CHAPTER I :

I N T R O D U C T I O N

I. IMPORTANCE OF ELECTRICITY INDUSTRY :

Each industry has its unique characteristics and problems. In this study, we propose to examine the growth of electricity utility in India, changes in factor productivities and technical progress therein. We also take up the pricing problems relating to electricity. Studies of individual industries have their own merits. They throw light on the similarities and dissimilarities among different industries and thereby deepen our understanding of the economic processes. They also help to build up a better empirical framework for the aggregative studies.

It would appear at first sight that the electricity industry occupies a minor place in the economy. Thus, its share in Net Domestic Product in 1970-71 was only 0.82%.[1] However, if one considers it as an individual industry or an

---

1 Worked out from the data available in National Accounts Statistics, 1960-61 - 1973-74, Central Statistical Organization, Government of India, 1976.

individual public utility, it is an industry or utility of gigantic proportions. Here, below we give the data relating to value of output and Income Generated by Railways, Electricity, Mining and Quarrying and some of the important large-scale manufacturing industries.

Table I.1

Value of Output and Income Generated/Gross Value Added in Selected Factory Sector Manufacturing Industries, Mining & Quarrying, Railways and Electricity: 1973-74. (Rs. in crores)

Industry	Value of Output	Income Generated/ Gross Value Added
1	2	3
Cotton Textiles	1752	518
Sugar	781	129
Fertilizers	348	66
Mild Steel	828	182
Coal	397	N.A.
Electricity	764 *	469
Railways	1072	601
Mining & Quarrying	N.A.	475
Petroleum & Coal Products	580	95

Note :

1. Figures for Electricity, Railways and Mining & Quarrying are the figures for Gross Value Added; published in National Accounts Statistics 1960-61 to 1973-74; Central Statistical Organization, Govt. of India, 1976.
2. Figures for the value of output and income generated by Cotton Textiles, sugar, Fertilizers, Mild Steel & Coal are from Basic Statistics Relating to the Indian Economy, Commerce Research Bureau, October 1975.

continue...

* Refers to 1970-71.

3. Figure for value of output of Railways is from Kishan Rao's Thesis : Growth, Productivity and Technical Change in Indian Railways: 1951-1972, p.39. Unpublished Ph.D. Thesis, M.S.University of Baroda, Baroda.
4. The figure for value of output for Electricity is from Public Electricity Supply - All India Statistics, 1971-72.

The above table shows that even if the percentage share of electricity in Net Domestic Product is small, in relation to other large industries, like coal, cotton textiles, fertilizers etc., Electricity has a sizeable amount of value added. As a public utility it is next only to Railways in terms of value of output and income generated.

Share of Electricity Industry in Plan Investment :

The growing importance of electricity is further reflected in larger and larger proportion of plan outlay being allocated to the power industry. This can be readily seen from the following :

Sectoral Allocation of Public Sector Plan Outlays

(Per cent)

	First Plan	Second Plan	Third Plan	Annual Plans	Fourth Plan	Fifth Plan
Power Industry[2]	8	10	15	18	19	17

2 Source: Basic Statistics Relating to the Indian Economy, Commerce Research Bureau, October 1975, Table 5.2.

The growing importance of electricity is further reflected in the rate at which it is growing as compared to some of the other large industries. Normally it is observed that large industries do not grow at a very fast rate. A comparative picture of the rates of growth of different industries is given below :

Industry[3] Yarn	Compound annual rate of increase from 1951 to 1974 (Per cent)
Cotton ~~Fabrics~~ (Mill Sector)	2.0
Sugar	5.8
Fertiliser: N_2 content	22.7
Fertilizer: P_2O_5 Content	16.4
Iron Ore	10.2
Coal	3.9
Railway	4.6
Mining and Quarrying	4.3
Electricity	11.2

It can be very easily seen from this table that electricity is one of the fastest growing industries in India. Similar ~~is~~ was the experience of America in the early days of her economic development. "Between the opening of the century and the outbreak of World War II, the output of

3 Source: 1. Kishan Rao's Thesis, (mentioned earlier) for Railways.
2. Basic Statistics Relating to the Indian Economy, op. cit. Table 9.12.

the electricity, light and power industry multiplied 40 times."[4] Electric light and power in America, over a period of 41 years viz., from 1900 to 1940, increased at an annual compound rate of 9.87%.

Special Advantages of Electricity as a Source of Energy :

However, much beyond the magnitudes of output and value added, electricity occupies a key position as a public utility and infrastructure in the process of modernization and economic development. As a source of energy and light it not only surpasses all the alternative sources, but, some of the processes and industries would be impossible to think of in the absence of electricity.

Electricity as a source of energy has some special advantages as compared to other alternative sources. It is not only convenient to use electricity, but it is cheaper, cleaner and safer to use electricity. "The safety, convenience, continuity, cleanliness, the simplicity of operation and the versatality of the uses to which it can be put has inevitably made it an important ingradient of process of

4 Gould J.M., Output and Productivity in the Electric and Gas Utilities: 1899-1942, p.2. National Bureau of Economic Research, New York, 1946.

modernization".[5] Therefore, as the economy progresses we expect more and more use of electricity as a means of lighting, heating and motive power. This is borne out by the Indian experience.

