POWER SECTOR REFORMS POST ELECTRICITY ACT 2003

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Declaration by the Guide

This is to certify that the Mr. Deep Mukherjee, a student of MBA Power Management, SAP ID 500068929 of UPES has successfully completed this dissertation report on "Power Sector Reforms Post Electricity Act 2003" under my supervision.

Further, I certify that the work is based on the investigation made, data collected and analysed by him and it has not been submitted in any other University or Institution for award of any degree. In my opinion it is fully adequate, in scope and utility, as a dissertation towards partial fulfilment for the award of degree of MBA.

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Abstract:

Power is one of the most critical components of infrastructure development, crucial for the economic growth and welfare of nations. The existence and development of adequate infrastructure is essential for sustained growth of the national economy.

India's power sector is one of the most diversified in the world. Electricity demand in the country has increased rapidly and is expected to rise further in coming years.

Energy sector in India has experienced a rapid transformational change with progressivepolicy-level changes and effective implementation of directives. These changespromised enormous opportunities for various stakeholders and market players. It has come a long way since it's laying down of the basic framework in 1910 right up to the Electricity Act of 2003, which brought in necessary changes to an evolving sector.

This report presents the status of development of power market in India post Electricity Act, 2003 with the creation of opportunities consequent to restructuring of the sector through unbundling, opening up of private sector participation, positioning of regulatory mechanism through commissions at State and Central level and Appellate Tribunal, allowing open access etc. Starting with the background, it aims at giving a clear picture of achievement till date and issues to be resolved to reach the goal.

Chapter 1 : Introduction

1.1 Overview

The power sector is a major consumer of energy and it has a significant impact oneconomic developments and social welfare. Per-capita electricity consumption of the country has now crossed 6,000 kilowatt-hour (kWh), but still, it is far below theaverage global consumption. Electric power is recognized as a major input for the country's economic development and accorded highest priority. The total installed capacity of power utilities has increased manifolds since independence but even then the demand-supply gap is increasing every year. In nineties, to cope up with the rising demand-supply gap and due to poor financial positions of the SEBs, the government decided to open up the power sector for private sector investment thus initiating the process of power sector reforms. Now, many states have started power sector reforms process and are passing through the different stages of the reforms. But, unfortunately the reforms which were started with so zeal and enthusiasm have not so far met with fate they were supposed to meet with.

1.2 Background

1.2.1 Evolution of Indian Power Sector

The power sector is one of the largest consumers of finite resources and forms the fundamental input in any growth industry. The Indian power sector has been regulated for almost a century. The legislative framework dates back to the Indian Electricity Act1910, which provided the basic framework for electric supply industry in India and the legal framework for laying down of wires and other works, envisaging growth of the sector through private licensees.

The Act of 1910 was followed by the Electricity (Supply) Act,1948, which mandated creation of vertically integrated state electricity boards and required that states extend electrification all across. The Electricity (Supply) Act 1948 was introduced after independence, but it did not achieve the desired results as the sector's performance started to deteriorate and a need was felt to restructure the sector.

Further, recognizing the needs for reforms in the electricity sector nationwide, the Central Government moved forward to enact the Central Regulatory Commission Act of 1998, which manded the formation of Central Electricity Regulatory Commission (CERC) with charge of setting the tariff of centrally owned or controlled generating companies. The Act also

introduced a provision for the states to create State Electricity Regulatory Commission (SERC) with power to set the tariffs without having to enact separate state laws.

The existing Electricity Act, 2003, consolidated the laws relating to generation, transmission, distribution, trade and use of electricity. This Act was enacted because it was perceived that the sector required substantial investments in the face of resource constraints, private participation in electricity generation, thus, paving the way for independent power producers (IPPs). Previously, some private sector licensees were operating in few urban areas, the power sector was mostly in the hands of the State Electricity Boards (SEBs) or the central government-owned utility companies. This Act repealed all earlier electricity acts and laws.

1.2.2 Indian Power Market Growth and Reforms

Indian power sector is undergoing a significant change that has redefined the industry outlook. Sustained economic growth continues to drive electricity demand in India. The Government of India's focus on attaining 'Power for all' has accelerated capacity addition in the country. At the same time, the competitive intensity is increasing at both the market and supply sides. Total installed capacity of power stations in India stood at 356.82 Gigawatt (GW) as of May 2019.India's per-capita energy consumption is about one-third of the global average.

1.2.3 Reforms post Electricity Act 2003

Many new provisions have been incorporated in Electricity Act2003 which promises many new reforms in power market.Generation is delicensed, thermal generation does not need clearance from Central Electricity Authority (CEA). Only hydro projects require concurrence from CEA. Many private players entered into the market to set up IPPs to supply power to the state on long term basis. Power Purchase Agreements (PPAs) were signed and investment has been made by the private players.

State governments can now un-bundle SEBs and create companies. Generation, Transmission and Distribution becomes separate activity. An Appellate tribunal is created at the centre for disposal of appeals against the decisions of CERC and SERCs.

Moreover by introducing open access in the electricity market, licensees and buyers become free to use the transmission and distribution system at a fee subject to the capacity availability.

Power trading is being recognized as a separate activity that can be taken up after authorization from appropriate regulatory commission. The appropriate regulatory commission issue trading licence and fix ceilings on trading margins.

On the policy and regulatory front, the Government and Regulatory bodies continued the reform process for improvement in efficiency in various aspects of power supply. Government of India launched "Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA)" to achieve universal household electrification in the country. Under UDAY scheme for financial and operational improvement of Distribution Compnies (Discoms), bonds have been issued by various States for a total amount of Rs 2,321.6 billion. Ministry of New and Renewable Energy (MNRE) launched competitive bidding for procurement of power from wind projects and so far bidding for more than 6,000 MW has taken place in four phases.

In further development for making coal allocation more transparent, Scheme for Harnessing and Allocating Koyala (Coal) (SHAKTI) was launched through which allocation of linkages for power sector shall be based on auction of linkages or through Power Purchase Agreement (PPA) based on competitive bidding of tariffs except for the State and the Central Power Generating companies, and the exceptions provided in Tariff Policy, 2016. Coal drawal will be permitted against valid Long Term PPAs and to be concluded Medium Term PPAs. The sector also witnessed emphasis on transparency through various web/mobile applications and digitization of competitive bidding through MSTC platform for short, medium and long term power procurement.

