

**ESTIMATES COMMITTEE**  
**(1972-73)**

(FIFTH LOK SABHA)  
**THIRTY-NINTH REPORT**  
MINISTRY OF IRRIGATION AND POWER—"POWER"



सत्यमेव जयते

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

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## INTRODUCTION

I, the Chairman, Estimates Committee having been authorised by the Committee to submit the Report on their behalf, present this Thirty-Ninth Report on the Ministry of Irrigation and Power—Power.

2. The Committee took evidence of the representatives of the Ministries of Irrigation and Power, Industrial Development, and Steel & Mines, Planning Commission and Central Water and Power Commission at their sittings held on the 24th, 25th, 29th, 30th, 31st January, 1973 and the 3rd February, 1973. The Committee wish to express their thanks to the officers of these Ministries and Departments for placing before them the material and information which they desired in connection with the examination of the subject and for giving evidence before the Committee.

3. The Committee also wish to express their thanks to Shri M. Hayath and Shri K. L. Vij, ex-Chairman and ex Vice-Chairman respectively of the Central Water and Power Commission 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 the associations and individuals and State Electricity Boards who furnished memoranda on the subject to the Committee.

5. The Report was considered and adopted by the Committee on the 16th April, 1973.

6. A statement giving the analysis of recommendations|conclusions contained in the Report is also appended to the Report (Appendix XIII).

NEW DELHI,  
*April 25, 1973*  

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*Vaisakha 5, 1895 (S)*

KAMAL NATH TEWARI,  
*Chairman,*  
*Estimates Committee*

## CHAPTER I

### INTRODUCTORY

Electricity is one of the most important infrastructure for development of the country's economy. Without it, there can be no development in the agricultural and industrial fields, the improvement of life both in the towns and villages cannot be achieved and prosperity cannot be carried to the backward areas of the country. Electricity supply is the life blood of development, it is essential that this life blood should flow to every limb of the body. Today, despite stupendous expansion both in the industrial and agricultural fields, the country is faced with acute shortage of electricity, its rising costs and charges and poor supply position. Power shortage today is no longer a regional problem. It has assumed the proportions of a national crisis.

1.2. Since the development of power began in 1950-51, power development made a considerable stride. The installed capacity has increased by less than 15 million KW over more than two decades—from 2 million KW in 1950 to 16.5 million KW in 1971—whereas between 1961 and 1972 amounts more than Rs. 5,000 crores have been invested. Despite nine fold increase in the generating capacity, the availability of power has become a major constraint in the development of industry and agriculture.

1.3. In the Northern region power deficit is endemic and it is also developing in the Western and Southern regions. Even in the Eastern region, the position is far from satisfactory and the West Bengal industrial complex has been severely affected by power shortage. The Northern region, despite Bhakra, is chronically a deficit area. Power supply from Bhakra Nangal which was on an average 12.5 million units per day in December, 1972 has been reduced thereafter to an average of 10.26 million units per day. Shortage of power has been mainly attributed to failure of monsoon. The Western region has been severely hit because Tarapur Atomic plant has been functioning erratically and there has been continued postponement of the commercial operation of Rajasthan Atomic Power Plant. Things are no better with the Indraprastha Power Station, Delhi, Patratu in Bihar, D.V.C. power projects and other Thermal plants in the country. In most of the States like Punjab, Maharashtra, Tamil Nadu, West Bengal, Mysore, etc., power cuts varying from 25 per cent to 60 per cent were imposed, severely affecting the industrial growth and agricultural production. In most of the States power shortage aggregates to about 35 million units per day. None of the power plans had achieved the target. The first plan was planned to add 1.40 MKW of power, the second 3.48

million, the third 7.04 MKW, the three annual plans (1966-69) 6.68 MKW and the first three years of the Fourth Plan 4.13 MKW. The actual achievement during the plan periods was 1.12 MKW, 2.23 MKW, 4.52 MKW, 4.12 MKW and 2.60 MKW which works out to a shortfall percentage of 20, 36, 35, 38 and 37 respectively. The latest review indicates that as against the target of 23 million KW to be attained by the end of the Fourth Plan, the generating capacity would be only 20 million KW resulting in shortfall of 3 to 3.5 million KW. This would entail a loss of about 25 per cent in the production of industries and agriculture and utilities which amounts to a tremendous loss to the economy of the country. Amidst the growing power crisis in the country, under-utilisation of capacity by the indigenous manufacturers of plants and equipment and restrictions imposed on their imports remain a serious drawback in the development of power.

1.4. Though the per capita consumption of electricity rose from 17.8 Kwh in 1950 to 88 Kwh in March 1971, and from about 90 Kwh in 1970-71 to 93 Kwh in 1971-72, the per capita consumption in the country is still dismally low as compared to the other developing countries. Even at the end of the Fifth Plan the per capita consumption of electricity is anticipated to be only 200 Kwh as against the per capita consumption of 10,000 Kwh in the United States and 2,000—3,000 Kwh Europe.

1.5. Despites nine-fold increase in the generating capacity, there still persists considerable imbalance in the per capita consumption between the various States in the country. Certain States/Areas viz., Uttar Pradesh, Rajasthan, Himachal Pradesh and Jammu and Kashmir in the Northern Region, Madhya Pradesh in the Western Region, Andhra Pradesh and Kerala in the Southern Region, North Bihar and North Bengal in the Eastern Region and the entire North Eastern Region comprising Assam, Meghalaya, Mizoram, Manipur, Tripura, Nagaland and Arunachal Pradesh are still below the national average.

1.6. The rapid growth of demand for electric power has led to infinite improvisations to enable an inadequate system of distribution to convey as much load as possible. In most of the cities in the country which are also centres of industry, the distribution system is not only outdated but very seriously overloaded. Energy losses in transmission in India in certain regions like the Southern and the Northern are very high. For example, in Punjab transmission losses are the largest viz., 34 per cent. The all-India average loss in transmission has been estimated to be as high as 16 per cent as against 8 to 12 per cent in Europe.

1.7. Rural electrification is another important aspect of the distribution of power. The concept of rural electrification has to be understood from

a wider perspective instead of restricting it simply to the number of villages electrified or the number of pumpsets energised.

1.8. At the commencement of the Fourth Plan the all-India average of village electrification was 13 per cent and the progress was below the all-India-average in the States of Assam, Bihar, Jammu and Kashmir, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Uttar Pradesh and West Bengal. The Progress of rural electrification in these States and in the States of Manipur, Meghalaya, Nagaland and Tripura as on 31-12-1972 was still below the all India average of 23.4 per cent. The percentage of rural population who have been deprived of the benefits of electricity is: Assam 92.14 per cent, Bihar 76 per cent, Jammu and Kashmir 82.40 per cent Madhya Pradesh 74.80 per cent, Manipur 62.50 per cent, Meghalaya 85.40 per cent, Nagaland 79.70 per cent, Orissa 80 per cent, Tripura 92 per cent U.P. 61.10 per cent and West Bengal 76.20 per cent.

1.9. In reply to USO No. 3108 dated 13-3-1973, the Deputy Minister of Irrigation and Power stated that "it is anticipated that power shortage conditions in the country will prevail during 1973-74 and will continue in early Fifth Plan period." According to a tentative programme drawn up by the Ministry of Irrigation and Power for the Fifth Plan, it is envisaged that an additional generating capacity of 21.8 million KW will need to be installed. An amount of Rs. 7,600 crores is required for power development programme during the Fifth Plan.

1.10. Replying to the call attention notice regarding crisis due to shortage of power throughout the country, the Deputy Minister of Irrigation and Power, stated in Lok Sabha on 28-2-1973 that "there is widespread power shortage in most of the country this year xxx. The main reasons for the shortage of power this year are—

- (a) reduced power generation from hydro-stations due to shortage of water in hydel reservoirs.
- (b) shortfall in power from Atomic Power stations.
- (c) continued growth in demand for power and shortfall in the addition to generating capacity."

The Deputy Minister added that "the aggregate energy demand in the country at present is of the order of 201 million units per day against which the estimated availability of energy is about 166 million units per day."

1.11. Speaking about the power shortage in the country in that context the Minister of Irrigation and Power stated: "Our total shortage today is about 54 million units a day. About 30 million is due to the extra demand over the last year; and about 24 million is because the hydel generation

being less by 22 and atomic power generation being less by 2, that is 22 plus 2, which comes to 24. Out of this 54 million, we have made up about 19 million units, still 35 million units are left. We have not been able to cut this gap of 35 million units. In the next plan we should fix the target rather high and try to implement the power programme in the country; without that the country gets paralysed in all sectors." The Minister continued: "Then in regard to Uttar Pradesh there has been chronic shortage right through. We are not able to make up that because power produced from Delhi goes to Haryana. Actually U.P. is asking for some share of it. But we are not able to give that because there is shortage all round. From Bihar they are giving off-peak power to the extent of about 5 lakh units daily. That is to say, that is given in the night and at times when it is not required elsewhere. Even though one would expect some power from D.V.C., the D.V.C. itself has gone short of power. It is still short of power by 3 million units a day. They are not able to supply full lead to Jamshedpur, TISCO and so on. That is a constant problem so we are not able to give relief to Uttar Pradesh from the D.V.C."

**1.12. The Committee feel greatly concerned about the acute power shortage in the country which has been responsible for retarding the development of the country's economy both in the industrial and agricultural sectors.**

**1.13. The Committee are perturbed over the State of helplessness exhibited by the Ministry in regard to solving the problem of power shortage in the country. They would, therefore, urge that the problem calls for immediate attention and recommend that a crash programme for meeting the power shortage should be devised at the highest level so that the development of the country's economy both in the industrial and agricultural fields may proceed and progress unhampered and uninterrupted.**

## CHAPTER II

### SCHEMES/PROJECTS UNDERTAKEN FOR DEVELOPMENT OF POWER DURING THE PLAN PERIODS

The Indian Constitution gives the States and the Centre a concurrent responsibility for electricity supply. The Central Government is required to lay down a uniform national policy and also to coordinate the work of the various Planning agencies in relation to the control and utilisation of national power resources. While power generation schemes are normally executed by the State Electricity Boards and the other State Electricity Supply Organisations, there is no bar on the Centre taking up power generation schemes.

2.2. The following schemes, which have a direct bearing on power development, were taken up by the Central Water and Power Commission (Power Wing), a technical organisation under the Ministry of Irrigation and Power during the First, Second and Third Plans:

- (1) All India Load Survey Scheme.
- (2) Hot Line Crew Training Scheme.
- (3) Scheme for setting up of Power Research Institute at Bangalore and the Switch-gear Testing & Development Laboratory in Bhopal.
- (4) Scheme for setting up of Specialised Engineering Organisation.

#### *All India Load Survey Scheme*

2.3. The Government of India decided in 1954 that a systematic power load survey of different regions and the country as a whole be undertaken by the Central Water and Power Commission as a National Project. The work was started in the First Plan itself.

#### *Hot Line Crew Training Scheme*

2.4. The Hot Line Crew Training Scheme provided for the establishment of two training centres at Bangalore and Nangal to train Indian personnel in the repairs, maintenance and operation of overhead power transmission and distribution lines and equipment in the energised condition. Working on the live lines with the aid of 'hot-line' tools is an important advancement in the maintenance of lines, as by the adoption of hot-line

techniques, it will be possible to carry out practically every maintenance job of the overhead power lines without switching off the power, thus increasing the reliability of supply by the Electricity Undertakings. This has been made possible by an Indo-U.S. Cooperation Programme. The work was initiated in the Second Plan and continued upto November, 1965.

### *Setting up of Central Power Research Institute*

2.5. The establishment of a Power Research Institute at Bangalore, under Centre's auspices, together with the Switchgear Testing Laboratory at Bhopal was intended to fulfil the long felt need for a Central Organisation for undertaking applied research on problems connected with generation, transmission and utilisation of power. The work was initiated during the Second Plan.

### *Specialised Engineering Organisation*

2.6. The Specialised Engineering Organisation for rendering Consulting Engineering Services was sanctioned in the Power Wing of the Central Water and Power Commission in March, 1961 for undertaking work of complete engineering, design, procurement and installation of large thermal and hydro power stations in the country, with the following objectives:

- (i) The continued dependence on foreign consultants in the execution of such jobs is not in the National interest. Self-sufficiency in this field is *sine-qua-non* for large scale development in the country that is being planned.
- (ii) Large expenditure by way of foreign exchange, being incurred in the employment of foreign consultants for undertaking engineering, design and erection of large size thermal and hydro power stations in the country has to be reduced and foreign exchange saved.
- (iii) There was need for a specialised organisation for designing and erection of equipment produced by the indigenous manufacturers required for various power projects.

### *Badarpur Thermal Power Station Scheme*

2.7. In the years ending with the Third Five Year Plan, the power supply in the capital city of Delhi had not been very satisfactory. There had been frequent failures of power supply and the Delhi Electricity Supply Undertaking had not been able to cope with the large demands for power supply to various small and medium industries, domestic and commercial needs and for the agricultural purposes in and around Delhi. It was felt all around that some arrangements should be made to establish

within Delhi a large thermal power station of such capacity as to provide reliable power generation facilities for catering to the demands of the Capital City. It was also felt that the Station could also help to some extent, in meeting the requirements of the various States in the Northern Region after meeting the local requirements. In the larger national interest, it was decided that the construction of this power station should be taken up under the direct control of the Centre. Accordingly, Central Water and Power Commission (Power Wing) was entrusted with the setting up of a large thermal power station with an installed capacity of 300 MW at Badarpur in Delhi Station. The Project was sanctioned in the year 1967-68.

### *Damodar Valley Project*

2.8. Besides the above projects, Damodar Valley Project had been established under the D.V.C. Act 1948 for the unified development of irrigation, flood control and power generation of the Damodar Valley in the States of Bihar and West Bengal. The Corporation started the work of construction of four multi-purpose dams at Tilaiya, Konar, Maithon and Panchet, three hydro power stations one each at Tilaiya, Maithon and Panchet, three large thermal power stations at Bokaro, Durgapur and Chandrapura, with a net-work of transmission and distribution lines, besides, irrigation and flood control works. In so far as power was concerned, the investment of these projects was shared equally between the Government of West Bengal, Bihar and the Central Government. The share of the Centre was provided in the budget of the Ministry of Irrigation and Power.

2.9. In the Fourth Plan, the following continuing and new schemes have been undertaken by the Ministry of Irrigation and Power/Central Water and Power Commission:

- (1) Central Power Research Institute (continuing).
- (2) Load despatch Training Institute (New).
- (3) Research Schemes on Power (continuing).
- (4) Hydro and Thermal Design Organisation in CWPC (Continuing).
- (5) Badarpur Thermal Power Project in Delhi (Continuing).
- (6) Investigation for Hydro-electric Scheme (Continuing).
- (7) Participation in the D.V.C. Extension (Continuing) Project which includes the installation of two generating units of 120 MW each at Chandrapura.
- (8) Establishment of Regional Load Despatch Stations (New).



- (9) Central Electricity Authority (Expansion).
- (10) Regional Electricity Boards (Expansion).
- (11) Rural Electrification Corporation (New).
- (12) Training Institute at Durgapur and Neyveli (Continuing).
- (13) Salal Hydro Electric Project in Jammu & Kashmir (New).
- (14) Baira Siul Hydro Electric Project in Himachal Pradesh (New).
- (15) Loktak Hydro Electric Project in Manipur (New).
- (16) Badarpur Thermal Power Station Extension in Delhi (New Delhi).

### **Inter-State Transmission Lines**

2.10. Besides the above, it has been decided that the construction of inter-State transmission lines should be sponsored by the Ministry of Irrigation and Power and the State Electricity Board finance the schemes through loans given by the Centre outside the State Plan ceilings. The execution of the schemes would still rest with the respective State Electricity Boards within their own jurisdiction.

2.11. Some of the important projects are dealt with as under:

#### *Badarpur Thermal Power Project*

To meet the growing power demand in the Northern Region comprising Punjab, Haryana, U.P., Rajasthan, Jammu and Kashmir, Himachal Pradesh and the Union Territory of Delhi (which are to be integrated into a unified electric grid), the construction of the Badarpur Thermal Power Project with three units of 100 MW each has been undertaken by the Central Water and Power Commission under the overall control and supervision of the Badarpur Thermal Project Control Board. As mentioned earlier, the Project was sanctioned in the year 1967-68.

2.12. The salient features of the project are given below:—

Boilers	· · · · ·	3 NOS of 420 T/hr. 96 at a 540°C
Turbo Generators	· · · · ·	3 NOS of 100 MW each.
Main Step Up transformers.	· · · · ·	3 NOS 125 MVA. 10·2/235 (KV)
Coal Consumption	· · · · ·	4500 tonnes/day/ (Max) 3600 tonnes /day (average) 1·3 million tonnes annually.
Water Source	· · · · ·	Agra Canal
Type of Cooling	· · · · ·	Once through cooling with provision of cooling towers.

Ash quantity . . . . Fly ash—95 tonnes/day Bottom ash—  
108 tonnes / day.

Main Transformers . . . . 3 NOS. 125 MVA 23 / 10.5 KV.

Transmission System :

- (i) Badarpur . . . . I. P. station 220 KV Double Circuit.
- (ii) Badarpur . . . . Najafgarh 220 KV Double Circuit.
- (iii) Badarpur . . . . Ballabgarh 220 KV Double Circuit.
- (iv) Badarpur . . . . Jaipur 22 KV Single Circuit.

2.13. The estimated cost of the Project as originally sanctioned was Rs. 39.25 crores. The revised cost of the project had been estimated at about Rs. 55 crores. The increase in the cost has been mainly attributed to the increase in the cost of boilers and Turbo Generator sets obtained from the **indigenous manufacturers** (Rs. 925 lakhs) increase in the price of other plants and equipment (Rs. 300 lakhs), Civil Works (Rs. 200 lakhs), land acquisition (Rs. 36 lakhs) and design and engineering (Rs. 37 lakhs). The Fourth Plan provision for the Project was Rs. 49.25 crores. The total expenditure upto the end of 1971-72 was of the order of Rs. 34 crores. Out of the provision of Rs. 12 crores (including 1 crore for operation and maintenance) made for the year 1972-73 expenditure upto the end of June, 1972 was about Rs. 1.6 crores.

2.14. Asked about the basis on which the original estimates were framed the Member (Thermal Central Water and Power Commission replied that "In the case of original estimates, for example, for the plants and equipment, the costs were based on the cost of comparable imported equipment in 1966. This was with reference to equipment portion. In the case of Civil Works, certain estimates were based upon the Delhi Schedule rates prevailing in the year 1962. In the case of Civil Works, the comparative increase is not as much as it is with reference to equipment. In the case of land acquisition I do not have to say much. On the design and engineering side the charges are based on percentage cost of the project. The cost estimates have gone up on design engineering also." With regard to the boilers and turbo generators, the witness stated, "The supply is entirely from the BHEEL and HEIL group and from some other indigenous sources. The estimated costs were based on the comparable imported equipment cost. But the actual prices have gone up very high and we are helpless in this regard. The main equipment is purchased mainly from the public sector plants. In the case of private sector purchases also, the costs have gone up considerably."

2.15. As to when the original plan was sanctioned and the time by which the material was to be handed over, the witness replied that the original plan was sanctioned in 1966 and the delivery of the material was

required to be made in about four years. The witness added that they could not take escalations into account as that would be a guess work. Elaborating, the representative of the Ministry of Finance stated, "This estimate though it was sanctioned in 1967, it was drawn up some time in March or April, 1965 before devaluation and after devaluation the cost of imported equipment went up straightway by 57 per cent plus customs duty thereon. So that is one big item which will account for the difference of the indigenous equipment costing Rs. 9 crores etc. Though it does not explain fully but it explains to a considerable extent. The second factor is that 1962 Schedule of rates were adopted as stated by the Administrative Ministry but that also does not explain completely. The original project was due to be completed in 1971-72. (The first unit was to be commissioned in 1971-72 and the second unit and third units by 1972-73). Now there has been more than one year's delay in the commissioning of this project. Now this delay has led to further escalation which could not have been there if the project had gone on schedule. Besides this, there are a few other factors which have partly contributed the increase in the cost which does not fully explain 9 crores of rupees so far as boiler is concerned. A provision of 1.65 crores was made for spares for two years for power station operation. It was not provided previously. In all there has been an increase of the order of two crores because of the new items not provided originally. Then there have been increase due to higher rates for contracts in Civil Works generating equipment. There have been increases partly because of escalation in materials and wages and partly because of changes in the project scope itself and also due to the extension in the period of the completion of the project."

2.16. With regard to the present schedule for the commissioning of the first unit of the project and the possibility of its being commissioned according to the schedule, the representative of the Ministry of Irrigation and Power replied:

"Trials have started already. The boiler is ready. Hydro test has been carried out. Further testing and commissioning comes in a row. They have to be done one by one. The turbo-generating set and rotating Turbine do come a little later."

The Member (Thermal) Central Water and Power Commission added, "Some auxiliaries were tried and not the Unit as such. By July/August we will get into commercial operation. Trial runs will be by the end of May or early June."

As regards the apportionment of power, the representative of the Ministry of Irrigation and Power stated that 300 MW would be available, the apportionment being 100 MW, U.P.; 100 MW Delhi; 60 MW Punjab and 40 MW Haryana.

2.17. In reply to Unstarred Question No. 2174 answered in Lok Sabha on 6-3-1973, the Ministry of Irrigation and Power had stated as under:—

“The first stage of the Badarpur Thermal Power Station comprises the installation of three units of 100 MW each. About 95 per cent of the work relating to the first Unit of 100 MW has been completed and the remaining works are expected to be completed in the next 2 to 3 months. The facilities for Unit I will be utilised in common for Units II and III as well. About 75 per cent of the work relating to the erection of boilers for Unit II and about 50 per cent for Unit III have been completed. The foundations for the turbo-generator and auxiliaries for Unit II have already been completed and these units and Unit III are in an advanced stage of construction.”

With regard to causes for delay, the Ministry of Irrigation and Power had stated:

“Delay in according of administrative approval, difficult site conditions, delay in construction of main power house building due to non-availability of the required structural steel, major civil works. Contractors not adhering to the targeted dates of completion, delays in the supply of plant and equipment, delay in the construction of railway siding, interruptions in the supply of steel, cement and other materials on account of Indo-Pak Conflict and general shortage of scarce materials like cement, steel, oxygen/acetyline gas etc.”

2.18. Asked about the reasons for delay in the commissioning of the unit, the Member (Thermal) Central Water and Power Commission stated during evidence. “Quite a bit is due to delay in civil works. Equipment deliveries also were unduly prolonged. Even today, we are having difficulty in regard to some of the major transformer equipment, pipes, battery pannels etc. We are sending our people to get the material from the suppliers.”

2.19. The Ministry of Irrigation and Power had stated in a written note, “The main reason for delay in civil works for which contracts have been awarded to three different public sector undertakings are due to inadequate employment of personnel and also due to non-availability of matching steel in time for structurals. As regards the Railway siding which is being executed by the Northern Railways, there has been delay of about one year in completion with the result that almost all the major heavy plant and equipment which were to be transported by rail to the Power Station were transported by road. In respect of structural works progress was delayed

due to non-receipt of steel from the producers in time in spite of the fact that necessary priority was accorded and other facilities were rendered by the Project. However, the allotments of steel quota from the producers by the Steel Controller were short of requirements for the project. The main Civil contractors on main power house building, auxiliary building and coal handling system have also failed to adhere to the target dates of completion of their work." It was further stated that the performance of the Bharat Sewak Samaj, National Building Construction Corporation, National Projects construction Corporation and Hindustan Housing Factory and not been satisfactory in relation to the requirements of the Project.

The table shows the performance of these undertakings:—

Contractor	Particulars of work	Estimated Dt. of award value (Rs. lakhs)	Dt. of comple- tion of work as per con- tract	Actual/likely dt. of com- pletion	Delay in months	No. of ex- tensions given
1. M/s. Bharat Sewak Samaj.	Levelling operation construction of drainage channel and roads.	23.97	23-11-68	3/70	16	15
2. M/s. National Building Construction Co-operation.	Construction of foundation for main Power House Building, Auxiliary Building, C. W. Ducts.	61.65	24-1-71	24-10-72	21	4
3. M/s National Projects Construction Corporation.	Civil Works for Coal Handling Plant, Ash Handling Plant, Water treatment Plant, Switchyard foundations etc.	90.11	3-1-70	Dec. 72	13	1
4. M/s. Hindustan Housing Factory.	Manufacture, supply and fixing in position of pre-fab. structure.	22.60	31-3-69	4/73	30	3

2.20. The Committee desired to know whether the question of taking action under the panel clauses of the agreement entered into with the undertakings was considered and if so, what decision was taken in the matter. The Member (Thermal) Central Water and Power Commission stated during evidence: "We give notice and he (contractor) has to give reasons for the delay. If the delay is for reasons within his control, penalty will be definitely imposed. But if some of the reasons are beyond his control, we have to examine the question of levy or waiver of penalty. In this case the works are actually going on. Today if we initiate any action, the work will further suffer. We did give notice once or twice but the stage is such that some of the major civil works are nearly getting completed...As soon as the first unit gets commissioned, we can afford to be a little more drastic. If we bring a new man at this stage, it will delay matters further." The representative of the Planning Commission added: "In all these contracts, penalty clause is incorporated. Even in the case of HEIL, the penalty clause and liquidated damages clause are there. The only question is under what circumstances you can invoke it. It is a bit of a legal matter which the project authorities will have to sort out."

2.21. It was suggested to the Committee that the Control Board should have powers to take decisions on all matters and it should not be necessary to refer any case decided by it for issue of formal orders by the Ministries of Irrigation and Power and Finance. Asked whether such powers are proposed to be delegated to the Control Board, the representative of the Ministry of Irrigation and Power stated during evidence: "Most of the Power Projects have this kind of trouble. We are trying to convince our friends in Finance and elsewhere that we must have some workable arrangement." The Officer on Special Duty in the Ministry of Irrigation and Power added: "One of the troubles about the so-called Control Boards is that they do not really control because the level at which every one is represented is so high. It should be a closely knit Board." The representative of the Ministry of Finance stated, "The position is that the Control Boards as constituted are advisory in nature and no executive powers have been entrusted to them. We have an open mind on the subject. If the Ministry of Irrigation and Power wishes to vest them with further authority, we shall examine it." He added, "But there cannot be wholesale delegation in which the Government will not keep any powers to them particularly those which have repercussions on other projects." He apprised the Committee of the following observations made by the Committee appointed by Government on the setting up of the Control Boards:—

"As a non-statutory Board, the Control Board can only function as an advisory body theoretically. The Control Board is a device for bringing together the representatives of the State Governments or the Governments concerned with the project and also

of the Centre so that decisions may be taken expeditiously without referring the proposal to the different parties. A decision of the Board is theoretically an advice to the State Government concerned who can also endorse the decision by the issue of formal orders. A convention should, therefore, be established whereby the State Government should agree to implement the decisions of the Control Board as a matter of course without any further examination. Unless such a convention is established, there will be no advantage in continuing the system of Control Boards.

[Note—In the case of the Badarpur project, the term 'State Government' will include the Central Government also.]”

2.22. The witness added, “If that convention were to be followed, there will be no difficulty in working of the Control Boards. The second point is unless the Control Board is delegated with financial power, the decisions taken by the Board cannot be communicated especially to the audit. . . Thirdly our case studies have shown that there have been no impediments in the functioning of the Control Board and carrying out decisions so far as Badarpur is concerned. The only issues are where Control Boards have proposed giving certain benefits in the matter of wages or service matters where we have our reservations. So far as this is concerned, Government will not be able to delegate that authority.”

2.23. The representative of the Planning Commission stated, “When we evolved the institution of Control Boards, the hope were that the Control Boards will take action to cut short all the delays and take decisions and execute the projects according to schedule. We have been setting up Control Boards in almost all the projects costing more than Rs. 20 crores. We have insisted on all States to do that. As the experience goes, the Control Boards performance is not satisfactory not only in the matter of framing policies but also taking decisions. . . The Control Board to be more effective has to be given the complete responsibility of bringing a project into operation by a certain date. Unless that responsibility is put squarely on the shoulders of the Control Board, I don't think the Control Board can be effective. Without responsibility no power can be invested on them. It should be a whole-time body.”

2.24. The Committee note that Badarpur Thermal Power Project was sanctioned in the year 1967-68 at an estimated cost of Rs. 39.95 crores. The revised cost of the project had been estimated at about Rs. 55 crores. The increase has been attributed to a number of factors such as increase in the cost of boilers and Turbo-Generators sets obtained from the indigenous manufacturers (Rs. 925 lakhs), 'increase in the price of other plant



and equipment (Rs. 300 lakhs), Civil Works (Rs. 200 lakhs), land acquisition (Rs. 36 lakhs) and design and engineering (Rs. 37 lakhs). The estimate though drawn up in 1965 was sanctioned in 1967.

2.25. The Committee further note that in the case of indigenous equipment the prices given by the manufacturers are usually the budgetary prices and not firm prices, and that delay in the completion of the project had further escalated the cost.

2.26. The Committee strongly feel that the whole estimate of the project was framed in a rather unrealistic manner. Low cost estimates are brought forward initially which ultimately not only prove inadequate but also result in delays in the execution of the projects. Unless this fact is recognised and better and more realistic estimates are prepared in the beginning, such delays are bound to occur. To avoid such situations, the Committee would like to stress the need for framing the estimates with a more realistic approach providing for annual escalations as far as possible so that the progress in the completion of the project is not held up for lack of funds.

2.27. The Committee note that delay in the execution of the project had been mainly attributed to delay in according administrative approval, delay in construction of the main power house building due to non-availability of the matching structural steel, contractors not adhering to the target dates of completion, delay in supply of plant and equipment, delay in the construction of railway siding and general shortage of scarce materials like cement, steel etc.

2.28. The Committee are distressed to note the manner in which the execution of the project which was taken up under the direct control of the Centre had been planned right from the beginning (1967). Cost of equipment alone supplied by the indigenous manufacturers had escalated the cost to the extent of Rs. 925 lakhs. There had been a year's delay in the completion of the Railway siding with the result that the equipment had to be transported by road. The Committee are constrained to observe that there had been complete lack of coordination among the various authorities concerned which could have been avoided with better planning and proper consultation to achieve better results and savings in expenditure.

2.29. The Committee are unhappy over the unsatisfactory performance of the National Building Construction Corporation, National Projects Construction Corporation and Hindustan Housing Factory who had been awarded the contracts for undertaking the civil works in relation to the requirements of the project. There had been slipping from the original schedule.

Considerable delays in the construction of civil works nullified the targeted acceleration of the project and escalated the cost. It is strange that the works awarded to these public undertakings were delayed for periods between 13 to 30 months. The Committee would like the Government to examine the question of taking action under the penal clauses of the agreements entered into with these undertakings and apprise them of the result of action taken in the matter.

2.30. The Committee also regret to note that M/s. Bharat Sewak Samaj who were also awarded the contract for civil works delayed the civil works by 16 months and were granted as many as 15 extensions of time. The Committee would urge that in this case also Government may examine the question of taking suitable action under the penal clauses of the agreement entered into with the Bharat Sewak Samaj.

2.31. The Committee note that the first unit of the project is likely to get into commercial operation by July/August 1973, as against the original target of 1971-72. The Committee hope that Government would take effective steps to ensure that the target now set for the commissioning of the first unit would be adhered to.

2.32. The Committee during an informal visit to Badarpur Project were informed of the difficulties which were being experienced by the project authorities in the day to day working of the project for want of adequate financial powers. The Committee recommend that the existing schedule of delegation of the powers to the Chief Executive of the project should be reviewed in detail in consultation with the Chief Executive of the project, Ministry of Finance, etc., so as to ensure that he has adequate powers for delivering the goods.

2.33. It was also brought to the notice of the Committee that after the Board of Control have gone into various issues and come to a decision the communication of formal approval from the concerned Departments/ Ministries takes unduly long time. The Committee feel that since the object of having senior representatives of various Ministries/Departments on the Board of Control is to facilitate decision making and to give them opportunities to know first-hand the background of the relevant issues involved, there should be no delay in issuing formal approval by the authorities concerned. The Committee would like Government at the highest level to review the existing procedure which is being followed in processing the formal references which are received from the project authorities in implementation of the decisions taken by the Board of Control with a view to streamline the procedure and cut out all delays. The Committee need hardly point out that where a matter needs further elucidation, this can best be done by either seeking comprehensive written information in order to dispose of the matter finally or by convening a meeting at a sufficiently high level to resolve and finalise the matter.

### *Baira Siul Hydro Electric Project*

2.34. The Baira Siul Hydro Electric Project with an installed capacity of 180 MW comprising three generating sets of 60 MW each, envisages the utilisation of the River flows of Baira, Bhaleth and Siul, tributaries of the River RAVI in Himachal Pradesh for power generation at Puniari Power Station. The Project Comprises:

- (a) A rockfill dam across the river Baira providing an effective pondage of 12,56,000 cusecs (1,030 acre ft.) and suitable intake structures.
- (b) Diversion weirs across the Siul and Bhaleth rivers and intake structures.
- (c) 7,730 metre long 4.75 metre dia. head race tunnel from Baira pondage to surge shaft and 430 metre long 2.75 metre dia. siul feeder tunnel.
- (d) 5,100 metre long 2.75 metre dia. Bhaleth Feeder Tunnel.
- (e) 200 metre long 2.75 metre dia. Penstock tunnel.
- (f) 125 metre deep 10-metre dia. surge shaft.
- (g) A surface power station with an installation of 3x60 MW generating sets designed for operation at a gross head of 926 ft.
- (h) 220 KV D/C transmission line, 100 KM long from the Power Station to Dasuya village near the border between Himachal Pradesh and Punjab from where the Punjab State Electricity Board would construct a line upto Talwara where a 220 KV sub-station has been planned.

### *Cost and Benefits*

2.35. The Scheme which was sanctioned in February 1970 for an estimated cost of Rs. 20.48 crores is now on the basis of contracts awarded, expected to cost Rs. 40.59 crores. The project, when completed, will add 180 MW (corresponding to an annual contribution of 920 million KWh) to the load carrying capacity of the Northern Regional Grid on a firm basis.

### *Progress of Works*

2.36. The pre-construction surveys and investigations for the tunnels and penstocks have been completed, alignments finalised and contracts awarded except for the Bhaleth Tunnel. Part of the land has already been acquired and the remaining is under acquisition. Construction of field hostels and temporary building has commenced. Construction of approach

roads, comprising 50 KM of hill roads and three major bridges is progressing rapidly and the roads are expected to be completed shortly. Arrangements for power required for construction have been made partly through procurement of Diesel Generating Sets and partly through arrangements by purchase of bulk power from Himachal Pradesh Electricity Board. Orders had also been placed on BHEL, Hardwar, for supply of generating plant.

Rs. 6.91 crores had been spent till the end of 1971-72. The Fourth Plan provides an outlay of Rs. 16.5 crores for this project.

#### *Schedule of Commissioning*

2.37. The progress at site is claimed as satisfactory and if this tempo is maintained and sufficient finances are made available, the first unit of 60 MW can be commissioned in the second half of 1974.

#### *Loktak Hydro Electric Project*

2.38. The Loktak Hydro electric project which was sanctioned in February 1971 with an installed generating capacity of 70 MW in the first stage envisages:

- (a) A 10.7 metre high and 68.6 metres long barrage across the river Manipur at Ithaj to provide adequate storage.
- (b) An open intake channel 4114.8 metres long.
- (c) A headrace tunnel of 6248.4 metres long, 3.7 metres dia, terminating into a surge shaft of about 61 metres height and 9.15 metres dia followed by a pressure tunnel of 245.4 metres length, 3.66 metres dia. and then three penstocks of 2.3 metres dia and 1448.7 metres length each.
- (d) Construction of a power house capable of accommodating three units of 35 MW each, housing at present only two units to a gross head of 312.4 metres for the generation of power.
- (e) About 16 KM long 132 KV transmission lines from the power house to connect Badarpur-Imphal 132 KV line near Bishanpur.

#### *Cost and Benefits*

2.39. The Scheme which was originally estimated to cost Rs. 10.25 crores on the basis of contracts awarded, it is now expected to cost Rs. 23.29 crores. The project when completed would feed about 369 million KWh of electrical energy and 70 MW of peaking capacity to the North-Eastern Grid.

### *Progress of Works*

2.40. The contracts for most of the civil works such as barrage, intake channels, tunnels and surge shaft, penstocks etc. have already been awarded. Preliminary works such as acquisition of land, construction of access roads, staff quarters have been completed. Work on the excavation of the intake channel, power house and penstock grading is in progress. Most of the construction equipment have been procured. Diesel sets have been procured and installed to provide power required during construction. Generation equipment has been ordered on BHEL, Hardwar. Orders for major auxiliary equipments like transformers, switchgear crane and butterfly valves have been placed.

An expenditure of Rs. 7.85 crores was anticipated to be incurred on this project by 1971-72. The Fourth Plan provides an outlay of Rs. 16 crores for this project.

### *Schedule of Commissioning*

2.41. The first unit is likely to be commissioned by end of 1974.

2.42. The Committee desired to know the basis on which the original estimates for these projects were framed. The representative of the Ministry of Irrigation and Power stated, "Both are Central Projects and the original estimates of both of them were prepared some seven years back and they were on the basis of the CPWD rates applying at that time in these areas. After the taking of the work, it could not immediately be started. There was a gap in between. In the intervening period there has been a very steep rise in the cost all over the country and especially in the case of hydro-electric projects we have faced different types of things, for example, cost of land that has gone up very steeply and items like this have caused unprecedented and absolutely very disturbing rise in the cost escalation but the original rates were based on the schedule of rates of the CPWD at that time. The rules of the Government do not allow to provide for escalation in the cost. Since we cannot do that on that account, it is inevitable that the estimates do go escalated as the time goes and the longer it takes it escalates the project. This is one thing, and the other thing is that cost of land has gone up. Then another important factor is that we are taking up these projects in remote areas in the States where the States themselves would not be in a position to take up the project and that is why the Centre is going there and taking up the project. And because of lack of good roads the construction contractors are afraid of moving heavy machinery and they are also being found more reluctant to go. When the original estimates were prepared, it was presumed that certain roads will be there but this road building programmes has lacked notably in Himachal Pradesh,

with the result that today we find that the project is faced with the prospect of either spending more on roads or getting the period extended further. These are the various reasons that have contributed to this delay. Then the third factor is that of Indianisation programme of the orders with BHEL and HEIL for plants and equipment. For example, BHEL wants Rs. 7 crores."

2.43. The witness added, "What is given by the manufacturers is usually the budgetary price. They say that they are not firm prices but budgetary prices for estimation of the cost of plant and equipment. For the indigenous manufacturers, the Government decision is that the cost for monopolistic undertakings should be within the ceiling of the landed cost of imported equipment. So, that is the basis on which the CPWD worked out the cost of plant and equipment for the Loktak and Baira Siul and so on. But in the case of Loktak Project, for example, what the manufacturers have claimed is that they had to import a number of things from Russia and the total cost of these things is very high. We have, therefore placed the matter with the Bureau of Public Enterprises which will go into it and arrive at a reasonable cost. Earlier there was reluctance on the part of BHEL to give us two things, namely a firm price and firm delivery date."

2.44. Asked how the prices of the imported equipment compare with the indigenous equipment, the representative of the Ministry of Irrigation and Power replied that indigenous equipment was much more costly.

2.45. The Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence that in other countries they do provide in the estimates for annual escalation but in our country it was not the policy at present. He added, "If there is any escalation, the Finance Ministry and the Planning Commission which makes allocations can take that into account. It is not so built in that it cannot be removed." The witness further added that one of the difficulties faced in the Central Projects was that the States did not want to spend money for facilities like roads, bridges etc., for the Central Projects. When asked about the period of time that expired between the estimates and the revised estimates, the witness replied, "Four to five years in both the cases." He added, "From now on, we do not expect much of escalation. The revised estimates are being made on actual contract. These estimates did not escalate as we go on further."

2.46. To another query made by the Committee, the Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence, "A very major part of the increase in cost is because the infra-structure was not there. Not only this, if it is delayed, the costs keep on escalating. What we really want is that in the original estimate, we should make some provision for the normal annual rise in cost. One other thing should also

be done. We should get absolute assurance from the State Governments concerned that the infra-structure will be there. That is to say, the State Governments should indicate that within a specified time, there will be roads, bridges and culverts. Otherwise, there will be trouble. Either the project cost has to be inflated, or the project has to be delayed and delay in itself means extra cost. When the Planning Commission take this up, and when they take up a central project, they should insist that the States should play their part. Otherwise, this will happen and this will keep on happening."

2.47. The witness added, "At a particular point of time estimates are drawn up. Escalation does not happen in a well-developed State like Andhra, Maharashtra, Gujarat. 99 per cent of the escalation takes place in areas where there are certain imponderables or unknown factors. If an area of land is submerged irrespective of how big it is, one of the troubles arises. If the cost of a particular piece of land in an undeveloped area is 'X', we always find that by the time the actual compensation is paid, it may be as high as 10X. If the question of submergence is not settled, it may go to 20X. We have trouble in the Pong Dam. The longer it takes to settle, the more we shall have to pay. As far as the Planning Commission is concerned, we have to say and we should be able to say that for these particular costs, *i.e.* equipment, labour contracts, at X & Y we can fix the point. If there is the cost of sub-mergence, which in future will also come up. I am not making excuses for anything. The lack of an infra-structure was part of the reason for delay. We laid down guidelines. If these guidelines are followed, as far as these three institutions are concerned, there should be less of a gap. Some formula can be settled between the Centre and the State to reduce the imponderables."

2.48. Asked how it was proposed to keep the projects within the estimated cost, the representative of the Planning Commission stated, "Unless project estimates are framed in a very realistic manner, we will always be landed into troubles. A characteristic thing in this field is that everybody is very anxious to see that the estimate for the project prepared by him is most attractive and very cheap and in this process we usually get stuck up from a large raise in price and escalation in the cost and ultimately in the estimate as a whole. This is not an isolated question. Almost every project has been behaving like this, sometimes it is 100 per cent, sometimes less and sometimes more even. So we have always been very much exercised in the Planning Commission. The funds provided usually do not meet the requirement because of the escalations and this is one of the reasons why some of the States failed to achieve their targets, because if a project costing Rs. 50.0 crores is revised to Rs. 100.0 crores, the States naturally cannot find the additional amount of Rs. 50.0 crores for one

project. The Centre may, however, like to help in this respect but it cannot sanction an additional amount to the tune of Rs. 50.0 crores for one project, that too for one State. Naturally due to these reasons, the project will be delayed. This is a phenomenon which has been there for quite sometime and I think by now all the States, Irrigation and Power Ministry and everybody, are aware of this fact and it is expected that better estimate will have to come out."

2.49. The witness added, "Till now, what is happening is that they come with very attractive plan. To my mind, this may lure you to accept it. You accept it, you accept the responsibility. Then when the execution of the project is taken in hand, you will be compelled to spend money on it. That is the calculation upon which those people are working. They are to accept these plans. These projects are framed by the States and then they are scrutinised in the CW&PC. Then the Advisory Committee set up by the Planning Commission goes through it. Then they come to the Planning Commission in all these various stages. We will have to take greater caution to see that these estimates are more and more realistic as also the cost etc. When we draw up plan and equipment, we have to consult Heavy Electricals and put in whatever they say. In this manner, we will try to build up more realistic estimates in future."

2.50. In reply to S.Q. No. 394 answered in the Lok Sabha on the 20th March, 1973, with regard to the completion of the Baira Siul Hydro Project, the Minister for Irrigation and Power stated, "The first unit of the project originally scheduled for commissioning in 1974 is now expected to be commissioned in 1975." With regard to the reasons for delay in the completion of the project he stated, "There has been initial delay due to lack of approach roads, bridges, difficult site and working conditions and difficulty in recruitment of experienced officers and staff posting in remote areas. Himachal Pradesh Government are being requested to expedite the completion of the approach roads and bridges."

2.51. The Committee note that the Baira Siul Hydro Project and the Loktak Hydro Electric Project are other instances where due to unrealistic estimates framed initially there had been steep rise in the costs of the projects. In the case of Baira Siul Hydro Project the escalation in the cost was expected to be Rs. 20.11 crores whereas in the case of Loktak Hydro Electric Project the rise in the cost was expected to be Rs. 13.04 crores.

The Committee have already emphasised the need for a more realistic approach in framing the estimates keeping in view the likely annual escalation in the costs so that there was smooth execution of the projects and the projects were not held up for lack of finances. The



Committee feel that the whole system of scrutinising the original estimates framed by the various agencies might be reviewed and guidelines laid down with a view to streamlining the procedure to ensure that the estimates were framed on a more realistic basis based on the actual contracts.

2.52. The Committee are surprised that the projects were taken up without ensuring that the infrastructure (viz. roads, bridges etc.) was there and that the estimates were prepared on the presumption that certain approach roads would be there resulting in inflation of project cost. This again goes to show lack of proper planning and coordination between the Centre and the State Governments concerned.

2.53. The Committee are also unhappy to note that the first unit of the Baira Siul Project which was originally scheduled to be commissioned in 1974 has been delayed for a year and is now expected to be commissioned in 1975. They, however, hope that the revised target would be adhered to and that there is no further postponement.

2.54. The Committee would like the Government to impress upon the State Government concerned to expedite the completion of the approach roads and bridges and also to take positive measures to ensure that the first unit of the Project is commissioned according to the revised schedule.

#### *Other Schemes/Projects*

2.55. In reply to Lok Sabha U.S.Q. No. 2987 answered on the 22nd August, 1972, the Minister of Irrigation and Power had stated that the scheme in respect of the following Power Projects received from Madhya Pradesh Government were pending Planning Commission's approval:—

Name of the Project.	Date of receipt in the
(1) Bodhghat Hydro Electric Project . . . .	6-8-70
(2) Expansion of Thermal stations at Korba and Amarkantak by installing one 120 MW unit at each station.	13-9-71
(3) Harinphal Hydel Project . . . .	19-5-72.
(4) Maheshwar Hydel Project. . . .	19-5-72

2.56. Asked about the present position with regard to these schemes, the representative of the Planning Commission stated during evidence, "Among these four projects, expansion of the No. 2 Thermal Plant by installing 120 MW station has already been sanctioned. This was sanctioned some time in September. The other three have not yet been

referred to the Planning Commission for sanction, these are on inter-State rivers. Bodhghat is on Indrani River while Harinphal and Maheshwar are on Narmada river. Because of the Tribunal's sittings these are perhaps not being cleared in the Ministry. As soon as the inter-State aspect is cleared they will come to the Planning Commission."

2.57. To a query made by the Committee as to how long it would take for finalising the three projects, the representative of the Ministry of Irrigation and Power stated during evidence, "Regarding Bodhghat, we have written to the Orissa Government for concurrence. Regarding Harinphal and Maheshwar, they are on the Narmada and we cannot do anything about them just now."

2.58. To another query made by the Committee regarding other Schemes pending before the Planning Commission for approval, the representative of the Planning Commission stated, "There are about seven to eight projects, I will give a list of them and the reasons why they are held up. The Thermal Projects which are with the Planning Commission are Badarpur Extension which is held up because the coal position is not clear—where exactly the coal supply will come from. Similarly, Vijayawada is also held up for coal as well as its locational aspect.

2.59. Subsequently, the following information was furnished to the Committee in a written note received from the Ministry of Irrigation and Power with regard to the power generation schemes pending approval of the Planning Commission:

*Schemes which have been examined by CW & PC and considered acceptable by the Technical advisory Committee on Irrigation, Flood control and power projects but the formal approval of the Planning Commission is awaited*

Sl.	Name of Region/ State	Name of the Scheme	Installed Capacity (MW)	Estimated Cost (Rs. Crores)	Date when accepted by Advisory Committee
<b>Northern Region</b>					
1	Delhi .	Badarpur Thermal Power Station Extension	1 x 200	28.19	20-5-71
2	Haryana	Panipat Thermal Power Station	2 x 110	45.83	10-10-72
3	Haryana	Faridabad Thermal Station Extension	2 x 55	26.33	2-6-72
4	J & K.	Kishtwar H. E. Project, Stage I	3 x 110	56.92	2-6-72
<b>Southern Region</b>					
5	Andhra Pradesh .	Vijayawada Thermal Power Station	2 x 200	66.60	2-6-72
6	Tamil Nadu .	Ennore Thermal Power Station Extension	1 x 110	17.54	8-2-72
7	Kerala	Idikki H. E. Scheme, Stage II	3 x 130	11.58	15-2-71
8	Mysore	Kalinadi H.E. Scheme, Phase II	4 x 135† 2 x 50	93.57	2-6-72
9	Mysore	Linganamakki dam power house	2 x 27.5	9.37	2-6-72
<b>Eastern Region.</b>					
10	Bihar .	Muzaffarpur Thermal Power Station	2 x 120	46.68	8-2-72
11	West Bengal	North of Ganga Thermal Power Station at Dalkhola.	2 x 120	46.69	2-6-72
Total number of schemes			—	—	11 Nos.
Aggregate installed capacity			—	—	2.935 Million KW

2.60. The Committee note that the scheme for expansion of Thermal Stations at Korba and Anarkantak has since been cleared by the Planning Commission. The Committee also note that other three projects viz., Bodhghat Project, Harinphal Hydel Project and Maheshwar Hydel Project in Madhya Pradesh are pending at various stages with the Ministry of Irrigation and Power. The Committee desire that the clearance of these projects may also be expedited by taking effective action in consultation with the State Governments and the Planning Commission.

2.61. The Committee further note the Projects/Schemes in various regions pending approval of the Planning Commission. The Committee cannot appreciate the slow progress in according the approval by the Planning Commission as most of these projects were accepted by the Advisory Committee more than a year ago. The Committee would urge that necessary steps should be taken to finalise these projects expeditiously.

2.62. In reply to a point arising out of evidence, the Ministry of Irrigation and Power have in a written note furnished to the Committee the information with regard to the various schemes at present under execution and the position about their progress as shown in Appendix I.

2.63. The Committee note that in the case of most of the power projects at present under execution the civil works are either progressing or are nearing completion. The Committee would, however, like to stress that the progress of these projects should be closely watched and effective measures taken wherever necessary to remove the bottlenecks with a view to ensuring the completion of the projects according to schedule.

2.64. The Committee would also like to emphasise that in respect of the projects on which work is yet to start, effective steps should be taken to ensure that the work on these projects is also taken up without further delay so that they are commissioned according to the schedule.

2.65. The Ministry of Irrigation and Power had furnished the information to the Committee with regard to the schemes currently under examination by the C.W.&P.C. as shown in Appendix II.

2.66. The Committee that fifty-nine schemes with an aggregate installed capacity of 13.55 MKW in various regions are currently under examination by the Central Water and Power Commission at various stages. Most of these schemes were referred to the Central Water and Power Commission more than 3 years ago. The Committee cannot appreciate the slow progress in examining these schemes. The Committee would, therefore, strongly urge that, in view of the general power shortage in the country, effective steps should be taken to ensure that the schemes in question are finalised without further delay, as a scheme normally takes five to seven years for execution.

2.67. In the preliminary material furnished by the Ministry of Irrigation and Power, they had stated that the schemes expected to be taken up by them during the Fifth Plan period/decade are given below:—

Sl. No.	Name of Scheme	Capacity MW.	Location
1.	Kishtwar Hydro Electric Scheme Stage I	330	Jammu & Kashmir.
2.	Thein Hydro Electric Project	420	Punjab
3.	Hishtwar Hydro Electric Scheme Stage II	390	Jammu & Kashmir
4.	Parbati Hydro Electric Scheme Stage I	1670	Himachal Pradesh.
5.	Jhakri Hydro Electric Project	750	Do.
6.	Dalkhola Thermal Project	240	West Bengal
7.	Tenughat Thermal Scheme	800	Bihar
8.	Kameng H. E. Project	250	Arunachal Pradesh
9.	Thermal Extensions in D.V.C.	640	West Bengal.
10.	D.V.C. Pump Storage Scheme	400	Do.
11.	Loktak Extension (Hydro Electric)	35	Manipur
12.	Koel-Karo Hydro Electric	985	Bihar.

2.68. In reply to Unstarred Question No. 2123 answered in Lok Sabha on the 6th March, 1973, the Ministry of Irrigation and Power had stated that the following projects (Region-wise) were proposed to be included in the Fifth Plan in the Central Sector:

*Northern Region*

- (1) Badarpur Thermal Extension (400 MW).
- (2) Atomic Power Station at RAPP (400 MW).
- (3) Dulhasti (330 MW).
- (4) Baira-Siul Hydro (180 MW).
- (5) Salal Hydro (270 MW).

*Western Region*

- (1) Tarapur Atomic Power Station Extension (200 MW).

*Southern Region*

- (1) Kalappakkam Atomic Power Station (400 MW).
- (2) Kalappakkam Atomic Power Station Extension (440 MW).
- (3) New Nuclear Stations (200 MW).

*Eastern Region*

- (1) Damodar Valley Corporation Thermal Projects (640 MW).
- (2) Tenughat Thermal Power Project (400 MW).
- (3) North-Bengal Thermal Power Project (240 MW).
- (4) Pumped Storage Hydro—DVC (200 MW).
- (5) Koel-Karo Hydel Project (120 MW).

*North-Eastern Region*

- (1) Loktak Hydro-electric Project.
- (2) Loktak Hydro-electric Project Extension (35 MW).
- (3) Kameng Hydro (200 MW).

2.69. In reply to Unstarred Question No. 1236 answered in Lok Sabha on the 8th August, 1972 the Deputy Minister of Irrigation and Power had stated:—

“A Plan covering power generating facilities required in the country over the decade 1971—81 was drawn up in early 1971 and this forms the basis for power development in the country upto 1981. The broad outlines of the Plan are as follows:—

- (i) It provides for increasing the installed generating capacity in the country to 52 million KW by 1980-81.
- (ii) It has been drawn up on a regional basis.
- (iii) New power generation schemes required for the purpose, have been identified.
- (iv) An attempt has been made to achieve a balance between the different energy sources for maximum economy and reliability.
- (v) Regional and other imbalances are sought to be reduced.
- (vi) The per capita consumption of electricity will increase from the present figure of about 90 Kwh to 240 Kwh by 1981.
- (vii) New Technical features, such as pumped storage hydro-electric plants, large size generating units and large power stations will be introduced.”

2.70. Asked whether this would meet the demand for power development and whether the target would be reached, the representative of the Ministry of Irrigation and Power stated during evidence:

“Actually we are falling short by about Rs. 2,000 crores.” As regards achieving the target for the 5th Plan, he said, “It

would not be possible. That is why, we feel anxious about the whole thing. We want to reach the whole target as set out in the Fifth Plan."

2.71. To a query made by the Committee as to how this allocation was going to affect the prospective plan, the representative of the Ministry of Irrigation and Power stated:—

"Briefly, I might mention that the lower allocation that is being proposed, namely, Rs. 5,700 crores for the power plus Rs. 300 crores for the basic minimum needs, that is, for the rural areas, results in our attaining only 32 million kilowatts instead of 40 million kilowatts."

He added:—

"There is very little latitude for cutting down transmission and distribution programme because that would in any case have to be of a magnitude to handle the power needs of the industries and of the States leading towards a national grid. The main axe will perforce fall on power generation schemes. So far as the total power generating capacity available in the country, it will not rise from 20 to 40 but it will rise only from 20 to 32 million kilowatts. In other words, instead of 20 million Kw addition, the addition will be only of the order of 12 million kilowatts."

2.72. The Committee drew the attention of the representative of the Planning Commission to the shortage of funds and asked about the thinking in the Planning Commission in this regard. The representative of the Planning Commission stated:—

"In the Planning Commission in the Approach to the Fifth Plan that paper which has been recently discussed and adopted in the MDC meeting, the power requirements which are required for supporting a growth of 5.5 per cent and industrial development growth enunciated in that, it has been indicated that the power requirements would be in terms of energy nearly about 106 billion kilowatt hours. And that is related to about 32 million kilowatt generating capacity. But in the Planning Commission we want to work out the Fifth Plan on a more liberal way and we want to achieve a minimum of 36 million kilowatt hours. Related to that is the consumption of 115 million kilowatt hours and generation of 142 million kilowatts hours. That is, the installed capacity will have to be raised to 36 million kilowatt hours from about 19 or 19.5 million Kw which would be raised by the end of the Fourth Plan.

Out of the Rs. 5,900 crores which have been allocated for power—we have not yet worked out the final figures—about Rs. 3,000 crores will be a generation and about Rs. 1,900 crores on transmission and distribution and the balance on rural electrification. This would roughly double. That will be the investment on generation during the Fourth Plan also on the transmission and distribution. Now, about 8 million KW capacity would be spilling over into the Fifth Plan from the Fourth Plan. So far, we have sanctioned schemes worth about 31 million KW. Out of it, 19-1/2 is going into operation by the end of the Fourth Plan and the balance would be in various stages of implementation during the Fifth Plan. We expect to get out of that about 30.5 million KW which is going into operation during the Fifth Plan. Out of 31 or so sanctioned, the spill over schemes which are already on the ground will require about 750 crores for completion” and the 8.9 MKW about 1,800 crores at the rate of about Rs. 2,000 per KW. For achieving 36 MKW, we would roughly require about 2,600 crores or so. The balance out of 3,000 crores would be for achieving again for the Sixth Plan schemes. No doubt, we will have to go in for a larger achievement again during the Fifth Plan and Sixth Plan schemes, it will be taken care of during the Fifth Plan.”

**2.73.** The Committee note that 12 new schemes with a total capacity of 6910 MW are expected to be taken up by Government during the Fifth Plan period. The Committee hope that in view of the fact that it takes several years for a scheme to get commissioned, advance planning action in regard thereto would be taken expeditiously so as to ensure that the schemes/projects are commissioned according to schedule.

**2.74.** The Committee feel that it is imperative that all the new power generation schemes proposed for implementation in the Fifth Plan are formally got sanctioned by the Planning Commission expeditiously and necessary funds for advance action made available during 1973-74 for all these schemes. The Committee need hardly emphasise the need for continuous sanction of the schemes as the piling and bunching of orders would make it difficult for the indigenous manufacturing plants to manufacture and supply the plant and equipment in time for the different projects and would inevitably result in need for more imports of plant and equipment which would mean a drain on foreign exchange which has to be avoided at all costs.



(i) Shortfall

PHYSICAL PERFORMANCE AND SHORTFALL IN RESPECT OF POWER GENERATION.

(i) Shortfall

The progress in the generation of electricity and consumption during 1960-61, 1965-66 and 1968-69 has been stated to be as under:

Year	Installed generating capacity at the end of (the year (Mill. Kw)	Electricity generated during the year (Mill. Kw)	Electricity consumed during the year (Mill. Kw)
1960-61	5.65	20123	16644
1965-66	10.17	36825	30365
1968-69	14.29	51700	41400

3.2. A number of schemes of power generation fell behind schedule during the Second and Third Plan periods. As against a target of 6.9 Million KW of installed capacity for 1960-61 the actual capacity commissioned was 5.65 million KW. This led to power cuts and a staggering of leads in some regions. The target for the Third Plan was 12.69 million KW of installed capacity. The actual capacity commissioned was 10.17 million KW. The outbreak of hostilities in 1962 and 1965 and other factors delayed the implementation of the projects. Power supply at the end of the Third Plan remained unsatisfactory. During the three Annual Plans priority was again accorded for the completion of the projects which were in advanced stages of construction. About 4.12 million KW of generating capacity, nearly equal to the total added during the Third Plan, was installed between 1966 and 1969. It has been stated that this appreciable addition, coupled with a slower rate of growth in demand made the power position at the beginning of the Fourth Plan on the whole satisfactory except for marginal shortages in some areas.

3.3. In a memorandum submitted to the Committee the shortfall in physical targets in respect of power generation during the Five Year Plans was stated to be as under:—

	Planned additional MKW	Achievement MKW	Shortfall percentage
First Plan (1951-56)	1.40	1.12	20
Second Plan (1956-61)	3.48	2.73	36
Third Plan (1961-66)	7.04	4.52	35
Three Annual Plans (1966-69)	6.68	4.12	38
Fourth Plan (1969-72—1st three years)	4.13	2.60	37

3.4. It has been stated that out of the total projected outlay of Rs. 2,500 crores on power development during the Fourth Plan, in the first three years of the Plan the anticipated outlay was about Rs. 1,600 crores representing over 60 per cent whereas the physical achievement has been 37 per cent less than the target.

3.5. Asked whether the physical achievement was commensurate with the capital expenditure, the representative of the Ministry of Irrigation and Power stated during evidence, "In so far as power generation plan as such is concerned, at the national level it is there" . . . . . About long term planning of project execution he said, "There, we have had difficulties, because the inputs from other sectors have not been forthcoming. For example, there has been shortage of steel, and in some projects, there has been shortage of cement and so on. Sometimes we have not been able to get the plant and equipment and steel and cement and move them to the projects which are placed in very remote locations. Then, there have been projects where plant and equipment deliveries from indigenous manufacturers or sometimes even from imported sources have been delayed. That has also contributed to this. So, the planning has been there, but in the execution, we have not been able to keep things moving as they should and this has been the main cause of delay."

3.6. The witness added, "But whatever the reasons, the net result has been that there has been increase in cost of raw materials, labour and higher cost of indigenous plant and equipment.

3.7. Another factor that has come into play is that whereas for the imported plant we generally used to pay most of the cost on delivery of the plant and equipment, the indigenous plants have been insisting that because of their own difficulties, they should be given advance payment

to the extent of 50 per cent of the cost of the plant almost along with the orders or within a period of six to eight months thereafter. This has resulted in the power project being obliged to spend much more money in the course of the project construction.

3.8. There is another reason. Because of the mechanism of the Five Year Plans and the various projects getting sanctioned and getting started towards the beginning of the plan and since the power projects have a gestation period of five to seven years at least, what happens is that the project completions all get bunched together towards the end of the plan. So, in the middle of the Plan you find that there are a lot of projects which half complete. They are in the pipeline, but if you see the physical achievement in terms of addition to generating capacity, it looks small compared to the investment that has been made therefor. The main reason is that the projects are half way through and they will get completed by the end of the Plan or by the beginning of the next Plan. That is another reason why apparently there would be a bigger shortfall. As regards the escalation of the cost, from Rs. 844 crores it has gone up to Rs. 2300 crores for the 69 generation projects which I have analysed."

3.9. The Committee desired to know the total quantity of power that was actually being generated both from the Thermal and Hydro Power Plants as against their installed capacity. In a written note furnished to the Committee, the Ministry of Irrigation and Power has given the following information for the year 1971-72:—

	Installed capacity MW	Generation Million KW
Thermal . . . . .	9,930	37,154
Hydro . . . . .	6,612	27,882
Nuclear . . . . .	420	1,190
TOTAL . . . . .	16,962	66,226

3.10. In reply to U.S.Q. No. 4855 answered in Lok Sabha on the 27th March, 1973 the Ministry of Irrigation had furnished the following information:—

Total No. of major Hydel Power Stations in operation at present	Total installed generating capacity	Energy generated during 1971-72
79	6627 MW	27882 MKW

3.11. In reply to U.S. Q. No. 4772 answered in Lok Sabha on the 27th March, 1973, the Ministry of Irrigation and Power furnished the information regarding the generating capacity of 67 Thermal Power Stations in the country and their production during the year 1972 as in Appendix III.

3.12. Asked to what extent the shortfall in power development can be attributed to lack of long term planning taking into account the long period of gestation of power projects to materialise the Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence, "The power crisis has arisen not because of shortage of coal or equipment but because of our rather ambitious Plans. The demand for power has out-paced the supply so much that we shall be in a perpetual state of crisis until that gap between demand and supply has been narrowed. We have plans to almost double the present capacity of power in the next five to ten years..... about a little more than 15 million kw of new schemes and about 6.7 million kw of continuing schemes. That would mean that instead of the annual increase in capacity ranging from  $\frac{1}{2}$  million to 1 million, we shall have to multiply it by four or eight and add to our present generating capacity. Another relevant factor is that we are bound largely by the Five Year Plans, in all other fields. But planning of power for five years has no meaning at all. The gestation period of a hydro, thermal or nuclear power plant is anything from 4 to 10 years. The second part of the ten year period will be the part when the construction that we are planning now would be coming in.

3.13. The representative of the Ministry of Irrigation and Power added, "We are not keeping the plan restricted only to adding generating capacity. As we add more and more stations, we must have adequate transmission and distribution system and all that goes with it to see that every rupee that invest in the power sectors from the scarce capital resources that we have will be used to the maximum extent possible in the service of the nation, in the service of industry and agriculture for maximisation of production. As we have more and more power stations, the operation of the power system becomes more complicated. Therefore, proposals are already being framed not only for adding to the transmission lines and sub-stations, which is the hardware, but also the facilities for a broad-based communication system, a system of load despatch from minute to minute, so that the whole power system operations is monitored and the best possible use is made of it."

3.14. It was brought to the notice of the Committee that in 1965 addition in power generation was 1.8 million kw, in 1967-68 it was 1.7 million kw and in 1971-72 the addition was only to the extent of 0.58 million kw and that the decline in the power generation was mainly due to delay in the supply of equipment by indigenous factories, delay in the supply of steel resulting in constructural delays and inadequate supply of coal. When

enquired about the position in this regard, the representative of the Ministry of Irrigation and Power stated during evidence, "Firstly, coming to the question of decline in addition to power generation year by year, factually of course, that is what has happened in the past few years. As I submitted earlier to the Committee, one of the main reason is because of the five-year planning, the progress appears slow at the middle of a Plan and all the fructification of the Plan, the commissioning of new generating capacity gets bunched up towards the end of the Plan or the first year of the next Plan. That is one reason why at the middle of the Plan, usually, addition to power generation appears to be on the low side. I recounted some of the main reasons earlier that have been causing delays in the implementation of the Plan projects, one additional thing has come up recently is that we have also to depend in a big way for our plant and equipment on indigenous manufacturers.

3.15. They are also in the nascent stage. They are just starting their manufacture of highly sophisticated plant and equipment. On this account there have been many delays and even where plants and equipments have been supplied, during the erection of it and commissioning of it we find new difficulties coming up and they have to be overcome. Under the direction of the Prime Minister, a team of experts have begun a survey of each of the projects. In 1973 the additions would be stepped up and the performance in 1974 would be still better."

3.16. With regard to year-wise target and achievement for the Fourth Plan, the representative of the Ministry of Irrigation and Power stated, "The target has not been fixed year-wise but for the plan as such. The plan target was 23 mkw. We expect we will be able to achieve about 20 mkw."

3.17. In reply to U.S. Q. No. 2164 answered in Lok Sabha on 6th March, 1973 the Ministry of Irrigation and Power had furnished the following information:

- (a) The Fourth Five Year Plan envisaged augmentation of installed generating capacity from 14.3 million kw. to 23.1 million kw after retirement of some old and obsolete sets. The latest review indicates that there may be a shortfall of 3 to 3.5 million kw in the Plan target.
- (b) The reasons for the shortfall are delay in execution of Projects due to delay in the supply of equipment by indigenous manufacturers, non-availability of essential materials like steel, cement, etc., to the required extent, delay in civil works, labour unrest and delay in receipt of replacement parts from abroad. Constant reviews of the Projects under construction are being taken at various levels with the indigenous manufacturers for

the timely supply of plant and equipment. Additional funds for early completion of the Projects have been provided. Monitoring groups have been appointed to monitor the progress of Projects and take remedial measures to avoid delays. Improved methods of project management are being adopted.

3.18. Subsequently the Ministry of Irrigation and Power in a written note furnished to the Committee the following information with regard to the anticipated shortfalls and the steps proposed to be taken to safeguard the shortfalls in the implementation of future plans:

“The shortfall anticipated during the Fourth Five Year Plan has been assessed to be of the order of about 3.5 million KW. The reasons for the shortfall and the capacity is as under:—

(1) Delay in delivery of main equipment by HEIL/BHEL . . . . .	1.2 Million KW
(2) Delay in delivery of main equipment as well as civil works . . . . .	1.2 Million KW
(3) Delay in civil works only . . . . .	0.85 Million KW
(4) Delay in erection . . . . .	0.20 Million KW
(5) Other causes . . . . .	0.11 Million KW
	3.56 Million KW”

3.19. To obviate delay in delivery of equipment during the future plans, particularly the Fifth Plan, a committee of Ministers headed by Shri N. D. Tiwari, Minister of Finance and Power, U.P. Government has been constituted to assess the capability of indigenous manufacturers to deliver equipment required for the generation programme of the Fifth Five Year Plan. Besides, the Ministry of I. & P. had constituted a Committee to watch the progress of manufacture and supply of electricity generating equipment by HEIL/BHEL under the Chairmanship of Vice-Chairman, CW&PC. This Committee has been holding meetings with the manufacturers so that the supply of equipment suits the construction requirements of the various projects.

3.20. The civil works are generally delayed for want of requisite sections of steel and also cement. The requirements of these commodities have already been estimated for the Fifth Plan generation programme and efforts have to be made to see that the requisite quantum of these essential material is available during the Fifth Plan.

3.21. Previously the terms of payment for manufacture and supply of T.G. units by HEIL/BHEL were such that the State Electricity Boards were reluctant to block their capital while placing orders. These terms of

payment have now, been modified with the result that only 10 per cent advance payment would have to be made at the time of placing the orders. This procedure would enable Electricity Boards to place orders on the indigenous manufacturers sufficiently in advance so that equipment is made available in time.

3.22. A monitory cell has been set up to visit the various projects and continuously monitor the progress of the Projects and remove bottlenecks in the speedy completion of the Projects.

In addition implementation cell in the Ministry of Irrigation and Power/CWPC and in the various States have been/are being set up for the above purpose."

3.23. In reply to U. S. O. No. 2994 answered in Lok Sabha on 13th March, 1973 the Ministry of Irrigation and Power had furnished the following information:

\* \* \* \* \*

During 1972-73, a capacity of 1000 MW is likely to be commissioned against the proposed addition of 1560 MW."

Projects spilling over to 1973-74 are shown below:—

Sl. No.	Name of the Project	No. & size of unit	Targetted date	Anticipated date of commissioning	Reasons for not adhering to the target
1	2	3	4	5	6
1	Kothagudem (Andhra Pradesh)	1 × 110	3/72	3/73	There has been shortage of steel in the early stage for completion of civil works, delay in supply of equipment by M/s. BHEL & HEIL.
2	Kosi Hydrel (Bihar)	1 × 5 (4th Unit)	70/71	3/73	There has been delay in receipt of replacement parts damaged/lost in transit.
3	Vir Hydrel (Maharashtra)	2 × 4.5	6/72	8/73	Delay in completion of civil works.
4	U.B.D.C. Hydrel (Punjab)	1 × 15 (3rd Unit)	3/73	3/73	Delay in completion of Power house civil works and erection of crane.

1	2	3	4	5	6
5	Obra Thermal Extn. (U.P.)	1 × 100 (2nd Unit)	4/72	6/73	Delay in supply of equipment by M/s. BHEL.
6	Yamuna Hydel II (U.P.)	1 × 60 (1st Unit)	9/71	9/73	Delay in delivery of plant and equipment by HEIL.
7	Badarpur Thermal (Delhi)	1 × 100	12/71	3/73	Delay in civil works as also in delivery of equipment by M/s. BHEL.
8	Chandrapura Thermal (DVC)	1 × 120 (1 Unit)	12/71	12/73	Delay in delivery of equipment by HEIL and completion of civil works.
9	Bokaro Steel (Non-utility)	1 × 55 1 × 12	71/72	73/74	Erection to suit steel plant programme.
	<b>TOTAL</b>	<b>586.0 MW</b>			

3.24. In a memorandum submitted to the Committee the following suggestions were made:—

- (a) forecasting of demand and assessment of generating capacity of project should be on scientific basis;
- (b) Power planning must be on a longer period than the conventional five year term;
- (c) there should be simultaneous forward planning by different authorities concerned such as Electricity Boards, CW&PC, Technical Advisory Committee, Planning Commission, Coal Board, indigenous manufacturers of equipment etc.;
- (d) careful assessment of the existing fuel resources and exploring the possibility of using alternative fuels.

3.25. Asked to comment on the above suggestions, the Vice-Chairman, CW&PC stated during evidence, "The question refers to forecasting of demand and assessment of generating capacity of project on scientific basis. This is perfectly correct. In fact, it should be done on scientific lines. Nowadays, it has become a science by itself unlike in olden days when it used to be done on, more or less, guess basis. In fact, we have established an expert committee to do local forecasting on scientific basis. We take experts from various fields and this committee gives a survey report every year."



3.26. The witness further stated, "Power Planning must be on a longer period than the conventional five year term. We also fully agree with that. The power planning has got to be done on a long-term basis. Keeping this in view, the Ministry has prepared a sort of draft Plan for projects not only for the next five years but upto the decade 1980-81. This is a sort of perspective plan."

3.27. The Officer on Special Duty in the Ministry of Irrigation and Power added, "We are entirely in agreement and I am happy to mention that in no quarters there is any difference of opinion on this. As the Estimates Committee themselves brought out very fully in the discussion yesterday, this is something on which we have to move forward on all fronts and see that proper planning is done not only by the power sector but also by other sectors which have to contribute to the success of the power programme."

3.28. With regard to the reasons for the present unsatisfactory state of affairs regarding power shortage, the Officer on Special Duty in the Ministry of Irrigation and Power replied, "They arise from a lot of things. For example, in Maharashtra, just now, the shortages are due to the fact that the coal supply is not adequate. But I think the main reason is that the whole Northern India and a large part of Southern India is almost dependent on hydel power and it so happens that in the last 100 years there has never been a situation like the present one where almost all the storage dams dealing with power have been only half-filled. The average filling up of the dams is about 50 per cent. That is the main reason and there is no other source from which such a bulk amount of power can be got to be fed into the State to sustain the system. The thermal stations have been running to capacity but they cannot make up a gap of 50 per cent loss in terms of hydel power. Also, if you remember, recently in Tarapur, one unit which is supposed to be functioning has broken down. So there is a combination of circumstances which has created this crisis. Any single factor might have been got over but a combination of three is too much to get over."

3.29. To another query the witness replied, "The Central Government through the Planning Commission makes bulk funds available to the States. Meanwhile, the States among themselves decide how much should go into irrigation, how much should go into power and how much should go into industries, so on. You are quite right in saying that no State is likely to invest a large portion of its Plan allocation in power to give it to other States. That is one of the reasons why we feel that if a State is not capable of finding or putting up a hydro-electric power station merely on the ground that it needs a much smaller station whereas the region as a whole is deficit and needs a large power station... and that stage has come now—where the Central Government should provide the funds and say, 'All right, we will put up a station sufficient to cater to the needs of the whole region.' That is the line on which we are thinking ourselves. That is to say that the Centre should intervene in case some change is needed and should set up a station in a particular State so that the regional concept of the generation of power and transmission of power is suitably implemented and a stage has now been reached that is not confined only to transmission between

States, but is a question of generation as a whole and inter-regional transmission."

3.30. In reply to U.S.Q. No. 144 answered in the Lok Sabha on 20th February, 1973, the Ministry of Irrigation and Power furnished the following information:

- (a) "The total installed generating capacity in the country at present is 17.5 Million KW and the yearly output is of the order of 65,000 Million Kwh.
- (b) There has been a reduced output from Hydro Stations. The performance of thermal stations except for a few in the Southern and Eastern Regions has generally been good and the output per KW installed has been higher than last year.
- (c) The shortfall in Hydro generation has been on account of a shortage of water in Hydel reservoirs due to a deficit monsoon which affects more than two-thirds of the country.

The shortfall from Thermal Stations in the Southern region has been due to lack of adequate fuel supplies and cooling water. In the Eastern region, the shortfall in Thermal Generation has been mainly due to the supply of inferior grade fuel and the difficulty of obtaining spares. There has been a shortfall in production from Atomic Power Plants due to the need for the replacement of fuel elements."

3.31. Asked about the annual growth rate in the installed capacity during the three Plan periods and the first three years of the Fourth Plan, the rate of utilisation and the measures taken by the Government to maximise the utilisation of available generating capacity streamlining the operation of existing thermal plants, the Vice-Chairman, OW&PC stated during evidence, "In the First Plan, the growth rate in demand was 10.4 per cent and the growth rate in the installed capacity was 12.5 per cent. During the three annual plans, the growth rate in demand was 12 per cent and the growth rate in installed capacity was 11.7 per cent. In the Fourth Plan, the growth rate in demand is 11.8 per cent and the growth rate in installed capacity is 7.2 per cent."

3.32. With regard to the short-term and long-term measures adopted by the Government, the representative of the Ministry of Irrigation and Power stated:

"In the short-term, we have already set up two teams of experts, one for thermal projects and the other for hydro projects. They have been asked to visit the different projects already operating and to suggest after on-the-spot study, what improvements can be done in the operation and maintenance

procedures and other matter concerned the management of the existing power plants and also for the prompt execution, where the projects are under construction.

This will result in two things. One is getting more energy as well as power out of the existing plants and also hurrying up the commissioning up of the new plants, so that we have got more margin and more satisfactorily availability of power generation.

In the long-term, we have taken a number of measures. Firstly, we feel that there is need for properly trained expert operating personnel for the power plants. Already training institutes have been started for the operating personnel for the thermal power plants. We are asking State Electricity Boards to send their people for training.

As we are going in a big way, naturally there will be need for properly trained personnel for operating the systems. In the past, we had small systems and we could train on job, but in future, with very large growth, we have to have schemes for training people.

For operating and maintenance of the transmission lines, we want to see that these lines can work without any dislocation. We are utilising hot-line techniques. That means, while the lines are carrying the full load, we have a way of doing certain maintenance and repairing operations without switching off the system. For that we are setting up a training centre. All the Electricity Boards will have properly trained crews for maintenance. We are also trying to see, what we can do about improving the quality of fuel for power stations. We have set up a linkage Committee, to see that all the power plants which are in existence get the proper fuel. And if they do not have proper fuel, what is the alternative. With the Standing Committee for Linkage and with the setting up of the control room, we hope that the situation will be improve greatly.

We are taking steps for expediting the completion of the power projects. Many of the programmes are suffering because of *lack of finances*. State Governments do not have adequate funds. For that a detailed study has been done and Planning Commission, Finance Ministry and ourselves have got together in order to see, by giving additional funds, what works can be expedited. We hope that the execution of the projects can be

substantially accelerated. For this purpose, we have taken specially those priority projects, where equipment has already come, or is coming in time and the civil work has been delayed. We are accelerating those.

Then about spares. Many of the projects suffer because of spare parts. The foreign firms who have given the plants and equipment in the earlier years are not now as much interested because they do not see much future in dealing with us. We are going to be self-sufficient. We are trying to bring all kinds of pressures on the manufacturers. We have taken up this matter with the BHEL and HEIL. They will try to make spare parts for us

There are difficulties about the procurement of steel and cement and some projects are delayed for that. We try to assist them as much as possible in procurement of these. We are having a programme of imports of special steels through HSL. There was shortage of aluminium also. There has to be proper marshalling of resources. So far as transmission is concerned, we have not had the shortage of aluminium last year and this year."

