Chapter 11

SUMMARY AND CONCLUSIONS

The foregoing Chapters were a critical survey of the electricity supply industry in Maharashtra. As a survey the study covered a number of aspects of the industry rather than concentrate on one. Information and data were furnished extensively. Remarks in the form of interpretation, criticism and suggestions were made at appropriate stages. They constituted the analytical orientation of this study.

In the first of the ten Chapters a general background was given. In the second Chapter the regulatory legislation was examined. In the following eight Chapters the study was directed towards the industry in Maharashtra. In this Chapter we may now bring together the main findings. The Chapter is divided into ten sections broadly corresponding to the foregoing Chapters. Another section is added for some more general remarks.

I

All over the world there are certain tendencies that may be observed in respect of consumption of energy and particularly consumption of electricity. Energy consumption is related to economic growth and standard of living. As energy consumption increases, the proportion of commercial energy rises; that of secondary
energy also rises. As a country economically advances
the proportion of energy used for industry and transport
shows an increase. As electricity has certain advan-
tages over other forms of energy, its consumption
increases faster than that of others. Similar trends
were noted in respect of India.

The electricity supply industry is seen to be one
of the biggest industries in this country, judged by
capital investment, employment and value added. The
growth of the industry is a phenomenon of the post-II
World War period.

As the industry is particularly developed in the
public sector, there is a controversy as to whether it
should be developed on State-basis or on all-India
basis. There are obvious advantages of development on
an all-India basis as all energy problems have to be
considered together and as there are economies and other
benefits of generation and distribution of electricity
in the perspective of the whole country. It seems, how­
ever, that time is not ripe for the adoption of an all-
India basis and that the State-basis has served well.
The crucial consideration is whether the State Electrical
Power Boards undertake projects as parts of national
planning, and we find that the ES Act of 1948 and the
general planning policy in this country ensure this
discipline.
The electricity supply industry is regulated mainly under the Indian Electricity Act of 1910, Indian Electricity Rules under that Act, and the Electricity Supply Act of 1948. The rules regulate generation and supply of energy in their technical aspects. The IE Act and ES Act regulate the industry as a public utility. Protection to the community and consumers against exploitation, cheap, non-discriminatory and regular supply of service, and fair return to the supplier are the main objectives of regulation. IE Act made use of the licence for the purpose, and ES Act contains detailed provisions. Particularly Sixth Schedule of the latter legislation controls rates to the consumers and returns to the supplier.

IE Act was made, mainly for the isolated generating and distributing licensees in the era of stagnant demand. Control was broad and general, and not individualised. In the ES Act, on the other hand, control was more specific and impinged on each licensee differentially. It also visualised the licensee as a unit in the Grid, thus necessitating additional principles of control.

ES Act visualised the Grid on the State basis rather than on the national basis. In the period in which this legislation was mooted, the State base rather
than the national base was natural considering the stage of power development in this country. That the subject of power development has been in the Concurrent List of the Constitution strengthened the State as a unit of power development on the State basis. Even the interconnection of the entire length and breadth of the State was beyond the ken of the ES Act at the beginning. However, the ES Act has served a useful purpose in enabling the extension of the State Grid over very large areas particularly with emphasis on the electrification of underdeveloped regions and villages in the States. Interlinking of State Grids and the laying of national trunk transmission lines under the Union Government's Fourth and Fifth Five Year Plans have contributed to the development of the national Grid.

There are several provisions in the ES Act by which the plans and projects in the States can be dovetailed with the national plan. There is no danger of a national power development plan being scuttled down by the States or State Electricity Boards. In near future there is no need of changing the conceptual framework of the ES Act, barring the provision that with the consent of the State Government the State Electricity Board may set aside the recommendations of the Central Electricity Authority.

There is strict control of the State Electricity Boards on the affairs of the licensees in the private
sector so as to achieve maximum economy and efficiency. However, there is no equal control of the Boards on the local authorities as licensees. This may be attributed to the restraint to be observed by an autonomous public corporation vis-a-vis a government organization. Apart from this legal and theoretical nicety there is no basis for this distinction to be made by the Boards between the licensees.