1.3 Purpose of the Study

The main purpose of this report is to understand the profoundness of present power market and its transforming scenario and in process identify the development of the market, detail study of government policies, directives, regulations, guidelines for improvement of the industry. This report is based on the extensive study of power sector in India. The objective of this report is to get a comprehensive and apparent knowledge of the power sector, and to study the changes in the power sector over a period of time.

This report also provides the current issues and challenges present in power industry and provide the inner side of yet to be addressed issues along with the identification of existing vocal issues existing in the market with some corrective implementation of methodology in respect of future prospective and to address/eliminate the issues.

Subsequent chapters of this report will provide the complete overview of present power market scenario with some reforms that has been implemented by appropriate regulatory authorities, Ministry and other bodies and some of the initiatives that are promised by the Government. Subsequent chapters will also address the current challenges and issues and some of the corrective measures to reach to the ultimate objective.

1.4 Research Hypothesis

Though Indian Power Sector has expanded and many reforms & policy initiatives have been implemented by both Central and State Governments, still many issues and challenges exist in Indian Power Market. Some reforms bring the desired output and some are still far away to reach the milestone.

The power generation profile in the country had a massive growth from1713 MW (Megawatt) in December, 1950 in utilities to 399000 MW at the end of March, 2018 comprising of thermal 276,293 MW (69.25%), renewable 70563 MW (17.58%). The share of Hydro and Nuclear energy was only 11.37% and 1.70%.The All India gross electricity generation from utilities has reached to 7,41,167 GWh (excluding generation from captive plants) during the year 2017-18.

At demand level, Electricity consumption has reached to 11,30,244 GWh during the year 2017-18. The industrial, domestic and agricultural categories are the major consumers of electricity, constituting about 41.48%, 24.20% and 18.08% respectively of the total consumption including non-utilities.

1.4.1 Issues Present in Power Market

The past decade had been highly challenging for power generation segment. The sector is plagued with issues pertaining to fuel availability, increase in imported fuel prices, declining plant load factors (PLFs), poor financial health of distribution companies and delays in clearances. Approximately 60,000 MW to 65,000 MW capacity is under financial stress due to tepid power procurement demand from Discoms in last 3 to 4 years, sectoral issues i.e. non-availability of the adequate fuel, delay in power sale agreement tie-ups.

The most critical issue facing by power sector is the dismantle health of discoms, which has lead to inadequate investment in the sector and in turn to power shortfalls and poor quality of supply. The quantum of subsidy paid and the regularity of payment by the state government impact the viability of discoms. Since the discoms are uncertain about receiving the entire agricultural subsidy on a regular and timely basis, there is tendency to curtail power supply to

farm sector. Other key concerns include need of reduction in cross subsidies between different consumer categories.

Section 42 of Electricity Act 2003 provides provision for open access, thereby providing an alternative to the consumer to source cheap power. But still discoms are reluctant to provide permission for open access to many industrial and commercial consumers this may affect the discoms' financial viability.

Power purchase costs, accounting for 60-70 percent of the total cost of utilities, have risen sharply in the past few years. Bottlenecks in fuel supply have escalated the costs of generation thus increases the cost. Price and availability of fuel are crucial for the power sector. The government has made efforts to promote renewable energy to reduce the dependence on fossil fuel. SERCs have mandated the Discoms to secure certain percentage of power from renewable sources. Since renewable energy involves a high effective cost, the Renewable Purchase Obligation (RPO) increases the average cost of power purchased by discoms.

1.4.2 Development of Hypothesis

Thus a hypothesis is developed by considering the above issues/challenges on whether the current regulatory and policy reforms by Government is actually resolving the issues that were promised or some necessary amendments/changes are required to uplift the power market.

Chapter 2:Literature Review

2.1 Review Area Broad

2.1.1 Power Sector Review

The Indian Electricity Sector has undergone a paradigm shift ever since reforms were initiated in 1991.Though the reforms had concentrated on the Generation sector initially, the focus thereafter has been on distribution since it was identified as the key element for a successful reform programme. The Indian power system is the fifth largest in the world and among the most complex. With an annual electricity production of 1,031 billion units (BU), it is among the top five power consumers across the globe, and the demand is expected to touch 1,900 BU by 2020. Growth in industrial activities, population, economy, prosperity and urbanisation, along with rising per-capita energy consumption, has widened the gap of energy access in the country.

Total installed capacity of power stations has reached to 365.981 Gigawatt (GW). Installed capacity of thermal power plants contribute 229.401 GW (62.7%), Nuclear energy contribute 6.78 GW (1.9%) and Renewable Energy contribute 129.739 GW (35.7%). The contribution from Central Sector is 91.497 GW (25.2%), State Sector is 103.815 GW (28.5%) and Private Sector is 170.668 GW (46.6%). Growth percentage of energy generation from conventional sources is 0.28% in FY 2019-20 (till Nov'19) and generating to 651.509 Bus of energy. The average PLF of coal based power plant is 56.01%.

All India energy requirement has reached to 1274.595 BU in the year 2018-19 with peak demand of 177,022 MW. The Aggregate Technical and Commercial (AT&C) losses is 18.72% in 2017-18.

The bulk transmission has reached to 4,13,407 circuit Kilometre(ckm) and substation capacity to 8,77,163 MVA(Megavolt Ampere) in 2018-19. There are about 54 Inter-state transmission licensees as on 31.3.2019 granted by CERC.

The total energy traded in short term market is 47.32 Mus in the year 2018-19. There are around 25 power traders active in the market.

2.1.2 Power Sector Reforms Post Electricity Act 2003

Government and Regulatory bodies continued the reform process for improvement in efficiency in various aspects of power market.

In the year 2004, CERC published Open Access regulation, providing the opportunities for buyers to explore cheaper source of power anywhere in the country.

In January 2008, CERC issued "Open Access in Inter-State Transmission Regulations" which covered Short-Term Open Access transactions including collective transactions through power exchanges. In June and October 2008 power exchange in India commenced its operation, provided a common platform for trading of electricity.

In 2009, CERC issued regulation for grant of trading licence. In 2010, CERC Power Market Regulations was introduced with focus on operations of Power Exchanges.