3.33. The representative of the Planning Commission added:—

"In the past, the power station capacities were between 5 megawatts and 25 megawatts. The Electricity Boards had a common cadre for installation, rural electrification etc. Now, a time has come when the generation cadre should be separated from transmission and the distribution from commercial and other cadres, because we are now going in for 100 and 200 megawatts etc. The expertise required for installation, operation and maintenance thereof, is something which comes only by experience. If that expertise is lost through transfers, it is lost for ever, because the new man will take time to get acquainted with the equipment. So, we have recommended to the Committee of Ministers that they take up the question of separation of cadres with the State Ministers and have different cadres for installation, operation and maintenance. Secondly the BHEL and the other unit have taken up installation and other works. They have also decided to set up workshops for repairing and servicing of the plants. These generating station plants require servicing frequently, i.e., after a fixed number of hours of operation. It is difficult to get trained staff for each of the power stations to service and overhaul them."

3.34. With regard to the extent to which the power stations had suffered and had to be shut down for want of spares which could not be imported, the representative of the Ministry of Irrigation and Power stated during evidence:—

“This point also has been troubling the group of Ministers. We have taken positive action about the breakdown of spare-parts supply; but a quantitative assessment as to how far the shut-down has been due to non-availability of spares, is a difficult one to make.”

3.35. The Member (Thermal), Central Water and Power Commission added:—

“It is not for want of routine maintenance spares that any of the plants are shut down. These break downs of a peculiar type take place and some delays occur. In respect of getting necessary foreign exchange and clearance to get spares there have been no avoidable delays. . . . . When we place an order with a foreign firm for a particular item, the foreign supplier cannot always supply the same from the shelf. Sometimes, they have to manufacture it and supply it. That necessarily takes 3-4 months. For want of routine maintenance spares, I can say that no plant has really been shut down. But unforeseen break-downs of a type are occurring for which manufacturers do take some time to supply spares. The Planning Commission and the Ministry of Finance are setting up a high-level committee to look into that. We want to see if we can have a Central pool of spares. This is being done on an emergency basis.”

3.36. With regard to the spares for the generators, the Minister of I&P had stated in Lok Sabha on 28th February 1973 while replying to a Call Attention Notice:—

“We are trying to get the spares as early as possible. Mainly the machines are from USA and West Germany. There were some machines in Delhi and Talcher which were imported from International General Electric from USA which were held up for spares. We got these spares. Unfortunately, those machines got broken, may be due to the faulty design. Anyway, it is too late in the day because the guarantee period is over. The machines have been waiting for spares for nearly 5 to 6 months. The worst thing was in Durgapur. There were two

West German machines in Durgapur and one at Bokaro—big 75 MW machines—waiting for the spares for some time. Unfortunately there was delay in bringing this matter to our notice. As soon as we came to know about it, we took action. Apart from the machines which I have mentioned earlier, as far as I know there are no other machines requiring spares. The only other machine I know of is in Satpura and for that also we have taken action. There is no machine for which we have not taken any action.”

3.37. In a memorandum submitted to the Committee by a State Electricity Board it had been stated that “many of the existing power plants are suffering for want of adequate imported spares. Efforts to substitute indigenous spares have not yielded satisfactory results. A lump sum amount of about Rs. 10 lakhs per year be placed at the disposal of each Electricity Board to enable it to judiciously utilise it for importing the proprietary spares of minor value not exceeding Rs. 10,000 per item, and fair items above Rs. 10,000 in cost extra foreign exchange should be sanctioned by the Planning Commission after detailed scrutiny.”

3.38. When asked what steps were taken to gear up the indigenous production of spares and to improve the quality, the Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence:—

“There is no special difficulty in finding foreign exchange for the import of spares. We released for these 4.5 crores earlier and this year the amount is 3.4 crores. Individual project authorities have been authorised to go straight to the Chief Controller of Imports, if they want spares to the extent of 1 per cent of the installed capital equipment. That gives them a fairly wide scope. That is with regard to existing power plants.”

3.39. With regard to the efforts made to substitute indigenous spares, the representatives of the BHEL added:—

“The manufacturing plants have the main difficulty of not being able to get the manufacturing design and production plans for spares which have been imported. Then there is no forecast of the possibility of spares which might be necessary in the course of operation of these plants. If these can be made available to the manufacturing plants, there should not be great difficulty in obtaining these spares.”

3.40. Asked whether there was not enough requirement of spare parts, he stated:—

“The plants are manufacturing to a certain design and the imported equipment may be of a different design. These design drawings and production drawings are not readily available to the manufacturing plants.”

3.41. To a query made by the Committee whether the design for the spare parts imported was given to the public sector undertakings, the representative of the Ministry of Irrigation and Power replied:—

“The position varies from plant to plant. Where we have got Russian and Czechoslovakian equipment, we have got collaboration and we can get design for local manufacture. In other cases, the foreign manufacturers who supplied us the plants, are not making the spares and are reluctant to give any design. In such cases, what we have to do is that we have to devise ways of manufacturing these. We are doing that. I am personally aware of certain hydro plants, where we prepared the necessary design and gave to the manufacturers.”

3.42. The representative of the BHEL added, “This kind of exercise will be necessary only when we do not get the drawings. I am also told that while duplicating the parts may be possible in some cases, it is not possible in the case of turbine plates and more complicated items.”

3.43. Asked whether any accounts were maintained to know the extent to which the power stations suffered due to shut-down for want of spare parts or due to under-utilisation so that economic implications could be known and whether any inventory was kept in respect of the spare parts, the representative of the Ministry of Irrigation and Power stated during evidence:—

“What happens is like this. For want of certain type of spare-parts, you have to stop the plant. Otherwise, for want of some spare-parts, you need not shut down the plant. You can go on operating it. Because of that, it is very difficult to segregate the causes. Our endeavour is that the plant should be hundred per cent operational.”

3.44. The Committee note that the Fourth Five Year Plan envisaged augmentation of installed power generating capacity from 14.3 million KW to 23.1 million KW. They are, however, deeply concerned to find that there is likely to be a shortfall to the tune of about 3.5 million KW during the Fourth Plan period.

3.45. The Committee are distressed to note that none of the power plans had achieved the targets envisaged. The First Plan was designed to add 1.40 MKW of power, the second 3.48 MKW, the third 7.04 MKW, the three annual plans (1966—69) 6.88 MKW, and the first three years (1969—72) of the Fourth Plan 4.13 MKW. The actual achievement during the plan periods was 1.12 MKW, 2.73 MKW, 4.52 MKW, 4.12 MKW and 2.60 MKW, which works out a shortfall percentage of 20, 36, 35, 38 and 37 respectively.

3.46. The Committee note that the shortfall in the plan has been mainly attributed to delay in the supply of equipment by indigenous manufacturers, non-availability of essential raw materials like steel, coal, cement etc. to the required extent and delay in the receipt of replacement parts from abroad. Delay in delivery of main equipment by HEIL, BHEL as well as civil works alone has resulted in shortfall to the extent of 3.25 MKW during the Fourth Plan period.

3.47. The Committee strongly feel that there is lack of proper planning and coordination between the Centre and the States in the matter of execution of the various projects undertaken by the State Government and between the various agencies like N.C.D.C., BHEL and HEIL, resulting in delays in supply of raw material and equipment.

3.48. The Committee observe that it has been admitted that grouping of projects by plan periods of 5 years has not achieved the desired results. The gestation period of a hydro, thermal or nuclear power plant is anything from 4 to 10 years. The second part of the ten year period is normally the part when the construction as planned would be coming in. The Committee, therefore, feel that the planning and execution of power projects should be a continuous process wherein a complete picture of targets to be achieved is always available in outline, and details are filled in as years progress. The Committee are in full agreement with the recommendation of the Power Economy Committee Report to the effect that advance action in respect of preliminary investigations and designs and estimates should be on a more definite basis and indicate the specific project to be undertaken and their time-table of the major stages. The plans and estimates for the first 5—7 years should be on a very definite basis at any time and prepared after detailed investigations so that any material change in estimates is avoided.

3.49. The Committee note that power is a basic infra-structure for building up the country's economic growth and development, and that shortfall in power impedes growth in the industrial and agricultural sectors.

3.50. The Committee, therefore, feel that there is need of a well-coordinated programme for power development correlated with the growth of industry, agriculture and other sectors which consume it.



3.51. The Committee recommended that having regard to the serious power shortage in the country, power should be given the highest priority next only to the operational needs of defence in the matter of allocation of funds and essential raw materials like steel, cement, coal etc. in the interest of economic development of the nation.

3.52. The Committee feel that as the power supply industry is capital intensive and the cost per kilowatt installed both for generation, transmission and distribution is increasing rapidly, it is important that the plan allocations are made in a more rational manner so as not to involve any significant variation in cost or time when implementation is taken up. The committee would in this connection reiterate their earlier recommendation made by them in their Thirtieth Report, 1962-63 (Third Lok Sabha) which is reproduced below:—

“Since the cost of installing 1 KW of electric power is but a fraction of the capital investment required to utilise it, it is obvious that if in any eventuality power generating capacity was under utilised, it would entail less overall loss to national economy than would be the case if productive machinery was to be rendered idle on account of power deficit. Past experience, in India and other countries, clearly shows that in a developing economy the demand for power nearly always outruns the available supply. Planning for surplus power is, therefore, essential for achieving an optimum rate of growth in the country. The Committee strongly recommend that power being a primary source of energy should be one step ahead of industrial and other requirements.”

3.53. The Committee are of the view that for the successful planning and implementation of power development it is necessary that a long range plan extending over a period of 10 to 15 years based upon realistic estimates of demand, optimal mix of hydro steam and nuclear generation, with adequate transmission system, taking into account the regional power system condition from time to time should be formulated.

3.54. The Committee are of the opinion that a scientific evaluation of projects should be made after a comparison of advantages of the alternative sources of energy/fuel—hydro, thermal and nuclear—and combination of them.

3.55. The Committee feel that an assessment of the indigenous machine building and design capacities and the time required for fabrication and delivery should be made with a view to planning imports wherever indigenous capacity is not sufficient to meet the requirements.

**3.56. The Committee are of the view that the projects included in any plan should be carefully scrutinised with a view to fixing a realistic target with reasonable possibility of achievement.**

**3.57. The Committee feel that there is need to have full and complete investigations carried out with regard to the projects, funds required, schedule of construction programme together with the requirements of raw material and equipment etc. in consultation with all the authorities concerned with a view to minimise delay in the sanctioning of the project.**

**3.58. The Committee feel that the State Electricity Boards should be required to place their orders with the indigenous equipment-manufacturers sufficiently in advance.**

**3.59. The Committee feel that the existing system of coordination should be reviewed thoroughly with a view to streamlining the existing procedure for scrutinising and sanctioning the projects and also to remove the bottlenecks, wherever they exist, in the implementation of the projects.**

**3.60. The Committee note that two teams of experts have been set up to visit different projects in the country both hydel and thermal. The Committee would like to be apprised of their findings and the recommendations/suggestions made by them together with the action taken by Government thereon.**

**3.61. The Committee note the steps taken by the Ministry of Irrigation and Power to obviate delays in the delivery of equipment, civil works etc. The Committee would like a Project Implementation Cell to function at the Centre as well in each State in order to watch closely the progress made in the execution of the projects to suggest remedial measures.**

**3.62. The Committee are unhappy to note that 9 projects in various States whose targeted dates of commissioning ranged between 1970-71 to June 1972 are being spilled over to 1973-74 because of delay in the supply of equipment by BHEL and HEIL and due to delay in civil works. The Committee have already emphasised the need for proper coordination and have for this purpose suggested setting up a Project Implementation Cell. The Committee, however, desire that necessary remedial steps should be taken to ensure that these projects are commissioned according to the revised schedule.**

**3.63. The Committee note the short-term and long-term measures taken by Government to maximise the utilisation of available generating capacity by streamlining the operation of the existing power plants. The Committee would like to be apprised how far these measures have achieved the desired results.**

3.64. The Committee are surprised to note that no inventory was being kept for spare parts and no data was being maintained to know the extent to which the power stations suffered due to shut-downs for want of spares or due to inferior quality of coal so that financial implications could be gauged. The Committee would like to emphasise that a proper procedure should be devised whereby the requisite data could be collected and maintained which might be useful to devise suitable remedial measures.

(ii) **Manufacture of turbines**

3.65. In a memorandum submitted to the Committee, they were informed that the largest single turbine produced in India had much lower capacity of about 200 MW against 1000 MW in US and USSR and 750 MW in Britain and Germany. When enquired as to what were the constraints in designing and fabrication of turbines of higher range, say, 500 MW especially when the heavy electrical plants had foreign collaboration, the representative of the BHEL stated during evidence:—

“The present licence agreements with both BHEL and HEL are only for 200 MW thermal sets. They would not face any difficulty in taking up development work on higher ranges with assistance in specific areas, and this is being examined, and in the forthcoming INDO-SOVIET Joint Commission, this will be an item which will be liked.”

3.66. The representative of the Planning Commission added:—

“There are technical limitations in each system and in each State grid in regard to the biggest size it can take. Presently, I do not think that there is any State grid which can take a 500 MW set; many State grids cannot take even 200 MW. It may be that Bombay city may be able to take 500 MW sets. But I doubt very much whether Calcutta can take it. So, there are several limitations of this type, and it has got to be a technical examination and not a question of producing a 500 MW or a 1000 MW set in a factory and installing it in a system.”

There are operational difficulties. A 500 MW set cannot be stopped or slowed down as and when you want it; its power production cannot be reduced as and when you like. Once you start it, it has got to run throughout the year and then you shut it down for overhauling. In the case of a 30 MW set, you may be able to shut it during the night-time and operate it during the day-time. But that cannot be done even with a 200 MW set.”

3.67. The Power Economy Committee had recommended:—

“The installed capacity in each of the four regions excepting the North-Eastern Region would be of the order of 10 million KW before the end of the decade. A generating unit of 500 MW would thus constitute only about 5 per cent of the regional installed capacity and it should, therefore, be quite feasible to instal such units in all the four regions of the country. Plans for manufacture, collaboration, import, installation etc., will take about 6 to 7 years. Action in connection with the installation of large sized units needs to be initiated immediately.”

3.68. The representative of the Planning Commission informed the Committee during evidence that a Committee had been set up to look into the question of evolving designs for 500 MW sets with a view to bring them into operation towards the end of the Fifth Plan when they expect to be in a position to put up 500 MW sets into operation. The demand pattern at that time will be such that 500 MW sets might be in a position to operate. To a query made by the Committee the representative of the Commission replied, “According to us, 200 to 300 MW should be the best in the present set-up.”

3.69. The Committee note that the Power Economy Committee have stated that the BHEL should concentrate on the 200 MW Unit size and also develop 500 MW Unit within the next 7-10 years but with sub-critical steam pressures, and one or two such large units could be put in operation in one of the regions in order to obtain experience on the prototype so that these large units could be put into operation in other regions also from 1981 onwards.

3.70. The Committee note that Government have set up a committee to look into the question of evolving designs for 500 MW sets with a view to bring them into operation towards the end of the Fifth Plan.

3.71. The Committee would like to be informed of the concrete action taken in implementation of the above recommendations of the Power Economy Committee.

### (iii) Inferior quality of Coal

3.72. Asked to what extent the use of inferior quality of coal and non-arrival of coal in time had aggravated the under-utilisation of capacity by way of damage to the equipment, the representative of the Ministry of Irrigation and Power stated during evidence:—

“In terms of the national policy of conserving resources, all the better coal is earmarked for use by steel plants etc. The

power plants have been obliged to use the most inferior fuel which cannot be used by anybody else. The power stations are obliged to burn washery by-products which have ash content as high as 40 per cent or even higher. That means that if we bring 100 tonnes of coal to the power station for burning, it is going to leave 40 tonnes of ash. Then there is a lot of harsh abrasive material in it. Because of this, in the eastern sector in large power stations, there is colossal erosion and abrasion of boilers and their auxiliaries. The wear and tear is extremely high in the fans and the coal mills. The coal has to be powdered in the coal mills and then blown into the furnace to give flame. The incombustible material in the coal remains as the ash. All this ash, along with the gas, has to go through the various boiler parts. That causes a great degree of abrasion at that high temperature and high velocity of gases with the result that these boilers suffer damage and require constant maintenance. They require spare parts more often than are required for power stations that burn better kind of fuel or oil. In the larger interest of the nation, we have to reconcile with the power stations having to work under those conditions. Because of the current power shortage, they have agreed for some time to allow the power houses to have much better quality than previously used. We have taken action in that direction and we hope that in the coming months our availability will be much better."

3.73. When asked whether supply of better quality of coal to the power houses would improve their working, the representative of the Ministry of Irrigation and Power replied in the affirmative. He, however, added: "About better quality of coal there are also technical limitations. In the modern boilers you cannot burn just any better type of coal. When the quality is much different, the plant naturally gets into trouble. You cannot burn metallurgical coal in these plants."

3.74. In reply to USQ No. 2179 answered in the Lok Sabha on 6-3-73, the Ministry of Irrigation and Power had stated that due to use of poor quality of coal, Bokaro Thermal Power Units had to be taken out frequently for maintenance.

3.75. Regarding supply of better quality of coal, the representative of the Ministry of Steel and Mines stated during evidence that they were in a position to produce and supply better quality of coal. He added, "But no body is prepared to move it. There is, therefore, fall in production in Bihar and Bengal."

3.76. The Officer on Special Duty in the Ministry of Irrigation and Power added, "the fuel policy is like that: the policy is that we should use only inferior quality of fuel."

3.77. To a query made by the Committee, the witness replied:—

"We have been very much seized of this question. There are two things—short term solutions and long term solutions. The group of Ministers formed for the purpose has been very effective for this. Improvement in the power generation by improving the quality of fuel was a point specifically taken up by us. We took advantage of this group of Ministers. The Calcutta Electricity Supply Corporation has been able to increase their generation by 20 megawatt with better supply of coal. Similarly in the case of Patratu, we have been able to step up generation. We hope to step up in respect of other power stations, if better coal supply is available."

3.78. During evidence the Member (Thermal), Central Water and Power Commission furnished the following information to the Committee regarding the extent to which ash contents had affected the working of the plants:—

"Between the range of 28 to 38 per cent for every 1 per cent increase in the ash content, there is about 2 per cent reduction in plant-availability. The estimated figures are:

Between 28 and 32 per cent there would be 1½ per cent reduction in plant availability;

Between 30 and 36 per cent there would be 1-1½ per cent reduction in plant availability."

He added:—

"Some studies are being made and we are trying to see to what extent we can keep down the ash content and how far the abrasive nature of the ash of the coals used can be minimised. This helps to minimise damage to the plant. When we say that these are the various parts of the plants which get affected, it means that we would not be able to maintain the combustion properly. Outage of the auxiliaries due to the working of the polluted atmosphere is also there."

3.79. The Power Economy Committee had made the following recommendation:—

“Utilisation of coal washery by-products is a necessity from the larger national view point both for improving the economics of coal supply and for disposal of the large volume of by-products. The abrasive content of the ash, however, plays havoc in the boiler or plant and equipment. Unless effective steps are taken for removal of stones and other abrasive materials and to reduce the percentage of ash content to 32 per cent of two by-products, it may become extremely difficult for the washeries which are owned by the Central Government to dispose of their by-products. In any case, the State Electricity Boards and other consumers would ask for substantial reduction in the cost of these fuels which would result in increased cost of coal for the steel industry.”

3.80. Asked as to what steps had been taken to remove the stones and other abrasive material and to reduce the percentage of ash content, the representative of the Ministry of Steel and Mines stated during evidence:—

“This recommendation of the power Economy Committee has been examined in the Department of Mines. We had constituted a Technical Committee on Coal Washeries. It has submitted its report in February, 1972. This Committee included representatives from the Irrigation and Power Ministry, Railways, CFRI, N.C.D.C., Hindustan Steel. This Committee has come to the conclusion that one of the solutions of the problem is to make two-stage washeries into three-stage washeries so that proper washing is done. One major problem is that more washing does not entirely do away with the abrasive content. So far no solution has been found to this problem. Part of the solution is better washing. Therefore, two-stage washeries are being converted into three-stage washeries.

Every time you wash it these impurities are reduced, less of stones are there and less of ash is there and that is why we have decided to convert two-stage washeries into three stage washeries.”

He added:—

The problem is in respect of abrasive content and middlings. There are two types of coal one is middlings and the other is raw coal which comes straight from the mines. The washed coal is used for steel making.”

3.81. Asked to what extent the ash content would be reduced by adding one more stage washery, the representative of the Ministry of Steel and Mines stated during evidence:—

“It will be reduced substantially. It is a decision which is yet to be implemented. For that, additional equipment is required. It should take a couple of years to implement this. Till, then the only alternative is to use only that coal which does not contain abrasive material.

3.82. The Committee regret to note that inferior quality of coal with heavy ash content, which is used by the Power plants, has seriously affected their working.

3.83. The Committee note that the recommendation made by the Technical Committee on Coal Washeries to make two-stage washeries into three stage washeries to bring down the percentage of ash content in coal is under examination of the Government. The Committee would like the Government to examine the recommendation of the Technical Committee expeditiously and to take necessary steps to implement it as early as possible. In the meantime, the Committee would like to stress that better quality of coal, which does not contain abrasive material, should be used as far as possible with a view to minimise the outage of the auxiliaries and to achieve the optimum generating capacity of the plants, as has been done in the case of Patratu and Calcutta Electricity Supply Corporation.

#### (vi) Inadequate Supply of Coal

3.84. Regarding the short supply of coal to the power stations, the representative of the Ministry of Irrigation and Power stated during evidence:—

“If I may refer to the performance of the power stations in the last three or four months, in the case the main power stations that had difficulties are those in Maharashtra particularly in Nasik, in Tamil Nadu, Ennore, in Bihar Patratu. Also Neyveli (lignite shortage) Ahmedabad had difficulties due to shortage of coal.

I may submit that we have been at it constantly. At our suggestion a control room has also been set up new in addition to revival of the Linkage Committee and it has been functioning for the last week. They meet everyday in the Railway Board to take a review of the coal supply position in the various power stations and where necessary divert coal movement from one source or another to meet the needs.



A year ago the requirements of the thermal power stations based on coal were met from the linked fields and the linked fields were fields attached to each power station on the basis of the decision of the Linkage Committee. The real trouble arose when Hydel Power in the North and South failed more or less by about 50 per cent and suddenly the Administration decided to use the reserve of thermal power capacity to make up the gap. To make up the gap, they had to ask for more coal and when they asked for more coal, they suddenly found that some of the coal fields could supply it and some could not. The question that straightway arises is that if the linkage coal field cannot supply the coal, from where is the coal going to come. Take the Maharashtra Stations which are in difficulties. This is a practical problem even now. Even if the NCDC supplies the maximum amount, it is not enough to keep the power station going in for increased production. So, they wanted power from the Central India coal fields. The Railways said they had a limited amount of rolling stock on these lines. You cannot suddenly ask them to produce more rolling. That is the present position. It is not that they cannot purchase coal. It takes some time to settle this kind of issue.

The Member (Thermal) CW&PC added,

“You are familiar with the difficulties being experienced today by the power stations getting adequate supplies of coal and the particular quality that they need. Once they set up a station in a particular field, it is automatically presumed that coal is suitable for that particular station. The co-ordinate of these two will help certainly in running the power station as well as the colliery in an economical way and also for supply of power from that particular station. In Madhya Pradesh all our stations are pit head stations and every station depends on that local coal, and the station is designed to burn that coal. I can tell you more about the Pathakhera Coal-field. The Electricity Board itself in the preliminary stages did prospecting of that coal-field. Later the State Government wanted to work that mine and supply coal to the Power station. Pathakhera has got no rail link. Whatever is raised must go to the power station. It is the only thermal station in India which has not got any rail link. It is about 13 miles away from Gova Dangri Railway Station and we are dependent entirely on the coal from the Pathakhera coal field. It is not that I am saying that the colliery should be handed over immediately, but with the co-ordinate working of the coal-field

and the power station results will definitely to better. Neyveli Power Station and the lignite mine are expected to be working in a coordinated manner. Madhya Pradesh's Korba Power Station is based on the Korba coalfield and there again there is lack of co-ordinated working of power station and mine. Pathakhera is a captive mine. Coal from this and from Korba Colliery cannot be used from any other purpose except power generation. The power stations and the collieries must work in a coordinated manner to produce better results."

He further stated:—

"Almost every station was suffering from wrong quality of supply of fuel. The Chandrapura Thermal station in D.V.C. got washery middling which had an abrasive material causing damage to the coal mill, fuel passages, etc. In some stations, the coal was not available at all.

They were not connected by rail. They were not getting coal in adequate quantities. We had to get coal by trucks. Now, such difficulties are being overcome and regular monitoring is being done. We have set up a Control Room in the Rail Bhawan consisting of the representatives of the Railway Ministry, the Ministry of Mines and the Ministry of Irrigation and power."

3.85. The representative of the Ministry of Steel and Mines stated,

"I would first of all like to clarify that power generation in the country has not, by and large, suffered because of lack of coal production. But it is lack of coal supply. If the supply is creating a problem, this kind of problem has been there for the last over three years. The production of coal has actually fallen in this country in 1969-70. We were producing 76 million tonnes of coal. It has come down to 71 million tonnes. It is only in industry where the production has fallen in a big way and the main reason is transportation. For example, first of all, there was the law and order situation in Bengal and Bihar, especially cutting of the overhead wires and looting of wagons parts. Secondly, the problem of Bengal has added to the difficulty of the railways. All these problems are there in the South, in the Andhra Pradesh, and the Railways are telling us that they cannot get the wagons back. Now the wagons movement is taking place because of scarcity of food-grains. In spite of all these difficulties,

railways are doing their best to move coal for steel plants and for thermal power stations. If enough wagons are available, we can move coal to any part of India in enough quantity. We have plenty of coal."

3.86. Asked about the position with regard to Patratu station, the representative of the Ministry of Steel and Mines stated,

"In so far as the coal supply to Patratu is concerned, on behalf of the Department of Mines, I can say without any difficulty that the coal supply is not coming in the way of full utilisation of the generating capacity. The requirements of the Electricity Board were mentioned at 90,000 tonnes per month and necessary arrangements were made not only for 90,000 tonnes but for 1,03,000 tonnes. NCDC has not only agreed to give what was agreed to be given earlier but they have also agreed to give more for another 50 mw unit when they commission it."

Explaining the position in respect of Satpura station, the witness stated:

"We have gone into it at great length. The total requirement of power house is 0.88 million tonnes. NCDC are committed to supply 0.6 million tonnes. Next year they will give 0.7 million tonnes and two years later the entire quantity. There was some misunderstanding. The M.P. Electricity Board could not place order on NCDC on a firm footing because M.P. Government were very keen to take over the mine and work it themselves. Later, Government decided that NCDC will continue to work this mine also. Previously NCDC were told that they should not take up new mines unless they have firm orders. Thus there was some delay in the development of the mine and consequently coal had to be got from the Pench Valley. Now we have got over these difficulties and there are going to be 3 mines. One is working to 95 per cent capacity. Another will be completed very soon. The third is catching up. The total production would be 1.2 million tonnes and the requirement is 0.8 million tonnes; there will be excess capacity after some years."

3.87. Asked whether any firm orders for the supply of coal were placed, the representative of the Ministry of Steel and Mines replied, "My submission is that the commitment was not made."

The Member (Thermal) CW&PC stated,

"An agreement need not be insisted upon as two public sector undertakings are concerned. Indication was given about the

requirements from the very beginning Indication in the sense that the requirements were clearly specified and moreover Satpura depends entirely on Pathekhedda and in the normal course there is no other source of coal supply for Satpura. The Electricity Board made out an agreement but the same was until recently not finalised by the NCDC. Insistence on an agreement between two public sector projects may not have to be insisted upon. None of the public sector units like Bhilai Steel Plant, Nepa Mills etc., have signed agreement for supply to the M.P. Electricity Board although power is being supplied to them since more than a decade. For each agreement, M.P. Electricity Board did not stop supplying power to the extent required. So, that is not the point. NCDC now supplies 50,000 tonnes to Satpura. Till the target of 70 to 75 million tonnes is reached, M.P. Electricity Board will obtain from Pench Valley which they are now doing. This involves transport for 13 miles from Ghora-langri, When this entire 0.88 million tonnes production comes up, the power stations requirement will be fully met by NCDC."

3.88. Asked what remedial measures were being taken by Government the representative of the Ministry of Steel and Mines stated:—

"There is no shortage of coal. Enough coal has been produced. But it is not possible to transport the required stock to the power stations all the time. There are temporary problems. You are fully aware of the problems in Bihar. We are not able to move coal which is being produced. The coal production had reached the figure of 76 million tonnes in 1969-70. Today it is about 71 million tonnes. It is one industry where production is falling and we have a capacity built up for 85-90 million tonnes. Coal is there and it can be produced, but the difficulty is of its moving."

3.89. In a subsequent note furnished to the Committee regarding the supply of coal, the Ministry of Irrigation and Power stated as follows:—

"At present, 10.2 million KW of thermal capacity is in operation and this will go upto 12.1 million KW by 1973-74. After allowing for all the hydro schemes which could be commissioned by the Fifth Plan, it has been found necessary to provide for additional 11.8 million KW of thermal plants so as to achieve the required capacity of 41 million KW within the short period of five years between 1974-79. The present demand for coal is of the order of 17 million tonnes which will go upto 24 million tonnes in 1973-74. Based on this

Ministry's draft Fifth Plan proposals the requirements of coal by 1978-79 are estimated at about 65 million tonnes. Although the thermal power stations would be distributed all over the country, there would be five major regions which would have to provide all the coal. These are Bengal, Bihar, Singrauli, Central India Coal fields, Pench, Maharashtra and Singareni.

It will be necessary to step up the production in the various collieries in the public sector and private sector to meet the above requirements. Considering that geological data collection and preparation of project report for additional capacity takes time and development of a mine takes five to six years, the lead time involved is 7-8 years. There is need to take action for planning and implementing schemes for expansion of the coal fields, so as to meet the projected requirements in time. The present demand for rail movement of coal is 9.5 million tonnes. A Committee has been formed to establish linkage of sources of supply for the power stations and this Committee has so far finalised the linkages for power stations that would be in operation by 1976-77 for which the coal requirements have been assessed at 39.30 million tonnes. Out of this, it is estimated that 27.58 million tonnes would require rail movement. There would be additional requirement of coal of the order of 26.30 million tonnes for the additional schemes. In the draft Fifth Plan proposals. Of this 15.48 million tonnes would involve rail movement. Thus, it is estimated that about 43 million tonnes of coal would involve rail movement by the end of the Fifth Plan. It is necessary that advance planning of rail facilities needed for the projected movements is taken up.

With large power stations, each requiring at least two to five full train loads of coal every day, the methods of mining, loading and unloading as well as transport will have to be revolutionised, introducing the latest modern techniques for efficiency and economy. Unit trains, possibly owned and operated by the power stations, as well as captive coal mines for the power stations may become an essential feature of the future set up. The administrative machinery and organisation for catering to these requirements have to be carefully considered and advance action initiated for these developments. The requirements of petroleum fuels will also grow as coal-fired power stations essentially require certain secondary oil fuels. Though every attempt will be made to keep these requirements to a minimum, the requirements in absolute terms are

bound to grow on account of large power installations and new modes of fuel transport, such as pipe lines or unit trains may have to be introduced at appropriate places. Sea transport will also have to be adopted particularly for fuel supplies to the coastal power stations which is estimated to be of the order of 2 million tonnes and suitable freight structure should also be evolved so that as compared to the freight cost from the nearest coal field, power stations are not put to extra expenses.

All the future thermal generation projects have to be based on low grade coal and washery by-products considering the economics of national resource utilisation. About 9 million tonnes of middlings which are by-products of coal washeries would be used by power stations in Eastern region by 1978-79. Experience has shown that due to higher content of ash and incombustible material in the middling obtained from two stage washeries, there is considerable wear and tear on the equipment resulting in frequent outages. This has to be remedied by supplying middlings with reduced ash content by setting up three stage washeries."

3.90. The Committee pointed out that a view was expressed that in order to ensure availability of coal in required quantity and coordination between the projects and the coal suppliers in the private sector, a coordination Committee comprising Secretaries of the Ministries of Railways, Department of Mines and NCDC might be set up.

3.91. Asked about the views of the Government and whether there was any machinery to ensure uninterrupted and adequate supply of coal to the projects, the representative of the Ministry of Steel and Mines agreed with the suggestion and added. "The Department of Mines have recently set up a Standing Linkage Committee where the representatives of the Ministry of Railway, CWPC, Planning Commission and coal producers to link the resources of coal supply with thermal power stations are there. Very wide terms of reference have been prescribed to review from time to time the coal requirements of the existing thermal power stations and establishing rational linkage with collieries for regular coal supplies and with washeries for the supply of middlings having regard to capacity for coal production, availability from the nearest source, the quality of coal required, the availability of transport, and the pattern of consumption of coal. The next is to plan supplies to already constructed power stations and to link with sources of supply, to advise from time to time regarding the planning and development of additional capacity of coal production, which should be developed in each coal field, having regard to the future thermal power stations, to examine from time to time

the extent to which the linkages already established between the power stations and the sources of coal are being observed, and introduce necessary changes to ensure their better observance, to advise the Government on the possibility of locating new thermal power stations having regard to the possibility of economic supply of coal and to examine matters that may be referred to the Committee by the Department of Mines, Ministry of Irrigation and Power, Ministry of Railways and Planning Commission regarding changes in the linkages and to advise the Government suitably in such matters.

3.92. We have agreed with the suggestion that such a Coordinating Committee is absolutely essential. There was a linkage Committee earlier, but it was an *ad hoc* one. Now, a Standing Committee has been set up to solve the problems that arise."

3.93. The witness added, "The Linkage Standing Committee was constituted only on the 6th January, 1973. . . . It will take account of the situation as it is today and suggest measures for immediate action. But the main point is that this Linkage Committee is not of the crash programme type; that is being done by the Control Room. A Control Room has been set up where all parties meet and try to solve the problem on crash programme basis. This Committee is a long term affair."

3.94. When enquired about the difficulty in stocking the coal for thermal plants where there was sufficient coal at pit-heads, the representative of the Ministry of Steel and Mines replied during evidence. "We have decided that in all consumers' centres including Railways, they should have at least 15 days' stock available with them." Asked whether Government was prepared to have their own stock, he replied, "So far, we had left this question to the State Governments. We have requested them to set up depots because we do not have a distribution system all over the country. Where we can have stock yards, we are now requesting the State Governments to open stock yards at different points in their States so that block movement of roads will be possible and coal in large quantities can be moved. "Some sort of Cooperative Society has to be formed which will take the responsibility of getting coal and then distributing it."

3.95. With regard to the question of linkage of power houses with the sources of coal supply, the representative of the Ministry of Steel and Mines stated, "In the past there has not been enough realisation that there should be firm linkage of power houses with sources of coal supply. I would submit that those who have to place orders for coal have realised it now. . . . Every year the power houses float tenders and invite quotations and then get coal. We have been pressing that there should be long term agreements between power houses and the coal suppliers and this is the only way of ensuring long term systematic supply of coal of the required

quality to the power houses and we have now taken steps to ensure this. We have requested the Ministry of Irrigation and Power to persuade Electric Boards to place long term contracts with suppliers of coal. Otherwise the mines cannot be developed and there have to be shifting of sources of supply from time to time."

3.96. Asked whether any inquiries were made from the State Electricity Boards or CW and PC with regard to their requirements for the next five years and make plan accordingly, he replied, "Yes...that is what exactly we do."

3.97. In a written note furnished to the Committee the coal requirements for the years 1972-73 had been assessed by the coal Fields Linkage Committee in their interim report as under:

Sl. No.	Name of coalfield	Actual supplies in 1970-71 (million tonnes)	Estimated demand in million tonnes		
			1971-72	1972-73	1973-74
1	Bengal/Bihar . . . .	8.67	9.82	11.76	12.11
2	C.I.C.				
	(a) Koria/Rewa . . . .	0.70	0.67	0.94	2.04
	(b) Koria . . . .	1.11	1.11	1.21	1.24
3	Ponch-Tawa-Kanhaan including Pathorkheda . . . .	0.99	1.46	1.69	1.74
4	Maharashtra Coalfields including Kamptee, Silewara, Umrer, Chanda	0.82	1.35	1.35	1.48
5	Talener . . . .	0.35	0.75	0.75	0.75
6	Singarani . . . .	1.30	1.61	2.66	3.22
7	Singrauli . . . .	0.45	0.67	1.07	2.18
TOTAL . . . .		14.39	17.44	21.43	24.76

3.98. The Committee note that power generation in the country has not by and large suffered because of lack of coal production but on account of lack of coal supply due to transport difficulties. The Committee further note that the coal production which had reached the figure of 76 million tonnes has fallen down to 71 million tonnes in 1969-70. They further note that the production is falling though there is a capacity built up for 85 to 90 million tonnes. Coal is there and it can be produced but the difficulty is of its moving.



3.99, The Committee would suggest that the Ministry of Railways (Railway Board) should arrange for enough wagons for transporting coal from the coal fields to the Thermal Power stations so that there is full utilisation of the generating capacity.

3.100. The Committee are greatly concerned to note that at a time when power is in acute short supply, some of the thermal stations have not been able to generate power to the maximum extent possible for want of assured supply of coal. The Committee feel that as coal has now been nationalised and the thermal stations are also in the public sector, there should be no difficulty in working out in detail the transport requirements of coal and for the Railways to provide the necessary transport on a regular basis in the larger national interests. The Committee cannot help feeling that the Control Room now set up in the Railway Board's office with representatives of the concerned Departments of Mining and Irrigation and Power etc. should have been constituted and made operative before power crisis assumed the present proportions.

The Committee are happy to note that a Control Room has been set up in the Rail Bhawan consisting of the representatives of the Ministries of Railways, Steel and Mines, and Irrigation and Power. The Committee hope that suitable remedial measures would be taken so as to obviate difficulties in regard to transport of coal. The Committee would also like to be apprised of the actual functioning of the Control Room in resolving the problem of coal supply.

3.101. The Committee note that the estimated coal demand of 21.43 million tonnes will go up to 24.43 million tonnes in 1973-74 and is further likely to go up to 65 million tonnes by 1978-79. They are, therefore, of the view that it will be necessary to step up production of coal in various collieries in public sector and private sector to meet these requirements.

3.102. The Committee note that having regard to fact that collection of the geological data and preparation of project report for additional capacity takes time and development of a mine takes 5 to 6 years, the lead time involved is 7 to 8 years. The Committee, therefore, feel that there is need to take action for planning and implementing the schemes for expansion of the coal fields so as to meet the projected requirement in time.

3.103. The Committee note that a committee has been formed to establish linkages of sources of supply for the power stations and this committee has so far finalised the linkages for power stations that would be in operation by 1976-77, for which the coal requirement has been assessed at 39.30 million tonnes. Out of this, it is estimated that 27.58 million

tonnes would require rail movement. There would be additional requirement of coal of the order of 26.30 million tonnes for the additional schemes in the draft Fifth Plan proposals. Of this 15.48 million tonnes would involve additional rail movement. Thus it is estimated that about 43 million tonnes of coal would involve rail movement by the end of the Fifth Plan. The Committee would, therefore, suggest that advance planning of rail facilities would be essential for the projected movements.

They would like this work to be done in great detail for the Fifth Plan so that Railways take necessary action in time and in an integrated manner to provide the requisite transport facilities on assured basis.

3.104. The Committee agree that with large power stations, each requiring at least 2 to 5 full train loads of coal every day, the methods of mining, loading and unloading as well as transport will have to be revolutionised, introducing the latest modern techniques for efficiency and economy. Unit trains, from specified mines for the power stations may become essential features of the future set up. The Committee would suggest that Government should carefully consider the administrative machinery and organization for catering to these requirements and initiate advance action for these developments.

3.105. The Committee agree that sea transport may have to be adopted particularly for fuel supply to the coastal power stations which is estimated to be of the order of 2 millions tonnes and suitable freight structure evolved so that as compared to the freight cost from the nearest coal field, power stations are not put to extra expenses.

3.106. In view of the fact that transport charges for coal are bound to be heavy and the fact that a national grid is being progressively developed in the country, the Committee would like Government to examine most carefully whether it would not be in the larger economic interest to locate the new thermal stations at the pit-heads.

3.107. The Committee stress that the decision should be taken in each case after most careful consideration so that power is generated and supplied at a most competitive rate to the public.

#### (v) Supply of Equipment by BHEL/HEIL

3.108. In their preliminary material, the Ministry of Irrigation and Power had furnished the following information with regard to the power plant and equipment:

“The additional generating capacity targetted to be commissioned during the Fourth Plan was 9.2 million KW comprising 4.9 million KW of indigenous plant and equipment and 4.3

million KW of imported plant. The indigenous suppliers were to supply 45 hydro generating machines (2.1 million KW generating capacity) and 30 thermal sets (2.6 million KW generating capacity). Against this, they have so far supplied 11 hydro units (totalling 0.31 million KW) and 16 thermal sets (totalling 1.23 million KW capacity). As per the latest indications, it is expected that the indigenous plant aggregating to about 2.7 million KW would spill over to Fifth Plan. The imported plant expected to spill over will be 0.8 million KW."

3.109. At the end of the Fourth Five Year Plan, the installed generating capacity in the country will be about 20 million KW. In the Fifth Plan, it is proposed to increase the installed capacity to 41 million KW. The doubling of the capacity calls for a vigorous and well coordinated effort on the part of all the agencies involved in the task of planning, progressing and implementation of the power projects.

3.110. For the successful implementation of power generation targets, plant and equipment to the tune of 4 million KW will have to be procured and erected by the executing agencies annually. The rated capacity of Heavy Electricals (India) Ltd., Bhopal and Bharat Heavy Electricals Limited for thermal and hydro sets is 2.7 million KW per year and 1.3 million KW per year respectively in addition to 0.235 million KW in turbo sets for nuclear plants.

3.111. The following thermal and hydro sets have been ordered so far on different units of BHEL/HEIL totalling to 10.85 million KW.

Thermal sets	No. of units	Total MW
30 MW . . . . .	4	120
60 MW . . . . .	9	540
100 MW . . . . .	6	600
110 MW . . . . .	15	1650
120 MW . . . . .	11	1320
200 MW . . . . .	7	1400
235 MW Nuclear . . . . .	2	470
SUB TOTAL . . . . .	54	6100
Hydro sets		
Hardwar . . . . .	34	1885
Bhopal . . . . .	45	2864
SUB TOTAL . . . . .	79	4749
TOTAL . . . . .	133	10849

Out of these sets aggregating to a capacity of about 1500 MW have so far been delivered. The programme for delivery as indicated by BHEL/HEIL is as given below:

Year	Thermal	Hydro	Total (MW)
Upto March 1972	1130	279	1409
1972-73	1080	482	1562
1973-74	1510	950	2460
1974-75	1705	948	2733
1975-76	595	1360	1955
1976-77	..	500	500
1977-78	..	230	230
<b>TOTAL</b>	<b>6100</b>	<b>2749</b>	<b>10849</b>

BHEL/HEIL have also indicated surplus capacity upto 1977-78 after completing the orders on hand as under:

Year	110 MW	120 MW	200 MW	235 MW Nuclear	Total
1974-75	3	..	..	..	3
1975-76	6	..	6	..	12
1976-77	6	3	6	1	16
1977-78	6	3	6	1	16
<b>TOTAL</b>	<b>21</b>	<b>6</b>	<b>18</b>	<b>2</b>	<b>47</b>
<b>MW</b>	<b>2310</b>	<b>720</b>	<b>3600</b>	<b>470</b>	<b>7100</b>

3.112. As far as hydro schemes are concerned, BHEL have intimated that they will supply the equipment for the following new Schemes for commissioning in the Fifth Five Year Plan:

**A. Heavy Electricals India Ltd.**

- |                           |                |         |        |
|---------------------------|----------------|---------|--------|
| 1. Idikki Extn.           | Kerala         | 1 × 130 | 130 MW |
| 2. Upper Sileru Extension | Andhra Pradesh | 2 × 60  | 120 MW |
| 3. Kalinadi Extension     | Mysore         | 21 × 35 | 270 MW |

<b>TOTAL</b>	<b>5 Units</b>	<b>520 MW</b>
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**B. Bharat Heavy Electricals Limited**

1. Balimela Extn. . . .	Orissa	2 × 60	120 MW
2. Kishtwar Stage I . . .	J&K	2 × 110	220 MW
3. Loktat Extn. . . .	Manipur	1 × 35	35 MW
4. Kameng . . . .	Arunachal	2 × 50	100 MW
5. Maneri II . . . .	U.P.	2 × 70	140 MW
6. Anandpur . . . .	Punjab	2 × 27·5	55 MW
7. Lower Pariyar . . . .	Kerala	1 × 70	70 MW
		12 Units	740 MW
TOTAL . . . .		17 Units	1260 MW

Due to longer time cycle in the implementation and preparatory design involved in each specific schemes, they have indicated their inability to deliver equipment by 1977-78 for the following schemes:—

Scheme	No. of Unit size in MW
1. Linganakki Dam Power House, Mysore . . . . .	2 × 27·5
2. Western Yamuna Canal, Haryana . . . . .	3 × 7·5
3. Kangan, J&K . . . . .	2 × 11
4. Gangabal, J&K . . . . .	2 × 15
5. Paralayar, Tamil Nadu . . . . .	1 × 35
6. Cholatipuzha, Kerala . . . . .	1 × 60
7. Nellithorai, Tamil Nadu . . . . .	1 × 50
8. Silent Valley, Kerala . . . . .	2 × 40
9. Kas/Pawna, Maharashtra . . . . .	1 × 10
10. Suruliar, Tamil Nadu . . . . .	1 × 35

3.113. Regarding the pumped storage schemes, BHEL/HEIL are still to acquire the know-how for this type of equipment. They have stated that if this facility is utilised for accruing the know-how, then orders should be placed on BHEL/HEIL even though for the initial sets there should be a larger import content to meet the deliveries desired. The Ministry's proposals include pumped storage schemes envisaging 13 sets (aggregating to 932 MW) for benefits in the Fifth Plan. For the remaining schemes aggregating for about 973 MW, BHEL have stated that sufficient details of the schemes were not available at this time and they will be able to supply that

during the Fifth Plan. From the above it would be seen that the following capacity remains uncovered by indigenous manufacturers:—

(Million K.W.)

	Total re- quirement for Fifth Plan Scheme.	Indigenous capacities	Balance uncovered
Thermal and Nuclear . . . . .	13.2	11.5	1.7
Hydro . . . . .	8.6	5.5 + 0.8*	2.3
	21.8	17.0 + 0.8	4.0

\*Already tied with impo.t.

3.114. The Committee invited the attention of the representatives of the Ministry of Irrigation and Power to their earlier statement that one of the main causes attributed to the shortfall in power was the supply of equipment by BHEL/HEIL and enquired whether the absence of any certainty in the availability of indigenous equipment it would be desirable to stop imports. The Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence: "There is no dispute that the development of energy is the most important problem. On the other hand, if we have a perspective planning, it is quite obvious that a large organisation like BHEL or HEIL have also to be given enough work to allow them to grow. The difficulty is to strike a balance between the necessity for Heavy Electricals industry to grow and the necessity for energy to be provided. We have contacted these people and discussed the problem. They have given us a programme of manufacture for the next seven or eight years, upto 1978-79. Apart from what they can do, we shall have to import the rest. If they fall down on their promise or their projections then, of course, we shall have to import even what they have now promised to prepare indigenously."

3.115. The Committee drew the attention of the representative of the Ministry of Irrigation and Power to the following recommendation of the Committee on Public Undertakings (1971-72):

"The Committee are greatly distressed to find that while on the one hand the Mid-term Plan Appraisal places the blame for shortfall in the installation of additional generating capacity on late-delivery of plant and equipment by public undertakings. Bharat Heavy Electricals have emphatically stated before the Committee the difficulties arising out of non-receipt of firm orders for

generating sets and equipment even though they have the capacity, the know-how and the skill to manufacture them. The Committee feel that the difficulty could have been easily got over by having an integrated plan for manufacture of generating sets and their delivery targets scheduled to match the plant requirements. The Committee consider that it should not have been beyond the ingenuity of the "Planning Commission, Central Government, State Electricity Boards, Public Undertakings to find means by which firm orders were placed, for generating sets and equipment a few years in advance so as to ensure timely delivery as well as full utilisation of the manufacturing capacity developed in the public sector."

3.116. Asked to comment, the representative of the Ministry of Irrigation and Power stated during evidence, "We are entirely in agreement with the suggestion made that there should be a very close coordination and the whole thing should function as if it is in one hand—the planning of the manufacture and the planning of the power projects. That would be the ideal condition under which we can utilise, on the one hand, the indigenous capacity of the manufacturers to the fullest possible extent and achieve self-reliance as quickly as possible and on the other hand, we can see to it that the power projects should get their plant and equipment without delays and they should be commissioned timely.

3.117. In this connection I might submit that we have been doing this exercise on a continuing basis in recent months with the Bharat Heavy Electricals and the Heavy Electricals India Ltd., and I have here a note, a comprehensive note, from them which gives in detail the planning that has been done and orders already placed with them for plant and equipment for the Fifth Plan and what is the additional capacity that after augmenting their manufacture capability they think they will have for the Fifth Plan purpose."

3.118. The Committee observed that this was not the first time that the Committee had laid stress on liaison between the different Departments. In 1962-63, the Estimates Committee had mentioned "The Committee consider that there should be a close liaison between the Heavy Electrical Limited, Bhopal on the one hand and the Central Water and Power Commission and the State Electricity Boards on the other." The Committee referred to the reply given by the Government that "necessary steps to ensure close liaison between the HEIL and the Central Water and Power Commission and the State Electricity Boards have been taken. One of the Members of the Power Wing of the Central Water and Power Commission is a Director of this company. The Chairman of the State Electricity Board has also been appointed on the Board of Directors some time ago." The Committee observed that after 10 years again these difficulties were felt. It was because still there was no proper coordination.

3.119. The Officer on Special Duty in the Ministry of Irrigation and Power stated, "The liaison is there and the liaison is strengthened all the time. But I would like to mention the difficulty which would probably show its head again. When we place orders on an organization like BHEL, HEIL, etc., which are growing, as I just mentioned, we have to take what they say as part of their planning as correct. It seems that they have their own problems. Sometimes, as is mentioned, their problem is getting experts from abroad or getting steel, etc., but at the same time whatever liaison there may be, we have to accept their planning as far as their output is concerned. The real answer is that BHEL and HEIL will have to update their production schedule."

3.120. With regard to the orders placed with BHEL, the representative of the Ministry of Irrigation and Power replied, "So far as the total picture is concerned, orders which are on hand with the HEIL/BHEL for thermal projects, they comprise of 33 sets comprising 4390 megawatts. All of them will be commissioned beyond March, 1974. For the hydel they have got orders on hand—59 sets totalling 4115 megawatts. Thus a total of 8.5 million kilowatts worth of orders are already in their hands for the Fifth Plan."

3.121. The author query made by the Committee whether these were firm orders, the witness replied in the affirmative.

3.122. Asked about the gap between the demand and supply, the witness stated, "That kind of gap has to be identified for individual projects. Where we find that all other factors are very favourable and we can very quickly by resorting to imports, commission additional plants, we go for that. Recently, last year, the Government took a decision in this matter for Koardi in Maharashtra where 2 sets of 120 MW were allowed to be imported. This was done after consultation with the Ministry of Industrial Development and all concerned and such imports were permitted. Similarly, where the civil works are well advanced and everything possible is done but the BHEL and HEIL are not in a position, for various reasons, to supply, then imports have been permitted." He added, "There are two aspects. One is keeping the order book of BHEL and HEIL full. That is, they require orders well in advance. As I submitted, we have already placed orders for about 8.5 million capacity, and also as the schemes get cleared from the Planning Commission, we are placing orders with BHEL and HEIL. On many schemes we are really restrained because the schemes have not yet been cleared by the Planning Commission. This is one aspect.

3.123. The Second aspect is about delay. My submission is that the delay may not be entirely due to BHEL not being able to manufacture; what they have explained in great detail is that they, in turn, have to depend



on import of sub-assemblies which are partly manufactured by their collaborators. In many cases, they were depending on Heavy Engineering complex, at Ranchi, but those things were not forthcoming and ultimately they had to rush out and place orders with foreign firms. It is those things that have delayed their giving the machinery in time to us. So, the fact remains that the delay in project competition has been due to delay in the supply of plant and equipment by these undertakings."

3.124. To a survey made by the Committee with regard to the orders placed with BHEL, the representative of the Ministry of Industrial Development replied, "I would like to tell the Committee that no orders were refused for want of capacity. Capacity was there. It was not our stand that there has been no capacity available. But what happened was, this was order placed by the State Electricity Board, the specification was revised at some subsequent stage. Naturally this led to some delay in delivery."

3.125. The representative of the Ministry of Irrigation and Power added, "I could also say that there has not been any refusal to accept orders. The only thing is, at times, there have been special cases where we wanted equipments very quickly. There they have indicated saying something may not be possible within the prescribed time-frame, and we had to resort to imports."

3.126. The representative of the Planning Commission added, "In the Planning Commission we also share their anxiety regarding the supply of plant and equipment. There have been some delays and the anxiety was felt right at the higher level and a higher power group under Mr. M. S. Pathak, Member, Planning Commission was set up and they went into the HEIL, their organisational methods, all these things have been gone into. Certain procedures and inventory controls have been introduced and the Committee has more or less come to the conclusion that by 1974 all the HEIL units would be going into full production and to safeguard against the non-delivery of castings and forgings from the indigenous sources, if I am not wrong, about 21 sets of castings and forging for the 110 megawatts and about 8-9 for 200 megawatts have been ordered in advance so that the tone of production is kept continuing irrespective of the development of the castings and forgings. This step was taken on the advice of the Action Group. There have been managerial changes and operational changes also and as I said, before we expect better results and better performance from HEIL, they at least are likely to disappear. As regards steel there has been shortage from all quarters and at a stage some import was allowed. I am not aware whether all the requirements were allowed to import. In that connection. I have been gathering data and a good deal of steel requirement has been sent to me, and which still requires to be imported, and they are for lines which have been under construction in the last two or three years, and some of them are vital for providing an outlet for some of the power

stations which will come into commissioning stage. So, there has been some slip somewhere. I am not very clear where it has been. It is not that delivery to Bharat Heavy Electricals and Heavy Electricals of steel and cement in time would see us through power shortages and there would not be any further delays in implementation of these power projects. For example, there are some projects for which plant and equipment was imported, and that plant and equipment is still in storage. There are some stored for about a year to 18 months or two years even. There are some organisational difficulties which require to be resolved... I would again reiterate the same thing and say that unless we reorganise our electrical industry, the State Electricity Boards, the project management, monitoring, purchasing etc., and unless all these things are put into a streamlined method, with any amount of timely delivery of plan and equipment, steel and cement, I do not think that we shall be able to get through."

3.127. To a query made by the Committee with regard to the imported equipment lying idle, the representative of the Ministry of Irrigation and Power stated, "There have been two or three projects where there has been delay in the use of the equipment imported. The first is Idiki in Kerala where civil works have been delayed entirely due to trouble with labour. The second is Lower Sileru in Andhra Pradesh where there is a big constraint on the financial position of the State Electricity Board. We are trying to help it in consultation with Finance and Planning Commission; we are pumping more money into the project so that execution can be expedited. Then there has been some delay in the Balimela-hydro-electric project in Orissa. But there also we have been able to expedite. The first unit is being commissioned in a month or so."

3.128. It had been brought to their notice of the Committee that the flow of orders from the State Electricity Boards was very erratic and did not always co-relate with the resources made available through State Budgets resulting in cancellation of the orders or deferment of deliveries. Often equipment brought by State Electricity Boards is not commissioned over years with the result that the operational guarantee is lost within the Storage Time. The Committee enquired whether such instances have come to the notice of the Government and whether the financial capacity to pay for the material ordered and the technical capacity for commissioning the equipment within the shortest possible time was not taken into consideration before the procurement was planned. The Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence, "These kinds of things have no doubt occurred and we want to avoid a repetition in the future. There is one additional thing that I may mention in this connection. The delay in placing orders is because of the delay in sanctioning of the projects by the Planning Commission. One of the causes that had been straining the resources of the State Electricity Boards

was that in the case of import of equipments, the terms of payment used to be that a very small advance is paid and the rest of the payment is made on delivery. BHEL had been insisting on very rigorous terms of payment, which required about 50 per cent of the cost to be paid, within 6 to 10 months of placing the order. This has been gone into very carefully. We have taken up this matter, a lot of discussions were held and as a result of that, these terms of payments have been agreed to be changed and I understand that orders are likely to be issued shortly by the Ministry of Industrial Development. That requires only 10 per cent to be paid as advance and the rest of the payment practically comes after the equipment is loaded. That will relieve the burden on the State Electricity Boards and they will be able to give more uniform flow of orders. The only other thing that is holding them back, is that some Boards in the past, in order to stake their claims and get funds quickly, have been trying to place orders even in advance of sanctioning of the projects. We are not encouraging this. We are urging the Planning Commission that the sanctions should come quickly so that the public sector undertakings can have uniform flow of order from different States."

3.129. With regard to the problem of setting up power equipment in the country, the representative of the Ministry of Industrial Development had stated during evidence:

"It is not merely the manufacturer of the power equipment who is solely responsible for getting power equipment into the spot, erecting it and commissioning it. There are various agencies involved and it is the combination of efforts of all these agencies that really give you ultimately the power that you require. I would like to place before you a few relevant facts in order to bring these into proper perspective. When I say, it is a combination of the efforts of the various agencies, I am referring to the agencies, such as the Ministry of Irrigation and Power which has the coordinating role in a subject, which is in the concurrent list. Power generation is also in the State list and the State Electricity Boards are the prime agencies which are responsible for implementing a power development programme. It is not merely the endeavour of the Irrigation and Power Ministry, or the endeavour of the Ministry of Industrial Development, but also the endeavour of the State Electricity Board which has to implement this programme of power development. When I say this, I would like to place before you some relevant factors.

In order to enable us to produce the power equipment required by electricity boards for installing it at a place, in respect of the

hydro sets, it is necessary to take note of the very highly unique specifications in respect of each hydro project. In other words, the various parameters involved in the hydro sets have to be furnished first to the power equipment production unit before it can be produced. Every hydro set is distinct in character because of the typical local conditions on ground which are so distinct and diverse. The hydro equipment has, therefore, to be tailor-made. There may be no two sets exactly a like in India. Therefore, the first pre-requisite even before the Irrigation and Power Ministry can plan anything, is that the absolute parameters of the hydro set requirements have to be furnished by the Electricity Boards. This takes its own time. The second aspect is, that even after this has been done, again the Electricity Board has a major role to play. They have to advance the money necessary for placing the orders without which we cannot produce sets. The manufacturing units have to produce something which is against a specific order with the necessary dimensional parameters, specifications as strictly defined by the Electricity Board. We are a young industry and are learning to build power sets. We must be given a little more longer lead time than would be given to power equipment producing industries in other countries who are highly advanced.

We have also to get a lot of raw material, components requirements etc., from suppliers. Sometimes the castings and forgings which are obtained by us after a long waiting period from indigenous or even foreign sources are defective in character. Suddenly we find that in a major casting, there are huge blow holes which have to be repaired. There are two alternatives, one is to reject these and ask them to produce the castings and forgings again, but this means further loss of time very often. We have developed techniques of repairing castings better than in most of the other countries. In fact this has been admitted by visitors from abroad. The Czechoslovakians have admitted after visiting our Hyderabad Unit that the repairs done here are better than in other countries.

We want a longer lead time. The Irrigation and Power Ministry are doing their best in this effort, but unfortunately when the matter trickles down to the Electricity Boards, the orders do not flow to us in time.

When the orders are placed on us, we produce these equipment. It so happens that in the case of thermal units, the equipment are little more simpler because by and large, there are common

parameters in the sets. Even here there are certain problems which we face before we can produce the equipment. One such is the problems of coal characteristics. . . . One of the problem that we face is delay in receiving information about the coal characteristics. The unit has to that extent to be tailor-made, particularly the boiler part of it, for getting the boiler to meet the specific characteristics of the coal to be used. Very often the coal used gets changed. These are all problems."

About the actual deliveries he added:

"60 MW unit that was ordered on the indigenous plant for Tamil Nadu State Electricity Board in March, 1966 was commissioned in 1970, 60 MW Unit for Delhi ordered in 1967 was commissioned in 1971. Another Unit ordered for Harduiganj Thermal Power Station ordered in February, 1967 was commissioned in March, 1971. A lot of imported equipment which was ordered for much earlier has been received much later and is still to be commissioned. It is not as if there is always major delay in respect of equipment produced here. Irrigation and Power Ministry has been very helpful to us. There are snags and if we take individual cases, we can explain them, but I do not think it would be necessary to do that there.

Coming to the Research and Development aspect, I would submit that we are building up skills. In fact, we are now nurturing an organisation called R & D Organisation for electrical industry which is closely associated with power production units. We want to reconstitute it into a very efficient and effective body like the Machine Tools Institute or some other similar autonomous body, where we would be able to do research and development specifically required in this field. I would submit that we are now poised for meeting the requirements of the country's power programme.

We have now organised ourselves to work in close unison with the Ministry of Irrigation and Power and also to the extent possible bringing in Central Water and Power Commission and the Electricity Boards in order to make sure that all the bottlenecks are removed. We have even looked at the problem of finance. What is required in the Fifth Plan has to be ordered during the Fourth Plan. Unless some streamlining is done in regard to the finance aspect, there would be delay, we are looking into this aspect also."

3.130. Asked how the indigenous equipment compared with the imported one, the representative of the Ministry of Industrial Development replied:

“So far as the thermal power stations are concerned—which constitutes the bulk of what the State Electricity Boards buy—I can say that the prices are very close to the landed cost of similar equipment. For one part *viz.*, Boilers I can even claim that it is lower than the landed cost of the equipment. But on the whole, the prices of the total equipment which the Bharat Heavy Electricals supply for thermal power stations are close to the landed cost of the equipment.

In regard to Hydro, in the past the prices have been higher, particularly because of the peculiar characteristics. There are certain conditions obtaining in India which make it difficult to compete with the international prices. But even here, we are today making efforts to see that our hydro prices are close to the international prices.”

3.131. To another query, the witness replied:

“We have contracts for the supply of 60 MW Turbo Generators; we have contracts for 100, 120 and 200 MW Turbo Generator sets also.

When it comes to 60 and 100 MW units, we have successfully concluded contracts with a variety of State Electricity Boards and we have convinced them that the prices are near about or are the same as the international market prices. If a further analysis is required by this Committee or by the Ministry of Irrigation and Power, I am prepared to submit it.

When it comes to the question of 120 MW units, there was a little difference and it was resolved satisfactorily by the Ministry of Finance and there can not be any complaint now.

When it comes to 200 MW, we are working out the prices and I can give an assurance that these prices are not likely to be very different from the international prices.”

3.132. In regard to the pricing, the representative of the Ministry of Industrial Development stated:

“First of all, I think, in regard to pricing we are tending to compare the prices in India with the prices that are quoted by foreign tenders, who usually get phenomenal subsidies from their own Government and sometimes their prices are almost ‘developing’ prices. Now, I would like to submit before you

that after all, both these Heavy Electrical Plants in India are producing not merely generating equipment but also 40 per cent of their effort is in producing transmission and distribution equipment like transformers, switch-gear and even traction motors, etc. Now, I am confident that in regard to these transmission and distribution equipment, they are competing with indigenous private firms with equal success. In fact, the prices quoted by us for some of these equipments—perhaps a large number of these equipments—are much more competitive than the prices quoted by the private sector units. After all you must look at the price perspective from the angle of view of the cost of manufacture of these equipments in India. We are able to compete with the indigenous manufacturers in industries where we are in competition with them. I agree that in this particular field we have a kind of monopoly, it is not because we chose to be monopolised but because very few private entrepreneurs are willing to come forward in such a highly difficult and sophisticated field which requires a huge investment. And further more, the absorption of skills in this field is a very difficult matter. As I said earlier, it takes a longer period to absorb skills and the investments are so high that I would like to look at it and compared with any well known motor car manufactured in India with the one manufactured in Germany or other country. Now if you compare the prices of these two, you will find the difference. So it will be invidious to compare our prices with the prices quoted by the highly advanced and industrialised country where steel is available at their command and other sophisticated components and parts are available easily while we have to pay higher prices for buying many of these parts and steel is not easily available in our country. Further, productivity of labour in India is not high, particularly in the highly sophisticated field of manufacture.

There is e.g., an item *viz.*, blade, it looks very simple, but every blade is specific in its own design. The skills that go into it are highly sophisticated and every turbine probably needs thousands of blades, each blade going into it is different and it is not the same as another. Therefore, the skill is so highly sophisticated that the costs go into it are not only of the material but it also the cost of absorption of skills, yet I say that in a fairly sophisticated field, for example, in a boiler manufacture, we have been able not only to tender but win a major tender worth more than Rs. 10.0 crores in an international tendering competition, we are today poised for building boilers for the Malaysian Government.

Now this proves that we are not fixing necessarily exorbitant prices on our equipment but it so happens that there are certain difficulties that we have to face and these difficulties naturally get into the field and ultimately affect the pricing pattern of these equipments but we have to address ourselves to tackle these problems.

There is a High Powered Pricing Committee and in this Committee, the customers are represented, customers like Irrigation and Power Ministry, Petroleum and Chemicals Ministry, etc. These Ministries buy a lot of equipment for their projects and after all the equipment is produced after taking into account all aspects of technical know-how to achieve precision and we are not pricing it simply because it is kept for stock and sale but we are pricing it on the basis of cost of production."

3.133. Asked to comment on the suggestion that a firm contract should be gone into from the date the letter of intent was issued to a manufacturer, if necessary with advance payment, after finalisation of the broad technical particulars and fixation of the price should be done, later with the assistance of a high level committee to be appointed by the Government, if necessary, the representative of the Ministry of Industrial Development replied:

"That we are not able to enter into firm contracts is not correct because we cannot do business without doing so. But if I am unable to enter into a firm contract in a few cases, I would request the agencies to help in the matter, rather than hinder the progress. We are keenly interested in entering into firm contracts, if possible at firm prices, but I would request the other organisation to help me in doing it."

He added:

"There are three stages. One is the stage at which the letter of intent comes. The second is when an advance of 10 per cent is made; (an order is not taken without this) and the third is when all the technical details are sorted out. Normally we expect an order from a customer on giving us all the technical details and on payment of 10 per cent advance and from that time onwards the delivery period starts."

3.134. Asked how the delivery period compared with the foreign fabricators, the witness replied:

"Our delivery period is around 6 to 12 months more than what the foreign delivery period is. I would say that it is 30—36 months. When I say 36 months, it is because of the peculiar situation obtaining in this country and we are one organisation



who supply that 5 or 6 people supply ancillary equipments. For each of the equipment, it may not take more than 24 months. We are imposing a discipline of supplying equipment in 36 months and Hydro equipment in 48 months.”

3.135. To a query made by the Committee regarding manufacturing of 60 megawatts units first and then 90 or 100 megawatts, the representative of the Ministry of Industrial Development replied:

“I have attempted to do it and with the cooperation of the Ministry of Irrigation and Power, we have reached a measure of success also. We had started with 60 megawatts capacity units and we went in for 100, 110 and 120 megawatts units. We dropped the 100 megawatts after making six units. Now we have got in our programme only 110 and 120 megawatts and 200 megawatts and we will not proliferate the number and the size.” He added, “We have examined these points and so far as the Fifth Plan is concerned, we expect that the power system would by and large, be operated with the additional units manufactured by all the three sets viz., 110, 120 and 200 megawatts. We manufacture 110 megawatt set at Hyderabad, 120 megawatt at Bhopal and 200 megawatt set at Hardwar. We are organising in such a manner that the total requirement of the three sizes of sets will be met adequately from the three units. We have recommended to the Government that in the next four-five years there should be a continuous manufacture of 200 MW sets. After that size, then we should start going for the next higher size. It may be 500; it may be any other size. This higher size set should be in operation sometime in 1979 or 1980. We have this suggestion for two reasons: (1) 200 size itself is a fairly big size set which is coming up. It is going to be in operation in 1975 or so. People should get used to it. (2) In my opinion, some of the manufacturing plants have suffered because of lack of standardisation. Before we started stabilising with the manufacture of 60 MW, we went on to 110 MW and so on. Hence the development of skill in the manufacture of works has suffered as also the development of confidence in the minds of the Indian engineers and technicians. We suggest for the next four or five years that we should concentrate on the manufacture of 200 MW units before we go on to the next higher size. By this method, we would have laid down a very proper and very strong basis for the manufacture of this equipment in this country. 200 MW size by all international standards is a very fairly larger size. We should not be in a great hurry to switch over to the larger size.”

3.136. Asked what percentage of production was being supplied to the Ministry of Irrigation and Power from these public undertakings, the representative of the Ministry of Industrial Development stated: "At present day levels, the total output from all these manufacturing units in BHEL is going to be of the order of Rs. 250 crores. Out of that, Rs. 70 to 75 crores of equipment would find its way to the various industries, like cement plant, paper plant, fertiliser plant, refineries, steel mills, traction on railways etc., and a variety of industries including small scale industries. I would place it at about Rs. 75 crores, against the total production capability of Rs. 250 in all these units."

3.137. He added the balance would go for power development to various State Electricity Boards. Clarifying the witness said, Rs. 170 to Rs. 175 crores. The same proportion would apply in the present level production. 35 per cent for Industrial use and 65 per cent for power development."

3.138. When asked whether the contribution from the indigenous manufacturing industry was not adequate, the witness replied in affirmative and added:

"The majority of what have contributed by HEIL/BHEL are for commissioning in the Fifth Plan period. The plants started production only during the Fourth Plan period, it took three to four years to produce the equipment and afterwards 1-1½ years are taken for erection. So what we are supplying today are likely to get translated as power equipment only in the Fifth Plan period. That is why our contribution in the Fourth Plan period by way of generating capacity available in the power stations is comparatively less. The efforts we are making now will get translated into working power stations only during the Fifth Plan. It has a long gestation period of 4-5 years."

3.139. In regard to the Fifth Plan period, the witness added:

"We are in touch with the Ministry of Irrigation and Power, more particularly with the Planning Commission. We are constantly aware of their current thinking on the subject. But we have a problem which I would request you to appreciate. We hear of targets of 40m, 42m, 36m, Econometricians say that it is 33m. We would like that some agency connected with this decide finally upon what is going to be the physical target. Based on this I can go and find out what exactly is going to our contribution. We have done our exercise. It is before the Government of India in the Irrigation and Power Ministry

and our own Ministry. If there is an agency which can tell us, 'Well we have examined your proposal. This is what we are accepting as realistic. These are the things which I am not accepting and we are going to get it from other sources.' If such a type of situation can come about, I think there can be progress. On the contrary, what I find today is that every week one isolated proposal comes up. Somebody says the industry cannot produce; we have got to import from one or the other source. I really do not know what is behind that and what is coming up afterwards. We do not have much of orders. We start the argument and more time is spent on that rather than in our knowing the whole picture. If there is one agency of Government which can bring us all together and say 'This is your role', then I can say whether I can fulfil it. My role is to manufacture power equipment required in the country and left to myself, I will do it and be answerable to that. But in the absence of that, piecemeal proposals come and we spend more time arguing a thing. This is a submission I would like to make.

So while we are constantly in touch with developments in the country, in the thinking that is going on with regard to the Fifth Plan power requirements, we are constantly readjusting our ideas of our requirement with the result that there is no clarity or finality in regard to what exactly in the total requirement of the Fifth Plan and what is expected of us. If the Government think that they can get only 80 per cent of what I am saying and the 20 per cent is going to be got from elsewhere, or if they say that we can give only 50 per cent, atleast that clarification will help me to organise myself in a better manner to fulfil my role and my target."

3.140. To a query made whether any proposal for requirement of 500 MW units had been received either from the Planning Commission or the Ministry of Irrigation and Power, the representative of the Ministry of Industrial Development replied, "To the best of my knowledge we have not discussed a concrete scheme regarding the 500 MW unit being installed."

3.141. The Committee desired the representative of the Planning Commission to clarify the position whether there was any coordination between the various Ministries concerned, the representative of the Planning Commission replied.

"We had discussed this in our earlier sittings whether our systems could take 500 MW or not. There are no definite proposals

to put in 500 MW sets either in the Ministry's Fifth Plan or the decade plan, nor has the Planning Commission asked the BHEL to manufacture 500 MW. What we have asked the BHEL and the Ministry of Industrial Development is to set up study teams to evolve designs for 500 MW sets, so that we could have a prototype going into operation towards the end of the Fifth Plan, and that team is already functioning."

To a query made whether, with the capacity of BHEL and HEIL with the existing size of units, it would be feasible to generate the capacity, the representative of the Planning Commission replied:

"Based on the Ministry's Fifth Plan, BHEL were requested to carry out an exercise, and they have carried out an exercise, according to which they have indicated that they can supply all the plant requirements of the Ministry's plan during the Fifth Plan period, except for small hydro-sets which are of odd sizes, one set of 30 MW or another set of 15 MW etc., which have also been listed by them in respect of which it has been stated that it will be advisable not to manufacture them in BHEL, because of certain reasons. That exercise has been carried out and it has been communicated to the Ministry of Irrigation and Power, to the Planning Commission and to other Ministries concerned."

3.142. Asked whether any definite idea had been given to the Ministry of Industrial Development so that they may start thinking about it now on, the witness replied,

"We have already applied our mind to this question and we have asked them to set up teams to evolve designs for 500 MW because we see or we foresee that in the Sixth Plan, we would require 500 MW sets or sets of higher ranges. That decision has been taken and they are working on it.

As for the Fifth Plan, the Planning Commission's exercise which was put into approach for the Fifth Plan indicates a target of 33 million KW as against 42 million KW indicated by the Ministry's Fifth Plan. Probably, the money available will allow us to work only upto 36 million KW. This is not a final figure. I am just indicating the thinking of the Planning Commission. As regards this 36 million KW, the schemes that have to be fixed are being fixed up, and that exercise is being carried out. Soon, the Ministry of Irrigation and Power, the Planning Commission, the BHEL and the Ministry of Industrial Development will sit together in working groups and steering groups

on power and finalise the programme; at that stage, we shall take a view of what BHEL can supply to suit our programme.

3.143. To another query made by the Committee, the representative of the Planning Commission replied,

“As regards whatever goes into operation during the Fourth Plan, most of it was ordered during the Third Plan period, because each station takes about five to six years to go into operation, so that whatever is ordered in the Fourth Plan will go into operation in the Fifth Plan period. Whatever has gone into the Fourth could not have been delivered by BHEL because they went into operation only in the Fourth Plan.”

3.144. The Committee wanted to know whether both BHEL and HEIL would be able to supply the equipment needed to achieve the Fifth Plan targets with their existing capacity. The representative of the Ministry of Industrial Development stated:

“With the equipment that have been ordered abroad and also those ordered from BHEL and HEIL, the total power generating capacity that will be achieved when these fructify and these power stations are completed is of the order of 32 million k.w. I do not know the exact figure. . . . If that target is 36 million k.w. the difference between 36 million k.w. and 32 million k.w. namely 4 million k.w. is the additional capacity for which we have to procure equipment in order to be sure that it is installed before the end of the Fifth Plan period. So, the exercise that has got to be made is in regard to this additional 4 million k.w., in what sizes the generating sets would be whether it is possible to get them from BHEL and HEIL. That exercise has been made, and that is what we have presented in October 1972 and it is for us to decide whether this can be met from Indian sources with the efforts that we have made or with added efforts or whether they have to be imported; a decision has to be taken in this regard.”

He added:

“We have the installed manufacturing facilities. We have the engineering capability and so long as manufacturing facilities are reasonably utilised, we will be able to meet the requirements of 36 million kilowatts. Only a few specific schemes may not be able to be completed by the end of the Fifth Plan period and we will have to locate alternative sources.”

3.145. The Power Economy Committee in their Report had observed:

“There have been considerable delays in the past in the supply of generating plant and equipment by the manufacturers. In so far as turbines and generators are concerned, these are now to be supplied chiefly by the two heavy indigenous electric manufacturing factories viz., M/s HEL, Bhopal and M/s. Bharat Heavy Electricals. It is suggested that the Ministry of Irrigation and Power should ensure that there is a smooth flow of orders suiting the capacities and stages of development of the two manufacturing units from time to time. The Ministry should plan the major items of plant and equipment for each project suitably on these manufacturing units, taking into account the requirements of the project in respect of similar units, schedule of construction etc. Sometimes considerable time is lost in negotiating prices with the above two Public Sector Undertakings. It is a fact that the prices of turbo-generators and other equipments supplied by these undertakings are comparatively much higher than the imported plant and equipment. One of the main reasons for this is that we are dependent on foreign designs and technology and have to import some of the most basic components of the plant. This would point out to the urgent need of organising design sections in the public heavy electrical manufacturing undertakings so that we should be able to evolve our own designs rather than be dependent on the collaborators for designs for all times.”

The Power Economy Committee had recommended:

“that the Ministry of Industrial Development and Internal Trade should look into the matter immediately and if necessary appoint a High-Level Committee to examine the prevailing status of designs work and to suggest steps so that it may be possible to produce designs for all types of generating plant and electrical equipment indigenously at the earliest possible date.”

3.146. Asked whether the matter had been taken up with the Industrial Development Ministry and if so, with what results, the representative of the Ministry of Industrial Development stated during evidence:

“In each of our Heavy Electrical Plants at Bhopal, Hardwar and Hyderabad and in the boiler plant at Tiruchi we have right from the beginning a full-fledged designs organisation. We selected a large number of Indian engineers and technicians and got them trained both in India and in the collaborating countries of

Soviet Union, U.K. and Czechoslovakia. While we are happy that in all these plants we have a full-fledged designs and engineering organisation, but I would not say this is complete. We are continuously in the process of extending the designing and engineering activities. At present in each plant we have a minimum of 250 to 300 engineers and technicians in this work. In Bhopal, the total number of people in the designs department is more than 400 and in Tiruchi 300. In Hardwar engineers in the designs department constitute more than 200. The total number of designs staff there is 450. In Hyderabad also it is about 250.

It is true we entered into collaboration agreements with some of the leading manufacturers abroad because this is highly sophisticated equipment and we could not have started from scratch. We had licence agreements with a number of firms who had supplied to us the initial designs data and also kindly trained our staff. Once we got the design data, we are continuously updating it and with the basic information and knowledge we have gained, subsequent developments are being attempted in them. If the Committee wants, I would submit a list of the achievements to the credit of this designs organisation in the various units. But a lot of original work has been done. The first thing was to translate the material specifications to suit Indian materials. That has been completed in most of the projects. If the original design is for a particular size of a unit and if our requirement is different, we were able to adapt those designs to suit our requirements."