The Sixth Schedule regulates the admissible expenditure and Clear Profit and also applies a ceiling to the Clear Profit, the ceiling being Reasonable Return that is allowed. The Reasonable Return mainly depends upon the Capital Base. The proposal once made prior to the enactment of 1948 that the small licensees having difficulties in raising finance, should be allowed a higher rate of return on their Capital Base than that for larger licensees, would have raised the electricity charges of the smaller licensees. It is, therefore, good that a flat rate is applicable to the Capital Base. The ES Act has been amended in 1956 and 1956 so as to revise the concepts of Clear Profit and Reasonable Return. In defining Clear Profit, expenditure to be deducted from income is that as is 'properly' incurred and also losses in the previous years which are to be deducted are such as are permitted by the State Government. However, the amendment of 1956 gave a bonanza to the industry by admitting as expenditure, interest on
debentures and on loans from Government-approved institutions, and by raising the Standard Rate to be applied to the Capital Base. The amendments of 1966 and 1966 also raised the Reasonable Return by conceding to the licensees one-half of one per centum on each of the Development Reserve, amount of debenture issue, and amount of borrowing from approved institutions. The industry can now borrow from the nationalised banks and issue debentures to any extent. As the Bank Rate has gone up, the industry can pay higher dividend as the Reasonable Return, through the Standard Rate, is related to the Bank Rate. In the circumstances, the Sixth Schedule is no grinding stone round the neck of the industry but actually a loving hand. The only difficulty is posed by the question as to how the consumers' demand would react to the rise in rates due to the rise in expenses of the business and Clear Profits. In this respect the industry is, irrespective of the Sixth Schedule, like any other industry.

There was emphasis on power development under the aegis of the State Electricity Boards. Increasingly, not only the generating licensees but also the distributing licensees are taken over by the State Electricity Boards to rationalise power supply. The take-over of some of the lucrative areas of supply may financially give strength to the State Electricity Boards. Some States found it necessary to pass legislation outside the frame of the ES Act to acquire the licensees in the private sector. The Industrial Policy Statement of 1966
which laid stress on the development of the public sector in power economy, the right of pre-emption given to the State Electricity Boards from 1969 in purchasing the assets of licensees after the revocation of licences and the recent nationalization trend, have helped the take-over.

III

As we turn from a general discussion of the regulatory legislation to the scene of the industry in Maharashtra we indicated at the outset the development of regulation and development of the industry in this state. The licensees are governed by the terms of the licences in addition to the legislation. However, where the terms of the licence contravene the legislation, it is the latter that supersedes the former. Thus the electricity rates laid down in the licence have no legal validity when they cannot be supported by the Sixth Schedule of the 22 Act. In the past licences were a powerful instrument of regulating the business of electricity generation and supply. From the recommendations made by the Shaveri Committee (1957) contents of the licences were devised so as to tighten up control and, more important, to stop the financial malpractices of the licensees. More particularly, lower rates specially for agriculture and small scale industries were fixed; licensees were placed under an obligation to stop generation on Government's
directive so as to take bulk supply from the Government or another licensee; and the period of expiry of the licence has been reduced. The Indian Electricity Rules of 1956 gave a model form of a licence and made it obligatory on the licensees to submit to the Government extensive technical and financial reports. There has been a section in the department of the electrical engineer of the State Government to scrutinize these reports and to perform financial audit. The audit reports are made very carefully, particularly to see that the provisions of the Sixth Schedule are observed.

It may be noted that it was in the year 1937 that responsible government was formed in the Provinces and also that, after the Provincial Ministries resigned on the eve of the Second World War, controls were exercised in the economy for the first time in the direction of planning about a decade before officially planning was ushered in. The imprint of this change in the situation can be seen in the licences and Government action in that behalf.

In the generation and supply industry there were the Tatas which were the biggest licensees and then came Sholapur and Nagpur power houses. These licensees together were responsible for about 95% of the installed capacity in the private sector. At the other extreme
diesel-fired small power houses proliferated in scores. So late as in 1964, a large number of power houses averaged merely 41.75 kW. Medium size power houses (501 kW to 1000 kW) were very few like Amalner, Dhulia, Karad, Manmad and Miraj. There were very few distributing licensees, again, as disparate as the generating licensees. What is most remarkable about the licensees is that even in the depression of the 'thirties they had sprung up notwithstanding the depression.

Except in a few big towns there were conditions of stagnation of demand which itself was a function of low living standard and meagre economic development. For example, spread of electricity to rural areas outside the licensees' compulsory area of supply was very limited. In 1961 such rural areas were in eight districts and were 60; and in 1962 they were 403 in fourteen districts.