In January 2010, CERC published "Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation" regulation to promote renewable sources of energy and development of market in electricity. The framework of Renewable Energy Certificate (REC) was developed to give push to Renewable Energy (RE) capacity addition in the country. The REC will be exchanged only in the Power Exchanges approved by CERC within the band of a floor price and a forbearance (ceiling) price to be determined by CERC from time to time. The distribution companies, Open Access consumer, Captive Power Plants (CPPs) will have option of purchasing the REC to meet their Renewable Purchase Obligations (RPO).

In 2010 CERC capped the trading margin to 7 paisa/kwh for short term open access transaction of electricity.

In 2019 CERC published regulation on cross border trade of Electricity for trading of electricity with neighbouring countries. These regulations apply to the participating entities in India and neighbouring countries which are engaged in cross-border trade of electricity with India. Cross-border trade of power between India and the neighbouring countries is allowed through mutual agreements between Indian entities and entities of the neighbouring countries under the overall framework of CERC (Cross Border Trade of Electricity Regulations), 2019.

Government of India launched "Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA)" to achieve universal household electrification in the country. The objective of this scheme is to achieve universal household electrification by providing last mile connectivity and electricity connections to all households in rural and urban areas.

In 2015, Government of India launched Ujwal DISCOM AssuranceYojana (UDAY). It is a scheme for the financial turnaround of power distribution companies with an objective to improve the operational and financial efficiency of the State DISCOMs. Under UDAY scheme, bonds have been issued by various States for a total amount of Rs 2,321.6 billion.

Launched in 2015, the Unnat Jyoti by Affordable LEDs for All (UJALA), in a short span of three years, has emerged as the world's largest domestic lighting programme. Developed to

address India's high cost of electrification and high emissions from inefficient lighting, UJALA's success lies in its inimitable strategic approach to energy efficiency.

The sector also witnessed emphasis on transparency through various web/mobile applications and digitization of competitive bidding through MSTC platform for short, medium and long term power procurement.DEEP (Discovery of Efficient Electricity Price) is a e-Bidding and e-Reverse auction portal for procurement of short/medium/long term power by DISCOMs. The web portal seeks to ensure seamless flow of power from seller to buyer. The portal is an initiative of the Ministry of Power with the objective to introduce uniformity and transparency in power procurement by the DISCOMs and at the same time promote competition in electricity sector. The e-Reverse auction process for competitive procurement is expected to result in overall reduction of cost of procurement of power thereby significantly benefiting the end consumers.

The union government has amended the National Tariff Policy for Electricity on 20 January, 2016. The National Tariff Policy (NTP) 2016 focussed on renewable energy and sourcing of power through competitive bidding. The amendments also aimed at achieving the objectives of UDAY scheme. The policy envisages 24x7 power supply to all consumers by 2022. State Governments and regulators to devise a power supply trajectory to achieve this. The new Tariff Policy tightens the discretion allowed to regulators while setting power tariffs and makes a strong pitch for promotion of clean energy. Further, one of the significant addition in the policy is promotion of renewable generation sources and creation of more competition, efficiency in operations and improvement in quality of power supply.

In further development for making coal allocation more transparent, Scheme for Harnessing and Allocating Koyala (Coal) (SHAKTI) was launched through which allocation of linkages for power sector shall be based on auction of linkages or through Power Purchase Agreement (PPA) based on competitive bidding of tariffs except for the State and the Central Power Generating companies, and the exceptions provided in Tariff Policy, 2016.

2.2 Review Area Narrow

2.2.1 Sponsoring Organization Review

Saranyu Power Trading Private Limited (SPTPL) envisages for its business of power trading and focus on providing hassle-free energy trading transactions for its clients with all regulatory and strategic support for a quick, effective, single-window clearance. SPTPL has a highly conversant research and development team that caters to the incessantly embryonic and varied requirements of clients and develop innovative solutions for extracting best

possible essences of Electricity Act, 2003 and value to the customers. SPTPL provides OTC (Over the Counter) marketing strategies for power generators across India.

SPTPL, a Category-III trader is trading arm of India Power (IPCL) and manages the complete power procurement profile of IPCL.IPCL is one of the oldest distribution licenses with 9 decades of experience in power distributing across 618 sq. kms. in Asansol-Ranigunj area in Burdwan District of West Bengal. The company has managed to reduce the T&D (Transmission and Distribution) losses over a period of time to one of the lowest in the country of less than 3%.

IPCL has been commissioned 1x12MW Thermal Power Plant on 25.09.2013 within the existing boundary of Dishergarh Power Station with AFBC Technology Boiler which was supplied by M/s Cheema Boiler Limited and Turbine was supplied by M/s Siemens Limited. The power generated from the plant is fed to Dishergarh Grid for supplying to IPCL licensing area. IPCL set up its first greenfield Thermal Plant in Haldia, West Bengal in 2012.Unit 1&2 of 300 MW (2 x 150 MW) commissioned in December 2017.

In Non-Conventional Energy sources India Power has installed 105.2 MW Wind Power plants in Rajasthan, Gujrat, Karnataka and Maharashtra. IPCL acquired, implemented and commissioned a 36MW Solar Power Plant in Rudrapur, Uttarakhand with asecured long-term PPA of 25 years. IPCL, in association with West Bengal Green Energy Development Corp Ltd., set up a Photovoltaic Solar Power Plant in 2008, located in Jamuria area of West Bengal. The plant has an annual capacity of 2 MW Power generated is directly fed into the company's distribution license at Asansol.

2.3 Factors Critical to Success of Study

There are many factors critical for success of this study report/power market. The main challenges currently the sector is facing are shortage in coal supply, increase in cost of power due to uncertainty in imported coal market, increase in stressed capacity of IPPs, issues regarding land clearances, many issues pertaining to competitive bidding, dismantle financial health of DISCOMs, electricity theft, increase in cost and availability of renewable power, demographical issues regarding transmission corridor availability and coal transportation, policy issues, regulatory issues and issues regarding reduction of AT&C losses. Main factors critical to success of study are:

a) Research in the areas of policies and regulations effectiveness and ground realities on a continuous basis to achieve fuel availability on sustainable basis to existing as well as new power plants by removing uncertainties for the entire period of plant life

through more transparent policies and regulations, increased participation of private sector in coal production and easing of regulatory framework, clearances and approvals for allocation and development of coal allocation.

b) Up gradation of existing distribution system for reduction of T&D losses.
c) Encouraging Demand Side Management (DSM) for achieving energy efficiency.
d) A robust and sustainable credit enhancement mechanism for funding in Energy Sector.
e) Policies for encouragement of more private participation in the sector.