3.147. Observing that one of the reasons for delay in the power projects was stated to be delay in the designing and delivering the equipment on schedule, the Committee wanted to know the reasons for delay in the supply of generating equipment plants in so far as the turbines and generators were concerned and the reasons for increase in the price of equipment at the time of delivery. The representative of the Ministry of Industrial Development stated:

"The manufacture of power equipment in this country is of very recent origin. It started only in 1967. It is a highly sophisticated equipment and it takes some time to develop the skills and the confidence amongst the Indian engineers, technicians and artisans. I agree in the last three or four years there have been a few instances where delivery promises have not been kept up. The delay could have been avoided in a few cases. But considering the achievements in this field in the various more advanced countries, I submit that you should not be little the

achievements of the Heavy Electrical Plants, particularly in their infancy in the last three or four years. There have been delays in the initial years but they have been coming down and probably in another 6 months or one year, there will be no question of any delay. The bulk of the delays in the early years has been in the case of hydro stations where every equipment had to be tailor-made and designing has taken a long time. There is no standard source from which we can get the materials. The main reason is the other infrastructure facilities in this country have not kept pace and casting, forgings and special steel are not available. We have to run from country to country for these things. These were our initial problems and there were some delays. But now the delays have come down. Currently we have given some assurances about supply and we are trying our best to keep up to those schedules.

It is not a very unusual phenomenon in this particular field. I might also amplify and submit not as a sort of supporting what has happened but it is not an unusual phenomenon in any part of the world where, for instance, we ourselves have been banking on a number of components and other things from other countries. I do not think that in all these things we get supplies from the more advanced countries like U.K. in time. There was a lot of delay. It is our earnest desire to see that these things do not recur again. In fact, we have introduced an internal discipline that we will put a firm delivery period which will not be different from the delivery period quoted by international manufacturers.

Here it is said that the prices are being raised at the time of delivery. I am unable to understand what exactly is the problem. We do enter into a contract with the customer but once the contract has been entered into, I do not think there has been any instance of increase in the prices. But all contracts have a price variation clause that if there is a statutory increase in the wages, if there is an escalation of prices in the inputs, we have got a price variation clause. That is the international practice. That is the practice in our country also unless the contract is a firm price variation clause. That is the international practice. That we do adjust the prices. It is not as a matter of course that the prices are being changed as the contract is being executed. I do agree that there have been a certain amount of slippages in the supplies in the past. But I assure you that these things will be stopped and to say today the power crisis is only account of such delays, will not be correct for the simple reason that a majority of the supplies were promised from 1973-74."



The witness added, "So far as the machines are concerned I would assure that our organisation would take care of the commitments that we have entered into with the State Electricity Boards and also the future demands that are likely to arise in the country."

**3.148.** The Committee are unhappy to note that one of the reasons for the shortfall of power as compared to capacity targets was the delay in the delivery of plant and equipment by the BHEL and HEIL which were two important undertakings in the public sector.

**3.149.** The Committee are greatly distressed to note that in spite of the stress laid earlier by the Estimates Committee and the Committee on Public Undertakings, as far back as 1962-63 and 1971-72 respectively, on close coordination and integrated plan for manufacture of generating sets to match the plan requirements, there has been no tangible achievement in coordinating closely the working of these undertakings with the authorities responsible for power development in the country. The Committee, therefore, feel that a sense of participation and involvement in the planned development of power leaves much to be desired.

**3.150.** The Committee have elsewhere in this Report commented upon the delay in the delivery of main equipment by HEIL/BHEL as well as civil works which alone resulted in shortfall to the extent of 3.25 MKW during the Fourth Plan.

**3.151.** They note that the Committee on Public Undertakings had occasion to examine the Heavy Electricals (India) Ltd., and Bharat Heavy Electricals Ltd., and had recommended in their 19th and 21st Reports (Fifth Lok Sabha) that Government should consider the question of transferring the administrative control of these two undertakings from the Ministry of Industrial Development to the Ministry of Irrigation and Power as the latter are the main users of the power machinery. Since then a new Ministry of Heavy Industry has been constituted at the Centre, and the two Public Undertakings—Heavy Electricals (India) Ltd., and Bharat Heavy Electricals Ltd., have been transferred to this new Ministry. The Committee would like to bring pointedly to the notice of Government that there continue to be heavy delays in delivery of machinery and equipment to the State Electricity Boards by the Heavy Electrical Industries with the result that the power generation programme in the Fourth Plan has greatly suffered. The Committee would like Government to ensure that advance orders for generating sets and other machinery are placed on these undertakings and that every effort is made to adhere to the time schedule for delivery. The Committee would also like members of CWPC who are represented as Directors on these undertakings to keep a close watch on the manufacturing programme of these undertakings in order to see that the delivery schedules are strictly adhered to.

3.152. The Committee have also expressed their unhappiness over the 9 projects in various States whose targeted dates of commissioning ranged between 1970-71 to June 1972 being spilled over to 1973-74 because of delay in the supply of equipment by BHEL/HEIL and delay in the civil works.

3.153. The Committee need hardly emphasise that close and continued coordination between the organisations charged with the responsibility for power development in the country and the manufacture of plant and equipment at all levels is vital in the context of rising demand not only from the traditional users in the industrial sector but also from the agricultural sector and rural areas.

3.154. The Committee, therefore, feel that in view of the experience gained, it is high time that the existing arrangements for coordination at all levels are reviewed in their entirety with a view to gearing up the machinery and streamlining the whole arrangement to ensure that the delivery of plant and equipment and other raw materials are according to the schedule so as to ensure smooth and uninterrupted progress in the power development programme.

3.155. The Committee need hardly stress that any shortfall in the achievement of programmed targets would seriously affect the growth of both the industrial and agricultural sectors resulting in a setback in the country's economic growth.

3.156. The Committee are unhappy to note that as against 45 hydro-generating machines (2.1 mkw generating capacity) and 30 thermal sets (2.6 mkw generating capacity) only 11 hydro units (totalling 0.31 mkw) and 16 thermal sets (totalling 1.23 mkw) had been supplied by the indigenous manufacturers and that indigenous plans aggregating to about 2.7 mkw would spill over to the Fifth Plan.

3.157. The Committee regret to note that out of the 54 thermal sets (totalling 6100 M.W.) and 79 Hydro sets (totalling 4749 M.W.) ordered with the different units of BHEL/HEIL, only sets aggregating to a capacity of about 1500 MW had been delivered so far, and the remaining sets aggregating to the capacity of 9349 M.W. are proposed to be supplied in a phased annual programme upto 1977-78. The Committee hope that the remaining generating sets would be delivered by BHEL/HEIL according to the schedule.

3.158. The Committee note that a Committee of Ministers headed by the Minister of Finance and Power, U.P. had been constituted to assess the capability of indigenous manufacturers to deliver the equipment required for the power generation programme of the Fifth Plan and to obviate delay in

the delivery of the equipment. The Committee would like to be apprised of the recommendation/suggestion made by the said committee and the action taken by Government thereon.

3.159. The Committee note that apart from the aforesaid committee, the Ministry of Irrigation and Power had constituted another committee to watch the progress of manufacture and supply of power generating equipment by HEIL/BHEL under the Chairmanship of the Vice-President, Central Water and Power Commission. The Committee would like to be apprised of the results achieved.

3.160. The Committee note that the requirements of steel and cement have been assessed for the Fifth Plan generation programme. The Committee desire that timely action should be taken to place the requirements with the suppliers well in time and the progress of supply orders watched closely to ensure the delivery according to schedule.

3.161. The Committee are surprised to find that while on the one hand late delivery of plant and equipment by BHEL/HEIL has been attributed as one of the major reasons for the shortfall in the projected targets and completion of the projects according to schedule, on the other hand it has been claimed by the Ministry of Industrial Development that no orders were refused for want of capacity and that the flow of orders was erratic. The Committee have already emphasised the desirability of placing firm and continuous flow of orders with the indigenous equipment manufacturers well in advance to obviate delay in their delivery.

3.162. The Committee are unhappy to note that the plant and equipment imported in certain cases was still lying idle for more than two years due to some organisational difficulties required to be solved. This again goes to show faulty planning on the part of the planners. The Committee would like to reiterate the desirability of reorganising all the segments in the electricity industry, the project management, monitoring and purchasing systems etc. so as to follow a streamlined procedure.

3.163. The Committee desire that immediate steps should be taken to ensure that the plant and equipment lying idle are put to use without delay and the Committee apprised of the final position in this regard.

3.164. The Committee note that with a view to obviate delay in the commissioning of certain projects, equipment was allowed to be imported. The Committee feel that though every effort should be made to accelerate the growth of the capability of BHEL/HEIL and their feeder projects so that the requirements are met indigenously, the execution of the schemes/projects should not be held up and where the indigenous manufacturers are unable to cope with the needs of the power supply industry, imports of

the plants and equipment may have to be allowed to the extent necessary in view of the widening gap between the demand and supply of power.

3.165. The Committee feel that it would be the responsibility of the Ministry of Irrigation and Power to assign priorities to the programme for the manufacture of equipment for various projects matching with the requirements in consultation with the concerned authorities.

3.166. The Committee are in agreement with the views of the Power Economy Committee that the Ministry of Industrial Development should plan the major items of plant and equipment for each project suitably on the manufacturing units, taking into account the requirements of the project in respect of similar units, schedule of construction etc.

3.167. Sometimes considerable time is lost in negotiating prices with the above two Public Sector Undertakings. It is reported that the prices of turbo-generators and other equipments supplied by these undertakings are comparatively much higher than the imported plant and equipment. One of the main reasons for this is that we are dependent on foreign designs and technology and have to import some of the most basic components of the plant. This points to the urgent need of organising design sections in the Public heavy electrical manufacturing undertakings so that we should be able to evolve our own designs rather than be dependent on the collaborators for designs for all times.

(vi) Investments made during the Plan periods

3.168. In their Annual Report for 1971-72, the Ministry of Irrigation and Power had stated:

“The investment in the power sector upto the end of the Third Plan was Rs. 2,350 crores. The average annual expenditure during the three year period 1966-67 to 1968-69 was of the order of Rs. 418 crores, bringing the total investment on power sector to Rs. 3,604 crores at the beginning of the Fourth Plan. The allocation for Power Sector in the Fourth Plan is Rs. 2,523 crores, including Rs. 75 crores in private sector. During the first two years of the Plan a total expenditure of Rs. 983,07 crores was incurred and it is anticipated that during the current year an expenditure of Rs. 528,97 crores will be incurred, bringing the total expenditure in the three-year period to Rs. 1,512,04 crores, which is about 63 per cent of the Plan allocation. The investment on power at the end of the year 1971-72 would be of the order of Rs. 5,116 crores.”

3.169. In their preliminary material the Ministry of Irrigation and Power had furnished the following information with regard to the investment in the Power Sector during the Five Year Plans:—

“Investment in electricity utilities at the beginning of the First Plan was Rs. 150 crores, less than half of which was in the Public Sector. The investment in self-generating industrial establishments was about Rs. 40 crores. The total investment on Power was thus Rs. 190 crores at the beginning of the first Plan. During the first plan the total outlay on power development was Rs. 302 crores—Rs. 260 crores in State-owned utilities, Rs. 32 crores in company-owned utilities and Rs. 10 crores in self-generating industrial establishments. Corresponding figures for the second Plan are Rs. 525 crores, Rs. 460 crores, Rs. 37 crores and Rs. 28 crores respectively. The figure of Rs. 460 crores includes investment by the Damodar Valley Corporation and some State Electricity Boards from their own resources. Thus the total investment on power into the end of the second Plan was Rs. 1017 crores. In the third Plan, the total investment on power was Rs. 1334 crores comprising Rs. 1252 crores in the public sector, Rs. 72 crores in the private sector and Rs. 10 crores for self-generating industrial establishments. The investment on power during the three Annual Plans for the years 1966—69 was Rs. 1253 crores comprising Rs. 1183 crores in public sector, Rs. 40 crores for self-generating industrial establishments.

The investment proposed in the Fourth Plan on power is Rs. 2522.75 crores comprising Rs. 2447.57 crores in the public sector and Rs. 75 crores in the private sector. The allocation for 1969-70 was Rs. 372.13 crores against which the actual expenditure amounted to Rs. 460.85 crores. In 1970-71, against an allocation of Rs. 482.40 crores, the actual expenditure was Rs. 512.75 crores. In 1971-72, against an allocation of Rs. 528.97 crores, the anticipated expenditure is Rs. 574.74 crores. In the first three years of the Fourth Plan the expenditure would aggregate to Rs. 1548.34 crores against an allocation of Rs. 1383.49 crores. Thus a balance of Rs. 276.2 crores would only remain from the total plan provision of Rs. 2447.57 crores for 1973-74. However, it is unlikely that the expenditure during 1973-74 would be less than that for 1972-73. Thus, an additional allocation of about Rs. 350 crores would be necessary. To this must be added the expenditure on advance action on some of the Fifth Plan schemes on which work has to be initiated at once and progressed.

*Investment on power during the Plans*

	Investment during the investment period	Total at the end of the investment period.
Pre—I Plan . . . . .	190	190
I Plan . . . . .	302	492
II Plan . . . . .	525	1017
III Plan . . . . .	1334	2351
1966-67 } 1968-69 }	1253	3604
IV Plan . . . . .	2523	6127

3.170. In a subsequent written note the Ministry of Irrigation and Power had furnished the following information with regard to the Budget allocation asked for in the Third and Fourth Five Year Plans, the allocations made by the Ministry of Finance and the actual amount spent :

“From the Second Plan onwards, the expenditure on power development sector has always been more than the provision made in the Plan. During the Third Plan, the actual expenditure was Rs. 1252.29 crores as against the Plan provision of Rs. 1039 crores. During the subsequent three Annual Plans (1966-67 to 1968-69) the actual expenditure was Rs. 1208.14 crores as against the total Plan provision of Rs. 1065.49 crores.

For the Fourth Five Year Plan, the Ministry of Irrigation and Power constituted in April 1968 a Working Group on Power to formulate the power development programme. On the basis of the demand which was then anticipated to develop in the country by the end of the Fourth Plan, the Working Group had recommended a target of 26.14 million KW of aggregate installed generating capacity. For this programme, the working group had recommended a provision of Rs. 3462 crores including Rs. 500 crores towards advance action on Fifth Plan schemes. In March, 1969 the Planning Commission brought out a Draft Plan according to which a target of 22 million KW was envisaged for an outlay of Rs. 2085 crores. The Ministry of Irrigation and Power stressed that in the context of the demands anticipated by end of the Fourth Plan, it would be essential to fix the target of 26 million KW, as recommended by the Work-

ing Group. However, in the draft Fourth Plan which was brought out by the Planning Commission in July, 1970 and approved by the Government of India, a target of 23 million KW was set and the outlay in the public sector was fixed at Rs. 2447.57 crores."

The Budget allocation asked for, allocation provided and actual amount spent in Third Plan and Fourth Plan is summarised in the table given below :

	Budget allocation asked for	Allocation provided	Actual amount spent
(Rs. in Crores.)			
Third Plan		1039	1252.29
Annual Plans		1065.49	1208.14
Fourth Plan	8462.00	2447.57	3116.55 including anticipa- ted expenditure in 1972-73 and 1973-74''

3.171. Asked during the evidence whether the physical achievement in the Plan targets was commensurate with the capital expenditure, the Officer on Special Duty in the Ministry of Irrigation and Power stated during evidence :—

"My submission is this that throughout the country there has been continuous escalation of cost and on account of that the estimate of a project later on has been found to be inadequate because the escalations have been much beyond what could have been anticipated in advance. For example, we have formulated a project in 1969 and for that the estimated cost at the beginning was something like Rs. 18.44 crores. Now today the position is that already there has been 30 per cent escalation on cost if you add up increase in the cost of material increase in the cost of labour, big increase in the cost of plant and equipment. We are entering into a new technology with the result that the cost on plant and equipment that our own factories can supply to us is much more than what was our experience for imported equipment which come from a number of countries."

The witness added :

“...If you see the physical achievement in terms of addition to generating capacity, it looks small compared to the investment that has been made so far.”

Giving the reason, the witness stated:

“The main reason is that the projects are half-way through and they will get completed by the end of the Plan or by the beginning of the next Plan.”

In reply to a point arising out of evidence, the Ministry of Irrigation and Power have furnished the following information in respect of the programme suffering because of lack of finances:—

“In order to expedite the progress of some of the power generation schemes which have either been delayed or are likely to be delayed, it is considered essential to provide additional assistance during the remaining period of the Fourth Five Year Plan. In assessing the requirement of additional funds, these have been broadly divided into three categories as follows:—

- (i) Schemes for which plant and machinery have been received at site but civil works are not yet completed,
- (ii) Schemes for which civil works are required to be expedited;
- (iii) Schemes in respect of which preliminaries have been completed and additional funds will expedite their commissioning during the Fifth Plan period;

and the requirement has been assessed as follows:—

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	1972-73
	(Rs. in Crores.)]
Category I . . . . .	37.85
Category II . . . . .	14.80
Category III . . . . .	12.52
TOTAL . . . . .	65.17

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3.172. Scheme-wise details of estimated cost, expenditure, additional funds asked for during 1972-73 over and above the approved by the Planning Commission, and additional funds released during 1972-73 are given in Appendix IV.



3.173. In their Annual Report for 1972-73 the Ministry of Irrigation and Power had stated that:

“The total investment in the power sector at the commencement of the Fourth Plan was of the order of Rs. 3,629 crores. In the Fourth Plan, the allocation for power in the Public Sector is Rs. 2,447.57 crores. During the first three years of the Plan, a total expenditure of Rs. 1,502.57 crores was incurred and it is anticipated that during 1972-73 an expenditure of Rs. 544.46 crores will be incurred bringing the total expenditure in the four year period to Rs. 2,047.03 crores, which is about 84 per cent of the Plan allocation. The investment on power at the end of the year 1972-73 would be of the order of Rs. 5,676.03 crores.”

3.174. The Committee note that the total investment in the power sector at the commencement of the Fourth Plan was of the order of Rs. 3,629 crores. In the Fourth Plan, the allocation for power in the Public Sector is Rs. 2,447.57 crores. During the first three years of the Plan, a total expenditure of Rs. 1,502.57 crores was incurred and it is anticipated that during 1972-73 an expenditure of Rs. 544.46 crores will be incurred bringing the total expenditure in the four year period to Rs. 2,047.03 crores, which is about 84 per cent of the Plan allocation. The investment on power at the end of the year 1972-73 would be of the order of Rs. 5,676.03 crores.

3.175. The Committee are unhappy to note that the achievement during the successive Five Year Plans was not commensurate with the investments made as there had been consistent shortfalls in the planned targets ranging from 20 per cent in the First Plan to 37 per cent in the Fourth Plan (1st three years).

3.176. The Committee urge that immediate steps should be taken to provide additional funds for the execution of the sixteen projects in respect of which preliminaries have already been completed and which have either been delayed or are likely to be delayed for lack of finances.

3.177. The Committee desire that effective measures should be taken to expedite the completion of civil works in respect of the above schemes in various States.

#### (vii) Per Capita Power Consumption in the Country

3.178. The total electricity production in India during 1968 was only 1.2 per cent of the total world electricity production and the per capita production in India was only 3 per cent of the world average which was

lower than even the average *per capita* production in developing countries as will be seen from the Table below:

Country	Electricity Production 1968 (10 KWH)	Population (10 KWH)	Per capita Electricity production 1968 (KWH)
U.S.A. . . . .	1436	201	7150
Canada . . . . .	175	21	8450
U. S. S. R. . . . .	639	238	2680
U. K. . . . .	223	55	4050
Other countries in Europe . . . . .	991	400	2470
Japan . . . . .	270	101	2680
India . . . . .	50	524	95
Other countries in the world. . . . .	408	1943	210
Total of the World. . . . .	4192	3483	1200

It would be evident that because of our large population base, impressive achievements become insignificant in terms of per capita electricity consumption in India (an accepted criterion for judging the economic welfare of a country) is dismally low.

3.179. The growth of per capita electricity consumption during the past two decades has been as follows:—

	Per capita Electricity consumption by end of:	KWH
December . . . . .	50	17·8
December . . . . .	55	26·4
March . . . . .	61	38·2
March . . . . .	66	61·3
March . . . . .	69	77·9
March . . . . .	71	88·0

Statewise and Regionwise details of *per capita* electricity consumption during the year 1970-71 is given below:

*Per Capita Consumption During 1970-71.*

<i>State</i>	<i>KWH</i>
1. Andhra Pradesh . . . . .	55
2. Assam . . . . .	21
3. Bihar . . . . .	65
4. Gujarat . . . . .	137
5. Haryana . . . . .	95
6. Himachal Pradesh . . . . .	27
7. Jammu & Kashmir . . . . .	40
8. Kerala . . . . .	75
9. Madhya Pradesh . . . . .	55
10. Maharashtra . . . . .	157
11. Mysore . . . . .	103
12. Orissa . . . . .	105
13. Punjab . . . . .	144
14. Rajasthan . . . . .	46
15. Tamil Nadu . . . . .	132
16. Uttar Pradesh . . . . .	58
17. West Bengal . . . . .	115
<i>Union Territories.</i>	
(a) Delhi . . . . .	264
(b) Chandigarh . . . . .	200
(c) Pondicherry . . . . .	184
All India. . . . .	88

Regionwise per capita consumption (of Electric Energy in KWH) during 1970-71.

<i>Region</i>	<i>KWH</i>
Northern Region . . . . .	69.1
Western Region . . . . .	116.3
Southern Region . . . . .	89.7
Eastern Region . . . . .	72.2
North-Eastern Region . . . . .	18.3

3 180 *Per Capita* electricity consumption in some of the foreign countries during the year 1968 was as under :—

<i>Country</i>	<i>KWH</i>
Albania . . . . .	239
Austria . . . . .	2471
Belgium . . . . .	2444
Bulgaria . . . . .	1522
Cyprus . . . . .	606
Czechoslovakia . . . . .	2554
Denmark . . . . .	2163
East Germany . . . . .	2868*
Finland . . . . .	3465
Greece . . . . .	756
Hungary . . . . .	1255
Ireland . . . . .	3000
Italy . . . . .	1745
Luxemburg . . . . .	6405
Canada . . . . .	911*
Japan . . . . .	2377
Iran . . . . .	171
Malta . . . . .	560*
Netherlands . . . . .	2330
Norway . . . . .	13010
Poland . . . . .	1468
Portugal . . . . .	530
Spain . . . . .	1110
Sweden . . . . .	6434
Switzerland . . . . .	3607
Turkey . . . . .	180
USSR . . . . .	1710
United Kingdom . . . . .	3481
West Germany . . . . .	3060
Yugoslavia . . . . .	925
United States . . . . .	6550
Pakistan . . . . .	47*
France . . . . .	2287
Nepal . . . . .	3*

World Average : 1131

Source : (i) Annual Bulletin of Electric Statistics for Europe 1968.  
(ii) World Energy Supplies.

\*for the year 1967.

3.181. Sectorwise *per capita* consumption State-wise for major categories of supply such as domestic, commercial, industrial, public lighting, agricultural pumping, and self-generating non-electric-utilities for the year 1969-70 is given in Appendix V.

3.182. The following table gives the actual *per capita* consumption of electricity in 1970-71 and anticipated *per capita* consumption in 1980-81 statewise:

Name of State	Per Capita consumption of electricity— KWH	
	1970-71 (Actual)	1980-81 (Anticipated)
1. Punjab . . . . .	159	420
2. Haryana . . . . .	98	376
3. Rajasthan . . . . .	50	172
4. Uttar Pradesh . . . . .	60	210
5. Jammu & Kashmir . . . . .	38	152
6. Himachal Pradesh . . . . .	35	113
7. Delhi (Union Territory) . . . . .	286	465
8. Gujarat . . . . .	138	372
9. Maharashtra . . . . .	158	378
10. Madhya Pradesh . . . . .	54	161
11. Andhra Pradesh . . . . .	56	178
12. Kerala . . . . .	76	179
13. Mysore . . . . .	104	312
14. Tamil Nadu . . . . .	130	278
15. Bihar . . . . .	65	205
16. West Bengal . . . . .	118	224
17. Orissa . . . . .	96	286
18. Assam, Meghalaya and Mizoram . . . . .	22	103
19. Manipur . . . . .	5	37
20. Tripura . . . . .	5	32
21. Nagaland . . . . .	8	47
<b>ALL INDIA . . . . .</b>	<b>90</b>	<b>250</b>

The *per capita* consumption of electricity expected to be achieved in India by the end of Fourth Plan has been estimated at 120 KWH.

3.183. Regarding imbalance in the power development, the Ministry of Irrigation and Power had stated:—

“Imbalance in *per capita* consumption of electricity exist between State in the country. The States/Areas where the *per capita* consumption is below the national average are (1) Uttar Pradesh (2) Rajasthan (3) Himachal Pradesh and (4) Jammu and Kashmir in the Northern Region, Madhya Pradesh in the Western Region, Andhra Pradesh and Kerala in the Southern Region, North Bihar and Bengal in the Eastern Region and the entire North Eastern Region. Elimination of imbalances in electricity consumption is difficult to achieve because it depends on complex economic factors. The prerequisite to reducing disparities is providing increased availability in States/ Areas which are below average in electricity consumption and this has to be achieved by providing additional installed generating capacity and building extensive transmission and distribution systems. The Fifth Five Year and the Decade Plans prepared by the Ministry of Irrigation and Power have kept this aspect in view while formulating the generation and transmission programmes. Additional availability of power in these areas would encourage industries to move into these areas and also make the local population electricity conscious. In this manner the use of electricity would be encouraged.”

3.184. Installed capacity and *per capita* consumption at the end of 1972-73, 1973-74 and 1978-79 is given in Appendix VI.

3.185. Information furnished by the Ministry of Irrigation and Power in respect of the estimated power requirement in the utilities in the country from 1973-74 to 1978-79 is given in Appendix VII.

3.186. In reply to US No. 4903 answered in Lok Sabha on 27th March 1973 the Ministry of Irrigation and Power gave the following information regarding *per capita* consumption of electricity in the various States as also for the country as a whole for the year 1971-72:—

State	Consumption in KW/ year 1971-72
Andhra Pradesh . . . . .	58
Assam . . . . .	23@
Bihar . . . . .	67

Estimated

State	Consumption in KW/ year 1971- 72
Gujarat . . . . .	143
Haryana . . . . .	114
Himachal Pradesh . . . . .	46
Jammu & Kashmir . . . . .	40@
Kerala . . . . .	74
Madhya Pradesh . . . . .	58
Maharashtra . . . . .	171
Manipur . . . . .	5@
Mysore . . . . .	117
Orissa . . . . .	07
Punjab . . . . .	168
Rajasthan . . . . .	55
Tamil Nadu . . . . .	138
Uttar Pradesh . . . . .	60@
West Bengal . . . . .	119
<i>Union Territories</i>	
(a) Delhi . . . . .	228
(b) Chandigarh . . . . .	227
(c) Pondicherry . . . . .	182
All India. . . . .	94

3.187. In reply to US No. 122 answered in the Lok Sabha on the 8th August 1972, the Minister for Irrigation and Power state, "In the Fifth Plan we want to double our output. Even then the per capita consumption here will be 200 kwh against 10,000 kwh in the United States and 2,000—3,000 kwh in Europe. We shall not be anywhere but we can't help it."

3.188. In their Annual Report for 1972-73 the Ministry of Irrigation and Power have stated that the *per capita* consumption in the country rose from about 90 kwh in 1970-71 to about 93 kwh in 1971-72. Of the total sale, over 70 per cent is accounted for by the industrial sector which indicates that the pattern of electricity consumption has not undergone any appreciable change from that during the last decade. The agricultural consumers have, however, been growing significantly being about 10 per cent at present. The level of consumption in all the sectors was generally maintained.

3.189. The Committee are unhappy to note that although the per capita electricity consumption rose from 17.8 kwh in 1950 to 88 kwh in March, 1971 and from about 90 kwh in 1970-71 to 93 kwh in 1971-72, the per capita consumption in the country is dismally low as compared to the world average of 1200 kwh.

3.190. The Committee are distressed to note that despite nine-fold increase in the generating capacity, there still persists considerable imbalance in per capita consumption between the various States in the country. The Committee are constrained to note that certain States/Areas viz. Uttar Pradesh (60 kwh), Rajasthan (55 kwh), Himachal Pradesh (46 kwh), Jammu and Kashmir (40 kwh) in the Northern Region; Madhya Pradesh (58 kwh) in the Western Region; Andhra Pradesh (58 kwh) and Kerala (74 kwh) in the Southern Region; North Bihar (18.3 kwh) and North Bengal in the Eastern Region, and the entire North Eastern Region comprising Assam, Meghalaya, Mizoram, Manipur, Tripura, Nagaland and Arunachal Pradesh are still far below the national average.

3.191. The Committee note that the pre-requisite to reduce the disparities is providing increased availability of power and States/Areas which are below average in electricity consumption. They therefore suggest that effective steps should be taken to achieve the desired results by providing additional installed generating capacity and building extensive transmission and distribution systems in such areas.

3.192. The Committee regret to note that the per capita consumption of electricity is anticipated to be only 200 kwh even at the end of the Fifth Plan as against the per capital consumption of 10,00 kwh in the United States and 2000—3000 kwh in Europe.

3.193. In view of the fact that per capita consumption of electricity is a yardstick for measuring the economic development of the country, the Committee feel that highest priority should be given for meeting the power demands in all sectors of economy, and the poor revenue yielding areas which have hitherto remained neglected should be given preference in regard to their economic uplift, by providing the essential infra-structure of electricity as cheap rates.



## CHAPTER IV

### DEVELOPMENT OF HYDRO POWER RESOURCES

#### Survey of Potential Hydro Power Sites in the Country

##### (i) *The Need*

The relief of India, a land of very high mountain ranges and numerous river systems is immediately suggestive of colossal water power resources. These resources have never been systematically surveyed in their entirety. An abortive first attempt was initiated between 1919 to 1921, under the auspices of the Central Government, but it fell into neglect when the subject was transferred to the sole jurisdiction of State Governments, as a result of the Montford Reforms. The paltry figure of 3.5 million kilowatts of firm potential, hazarded in 1921 as a 'preliminary forecast', of the resources of the entire territories now comprising the Union of India by J.W. Meares therefore, continued for a long time to represent the country's hydro potential.

4.2. With planned development of the country's industrial and other activities, demands for power have taken a sharp upward trend. In order to meet these large and steadily increasing demands for power, plant capacity would have to be further augmented at unprecedented rates in the future and this, in turn, requires a careful assessment.

4.3. The main conventional resources of electricity generation are water-power: will naturally occupy the prime place in electricity development of new and important source of electric power, viz., nuclear energy. Hydro power will naturally occupy the prime place in electricity development of the country for a long time to come for the reasons that it provides electricity at the lowest costs of generation. Further, it is a perennial inexhaustible source of energy, the reservoirs being constantly replenished by the climatic cycles. Lastly, its development is largely based on the use of indigenous materials and labour, placing very limited demands on the country's scarce foreign exchange reserves and consequently can be achieved with the least strain on National economy. It is in this context that a comprehensive and realistic assessment of the water power resources of the country assumes particular significance.

##### (ii) *Increasing Estimates of Utilisable Resources*

4.4. The ultimate objective of water power studies is to arrive at the quantum of power which can be developed on a practical and commercial

basis. An assessment of this limit of "utilisable" resources, is naturally influenced, at any time, by the level of technological development attained and by the prevailing economic indices and criteria. In most countries of the world, estimates of utilisable water power resources during the last four or five decades have thus had to be constantly revised upwards with continuous technological progress. Perhaps, the most important technological advancement, affecting water power assessments, were those which took place in the field of transmission of electric power. Hydro power sites, by their very nature, are mostly located in the precipitous upper reaches of various river basins and in the early stage of electricity development, when there were serious limitations to the transmission of electric power, only a few very favourably located hydro sites were regarded as 'useful'. Subsequently large scale development of hydro power was due mainly to the progress made in the field of transformation and transmission of power. The technical developments in the field of electric power transmission have already reached a stage where even the most remote sites for hydro generations have been brought within the realm of practical development. Simultaneously, there have been rapid strides in construction techniques for dams and other structures associated with river valley projects. Dams over 900 ft., in height are now being constructed, and modern techniques of underground work of tunnelling and power-house construction, have pushed forward the frontiers of water power development. On the economic side, the evolution of the concept of integrated basin-wise development of river basins, for power generation, irrigation, navigation, flood control and other benefits has also contributed considerably to development of a large number of sites, which might have otherwise been ignored. Also, larger and ever increasing demands for power, irrigation and flood control benefits, now justify the large investments required for major projects, and have brought many projects, e.g., Bhakra and Hirakund etc., into the realm of economic feasibility.

4.5. Thus, assessments of hydro resources in various countries of the world have been constantly increasing with time, towards an upper limit of development, set by the total quantity of water and the entire available drops or differences in river elevations—a limit referred to as the "theoretical potential."

(iii) *Theoretical Water Power Potential and Limitations of Development*

4.6. Theoretically, every drop of water on an elevated land surface constitutes water power potential corresponding to the difference in elevation between the point and the lowest point of drainage in that area, ordinarily the sea. The aggregate of the potential thus constituted, corresponding to the total average precipitation over a given land surface area represents the absolute constant upper limit of potential water power. A common method of assessment of water power resources commences with an assessment of this upper limit or theoretical potential. To this theoretical limit, various

factors are then judiciously applied to arrive at the practical limits of possible development in order to take into account the various restrictions on development. These restrictions stem basically from the requirement that supply of electricity has to be of assured reliability of its vital importance. It is considered that power generation from a hydel station should be maintained at its firm output for about 90 per cent of the time. The flows of Indian rivers are characterised by large variations both during different seasons of the year and with the strength of monsoons in different years. Rivers swell to enormous proportions during the floods and dwindled down to a trickle in the dry seasons and dry years. The only way of assuring adequate water supplies for hydro stations is by construction of large reservoirs which, in turn, are feasible only at a few sites along the various water courses, both from considerations of economy and of problems of submergence of habited and cultivated lands. Another restrictive condition, is the prior overriding claim of irrigation with available water supplies due to agricultural reaches of the river basins above potential hydro sites reduce the waters available for the power schemes, whereas requirements of irrigation projects downstream, because they vary from season to season, may impose further limitations on the quantum of power generation that can be assured on a continuous or "firm" basis. Yet another limitation is imposed by the great need for flood control in some regions. With recent emergence of interconnected regional grids many of the above limitations are getting released and in future, it is expected that it will be possible to utilise all available hydro-electric energy even if it is only seasonal by operating in coordination with thermal power stations.

(iv) *Orientation of Water Power Studies*

4.7. With all the above various restrictions that are imposed on practical development of water power, it would be quite futile to arrive at an assessment of water potential, derived mainly from gross theoretical potentialities. Besides, this method, at best, affords only a rough idea of the total potential available for development. It does not indicate the probable order of economy of development of these resources. Such an assessment would not also help to determine priorities for planning, investigation and development of the water power resources in various basins of the country. To be of practical value, an assessment of the country's hydro resources has essentially to be built up on the basis of specific schemes of development, with each scheme outline in sufficient detail to ensure (a) the necessary water supplies, (b) the necessary storage for regulation of these water supplies to a firm or steady discharge, and (c) practical feasibilities of utilising the regulated waters to obtain commensurate benefits of power generation. The essential first step is a thorough and exhaustive study of the available topographical maps of the entire country, collection and collation of hydrological data, regarding rainfall and stream flow, of current irrigation utilisation and future requirements, and all other relevant data,

on the basis of which, all potential hydro sites are first located on the maps. Prima facie, alternatives for power development, consistent with the utilisation of waters for other purposes, have then to be evolved and the most promising ones chosen to fit into an overall basinwise master plan for optimum power development.

(v) *CW&JC's Survey based on Specified Schemes*

4.8. In 1953, the Central Water and Power Commission embarked upon this first step viz., a systematic assessment of the water resources of the entire country on the basis of such specific schemes of development. The object was not only to assess the practical limit of hydel development, but to obtain sufficient detailed data to enable the relative economics of different schemes to be judged and priorities for their investigations and further development assigned. Two aspects made such a survey possible. The first was the fact that most of the areas of the country which are of a particular importance from the point of view of water power development had already been mapped on a fairly adequate scale. These contour maps were found to be of reliable accuracy for determination of potential sites for hydro development, including the suitability of sites for construction of storages, location of water conductor systems, e.g., tunnels, channels, pen-stocks alignments, power-house sites etc. The second was that although river flows had not been systematically gauged at all the potential sites, there were, in most cases, fairly adequate streamflow data at points lower down, gauged in connection with the existing irrigation schemes etc. In most of the catchment areas fairly adequate raingauge data was available for long periods of time. On the basis of this data it was possible to assess the probable runoffs that could be expected at potential sites, their possible variations, and hence the extent to which the schemes for hydel generation would have to depend upon storage. Thus, the available hydrological and topographical data in most basins of the country, was sufficient for a prima facie study based on specific schemes. Further, irrigation in this country, as is well known has been practised from time immemorial and has already reached a fair stage of advancement. Existing riparian rights for irrigation are well-known and in many cases, for example, the Krishna basin, the ultimate potentialities have also been fairly established. It was thus possible to take the restricting requirements of irrigation, flood control etc., also realistically into account in such a survey. The country was divided into six regions for the purpose, based on contiguity and geographical similarities. These regions are:

- (a) West Flowing Rivers of the Western Ghats.
- (b) East Flowing Rivers of the Southern India.
- (c) Central Indian Rivers.
- (d) Ganga basin.

(e) Brahmaputra Basin

(f) Indus Basin.

Based on the above studies the hydro power potential of the country is assessed at 41.15 million KW at 60 per cent load factor. The State-wise distribution of this power potential is as indicated in Appendix VIII.

4.9. A programme of investigation of 62 potential generating schemes all over the country with an aggregate installed generating capacity of 12 million K.W., has been taken up with the assistance of U.N. Special development funds. The investigations are being done by the State authorities with Central Water and Power Commission as a co-ordinating authority, for procurement and distribution of equipment.

Investigation of 38 of these schemes have been completed and investigations of another 10 schemes are expected to be completed by 1973-74.

#### *Investigation of Hydro Electric Schemes*

(i) *National network of Hydrological and Meteorological Observation in Chenab Basin*

4.10. The work of collection of hydrological and meteorological data in Chenab basin was taken up by the Central Water and Power Commission for project planning in the Chenab basin in the context of Indus Water Treaty. The Scheme was being operated from March, 1964 to February, 1971 against the provision of the estimate amounting to Rs. 27.23 lakhs.

4.11. Due to location of these sites in difficult areas in isolated and far off places and other administrative difficulties, the various hydrological and meteorological sites could be opened only in stages. This work being of a continuing nature, Govt. felt that for detailed assessment of water potential of the basin and its various tributaries, the collection of hydrological and meteorological data may be continued for some more years. For this purpose a separate estimate of an amount of Rs. 44.79 lakhs covering the period from 1st March 1971 to February, 1974 has been recently sanctioned.

4.12. Against a total plan provision of 24.72 lakhs the expenditure incurred during the first two years *i.e.*, 1969-70 and 1970-71 was Rs. 10.65 lakhs. During 1971-72 the expenditure was expected to be of the order of Rs. 6.90 lakhs. According to the programme of work, during the year 1972-73, an amount of Rs. 8.46 lakhs would be required for setting up new stations and for the maintenance and operation of various hydrometeorological stations and collection of data therefrom.

**(ii) Sawalkot Hydrel Proect**

4.13. The investigations of the Sawalkot Hydro-electric project on the main Chenab river were undertaken by the Central Water and Power Commission under the provision of an estimate amounting to Rs. 29.30 lakhs.

4.14. The entire field investigations of the project have been completed. The field data collected has been compiled and is now under examination for the purpose of design studies and preparation of drawings. The preparation of the project report is also stated to be in hand.

4.15. Due to occurrence of heavy slides in the reservoir area, proposed under this project, which threatened to block the flow of the river, it has been decided to carry out further investigations in respect of 2 major slides, namely Tangar and Pari. For this purpose observations pillars are proposed to be set up at the site of slides to ascertain the rate of movement of the slides, carry out detailed surveys of the area and geo-physical investigations as well as drilling of holes, excavation of drifts and open pits at suitable places.

4.16. Against the plan provision of Rs. 7.53 lakhs, the expenditure incurred during 1969-70 and 1970-71 was Rs. 6.96 lakhs.

On the basis of investigations proposed to be carried out it is anticipated that an expenditure of Rs. 1.00 lakh will be incurred during 1971-72. For the year 1972-73, a provision of Rs. 0.50 lakhs is required.

**(iii) Bursar Project**

4.17. The Bursar Project on the Marusudar river, a tributary of the Chenab, is one of the important projects in the Chenab basin being a storage project.

Earlier investigations carried out at two alternative sites, at Bursar and Tillar, had revealed deep over-burden in the river bed and along the abutments. Investigations of the third alternative site, located near Nagar village, have been taken up. The drilling operations so far carried out at this site have shown that rock strata may not be available even at this site at reasonable depth. In view of this position, it has been decided that minimum investigations, comprising a couple of angular holes, may be carried out at 4th alternative sites at Hanzal, located at about 8 KM downstream of the Nagar site, so as to ascertain the availability of rock strata in the river bed. Based on these investigations, economics of the various alternatives will be worked out and the project report finalised. This work is programmed to be completed during the year 1972-73.

4.18. Against a total plan provision of Rs. 17.14 lakhs, the actual expenditure incurred during 1969-70 and 1970-71 was Rs. 7.82 lakhs. Based on the progress of expenditure achieved so far and investigations proposed to be carried out during 1971-72 it was anticipated that an expenditure of Rs. 3.87 lakhs would be incurred. As per the programme formulated, a provision of Rs. 3.45 lakhs will be required for 1972-73.

(iv) *Ikhal-Bhandalkot-Kiyar Nalla Downstream of Bursar Project*

4.19. These are of run-of the river schemes located downstream of the proposed Bursar Storage project and envisaged development of hydro-electric power from the natural flow of the river Marusudar, an important tributary of river Chenab.

4.20. All field investigations, surveys and a major part of investigations of these diversion schemes have already been completed. Investigations have now been taken up in respect of an alternative for diverting waters of Marusudar river—below the Power House site of Bursar Project at Pakkal—to Chenab river upstream of Dul diversion weir. After the investigations of this alternative are completed, comparative economic studies of the various alternatives will be made and project will be completed during the year 1972-73.

4.21. Against the plan provision of Rs. 16.20 lakhs, the expenditure incurred during the first two years of the Plan *i.e.* upto and of 1970-71 was Rs. 6.60 lakhs.

Based on the programme of investigations to be carried out during the remaining period of the year 1971-72 it was anticipated that the budget grant, which was of the order of Rs. 2.05 lakhs, will be utilised in full. A provision of Rs. 1.60 lakhs will be required for the year 1972-73.

(v) **Diversion Schemes on main Chenab River between Arthal and Confluence of Niru Tributary**

4.22. Under this scheme, investigations are being carried out at two promising diversion sites, located on the main Chenab, for development of hydro-electric power from run-of-the-river under stage I and development of additional block of power in stage-II after construction of two storage projects in the upstream reaches *viz.* (i) Thiroat/Gyspa on main Chenab in Himachal Pradesh and (ii) Bursar on the Marusudar river in Jammu and Kashmir when regulated supplies would be made available.

4.23. Field surveys and investigations of both these schemes have already been completed except for 2 drill holes which have been suggested by the Geologist recently. It is programmed to complete all the field surveys and investigation of these two schemes and preparation of project

report by June, 1972. Thereafter, detailed investigation of one of these schemes namely Dul-Hasti diversion scheme, preparation of its construction will be taken up in hand.

4.24. Against the plan provision of Rs. 15.50 lakhs the expenditure incurred upto the end of 1970-71 was Rs. 1.46 lakhs.

4.25. On the basis of progress of expenditure so far achieved and further investigations programmed to be completed during the remaining period of 1971-72 an expenditure of Rs. 4.09 lakhs was anticipated to be spent during the year. A provision of Rs. 2.00 lakhs would be required for the year 1972-73.

**(vi) Survey in Chenab Basin**

4.26. The work of this scheme has long since been completed.

**(vii) Tenga Hydel Scheme in Kameng Frontier Division of NEFA**

4.27. The scheme envisages diversion of the waters on Tenga below Gohaintan village to the Kameng river through a tunnel. Thereby a head of 495 meters is available and this would be used for generating firm power of 50 MW at 50 per cent load factor in the first stage. However, later on water of Bichom would be diverted into Tenga River to supplement the diversion of water from Tenga to Kameng. Power output during second stage is likely to be of the order of 296 MW at 50 per cent load factor.

4.28. The investigations of stage-I of the project have been completed except for drilling along the Kimi tunnel alignment. The investigation of the second stage of the project is in hand.

4.29. It was decided that jeepable approach road to the weir site and the Power house site be constructed and that this work be entrusted to the Border Roads Organisation. The estimate for investigation of the Tenga Hydel Project sanctioned for Rs. 161.22 lakhs included a provision of Rs. 130.48 lakhs only for the Border Roads Organisations. The Border Roads Organisation has indicated the cost of the construction of the following approach roads to be Rs. 210.73 lakhs:—

(i) KMO to Weir site 18 KM—Rs. 63,91,000.

(ii) KMO to Power House site 32 KM—Rs. 1,46,82,000.

The B.R.D.B. had indicated the phasing of expenditure in the years 1971-72, 1972-73 and 1973-74 as Rs. 72 lakhs, Rs. 120 lakhs and Rs. 18 lakhs respectively. Due to other works of national importance, they had

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to reallocate the priorities of the works entrusted to them. They had indicated the requirements in 1971-72 and 1972-73 as Rs. 40 lakhs and Rs. 90 lakhs respectively.

4.30. The requirement of funds for C.W. & P.C. investigations in the revised estimates 1971-72 and budget estimates 1972-73 will be Rs. 14 lakhs and Rs 10.00 lakhs respectively. The total provision required including that for the construction of the approach roads by the B.R.D.B. in R.E. 1971-72 was Rs. 40 lakhs plus Rs: 14 lakhs—Rs. 54.00 lakhs and in the B.E. 1972-73 will be Rs. 70.00 lakhs plus Rs. 10.00—Rs. 80.00 lakhs: The investigation including the construction of roads was to cost Rs. 241.48 lakhs.

**(viii) Investigations in Andaman and Nicobar Islands**

4.31. It was decided to establish a Division in Andaman for investigating the water resources of the Islands. In the absence of detailed survey plans of the area, it was decided to first carry out reconnaissance to locate potential hydro-power and irrigation schemes. Accordingly, reconnaissance surveys were carried out on Kalpong, Hangat and Batapur rivers. Preliminary surveys on Kalpong have been taken up in hand. Detailed investigations will be planned on the basis of results of reconnaissance surveys of promising project sites.

4.32. Against the plan provision of Rs. 18.09 lakhs the expenditure incurred upto the end of 1970-71 was Rs. 0.48 lakhs only. Based on the progress made in the work it was anticipated that the expenditure to be incurred during the year 1971-72 would be Rs. 4.03 lakhs. The requirement for the year 1972-73 would be Rs. 4.00 lakhs.

**(ix) Teesta Multipurpose Project**

4.33. The investigations were completed by CWPC in 1966, but an amount of Rs. 1.04 lakhs was required during 1971-72 for adjustment of liabilities.

**(x) Investigation of 62 Hydro potential projects under U.N. Aid programme**

4.34. An outlay of Rs. 42.32 lakhs is required towards the payment of Customs duty on equipment received under UNDP on its transfer to the Government of India. An amount of Rs. 5.04 lakhs for 1971-72 had been provided to meet this expenditure. The balance amount of Rs. 36.00 lakhs would be required in 1972-73.

4.35. Against the plan provision of Rs. 45.20 lakhs, the expenditure incurred upto the end of 1970-71 was Rs. 1.35 lakhs.

4.36. To handle and maintain the equipment supplied under the aid programme some staff has been sanctioned under CSMRS. A provision

of Rs. 30.00 lakhs was made for the expansion of CSMRS under the irrigation sector which comprises of expansion of the station for irrigation work and power programme. During the course of discussions held in the Planning Commission for Annual Plan 1971-72 it was decided the Plan outlay for the expansion of the stations under the power programme be transferred to the power side. Accordingly a sum of Rs. 27 lakhs is to be transferred to power side to meet the expenditure in this regard and for maintenance of equipment a provision of Rs. 5.27 lakhs had been made in the Budget for 1971-72 which was likely to be spent. The estimated requirement for 1972-73 on this account is Rs. 6.7 lakhs.

**(xi) Baglihar Hydro Electric Project in Chenab Basin**

4.37. The Baglihar Hydro Electric Project envisages construction of a 425 feet high lifting dam across the river Chenab upstream of Sawalkot dam site for developing about 310 MW at 60 per cent load factor. The investigations of this project are considered essential for finalising the project proposals of Rattle diversion scheme, located upstream, as the tail race water level of the later scheme will depend upon the FRL of Baglihar reservoir. An estimate for the above scheme has been prepared and is under examination in consultation with the Ministry of Finance. The work on the scheme will be undertaken as soon as the estimate is sanctioned. The requirement for the year 1972-73 will be Rs. 3 lakhs.

**(xii) Manikaran Geothermal Field Investigations in Himachal Pradesh**

4.38. A committee to collect and collate the available upto date data in respect of Hot Springs in India was set up in 1966. The Hot Spring Committee in their report recommended that the Manikaran springs in Himachal Pradesh form the most prospective geothermal field in India which merits exploration, by detailed geological, geophysical and drilling techniques. In their report, the U.N. Experts, who visited India in 1971 have also recommended the Manikaran springs for the purpose. This scheme has been posed for U.N. Assistance as well.

4.39. In order to meet the cost of preliminary investigations, a provision of Rs. 1 lakhs has been made in R.E. 1971-72. The requirement for the year 1972-73 will be of the order of Rs. 7 lakhs.

**(xiii) Jai Bhorelli and Subansiri Complex Hydro Electric Scheme in NEFA**

4.40. It was decided by Minister of Irrigation and Power that the complete power potential of the Jai Bhorelli Complex in the NEFA region may be investigated. Investigations of other hydel projects in NEFA are also to be carried out.

4.41. The Adviser to the Governor of Assam had suggested that C.W. & P.C. may undertake the entire investigations in NEFA, by having one Circle over seven Divisions. The Investigations of major projects and reconnaissance of other potential are likely to cost Rs. 40 lakhs.

4.42. A provision of Rs. 15 lakhs is required during the Plan period to carry out investigations in NEFA. In order to carry out these investigations, the requirement for 1972-73 will be Rs. 4 lakhs. The total outlay required for 1972-73 is Rs. 150 lakhs. This has been agreed to.

4.43. It had been stated that based on the studies the hydro power potential of the country was assessed at 41.15 million kw at 60 per cent load factor. Asked to what extent power resources available in the country have been developed and the States/regions in which hydro potential had been harnessed, the representative of the Ministry of Irrigation and Power stated during evidence:—

“The total hydel power potential we usually express it at 60 per cent load factor, comes to 41.15 million kilowatts. Out of that, the hydel power potential which is already under development comes to about 18 per cent.”

4.44. Subsequently the Ministry of Irrigation and Power have in a written note furnished the following information with regard to the hydro electric potential and status of its development:—

Sl. No.	State	Hydro Lower Potential (million KW at 60— LF)	Hydro Power Potential developed/ under development at present	
			Million KW at 60— LF.	Percentage
1	2	3	4	5
1.	Andhra Pradesh	2.48	0.65	26.2
2.	Assam/Meghalaya	2.57	0.04	1.56
3.	Bihar	0.61	0.08	13.10
4.	Gujarat	0.68	0.09	13.20
5.	Jammu & Kashmir	3.59	0.19	5.3
6.	Kerala	1.54	0.86	56.0
7.	Madhya Pradesh	4.58	0.14	3.1
8.	Maharashtra	1.91	0.72	37.6

1	2	3	4	5
9.	Mysore . . . . .	3.37	1.00	29.6
10.	Orissa . . . . .	2.06	0.47	22.8
11.	Punjab/Haryana . . . . .	0.31	1.64	46.0
12.	Rajasthan . . . . .	0.15		
13.	Himachal Pradesh . . . . .	2.91		
14.	Tamil Nadu . . . . .	0.71	0.71	100.0
15.	Uttar Pradesh . . . . .	3.76	0.77	20.5
16.	West Bengal . . . . .	0.02	0.02	100.0
17.	Manipur . . . . .	0.87	0.07	8.0
18.	Arunachal Pradesh (NEFA)	9.03	..	
TOTAL . . . . .		41.15	7.45	18.0%

(as assessed by C.W. & P.C.)

4.45. In regard to the hydro-electric Schemes under execution, the Ministry of Irrigation and Power have furnished the following information:—

Sl. No.	Scheme	State	Installed capacity (MW)	Remarks
1	2	3	4	5
1.	Lower Sileru . . . . .	Andhra Pradesh	400	
2.	Srisaïlam . . . . .	„	440	
3.	Nagarjunsagar Pumped Storage . . . . .	„	100	
4.	Kydenkuali . . . . .	Assam	60	
5.	Subarnarekha . . . . .	Bihar	130	
6.	Ukai . . . . .	Gujarat	300	
7.	Kadana Pumped Storage . . . . .	„	240	
8.	Giri Bata . . . . .	Himachal Pradesh	60	
9.	Cherani . . . . .	J & K	23	Partly commissioned.

1	2	3	4	5
10.	Upper Sindh	J & K	22	
11.	Lower Jhelum	"	96	
12.	Idikki Stage I	Kerala	390	
13.	Jawahar Sagar	Madhya Pradesh/ Rajasthan	100	Partly com- missioned.
14.	Koyna Tailrace (St. III)	Maharashtra	320	
15.	Bhatgar	"	17	
16.	Vir	"	7	
17.	Vaitarna	"	60	
18.	Tilari	"	60	
19.	Bhira Tail Race	"	80	
20.	Pench	" & M.P.	160	
21.	Sharavati Stage-III	Mysore	178	
22.	Kalinadi-Stage-I	"	270	
23.	Balimela	Orissa	360	
24.	Dehar	Punjab, Haryana and Rajasthan	660	
25.	Pong	"	240	
26.	U.B.D.C. (III Unit)	Punjab	15	
27.	Pandiar-Punnapuzha	Tamil Nadu	100	
28.	Suruliar	Tamil Nadu	35	
29.	Chibro (Yamuna Stage-III)	Uttar Pradesh	240	
30.	Khodri (Yamuna Stage II)	"	120	
31.	Yamuna Stage IV	"	30	
32.	Maneri Bhali	"	105	
33.	Ramganga	"	180	
34.	Tehri	"	600	
35.	Jaldhaka Stage I	West Bengal	27	Partly com- missioned.
36.	Baira Siul (H.P.)	Central Sector	200	
37.	Loktak (Manipur)	"	70	
38.	Salal (J & K)	"	270	

4.46. To a query made by the Committee regarding the target for development of hydro-power resources during the Fourth Plan and the possibilities of achieving it, the representative of the Ministry of Irrigation and Power replied that out of the target of 9.7 million kw, 7.5 kw would actually be achieved within the Plan. Asked about the reasons for the shortfall in the target, the witness replied, "on many hydro-projects the shortage is due to civil works and somewhere due to equipment." In regard to the target for the development of hydro during the Fifth Plan, the representative of the Ministry of Irrigation and Power informed the Committee that the plan provision had been placed at 16 million kw.

4.47. The Committee desired to know the nature and extent of Central Assistance given to the various State Governments for the development of hydro-power resources as against their demand. The representative of the Ministry of Irrigation and Power stated during evidence:—

"So far as I know there is no such offer but we do assist the States and on behalf of the States we also undertake investments. As far as giving money is concerned, I am afraid, there is no separate allocation for developing hydro-electric as distinguished from other schemes."

4.48. The representative of the Planning Commission added, "All the projects are financed through the State Plan and there is no separate provision as such for development of hydro-electric projects only". He added, "From the Fourth Plan 70 per cent of the Central assistance is given as loan and 30 per cent as grant and within a State Plan we earmark year to year outlay of certain schemes which are required to be completed during the Fourth Plan period. But the central assistance is not earmarked for that particular project but the money that is tied upto that project is earmarked to come through the State Plan."

The witness further added:—

"There are requests for even financing thermal projects also, but these are being discussed presently in the Planning Commission and some sort of formula is likely to emerge soon."

4.49. To a query made by the Committee whether it was a policy to sanction all the schemes or the financial considerations come in the way for sanctioning the schemes, the representative of the Ministry of Irrigation and Power replied:—

"For over-all plan, financial considerations naturally come in the way. Within the funds available with us, it has been our policy—also accepted by the Planning Commission and the Finance Ministry, that hydro will be given the first preference

wherever it is possible. The balance requirements will be made up by thermal, nuclear and so on."

4.50. Asked whether there were any such schemes pending for consideration of finances, the representative of the Planning Commission stated:—

"As the matter stands, under the Fourth Plan, the States have their own 5 year Plans within which they have to finance their projects and a view is yet to be taken regarding the financing of the 5th Plan. Within the financial policy for the 4th Plan, that is, central assistance plus States own resources for financing their own schemes, we take a view and when we are considering any power project in any State, we have to view this from the point of view of their own requirements, and secondly, from the point of view of regional requirements. Kerala is surplus in power. They are actually settling power to Tamil Nadu, Mysore etc. They do not want any more power schemes for their purpose just now. For the Fifth Plan, Idikki scheme is coming in and by and large, that will satisfy their needs.

Mysore has already got plenty of power potential. For exploiting the hydro potential of Mysore and Kerala, their own State plans cannot finance them. Therefore, they are coming to the centre saying that they can develop these schemes and provide power for the Southern Region, if Centre puts in money. Many other considerations come in, apart from financing and making available power. In this federal set-up, everybody wants his own share of money from the Central pool. It is difficult for me to say at this moment, whether the States will agree that we can give all the money required for producing power and supply to the Southern Region and provide less money to Tamil Nadu or Andhra Pradesh. This may not be agreeable. The States are not likely to give up their financial resources. These matters are being looked into. We have actually got several requests at this moment. Himachal Pradesh is the other State which has got a great deal of hydro-potential which they can utilise. According to the Chief Minister of Himachal Pradesh, he can flood the entire Northern Region with power provided he is given the money. This will come to several hundreds of crores of rupees. These are being looked into and a view will have to be taken by the National Development Council before a policy decision is taken as to how exactly we will be going about financing of these projects for supplying power outside the State."

4.51. Asked whether any Master Plan for hydro and Thermal Projects on the basis of the total resources available in the country has been worked out, the Officer on Special Duty in the Ministry of Irrigation and Power replied ".....The Fuel Policy Committee recently gave a report. They will be giving another report. In the next five years that will be a master plan for that".

4.52. The Ministry of Irrigation and Power had stated in their preliminary material that investigations of 38 out of 62 potential generating schemes all over the country with an aggregate installed capacity of 12 MKW taken with the assistance of U.N. Special Development Fund have been completed. Asked to elucidate the present position in respect of the other projects the Vice-Chairman of the C.W. & P.C. stated during evidence:—

"It is true that a systematic survey was carried out with the assistance of the UN with regard to the hydro-potential in the country. Prior to 1951-52 we did not have a systematic field survey of the power potential in the country. In fact, individual projects used to be taken up, investigated and proposed for construction. But sometime in 1961-62 it was felt that it would be desirable to carry out a systematic field survey of the hydro potential available in the various river basins, because it is the cheapest source of power. The UN can forward with assistance for specialised equipment for carrying out surveys and also for drilling equipment and so on. They spared one of their experts for this job. With this UN Assistance, a systematic survey was carried out in the major river basins in the country and this covers a good percentage of the hydro-electric potential in the country.

I will give the details with regard to the various projects. Schemes investigated and for which preliminary or detailed project reports have already been procured are 38. These cover various States like Andhra Pradesh, Assam, Bihar, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Mysore, Orissa, Punjab, Rajasthan, Tamil Nadu and U.P. We have got the names and details of the schemes and the present stage of the report."

4.53. It has been stated in the 10 year power plan for the decade 1971—81 that hydel resources which represent the cheapest source of power in the country would have to be the first choice and they would warrant development to the maximum extent wherever possible. Incidentally, the hydel projects also afford the highest employment potential.



4.54. Hydel power was the cheapest source of power and had highest employment potential. Because of the long gestation period and the investment and cost involved at initial stages, we go in for thermal power whatever the cost. Because of drought and poor rain even the rivers which had potential for hydel power are abandoned and are given a secondary importance. Water resources when harnessed would result in prevention of floods. The Committee wanted to know whether an integrated and coordinated approach for harnessing the rivers had been undertaken or the programmes were taken in an isolated manner. The Vice-Chairman of the C. W. & P. C. stated that "the Committee had raised a very correct and pertinent point, namely full exploitation of the hydro electric potential of the country." He added :—

"It is the cheapest source of power today and it will remain so far many years to come. It is more or less a national wealth and has to be exploited fully.

With regard to the actual process of exploitation, first, as you have rightly pointed out, these schemes have a long gestation period. Investigations themselves will take a very long time. In the case of hydro-electric project, we have to go into very detailed investigations; otherwise, later on, we will run into difficulties. If it is poorly investigated, during execution, unforeseen things come up. If you hastily clear a project, later on, probably crores of rupees will have to be sunk to salvage the situation. That is why detailed investigations are necessary. These are also spread over a number of years. Hence, we have been giving priority for the investigation of hydro-electric potential; we always provide for investigations of projects of much in advance. For the Sixth Plan projects, in the Fifth Plan itself advance action is taken. We permit as much investigations as possible. Investigations do not require much money, as compared to the cost of the project itself. But, as I said, it is a time-consuming problem and advance action is to be taken. With regard to the actual execution of the projects, there are two problems. One is the long gestation period, as has been pointed out just now. Secondly, in the case of hydro electric projects, except a few, most of them are multipurpose projects. Some of these rivers like Narmada, etc., flow through different States and, therefore, inter-State problems come. All these problems have to be sorted out before the project can be sanctioned. Now some of the big sources of power near the load centre in the southern region have already been sanctioned for execution. The bulk of hydro-electric power now is in the northern Himalayan region. These are located in some of the

States like Himachal Pradesh, Jammu and Kashmir and Arunachal Pradesh and so on. There the potential is very much more than what is required for the States concerned. So there naturally the scheme will have to be processed for the benefit of more than one State—for three or more States. Now because of these problems we have taken some of them as central projects like Salal Project. Similarly in Himachal Pradesh we have a very big potential in the Parvati valley where investigation and construction will take a long time. This project is capable of generating more than a million kilowatts of power. Himachal Pradesh may not require all this power. Therefore, this may also be processed as a sort of a central project. At least that is the thinking. Thus, in these new hydro-electric projects, more than one State is involved. Necessarily it has taken more time. Otherwise, the investigation should go ahead in full speed. The project should be ready for sanction whenever funds are available. Of course, as you have rightly pointed out, the tendency sometimes is that the hydro-electric projects has a large gestation period and for immediate requirement we have to go in for thermal power projects. That cannot be helped because the hydro-electric projects have a long gestation period. The country cannot wait till then. Therefore, a sort of combination of hydro and thermal power would be required.”

4.55. The representative of the C.W.&P.C. agreed to another observation made by the Committee that investigations should be made from now on so that in the Sixth or the Seventh or future plans the hydro potential could be harnessed, and added:—

“We should go with the investigation of the hydro-electric projects in a big way. We have got to take up the investigation of individual projects. Of course, hydro-potential assessment has already been done. Now, the question of investigation comes.

The other problem which was raised was with regard to valley-wise development of our rivers for various multipurpose development. That is also a very important factor. Therefore, the difficulty is that most of the rivers run through different States. So the problem arises of getting the consensus of all the States, concerned and meeting the divergent views of the various States. It is there that a certain amount of delay occurs but, by and large, I certainly agree with you that we have got to go in a very very big way for developing our hydro-electric projects.”

4.56. Referring to the decade plan, the Officer on Special Duty in the Ministry of Irrigation and Power added that most of the hydel schemes included in the present plan were already being investigated and the project reports were being prepared. Six additional schemes were being investigated on which advance action had to be taken in the Fifth Plan for inclusion in the Sixth Plan.

4.57. Asked about the North Eastern Region the witness said, "At present a lot of this is based directly on demand upto 1981 and beyond 1981. The North Eastern Region is a developing region. It will take some time."

The witness added :—

"It has been the agreed policy of the Ministry of Irrigation and Power and the Planning Commission together to concentrate as much as possible on Hydro Power Development rather than Thermal or any other power development. In the 5th Plan we are including all the investigated schemes which are available. Not only that, there are also other limitations. Taking these into account we put as much Hydro power in each of the regions as possible. Hydro power in the southern or northern region will come up faster than the northern eastern region."

To another query the witness replied,

"One limitation would be that some of these schemes take a long time for the completion of civil works. This is one constraint. Even if there is more money, there will be this limitation. We expect that a very substantial proportion of their hydro potential will be already exploited by the end of the 5th Plan. We expect that in the case of Tamil Nadu and West Bengal, cent per cent capacity will be exploited by the end of the 5th Plan."

4.58. In their subsequent written note the Ministry of Irrigation and Power furnished the information showing progress of investigations of 62 Hydel-schemes investigated under the UN Special Fund Assistance Programme (Appendix IX).

4.59. In a written note the Ministry of Irrigation and Power furnished the information in respect of the continuing extension and new hydro-electric schemes from which benefits were expected during the Fifth Plan, as shown in Appendix X.

4.60. The Committee are unhappy to note that out of the 41.15 mkw. (at 60 per cent load factor) of hydro-electric potential in the country only

16 per cent has been developed so far and it is expected to rise to 18 per cent only at the end of the Fourth Plan.

4.61. The Committee note that the hydro potential in the country is the cheapest source of power and the present extent of utilisation would only be of the order of about 18 per cent by the end of the Fourth Plan period. The Committee feel that there is great scope for hydro-power development in the various regions of the country and, therefore, recommend that high priority should be given for hydel development in the subsequent Plans.

4.62. The Committee would, in this connection, like to reiterate the recommendation contained in para 2.49 of their Fortieth Report on Fertilizers (1972-73) regarding the feasibility and economics of harnessing, in an integrated manner, the river water for flood control, irrigation and production of electricity for various purposes including its use as a feedstock for the production of fertilizers which are also in great demand.

4.63. The Committee are distressed to note that against the planned target of 9.7 mkw. for development of hydro-power resources during the Fourth Plan, only 7.5 mkw. would actually be achieved, thus leaving a shortfall to the extent of 2.2 mkw.

4.64. The Committee cannot too strongly emphasise the need for putting to full use the hydro-electric power of the country, as it is well known that hydel power is the cheapest to generate. Besides, with the progress in the development of the national grid, it should be possible to transmit the power in a wider area. The country has also got experience extending to several decades in regard to the investigation and execution of hydel projects. The Committee, therefore, suggest that a time-bound programme should be drawn up for harnessing in full the hydel power resources in the country.

4.65. The Committee note the progress of investigations made in respect of the 62 Hydel schemes investigated under the U.N. Special Fund Assistance Programme. The Committee desire that in all the cases where investigations have been completed, speedy action should be taken to draw up the project proposals and to finalise them early.

4.66. The Committee recommend that high priority should also be given for detailed investigations hydro-electric projects so that these could be taken up for implementation for deriving the benefits in the next decade.

4.67. The Committee desire that schemes pending due to inter-State agreements should also be finalised without delay.

4.68. The Committee are in agreement with the views of the Power Economy Committee that optimum and proper utilisation of energy potential of hydro electric sites is intimately linked with proper water management. This act is often overlooked leading to adverse conditions. It is not generally appreciated that the constraints on generation at a particular hydro-electric plant are normally set by availability of water and not by the capacity of the plant as is the case with fuel burning plant. The generation of energy with the available water and given regulation facilities has to be carefully anticipated and programmed. Serious difficulties not merely of non-availability of energy but of serious impairment of generating capacity and system regulating facilities can arise if due attention is not paid to water management. On the other hand, continued attention to this problem may enable improving of utilisation of water at many sites as the system demands.

4.69. The Committee strongly recommend that concerted efforts should be made to ensure that each hydro-electric power station in the country is operated to utilise fully the energy potential available at site from time to time.

4.70. The Committee recommend that arrangements should be made for periodical expert inspection of the hydro-electric projects so that the old or worn out parts and components are replaced well in time.

4.71. The Committee recommend that all the projects in the country which have become very old and outmoded in design resulting in reduction in capacity and performance should be carefully reviewed with a view to examine how these could be improved by modernisation, utilising new and improved plant.

## CHAPTER V

### INTER STATE REGIONAL TRANSMISSION LINKS AND STATE/ REGIONAL POWER GRIDS

#### (i) Regional Grids and All India Grid

The concept of unifying the power Systems on a regional basis has been fully recognised and systematic efforts are being made for evolving a co-ordinated plan of development of Regional Grid Systems with the ultimate objective of evolving an All-India Grid. For this purpose the country has been demarcated into five Regions as follows:—

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<i>Region</i>	<i>Constituent States/Power Systems</i>
Northern Region . . . . .	Punjab, Uttar Pradesh, Rajasthan, Haryana, Himachal Pradesh, Jammu & Kashmir and Union Territories of Delhi and Chandigarh.
Western Region . . . . .	Gujarat, Maharashtra, Madhya Pradesh and Union Territories of Goa, Daman and Diu.
Southern Region . . . . .	Andhra Pradesh, Mysore, Tamil Nadu, Kerala and Union Territory of Pondicherry.
Eastern Region . . . . .	Orissa, Bihar, West Bengal and D.V.C.
North-Eastern Region . . . . .	Assam, Meghalaya, Manipur, Nagaland, Tripura and the Union Territories of Mizoram and Arunachal Pradesh.

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#### **Inter-State/Regional Transmission Lines**

5.2. One of the main pre-requisites for coordinated operation of State and Regional Power Systems is to ensure that strong inter-State/Regional links are re-established. By the end of the third Five Year Plan, thirty one lines crossing State Boundaries were in existence. Some of them were constructed during the earlier plan periods as a result of an arrangement between the adjoining States under which one State was feeding the load in its proximity in the neighbouring State. Some lines originally constructed in a single State had later become 'Inter-State' lines due to subsequent political demarcation and creation of two or more States in a particular region (e.g. Punjab, Haryana, etc.). Many of the lines were constructed to enable partner States to draw their share of power from a common project such

as Bhakra, Chambal, Matatila, Rihand, D.V.C., TAPP, Tungbhadra etc. A few inter-State lines were constructed during the Third Plan specifically to promote inter-State cooperation (e.g. Bangalore-Singarapet, Pamba-Madurai).

5.3. One of the main guidelines of the Fourth Plan is that planning for power development should be on a regional basis, that inter-State transmission links should be strengthened and that power systems of the neighbouring States should be operated in an integrated manner so as to improve power supply conditions and maximise benefits.

5.4. In order to accelerate establishment of Regional Grids, the Government of India decided to provide 100 per cent loan assistance to States under a Centrally-sponsored scheme for the construction of various inter-State links during the Fourth Plan period. Under this arrangement, while the funds are advanced by the Central Government, the agencies for the execution are State Electricity Boards/State Governments within their respective areas of supply. Out of 38 lines approved during the Fourth Plan period at an estimated cost of Rs. 53.80 crores only three lines, i.e. Munirabad-Hampi, Belgaum-Kolhapur and Chandni-Bhusawal have so far been completed.

5.5. It has been stated that the progress of inter-State/Regional lines has not been satisfactory due to various bottlenecks particularly non-availability of raw materials, such as steel for towers, and conductors, Zinc etc. Realising these difficulties the import of steel has been arranged through M/s. Hindustan Steel Ltd. for some of the inter-State/Regional lines. Arrangements have also been made for meeting the urgent requirements of angles and plates for various transmission lines. An outlay of Rs. 22 crores exists in the Fourth Plan for this scheme. This outlay is being increased to Rs. 40 crores so that more lines could be constructed during the plan period. An amount of Rs. 14.72 crores has been sanctioned to the States upto March, 1972 and there is a budget provision of Rs. 11.50 crores for the year 1972-73.

#### *Future Plan for inter-State/Regional Links*

5.6. It is envisaged that the size of regional grids would increase considerably in the Fifth and successive Five Year Plans with substantial additions of generating from one State/Region to the other. The total capability of the inter-State/Regional lines existing and programmed during the Fourth Plan would be inadequate for this purpose.

5.7. In order to fix the physical targets and outlays, it is necessary to finalise the generation and load demand of the various regions and carry out extensive studies to decide the important trunk lines within the State,

as well as the inter-State/Regional Lines. It is, however, visualised that a number of 400 KV inter-State/Regional links would have to be established during the Fifth Plan. It has stated that as a rough estimate, a capital outlay of the order of Rs. 125—150 crores would be required during the Fifth Plan period for the inter-State/Regional lines.

5.8. It is also necessary to work out the requirement of key materials for implementing the programme and take advance action for procurement of materials and equipment involving long delivery periods, such as transformers, switchgear, control gear, steel, zinc etc. for terminal equipment and lines.

#### *Load Dispatching Stations*

5.9. Planning and implementation of State/Regional Grids involves not only the construction of a number of inter-State/Regional E.H.V. Transmission lines but also the establishment of State/Regional Load Dispatching Stations for control and operation of the State/Regional Grids.

#### *State Load Dispatching Stations:*

5.10. The State Load Dispatching Stations are to be planned and constructed by the respective States power systems.

### **Regional Load Dispatching Stations**

#### *Northern Region*

5.11. It is proposed to set up the Regional Load Dispatching Station for the Northern Region at Badarpur (Delhi). The necessary project feasibility report for the establishment of this Station has been prepared and this has been accepted by the Technical Advisory Committee and cleared by the Planning Commission in May, 1972. A new feature emerging from the studies carried out in connection with planning this station is that the need for large capacity communication facilities and adoption of micro-wave facilities appears necessary over certain sections in place of the conventional PLCC.

5.12. As a first step in providing the communication facilities for operation of the Northern Regional Load Dispatching station, orders have been placed for the equipment required for an Express Communication Link between Delhi I.P. Station and Ganguwal (Bhakra).

5.13. The development of a full-fledged, sophisticated Regional Load Dispatching Station will take considerable time. It is, therefore, proposed to commence the functions of regional coordination with certain minimum



communication facilities, etc. that can be made available immediately so that benefits of coordinated operation could be achieved to some extent. Such an interim arrangement would also facilitate training of personnel on the job and would enable collection of operational statistics which will be very valuable for system operation. The functions that could be initiated at the Regional Despatching Station prior to installation of more sophisticated equipment are forecasting of daily load demands, preparation of operating procedures, generation scheduling, preparation of coordination, overhaul and maintenance schedules, and coordination of protection schemes etc.

5.14. With this end in view, communication facilities in the form of telephones and teleprinters have already been provided and orders for a mimic board have also been placed. The necessary operational staff for manning the temporary Regional Load Despatching Station has also been sanctioned and it is expected that the operation of this station will commence shortly.

#### *Western Region*

5.15. The Western Regional Electricity Board propose to set up the Regional Load Despatching Station at Kalwa near Bombay. A project report for the establishment of Regional Load Despatching Station has been prepared by the Board. The technical details covered in the report are being finalised in connection with the Western Regional Electricity Board.

#### *Southern Region*

5.16. It is proposed to locate the Regional Load Despatching Station for the Southern Region at Bangalore. The project Report (Phase-I) at an estimated cost of Rs. 42.05 lakhs has already been approved and steps are now being taken for inviting tenders for the equipment under World Bank Loan.

5.17. For the location of the building for the Regional Load Despatching Station, the Mysore State Electricity Board have gifted a piece of land adjacent to their own Load Despatching Station at Bangalore. The work on building construction has also been initiated.

5.18. Pending the installation of the fullfledged Regional Load Despatching Station, a temporary Regional Despatching Station is proposed to be started shortly. For this purpose, necessary telex facilities have already been provided and a mimic board is also being installed. The necessary operational staff for manning the temporary Regional Load Despatching Station has also been sanctioned and the work is being organised so that the operation of this station commences shortly.

*Eastern Region*

5.19. The Eastern Regional Electricity Board are preparing a Project Report for the establishment of Regional Load Despatching Station at Howrah (Calcutta). It is proposed to take up the work in phases. In the first phase, operation of the temporary regional load despatching station on the lines of the Regional Despatching Stations in the Northern and Southern Regions, is contemplated, and necessary action is being taken to provide necessary communication facilities and mimic board etc.

*North-Eastern Region*

5.20. The power development in this Region is more or less confined to Assam and the need for establishment of a Regional Load Despatching Station in the Region is not, therefore, being felt at this stage.

5.21. It has been stated that the Planning Commission has been moved to sanction an outlay of Rs. 40 crores as against Rs. 22 crores provided in the Fourth Plan to implement 37 inter-State and inter-Regional transmission links covering 5 regional transmission links in 5 regions of the country instead of 19 inter-State links in various regions and 4 inter-regional links as envisaged earlier at the time of formulating the Fourth Five Year Plan.

5.22. Asked whether the above proposal was approved by the Planning Commission and what was the anticipated period likely to be taken in the implementation of the projects, the representative of the Planning Commission stated:—

“This programme has not suffered for want of money. Although schemes have been sanctioned and money is being made available according to their requirements, there has been some difficulty regarding steel which is the main item in the transmission lines and probably because of that the progress has not been according to our previous target.

5.23. Subsequently the Ministry of Irrigation and Power have in a written note furnished to the Committee stated:

“In order to expedite construction of inter-State transmission lines it has been decided to advance loan assistance to the States under the Centrally sponsored Scheme during the Fourth Plan period. A plan outlay of Rs. 22 crores was provided for the scheme to cover the cost of 23 inter-State/inter Regional Transmission lines. Subsequently it was desired to accelerate the programme and also to include more lines enhancing the

outlay for scheme. Accordingly an amount of Rs. 40 crores is likely to be spent on this scheme during the Fourth Plan period. The enhanced outlay will enable taking up construction of 37 transmission lines during the plan period. The progress of work on the lines was affected due to the non-availability of essential material like steel. Action has, however, been taken to arrange for the necessary steel and the States are being impressed upon the necessity for expeditious completion of the inter-State transmission lines. It is expected that 24 lines would be completed within the plan period."

5.24. It has been decided that as a result of the finding of the Seventh Annual Electric Power Survey, the gross margin available in the country as a whole was anticipated to decrease from 27 per cent in 1970-71 to 11 per cent at the end of the Fourth Plan and slightly increase to 13 per cent at the end of the survey period.

5.25. Asked to elucidate the position, the representative of the Ministry of Irrigation and Power stated during evidence:—

"The gross margin is a sort of reserve that we have for taking machinery out for maintenance and all that in a given power station. We require something like 20 to 25 per cent margin for having adequate reserves for taking machinery for overhauling and repairing periodically one by one. Now what is happening is that this gross margin is coming down very rapidly due to power shortage. Since we are cutting the margin already, as soon as any machine closes down, suddenly you will find that there is shortage of power in that area. One solution to this is to inter-connect different power stations throughout the country as quickly as possible so that if one machine is shut down in one place, the shortage due to that spreads over a much wider area so that the proportion of shortage is reduced to marginal level and then nobody will feel the shortage. Then this shortage can also be met by increasing power in the thermal and nuclear power stations."

5.26. Asked whether any attention was also paid to the maintenance, the witness replied:—

"That we have to do in an increased manner because the gross margin is coming down to 11 per cent. It is really a very dangerous and very distressing low level of margin and that is why we want to push up the projects as quickly as possi-

ble. In our expectation after the end of the Fourth Plan these various steps that we are taking will add to the additional generating capacity and then the gross margin will take up-swing."

