFC, both for regional requirements, on various grounds such as spinning reserve not being available in the system, continuing capacity shortage in the Northern Region etc. and they will have nothing to do with the scheme.”

8.56. Asked to State the views of the Department of Power on the objections of the States in the Northern region, the Department of Power have stated in a note that:—

“The LFC Scheme for the RLDC (Regional Load Despatch Centres) does not comprise any equipment (under the RLDC Project) at generating stations to act on the generators. It comprises only softwares through which the computers at the RLDC convey a signal to the computer terminal at the SLDC (State Load Despatch Centres) through an interface. The equipment at the generating Stations is a part of the States own LFC system. It may be mentioned, *inter-alia*, that the system has been installed at Rajasthan and Uttar Pradesh.”

8.57. It has been further stated in the note:—

“Except for the philosophy of LFC control system to which some of the constituents of NREB had some reservations, there has not been any reluctance for installing the equipment under the RLDC contract at the BLDC and SLDCs and further any such

reservations was only to the philosophy of control. The CEA under whose overall control the scheme is being implemented, however, felt that the LFC feature is essential for the working of a regional grid of the dimension of the Northern Grid."

8.58. LFC feature, it is stated is a part of the Load despatch schemes being implemented in the other regions.

8.59. Asked why the State Electricity Boards of the Northern Region opposed to the LFC and how the Government proposed to make the scheme a success in the face of opposition of these States, Secretary (Power) stated before the Committee:—

"Unfortunately some of the States in the Northern Region are raising this issue although most of the states in the country have agreed. Out of four power regions in the country, three have totally agreed with the view.

We feel that it is something which is a must. National Grid will not be able to work if it is not there. I support CEA's views."

The Chairman, C.E.A. stated:—

"The states of Punjab, Bihar and Rajasthan have certain reservations. Once the control of Bhakra and Dehar Power stations is passed on to the regional grid, they apprehend that they start facing shortage of power. By LFC we are going to control the system power flow. The system operation will be optimised and losses reduced. Punjab and Haryana are hydro states. Once the control is passed on to the Regional Board, the Regional Board will operate hydro stations to suit the system requirement. That is their fear."

8.60. He further stated:—

"In the Southern region, the load frequency has started working. The Eastern and Western regions have agreed fully to LFC. The above states will also fall in line ultimately. Today they are not deficit in power to LFC. Tomorrow they may be. All deficit states have agreed."

8.61. The Committee note that it is proposed to instal load frequency control system in different regions to control the system power flow, optimise the system operation and reduce losses. While this system has already started working in Southern Region, and Eastern and Western regions have agreed to the same, the scheme is being opposed by the states in the Northern region as they apprehend that they will lose control on their

hydro stations. However, the Central Electricity Authority feel that the system is essential for the successful functioning of National grid. As the continued opposition of these Northern States is likely to delay the operation of Regional Grid, the Committee would like the CEA/Deptt. of Power to discuss this matter with the Authorities concerned at the highest level, with a view to allaying their apprehensions and bringing them round to agree to LFC system in the larger interest of efficient working of National Grid. (Serial No. 102)

**G—Action on the Reports of Committees on the problems relating to Power.**

8.62. It has been stated in a memorandum submitted to the Committee that “A large number of Committees have been appointed in the past from time to time on the problems plaguing the power sector. A large number of recommendations have been given by these various Committees. These have not been scientifically and methodically implemented. It is recommended even now that a Task Force should examine these various recommendations and ensure implementation of these recommendations.”

8.63. Asked to state the reaction of Government to the suggestion regarding appointment of a Task Force to examine the recommendations made by various Committees on Power Sector and ensuring implementation of these recommendations, the Deptt. of Power have stated in a note:—

“Recently, a Committee on Power under the Chairmanship of Shri Rajadhyaksha, while reviewing the functions of the power Supply industry had considered the observations and recommendations of the various Committees that had been set up earlier and taken them into account while formulating their views. The Committee have also held discussions with various organisations and associations representing power supply industry. They had also written to eminent power engineers who had retired from Government service for their views. This—the Committee on Power can perhaps be considered as having done the job of the task force that the Estimates Committee has in mind. Government is already taking steps to consider the recommendations of the Committee on Power and initiate follow-up action. In doing this, the Govt. would keep in mind the action that is being taken on the important recommendations of the earlier Committees.”

8.64. A number of Committees have been appointed in the past to examine the problems faced by the power sector and these Committees have made a number of useful recommendations but these recommendations it is stated have not been methodically implemented. Government:

have, however, stated that the Rajadhyaksha Committee on Power have considered the observations and recommendations of the various Committees set up earlier and have taken them into account while formulating their views and Government are taking steps to consider the recommendations of the Committee on Power and initiate follow up action. The Committee hope that the examination of the recommendations of the Rajadhyaksha Committee would be completed expeditiously and follow up action taken without delay. The Committee further hope that the Report of the Rajadhyaksha Committee on Power will not meet the same fate as the Reports of some of the earlier Committees have met.

(Serial No. 103)

### H—Professionalisation of Management in Power Sector

8.65 Most of the generation and distribution of power in the country is done through the State Electricity Boards.

8.66. It has been stated in the Background Papers for Power Ministers Conference (June, 1980):—

“The management of the SEB’s can be professional, efficient and autonomous, only if the top executives such as Chairman and Members are selected on merit by an objective selective process.

In view of the importance of the matter in the interest of efficient and competent management of the SEB’s it is suggested that the Central Government may evolve guidelines for setting up such a selection machinery in which there could be representative of the Central Government as well as senior representatives of the State Government concerned.”