2.4 Summary

The Indian power system is the fifth largest in the world and among the most complex. With an annual electricity production of 1,031 billion units (BU), it is among the top five power consumers across the globe, and the demand is expected to touch 1,900 BU by 2020. Total installed capacity of power stations has reached to 365.981 Gigawatt (GW). Growth percentage of energy generation from conventional sources is 0.28% in FY 2019-20 (till Nov'19) and generating to 651.509 Bus of energy. The average PLF of coal based power plant is 56.01%. All India energy requirement has reached to 1274.595 BU in the year 2018-19 with peak demand of 177,022 MW. The Aggregate Technical and Commercial (AT&C) losses is 18.72% in 2017-18.

Government and regulators continuously making policies and regulations to upgrade the market and introducing necessary reforms to reach the target. With this vision regulations has been implemented regarding issuance of trading licence, fixing of trading margin, introduction of open access, encouragement of renewable generation by issuance of REC, cross border electricity trade with neighbouring countries etc. From policy front, policies have been implemented regarding transparent allocation of coal, competitive bidding in Ministry portal, AT&C loss reduction, policies regarding generation of renewable power etc. There are many challenges currently the sector is facing which are shortage in coal supply, increase in cost of power due to uncertainty in imported coal market, increase in stressed capacity of IPPs, issues regarding land clearances, many issues pertaining to competitive bidding, dismantle financial health of DISCOMs, electricity theft, increase in cost and availability of renewable power, demographical issues regarding transmission corridor availability and coal transportation, policy issues, regulatory issues and issues regarding reduction of AT&C losses.

Chapter3: Research Design, Methodology and Plan

3.1 Data Sources

Data collection is a standout amongst the most essential stages in carrying on a research. Data collection is an extremely challenging work which needs exhaustive planning, diligent work, understanding, determination and more to have the capacity to complete the assignment effectively. Data collection begins with figuring out what sort of data is needed, followed by the collection of a sample from a certain section of the population.

Normally there are two types of sources of data:

1) **Primary Data:** The primary data are those, which are collected fresh and for the first time.Primary data is called raw information; the information gathered from the first source in a controlled or an uncontrolled situation. No primary data is used in this report.

2). **Secondary Data:** Secondary data is the data acquired from optional sources like magazines, books, documents, journals, reports, the web and more. In this research, sources of secondary data are collected through:

- Internet

  - Wikipedia
  - Website of Central Electricity Regulatory Commission (CERC)
  - Website of West Bengal Electricity Regulatory Commission (WBERC)
  - Website of Ministry of Power (MoP)
  - Website of Ministry of New & Renewable Energy (MNRE)
  - Website of Ministry of Coal (MoC)
  - Website of Central Electricity Authority (CEA)
  - Websites of different Regional Load Despatch Center (RLDC)
  - Website of Power Finance Corporation Ltd. (PFC)
  - Slideshare (LinkedIn)
  - Website of Planning Commission, Govt. of India
  - Website of Statistics and Programme Implementation, Govt. of India

- Journals

- Newspaper
  - Times of India
  - The Economic Times
  - Business Standard

- Database available in presentations and other reports

- Different Reports by Expert Group/Committee
  - Report on "The Performance of State Power Utilitiesfor the years 2013-14 to 2015-16" by Power Finance Corporation Ltd. (PFC)
  - Report on "Impact of RBI's Revised Framework for Resolution of StressedAssets on NPAs in the Electricity Sector" by Standing Committee on Energy, Ministry of Power
  - Report on "Short Term Power Market in India: 2018-19" by Economics Division, Central Electricity Regulatory Commission
  - Annual Report on the Working of State Power Utilities & Electricity Departments (2013-14) by Power & Energy Division, Planning Commission, Govt. of India
  - Load Generation Balance Report 2019-20 by Central Electricity Authority
  - Energy Statistics 2019 by Ministry of Statistics and Programme Implementation, Govt. of India

3.2 Research Design

This research is a descriptive research as it includes of plotting and information gathering. Descriptive research comprises of surveys and fact finding enquires of various kinds. In this research secondary data is referred. The data are collected from websites of CERC, different SERCs, RLDCs, MoPetc, different journals, discussion papers, research papers, reports etc. Firstly in this report the background of the market has been discussed right from Indian Electricity Act, 1910 to Electricity Act,2003. The new provisions for development of Indian electricity market envisaged in Electricity Act, 2003 has been presented.

A brief overview of current scenario of the market is presented with the help of data present in Energy Statistics 2019 published by Central Statistics Office, Ministry of Statistics and

Programme Implementation, Government of India. The data from Energy Statistics 2019 gives the clear picture of current installed capacity of power stations in India with percentage share of thermal, nuclear and renewable energy and also the growth trajectory. The average PLF of coal based plants is also presented which provides the idea of capacity utilization of coal based plant. Energy Statistics also gives the clear picture of India's per capita consumption and increase in demand with respect of energy requirement. Further in this segment, with the help of CERC Short Term Power Market Report 2018-19, a snapshot on the short-term transactions of electricity through different instruments used by various market participants is presented which tells us trends in short-term transactions of electricity on annual, monthly and daily basis, time of the day variation in volume and price of electricity.

Gradually this report is progressed by presenting energy market reforms post Electricity Act 2003. In context with regulatory reforms, CERC regulations are described starting with Open Access regulation 2004, which provide the opportunities to electricity buyer to explore cheaper source of power. In 2008, new open access regulation was published by CERC incorporating collective transaction through power exchange. This introduction of power exchange developed a common platform for electricity trading where trade would be conducted in an equitable, transparent and efficient manner. The concept behind introduction of power exchange in the market is to fulfil the short term requirement of DISCOMs/buyers in an organised, efficient and transparent manner. Subsequently CERC laid down detail procedure for grant of trading licensee in line with Electricity Act 2003 where trading is considered as separate licence activity. Keeping this idea in mind, regulatory commission laid down the detail procedure for grant of trading license which includes credit worthiness, net worth requirement, technical qualification and licence obligation for the entities applying for trading licence. After this detailed procedure, CERC capped trading margin for short term transactions to encourage healthy trading market and protection of consumer interest. Fixation of trading margin is introduced with a view to balance the interests of buyers as well as the traders due to the volatility of short term prices which has a direct impact on the finances of the trader. With the responsibility of promotion of co-generation and renewable energy generation and policy framework of the Government of India (GoI) on the encouragement of renewable energy sources keeping in view the need for energy security of the country, regulatory commission introduced detail terms and conditions for issuance of Renewable Energy Certificates (RECs) for renewable energy generation. Introduction of RECs benefit the obligated entities to fulfil Renewable Purchase Obligation