5.27. To a query whether there was any norm prescribed for this gross margin so that a particular station might be working efficiently making provision for maintenance etc., the representative of the Ministry of Irrigation and Power replied, "We feel that about 25 per cent margin should be there". Asked whether it was not a big risk in reduction the percentage to 11 per cent and whether it would not damage the plant, the witness replied:—

"We are not reducing it deliberately but our programme for power generation has come down from 26 million to 23 million for the Fourth Plan. It is due to the falling short in power generation and that is why this trouble is there."

5.28. The Officer on Special Duty in the Ministry of Irrigation and Power added:—

"One of the reasons why we are anxious to have a national grid as a central source/reserve of power is that when we have it, the gross margin and the spinning reserve of each station can be much less what they are now. An 11 per cent gross margin is now dangerous for the power supply, but when we have a grid, it would not mean so much. If the margin was to come down below the norm, there was danger to the continuity of power supply to the consumer and also the reliability of power supply. If we have a national grid, then the percentage of shortage due to any one machine getting out of order gets reduced."

5.29. If the margin was to come down below the norm, there was danger to the continuity of power supply to the consumer and also the reliability of the power supply. . . . . If we have a national grid, then the percentage of shortage due to any one machine getting out of order gets reduced."

5.30. It was brought to the notice of the Committee that there are no good links between U.P. and Bihar, Madhya Pradesh and Orissa and several other States, and that inter-State links at 220 KV should have been completed several years back. The Committee enquired whether any overall planning had been made to execute the work according to the set

schedule now that 400 kv links were being planned. Agreeing with the observation made by the Committee, the representative of the Ministry of Irrigation and Power stated during evidence:—

“We are pressing both U.P. and Bihar for having stronger inter-links. Gaya-Dehri is good link and we have been pressing for its completion as quickly as possible. Bihar landed in some contractual difficulties and there was delay. Recently we have ourselves intervened and I think it will be completed by the end of this year.”

5.31. When asked about the additions made in the transmission lines in the Third Plan period and the progress made during the Fourth Plan period, the representative of the Ministry of Irrigation and Power stated:—

“At the beginning of the Third Plan, the total length of transmission and distribution lines in the country was about 147,000 circuit km. During the Third Plan we added 395,000 circuit km., a very substantial addition. The total length of transmission and distribution lines as on 31st March, 1971 was 11,17,000 circuit km.”

5.32. The Ministry of Irrigation and Power have furnished the following written information regarding inter-State/Regional links:—

“It is expected that by the end of the Fourth Plan period about 2470 circuit Km of 400 KV lines, 26536 circuit-km of 220 KV lines including inter-State/Regional links and 4,505 circuit-Km of 132/110 KV inter-State/Regional links would have been completed or under construction.

The Progress of transmission lines within the States and inter-State/Regional lines has not been satisfactory due to inadequate capital outlays on transmission and distribution Schemes in the earlier Plans as well as in the Fourth Plan, a certain amount of reluctance on the part of State authorities to pursue the programme vigorously for some reason or the other, and lately due to bottlenecks in the availability of key materials such as steel for towers and conductors, zinc etc. Consequent on delays in commissioning of some of the transmission lines, the power available in one State is not utilised fully whereas the neighbouring State suffers severe power shortage resulting in loss of production to the nation.”

5.33. In regard to the proposed and actual investments the witness stated:—

“For 1969-70 the allocation was Rs. 95.63 and the actual was Rs. 1.33 crores. In 1970-71 the allocation was Rs. 123 crores and the actual Rs. 136 crores. In 1971-72 the allocation was Rs. 154.4 crores. We are compiling the actuals. Actually, we have been able to spend more than the allocation in the earlier years.

5.34. In a memorandum submitted to the Committee it had been stated that the Government's scheme to provide 100 per cent loan assistance to the States to implement programme of inter-State transmission links has not proved to be very effective and that on 3 out of 38 inter-State links approved during the Fourth Plan had so far been completed.

5.35. Commenting during the evidence, the representative of the Ministry of Irrigation and Power stated:—

“All these 38 inter-State links have been taken up during the Fourth Plan. Earlier, we took up 22 programmes. As a result of the recommendation of the Power Economic Committee, during the last one and a half-years we have now included 38 lines. For these lines surveys have to be carried out on the ground and various steps for the construction of the lines have to be taken. All are going on simultaneously. It is not as if we complete one line and then take up another line. That is why it looks as if the programme is not progressing and we have completed only 3 lines. These three are short lines. 24 of them would be completed during the Fourth Plan. The remaining lines would be completed in the next year or two after the Fourth Plan.”

5.36. The Power Economy in their Report had observed that:—

“The lack of adequate investment in the field of transmission and distribution is chiefly responsible for inadequacy of inter-connection, high transmission/distribution losses, unsatisfactory voltage conditions and low reliability of supply in various power systems in the country. In view of this, it is important that plans for augmentation of transmission and distribution systems and optimum utilisation of generating capacities should be planned as an integral part of the plans for increase in

generating capacity. The allocation of funds for generation, transmission and distribution facilities should be separately made and suitably matched.”

5.37. Asked what steps were taken to augment transmission and distribution system and optimum utilisation of generating capacity as recommended by the Power Economy Report, the representative of the Ministry of Irrigation and Power stated during evidence:—

“In our Fifth Plan we have made a matching provision for distribution along with generation. We have taken up with the State Electricity Boards because many of the smaller lines, 33 k.v. 11 k.v. we asked them to make all their transmission 220 k.v. even within the State. In order to see that proper adequate transmission systems are built up, W.P.C. takes up studies on regionwise basis. We have got computer in which we make a study of systems for a point of time in future. During the Third Plan period we made study upto the end of the Fourth Plan and tell the State that from such and such point transmission facilities are required and that assisted the States. Similarly, we are already taking up studies that will take into account the power stations that will come into being at the end of Fifth or Sixth Plan. That we have been doing and when the States will also fit their steams in this broad outline that we would be working.”

5.38. Subsequently the Ministry of Irrigation and Power furnished the following information:—

“In order to accelerate establishment of Regional Grids the Government of India decided to provide 100 per cent loan assistance to States under Centrally-sponsored schemes outside the State ceiling for the construction of various inter-State links during the Fourth Plan period. Under this arrangement, while the funds are advanced by the Central Government, the agencies for the execution are State Governments/State Electricity Boards within their respective areas of supply. Even with this arrangement, the progress of inter-State/Regional lines has not been satisfactory. Out of sanctioned outlay of Rs. 14.73 crores during the years 1969-70 to 1971-72, the expenditure over these lines was only about Rs. 11.62 crores. The States have expressed the view that Central assistance should be in the form of outright grants on the pattern of National Highways, instead of loans which have to be repaid by the States.”

5.39. Asked about the major impediments in the progress of establishment of inter-State and inter-Regional transmission links, the representative of the Ministry of Irrigation and Power replied during evidence —

“We want the lines to be taken up, but the States do not agree. Luckily, such instances are very few. But there are States which resist linking. For instance, Rajasthan does not want a link with Gujarat in one case. Similarly, Orissa has been resisting a link with Madhya Pradesh. But, by and large, we have been able to convince the States and we are gaining funds outside the plan provision. Once we sanction the scheme, one trouble has been that the States have their own programme of line construction and the inter-State links get only secondary priority, because they are not essential for that State. So, we have to persuade the States to give them adequate priority.

The main physical constraints are lack of power transmission lines and steel. That trouble is there both for projects within the States as also inter-State projects.”

5.40. He added, “the only hold up is on account of steel in some lines and that we are trying to solve by imports.”

**5.41. The Committee note that at the beginning of the Third Plan, the total length of transmission and distribution lines in the country was about 147,000 circuit km. During the Third Plan period about 395,000 circuit km. were added bringing the total length as on 31st March, 1971 to 11,17,000 circuit km.**

**5.42. The Committee note that by the end of Fourth Plan period about 2470 circuit km. of 400 kv. lines, 26,536 circuit km. of 220 kv. lines including inter-State/Regional links and 4,505 circuit km. of 132/110 kv. inter-State/Regional links are likely to be completed or would be under construction.**

**5.43. The Committee note that out of the sanctioned outlay of Rs. 14.73 crores during the years 1969-70 to 1971-72, the expenditure on inter-State/Region Lines was only about Rs. 11.62 crores.**

**5.44. The Committee note that in order to accelerate the establishment of Inter-State/Regional links during the Fourth Plan, an outlay of Rs. 22 crores provided in the Fourth Plan is being raised to Rs. 40 crores for implementation of construction of 37 transmission lines during the plan period.**



5.45. The Committee also note that out of all the 38 inter-State links taken up, 24 lines would be completed during the Fourth Plan and the remaining lines within the next year or two. The Committee would urge that effective steps should be taken to expedite the completion of all these lines.

5.46. The Committee are distressed to note that the progress of inter-State/Regional lines has not been satisfactory mainly due to inadequate capital outlay in the earlier Plans as well as in the Fourth Plan coupled with the bottlenecks in the availability of raw materials like steel, zinc, etc., and equipment like transformers, switch-gear control gear etc., involving long term delivery.

5.47. The Committee have elsewhere in the Report emphasised the need for more rational allocations for the plans/schemes so that these are not held up for lack of finances and for close coordination at all levels to ensure timely supply of equipment and raw materials etc.

5.48. The Committee suggest that action should be taken well in advance to work out the requirements of the essential raw materials so that delivery is assured according to schedule.

5.49. The Committee are unhappy to note that there is lack of enthusiasm on the part of the State authorities to pursue the inter-transmission programmes vigorously even though the Centre decided to provide 100 per cent loan assistance to States under Centrally-sponsored schemes outside the State ceiling for the construction of various inter-State links during the Fourth Plan period resulting in delay in the commissioning of some of the transmission lines and the sharing of surplus power with the State suffering from power shortage in the region.

5.50. The Committee urge that Government should take up the question with the State authorities concerned with a view to impressing upon them the necessity for giving adequate priority for speedy completion of these schemes.

5.51. The Committee also note that State/Regional Load Despatch Stations are planned to be established to control and operate the State/Regional Grids and that the proposals are at various stages.

5.52. The Committee would like to urge that necessary action should be taken to ensure that these schemes are finalised speedily matching with the delivery of equipment and other raw material so that their implementation is taken in hand well in time.

5.53. The Committee feel that with the large size power stations proposed in the Fifth Plan and envisaged enlargement of transmission and

distribution net-work, integrated operation of power system with utmost expedition is necessary. The Committee, therefore, recommend that the question of setting up a Central Agency to operate the regional grid system with the cooperation of the Constituent power system in each region should be examined.

5.54. The Committee feel that though the Electricity (Supply) Act, 1948 provides for coordinated development of State Power Grid and for the efficient running and working of the licensees/undertakings, the growth of power development has been so rapid that it is high time to examine the question whether any modification in the legislation is necessary with a view to achieving the objective of establishment and operation of regional power grid in the interest of optimum benefit to all concerned.

5.55. The Committee recommend that in order to fix physical targets and outlays for the transmission programme in the Fifth Plan, advance action should be taken to finalise the generation and load demand of various regions and extensive studies should be under-taken to decide the important trunk lines within the State as well as the inter-State/Regional lines.

5.56. The Committee recommend that long range planning for the inter-State/Regional Grid should be devised keeping in view the fact that not only the State systems should completely integrate to form regional grids, but also that these grids get adequately inter-connected to form a National Grid, with attendant economic gains to the community at large.

#### Transmission Losses

5.57. The Power Economy Committee in their report have observed that the transmission and distribution losses in India are, on the whole, high as compared to other industrially advanced countries.

5.58. The transmission and distribution losses in different States during the year 1966-67 to 1968-69 have been shown as under:—

State/Union Territory	Y E A R		
	1966-67	1967-68	1968-69
I	2	3	4
Andhra Pradesh . . . . .	26·57	25·2	25·7
Assam . . . . .	24·10	25·6	20·9
Bihar (Excluding DVC) . . . . .	10·46*	18·4	18·6
Gujarat . . . . .	11·8	14·2	14·2
Haryana . . . . .	**	16·6	28·4

1	2	3	4
Jammu & Kashmir . . . . .	13·52**	23·9	29·3
Kerala . . . . .	20·42	15·8	16·7
Madhya Pradesh . . . . .	12·64	13·1	10·1
Maharashtra . . . . .	14·29	11·7	12·4
Mysore . . . . .	16·54	16·6	13·5
Nagaland . . . . .	6·24*	7·6	22·3
Orissa . . . . .	14·21	9·8	9·9
Punjab . . . . .	13·88@@	10·9(2)	12·3(2)
Rajasthan . . . . .	25·93	30·7	22·8
Tamil Nadu . . . . .	17·06	18·2	18·0
Uttar Pradesh . . . . .	19·37	20·1	22·4
West Bengal . . . . .	9·16(3)	11·8(3)	11·8(3)
D.V.C. . . . .	4·67(3)	6·2(3)	4·9(3)
<b>Union Territories</b>			
Delhi . . . . .	12·83	15·6	13·1
Andaman and Nicobar Islands.	15·97@	16·0@	(4)
Chandigarh . . . . .		n.a.	(4)
Dadra & Nagar Haveli . . . . .	9·68	9·7	(4)
Goa, Daman & Diu . . . . .	17·95	10·3	11·3
Himachal Pradesh . . . . .	11·41@@	21·5	(4)
Laccadiv Minicoy & Amindive Islands . . . . .	9·43	9·2	(4)
Manipur . . . . .	26·60(1)	29·2(1)	n.a.
Pondicherry . . . . .	14·63	12·4	15·2
Tripura . . . . .	19·50(1)	8·0*	15·3(1)
<b>All India . . . . .</b>	<b>15·9</b>	<b>16·5</b>	<b>16·7</b>

\*Provisional.

\*\*Included in Punjab.

@Estimated

@Erstwhile Punjab and Himachal Pradesh.

(1) Data received do not appear to be very reliable.

(2) Due to intensive consumption in Nangal Fertiliser, the figure works out low.

(3) The element of distribution network is small.

(4) Combined figure for other Union Territories roughly estimated at 26·4.

5.59. Transmission losses in advanced countries which were comparatively much less have been indicated as under:—

Sl. No.	Country	Transmission & energy losses		Distribution percentage	
		1967		1968	
1	2	3		4	
1.	Austria . . . . .	9.6		9.0	
2.	Czechoslovakia . . . . .	7.8		8.1	
3.	Finland . . . . .	8.3		7.7	
4.	France . . . . .	7.6		7.4	
5.	Hungry . . . . .	9.3		10.3	
6.	Ireland . . . . .	11.2		10.6	
7.	Italy . . . . .	10.1		9.1	
8.	Norway . . . . .	10.4		10.15	
9.	Poland . . . . .	8.7		8.6	
10.	Sweden . . . . .	12.1		12.5	
11.	Switzerland . . . . .	8.2		8.1	
12.	West Germany . . . . .	5.9		5.7	
13.	Yugoslavia . . . . .	11.9		11.1	
14.	U.S.A. . . . .	..		10.0	

5.60. The Power Economy Committee in their Report had observed that the main reasons for higher transmission losses in India are (a) transmission and distribution of energy over long distances and large number transformation stages, (b) inadequate sizes for conductors, (c) loads being predominantly industrial and agricultural which have low power factor, (d) lack of proper inter-connections/integrated operation, (e) unauthorised tapping of energy without being metered.

5.61. It was brought to the notice of the Committee that transmission and distribution losses in the country were of the order of 18 per cent and in certain States the losses were as high as 25 per cent as compared to advanced countries which were comparatively much less and varied from 8 per cent to 10 per cent.

5.62. Asked to comment on the above observation the representative of the Ministry of Irrigation and Power stated during evidence:—

“It is true that in the advanced countries, the losses are much lower than what we are experiencing. In this connection, I would submit that in the earlier stages of development even in USA, the losses were more. When loads are small and are spread over a longer area, in that condition, you have to transmit power over longer distances. The proportion of losses appears higher. When over the same transmission net work you transmit more and more energy, the proportion of losses comes down. But that does not lead us to complacency. These losses are very high in some cases. I have got the details here. In the statement placed before the House in November, we have given losses Statewise. In that you will find that for the whole country, the average losses are 17.3 per cent, whereas there are States like Punjab, where losses are extremely high *i.e.*, 34.4 per cent. In Punjab, it is a very peculiar condition. All the agricultural loads that they give are not metered by them. They give the connections and depending upon the Horse Power of the motor, charge them at fixed rates, though there is no loss of revenue. When we take the readings in different meters and in the power house, the difference or losses look to be 34.4 per cent. Actually the proportion of losses in Punjab is not that high. It should be of the same order as Haryana or even less, *i.e.*, of the order of 25—28 per cent. -

“We are making special efforts in Punjab and Haryana to bring down the losses. Some studies are being made on the spot. One of the reason is that the rural loads have grown very fast in Punjab and Haryana. Small lines are radiating all over the places and thus the losses are high. In Delhi the losses are very low, because all the energy is concentrated in the urban areas.”

5.63. In reply to a Calling Attention Notice, the Minister of Irrigation and Power stated in Lok Sabha on 28th February, 1972, “it is true there is certain amount of leakage. We do not know exactly the quantum of it. For example, in Punjab, transmission losses are the target 34 per cent.”

5.64. The Power Economy Committee had recommended:—

“If the results are to be achieved within the required time, a decision on the next higher voltage, *i.e.*, 400 or 500 KV has to be taken without any further losses of time. This question has been under discussion in the country for some time now.

It is suggested that a Study Group should be set up to evaluate the need of the country over the next 10/15 years and recommended suitable voltage levels above 220 KV for development in the country."

5.65. Asked whether a Study Group has been set up as recommended by the Power Economy Committee, the representative of the Ministry of Irrigation and Power stated during evidence:—

"Already we have taken a decision favouring 400 KV, and there are lines in the country where 400 KV lines work has been taken up. As I had submitted earlier, one line is from Deharu and Panipat, one from Obra to Sultanpur and Lucknow in U.P. and the third is from Koradi near Nagpur to Kalwa near Bombay.

Among the technical people there was difference of opinion whether we should have 400 KV or 500 KV. But if we go on discussing nothing would come out, and, therefore, ultimately we took the decision in favour of 400 KV and the work is going on the three lines that I have mentioned.

Similarly, in the Central Board of Irrigation and Power a Study Group has been set up to see the next higher voltage which should be there. After 400 KV we have not taken a decision yet; we are projecting into the future and seeing whether the next higher voltage should be 750 KV or some other voltage and so on. We are studying that. But so far as the Fifth Plan is concerned, when we are going to double the percentage, what the voltage should be is under consideration. 400 KV is the highest voltage that is required, and as I said we have settled it more or less and work is going on."

5.66. The Power Economy Committee had recommended:—

"We have, therefore, to plan for an interchange of over one million KW between the different regional power systems. Such power transfer would need extra high voltage lines with voltages of 400 or 500 KV. At present not a single inter-State or inter-Regional tie with such capacity is proposed nor have any feasibility studies to evolve the concept and plans for national grid immediately been made if it has to be a reality in the next 10 years. All short-range plans should be made to fit into such a long-range perspective plan."

5.67. Asked whether any long range perspective plan had been prepared, the representative of the Ministry of Irrigation and Power, stated during evidence:—

“ . . . . . During the last two years, we have made studies and make plans for a national power grid, and we have already identified the lines that would be required, where they would be required, what the voltages would be and so on. Of course, it has to fit into the general plan as it evolves further for the Fifth Plan.”

5.68. The Power Economy Committee in their Report had recommended:—

“Each Divisional Engineer should be made responsible for watching and reporting the performance of the system under his control in respect of losses. Periodic comparisons should be made of the performance of different divisions in this respect in order to promote healthy competition.

The transmission and distribution net work have to be strengthened. There has been an imbalance in the investments in the electric power supply industry and this has to be rectified. The strengthening of the network would involve provision of additional circuits, choice of appropriate voltage level etc.”

5.69. Asked what specific action had been taken by Government in pursuance of the recommendations made by the Power Economy Committee, the representative of the Ministry of Irrigation and Power replied during evidence:—

“We are completely in agreement with this suggestion regarding the Divisional Engineer being involved in reduction of the losses, and we have already recommended it to the State Electricity Boards. In fact, some State Electricity Boards and some of the authorities at some places have already some similar arrangement working.”

5.70. In reply to U.S.Q. No. 4387 answered in Lok Sabha on 27th March, 1973, the Ministry of Irrigation and Power gave the following information in regard to investment on transmission and distribution:—

“The investment on transmission and distribution should generally be of the same order as on power generation scheme.

Upto the end of 1968-69, the investment on transmission and distribution was only Rs. 1340 crores as against Rs. 224 crores envisaged on power generation. During the Fourth Plan, an

outlay of Rs. 1166.27 crores has been provided for transmission and distribution schemes against Rs. 1250 crores for generation schemes. During the Fifth Plan, an investment of Rs. 7600 crores to be shared equally between generation and transmission and distribution has been proposed."

**5.71. The Committee note that upto the end of 1968-69 investment on transmission and distribution was only Rs. 1340 crores as against Rs. 2240 crores envisaged on power generation. They also note that during the Fourth Plan and outlay of Rs. 116.27 crores has been provided for transmission and distribution schemes as against Rs. 1250 crores for generation schemes and during the Fifth Plan an investment of Rs. 7600 crores to be shared equally between generation and transmission and distribution has been proposed.**

**5.72. The Committee are distressed to note that the distribution and transmission losses in the country are on the high side. The transmission losses in the country are of the order of 18 per cent to 25 per cent and in certain States like Punjab the losses are as high as 34 per cent whilst in other countries such losses are of the order of 5.7 per cent to 12 per cent only.**

**5.73. The Committee feel that there is imbalance in the planning of generation vis-a-vis transmission and distribution resulting in not only poor voltage conditions in many areas but heavy losses in transmission and distribution.**

**5.74. The Committee feel that investment in transmission and distribution facilities in the country has remained much lower than the desired level and this is one of the chief reasons contributing to higher percentage of losses. More investment does not necessarily mean construction of additional transmission and distribution lines alone; but use of higher transmission or sub-transmission voltages, adequate size of conductors, integrated operation of power system etc., are factors which would help in reducing the transmission losses substantially.**

**5.75. The Committee are in full agreement with Power Economy Committee that saving effected by reduction in energy losses and extra investment required have to be balanced and it may not be economical to reduce the energy losses beyond a certain limit and the losses should be reduced to an optimum value after a techno-economic study.**

**5.76. The Committee feel that with a view to reduce such losses optimum performance of power system in the country is necessary. The Committee, therefore, recommend that there should be a continuous watch over the efficiency of operation in the generation distribution and transmission system.**



5.77. The Committee note that the Central Government have taken up with the State Governments the question of making each Divisional Engineer responsible for watching and reporting the performance of the system under his control in respect of losses. The Committee would like to be apprised of the final outcome in this regard.

5.78. The Committee would like to draw special attention to the following points of action recommended by the Power Economy Committee regarding transmission and distribution losses:—

- (i) Improvements in the transmission and distribution systems designs by :
  - (a) Selection of transformers with reference to expected load cycle so as to obtain minimum total fixed and variable losses.
  - (b) Use of low iron loss transformers, particularly for rural areas and areas of low load factor.
  - (c) Reduction in the number of power transformation stages.
  - (d) Improvement of power factor—installation of capacitors etc., at appropriate locations.
  - (e) Selection of appropriate sizes of low tension feeders keeping in view their lengths and load required to be carried.
- (ii) Introduction of proper instrumentation and information collection system at all levels for monitoring of system performance.
- (iii) Integrated operation of power systems including reactive scheduling.
- (iv) Elimination of theft of energy.
- (v) Elimination of miscellaneous losses by improved operation and maintenance.
- (vi) Continuous monitoring of system performance and introduction of corrective action at the divisional level.

5.79. The Committee would like to be apprised of the action taken or proposed to be taken by Government on the aforesaid recommendations of the Power Economy Committee.

## CHAPTER VI

### ELECTRICITY TARIFFS

In their report the Power Economy Committee brought out the following facts regarding the over-all revenue in paise per unit of electrical energy sold by different State Electricity Boards in recent years:

S. No.	State Electricity Boards	Years					
		1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
1.	Andhra Pradesh	13.4	13.8	16.3	17.1	17.1	16.1
2.	Assam	22.8	20.5	18.0	19.4	15.1	14.4
3.	Bihar	11.3	11.9	11.1	11.1	15.5	16.7
4.	Gujarat	14.5	12.1	12.1	12.0	12.4	12.6
5.	Haryana (counted from 3-5-67)			..	6.2	7.6(a)	8.6
6.	Kerala	7.7	8.7	8.4	7.1	7.8(a)	8.6
7.	Madhya Pradesh	11.6	11.8	12.4	11.3	12.4	12.8
8.	Mysore	6.5	7.7	8.3	8.4	8.4	8.7
9.	Maharashtra	6.7	7.0	7.0	7.8	8.6	9.5
10.	Orissa	6.3	6.3	8.0	7.4	6.9	7.0
11.	Punjab	5.5	6.1	6.6	6.3	7.9	7.6
12.	Rajasthan	12.8	14.2	16.1	19.1(a)	12.3(a)	12.5
13.	Tamil Nadu	9.5	9.9	11.4	10.6	10.9	11.5
14.	Uttar Pradesh	13.8	9.2	10.0(a)	11.1(a)	12.4(a)	13.7
15.	West Bengal	9.3	9.7	11.2	11.9	11.5(a)	11.8
16.	D.E.S.U.	12.0	12.7	12.7	13.4	13.9(a)	14.7

The figures in case of Punjab for the period 1964-65 to 1966-67 are for the combined Punjab and the subsequent period for the bifurcated Punjab.

(a) Board's figures as given in the physical statistics or annual survey Reports. The figures of ASFR are indicated by (a). All others are as the Physical Statistics.

Source : SEB's as furnished to CW&PC.

6.2. The average tariff for power in 1968-69 is indicated below:—

S. No.	State Electricity Board	Units sold	Average* Tariff (Paise)	Percentage return on average capital base (of the Board portion only)
1.	Orissa	1250	6.9	6.7/4.3
2.	Haryana			
	Sales to Common Pool Consumers	630	2.4	} 8.4
	Sales to other consumers	662	12.5	
3.	Kerala	1366	7.8	3.8.
4.	Punjab—			
	Sales to Common Pool Consumers	782	2.4	} 7.6
	Sales to other Consumers	922	12.6	
5.	Mysore	2118	8.4	5.9
6.	Maharashtra	3955	8.6	2.9/8.1
7.	Tamil Nadu	4282	10.9	7.7
8.	West Bengal	1606	11.5	8.6
9.	Madhya Pradesh	1586	12.4	7.5
10.	Gujarat	1752	12.4	7.2
11.	Uttar Pradesh	3563	12.4	6.6
12.	D.E.S.U.	1957	13.9	9.0
13.	Bihar	1354	15.5	1.1
14.	Assam	176	15.1(—)	0.8
15.	Rajasthan—			
	Sales to Common Pool Consumers	271	3.7	} 4.4
	Sales to other Consumers	652	15.9	
16.	Andhra Pradesh	1638	17.1	7.8

\*Obtained by dividing total revenue realised by the State Electricity Board by the units sold.

The rate of return given in col. 5 is for the operations of the Board only excluding the operations of the Government projects (Durgapur Projects in case of West Bengal).

Source : SEB's as furnished to CW&PC.

6.3. The Power Economy Committee in their Report had made the following observations with regard to the cost of electrical energy:

The cost of electrical energy is broadly composed of two main components, one dependent on the capital cost and the other on the running costs. In the case of Hydro-electric stations as well as for transmission and distribution system, it is capital cost that determines the cost of power supply. On the other hand in the case of Thermal Power Stations, the running costs general predominate. Capital costs for all types of power generation are greatly influenced by the technical parameters adopted (such as size of generating units, voltage handled etc.) as well as construction methods and delays in project implementation, margins required as system reserves etc. The running costs include the wage bills and in the case of thermal power stations, the cost of fuel. The cost of fuel is the largest single item affecting the cost of power from thermal power stations.

Costs of hydro energy generation vary from site to site depending on the nature of civil works, magnitude of power potential and the period and speed of construction. Besides, at each developed site, they will vary from year to year depending upon the actual river flows and degree of utilisation thereof. In general the costs of hydro energy vary almost directly in proportion to the investment involved. The investment cost on the hydel projects completed during the last decade in the country ranged from Rs. 1000 to Rs. 1,500 per KW of installed capacity. An assessment of the expected cost of energy generation from existing and recently completed hydel installations and those under construction has been made on the basis of actual up-to-date estimates of capital outlays and firm energy outputs. It is seen that the expected cost of energy generation from hydro stations generally vary from 2 to 3 per KWh.

The cost of energy generation of thermal power stations and thermal power system vary with (a) investment cost (b) cost of fuel (c) thermal efficiency (d) transportation costs from collieries/sources of fuel (e) changes in the load factors (to which, unlike hydel schemes they are very sensitive) (f) operation and maintenance and (g) machine parameters. In a purely thermal power system, the possible energy generation is seldom more than 4000 KWh per KW installed due to firstly, the margins required to be maintained over peak capability to cover longer periods of scheduled maintenance and forced outages, spinning reserves, etc., and secondly the limitations

on energy generation imposed by the system load curves. In a properly designed mixed hydro-thermal power system, where all the effective on-line thermal capacity can be operated almost continuously at base load, the energy output of thermal stations can be increased to about 6000 KWh/KW installed on the average.

The capital outlays on thermal installations are generally well established and should not be subjected to large variations during periods of construction if estimates have been prepared with due care. However, the cost of energy generation from them vary substantially over the life of the plant, tending to increase steadily on account of decrease in operational efficiency, increases in the cost of fuels and their transport costs with time. During the decade prior to devaluation, the capital outlay of thermal power stations employing 50/100MW units was about Rs. 1000 to Rs. 1200/- per KW installed based on imported equipment. Current investment costs on new thermal installations taking into account the increases due to devaluation and indigenous manufacture are of the order of Rs. 1700/- per KW installed. In some cases, it has been as high as Rs. 2000 per KW installed even for units in the range of 100/120 MW. At these higher investment costs, the corresponding cost of energy generation would be about 6.2 paise per KWh at the collieries. Generation cost at sites remote from the collieries will be more, depending upon the distance of haulage of coal.

In the case of nuclear stations, their investment costs are relatively high though incremental fuel costs are low requiring base load operation as an essential prerequisite for competitive electricity generation. Maximum benefits from nuclear stations can therefore be derived in a grid with hydro and thermal generating stations and not as an independent source of supply. At present only one nuclear power station of the Boiling Water Reactor Type is in operation in the country at Tarapur. The capital outlay on this station is about Rs. 68.3 crores (Rs. 1630 per KWh installed) and the fuel used is lightly enriched uranium. The average cost of energy generated at the station works out to about 4.21 paise per KWh assuming depreciation on sinking fund basis. The present strategy for development of atomic power in the country aims at reliance on natural uranium reactors during 1970—80 and from 1980—85, simultaneously developing thermal and fast breeder concepts based exclusively on thorium cycle. The capital cost of such like power stations has roughly been worked out at about Rs. 300

per KW installed. Two such power stations one at Ranapratap Sagar in Rajasthan and the other at Kalapakkam in Madras are currently under construction. The cost of energy generation at these power stations has been worked out at about 6 paise per KWh, the net fuel cost being about 0.83 paise KWh.

Cost of generation from thermal and nuclear power stations are at their lowest when the power stations are operated at high load factors on base loads. On the other hand, hydro energy generation is relatively insensitive to large changes in load factor. Hydel station can, therefore, conveniently be assigned the most difficult function of dealing with fluctuating peak demands on electrical power systems. Mixed power systems emerge usually under conditions of scarcity of cheaper hydel energy resources and are basically intended to take advantage of the above facts although there are several other advantages also."

6.4. It was brought to the notice of the Committee that for formulating the industrial growth, provision of cheap power had to be an essential ingredient of Government policy. An element of subsidy in pricing electricity was implicitly accepted everywhere. The Energy Survey Committee (1965) had observed that while it was important that electricity undertakings earned a return on their investments, it was equally significant to ensure that the tariffs at higher level did not create an atmosphere of "relaxation and lack of effort to push up efficiency".

6.5. Asked to indicate the present pattern of tariff obtaining in the country and how the present tariff structure differed from State to State and even within the State, the representative of the Planning Commission replied during evidence:

"State Electricity Boards have to incur certain expenditure by way of maintenance charges, depreciation on plant and equipment and interest paid on the loans they have taken. All these have to be recovered from the sale of electricity. The sale is 70 per cent to industry, 12 per cent to Agriculture and 18 per cent to domestic consumers. They try to recover from each consumer to the extent he can bear. But no Electricity Board is getting all the revenue it wants."

6.6. To another query the witness replied:

"If power is to be treated as industry, it should be earning a profit. But the Act lays down that it should be on the basis of no profit no loss. By the end of the Fifth Plan, investment in power would be about Rs. 10,000 crores. If we are going to lose at the rate we are losing now, the loss would be of the order of Rs. 4 crores per year."

6.7. In reply to U.S.Q. No. 1347 answered in Lok Sabha on the 8th August, 1972, the Deputy Minister of Irrigation and Power had stated:—

“The State Electricity Boards had been requested in 1969 to achieve uniformity in tariffs for each category of consumers within the State. This has, by and large, been achieved with the formation of State Grid net-works. The integrated operation of State Power Systems in a regional net-work, which is now being promoted in the country, will pave the way for pooling of costs of generation which can lead to more uniformity of tariffs within each region. Inter-regional disparities will gradually be removed with the formation of All-India Grid which is being visualised.”

6.8. In reply to U.S.Q. No. 3076 answered in Lok Sabha on 22nd August, 1972, the Deputy Minister of Irrigation and Power had stated:—

“The question of bringing about uniform electricity tariffs in the country has been engaging the attention of the Government. The cost of electricity depends upon various factors such as source of supply, extent of transmission and distribution systems, capital cost incurred, load characteristics and also other local conditions. The State Electricity Boards are empowered to frame their own tariffs for power supply to their consumers so that they shall not, as far as practicable, carry on their business at a loss. This was discussed at the Conference of the Chairman of the State Electricity Boards held on 10th and 11th May, 1972. The Conference agreed that the States will take suitable action to adjust the tariff rates so that the disparity between the rates of the same categories of consumers in the States of the same region is reduced. Thus efforts are being made to bring about uniformity in tariffs on a regional basis.”

6.9. Subsequently in reply to another U.S.Q. No. 4786 replied in Lok Sabha on the 27th March, 1973 regarding electricity rate, the Deputy Minister of Irrigation and Power stated:

“The State Electricity Boards have powers to frame their own tariffs for power supply to various consumers in their respective areas. Power tariffs vary from State to State because of variations in the cost of generation, transmission and distribution. However, it is the aim of Government to ensure that there are uniform tariff rates for each category of consumers within each State in the first instance and ultimately, on the establishment of an All India Grid to narrow down the disparities in the rates to the extent feasible in the country as a whole. Uniform power tariffs for each category of consumers have been introduced in the States of Andhra Pradesh, Assam.

Bihar, Gujarat, Haryana, Kerala, Mysore, Punjab, West Bengal, Madhya Pradesh and Maharashtra. The Boards in the States of Orissa and Rajasthan are also taking steps in this direction. In Uttar Pradesh there is uniform tariff throughout the State, except in three major cities namely, Allahabad, Kanpur and Lucknow, where lower low tension tariff for domestic and commercial consumers is in force. Although Tamil Nadu Electricity Board had introduced uniform tariff, it has kept separate high tension tariffs for large and heavy industries in hydro and thermal areas."

6.10. The Committee note that a number of State Electricity Boards are running at a loss at present though the policy is that on the whole there should be no-profit and no-loss. The Committee feel that at a time when there is widespread demand for power, there is no reason why the State Electricity Boards should not be able to break even by improving the utilisation of their plants effecting economy in overhead expenditure and reducing losses in transmission etc. The Committee would like the Government to impress on the State Electricity Boards to carry out a detailed cost analysis with a view to pin-pointing the factors which are responsible for the loss and take necessary remedial measures.

6.11. Above all, the Committee feel that the Central Power Plants which are coming up in a big way should be managed most efficiently so as to be able to set an example for the States to follow.

6.12. The Committee would like to make it clear that what they are anxious is that power should be supplied at most competitive rates in the interest of development of economy and this should be achieved by improving efficiency and effecting economy in the working of authorities responsible for generation, transmission and distribution of power.

6.13. The Committee note that uniform power tariffs for each category of consumers have been introduced in most of the States and that the States of Rajasthan and Orissa are also taking necessary steps in this direction. The Committee hope that with the establishment of an All India Grid the disparities in the tariff rates in the various States and Regions would be narrowed down.

6.14. Consistent with the policy of Government to promote the uplift of weaker sections of the people, the Committee would suggest that Government should examine the question of supply of electricity to the weaker sections of the rural population including agriculturists and artisans, backward classes and industrially backward areas at concessional rates.



## CHAPTER VII

### (i) RURAL ELECTRIFICATION

India is predominantly an agricultural country and 80 per cent of the population live in villages. Provision of electricity is an essential prerequisite for the development of rural areas and can bring about far-reaching changes in methods of irrigation and farming, and create conditions for the growth of industries and commerce, greater rural employment and provide amenities generally associated with urban areas. Although the first ever electric station in India was commissioned in 1897, very little efforts were made till independence to take electricity to the villages and on 31st March, 1951, only 2525 villages out of total number of 5,66,878 villages were electrified and 18,709 pumpsets were operating in the entire country. This was largely on account of the fact that rural electrification entailed serving scattered consumption centres with seasonal loads and poor load factor resulting in low returns on investment.

#### Rural Electrification during Five Year Plans

7.2. The programme of rural electrification is generally executed by the State Governments. The position in respect of each of the plans is indicated below:—

##### (i) *First Five Year Plan (1951—56).*

7.3. During the latter part of the First Five Year Plan a scheme was introduced in 1954-55 for expansion of power facilities for increasing employment opportunities. The programme included a number of diesel generating stations and extensions to the existing distribution systems. These schemes were assisted with loans given to State Governments on which interest alone was payable during the first five years and repayment of the loans with interest in equal instalments was to spread over a subsequent period of 25 years. An expenditure of Rs. 8.27 crores was incurred and 5837 villages were electrified and 33,260 pumpsets energised.

##### (ii) *Second Five Year Plan (1956—61)*

7.4. The programme of expansion of power facilities for increasing

employment opportunities was continued in the Second Plan. An investment of Rs. 75 crores was made in this respect during Second Plan. 16,044 additional villages and 1,40,855 additional pumpsets were electrified during the Second Plan period.

7.5. The progress remained tardy for many years on account of paucity of resources and a relatively low priority for programmes of rural electrification. Thus until the close of Second Plan, only 25,453, out of a total of our 5,60,000 villages or in other words hardly one out of 20 villages could be electrified.

(iii) *Third Five Year Plan (1961—65)*

7.6. In the Third Plan, the need for an accelerated programme of rural electrification was recognised but the emphasis was still on village electrification with a view to creating additional employment opportunities through development of rural industries. Attention was also paid in the Third Plan to the establishment of State-wise grid net-works. The nomenclature viz., "Expansion of Power Facilities for increasing Employment Opportunities" was changed to "Rural Electrification" in the Third Five Year Plan. The Outlays on rural electrification was earmarked in the Third Plan. With an outlay of Rs. 105 crores on rural electrification during the Third Plan, it was targetted to electrify about 25,000 villages in the country. Due to drought conditions, in Uttar Pradesh and Bihar and in order to boost programme of energisation of agricultural pumpsets in context of grow-more-food campaign an additional outlay of about Rs. 11 crores was sanctioned during the last two years of the Third Five Year Plan. The actual investment in the Third Plan was Rs. 153 crores. The achievements during the Third Plan period were as under:—

Villages electrified	..	20,503
Tubewells/Pumpsets energised	..	3,20,096

Thus as on 31st March 1966, 45,909 villages were electrified and 5,12,920 pumpsets/tubewells were energised in the country.

*Rural Electrification during the Three Annual Plans—1966—68*

7.7. A decision was taken in 1965 by the National Development Council, to orient the rural electrification schemes primarily for the energisation of pumpsets and the emphasis was shifted from village electrification to energisation of pumpsets from 1966-67, the electrification of villages being a subsidiary part of this programme.

7.8. The normal and additional outlay for Rural Electrification during the years 1966—69 was of the order of Rs. 151 crores. The State Electricity Boards also augmented their resources from funds raised by them from Life Insurance Corporation, Agricultural Finance Corporation, Agricultural Refinance Corporation and also from Commercial Banks. The expenditure incurred on rural electrification during these three years was of the order of Rs. 238 crores. During this period additional 28,557 villages and 5,75,638 irrigation pumpsets/tubewells were electrified in the country, bringing total number to 74,466 electrified villages and 10,88,558 energised pumpsets in the country as on 31st March, 1969.

*Rural Electrification during the Fourth Five Year Plan*

7.9. During the Fourth Plan, an outlay of Rs. 295 crores has been provided in the State Plans. In addition Rs. 150 crores have been provided in the Central Sector for the Rural Electrification Corporation. Another amount of about Rs. 75 crores (not included in the Plan) was expected to be raised from other financing institutions like the Agricultural Finance Corporation and the Agricultural Refinance Corporation. The target envisaged during the Fourth Plan is 12.5 lakhs pumpsets—7 lakh pumpsets from the State Plan outlays and 5 lakhs pumpsets from the Rural Electrification Corporation's outlays. In addition, from the outlays of Rs. 75 crores to be raised from the other financing institutions, an additional 2.5 lakhs pumpsets are expected to be energised. No target for village electrification was, however, laid down in the Fourth Plan since the emphasis during the Plan period continues to be on the energisation of pumpsets. However, it was generally expected that as incidental and consequential to the energisation of pumpsets about 50,000 new villages would be electrified.

7.10. The Rural Electrification Corporation sanctioned schemes which are prepared on a 'project' approach. Other inputs relating to provision of connections for small scale and agro industries are also integrated though the bias remains on increase of agricultural production. So far, the Corporation (as on 1st July, 1972) has sanctioned 242 schemes of State Electricity Boards (there are State Electricity Boards in all the States excepting Jammu and Kashmir, Nagaland Manipur and Tripura) envisaging a loan assistance of Rs. 138.21 crores for electrification of 22,514 villages, energisation of 3,04,035 pumpsets and provision of 49,479 connections for small scale and agro industries. In addition the Rural Electrification Corporation has sanctioned loans of Rs. 12.81 crores to five Pilot Rural Electric Cooperatives set up in the States of Andhra Pradesh, Gujarat, Maharashtra, Mysore and Uttar Pradesh for the electrification of 729 villages, energisation of 27,605 pumpsets and provision of connections to 1,553 small scale and agro industries.

7.11. The Rural Electrification Corporation has evolved concessional terms of financing for schemes in the backward areas. Out of 242 schemes

sanctioned by the Rural Electrification Corporation 94 relate to the backward areas. It has been observed that in nine States the progress of villages electrification is below the All India percentage of about 21. These States are Assam, Bihar, Jammu and Kashmir, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Uttar Pradesh and West Bengal. The Rural Electrification Corporation have provided additional facilities in regard to financing schemes in the backward States. These are as follows:—

- (i) The agricultural emphasis in rural electrification schemes has been widened to include forestry, animal husbandry, agro-industries and other allied agricultural activities. This would provide special benefits to those backward States where there is greater scope for such activities in addition to energisation of pumpsets.
- (ii) Since the main limitation in extension of rural electrification schemes in backward States has been the absence of a well-developed high tension transmission network, the Rural Electrification Corporation has decided to sanction special loans for extension of high tension transmission networks in backward States for rural electrification schemes.
- (iii) Further concessional terms of financing are to be provided for rural electrification in specially under-developed hill areas, particularly in the States of Uttar Pradesh and Assam.

7.12. During the first three years of the Fourth Plan *viz.*, 1969-70, 1970-71 and 1971-72, the progress achieved is as under:—

Village electrified	46,400
Pumpsets energised	7,98,775

The total number of electrified villages and energised pumpsets in the country as on 1st April, 1972 was 1,21,874 and 18,87,333 respectively. There was thus an increase of 62 per cent in the case of village electrification and 73 per cent in case of pump energisation in first three years of the Fourth Plan as compared to achievement during the 18 years (at the end of 1968-69).

7.13. A statement giving the position of villages electrified and pumpsets energised in States and Union Territories beginning from the First Plan to Fourth Plan is given in para 7.17.

7.14. Considering the progress of rural electrification so far, it is estimated that 75,000 villages will be electrified and the target of 15 lakhs pumpsets would be achieved during the Fourth Plan period.

*Decade Plan (1971—81)*

7.15. A perspective Plan for the Decade commencing from April, 1971 to March, 1981 for rural electrification with emphasis on energisation of pumpsets for increasing agricultural production has also been prepared. The salient features of the Decade Plan are given below:—

- (a) Efforts should be made so that all the irrigation wells in the country are energised at the earliest possible time leaving aside those which will not be suitable for energisation or which may have to be continued to run with diesel engine or other means, for special reasons like being far away from available electricity sources. It is estimated that about 65 lakhs irrigation wells in the country would be capable of energisation. It is proposed that the programme for the Decade should cover them. This would envisage energisation of additional 48.7 lakhs pumpsets during the decade. Of this number, about three-fourths are proposed to be covered during the period from 1971 to 1979 (*i.e.* remaining period of Fourth Plan and the Fifth Plan) the balance to be covered in the first two years of the Sixth Plan;
- (b) To electrify 3.4 lakhs villages representing about 60 per cent of the total number of villages in the country by the end of the decade. It is proposed to electrify all villages with population range of more than 500 in the country. Also in each State 50 per cent of the villages will be electrified by the end of the decade. This will require electrification of about 2.33 lakhs additional villages during the decade. Of this number about three-fourths are proposed to be electrified during the period from 1971-79 (*i.e.* during the remaining period of Fourth Plan and Fifth Plan) and the balance to be covered during the first two years of the Sixth Plan;
- (c) The total outlay involved for the implementation of the decade Plan is estimated at Rs. 2,270 crores.

It may be noted that the programme envisages the stepping up of village electrification particularly in backward States to the level of 50—55 per cent.

7.16. The following table gives position of the total number of villages in each States, villages electrified and percentage of villages electrified in

## each State/Union Territory as on 31-3-1972:—

State/Union Territories	Total Number	Villages electrified as on 31-3-1972	Percentage
Andhra Pradesh . . . . .	27,084	9,264	34.2
Assam . . . . .	25,702	900	3.5
Bihar . . . . .	67,665	8,189	12.1
Gujarat . . . . .	18,584	4,706	25.3
Haryana . . . . .	6,669	6,091	91.5
Himachal Pradesh . . . . .	13,060	3,124	23.8
Jammu & Kashmir . . . . .	6,559	769	11.6
Kerala . . . . .	1,573	1,268	80.6
Madhya Pradesh . . . . .	70,414	8,797	12.4
Maharashtra . . . . .	35,851	13,661	38.1
Mysore . . . . .	26,377	10,075	38.2
Nagaland . . . . .	814	77	9.4
Orissa . . . . .	46,466	2,615	5.6
Punjab . . . . .	11,947	6,366	53.3
Rajasthan . . . . .	32,241	4,023	12.5
Tamil Nadu . . . . .	14,124	12,709	90.0
Uttar Pradesh . . . . .	1,12,624	23,755	21.1
West Bengal . . . . .	38,454	3,278	8.5
	<b>5,56,208</b>	<b>1,19,667</b>	<b>21.3</b>
<i>Union Territories</i>			
Andaman & Nicobar Islands . . . . .	399	28	7.0
Chandigarh . . . . .	31	31	100.0
Dadra & Nagar Haveli . . . . .	72	13	18.0
Delhi . . . . .	276	276	100.0
Goa, Daman & Diu . . . . .	245	151	61.7
L.M.A. Island . . . . .	10	8	80.0
Manipur . . . . .	1,866	188	10.0
N.E.F.A. . . . .	2,451	48	1.9
Pondicherry . . . . .	388	388	100.0
Tripura . . . . .	4,932	85	1.5
	<b>10,670</b>	<b>1,216</b>	<b>11.4</b>

7.17. The progress of rural electrification during the various plans in physical terms is given below:—

Position	Villages electrified	Pumps energised
At the beginning of First Plan . . . . .	3,623	18,709
During the First Plan . . . . .	5,986	33,260
During Second Plan . . . . .	15,844	1,40,855
During Third Plan . . . . .	19,041	3,20,096
During 1966-67 . . . . .	11,177	1,36,514
During 1968-69 . . . . .	10,036	2,38,946
Position at the beginning of Fourth Plan . . . . .	73,971	10,87,662
Target for Fourth Plan . . . . .	75,000	15,00,000

#### *Supply of electricity to Harijan Bastis*

7.18. It was observed that some Harijan Bastis adjacent to already electrified villages were not electrified because of unremunerative loads in these areas and constraint of financial resources of the State Electricity Boards. The Government of India have introduced since December, 1971, a special scheme for electrification of such Harijan Bastis. According to this scheme, loan assistance at concessional terms is being provided through the agency of Rural Electrification Corporation to the State Electricity Boards for electrification of such Harijan Bastis. The loan carried an interest of 4½ per cent per annum and is to be repaid over a period of 15 years. Against the amount of Rs. 50 lakhs provided for this purpose in the last financial year (1971-72), the Corporation has sanctioned schemes reports of Andhra Pradesh, Gujarat, Madhya Pradesh, Maharashtra, Mysore, Punjab, Rajasthan, Tamil Nadu, West Bengal and Uttar Pradesh State Electricity Boards envisaging loan assistance of Rs. 55.841 lakhs for the electrification of 1142 Harijan Bastis. Depending on the availability of resources, it is proposed to provide Rs. 5 crores for the electrification of 20,000 Harijan Bastis by the end of the Fourth Plan. For the year 1972-73, a budget provision of Rs. 1 crore has been made for the electrification of Harijan Bastis. Out of this, Rs. 50 lakhs have since been released to the Corporation for advancing further loans to the State Electricity Boards.

7.19. In respect of projects to be undertaken for the electrification of village in future, the State Electricity Boards have been advised to ensure

that while electrifying the villages, adjacent Harijan Bastis should also be electrified.

7.20. The Power Economy Committee in their Report submitted in March, 1971 had stated about the rural electrification programme:

“The order of priority followed in the selection of villages for rural electrification in different States does not seem to indicate that it has been spelt out fully. Broadly speaking, remunerativeness, nearness to main transmission lines, population, and accessibility have been the guiding criteria. Due consideration should be given for electrification programmes in backward areas. Also to the extent possible, rural electrification should be taken up in a concentrated form in compact blocks of area with considerable agricultural or other potential as such a programme will lead to an integrated area development and yield richer dividend in the future.”

7.21. The Power Economy Committee further recommended that “in order to enable the State Electricity Boards to take up the programme of rural electrification in a massive manner which generally results in financial losses, especially in the first few years, financial assistance in one form or the other should be provided to them”.

#### *Investments in the Five Year Plans*

7.22. A brief summary of the outlays and actual investments in rural electrification in the successive plans commencing with the First Five Year Plan is given below:

Period	Plan Outlay (Rs. in crores)	Actual Investment
First Plan	20	8
Second Plan		75
Third Plan	105	153
<i>Annual Plans :</i>		
1966-67	62	74
1967-68	46	75
1968-69	43	289
Fourth Plan	520	225
	786	699
		For two years of Plan.



7.23. Regarding provision of funds for rural electrification from Fifth Plan period, the Power Economy Committee have stated that :

“The position regarding planning for the period 1974—81 has been discussed in detail in the Report of Study Group 4. It has been suggested therein that this plan should comprise electrification of additional 28.11 lakhs pump sets and of 1,40,000 villages. In addition, financial provision has to be made for the normal load growth of villages already electrified. On these basis, the requirements of funds for the seven year period (1974—81) has been worked out as Rs. 1850 crores. In other words, about Rs. 265 crores annually would be required for the above modest plan against Rs. 104 crores proposed to be spent annually during the Fourth Plan. Immediate consideration should, therefore, be given by all the concerned Central and State authorities to ensure that it would be possible to provide about Rs. 165 crores on the average annually for the rural electrification programme during the period 1974—81.”

7.24. Asked about the targets of rural electrification during the Fourth Plan and achievements made so far, the representative of the Ministry of Irrigation and Power stated in his evidence before the Committee :—

“In the Fourth Plan, no targets for village electrification were fixed as such. The emphasis in the Fourth Plan has been to continue the energisation of pump sets to increase agricultural production. Under the Plan allocation of the order of Rs. 195 crores, a target of 7½ lakh pump sets were to be energised. Apart from this, in the Central Sector, we were going to finance schemes from the Rural Electrification Corporation to the extent of Rs. 150 crores, and that was expected to energise another 5 lakhs pumpsets. It was also expected that private financing institutions would also finance rural electrification programme and about 2½ lakh pumpsets were expected to be energised as a result of that. Therefore, in all 15 lakh pump sets were to be energised in the Fourth Plan. At the beginning of the Plan, there were 10.88 lakh pumpsets. Today we have energised 20.3 lakh sets.”

7.25. Asked about the reasons for some States being backward in the matter of rural electrification and steps being taken to step up the progress of rural electrification in these States, the representative of the Ministry of Irrigation & Power stated before the Committee :

“We categorise the States as backward those which are below the all India level of electrification. So far as those States are

concerned, these are Assam, Bihar, J. & K., M.P., Nagaland, Orissa, Rajasthan, U.P. and West Bengal. The main reason why these States are backward are, that upto the Third Plan, the allocations that were set apart for rural electrification, were very much low. But since 1966 onwards, the allocations have been stepped up and considerable progress has been made thereafter. In the Fourth Plan, the provision that have been made are very substantial. For example, in Assam the estimated expenditure on rural electrification from 1961 to 1969 was Rs. 3 crores. The outlay in the Fourth Plan is Rs. 10.88 crores. In the case of Bihar, it was Rs. 19.36 crores. It will be Rs. 36 crores in the Fourth Plan. It is not only the funds, there are also deficiencies in organisations. For example, in the States of West Bengal and Assam, there are organisational deficiencies."

7.26. The representative of the Planning Commission stated:—

"During the Fifth Plan, about Rs. 300 crores are being set apart only for rural electrification of backward areas. Now the basic minimum need is to see that States with a rural population of about 30 per cent, if they are below par, would be brought at par during the Fifth Plan period."

7.27. Asked if in view of the fact that the main obstacle for rapid rural electrification of backward areas is the lack of high tension transmission lines and connected sub-stations, special efforts are being made in this direction, the representative of the Planning Commission stated:—

"Under the State Plan, there is a separate allocation for transmission and distribution. No doubt it has not been adequate and according to needs and there has been more emphasis on generation than on transmission and sub-transmission, so this has created the serious imbalance all over the country and there are States where power is available but it cannot reach the consumer and there are States which have got money for spending on rural electrification, but there is no transmission line. Now, take for example, Orissa State. Even if you give them money for rural electrification, it is difficult to go in for rural electrification because they have not laid the transmission lines. People have realised the difficulties and there is a greater awareness and I think this imbalance will be rectified in due course over the Fifth Plan period... Transmission lines are the first necessity to take the power supply to the consumer."

7.28 Regarding the schemes sanctioned by the Rural Electrification Corporation so far and the progress of implementation of these schemes, the representative of the Rural Electrification Corporation stated before the Committee:—

“The position as on 31-12-1972 is that the REC has sanctioned 344 schemes to the State Electricity Boards involving loans amounting to Rs. 186.40 crores and on their completion the schemes will lead to energisation of 3,84,000 agricultural pump sets and provision of electricity to 63,839 LT Industries. So far as implementation is concerned the results can be achieved only on the completion of the schemes. The period of completion of these schemes range between 3 to 5 years. The first batch of these schemes for which we released loan amount was in 1970-71. These schemes will, therefore, be completed only in 73-74 and those which were due for completion in 5 years will take two years more. We have made an attempt to examine the progress in the case of the schemes which we have inspected as to how much they have progressed. Out of the 344 schemes, 154 schemes are less than a year old and in 91 cases the first instalment itself is yet to be released. Even so, in quite some of the schemes which have been on the ground for a year or so we have made an attempt to judge the progress and we are happy to report to you that in a number of cases in regard to village electrification particularly, the target set have actually been even exceeded in some cases and in other cases it is keeping pace. So far as service connections are concerned, these can of course fructify fully only after the construction work is completely over. For instance, in Haryana, in respect of whose schemes (7 cases where we took up on the spot inspections and evaluated the progress) out of 432 villages which were envisaged to be electrified, as on date they have already achieved 527. In Maharashtra in respect of 8 schemes where we examined, out of 723 which were envisaged as on date, they have already achieved 675. In Tamil Nadu out of 595, 526. So the progress has been very satisfactory.”

7.29. Asked if schemes in backward areas which are not economically viable are not being advanced loans by Rural Electrification Corporation, the representative of the Ministry of Irrigation and Power stated:—

“So far as R.E.C. is concerned it functions on certain directions. But even so, because we are giving certain reasonable relaxations to give incentives to the backward areas, in the case of

backward areas we have prescribed certain easier norms of viability. The norms which a scheme should reach in 10 years in the ordinary advanced areas need to be reached in only 20 years in the backward areas—that is, 10 more years is given. Then, we have also said that they can repay the loans in 20 years as against 10 years in the advanced areas. The rate of interest is also much lower—4 per cent in the backward areas as against 6 per cent in the advanced areas. When you take the totality of the scheme into account you will find that if there is potential in the area for development, backward areas can also qualify for this. And the investment of the State Electricity Boards on rural electrification is itself about 30 per cent of the total investment. Although the REC provides only 30 per cent, the balance amount for rural electrification of the States comes from other sources.”

*Report of the Committee of Members of Parliament on Rural Electrification*

7.30. The Committee of Members of Parliament on Rural Electrification was set up in pursuance of the recommendations of the Informal Ministry of Irrigation and Power at its meeting on 5th March, 1968. The terms of reference of the Committee were as follows:—

- (i) Review the present progress in the electrification of villages and energisation of pumpsets in the States of Assam, Bihar, Jammu & Kashmir, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Uttar Pradesh and West Bengal.
- (ii) Suggest measures for accelerating the progress of rural electrification in the above States with particular reference to energisation of pumpsets/tubewells and electrification of villages with a population range of 2,000 and above.
- (iii) Recommend the funds, State-wise, that would be required for implementing the recommended programme.
- (iv) Suggest ways and means of mobilising resources for implementing the recommended programme.
- (v) Any other matter relating to rural electrification and energisation of wells.

7.31. That Committee reached the conclusion that the following are the main reasons for the comparatively slow progress of rural electrification in backward areas:—

- (i) Lack of adequate financial resources to take up extensive rural electrification schemes.

- (ii) Lack of adequate financial resources for developing and extending high tension transmission lines.
- (iii) In some areas of the backward States, *e.g.*, Assam and West Bengal there is more scope for agro-industries than for electrification of pumpsets. A reorientation of policy is required where the emphasis on agriculture includes agro-based industries, forestry and animal husbandry.
- (iv) Some of the State Electricity Boards in the backward States have not been able to build up sufficient inventories of equipment and raw materials required for rural electrification schemes, because of inadequacies of resources.
- (v) The cost of rural electrification is comparatively high in the initial stages mainly because of the inadequacies of high tension transmission networks and difficulties in arranging for bulk ordering of materials and equipment which would provide economies in standardisation of equipment and reduce construction periods.

7.32. The Committee made a number of recommendations for accelerating the pace of rural electrification in backward areas. Some of the important recommendations are enumerated below:—

- (i) The Rural Electrification Corporation has done excellent work and we are happy that it continues to give increasing emphasis to sanctioning of new schemes in backward States and backward areas. This emphasis should be continued so that all the backward States lead in respect of number of schemes sanctioned and the amount sanctioned for rural electrification schemes. This emphasis should continue till the backward States reach the all India average of village electrification.
- (ii) High tension transmission networks should be provided in areas where there is rapid development of rural loads. It is essential that transmission lines of 11 KV should not be extended beyond 30 km. If any extensions are required beyond that distance, the high voltage sub-stations and associated transmission networks should be provided.
- (iii) The Rural Electrification Corporation would be able to provide only a small portion of the funds required for high tension transmission networks in rural areas. It is essential that the bulk of the outlays namely Rs. 46.5 crores are provided during the Fourth Plan for taking up essential high tension transmission lines in the backward States.

- (iv) Enhanced targets of electrification of villages and pumpsets in backward States should be supported by provision of the necessary funds. The Rural Electrification Corporation has asked for an additional outlay of Rs. 110 crores. Out of the present outlay of Rs. 150 crores it is envisaged that Rs. 83 crores would go to the backward States. It is expected that out of the additional outlay asked for by the Corporation, due weightage would continue to be given to backward States and also for financing of high tension transmission lines in rural areas in respect of backward States.
- (v) The Rural Electrification Corporation has been directed to sanction schemes with a primary objective of increasing agricultural production. For balanced rural development, specially in areas where there is as great a scope for agro/small scale industries as there is for irrigation, the schemes financed by the Rural Electrification Corporation should be agriculture-oriented in the wider sense of the terms so that electricity can provide for development of forestry, animal husbandry, fisheries, agro-industries and small scale industries.
- (vi) It has been observed that under-developed hilly tracts specially in Assam, Uttar Pradesh, Chhota Nagpur in Bihar, have special problems because of sparse population, difficult terrain, long distances between villages and limited scope of lift irrigation and other agricultural operations. For schemes in such areas, the Rural Electrification Corporation should introduce special concessions so that a longer period may be given for the schemes to earn the desired return as compared with the schemes in other backward areas.
- (vii) Whereas in most of the States, the expenditure within the Plan is higher than the approved Plan outlay, in some of the backward States like West Bengal and Orissa, the expenditure has been less than the approved plan outlay. It has also been observed that in some of the advanced States like Maharashtra, there has been no expenditure from the Plan outlay since considerable finances are made available from financing institutions like commercial banks and the Agricultural Refinance Corporation. It is essential that State Governments should provide to the State Electricity Boards an approved Plan outlay each year for extension of rural electrification. This should be a pre-condition before any further financing is done by the Rural Electrification Corporation. Further, in order to ensure that the funds provided by the Rural Electrification Corpora-

tion are additive to State Plan outlays, it is suggested that from the Fifth Plan, the policy of earmarking Plan outlays for rural electrification schemes followed in the Third Plan should be restored.

- (viii) Backward areas are not in a position to avail of substantial assistance from financing institutions other than the Rural Electrification Corporation. It is, therefore, recommended that special Central assistance to the extent of Rs. 65 crores should be provided to these backward States during the Fourth Plan. This amount of Rs. 65 crores should be specifically earmarked for rural electrification scheme in the backward areas in addition to already approved State Plan outlays.
- (ix) The backward States, specially Assam, Orissa and West Bengal, have to build up the necessary technical organisation to ensure (a) necessary co-ordination with the Agriculture and Industries Departments for building up loads required for rural electrification projects; and (b) implementation of these projects sanctioned by the Rural Electrification Corporation and other agencies. While steps are being taken in this direction by the various States, it is necessary that the Rural Electrification Corporation should ensure that positive steps are taken in this direction. An assessment of the rural electrification organisation of each State and recommendations to augment its staff and improve its working should be a necessary part of the evaluation which is to be made from time to time by the Rural Electrification Corporation of the progress of various schemes sanctioned by it not only in the backward States but also in other States in the country.

7.33. In a written note submitted to the Committee on the subject of progress of rural electrification in backward areas, the Committee have been informed by the Ministry of Irrigation and Power that:—

“At the commencement of the Fourth Plan, the all India average of village electrification was 13 per cent and the progress was below the all India average in the States of Assam, Bihar, Jammu and Kashmir, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Uttar Pradesh and West Bengal. The comparatively slow progress of rural electrification in these States was mainly due to constraint of resources in developing and extending the high tension transmission and distribution networks in the rural areas. During the Fourth Plan the outlays on rural

electrification within the State Plan ceilings were enhanced to provide for acceleration of rural electrification schemes in the backward States. The national emphasis in rural electrification schemes on energisation of pumpsets has been continuing during the Fourth Plan with a view to increasing agricultural production. The position in respect of the backward States is briefly indicated below:—

Name of State	Total No of villages	No. of villages electrified on 31-3-69	Percentage	No. of pumps energised as on 31-3-69	Estimated expenditure on R.E. from 1961-69	Outlay in the States on R.E. on IV Plan	Targets of pumps to be energised during IV Plan
(Rs. in crores)							
Assam	25,702	380	1.4	55	3.10	10.88	3,200
Bihar	67,665	6,350	9.3	50,005	19.36	36.00	89,000
J. & K.	6,559	614	9.3	162	4.51	1.00	120
Madhya Pradesh	70,424	2,749	3.8	24,631	22.52	20.00	50,000
Nagaland	814	27	3.3		0.25	0.07	
Orissa	46,466	821	1.7	477	6.26	6.05	1,500
Rajasthan	32,241	2,219	6.9	18,362	11.18	14.00	35,000
U. P.	1,12,624	13,075	11.6	75,465	48.87	61.00	1,50,000
West Bengal	38,454	2,435	6.9	1,199	5.02	10.00	2,410

It may be observed that the outlays provided in the State Plans during the Fourth Plan are substantial and in respect of the States of Assam, Bihar, Rajasthan, Uttar Pradesh and West Bengal are more than the expenditure incurred by the various States on rural electrification during the 8 year period preceding the Fourth Plan. Further, the State Governments would be availing of additional finances mainly from the Rural Electrification Corporation. The targets to be achieved during the Fourth Plan in these States on the basis of State Plan outlays, and



additional financing provided by the Rural Electrification Corporation and other sources are indicated below:

Name of the State	Total No. at the beginning of 4th Plan		Targets during 4th Plan		No. at the end of 4th Plan	
	Villages electrified	Pumps energised	Villages electrified	Pumps energised	Villages electrified	Pumps energised
Assam . . .	380	55	900	5,000	1,280	5,055
Bihar . . .	6,350	50,005	5,835	1,00,000	12,185	1,50,005
J. & K. . .	614	162	150	120	764	282
Madhya Pradesh .	2,749	26,631	6,500	1,00,000	9,249	1,24,631
Nagaland . . .	27	..	60	1	87	1
Orissa . . .	821	477	3,000	20,000	3,821	20,477
Rajasthan . . .	2,129	18,362	2,500	50,000	4,719	68,362
Uttar Pradesh .	13,075	75,465	15,000	1,65,000	28,075	2,40,465
West Bengal . .	2,435	1,199	3,500	20,000	5,935	21,199

“The above statements would indicate the impact of special measures in progress during the Fourth Plan for promoting and accelerating rural electrification in the backward States. The number of villages electrified in these States during the Fourth Plan as also the number of pumpsets energised would be generally more than the achievement during the 8 year period preceding the commencement of the Fourth Plan.”

7.34. In reply to unstarred Question No. 3037 dated 13th March 1973 the Minister of Irrigation and Power stated in Lok Sabha that:

“Considerable progress has been made during the Fourth Plan period in village electrification. As against 73, 722 villages electrified as on 31st March 1969, 132, 419 villages have been electrified upto 31st December 1972 and the number of villages electrified has almost doubled. The All-India average of village electrification is 23.4 per cent. The Rural Electrification schemes are formulated and implemented by the State Electricity Boards/Governments and financed from State Plan outlays and also from loans from financing institutions like Life Insurance Corporation, Banks etc. Besides additive finances are provided by Rural Electrification Corporation which has been set up in the Central Sector in 1969. The loans from Rural Electrification Corporation thus finance only a part of the rural electrification programmes. The Rural

Electrification Corporation financing has become available during the Fourth Five Year Plan only. The Corporation has so far sanctioned 394 schemes envisaging loan assistance of Rs. 208.97 crores for electrification *inter alia* of 35,957 villages. These schemes are still in progress as they are scheduled to be completed over a period of 3 to 5 years."

7.35. In reply to Unstarred Question No. 2926 dated 13th March 1973, the Minister of Irrigation and Power had given the following position relating to electrification of villages as on 31st December 1973:—

Sl. No.	Name of the State	Percentage of villages electrified as on 31-12-72	Percentage of rural population deprived the benefits of electricity.
1	2	3	4
1	Andhra Pradesh . . . . .	34.9	40.4
2	Assam . . . . .	3.3	92.14
3	Bihar . . . . .	12.9	76.00
4	Gujarat . . . . .	27.4	49.70
5	Haryana . . . . .	100.0	..
6	Himachal Pradesh . . . . .	26.7	56.20
7	Jammu & Kashmir . . . . .	11.2	82.40
8	Kerala . . . . .	83.9	11.50
9	Madhya Pradesh . . . . .	13.2	74.80
10	Maharashtra . . . . .	40.1	41.30
11	Manipur . . . . .	10.3	62.50
12	Meghalaya . . . . .	1.7	95.40
13	Mysore . . . . .	41.4	41.50
14	Nagaland . . . . .	10.9	79.70
15	Orissa . . . . .	10.7	80.00
16	Punjab . . . . .	54.6	34.00
17	Tamil Nadu . . . . .	96.4	2.50
18	Tripura . . . . .	1.9	92.00
19	Uttar Pradesh . . . . .	23.00	61.10
20	West Bengal . . . . .	12.1	76.20

The All India percentage of villages electrified as on 31st December 1972 is 23.2.

7.36. The Committee note that power plays a vital role in development. The Committee would like to stress that for an allround development of rural areas and for bringing about far reaching changes in the methods of irrigation and farming it is very essential to accelerate the pace of rural electrification in the country. In the opinion of the Committee rural electrification is necessary for:

- (i) increasing agricultural production by energising tube-wells as a regular and steady source of irrigation;
- (ii) agro-based industries as well as small scale rural industries in the rural areas;
- (iii) providing employment potential in villages themselves in agro-based and small scale rural industries thereby arresting the drift of population to bigger cities and creating of slums there;
- (iv) providing electrification and lighting facilities etc., in the villages which would not only make the educated persons from the villages not to leave villages but would also attract doctors and other social and technical workers to the villages by providing the basic amenities like power and light in the villages;
- (v) providing means of better standard of living to the rural inhabitants and farm workers by giving them the benefit of industrialisation, etc.

7.37. The Committee regret to note that although 80 per cent of the population of India live in villages and provision of electricity is an essential pre-requisite for the development of rural areas and can bring far reaching changes in the economy of these areas, very little was done in the First Three Five Year Plans for rural electrification with the result that till the end of Third Plan, only 45,409 villages out of total 5,66,878, that is, about 8 per cent were electrified and only 3,20,096 tubewells/pumpsets were energised throughout the country. It was only in the Three Annual Plans of 1966—69 and the Fourth Five Year Plan that the programme of rural electrification has picked up. The Committee note that even now only 23.4 per cent of the villages in the country have been electrified and only 18,76,188 tubewells/pumpsets energised. The Committee recommend that a time bound programme of rural electrification should be prepared by the Government which while fixing a long-term programme for providing power to every village of the country, should fix a target date for providing electricity to each and every village having a specific number of residents. The Committee recommend that sufficient funds should be provided in the Five Year Plans and implementation machinery at the field level should be geared up to achieve targets fixed.

7.38. The Committee note that although 23.4 per cent of the villages in the country have been electrified and about 19 lakh pumpsets have been provided in the country, there are wide disparities in the provision of electricity and installation of pumpsets in the various States. While there are States like Haryana and Tamil Nadu where practically every village has been electrified, there are States like Assam where only 3.3 per cent of the villages have been electrified and only 105 tubewells and pumpsets have been energised. Similarly, percentage of villages electrified in Orissa is 7.7 per cent, in West Bengal 12.7 per cent and in 9 other States, the percentage is less than all India average of 23.4 per cent.

7.39. The Committee regret to note that inspite of the various steps taken by the Government to provide incentives for the rural electrification of backward areas the number of States whose percentage was less than the all India percentage in the matter of rural electrification has increased from 9 in 1968 to 12 in 1973, and these backward States have not been able to come up to the all India standard. The Committee cannot but conclude that the steps taken and the special assistance provided so far for the rural electrification of backward areas have been far from adequate and would require to be further intensified and increased. The Committee recommend that the problems of the backward States in regard to slow progress of rural electrification should be examined in detail and concrete measures taken to accelerate the pace of rural electrification in these States.

7.40. It has been suggested before the Committee by the representative of the Government that rural electrification programme has not been able to make much headway in some of the States because of deficiencies in organisation. It has also come to the notice of the Committee that some of the States have remained backward in the matter of rural electrification because State Governments concerned have not accorded proper priority to the rural electrification programme and have not taken sufficient steps to activate the organisation in their States at the field level. The Committee recommend that the Central Government should impress upon all the State Governments, the immediate necessity of according proper priority to the rural electrification programme and to gear up organisational set up at the field level. The Committee recommend that the Union Ministry of Irrigation and Power and Planning Commission should depute Study Teams to the States which are backward in the matter of rural electrification, to impress upon and render necessary assistance to the authorities concerned to take immediate steps in the matter.

7.41. The Committee note that so far the States have laid more emphasis on generation than on transmission and distribution of power in the various States, with the result that it has created serious imbalance all over the country and even if power is available, the same cannot reach rural areas because of the absence of transmission lines. The Committee

have before them the example of the States of Orissa and Bihar where it is difficult to provide power in the rural areas as transmission lines have not been laid there. The Committee recommend that wherever schemes for the generation of power are initiated, effective measures should also be taken to lay transmission lines well in advance of such generation so that as soon as power is available, the transmission lines are also ready to distribute the power to the consumer.

7.42. The Committee note that in a number of villages where electricity has been provided, the 'Harijan Bastis' in those villages were not electrified because of unremunerative loads in those areas. The Committee further note that the Government of India have introduced since December, 1971, a special scheme for electrification of such "Harijan Bastis" and for that purpose loan assistance at concessional terms is being provided through the agency of Rural Electrification Corporation to the State Electricity Boards. The Committee recommend that the provision of public lighting to the economically weaker sections of the society particularly in the Harijans and Adivasis areas and 'bastis' should be given special consideration by the Government and if necessary, further incentives, viz., interest free loans etc., should also be given to the State authorities concerned for this purpose.

7.43. The Committee would, however, like to add that mere electrification and provision of pumping sets/tubewells in villages will not be able to achieve the desired results and the concept of rural electrification has to be understood in the wider perspective of all round development of areas where electrification has been done. To achieve the maximum results, the Committee feel that the programme of rural electrification has to be dovetailed with a well coordinated programme of establishment of rural industries and wide-spread growth of infrastructure like transport, forestry, agrobased industries, etc. The Committee have no doubt that if the programme of rural electrification is suitably coordinated with national and regional development plans, it will not only lead to reduction in imbalances in regional development but would also lead to increased consumption of power by rural people thereby making rural electrification a viable proposition.

7.44. The Committee consider that effective and well-coordinated measures should be taken for increasing consumption of electricity in rural areas. This can be done if agro-industrial centres and rural industrial estates for manufacture of articles of use for farmers like pumpsets, agricultural implements etc., are set up simultaneously in rural areas where rural electrification has been provided by proper coordinated and integrated plans. The Committee consider it necessary that the suitable maintenance, repair and operational facilities for pumpsets and electric gadgets should be encouraged to be set up in the rural areas where rural electrifi-

cation has been provided. This will go a long way in making use of electricity, popular among masses and would also ensure maximum utilisation of electric power for production purposes. The Committee further recommend that proper training facilities should be provided to local people so as to make them proficient in the work of maintenance, repair and operational facilities, so as to avoid dependence on outsiders.

7.45. The Committee would like to point out that there are a number of small and marginal farmers in the country who are not in a position to afford the cost of installation of tubewells or bear expenditure of its maintenance and operation, with the result that they have to remain at the mercy of big farmers for the supply of water for their fields. The Committee recommend that the Government should encourage such small farmers to form cooperatives and own tubewells on a cooperative basis. In case it is not found possible, the Government should instal State tubewells where necessary, in order to provide irrigation facilities and cater to the needs of the small and marginal farmers to the extent possible.

7.46. The Committee note that although a number of new projects for the generation of power have been taken up the rural areas have not been getting their due shares and in case of reduction or failure in supply of power, rural areas are always worst hit, and supply of power in these areas is adversely affected. The Committee recommend that a fixed percentage of power generated in a State should be earmarked for the rural areas and it should be ensured that rural areas get their proportional share of power even in case of reduction in the supply of power.

7.47. The Committee note that while power is being supplied to industries etc., on a cheap rate, no such concession is being allowed to the rural areas for agricultural purposes. The Committee fail to understand why in view of the importance that agricultural occupies in the country's economy, such concessions should not be allowed to the agriculturists particularly in view of the increasing need for more production of foodgrains etc. The Committee recommend that steps should be taken by Government to supply power to agriculturists at rates comparable, if not cheaper, to the industries.

7.48. The Committee note that a perspective plan for the decade commencing from April, 1971 to March, 1981 for rural electrification with emphasis on energisation of pumpsets, for increasing agricultural produce has been drawn up. The Plan provides for the electrification of 3.4 lakh villages representing about 60 per cent of the total villages and energisation of 48.7 lakh additional pumpsets by the end of 1981. The Committee note that the total outlay involved in the implementation of the Plan is estimated at Rs. 2,270 crores and about 265 crores annually would have to be provided for the seven-year period (1974—81). The Committee

recommend that in view of the urgent need for rural electrification for the development of rural areas the necessary allocation of funds may be made.

7.49. The Committee note that the Government had set up a Committee of Members of Parliament to review the programme of rural electrification in backward areas. This Committee of Members of Parliament had submitted their Report in July, 1972. The Committee, however, note that in their Report, the Committee of Members of Parliament had pinpointed that the main reason for the comparatively slow progress of rural electrification in backward States is lack of adequate financial resources to take up programme and development and extend high tension transmission lines. This Committee had recommended that a provision of additional Rs. 46.5 crores in the Fourth Plan should be made for the purpose. The Committee recommend that the above recommendations of the Committee of Members of Parliament should be implemented as early as possible.

7.50. The Committee further note that Committee of Members of Parliament had observed that under-developed hilly tracks specially in Assam, Uttar Pradesh and Chhota Nagpur in Bihar have special problems and should be given special concessions by the Rural Electrification Corporation so that a longer period may be given for the schemes to earn the desired return. The Committee hope that necessary action will be taken in the matter.

7.51. The Committee of Members of Parliament had also suggested that enhanced targets of electrification of villages and pumpsets in backward States should be supported by provision of necessary funds and the additional outlay asked for by the Rural Electrification Corporation should be granted to the Corporation. The Committee hope that rural electrification programme in the backward States will not be allowed to suffer because of shortage of funds.

#### (ii) Rural Electric Cooperatives

7.52. With the increase in the tempo of rural electrification programme over the last few years and the heavy responsibility devoting on the State Electricity Boards on this account, it was felt that the Cooperative system of electricity distribution in rural areas could be promoted in an experimental way so that, if successful, it might supplement the efforts of the State Electricity Boards. The first step in this direction was taken when the Central Government invited a team of experts from the National Rural Electric Cooperative Association of U.S.A. to visit India and carry out a feasibility study. This study was intended to examine the feasibility and scope for rural electric cooperative's in India and identify suitable areas where rural electric cooperatives could be promoted as on experi-

mental measure. On the basis of this study, five areas, one each in five States, were identified as suitable for the pilot experiment. These are located in Andhra Pradesh (Sircilla Taluk in Karimnagar district), Gujarat (Kodinar Taluk in Amreli District), Maharashtra (Rahuri and Mula-Pravara Taluks in Ahmednagar district), Mysore (Hukeri Taluk in Belgaum district) and Uttar Pradesh (five blocks in Lucknow district).