8.67. Asked about the steps being taken by Government to develop a Stable Organisation, requisite functional competence and professional management style in the power sector, Secretary (Power) stated before the Committee:—

“Management is extremely important for any industry and power industry today is one of the largest. . . . We have suggested guidelines on the mechanisation of generation on on-going scheme quickly, the need for commercial approach, the right type of organisational structure, monitoring machinery, finan-

cial management, reorganisation of Boards with proper discipline in generation and transmission, non-technical areas, personnel management, material management, introduction of commercial accounting etc. This is one of the subjects which we have been discussing in detail. The team which has been going from Board to Board has been going into it."

8.67 Secretary (Power) further stated that generally there was over-staffing in State Electricity Boards.

8.69 Regarding the Chairmen and Members of State Electricity Boards, Secretary (Power) stated:—

"Every Committee that has been appointed to go into the affairs of the Boards has recommended that there should be a selection process for the appointment of the Chairman and members of the Board. . . . Centre is prepared to associate itself. We never get a reply from even one State. The selection is very bad in many cases."

8.70 Regarding the selection of Chairmen and Members of State Electricity Boards, the Committee on Power headed by Shri Rajadhyaksha have recommended that:—

1. The guidelines and conventions regarding filling of posts in Central Public Sector companies adopted by the Public Enterprises Selection Board (PESB) should be adopted for filling up top level posts in the CEA, REA's and SEB's.
2. These changes in the selection procedure for the SEBs should be incorporated into the Electricity Act.
3. The tenure of the Chairman and Members of the Board should be at least 3 and preferably 5 years.
4. If a State Government wishes to terminate the appointment of a full time member or Chairman on SEB before he completes his office, the Government should consult the appropriate Selection Committee."

8.71 The need for professionalisation of management in State Electricity Boards is too obvious to require any emphasis. The Central Government, Rajadhyaksha Committee and many other Committees have impressed upon the SEBs the desirability of reorganising the structure and

management of the Boards and, in particular, evolving a sound system of making appointments of Chairman & Members of the Boards. The question of devising a suitable selection machinery for top posts has now also been taken up at the level of State Power Ministers' Conference. The Committee would recommend that the matters regarding professionalisation of top management in the SEBs and the system of top appointments should continue to be pursued by the Central Government with the States with a view to bringing about improvement and efficiency in the Working of the Boards.

(Serial No. 104)

  
(S. B. P. PATTABHI RAMA RAO)  
Chairman,

NEW DELHI;

April 20 1981

Chaitra 30 1903 (Saka)

*Estimates Committee*



## APPENDIX

### Summary of Recommendations/Observations.

Sl. No.	Para No. of the Report	Recommendations/Observations
1	2	3
1	1.8	Government should formulate a National Policy on Power without any further delay giving clearly their long-term projections for the development of power, share of different sources of power generation, viz., hydel, thermal, nuclear etc. as well as the role of Central Government and State Governments in the field of generation and distribution. The Committee further recommend that Government should present a White Paper on Power Policy to Parliament by the end of this year (if possible) to facilitate a national debate on the subject.
2	1.21	The Committee would like to point out that if the target of capacity addition of 20,000 MW during Sixth Plan is to be achieved, Government would have to take more effective measures than taken hitherto in order to ensure timely commissioning of power projects from year to year so as no excuse is allowed to delay the project according to schedule.
3	1.27	The Committee are of the view that if the new strategy of long-term power perspective has to succeed, it is absolutely necessary to tie up the 15 year power plan not only with 15 year investment planning but also with long-term planning and development of all other inputs like Coal, Steel, Cement, equipment and infrastructure like transport capacity so that funds and materials required for power projects become available at the right time and the projects are commissioned on Schedule. The Committee would like the Ministry of Energy to take up these matters with the Planning Commission and other concerned authorities and

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draw up a comprehensive plan covering all aspects well in time in the Central Sector and some more projects have been identified for execution by them.

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1.39 The Committee agree with the view that for optimum utilisation of resources and minimising cost of power and for a balanced development of the country as a whole, the power planning should be done on a regional rather than on state-wise basis.

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1.40 The Committee do not agree with the view that the entire generation and transmission should be taken over by Centre. The Committee, however, feel that the Central share in power generation should increase substantially and this aim should be achieved not by acquiring any existing power stations run by the States, but by progressively taking up more and more of new projects in central sector. Power projects which are beyond the resources of States or are likely to become subjects of inter-State disputes, particularly hydro projects, should be taken up in Central Sector straight-away without any loss of time.

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1.41 The Committee agree that in order to derive maximum benefits from increasing central share in generation and regional planning and operation, it will be absolutely necessary for the centre to have under its ownership and control all inter-State and inter-regional high tension transmission lines together with their substations.

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1.42 The question of transfer of "Power" from Concurrent List to Union List may be examined and if in the larger interest, it is considered necessary, Government should not hesitate to go in for a constitutional change. Then, the nature and structure of the organisation at the Centre for handling efficiently and economically the gigantic task of erecting, operating and maintaining power stations all over the country would also have

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to be critically examined keeping in view the experience in this field.

- 8 1.57 The Committee feel that captive power plants in private sector should be allowed to be set up by Government liberally provided the private sector can raise resources of their own without approaching the public financial institutions.
- 9 1.58 The Committee also feel that as an extension of the concept of captive power plant, Government may also view sympathetically any proposal for setting up power plants on cooperative basis which might serve cluster of industries situated in a compact area. Here too, the entrepreneurs of the proposal should be able to raise funds of their own.
- 10 1.59 The Committee would not like the control on transmission and distribution of power generated from captive or cooperative power plants to be handed over to the private sector except to the extent to which it is necessary for them to supply power to the units for which the power plants are set up. Any surplus power generated by such plants should be fed into the national or regional grid.
- 11 1.60 The Committee would suggest that a White paper seeing down the Government policy in this regard in clear terms should be prepared and placed before Parliament at an early date.
- 12 2.13 Now when the detailed methodology for maximising power generation has been developed, all that is required to be done is a vigorous and sustained follow-up action to put the methodology into practice. The Committee would like to urge with all the emphasis at their command that the administrative and technical agencies all over India should be fully geared so as to keep each power station under observation with a view to preventing unscheduled outages and to mobilise all resources to bring each power station up to the ideal level of performance.