(RPO).Renewable Energy Certificates (RECs) are basically a market-based instrument that certifies the bearer owns one megawatt-hour (MWh) of electricity generated from a renewable energy. Renewable Energy generator receives the credit in form of REC that can be sold on the open market as an energy commodity. The credit in form of REC is received by renewable generators for generation of renewable energy.REC acts as an accounting or tracking mechanism for solar, wind, and other green energies as they flow into the power grid. In 2019, CERC published Cross Border Trade of Electricity Regulation for trading of electricity with neighbouring countries. This exchange of across the South Asian region promote economic growth and improve the quality of life for all nations and balance the diversity of primary energy sources and differences in seasonal patterns of supply and demand. The main objective behind introducing cross border trade of electricity is to facilitate cross border trade of electricity between India and neighbouring countries, meet the demand of the participating countries by utilising the available resources and reliable grid operation and transmission of electricity across the borders.

After describing the regulatory reforms in power sector, this report progress to policy reforms initiatives by Central government. The data collected from website of Ministry of Power (MoP) and different reports and presentations published by Power Ministry. "Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA)" was launched to provide free electricity connections to all households (both APL and poor families) in rural areas and poor families in urban areas. The main objective of the scheme is to achieve universal household electrification. When this scheme was launched there were about 300 Lakh un-electrified households. As per the latest report around 99.92% electrification is achieved. Ujwal DISCOM Assurance Yojana (UDAY),a scheme for the financial turnaround of power distribution companies, has been approved by the Government of India with an objective to improve the operational and financial efficiency of State DISCOMs. Under this scheme, both Government and State takes steps to reduce cost of power. Considering the fact and government objective to promote competitive procurement of bilateral power by Distribution Licensees and reduction of overall power procurement cost through a transparent manner, DEEP (Discovery of Efficient Electricity Price) portal was launched. It is a e-Bidding and e-Reverse auction portal for procurement of Short/Medium/Long term power through competitive bidding process. This portal is an initiative of the Ministry of Power (MoP) with the objective to introduce uniformity and transparency in power procurement by the DISCOMs and at the same time promote competition in electricity sector. Finally under the policy reforms , the report describe new coal linkage policy by Central Government for

assured long term coal supply to power producers. Coal availability is not adequate and international price is high compared to the domestic price. Inadequate quantity of domestic coal, rising imports and high price for imported coal necessitates government intervention while allocating the available coal among power producing firms. Scheme for Harnessing and Allocating Koyala (Coal) (SHAKTI) was launched for introduction of a new more transparent coal allocation policy for power sector. Under the scheme, Coal India offers assured coal supply to units through bidding. The units have to quote the discount in their power tariffs that they would offer after getting cheaper coal from the company. As a part of this policy, CIL/SCCL is to grant coal linkages on notified price on auction basis for Independent Power Producers (IPPs) having already concluded domestic coal based Power Purchase Agreement (PPAs), with the bidding parameter being levelized discount on existing tariff that the IPP is willing to provide. This is expected to result in a win-win situation of IPPs having a long term supply security of coal from a source of their choice while consumers will benefit from a lower tariff.

After describing and discussion on reforms in power sector, issues is discussed and a hypothesis is developed that whether the current promises made by government is actually achieved the desired target or is still finding the ways to fulfil the loopholes of energy sector. In this segment data are mainly collected from journals, different research papers, newspapers and government reports. As per Times of India's report, Approximately 60,000 MW to 65,000 MW capacity is under financial stress due to tepid power procurement demand from Discoms in last 3 to 4 years. As per 37th report of the Standing Committee on Energy, Ministry of Power, the main issues for stresses capacity are Non-availability of fuel (Cancellation of Coal Block, Projects set up without linkage), lack of enough PPA by states, Inability of the promoter to infuse equity and working capital, delay in project implementations result in cost overrun, contractual and tariff related disputes. The issue currently facing by DISCOMs is dismantle financial health which ultimately lead to inadequate investment. As per PFC Limited's report on State Power Utilities performance, the aggregate losses of State Utilities have reached to Rs 89,603 Crore in FY 2015-16. Total outstanding debt has reached to Rs 7,26,721 Crore as on 31st March, 2016. Section 42 of Electricity Act 2003 provides provision for open access, thereby providing an alternative to the consumer to source cheap power. But still discoms are reluctant to provide permission for open access to many industrial and commercial consumers as this may affect the discoms' financial viability. Power purchase costs, accounting for 60-70 percent of the total cost of utilities, have risen sharply in the past few years despite of many reforms and steps

implemented by Government. The government has made efforts to promote renewable energy to reduce the dependence on fossil fuel. SERCs have mandated the Discoms to secure certain percentage of power from renewable sources. Since renewable energy involves a high effective cost, the RPO increases the average cost of power purchased by Discoms. The RPOs make it compulsory for all large consumers of energy to ensure that a certain percentage of that energy mix is from renewable sources such as wind and solar. The Economic Survey of 2017 indicated that the social cost of renewables is three times that of coal, at around Rs11 per kilowatt-hour. Moreover, Solar and wind have plant load factors of only 15-20%, which means the installed capacity is idle for nearly 80% of the time. Furthermore, not every state has adequate RE power available to be purchased. So, instead, renewable energy certificates (RECs) have to be purchased in lieu of RPOs. RECs increase the cost of power, since these are in addition to the total conventional power that needs to be produced and consumed anyway.

This report will end after analysis of each and every issues currently exist in the market and future prospective and some necessary remedial measure that to some extent provide the relief to different market players.

3.3 Survey Questions

As the research is descriptive research there is no survey questions.

3.4 Interview Procedures

There is no interview in the research, only available interviews of expert from different magazines, journals, newspapers, research papers are included in the report.