It was during the Second Five Year Plan that the chronic stagnation was, for the first time, broken. It was in 1964 that the State Electricity Board was formed for the first time. It was bound to pursue the idea of a State Grid and rural electrification and to develop the public sector in the power supply industry. This was according to the objectives of the ES Act, the Five Year Plans and the Industrial Policy Statement of 1956.
It had the small hydro schemes of Bhatghar and Hadh-nagari and the very many diesel power houses passed on to it by the State Government and Princely States that were merged. It also acquired a number of diesel powerhouses from the private sector. Further it constructed a number of diesel nursery schemes following the principles of the Government's Grid Department which was started a decade earlier. The take-over period is continuous and after 1992, consequent upon the expiry of many licences, there may survive some four municipal enterprises and another six licensees, unless the State Electricity Board stays its hands off some of the bigger licensees like the Tatas. Those surviving licensees other than the Tatas are all distributing licensees. The nursery power-houses of the Electricity Board have been closed down by it, the supply being made from the Grid.

The Grid itself was set up initially in three parts: the Vidarbha, Chandras-Merathwada and Western Maharashtra. They were later interlinked to form the State Grid. The State Grid in its turn was interlinked with MP, Gujarat and Karnataka States and the Union territory of Goa. The State Grid is fed by generation done by the MSEB from its four hydro power houses (568 MW), its seven thermal stations (757.5 MW) and the Terapur

*including Kersad of which a capacity of 180 MW was installed in 1974-75.
nuclear power station (210 mW). The MSEB takes energy from the Tatas and the adjoining States, and also supplies energy to them.

In the development of the Grid the MSEB has to strike a balance between the financial pay-off and social consideration in respect of the several districts and particularly the three main regions of Maharashtra. It has a similar problem in respect of rural electrification. It has further to strike a shifting balance between its function of developing the generation and transmission complex and that of normal supply of energy. In installing generating capacity it has the senior partner in the State Government. The Government, for example, constructed in recent years the Koyya and Bidari hydro works and leased them to the MSEB.

As the public sector (the Grid) was expanding, the generating capacity in the private sector could make only a limited progress. It was 302 mW in 1947, 626 mW in 1960-61 and 200 mW in 1969-70. In the MSEB's sector the installed generating capacity increased very much faster. It was 104.5 mW in 1960-61, 1148.0 mW in 1969-70, 1299 mW in 1973-74 and 1936.3 in 1974-75.

The MSEB's more spectacular work consisted of development of transmission lines (from 4.26 thousand circuit km in 1939-40 to 95.2 thousand circuit km in 1969-70 and 70.3 thousand circuit km in 1974-75) and distribution lines (from 3.42 thousand route km in
1950-60 to 47.4 thousand route km in 1969-70 and 70.3 thousand route km in 1974-75. In the State as a whole electricity output increased from 1,541 million kWh in 1961 to 2,949 million kWh in 1966, 3,268 million kWh in 1966-67, 3,194 million kWh in 1967-71 and 11,601 million kWh in 1974-75. Per capita consumption increased from 30 kWh to 177 kWh in the period of a decade or so from 1960.

Prior to Second Five Year Plan electricity shortages, whenever they arose, were limited to Bombay-Pune region. In the rest of the State there used to be surplus installed generating capacity due to limited demand. In the meantime, however, power shortages general and to assuage the hunger for power, total generation will have to be raised to about 21,000 million kWh and assuming 50% plant factor, generating capacity to 4200 MW in 1974-75. Assuming that 130 MW will have to be retired the total generating capacity will have to be 4330 MW as the target for the above year.

IV

In considering the structure of the industry in the State, we may consider the organisation of the industry and the demand composition. In the industry the public sector is predominant with its share of 71%.

1. This figure in the Draft Outline of the Five Year Plan of Maharashtra State (p.177) is 130 MW.
in the installed generating capacity (1972-73). This proportion is much lower than the all-India figure of 96%, mainly because of the existence of the Tatas in the private sector. The licensees were in the past mainly in Western Maharashtra and at present, much of them as survive are only in this region. The industry as a whole has generating capacity which, in 1972-73, was only second to that in Tamil Nadu, but the total and per capita sale of electricity in this State was the highest in all-India comparison. The sale or consumption figure has to be taken along with the fact that a little more than half this consumption is done in Bombay-Thane area. Considering districtwise distribution outside the Bombay City, it is found to be extremely unequal in which Ratnagiri and Sihir districts are the poorest consumers. Maharashtra as a whole is the poorest region in this respect judged by the extent of electrification on the basis of population and area. The disparity should be a matter of concern for the MSBE.