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| 13 | 2.14 | <p>The Committee note that when Plant Load Factor (PLF) in 1979-80 in some of the States was as low as 24 per cent to 38 per cent and all-India average was 44.7 per cent, But Maharashtra and Madhya Pradesh, to take two examples, were able to achieve a capacity utilisation of 55.6 per cent and 52.6 per cent respectively, by employing modern methods of capital and preventive maintenance of equipment and by organising practical training of high standard for their operators and engineers. From the example of these two States the Committee cannot but conclude that the problem of low utilisation of capacity is not uncontrollable. The Committee have no doubt that if other States can be persuaded to take similar steps and it should not be difficult for the Centre to do so, the plant load factor can show substantial improvement all over the country. The Committee will like that the Centre should keep a watch over this and see that the utilisation aspect is not allowed to slip.</p> |
| 14 | 2.15 | <p>The Ministry have claimed that the plant load factor of thermal power stations in India (which was 45.94 per cent in 1976) is comparable with that in many other countries (in the same Year) like USA (44.04 per cent), France (44.19 per cent), USSR (55.57 per cent) Japan (49.99 per cent) and UK (40.22 per cent). The Committee would like to point out that such a comparison would be erroneous. As pointed out by Rajadhyaksha Committee on Power, while in other countries, the plant load factor is low because of their policy to keep considerable reserve capacity to meet sharp peaks and unexpected breakdowns, which though available remain unutilised due to lack of load for most of the time, in India the low plant load factor is not due primarily to lack of demand but low plant availability as a result of which the demands for power cannot be met. The Committee would, therefore, like to caution the Government against any sense of complacency on this account.</p>                  |

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15	2.16	A suggestion has been made to the Committee that planning in power should be done on the basis of 50 per cent capacity utilisation so as to have adequate spare capacity in reserve to provide for scheduled outages and unforeseen breakdowns or demands. The Committee also take note of the facts that power is a capital intensive industry and demand for power in the country is increasing rapidly and due to constraint of resources it has not been possible to provide adequate funds even for the capacity on the basis of 60 per cent utilisation factor. The Committee, therefore, feel that while planning on the basis of 50 per cent utilisation may be an ideal in the long run, it will perhaps not be a practicable proposition in the present situation in the country.
16	2.21	Since efficiency in power sector is as much that concern of the Centre as that of the States, the Central Electricity Authority would do well to find out the difficulties of the State Electricity Boards in adopting the modern maintenance procedures in their thermal Stations recommended by the Kulkarni Committee and render them every possible help to overcome the difficulties. The Committee would like to be informed of the progress made on this point, State-wise.
17	2.32	The Committee would also like the Central Electricity Authority to impress upon the State Electricity Boards that while adhering to time schedules for preventive maintenance and overhaul, the quality and standard of maintenance should not be ignored.
18	2.33	The Committee would like to suggest that the maintenance procedures and practices adopted by the Maharashtra and Madhya Pradesh State Electricity Boards which have been found to have yielded good results should be widely publicised and circulated by CEA for the benefit of State Electricity Boards in other States.
19	2.34	A Roving Team of Central Electricity Authority is stated to have so far visited 20 Power Stations and brought to the notice of the State authorities deficien-

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cies in the working of the plant and equipment and the modern maintenance procedures followed elsewhere. The Committee would like that a time bound programme should be prepared by the Central Electricity Authority for the visits of this Team to all the power stations whose performance is below the all India level. The Central Electricity Authority should not only keep a watch on the actual implementation of the suggestions made by the Roving Team but also help the SEBs where necessary, in their implementation.

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2.35

The Committee feel that CEA should take initiative to inspire State Electricity Boards to hold meetings of their respective power engineers on a regular basis to enable them to exchange information and experience about the maintenance problems in power stations. Such meetings should also be held by CEA at national level with adequate preparations and results of deliberations circulated to all the State Electricity Boards.

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2.36

The Committee would like the CEA to ensure, through a system of regular monitoring and liaison with the State Electricity Boards, that maintenance and overhaul schedules, on which depend the health of a plant and its availability for maximum generation, are not disregarded in their anxiety to temporarily tide over a difficult situation.

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It will be immensely helpful to power stations and State Electricity Boards if detailed data about the age, condition, weak points of each power unit, defects developed by it in the past and repairs carried out from time to time, and other aspects requiring special attention is collected and analysed in a scientific manner and kept handy for reference purposes not only for drawing up future maintenance programmes but also for carrying out repairs in times of breakdowns. The Committee would like the CEA to draw up a detailed scheme for setting up data banks on these lines in the State Electricity Boards and urge the Boards to give it a concrete shape.