II. CHARACTERISTICS OF ELECTRICITY INDUSTRY :

Public Utility :

The Electricity industry is thus a large industry and it is also a fast growing industry. It is a highly capital intensive industry. As an infrastructure, it is considered to be a public utility.

The characteristics of public utility are very clearly explained by Caywood when he writes, "There are, however, three important differences between the electricity utility and the usual business enterprise. First, the utility has an obligation to serve all who apply for service. Second, the utility does not have direct competition..., that is, only one utility operates in an area, except in isolated instances. Third, in the place of direct competition, government is substituted".[6]

---

5 Kothari V.N. and Dadi M.M.: Economic Benefits of Rural Electrification in Gujarat, Department of Economics, Faculty of Arts, M.S.University, Baroda, 1977, p.1.

6 Russell E. Caywood, Electricity Utility Rate Economics, McGraw-Hill Book Co.Inc., New York, 1956, p.1.

On account of it being a public utility certain advantages are given to this industry by the government. These advantages are: (1) Protection from competition; (2) Right to dig and utilize streets and highways; and (3) Right to condemn property. Against these advantages there are certain disadvantages also. These disadvantages are : "(1) Limitation of earnings; (2) The obligation to serve all who apply for service, (3) Prohibition against withdrawal of service without regulatory approval."[7]

Peak-Loading :

The other characteristic of electricity industry is that its output cannot be stored. Therefore, the capacity is to be installed, not on the basis of average demand, but, on the basis of maximum demand. Since the maximum demand does not last for twenty four hours a day, some capacity has to lie idle. If an additional demand takes place at the time of peak, then it can be satisfied only by creating additional capacity.

Types of Generation :

There are different methods of generating electricity

---

7 Ibid, p.3.

depending on the types of fuel used. Thus, we have Hydro-electric power plants using water for generation of electricity. Alternatively electricity can be generated by Thermal plants. Thermal power plants use coal or oil as their basic fuel in generating electricity. Since 1969, in India, electricity is generated by Nuclear plants also. These plants use atomic energy for power generation.

Generation, Transmission and Distribution :

The electricity industry is further characterised by the fact that it does not include only the production of output, but, it also combines transmission and distribution of electricity. Electricity is not only to be generated but is also to be transmitted to different centres through transmission lines. Having transmitted electricity it has to be distributed among different consumers through distribution network. All these processes have to be simultaneous because electricity cannot be stored for distribution at a later time. Electricity industry not only produces electricity but also retails it.

Electricity Industry in India :
A Preserve of Public Sector :

Electricity industry, on account of its being a public utility, has a greater influence on the general welfare of the people. In India, under the Industrial Policy Resolution of 1948 and 1956, Electricity Industry is reserved for public sector only. Thus, generation, transmission and distribution of electricity is the exclusive responsibility of the state. As a result of this the share of private sector in Electricity is shrinking.

III. PROBLEMS STUDIED :

In this thesis we have tried to study the following problems pertaining to electricity industry.

Characteristics of Growth of Output :

Here, we have made an attempt to see how the output of electricity has grown over a period of time. In order to capture the qualitative differences in output of electricity we have also observed the growth of sales, in physical terms, to different categories of consumers. Having seen the rate at which the output has grown, we have, further, observed the rate at which the rate of growth of output has changed.

Partial Productivity Analysis :

Three very important inputs required for the generation of electricity are labour, fuel and capital. The rate of growth depends on the rate of growth of inputs and the rate at which the productivity of these inputs undergoes a change. Therefore, we have undertaken the analysis of partial productivity of these three inputs.This is done by estimating the rate at which the productivity of each of the,above mentioned, inputs has increased over a period of time. Then, we have observed the rate of change in these rates of growth of partial productivities.

Measurement of the Contribution of Technical Progress :

After observing the changes in productivity of these inputs we have tried to observe the joint productivity of all the inputs taken together. Whatever is not explained by the productivity of inputs - labour and capital - is the contribution of technical progress in the growth of output. The effect of technical progress is estimated by fitting production functions.

The time period that we have selected, for observing

the growth of output and input productivity, is roughly a period of 21 years; in some cases 20 years or 16 years; depending on the availability of data. The period covered by this study is from 1950-51 to 1970-71. The selection of the time period is mainly guided by the availability of data.

Pricing of Electricity :

There are many problems associated with pricing of electricity. These problems emerge mainly because it is very difficult to estimate the marginal cost of electricity. The marginal cost of electricity varies not only with the time of the day but also with seasons and types of consumers to be supplied. In this thesis, an attempt is made to study some of the problems associated with pricing of electricity. Over and above this we have also tried to study the extent of price discrimination among different categories of consumers of electricity in India.

This study takes into account the electricity generated and distributed by the utility and the electricity generated by the non-utilities such as the self-generating industries and railways is excluded. The non-utilities constituted less than 10% of the installed capacity and power generation in India in 1970-71.