In load structure of the licensees, only a few cities and industrial centres show preponderance of industrial demand (%). At the other extreme, it is found that industrial demand is one-third of the total, domestic demand is another one-third and a third consists of the rest. In most of the smaller places industrial demand is a phenomenon that arose after 1950 and it is rising in its proportion to the total demand.
MSED's load structure is one of its characteristics and it determines its cost-revenue position. The load character is due to the role that the MSED has to play in the Grid. Its irrigation load was 6.5% to 7.6% in 1973-74 whereas it was 1% for the licensees. Its industrial load was only about one-third as that of the small licensees. Its bulk supply to licensees was about a half. Agricultural, industrial and licensees' loads are disadvantageous as, out of social considerations, they are generally subsidized.

Growth of loads over the period 1960-61 through 1970-71 in this State is less than the all-India rates except in irrigation. Even then the proportion of irrigation load in Maharashtra was 4.7% as against 10.2% for the country. Taking the growth trends it is estimated that the total demand in 1978-79 would be six and a quarter times what it was in 1960 (i.e. about 21,000 million kWh as said above).

It is obvious that demand and, therefore, supply, of electricity will increase much more in the Western Maharashtra than in the other regions. Then the question is how and where additional electricity will be generated in the future. The following is the picture of the situation. In 1972-73, of the total generating capacity, 1071 mw was coal-based, 844.3 mw hydro and 210 mw nuclear. The Fifth Plan shows additional thermal capacity of 1600/1800 mw and hydro capacity of 1022 mw.
in the public sector. In the private sector an additional capacity of 600 MW will be added at Trombay.

Maharashtra has total hydro electrical potential of 3000 MW of which about a third exists in Western Ghats. The reserves of non-cooking coal are estimated at 3821.66 million tonnes, there being no coking coal and there being no coal reserves of either type in Western Maharashtra. It may be seen that by the end of the Fifth Plan almost the whole of the hydro potential in Western Maharashtra will have been used, whereas it has no coal supply of its own. Tatas' Trombay Station has to get coal at very high cost and also the supply being not always regular. Thus both hydro and thermal power will have to be produced outside this region and transmitted here. If there are transmission difficulties, expansion of atomic energy is the Hobson's choice.

V

The Grid has economies and conveniences of its own. There can be an optimum trade-off among the hydro, thermal and atomic sources of electricity considering the relative merits of each. Cost can be minimized by locating the coal-based power-houses, comparing the cost of transport of coal and the cost of transmission of energy. Within a Grid, load can be despatched to improve LF and reduce requirement of total generating capacity. These and other advantages have been realised by
interchange of energy between this State and others, interchange between KHYT and Vidarbha sectors, increase in plant size, raising of transmission voltage and reducing transmission losses, and siting the thermal stations in the north of Maharashtra at Nasik and above. This is evidenced by data which we have added.

More specifically we applied certain efficiency criteria to the power houses in the Vidarbha (thermal) Grid and the rest. The ratio of maximum demand to the installed capacity was satisfactory. Except at Shusumal and Paves in certain years, the LF was high in the thermal Grid. Except at Radhanagar and Bhatgir power houses which might have been used as subsidiary ones, the LF was high also in the other Grid. The LF of the integrated Grid can be further improved by allowing agricultural load early in the morning and load of offices (e.g. air conditioning) between 1 p.m. and 4 p.m. Utilization of the installed capacity measured by energy (MWh) generated in the year per kW of the capacity was good enough, viz. 6000 MWh except at Khaparkheda, Ballarshah and the small hydro stations. However, fuel consumption was high though it showed a salutary declining trend. Auxiliary consumption and transmission losses of energy too were on the higher side. If fuel consumption could be reduced (say, by 0.05 Kg per MWh) and energy losses were reduced (say, by 1%) the MSED could increase its income to a great extent (e.g. about Rs 1.54 crores in 1971-72).
Coal prices were comparatively cheap at Ballar-
ashen. At Bhusawal and Nasik they were high because of
the distance from collieries. However, at these sta-
tions there were countervailing tendencies in physical
consumption of coal per unit of power. We have shown
that comparing transport cost of coal and transmission
cost of electricity, the location of Khaparikheva and
Bhusawal was well advised.