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| 23 | 2:62 | <p>The Committee take note of the result of study of relative economics of transmission of coal vs. transmission of electrical energy which shows that transmission of power would be more economical over a distance of 500 Km and 1000 km. Besides being cost effective, pithead location of power station would also lead to greater efficiency in power generation since the problem of low availability of coal because of transport difficulties will not be there. The Committee therefore, welcome the Government decision to set up Super Thermal Power Stations (STPS) at pithead as a step in the right direction.</p>  |
| 24 | 2:63 | <p>The Committee also welcome the decision of the Government to set up these power Stations in the Central Sector to meet the requirements of the concerned regions and not merely of the States in which they are located. This is a positive step in the right direction of regional planning for power as recommended by the Rajadhayaksha Committee and also by this Committee in earlier Chapter. These power stations being the property of the nation as a whole the Committee hope that distribution of power from these Power Stations would be done in the most equitable manner so as to ensure that the really needy States in each region receive optimum benefits from the Super Thermal Station in that region.</p> |
| 25 | 2:64 | <p>The Committee are concerned at the delay that has already taken place in placement of orders for major equipment for Neyveli Second Power Station resulting in postponing the date of commissioning of its three units by more than a year in each case. As the decision about placement of orders for the equipment has not even now been taken there is likelihood of further delay in the commissioning of projects. The Committee recommend that decision in the matter should be taken without any further delay and all possible efforts made to avoid any further delay in the erection and commissioning of the projects at Neyveli Second Power Station.</p>   |

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The Committee are glad to note that the work on the 4 Super Thermal Power Stations at Singrauli, Korba, Farakka and Ramagundam is progressing according to schedule and in the case of Korba in certain fields the work is progressing ahead of schedule. The Committee hope that all the units in the Super Thermal Power Stations will be commissioned by target dates and the Centre would be able to give a lead to the State Electricity Boards in this regard.

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The Committee note that this has been made possible by the introduction of an integrated project management and control system aimed at integrating the efforts of all functions to meet the ambitious time schedules, maintain quality and control project costs. The Committee would expect the CEA to persuade the State Electricity Boards to adopt the integrated project management and control system of the NTPC in their projects.

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2.67

The Committee however, feel that the opinions expressed by experts who are quite eminent in the field merita more dispassionate consideration. The Committee are therefore, of the opinion that it would be prudent to consider the question of introduction of 500 MW sets in the power system in greater depths in the light of the level of technical development achieved here and the experience of foreign countries identically placed before taking a final decision.

Delay in the timely availability of spares of requisite quality has been one of the reasons for the poor performance of Thermal Power Stations in the country.

A major reason for non-availability of spares could have been that the major indigenous manufacturers in their eagerness to meet the target dates for the supply of equipment of Power Stations have not been giving adequate attention to the manufacture of spares and their quality. The State Electricity Boards have also not been placing orders of spares with the



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		manufacturers sufficiently in advance. For the solution of the problem of spares both the manufacturers as well as the State Electricity Boards will have to make a cooperative endeavour, the former by sparing adequate capacity for the manufacture of spares and the later by placing orders in time.
29	2.79	The Committee, recommend that the indigenous manufacturers should give due priority to the manufacture of spares and should have separate department under a high ranking officer to supervise the manufacture and supply of spares.
30	2.80	The State Electricity Boards should also assess their requirements of spares well in time and place orders with indigenous manufacturers sufficiently in advance so as to give adequate notice to the manufacturers to meet their requirements without delay. Now that the catalogues of different spares have been prepared by the manufacturers except in the case of 200 MW which are also expected to be prepared shortly along with the time required for delivery, the State Electricity Boards would be themselves to blame if they do not place orders for spares with the manufacturers in time.
31	2.81	The Committee further recommend that Central Electricity Authority should monitor the placing of orders for spares by the State Electricity Boards and the supply of spares by manufacturers and if at any stage delay on the part of the manufacturers in the supply of spares is apprehended, the matter should be taken up by CEA with the highest authority in order to ensure timely supply of the spares.
32	2.82	The Committee recommend that the other State Electricity Boards may also be advised to emulate the example of Maharashtra State Electricity Board in the matter and try to manufacture maximum number of

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		spares either in their work shop or make arrangements to procure the same from the reliable local suppliers.
33	2.83	To enable the SEBs to have spares manufactured locally it is necessary that manufacturers viz. Bharat Heavy Electricals Ltd., and Instrumentation Limited Kota should make the drawings and specifications of spares available to the State Electricity Boards. The Committee would expect the CEA to assist the SEBs in getting drawings and specifications of such spares from the manufacturers as early as possible.
34	2.85	The Committee also feel that each State Electricity Board who have a number of thermal power stations under their control should be encouraged. advised and assisted to start a "Spares bank" where all the spares which are frequently required can be stored for ready availability.
35	2.85	The Committee have no doubt that with progressive decentralisation and better coordination and with the CEA playing the role of a mentor as well as a monitor, the position of spare parts availability would ease and improve to the satisfaction of SEBs.
36	2.112	The Committee urge that the problem of extraneous matters in coal and oversize coal should be tackled on a priority basis by installing coal handling plants in all open cast mines as are linked with power stations, according to a time-bound programme. Till coal handling plants are installed in such mines, coal authorities should ensure by engaging extra labour that extraneous matters are manually removed from coal to the extent possible before it is despatched to Thermal Power Stations. In the future, whenever a mine is taken up for development for the purpose of supplying coal to thermal stations, it should be ensured that coal handling plant is installed there before it is commissioned.
37	2.113	The Committee recommend that other State Electricity Boards should also be advised to follow suit and depute their representatives to exercise check

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over the quality of coal at the loading stage. The Committee hope that the representatives of the State Electricity Boards deputed at coal mines will be given full cooperation by coal authorities to enable them to keep an effective watch over the quality of coal intended for power stations.

38      2.115      The Committee regret to observe that because of lack of coordination between coal producers and Railways, power generation in the country is suffering with the consequent loss to the entire economy. Now, that the Cabinet Committee on infrastructure is supervising the problem of movement of coal, the Committee feel that a permanent solution to this problem should be found out at the earliest so that Thermal Power Stations in the country do not suffer for want of coal.

39      2.116      The Committee are glad that there has been considerable improvement in supply of coal to Thermal Power Stations during the last four months and in February, 1981, coal movement was stepped up to 3,970 wagons a day as against a requirement of 4,100 wagons. The Committee hope that Railways will continue their endeavour to improve loading of wagons further and will be able to reach the target of 4,100 wagons per day for the thermal power stations at the earliest.

