Chapter I

INTRODUCTION
Today electricity has become the essential ingredient of human life with vast social implications. Human life is touched daily by electricity and economic development has been intrinsically coupled to electricity use. Its absence is usually associated with poverty and poor quality of life. In the present digital age, electricity is the most convenient of all forms of commercial energy and has rightly emerged as the most crucial and critical input for sustaining the process of economic and social development. Development of different sectors of economy is not possible without matching development of power sector.

Globally, the growth rate of power demand is around 2 to 3 percent, whereas in developing countries it has reached access to adequate and affordable energy, which holds the key in improving the living standards of the people. Per capita consumption of electricity has become one of the important indices of economic development of a nation and policies aimed at providing electricity in a sustainable manner.

Exclusive dependence on government for the provision of all infrastructure services causes difficulties concerning adequate scale of investment, technical efficiency, proper enforcement of user charges, and competitive market structure. At the same time, complete reliance
on private production, particularly without appropriate regulation, is also not likely to produce optimal outcomes. Therefore, in the last two decades the power sector in both developed and developing countries has been subject to restructuring. Although the approaches to reform have varied across countries, the main objective has been to improve the economic efficiency of the sector by introducing private capital, liberalizing markets and introducing new regulatory institutions.

Andhra Pradesh state’s power demand has been increased continuously and the dependence on the power from outside has been increasing simultaneously. Power reforms were introduced to improve the efficiency of the system and to rationalize tariffs and financial health of the sector. Despite the power sector reforms in Andhra Pradesh, the gap between demand and supply was increasing due to substantial increase in agricultural and domestic consumption in the state.

In Andhra Pradesh, agriculture is the primary occupation of about 70 per cent of the population, with only 36 per cent of the land is covered through surface irrigation. Political processes enabled the expansion of electricity service for irrigation which has made the farmers more dependent on the technologies. Currently, an estimated 75-lakh acres during Kharif and 35 lakh acres during Rabi season are
under pump irrigation. High transmission & distribution losses, increasing inefficiency in metering & collection, very low tariff to agricultural consumers and high cost of power from private generators are some of the factors that have contributed to the deterioration of financial health growth.

1.1 Problems of the Power Sector in India

Energy Sector in India fulfils around 90 per cent of the energy requirements in the country. The India energy scenario shows a drift in the energy balance mainly due to the differed energy sources in India. In recent years, India’s energy consumption has been increasing at one of the fastest rates in the world due to population growth and economic development. India lacks sufficient domestic energy resources and must import much of its growing energy requirements. India is not only experiencing an electricity shortage but also increasingly dependent on oil imports to meet demand. In addition to pursuing domestic oil and gas exploration and production projects, India is also stepping up its natural gas imports, particularly through imports of liquefied natural gas.

India is the third-largest consumer and third-largest producer of coal in the world, and although the country can supply the bulk of its needs domestically, it is currently a net importer of coal. In spite of
the sector’s heavy reliance on coal, natural gas is becoming increasingly important in the Indian electric sector due to environmental considerations, quality concerns pertaining to the steel industry, and supply constraints surrounding coal. Although the sector’s reliance on coal is unlikely to wane significantly, the power industry is largely driving the demand for natural gas in the country.

India suffers from a severe shortage of electric capacity. According to the World Bank, roughly 40 percent of residences in India are without electricity. In addition, blackouts are a common occurrence throughout the country’s main cities. The World Bank also reports that one-third of Indian businesses believe that unreliable electricity is one of their primary impediments in doing business. Further compounding the situation is that total demand for electricity in the country continues to rise and its outpacing increases in capacity. Adequate additional capacity has failed to materialize in the light of market regulations, insufficient investment in the sector, and difficulty in obtaining environmental approval and funding for hydropower projects. In addition, coal shortages are further straining power generation capabilities.

Electricity can not be stored (except in case of pump storage that is highly capital intensive and location specific) and if there is
shortage, it requires huge investment and at least three-year to produce it. Because electricity is essential in most of the productive processes and can not be stored, power outages are costly that encourage over-investment in order to secure ample reserves.

