CHAPTER- I
INTRODUCTION
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1.1 Introduction:

Under the 1991 power policy:

...generating companies can now set up one or more generating stations and offer to sell electricity to the grid, unlike licensees, who supply and distribute energy within a specified area and who may or may not have generating stations. It is possible for an enterprise to combine the functions of a generating company in one area and that of a licensee in another area. The generating company will sell power to SEBs, on the basis of an agreement, and, at tariff, based on parameters applicable, to generating companies.

Power is one of the most important forms of Energy necessary for the economic development of nation. Power is a key input factor for ensuring and accentuating orderly socio-economic life to maximize welfare. Full utilization of other inputs and resources like man power, land (irrigation) and capital related resources rely on the easy and adequate available of Electricity. The draft 9th plan\(^1\) rightly stated thus:

\(^1\) The draft 9th plan- Planning Commissions GOI Draft Proposal 1996
Electricity is the most versatile form of energy and provide infrastructure for economic development. It is a vital input for industry and agriculture; and is also of particular importance to developing rural sector. The future development of the country therefore will depend upon the rate of growth of Power generation capacity.” The role of power sector is so influential that economists often establish a one to one correspondence between energy and economic development.

Power is the back bone of our economy and for any nation in the world for improving quality of life. Power sector accelerate growth of a nation’s GDP. India’s power sector has grown tremendously since Independence in 1947, with installed capacity rising 8% annually to more than 1,24,287 MW by 2007. Despite this eighty-fold increase, per capita consumption of electricity is only 366 kWh per annum in 2001, much lower than world average of over 2,000 kWh. Indian’s often compare their performance with China, which had lower level of development two decades ago, but today has more than double the per capita electricity consumption (and GDP) than India. Indian power sector had grown since 1897 to the present installed capacity of 1,24,287 MW as on 30.03.2006 (Annual Report, 2006, Ministry of Power). India maintains a low per-capita power consumption of 366
Kwh. in 2001 As compared to USA's 12441 kWh, Canada 15758 kWh, Japan 7405 kWh, China's 872 kWh and S.Korea's 4497 kWh 1998, as per CEA data (Central Electrical Agency, 2000). End users of power in the country are faced with shortage of power, frequent power cuts, voltage drops, frequency variations leading to severe daily life difficulties and economical loss to nation.

According to 16th Electric power survey² conducted by CEA which reveals recommendation for improving power generation in India, as below: i) Based on the projections made in the 16th Electric power survey conducted by CEA, over 1,00,000 MW additional generation capacity needs to be added by 2012 to bridge the gap of demand and supply.

Accordingly demand side management and additional capacity plan formed part, ii) In view of high investment involved in the installation of new plant, urgent need for optimal utilization of existing generation capacity and to renovate and modernize (R&M) and life extension (LE) of existing old plants were considered to be most economical option but to obtain additional generation, iii) Electrification of villages had seen as 77,897 villages still do not have access to electricity, iv) In adequate

² 16th Electric power Survey Report by CEA-2001 for power projections
power supply / Generation capacity leading to capacity expansions, v) Optimum utilization of existing generation capacity, energy conservation, vi) Increasing the efficiency of Power generations, vii) Inadequate inter regional transmission links and development, and viii) Electrification of Villages and households. On the other hand, Agricultural consumes almost one third of power in India, yet provides less than 5% of the revenues. Official estimates of the subsidy to agriculture are based on the difference between the tariff charged and the average cost of supply for all users. The study address a number of issues related to changing trends in electricity generation and its impact on power sector reforms in thermal utilities.

1.2 Statement of the Problem:

India’s power sector is undergoing significant reforms, beginning in 1991, which are changing and diminishing the role of government, which functioned earlier as the near monopoly integrated utility. From being government departments, the State Utility Boards (SEBs) are being unbundled, and the role of the government might be recast as the regulator and (last resort) financier, with operations in the hands of
companies, especially private companies or privately controlled companies.