40      2.117      The Committee urge that the Deptt. of Coal should formulate a detailed plan with yearly targets to step up coal production and take concerted measures from now on to increase the coal output so as to meet in full the requirements of the Thermal Power Stations in the Five Year Plans. It should be ensured that the production of coal every year matches with the requirements and that shortage of coal should not prove to be a constraint in the achievement of power targets in the Five Year Plans.

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| 41 | 2.118 | The Committee feel that as adequate capacity in the Railways is an essential pre-requisit for the efficient working of Power sector as well as of other key sectors it will be disastrous if the freight capacity of Railways does not keep pace with the demand. The Committee feel that this is an aspect which should be taken serious note of now, rather than later, and not only by Railways but also Deptts. of Power and Coal and reviewed jointly by them in consultation with the Planning Commission to make sure that the Railways are allotted adequate funds to develop transportation capacity to the desired level and the development programmes keep pace with the growing requirements. |
| 42 | 2.119 | The Committee find that Railways have not so far been informed of the quantity of coal that will be required to be transported by them for thermal power stations during the next 15 years. This should be done at the earliest.   |
| 43 | 2.120 | The Committee would suggest that feasibility of organising alternate systems of coal transport (including coastal shipping) should be explored with a long term perspective in view and an integrated long-term approach evolved to deal with the problem before it becomes too acute for the Railways to handle it alone.   |
| 44 | 2.130 | The Committee feel that the reasons for poor performance of Badarpur Power Station should be clearly identified and action taken forthwith to improve the quality of power supply and capacity utilisation of the station.   |
| 45 | 2.131 | It is a short sighted approaches to delay or postpone overhauling or periodical maintenance just on considerations of expediency in disregard of long term consequent. The Committee expect that in future the annual overhauling/maintenance will not be delayed or postponed beyond a safe limit.  |

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46	2.132 & 2.133	The Committee recommend that the authorities should arrange to have necessary modifications made in his power plant at the earliest so as to make it operationally efficient and reliable. The Committee also recommend that in the next 210 MW unit which is under erection, steps should be taken right now to ensure that there are no design deficiencies when it is put into commercial operation.
47	2.134	The Centre is noised to play a big role in power sector in the years to come. Badarpur Power Station is perhaps the first thermal station being run and managed by the central sector. The Committee feel that the central agency charged with the responsibility of running Badarpur Power Station should spare no effort to operate this power station as a model of efficiency, in order to inspire confidence about its capacity to manage bigger units that are coming up elsewhere corrected the imbalance at the planning up stage.
48	3.20	In view of the need to conserve coal for future generations and in view of the fact that hydro-power is a perennial, regenerative pollution-free and the cheapest source of energy that can be transmitted to any part of India through regional and national grids, the Committee cannot over-emphasize the desirability of giving hydro-power development the "high priority" in actual practice. The Committee would expect that at least hereafter the Central Electricity Authority should ensure that the development of new power capacity conforms to the policy of "high priority" being given to hydro-power.
49	3.21	The Committee agree with the view expressed by a power expert that long gestation factor of hydro-power projects in quick succession and so planning a long term strategy of taking up a number of hydro-power projects in quick succession and so planning their execution that they become available for service one after the other according to a well-thought out time frame.

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50	3.22	<p>The Committee regret that although large amount of hydro power capacity has been sanctioned and cleared by the Central Electricity Authority, the apex body in techno-economic field, it has been held up for want of approval by the Planning Commission. Seeing the tardy development of hydro-power in the past, the Committee would recommend that fully investigated and techno-economically cleared hydro-projects should be given highest priority at all levels, including the Planning Commission. The Committee would like the CEA to pursue the matter with the Planning Commission and apprise the Committee of the outcome.</p>
51	3.23	<p>The Committee attach great importance to the exploitation of untapped hydro-power potential in North-eastern region. They would urge that, in the interest of the economic development of the North-eastern region, no effort should be spared in mobilising all available technical and other inputs with a view to overcome all constraints in the way of development of hydro-potential in that region expeditiously.</p>
52	3.24	<p>The Committee would like the Government to take stock of the situation and if import of foreign technology is unavoidable in the national interest, it may be imported without delay, but in selecting foreign technology, it should be ensured that the latest and the most dependable technology is imported to put an end to the problems in this field at the earliest.</p>
53	3.25	<p>The Committee would like Government to ensure that execution of the nine projects under implementation is regularly monitored at the highest level with a view to avoiding any slippage and completing them in accordance with a time-bound programme. The Committee would like to be apprised of the programme of their execution. The Committee would also like that in order to instil a sense of</p>

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urgency to the investigation of new projects decided to be taken up in Central sector, a definite programme should be formulated for carrying out investigations of the projects and progress watched.

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3.25

The Committee feel that national interest demands a more drastic approach to the problem than adopted in the past. Either the legislative measures already existing should be given strong enough teeth to deal with the river water disputes within a prescribed time limit through arbitration or otherwise, without any right to any party to prolong the dispute through the device of appeals or reviews to higher authorities; or through constitutional amendment, if necessary, water may be declared as a national resource, to be exploited by the Centre with due consideration being shown to the State or States in which the resource lies. The Committee would urge that the matter should be considered at the highest level without delay with a view to finding a speedy and abiding solution to the chronic problem.

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3.26

The Committee would also recommend that as a stop gap arrangement, to be arrived at in consultation with the State Governments, a power project which is held up because of inter-state dispute, should be taken up by the Centre without delay subject to the condition that the power and water from such project would be shared among the disputing States according to the decision that may ultimately be taken by the tribunal or arbitrator that may be appointed in the matter. This approach would atleast allow the intervening period to be utilised towards the execution of the project and translating it into a reality by the time the dispute is resolved.