In the MSEB's Grid all costs have been rising. For
example, from the year 1972-73, the unit costs were
6.57 P. for generation, 1.61 P. for transmission, 1.36
P. for HT distribution and 10.39 P. for LT distribution.
Thus the cost of supply to LT consumer was 24.67 P. and
that to HT consumer 8.53 Paise. The generation cost in
the thermal Grid was much higher (around 9 P.) and at
some of the thermal stations even 11.6 Paise. The cost
variations at different power houses can be explained,
among other things, by their cost of construction in
different years in the period of rising prices and
interest rates. All unit costs in the 'other' Grid
were lower because of Koyna generation (cost 2.75 P.
in 1972-73) and the nature of the market.

At present there are in operation opposite tenden-
cies in the movement of costs. Cost of coal and
materials, wages and salaries, lease and interest,
increased proportion of thermal power and power purchased
from other States, and extension of supply to rural areas exert an upward pressure. Elimination of diesel-based power, scale of generation and more effective working of the Grid as Grid tend to lower the costs.

Technically the MSEB's sector compared well with the big units in the private sector. Koyla power house utilized its potential better than the Tata's hydro stations. In 1971-72 MSEB's thermal power houses generated electricity per kW of capacity more than the Trombay Station. Fuel cost which is about half of generation cost was lower in some of the MSEB's stations than in some of the private stations. 0 and A charges, however, have to be kept in check in the public sector.

VI

In the licensees' sector we included even those which were municipal and cooperative. Information of the licensees could not be available under the same headings as for the MSEB's system. We considered their efficiency according to ratio of maximum load and installed capacity, generation/purchase per kW/VA of installed capacity, losses of energy, connected load per consumer and consumption per consumer. In respect of large licensees the last two were high. In respect of small licensees the first three criteria applied very well. Load conditions were the paramount factor in determining efficiency and cost. They varied widely.
from licensee to licensee. Costs of generation with
diesel oil were very high. Those few licensees that
received bulk supply from the Tatas got power cheaper.
Among them the best example is that of Bhimandi which
also benefited from predominant industrial demand.

In 1964-65 there was a great deal of unutilized
capacity (about 40%) at the maximum demand. In subse-
quent years it has declined. In 1964-65 some small
stations were producing 2000/3000 kwh in the year per
MW of their installed capacity, but also there were
stations producing some 600 kwh. This state of things
did not improve over years. It is likely that in the
last of the three years under consideration (1954-55,
1955-56 and 1960-70) the licensees were depending on
purchase of power from the MSHE and continuing to use
their old large generating capacity to augment that
supply to some extent.

High percentage of losses of energy (25% to 30%) has been a common phenomenon over years except for the
Tatas. It is common both for generating and distribut-
ing licensees, though in a comparison between them
distributing licensees recorded a lower percentage of
losses. There were some examples of small distributing
licensees to have reduced this percentage.
Distributing licensees in 1964-65 received bulk supply of hydro power which was cheap (e.g. Tata's power being available at 0.45 As to 0.74 As per unit). Bhusawal licensee purchased thermal power at 3.02 As per unit, and also subsequently continued to make its purchase at higher cost than other distributors. Generating stations produced power at a higher cost than the distributors (other than the Bhusawal distributor). This distinction persisted even after the MSEB made supply to the distributing licensees from its Grid/ Grids. In 1960-61 distributing licensees (with the exception of Bhusawal) received power below 11 P. per kWh whereas for generating station's fuel cost itself was between 9.2 P. and 14.6 Paise, except for the biggest thermal producers (power houses of Nashik, Mulegaon, Jalgaon, Ahmednagar and Dhulia where installed capacity was between 3375 kW and 1263 kW). Only in this latter class the generation cost came near to the cost of bulk purchase. In 1966-70 distributors (with the exception of Bhusawal) purchased power below 10.5 P. but at the biggest thermal stations of Jalgaon, Mulegaon, and Chalisgaon, fuel cost itself was 13.4 P., 12.6 P. and 14.4 P. respectively. Not to say anything about the very small power houses like Koregaon and Aundh (where generation cost was respectively 11 As in 1964-65 and 73.6 P. in 1960-61) there was a clear case for stopping thermal generation of the licensees and rendering them as distributors.
The MSEB could allow the licensees to be distributors or take them over completely, both courses of action being subject to its capacity to make the supply. The take-over of distributing licensees was advantageous to the MSEB and to the consumers. To the consumers because of the lower tariff rates of the MSEB (except in the Bombay-Thane-Bhiwandi area) and to the MSEB by improving its LF and yielding economies of scale.