The power sector in India has gone through zigzag changes in ownership structure over the years. In 1880, supply of electricity began in India with a small hydroelectric plant in Darjeeling, operated by a private party. In 1948, Electricity Supply Act was enacted by the Government of India, leading to establishment of State Electricity Boards, which took over the licensees operating in the private sector. In 1991, Central Government instituted policy to attract private sector to participate in generation, transmission, and distribution of electricity, under license from State Governments. Initially, electricity supply was the domain of private parties, who chose to supply only to urban centres and areas around them. These state of affairs continued till just after independence. But, in 1948, the Electricity Supply Act was enacted, leading to establishment of State Electricity Boards (SEBs). These SEBs took over the licensees operating in the private sector and enlarged the customer base by bringing in rural areas under their operation. Almost after three decades, the Government of India established entities like NTPC and NHPC, followed by PFC to supplement the budgetary resources of the Central
Government. In 1989, NTPC was unbundled and its transmission assets were passed on to newly-created Power Grid Corporation, which was given the task of developing the regional and national grid. Over the years, in contrast to the well-functioning central entities, the State Electricity Boards (SEBs) showed signs of sickness. Soon, it became necessary to reform these entities.

Other reforms on the administrative, legal, structural, and regulatory front were also brought in by shooting for faster clearance of projects, higher ceiling on investment without approval, breaking down SEBs into manageable entities, and setting up of regulatory mechanism to rationalize power tariff and promote efficient policies.

1.2 Power Sector reforms in India

The power sector in India has undergone significant progress after Independence. When India became independent in 1947, power was available only in a few urban centers; rural areas and villages did not have electricity. After 1947, all new power generation, transmission and distribution in the rural sector and the urban centers came under the purview of State and Central government agencies. State Electricity Boards (SEBs) were formed in all the states.
The power Sector has been receiving adequate priority ever since the process of planned development began in 1950. The Power Sector has been getting 18-20 per cent of the total Public Sector outlay in initial plan periods. Remarkable growth and progress have led to extensive use of electricity in all the sectors of economy in the successive five years plans. About 85 per cent of the villages have been electrified except far-flung areas in North Eastern states, where it is difficult to extend the grid supply.

The Indian Constitution specifies that power sector in the country is the combined responsibility of the Central and the State Governments. The Electricity Supply Act (ESA), 1948 prescribed three kinds of entities in the power-sector, namely, State Electricity Boards (SEBs), generating companies, and licensees. State Electricity Boards are permitted to generate, transmit, and distribute electricity within a state; they enjoy all the powers of a licensee. They account for about two thirds of the power generated in the country. Generating companies in the country are responsible for supplying power to the grid without the specific responsibility of retail distribution. Major players in this category are NTPC (National Thermal Power Corporation), NHPC (the Hydro-electric analogue of NTPC), and NPCIL (Nuclear Power Corporation of India Limited). Though the ESA was allowed only the governments to set up generating companies till
1991, thereafter it was liberalised. Independent Power Producers (IPPs) now fall under this category. Existing licensees are private-sector utilities licensed by a State Government for power generation, distribution, or both within a specified area. For example, Gujarat Industrial Power Corporation is only meant for generation and Central Electricity Supply Corporation (in Orissa) is confined to distribution, whereas Bombay Suburban Electric Supply Limited (BSES) and Tata Electric Company (TEC) are involved both in generation and distribution.

During the post independence period, the various States played a predominant role in the power development. Most of the States have established State Electricity Boards. In some of these States separate corporations have also been established to install and operate generation facilities. In the rest of the smaller States and UTs the power systems are managed and operated by the respective electricity departments. In a few States private licencees are also operating in certain urban areas.

In our country all the first five years plans have helped the nation towards the industrialization and contributed to the growth in GDP. At the same time the nation is beset with the perennial problem of infrastructural bottlenecks particularly in the power sector. From,
the Fifth Plan onwards i.e. 1974-79, the Government of India got itself involved in a big way in the generation and bulk transmission of power to supplement the efforts at the State level and took upon itself the responsibility of setting up large power projects to develop the coal and hydroelectric resources in the country as a supplementary effort in meeting the country’s power requirements. The National thermal Power Corporation (NTPC) and National Hydro-electric Power Corporation (NHPC) were set up for these purposes in 1975. North-Eastern Electric Power Corporation (NEEPCO) was set up in 1976 to implement the regional power projects in the North-East. Subsequently two more power generation corporations were set up in 1988 viz. Tehri Hydro Development Corporation (THDC) and Nathpa Jhakri Power Corporation (NJPC). To construct, operate and maintain the inter-State and interregional transmission systems the National Power Transmission Corporation (NPTC) was set up in 1989. The corporation was renamed as POWER GRID in 1992.