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3.45

The Committee feel that in view of the fact that mini hydel projects have a short gestation period, save on transmission and distribution networks, major civil works, and transportation of fuel and can meet the power needs of remote and rural

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		<p>areas in the country situated away from regular grid, a systematic and detailed study of small hydro potential available on canal falls, irrigation outlets and small hill streams and rivers should be undertaken expeditiously and a comprehensive plan to exploit small hydro potential should be drawn up for implementation.</p>
57	3.46	<p>The Committee feel that the problems of setting up mini and micro hydel projects, which can prove to be very useful to meet the local needs of remote and rural areas, should be examined by the Central Electricity authority in collaboration with manufacturers of power equipment in public and private sectors, with a view to standardising the equipment for mini projects and encouraging their manufacture so as to make them more economical.</p>
58	3.47	<p>The Central Government should impress upon the State Governments concerned the usefulness of mini and micro hydel projects and organise technical and consultancy services to help the States take up construction of small hydel projects at the most suitable sites.</p>
59	4.17	<p>The Committee hope that in the 15 years power Plan being formulated by the Central Electricity Authority the need to step up the role of nuclear power stations will be given due attention.</p>
60	4.18	<p>The Committee would urge that every possible assistance should be provided to our scientists and indigenous industries to fill the gaps in technology and industrial capability and capacity so as to enable the country to embark upon a programme for nuclear power development on a larger scale and at faster pace than in the past.</p>
61	4.19	<p>The Committee would suggest that a joint survey of the nuclear power potential, technical manpower and industrial capacity in this field should be undertaken by the Government to have a sound base to formulate realistic programmes for setting up nuclear power stations in coming years.</p>



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62	4.20	<p>There is great weight in the suggestion made by a power expert that nuclear power stations should be set up at places which are far away from coal stocks and hydel sources. The Committee are glad to note that Government have been following this criterion in the selection of sites for such stations in the past. The Committee hope that the nuclear power stations to be set up hereafter will be located at the most suitable sites and will be selected on merits in the light of the aforesaid criterion.</p>
63	4.21	<p>The Committee have taken note of the recommendation of the Committee on Power (Rajadhyaksha Committee) that there should be an independent body outside the Department of Atomic Energy to lay down and monitor observation of minimum standards for siting, design, construction, operation, maintenance and safety of nuclear power plants, and the reply of the Department of Atomic Energy that the research and development activities on the one hand and the construction and operation of the power projects and plants on the other are only complementary to one another in the field of nuclear power generation and cannot be mutually exclusive. The Committee would like that this aspect should be dispassionately examined by the Government in the larger interest of future nuclear power development in the country.</p>
64	5.15	<p>The Committee welcome the decision of Government to set up a Commission for Additional Sources of Energy for organising a well-coordinated and integrated research and development programme for harnessing alternate sources of energy like solar, wind, and bio-mass. The Committee hope that the institutional mechanism now set up by the Government will identify the energy potential from all types of renewable sources, including geo-thermal tidal waves, ocean thermal energy and initiate major and sustained efforts for rapid development of these renewable sources of energy.</p>

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65	6.19	The Committee recommend that the Central team should prepare a time-bound programme for rectifying the manufacturing defects and design deficiencies in all the indigenous sets of not only of 200/210 MW capacity but also of 110/120 MW capacity, on which renovation work was taken up but has not yet been completed.
66	6.20	The Committee take note of the measures taken by BHEL for monitoring the working of power stations, analysing forced outages and other problems and holding consultation with SEBs and CEA etc. in order to draw up and implement co-ordinated plans for stabilising the indigenous sets. The Committee welcome these measures and hope that CEA will so arrange that the SEBs draw the maximum benefit from these measures in the interest of improving performance of their indigenous sets.
67	6.21	The Committee also recommend that while entering into foreign collaboration agreement the indigenous manufacturers viz. BHEL, ILK etc. should make sure that the design of the equipment for which the agreement is being made suits Indian conditions.
68	6.22	The Committee suggest that the system of consultative machinery should be introduced at an early date in the larger interest of producing quality equipment in the country.
69	6.23	The Committee hope that the Model Contract will be finalised at an early date and State Electricity Board's advised to execute a formal contract on the standard lines for each transaction and enforce it to ensure timely supply of equipment of guaranteed quality and design.
70	6.24	The Committee would, suggest that Central Electricity Authority should take stock of the expertise and facilities available in the various State Elec-

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		<p>tricity Boards and evolve a joint mechanism in consultation with the Boards for conducting quality inspection during manufacture and erection of power equipment. If such a mechanism is not evolved, the inspection by State Electricity Boards may continue to be unsatisfactory with consequent effect on generation efficiency.</p>
71	6.25	<p>The Committee feel that another unit to be set up in public sector would not only bring about improvement in quality through competition but would also accelerate the pace of production to meet the expanding needs of power sector. The Committee recommend that this aspect may be examined critically and dispassionately.</p>
72	6.42	<p>The Committee would suggest that a critical review of the actual production vis-a-vis installed capacity in BHEL should be undertaken immediately by the Department of Power in consultation with BHEL and other connected organisations to determine whether, in the light of past experience, BHEL can be relied upon to deliver the equipment on Schedule to keep pace with the plan. It would, in the Committee's opinion be better to err on the right side and provide for slightly higher manufacturing capacity in the country than the actual need and it would be preferable to set up another unit in public sector. In this connection, the Committee would like to draw attention to their recommendation on the subject earlier in this chapter.</p>
73	6.43	<p>BHEL is stated to be deficient in technology for lignite fire boilers and bulb turbines for hydro projects. It is also stated to be short of capacity for critical piping and pressure parts. The Committee would recommend that the areas in which BHEL lacks technology or capacity should receive urgent attention of the Government.</p>
74	6.44	<p>The Rajadhyaksha Committee have pointed out that a problem which has frequently occurred is the bunching of orders when manufacturers are asked to</p>

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supply equipment for a number of projects at the same time. This should not be a problem difficult of solution if a proper planning is made by the CEA, Central Public Sector Undertakings in the field of power and State Electricity Boards. The Committee would expect the Ministry to impress upon all these agencies the need for a proper planning to avoid bunching of orders.