7.53. The Rural Electrification Corporation, under its charter, had been given special responsibility for the promotion and financing of rural electric cooperative in the country. As a first step, in January, 1970, the Rural Electrification Corporation sanctioned a pre-construction loan of Rs. 1 lakh to each of the five societies to enable them to proceed with the preliminary work connected with the setting up of their organisation and the formulation of the project estimates. With the help of the pre-construction loan sanctioned by the Rural Electrification Corporation and with the assistance provided by the concerned State Electricity Boards, all the five cooperatives took up preliminary work and sent up project estimate to the Rural Electrification Corporation for project loans. Project loans totalling Rs. 12.86 crores for all the five cooperatives were approved by the Rural Electrification Corporation and all the five projects went into operation during 1970-71. The earliest to go into operation was the project of Hukeri (Mysore State) in October, 1970 and the latest was the one at Lucknow (Uttar Pradesh) in March, 1971. During the year 1970-71, the five societies drew from the Rural Electrification Corporation loan instalments totalling Rs. 4.97 crores. The five projects are phased over a period of five years. On completion, the projects will result in energisation of 27,605 pumpsets and supply power to 1,553 small industrial units, 729 villages will be electrified and electricity made available for domestic connections, street lighting etc.

7.54. In the light of the experience of the five pilot societies, the question of promoting a few more societies is being considered by the Rural Electrification Corporation and preliminary feasibility studies are expected to be taken up soon.

7.55. Asked about the progress made by these Rural Electric Cooperatives, the representative of the Rural Electrification Corporation stated before the Committee.—

“Power supply in the bulk quantity will be made by the Electricity Boards and this supply will be made to a particular area over which the Society has jurisdiction. The cooperatives do the retail distribution work and that includes laying of LT and HT lines, giving connections and then the maintenance of these transmission lines etc. The consumer gets the supply at the same rate. It (society) serves all the people directly in the



area which is given to the cooperative and the rates are the same as those charged by the Electricity Board in their areas."

The representative of the Planning Commission stated:

"This is an experiment being carried out. This system is worked as a public sector unit. They purchase bulk supply of power from the Electricity Board and distribute the same within the licenced area marked out and they charge the consumers like retail charges and the margin is utilised for operating the Cooperatives. The initial investment and working capital have been provided through the Rural Electrification Corporation and in five States we are going through this experiment. We have to evaluate the experiences that we get before we take a decision whether they should have more cooperatives or not."

7.56. Asked about the progress made by these societies, the representative of the Rural Electrification Corporation stated:—

"The details of progress made are as follows—

Number of villages electrified so far by Cooperatives	217
LT lines laid by these Cooperatives	794Km
Number of Agricultural Connections given	451
Number of domestic and commercial connections given	8771

The Power Economy Committee had recommended that some kind of decentralised distribution may ultimately be necessary. So this is an experiment which we are trying out with 5 Cooperatives. When we compare their achievements against their targets, we find that they have done fairly well. We gave certain studies to the Indian Institute of Management, Ahmedabad, Vaikunta Mehta National Institute of Cooperative Management; their recommendations, by and large are favourable and they feel that the cooperatives will serve the purpose of decentralised retail distribution."

7.57. Asked about his own experience about the working of these Cooperatives, the witness replied:

"As far as physical targets are concerned, they have done very well. As far as consumers in the area are concerned, they have much better satisfaction in the area than in the other areas. There have been certain basic difficulties and a Committee has been appointed with Joint Secretary, Planning Com-

mission as Chairman. The guidelines are being evolved by the Committee and that would help to our thinking on the future of cooperatives about which 5 or 7 may be started in this year and some 50—100 in the Fifth Plan.”

7.58. Asked about the difficulties reported in the working of these Cooperatives, the representative of the Rural Electrification Corporation stated:

“There were mainly two assumptions made; (1) That the line losses would be 10 per cent. In actual practice we find that they average about 30 per cent. (2) In fixing the rates for supply to the Cooperatives, we had gone by the rate at which the Electricity Boards could supply. But we find that actually in some cases the Electricity Boards were losing. If in retail distribution, there was no return, then when handed over to the cooperatives, it could not suddenly become a paying proposition. This was the basic mistake which will not be repeated for future Cooperatives. We will take care that the guidelines that come from the Puri Committee would form the basis for more Cooperatives. . . . Very tentatively, we are thinking of one Society to be set up in each of the States which we have not yet covered mainly in the eastern sector.”

7.59. The Committee note that in order to supplement the efforts of the State Electricity Boards in the matter of distribution of power, 5 Rural Electric Cooperatives have been set up, one each in the States of Andhra Pradesh, Gujarat, Maharashtra, Mysore and Uttar Pradesh and these Cooperatives have already started work on projects which after completion, will provide electricity to 729 villages, energise 27,605 pump-sets and supply power to 1,553 small industries. The Committee further note that these Cooperatives have shown progress in their work and their performance had been quite satisfactory and these Cooperatives have already electrified 217 villages and given connections 451 agriculturists. The Committee note that Government are considering the question of promoting a few more Cooperatives by the Rural Electrification Corporation.

7.60. The Committee note that some difficulties have been experienced in the working of these Cooperatives viz., high percentage of line losses and financial losses in the retail distribution of power. A Departmental Committee headed by an officer of the Planning Commission has been set up to suggest guidelines for improving the working of these Cooperatives. The Committee hope that urgent action would be taken on the recommendations of this Departmental Committee so as to streamline the working of these Cooperatives.

7.61. The Committee recognise the importance of Rural Electric Co-operatives in the decentralised retail distribution of electricity and in promoting direct participation of users in this task. The Committee would like Government to encourage setting up more cooperatives and maximise their number in the country. They would, however, like to stress that as some difficulties have been experienced in the working of Rural Electric Co-operatives already set up by Government, which are being examined by a Departmental Committee, Government should lay down firm guidelines in the light of this evaluation, for the benefit of such co-operatives so as to avoid the repetition of the mistakes in the working of Rural Electric Cooperatives.

7.62. The Committee would further like to caution the Government that a number of Cooperatives set up in the country under the co-operative movement have been suffering from organisational weaknesses and are not able to discharge their functions effectively. The Committee would like Government to ensure that these Rural Electric Cooperatives are not allowed to suffer from similar organisational weaknesses and their working should be reviewed from time to time and corrective measures taken in time to keep them active so that they may be able to fulfil their role in the rural electrification programme of the country effectively. It should also be ensured that the over-heads of these Cooperatives are kept in the minimum.

7.63. The Committee would like to suggest that in order to keep a watch on the proper functioning of the Rural Electric Cooperatives, representatives of the Rural Electrification Corporation and State Electricity Boards concerned should also be represented on the Managing Committees of these Cooperatives. Moreover, these Cooperatives should be required to furnish quarterly reports on their working to the Rural Electrification Corporation which should monitor these Reports so as to ensure their smooth and efficient working. The accounts of these Cooperatives should also be got audited by the competent Auditors.

## CHAPTER VIII

### RESEARCH AND TRAINING SCHEMES

#### (i) Research programmes for development of power in the country

##### *Research Institute*

The Central Board of Irrigation and Power is an autonomous body which is concerned with the promotion and coordination of research in the field of irrigation and power in the country and is closely associated with the Ministry of Irrigation and Power.

8.2. It has been stated that the growing development in the power field is closely related to the creation, expansion of research and testing facilities so that economy, quality control and standardisation could be achieved in construction, generation, transmission, distribution and superior performance of the supply systems. Considering the dynamic industrial policy of the country and the fast changing pattern of economy growth there is large scope for research in power engineering. At present there is dearth of technical information relating to the conditions in India which is so very essential for the efficient and economic design and construction of extra high voltage lines. It is absolutely necessary to get this information in greater detail than is available at present especially when the inter-connections between the different systems will have to be done for exchange of bulk power over long distances and at much higher voltages. As cost of line increases rapidly with the increase in voltage, it is neither possible nor advisable to apply the practices adopted for such performance in the developed countries and the basic data is essential for designing such systems for the minimum margin of safety without sacrificing reliability. This can only be achieved through intensive research and collection of statistical data.

8.3. Realising the importance that was required to be attached to research, it was decided that the maintenance of testing laboratories of the State Electricity Boards should be upgraded to the level of Research units by providing suitable personnel and additional equipment as required by them. Further, with the ever increasing demands for electrical power and growth of power systems in the country, need was being felt for establishment of a Central Organisation having facilities for conducting applied research in the field of power engineering—supported by adequately qualified technical personnel. With this end in view the Government of India appointed a High Power Planning Committee in the year 1955, to

consider the establishment of a Central Organisation to undertake applied research in the various fields of the power engineering. This Committee recommended the establishment of the Power Research Institute recently renamed as Central Power Research Institute (CPRI) consisting of two units, one at Bangalore and the other at Bhopal, as part of the Central Water and Power Commission (Power Wing), Ministry of Irrigation and Power, of the Government of India.

8.4. In 1959, a memorandum was presented to the United Nations Special Fund seeking assistance for a comprehensive Power Engineering Research Organisation on the lines mentioned above. This scheme was accepted only in part by the UNSF and foreign exchange worth Rs. 91 lakhs was released to meet the cost of imported equipment provide experts for setting up of the organisation and training facilities for Indian engineers abroad. The Government of India was to meet the counterpart Indian expenditure. Sanction for the establishment of the Power Research Institute was accorded by the Government of India in the year 1960.

#### *Objectives of Central Power Research Institute*

8.5. To satisfactorily cope with the problems of generation, transmission distribution and utilisation of electrical energy, and to benefit the power supply utilities and electrical manufacturing industries, the CPRI was established with the following objectives:—

- (i) "to undertake investigations and research on various problems connected with the development and utilisation of electrical energy resources in India in a rational and economical manner;
- (ii) to conduct such experiments and studies as would lead to better technical efficiency and economy in various aspects of the power supply industry;
- (iii) to develop through applied research, suitable design and types of equipment for utilising indigenous material resources for rapid growth of power supply facilities; and
- (iv) to undertake applied research to help promotion of the manufacturing potential of electrical equipment in this country to meet the rapidly increasing demand for power from large scale industrial and agricultural programmes."

8.6. The Institute comprises two units—one at Bangalore and the other at Bhopal. The Bangalore Unit is intended to undertake applied research in the fields of high voltage engineering, electrical insulating materials, power system performance studies, generation, transmission and distribution etc. A number of laboratories have been set up at the Bangalore Unit.

8.7. The Bhopal Unit is desired to serve as a national testing centre where the manufacturers/purchasers of switchgear and circuit breakers can have their equipment tested and certified. The development work in the field of circuit breakers will also be undertaken. It is equipped with a 1250 MVA short circuit generator and other accessories required for high voltage switchgear tests. This unit, undertaken with UNDP assistance, was commissioned in October, 1971. With the commissioning of the unit, the testing of switchgear etc., which were hitherto carried out abroad, has been undertaken in India itself thereby saving foreign exchange and time involved.

8.8. It has been stated that during the first few years of its inception, the CPRI has been mainly engaged in the work connected with the procurement of specialised types of equipment from abroad setting up its different laboratories and Research facilities. All major equipment for the Bangalore and Bhopal units of CPRI have been procured and installed and all the laboratories, with the exception of the 50 MVA Low Voltage Switchgear Laboratory at Bangalore and the 1250 MVA Switchgear Testing and Development Station at Bhopal, have been functioning satisfactorily. During the course of evidence the Committee, have, however, been informed that both the stations have been working satisfactorily.

#### *Financial Allocations and Progress*

8.9. It has been stated in a written note to the Committee that the first stage of the scheme which covers the establishment at the Central Power Research Institute at Bangalore and Switchgear Testing Station at Bhopal was sanctioned for Rs. 333.66 lakhs. Due to escalation of prices, the estimate has been revised to Rs. 491.64 lakhs. The break-up of the sanctioned and revised estimates is as under:—

	Original Estimates	Revised Estimates
	(Rs.)	in lakhs)
Land and Building	110.54	121.94
Indigenous equipment	60.32	86.08
U. N. Equipment and contribution	70.32	163.24
Establishment	33.94	120.38
TOTAL :	333.66	491.64

8.10. The total provision for the Central Power Research Institute during the Third Five Year Plan (1961-66) was Rs. 250 lakhs and Rs. 430 lakhs for the Fourth Plan.

8.11. A sum of Rs. 250.63 lakhs was spent on the project prior to the Fourth Plan. Details of expenditure on various items are as under:—

	Rs. in lakhs
Land and Building . . . . .	57.46
Equipment :	
Indigenous	36.41
Through U. N. . . . .	113.91
Establishment . . . . .	42.85
TOTAL :	250.63

8.12. Against the Fourth Plan provision of Rs. 430 lakhs the actual expenditure upto 1970-71 was Rs. 68.82 lakhs. An expenditure of Rs. 59.13 lakhs was expected to be incurred during 1971-72.

8.13. The second stage of the scheme for expansion of the Central Power Research Institute is estimated to cost Rs. 550 lakhs.

8.14. In view of the increase in estimates from Rs. 333.66 lakhs to Rs. 491.64 lakhs, the Committee had desired to know, the time gap between sanction and implementation of the scheme and why an expenditure of Rs. 68.82 lakhs only was incurred upto 1970-71 against the Fourth Plan provisions of Rs. 430 lakhs. During course of evidence, the representative of the Ministry informed the Committee:

“This is one of those schemes where there was no time gap between sanction and implementation of the scheme. Actually, this Central Power Research Institute has been established as a result of an agreement between the Government of India and the then United Nations Special Fund. This agreement was signed in February, 1959 and authorisation to commence operations was given in 1962, we went ahead with the project in 1960 itself. \* \* \* \* The increase in cost from Rs. 333.66 lakhs to Rs. 491 lakhs was due to the increase in prices of both foreign and indigenous equipment, and rise in labour cost. The 4th Plan provision of Rs. 430 lakhs was for both stages, Stage I and Stage II. It is not intended only for Stage I. The Stage I project was due for completion by March, 1972 and the total expenditure on this project up to the beginning of the 4th Plan was Rs. 250 lakhs. The expenditure during 1970-71 was Rs. 35.36 lakhs as against Rs. 68.82 lakhs indicated here. \* \* \* The total expenditure which I have given earlier was on the first stage.”

8.15. When asked what was the provision in the first stage and what was the expenditure, the representative of the Ministry replied:

“The break-up was not given at that time. It was also pointed out that the whole project was to be completed by March, 1974. As regards first stage it was to be completed by March, 1972. It has been stated that this has not been completed. The remaining items yet to be completed are the staff quarters and Tower Testing Station.”

8.16. Intervening during evidence the representative of the Planning Commission informed the Committee “One is the equipment part and putting into operation and this has been done. Some quarters etc., have to be constructed and this is being done.”

8.17. The Committee were informed that a part of the equipment arrived after devaluation. The Officer on Special Duty in the Ministry of Irrigation and Power explained “the cost of equipment was changed after devaluation. That is why, the extra amount had to be provided.” The Member, Central Water and Power Commission stated “Out of the total expenditure UN equipment is only Rs. 143 lakhs and the indigenous equipment comes to Rs. 229 lakhs. Rest of the expenditure is on staff.”

8.17. With regard to the second stage of the scheme it was stated that it was considered to be a scheme of substantial importance. The foreign exchange under UNDP was being arranged. The representative of the Planning Commission explained :

“Stage II is augmentation of Stage I, plus a new scheme of setting up a synthetic testing plant. It is important from the point of view of testing our plant and equipment which is being manufactured in the country.”

8.19. In the Annual Technical Report of the Central Power Research Institute for the year ending 31st March, 1972 it had been stated that the initial approval for the establishment of C.P.R.I. was for Rs. 232.39 lakhs, out of which a sum of Rs. 226.35 lakhs was to be utilised by 1965-66. However, the project could not be completed due to certain difficulties. Since the prices of equipment and civil works etc., had gone up, a fresh estimate of Rs. 333.66 lakhs, including capital expenditure of Rs. 299.72 lakhs, was accepted and accorded administrative approval and expenditure sanction by the Government in 1968.

8.20. The present estimated cost of the project is Rs. 491.45 lakhs. The total UN Special Fund Allocation is \$2.739 million for financing the cost of imported equipment and technical experts. The balance expenditure is being met by the Government of India.



8.21. In the Annual Report of the Ministry of Irrigation and Power for the year 1968-69 it had been stated that "the initial years were spent on preliminaries such as land acquisition, construction of laboratory buildings and erection of major equipment.\* \* \* \* \*

Power Research Institute, when fully organised and developed, would serve as a national laboratory for conducting applied research in technical power engineering and would benefit the power supply industry as well as the electrical manufacturing industries. The Switchgear Testing and Development Station at Bhopal will serve as a National Test Centre for indigenously produced switchgear, thus avoiding the need to send them abroad for proving test, thereby effect substantial savings in foreign exchange. It is expected that this station will be commissioned by the end of 1969-70."

8.22. In the Annual Report of the Ministry of Irrigation and Power for the Year 1969-70, it has been stated:

"The scheme is being implemented with the assistance of the United Nations Development Programme. In terms of the Plan of Operations executed in January, 1960, the United Nations Development Programme agreed to provide aid amounting to \$ 1,928,000 for setting up two units of the Power Research Institute at Bangalore and Bhopal. The counterpart expenditure of the Government of India was estimated at Rs. 140.54 lakhs. The United Nations Development Programme authorities have since agreed to extend additional aid amounting approximately to \$ 387,000 for the completion of the first phase of the scheme. The total estimated cost of the project was revised in view of the rise in the cost of labour and materials, changes in the design of certain major equipments and devaluation of the rupee and now stands at Rs. 374.38 lakhs. The first phase of the project is now expected to be completed by the end of 1970-71".

8.23. Subsequently, after the taking of the official evidence, the Ministry of Irrigation and Power in a written note to the Committee has provided the following information:

"The Central Power Research Institute has been established under an Agreement between the Government of India and the United Nations Development Programme. The Plan of Operation was signed on 15th January, 1960. The UNDP was designated as the Executing Agency and the Ministry of Irrigation and Power as the Co-operating Government Agency. Authorisation to start operations was given in March 1960. The Project was to be completed in a period of 12 years.

Although the works on the Project started in March 1960 as mentioned above, the formal expenditure sanction for an amount of Rs. 232.39 lakhs was given in 1963. Subsequently, the estimate was revised to Rs. 333.66 lakhs in 1968. The present estimate is Rs. 491.45 lakhs. The break-up of this figure is as follows :

UNDP Contribution	Rs. 143.40 lakhs
Indian equipment	Rs. 119.73 lakhs
Land and Buildings	Rs. 109.93 lakhs
Establishment (cumulative from March 60 to March 74)	Rs. 118.93 lakhs
	<hr/>
	Rs. 491.45 lakhs

The Stage-I of the Power Research Institute consists of two Units, one at Bangalore and the other at Bhopal.

The Project was substantially completed by March, 1972 (i.e., within 12 years as originally envisaged by UNDP) except for the Tower Testing Station and the staff quarters. The benefits from the project commenced from 1966-67, when research work and various tests on electrical equipment and materials began to be undertaken. The Test fees realised from the Project has been of the order of Rs. 3.5 lakhs comprising Rs. 1.37 lakhs from the Bangalore unit and Rs. 2.03 lakhs from the Bhopal Unit. The anticipated test fees for the year 1973 is about Rs. 10 lakhs.

The delay in completion of the Tower Testing Station has been due to delay in the receipt of necessary steel sections and the delay in the construction of staff quarters was due to lower priority being assigned for this work. All these works are now expected to be completed by March, 1974.

The Fourth Plan provision of Rs. 430 lakhs for the Central Power Research Institute comprised of Rs. 76 lakhs for completion of Stage I and Rs. 354 lakhs for commencement of work on Stage II of the Project. The spill-over provision of Rs. 76 lakhs for Stage-I was determined based on the original estimated cost of Rs. 333.66 lakhs for Stage-I and the then estimated expenditure of Rs. 258 lakhs up to beginning of Fourth Plan.

The second stage of the scheme comprises the expansion of the Switchgear Testing Station at Bhopal by adding a second short circuit generator and synthetic testing facilities, at an estimated cost of Rs. 550 lakhs. This will increase the scope of the Switchgear Testing Station by enabling it to carry out tests on the higher capacity circuit breakers being manufactured in the country. The scheme has not yet been sanctioned. It is expected that UNDP assistance will be forthcoming to some extent for the second Stage also."

8.24. The importance of research and testing facilities in the growing field of power development in the country, cannot be too strongly emphasised. Research is necessary for achieving economy, quality control and standardisation in construction, generation, transmission, distribution and superior performance of the power supply system. Collection of technical information and basic data for the efficient and economic design and construction of extra high voltage lines, after taking into account the conditions prevailing in our country, is also necessary. There is thus much scope for research in power engineering in the country.

8.25. The Committee note that realising the importance of research, Government appointed a High Powered Planning Committee in 1955 to consider establishment of a Central Organisation to undertake applied research in the various fields of power engineering. As a result of the recommendations of this Committee, a memorandum was presented in 1959 to the United Nations Special Fund seeking assistance for power Engineering Research Organisation. Sanction for the establishment of the Power Research Institute was accorded in the year 1960. The two units of this Research Institute one at Bangalore and the other at Bhopal started functioning in October, 1971. The Committee regret to note that some work is still to be completed at the two units of the Institute which would be done by 1974. According to the latest information furnished to the Committee, Government envisages a period of 12 years for the setting up and commissioning of the two units of the Research Institute. The Committee note that various periods have been indicated by Government for the completion of the Institute. In the Annual Reports of the Institute for 1971-72, the project was to be completed by 1965-66. In the Annual Reports of the Ministry for the year 1968-69 and 1969-70, the period of completion and commissioning has been given by the end of 1969-70, and 'by the end of 1970-71' respectively.

8.26. The Committee cannot help feeling that the work relating to the setting up of the institute was not given the urgency that it deserved. The Committee consider that a period of 12 years for the setting up of the Institute is too long. Considering that the matter regarding the setting up of Institute was initiated in 1965 it is regrettable that the two units of the Research Institute are yet to be fully completed and commissioned.

8.27. The Committee are concerned to note that the second stage of the Institute which is stated to be very important from the point of view of testing plant and equipments manufactured in the country and which is estimated to cost about Rs. 550 lakhs has not commenced at all, though it was to be completed by March, 1974. They would like the Government to investigate the reasons for delay in commencing the second phase of the Research Institute and take concrete measures to complete the same expeditiously.

8.28. The Committee note that there are variations in the information furnished to the Committee and in the various publications brought out by the Ministry regarding the estimated expenditure guarantee of U.N. assistance and dates of completion and commissioning of the Institute. It appears that adequate care has not been taken to present full and accurate information in this regard. The Committee would like the Government to work out the details of the schemes in the very beginning itself and present a complete picture in the various publications brought out by it for the information of public and Parliament. The Committee need hardly point out that the information furnished should not only be correct but uniform and if there are any variations due to any reason, the same should be fully explained.

### Research Activities

8.29. It has been stated by the Ministry that some of the important research activities carried out in the Institute are as indicated below:—

- “(1) For load flow study and optimum location of capacitors in radial distribution systems, a digital computer programme was evolved.
- (2) The design of a high-weight structure as a substitute for reinforced cement concrete poles for use in electrical distribution system was completed.
- (3) Development of a portable lightning arrester field testing kit was completed and the first kit was supplied to M/s. Tata Power company for use in their power net-work. Work on orders on similar kits for Electricity Boards is in progress.
- (4) Fabrication of a ‘Hot Stick Testor’ was completed for Tamil Nadu Electricity Board.
- (5) Interfacial tension test as a guide to the quality of insulating oils.
- (6) Result of measurement of lightning currents in transmission lines by means of magnetic links.
- (7) A document on draft test procedures and test equipments for electrical tests on plastic insulated cables was prepared for use of cable manufacturers. Power Research Institute has been entrusted by Directorate General of Technical Development to carry out evaluation of plastic insulated cables manufactured in India for change over from P.I.C to PVC cables upto 11 KV for saving foreign exchange.
- (8) A thyatron Trip Circuit for use in dielectric breakdown test was fabricated.

- (9) Work on the development of Class B insulating materials and indigenous evolution of electrical grade paper is under progress.
- (10) Reports on:—
- (i) The use of bundle conductors for grounding; and
  - (ii) certain novel methods of fault location on cables and overhead transmission lines are under preparation before issue.
- (11) The Institute has done some investigation work, on the problems associated with use of aluminium windings, in place of copper windings in distribution transformers.
- (12) It is rendering assistance in the field trials on cable samples of sodium conductors cables imported from U.S.A. for performance data for possible use in L.T. power network.

A patent certificate was granted for the "Portable Lightning Arrester Field Testing Device" by the Chief Controller of Patents and Designs, Calcutta. The patent has been sealed. The National Research and Development Corporation have been approached for its commercial exploitation and manufacture.

A patent was granted for "the invention for location of low impedance faults in unarmoured or non-magnetically sheathed cables at exposed locations."

An application was filed for the grant of a patent for "A new test and a portable kit for determining the acid content of Insulating oils."

8.30. It has further been stated by the Ministry that some of the Problems connected with generation, transmission and distribution of power as also on the manufacture of electrical machinery and equipment which were taken in hand by the Bangalore Unit of the Institute, have yielded good results. The Institute has applied for several patents and has already been granted two patents. In addition to research work, testing facilities and other assistance have been provided to the State Electricity Board and Electrical manufacturing industry both in the Public and private sectors. Besides a number of successful development and imports substitution projects, 59 Technical Reports have been brought out based on the research and investigation work done by the Bangalore Unit.

8.31. To a question how far the objectives have been achieved and to what extent the results achieved have been instrumental in formulation of power development programmes and in reducing dependence on foreign

technical know-how in developing various equipments, the Committee were informed during evidence:

“Regarding the activities of the Power Research Institute, we have been publishing every year an annual report giving in detail the research work done during the year and the technical reports published. So far we have published 62 technical reports on various research problems taken up in the Institute.”

8.32. In a written note to the Committee it has been stated that the following twelve problems relating to the design, construction, maintenance and operation of power systems are being studied under the Research Scheme on Power by 18 Research Units of State Electricity Boards and Educational Institutions:

- (i) Lightning Studies;
- (ii) Soil Resistivity;
- (iii) Transmission Line Problems;
- (iv) Transformer Oil Deterioration and Reclamation;
- (v) Corrosion Studies in Conductors, Towers, Cable Sheaths, Penstocks etc.;
- (vi) Insulation Studies of Power equipment;
- (vii) Rural Electrification;
- (viii) Thermal Stations;
- (ix) Development of Instruments and Indigenous Manufacture of Materials;
- (x) Pattern of Power System losses;
- (xi) Problems of Earthing in Power Systems; and
- (xii) Hydro Stations.

The problems and the aspects of study under them as also the research units to which these aspects have been allotted for work are given in Appendix XI.

8.33. The Central Board of Irrigation and Power coordinates the activities of various research units. The expenditure on the problems being studied by the various Research Units is met from the grants-in-aid released by the Government of India on the recommendation of Central Board of Irrigation and Power. Fourth Plan is Rs. 100 lakhs.

8.34. The Ministry have further studied that even though the research scheme on power was initiated hardly a decade back a number of useful results resulting in considerable savings and increase in efficiency in the working of the various power systems have been achieved. Under the Scheme studies are being conducted on 63 aspects of 12 important problems. Some of the more important studies and results are:

- (1) "In view of the large number of transformers being in operation in the various State Electricity Boards it has become necessary to examine as to whether the insulating oils used in these transformers could be reclaimed. Experimentation has been done on this subject and pilot units have been established by a few State Electricity Boards to reclaim the used transformer oils and substantial savings are envisaged. As the transformer oil has to be entirely imported this indirectly helps conservation of foreign exchange. So far, the Mysore State Electricity Board alone has reclaimed more than 10,000 gallons of transformer oil, which would have normally been thrown away, resulting in savings of more than Rs. 70,000. Similarly, Andhra Pradesh State Electricity Board had reclaimed more than 2000 gallons of transformer oil. Further studies on the reclamation of used transformer oils for improvement of process of the reclamation are continuing.
- (2) Study of incidence of lightning of high voltage transmission lines.

Complete studies for lightning discharge transmission lines are being conducted all over the country to prepare an isocoranic map it will aid in the designing of transmission lines in the country for adopting proper designs based on the lightning data obtained. Considerable progress has been achieved on the studies conducted on this subject in the various States. This has incidentally helped in developing indigenous equipment like, hook-on type klydonograph for carrying over the studies on lightning phenomena. Lightning instruments developed are very simple and extremely cheap costing only Rs. 35/-. Import of similar equipment for conducting studies would have been a drain on the foreign exchange.

### (3) Rural Electrification.

- (a) In view of the importance attached to the Rural Electrification of even remote villages one of the important studies in power distribution is that of use of single earth return system. Experimental lines on SWR system have

been constructed in West Bengal and these have been successfully utilised for running of pump sets for Irrigation purposes. Further studies are being conducted so that the system could be extended to other parts of the country and it is envisaged the substantial savings could be expected by this method.

- (b) To achieve economy in the distribution supports a light weight structure has been developed and it is expected that this could result in an appreciable saving of steel in 11 KV lines.

To achieve economic distribution support a light weight structure that can be used in place of the PCC poles has been developed and it is expected that this would result in an appreciable saving of steel for rural 11 KV lines.

- (c) To ensure an uninterrupted supply of electricity to villages and small scale industries at appropriate voltages studies are being conducted on the use of shunt capacitors. It is expected that by the use of these shunt capacitors it would be possible not only to effect supply at appropriate voltages but also reduce the lightning lines. Further studies are in progress.

#### (4) Transmission Lines.

Intensive studies have been conducted on problems of vibration of conductors on 132/320 KV transmission lines. These studies are required to ensure that conductors are not damaged due to vibration induced by wind force. Preliminary studies have indicated that phase type dampers should be avoided on the Extra High Voltage and the stock bridge dampers are found to be more efficient. Further studies are in progress.

#### (5) Development of Relays.

To overcome the present difficulties in clearing the faults of conductors occurring on high voltage distribution lines in areas where soil resistivity is high and consequently the faults continue to exist unnoticed and are likely to cause electrocution of men and animal. To overcome this an earth fault relay has been developed. It is observed that this relay is capable of clearing earth faults of over head conductors of very feeble currents and the prototype of these relays are being manufactured for exclusive studies before these could be introduced in the power system.



**(6) Development of Instruments and Indigenous Manufacture of Materials,**

- (a) One of the research units have developed an expulsion type fuse with indigenous material for use on voltage of 32 to 110 KV capable of interrupting fault currents of the magnitude of 200 MVA and above. Field studies of these are being conducted and the results so far are very encouraging.
- (b) For conducting polymerisation studies on insulating materials.

A 2 million volts Van-De-Graaff Generator is being set up in the High Voltage Engineering Department of the Indian Institute of Science. This is expected to commission shortly.

8.35. With regard to the reclamation of the used transformer oil, the Committee had desired to know which other States in addition to Mysore and Andhra Pradesh had successfully reclaimed it. The representative of the Ministry of Irrigation and Power informed the Committee:

“The Research Institute at Bangalore has evolved a method by which we can with some inhibitors to be imported from abroad which are not very costly, like Fuller’s earth and some other chemicals, reclaim the used transformer oil from the transformers which get burnt while in service due to various reasons.

Not only the two Boards mentioned in the question but in erstwhile Madhya Pradesh Board also, we have been trying and reclaiming the transformer oil. There is a definite procedure, and enough literature has been provided to the various Electricity Boards. We have not got the full information about how many Boards have established it, but quite a few are there; apart from the two Boards \* \* \* \* \* We shall enquire from the other Boards also. Since it is a costly oil, the import has to be restricted, and every board is therefore trying to reclaim the used transformer oil, because the process has been evolved by the Research Institute at Bangalore.”

The Committee were further informed that the import of transformer oil was still required, though it was restricted to the minimum. One or two units in the country were making transformer oil. It was pointed out that in the manufacture of transformer oil there was a little bit of know-how which was not available. The representative of the Ministry added:

“The oil made by these two oil companies is used in some of our biggest transformers at Bhopal. It is quite good except the

fact that insulation value is not what we insist. We say it should be in the range of 3,000 megohm resistance for a particular voltage transformer. When the oil is given for other tests, it conforms to that, but the insulation value, is not 3,000. With this the transformers will certainly work all right, but that little know-how which is there in the imported oil is not there in this. So what is happening is that the value is 600 megohms as against 3,000. But the manufacturers give the guarantee that it will work all right. On the basis in Madhya Pradesh we had gone for it. They say even with this value it will work. But in the normal course, it left to me, I would have insisted on 3,000 megohms instead of 600. This little bit of know to bring this value upto what is obtaining elsewhere in the world should be available to us."

8.36. After the official evidence was over, Government in a written note to the Committee has stated the position regarding the import and manufacture of transformer oil in the country as below:

"The import of transformer oil has been completely banned with the availability of indigenous oil. There are three companies manufacturing transformer oil indigenously.

Name of Company	Annual Production capacity	
1. M/s Power Cables, Bombay	15000 tons	} All 3 firms producing full quantity
2. M/s. Nagpal Manali, Madras	15000 tons	
3. M/s. Sarita Chemicals Pvt. Ltd., Bombay.	10000 tons	

8.37. The Committee asked for the views of the State Electricity Boards about research programmes for development of power in the country. Out of the six Electricity Boards which sent replies, two State Electricity Boards have not offered any comments. One State Electricity Board has found these programmes to be adequate. The comments of the other three State Electricity Boards are given below:

"Research and design programmes in the field of power are necessary for improving the techniques of construction and operation and for greater economy in all aspects of power development. There are great possibilities to develop better technology suited to the conditions obtaining in our country and the Research and Designs programmes must be carried out with more industry. The funds made available for this programme

are very meagre and more funds have to be allotted to Research Schemes.”

“There are no such research programmes for development of power. However, a Research Unit is functioning in the— State Electricity Board, on the problems on power as assigned by the C.B.I.P., Government of India, is undertaken. There is dire need of establishing some research centres for the development of power in the country.”

“There is urgent need for detailed programme for development of power in the country as at present we are depending on many of the components used in the power sector which have to be imported from abroad. The Government of India has two big organisations in the Public Sector *i.e.* HEL and BHEL for manufacture of equipment required for power development, but it is observed that the cost of the indigenous equipment of these concerns does not compare favourably with landed price of the imported equipment. The high cost of the indigenous equipment appears to be mainly on account of the fact that we are again depending upon the imports and technical know-how from foreign countries and unless the price of the indigenous equipment is brought down substantially, it will not be possible to have reduction in cost of electrical energy. It is proposed that a massive research and development programme for various equipments used in the power sector is launched by the Government of India so that the dependance on foreign countries is avoided without much delay.

The manufacturers under the Public Sector as well as in the Private Sector remain fully booked with the manufacturing programmes of conventional equipment and they are not paying attention to developmental manufacture of a number of items of power supply equipment which are available in the advanced countries. For example, high voltage regulation transformers, synchronous condensers, high voltage testing sets, substandard measuring instruments, recording type measuring instruments extra high voltage equipment for 400 KV and above etc. Steps should be taken to ensure manufacture and supply of these types of equipment also in sufficient variety and quantity which will enable the country to keep pace with the requirements of power supply.”

8.38. The Power Economy Committee in its Report presented to Government in March 1971 has found that one important factor retarding the growth and vitiating the functioning of power supply industry in an optimum manner is the gross inadequacy of the research and development

activities. This is true mainly for the conventional modes of power generation as well as transmission and distribution. Fortunately nuclear power engineering which is just making a start in this country has some very good research and development facilities and organisation available within the country. However, strangely, there has been little development in this respect for conventional power engineering. The other important observations made by the Committee are as below:

- (i) A reliable and continuing arrangement for watching the technological and scientific advances elsewhere in the world is required, keeping the Government and the power supply industry informed of the latest developments and devising the manner in which and assessing the extent to which, these can be utilised. A follow up study based on collection and analysis of statistical data of working experience with technical advances newly introduced in India is also necessary.
- (ii) All the advanced countries are all in the temperate Zone of the globe and most of the technological developments are taking place in those regions. India is easily the most advanced country in the tropics and cannot, therefore, have the benefit of the full experience, necessary to develop our own research and development facilities for evaluation and adoption of new technological advances.
- (iii) The Central Power Research Institute was set up in 1960 under the CWPC (PW) but this has not made adequate progress. Recently, the awareness of lacunna in this regard has grown and, through the initiative of the Ministry of Irrigation and Power and the Central Board of Irrigation and Power, research units have been formed in each of the State Electricity Boards and a few large electricity undertakings in the country.
- (iv) Another handicap in working the power installations efficiently is inadequate knowledge about the actual rating and capabilities of the different components in the power generating plant. Elaborate Acceptance Test in the field provide the requisite data and information.
- (v) To establish planning for energy and electric power development in the country on rational and scientific lines, as well as to improve the working of the existing installation by introducing scientific methodology, it has become essential to organise the collection of statistics in a comprehensive manner on some scientific lines and in such manner as to require a minimum of effort on the part of the power systems. A review of the working as organised at present shows that it is highly inadequate.

The data do not flow fast enough and there is not adequate capability for statistical analysis for the same.

8.39. The Power Economy Committee has made the following recommendations in this regard:

- (i) The scope of collection of statistical data and information and analysis thereof should be widened considerably. A number of new items of data collection will have to be included to meet the modern requirements.
- (ii) The work can be rationalised. The proforma for data collection should be rationalised and simplified. These should further be recast so as to enable use of modern computer facilities for the analysis of the data. The data and information of lasting nature should be formed into a data bank where in only supplementary data or corrections need be fed from time to time.
- (iii) A time table should be prescribed for data processing and publication of periodical reviews so that the latest data can be made available with a minimum time lag.
- (iv) All the State Electricity Boards and Electricity Undertakings should be made fully aware of the importance of furnishing timely, accurate and complete returns of data. If necessary, requisite legislation may be passed as recommended by Study Group I in their report for ensuring collection of statistical and other information.
- (v) This work is rightly the charge of CWPC (PW)/CEA. It is felt that this arrangement is beneficial. The organisation in CWPC (PW)/CEA needs to be suitably strengthened and equipped in order to ensure speed and accuracy. Besides engineers, persons trained in statistical work should also be employed on this work and machine methods of data analysis and presentation should be introduced."

8.40. The Committee note that the Central Board of Irrigation and Power coordinates the activities of the various Research Units. Besides the two Units of the Central Power Research Institute, research on power engineering is also being done by the Research Units of State Electricity Boards and Educational Institutions in the country. From the information furnished to the Committee, it appears that the Institute has so far carried out research on about 9 problems, some of which are stated to have yielded good results. The Institute has also obtained two patents so far. In addition, 12 problems are being studied by the 18 Research Units of State Electricity Board and Educational Institutions, expenditure on which is met

from grants-in-aid released by Government on the recommendation of Central Board of Irrigation and Power.

8.41. The Committee feel that very little has been done in the matter of research on power engineering so far. This view is also supported by the Power Economy Committee which has stated that "one important factor retarding the growth and vitiating the functioning of power supply industry in an optimum manner is the gross inadequacy of the research and development activities." The State Electricity Boards have also considered the research programmes inadequate and have stressed the need of larger research and development programmes for power engineering. Considering the heavy investments made/proposed to be made for the development, generation, transmission and distribution of power in the country, the Committee feel that there is an urgent need for large scale increase in the research and development programme for power engineering in the country so that the various problems of power engineering can be solved expeditiously. Some of the problems requiring immediate attention are:

- (i) rising cost of electric energy in the country;
- (ii) high cost of electric plant and equipment manufactured indigenously;
- (iii) need for self-reliance and import substitution of spares and components as well as avoidance and dependence on foreign sources for spares etc.
- (iv) frequent break downs in generation and transmission and the need to avoid recurrence thereof;
- (v) heavy losses in transmission and distribution of power, particularly, in rural electrification systems;
- (vi) need for economy in the equipment, construction practices and designs for rural electrification programme to enable cheaper power supply to rural areas; and
- (vii) Designing for "Thermal and Hydel Stations as also Atomic Power Stations."

8.42. The Committee recommend that Government should prepare short term and long term programme to intensify research activities so as to meet the current and the future needs in this important field.

8.43. The Committee stress that highest priority should be given to the problem of heavy losses in transmission of power as these are of crucial importance in the setting up of the proposed national grid and in extending the programme of rural electrification. The Committee would

also like priority to be given to the question of finding the most economic size of generators and other equipment suited to Indian conditions.

8.44. The Committee realise that research is a slow process and takes time to produce results capable of being utilised. It is, therefore, necessary that research programmes of the Institute as well as the research units of the State Electricity Boards particularly long term programmes should be anticipated as far as possible and spelt out in clear terms well in advance to enable the units to organise their research programmes accordingly. The perspective research plan for power engineering should be integrated with the development of power within the country over the next 10 to 15 years. This plan should be widely circulated among the concerned industries, State Electricity Boards, user departments, universities, eminent engineers etc., and their suggestions invited so that the plan and programmes included therein could be improved upon and duplication of research efforts among various units obviated.

8.45. The Committee would like to emphasise that greatest care should be taken at the time of selecting research projects. The project should be problem-oriented and should be such as would yield quick results. In selecting the projects, full consultation and coordination should be maintained with the State Electricity Boards and the Electrical Manufacturing Units. The Committee would further suggest that in the Annual Reports of the Institute, broad indications of the money and time required for the completion of individual projects selected for research should be indicated so as to enable Government to assess the requirements with reference to outlays and time factor.

8.46. The Committee suggest that after the problems have been identified, these should be distributed on a rational basis to the research institutions having regard to their resources and experience so as to avoid duplication as far as possible and getting the best results in the shortest time. The Committee would also suggest that the progress made in these research assignments should be reviewed by a competent technically qualified body from time to time say once in six months so that timely action could be taken as necessary in the interest of speeding up progress.

8.47. The Committee would like to point out that research institutes have a tendency to go in for pure basic research work. The Committee would suggest that only basic research work should be taken up at the Institute and the Research Units of the State Electricity Boards which is necessary for supporting the applied research in hand. Detailed information should also be given in the annual report of the Institute about the proportion of basic and applied research work done in the Institute so that a watch could be kept on the progress made in this regard.

8.48. The Committee further consider that maximum benefit from research would be possible if periodical assessment of the results achieved and progress made is carried out with reference to expenditure and estimated future cost. This would encourage cost consciousness not only among higher management but also among those who are directly responsible for individual projects.

8.49. The Committee would further recommend that when a process has been developed by the Research Institute successfully and a patent taken, effective measures should be taken for its expeditious commercial exploitation. Successful processes should also be widely publicised to stimulate interest among the industry and the users.

8.50. In regard to the problems referred to the Institute by the users industries and State Electricity Boards, utmost efforts should be made to find workable solution to the problem and communicate them urgently to the concerned bodies so as to gain their confidence.

8.51. The Committee suggest that it would be useful if a periodical evaluation of the research work done by the Institute and the Research Units of State Electricity Boards as well as universities is undertaken every five years by Government through an independent Committee as such an evaluation would provide an objective and independent assessment of the working of the research programme and would act as a stimulant to its functioning.

**(ii) Training Schemes for Maintenance and Operation of Power Generating Stations.**

8.52. The operation and maintenance of hydel stations is not complicated and could be managed without much difficulty. The situation is different in respect of thermal stations. Dealing with the subject that technology of thermal generation has advanced, it has been stated in a written note to the Committee thus:

“The technology of thermal generation has advanced rapidly with the result that thermal generating units are built in much larger sizes than before. These have better efficiencies. The regional concept of power development would also make it possible to install much bigger sizes of units at the most economic location. A beginning has already been made with 200 MW size units. With the large scale of development envisaged in the country it will be possible to use in due course sizes of 300 MW and 500 MW units. Modern thermal power station



employing very large sets and large pulverised fuel boilers working at high steam parameters comprise highly complex and sophisticated system with automation of specially designed auxiliary equipments whose characteristics are carefully coordinated to ensure efficient operation. These require a very high degree of skill and specialisation in their operation and maintenance. Abnormal conditions arise in the plant in operation as a result of one or more of a multitude of reasons and these can and have resulted in very serious and costly damage to the plant. Prompt and accurate analysis with subsequent corrective action by an engineer who has to work under severe stress conditions could prevent costly failures.

The rapid progress in increasing size of units, complexity of instrumentation and controls, automation, lower margin of safety and other conditions have complicated the matter further in the selection, training and appraisal of steam power plant engineers."

8.53. It has been further stated that before engineering personnel can take over the duties and responsibilities operating plant in a modern power station, specialised training both theoretical and practical with particular reference to the plant is necessary. Considerable difficulty is being experienced in securing suitable operating personnel for manning the modern large thermal power stations which are being built up in the country.

8.54. Accordingly, for the efficient operation of the thermal stations, Government of India started Thermal Power Personnel Training Institutes at Neyveli and Durgapur in the year 1965-66 and 1968-69 with intake of 28 and 27 trainees respectively. Subsequently, the expansion of Neyveli and Durgapur Training Institutes to increase the intake of the trainees to 50 and 100 respectively has been sanctioned to meet the requirements of the Fourth Plan. A provision of Rs. 18.88 lakhs has been made for the year 1972-73 against the plan provision of Rs. 70 lakhs in the Fourth Five Year Plan.

8.55. In the Performance Budget document for the year 1971-72, it has been stated that in the Fourth Plan, additional 7.5 million KW of thermal power is envisaged. The increased generating capacity will require about 1600 trained engineers and 4500 technicians for proper maintenance and operation of thermal power stations, for which a comprehensive scheme for training of personnel is necessary. As a step in the direction an expansion scheme for the existing training facilities is envisaged and

capital provision for acquisition of land, construction of hostel building etc., has been suggested in the Budget Estimates 1971-72.

8.56. The Ministry in a written note to the Committee while dealing with the existing position of thermal power generation and the proposed thermal power generation in the Fifth Plan has stated :

“Out of an aggregate 17 million KW of power generating plant existing at present in the country, thermal power plant account for about 10.2 million KW. At the end of the Fourth Plan, the total thermal generating capacity in the country would be about 12.5 million KW out of a total of about 20 million KW. In the Fifth Plan, further additions to thermal generating capacity contemplated would bring the total thermal generating capacity to about 24 million KW at the end of 1978-79.”

*Thermal Power Station Personnel Training Institute, Neyveli :*

8.57. The Thermal Power Station Personnel Training Institute, Neyveli started imparting training to the supervisory officers engaged in operation and maintenance of thermal power stations in 1965-66. The trainees must hold a degree/3 year Diploma in Electrical/Mechanical Engineering. The courses in the following branches are being offered, the duration of each of which is one year.

- (i) Thermal
- (ii) Electrical
- (iii) Automatic Control and Instrumentation.

8.58. The training covers both theoretical and practical aspects of thermal power engineering. During the courses the candidates are given in plant training and afterwards they are placed in Neyveli Lignite Corporation's thermal power station as parallel with the staff. Towards the end of the course, trainees are also taken around different thermal power stations and the premises of the manufacturers manufacturing the various equipment of the thermal power stations.

8.59. The Institute has been patronised by all the State Electricity Boards and Corporations who have been sending their officers to avail the

training facilities. Number of officers trained and budget allocation and expenditure from year to year is as given below:

Year	No. of Trainees	Budget allocation in lakhs of Rs. (Non Plan)	Expenditure in lakhs of Rupees
1965-66	28		
1966-67	29		1.36
1967-68	26	2.90	1.62
1968-69	23	3.61	1.89
1969-70	31	1.82	2.27
1970-71	30	1.86	1.86
1971-72	32	1.89	1.88
1972-73	26	1.02	10.88

8.60. The proposal to install a computerised simulator under the U.N.D.P. Assistance has been included in the aid programme. This will help the trainees to deal with the emergencies which are not possible to be treated on a running plant.

8.61. The Institute is headed by an Officer of the rank of a Director, who is aided by Deputy Directors and Assistant Directors. The Officers from the various Thermal Power Stations like Neyveli Lignite Corporation are also associated with the training programme who deliver lectures on specialised subjects and problems confronting modern power stations.

*Thermal Power Station personnel Training Institute, Durgapur :*

8.62. The Thermal Power Station Personnel Training Institute, Durgapur was started for imparting training to the technician staff engaged in operation and maintenance of various thermal power stations in the country in 1968-69. The trainees admitted must hold a diploma in Electrical/Mechanical Engineering or a degree in Science. The qualifications are relaxed in case of adequately experienced trainees. The courses are meant for Boiler turbine and auxiliaries operators and Technicians on mechanical side and electricians, generator operators, instrument mechanics on electrical side and are covered in the following branches :

- (i) Mechanical
- (ii) Electrical

The Institute has been patronised by all the State Electricity Boards and Corporations who have been sending the staff for training. Number of trainees trained and budget allocation as well as expenditure from year to year are as given below.

Year	No. of trainees	Budget allocation in lakhs of Rupees (Non Plan)	Expenditure in lakhs of Rupees
1968-69 . . . . .	27	2.18	0.94
1969-70 . . . . .	38	2.14	1.60
1970-71 . . . . .	77	2.05	1.71
1971-72 . . . . .	51	1.91	1.84
1972-73 . . . . .	..	1.87	6.09

8.63. The training method and the facilities are on the pattern of the Neyveli Institute. The provision to install a simulator during the Fourth Five Year Plan has also been made.

*Hot Line Crew Training Scheme :*

8.64. In a note submitted to the Committee it has been stated that maintenance of transmission and subtransmission lines as well as associated equipment is an important factor for reliable and continuous power supply to the consumers. This necessitates deenergising the lines which in turn causes not only interruption of power supply but also loss of huge revenue. Further, providing a duplicate line as a stand by arrangement needs tremendous capital investment. Hot line maintenance techniques are being in vogue in U.S.A. since 1913 when such techniques were first used for lines upto 34 kV. Similarly, in Canada and Australia such techniques are being used for maintenance of the lines since quite some years past on other highest voltage lines. In Russia, also live line methods are being used since 1942. Having seen that the maintenance of lines and related equipment in energised state had been done successfully and with great advantage in the developed countries, a proposal for setting up of hot line crew training centres in India was mooted by the Central water and Power Commission sometime in 1955. This proposal covered imparting training to the employees of the various State Electricity Boards/Undertakings. Considering the need and enthusiasm of the Electricity Boards, the Government of India entered into an agreement with USAID for establishing two training centres called "Hot Line Crew Training Centres"—one at Bangalore and the other at Ganguwal. This agreement covered supply of

required number of sets of tools and loaning of two American experts from USA. All the required officers and staff were provided by the Government of India for proper functioning of these centres. Both the training centres started functioning in 1958. Whereas Ganguwal training center was closed in 1961, the centre at Bangalore continued to function till 1965.

8.65. A few experimental lines of different type and design were constructed in the premises of the training centre. In the beginning, training was imparted on these experimental lines. Subsequently, after a good deal of practice, the trainees were made to work on the actual transmission lines upto 132 kV belonging to the State Electricity Boards. The period of training for each batch of about 24 candidates was six months. In all 334 employees representing the various State Electricity Boards/Undertakings and Railway Board, including six employees of Shri Lanka Electricity Board were trained. Besides, training the employees of Boards/Undertakings a few officers of this Commission also received training at these centres. Two of them were even deputed to obtain special training in U.S.A. On their return they continued imparting training at the centres after the American experts had gone back. A few of the important items of work on which training was imparted are given below:—

1. Replacement of poles, cross-arms, etc.
2. Change of pin and disc insulators of the lines.
3. Change of disc and post insulators at the S/Stn.
4. Repair of conductor at mid-span, etc.
5. Cleaning of insulators.
6. Painting of structures.
7. Routine maintenance of lines such as removal of bird nests and other foreign material at the gross-arm etc.

8.66. It is understood that most of the State Electricity Boards/Undertakings have separate teams comprising such training personnel for maintenance of their lines in energised condition in their system. It is expected that the State Electricity Boards would have earned considerable additional revenue by way of reducing shutdowns of the transmission lines which they would have otherwise lost by de-energising the lines for maintenance purposes.

8.67. Whereas the techniques on live line maintenance followed in USA, Canada, etc. was the use of hot sticks, called 'Hot Stick Method', an altogether different technique called Bare Hand Method was employed in Russia. In latter method, the workmen are brought to the potential of the power line/equipment on which they have to work, by raising them

on an insulated aerial platform fitted to the fibreglass boom and operated hydraulically. As such it is possible for the workmen to use ordinary tools with his bare hands for carrying out maintenance work. In view of the large expansion in the power system there is a great demand from the State Electricity Boards for the trained personnels on the live line maintenance techniques. As such a proposal is already under consideration for training employees of the Boards/Undertakings on the new techniques "Bare Hand Method" and to conduct refresher course on the "hot-stick method."

8.68. To a question how far this new technique has helped the States in earning additional revenue by way of reducing shut downs of transmission lines and in maintaining continuous power supply to the consumer and the reasons for closing down the training centres, the representative of the Ministry of Irrigation and Power informed the Committee during evidence :

"Various States Electricity Boards have set up hot lines maintenance units which are making repairs of transmission lines and distribution lines in the energised condition. There can be no doubt that such maintenance results in increased revenue. But no precise assessment can be made. What is more important is the satisfaction to the consumers by avoiding annoyance of interruption. The two training centres were closed down one in 1962 and the other in 1965 as the response for training was poor because the State Electricity Boards had got their personnel already trained. These people who were already trained, are imparting training to others in the respective Boards. Now, Boards are asking us to revive this training scheme and we have sent a proposal for revising this programme. With reference to Madhya Pradesh, we took advantage of the training facilities created at Bangalore. Then we had the good fortune of some of our men getting supervisors certificates in hot lines maintenance. That means they are entitled to train other men on hot line techniques. I am not sure how many States have been able to get for their staff such Supervisory Certificates. But the lines are increasing and the lines may go upto 400 kV. For 200 kV, we are not able to get the Supervisory Certificates. Then as far as new techniques and tools are concerned it is very difficult for us in our country to produce these. We are required to get them from abroad."

8.69. In the Annual Report of the Ministry of Irrigation and Power for the year 1970-71 it has been stated that a pilot training Institute has also

been set up at Delhi for training the thermal power station personnel. The Institute started functioning on 1st October, 1970 with 29 trainees, sponsored by various State Electricity Boards of the Northern region.

8.70. In the Performance Budget document of the Ministry of Irrigation and Power for the year 1970-71, it has been stated that a Load Despatch Training Institute for Training in load despatching techniques is proposed to be set up at Roorkee. A provision of Rs. 10,000 was made to accommodate the British experts for preparation of the scheme report for setting up the Institute. However, in the Performance Budget Document for the year 1971-72, it has been stated that a Load Despatch Training Institute is proposed to be set up at Bangalore for training in load despatching techniques. A provision of Rs. 50,000 was made for the setting up of the Institute at Bangalore.

8.71. In the Performance Budget document for the year 1972-73, it has been stated that a provision of Rs. 2.27 lakhs has been made for setting up of a Load Despatch Training Institute at Bangalore for training in load despatch techniques on inter State Grids.

8.72. During evidence asked when the Performance Load Despatch Stations would go into operation, the Committee were informed:

“The permanent load despatch stations are expected to go into operation in the next couple of years—during 1974. What we are trying to do is to establish load despatching stations in the country as quickly as possible because that is the principal tool for establishing our power generation and getting most economical power available at any time.”

8.73. The position of budgetary estimates on training during the years 1969-70, 1970-71, 1971-72 and 1972-73 is as below :

Year	Budget Estimates	Revised Estimates
	(in lakhs)	
1969-70 . . . . .	5.88	4.26
1970-71 . . . . .	4.01	4.04
1971-72 . . . . .	11.03	3.84
1972-73 . . . . .	17.26 (Plan & 3.84 Non-Plan)	6.33
TOTAL	21.15	
	42.07	18.47

8.74. In the Demands for Grants for 1973-74 a sum of Rs. 20 lakhs have been included as budgetary estimates under the heading Thermal Power Station Performance Training Institute has been earmarked for the Load Despatching Institute. Earlier to this a token grant of Rs. one lakh was provided for this Institute.

8.75. In a memorandum submitted to the Committee, an expert in the Power Engineering Industry, while dealing with the importance of training for maintenance and operation of power generating station stated:—

“From reports of failure of equipment in the generating stations it can be surmised that the operating staff manning the stations are not well trained. Further there are no standard ‘codes of practice’ available to them to learn the work by studies. This deficiency needs to be eliminated. At present the power generating stations are in most cases operating without sufficient resources and failure of equipment necessarily results in power cuts which in turn effects adversely the economic development of the country. This is worse than shortage of power in an area. The entrepreneur is put to heavy loss as his investment in machinery and labour remains unproductive to the extent of reduction of power supply. This is in addition to loss of revenue to the power supply industry apart from the reduction in overall production of the country. The following suggestions are made to overcome the difficulty to a large extent:—

- (i) A team of engineers well experienced and technically qualified should be assigned the job of preparation of codes for maintenance of important items of equipment in a generating station. Perhaps qualified engineers who have been in charge of power stations for a long time would most appropriately meet this need.
- (ii) each electricity Board should have a scheme for training on the job for every new recruit before he is put in charge of operation and maintenance of generating stations. Though it takes some time of the trained engineers and salaries of fresh recruits during the period training may be considered as unproductive but the saving resulting from absence of failure of equipment (costly and unavailable for quick replacement) more than compensates the investment made in this behalf. In fact there should be a standing rule that every one who is to be entrusted with the maintenance and operation of generating stations should have gone through the necessary training and passed prescribed tests.”



8.76. During his evidence before the Committee, he stated:—

“I suggest that a sort of continuous institution should be maintained by Regional Boards for training operating staff and also giving senior staff some training at different periods. Courses should be given, because maintenance of equipment is one of the important things and that has been causing some interruptions, which are rather serious, and costly.”

8.77. In response to the Committee's request seeking the views of the State Electricity Boards on the subject of training schemes for maintenance and operation of power generating the following points have been made out by the various State Electricity Boards in their memorandum:—

- (1) Every Regional Electricity Board should start training programmes and refresher courses in—
  - (i) power plant management
  - (ii) power plant operations and control
  - (iii) load despatch
  - (iv) plant protection
  - (v) energy losses and their prevention.
  - (vi) construction techniques

All Electricity Boards should depute their Engineers in rotation to these programmes so that every Engineer spends at least 15 days per year either on the condensed course or on the refresher course and is thus up-to-date in his knowledge from time to time.”

- (2) There should be incentive training programmes for maintenance and operation of power generating stations fully financed by the Centre. A training Centre may be located on each power Station and should have bigger set up at regional level.
- (3) The training facilities available at present in our country are not adequate to cope with the increasing number of engineering and skilled personnel that are to be trained to man the large thermal stations coming up very fast all over the country. There is need to set up more training centres like those at Neyveli.
- (4) Need to place greater emphasise on imparting practical training. The personnel appointed in these training centres must

have wide practical experience in construction, operation and maintenance of thermal stations and also of proven ability in that field.

- (5) It would be exceedingly advantageous if a separate cadre of engineers is established in every organisation in the country to look after the construction, operation and maintenance of generating stations. The best talent available can be absorbed into this cadre, and given proper training they will prove to be a great asset to the organisation they are attached to and to the country.

8.78. Explaining the reasons for power failure in the country, the Minister of Irrigation and Power in reply to a question in Lok Sabha on the 8th August, 1972 stated:

“One of the most important reasons is that the load is going up much more than what we are able to install at the moment. Therefore, we have now drawn up in the Sixth Plan many more projects to deal with the matter . . . . .”

One important reason is the efficiency of the operation and maintenance staff. I am afraid we have got to accept this position because we have just started power development in a big way. Apart from engineers, we do not have experienced technicians who should be able to smell out difficulties in advance. This class, I am afraid, we have not got in the country and we have got to develop that class. Delhi Power Station is now being operated by persons having six years' experience all over. That sort of people are required. At DVC and Neyveli we have some training classes. We want to open some more training classes and make up the deficiency.”

8.79. The representative of the Ministry admitted during evidence that there is shortage of technical staff for maintenance work and the safety of the dams is part of the maintenance aspect. Qualified engineers are available for installation but that much importance is not attached to maintenance aspect and qualified technical people are not put in charge on maintenance.

8.80. The Planning Commission in their 'Approach to the Fifth Plan' has stated as follows :—

“Operational problems, often attributable to poor maintenance, are another important factor for under-utilisation of capacity. Maintenance needs to be given much more attention. An important step to that end has been to expand the scope of

Plan investment to cover not only new investment but also major replacement, renewal and renovation. Since the Plan provision will be made on the basis of gross fixed capital formation, maintenance of fixed assets in proper form should receive adequate attention."

8.81. Giving details about short term and long term measures taken to keep the stations running, the representative of the Ministry of Irrigation and Power informed the Committee:—

"In the short-term, we have already set up two teams of experts, one for thermal Projects and the other for hydro projects. They have been asked to visit the different projects and to suggest after on-the-spot study, what improvements can be done in the operation and maintenance procedures and other matters concerning the management of the existing power plants \* \* \* In the long-term, we have taken a number of measures. Firstly, we feel that there is need for properly trained expert operating personnel for the power plants. Already training institutes have been started for the operating personnel for the thermal power plants. We are asking State Electricity Boards to send their people for training.

As we are going in a big way, naturally there will be need for properly trained personnel for operating the systems. In the past, we had small systems and we could train on the job, with very large growth, we have to have schemes for training people.

For operating and maintenance of the transmission lines, we want to see that these lines can work without any dislocation. We are utilising hot-line techniques. That means, while the lines are carrying the full load, we have a way of doing certain maintenance and repairing operations without switching off the system. For that we are setting up a training centre. All the Electricity Boards will have properly trained crews for maintenance.

8.82. To a question whether it was a fact that fully trained maintenance staff was not there, the representative of the Ministry replied "That is unfortunately true. One of the thing that the Power Economy Committee considered was whether we should have some sort of examination and things like that. We are giving help for starting training institutes so that the States could equip themselves well in advance for maintenance of their thermal power stations." With regard to imparting of practical training, he stated. "In the past, when our systems were not

very big, each Station had its own in-service training. For the future programmes, however, it is very inadequate. That is why, we want to have proper training institutes and also give them practical training."

8.83. Replying to a further question regarding the number of stations where there were no trained personnel, he stated "we do not have statistics in that shape."

The Power Economy Committee dealing with the staff has recommended :—

"The staff required for operation and maintenance should be sanctioned with the finalisation of the design and start of construction and in any case at least 18 months before the expected date of commissioning of the first unit. The sanctioned strength should be fully recruited at the earliest, for purposes of training on similar installations during the year preceding the commissioning of the power plant. The full sanctioned strength of the technical personnel should be in position for gaining an understanding of the plant by assisting during the Acceptance and Commissioning tests and installation of the major plant sub-assemblies."

8.84. During the course of evidence the representative of the Ministry stated :

"We are completely at one with the suggestion. The Power Economy Committee also stressed this point. Even earlier we have told the State Governments that this is most desirable and they must act on these lines."

Stating the position about the action taken by Government on the recommendation of the Power Economy Committee, it has been stated that the recommendation was communicated to the State Governments State Electricity Boards etc. for implementation.

8.85. With regard to the training of personnel for manning the power generating stations, the Power Economy Committee stated:

- (i) There should be a requirement preferably statutory that the O & M staff must be qualified by proper training and experience preferably through some recognised training institutes before being given the full and independent charge of the costly and intricate modern power station equipment. A system of certification of the O & M staff similar to that in vogue in the Civil Aviation Industry could be adopted.

- (ii) Refresher Training Courses should be arranged for all the technical staff in a phased manner so that each person has to go through a course at the interval of 5—7 years. Even the O & M staff at the technical level should be routed through other similar systems.
- (iii) Existing facilities for training of personnel for operation and maintenance of steam power stations are grossly inadequate.
- (iv) Training of personnel for operation and maintenance of power stations should be the responsibility of the Regional Electricity Boards. They should assess the requirements and organise adequate training facilities including in-Plant training to suit the requirements peculiar to the respective regions.
- (v) For the purpose of certification of competency in operation and maintenance the Central Electricity Authority should formulate minimum requirements on a nation-wide basis.
- (vi) Break-downs in power supply are mostly on account of failures of distribution lines and sub-stations. Standardised plans for operation and maintenance of these should be evolved.
- (vii) There is an urgent need for developing technical manpower resources to remove scarcity of adequately trained and experienced personnel for manning technical jobs at all levels. This will also help reduce growing unemployment among persons passing through technical institutes.

8.86. To a suggestion that for maintenance and operation of Power Generation Stations a team of engineers well-experienced and technically qualified should be assigned the job for preparation of 'codes for maintenance' of important items of equipment in a generating station and each electricity board should have schemes for training on the job for every new recruit before he is put in charge of operation and maintenance of generating stations, the representative of the Ministry replied :

"In any major power station for the individual piece of equipment there are the manufacturers' manuals for the operation and maintenance of the equipment. When the power station is completed, two set of manual as made out by the manufacturers is compiled and given to the operating staff. The manufacturer gives directions how the equipment should be operated. There are general codes also prepared by the ISI for various pieces of equipment like the transformers. Codes of maintenance are made available to the power station staff.

The suggestion here is of collecting a group of engineers experienced and technically qualified for the job of preparation of maintenance codes. May be that way we can evolve common code of general nature. We will try to do that. We will try to create a cell in the CWPC."

8.87. The Committee note that Government have set up two Thermal Power Station Personnel Training Institutes—one at Neyveli in 1965-66 and the other at Durgapur in 1968-69. While the Neyveli Institute imparts training to the supervisory officers, the Durgapur Institute imparts training to the technicians, engaged in operation and maintenance of thermal power station. The Committee further note that the intake of trainees at Neyveli and Durgapur, which was 28 and 27 respectively, has been increased to 50 and 100 respectively to meet the requirements of the fourth Plan. Till 1971-72, 199 supervisory officers have been trained at Neyveli and 193 technicians at Durgapur. The Committee note that for the increased generating capacity during the Fourth Plan, 1600 trained engineers and 4500 technicians would be required for proper maintenance and operation of thermal power stations. The Committee are concerned to note that against such a large requirement of trained personnel, the actual personnel of both categories trained so far have been very much less and at this rate it would not be possible for Government to train more than 150—200 personnel in both Institutions during 1972-73 and 1973-74 resulting in heavy shortages in the number of trained personnel for operation and maintenance of Thermal Power Stations.

8.88. The Committee regret to note that even the capacity of the institutes, which is sanctioned at 50 and 100 trainees respectively, is being utilised only at about 50 per cent. The Committee would like to point out that the general shortage of trained technical personnel for operation and maintenance of Thermal Stations, was admitted by the representative of the Ministry. Even the Minister has admitted the shortage of experienced technicians and has admitted the need for more training centres to make up the deficiency. The Committee fail to understand why it was not possible for Government to utilise the existing capacity of the two institutes and set up more institutes to make up the shortages of trained manpower which is essential for the efficient operation and maintenance of Thermal Stations and thereby ensuring continued supply of power to the users without any break-downs. The Committee are of the opinion that operation and maintenance of existing generating stations and transmission lines are equally if not more important and necessary than the expansion of generating capacity and it is imperative that adequate trained man power is available for this purpose. The Committee recommend that immediate steps should be taken by Government to assess realistically the requirement of trained engineers and technicians for the Fifth Plan when the generation of power is to be increased from about 20 million KW at the

end of Fourth Plan to about 32 million KW in 1978-79—the generation of thermal power is estimated to be increased from about 12.5 million KW to about 24 million KW during the same period—and effective measures taken to provide training facilities for them by augmenting the capacity of the existing institutes and setting up more institutes for the purpose to the extent necessary. They apprehend that in case adequate steps are not taken in time in this regard, the non-availability of trained manpower for efficient and economic operation and maintenance, may become a major bottleneck in the achievements of targets of power generation, transmission and distribution in the Fifth Plan.

8.89. The Committee note that in foreign countries Hot Line maintenance techniques are being used for a long time which enable maintenance of lines and related equipment without de-energising and disrupting the power supply. They further note that two Hot Line Crew Centres—one at Bangalore and another at Ganguwal—were set up by the Government after entering into an agreement with USAID. These centres, which started functioning in 1958, were closed in 1962 and 1965 respectively. The Committee note that there is a great demand from the State Electricity Boards for the trained personnel in the Hot Line Maintenance Techniques and that a proposal is under consideration for training employees on the new techniques called 'Bare Hand Method' which is in vogue in Russia and to conduct refresher courses on the 'Hot Stick Method', which is in vogue in U.S.A.

8.90. The Committee cannot over-emphasise the usefulness of Hot Line Maintenance Techniques being adopted in the country on a large scale in view of the large expansion in the power system in the country and the advantages of the technique in carrying out maintenance without interrupting power supply. The Committee are unable to appreciate why the two centres were closed down after a brief period of 5 to 8 years. They would urge that Government should set up training centre/centres for imparting training in this new technique as early as possible so as to meet the needs of the State Electricity Boards and other bodies engaged in the operation and maintenance of power supply in the country.

8.91. The Committee further note that Government have been proposing since 1970-71, to set up a 'Load Despatch Training Institute for training in Load Despatch technique'. They note that the location of the institute, which was originally to be set up at Roorkee, has been changed to Bangalore. They regret to note that the Institute has not yet been completed although Load Despatching Stations are expected to come into operation during 1974. The Committee would like Government to take expeditious measures to set up this institute at an early date so as to make trained personnel available by the time load despatching stations go into operation as they are stated to be the principal tool for stabilising power generation and getting most economical power available at any time.

8.92. The Committee were informed by an eminent non-official that there are no Standard 'Codes of Practice' available to the operating staff manning the power generating stations. The Committee feel that for efficient maintenance of power generating stations and to ensure uninterrupted supply, it is very necessary that Standards "Codes of Practice" are readily available to the operating staff for reference and guidance. The Committee cannot too strongly emphasise the need for bringing out a Standard Code of Practice expeditiously by associating eminent, experienced and technically qualified engineers in its preparation.

8.93. The Committee have noticed that there are frequent power interruptions which cause considerable loss to production both in industry and agriculture, apart from causing inconvenience to general users. They would, therefore, like the Government to impress upon the State Electricity Boards, who are mainly responsible for operation and maintenance of power generation and for keeping the transmission lines working. It should also be impressed upon these Boards to provide injob training to their technicians and engineers and should prescribe tests so that the persons who are manning the generation plants and operating and manning the transmission lines, maintain their efficiency which would result in reducing the interruption in power supply to the barest minimum. There should also be courses for maintenance of equipment as slackness in this regard is the main cause of interruption in power supply.

8.94. The Committee would like to emphasise that the Power Economy Committee, appointed by Government which submitted its report in March, 1971, has made several valuable suggestions regarding the training of personnel for manning power generation stations and operation and maintenance of transmission lines. They would like the Government to take expeditious decisions on these recommendations and implement them without delay.



## CHAPTER IX

### ORGANISATIONAL SET UP AND FUNCTIONS

#### (i) Set up in the Ministry

The Ministry of Irrigation and Power, established as a separate entity in 1952, is responsible for laying down the national policy for conservation, development and regulation of the country's water and power resources and for the formulation and promotion of the national programmes in the fields of irrigation, power and flood control.

9.2. The Ministry is headed by a Secretary who is assisted by four Joint Secretaries at different Wing levels. The Secretariat of the Ministry comprises four units namely: (i) Indus Wing including Flood Control (ii) Ganga Basin Wing including Irrigation (iii) Administration Wing, and (iv) Power Wing, each headed by a Joint Secretary. Besides there is a Foreign Exchange and Public Enterprises Division headed by a Director.

9.3. The functions of the Power Wing of this Ministry comprise the following:—

- (1) Provision of financial and technical assistance to State Governments and Union Territories in the field of power;
- (2) Applied research in power;
- (3) Watching the progress of power projects and costs against estimates.
- (4) Examination of schemes formulated by the States and Union Territories and other Central Organisations for inclusion in Plans.
- (5) Administration of the Central hydro generation and thermal projects taken up by the Central Government.
- (6) Arranging allocation of foreign exchange and materials in short supply for power projects.
- (7) Arranging for the allocation of generating plants and equipments from the indigenous sources. Watching the progress of manufacture and delivery of equipment and assisting in the

fixation of price for the equipment in consultation with the Ministry of Finance.

- (8) Administration of the Indian Electricity Act, 1910—in so far as Centre is concerned.
- (9) Administration of the Electricity (Supply) Act, 1948—in so far as it relates to the functions of the Centre.
- (10) Setting up the Central Electricity Authority and discharge of such functions relating to it as laid down under the Electricity Supply Act, 1948.
- (11) Matters relating to the Central Electricity Board.
- (12) Damodar Valley Corporation in so far as it relates to power.
- (13) Matters relating to Central Electrical Inspectorate.
- (14) Indus Waters Treaty, 1960 in so far as it relates to power.
- (15) Administration of inter-State Water Disputes Act, 1956 and River Boards Act, 1956 in so far as these relate to 'power'.
- (16) International Commissions and Conferences relating to power.
- (17) Rural electrification.
- (18) Rural Electrification Corporation.
- (19) Central Water and Power Commission (Power Wing).
- (20) Central Water and Power Commission (Water Wing) in so far as it relates to investigation of hydro-power project.

*Set up in the C.W.P.C.*

9.4. The Central Water and Power Commission, an attached office under the Ministry, is charged with the general responsibility of initiating, coordinating and further (in consultation with the State Governments concerned) the schemes for the control, conservation and utilisation of water resources throughout the country, investigation of projects, navigation, flood control and water power development and also schemes of transmission and utilisation of electrical energy throughout the country.

9.5. The functions of the Power Wing of the Central Water and Power Commission as contained in the Ministry of Natural Resources and Scientific Research Resolution No. EI-I-201 (5) dated the 21st April, 1951, are as follows:—

The Power Wing will be charged with the general responsibility of initiating, coordinating and furthering, in consultation with the

State Governments concerned, schemes for the utilisation of Water resources throughout the country for the purpose of water-power generation, as well as schemes of thermal power development and also schemes of transmission and utilisation of electric energy through the country. The Power Wing will, if so required, also undertake the construction and execution of any such schemes. In exercise of the above responsibilities it will be the function of the Power Wing:—

- (a) to make all necessary investigations and surveys and when so required, to prepare schemes and designs—
  - (i) for the development of water resources in respect of power generation; and
  - (ii) for thermal electric power development;
- (b) to undertake construction work on any electric power development schemes on behalf of the Government of India or State Governments concerned;
- (c) to advise and assist, when so required, the State Governments (Commission, Corporations or Boards that may be set up) in the investigation, surveys and preparation of power development schemes for particular areas and regions and in the surveying of potential sources of load, the forecasting of revenue from electricity supply and the formulation of electricity tariffs;
- (d) to advise the Government of India in regard to all matters relating to electric power development, Public electric utilities both private and State-owned;
- (e) to advise the Government of India in regard to the settlement of priorities for plant, materials and foreign exchange as between various river valley development and power projects;
- (f) to collect, maintain and publish statistical data relating to the generation, distribution and utilisation of electricity throughout India and to act as the Central Bureau of Information on all matters relating to the Public electricity supply;
- (g) to initiate schemes and arrange for the training of Indian Engineers in India and abroad in all aspects of electricity supply industry;

- (h) to review and lay down for the whole of India Standard voltages and practices for generation, transmission and distribution of electrical energy;
- (i) to conduct and coordinate research on various aspects of power development etc. and the connected structural and design features; and
- (j) to conduct experiments, research, propaganda and generally to carry out such other activities as will promote the spread and use of electricity throughout the country, in particular in the semi-urban and rural areas.

9.6. Since the above functions were laid down in 1951, the following additional functions have been assigned to the Power Wing:—

- (i) to provide secretariat assistance to the Central Electricity Authority;
- (ii) to carry out Power Load Survey of the country on an all-India basis as a national project;
- (iii) to render Consulting Engineering Services covering engineering design, procurement and installation of large thermal and Hydro Power Station in the country.
- (iv) to carry out investigations and research on various problems connected with development and utilisation of energy resources and to conduct studies for promotion of technical efficiency and economy in various aspects of power supply industry;
- (v) to impart training in the repairs and maintenance of overhead lines in an energised State (technically known as Hote Line Training);
- (vi) to carry out inspections of Electrical Installation in the Union Territories (excluding Delhi) and Similar installations under the All India Radio, Civil Aviation and the C.P.W.D.; and
- (vii) to plan and establish an All India Super Grid.
- (viii) Training of operation and maintenance engineers in the operation and maintenance of large modern Thermal Power Stations.

9.7. In a memorandum submitted to the Committee it has been represented that:—

“At present, the total installed capacity in the country is about 17 million KW. At the end of the Fourth Plan, some of the concerned authorities in the Government of India expect it to rise

to about 20 million KW. The authorities in the Government of India, *i.e.* the Ministry of Irrigation and Power etc. have placed a target of 40 million KW at the end of Fifth Plan. In other words an average addition of about 4 million KW annually would need to be made. If this target is to be attained, the question to be asked is whether the Central and the State authorities are really geared to the task of adding 4 million KW in 1971-72. The present organisational set-up in the centre to my mind needs to be completely reorganised if the future goals are to be achieved. By and large, all the work in the field of power development falls on the C.W. and P.C. which has become a very unwieldy organisation. Further it lacks the status and powers for achieving the set goals. The question is best summarised by Dr. Bhagvantham, Chairman, C.W. and P.C. Re-Organisation Committee in March, 1969, in his letter of transmittal of the Committee's Report:

“by and large, the C.W. and P.C. had during the course of its existence over the last two decades discharged its functions satisfactorily, commensurate with the status given to the organisation, and the responsibility devolving on those at the top levels. Nevertheless, the Committee feels that it could have done much better had it been given adequate powers to deal with the problems at the national level.

I am in agreement with the above. Neither C.W. and P.C. today is organised to cope with the increasing tasks at the central level in the field of power development nor it has a adequate powers to deal with the problems at a national level.”

9.8. It has been represented further that:—

“At the time the Central Water and Power Commission was established, the activities of the Ministry of Irrigation and Power were limited as the irrigation and power development in the country was at its initial stages. Activities in both these fields have increased enormously, particularly in the power supply industry the demand for power due to industrialisation of the country is increasing very rapidly. To meet this growing demand, the generating capacity is required to be doubled in five years or less. The power supply industry is capital intensive and due to all round increase in costs the expenditure to be incurred in the power supply industry has increased considerably. Similarly the irrigation development has also extended and the expenditure that is being incurred in this field of

activity is also very large. It is obvious that the combined workload is becoming too large to be handled by one technical organisation and one ministry. The activities in both these fields of economic development are going to increase much more. Therefore, time has come when serious consideration should be given to divide the Irrigation and Power Ministry and the Central Water and Power Commission into two. As far as power is concerned, establishment of a separate Ministry of Power and a separate technical organisation called either Central Electricity Commission or Central Electricity Authority would be most appropriate. The Electricity Supply Act of 1948 provides for the establishment of a Central Electricity Authority and this could undertake all the functions assigned to it in the Electricity Supply (1948) and serve as the highest technical organisation of the country to plan and scrutinise all the power development projects. I believe that it is now the most appropriate time to establish the above suggested organisations and thus ensure the efficient development of the power supply industry in the country. Once a separate ministry and the highest technical organisation is decided upon, the allied bodies such as Regional Electricity Boards, Central Board of Irrigation and Power etc. could be remodelled to suit the new set up."