The policy of liberalisation the Government of India announced in 1991 and consequent amendments in Electricity (Supply) Act have opened new vistas to involve private efforts and investments in electricity industry. Considerable emphasis has been placed on attracting private investment and the major policy changes have been announced by the Government in this regard.
In these critical circumstances, in view to make the power sector to get rid of this overwhelming and alarming crisis, that terribly tumbled the Power Sector, the Govt. of India had initiated several policy measures which led to changes in the ownership and structure of the power sector since 90s. This process began with the permission granted for private generation in early 90s, followed by the introduction and implementation of the far reaching reforms in the power sector of Orissa in mid 90s, which however proved unsuccessful. The third phase of reforms were started with the enactment of the Electricity Act 2003, in June 2003.

1.2.1 Evolution of Indian Power Sector Policy

There are four phases, which are briefed here under, are identified in the evolution of Indian Power Sector Policy.

Phase I : (1950s & 60s – Era of State Patronage)

- Enactment of Electricity (Supply) Act, 1948
- Establishment of State Electricity Boards, to generate, transmit and distribute power.
- Predominantly state ownership of electricity utilities.
- Professional management of State Electricity Boards and establishment of BHEL.
Phase II: (1970s & 80s – Era of subsidization and populist policies)

- AP started giving electricity at a flat rate for agriculture from 1982. Other states followed AP. Non-metering of agricultural consumption began.
- Concealing of theft and T & D losses under agricultural consumption figures began.
- Determination of State Electricity Boards.
- Establishment of Central sector generation companies like NTPC.

Phase III: (1990s – Era of liberalization)

- Increasing role of Central government and International Financial Institutions in the sector policies.
- Stage. I (early 90s) : Focus on generation through private sector – IPP policy which proved to be counter productive due to poorly negotiated contracts (High Capital cost, unfair incentives, wrong fuel choice etc.)
- Stage. II (mid 90s) : Focus on restructuring of SEBs and introduction of Regulatory Commissions.
- Stage. III (late 90s) : Enactment of Electricity Regulation Act, 1998, creating the Central Regulatory Commission and providing legal framework for constituting State Regulatory Commissions.
Phase IV : (2003 till date – Era of far reaching changes)

- The number and reach of policy changes introduced are unprecedented.
- Enactment of Electricity Act, 2003
- Restructuring of SEBs, de licensing of generation, open access and competition in distribution, cost reflective tariffs, limiting cross subsidies etc., are the implications of the Act.

Before the implementation of the E-Act 2003, the ‘single buyer model’ was followed in the sector. According to this model, all the generators, both public and private have sell the power to one transmission company, which in turn sells power to many distributing companies. So that single transmission company is the sole buyer of the generated power. The newly implemented E-Act, 2003, has provided the path for the evolution of other models such as the ‘Bulk Competition Model’ and the ‘Real Competition Model.’

1.3 Statement of the Problem

A huge blackout that plunged half of India into darkness highlights the need for reforms in a sector riddled with problems and with fuel shortages, subsidies and tariff controls. While India has always struggled with an energy deficiency, this has grown more acute over the past year. An expanding middle class is demanding more
refrigerators, TVs and gadgets from the power-hungry malls and stores that sell them so the need for electricity has never been greater. Thus, rolling blackouts in cities, including the National capital New Delhi, are normal while towns and villages can go without electricity for eight to 10 hours a day.

Rolling power outages are not new to India but the recent disruptions add voice to a growing chorus for power-sector reform. In spite of the overall development that has taken place, the power supply industry has been under constant pressure to bridge the gap between supply and demand. This sector is suffered a lot with inefficiencies like under utilization of the capacities, system losses such as transmission and distribution losses, mounting arrears as well as growing subsidies in agricultural and domestic sector.

In the electric power, any increase in generation capacity is more than offset by inefficiencies and wastage at every stage — production, transmission, distribution and delivery. Without fixing these inefficiencies and wastage, increasing generation capacity and production is like filling a bucket full of holes! The first and foremost task should be to fill these holes, which is very much doable. So, that is the importance of transmission and distribution of power. Power distribution/delivery network is full of constraints and is clumsy to
the core. The ills of the system are many — ill-trained workforce, poor reliability, high line losses, low voltage profiles, overloading of transformers, poor maintenance, absence of conservation measures, power theft, haphazard layouts, whimsical load connection, inadequate clearance, etc.