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The Committee would like the Department of Power and CEA to look into this genuine difficulty of BHEL and evolve an arrangement which will enable BHEL to receive payment for the equipment supplied to SEBs and other agencies without delay.

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7.26

The Committee would like the Department of Power not to confuse the role of the CEA in this regard and arrogate to themselves a function which the Electricity (Supply) Act, 1948 has clearly assigned to CEA. One of the most important functions of CEA, under Section 3 of the Act, is to "develop a sound, adequate and uniform national power policy" and it should be allowed to perform this function without any obstacle. In this task the involvement of Planning Commission, Deptt. of Power and States and other organisations is, of course, essential and should be brought about.

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7.27

The Committee are of the view that the Ministry of Energy have no authority to declare a statutory body like CEA, as an "Attached Office *under* the Department of Power. The Committee would like that the opinion of the Ministry of Law be taken in the matter, if necessary, and the CEA given its rightful status which is essential if it has to discharge the onerous responsibilities assigned to it under the Act.

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7.28

The Committee feel that unattractive pay scales and allowances are partly the result of declaring CEA as an "Attached Office" of the Government of India and for this the Department of Power are themselves

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to blame. Now when this deficiency has been forcefully highlighted by SEBs and Rajadhyaksha Committee and admitted by Department of Power, the Committee expect that the Department will look into this matter seriously and immediately and take measures necessary to attract and induct the best available talent in the CEA so that the CEA becomes the repository of experts to whom State Electricity Boards can look for guidance.

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7.29

The Committee are unhappy at the shifting of blame for delays on each other. The Committee would like CEA not only to lay down in clear terms guidelines for preparation of project reports which they appear to have done in the case of thermal projects but not hydel projects, but also take initiative to "educate" the SEBs on the manner of preparing comprehensive project reports giving complete data to avoid any delay at the techno-economic approval stage. The Committee strongly feel that CEA also have a responsibility to clear all projects referred to them within a time schedule. No project should as far as possible, remain pending for more than 2 years. All objections and the additional information required with reference to any project should be communicated to the States concerned in one lot and not piece-meal. Where any data in a project report is found wanting the CEA should sit down with the representatives of the SEBs and help them fill the gaps with a view to according techno-economic approval to the project without further delay. All those projects which are at present pending with the CEA for over two years should be cleared within six months and in any case before one year. The Committee would like to be apprised of the progress in the clearance of the pending project together with the reasons for delay in the case of pending project within 6 months.

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80	7.44	<p>The sanctioned strength of the Central Electricity Authority is a Chairman and 6 Members but at present the Chairman and 4 Members are in position and the posts of Member (Thermal) and Member (Planning) have been lying vacant for nearly a year at a time when thermal generation and Power planning are at a critical stage. It is difficult to accept Secretary (Power)'s view that CEA's work has not suffered on this account. The principal reason why CEA has not been able to draw suitable candidates for these posts is that the salary and conditions of service are not sufficiently attractive. The Committee are unable to appreciate why this deficiency was not removed when it was already known to the Department of Power. The Committee cannot but hold Department of Power responsible for lack of planning and casual attitude for this State of affairs and would urge them to take urgent steps to fill the vacancies without delay.</p>
81	7.45	<p>The Committee take note of the suggestions made by Rajadhyaksha Committee to re-structure and strengthen the CEA by creation of certain new posts and re-organise the system of work and control in the CEA. They would like the Department of Power to take final decision in the matter expeditiously in the larger interest of efficient working of power sector.</p>
82	7.46	<p>The Committee would expect the staff Inspection Unit of the Ministry of Finance, which is making a study into the structure and staff strength of CEA, to look into the matter and make recommendations for a scientific allocation of work among various wings with a view to avoiding duplication of work.</p>
83	7.47	<p>One of the statutory responsibilities of CEA is to assist in the timely completion of power schemes. It is seen that out of 51 thermal schemes sanctioned during the last five years, only one scheme was completed in time; and out of 65 hydro schemes, only 2 were executed on schedule. From this the Committee are constrained to conclude that</p>

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CEA has miserably failed to discharge this important statutory responsibility.

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8.10

The Committee feel that a person employed to operate and maintain the power stations or transmission and distribution systems should not only be suitably qualified but also adequately trained before he is put on the job. For this purpose it should be necessary that when a power station is to be taken up for erection the engineers and other technical staff required for erection, operation and maintenance should be recruited well in advance, and given practical training both with the manufacturers of the equipment and in power stations so that technically competent persons of the required disciplines are available to take up responsibility and handle the work of erection, operation and maintenance, as the case may be, at the appropriate time.

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8.11

The Committee would suggest that the Power Engineers Training Society should take stock of the training needs of all kinds of the entire power sector in the country *vis-a-vis* training facilities already available and not only augment the training facilities to meet the growing requirements in full in accordance with a comprehensive plan to be drawn up in consultation with the State Electricity Boards but also help the States in upgrading the existing training facilities to high standard consistent with the requirements. In doing so, the Committee would expect that duplication of facilities will be avoided and requirements of each region will be taken care of. The Committee would like the CEA to liaison between the Society and the Boards to bring about coordinated development and optimum utilisation of training facilities.