We took up certain case studies either to discover new features or to confirm what was found earlier as above. Tatas' Trombay thermal station uses coal, oil and gas. Yet its fuel cost of generation per kWh is higher than in the Vidarbha Grid. Trombay has an edge over Kaperkheda only in O & M charges. Tatas' success lies mainly in the low hydro costs and the market composition and density. Opposition to Tatas' Mulshi dam construction (1929) exposed the prejudice of Maharashtra against electricity and industrialization that obtained till recently. On the other hand, in the present enthusiasm for power development the pollution effects of Tatas' thermal station are not being noted.

DELT, BSES, Thana and Bhiwandi licensees' success greatly depends on their getting cheap power from the Tatas and the nature of their load. BEST, BSES and Thana licensees have in this order decreasing number of consumers per km and increasing amount of consumption
per consumer. Consequently there are increasing energy losses. BEST as a Limited Co had opposed (1906) the licence being given to the Tatas as that would have created a competition, and later (1926) it stopped its own thermal generation to take cheap hydro power from the Tatas! And yet a third event is significant, viz. the BEST did not think in the 'twenties that a licence for supplying electricity to the north of Bombay would be worth its while. The BBD Co was formed for this purpose and after it has prospered the BEST in recent years would like to take over this power supply and utilize its profits for its bus services in the north of Bombay.

Ranwadi and Ichalkaranji have industrial load to the extent of 80% and above. Nagapoon, Jalgaon, Chalisgaon and Bhausnai have this type of load in diminishing proportions. Their total load also diminishes. Their efficiency too. Miraj is a case which may be typical of the medium size of towns. Its industrial load is 60% and domestic, commercial and water works loads are each almost equal, and yet it is one of the successful enterprises giving a dividend of 8%.

Savda-Faispur and Kurundwad licensees were very small in the year 1965-66. They had diesel power stations. Cost of power supply at Savda-Faispur in
1965-66 would be 7 to 8 As per kWh. This rate itself would restrict demand and would bar the possibility of reducing cost. The only option would be to stop generation and instead take bulk supply from the Electricity Board at a price below 5 As per unit. Murundwad licensee was not only saved this way by being a distributing licensee but also it has done better since it took supply from the Electricity Board from 1966. It could reduce tariffs and also give dividends to shareholders at 6% and above.

VII

The Tarapur Atomic Power Project (420 MW) was commissioned in October 1969, half its power being received by the NSHEB in its grid. In the great debate that preceded the setting up of the TARP those who opposed it did not foresee the increase in power requirement in this region. Nor did they consider the advantages in the form of training scientists in the new technology and the advantages in the form of application of isotopes and radiation to agriculture and industry. Today it may also be said with a hindsight that they did not foresee the forces that could be released by atomic detonation which was done in May 1974.

As it was said above, in Bombay region the atomic power has a very good case in view of non-availability
of coal and near-exhaustion of hydro potential. The only question is how far atomic power would compare economically with thermal power. Bhabha-strategy need not be mentioned here as it is a long term strategy based on the development of fast-breeders and also because the TAPP is an isolated step in that it is using BWR with enriched uranium that is imported. In the first place, it may be noted that thermal power, the only alternative, would have required one million tonnes of superior grade coal every year, i.e. three train loads every day. Secondly, the actual cost of the atomic station worked out at Rs 1757.3 per kw as against Rs 1700-1200 per kw of thermal plant. For first seventeen months Availability Factor was 86.26% and the Plant Factor 62.1%. Only in the following period (upto June 1974) the first factor fell to 54.12% and the second 39.7%. This made a big difference. Even then over the period 1970-71 to 1973-74, the average cost of energy boiled down to 6.55 P. per unit though this was exclusive of certain charges in some period and particularly of return on capital. In the year 1973-74 the RSE may have according to our calculation, received power at 8 P. per unit. This compared with the price of thermal power. Thirdly, the use of foreign exchange (to the extent of Rs 37.32 on capital account and Rs 27.59 crores on fuel upto March 1973) was a serious matter in a country with chronic adverse
balance of payments. Increasingly, however, the re-
current foreign exchange cost (mainly for fuel) is
likely to decline. If Availability and Plant Factors
rise and if use can be made of isotopes and radiation,
atomic power could be considered cheap.

VIII

Turning to the problem of electricity tariffs,
we found that administrative rate-making contained an
element of arbitrariness. The rates laid down in the
licences were high, except in Bombay, Thana and Bhi-
wandi. Now that the rates are regulated under the
Sixth Schedule of the PS Act, they may cover up the
inefficiency of the supplier. As compared to the rates
in the past they have in recent years not risen in step
with the general price rise. On the contrary, they
have declined in many cases upto 1970. The rates have
been such that the revenue together from all consumer
classes satisfied the conditions laid down in the Sche-
dule, but the relative rates cannot be said to be just
i.e. according to the payers' ability to pay.