9.9. A State Government has also expressed the view that "the Central Water and Power Commission needs splitting up in two independent commissions for water and power separately."

Bifurcation of the Irrigation and Power Secretariat into two Secretariats has been suggested in another memorandum in the following words:—

"Bifurcation of the Irrigation and Power Secretariat into two Secretariats, one for Irrigation and another for Power.

Similarly, separation of the CWPC into two Commissions, one for Irrigation and one for Power.

When the combined Secretariat and Commission were created many years ago, the irrigation and power projects (both existing and proposed) were few. These have grown many-fold since then and each sector requires individual and independent attention for rapid decisions and speedier implementation of the schemes.

Further, in the past irrigation projects were also power projects and hence a coordinated processing was required. But now the

emphasis on power projects is for larger units of type thermal, nuclear and hydro-schemes. The multipurpose irrigation-cum-power projects are very few in the modern planning. Therefore, the necessity of having a combined commission for Irrigation and Power does not exist to the same extent as before."

9.10. Asked if the time had come when the power wing of C.W.P.C. may be merged or amalgamated with the C.E.A. the representative of the Planning Commission stated during evidence:—

"It involves C.W.P.C. and it may probably be the Secretariat of C.E.A. The Ministry is already working on it."

9.11. In reply to another question the representative of the Ministry of Irrigation and Power informed the Committee that water and power wings of the Central Water and Power Commission were to be separated.

9.12. In the coming years there is no doubt that the requirements of the electrical energy in the country will continue to increase exponentially for many years. In other words, the installed capacity available in the country will have to be increased very rapidly so that the capacity is doubled in every 5 to 6 years. This will necessitate a great deal of activity of planning as well as project execution. Further, the increasingly bigger power systems of the States will have to be knit into regional power systems and coordinated and integrated operation of regional power systems brought about. The working of the power stations, sub-stations, transmission lines as well as construction of power projects will have to be watched carefully and monitored in order to ensure that the limited resources of the country, allocated for power, are utilised in the best possible way. The centre will have to be involved in the power supply industry more and more actively through central generations as well as through integrated operation of power systems on the regional/national basis. Marshalling of resources by way of plant and equipment, essential materials like steel and cement as well as supply and transport of coal and oil fuels for running power stations will be largely the responsibility of the Centre. The Committee, therefore, feel that it is absolutely necessary that early steps are taken to see that the set up at the Centre is rationalised and, if necessary strengthened so that this big task can be adequately tackled.

913. In view of the considerations mentioned in the preceding paragraph and in view of the importance of power as a basic infrastructure for the economic growth of the country, Government may examine the desirability of splitting up the Central Water and Power Commission into two separate Departments and combining the Power Wing with Central Electricity Authority.

9.14. A former Chairman of the Central Water and Power Commission has stated in a memorandum submitted to the Committee:—

“Years ago, the Ministry of Irrigation and Power of Government of India, established a technical organisation called Central Water and Power Commission. This was intended to be the highest technical organisation in the country for planning irrigation and power projects as well as for scrutinising technically all the projects prepared by the various State Governments before clearance is given by the Government of India for the implementation of the projects. This organisation was intended to be the highest technical organisation manned by well-qualified personnel and once the projects were cleared by this organisation, no further technical scrutiny of the projects was contemplated. The projects cleared by the Central Water and Power Commission were to be processed Administratively by the Ministry of Irrigation and Power for obtaining clearance for implementation. Since then many changes have taken place in the organisational set up in Government of India. The Central Water and Power Commission no longer enjoys the authority that was vested in it at the time of its establishment and the projects scrutinised and passed by Central Water and Power Commission are now under-going further technical scrutiny at various levels. This has necessarily undermined the confidence the Central Water and Power Commission enjoyed and considerable delays are occurring in this multi-stage scrutiny of projects. In some cases, years have elapsed before projects have been cleared.”

9.15. Asked to elucidate his statement the witness stated during evidence:—

“The project reports are being sent to the C.W.P.C. by the States as being the highest technical organisation in the Central Government. But then there is a technical wing in the Ministry of Irrigation and Power. There is also a technical wing in the Planning Commission. So, whatever is scrutinised by the C.W.P.C. is again looked into at these two levels before a project is passed. My feeling is that the Central Government should have one technical organisation, which should be the highest technical organisation, whatever you may call it. After scrutiny by that organisation there should be no further scrutiny on the technical side. If you have various tiers of scrutiny, there is delay in taking a decision. You will have to stop it at a particular point. After a project is cleared by C.W.P.C. there should be only administrative study and no technical study.”



9.16. Explaining the procedure followed in the Planning Commission in this regard the representative of the Planning Commission explained during evidence:—

“We are an advisory body. Sometimes some jobs are given to us to supervise. That is a rare happening. But, normally, we are an advisory body. The Ministries are the supervisory bodies. But what the Planning Commission does in respect of power is: from the very beginning, I will give you the sequence. The project reports are prepared by the State Electricity Boards or the State Governments and they are sent to the Central Water Power Commission, Planning Commission, Ministry of Finance and Ministry of Irrigation and Power. Then when the C.W.P.C. has examined the scheme in all its aspects and thinks that it is a feasible scheme, then there is an Advisory Committee on Irrigation and Flood Control and Power Projects set up by the Planning Commission. It is chaired by the Secretary, Ministry of Irrigation and Power and is membered by the Representatives of the various Ministries of Industry, Finance and Mines and Metals. There are one or two non-official members also. When the Advisory Committee considers the scheme from the point of view of financing it and have overall look at it, whether in the case of a thermal station whether the coal is available for it and whether the State has got the financial capability of financing it and all those things and then we issue the sanction.”

9.17. Illustrating the point the representative of the Planning Commission explained:—

“Suppose a thermal station is proposed we have got to see that the Mines and Metals Ministry has got the proposal for building adequate coal stock for it, whether the railway transport capacity is there etc. All these are being coordinated in the Planning Commission. To that extent, if you call it supervisory, that is supervisory. But these things are generally looked into before the scheme comes to the Planning Commission. We only double-check it there. It is not that the Ministry does not look into it. The Ministry goes through it. The C.W.P.C., the Ministry of Mines and Metals and the Ministry of Irrigation and Power scrutinise it to see whether the coal is there. It is only then the proposal is recommended and sent to us. We do check whether the coal is there etc. We are coordinating at that level, but it does not mean that we supervise the Ministries' work. Though we are an overall supervi-

sory body, I do not think that is the contribution made by the Planning Commission."

**9.18.** The Committee note that the projects at present being scrutinised from the technical point of view by the Central Water and Power Commission after they have been cleared by the Ministry of Irrigation and Power administratively are being put to further examination by the Technical Advisory Committee of the Planning Commission on the Ministry. The Committee take note of the argument put forward by the representative of the Planning Commission during evidence that these schemes are examined in the Planning Commission with a view to coordinate for the availability of fuel and transportation facilities etc. While the Committee note the anxiety of the Planning Commission to ensure the proper utilisation of Public finances they feel that the procedure in regard to a recheck of the schemes already cleared by the Central Water and Power Commission which is admittedly the top technical organisation in the country for power should be reviewed at the highest level to avoid duplication. They hope that with the activation of the Central Electricity Authority with full powers and authority, the coordination part of the job, in addition to a competent scrutiny at the highest level, will also be performed by that body and avoidable delays and duplication in the processing of the schemes eliminated.

#### (ii) Central Electricity Authority

9.19. The Central Electricity Authority has been constituted by the Central Government under Section 3 of the Electricity (Supply) Act, 1948.

The functions and duties assigned to the Authority under the Electricity (Supply) Act, 1948 are given below:—

#### *Functions*

- (1) To develop a sound adequate and uniform national power policy.
- (2) To coordinate the activities of the planning agencies in relation to the control and utilisation of national power resources.
- (3) To act as arbitrators in matters arising between the State Government or the Board and the licensee or other person as provided in the Act.
- (4) To carry out investigations and to collect and record the data concerning the generation, distribution and utilisation of power and the development of power resources.
- (5) To make public from time to time information secured under the Act and to provide for the publication of the reports and investigations.

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

“In the context of the progress that is required to be made in the Fifth and subsequent plans, the work of planning for power generation and transmission projects is a colossal one. So far at the central level, the responsibility for planning has been divided between the C.W. & P.C., Planning Commission, Ministries of Irrigation and Power, Finance, Industrial Development etc. If the desired objective of planning well in time and ensuring timely implementation of projects is to be achieved, it is essential to reorganise the administrative structure at the centre. In this connection, I would suggest the following:—

- (i) Situated as we are today, it is difficult to divorce political considerations from work involving very heavy investments in the power sector. A central Consultative Council with Ministers of I&P Government of India as Chairman, 5—7 State Ministers in-charge of power departments, a representative of Planning Commission and Ministry of Finance, a few top technical experts, etc. should be constituted to review the working of the Power Supply industry from time to time and to give necessary guidance to the central Electricity Authority mentioned below:—
- (ii) The Central Electricity Authority has so far been working only in name to comply with the statute. It should be re-activated on whole-time basis and given the following functions:—
  - (a) Planning for power—This should conform to the guidelines laid down by the Council.
  - (b) Coordination work for supply of generating plants and equipment, steel, cement, etc., for the various power projects in the country and to ensure that these are supplied well in time.
  - (c) Watching the implementation of the projects right from the start of construction or even investigations—sort out difficulties of the construction agencies arising from time to time and see that the projects are commissioned by the scheduled dates.
  - (d) To ensure integrated operation of the regional power systems. They may have to take steps in this direction including installation of load-despatching stations, etc. One of the main hurdles in this is that the States are not able to agree upon the tariffs for inter-State exchanges. The Central Electricity Authority should be invested with

power by statute to resolve the tariff problems between different States and in case of differences not being reconciled, the decision of the C.E.A. should be final and binding on the parties concerned.

- (e) To act as arbitrators in disputes between the State Governments/State Electricity Boards and the licencees.
- (f) To ensure that for the schemes included in the long and short terms plans, investigations work is proceeding according to schedule."

9.20. One of the State Governments has also stated in a written memorandum to the Committee:—

"The Central Electricity Authority is, at present, existing only in name and is not discharging the role assigned to it under the Indian Electricity Act—1948, under which this should be an independent authority responsible for the planned development of power in the country. The Indian Electricity Act vests this body with the authority for resolving State/Central and inter-State issues on power and makes in the apex body over the regional Boards. The present Central Electricity Authority is functioning only as an adjunct of the Ministry of Irrigation and Power and most of its functions in approving the power projects are being carried out through the C.W. & P.C."

9.21. The Power Economy Committee constituted by the Government of India have also in their Report submitted in 1971 recommended activation of the Central Electricity Authority as a full time body with a full time chairman to achieve the functions allotted to it under the Electricity (Supply) Act, 1948.

9.22. Recommending activation of the Central Electricity Authority with a view to carry out their function under the Electricity Supply Act, 1948 in regard to the Planning and Coordinating the activities of the various planning agencies in the country and to carry out necessary investigations the Power Economy Committee stated:—

"At the central level, the responsibility for planning, at present, is divided between the Planning Commission, Central Water and Power Commission (Power Wing), *ad hoc* Committee for Irrigation and Power Projects, the Ministries of Irrigations and Power, Finance, etc. The Committee feels that this division of responsibility is not conducive to a unified and purposeful objective which is so essential now for economic planning in the power supply industry. It feels that the entire work of preparing long-term perspective plans should be entrusted to a

single centralised agency which is competent to carry it out and ensure that the above objectives are achieved. The work involved, being primarily of a technical nature, the main question to be decided is whether this central responsibility should be discharged by the C.W. & P.C. (Power Wing) or the Central Electricity Authority.

The C.W. & P.C. (Power Wing) has been set up primarily, as a high-level consultant body to function at the request of States and other organisations. It has no statutory authority for carrying out investigations which seem to be the biggest bottleneck in the implementation of economic plans. Notwithstanding the major contributions, *i.e.*, National Hydro Electric Surveys (1953-60), preparation of the First Perspective Plan for Power Development (1962) and other important contributions to planning and designs of power projects. C.W. & P.C. (PW) was not entrusted with the work of investigation of 62 hydel sites—this work being taken up with the assistance of the United Nations Special Fund.”

“The Central Electricity Authority, on the other hand, even now enjoys statutory status and has the responsibility, *inter alia*, to develop a sound, adequate and uniform national power policy, and to coordinate the activities of the various planning agencies in the country, to carry out such investigations, as are necessary and to connect and record all data concerning generation, distribution, and utilisation of power and the development of power resources. These powers, it may be noted, were vested in the Central Electricity Authority, on the basis of recommendations of the Select Committee appointed by the Constituent Assembly to consider the Electricity Supply Bill—which, ultimately, became the Electricity (Supply) Act, 1948, which deliberately widened the scope and functions of the Authority. They had felt even then that non-statutory institutions would not serve the purpose even of discharging the duties of Electricity (Supply) Act, 1948. The Indian Atomic Energy Act of 1962, while empowering the Central Government “to develop a sound and adequate national policy in regard to atomic power”, also lays down that the Central Government should coordinate such policy with the C.E.A. This Act, further directs that (a) the Central Government should fix rates for and regulate the supply of electricity from atomic power stations with the concurrence of the CEA; and (b) in case of differences of opinion between the Central Government and any State Electricity Board in regard to provision of necessary transmission lines (for inter-State supply of power from nuclear power stations), the matter

shall be referred to the Central Electricity Authority whose decision shall be binding on the parties concerned. It is clear from the above that the required status to ensure that the work of planning for power development is carried unimpeded already vests in the C.E.A., in principle."

9.23. In this connection the Power Economy Committee has further remarked:—

"The Committee feels that when a statutory authority like the C.E.A. is already in existence, is fully vested with power to undertake all the power planning programmes on rational considerations, and it is admitted that it is lack of this statutory status which has been inhibiting the work of the C.W. & P.C., it is obviously not necessary to look for another agency to carry out this task. There appears no point in introducing or attempting fresh legislation merely for taking away functions from the Central Electricity Authority and entrusting it to another Commission.

The Committee feels that the overall responsibility for planning for power, including investigations and processing of schemes, right up to the stage of initiation of construction should be centralised with the C.E.A. This will mean activation of the C.E.A. which has never been set up as a full-time body and is, therefore, not adequately equipped now to discharge its responsibility. The C.W. & P.C. has been carrying out this responsibility on a *de facto* basis. The C.W. & P.C. (PW) or the units thereof, which are engaged on this work could be reconstituted as the Central Electricity Authority, and the Authority further strengthened on a technical and administrative plan to discharge these and other centralised functions."

9.24. Commenting on the functions of the C.E.A., it has been stated by the Ministry of Irrigation and Power in a written note—

"The function of developing a sound, adequate and uniform national power policy and coordinating the activities of the planning agencies in relation to the control and utilisation of national power resources is one of the most important functions the CEA has to perform. It embraces various aspects of electricity supply industry such as basis for planning of generation and transmission schemes on State basis or on regional basis, ensuring appropriate mix of hydro and thermal power generation. A national power policy cannot afford to exclude other related matters such as size of plant, transmission line voltages, standardisation, improvements in design based on the latest technological advancements, proper coordination with manufacturers

in developing advanced type of plant for power generation and utilisation. Commercial and economic aspects of power system operation and allied research is another most important and vital function, which is necessary to accelerate power development on regional lines.”

9.25. Asked if Government had taken a decision regarding the setting up of a Central Authority to look after power generation in the country the Minister of Irrigation and Power state in reply to the Starred Question No. 126 on the 8th August, 1972:—

“Presently coordination of matters regarding power is affected mainly through the agency of Central Water and Power Commission. The principal activities of power generation and supply are in the hands of State Electricity Boards, licencees and departments of State Governments. The Central Electricity Authority constituted under the provisions of the Electricity (Supply) Act, 1948 has been assigned specific functions under the Act which are generally of a coordinating nature in respect of planning power development in the country. At the time of formulation of the legislation, the power supply development has on a small scale and was restricted to major urban areas excepting in a few States where power supply was extended to some rural areas also. Since the commencement of planned development, power supply industry has progressed rapidly and installed capacity which was about 2.3 million KW in 1950 has reached over 17 million KW by 1971-72. In spite of this rapid development, power is in short supply and compared to the advanced countries the per capita consumption is very low and is only about 90 KWH/Year. In order, achieve at least a reasonable per capita consumption figure of 250 kwh by 1980-81, it would be necessary to achieve the target of about 52 million KW installed generating capacity by then. In this context it is felt that a strong Central organisation should be set up so as to play an active and effective role in the power development of the country. Such a body would also enable adoption of uniform power policy throughout the country.

The Conference of State Minister of Irrigation and Power held in June|July, 1972 recognising the need for reorganising the organisational structure of the power supply industry at the Central and State levels recommended amending the existing legislation on Electricity. Proposals in this regard will be finalised in consultation with State Governments.

The Conference was also of the view that for the Fifth Plan the generation by Central Government may be for large inter-State power projects or by way of supplementing the power generation by the States and the Policy of generation may be reviewed further for subsequent Plans."

9.26. During evidence the representative of the Ministry of Irrigation and Power stated:—

"The Centre has a right, concomitant with other responsibilities, to deal with "Power". The Centre does not want to interfere in operational matters. While the Centre has done general planning, it has kept its hands pretty free from operational matters. By and large, the State Electricity Boards have fulfilled their responsibility and will continue to fulfil their responsibility for the generation and distribution of power.

Now, a stage has been reached when it is felt that the State as a unit is rather small for taking up a massive development of power. It is too small a unit financially as well as operationally. When it becomes a regional matter, each State in the region is not going to undertake generation and transmission of power. The Centre is not keen on taking up operational responsibility unless it has an organisation which can take the burden on its shoulders and discharge the functions properly. When the time comes, either because a State has not got finances or because the operations are on a massive scale which need a larger unit than a State or several States in a region, when that situation comes—I think, it has come—then the Centre will have to step in.

In 1948, when the Central Electricity Act was passed, the role was laid down for the Central Electricity Authority, at that stage, it was largely advisory. But it was provided that the Centre would from time to time dictate to the Central Electricity Authority as to what its functions should be. At present, the Central Electricity Authority is an appendage of the C.W.P.C. It is not functioning as it was intended to function. The members are part-time members. It is a very small organisation. We have certain ideas which we are discussing with various bodies as to how to give the Central Electrically Authority a little more tooth."

9.27. Referring to the role of C.E.A. in the matter of coordination the representative of the Planning Commission stated during evidence:—

"We have realised that coordination is the key to the whole problem and also the deficiency therein. Hence, the Planning Commis-



sion suggested the setting up of the Central Electricity Authority. The Ministry of Irrigation and Power have actually prepared the note for the Cabinet to set up a full-time effective Central Electricity Authority and Statutory regional boards to look into the coordination problem, to ensure close coordination on each project."

9.28. When pointed out that coordination had been lacking because these bodies had not been set up with the purpose of fulfilling these functions the representative of the Ministry stated:—

"When you have a developing country, all the institutions are in a state of growth. In the last 25 years, the electricity and power industry has grown in quite a phenomenal fashion in India. Immediately after partition, Government wanted to set up two different organisations. The position has changed from year to year. It is not that nothing has been done. The full-time members of the C.W.P.C. have done the same work as the CEA would have done. They will now be done by the CEA. Organisationally, it may not have been done; but actually, it has been done."

9.29. When asked if the Central Electricity Authority had the same authority as contemplated under the Act the representative stated:—

"If you say technically, yes; statutorily no."

He added that whatever operations, technically, were to be done by the C.E.A. had been done by a device by which the members of the C.W.P.C. are members of CEA.

9.30. Asked why it had taken so long a time, since 1948, to keep the CEA from functioning as contemplated under the Act, the representative stated:—

"Upto very recently, even though power is concurrent subject, 99 per cent of the activities in power except in technical matters where C.W.P.C. will do it, have been performed in the States. Now, we have come to a stage where the Centre has to discharge its responsibility. There is a very massive programme for power. Now, we say, this is not adequate and it should be more."

9.31. The Committee were informed during evidence that the details regarding the functioning of the CEA had not yet been worked out. This matter would have to be discussed in an inter-ministerial meeting and a

view taken on the functioning of the CEA. The representative of the Planning Commission, was, however of the view that unless CEA was effective it will not be in a position to function properly. If it was only an advisory body without any proper authority, it would not be effective. Giving his personal view he stated the C.E.A. would have to be equipped with some financial powers. This was only a tentative view and a final view and yet to be taken.

9.32 It has been stated earlier that the Electricity (Supply) Act, 1948 envisaged the setting up of a Central Electricity Authority with a view to develop a sound, adequate and uniform national power policy and in particular to coordinate the activities of the Planning agencies in relation to control and utilisation of national power resources.

9.33. The Committee wanted to know if a national power policy had been formulated. During evidence the representative of the Ministry of Irrigation and Power stated:—

“There is a policy, but not a policy by Resolution like the Industrial Policy Resolution.”

9.34. Asked why it had not been possible to formulate national policy on power and to place it before Parliament formally, the representative of the Ministry of Irrigation and Power stated during evidence:—

“One of the reasons why a formal national policy declaration has not been framed is that uptill now, the States were responsible for the generation and transmission of powers. In other words, the stage has now come when we will have to take a national view of it, because the requirements of the region have not been met by the individual States. Now the time has come for a declaration of a national policy.”

He explained further:—

“We had a policy uptill now like the Food policy. We had a policy that we should try to meet the demand of power, to the extent that the States were able to meet it. It was effective. The future policy of power will have to give the priorities for the use of power. Is it going to be the agricultural sector or the industrial sector, or what percentage should be for what? That has not been declared uptill now. Whether we should have a regional system, or a national grid—things like that are all policy matters, which have not been decided and will have to be decided.”

9.35. The representative expressed the view that a stage had been reached when States could not be depended upon for their resources and operational capacity. It was, therefore, contemplated to enlarge the concept embodied in the 1948 Act, to give the Central Authority a more precise definition, of its functions, to the policy that it was supposed to implement and to give it powers to operate that policy. He stated that it was desired to have the regional concept accepted, rather than have the State as a basis.

When pointed out that when the Electricity Act was formulated in 1948, the Atomic Energy Commission had not been and consequently it would not have visualised its potentialities, the representative agreed to the view that it had to be taken into account. Indicating the other aspects likely to be covered under this policy the representative remarked:—

“The Centre should be in possession of a bulk of source of power, to redress the imbalances between States and regions. The policy will be formulated on those lines. The Centre must not only intervene in financial matters but also in this. That would be a declaration of policy. Secondly, when it decides where the imbalances lie, it will have to declare eventually what the priorities would be for the country as a whole and for regions as a whole. Thirdly, it will have to declare what would be in the form in which the Centre would create this electricity and the organisation by which it would transfer it from one region to another. We are trying to come up with proposals for the formulation of policy and a legislation to embody them.”

9.36. It has been stated in a written note furnished to the Committee that formulation, of a national policy would *inter alia* involve:—

- (a) Demand surveys for the power and energy.
- (b) Assessment of energy resources and relative economics of their development.
- (c) Immediate as well as continuous planning for power development.
- (d) Coordination of hydro power development with the development of water resources for other uses such as irrigation, water supply etc. and for flood control.
- (e) Coordination of power development with
  - (i) development in other sectors of the economy.
  - (ii) development of other forms of energy.

**(f) Coordination of power development with**

- (i) manufacture of heavy electrical and allied equipment required for setting up generation|transmission|distribution facilities.
  - (ii) supply of essential construction material like steel and cement.
  - (iii) supply of construction machinery and equipment,
  - (iv) Fuels for thermal stations and their transport.
- (g) Formulation of commercial principles for inter-State and inter-Regional tariffs for power supply.
- (h) Arranging finances for power development.

9.37. It has been stated that this would require detailed technical and economic studies to be carried out in respect of items (a) to (h) mentioned above. In addition, extensive work will be involved in respect of—

- (a) translating the power policy into detailed plans/programmes for power developments in the various States|Regions of the country.
- (b) providing a feed-back for reviewing the National Power Policy from time to time in the light of experience gained.
- (c) overseeing the performance of various management agencies incharge of power development in different States/Regions.
- (d) arbitration between different management agencies in respect of tariff and inter-State sale of power, and
- (e) provision of expertise in design and engineering of power projects and consultancy services for the projects, where required.

9.38. It has been stated further that this work being necessarily detailed in nature and requiring studies in depth, would have to be dealt with by a high level technical organisation under the Ministry of Irrigation and Power. The Ministry are of the view that such an organisation, should have autonomy in its day to day working and should also have a statutory status with clearly defined responsibilities, particularly in view of the fact that "Electricity" was under the "Concurrent list" in the Constitution.

9.39. The Committee note that the Central Electricity Authority which was required to perform some highly important functions such as developing a sound and uniform power policy, coordinate the activities of the

power planning agencies and carry out investigations and collect and publish data, concerning generation, distribution and utilisation of power and development of power resources, has so far been working only in name and as a part-time body with a part-time Chairman. These functions have by and large devolved in the Central Water and Power Commission.

9.40. The Committee also note that the Central Water and Power Commission (Power Wing) which was set up primarily as high-level consultant body to function at the request of States and other Organisations has no statutory authority for carrying out investigations which, according to the Power Economy Committee, is the biggest bottleneck in the implementation of economic plans.

9.41. Power for its development depends on a number of other vital sectors such as mining and transport of coal for thermal stations, manufacture of heavy electrical and ancillary stations, ready availability of materials like cables, steel, aluminium, cement etc. This involves coordination with various agencies including the Planning Commission, the Ministries of Industrial Development, Steel, Railways Department of Mines etc. apart from coordination with the State authorities who are primarily responsible for generation, transmission and distribution of power within the States. The Committee have already observed the shortfalls all along in the augmentation of generating capacities on account of a number of factors such as delay in supply of equipment, non-availability of essential materials like coal, cement, etc. In adequate quantities, want of proper planning and coordination etc. Unless such coordination is very effective, it is bound to result in delays leading to power shortage conditions. There is, therefore, urgent need for a single agency at the Centre which should be responsible for such effective coordination.

9.42. Apart from effective coordination, it is also necessary to formulate at the Central level, a National Power Policy and prepare long term plans for power development extending over a period of at least 15-20 years as power generation schemes and also schemes for mining of coal, manufacture of equipment etc. have long gestation periods of over five years. The Committee feel that for this purpose also, there should be at the Central level a strong technical organisation.

9.43. The Committee note that there is a general consensus that these functions could be performed by the Central Electricity Authority already provided for in the Electricity (Supply) Act, 1948. The Committee also note that the Government are actively considering the proposal for activation of Central Electricity Authority and for this purpose they propose bringing in new legislation. In view of the pivotal role proposed for this body the Committee feel that the Authority should be activated with all the necessary powers at the earliest.

(iii) **State Electricity Boards**

9.44. The present organisational structure of the electric supply industry follows the Electricity (Supply) Act of 1948 in which the emphasis is on State level development. The Act envisages the establishment of State Electricity Boards as autonomous corporate bodies for performing "the general duty of promoting coordinated development of generation, supply and distribution of electricity within the States in the most efficient and economical manner with particular reference to such development in areas not for the time being served or adequately served by any licensee".

9.45. At present, the State Electricity Boards have been formed in almost all the States except in the States of Nagaland, Manipur and Tripura where power development is stated to be at its infancy.

9.46. It has been represented to the Committee that the Act "provides for a comprehensive set of principles which if closely adhered to would result in the establishment of an efficient and financially sound organisation in the Centre and at the State level for the healthy development of the power supply industry. Unfortunately, interferences by State Governments in the recruitment to the top positions in the Board and in its day-to-day working have brought down the reputation of Electricity Boards in the public eye and justifiable dissatisfaction is expressed by consumers everywhere."

9.47. With a view to eliminate this difficulty it has been suggested to the Committee that the matters on which State Governments may give policy directives to the State Electricity Boards should be clearly defined and identified. Similar representation has been received from the Chairman of a State Electricity Board. It has been stated that:—

"It is possible that in the absence of a defined parameter of policy directives, some State Governments may indulge in loose directives such as store purchase matters, recruitment matters, promotional matters, preferential tariff matters, for certain industries etc."

9.48. It has been pointed out that the State Governments can give directives to the State Electricity Board under Sub-Section (1) of 78A of the Electricity (Supply) Act, 1948 which reads as follows:

"In the discharge of its functions, the Board shall be guided by such directions on questions of policy as may be given to it by the State Government."

This Section is quite vague. What matters constitute policy matters upon which the State Governments can give directions to the Electricity Boards must be clearly defined in the Act.

9.49. A former Chairman of the Central Water and Power Commission has amplified this point during his evidence as follows:—

“The authority to appoint Chairman and Members is given to the State Government. At present the qualifications of the members to be appointed have been laid down in the Act in Chapters III, on pages 4 and 5. These do not in any way bind the State Government not to exercise influence in selecting those people. They have got the authority; they appoint them whenever they want and dismiss them whenever they want to take somebody else, with the result that the State Electricity Board Officers like Chairman and Members go to toe their line if they want to continue in service. The witness suggested:

“There must be an amendment to the Act that the State Electricity Board Chairman should be a technical man, an electrical engineer, that he should be appointed only for a certain period, say three or five years as the case may be, and that his services should not be extended further—this is because for the sake of extension he should not be at the mercy of the State Government.”

9.50. Illustrating the interference the witness stated:—

“The interference is possible in various ways: in promotions, postings and tariffs in particular. If in a particular industry somebody is an influential man and he comes to the Government at certain level, he influences the Chairman; he tells him, ‘You give this man power at this rate, whether it is profitable or not’. He enforces it practically. He does not give anything in writing because if any written instruction is given, it has to be put before the Legislature along with the accounts of the Board at the end of the year. Therefore, there is no written instruction issued; it is all unwritten. The Chief Minister, for instance, may call the Electricity Board Chairman and say that a particular thing should be done. And if he does not do that, he may not continue even for the next month. It has happened. This is the thing that should be avoided; somehow this lacuna should be overcome by making necessary provision in the Act.”

9.51. The witness stressed the point that the directives should be issued in writing.

9.52. The Power Economy Committee has also recommended as follows:—

“The top management needs to be strengthened and organised so that they are in a position to give greater attention to planning, investigations, project preparation and project execution. This is a very big task and demands intimate knowledge of all aspects of power engineering. There is also the need to adopt latest technological advances in a practical manner. A stage has, therefore, been reached when each State Electricity Board should be headed by an experienced power engineer as the Chairman of the Board. All technical work should be put directly under the charge of another technical member. The Electricity (Supply) Act should be suitably amended to implement this.”

9.53. Commenting on the working of the State Electricity Boards the representative of the Planning Commission remarked during evidence:—

“It is not enough that the C.E.A. here or the Regional Board functions. After all, for a project, unless the project functions properly, the CEA or the regional board will not be able to deliver the goods. The State Electricity Boards will have to gear themselves up for very close organisation—monetary, purchase and management, all these things will have to be organised on a very closely coordinated manner and there is a very urgent need for re-organisation and having a look at the Electricity Boards’ organisation, their financial set up, their organisational concept. All these things will have to be looked into because in the Electricity Board now though it is headed by a technical Chairman there are 4 or 5 politicians who are not in any way connected with power development. They have no idea about technical things. Such things are not conducive to development of power. Electricity Boards will have to be geared up for that big ambitious programme. Otherwise, neither the CEA nor the Regional Board will be of any effect.”

**9.54. The State Electricity Boards have to play a pivotal role in the generation and distribution of power in their States. As the Power Economy Committee have aptly pointed out in their Report of 1971, the State Electricity Boards would have to undertake intensive investigation and planning for power projects and would also have to undertake the executive work of completing these additional power projects in time. The State Electricity Boards have also to ensure that transmission lines are in position well in advance of the generation of power, so that power can be taken to**



the consumers as soon as it is generated. The Committee stress that the working of State Electricity Boards should be get reviewed urgently by a high-powered Committee in consultation with State Governments and the Electricity Boards, with a view to strengthening their technical and managerial capabilities, so that these are commensurate with the challenging tasks which are being entrusted to them. The Committee need hardly point out that the head of the State Electricity Board should invariably be a power engineer as he has to provide technical guidance at all stages of investigation, execution and implementation, ensure that the power programme as per Plan, is adhered to. The Committee have been greatly disturbed at the spate of strikes and wide spread unrest which has been reported in the Press, about the Electricity Boards. This obviously points to the fact there is a great deal of scope for improving the personnel management and ensuring that rules and regulations are properly framed and implemented, so as to inspire the confidence of all concerned.

9.55. Another aspect which has greatly exercised the mind of the Committee, concerns the stores purchases, particularly transmission lines. The Committee feel that as these purchase would have to be made on a larger and larger scale in keeping with the ambitious plan programme, detailed guidelines to ensure purchases on sound lines and in a manner which would be free from all suspicion, should be laid down.

9.56. Another aspect of wide public interest relate to the grant of concessional rates on ad hoc basis. The Committee feels that since most of the Electricity Boards have acute financial difficulties, it is but right that broad guidelines for grant of such ad hoc concessions should be laid down, in consultation with the Finance and Audit departments and that where an executive authority desires a concessional rate to be given, the communication should invariably be sent in writing. The Committee feel that if these objectives are followed in letter and spirit, it would lift the State Electricity Boards from the present state of controversy in which they have fallen and would enable them to provide the leadership which would be necessary for meeting the challenging task of generating and distributing power as per plan provision.

9.57. The Committee would further like to suggest that the provisions of the State Electricity Boards Act, 1948, may be comprehensively reviewed and necessary amendments which will improve the functioning of the State Electricity Boards, effected at an early date.

#### (iv) Regional Electricity Boards

9.58. The Electricity (Supply) Act, 1948 mainly envisaged development at the State level, and accordingly the developmental activities in this field as also the responsibility for the construction and operation of

power generation, transmission and distribution facilities rests, by and large, with the State Electricity Boards. However, the fast rate of growth in the demand for electric—power—which, in the past few years has been doubling every 5 to 6 years—requiring a greater magnitude of power development, the un-even distribution of energy resources among the political divisions of the country, the advent of nuclear power and advances in technology, have led to a growing realisation that the State is no longer a convenient unit for planning power development, and that there is need for a change in approach, so that the basis for planning is not the State but a Region formed of contiguous States. It is now well-recognised that only through Regional and inter-Regional planning would it be possible to ensure the implementation of the most economical schemes and to derive the maximum benefits from integrated operation. The National Development Council in laying down in the guidelines for framing the Fourth Plan Power Development Programme had recommended that “with the introduction of integrated operation of Regional Systems, assessment of power requirements would be made on the basis of the requirements of the Region as a whole and selection of new generation schemes would be made to serve the requirements indicated by load characteristics of a particular Region.”

9.59. The Ministry of Irrigation and Power constituted five Regional Electricity Boards during the year 1964, namely, Northern, Southern, Eastern, Western and North-Eastern by special Resolution in this regard. The Chairman of the constituent State Boards in the Region and Heads of Electricity Organisations where there are no Boards are the Members of respective regional Boards. A representative of Central Electricity Authority has also been nominated as a Member on these Boards. The Secretariat for these Regional Boards, has been provided by the Central Electricity Authority/C. W. & P. C. (PW).

9.60. The Boards are advisory and have generally the following functions :—

- (1) Reviewing the progress of power development schemes in the region.
- (2) Planning and ensuring integrated operation of the system in the region in such a manner that at any time the total amount of electricity generated and transmitted shall give the maximum possible benefits to the region as a whole.
- (3) Preparation of a coordinated overhaul and maintenance programme for the generating plants in the region.
- (4) The generation schedules to be followed by the constituent systems.

- (5) Determining the quantum of power available for exchange from time to time between the States, over and above the requirements of the State,
- (6) Determination of a suitable tariff structure to govern exchanges of power within the region."

9.61. It has been stated in a memorandum submitted to the Committee that :—

"The Regional Electricity Boards are at present ineffective since their role is purely advisory to the States and their advice is not necessarily accepted in practice. If the Regional Electricity Boards should function effectively, it is necessary that they are vested with sufficient powers for coordinated operation of the area systems for the most economical power exchanges on mutually acceptable terms.

The area Regional Electricity Boards are headed by a Member-Secretary who is of the rank of a Chief Engineer of the C. W. P. C. and is not in a position to argue in equality with the State Electricity Board Chairman and the area Regional Electricity Ministers. It is necessary that the area Regional Electricity Boards are manned by more senior persons of status of not less than that of a Member of the Power Commission. In other words, the posts of the Member-Secretary at the Regional Electricity Boards requires to be upgraded to that of Member of the Power Commission.

The Chairman of the Regional Electricity Board is any one of the Chairman of the area State Electricity Board in rotation. If the place of the Member-Secretary of the area Regional Electricity Board is upgraded to that of a Member, Power Commission, then he himself can be a permanent Chairman".

9.62. During evidence a former Chairman of the Central Water and Power Commission stated:

"At present, the Regional Electricity Boards are advisory bodies with the result that even though there is some surplus power available in one State, it is not obligatory on the part of the State which possesses surplus power to give it to the neighbouring State which is inter-connected with the power system. In some cases, that may cause wastage of national assets. So long as the State has met its own requirements, any surplus power available should be made available to the neighbouring State. That is the object with which a regional grid is created.

Now, there is some force in the State saying, "we will dictate our own terms for the supply of power to other States." I suggest that some sort of formula should be evolved for supplying of power by one State to other States comprising the region. It should be applicable to all States. If such a formula is evolved, I assure, there will not be any difficulty for Regional State Electricity Boards in exercising powers to compel the State which has surplus power to make it available to the deficit State in the region."

9.63. The witness was of the view that the Act was not necessarily to be amended to make the Regional Boards more effective. The Central Electricity Authority had the necessary authority. It could have any form of organisation at the regional level. The Central Electricity Authorities could have a branch or a division of the Central Electricity authority at the regional level.

9.64. It has been stated in a written note furnished to the Committee that although the advantages of planning for the development of power and operating power systems on a regional basis are universally appreciated, there are difficulties in establishing regional systems. These systems mainly from the fact that Regions are not administrative units and remain notional in concept. States, which constitute the political divisions of the country and also the basis for the structural organisation of the power supply industry, continue to show interest mainly in activities at the State level, and their enthusiasm for the promotion of regional concept has not extended beyond their acceptance of it in principle. The reasons for this are not far to seek. These mainly stem from the fact that the construction of a major power project in a State boosts economic activities and generates employment and no State is willing to forego these advantages by entrusting the installation of power projects to any authority or construction of power stations outside the State. On the other hand, due to limitation of resources, the States are unable to take up large power projects required for the region as such and avail of large economies of scale.

9.65. It has been stated further that there is also a tendency on the part of States which have surplus power, to charge unduly high rates for the supply of electricity to their less fortunate neighbours. This also inhibits inter-State collaboration. Since the existing statutes make no provision for the regulation of inter-State transfers or sales of electricity by the Central Government, such transfers and sales are taking place on a bilateral basis or through the good offices of the Central Government. Without Central regulation, the States which have surplus power, enjoy

a strong bargaining position *vis-a-vis* their neighbours who suffer from power shortages. Even when transfers occur, they are net reliable or pre-scheduled.

9.66. Although, funds for the construction of inter-State transmission links to promote intergrated operation are provided by the Centre, the Centre has no control on the construction of these lines. Nor has it the power to expedite their construction. The result of this situation has frequently been that, whereas surplus power is available in a particular State, the lack of adequate inter-State transmission links makes it impossible for this power to be transferred to a neighbouring State which may be suffering from a power shortage and consequent loss of production.

9.67. As the regional concept has been universally accepted, the integrated operation of regional systems, the requirements of regional and national grids and the necessity to ensure a reliable nation-wide power supply, all point to the necessity for greater participation by the Centre at the regional level. This seems inescapable, considering the massive development of power required in future and the equally massive financial support which will have to be extended by the Central Government for this purpose.

9.68. On the operational side it is felt that the Regional level organisations could establish large power stations, lay E.H.V. transmission lines, connect various systems with each other to form the national grid and establish regional load despatch stations to facilitate the integration of power systems. If these Regional organisations get set up under a Central Agency, their capacity to ensure balanced distribution of power within the regions and to intervene at critical times to redress imbalances will be greatly strengthened.

9.69. The Ministry of Irrigation and Power, feels that there are compelling reasons for a change in the basis of planning from the State to the Region, and that there is also urgent need for the Centre to participate, both directly, and at the Regional level, to an ever-increasing extent in power development.

9.70. It has however, been stated that there is no organisation at present at the Regional level which can effectively plan and coordinate the diverse activities involved in rationalised power development. The Electricity (Supply) Act, 1948 does not envisage any Regional Organisation. The Regional Electricity Boards which have been constituted since 1964-65 in all the Five major regions of the country (*viz.*, Northern, Western, Southern, Eastern—North-Eastern) are purely advisory

organisations of the States in the Region set up by Resolutions of the Central Government. These Regional Boards have been created mainly for the purpose of promoting the integrated operation of the constituent State Power systems within each Region and are primarily concerned with ensuring operating economy in the power system.

9.71. With the fast rate of growth in the demand for power—which in the past few years has been doubling every five to six years—requiring the greater magnitude of power development, the uneven distribution of energy resources among the political divisions of the country, the advent of nuclear power and advances in technology have led to a growing realisation that the State is no longer a convenient unit for planning power development and that there is need for change in the approach, so that the basis for planning is not the State but a Region formed of contiguous States. It is now well recognised that only through Regional and Inter-Regional planning would it be possible to ensure the implementation of the most economical schemes and to derive the maximum benefit from integrated operations. The Committee note that there is no organisation at present on the Regional level which can effectively plan and coordinate the diverse activities involved in rationalised power development. The Electricity (Supply) Act, 1948 does not envisage any Regional Organisation. Regional Electricity Boards which have been constituted since 1964-65 in all the five major Regions of the country, are purely advisory organisations of the States in the Region set up by resolutions of the Central Government. Since, however, the Electricity (Supplies) Act, 1948 does not provide for the generation, transmission and distribution of power on a Regional basis supplemental legislation to make such Regional activities possible may have to be introduced. The Committee suggest that early steps should be taken to bring forth a suitable legislation with a view to give the Regional Boards Statutory recognition.

9.72. The Committee note further that there is a tendency on the part of States which have surplus power, to charge unduly high rates for the supply of electricity to their less fortunate neighbours. This also inhibits inter-State collaboration. Since the existing statutes make no provision for the regulation of inter-State transfers or sales of electricity by the Central Government, such transfers and sales are taking place on a bilateral basis or through the good offices of the Central Government. Without such regulation, the States which have surplus power, enjoy strong bargaining power vis-a-vis their neighbours who suffer from power shortage. The Committee suggest that the Central Government should initiate necessary legislation to regulate on rational basis inter-State transfer or sales of electricity.

9.73. The Committee also note that even though funds for the construction of inter-State transmission links to promote integrated operation are provided by the Centre, the Centre has no control on the construction of these lines nor it is in a position to expedite their construction. Consequently the neighbouring States which may be suffering from power shortage cannot avail of the surplus power in other States. The Committee, therefore, recommend that keeping in view these difficulties and also keeping in view the massive development of power required in future and the equally massive financial involvement of the Centre in future programmes, Government should take suitable statutory measures to make greater Central participation possible at regional levels.

#### (v) Indian Engineering Service

9.74. It has been suggested that All India Service of Engineers must be constituted so that the available expertise at the higher ranks is equitably shared in the country.

9.75. The representative of the Ministry of Irrigation and Power stated during evidence that the question was still being considered. Some of the States had accepted the suggestion while the other had not accepted.

9.76. The Committee were further informed as follows:—

“According to the legal and constitutional position, it is permissible to go ahead with the Constitution of this service even if some of the State Governments do not agree to participate. We are informed by the Department of Personnel that six States are not willing to join the scheme at the moment. Recently the Minister of State for Department of Personnel has written a letter to the concerned Chief Ministers requesting them to reconsider their Governments stand on this issue.”

9.77. The Committee note that the suggestion for setting up an All India Service of Engineers is under consideration of Government in consultation with the State Governments. The Committee hope an accord in the matter will be reached soon and the State Governments will agree to the formation of this service in the overall interest of efficient set up in the key sector of power.

## CHAPTER X

### CONCLUSION

#### I. General

10.1. There is acute power shortage in the country which has been responsible for retarding the development of the country's economy both in the industrial and agricultural sectors.

10.2. In view of the State of helplessness exhibited by the Ministry in regard to solving the problem of power shortage in the country, it calls for immediate attention requiring that a crash programme for meeting the power shortage should be devised at the highest level so that the development of the country's economy both in the industrial and agricultural fields may proceed and progress unhampered and uninterrupted.

#### II. Schemes/Projects

10.3. It is noted that Badarpur Thermal Power Project was sanctioned in the year 1967-68 at an estimated cost of Rs. 39.95 crores. The revised cost of the project had been estimated at about Rs. 55 crores. The increase has been attributed to a number of factors such as increase in the cost of boilers and Turbo Generators sets obtained from the indigenous manufactures (Rs. 925 lakhs), increase in the price of other plant and equipment (Rs. 300 lakhs), Civil Works (Rs. 200 lakhs), land acquisition (Rs. 36 lakhs) and design and engineering (Rs. 37 lakhs). The estimate though drawn up in 1965 was sanctioned, in 1967.

10.4. It is felt that the whole estimate of the project was framed in a rather unrealistic manner. Low cost estimates are brought forward initially which ultimately not only prove inadequate but also result in delays in the execution of the projects. Unless this fact is recognised and better and more realistic estimates are prepared in the beginning, such delays are bound to occur. To avoid such situations, there is need for framing the estimates with a more realistic approach providing for annual escalations as far as possible so that the progress in the completion of the project is not held up for lack of funds.

10.5. It is noted that delay in the execution of the project had been mainly attributed to delay in according the administrative approval, delay in construction of the main power house building due to non-availability of the matching structural steel, contractors not adhering to the target



dates of completion, delay in supply of plant and equipment, delay in the construction of railway siding and general shortage of scarce materials like cement, steel etc.

10.6. The manner in which the execution of the project which was taken up under the direct control of the Centre had been planned right from the beginning (1967) cannot be appreciated. Cost of equipment alone supplied by the indigenous manufacturers had escalated the cost to the extent of Rs. 925 lakhs. There had been a year's delay in the completion of the Railway siding with the result that the equipment had to be transported by road. It is clear that there had been complete lack of coordination among the various authorities concerned which could have been avoided with better manning and proper consultation to achieve better results and savings in expenditure.

10.7. The performance of the National Building Construction Corporation, National Projects Construction Corporation and Hindustan Housing Factory all in public sector—who had been awarded the contracts for undertaking the civil works in relation to the requirements of the project was unsatisfactory. There had been slippage from the original schedule. Considerable delays in the construction of civil works nullified the targeted acceleration of the project and escalated the cost. It is strange that the works awarded to these public undertakings were delayed for periods between 13 to 30 months. The Government should examine the question of taking action under the penal clauses of the agreements entered into with these undertakings.

10.8. It is regrettably noted that M/s. Bharat Sewak Samaj who were also awarded the contract for civil works delayed the civil works by 16 months and were granted as many as 15 extensions of time. In this case also Government may examine the question of taking suitable action under the penal clauses of the agreement entered into with the Bharat Sewak Samaj.

10.9. It is noted that the first unit of the project is likely to get into commercial operation by July/August, 1973, as against the original target of 1971-72. It is hoped that Government would take effective steps to ensure that the target now set for the commissioning of the first unit would be adhered to.

10.10. During an informal visit to Badarpur Project difficulties which were being experienced by the project authorities in the day to day working of the project for want of adequate financial powers were explained. It is felt that the existing schedule of delegation of the powers to the Chief Executive of the project should be reviewed in detail in consultation with the Chief Executive of the project, Ministry of Finance etc. so as to ensure that he has adequate powers for delivering the goods.

10.11. It is felt that Government at the highest level should review the existing procedure which is being followed in processing the formal references which are received from the project authorities in implementation of the decisions taken by the Board of Control with a view to streamline the procedure and cut out all delays.

10.12. It is noted that the Baira Siul Hydro Project and the Loktak Hydro Electric Project are other instances where due to unrealistic estimates framed initially there had been steep rise in the costs of the projects. In the case of Baira Siul Hydro Project the escalation in the cost was expected to be Rs. 20.11 crores whereas in the case of Loktak Hydro Electric Project the rise in the cost was expected to be Rs. 13.04 crores.

10.13. It is felt that the whole system of scrutinising the original estimates framed by the various agencies might be reviewed and guide-lines laid down with a view to streamlining the procedure to ensure that the estimates were framed on a more realistic basis based on the actual contracts.

10.14. It is surprising that the projects were taken up without ensuring that the infrastructure (*viz.* roads, bridges, etc.) was there and that in some cases, the estimates were prepared on the presumption that certain approach roads would be there resulting in inflation of project cost. This again goes to show lack of proper planning and coordination between the Centre and the State Governments concerned.

10.15. It is observed that the Projects/Schemes in various regions are pending approval of the Planning Commission. It is difficult to appreciate the slow progress in according the approval by the Planning Commission as most of these projects were accepted by the Advisory Committee more than a year ago. It is, therefore, suggested that necessary steps should be taken to finalise these projects expeditiously.

10.16. It is noted that fifty-nine schemes with an aggregate installed capacity of 13.55 MKW in various regions are currently under examination by the Central Water and Power Commission at various stages. Most of these schemes were referred to the Central Water and Power Commission more than 3 years ago. The slow progress in examining these schemes cannot be appreciated. It is therefore felt that in view of the general power shortage in the country, effective steps should be taken to ensure that the schemes in question are finalised without further delay, as a scheme normally takes five to seven years for execution.

10.17. It is noted that 12 new schemes with a total capacity of 6,910 MW are expected to be taken up by Government during the Fifth Plan period. It is hoped that in view of the fact that it takes several years for:

a scheme to get commissioned, advance planning action in regard thereto would be taken expeditiously so as to ensure that the schemes/projects are commissioned according to schedule.

10.18. It is felt that it is imperative that all the new power generation schemes proposed for implementation in the Fifth Plan are formally got sanctioned by the Planning Commission expeditiously and necessary funds for advance action made available during 1973-74 for all these schemes. The need for continuous sanction of the schemes can hardly be emphasised as the piling and bunching of orders would make it difficult for the indigenous manufacturing plants to manufacture and supply the plant and equipment in time for the different projects and would inevitably result in need for more imports of plant and equipment which would mean a drain on foreign exchange which has to be avoided at all costs.

### III. Physical Performance & Shortfalls

10.19. It is noted that the Fourth Five Year Plan envisaged augmentation of installed power generating capacity from 14.3 million KW to 23.1 million KW. It is distressing to find that there is likely to be a shortfall to the tune of about 3.5 million KW during the Fourth Plan period.

10.20. It is a matter of concern that none of the power plans had achieved the targets envisaged. The First Plan was designed to add 1.40 MKW of power, the second 3.48 MKW, the third 7.04 MKW, the three annual plans (1966—69), 6.88 MKW, and the first three years (1969—72) of the Fourth Plan 4.13 MKW. The actual achievement during the plan periods was 1.12 MKW, 2.73 MKW, 4.52 MKW, 4.12 MKW and 2.60 MKW, which works out a shortfall percentage of 20, 36, 35, 38 and 37 respectively.

10.21. It is noted that the shortfall in the plan has been mainly attributed to delay in the supply of equipment by indigenous manufactureres, non-availability of essential raw materials like steel, coal, cement etc. to the required extent and delay in the receipt of replacement parts from abroad. Delay in delivery of main equipment by HEIL/BHEL as well as civil works alone has resulted in shortfall to the extent of 3.25 MKW during the Fourth Plan period.

10.22. It is strongly felt that there is lack of proper planning and co-ordination between the Centre and the States in the matter of execution of the various projects undertaken by the State Governments and between the various agencies like N.C.D.C., BHEL and HEIL, resulting in delays in supply of raw material and equipment.

10.23. It has been admitted that grouping of projects by plan periods of 5 years has not achieved the desired results. The gestation period of a hydro, thermal or nuclear power plant is anything from 4 to 10 years. The

second part of the ten year period is normally the part when the construction as planned would be coming in. It is, therefore, felt that the planning and execution of power projects should be a continuous process wherein complete picture of targets to be achieved is always available in outline, and details are filled in as years progress.

10.24. It is felt that there is need of a well-coordinated programme for power development correlated with the growth of industry, agriculture and other sectors which consume it.

10.25. Having regard to the serious power shortage in the country, power should be given the highest priority next only to the operational needs of defence in the matter of allocation of funds and essential raw materials like steel, cement, coal etc. in the interest of economic development of the nation.

10.26. It is felt that as the power supply industry is capital intensive and the cost per kilowatt installed both for generation, transmission and distribution is increasing rapidly, it is important that the plan allocations are made in a more rational manner so as not to involve any significant variation in cost or time when implementation is taken up.

10.27. It is strongly felt that for the successful planning and implementation of power development it is necessary that a long range plan extending over a period of 10 to 15 years based upon realistic estimates of demand, optimal mix of hydro steam and nuclear generation, with adequate transmission system, taking into account the regional power system condition from time to time should be formulated.

10.28. It is felt that the State Electricity Boards should be required to place their orders with the indigenous equipment-manufacturers sufficiently in advance.

10.29. It is also felt that existing system of coordination should be reviewed thoroughly with a view to streamlining the existing procedure for scrutinising and sanctioning the projects and also to remove the bottlenecks, wherever they exist, in the implementation of the projects.

10.30. It is distressing to note that 9 projects in various States whose targeted dates of commissioning ranged between 1970-71 to June 1972 are being spilled over to 1973-74 because of delay in the supply of equipment by BHEL and HEIL and due to delay in civil works. It is felt that necessary remedial steps should be taken to ensure that these projects are commissioned according to the revised schedule.

10.31. It is noted that the Power Economy Committee have stated that the BHEL should concentrate on the 200 MW Unit size and also develop 500 MW Unit within the next 7—10 years but with sub-critical steam pressures, and one or two such large units could be put in operation in one of the regions in order to obtain experience on the prototype so that these large units could be put into operation in other regions also from 1981 onwards.

10.32. It is regretfully noted that inferior quality of coal with heavy ash content, which is used by the Power plants, has seriously affected their working.

10.33. It is observed that the recommendation made by the Technical Committee on Coal Washeries to make two stage washeries into three stage washeries to bring down the percentage of ash content in coal is under examination of the Government. In the meantime, it may be stressed that better quality of coal, which does not contain abrasive material, should be used as far as possible with a view to minimise the outage of the auxiliaries and to achieve the optimum generating capacity of the plants.

10.34. It is noted that power generation in the country has not by and large suffered because of lack of coal production but on account of lack of coal supply due to transport difficulties. The coal production which had reached the figure of 76 million tonnes has fallen down to 71 million tonnes in 1969-70. The production is falling though there is a capacity built up for 85 to 90 million tonnes. Coal is there and it can be produced but the difficulty is of its movement.

10.35. It is, therefore, suggested that the Ministry of Railways (Railway Board) should arrange for enough wagons for transporting coal from the coal fields to the Thermal Power Stations so that there is full utilisation of the generating capacity.

10.36. At a time when power is in acute short supply, some of the thermal stations have not been able to generate power to the maximum extent possible for want of assured supply of coal. It is felt that as coal has now been nationalised and the thermal stations are also in the public sector, there should be no difficulty in working out in detail the transport requirements of coal and for the Railways to provide the necessary transport on a regular basis in the larger national interests. The Control Room now set up in the Railway Board's office with representatives of the concerned Departments of Mining and Irrigation and Power etc. should have been constituted and made operative before power crisis assumed the present proportions.

10.37. It is noted that the estimated coal demand of 21.43 million tonnes will go up to 24.34 million tonnes in 1973-74 and is further likely

to go up to 65 million tonnes by 1978-79. It will, therefore, be necessary to step up production of coal in various collieries in public sector and private sector to meet these requirements.

10.38. It is noted that a committee has been formed to establish linkages of sources of supply for the power stations and this committee has so far finalised the linkages for power stations that would be in operation by 1976-77, for which the coal requirement has been assessed at 39.30 million tonnes. Out of this, it is estimated that 27.58 million tonnes would require rail movement. There would be additional requirement of coal of the order of 26.30 million tonnes for the additional schemes in the draft Fifth Plan proposals. Of this 15.48 million tonnes would involve additional rail movement. Thus it is estimated that about 43 million tonnes of coal would involve rail movement by the end of the Fifth Plan. It is, therefore, suggested that advance planning of rail facilities would be essential for the projected movements.

10.39. With large power stations, each requiring at least 2 to 5 full train loads of coal every day, the methods of mining, loading and unloading as well as transport will have to be revolutionised, introducing the latest modern techniques for efficiency and economy. Unit trains, from specified mines for the power stations may become essential features of the future set up. Government should therefore, carefully consider the administrative machinery and organisation for catering to these requirements and initiate advance action for these developments.

10.40. In view of the fact that transport charges for coal are bound to be heavy and the fact that a national grid is being progressively developed in the country, Government should examine most carefully whether it would not be in the larger economic interests to locate the new thermal stations at the pit-heads.

10.41. It is distressing to note that one of the reasons for the shortfall in power as compared to capacity targets was the delay in the delivery of plant and equipment by the BHEL/HEIL which were two important undertakings in the public sector.

10.42. It is observed that the Committee on Public Undertakings had occasion to examine the Heavy Electricals (India) Ltd., and Bharat Heavy Electricals Ltd., and had recommended in their 19th and 21st Reports (Fifth Lok Sabha) that Government should consider the question of transferring the administrative control of these two undertakings from the Ministry of Industrial Development to the Ministry of Irrigation and Power as the latter are the main users of power machinery. Since then a new Ministry of Heavy Industry has been

constituted at the Centre, and the two Public Undertakings—Heavy Electricals (India) Ltd., and Bharat Heavy Electrical Ltd., have been transferred to this new Ministry. It is pointed out that there continue to be heavy delays in delivery of machinery and equipment to the State Electricity Boards by the Heavy Electrical Industries with the result that the power generation programme in the Fourth Plan has greatly suffered. Government should, therefore, ensure that advance orders for generating sets and other machinery are placed on these undertakings and that every effort is made to adhere to the time schedule for delivery. Members of C.W.P.C. who are represented as Directors on these undertakings should keep a close watch on the manufacturing programme of these undertakings in order to see that the delivery schedules are strictly adhered to.

10.43. It need hardly be emphasised that close and continued coordination between the organisations charged with the responsibility for power development in the country and the manufacture of plant and equipment at all levels is vital in the context of rising demand not only from the traditional users in the industrial sector but also from the agricultural sector and rural areas.

10.44. It is surprising to find that while on the one hand late delivery of plant and equipment by BHEL/HEIL has been attributed as one of the major reasons for the shortfall in the projected targets and completion of the projects according to schedule, on the other hand it has been claimed by the Ministry of Industrial Development that no orders were refused for want of capacity and that flow of orders was erratic. It is, desirable to place firm and continuous flow of orders with the indigenous equipment manufacturers well in advance to obviate delay in their delivery.

10.45. It is noted that with a view to obviate delay in the commissioning of certain projects, equipment was allowed to be imported. Though every effort should be made to accelerate the growth of the capability of BHEL/HEIL and their feeder projects so that the requirements are met indigenously, the execution of the schemes/projects should not be held up and where the indigenous manufacturers are unable to cope with the needs of the power supply industry, imports of the plants and equipment may have to be allowed to the extent necessary in view of the widening gap between the demand and supply of power.

10.46. It is noted that the achievement during the successive Five Year Plans was not commensurate with the investments made as there had been consistent shortfall in the planned targets ranging from 20 per cent in the First Plan to 37 per cent in the Fourth Plan (1st three years).

10.47. It is considered that immediate steps should be taken to provide additional funds for the execution of the sixteen projects in respect of which preliminaries have already been completed and which have either been delayed or likely to be delayed for lack of finances.

10.48. It is distressing to note that although the *per capita* electricity consumption rose from 19.8 kwh in 1950 to 88 kwh in March, 1971 and from about 90 kwh in 1970-71 to 93 kwh in 1971-72, the *per capita* consumption in the country is dismally low as compared to the world average of 1200 kwh.

10.49. Further, despite nine fold increase in the generating capacity, there still persists considerable imbalance in *per capita* consumption between the various States in the country. The Committee are constrained to note that certain States/Areas viz., Uttar Pradesh, Rajasthan, Himachal Pradesh, Jammu and Kashmir, in the Northern Region; Madhya Pradesh, and Kerala in the Southern Region; North Bihar and North Bengal in the Eastern Region, and the entire North Eastern Region comprising Assam, Meghalaya, Mizoram, Manipur, Tripura, Nagaland and Arunachal Pradesh are still far below the national average.

10.50. The Committee note that the pre-requisite to reduce the disparities is providing increased availability of power in States/Areas which are below average in electricity consumption. They therefore suggest that effective steps should be taken to achieve the desired results by providing additional installed generating capacity and building extensive transmission and distribution systems in such areas.

10.50. It is regretfully noted that the *per capita* consumption of electricity is anticipated to be only 200 kwh even at the end of the Fifth Plan as against the per capita consumption of 10,000 kwh in the United States and 2000—3000 kwh in Europe.

10.52. In view of the fact that *per capita* consumption of electricity is a yardstick for measuring the economic development of the country, it is felt that highest priority should be given for meeting the power demands in all sectors of economy, and the poor revenue yielding areas which have hitherto remained neglected should be given preference in regard to their economic uplift, by providing the essential infra-structure of electricity etc., at cheap rates.

#### IV. Development of Hydro Power Resources

10.53. It is distressing to note that out of the 41.15 mkw (at 60 per cent load factor) of hydro-electric potential in the country only 16 per cent



has been developed so far and it is expected to rise to 18 per cent only at the end of the Fourth Plan.

10.54. It is noted that the hydro potential in the country is the cheapest source of power and the present extent of utilisation would only be of the order of about 18 per cent by the end of the Fourth Plan period. It is felt that there is great scope for hydro-power development in the various regions of the country and as such high priority should be given for hydel development in the subsequent Plans.

10.55. It is distressing to note that against the planned target of 9.7 mkw for development of hydro-power resources during the Fourth Plan only 7.5 mkw would actually be achieved, thus leaving a shortfall to the extent of 2.2 mkw.

10.56. It is felt that there is great need for putting to full use the hydro-electric power of the country as it is well known that hydel power is the cheapest to generate. Besides, with the progress in the development of the national grid, it should be possible to transmit the power in a wider area. The country has also got experience extending over several decades in regard to the investigation and execution of hydel projects. It is, therefore, suggested that a time-bound programme should be drawn up for harnessing in full the hydel power resources in the country.

#### **V. Inter State/Regional Transmission Links and State/Regional Power Grids**

10.57. It is noted that at the beginning of the Third Plan, the total length of transmission and distribution lines in the country was about 147,000 circuit km. During the Third Plan period about 395,000 circuit km were added bringing the total length as on 31st March 1971 to 11,17,000 circuit km.

10.58. It is also noted that by the end of Fourth Plan period about 2470 circuit km of 400 kv lines, 26,536 circuit km of 220 kv lines including inter-State/Regional links and 4,505 circuit km of 132/110 kv inter-State/Regional links are likely to be completed or would be under construction.

10.58. It is also noted that out of the sanctioned outlay of Rs. 14.73 crores during the years 1969-70 to 1971-72 the expenditure on inter-State/Regional Lines was only about Rs. 11.62 crores.

10.59. It is noted that out of all the 38 inter-State links taken up, 24 lines would be completed during the Fourth Plan and the remaining lines within the next year or two. It is therefore urged that effective steps should be taken to expedite the completion of all these lines.

10.60. It is distressing to note that there is lack of enthusiasm on the part of the State authorities to pursue the inter-transmission programmes vigorously even though the Centre decided to provide 100% loan assistance to States under Centrally sponsored schemes outside the State ceiling for the construction of various inter-State links during the Fourth Plan period resulting in delay in the commissioning of some of the transmission lines and the sharing of surplus power with the State suffering from power shortage in the region.

10.61. It is, therefore, suggested that Government should take up the question with the State authorities concerned with a view to impressing upon them the necessity for giving adequate priority for speedy completion of these schemes.

10.62. It is noted that State/Regional Load Despatch Stations are planned to be established to control and operate the State/Regional Grids and that the proposals are at various stages. It is suggested that necessary action should be taken to ensure that these schemes are finalised speedily matching with the delivery of equipment and other raw material so that their implementation is taken in hand well in time.

10.63. It is felt that with the large size power stations proposed in the Fifth Plan and envisaged enlargement of transmission and distribution network, integrated operation of power system with utmost expedition is necessary. The question of setting up a Central Agency to operate the regional grid system with the cooperation of the Constituent power system in each region should therefore be examined.

10.64. It is felt that long range planning for the inter-State/Regional Grid should be devised keeping in view the fact that not only the state systems should completely intergrate to form regional grids, but also that these grids get adequately inter-connected to form a National Grid with attendant economic gains to the community at large.

10.65. It is noted that upto the end of 1968-69 the investments on transmission and distribution was only Rs. 1340 crores as against Rs. 2240 crores envisaged on power generation. During the Fourth Plan an outlay of Rs. 1166.27 crores has been provided for transmission and distribution schemes as against Rs. 1250 crores for generation schemes and during the Fifth Plan an investment of Rs. 7800 crores to be shared equally between generation and transmission and distribution has been proposed.

10.66. It is distressing to note that the distribution and transmission losses in the country are on the high side. The transmission losses in the country are of the order of 18 per cent to 25 per cent and in certain States

like Punjab the losses are as high as 34 per cent whilst in other countries such losses are of the order of 5.7 per cent to 12 per cent only.

10.67. It is felt that there is imbalance in the planning of generation *vis-a-vis* transmission and distribution resulting in not only poor voltage conditions in many areas but heavy losses in transmission and distribution.

10.68. It is felt that investment in transmission and distribution facilities in the country has remained much lower than the desired level and this is one of the chief reasons contributing to higher percentage of losses. More investments does not necessarily mean construction of additional transmission and distribution lines alone; but use of higher transmission or sub-transmission voltages, adequate size of conductors, integrated operation of power system etc, are factors which would help in reducing the transmission losses substantially.

10.69. Special attention is invited to the following points of action recommended by the Power Economy Committee regarding transmission and distribution losses:

- (i) Improvements in the transmission and distribution systems designs by:
  - (a) Selection of transformers with reference to expected load cycle so as to obtain minimum total fixed and variable losses.
  - (b) Use of flow iron loss transformers particularly for rural areas and areas of low load factor.
  - (c) Reduction in the number of power transformation stages.
  - (d) Improvement of power factor—installation of capacitors etc., at appropriate locations.
  - (e) Selection of appropriate sizes of low tension feeders keeping in view their lengths and load required to be carried.
- (ii) Introduction of proper instrumentation and information collection system at all levels for monitoring of system performance.
- (iii) Integrated operation of power systems including reactive scheduling.
- (iv) Elimination of theft of energy.
- (v) Elimination of miscellaneous losses by improved operation and maintenance.

- (vi) Continuous monitoring of system performance and introduction of corrective action at the divisional level.

### VI. Electricity Tariffs

10.70. It is observed that a number of State Electricity Boards are running at a loss at present though the policy is that on the whole there should be no-profit and no-loss. At a time when there is widespread demand for power, there is no reason why the State Electricity Boards should not be able to break even by improving the utilisation of their plants effecting economy in overhead expenditure and reducing losses in transmission etc. Government should impress on the State Electricity Boards to carry out a detailed cost analysis with a view to pin-pointing the factors which are responsible for the loss and take necessary remedial measures.

10.71. It is felt that the Central Power Plants which are coming up in a big way should be managed most efficiently so as to be able to set an example for the States to follow.

10.72. Power should be supplied at most competitive rates in the interest of development of economy and this should be achieved by improving efficiency and effecting economy in the working of authorities responsible for generation, transmission and distribution of power.

10.73. It is noted that uniform power tariffs for each category of consumers have been introduced in most of the States. It is hoped that with the establishment of an All India Grid the disparities in the tariff rates in the various States and Regions would be narrowed down.

10.74. Consistent with the policy of Government to promote the uplift of weaker sections of the people, it is suggested that government should examine the question of supply of electricity to the weaker sections of the rural population including agriculturists and artisans, backward classes and industrially backward areas at concessional rates.

### VII. Rural Electrification

10.75. It is noted that power plays a vital role in development. For an all round development of rural areas and for bringing about far reaching changes in the methods of irrigation and farming it is very essential to accelerate the pace of rural electrification in the country. Rural electrification is necessary for:

- (i) Increasing agricultural production by energising tube-wells as a regular and steady source of irrigation;
- (ii) agro-based industries as well as small scale rural industries in the rural areas;

- (iii) providing employment potential in villages themselves in agro-based and small scale rural industries thereby arresting the drift of population to bigger cities and creating of slums there;
- (iv) providing electrification and lighting facilities etc., in the villages which would not only make the educated persons from the villages not to leave villages but would also attract doctors and other social and technical workers to the villages by providing the basic amenities like power and light in the villages;
- (v) providing means of better standard of living to the rural inhabitants and farm workers by giving them the benefit of industrialisation etc.

10.76. It is noted that although 80 per cent of the population of India live in villages and provision of electricity is an essential pre-requisite for the development of rural areas and can bring far reaching changes in the economy of these areas, very little was done in the First Three Five Year Plans for rural electrification with the result that till the end of Third Plan, only 45,409 villages out of total of 566,878, that is, about 8 per cent were electrified and only 320,096 tubewells/pumpsets were energised throughout the country. It was only in the Three Annual Plans of 1966—69 and the Fourth Five Year Plan that the programmes of rural electrification has picked up. The Committee note that even now only 23.4 per cent of the villages in the country have been electrified and only 1,876,138 tubewells pumpsets energised. It is recommended that a time bound programme of rural electrification should be prepared by the Government which while fixing a long term programme for providing power to every village of the country, should fix a target date for providing electricity to each and every village having a specific number of residents. Sufficient funds should be provided in the Five Year Plans and implementation machinery at the field level should be geared up to achieve targets fixed.

10.77. It is noted that although 23.4 per cent of the villages in the country have been electrified and about 19 lakh pumpsets have been provided in the country, there are wide disparities in the provision of electricity and installation of pumpsets in the various States. While there are States like Haryana and Tamil Nadu where practically every village has been electrified, there are States like Assam where only 3.3 per cent of the villages have been electrified and only 105 tubewells and pumpsets have been energised. Similarly, percentage of villages electrified in Orissa is 7.7 per cent, in West Bengal 12.7 per cent and in 9 other States, the percentage is less than the all India average of 23.4 per cent.

10.78. In spite of the various steps taken by the Government to provide incentives for the rural electrification of backward areas, the number of

States whose percentage was less than the all India percentage in the matter of rural electrification has increased from 9 in 1968 to 12 in 1973, and these backward States have not been able to come up to the all India standard. The steps taken and the special assistance provided so far for the rural electrification of backward areas have been far from adequate and would require to be further intensified and increased. The problems of the backward States in regard to slow progress of rural electrification should be examined in detail and concrete measures taken to accelerate the pace of rural electrification in these States.

10.79. It has been suggested by the representative of the Government that rural electrification programme has not been able to make much headway in some of the States because of deficiencies in organisation. It has also come to notice that some of the States have remained backward in the matter of rural electrification because State Governments concerned have not accorded proper priority to the rural electrification programme and have not taken sufficient steps to activate the organisation in their States at the field level. It is recommended that the Central Government should impress upon all the State Governments, the immediate necessity of according proper priority to the rural electrification and to gear up organisational set up at the field level. The Union Ministry of Irrigation and Power and Planning Commission should depute Study Teams to the States which are backward in the matter of rural electrification, to impress upon and render necessary assistance to the authorities concerned to take immediate steps in the matter.

10.80. It is noted that so far the States have laid more emphasis on generation than on transmission and distribution of power in the various States, with the result that it has created serious imbalance all over the country and even if power is available, the same cannot reach rural areas because of the absence of transmission lines. The Committee have before them the example of the States of Orissa and Bihar where it is difficult to provide power in the rural areas as transmission lines have not been laid there. It is recommended that wherever schemes for the generation of power are initiated, effective measures should also be taken to lay transmission lines well in advance of such generation so that as soon as power is available, the transmission lines are also ready to distribute the power to the consumer.

10.81. It is noted that in a number of villages where electricity has been provided, the 'Harijan Bastis' in these villages were not electrified because of unremunerative loads in those areas. The Government of India have introduced since December, 1971, a special scheme for electrification of such "Harijan Bastis" and for that purpose loan assistance at concessional terms is being provided through the agency of Rural Electrification

Corporation to the State Electricity Boards. It is felt that the provision of public lighting to the economically weaker sections of society particularly in the Harijans and Adivasis areas and 'bastis' should be given special consideration by the Government and if necessary, further incentives, *viz.*, interest free loans etc., should also be given to the State authorities concerned for this purpose.

10.82. Mere electrification and provision of pumping sets/tubewells in villages will not be able to achieve the desired results and the concept of rural electrification has to be understood in the wider perspective of all round development of areas where electrification has been done. To achieve the maximum results, it is felt that the programme of rural electrification has to be dovetailed with a well coordinated programme of establishment of rural industries and wide-spread growth of infrastructure like transport, forestry, agro-based industries, etc. If the programme of rural electrification is suitably coordinated with national and regional development plans, it will not only lead to reduction in imbalances in regional development but would also lead to increased consumption of power by rural people thereby making rural electrification a viable proposition.

10.83. Effective and well-coordinated measures should be taken for increasing consumption of electricity in rural areas. This can be done if agro-industrial centres and rural industrial estates for manufacture of articles of use for farmers like pumpsets, agricultural implements etc., are set up simultaneously in rural areas where rural electrification has been provided by proper coordinated and integrated plans. It is considered that it is necessary that the suitable maintenance, repair and operational facilities for pumpsets and electric gadgets should be encouraged to be set up in the rural areas where rural electrification has been provided. This will go a long way in making use of electricity, popular among masses and would also ensure maximum utilisation of electric power for production purposes. It is further recommended that proper training facilities should be provided to local people so as to make them proficient in the work of maintenance, repair and operational facilities, so as to avoid dependence on outsiders.

10.84. There are a number of small and marginal farmers in the country who are not in a position to afford the cost of installation of tubewells or bear expenditure of its maintenance and operation, with the result that they have to remain at the mercy of big farmers for the supply of water for their fields. It is recommended that the Government should encourage such small farmers to form cooperatives and own tubewells on a cooperative basis. In case it is not found possible, the Government should instal State tubewells where necessary, in order to provide irrigation facilities and cater to the needs of the small and marginal farmers to the extent possible.

10.85. It is noted that although a number of new projects for the generation of power have been taken up, the rural areas have not been getting their due shares and in case of reduction or failure in supply of power, rural areas are always worst hit, and supply of power in these areas is adversely affected. It is recommended that a fixed percentage of power generated in a State should be earmarked for the rural areas and it should be ensured that rural areas get their proportional share of power even in case of reduction in the supply of power.

10.86. It is noted that while power is being supplied to industries etc., on a cheap rate, no such concession is being allowed to the rural areas for agricultural purposes. It is not understood why in view of the importance that agriculture occupies in the country's economy, such concessions should not be allowed to the agriculturists particularly in view of the increasing need for more production of foodgrains etc. Steps should be taken by Government to supply power to agriculturists at rates comparable, if not cheaper, to the industries.

10.87. It is noted that a perspective plan for the decade commencing from April, 1971 to March, 1981 for rural electrification with emphasis on energisation of pumpsets, for increasing agricultural produce has been drawn up. The Plan provides for the electrification of 3.4 lakh villages representing about 60 per cent of the total villages and energisation of 48.7 lakh additional pumpsets by the end of 1981. The total outlay involved in the implementation of the Plan is estimated at Rs. 2270 crores and about 265 crores annually would have to be provided for the seven-year period (1974-81). In view of the urgent need for rural electrification for the development of rural areas the necessary allocation of funds be made.

10.88. The Government had set up a Committee of Members of Parliament to review the programme of rural electrification in backward areas. This Committee of Members of Parliament had submitted their Report in July, 1972. In their Report, the Committee of Members of Parliament has pinpointed that the main reason for the comparatively slow progress of rural electrification in backward States is lack of adequate financial resources to take up programme and development and extend high tension transmission lines. This Committee had recommended that a provision of additional Rs. 46.5 crores in the Fourth Plan should be made for the purpose. The above recommendations of the Committee of Members of Parliament should be implemented as early as possible.

10.89. The Committee of Members of Parliament had observed that under-developed hilly tracks specially in Assam, Uttar Pradesh and Chhota Nagpur in Bihar have special problems and should be given special concessions by the Rural Electrification Corporation so that a longer period may



be given for the schemes to earn the desired return. It is hoped that necessary action will be taken in the matter.

10.90. The Committee of Members of Parliament had also suggested that enhanced targets of electrification of villages and pumpsets in backward States should be supported by provision of necessary funds and the additional outlay asked for by the Rural Electrification Corporation should be granted to the Corporation. It is hoped that rural electrification programme in the backward States will not be allowed to suffer because of shortage of funds.

10.91. In order to supplement the efforts of the State Electricity Boards in the matter of distribution of power, 5 Rural Electric Cooperatives have been set up, one each in the States of Andhra Pradesh, Gujarat, Maharashtra, Mysore and Uttar Pradesh and these Cooperatives have already started work on projects which after completion, will provide electricity to 729 villages, energise 27,605 pumpsets and supply power to 1,553 small industries. These Cooperatives have shown progress in their work and their performance had been quite satisfactory and these Cooperatives have already electrified 217 villages and given connections to 451 agriculturists. Government are considering the question of promoting a few more Cooperatives by the Rural Electrification Corporation.

10.92. Some difficulties have been experienced in the working of these Cooperatives viz., high percentage of line losses and financial losses in the retail distribution of power. A Departmental Committee headed by an officer of the Planning Commission has been set up to suggest guidelines for improving the working of these Cooperatives. It is hoped that urgent action would be taken on the recommendations of this Departmental Committee so as to streamline the working of these Cooperatives.

10.93. The importance of Rural Electric Cooperatives in the decentralised retail distribution of electricity and in promoting direct participation of users in this task is recognised. Government should encourage setting up more cooperatives and maximise their number in the country. As some difficulties have been experienced in the working of Rural Electric Cooperatives already set up by Government, which are being examined by a Departmental Committee, Government should lay down firm guidelines in the light of this evaluation, for the benefit of such cooperatives so as to avoid the repetition of the mistakes in the working of Rural Electric Cooperatives.