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8.12

In the Committee's opinion, training should not be a one-time operation. After a thorough training in the beginning, refresher courses and courses in new technology, well before its introduction, should be held for serving engineers and technicians to keep their efficiency at optimum level.

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87.	8.13	The Central Electricity Authority should ensure that training requirement of all those Electricity Boards which do not have well-established training facilities of their own are met by the Institutes run by the Power Engineers Society or the neighbouring SEBs having such facilities till the time they set up their own independent training Institutes.
88	8.14	The Estimates Committee expect that the Government would examine the recommendations made by the Rajadhyaksha Committee on Power regarding training of Engineers & operators expeditiously and take an early decision thereon. They would like to be apprised of the Government decisions in this regard and the follow-up action taken in pursuance thereof.
89	8.18	Power system is no longer the exclusive concern of a State. Regional planning and inter-dependence have added a new dimension and before long the power system, no matter where it is located, will assume national proportions. In view of these developments, the Committee feel that the creation of an All-India pool of senior engineers of the level of Superintending Engineers and above, through the establishment of an All-India Service of Power Engineers or otherwise, will be necessary to provide for mobility of power experts and handle the power problems across the State frontiers.
90	8.26	It has been brought to the notice of the Committee that while in some of the States power cuts are imposed after consulting major consumers, in some other States the cuts are unplanned, arbitrary and abrupt. The Committee feel that while in certain situations such as sudden breakdowns, unplanned power cuts may not be unavoidable altogether, as far as possible, the power cuts should be planned and announced in advance. The Committee would expect the CEA to impress upon the State Electricity Boards the need to plan and notify power cuts in advance to enable the industries, agriculturists and



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		householders to regulate their operations accordingly and thus minimise the loss.
91	8.27	As laid down in the Electricity (Supply) Act, there is to be a consultative machinery of consumers in every State Electricity Board. These bodies, it is stated by Secretary (Power), are generally not functioning well. If these bodies can be activated, they can play a very useful role in the matter of planning of power cuts and laying down general guidelines for the guidance of SEB's and thus protect Consumers' interests. The Committee would like CEA to take up this matter with SEBs and persuade them to activate these bodies in their as well as consumers' interests.
92	8.31	The Committee, therefore, feel that CEA would do well to bring it home to State Electricity Boards that the cost of production is controllable and can be brought down to some extent if certain capital and running costs are taken proper care of.
93	8.45	The Committee would like that just a programme for establishing the regional grid by the end of the Sixth Five Year Plan had been formulated, a time bound programme for completing the various stages of the national grid should also be laid down and progress monitored with a view to making the national grid a reality by a target date.
94	8.46	There are certain parts of India like Andamans and Nicobar and Lakshadweep Islands which being far removed from the mainland, cannot look to the regional grids or the proposed national grid for help in times of power shortage or power breakdown there. The Committee, therefore, feel that these Islands will have to be made self-reliant to meet the power demand even at peak periods on their own.
95	8.47	To enable them to do so, the CEA should arrange to build up adequate reserve stocks of diesel, coal and spare parts in these islands to keep their power stations running even in the event of temporary and

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		unavoidable delays in the movement of these inputs by ships.
96	8.48	The Committee would also like to suggest that the power planning in the case of Andamans and Nicobar Island, Lakshadweep Island and such other islands should be done keeping in mind the imperative need to keep the power capacity always ahead of demand to ensure progressive growth of economy of these islands.
97	8.49	The Committee feel that criteria to judge the viability and techno-economic feasibility of power projects in these Islands cannot be the same as for the rest of the country for obvious reasons. Apart, from other considerations, national security will be an additional factor which will have to be given due weight while planning and approving new power systems there.
98	8.50	In order to have a judicious combination of thermal and hydro power which will give the power systems in these islands stability, the CEA should explore the feasibility of exploiting micro and mini hydel potential on irrigation channels and small streams and rivers in the islands. The study which the Committee have recommended earlier in this Report to assess the small hydel potential in the various parts of the country should also be made in Andamans and Nicobar Island (e.g. on Kalpong River in Andamans), Lakshadweep Islands and other such islands.
99	8.51	The Committee feel that the remote areas such as North Eastern region also require special attention in the matter of build up of adequate reserves of inputs like coal, diesel, spare parts etc. to keep the poor states there working without interruption and it should be ensured that poor states in such areas do not suffer because of shortage of these inputs in the event of sudden and unforeseen transport bottlenecks.

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100	8.52	The Committee would like the Government to consider the matter from all points of view and take a decision on merits in the larger interest of the efficiency of National Grid system. They expect that the studies into the high voltage level for adoption in the future would be completed expeditiously and the on-going and new programmes of transmission lines would be reviewed in the light of the studies.
101	8.53	The Committee would like the Department of Power to compare the extra cost of 20 per cent now with the estimated expenditure likely to be incurred later on providing extra circuits and see whether it would not be far-sightedness to go in straight-away for towers which should have provision for taking 2 or more circuits, depending on the future needs, but which may at present have one circuit as is required now.
102	8.61	As the continued opposition of the Northern States is likely to delay the operation of Regional Grid, the Committee would like the CEA/Deptt. of Power to discuss this matter with the Authorities concerned at the highest level, with a view to allaying their apprehensions and bringing them round to agree to LFC system in the larger interest of efficient working of National Grid.
103	8.64	The Committee hope that the examination of the recommendations of the Rajadhyaksha Committee would be completed expeditiously and follow up action taken without delay. The Committee further hope that the Report of the Rajadhyaksha Committee on Power will not meet the same fate as the Reports of some of the earlier Committees have met.
104	8.71	The Committee would recommend that the matters regarding professionalisation of top management in the SEB's and the system of top appointment with the States with a view to bringing about improvement and efficiency in the Working of the Boards.