As we turn to the tariffs of the MSEB, we do not
apply Hotelling's principle of marginal cost pricing
which we think is open to several criticisms. Instead
we devote attention to "the examination of the policies
actually adopted in order to discover their effects."2

2. Jack Wisseman quoted in Appendix to Chapter VIII.
We have examined the approach made by the Working Group of the ISI and, applying that, found that the MSEB rates were lower for domestic class, industry and bulk supply, and higher for commercial and street lighting and small industry classes than they should have been. Also irrigation rates were very low.

Our own approach is twofold. Firstly, total revenue should cover the total cost with a reasonable return on capital for capital formation. Secondly, the relative rates should be based on the principle of ability to pay. This principle has to be juxtaposed against the customary mode of rate-making in which a distinction is made between peak demand and off-peak demand. The distinction is being evened out and also losing its significance. Peak and off-peak distinction is one form of cost approach. Better form of this approach is to compare cost and revenue per kW connected load for different consumer classes. Here we found that there was a case for rise of industrial and agricultural tariffs.

On the principle of ability to pay, we suggest that domestic light and fan rate should be reduced. Industrial and commercial rates may be raised. Block rates should be fixed not 'promotionally' but 'progressively'. Blocks may be manipulated to suit different areas in view of their needs. Tariffs on electricity
used for water works, public lighting, hospitals and agriculture etc., should be subsidised from progressive taxation. Tariffs to licensees are a class by themselves as the licensees take power not for use but for resale. They may be given subsidy if, having adopted the above rate pattern, they fall short of Reasonable Return. Tariffs to be charged to them may be considered in this light.

IX

Financially the MSEB has grown very greatly. Its assets and liabilities were 79 crores in 1963-64 and they mounted to Rs 634 in 1973-74. Liabilities consisted of loans to the extent of 69% to 84%. Current liabilities were between 12% and 24%. Among assets, net fixed assets were 67% to 85%. Rates of growth of fixed assets formation were highest in 1968-69, between 31% and 36%. These figures give an idea of the magnitude of the task of the MSEB. The high proportion of loans in different forms involves a huge charge on the MSEB's finances, though the interest rate is lower for the MSEB than for the private sector. Net of interest payment the profits of the MSEB would have been negative in the years 1971-72 and 1972-73 and merely Rs 0.23 crores in 1973-74.

We have shown MSEB's returns as percentage of the Capital Base, following the IMF's principles in this behalf. Applying the principles applicable to the
licensees, we have shown that the HSB's returns varied between 6.2% and 8.3% if works in progress were excluded from the Capital Base and between 2.6% and 6.3% if these works were counted, in the period 1966-67 to 1973-74.

We have discussed the authoritative views on the need of the State Electricity Board making surplus over cost. The Venkatraman Committee recommended 6 1/2% and 9 1/2% (both inclusive of provision for interest) returns to be obtained. We have shown the extent to which the electricity rates would have to be enhanced by the HSB if these norms had to be satisfied. In 1972-73, for example, the charges should have risen by 39% so as to yield 9 1/2% surplus.

Finances of the licensees were examined at three stages, (circa) 1954-55, 1960-61 and 1969-70. For certain purposes the year 1964-65 too was considered. In case of some licensees we have gone in greater depth and brought the analysis to more recent years.

Operating Profits were less for generating licensees than for distributing licensees. They also were found to decline with diminishing size of the licensee.

Proportion of Share Capital showed a decrease. This shows the diminishing significance of Reasonable Return and Standard Rate prescribed in the EE Act. In respect of Tatas, BSES and the Thana licensee it was seen
that their shares have been purchased by public sector financial institutions to the extent of their having control of these companies.

On comparing balance sheets of 1960-61 and 1969-70, we found that the annual compound rate of capital formation was 8.2%. It was higher in case of distributing licensees than in case of generating licensees.

Distributors had more Clear Profit than the generating licensees. Among the latter Tatas were the only licensees who made Clear Profit in excess of Reasonable Return over a period of nearly a decade. Some small licensees made losses year after year.