Even in 2005, after a 'reality-check' on the power sector, the Planning Commission, headed by Mr Ahluwalia, had admitted that though there have been a number of experiments in electricity reform, including the one fashioned by himself in the mid-90s, none of them had established "a viable model". The approach document of the 11th Five Year Plan said this: “Shortage of electric power and the unreliability of power supply are universally recognised as a drag on the pace of India’s development. If India is to attain 8.5 per cent growth in the 11th Five Year Plan, uninterrupted power supply is a must; so it is widely accepted that power reforms are urgently needed in the country”. There is an eminent need to reform the power sector, and bring about infrastructural improvements to meet the new challenges of the growing economy.

In spite of the reforms in the power sector in Andhra Pradesh, there is a severe crisis in the power sector in the State in the recent
past. Hence, there is a need to examine the loopholes in the reform process and to elucidate the causes for such power crisis in the State.

Most of the studies on the impact of power sector reforms have concentrated on analysis of national policies and national approaches leaving aside the impact on generation, transmission and distribution. Though there is a growing body of literature about different aspects of the electricity sector reforms in India, no study is made elucidating the causes for the power crisis from the micro-level. Therefore, there is a gap in the existing literature. Hence, the present study is taken up to fill this gap. The study examines the development of the electricity sector in the state of Andhra Pradesh and assesses the impact of reforms on generation, transmission and distribution besides the causes for the power crisis in the State. The Andhra Pradesh state has been chosen as the unit of study being the native state of the author. Basing on the findings, solutions are offered to overcome the power crisis.
1.4 Significance of the Study

India needs to sustain 8-10 per cent growth rate over the next 25 years for eradicating poverty and meeting its human development goals. This would require, at least, enhancing primary energy supply by 3-4 times and the electricity supply by 5 times of the present level. Power generation capacity would need to be in the order of 8,00,000 MW in year 2031-32 from the current installed capacity.

Supply of electricity at reasonable rate is essential for overall development. Reliable and quality power at competitive rates to Indian industry is necessary to make it globally competitive. Services sector has made significant contribution to the growth of our economy. Availability of quality power is very crucial to sustained growth of this segment as well.

Even as the Indian government draws-up ambitious plans envisaging 100 GW capacity addition in the 12th Plan period, the country’s Power sector is facing multidimensional challenges. These issues are constraining growth in the Power sector and may adversely impact economic growth in the long term.

Not only do 400 million Indians lack access to electricity, but electricity supply is unreliable and of poor quality even in large parts of “electrified” India. In addition to the existing demand, Indian
consumers, businesses, and industries seek more electricity to power appliances, processes, and products, further exacerbating the demand-supply gap. By 2035, India’s power demand is expected to more than double. Unless the issues plaguing the Power sector are urgently addressed, the aspiration for 9 per cent growth in the 12th Five Year Plan of India (2012-2017) may not be met.

The study gives practical suggestions since the study examines certain questions like development of the power sector in Andhra Pradesh, the reasons for initiating power sector reforms in Andhra Pradesh, the evolution of power sector reform process in Andhra Pradesh, the action taken by the government on the implementation of the power sector reforms, slow down in the power sector reform process in Andhra Pradesh, impact of the power sector on power generation, transmission and distribution in Andhra Pradesh, the causes for the power crisis in Andhra Pradesh, the weaknesses in the electricity governance and the crucial issues in the power sector. Therefore, the present study will be useful for the policy makers to formulate appropriate policies to meet the power demand.

1.5 Objectives of the Study

Keeping in view of the importance of the study, the objectives of the study are
(i). To discuss the genesis of power sector in Andhra Pradesh

(ii). To discuss the power sector reforms in Andhra Pradesh

(iii). To examine the impact of power sector reforms in Andhra Pradesh on power generation

(iv). To portrait the impact of power sector reforms in Andhra Pradesh on distribution and transmission of power

(v). To elucidate the causes for power crisis in Andhra Pradesh inspite of power sector reforms

(vi). To suggest solutions to overcome the power crisis in the State in particular and in the country in general

1.6 Hypothesis

The following set of hypothesis have been drawn based on the literature existing in the area of research.