10.94. A number of Cooperatives set up in the country under the cooperative movement have been suffering from organisational weaknesses and are not able to discharge their functions effectively. Government

should ensure that these Rural Electric Cooperatives are not allowed to suffer from similar organisational weaknesses and their working should be reviewed from time to time and corrective measures taken in time to keep them active so that they may be able to fulfil their role in the rural electrification programme of the country effectively. It should also be ensured that the over-heads of these Cooperatives are kept to the minimum.

10.95. In order to keep a watch on the proper functioning of the Rural Electric Cooperatives, representatives of the Rural Electrification Corporation and State Electricity Boards concerned should also be represented on the Managing Committees of these Cooperatives. Moreover, these Cooperatives should be required to furnish quarterly reports on their working to the Rural Electrification Corporation which should monitor these Reports so as to ensure their smooth and efficient working. The accounts of these Cooperatives should also be got audited by the competent Auditors.

### VII. Rural Electrification

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- (i) Increasing agricultural production by energising tube-wells as a regular and steady source of irrigation;
- (ii) agro-based industries as well as small scale rural industries in the rural areas;
- (iii) providing employment potential in villages themselves in agro-based and small scale rural industries thereby arresting the drift of population to bigger cities and creating of slums there;
- (iv) providing electrification and lighting facilities etc., in the villages which would not only make the educated persons from the villages not to leave villages but would also attract doctors and other social and technical workers to the villages by providing the basic amenities like power and light in villages;
- (v) providing means of better standard of living to the rural inhabitants and farm workers by giving them the benefit of industrialisation etc.

10.97. Although 80 per cent of the population of India live in villages and provision of electricity is an essential pre-requisite for the development of rural areas and can bring far reaching changes in the economy

of these areas, very little was done in the First Three Five Year Plans for rural electrification. It was only in the Three Annual Plans of 1966—69 and the Fourth Five Year Plan that the programmes of rural electrification has picked up. Even now only 23.4 per cent of the villages in the country have been electrified and only 18,76,188 tubewells/pumpsets energised. It is recommended that a time bound programme of rural electrification should be prepared by the Government which while fixing a long term programme for providing power to every village of the country, should fix a target date for providing electricity to each and every village having a specific number of residents. Sufficient funds should be provided in the Five Year Plans and implementation machinery at the field level should be geared up to achieve targets fixed.

10.98. There are wide disparities in the provision of electricity and installation of pumpsets in the various States. While there are States like Haryana and Tamil Nadu where practically every village has been electrified, there are States like Assam where only 3.3 per cent of the villages have been electrified and only 105 tubewells and pumpsets have been energised. Similarly, percentage of villages electrified in Orissa is 7.7 per cent, in West Bengal 12.7 per cent and in 9 other States, the percentage is less than the all India average of 23.4 per cent.

10.99. In spite of the various steps taken by the Government to provide incentives for the rural electrification of backward areas, the number of States whose percentage was less than the all India percentage in the matter of rural electrification has increased from 9 in 1968 to 12 in 1973. The steps taken and the special assistance provided so far for the rural electrification of backward areas have been far from adequate and would require to be further intensified and increased.

10.100. It is noted that so far the States have laid more emphasis on generation than on transmission and distribution of power in the various States, with the result that it has created serious imbalance all over the country and even if power is available, the same cannot reach rural areas because of the absence of transmission lines. It is recommended that wherever schemes for the generation of power are initiated effective measures should also be taken to lay transmission lines well in advance of such generation so that as soon as power is available, the transmission lines are also ready to distribute the power to the consumer.

10.101. It is felt that to achieve the maximum results the programme of rural electrification has to be dovetailed with a well-coordinated programme of establishment of rural industries and wide-spread growth of infrastructure like transport, forestry, agro-based industries etc. If the programme of rural electrification is suitably coordinated with national

and regional development plans, it will not only lead to reduction in imbalances in regional development but would also lead to increase consumption of power by rural people thereby making rural electrification a viable proposition.

10.102. There are a number of small and marginal farmers in the country who are not in a position to afford the cost of installation of tubewells or bear expenditure of its maintenance and operation, with the result that they have to remain at the mercy of big farmers for the supply of water for their fields. It is recommended that the Government should encourage such small farmers to form cooperatives and own tubewells on a cooperative basis. In case it is not found possible, the Government should instal State tubewells where necessary, in order to provide irrigation facilities and cater to the needs of the small and marginal farmers to the extent possible.

10.103. It is noted that although a number of new projects for the generation of power have been taken up, the rural areas have not been getting their due shares and in case of reduction or failure in supply of power, rural areas are always worst hit, and supply of power in these areas is adversely affected. It is recommended that a fixed percentage of power generated in a State should be earmarked for the rural areas and it should be ensured that rural areas get their proportional share of power even in case of reduction in the supply of power.

10.104. It is noted that while power is being supplied to industries etc., on a cheap rate, no such concessions being allowed to the rural areas for agricultural purposes. It is not understood why in view of the importance that agriculture occupies in the country's economy, such concessions should not be allowed to the agriculturists particularly in view of the increasing need for more production of foodgrains etc. Steps should be taken by Government to supply power to agriculturists at rates comparable, if not cheaper, to the industries.

10.105. It is noted that a perspective plan for the decade commencing from April, 1971 to March, 1981 for rural electrification with emphasis on energisation of pumpsets, for increasing agricultural produce has been drawn up. The Plan provides for the electrification of 3.4 lakh villages representing about 60 per cent of the total villages and energisation of 48.7 lakh additional pumpsets by the end of 1981. The total outlay involved in the implementation of the Plan is estimated at Rs. 2,270 crores and about 265 crores annually would have to be provided for the seven-year period (1974—81). In view of the urgent need for rural electrification for the development of rural areas the necessary allocation of funds may be made.

10.106. The importance of Rural Electric Cooperatives in the decentralised retail distribution of electricity and in promoting direct participation of users in this task is recognised. Government should encourage setting up more cooperatives and maximise their number in the country. As some difficulties have been experienced in the working of Rural Electric Cooperatives already set up which are being examined by a Departmental Committee, Government should lay down firm guidelines in the light of this evaluation, for the benefit of such cooperatives so as to avoid the repetition of the mistakes in the working of Rural Electric Cooperatives.

10.107. In order to keep a watch on the proper functioning of the Rural Electric Cooperatives, representing of the Rural Electrification Corporation and State Electricity Boards concerned should also be represented on the Managing Committees of these Cooperatives. Moreover, these Cooperatives should be required to furnish quarterly reports on their working to the Rural Electrification Corporation which should monitor these Reports so as to ensure their smooth and efficient working. The accounts of these Cooperatives should also be got audited by the competent Auditors.

#### VIII. Research & Training Schemes

10.108. The importance of research and testing facilities in the growing field of power development in the country, cannot be too strongly emphasised. Research is necessary for achieving economy, quality control and standardisation in construction, generation, transmission, distribution and superior performance of the power supply system. Collection of technical information and basic data for the efficient and economic design and construction of extra high voltage lines, after taking into account the conditions prevailing in our country, is also necessary. There is thus much scope for research in power engineering in the country.

10.109. It is felt that the working relating to the setting up of the Power Research Institute was not given the urgency that it deserved. It is considered that a period of 12 years for the setting up of the Institute is too long. Considering that the matter regarding the setting up of Institute was initiated in 1955 it is regrettable that the two units of the Research Institute are yet to be fully completed and commissioned.

10.110. The second stage of the Institute which is stated to be very important from the point of view of testing plant and equipments manufactured in the country and which is estimated to cost about Rs. 550 lakhs has not commenced at all, though it was to be completed by March, 1974. It has been designed that Government should investigate the reasons for delay in commencing the second phase of the Research Institute and take concrete measures to complete the same expeditiously.

10.111. It is noted that the Central Board of Irrigation and Power coordinates the activities of the various Research Units. Besides two Units of the Central Power Research Institute, research on power engineering is also being done by the Research Units of State Electricity Boards and Educational Institutions in the country. It is felt that very little has been done in the matter of research on power engineering so far. This view is also supported by the Power Economy Committee which has stated that "one important factor retarding the growth and vitiating the functioning of power supply Industry in an optimum manner is the gross inadequacy and have stressed the need of larger research and development programmes for power engineering. Considering the heavy investments made/proposed to be made for the development, generation, transmission and distribution of power in the country, it is felt that there is an urgent need for large scale increase in the research and development programme for power engineering in the country so that the various problems of power engineering can be solved expeditiously.

10.112. Government should prepare short term and long term programme to intensify research activities so as to meet the current and the future needs in this important field.

10.113. Highest priority should be given to the problem of heavy losses in transmission of power as these are of crucial importance in the setting up of the proposed national grid and in extending the programme of rural electrification. It is desirable that priority should be given to the question of finding the most economic size of generators and other equipment suited to Indian conditions.

10.114. It is realised that research is a slow process and takes time to produce results capable of being utilised. It is, therefore, necessary that research programmes of the Institute as well as the research units of the State Electricity Boards particularly long term programmes should be anticipated as far as possible and spelt out in clear terms well in advance to enable the units to organise their research programmes accordingly. The perspective research plan for power engineering should be integrated with the development of power within the country over the next 10 to 15 years. This plan should be widely circulated among the concerned industries, State Electricity Boards, user departments, universities, eminent engineers etc. and their suggestions invited so that the plan and programmes included therein could be improved upon and duplication of research efforts among various units obviated.

10.115. It has been emphasised that greatest care should be taken at the time of selecting research projects. The project should be problem oriented and should be such as would yield quick results. In selecting the projects, full consultation and coordination should be maintained with the

State Electricity Boards and the Electrical Manufacturing Units. After the problems have been identified, these should be distributed on a rational basis to the research institutions having regard to their resources and experience so as to avoid duplication as far as possible and getting the best results in the shortest time. It is also suggested that the progress made in these research assignments should be reviewed by a competent technically qualified body from time to time say once in six months so that timely action could be taken as necessary in the interest of speeding up progress.

10.116. It is recommended that when a process has been developed by Research Institute successfully and a patent taken, effective measures should be taken for its expeditious commercial exploitation. Successful processes should also be widely publicised to stimulate interest among the industry and the users.

10.117. It is suggested that it would be useful if a periodical evaluation of the research work done by the Institute and the Research Units of State Electricity Boards as well as Universities is undertaken every five years by Government through an independent Committee as much an evaluation would provide an objective and independent assessment of the working of the research programme and would act as a stimulant to its functioning.

10.118. It is noted that against the requirements of 1600 trained engineers and 4500 technicians for proper maintenance and operation of thermal power stations during the Fourth Plan, the actual personnel of both categories trained at the two Thermal Power Stations, Personnel Training Institutes—at Neyveli and Durgapur—would be much less by the end of the Fourth Plan, resulting in heavy shortage in the number of trained personnel. It has been stressed that operation and maintenance of existing generating stations and transmission lines are equally if not more important and necessary than the expansion of generating capacity. It has been recommended that immediate steps should be taken by Government to assess realistically the requirement of trained engineers and technicians for the Fifth Plan and take effective measures to provide training facilities for them by augmenting the capacity of the existing institutes and setting up more institutes for the purpose to the extent necessary. It has been apprehended that in case adequate steps are not taken in time in this regard, the non-availability of trained manpower for efficient and economic operation and maintenance, may become a major bottleneck in the achievements of targets of power generation, transmission and distribution in the Fifth Plan.

10.119. It is noted that in foreign countries Hot Line maintenance techniques are being used for a long time which enable maintenance of lines and related equipment without de-energising and disrupting the

power supply. It is, further noted that two Hot Line Crew Centres—one at Bangalore and another at Ganguwal—were set up by the Government after entering into an agreement with USAID. These centres, which started functioning in 1958, were closed in 1962 and 1965 respectively. As there is a great demand from the State Electricity Boards for the trained personnel in the Hot Line Maintenance Techniques, a proposal is under consideration for training employees on the new technique called 'Bare Hand Method' which is in vogue in Russia and to conduct refresher courses on the 'Hot Stick Method's, which is in vogue in U.S.A.

10.120. It has been urged that Government should set up training centre/centres for imparting training in this new technique as early as possible so as to meet the needs of the State Electricity Boards and other bodies engaged in the operation and maintenance of power supply in the country.

### IX. Organisational Set-up and Functions

10.121. In the coming years there is no doubt that the requirements of the electrical energy in the country will continue to increase exponentially for many years. In other words, the installed capacity available in the country will have to be increased very rapidly so that the capacity is doubled in every 5 to 6 years. This will necessitate a great deal of activity of planning as well as project execution. Further, the increasingly bigger power systems of the States will have to be knit into regional power systems and coordinated and integrated operation of regional power systems brought about. The working of the power stations, sub-stations, transmission lines as well as construction of power projects will have to be watched carefully and monitored in order to ensure that the limited resources of the country, allocated for power, are utilised in the best possible way. The centre will have to be involved in the power supply industry more and more actively through central generations as well as through integrated operation of power systems on the regional/national basis. Marshalling of resources by way of plant and equipment, essential materials like steel and cement as well as supply and transport of coal and oil fuels for running power stations will be largely the responsibility of the Centre. It is, therefore, felt that it is absolutely necessary that early steps are taken to see that the set-up at the Centre is rationalised and, if necessary, strengthened so that this big task can be adequately tackled.

10.122. In view of the considerations mentioned in the preceding paragraph and in view of the importance of power as a basic infrastructure for the economic growth of the country, Government may



examine the desirability of splitting up the Central Water and Power Commission into two separate Departments and combining the Power Wing with Central Electricity Authority.

10.123. The projects at present being scrutinised from the technical point of view by the Central Water and Power Commission after they have been cleared by the Ministry of Irrigation and Power administratively are being put to further examination by the Technical Advisory Committee of the Planning Commission on the Ministry. While the Committee note the anxiety of the Planning Commission to ensure the proper utilisation of public finances they feel that the procedure in regard to a recheck of the schemes already cleared by the Central Water and Power Commission which is admittedly the top technical organisation in the country for power should be reviewed at the highest level to avoid duplication. It is hoped that with the activation of the Central Electricity Authority with full powers and authority, the coordination part of the job, in addition to a competent scrutiny at the highest level, will also be performed by that body and avoidable delays and duplication in the processing of the schemes eliminated.

10.124. The Central Electricity Authority which was required to perform some highly important functions such as developing a sound and uniform power policy, coordinate the activities of the power Planning agencies and carry out investigations and collect and publish data, concerning generation, distribution and utilisation of power and development of power resources, has so far been working only in name and as a part-time body with a part-time Chairman. These functions have by and large delved in the Central Water and Power Commission.

10.125. The Central Water and Power Commission (Power Wing) which was set up primarily as high-level consultant body to function at the request of States and other Organisations has no statutory authority for carrying out investigations which, according to the Power Economy Committee, is the biggest bottleneck in the implementation of economic plans.

10.126. Power for its development depends on a number of other vital sectors such as mining and transport of coal for thermal stations, manufacture of heavy electrical and ancillary stations, ready availability of materials like cables, steel, aluminium, cement etc. This involves co-ordination with various agencies including the planning Commission, the Ministries of Industrial Development, Steel, Railways, Department of Mines etc. apart from coordination with the State authorities who are primarily responsible for generation, transmission and distribution of power within the States. There have been shortfalls all along in the

augmentation of generating capacities on account of a number of factors such as delay in supply of equipment, non-availability of essential materials like coal, cement etc. inadequate quantities, want of proper planning and coordination etc. Unless such coordination is very effective, it is bound to result in delays leading to power shortage conditions. There is, therefore, urgent need for a single agency at the Centre which should be responsible for such effective coordination.

10.127. Apart from effective coordination, it is also necessary to formulate at the Central level, National Power Policy and prepare long term plans for power development extending over a period of at least 15—20 years as power generation schemes and also schemes for mining of coal, manufacture of equipment etc. have long gestation periods of over five years. It is felt that for this purpose, also, there should be at the Central level a strong technical organisation.

10.128. It is noted that there is a general consensus that these functions could be performed by the Central Electricity Authority already provided for in the Electricity (Supply) Act, 1948. It is also noted that the Government are actively considering the proposal for activation of Central Electricity Authority and for this purpose they propose bringing in new legislation. In view of the pivotal role proposed for this body, it is felt that the Authority should be activated with all the necessary powers at the earliest.

10.129. The State Electricity Boards have to play a pivotal role in the generation and distribution of power in their States. As the Power Economy Committee have aptly pointed out in their Report of 1971, the State Electricity Boards would have to undertake intensive investigation and planning for power projects and would also have to undertake the executive work of completing these additional power projects in time. The State Electricity Boards have also to ensure that transmission lines are in position well in advance of the generation of power, so that power can be taken to the consumers as soon as it is generated. It may be stressed that the working of State Electricity Boards should be got reviewed urgently by a high-powered Committee in consultation with State Governments and the Electricity Boards, with a view to strengthening their technical and managerial capabilities, so that these are commensurate with the challenging tasks which are being entrusted to them. The head of the State Electricity Board should invariably be a power engineer as he has to provide technical guidance at all stages of investigation execution and implementation, to ensure that the power programme as per Plan, is adhered to. It is disturbing to see the spate of strikes and widespread unrest which has been reported in the Press, about the Electricity Boards.

This obviously points to the fact there is a great deal of scope for improving the personnel management and ensuring that rules and regulations are properly framed and implemented, so as to inspire the confidence of all concerned.

10.130. Another aspect which has greatly exercised the mind, concerns the stores purchases, particularly transmission lines. It is felt that as these purchases would have to be made on a larger and larger scale in keeping with the ambitious plan programme, detailed guidelines to ensure purchases on sound lines and in a manner which would be free from all suspicions, should be laid down.

10.131. Another aspect of wide public interest relates to the grant of concessional rates on *ad hoc* basis. It is felt that since most of the Electricity Boards have acute financial difficulties, it is but right that broad guidelines for grant of such *ad hoc* concessions should be laid down, in consultation with the Finance and Audit departments and that where an executive authority desires a concessional rate to be given, the communication should invariably be sent in writing. It is felt that if these objectives are followed in letter and spirit, it would lift the State Electricity Boards from the present state of controversy in which they have fallen and would enable them to provide the leadership which would be necessary for meeting the challenging task of generating and distributing power as per plan provision.

10.132. It is also suggested that the provisions of the State Electricity Boards Act, 1948, may be comprehensively reviewed and necessary amendments which will improve the functioning of the State Electricity Boards, effected at an early date.

10.133. With the fast rate of growth in the demand for power—which, in the past few years has been doubling every five to six years—requiring the greater magnitude of power development, the uneven distribution of energy resources among the political divisions of the country, the advent of nuclear power and advances in technology have led to a growing realisation that the State is no longer a convenient unit for planning power development and that there is need for change in the approach, so that

the basis for planning is not the State but a Region formed of contiguous States. It is now well recognised that only through Regional and Inter-Regional planning would it be possible to ensure the implementation of the most economical schemes and to derive the maximum benefit from integrated operations. It is noted that there is no organisation at present on the Regional level which can effectively plan and coordinate the diverse activities involved in rationalised power development. The Electricity (Supply) Act, 1948 does not envisage any Regional Organisation. Regional Electricity Boards which have been constituted since 1964-65 in all the five major Regions of the country, are purely advisory organisations of the States in the Region set up by resolutions of the Central Government. Since, however, the Electricity (Supply) Act, 1948 does not provide for the generation, transmission and distribution of power on a Regional basis supplemental legislation to make such Regional activities possible may have to be introduced. It is suggested that early steps should be taken to bring forth a suitable legislation with a view to give the Regional Boards Statutory recognition.

10.134. It is noted that there is a tendency on the part of States which have surplus power, to charge unduly high rates for the supply of electricity to their less fortunate neighbours. This also inhibits inter-State collaboration. Since the existing statutes make no provision for the regulation of inter-State transfers or sales of electricity by the Central Government, such transfers and sales are taking place on a bilateral basis or through the good offices of the Central Government. Without such regulation, the States which have surplus power, enjoy strong bargaining power *vis-a-vis* their neighbours who suffer from power shortage. It is suggested that the Central Government should initiate necessary legislation to regulate on rational basis inter-State transfer or sales of electricity.

10.135. Even though funds for the construction of inter-State transmission links to promote integrated operation are provided by the Centre, the Centre has no control on the construction of these lines nor it is in a position to expedite their construction. Consequently the neighbouring States which may be suffering from power shortage cannot avail of the surplus power in other States. It is therefore, commended that keeping in

view these difficulties and also keeping in view the massive development of power required in future and the equally massive financial involvement of the Centre in future programmes, Government should take suitable statutory measures to make greater Central participation possible at regional levels.

10.136. It is noted that the suggestion for setting up an All India Service of Engineers is under consideration of Government in consultation with the State Governments. It is hoped that an accord in the matter will be reached soon and the State Governments will agree to the formation of this Service in the overall interest of efficient set up in the key sector of power.

NEW DELHI;

April 25, 1973.

Vaisakha 5, 1895 (Saka).

KAMAL NATH TEWARI,

Chairman,

Estimate Committee.

## APPENDIX I

(Vide para 2.62)

*Statement showing the various schemes at present under execution and the latest position with regard to their completion.*

Name of State and Project	No. of Schedu- Units and size (MW)	Schedu- led target date	Anticipated dates of commissioning	Present position
1	2	3	4	5
<b>Uttar Pradesh</b>				
1. Yamuna St. II, Hydel (i) Chibro	4x60	9/71 I 12/71 II 3/72 III 6/72 IV	9/73 12/73 3/74 7/74	Turbine of unit I erected. Erection of Gen. and auxiliaries as also erection of balance units was in progress. Completion of Head Race tunnel and delivery of inlet valve have been the main bottlenecks.
(ii) Khodri . . .	4x30	I II III IV	3/75 6/75 3/76 6/76	Civil works were in progress. Erection of E.O.T. crane was completed. Erection of speed ring of Unit I and II was in progress.
2. Yamuna St. IV Hydel Kulhal.	3x10	3/74 I II III	12/74 3/75 6/75	Civil works were in progress. Erection of E.O.T. crane was completed. Delivery of speed ring and spiral casing for Unit I was awaited.
3. Ramganga Hydel .	3x60	12/72 I 2/73 II III	12/74 5/75 9/75	Erection of crane No. 2 was completed and commissioned. Erection of speed ring and spiral casing for Unit-I completed.
4. Maneri Bhali Hydel .	3x30	I II III	6/77 8/77 10/77	Civil works were in progress. Layout of Power Station was finalised.
5. Obra Thermal Exten- sion	3x100	8/71 I 4/72 II 11/72 III	5/73 12/73 3/74	Erection of unit-I was nearing completion. About 74% and 51% progress was achieved on Unit-II and III respectively. While there is no significant hold up in commissioning of Unit-I, Unit-II and III may be affected due to uncertain delivery of transformer and other equipments.

1	2	3	4	5
6. Harduaganj Thermal Stage-V	1x110	3/74	6/75	Procurement action and preliminary civil works were taken up.
7. Harduaganj Thermal Stage-VI.	2x60		I 9/74 II 3/75	Civil works are in progress.
8. Panki Thermal Extn.	2x110	3/74	I 12/74 II 6/75	Foundation and piling works and procurement action were in progress.
9. Obra Thermal Extn.	5x200		I 75-76 II 75-76 III 76-77 IV 77-78 V 77-78	The works are yet to start. " " " " " "
<i>Punjab</i>				
10. Bhatinda Thermal Stage-I	2x110	10/72	I 9/73 II 9/74	Civil works were almost completed for Unit-I and where in progress for Unit-II. Erection of eqpt. was in progress. Boiler No. I would be hydro tested by March, 1973.
11. Bhatinda Thermal Stage-II	2x110		I 75-76 76-77	Works are yet to start after completing stage-I.
12. U.B.D.C. Hydel	3x15	3/72	I 8/71 II 5/72 III 7/73	Two units have already been commissioned. Erection of 3rd unit was in fast progress.
13. Beas Hydel Project (i) Dehar	4x165	3/74	I 10/74 II 9/75 III 8/76 IV 10/76	Various civil works and erection of embedded parts was in progress. Delivery of first speed ring and spiral casing was anticipated by April, 1973.
(ii) Pong	4x60		I 4/77 II 9/77 III 1/78 IV 7/78	Civil works were in progress. Layout of switchyard was finalised.
<i>Rajasthan</i>				
14. Jawaharsagar	3x33	70/71 71/72	I 5/72 II 3/73 III 6/73	Two units have already been commissioned. Second stage concreting for unit was completed and turbine erection was in progress.
15. Rajasthan Atomic Power Projects.	2x200	12/79 12/72	I 7/73 II 12/74	First Unit has been on trial runs. The works on Unit-II are in progress.

	1	2	3	4	5						
<i>Haryana</i>											
16. Faridabad Thermal Extn. 2x55	3/74	I	9/74	II	3/75	Civil works are in good progress. Construction of Chimney was completed, erection of boiler was started					
<i>Himachal Pradesh</i>											
17. Giribata	2x30	72/73	I	9/74	II	3/75	Civil works were in progress. Erection of equipment was to commence shortly.				
18. Baisa Siul (Central Sector)	3x66	73/74	I	74/75	II	75/76	III	75/76	Civil works were taken up. Delivery of equipment was delayed, hence civil works were programmed accordingly.		
<i>Jammu and Kashmir</i>											
19. Chenani Hydel St. II	2x4.6	72/73	I	12/73	II	9/74	Civil works are almost completed including erection of penstock II. Erection of equipment would be taken up after receipt.				
20. Upper Sindh Hydel	2x11	72/73	I	1/74	II	12/73	III	3/74	Civil works for 2 units were almost completed and were in progress for third unit. Erection of equipment was in advanced stage for Unit-I except the works on some auxiliaries. Erection of Unit-II and III is behind schedule due to non-completion of civil works and limit to travel of tower crane.		
<i>Jammu and Kashmir— Central Sector.</i>											
23. Salal Hydel	3x115		I	77/78	II	78/79	III	78/79	Preliminary civil works are in progress. Construction of coffer dam was completed. Works on diversion tunnel spillway and main dam were in progress.		
<i>Gujarat</i>											
24. Ukai Hydel	4x75	5/72	I	10/73	II	6/74	III	12/74	IV	2/76	Dam was completed and water stored. Erection of embedded parts was 75% completed. Speed ring of Unit-I was erected and erection of spiral casing was in progress.



I	2	3	4	4	
25. Ukai Thermal	2x120	3/74	I II	9/74 3/75	Civil works were in progress. Erection of structural steel and equipment was taken up. There has been delay in supply of equipment. The auxiliaries like coal and Ash handling plants, C.W. pumps are still critical items for commissioning of Unit-I.
26. Gandhisagar Thermal (North Gujarat)	2x120		I II	76/77 76/77	Work yet to be taken up.
27. Kadana Hydel	2x60		I II	5/77 11/77	Work yet to be taken up.
<i>Madhya Pradesh</i>					
28. Korba Thermal Extn.	2x120		I II	75/76 76/77	Civil works are in progress.
29. Amarkantak Thermal Extension.	1x120			76/77	Work yet to start.
<i>Maharashtra</i>					
30. Koyna Hydel Station-III	4x80	7/72	I II III IV	3/75 6/75 9/75 12/75	Civil works were in progress. Laying of embodded parts was in progress. Speed Ring and spiral casing for first unit was received. Works on switchyard area were in progress.
31. Vaitarna Hydel	1x60	7/73		7/74	Civil works were in progress. Erection of Electrical and mechanical works was taken up recently.
32. Bhatgar Hydel	1x16	6/73		3/75	Civil works were in progress as per revised schedule.
33. Vir Hydel	2x4.5	6/72	I II	8/73 10/73	Civil works were in progress. Most of the plant equipment was since received at site but could not be erected due to non-completion of civil works. Erection of embodded parts and E.O.T. crane were completed.
34. Bhaira Tail Race Hydel	2x40		I II	78/79 78/79	Procurement action for plant equipment was in progress. Work was not started as yet.
35. Paithan Hydel	1x12			75/76	Erection of penstocks was commenced. Procurement action for plant equipment was in progress.

	1	2	3	4	5
36. Koradi Thermal St. I	2x120	1/72 7/72	I II	10/73 12/73	Major civil works were almost completed. Erection of both units was in progress.
37. Koradi Thermal St. II.	2x120		I II	6/74 9/74	Civil works were in progress. Procurement action and supply of plant equipments was in progress.
<i>Mysore</i>					
38. Sharavathi Hydel Stage-III	2x89.1	73/74	I II	6/74 12/74	Civil and foundation works were in progress.
39. Kalinadi Hydel St. I	2x135		I II	5/76 11/76	Civil works are in progress.
<i>Kerala</i>					
40. Idikki Hydel	3x130	3/72 8/72	I II III	12/74 6/75 12/75	Civil works were in progress.
<i>Tamilnadu</i>					
41. Ennore Thermal	2x55+ 2x110	71/72 73/74 73/74	I II I II	69/70 70/71 3/72 3/73	2 of 55 and one of 110 MW units have since been commissioned. The second unit of 110 MW is also expected to be commissioned shortly.
42. Ennore Thermal Extn. Ix110				75/76	The civil works are in progress
43. Kundah Hydel St. IV	1x60+ 1x50			—	No civil works are involved. The source of supply for plant equipment is yet to be decided.
44. Kalpakkam (N)	2x235	3/74	I II	75/76 76/77	Civil works are in progress.
<i>Andhra Pradesh</i>					
45. Kothagudem Thermal Stage-III	2x110	3/72 9/72	I II	5/73 12/73	Civil works were nearing completion. Erection works of unit-I were in advanced stage and those of Unit-II are progressing as per schedule.
46. Lower Sileru Hydel	4x100		I II III IV	3/75 9/75 3/76 9/76	Civil works were in progress. Equipment erection is yet to start.
47. Srisaliam Hydel	4x110		I II III IV	76/77 77/78 78/79 78/79	Civil works were in progress.
<i>Bihar</i>					
48. Barauni Thermal Extn. Ix110		73/74		3/77	Procurement action was in progress. Work has not started so far.

	1	2	3	4	5
49. Patratu Thermal (7 & 8th units)	2x110	73/74	7th 3/75 8th 3/76		Civil works and structural steel works were in progress.
50. Kosi Hydel	4x5	70/71	I 3/70 II 3/71 III 3/73 IV 3/74		Three units have since been commissioned. The erection of 4th unit is to start after receipt of replacement parts.
51. Gandlak	3x5		.. ..		Civil works are in progress.
52. Subernarekha	2x65		I 12/75 II 6/76		Civil works were in progress.
<i>West Bengal</i>					
53. Santaldih Thermal	4x120	71/72	I 6/73 II 12/73 III 75/76 IV 77/78		Civil works and erection was in progress. Erection of Boiler No. I was nearing completion. For this unit, the fuel oil facilities have been a critical item.
<i>D.V.C.</i>					
54. Chandrapura Thermal Extension.	2x120	12/71	I 12/73 II 12/74		Erection works were in progress. The hydro tests on Boiler No. I were to be taken up in early February, 1973.
<i>Orissa</i>					
55. Balimela Hydel	6x60	8/72	I 5/73 II 11/73 III 4/74 IV 7/74 V 10/74 VI 1/75		The civil works were in progress. Partial filling of the reservoir was achieved. The erection of various units was in progress.
<i>Assam</i>					
56. Namrup Thermal Extn.	1x30	12/72		12/74	Civil works are nearing completion. Erection work was in progress.
57. Umium Hydel St. III (Kyrdem-Kulai)	2x30		I 9/76 II 3/77		Project is in initial stages. Preliminary civil works and tunnel excavation were in progress.
<i>Tripura</i>					
58. Gumti Hydel	2x5		I 12/74 II 3/75		Various civil works were in progress.
<i>Manipur</i>					
59. Loktak Hydel (Central Sector)	2x25	73/74	I 75/76 II 77/78		Civil works were in progress. Erection of penstocks were commenced. There has been delay in supply of equipment.
<i>Nagaland</i>					
60. D'Suza Hydel	3x0.5			75/76	Civil works are in progress.

APPENDIX II

(Vide Para 2.65]

Statement showing the Schemes Currently under Examination by CWP & PC

Sl. No.	Name of Region/State	Name of the Scheme	Installed Capacity (MW)	Estimated Cost (Rs. Crores)	Date of receipt of scheme report	Remarks
1	2	3	4	5	6	7
<i>Northern Region</i>						
1	Punjab	Shansan Hydel Extension	212.5	4.73	26-3-70	Scheme was considered by Advisory Committee at its meeting held on 15-2-71 when it was decided that Ministry of I&P would pursue the matter with the Government of H. P. to solve the inter-state aspect of the scheme.
2	Punjab	Anandpur Sahib Hydel Scheme	422.7.5	32.43	28-7-70	Involves inter-State aspect
3	Punjab	Thein dam project	6870	90.87	14-5-69	Do.
4	Punjab	UBDC Hydel Scheme, Stage II	3215	..	..	Scheme forms a part of Thein dam-Project.
5	Haryana	Western Yamuna Canal Hydel Project	627.5	12.92	11-9-72	..
6	Uttar Pradesh	Obra Thermal Station Extn.	21200	60.13	16-6-71	..
7	Uttar Pradesh	Hardunganj Thermal Station, Stage VI	2155	22.60	30-4-71	Scheme considered by the Advisory Committee at its meeting held on 4-10-72 and the Committee it was felt by that a firm commi men for the supply of coal may be obtained.

2	3	4	5	6	7
8	Uttar Pradesh	• Maneri Bhali H.E. Scheme, Stage II	3x52	43.33	27-9-72
9	Uttar Pradesh	• Vishnuprayag H.E. Scheme	4x65.5	57.18	17-12-71
10	Uttar Pradesh	• Bowala Nandprayag H.E. Scheme	2x65	35.83	28-9-72
11	Uttar Pradesh	• Rihikesh-HardwarHydel Scheme	3x33.3	34.74	23-11-70
12	Jammu & Kashmir	Kangan H.E. Scheme	2x11	7.61	24-6-68
<i>Western Region</i>					
13	Gujarat	• Ukai Thermal Power Station	2x20	39.50	23-8-71
14	Gujarat	• Ukai Thermal Power Stn, Extn.	1x200	31.60	20-9-72
15	Gujarat	• Wanakbori Thermal Power Station	3x200	115.50	22-11-72
16	Maharashtra	• Koradi Thermal Power Station.	4x120	85.94	29-5-70
17	Maharashtra	• Kas H.E. Project	1x11.4	2.01	10-10-69
18	Maharashtra	• Pawna H.E. Project	1x10	1.03	27-1-70
19	Maharashtra	• Jalaindhi H.E. Project	6x75	47.13	6-8-70
20	Maharashtra	• Nasik Thermal Power Station. Extension.	2x120	51.91	13-12-72

Replies to the comments of  
CPWD under examination

Scheme was accepted in principle  
by the Planning Commission in  
May, 1971.

Scheme was accepted in principle  
by the Planning Commission  
in September '66.

Replied to the comments of CWPC  
under examination

Action in processing the scheme for  
implementation will be taken as  
soon as the dispute on Narmada  
waters is settled

21	Maharashtra	Bhandarada H.E. Project	(1x10+1x35)	5.77	17-8-72
22	Maharashtra	Vairata H.E. Project, Stage II	1x6	1.70	10-9-71
23	Maharashtra	Chandrapur Thermal Power Station	(4x200+1x500)	221.61	23-10-72
24	Maharashtra	Bhusawal Thermal Power Station	2x120	45.51	23-11-72
25	Maharashtra	Khasikhedda Thermal Stn. Extension.	1x120	26.54	5-1-73
26	Madhya Pradesh	Satpura Thermal Stn. Extension	6x200	222.09	27-12-72
27	Madhya Pradesh	Narmadasagar Multipurpose Project	10x100	111.30	26-5-69 Action to process the scheme will be taken as soon as the dispute on Narmada waters is settled.
28	Madhya Pradesh	Harinphal Hydrel Project	4x50	38.31	19-5-72
29	Madhya Pradesh	Maheshwar Hydrel Project	3x40	18.30	19-5-72
30	Goa	Dudhsagar Multipurpose Project	2x110	11.67	Nov. 1971
<b>Southern Region</b>					
31	Andhra Pradesh	Kothagudem Thermal Station Stage IV	2x110	45.20	2-6-71 Scheme was considered by Advisory Committee at its meeting held on 4-10-72 when it was felt that the arrangements for firm tie up of coal etc. be made and feasibility of reducing the cost estimates looked into.
32	Andhra Pradesh	Upper Sileru H.E. Schemes Stage II& III	2x60	11.94	6-7-72
33	Andhra Pradesh	Kothagudem Thermal Station Estn. Stage V	2x200	66.30	26-11-71

1	2	3	4	5	6	7
34	Andhra Pradesh	Canal Power house at Donkary dam	1x25]	5.00	8-6-72	
35	Andhra Pradesh	Pochampad H.E. Project	4x9	6.25	9-11-72	
36	Andhra Pradesh	Kuntala H.E. Project	1x15	3.55	15-12-72	
37	Tamil Nadu	Mettur Thermal Power Project	3x110	65.53	5-1-73	
38	Tamil Nadu	Cholapuzha H.E. Project	1x60	7.39	8-3-68	Involves inter-State aspects with Kerala
39	Tamil Nadu	Paralayar H.E. Project	1x35	4.73	9-3-71	
40	Tamil Nadu	Shanmukhanddi H.E. Project	1x30	9.02	25-3-72	
41	Tamil Nadu	Coonoor-Kallar H.E. Project	1x50	14.45	5-7-72	
42	Tamil Nadu	Lower Moyar H.E. Project	1x30	13.36	27-6-72	
43	Kerala	Idamalayar Multipurpose Project	3x30	15.97	15-3-73	
44	Kerala	Idikki H.E. Project Stage III		4.20	19-12-72	
45	Kerala	Kakkad (Sabirigiri tailrace) H.E. Scheme	2x35	14.07	17-2-73	
46	Kerala	Pandiyyar-Punnapuzha H.E. Scheme	2x35	11.22	23-2-73	
47	Kerala	Kerala Bhavani Multipurpose Project	2x50	12.24	29-11-72	Schemes involve inter-state aspects with Tamil Nadu which need to be sorted out before these can be considered for implementation.
48	Kerala	Mananthody Multipurpose Project	4x50	16.12	29-11-71	

*Eastern Region*

49.	Bihar	Pathratu Thermal Station Extn.	2x110	44.99	10-11-72	Scheme was accepted in principle by the Planning Commission in September, 1966.
50.	Bihar	Pathratu Thermal station Extn. Stage IV	2x110	42.70	18-10-72	
51.	Bihar	Tenughat Thermal Power Station (4x200+1x500)	195.20	2-3-72		
52.	Bihar	Barauni Thermal stn. extn. Stage-IV	1x110	21.00	18-10-72	
53.	Orissa	Upper Kolab Dam Project	3x80	55.24	Feb. 1973	
54.	West Bengal	Rinchington H.E. Project	(1x1+2x0.5)	0.82	17-2-71	
55.	West Bengal	Jaldhaka H.E. Project, Stage-II	2x4.5	2.97	27-1-73	
56.	West Bengal	Santalidih Thermal Power Station	4x120	86.90	24-3-72	Scheme was accepted in principle by the Planning Commission in September, 1966.

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57.	West Bengal	Santalidih Thermal Station Extn.	1x200	36.01	22-4-72	
58.	D.V.C.	Bokaro 'B' Thermal Station	2x200	56.00	22-3-72	
<i>North-Eastern Region</i>						
59.	Assam	Lower Umiam-Umkhet Project	3x50	30.20	6-12-71	

Total number of Schemes

Aggregate installed capacity

59 Nos.  
13.55 Million KW.



### APPENDIX III

(Vide Para 3·11)

*Statements showing the installed Capacity and actual production of Thermal Power stations in the country during 1972.*

Sl. No.	Name of the Power Station.	Location.	Installed Capacity MW.	Actual Production MW (1972).
1	2	3	4	5
1	Nellore . . . . .	Kovur	30	247
2	Kothagudem . . . . .	Kothagudem	240	1638
3	Ramagundam A&B . . . . .	Ramagundam	100	2032·2
4	Hyderabad . . . . .	Hyderabad	12·5	19·8
5	Patna Electric Supply Co. . . . .	Patna	13·50	33·9
6	Leharisaria Electric Supply Co. . . . .	Darbhanga	0·27	0·512
7	Patratu . . . . .	Patratu	400·00	1248·349
8	Barsuni . . . . .	Barsuni	145·00	608·00
9	D.E.S.U. . . . .	Central Power House, Rajghat.	15 51·6 278·5	1468·00
10	Ahmedabad Electric Supply Company Limited. . . . .	Ahmedabad	217·50	1392
11	Bhavnagar Electric Supply Company Limited . . . . .	Bhavnagar	16·60	74
12	Kandla . . . . .	New Kandla	16·0	57
13	Porbander . . . . .	Porbander	15·0	62
14	Sikka . . . . .	Sikka	16·0	67
15	Shahpur . . . . .	Shahpur	16·0	64
16	Utran . . . . .	Utran	67·5	424
17	Faridabad . . . . .	Faridabad	20·75	68·4
18	Surajpur . . . . .	Surajpur	6·80	14
19	Jubbulpore Electric Supply Company Limited . . . . .	Jubbulpore	15·25	10·3
20	Chandni . . . . .	Nepanagar	17·0	11·8

1	2	3	4	5
21	Satpura . . . .	Satpura	312.5	1339
22	Korba I & II. . . .	Korba	300.0	1441
23	Khaperkhe da . . . .	Khaperkheda	120.0	642
24	Paras . . . .	Paras	92.50	476
25	Bhusaval . . . .	Deepnagar	62.50	393
26	Nasik . . . .	Eklahare	280.0	1231
27	Parli . . . .	Parli	60	34
28	Trombay . . . .	Trombay	387.5	2329
29	Nangal . . . .	Nangal Township	16.10	13.7
30	Talwara . . . .	Talwara Township	11.10	44
31	Bharatpur . . . .	Bharatpur	4.0	NA**
32	Jaipur . . . .	Jaipur	15.50	9
33	Jodhpur . . . .	Jodhpur	15.25	NA**
34	Kota . . . .	Kota	2.65	NA**
35	Alwar . . . .	Alwar	2.00	NA**
36	Basin Bridge . . . .	Basin Bridge	90.00	300
37	Ennore . . . .	Ennore	220.00	474
38	Banaras . . . .	Benarat	14.50	44
39	Bareilly Electric Supply Com- pany Limited. . . .	Bareilly	5.00	15
40	Agra Electric Supply Co. Ltd.	Agra	29.65	115
41	Kanpur Electric Supply Co. Ltd.	Kanpur	91.5	403
42	Panki . . . .	Panki	64	363
43	Allahabad Electric Supply Company Limited . . . .	Allahabad	14.50	29
44	Lucknow Electric Supply Company Limited . . . .	Lucknow	28.50	121
45	Gorakhpur . . . .	Gorakhpur	15.00	90
46	Chandausi . . . .	Chandausi	15.60	43.3
47	Rampur . . . .	Rampur	4.20	NA**
48	Mainpuri . . . .	Mainpur	10.00	34
49	Mau . . . .	Azamgarh	15.0	61
50	Balrampur . . . .	Balrampur	3.40	9.8
51	Sohwal . . . .	Sohwal Faizabad	19.56	81

\*\*These Power Stations did not work in 1972. These have now (1973) been put in to service due to power shortage.

1	2	3	4	5
52	Harduaganj 'A' . . . .	Kasimpur	110	450
53	Harduaganj 'B' . . . .	Kasimpur	210	828
54	Obra . . . . .	Obra	250	1460
55	Gourepore Electric Supply .	Naithati	45.0	79.5
56	Bandel . . . . .	Bandel	330	1508
57	The Calcutta Electric Supply Corporation Limited .	Calcutta	499.5	1829
58	Durgapur D.V.C. . . . .	Durgapur	290	1010
59	Talcher . . . . .	Talcher	250	650
60	Durgapur (West Bengal) . . . .	Durgapur	285	753
61	Chanderpura . . . . .	Chanderpura	420	2084
62	Bokaro . . . . .	Bokaro	225	945
63	Ballarshah . . . . .	Ballarshah	22.50	121
64	Amarkantek . . . . .	Amarkantek	60	442
65	Neyveli . . . . .	Neyveli	600	1954
66	Dhuvaran . . . . .	Dhuvaran	534	2022
67	Kalakot . . . . .	Kalakot	22.5	NA
			8136.28	27647.96

**APPENDIX IV;**

(vide Para 3.172)

*Statements showing details of estimated cost expenditure incurred Additional financial assistance asked for during 1972-73 and amount released for Power generation schemes.*

Name of the Scheme/State	Estimated cost as revised.	Expenditure prior to IV Plan	Fourth Plan outlay	Expenditure incurred upto March 1972	Expenditure provision as approved during 1972-73	Additional funds asked for during 1972-73	Additional funds released during 1972-73
	Rs. crores	Rs. crores	Rs. crores	Rs. crores	Rs. crores	Rs. crores	Rs. crores
	2	3	4	5	6	7	8
(i) Schemes for which plant and Machinery have been received at site but civil works are not yet completed.							
<i>Andhra Pradesh</i>							
1. Kothagudem Thermal Station (2x110 MW);	*43.00	0.45	44.50	25.68	11.50	7.77	2.00
2. Lower Sileru H.E. Project (4x100MW)	77.50	6.35	17.75	10.89	10.00	6.00	
<i>Bihar</i>							
3. Patratu Thermal power Station (2x110MW)	43.00	6.41	32.00	12.12	8.00	6.00	3.00
<i>Orissa</i>							
4. Bellmeha H.E. Scheme (6x60MW)	62.75	18.00	30.89	23.78	7.80	3.00	1.00
<i>Uttar Pradesh</i>							
5. Obra Thermal Station Extension (3x100MW)	53.34	6.87	46.00	36.90	5.00	3.08	3.00

	1	2	3	4	5	6	7	8
<i>West Bengal</i>								
6. Santaldih Thermal Station (2x120 MW)		47.05	8.06	38.08	24.41	9.10	5.00	2.47
<i>Kerala</i>								
7. Iddikki H.E. Project (3x130 MW)		80.00	20.66	44.45	26.76	11.00	7.00	3.00
					TOTAL :		37.85	
<i>(d) Fourth Plan Schemes for which Civil Works are to be expedited</i>								
<i>Haryana</i>								
8. Faridabad Thermal Station (2x55 MW)		26.38	..	10.00	2.65	3.74	1.00	1.00
<i>Maharashtra</i>								
9. Koradi Thermal Station (2x120 MW)		51.25	4.58	38.02	29.32	8.00	5.00	3.38
10. Koyna H. E. Project State-III (4x80 MW)		40.78	10.39	26.37	11.26	8.24	2.00	2.00
11. Vaitarna H. B. Project Stage-I (1x160 MW)		15.53	4.50	10.25	3.13	1.65	0.80	
<i>Punjab</i>								
12. Bhatinda Thermal Station (2x110MW)		46.36	..	24.32	31.04	8.70	4.00	2.00
<i>Punjab/Haryana/Rajasthan</i>								
13. Bess Unit-I (4x165 MW)		179.64	55.61	71.17	50.54	23.50	2.00	5.33
					TOTAL :		14.80	

(iii) Schemes in respect of which preliminaries have been completed and additional funds will expedite their commissioning during the Fifth Plans period.

*Andhra Pradesh*

14. Srishailam H.E. Project (4110MW) . . . 106.00 22.09 16.00 11.20 5.20 5.00

*Jammu & Kashmir*

15. Lower Jhelum Project (3132MW) . . . 35.00 1.84 17.00 5.95 4.58 4.00  
 16. Salal (Central Sector) (3290 MW) . . . 55.20 . . . 5.50 3.59 1.50 3.52

TOTAL :- 12.52

GRAND TOTAL :- 65.17

## APPENDIX V

(Vide para 3.181)

Sector-wise per Capital Consumption State-wise  
for the year 1969-70.

Sl. No.	STATE	Population Millions (Mid-Financial year) Estimated.	Utilities			Utilities			Total	KWH from self generation of non-Utilities	Total (Col. 9+10).
			Domestic	Commercial	Industrial including Public Works & Sewage	Public Lighting	Agricultural Pumping	8			
			3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	42.65	3.32	5.90	27.3	0.67	7.87	45.06	4.46	49.52	
2	Assam	15.31	2.19	3.30	10.83	0.23	0.02	16.57	1.88	18.44	
3	Bihar	56.80	1.52	1.73	39.48	0.1	1.25	44.08	18.40	62.48	
4	Gujarat	26.06	8.24	4.14	86.55	1.20	13.70	113.83	13.37	127.20	
5	Haryana	9.78	5.20	4.19	46.32	0.42	24.5	80.63	7.60	88.23	
6	J. & K.	4.01	16.59	2.83	18.21	0.81	2.02	40.46	..	40.46	
7	Kerala	20.94	4.35	3.08	57.31	0.98	1.89	67.61	2.83	70.44	
8	Madhya Pradesh	40.05	3.30	1.72	36.86	0.51	1.29	43.68	9.04	52.72	
9	Maharashtra	49.21	13.48	8.80	113.96	1.40	6.21	143.85	4.41	148.26	

10	Mysore . . . . .	28.84	7.14	2.76	64.06	1.68	5.18	80.82	1.57	82.39
11	Nagaland . . . . .	0.43	3.37	2.09	0.75	1.37	..	7.58	..	7.58
12	Orissa . . . . .	21.28	1.65	2.43	57.60	0.31	0.20	62.19	27.50	89.69
13	Punjab . . . . .	13.80	9.60	5.74	138.52	0.59	26.60	181.05	0.04	181.09
14	Rajasthan . . . . .	25.76	2.53	2.19	21.61	0.38	3.54	30.25	12.90	43.15
15	Tamil Nadu . . . . .	39.04	7.74	8.72	74.49	1.81	27.75	120.51	3.02	123.53
16	Uttar Pradesh . . . . .	89.43	3.65	1.55	39.24	0.33	6.93	51.70	1.37	53.07
17	West Bengal . . . . .	44.06	14.20	5.22	86.29	0.80	0.41	106.92	9.37	116.29
<i>Union—Territories</i>										
(a)	Delhi . . . . .	4.08	64.52	48.37	109.95	4.24	1.72	228.80	26.62	255.42
(b)	Andaman & Nicobar Islands . . . . .	0.09	13.78	1.78	9.00	1.00	..	25.96	..	25.96
(c)	Chandigarh . . . . .	0.19	77.58	56.95	171.79	6.68	2.32	315.32	..	315.32
(d)	Dadra & Nagar Haveli . . . . .	0.071	2.54	..	5.21	0.85	0.56	9.16	..	9.16
(e)	Goa, Daman & Diu. . . . .	0.86	7.56	5.44	71.82	1.38	0.13	86.33	1.32	87.65
(f)	Himachal Pradesh . . . . .	4.21	4.96	3.19	17.96	0.29	0.15	26.55	..	26.55
(g)	Laccadive, Minicoy & Amindive Islands . . . . .	0.03	4.00	1.00	1.00	0.67	..	6.67	..	6.67
(h)	Manipur . . . . .	1.09	2.52	..	0.43	0.76	..	3.71	..	3.71
(i)	N.E.F.A. . . . .	0.39	..	..	No Data	No. Data	..	..	..	..
(j)	Pondicherry. . . . .	0.44	9.52	8.43	84.02	1.84	55.05	158.86	..	158.86
(k)	Tripura. . . . .	1.48	2.91	..	1.48	0.06	0.01	4.46	..	4.46
All India : . . . . .		540.20	6.46	4.32	57.47	0.77	6.99	76.01	7.51	83.5



## APPENDIX VI

(Vide Para 3-184)

### *Installed Capacity and Per Capital Consumption*

S. Region/State No.	Installed capacity at the end of			Per capital consumption			
	1972-73	1973-74	1978-79	1971-72	1973-74	1978-79	
1	2	3	4	5	6	7	8
<b>I. Northern Region</b>							
1. Uttar Pradesh		1458	2187	5065	60	83	9
2. Punjab .		715	696	1996	168	272	90
3. Haryana .		503	526	1344	114	194	317
4. Rajasthan .		559	767	1716	55	61	121
5. Delhi . .		307	392	610	288	320	372
6. Himachal Pradesh .		51	48	228	46	59	91
7. Jammu & Kashmir .		69	100	430	40	75	131
8. Chandigarh .		2	2	2	277	410	..
<b>TOTAL .</b>		<b>3664</b>	<b>5043</b>		<b>11516</b>		
<b>II. Western Region</b>							
1. Maharashtra .		2174	2459	4748	171	194	290
2. Gujarat .		1180	1329	2660	143	170	288
3. Madhya Pradesh		743	783	2310	58	64	117
4. Goa, Daman & Diu . .		5	5	5	..	174	..
<b>TOTAL .</b>		<b>4102</b>	<b>4576</b>	<b>9723</b>			
<b>III. Southern Region</b>							
1. Andhra Pradesh		671	883	2729	58	82	139
2. Kerala .		623	682	1852	74	87	137
3. Mysore .		967	1055	1999	117	143	240
4. Tamil Nadu .		2186	2285	3958	138	170	234
<b>TOTAL .</b>		<b>4447</b>	<b>4845</b>	<b>10538</b>			

1	2	3	4	5	6	7	8
<b>IV. Eastern Region</b>							
1.	Bihar . . .	598	12300	2843	67	67	126
2.	West Bengal .	1224	2043	3596	119	126	170
3.	D.V.C. . .	1061	Included in West Bengal and Bihar				
4.	Orissa . . .	556	674	1437	97	76	172
TOTAL . . .		3439	3947	7866			
<b>V. Northern Eastern Region</b>							
1.	Assam-Meghalaya	179	239	624	23	30	68
	Other	17	23	203			
TOTAL :		196	262	827			
TOTAL ALL-INDIA :							
	UTILITIES . .	15848	18548	40345	94	113	185
	Non-Utilities	1617	1684	1809	..	..	..
All-India (Utilities — Non-Utilities)		17465	20232	42154		120	192
				41500	(after allowing for retirements)		

## APPENDIX VII

(Vide Para 3.185)

*Statement showing estimated power requirements in utilities in the country from  
1973-74 to 1978-79*

Sl. No.	State/Region	Maximum Demand in MW					
		1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
1	2	3	4	5	6	7	8
<b>I. Northern Region</b>							
	(i) Punjab	890	1003	1125	1260	1415	1590
	(ii) Haryana	617	703	795	905	1030	1175
	(iii) Chandigarh	29.8	31.9	35.8	39.8	44.5	49.8
	(iv) Rajasthan	411	488	580.0	690.0	817	975.0
	(v) Uttar Pradesh	1814	2061	2410.0	2800	3220	3720
	(vi) Jammu & Kashmir	97	108.0	122	140	159	179
	(vii) Himachal Pradesh	55.3	65.5	72	80	88	98
	(viii) Delhi	319	351.0	384	417	455	495
<b>Sum Total of Non-Coincident Maximum Demands</b>		<b>4233.1</b>	<b>4811.4</b>	<b>5523.8</b>	<b>6331.8</b>	<b>7228.5</b>	<b>8281.8</b>
<b>Coincident M. D. (1.05 D.F. from 75/76)</b>		<b>4233.1</b>	<b>4811.4</b>	<b>5260</b>	<b>6020</b>	<b>6880</b>	<b>7890</b>
<b>II. Western Region</b>							
	(i) Gujarat	1112	1324	1485	1660	1860	2080
	(ii) Maharashtra	2098	2319	2585	2880	3220	3580
	(iii) Madhya Pradesh	646	801	920	1060	1220	1410
	(iv) Goa, Daman & Diu	39	68	81	97	116	139
<b>Sum Total of Non-Coincident Maximum Demands</b>		<b>3895</b>	<b>4512</b>	<b>5071</b>	<b>5697</b>	<b>6416</b>	<b>7209</b>
<b>Coincident M. D. (1.02 D.F. from 75/76)</b>		<b>3895</b>	<b>4512</b>	<b>4970</b>	<b>5585</b>	<b>6290</b>	<b>7070</b>

I	2	3	4	5	6	7	8
<b>III. Southern Region</b>							
(i) Andhra Pradesh . . . . .	884	1008	1140	1285	1450	1640	
(ii) Kerala . . . . .	402	443	495	555	623	697	
(iii) Mysore . . . . .	900	1017	1165	1320	1500	1710	
(iv) Tamil Nadu . . . . .	1726	1913	2060	2240	2420	2630	
(v) Pondicherry . . . . .	24	25	28	30	33	36	
Sum Total of Non-Coincident M.D. . . . .	3936	4406	4888	5430	6026	6713	
Coincident M. D. (1.04 D. F. from 75/76) . . . . .	3936	4406	4700	5220	5795	6455	
<b>IV. Eastern Region</b>							
(i) Bihar . . . . .	845	988	1145	1330	1550	1810	
(ii) West Bengal . . . . .	1285	1362	1510	1670	1850	2045	
(iii) Orissa . . . . .	330	457	535	625	740	895	
(iv) A. & N. Islands . . . . .	1.6	1.8	2.1	2.4	2.7	3.1	
Sum Total of Non-Coincident M.D. . . . .	2461.6	2808.8	3192.1	3627.4	4142.7	4753.1	
Coincident M.D. (1.02 D.F. from 75/76) . . . . .	1461.6	2808.8	3130	3555	4060	4660	
<b>V. Northern Eastern Region</b>							
(i) Assam including Meghalaya & Mizoram . . . . .	131	152	184	224	274	336	
(ii) Manipur . . . . .	6.5	9.1	10.7	12.6	14.8	17.4	
(iii) Tripura . . . . .	6.7	8.5	10.0	11.8	13.8	16.4	
(iv) Nagaland . . . . .	4.4	4.9	6.0	7.3	9.2	12.2	
(v) Arunachal Pradesh . . . . .	3.9	4.7	5.7	6.3	8.2	10.2	
Sum Total of Non-Coincident M.D. . . . .	152.5	179.2	216.4	262.5	320.0	392.2	
Coincident M.D. (1.00 D.F.) . . . . .	152.5	179.2	216.4	262.5	320.0	392.2	
TOTAL—ALL INDIA (UTILITIES) . . . . .	14678.2	16717.4	18276.4	20642.5	23345	26467.2	

## APPENDIX VIII

(Vide para 4.8)

*Hydro Electric Resources in India as per CW&PC's Hydro-Electric Survey (1953—58)*

### Statewise Distribution

Sl. No.	State	Hydro Power Potential at 60 per cent L.F. (Million KW)
1.	Andhra Pradesh . . . . .	2.48
2.	Assam . . . . .	0.35
3.	Bihar . . . . .	0.61
4.	Gujarat . . . . .	0.68
5.	Jammu and Kashmir . . . . .	3.59
6.	Kerala] . . . . .	1.54
7.	Madhya Pradesh . . . . .	4.58
8.	Maharashtra . . . . .	1.91
9.	Mysore . . . . .	3.37
10.	Orissa . . . . .	2.06
11.	Punjab/Haryana . . . . .	0.31
12.	Rajasthan . . . . .	0.15
13.	Himachal Pradesh . . . . .	2.91
14.	Tamilnadu . . . . .	0.71
15.	Uttar Pradesh . . . . .	3.76
16.	West Bengal . . . . .	0.02
17.	Manipur . . . . .	0.87
18.	Arunachal Pradesh . . . . .	9.03
19.	Meghalaya . . . . .	1.66
20.	Mizoram . . . . .	0.56
		41.15

## APPENDIX IX

(Vide para 4, 57)

*Statement showing the progress of investigations of 62 Hydel Schemes investigated under U.N. Special Fund Assistance Programmes*

State	Scheme	Progress
A. Projects for which reports have been prepared		40 Nos.
ANDHRA PRADESH	1. Inchampalli	Investigations have been substantially completed, except for Survey of reservoir area lying in Maharashtra State which could not be completed due to objection from that State. Preliminary project report on the basis of investigations carried out has been framed.
ASSAM	2. Further stages of Umian Umtru	Preliminary investigations completed and preliminary project reports prepared.
	3. Kopili	Investigations completed and project reports prepared. Due to presence of lime stone caverns in the reservoir area, alternatives with less dam heights are being considered.
BIHAR	4. Basia	Investigations completed and feasibility report prepared. Detailed project report under preparation.
	5. North Karo II & III	
	6. Lower and Upper Sankh	Investigation completed and preliminary project report prepared.
GUJARAT	7. Narmada	Investigations have been completed and project proposals formulated. The project report will be finalised when inter-state agreement is reached.
	8. Damanganga	Investigation completed and project report prepared.
KERALA	9. Kerala Bhawani	Preliminary investigations and surveys of head works carried out. Preliminary project report prepared.
	10. Kakkad	The project report prepared.
	11. Lower Periyar	Investigations completed and preliminary project report prepared.

State	Scheme	Progress
	12. Mananthody	Preliminary surveys of the scheme completed and preliminary project report prepared.
MADHYA PRADESH	13. Bodhghat	Project investigations completed and project report prepared and submitted to C.W.&P.C.
	14. Ken	Investigations completed and the report is stated to have been prepared.
MADHYA PRADESH	15 & 16. Demba & Hurma	Investigations completed. Project report for the Demba (Banasagar) project prepared and submitted to C.W.&P.C.
	17. Oreha	Investigations substantially completed and report is stated to have been prepared.
MAHARASHTRA	18. Vaitarna State II	Investigations completed and project report prepared.
	19. Tillari	Investigations completed and project report prepared and submitted to C.W. & P.C. Project sanctioned for implementation.
	20. Bhandharadhara	Investigations completed and project report prepared & submitted to C.W.&P.C.
MYSORE	21. Kalinadi	Investigations are substantially completed. Stage-I of the project under execution. Project report for Stage-II also prepared and project awaiting sanction.
	22. Varahi	Surveys and investigations completed and preliminary project report prepared.
	23. Bedti	Investigations are in advanced stage. The project report of Stage I completed and a preliminary note on State-II has been prepared
	24. Aghanashini	Investigations are in an advance stage. A preliminary report is reported to have been framed.
ORISSA	25. Tikkarpara 26. Gania (Manibhandaa) 27. Tulsipur- 28. Tangi	{ No progress reports received from State. A project report on Tikkarpara & Manibhadra was received from the State. In this report the Tulsipur & Tangi power stations are also indicated.

State	Scheme	Progress
	29. Indravathy	Preliminary investigations completed and preliminary report prepared.
	30. Upper Kolab	Preliminary investigations completed and preliminary report prepared.
	31. Bhimkund	The preliminary investigations completed and preliminary report prepared. Revised project report has also been prepared.
PUNJAB	32. Thein	Investigations have been completed. Projects report prepared and submitted to C.W. & P.C. Awaiting sanction pending clearance of inter-state aspects.
RAJASTHAN	33. Mahi	Investigations completed and report prepared.
TAMIL NADU	34. Upper Thambraparni	Investigations completed. Projects report for part development viz. Mundanthorai Unit (30 MW) prepared and submitted to C.W. & P.C. Project report for the balance development under preparation.
	35. Pandiyar Punnapuzha	Investigations completed. Project sanctioned for implementation. However, the scope of the project is currently under review by the Tamil Nadu authorities, with a view to diverting the waters to the neighbouring Bhavani basin for irrigation, incidentally utilising a head of about 1200 ft. for power generation against 2650 ft. (1650 ft. in Tamil Nadu and 1000 ft. in Kerala) proposed under the sanctioned scheme. Concurrence of Kerala to the above proposal is also to be obtained.
UTTAR PRADESH	36. Kishau	Investigations at Kishau site have been completed and project report prepared.
	37. Tehri	Investigations completed and project report prepared. Project sanctioned for implementation.



State	Scheme	Progress
	38+39. Rajghat Dhurwara	Investigations have been completed and the report prepared. It is on the Betwa, an inter-state river and the project features can be finalised only after the sharing of water available between Uttar Pradesh and M.P. is decided.
	40. Pencheshwar . . .	Investigations completed and the preliminary project report prepared.
<b>B. Projects on which investigations have been completed not, found technically feasible.</b>		
2 Nos.		
MAHARASHTRA . . .	1. Venna . . .	Investigations completed and it was found that the scheme is technically not feasible since foundations are on laterite formation.
UTTAR PRADESH . . .	2. Koteswar Shivpur . . .	Investigations have been completed and have revealed that the scheme as conceived is not technically feasible and hence dropped.
<b>C. Projects requiring inter-state settlement . . . . . 2 Nos.;</b>		
ANDHRA PRADESH . . .	1. Pranhita . . .	Investigations in an advanced stage. The Maharashtra State has objected to the Survey and investigation of this project in their area. The investigation work is therefore, confined to Andhra Pradesh only.
UTTAR PRADESH . . .	2 Harr . . .	This project can be investigated only after the quantum of water available from the Upstream Demba (Bansagar) project in M.P. is fixed.
<b>D. Projects on which reports are expected to be completed by 1973-74 . . . . . 6 Nos.</b>		
BIHAR . . . . .	1. Nimtoli . . .	Investigations have been substantially completed.
KERALA . . . . .	2. Periniakutty . . .	Investigations are in progress. The project report is expected to be framed by 1973-74.
	3. Chalipuzha . . .	Investigations are in progress and are programmed to be completed in 1973-74.
MYSORE	4. Cauvery . . .	Investigations are in progress. According to the latest progress report, the investigations and project report are expected to be completed by 1973-74.

State	Scheme	Progress
	5. Barapole.	Preliminary investigations of the project have been completed. The detailed investigations are programmed to be completed by December, 1973.
	6. Mahadayi	Preliminary surveys and detailed investigations of head works are in progress. Investigations are likely to be completed in 1973-74.
<b>E. Projects for which target dates of completion of investigations, Project reports not fixed by the States</b> . . . . . 12 Nos.		
BIHAR . . . . .	1 North Koel . . . . .	It is an irrigation scheme, the project report of which has been prepared by the State Irrigation Department. Investigation of the Water Conductor system and power house has been taken up.
	2. South Kare . . . . .	Preliminary surveys and geological exploration substantially completed.
MADHYA PRADESH . . . . .	3. Chitrakot . . . . .	The investigations are in an advanced stage. Target dates of completion of detailed investigations are not fixed by State Electricity Board since priority is given to other projects.
	4. Kutru . . . . .	Investigations are in progress
	5. Majimandri . . . . .	Only preliminary surveys of the project are taken up by the State Electricity Board. Programme of investigations not yet been finalised.
	6. Kanhar . . . . .	Excepting for carrying out preliminary surveys for this project there had been no progress of investigations of this scheme. Progress and programme of investigations not reported by the State.
	7. Konta . . . . .	Preliminary surveys of this scheme has been completed and part of the detailed investigations are also completed. Programme of investigations are not reported by the State.
ORISSA . . . . .	8. Tikra . . . . .	Only preliminary surveys are completed. The programme of investigations not submitted by the State.

State	Scheme	Progress
RAJASTHAN	9. Barakot . . .	Investigations have been taken up. Programme of investigation not reported by the State.
	10. Lower Kolab . . .	Programme of investigations not reported by the State.
	11. Anas . . .	Investigations were in progress but they are suspended from January, 1971 as reported by the State.
	12. Wakkal . . .	Preliminary investigations were in progress but they are suspended from January, 1971 as reported by the State.

**APPENDIX X**

*(Vide para 4.59)*

*Continuing, extensions and new Hydro-electric Schemes from which benefits are expected during Fifth Plan.*

Scheme	State
<b>NORTHERN REGION</b>	
<i>(i) Continuing Schemes</i>	
1. Dehar . . . . .	Punjab, Haryana, Rajasthan
2. Pong . . . . .	Do.
3. Yamuna Stage II (Khodri) . . . . .	Uttar Pradesh
4. Yamuna Stage IV* . . . . .	Uttar Pradesh
5. Ramganga . . . . .	Uttar Pradesh
6. Maneri Stage I . . . . .	Uttar Pradesh
7. Lower Jhelum . . . . .	Jammu & Kashmir
8. Giri* . . . . .	Himachal Pradesh
9. Siul* . . . . .	Central Project in Himachal Pradesh
10. Salal . . . . .	Central Project in Jammu & Kashmir.
<i>(ii) Extensions &amp; New Schemes</i>	
1. Shanana Extn.* . . . . .	Punjab
2. U.B.D.C. Extn.* . . . . .	Punjab
3. Western Yamuna Canal* . . . . .	Haryana
4. Anandpur Sahib* . . . . .	Punjab
5. Maneri St. II . . . . .	Uttar Pradesh
6. Vishnuprayag . . . . .	Uttar Pradesh
7. Kangan* . . . . .	Jammu & Kashmir
8. Gangabal* . . . . .	Jammu & Kashmir
9. Kishtwar . . . . .	Central Project in Jammu & Kashmir.

Scheme	State
<b>WESTERN REGION</b>	
<i>(i) Continuing Schemes</i>	
1. Ukai . . . . .	Gujarat
2. Kadana Pumped Storage . . . . .	Gujarat
3. Koyna St. III . . . . .	Maharashtra
4. Bhira Tail-race . . . . .	Maharashtra
5. Paithan* . . . . .	Maharashtra
6. Tijari* . . . . .	Maharashtra
<i>(ii) New Schemes</i>	
1. Pumped Storage . . . . .	Maharashtra
2. Kas/Pawna . . . . .	Maharashtra
3. Chitrakot . . . . .	Madhya Pradesh
4. Bodhghat . . . . .	Madhya Pradesh
5. Narmada Development . . . . .	Gujarat
6. Narmada Development . . . . .	Madhya Pradesh
7. Dudhsagar . . . . .	Goa
<b>SOUTHERN REGION</b>	
<i>(i) Continuing Schemes</i>	
1. Lower Sileru . . . . .	Andhra Pradesh
2. Srisaïlam . . . . .	Andhra Pradesh
3. Nagarjunasaagr Pumped Storage . . . . .	Andhra Pradesh
4. Kundah St. IV . . . . .	Tamil Nadu
5. Kadamparai Pumped Storage . . . . .	Tamil Nadu
6. Sharavati . . . . .	Mysore
7. Kalinadi . . . . .	Mysore
8. Idikki St. I . . . . .	Kerala
9. Silent Valley . . . . .	Kerala
<i>(ii) Extension and New Schemes</i>	
1. Upper Sileru . . . . .	Andhra Pradesh
2. Idikki St. II . . . . .	Kerala
3. Nagarjunasagar Pumped Storage Extns. . . . .	Andhra Pradesh

Scheme	State
4. Suriliar* . . . . .	Tamil Nadu
5. Upper Thambraparni* . . . . .	Tamil Nadu
6. Paracayar* . . . . .	Tamil Nadu
7. Cholati-puzha* . . . . .	Tamil Nadu/Kerala
8. Nellithorai* . . . . .	Tamil Nadu
9. Kajinadi Phase II . . . . .	Mysore
10. Linganamakki Dam* . . . . .	Mysore
11. Sharavathi Tailrace . . . . .	Mysore
12. Lower Periyar . . . . .	Kerala

## EASTERN REGION

(i) *Continuing Schemes*

1. Subarnarekha . . . . . Bihar
2. Balimela . . . . . Orissa

(ii) *Extensions & New Schemes*

1. Balimela Extn. . . . . Orissa
2. Pumped Storage . . . . . D.V.C.
3. Koel Karo . . . . . Bihar

## NORTH-EASTERN REGION

Kyrdenkulai . . . . . Meghalaya

(i) *Continuing Schemes*

1. Kyrdenkulai . . . . . Meghalaya
2. Loktak . . . . . Central Project in Manipur.

(ii) *New Schemes*

1. Loktak . . . . . Central Project in Manipur.
2. Umiam-Umkhen . . . . . Assam/Meghalaya
3. Kameng . . . . . Central Project in Arunachal Pradesh.
4. Small Schemes . . . . . Do.

**Note :** 1. The CW&PC's Hydro-Electric Survey did not include pumped storage possibilities, as these do not constitute strictly sources of hydro-electric potential.

2. The CW&PC's Survey was based on specific major possibilities considered technically feasible and economically viable at the time of survey. It did not include schemes marked\* which did not come within the techno-economic limit. Most of these Schemes have relatively small energy potential and have been taken up or are being considered for providing valuable peaking capacity to the systems.

## APPENDIX XI

(Vide Para 8·32)

### List of Problems—Research Scheme on Power

*Nomenclature of problem*

*Research unit to which allotted*

#### PROBLEM I—LIGHTNING STUDIES

- (i) Study of Incidence of storms and lightning on Power Systems/To record frequency and measure the severity of lightning strokes.
1. Andhra Pradesh State Electricity Board.
  2. Assam State Electricity Board.
  3. Kerala State Electricity Board.
  4. Maharashtra State Electricity Board.
  5. Mysore State Electricity Board.
  6. Orissa State Electricity Board.
  7. Punjab State Electricity Board.
  8. Rajasthan State Electricity Board.
  9. West Bengal State Electricity Board.
- (ii) Functional evaluation of lightning protection facilities on 11 kV distribution system.
1. Kerala State Electricity Board.
- (iii) Study of lightning surges and performance of lightning arresters.
1. Bihar State Electricity Board.

#### PROBLEM II—SOIL RESISTIVITY

- (i) Study of Soil Resistivity
1. Tripura Government Research unit.
- (ii) To collect geological data, measure resistivity of earth and seasonal variation of the same.

#### PROBLEM III—TRANSMISSION LINE PROBLEMS

- (i) Study of insulator contamination/Evaluating the performance of insulators and lightning arresters for operation in polluted atmosphere.
1. Andhra Pradesh State Electricity Board.
  2. Bihar State Electricity Board.
  3. Gujarat State Electricity Board.
  4. Orissa State Electricity Board.
  5. Tamil Nadu Electricity Board.
  6. High Voltage Engineering Department, Indian Instt. of Sc. Bangalore.
- (ii) Study of vibration of conductors in transmission lines.
1. Punjab State Electricity Board.
  2. Rajasthan State Electricity Board.
  3. Tamil Nadu Electricity Board.

- (iii) 400 kV Experimental Line . 1. Highvoltage Engg. Department (I.I.Sc. Bangalore).
- (iv) Transmission line support design. 1. Rajasthan State Electricity Board.
- (v) Choice of insulation level in 400 kV transmission lines and network. 1. Highvoltage Engg. Department (I.I.Sc. Bangalore.)
- (vi) Investigation of the Amount and Effects of Heat produced in Steel Reinforcement in Concrete Structures, Bush-bars carrying Heavy Currents. 1. Roorkee University.
- (vii) Temperature rise in overhead line conductors. 1. Tamil Nadu Electricity Board.
- (viii) Control of bushes and shrubs growing under transmission lines by chemical spray methods. 1. Orissa State Electricity Board.
- (ix) Evaluation of fault currents in different sections of power system during outage conditions on vulnerable line sections. 1. Kerala State Electricity Board.

#### PROBLEM IV—TRANSFORMER OIL DETERIORATION AND RECLAMATION

- (i) Study of Transformer Oil Deterioration and Reclamation. 1. Tamil Nadu Electricity Board.

#### PROBLEM V—CORROSION STUDIES IN CONDUCTORS, TOWERS, CABLE, SHEATHS, PENSTOCKS ETC.

- (i) Corrosion and Tuberculation in Penstocks. 1. Tamil Nadu Electricity Board.
- (ii) Study of corrosion of buried steel work/ Study of the extent of rusting of embodied structures of towers and other metallic supports. 1. Bihar State Electricity Board.  
2. Punjab State Electricity Board.
- (iii) Study of corrosion of ferrous and non-ferrous metals in natural and artificially treated soils. 1. Mysore State Electricity Board.
- (iv) Corrosion in insulator fittings . 1. Tamil Nadu Electricity Board.

#### PROBLEM VI.—INSULATION STUDIES OF POWER EQUIPMENT

- (i) To study insulation of equipments under operating conditions. 1. Andhra Pradesh State Elec. Board.  
2. Mysore State Electricity Board.  
3. Tamil Nadu Electricity Board.
- (ii) Studies on liquid dielectrics (Natural ester like castor oil, cotton seed oil, etc.) 1. Highvoltage Engg. Department (I.I.Sc. Bangalore).

#### PROBLEM VII—RURAL ELECTRIFICATION

- (i) Study of wood and jointed poles for rural electrification 1. Himachal Pradesh State Electricity Board.  
2. Madhya Pradesh Electricity Board.



- (ii) Investigation of problems with regard to the use of earth as return on single phase rural distribution system/Study of methods of cheap and reliable rural line construction.
1. Mysore State Electricity Board.
  2. West Bengal State Electricity Board.
  3. Assam State Electricity Board.
- (iii) Improvement in continuity of Power Supply.
1. Haryana State Electricity Board.
- (iv) Voltage regulation and improvement of voltage conditions in distribution systems Study of distribution problems viz., losses, voltage regulation and application of capacitors.
1. Haryana State Electricity Board.
  2. West Bengal State Electricity Board.
- (v) Study and development of cheap protective devices for 11 kV rural feeders and  
Study of definite time current characteristics of out-door fuses for various weather conditions.
1. Bihar State Electricity Board.
- (vi) Methods of economising in rural electrification works.
1. Tamil Nadu Electricity Board.
- (vii) Use of insulated ground wire of H.V. transmission line for single phase distribution and also for direct tapping of power.
1. Madhya Pradesh Electricity Board.
  2. West Bengal State Electricity Board.

#### PROBLEM VIII—THERMAL STATIONS

- (i) Study of feed and cooling water treatment in Thermal Stations
1. Maharashtra State Electricity Board.
- (ii) Developmental work relating to elimination of failure of condenser tubes in large Power Houses.
1. Gujarat State Electricity Board.
- (iii) Study of burning of high ash content coal.
1. Madhya Pradesh State Electricity Board.

#### PROBLEM IX—DEVELOPMENT OF INSTRUMENTS AND INDIGENOUS MANUFACTURE OF MATERIALS

- (i) Development of 2 Million volts Vaned-graaf Generator for Polymerisation studies on insulating materials.
1. H. V. Engineering Department, (I. I. Sc., Bangalore).
- (ii) Determination of number and location of lightning arresters in a multi-circuit sub-stations.
1. West Bengal State Electricity Board.
- (iii) Design development and construction of an electronic differential analyser.
1. Electrical Engg. Department, (I. I. Sc., Bangalore)
- (iv) Development of Computer programming for Power System Problems.
1. Electrical Engg. Department, (I. I. Sc., Bangalore).
- (v) Lightning arrester application for EHV—400 kV.
1. H. V. Engineering Department, (I. I. Sc., Bangalore).
- (vi) Isolators using Aluminium contacts.
1. H. V. Engineering Department, (I. I. Sc., Bangalore).