3.5 Data Analysis Procedures

As this is a descriptive report describing the present power market reforms and issues with remedial solutions, the data are collected mainly from Government websites, reports, regulations, some journals from power market, newspapers. The research begins with describing the past power market scenario and situation. After describing the background, the research progress to the reforms of current power market with issues and ultimately develop hypothesis. Research also describes the organization review. Below is the detailed Data analysis procedure:

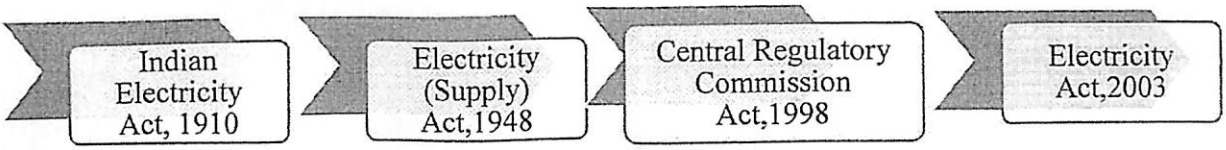
Content	Data Analysis Procedure
Background of Indian Power Sector	1). Relevant data collected from Indian Electricity Act,1910 describing the major provisions introduced in the market 2). Relevant data/provisions collected from Electricity (Supply) Act,1948 describing major changes introduced in the market which were absent in Indian Electricity Act,1910. 3).Relevant provision extracted from Electricity Regulatory Commissions Act, 1998 describing the need of setting regulatory commission both at Central and State level and their functions. 4).Major provisions of prevailing Electricity Act, 2003 which completely change the power market by introduction private sector participation and creation of competition with choice of electricity supplier for buying entities is discussed.
Power Market growth	Numerical Data in this section regarding per capita consumption of electricity, Growth of generation segment, percentage share of different power plants is collected from Energy Statistics 2019 and Load Generation Balance Report (LGBR) by Central Electricity Authority (CEA).
Regulatory Reforms in Power Market Envisaged in Electricity Act, 2003	Different regulatory reforms like introduction of Open Access in the market, Grant of trading licence with fixation of trading margin, operation of power exchange, tightening of laws related to power exchange transaction, introducing of renewable energy certificate for encouraging renewable energy generation and cross border transaction with neighbouring countries is referred from relevant CERC regulations.
Policy Reforms initiative by Central Government	Relevant government policies guidelines and its detail analysis is derived from Ministry of Power (MoP) and Ministry of Coal (MoC) website.

Challenges/Issues in current power market	1). Challenges/issues mainly referred from different research papers, discussion papers, newspapers, journals and internet. 2). Numerical data in this segment is collected from different reports published by Standing committee on Energy, Ministry of Power, Annual Report on the working of State Power Utilities by Power & Energy Division of Planning Commission and Report on The Performance of State Power Utilities by PFC Limited.
Saranyu Power Trading Pvt. Ltd. (SPTPL) review	Organization detail is referred from its Website www.indiapower.com

Chapter 4: Findings and Analysis

4.1 Descriptive Statistics

Figure 4.1 Chronological Evolution of Electricity Acts in India



Indian Electricity 1910- Enacted to regulate supply by licensees to consumers during British regime.

Electricity (Supply) Act 1948- Formation of State Electricity Boards with full powers to control generation, distribution and utilization of electricity within their respective states and Central Electricity Authority for planning and development of power system.

Central Regulatory Commission Act 1998- Paving the way for the formation of Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERC). Regulatory power of the State governments transferred to SERC. Consequently, Tariff regulatory function of CEA transferred to CERC.

Electricity Act 2003-This Act repeals the India Electricity Act 1910, Electricity (Supply) Act 1948, Central Electricity Commission Act 1998.

Table 4.1: All India Installed Capacity (in MW) of Power Stations (as on 30.11.2019)

Region	Ownership/Sector	Mode wise breakup				Grand Total
		Thermal	Nuclear	Hydro	RES	
Northern Region	State	19338.2	0	5777.25	701.01	25816.46
	Private	23318.83	0	2514	15312.61	41145.44
	Central	15516.2	1620	11416.52	379	28931.72
	Sub Total	58173.23	1620	19707.77	16392.62	95893.62
Western Region	State	26049.82	0	5446.5	548.95	32045.27
	Private	39406.67	0	481	23869.91	63757.58
	Central	20443.62	1840	1620	666.3	24569.92
	Sub Total	85900.11	1840	7547.5	25085.16	120372.77
Southern Region	State	20884.44	0	11774.83	586.88	33246.15
	Private	17720.3	0	0	39923.08	57643.38
	Central	14484.6	3320	0	541.9	18346.5
	Sub Total	53089.34	3320	11774.83	41051.86	109236.03
Eastern Region	State	7660	0	3537.92	275.11	11473.03
	Private	6387	0	399	1203.57	7989.57
	Central	15569.87	0	1005.2	10	16585.07
	Sub Total	29616.87	0	4942.12	1488.68	36047.67
North Eastern Region	State	533.71	0	422	233.25	1188.96
	Private	24.5	0	0	100.16	124.66
	Central	2023.62	0	1005	30	3058.62
	Sub Total	2581.83	0	1427	363.41	4372.24
Islands	State	40.05	0	0	5.25	45.3
	Private	0	0	0	7.84	7.84
	Central	0	0	0	5.1	5.1
	Sub Total	40.05	0	0	18.19	58.24
All India	State	74506.22	0	26958.5	2350.45	103815.17
	Private	86857.3	0	3394	80417.17	170668.47
	Central	68037.91	6780	15046.72	1632.3	91496.93
	Total	**229401.4**	**6780**	**45399.22**	**84399.92**	**365980.57**

The above table shows region wise installed capacity of different power plants in India. India's installed capacity has reached to 365 GW with thermal power contributing 229 GW, Nuclear power contributing 6.7 GW, Hydro contributing around 45 GW and Renewable sources 84 GW.

Table 4.2: Breakup of Renewable Energy Sources (RES) as on 30.11.2019 (in MW)

Small Hydro Power (Less than 25 MW)	Wind Power	Bio-Power	Solar Power	Total Capacity
4647.56	37278.68	9946.11	32527.55	84399.9

The above table depicts that in overall installed capacity of 85 GW from renewable energy sources, small hydro contribute 46 GW, Wind contribute 37 GW, Bio power contribute around 9 GW and solar power contribute 32 GW.