We made an attempt to compare the electricity generation and supply industry with other industries. We used all-India data for the periods 1950-51 to 1963-64 and 1965-66 to 1969-70, in respect of gross profit as percentage of sale and capital employed and percentage of dividend on paid-up capital. In the first of these periods the large and medium units in this industry did not fare as well as other industries though the small scale units compared well with those in other industries. In the second period the large and medium public limited companies in the electricity supply industry were comparable with those in the other industries except in
gloss profit as a ratio of capital employed. In respect of electricity supply companies quoted in the stock exchange we found that their dividend rate was as good as that of companies in other industries.

X

Rural electrification (abbreviated here as RE) has much advanced in Maharashtra. In the number of villages electrified this State is second only to U.P. and in pumps electrified it is second only to Tamil Nadu. In Maharashtra in recent years the pace of RE has been highly accelerated. Size of pumps has been increasing though, however, electricity consumption per pump does not show a similar trend. The latter is true partly because there is no adequate water in the wells to lift.

Having referred to the experience of RE in this country in general and in the five cooperative RE projects sponsored out of funds made available by the US AID, we have particularly drawn on the experience of one of the above cooperatives that is in Maharashtra (Mula Pravara Electric Cooperative at Rahuri) and the data that we have collected in respect of 32 villages in Poona, Kolhapur and Thane districts. We did not
have the necessary data in respect of the MSRB and hence we had to depend on the above.

In the Raha Pravra Co-operative, the agricultural load has been preponderant (95%) and it was also found to be fluctuating from month to month in the year. For the given load, overhead costs were very heavy. In respect of other costs, energy losses were too high (35% to 50%). Naturally financial losses were heavy. If the energy losses could be reduced to 25% as at Sircilla, Kodinar and Lucknow, there might arise a medium of financial surplus.

In our sample villages, electricity consumption was found both limited and subject to severe fluctuations. In these villages taken separately in each district, industrial load was about 50% to 58%. We calculated return on investment which was positive for 16 villages out of 21. Eight out of these 16 villages showed return of more than 6%.

Turning to the impact of RE on the MSRB’s finances, we found that the subsidies so far received by it from the Government were inadequate. On its own showing the deficit on account of RE was about Rs 12 crores as against the subsidy of Rs 4.17 crores in 1974-75. Even if the MSRB received a subsidy to the extent of the loss on account of its RE programme, socially some larger problems would have to be reckoned with. They
would be the problems of increasing load, improving LF, reducing current costs by reducing energy losses and reducing overhead costs by restructuring capital financing. Lastly, we have quoted from other studies benefits of RE and saving in costs by electrification as compared to dieselization. If soft and perpetual loans could be obtained for RE programme it would both be viable as an industry and socially worthwhile.

It may be noted that in calculating viability we have excluded the capacity to make repayment of loans and deposits because we believed interest payment and provision of depreciation should be regarded as adequate price for the use of capital.

XI

Distributing licensees were found to work more economically than the generating licensees and also larger licensees were economical than smaller licensees. In eliminating the smaller power houses the MSEB has done a distinct service. In taking over the licensees (even distributors) the MSEB has reduced the electricity rates to the consumers. The MSEB as compared to the private sector was generally maintaining a high degree of efficiency in generation, though in a comparison of the two sectors, the ceteris paribus assumption is not applicable. In extending rural electrification the grid had a further justification.
In future the Grid will have to reduce coal consumption in thermal power houses and reduce line losses and improve Load Factor in distribution. Overall O & M charges too have to be held in check. In view of the fact that energy will have to be imported into main load centres in Western Maharashtra from Vidarbha, transmission costs have to be economised by taking special measures.

In developing the existing generating capacity by about as much in the next three years the MSEB's organisation which has the symbiotic functions of developing the generating and distributing complex and also supplying energy to consumers from the given complex will be put under strain which it will be its test to withstand successfully. Its relations with two major partners in its task viz. the Tatas and the Atomic Energy Commission will have to be managed carefully and to the advantage of both. It may have to take over bigger distributing licensees further to strengthen its financial position so that on the one hand services can be improved and on the other hand rates may be lowered and capital formation may be done.

In the distribution system of the Grid, the MSEB will have to strike a balance between the requirements of the main load centres in the Western Maharashtra and
special consideration to the needs of development of the Vidarbha-Marathwada regions. In developing the distribution system faster in the latter regions there will be the advantage of nearness to the generating centres. The MSEB's need of improving the LF and improving its finances will be a pull in the direction of the developed centres in Western Maharashtra. If the decision involved is not to be only political, the MSEB will have to have a perspective of its own position between the opposite pulls.