- (vii) Improvement of speech in telephone lines running along transmission lines/Inductive interference and corona on telephone lines and PLC equipment.
1. Andhra Pradesh State Electricity Board.
  2. Mysore State Electricity Board.
  3. West Bengal State Electricity Board.
- (viii) Development of N.R.C. explosion and drop out Power Fuses/Development of simulated fault testing for standardisation of 11 & 33 kV H.G. and drop out fuses to be used where fault level is below 50 MVA.
1. Mysore State Electricity Board.
- (ix) Development of voltage time characteristics for rod gaps, bushing, insulators strings, etc.
1. H. V. Engineering Department, (I. I. Sc., Bangalore).
- (x) Use of silicon controlled rectifiers for H.V.D.C. transmission and protection of H.V.D.C. lines and equipment.
1. Roorkee University.
- (xi) Development of instrumentation applied to power system studies and automatic control.
1. Roorkee University.
- (xii) Development of Relays
1. Elec. Engg. Department, (I.I.Sc., Bangalore).
- (xiii) Control co-ordination for dynamic stability of an inter-connected system.
1. Roorkee University.
- (xiv) Transient stability studies of power systems by dynamic modelling.
1. Roorkee University.
- (xv) Radio interference measurements on insulators and hardware in the design of 400 kV lines.
1. H. V. Department (I. I. Sc., Bangalore).
- (xvi) Design, Development and construction of a Solid State Hybrid Computer.
1. Elec. Engg. Department (I.I.Sc., Bangalore).
- (xvii) Development of Solid State Excitation System for Synchronous Machines.
1. Elec. Engg. Deptt. (I.I.Sc., Bangalore)
- (xviii) Development of current limiters and upgrading of capacitors for C.B.
1. Mysore State Electricity Board.

#### PROBLEM X—PATTERN OF POWER SYSTEM LOSSES

- (i) General Study in system losses/To study the line interruptions and improvement of power factor and line losses
1. Assam Electricity Board.
  2. Haryana State Electricity Board.
  3. Maharashtra State Electricity Board.
  4. Orissa State Electricity Board.

#### PROBLEM XI—PROBLEMS FOR EARTHING IN POWER SYSTEMS

- (i) Study of Earthing practices.
1. Rajasthan State Electricity Board.

## PROBLEM XII—HYDRO-STATIONS

- (i) Field study of cavitation in turbines and to suggest Remedial measures I. Punjab State Electricity Board.
- (ii) Induced melting of snow by spraying of coal dust. I. Himachal Pradesh Electricity Board.
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## APPENDIX XII

*Statement showing summary of Recommendation*

Sl. No.	Reference to para No. of the Report	Summary of Recommendations
1	2	3
1	1.12	The Committee feel greatly concerned about the acute power shortage in the country which has been responsible for retarding the development of the country's economy both in the industrial and agricultural sectors.
2.	1.13	The Committee are perturbed over the State of helplessness exhibited by the Ministry in regard to solving the problem of power shortage in the country. They would, therefore, urge that the problem calls for immediate attention and recommend that a crash programme for meeting the power shortage should be devised at the highest level so that the development of the country's economy both in the industrial and agricultural fields may proceed and progress unhampered and uninterrupted.
3	2.24	The Committee note that Badarpur Thermal Power Project was sanctioned in the year 1967-68 at an estimated cost of Rs. 39.95 crores. The revised cost of the project had been estimated at about Rs. 55 crores. The increase has been attributed to a number of factors such as increase in the cost of boilers and Turbo Generators sets obtained from the indigenous manufactures (Rs. 925 lakhs), increase in the price of other plant and equipment (Rs. 300 lakhs), Civil Works (Rs. 200 lakhs), land acquisition (Rs. 36 lakhs) and design and engineering (Rs. 37 lakhs). The estimate though drawn up in 1965 was sanctioned in 1967.

1	2	3
4	2.25	The Committee further note that in the case of indigenous equipment the prices given by the manufacturers are usually the budgetary prices and not firm prices, and that delay in the completion of the project had further escalated the cost.
5	2.26	The Committee strongly feel that the whole estimate of the project was framed in a rather unrealistic manner. Low cost estimates are brought forward initially which ultimately not only prove inadequate but also result in delays in the execution of the projects. Unless this fact is recognised and better and more realistic estimates are prepared in the beginning, such delays are bound to occur. To avoid such situations, the Committee would like to stress the need for framing the estimates with a more realistic approach providing for annual escalations as far as possible so that the progress in the completion of the project is not held up for lack of funds.
6	2.27	The Committee note that delay in the execution of the project had been mainly attributed to delay in according administrative approval, delay in construction of the main power house building due to non-availability of the matching structural steel, contractors not adhering to the target dates of completion, delay in supply of plant and equipment, delay in the construction of railway siding and general shortage of scarce materials like cement, steel etc.
7	2.28	The Committee are distressed to note the manner in which the execution of the project which was taken up under the direct control of the Centre had been planned right from the beginning (1967). Cost of equipment alone supplied by the indigenous manufacturers had escalated the cost to the extent of Rs. 925 lakhs. There had been a year's delay in the completion of the Railway siding with the

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result that the equipment had to be transported by road. The Committee are constrained to observe that there had been complete lack of coordination among the various authorities concerned which could have been avoided with better planning and proper consultation to achieve better results and savings in expenditure.

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2.29

The Committee are unhappy over the unsatisfactory performance of the National Building Construction Corporation, National Projects Construction Corporation and Hindustan Housing Factory who had been awarded the contracts for undertaking the civil works in relation to the requirements of the project. There had been slippage from the original schedule. Considerable delays in the construction of civil works nullified the targeted acceleration of the project and escalated the cost. It is strange that the works awarded to these public undertakings were delayed for periods between 13 to 30 months. The Committee would like the Government to examine the question of taking action under the penal clauses of the agreements entered into with these undertakings and apprise them of the result of action taken in the matter.

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2.30

The Committee also regret to note that M/s. Bharat Sewak Samaj who were also awarded the contract for civil works delayed the civil works by 16 months and were granted as many as 15 extensions of time. The Committee would urge that in this case also Government may examine the question of taking suitable action under the penal clauses of the agreement entered into with the Bharat Sewak Samaj.

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2.31

The Committee note that the first unit of the project is likely to get into commercial operation by July/August, 1973 as against the target of 1971-72. The Committee hope that Government would take effective steps to ensure that the

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target flow set for the commissioning of the first unit would be adhered to.

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2.32

The Committee during an informal visit to Badarpur Project were informed of the difficulties which were being experienced by the project authorities in the day to day working of the project for want of adequate financial powers. The Committee recommend that the existing schedule of delegation of the powers to the Chief Executive of the project should be reviewed in detail in consultation with the Chief Executive of the project, Ministry of Finance, etc. so as to ensure that he has adequate powers for delivering the goods.

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2.33

It was also brought to the notice of the Committee that after the Board of Control have gone into various issues and come to a decision the communication of formal approval from the concerned Department/Ministries takes unduly long time. The Committee feel that since the object of having senior representatives of various Ministries/Departments on the Board of Control is to facilitate decision making and to give them opportunities to know first-hand the background of the relevant issues involved, there should be no delay in issuing formal approval by the authorities concerned. The Committee would like Government at the highest level to review the existing procedure which is being followed in processing the formal references which are received from the project authorities in implementation of the decisions taken by the Board of Control with a view to streamline the procedure and cut out all delays. The Committee need hardly point out that where a matter needs further elucidation, this can best be done by either seeking comprehensive written information in order to dispose of the matter finally or by convening a meeting at a sufficiently high level to resolve and finalise the matter.

1	2	3
13	2.51	<p>The Committee note that the Baira Siul Hydro Project and the Loktak Hydro Electric Project are other instances where due to unrealistic estimates framed initially there had been steep rise in the costs of the projects. In the case of Baira Siul Hydro Project, the escalation in the cost was expected to be Rs. 20.11 crores whereas in the case of Loktak Hydro Electric Project the rise in the cost was expected to be Rs. 13.04 crores.</p> <p>The Committee have already emphasised the need for a more realistic approach in framing the estimates keeping in view the likely annual escalation in the costs so that there was smooth execution of the projects and the projects were not held up for lack of finances. The Committee feel that the whole system of scrutinising the original estimates framed by the various agencies might be reviewed and guide-lines laid down with a view to streamlining the procedure to ensure that the estimates were framed on a more realistic basis based on the actual contracts.</p>
14	2.52	<p>The Committee are surprised that the projects were taken up without ensuring that the infrastructure (<i>viz.</i> roads, bridges etc.) was there and that the estimates were prepared on the presumption that certain approach roads would be there resulting in inflation of project cost. This again goes to show lack of proper planning and coordination between the Centre and the State Governments concerned.</p>
15	2.53	<p>The Committee are also unhappy to note that the first unit of the Baira Siul Project which was originally scheduled to be commissioned in 1974 has been delayed for a year and is now expected to be commissioned in 1975. They, however, hope that the revised target would be adhered to and that there is no further postponement.</p>



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| 16 | 2.54 | The Committee would like the Government to impress upon the State Government concerned to expedite the completion of the approach roads and bridges and also to take positive measures to ensure that the first unit of the Project is commissioned according to the revised schedule.  |
| 17 | 2.60 | The Committee note that the scheme for expansion of Thermal Stations at Korba and Anarkantak has since been cleared by the Planning Commission. The Committee also note that other three projects viz., Bodhghat Project, Harinphal Hydel Project and Maheshwar Hydel Project in Madhya Pradesh are pending at various stages with the Ministry of Irrigation and Power. The Committee desire that the clearance of these projects may also be expedited by taking effective action in consultation with the State Governments and the Planning Commission. |
| 18 | 2.61 | The Committee further note the Projects/ Schemes in various regions pending approval of the Planning Commission. The Committee cannot appreciate the slow progress in according the approval by the Planning Commission as most of these projects were accepted by the Advisory Committee more than a year ago. The Committee would urge that necessary steps should be taken to finalise these projects expeditiously.   |
| 19 | 2.63 | The Committee note that in the case of most of the power projects at present under execution the civil works are either progressing or are nearing completion. The Committee would, however, like to stress that the progress of these projects should be closely watched and effective measures taken wherever necessary to remove the bottlenecks with a view to ensuring the completion of the projects according to schedule.   |
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20	2.64	<p>The Committee would also like to emphasise that in respect of the projects on which work is yet to start, effective steps should be taken to ensure that the work on these projects is also taken up without further delay so that they are commissioned according to the schedule.</p>
21	2.66	<p>The Committee note that fifty-nine schemes with an aggregate installed capacity of 13.55 MKW in various regions are currently under examination by the Central Water and Power Commission at various stages. Most of these schemes were referred to the Central Water and Power Commission more than 3 years ago. The Committee cannot appreciate the slow progress in examining these schemes. The Committee would, therefore, strongly urge that, in view of the general power shortage in the country, effective steps should be taken to ensure that the schemes in question are finalised without further delay, as a scheme normally takes five to seven years for execution.</p>
22	2.73	<p>The Committee note that 12 new schemes with a total capacity of 6910 MW are expected to be taken up by Government during the Fifth Plan period. The Committee hope that in view of the fact that it takes several years for a scheme to get commissioned, advance planning action in regard thereto would be taken expeditiously so as to ensure that the schemes/projects are commissioned according to schedule.</p>
23	2.74	<p>The Committee feel that it is imperative that all the new power generation schemes proposed for implementation in the Fifth Plan are formally got sanctioned by the Planning Commission expeditiously and necessary funds for advance action made available during 1973-74 for all these schemes. The Committee need hardly emphasise the need for continuous sanction of the schemes as the piling and bunching of orders would make</p>

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it difficult for the indigenous manufacturing plants to manufacture and supply the plant and equipment in time for the different projects and would inevitably result in need for more imports of plant and equipment which would mean a drain on foreign exchange which has to be avoided at all costs.

- 24      3.44      The Committee note that the Fourth Five Year Plan envisaged augmentation of installed power generating capacity from 14.3 million KW to 23.1 million KW. They are, however, deeply concerned to find that there is likely to be a shortfall to the tune of about 3.5 million KW during the Fourth Plan period.
- 25      3.45      The Committee are distressed to note that none of the power plans had achieved the targets envisaged. The First Plan was designed to add 1.40 MKW of power, the second 3.48 MKW, the third 7.04 MKW, the three annual plans (1966—69) 6.88 MKW, and the first three years (1969—72) of the Fourth Plan 4.13 MKW. The actual achievement during the plan periods was 1.12 MKW, 2.73 MKW, 4.52 MKW, 4.12 MKW and 2.60 MKW, which works out a shortfall percentage of 20, 36, 35, 38 and 37 respectively
- 26      3.46      The Committee note that the shortfall in the plan has been mainly attributed to delay in the supply of equipment by indigenous manufacturers, non-availability of essential raw materials like steel, coal, cement etc. to the required extent and delay in the receipt of replacement parts from abroad. Delay in delivery of main equipment by HEIL/BHEL as well as civil works alone has resulted in shortfall to the extent of 3.25 MKW during the Fourth Plan period.
- 27      3.47      The Committee strongly feel that there is lack of proper planning and coordination
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between the Centre and the States in the matter of execution of the various projects undertaken by the State Governments and between the various agencies like N.C.D.C., BHEL and HEIL, resulting in delays in supply of raw material and equipment.

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3.48

The Committee observe that it has been admitted that grouping of projects by plan periods of 5 years has not achieved the desired results. The gestation period of a hydro, thermal or nuclear power plant is anything from 4 to 10 years. The second part of the ten year period is normally the part when the construction as planned would be coming in. The Committee, therefore, feel that the planning and execution of power projects should be a continuous process wherein a complete picture of targets to be achieved is always available in outline, and details are filled in as years progress. The Committee are in full agreement with the recommendation of the Power Economy Committee Report to the effect that advance action in respect of preliminary investigations and designs and estimates should be on a more definite basis and indicate the specific project to be undertaken and their time-table of the major stages. The plans and estimates for the first 5—7 years should be on a very definite basis at any time and prepared after detailed investigations so that any material change in estimates is avoided.

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3.49

The Committee note that power is a basic infra-structure for building up the country's economic growth and development, and that shortfall in power impedes growth in the industrial and agricultural sectors.

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The Committee, therefore, feel that there is need of a well-coordinated programme for power development correlated with the growth of industry, agriculture and other sectors which consume it.

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31	3.51	The Committee recommended that having regard to the serious power shortage in the country, power should be given the highest priority next only to the operational needs of defence in the matter of allocation of funds and essential raw materials like steel, cement, coal etc. in the interest of economic development of the nation.
32	3.52	The Committee feel that as the power supply industry is capital intensive and the cost per kilowatt installed both for generation, transmission and distribution is increasing rapidly, it is important that the plan allocations are made in a more rational manner so as not to involve any significant variation in cost or time when implementation is taken up. The committee would in this connection reiterate their earlier recommendation made by them in their Thirtieth Report, 1962-63 (Third Lok Sabha) which is reproduced below:—  “Since the cost of installing 1 KW of electric power is but a fraction of the capital investment required to utilise it, it is obvious that if in any eventuality power generating capacity was under-utilised, it would entail less overall loss to national economy than would be the case if productive machinery was to be rendered idle on account of power deficit. Past experience, in India and other countries, clearly shows that in a developing economy the demand for power nearly always outruns the available supply. Planning for surplus powers, therefore, essential for achieving an optimum rate of growth in the country. The Committee strongly recommend that power being a primary source of energy should be one step ahead of industrial and other requirements.”

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33	3.53	The Committee are of the view that for the successful planning and implementation of power development it is necessary that a long range plan extending over a period of 10 to 15 years based upon realistic estimates of demand, optimal mix of hydro steam and nuclear generation, with adequate transmission system, taking into account the regional power system condition from time to time should be formulated.
34	3.54	The Committee are of the opinion that a scientific evaluation of projects should be made after a comparison of advantages of the alternative sources of energy fuel—hydro, thermal and nuclear—and combination of them.
35	3.55	The Committee feel that an assessment of the indigenous machine building and design capacities and the time required for fabrication and delivery should be made with a view to planning imports wherever indigenous capacity is not sufficient to meet the requirements.
36	3.56	The Committee are of the view that the projects included in any plan should be carefully scrutinised with a view to fixing a realistic target with reasonable possibility of achievement.
37	3.57	The Committee feel that there is need to have full and complete investigations carried out with regard to the project, funds required, schedule of construction programme together with the requirements of raw material and equipment etc. in consultation with all the authorities concerned with a view to minimise delay in the sanctioning of the project.
38	3.58	The Committee feel that the State Electricity Boards should be required to place their orders with the indigenous equipment-manufacturers sufficiently in advance.

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39	3.59	The Committee feel that the existing system of coordination should be reviewed thoroughly with a view to streamlining the existing procedure for scrutinising and sanctioning the projects and also to remove the bottlenecks, wherever they exist, in the implementation of the projects.
40	3.60	The Committee note that two teams of experts have been set up to visit different projects in the country both hydel and thermal. The Committee would like to be apprised of their findings and the recommendations suggestions made by them together with the action taken by Government thereon.
41	3.61	The Committee note the steps taken by the Ministry of Irrigation and Power to obviate delays in the delivery of equipment, civil works etc. The Committee would like a Project Implementation Cell to function at the Centre as well in each State in order to watch closely the progress made in the execution of the projects to suggest remedial measures.
42	3.62	The Committee are unhappy to note that 9 projects in various States whose targeted dates of commissioning ranged between 1970-71 to June 1972 are being spilled over to 1973-74 because of delay in the supply of equipment by BHEL and HEIL and due to delay in civil works. The Committee have already emphasised the need for proper coordination and have for this purpose suggested setting up a Project Implementation Cell. The Committee, however, desire that necessary remedial steps should be taken to ensure that these projects are commissioned according to the revised schedule.
43	3.63	The Committee note the short-term and long-term measures taken by Government to

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maximise the utilisation of available generating capacity by streamlining the operation of the existing power plants. The Committee would like to be apprised how far these measures have achieved the desired results.

- 44            3.64            The Committee are surprised to note that no inventory was being kept for spare parts and no data was being maintained to know the extent to which the power station suffered due to shut-downs for want of spares or due to inferior quality of coal so that financial implications could be gauged. The Committee would like to emphasise that a proper procedure should be devised whereby the requisite data could be collected and maintained which might be useful to devise suitable remedial measures.
- 45            3.69            The Committee note that the Power Economy Committee have stated that the BHEL should concentrate on the 200 MW Unit size and also develop 500 MW Unit within the next 7-10 years but with sub-critical steam pressures, and one or two such large units could be put in operation in one of the regions in order to obtain experience on the prototype so that these large units could be put into operation in other regions also from 1981 onwards.
- 46            3.70            The Committee note that Government have set up a committee to look into the question of evolving designs for 500 MW sets with a view to bring them into operation towards the end of the Fifth Plan.
- 47            3.71            The Committee would like to be informed of the concrete action taken in implementation of the above recommendations of the Power Economy Committee.
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48	3.82	The Committee regret to note that inferior quality of coal with heavy ash content, which is used by the Power plants, has seriously affected <b>their working.</b>
49	3.83	The Committee note that the recommendation made by the Technical Committee on Coal Washeries to make two stage washeries into three stage washeries to bring down the percentage of ash content in coal is under examination of the Government. The Committee would like the Government to examine the recommendation of the Technical Committee expeditiously and to take necessary steps to implement it as early as possible. In the meantime, the Committee would like to stress that better quality of coal, which does not contain abrasive material, should be used as far as possible with a view to minimise the outage of the auxiliaries and to achieve the optimum generating capacity of the plants, as has been done in the case of Patratu and Calcutta Electricity Supply Corporation.
50	3.98	The Committee note that power generation in the country has not by and large suffered because of lack of coal production but on account of <b>lack of coal supply</b> due to transport difficulties. The Committee further note that the coal production which had reached the figure of 76 million tonnes has fallen down to 71 million tonnes in 1969-70. They further note that the production is falling though there is a capacity built up for 85 to 90 million tonnes. Coal is there and it can be produced but the difficulty is of its moving.
51	3.99	The Committee would suggest that the Ministry of Railways (Railway Board) should arrange for enough wagons for transporting coal from the coal fields to the Thermal Power stations so that there is full utilisation of the generating capacity.

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52	3.100	<p>The Committee are greatly concerned to note that at a time when power is in acute short supply, some of the thermal stations have not been able to generate power to the maximum extent possible for want of assured supply of coal. The Committee feel that as coal has now been nationalised and the thermal stations are also in the public sector, there should be no difficulty in working out in detail the transport requirements of coal and for the Railways to provide the necessary transport on a regular basis in the larger national interests. The Committee cannot help feeling that the Control Room now set up in the Railway Board's office with representatives of the concerned Departments of Mining and Irrigation and Power etc. should have been constituted and made operative before power crisis assumed the present proportions.</p> <p>The Committee are happy to note that a Control Room has been set up in the Rail Bhawan consisting of the representatives of the Ministries of Railways, Steel and Mines and Irrigation and Power. The Committee hope that suitable remedial measures would be taken so as to obviate difficulties in regard to transport of coal. The Committee could also like to be apprised of the actual functioning of the Control Room in resolving the problem of coal supply.</p>
53	3.101	<p>The Committee note that the estimated coal demand of 21.43 million tonnes will go up to 24.43 million tonnes in 1973-74 and is further likely to go up to 65 million tonnes by 1978-79. They are, therefore, of the view that it will be necessary to step up production of coal in various collieries in public sector and private sector to meet these requirements.</p>

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54            3.102            The Committee note that having regard to fact that collection of the geological data and preparation of project report for additional capacity takes time and development of a mine takes 5 to 6 years, the lead time involved is 7 to 8 years. The Committee, therefore, feel that there is need to take action for planning and implementing the schemes for expansion of the coal fields so as to meet the projected requirement in time.

55            3.103            The Committee note that a committee has been formed to establish linkages of sources of supply for the power stations and this committee has so far finalised the linkages for power stations that would be in operation by 1976-77, for which the coal requirement has been assessed at 39.30 million tonnes. Out of this, it is estimated that 27.58 million tonnes would require rail movement. There would be additional requirement of coal of the order of 26.30 million tonnes for the additional schemes in the draft Fifth Plan proposals. Of this 15.48 million tonnes would involve additional rail movement. Thus it is estimated that about 43 million tonnes of coal would involve rail movement by the end of the Fifth Plan. The Committee would, therefore, suggest that advance planning of rail facilities would be essential for the projected movements.

They would like this work to be done in great detail for the Fifth Plan so that Railways take necessary action in time and in an integrated manner to provide the requisite transport facilities on assured basis.

56            3.104            The Committee agree that with large power stations, each requiring at least 2 to 5 full train loads of coal every day, the methods of mining, loading and unloading as well as transport will

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have to be revolutionised, introducing the latest modern techniques for efficiency and economy. Unit trains, from specified mines for the power station may become essential features of the future set up. The Committee would suggest that Government should carefully consider the administrative machinery and organization for catering to these requirements and initiate advance action for these developments.

- 57        3.105        The Committee agree that sea transport may have to be adopted particularly for fuel supply to the coastal power stations which is estimated to be of the order of 2 millions tonnes and suitable freight structure evolved so that as compared to the freight cost from the nearest coal field power stations are not put to extra expenses.
- 58        3.106        In view of the fact that transport charges for coal are bound to be heavy and the fact that a national grid is being progressively developed in the country, the Committee would like Government to examine most carefully whether it would not be in the larger economic interests to locate the new thermal stations at the pit-heads.
- 59        3.107        The Committee stress that the decision should be taken in each case after most careful consideration so that power is generated and supplied at a most competitive rate to the public.
- 60        3.148        The Committee are unhappy to note that one of the reasons for the shortfall of power as compared to capacity targets was the delay in the delivery of plant and equipment by the BHEL and HEIL which were two important undertakings in the public sector.
- 61        3.149        The Committee are greatly distressed to note that in spite of the stress laid earlier by the Estimates Committee and the Committee on Public

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		<p>Undertakings, as far back as 1962-63 and 1971-72 respectively, on close coordination and integrated plan for manufacture of generating sets to match the plan requirements, there has been no tangible achievement in coordinating closely the working of these undertakings with the authorities responsible for power development in the country. The Committee, therefore, feel that a sense of participation and involvement in the planned development of power leaves much to be desired.</p>
62	3.150	<p>The Committee have elsewhere in this Report commented upon the delay in the delivery of main equipment by HEIL/BHEL as well as civil works which alone resulted in shortfall to the extent of 3.25 MKW during the Fourth Plan.</p>
63	3.151	<p>They note that the Committee on Public Undertakings had occasion to examine the Heavy Electricals (India) Ltd., and Bharat Heavy Electricals Ltd., and had recommended in their 19th and 21st Reports (Fifth Lok Sabha) that Government should consider the question of transferring the administrative control of these two undertakings from the Ministry of Industrial Development to the Ministry of Irrigation and Power as the latter are the main users of the power machinery. Since then a new Ministry of Heavy Industry has been constituted at the Centre, and the two Public Undertakings—Heavy Electricals (India) Ltd., and Bharat Heavy Electricals Ltd., have been transferred to this new Ministry. The Committee would like to bring pointedly to the notice of Government that there continue to be heavy delays in delivery of machinery and equipment to the State Electricity Boards by the Heavy Electrical Industries with the result that the power generation</p>

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		<p>programme in the Fourth Plan has greatly suffered. The Committee would like Government to ensure that advance orders for generating sets and other machinery are placed on these undertakings and that every effort is made to adhere to the time schedule for delivery. The Committee would also like members of CWPC who are represented as Directors on these undertakings to keep a close watch on the manufacturing programme of these undertakings in order to see that the delivery schedules are strictly adhered to.</p>
64	3.152	<p>The Committee have also expressed their unhappiness over the 9 projects in various States whose targeted dates of commissioning ranged between 1970-71 to June 1972 being spilled over to 1973-74 because of delay in the supply of equipment by BHEL/HEIL and delay in the civil works.</p>
65	3.153	<p>The Committee need hardly emphasise that close and continued coordination between the organisations charged with the responsibility for power development in the country and the manufacture of plant and equipment at all levels is vital in the context of rising demand not only from the traditional users in the industrial sector but also from the agricultural sector and rural areas.</p>
66	3.154	<p>The Committee, therefore, feel that in view of the experience gained, it is high time that the existing arrangements for coordination at all levels are reviewed in their entirety with a view to gearing up the machinery and streamlining the whole arrangement to ensure that the delivery of plant and equipment and other raw materials are according to the schedule so as to ensure smooth and uninterrupted progress in the power development programme.</p>

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- 67      3.155      The Committee need hardly stress that any shortfall in the achievement of programmed targets would seriously affect the growth of both the industrial and agricultural sectors resulting in a setback in the country's economic growth.
- 68      3.156      The Committee are unhappy to note that as against 45 hydro-generating machines (2.1 mkw generating capacity) and 30 thermal sets (2.6 mkw generating capacity) only 11 hydro units (totalling 0.31 mkw) and 16 thermal sets (totalling 1.23 mkw) had been supplied by the indigenous manufacturers and the indigenous plans aggregating to about 2.7 mkw would spill over to the Fifth Plan.
- 69      3.157      The Committee regret to note that out of the 54 thermal sets (totalling 6100 M.W.) and 79 hydro sets (totalling 4749 M.W.) ordered with the different units of BHEL/HEIL, only sets aggregating to a capacity of about 1500 M.W. had been delivered so far, and the remaining sets aggregating to the capacity of 9349 M.W. are proposed to be supplied in a phased annual programme upto 1977-78. The Committee hope that the remaining generating sets would be delivered by BHEL/HEIL according to the schedule.
- 70      3.158      The Committee note that a Committee of Ministers headed by the Minister of Finance and Power, U.P. had been constituted to assess the capability of indigenous manufacturers to deliver the equipment required for the power generation programme of the Fifth Plan and to obviate delay in the delivery of the equipment. The Committee would like to be apprised of the recommendation/suggestion made by the said Committee and the action taken by Government thereon.
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71	3.159	The Committee note that apart from the aforesaid Committee, the Ministry of Irrigation and Power had constituted another Committee to watch the progress of manufacture and supply of power generating equipment by HEIL/BHEL under the Chairmanship of the Vice-President, Central Water and Power Commission. The Committee would like to be apprised of the results achieved.
72	3.160	The Committee note that the requirements of steel and cement have been assessed for the Fifth Plan generation programme. The Committee desire that timely action should be taken to place the requirements with the suppliers well in time and the progress of supply orders watched closely to ensure the delivery according to schedule.
73	3.161	The Committee are surprised to find that while on the one hand late delivery of plant and equipment by BHEL/HEIL has been attributed as one of the major reasons for the shortfall in the projected targets and completion of the projects according to schedule, on the other hand it has been claimed by the Ministry of Industrial Development that no orders were refused for want of capacity and that the flow of orders was erratic. The Committee have already emphasised the desirability of placing firm and continuous flow of orders with the indigenous equipment manufacturers well in advance to obviate delay in their delivery.
74	3.162	The Committee are unhappy to note that the plant and equipment imported in certain cases was still lying idle for more than two years due to some organisational difficulties required to be solved. This again goes to show faulty planning on the part of the planners. The Committee

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		would like to reiterate the desirability of reorganising all the segments in the electricity industry, the project management, monitoring and purchasing systems etc. so as to follow a streamlined procedure.
75	3.163	The Committee desire that immediate steps should be taken to ensure that the plant and equipment lying idle are put to use without delay and the Committee apprised of the final position in this regard.
76	3.164	The Committee note that with a view to obviate delay in the commissioning of certain projects, equipment was allowed to be imported. The Committee feel that though every effort should be made to accelerate the growth of the capability of BHEL/HEIL and their feeder projects so that the requirements are not indigenously, the execution of the schemes/projects should not be held up and where the indigenous manufacturers are unable to cope with the needs of the power supply industry, imports of the plants and equipment may have to be allowed to the extent necessary in view of the widening gap between the demand and supply of power.
77	3.165	The Committee feel that it would be the responsibility of the Ministry of Irrigation and Power to assign priorities to the programme for the manufacture of equipment for various projects matching with the requirements in consultation with the concerned authorities.
78	3.166	The Committee are in agreement with the views of the Power Economy Committee that the Ministry of Industrial Development should plan the major items of plant and equipment for each project suitably on the manufacturing units, taking into account the requirements of the project in respect of similar units, schedule of construction etc.

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79	3.167	<p>Sometimes considerable time is lost in negotiating prices with the above two Public Sector Undertakings. It is reported that the prices of turbo-generators and other equipments supplied by those undertakings are comparatively much higher than the imported plant and equipment, one of the main reasons for this is that we are dependent on foreign designs and technology and have to import some of the most basic components of the plant. This points to the urgent need of organising design sections in the Public heavy electrical manufacturing undertakings so that we should be able to evolve our own designs rather than be dependent on the collaborators for designs for all times.</p>
80	3.174	<p>The Committee note that the total investment in the power sector at the commencement of the Fourth Plan was of the order of Rs. 3,629 crores. In the Fourth Plan, the allocation for power in the Public Sector is Rs. 2,447.57 crores. During the first three years of the Plan, a total expenditure of Rs. 1,502.57 crores was incurred and it is anticipated that during 1972-73 an expenditure of Rs. 544.46 crores will be incurred bringing the total expenditure in the four year period to Rs. 2,047.03 crores, which is about 84 per cent of the Plan allocation. The investment on power at the end of the year 1972-73 would be of the order of Rs. 5,676.03 crores.</p>
81	3.175	<p>The Committee are unhappy to note that the achievement during the successive Five Year Plans was not commensurate with the investments made as there had been consistent short-falls in the planned targets ranging from 20 per cent in the First Plan to 37 per cent in the Fourth Plan (1st three years).</p>

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82	3.176	The Committee urge that immediate steps should be taken to provide additional funds for the execution of the sixteen projects in respect of which preliminaries have already been completed and which have either been delayed or are likely to be delayed for lack of finances.
83	3.177	The Committee desire that effective measures should be taken to expedite the completion of civil works in respect of the above schemes in various States.
84	3.189	The Committee are unhappy to note that although the <i>per capita</i> electricity consumption rose from 17.8 kwh in 1950 to 88 kwh in March, 1971 and from about 90 kwh in 1970-71 to 93 kwh in 1971-72, the per capita consumption in the country is dismally low as compared to the world average of 1200 kwh.
85	3.190	The Committee are distress to note that despite nine-fold increase in the generating capacity, there still persists considerable imbalance in per capita consumption between the various States in the country. The Committee are constrained to note that certain States Areas viz. Uttar Pradesh (60 kwh), Rajasthan (55 kwh), Himachal Pradesh (40 kwh), Jammu and Kashmir (40 kwh) in the Northern Region; Madhya Pradesh (58 kwh) in the Western Region; Andhra Pradesh (58 kwh) and Kerala (74 kwh) in the Southern Region; North Bihar (18.3 kwh) and North Bengal in the Eastern Region, and the entire North Eastern Region-comprising Assam, Meghalaya, Mizoram, Manipur, Tripura, Nagaland, and Arunachal Pradesh are still far below the national average.
86	3.191	The Committee note that the pre-requisite to reduce the disparities is providing increased availability of power in States/Areas which are

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below average in electricity consumption. They therefore suggest that effective steps should be taken to achieve the desired results by providing additional installed generating capacity and building extensive transmission and distribution systems in such areas.

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3.192

The Committee regret to note that the *per capita* consumption of electricity is anticipated to be only 200 kwh even at the end of the Fifth Plan as against the *per capita* consumption of 10,000 kwh in the United States and 2000—3000 kwh in Europe.

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3.193

In view of the fact that *per capita* consumption of electricity is a yardstick for measuring the economic development of the country, the Committee feel that highest priority should be given for meeting the power demands in all sectors of economy, and the poor revenue yielding areas which have hitherto remained neglected should be given preference in regard to their economic uplift, by providing the essential infrastructure of electricity at cheap rates.

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4.60

The Committee are unhappy to note that out of the 41.15 mkw (at 60 per cent load factor) of hydro-electric potential in the country only 16 per cent has been developed so far and it is expected to rise to 18 per cent only at the end of the Fourth Plan.

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4.61

The Committee note that the hydro potential in the country is the cheapest source of power and the present extent of utilisation would only be of the order of about 18 per cent by the end of the Fourth Plan period. The Committee feel that there is great scope for hydro-power development in the various regions of the country and, therefore, recommend that high priority should be given for hydel development in the subsequent Plans.

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- :91      4.62      The Committee would, in this connection, like to reiterate the recommendation contained in para 2.49 of their Fortieth Report on Fertilizers (1972-73) regarding the feasibility and economics of harnessing, in an integrated manner, the river water for flood control, irrigation and production of electricity for various purposes including its use as a feedstock for the production of fertilizers which are also in great demand.
- :92      4.62      The Committee are distressed to note that against the planned target of 9.7 mkw for development of hydro-power resources during the Fourth Plan, only 7.5 mkw would actually be achieved, thus leaving a shortfall to the extent of 2.2 mkw.
- :93      4.64      The Committee cannot too strongly emphasise the need for putting to full use the hydro-electric power of the country, as it is well known that hydel power is the cheapest to generate. Besides, with the progress in the development of the national grid, it should be possible to transmit the power in a wider area. The country has also got experience extending to several decades in regard to the investigation and execution of hydel projects. The Committee, therefore, suggest that a time-bound programme should be drawn up for harnessing in full the hydel power resources in the country.
- :94      4.65      The Committee note the progress of investigations made in respect of the 62 Hydel schemes investigated under the U.N. Special Fund Assistance Programme. The Committee desire that in all the cases where investigations have been completed, speedy action should be taken to draw up the project proposals and to finalise them early.
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95	4.66	The Committee recommend that high priority should also be given for detailed investigations of hydro-electric projects so that these could be taken up for implementation for deriving the benefits in the next decade.
96	4.67	The Committee desire that schemes pending due to inter-State agreements should also be finalised without delay.
97	4.68	The Committee are in agreement with the views of the Power Economy Committee that optimum and proper utilisation of energy potential of hydro electric sites is intimately linked with proper water management. This fact is often overlooked leading to adverse conditions. It is not generally appreciated that the constraints on generation at a particular hydro-electric plant are normally set by availability of water and not by the capacity of the plant as is the case with fuel burning plant. The generation of energy with the available water and given regulation facilities has to be carefully anticipated and programmed. Serious difficulties not merely of non-availability of energy but of serious impairment of generating capacity and system regulating facilities can arise if due attention is not paid to water management. On the other hand, continued attention to this problem may enable improving of utilisation of water at many sites as the system demands.
98	4.69	The Committee strongly recommend that concerted efforts should be made to ensure that each hydro-electric power station in the country is operated to utilise fully the energy potential available at site from time to time.
99	4.70	The Committee recommend that arrangements should be made for periodical expert inspection of the hydro-electric projects so that the

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		old or worn out parts and components are replaced well in time.
100	4.71	The Committee recommend that all the projects in the country which have become very old and outmoded in design resulting in reduction in capacity and performance should be carefully reviewed with a view to examine how these could be improved by modernisation, utilising new and improved plant.
101	5.41	The Committee note that at the beginning of the Third Plan, the total length of transmission and distribution lines in the country was about 147,000 circuit km. During the Third Plan period about 395,000 circuit km were added bringing the total length as on 31st March, 1971 to 11,17,000 circuit km.
102	5.42	The Committee note that by the end of Fourth Plan period about 2,470 circuit km of 400 kv lines, 26,536 circuit km of 220 kv lines including inter-State/Regional links and 4,505 circuit km of 132/110 kv inter-State/Regional links are likely to be completed or would be under construction.
103	5.43	The Committee note that out of the sanctioned outlay of Rs. 14.73 crores during the years 1969-70 to 1971-72, the expenditure on inter State/Region Lines was only about Rs. 11.62 crores.
104	5.44	The Committee note that in order to accelerate the establishment of Inter-State/Regional links during the Fourth Plan, an outlay of Rs. 22 crores provided in the Fourth Plan is being raised to Rs. 40 crores for implementation of construction of 37 transmission lines during the plan period.

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105	5.45	The Committee also note that out of all the 38 inter-State links taken up, 24 lines would be completed during the Fourth Plan and the remaining lines within the next year or two. The Committee would urge that effective steps should be taken to expedite the completion of all these lines.
106	5.46	The Committee are distressed to note that the progress of inter-State/Regional lines has not been satisfactory mainly due to inadequate capital outlay in the earlier Plans as well as in the Fourth Plan coupled with the bottlenecks in the availability of raw materials like steel, zinc, etc., and equipment like transformers, switch-gear, control gear etc., involving long term delivery.
107	5.47	The Committee have elsewhere in the Report emphasised the need for more rational allocations for the plans/schemes so that these are not held up for lack of finances and for close coordination at all levels to ensure timely supply of equipment and raw materials etc.
108	5.48	The Committee suggest that action should be taken well in advance to work out the requirements of the essential raw materials so that delivery is assured according to schedule.
109	5.49	The Committee are unhappy to note that there is lack of enthusiasm on the part of the State authorities to pursue the inter-transmission programmes vigorously even though the Centre decided to provide 100 per cent loan assistance to States under Centrally-sponsored schemes outside the State ceiling for the construction of various inter-State links during the Fourth Plan period resulting in delay in the commissioning of some of the transmission lines and the sharing of surplus power with the State suffering from power shortage in the region.

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110	5.50	The Committee urge that Government should take up the question with the State authorities concerned with a view to impressing upon them the necessity for giving adequate priority for speedy completion of these schemes.
111	5.51	The Committee also note that State/Regional Load Despatch Stations are planned to be established to control and operate the State/Regional Grids and that the proposals are at various stages.
112	5.52	The Committee would like to urge that necessary action should be taken to ensure that these schemes are finalised speedily matching with the delivery of equipment and other raw material so that their implementation is taken in hand well in time.
113	5.53	The Committee feel that with the large size power stations proposed in the Fifth Plan and envisaged enlargement of transmission and distribution network, integrated operation of power system with utmost expedition is necessary. The Committee, therefore, recommend that the question of setting up a Central Agency to operate the regional grid system with the co-operation of the Constituent power system in each region should be examined.
114	5.54	The Committee feel that though the Electricity (Supply) Act, 1948 provides for coordinated development of State Power Grid and for the efficient running and working of the licensees/undertakings, the growth of power development has been so rapid that it is high time to examine the question whether any modification in the legislation is necessary with a view to achieving the objective of establishment and operation of regional power grid in the interest of optimum benefit to all concerned.

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115	5.55	<p>The Committee recommend that in order to fix physical targets and outlays for the transmission programme in the Fifth Plan, advance action should be taken to finalise the generation and load demand of various regions and extensive studies should be under-taken to decide the important trunk lines within the State as well as the inter-State/Regional lines.</p>
116	5.56	<p>The Committee recommend that long range planning for the inter-State/Regional Grid should be devised keeping in view the fact that not only the State systems should completely integrate to form regional grids, but also that these grids get adequately inter-connected to form a National Grid, with attendant economic gains to the community at large.</p>
117	5.71	<p>The Committee note that upto the end of 1968-69 the investment on transmission and distribution was only Rs. 1340 crores as against Rs. 2240 crores envisaged on power generation. They also note that during the Fourth Plan an outlay of Rs. 1166.27 crores has been provided for transmission and distribution schemes as against Rs. 1250 crores for generation schemes and during the Fifth Plan an investment of Rs. 7600 crores to be shared equally between generation and transmission and distribution has been proposed.</p>
118	5.72	<p>The Committee are distressed to note that the distribution and transmission losses in the country are on the high side. The transmission losses in the country are of the order of 18 per cent to 25 per cent and in certain States like Punjab the losses are as high as 34 per cent whilst in other countries such losses are of the order of 5.7 per cent to 12 per cent only.</p>

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119	5.73	The Committee feel that there is imbalance in the planning of generation <i>vis-a-vis</i> transmission and distribution resulting in not only poor voltage conditions in many areas but heavy losses in transmission and distribution.
120	5.74	The Committee feel that investment in transmission and distribution facilities in the country has remained much lower than the desired level and this is one of the chief reasons contributing to higher percentage of losses. More investment does not necessarily mean construction of additional transmission and distribution lines alone; but use of higher transmission or sub-transmission voltages, adequate size of conductors, integrated operation of power system etc., are factors which would help in reducing the transmission losses substantially.
121	5.75	The Committee are in full agreement with Power Economy Committee that saving effected by reduction in energy losses and extra investment required have to be balanced and it may not be economical to reduce the energy losses beyond a certain limit and the losses should be reduced to an optimum value after a techno-economic study.
122	5.76	The Committee feel that with a view to reduce such losses optimum performance of power system in the country is necessary. The Committee, therefore, recommend that there should be a continuous watch over the efficiency of operation in the generation, distribution and transmission system.
123	5.77	The Committee note that the Central Government have taken up with the State Governments the question of making each Divisional Engineer responsible for watching and reporting the performance of the system under his control in respect of losses. The Committee would like to be apprised of the final outcome in this regard.

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124	5.78	<p>The Committee would like to draw special attention to the following points of action recommended by the Power Economy Committee regarding transmission and distribution losses:—</p> <ul style="list-style-type: none"><li>(i) Improvements in the transmission and distribution systems designs by:<ul style="list-style-type: none"><li>(a) Selection of transformers with reference to expected load cycle so as to obtain minimum total fixed and variable losses.</li><li>(b) Use of flow iron loss transformers, particularly for rural areas and areas of low load factor.</li><li>(c) Reduction in the number of power transformation stages.</li><li>(d) Improvement of power factor—installation of capacitors etc., at appropriate locations.</li><li>(e) Selection of appropriate sizes of low tension feeders keeping in view their lengths and load required to be carried.</li></ul></li><li>(ii) Introduction of proper instrumentation and information collection system at all levels for monitoring of system performance.</li><li>(iii) Integrated operation of power systems including reactive scheduling.</li><li>(iv) Elimination of theft of energy.</li><li>(v) Elimination of miscellaneous losses by improved operation and maintenance.</li><li>(vi) Continuous monitoring of system performance and introduction of corrective action at the divisional level.</li></ul>

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125	5.79	The Committee would like to be apprised of the action taken or proposed to be taken by Government on the aforesaid recommendations of the Power Economy Committee.
126	6.10	The Committee note that a number of State Electricity Boards are running at loss at present though the policy is that on the whole there should be no-profit and no-loss. The Committee feel that at a time when there is widespread demand for power, there is no reason why the State Electricity Boards should not be able to break even by improving the utilisation of their plants effecting economy in overhead expenditure and reducing losses in transmission etc. The Committee would like the Government to impress on the State Electricity Board's to carry out a detailed cost analysis with a view to pin-pointing the factors which are responsible for loss and take necessary remedial measures.
127	6.11	Above all, the Committee feel that the Central Power Plants which are coming up in a big way should be managed most efficiently so as to be able to set an example for the States to follow.
128	6.12	The Committee would like to make it clear that what they are anxious is that power should be supplied at most competitive rates in the interest of development of economy and this should be achieved by improving efficiency and effecting economy in the working of authorities responsible for generation, transmission and distribution of power.
129	6.13	The Committee note that uniform power tariffs for each category of consumers have been introduced in most of the States and that the States of Rajasthan and Orissa are also taking necessary steps in this direction. The Commit-

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		tee hope that with the establishment of an All India Grid the disparities in the tariff rates in the various States and Regions would be narrowed down.
130	6.14	Consistent with the policy of Government to promote the uplift of weaker sections of the people, the Committee would suggest that Government should examine the question of supply of electricity to the weaker sections of the rural population including agriculturists and artisans, backward classes and industrially backward areas at concessional rates.
131	7.36	<p>The Committee note that power plays a vital role in development. The Committee would like to stress that for an all round development of rural areas and for bringing about far reaching changes in the methods of irrigation and farming it is very essential to accelerate the pace of rural electrification in the country. In the opinion of the Committee rural electrification is necessary for:</p> <ul style="list-style-type: none"> <li>(i) increasing agricultural production by energising tube-wells as a regular and steady source of irrigation;</li> <li>(ii) agro-based industries as well as small scale rural industries in the rural areas;</li> <li>(iii) providing employment potential in villages themselves in agro-based and small scale rural industries thereby arresting the drift of population to bigger cities and creating of slums there;</li> <li>(iv) providing electrification and lighting facilities etc., in the villages which would not only make the educated persons from the villages not to leave villages but would also attract doctors and other social and technical workers to the villages by providing the basic amenities like power and light in the villages;</li> </ul>

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(v) providing means of better standard of living to the rural inhabitants and farm-workers by giving them the benefit of industrialisation etc.

132

7.37

The Committee regret to note that although 80 per cent of the population of India live in villages and provision of electricity is an essential pre-requisite for the development of rural areas and can bring far reaching changes in the economy of these areas, very little was done in the First Three Five Year Plans for rural electrification with the result that till the end of Third Plan, only 45,409 villages out of total of 5,66,878, that is, about 8 per cent were electrified and only 3,20,096 tube-wells/pumpsets were energised throughout the country. It was only in the Three Annual Plans of 1966—69 and the Fourth Five Year Plan that the programmes of rural electrification has picked up. The Committee note that even now only 23.4 per cent of the villages in the country have been electrified and only 18,76,188 tubewells/pumpsets energised. The Committee recommend that a time bound programme of rural electrification should be prepared by the Government which while fixing a long-term programme for providing power to every village of the country, should fix a target date for providing electricity to each and every village having a specific number of resident. The Committee recommend that sufficient funds should be provided in the Five Year Plans and implementation machinery at the field level should be geared up to achieve targets fixed.

133

7.38

The Committee note that although 23.4 per cent of the villages in the country have been electrified and about 19 lakh pumpsets have been

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provided in the country, there are wide disparities in the provision of electricity and installation of pumpsets in the various States. While there are States like Haryana and Tamil Nadu where practically every village has been electrified, there are States like Assam where only 3.3 per cent of the villages have been electrified and only 105 tubewells and pumpsets have been energised. Similarly, percentage of villages electrified in Orissa is 7.7 per cent, in West Bengal 12.7 per cent and in 9 other States, the percentage is less than the all India average of 23.4 per cent.

134

7.39

The Committee regret to note that inspite of the various steps taken by the Government to provide incentives for the rural electrification of backward areas, the number of States whose percentage was less than the all India percentage in the matter of rural electrification has increased from 9 in 1968 to 12 in 1973, and these backward States have not been able to come up to the all India standard. The Committee cannot but conclude that the steps taken and the special assistance provided so far for the rural electrification of backward areas have been far from adequate and would require to be further intensified and increased. The Committee recommend that the problems of the backward States in regard to slow progress of rural electrification should be examined in detail and concrete measures taken to accelerate the pace of rural electrification in these States.

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7.40

It has been suggested before the Committee by the representative of the Government that rural electrification programme has not been able to make much headway in some of the States because of deficiencies in organisation. It has also come to the notice of the Committee



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that some of the States have remained backward in the matter of rural electrification because State Governments concerned have not accorded proper priority to the rural electrification programme and have not taken sufficient steps to activate the organisation in their States at the field level. The Committee recommend that the Central Government should impress upon all the State Governments, the immediate necessity of according proper priority to the rural electrification programme and to gear up organisational set up at the field level. The Committee recommend that the Union Ministry of Irrigation and Power and Planning Commission should depute Study Teams to the States which are backward in the matter of rural electrification, to impress upon and render necessary assistance to the authorities concerned to take immediate steps in the matter.

136

7.41

The Committee note that so far the States have laid more emphasis on generation than on transmission and distribution of power in the various States, with the result that it has created a serious imbalance all over the country and even if power is available, the same cannot reach rural areas because of the absence of transmission lines. The Committee have before them the example of the States of Orissa and Bihar where it is difficult to provide power in the rural areas as transmission lines have not been laid there. The Committee recommend that wherever schemes for the generation of power are initiated, effective measures should also be taken to lay transmission lines well in advance of such generation so that as soon as power is available, the transmission lines are also ready to distribute the power to the consumer.

137

7.42

The Committee note that in a number of villages where electricity has been provided,

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the 'Harijan Bastis' in those villages were not electrified because of unremunerative loads in those areas. The Committee further note that the Government of India have introduced since December, 1971, a special scheme for electrification of such "Harijan Bastis" and for that purpose loan assistance at concessional terms is being provided through the agency of Rural Electrification Corporation to the State Electricity Boards. The Committee recommend that the provision of public lighting to the economically weaker sections of the society particularly in the Harijans and Adivasis areas and 'bastis' should be given special consideration by the Government and if necessary, further incentives, viz., interest free loans etc., should also be given to the State authorities concerned for this purpose.

138

7.43

The Committee would, however, like to add that mere electrification and provision of pumping sets/tubewells in villages will not be able to achieve the desired results and the concept of rural electrification has to be understood in the wider perspective of all round development of areas where electrification has been done. To achieve the maximum results, the Committee feel that the programme of rural electrification has to be dovetailed with a well coordinated programme of establishment of rural industries and wide-spread growth of infra-structure like transport, forestry, agro-based industries, etc. The Committee have no doubt that if the programme of rural electrification is suitably coordinated with national and regional development plans, it will not only lead to reduction in imbalances in regional development but would also lead to increased consumption of power by rural people thereby making rural electrification a viable proposition.

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7.44

The Committee consider that effective and well-coordinated measures should be taken for increasing consumption of electricity in rural areas. This can be done if agro-industrial centres and rural industrial estates for manufacture of articles of use for farmers like pumpsets, agricultural implements etc., are set up simultaneously in rural areas where rural electrification has been provided by proper coordinated and integrated plans. The Committee consider it necessary that the suitable maintenance, repair and operational facilities for pumpsets and electric gadgets should be encouraged to be set up in the rural areas where rural electrification has been provided. This will go a long way in making use of electricity, popular among masses and would also ensure maximum utilisation of electric power for production purposes. The Committee further recommend that proper training facilities should be provided to local people so as to make them proficient in the work of maintenance, repair and operational facilities, so as to avoid dependence on outsiders.

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7.45

The Committee would like to point out that there are a number of small and marginal farmers in the country who are not in a position to afford the cost of installation of tubewells or bear expenditure of its maintenance and operation, with the result that they have to remain at the mercy of big farmers for the supply of water for their fields. The Committee recommend that the Government should encourage such small farmers to form cooperatives and own tubewells on a cooperative basis. In case it is not found possible, the Government should instal State tubewells where necessary, in order to provide irrigation facilities and cater to the needs of the small and marginal farmers to the extent possible.

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141	7.46	<p>The Committee note that although a number of new projects for the generation of power have been taken up, the rural areas have not been getting their due shares and in case of reduction or failure in supply of power, rural areas are always worst hit, and supply of power in these areas is adversely affected. The Committee recommend that a fixed percentage of power generated in a State should be earmarked for the rural areas and it should be ensured that rural areas get their proportional share of power even in case of reduction in the supply of power.</p>
142	7.47	<p>The Committee note that while power is being supplied to industries etc., on a cheap rate, no such concession is being allowed to the rural areas for agricultural purposes. The Committee fail to understand why in view of the importance that agriculture occupies in the country's economy, such concessions should not be allowed to the agriculturists particularly in view of the increasing need for more production of food-grains etc. The Committee recommend that steps should be taken by Government to supply power to agriculturists at rates comparable, if not cheaper, to the industries.</p>
143	7.48	<p>The Committee note that a perspective plan for the decade commencing from April, 1971 to March, 1981 for rural electrification with emphasis on energisation of pumpsets, for increasing agricultural produce has been drawn up. The Plan provides for the electrification of 3.4 lakh villages representing about 60 per cent of the total villages and energisation of 48.7 lakh additional pumpsets by the end of 1981. The Committee note that the total outlay involved in the implementation of the Plan is estimated at Rs. 2270 crores and about 265 crores annually would have to be provided for the seven year</p>

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period (1974—81). The Committee recommend that in view of the urgent need for rural electrification for the development of rural areas the necessary allocation of funds may be made.

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7.49

The Committee note that the Government had set up a Committee of Members of Parliament to review the programme of rural electrification in backward areas. This Committee of Members of Parliament had submitted their Report in July, 1972. The Committee, however, note that in their Report, the Committee of Members of Parliament had pinpointed that the main reason for the comparatively slow progress of rural electrification in backward States is lack of adequate financial resources to take up programme and development and extend high tension transmission lines. This Committee had recommended that a provision of additional Rs. 46.5 crores in the Fourth Plan should be made for the purpose. The Committee recommend that the above recommendations of the Committee of Members of Parliament should be implemented as early as possible.

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7.50

The Committee further note that the Committee of Members of Parliament had observed that under-developed hilly track specially in Assam, Uttar Pradesh and Chhota Nagpur in Bihar have special problems and should be given special concession by the Rural Electrification Corporation so that a longer period may be given for the schemes to earn the desired return. The Committee hope that necessary action will be taken in the matter.

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7.51

The Committee of Members of Parliament had also suggested that enhanced targets of electrification of villages and pumpsets in backward States should be supported by provision of necessary funds and the additional outlay asked for

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by the Rural Electrification Corporation should be granted to the Corporation. The Committee hope that rural electrification programme in the backward States will not be allowed to suffer because of shortage of funds.

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7.59

The Committee note that in order to supplement the efforts of the State Electricity Boards in the matter of distribution of power, 5 Rural Electric Cooperatives have been set up, one each in the States of Andhra Pradesh, Gujarat, Maharashtra, Mysore and Uttar Pradesh and these Cooperatives have already started work on projects which after completion, will provide electricity to 729 villages, energise 27,605 pump-sets and supply power to 1,553 small industries. The Committee further note that these Cooperatives have shown progress in their work and their performance had been quite satisfactory and these Cooperatives have already electrified 217 villages and given connections to 451 agriculturists. The Committee note that Government are considering the question of promoting a few more Cooperatives by the Rural Electrification Corporation.

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7.60

The Committee note that some difficulties have been experienced in the working of these Cooperatives viz. high percentage of line losses and financial losses in the retail distribution of power. A Departmental Committee headed by an officer of the Planning Commission has been set up to suggest guidelines for improving the working of these Cooperatives. The Committee hope that urgent action would be taken on the recommendations of this Departmental Committee so as to streamline the working of these Cooperatives.

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7.61

The Committee recognise the importance of Rural Electric Cooperatives in the decentralised retail distribution of electricity and in promoting direct participation of users in this task.

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The Committee would like Government to encourage setting up more cooperatives and maximise their number in the country. They would, however, like to stress that as some difficulties have been experienced in the working of Rural Electric Cooperatives already set up by Government, which are being examined by a Departmental Committee, Government should lay down firm guidelines in the light of this evaluation, for the benefit of such co-operatives so as to avoid the repetition of the mistakes in the working of Rural Electric Cooperatives.

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7.62

The Committee would further like to caution the Government that a number of Cooperatives set up in the country under the co-operative movement have been suffering from organisational weaknesses and are not able to discharge their functions effectively. The Committee would like Government to ensure that these Rural Electric Cooperatives are not allowed to suffer from similar organisational weaknesses and their working should be reviewed from time to time and corrective measures taken in time to keep them active so that they may be able to fulfil their role in the rural electrification programme of the country effectively. It should also be ensured that the over-heads of these Cooperatives are kept to the minimum.

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7.63

The Committee would like to suggest that in order to keep a watch on the proper functioning of the Rural Electric Cooperatives, representatives of the Rural Electrification Corporation and State Electricity Boards concerned should also be represented on the Managing Committees of these Cooperatives. Moreover, these Cooperatives should be required to furnish quarterly reports on their working to the Rural Electrification Corporation which should monitor these Reports so as to ensure their smooth

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and efficient working. The accounts of these Cooperatives should also be got audited by the competent Auditors.

152

8.24

The importance of research and testing facilities in the growing field of power development in the country, cannot be too strongly emphasised. Research is necessary for achieving economy, quality control and standardisation in construction, generation, transmission, distribution and superior performance of the power supply system. Collection of technical information and basic data for the efficient and economic design and construction of extra high voltage lines, after taking into account the conditions prevailing in our country, is also necessary. There is thus much scope for research in power engineering in the country.

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8.25

The Committee note that realising the importance of research, Government appointed a High Powered Planning Committee in 1955 to consider establishment of a Central Organisation to undertake applied research in the various fields of power engineering. As a result of the recommendations of this Committee, a memorandum was presented in 1959 to the United Nations Special Fund seeking assistance for power Engineering Research Organisation. Sanction for the establishment of the Power Research Institute was accorded in the year 1960. The two units of this Research Institute one at Bangalore and the other at Bhopal started functioning in October, 1971. The Committee regret to note that some work is still to be completed at the two units of the Institutes which would be done by 1974. According to the latest information furnished to the Committee, Government envisaged a period of 12 years for the setting up and commissioning of the two units of the Research Institute. The Committee note that

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various periods have been indicated by Government for the completion of the Institute. In the Annual Reports of the Institute for 1971-72, the projects was to be completed by 1965-66. In the Annual Reports of the Ministry for the years 1968-69 and 1969-70, the period of completion and commissioning has been given 'by the end of 1969-70' and 'by the end of 1970-71' respectively.

154

8.26

The Committee cannot help feeling that the work relating to the setting up of the institute was not given the urgency that it deserved. The Committee consider that a period of 12 years for the setting up of the Institute is too long. Considering that the matter regarding the setting up of Institute was initiated in 1955 it is regrettable that the two units of the Research Institute are yet to be fully completed and commissioned.

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8.27

The Committee are concerned to note that the second stage of the Institute which is stated to be very important from the point of view of testing plant and equipments manufactured in the country and which is estimated to cost about Rs. 550 lakhs has not commenced at all, though it was to be completed by March, 1974. They would like the Government to investigate the reasons for delay in commencing the second phase of the Research Institute and take concrete measures to complete the same expeditiously.

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8.28

The Committee note that there are variations in the information furnished to the Committee and in the various publications brought out by the Ministry regarding the estimated expenditure guarantee of U.N. assistance and dates of completion and commissioning of the Institute. It appears that adequate care has not been taken to present full and accurate information in this

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regard. The Committee would like the Government to work out the details of the schemes in the very beginning itself and present a complete picture in the various publications brought out by it for the information of public and Parliament. The Committee need hardly point out that the information furnished should not only be correct but uniform; and if there are any variations due to any reason, the same should be fully explained.

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8.40

The Committee note that the Central Board of Irrigation and Power coordinates the activities of the various Research Units. Besides the two Units of the Central Power Research Institute, research on power engineering is also being done by the Research Units of State Electricity Boards and Educational Institutions in the country. From the information furnished to the Committee, it appears that the Institute has so far carried out research on about 9 problems, some of which are stated to have yielded good results. The Institute has also obtained two patents so far. In addition, 12 problems are being studied by the 18 Research Units of State Electricity Board and Educational Institutions, expenditure on which is met from grants-in-aid released by Government on the recommendation of Central Board of Irrigation and Power.

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8.41

The Committee feel that very little has been done in the matter of research on power engineering so far. This view is also supported by the Power Economy Committee which has stated that "one important factor retarding the growth and vitiating the functioning of power supply industry in an optimum manner is the gross inadequacy of the research and development activities." The State Electricity Boards have also considered the research programmes

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inadequate and have stressed the need of larger research and development programmes for power engineering. Considering the heavy investments made/proposed to be made for the development, generation, transmission and distribution of power in the country, the Committee feel that there is an urgent need for large scale increase in the research and development programme for power engineering in the country so that the various problems of power engineering can be solved expeditiously. Some of the problems requiring immediate attention are:

- (i) rising cost of electric energy in the country;
- (ii) high cost of electric plant and equipment manufactured indigenously;
- (iii) need for self-reliance and import substitution of spares and components as well as avoidance and dependence on foreign sources for spares etc.
- (iv) frequent break downs in generation and transmission and the need to avoid recurrence thereof;
- (v) heavy losses in transmission and distribution of power, particularly, in rural electrification systems;
- (vi) need for economy in the equipment, construction practices and designs for rural electrification programme to enable cheaper power supply to rural areas; and
- (vii) Designing for "Thermal and Hydel Stations" as also Atomic Power Stations.

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8.42

The Committee recommend that Government should prepare short term and long term programme to intensify research activities so as to meet the current and the future needs in this important field.

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160	8.43	The Committee stress that highest priority should be given to the problem of heavy losses in transmission of power as these are of crucial importance in the setting up of the proposed national grid and in extending the programme of rural electrification. The Committee would also like priority to be given to the question of finding the most economic size of generators and other equipment suited to Indian conditions.
161	8.44	The Committee realise that research is a slow process and takes time to produce results capable of being utilised. It is, therefore, necessary that research programmes of the Institute as well as the research units of the State Electricity Boards particularly long term programmes should be anticipated as far as possible and spelt out in clear terms well in advance to enable the units to organise their research programmes accordingly. The perspective research plan for power engineering should be integrated with the development of power within the country over the next 10 to 15 years. This plan should be widely circulated among the concerned industries, State Electricity Boards, user departments, universities, eminent engineers etc. and their suggestions invited so that the plan and programmes included therein could be improved upon and duplication of research efforts among various units obviated.
162	8.45	The Committee would like to emphasise that greatest care should be taken at the time of selecting research projects. The project should be problem-oriented and should be such as would yield quick results. In selecting the projects, full consultation and coordination should be maintained with the State Electricity Boards and the Electrical Manufacturing Units. The Committee would further suggest that in the Annual Reports of the Institute, broad indications

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of the money and time required for the completion of individual projects selected for research should be indicated so as to enable Government to assess the requirements with reference to outlays and time factor.

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8.46

The Committee suggest that after the problems have been identified, these should be distributed on a rational basis to the research institutions having regard to their resources and experience so as to avoid duplication as far as possible and getting the best results in the shortest time. The Committee would also suggest that the progress made in these research assignments should be reviewed by a competent technically qualified body from time to time say once in six months so that timely action could be taken as necessary in the interest of speeding up progress.

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8.47

The Committee would like to point out that research institutes have a tendency to go in for pure basic research work. The Committee would suggest that only basic research work should be taken up at the Institute and the Research Units of the State Electricity Boards which is necessary for supporting the applied research in hand. Detailed information should also be given in the annual report of the Institute about the proportion of basic and applied research work done in the Institute so that a watch could be kept on the progress made in this regard.

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8.48

The Committee further consider that maximum benefit from research would be possible if periodical assessment of the results achieved and progress made is carried out with reference to expenditure and estimated future cost. This would encourage cost consciousness not only among higher management but also among those who are directly responsible for individual projects.

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- 166 8.49 The Committee would further recommend that when a process has been developed by the Research Institute successfully and a patent taken, effective measures should be taken for its expeditious commercial exploitation. Successful processes should also be widely publicised to stimulate interest among the industry and the users.
- 167 8.50 In regard to the problems referred to the Institute by the users industries and State Electricity Boards, utmost efforts should be made to find workable solution to the problem and communicate them urgently to the concerned bodies so as to gain their confidence.
- 168 8.51 The Committee suggest that it would be useful if a periodical evaluation of the research work done by the Institute and the Research Units of State Electricity Boards as well as universities is undertaken every five years by Government through an independent Committee as such an evaluation would provide an objective and independent assessment of the working of the research programme and would act as a stimulant to its functioning.
- 169 8.87 The Committee note that Government have set up two Thermal Power Station Personnel Training Institutes—one at Neyveli in 1965-66 and the other at Durgapur in 1968-69. While the Neyveli Institute imparts training to the supervisory officers, the Durgapur Institute imparts training to the technicians, engaged in operation and maintenance of thermal power stations. The Committee further note that the intake of trainees at Neyveli and Durgapur, which was 28 and 27 respectively, has been increased to 50 and 100 respectively to meet the requirements of the Fourth Plan. Till 1971-72, 199 supervisory
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officers have been trained at Neyveli and 103 technicians at Durgapur. The Committee note that for the increased generating capacity during the Fourth Plan, 1600 trained engineers and 4500 technicians would be required for proper maintenance and operation of thermal power stations. The Committee are concerned to note that against such a large requirement of trained personnel, the actual personnel of both categories trained so far have been very much less and at this rate it would not be possible for Government to train more than 150—200 personnel in both Institutions during 1972-73 and 1973-74 resulting in heavy shortages in the number of trained personnel for operation and maintenance of Thermal Power Stations.

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8.88

The Committee regret to note that even the capacity of the institutes, which is sanctioned at 50 and 100 trainees respectively, is being utilised only at about 50 per cent. The Committee would like to point out that the general shortage of trained technical personnel for operation and maintenance of Thermal Stations, was admitted by the representative of the Ministry. Even the Minister has admitted the shortage of experienced technicians and has admitted the need for more training centres to make up the deficiency. The Committee fail to understand why it was not possible for Government to utilise the existing capacity of the two institutes and set up more institutes to make up the shortages of trained manpower which is essential for the efficient operation and maintenance of Thermal Stations and thereby ensuring continued supply of power to the users without any break-downs. The Committee are of the opinion that operation and maintenance of existing generating stations and transmission lines are equally if not more important and necessary than the expansion of generating

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capacity and it is imperative that adequate trained man power is available for this purpose. The Committee recommend that immediate steps should be taken by Government to assess realistically the requirement of trained engineers and technicians for the Fifth Plan when the generation of power is to be increased from about 20 million KW at the end of Fourth Plan to about 32 million KW in 1978-79—the generation of thermal power is estimated to be increased from about 12.5 million KW to about 24 million KW during the same period—and effective measures taken to provide training facilities for them by augmenting the capacity of the existing institutes and setting up more institutes for the purpose to the extent necessary. They apprehend that in case adequate steps are not taken in time in this regard, the non-availability of trained manpower for efficient and economic operation and maintenance, may become a major bottleneck in the achievements of targets of power generation, transmission and distribution in the Fifth Plan.

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8.89

The Committee note that in foreign countries Hot Line maintenance techniques are being used for a long time which enable maintenance of lines and related equipment without de-energising and disrupting the power supply. The further note that two Hot Line Crew Centres—one at Bangalore and another at Gan-  
guwal—were set up by the Government after entering into an agreement with USAID. These centres, which started functioning in 1958, were closed in 1962 and 1965 respectively. The Committee note that there is a great demand from the State Electricity Boards for the trained personnel in the Hot Line Maintenance Techniques and that a proposal is under consideration for training employees on the new technique called

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'Bare Hand Method' which is in vogue in Russia and to conduct refresher courses on the 'Hot Stick Method', which is in vogue in U.S.A.

172 8.90

The Committee cannot over-emphasise the usefulness of Hot Line Maintenance Techniques being adopted in the country on a large scale in view of the large expansion in the power system in the country and the advantages of the technique in carrying out maintenance without interrupting power supply. The Committee are unable to appreciate why the two centres were closed down after a brief period of 5 to 8 years. They would urge that Government should set up training centre/centres for imparting training in this new technique as early as possible so as to meet the needs of the State Electricity Boards and other bodies engaged in the operation and maintenance of power supply in the country.

173 8.91

The Committee further note that Government have been proposing since 1970-71, to set up a 'Load Despatch Training Institute for training in Load Despatch technique'. They note that the location of the institute, which was originally to be set up at Roorkee, has been changed to Bangalore. They regret to note that the Institute has not yet been completed although Load Despatching Stations are expected to come into operation during 1974. The Committee would like Government to take expeditious measures to set up this institute at an early date so as to make trained personnel available by the time load despatching stations go into operation as they are stated to be the principal tool for stabilising power generation and getting most economical power available at any time.

174 8.92

The Committee were informed by an eminent non-official that there are no Standard 'Codes of Practice' available to the operating

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staff manning the power generating stations. The Committee feel that for efficient maintenance of power generating stations and to ensure uninterrupted supply, it is very necessary that Standards "Codes of Practice" are readily available to the operating staff for reference and guidance. The Committee cannot too strongly emphasise the need for bringing out a Standard Code of Practice expeditiously by associating eminent, experienced and technically qualified engineers in its preparation.

175

8.93

The Committee have noticed that there are frequent power interruptions which cause considerable loss to production both in industry and agriculture, apart from causing inconvenience to general users. They would, therefore, like the Government to impress upon the State Electricity Board, who are mainly responsible for operation and maintenance of power generation and for keeping the transmission lines working. It should also be impressed upon these Boards to provide in-job training to their technicians and engineers and should prescribe tests so that the persons who are manning the generation plants and operating and manning the transmission lines, maintain their efficiency which would result in reducing the interruption in power supply to the barest minimum. There should also be courses for maintenance of equipment as a slackness in this regard is the main cause of interruption in power supply.

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8.94

The Committee would like to emphasise that the Power Economy Committee, appointed by Government which submitted its report in March, 1971, has made several valuable suggestions regarding the training of personnel for manning power generation stations and operation and maintenance of transmission lines.

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They would like the Government to take expeditious decisions on these recommendations and implement them without delay.

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9.12

In the coming years there is no doubt that the requirements of the electrical energy in the country will continue to increase exponentially for many years. In other words, the installed capacity available in the country will have to be increased very rapidly so that the capacity is doubled in every 5 to 6 years. This will necessitate a great deal of activity of planning as well as project execution. Further, the increasingly bigger power systems of the States will have to be knit into regional power systems and coordinated and integrated operation of regional power systems brought about. The working of the power stations, sub-stations, transmission lines as well as construction of power projects will have to be watched carefully and monitored in order to ensure that the limited resources of the country, allocated for power, are utilised in the best possible way. The Centre will have to be involved in the power supply industry more and more actively through central generations as well as through integrated operation of power systems on the regional national basis. Marshalling of resources by way of plant and equipment, essential materials like steel and cement as well as supply and transport of coal and oil fuels for running power stations will be largely the responsibility of the Centre. The Committee, therefore, feel that it is absolutely necessary that early steps are taken to see that the set up at the Centre is rationalised and, if necessary strengthened so that this big task can be adequately tackled.

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9.13

In view of the consideration mentioned in the preceding paragraph and in view of the importance of power as a basic infra-structure for

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the economic growth of the country, Government may examine the desirability of splitting up the Central Water and Power Commission into two separate Departments and combining the Power Wing with Central Electricity Authority.

179

9.39

The Committee note that the Central Electricity Authority which was required to perform some highly important functions such as developing a sound and uniform power policy, co-ordinate the activities of the power Planning agencies and carry out investigations and collect and publish data, concerning generation, distribution and utilisation of power and development of power resources, has so far been working only in name and as a part-time body with a part-time Chairman. These functions have by and large devolved in the Central Water and Power Commission.

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9.40

The Committee also note that the Central Water and Power Commission (Power Wing) which was set up primarily as high-level consultant body to function at the request of States and other Organisations has no statutory authority for carrying out investigations which, according to the Power Economy Committee, is the biggest bottleneck in the implementation of economic plans.

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9.41

Power for its development depends on a number of other vital sectors such as mining and transport of coal for thermal stations, manufacture of heavy electrical and ancillary stations. ready availability of materials like cables, steel, aluminium, cement etc. This involves coordination with various agencies including the Planning Commission, the Ministries of Industrial Development, Steel, Railways,

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Department of Mines etc. apart from coordination with the State authorities who are primarily responsible for generation, transmission and distribution of power within the States. The Committee have already observed the shortfalls all along in the augmentation of generating capacities on account of a number of factors such as delay in supply of equipment, non-availability of essential materials like coal, cement etc. in adequate quantities want of proper planning and coordination etc. Unless such coordination is very effective, it is bound to result in delays leading to power shortage conditions. There is, therefore, urgent need for a single agency at the Centre which should be responsible for such effective coordination.

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9.42

Apart from effective coordination, it is also necessary to formulate at the Central level, a National Power Policy and prepare long term plans for power development extending over a period of at least 15—20 years as power generation schemes and also schemes for mining of coal, manufacture of equipment etc. have long gestation of periods of over five years. The Committee feel that for this purpose also, there should be at the Central level a strong technical organisation.

183

9.43

The Committee note that there is a general consensus that these functions could be performed by the Central Electricity Authority already provided for in the Electricity (Supply) Act, 1948. The Committee also note that the Government are actively considering the proposal for activation of Central Electricity Authority and for this purpose they propose bringing in new legislation. In view of the pivotal roll proposed for this body the Committee feel that the Authority should be activated with all the necessary powers at the earliest.

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9.54

The State Electricity Boards have to play, a pivotal role in the generation and distribution of power in their States. As the Power Economy Committee have aptly pointed out in their Report of 1971, the State Electricity Boards would have to undertake intensive investigation and planning for power projects and would also have to undertake the executive work of completing these additional power projects in time. The State Electricity Boards have also to ensure that transmission lines are in position well in advance of the generation of power, so that power can be taken to the consumers as soon as it is generated. The Committee stress that the working of State Electricity Boards should be got reviewed urgently by a high-powered Committee in consultation with State Governments and the Electricity Board, with a view to strengthening their technical and managerial capabilities, so that these are commensurate with the challenging tasks which are being entrusted to them. The Committee need hardly point out that the head of the State Electricity Board should invariably be a power engineer as he has to provide technical guidance at all stages of investigation, execution and implementation to ensure that the power programme as per Plan, is adhered to. The Committee have been greatly disturbed at the spate of strikes and widespread unrest which has been reported in the Press, about the Electricity Boards. This obviously points to the fact there is a great deal of scope for improving the personnel management and ensuring that rules and regulations are properly framed and implemented, so as to inspire the confidence of all concerned.

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9.55

Another aspect which has greatly exercised the mind of the Committee, concerns the stores purchases, particularly transmission lines. The Committee feel that as these purchases would

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		have to be made on a larger and large scale in keeping with the ambitious plan programme, detailed guidelines to ensure purchases on sound lines and in a manner which would be free from all suspicion, should be laid down.
186	9.56	Another aspect of wide public interest relates to the grant of concessional rates on <i>ad hoc</i> basis. The Committee feel that since most of the Electricity Boards have acute financial difficulties, it is but right that broad guidelines for grant of such <i>ad hoc</i> concessions should be laid down, in consultation with the Finance and Audit departments and that where an executive authority desires a concessional rate to be given, the communication should invariably be sent in writing. The Committee feel that if these objectives are followed in letter and spirit, it would lift the State Electricity Boards from the present state of controversy in which they have fallen and would enable them to provide the leadership which would be necessary for meeting the challenging task of generating and distributing power as per plan provision.
187	9.57	The Committee would further like to suggest that the provisions of the State Electricity Boards Act, 1948, may be comprehensively reviewed and necessary amendments which will improve the functioning of the State Electricity Boards, effected at an early date.
188	9.71	With the fast rate of growth in the demand for power—which, in the past few years has been doubling every five to six years—requiring the greater magnitude of power development, the uneven distribution of energy resources among the political divisions of the country, the advent of nuclear power and advances in technology have led to a growing realisation that

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the State is no longer a convenient unit for planning power development and that there is need for change in the approach, so that the basis for planning is not the State but a Region formed of contiguous States. It is now well recognised that only through Regional and Inter-Regional planning would it be possible to ensure the implementation of the most economical schemes and to derive the maximum benefit from integrated operations. The Committee note that there is no organisation at present on the Regional level which can effectively plan and coordinate the diverse activities involved in rationalised power development. The Electricity (Supply) Act, 1948 does not envisage any Regional Organisation. Regional Electricity Boards which have been constituted since 1964-65 in all the five major Regions of the country, are purely advisory organisations of the States in the Region set up by resolutions of the Central Government. Since, however, the Electricity (Supplies) Act, 1948 does not provide for the generation, transmission and distribution of power on a Regional basis supplemental legislation to make such Regional activities possible may have to be introduced. The Committee suggest that early steps should be taken to bring forth a suitable legislation with a view to give the Regional Boards Statutory recognition.

189

9.72

The Committee note further that there is a tendency on the part of States which have surplus power, to charge unduly high rates for the supply of electricity to their less fortunate neighbours. This also inhibits inter-State collaboration. Since the existing statutes make no provision for the regulation of inter-State transfers or sales of electricity by the Central Government, such transfers and sales are taking place on a bilateral basis or through the good



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offices of the Central Government. Without such regulation, the States which have surplus power, enjoy strong bargaining power *vis-a-vis* their neighbours who suffer from power shortage. The Committee suggest that the Central Government should initiate necessary legislation to regulate on rational basis inter-State transfer or sales of electricity.

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9.73

The Committee also note that even though funds for the construction of inter-State transmission links to promote integrated operation are provided by the Centre, the Centre has no control on the construction of these lines nor it is in a position to expedite their construction, Consequently the neighbouring States which may be suffering from power shortage cannot avail of the surplus power in other States. The Committee, therefore, recommend that keeping in view these difficulties and also keeping in view the massive development of power required in future and the equally massive financial involvement of the Centre in future programmes, Government should take suitable statutory measures to make greater Central participation possible at regional levels.

191

9.77

The Committee note that the suggestion for setting up an All India Service of Engineers is under consideration of Government in consultation with the State Governments. The Committee hope an accord in the matter will be reached soon and the State Governments will agree to the formation of this Service in the overall interest of efficient set up in the key Sector of power.

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## APPENDIX XIII

(Vide Introduction)

### *Analysis of Recommendations contained in the Report*

#### **Classification of recommendations :**

##### **A. Recommendations for improving the organisation and working**

###### **Serial Nos:**

7, 11, 12, 27, 38, 39, 41, 42, 44, 52, 53, 54, 55, 60, 62, 64, 65, 68, 69, 70, 71, 72, 74, 75, 76, 77, 97, 107, 108, 111, 112, 113, 133, 137, 138, 145, 146, 147, 148, 149, 150, 151, 152, 156, 157, 159, 160, 161, 162, 163, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191.

##### **B. Recommendations for effecting Economy:**

###### **Serial Nos:**

13, 23, 28, 32, 56, 57, 118, 119, 120, 122, 124, 126, 158.

##### **C. Miscellaneous] Recommendations :**

###### **Serial Nos:**

1, 2, 3, 4, 5, 6, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 29, 30, 31, 33, 34, 35, 36, 37, 40, 43, 45, 46, 47, 48, 49, 50, 51, 58, 59, 61, 63, 66, 67, 73, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 101, 102, 103, 104, 105, 106, 109, 110, 114, 115, 116, 117, 121, 123, 125, 127, 128, 129, 130, 131, 132, 134, 135, 136, 139, 140, 141, 142, 143, 144, 153, 154, 155, 164, 165.