Table 4.3: Actual Power Supply Position in Terms of Energy Requirement during the Year 2018-19

Region	Requirement (MU)	Availability (MU)	Surplus (+)/Deficit(-)	
			(MU)	(%)
Northern Region	382493	377595	-4898	-1.3
Western Region	390349	390136	-213	-0.1
Southern Region	339377	338960	-417	-0.1
Eastern Region	145686	144616	-1070	-0.7
North Eastern Region	16691	16219	-472	-2.8
All India	**1274596**	**1267526**	**-7070**	**-0.6**

Above table shows that all India Energy requirement has reached to 1274 BU during 2018-19.

Table 4.4: Actual Power Supply Position in terms of Peak Demand during the year 2018-19

Region	Peak Demand (MW)	Peak Met (MW)	Surplus (+)/Deficit(-)	
			(MU)	(%)
Northern Region	63,166	61,726	-1,440	-2
Western Region	56,675	55,821	-854	-2
Southern Region	49,623	49,534	-89	-0
Eastern Region	23,141	22,733	-408	-2
North Eastern Region	2,967	2,850	-117	-4
All India	**1,77,022**	**1,75,528**	**-1,494**	**-0.8**

Above table clearly depicts that India's peak demand has reached to 177 GW during the year 2018-19.

Table 4.5: Size of Short-term Power Market (Bilateral and Power Exchange) during the year 2018-19

Year	Energy Transacted through trading Licensees (BU)	Price of Electricity transacted through Trading licensees (Rs/kWh)	Electricity Transacted through Power Exchanges (BU)	Price of Electricity Transacted through Power Exchanges (Rs/kWh)
2009-10	26.72	5.26	7.19	4.96
2010-11	27.7	4.79	15.52	3.47
2011-12	35.84	4.18	15.54	3.57
2012-13	36.12	4.33	23.54	3.67
2013-14	35.11	4.29	30.67	2.9
2014-15	34.56	4.28	29.4	3.5
2015-16	35.43	4.11	35.01	2.72
2016-17	33.51	3.53	41.12	2.5
2017-18	38.94	3.59	47.7	3.45
2018-19	47.32	4.28	53.52	4.26

Above figure shows that energy transaction through traders in short term market is increasing in subsequent years and has reached to 47.32 MUs.

Table 4.6: All India Household Electrification Status under SAUBHAGYA Scheme

State	Total Households	Household Electrification (%)
Uttar Pradesh	28675462	100
Maharashtra	24560406	100
West Bengal	15058530	100
Bihar	13973122	100
Madhya Pradesh	12621007	100
Rajasthan	12598991	100
Andhra Pradesh	11442705	100
Gujarat	11414532	100
Tamil Nadu	10285848	100
Karnataka	10221324	100
Kerala	9813032	100
Odisha	9621296	100
Assam	6966079	100
Jharkhand	6749036	100
Telangana	6536671	100
Chhattisgarh	5683509	99.67
Punjab	3693061	100
Haryana	3469972	100
Jammu &Kashmir	2451154	100
Uttarakhand	2076613	100
Himachal Pradesh	1855669	100
Tripura	788871	100
Meghalaya	635802	100
Nagaland	523870	100
Manipur	453142	100
Arunachal Pradesh	302361	100

Mizoram	241796	100
Goa	128208	100
Sikkim	98768	100
Puducherry	95616	100
Total	**21,30,36,453**	**99.989**

Table 4.7: Recent Tender Rates Discovered at deep e-bidding portal for Purchase of RE Power

State	Rate (Rs/Kwh)
Goa	5.27
CESC	6.3
Haryana	5.31
Uttarakhand	4.71

As per the recent short term tender results, rates are on higher side for RE power.

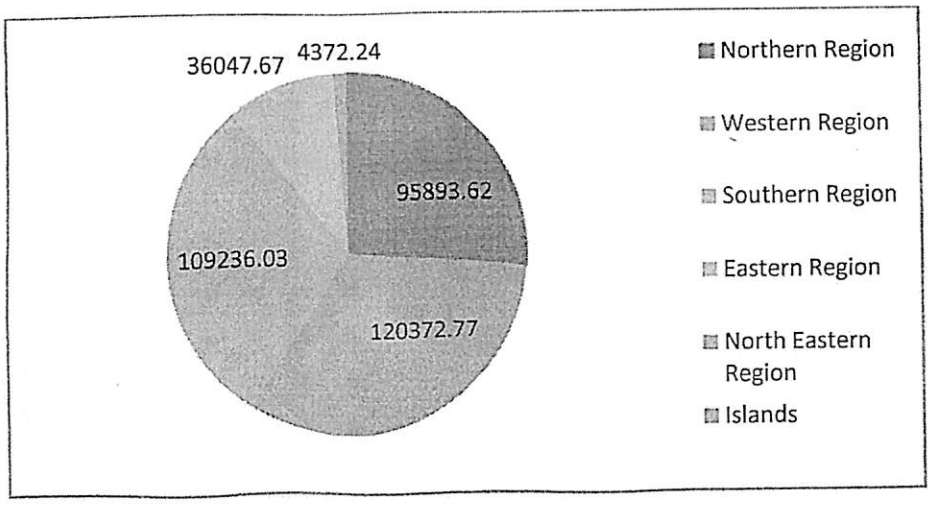
Table 4.8: PLF in the Country (Coal & Lignite based) from 2009-10 to 2019-20

Year	PLF	Sector-wise PLF (%)		
	(%)	Central	State	Private
2009-10	77.5	85.5	70.9	83.9
2010-11	75.1	85.1	66.7	80.7
2011-12	73.3	82.1	68	69.5
2012-13	69.9	79.2	65.6	64.1
2013-14	65.6	76.1	59.1	62.1
2014-15	64.46	73.96	59.83	60.58
2015-16	62.29	72.52	55.41	60.49
2016-17	59.88	71.98	54.35	55.73
2017-18	60.67	72.35	56.83	55.32
2018-19	61.07	72.64	57.81	55.24
2019-20	55.84	63.54	50.11	54.97

From above table it can be derived that PLF of power plants in all segment i.e. Central, State and Private sector is decreasing.