(1). The reforms in the power sector of Andhra Pradesh have failed in proper distribution of power generated by both public and private sectors.

(2). Andhra Pradesh power sector could not overcome the losses even after the introduction of reforms.
The major drawback in the power sector even after introduction of reforms is governance and lack of responsibilities of those who manage the power sector both at the government level as well as at the Department level.

1.7 Research questions

The following are research questions examined in the present study.

1. What is the political economy and policy context against which the power sector has developed in Andhra Pradesh?

2. Why have reforms been introduced in the Power sector in Andhra Pradesh? What were the policy debates and discourses that defined the nature and scope of these reforms?

3. What are consequences, outcomes and limitations of reforms in the production, distribution and transmission of power?

4. Is there any impact on generation of power in Andhra Pradesh due to the reforms introduced in the power sector recently?

5. What impact does the reforms have on distribution and transmission of power sector in Andhra Pradesh?
1.8 Methodology

The main aim of the research is to bring out the consequences of reforms on power generation, transmission and distribution before and after the introduction of reforms in the power sector. However, due to the constraints of the data available, the time period of data has been restricted to years 2000-2001 and 2008-2009. However, the data collected is not uniform for all the variables as the data on the some of the variables was not maintained by the concerned Departments. In spite of these limitations, the data has been collected for all the relevant variables that are useful to measure the impact of power sector in Andhra Pradesh.

The primary data collected was directly from records maintained by the concerned departments of generation, transmission and distribution. As a first step, the variables that have affected these three areas have been identified. In the second phase, all these departments are visited personally and the data has been collected from the respective ‘departments’ records.

The major source of information and data is the reports of the governments such as the Bureau of Economics and Statistics of Government of Andhra Pradesh and various articles and books written and published by different authors. The authenticity of the data
collected from the Government records is foolproof, the data taken from other sources is as it was published by respective authors.

The data such collected has been tabulated using simple tabulated forms. Simple statistics such as percentages and averages have been used wherever it is felt necessary.

However, the major limitation of the researcher is that the researcher is not much acquainted with rigorous statistical tools. As such the tables presented are more descriptive in their nature rather than making use of statistical techniques. The trends in the data have been identified and explained verbally rather than using any statistical techniques.

1.8.1 Research Philosophy

Knowledge is processed differently by different people. A positivist approach is adopted and tried to keep observations structured and quantifiable. The reform that were introduced by the Government of Andhra Pradesh in the power sector were widely criticized mainly by the opposition political parties as well as by many critics. However, the criticism was made before and after the introduction without really going into the factual data of the power sector. However, the reforms were introduced with a positive intention to bring out the power sector from the heavy losses it was facing. The
government has also implemented the reforms with true spirit of the reforms laid down by them.

Due to the reforms that were brought out, the researcher feels that they had positive impact of all the three sections of the power sector, namely, generation, transmission and distribution. The ground reality of power sector after the introduction of reforms is totally different from what has been criticized by those who are trying to dig out the holes. Due to the introduction of reforms, the distribution and the transmission have changed positively in Andhra Pradesh. The public are happy as far as the quality of power supply is concerned and the reforms could bring the power sector out of its heavy losses to a certain extent. Hence, the research has chosen the positivist approach to bring out the truth by analyzing the data that was not published and was not available to those who were criticizing the reforms.

1.9 Limitations of the Study

Due to the vastness of the power sector in general, the present study focuses only on the changes in the generation, transmission and distribution of power due to power sector reforms and on understanding the causes for the power crisis inspite of the reforms. The study is confined only to Andhra Pradesh state.
1.10 Organization of the Thesis

The study is presented in seven Chapters. Chapter I gives introduction. Review of literature is given in Chapter II. Chapter III details economic profile of Andhra Pradesh, the evolution of power industry in Andhra Pradesh besides rationale behind power sector reforms in the State. Chapter IV explains the evolution of power sector reform process in Andhra Pradesh and the impact of the power sector reforms on generation. The impact of the power sector reforms on transmission and distribution is delineated in Chapter V. Chapter VI addresses the causes of the continuing power crisis in Andhra Pradesh. The study and its implications are given in the last Chapter.

***

24