Indian power sector have four major sources, namely thermal, hydro, nuclear, non conventional. Of these sources Thermal accounts for 66.30%\(^3\), Hydro power 26%, Nuclear 2.70%, and non conventional 5%. Thus forming a major source of power as Thermal source.

In thermal power there are three sub sources such as Coal/lignite, Gas, diesel form resources of power. Of the total installed capacity of 124287 MW as on 31.03.2006, coal based power accounts for 55% which is 68,518 MW. 1,00,000 MW additional generations capacity needs to be added by 2012 to bridge the gap of demand and supply. Otherwise huge power shortage will cripple the country.

India is abundant with coal resources. More than half of national power is generated from this sources. Thus, the study addresses on the power sector reforms after 1991. Economic reforms of the changing scenario Necessitated power sector also to undergo reforms the reforms in the Indian power sector were initiated in 1991 to mobilize private sector for addition of power generation in installed capacity, renovation and modernization of plants, healthy performance orientation.

\(^3\) CEA General Review-2006
Performances of these power utilities and their healthiness are important aspects of power sector which is fast decorating due to subsidies of state governments and poor status of State Electricity Boards (SEBs). The current thrust of reforms is on the generations, transmission and distribution sector, reducing losses, privatization and increasing efficiency.

Given India as a large nation, with 29 states different states will and do behave differently. This dynamics, with increased competition between states is a positive sign in the reforms and development process. At the end of the day, India’s reforms have thus far gone a fair way towards the ingredients necessary to reaching the goals of increased access, efficiency, and viability, but they have not yet directly done so.

These reforms are necessary but perhaps not sufficient; it will be the focus of enormous effort and expenditure by the government, funding agencies and companies in the thermal utilities.
1.3 Objectives:
The specific objectives are in order:

1. To study thermal power utilities in India during power sector reforms,
2. To analyze operational performances and financial performances of thermal power utilities during power sector reforms, and
3. To suggest for improving thermal power utilities performances and developments for economic growth of nation.

1.4 Hypothesis:
These objectives present specific questions to be answered by the study. The answers depend largely on the hypothesis to be empirically verified.

1. There is increasing trend in financial performance of major thermal power utilities in India.
2. Thermal power utilities are tuned more efficient during the power sector reforms in India.
3. There is congenial cooperation between market structures for thermal utilities, and
4. There is an adequate tariff and pricing policy for thermal power utilities.
1.5 Methodology:

The study is based on primary and secondary data collected through questionnaire surveys and interviews with the utility managers and a number of subject matter experts. The methodology consists of a comparative analysis of the pre and post reforms of the thermal generation utilities for understanding the factors that drive the changes over the reform process and predicting the future outcome based on the findings.

The study covers 25 generating units across 29 states, encompassing the entire thermal generation utilities of the nation. Data have been collected for thermal utilities for pre-reform period from upto 1990 and post-reform period 1991 to 2006 to capture the changes that may have taken place after initiation of the reforms in 1991.

Data Source: The required data are collected from Central Electricity Authority (CEA) data publications, Ministry of Power (MOP) – Annual Reports and its Publications, Power Finance Corporation data publications, State Electricity Boards Annual Reports and its Publications, Central Electricity
Regulatory Commission publications, Review Reports of CEA, Power Line monthly publications, Planning Commission Reports publications, Electricity India Vision 2007 publications, and News reports publications. Published Annual Reports of Power Utilities in India forms part of data collection. All these published data are collected from print media and from concerned sources. A Sets of questionnaires have been designed for the study. The questionnaire, referred for generating plant technology, efficiency, cost, consumption, production and other generating parameters and for information about decision making that is administered to practicing managers, regulators and other stake holders connected with generation utilities.

Tools of Analysis:
Analysis of data includes tools such as hypothesis testing, time series and trend lines using Whole Sale Price Index to analyze the average cost of supply and tariff. To verify the hypothesis of the study the ‘t’ distributions, regression analysis, Chi-Square, correlation has been applied using the minitab-15 (software package is used to analyze statistical data).
Since plant level and other data have to be collected from authenticated and reliable sources, primary source of data collection are not possible to get all relevant data, due to larger volumes, accuracy and reliability of data. Hence the researcher opted for secondary data from reliable sources

**Period of Study:** The present study is also primarily based on the secondary data. The period of study is 1897-1990 pre reforms period of power sector and 1991-2006 post reforms period of power sector.

1.6 Significance of the study:

The study elaborates the need for reforms. It addresses the different sectors shambled status of thermal power utilities, financial performances of various coal based thermal power utilities in the nation. Measures of good financial performances, plant load factors, renovation and modernization, tariff on sale of power to end users, revenues, its collections and its impacts on profits are explained. The study will elaborate various steps to develop financial performances for a betterment of thermal power sector. The study will examine the entry private players in generation, but have led to the emergence of various
ownership structures, which are not present earlier. Scope of the study cover thermal power utilities using coal, lignite as fuel for power generation. The study analyze financial performances of thermal utilities that depends on various parameters, such as efficient generation, Higher Plant Load Factor (PLF), timely generation bill realization, tariff regulations, distribution of generated power, profits. These performances on power generation, capacity addition, PLF, revenue collections will enhance the healthiness of the power utilities further. Financial performance in the past and present are compared with each others during power sector reforms period that started from 1991 onwards.

1.7 Limitations of the study:

1. The study is confined to Indian thermal power utilities that operate on coal/lignite, gas as fuel prior to reform and after reforms. The researcher had to gather inputs on an all India basis on thermal power utilities, hence various sources of primary and secondary sources and publications have been considered. Many corporate and public sector utilities financial and cost data and its access are difficult to procure and compile, in view of its complexities and nature of data.
1.8 Thesis Organization

Chapter – I describes Introduction, objectives, Hypothesis, methodology and Limitation of the study

Chapter – II elaborates working definitions & a robust review of literature of power sector reforms in India and other developing countries.

Chapter – III elaborates profile of thermal unities, transmission, distribution, regulatory commissions of state & central and consumers.

Chapter – IV analysis of data & inferences on Generations, Plant Load Factor, Capacity additions, Tariff, Revenues and financial performances of thermal Utilities.

Chapter – V Concludes with findings, suggestions and conclusions.

Chapter – VI explains an application of this study for future perspectives of power sectors in India.

1.9 Conclusion

Financial Performances and operational performance of the thermal utilities have improved during power sector reforms period and paved ways for loss reduction and development. Plant load factors have creditably improved to set standards and recover cost of installations. Capacity addition programmers are achieved but not very much.
Nonetheless, they are a step in the right direction, ending years of government control, monopoly and mindset. The government corporations- state electricity boards are performing worse than private companies, but having all of them competing to perform better and it will only help the consumer and thermal utilities as a whole. There is a need for coordination between generation utilities, transmission utility, distribution utility, and consumers in India for further better performance.

The study elaborate further in chapter II for Review of Literature in the next chapter.
1.11 Research Model

Generations
Thermal Power utilities
Private / Govt.

Power
Transmission
Govt. ownership

Distribution
SEB’s Govt. ownership

Pre-Reforms period 1947-1990 leading to sickness of utilities
Low tariff by Govt. , Huge loss accumulation

Generations
Thermal Power utilities
Private / Govt.

Power
Transmission
Govt. / Private Ownership

Distribution
Private / Govt. ownership

Consumers
Industrial
Domestic
Commercial
Agriculture

Post-Reforms period 1991-2006 still continues →
unbundling, Privatization, competition, Tariff rationalization by regulators → sickness and
deficiency development of utilities, loss reduction-financial healthiness development, and
consumer satisfaction