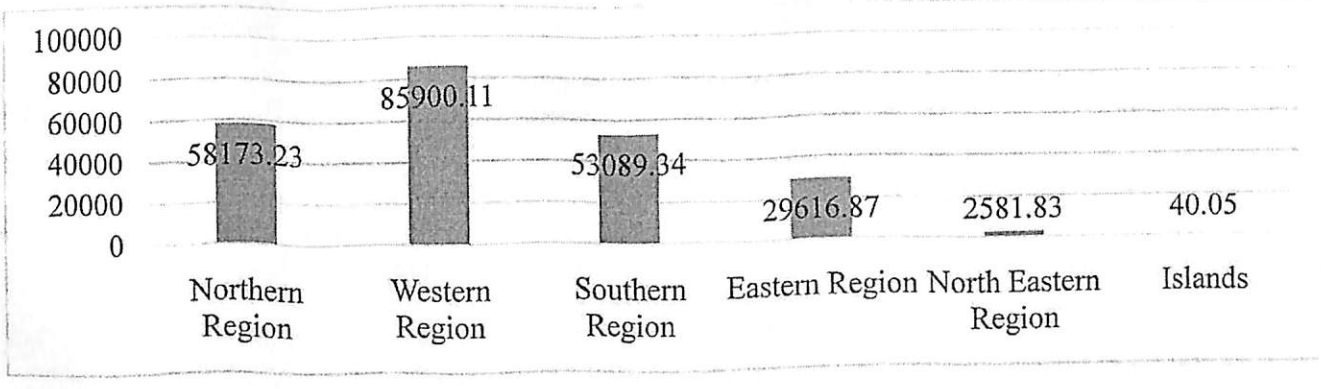
4.2: Correlation/Regression Analysis

Figure 4.2: All India Installed Capacity (in MW) of Power Stations



The above representation derived from table 4.1 clearly shows that Western region has highest installed capacity followed by Southern region, Northern region, Eastern region, North Eastern region and at last islands. Installed capacity of Western region is 120.372 GW, Southern region is 109.236 GW, Northern region is 95.893 GW, Eastern region is 36.047 GW and North Eastern region is 4.372 GW. Islands have only 58.24 MW of installed capacity.

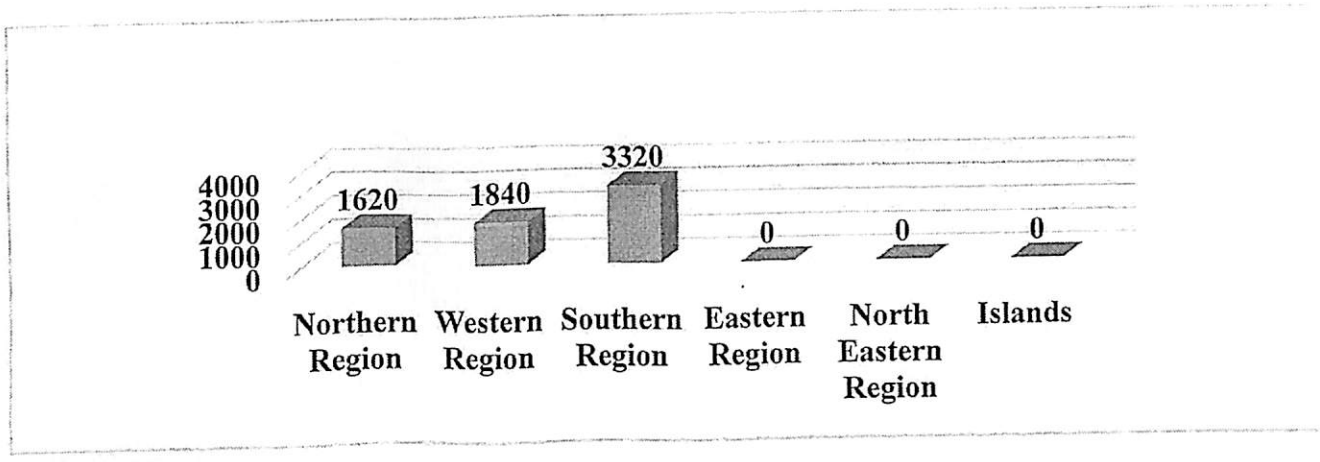
Figure 4.3: Region Wise Installed Capacity of Thermal Plant in MW



In terms of Thermal power capacity, Western region has highest installed capacity of 85.90 GW. Northern region which is second among the list has installed capacity of 58.173 GW followed by Southern region having installed capacity of 53.089 GW, Eastern region having

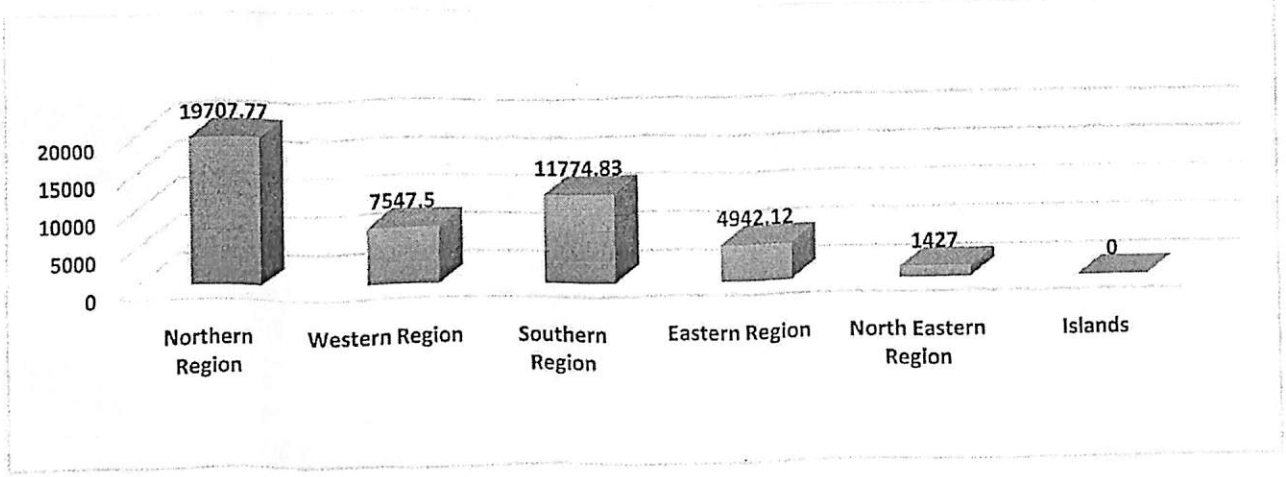
installed capacity of 29.616 GW, North Eastern region having installed capacity of 2.581 GW and at last Islands having installed capacity of only 40.05 MW.

Figure 4.4: Region wise installed Capacity of Nuclear Plant in MW



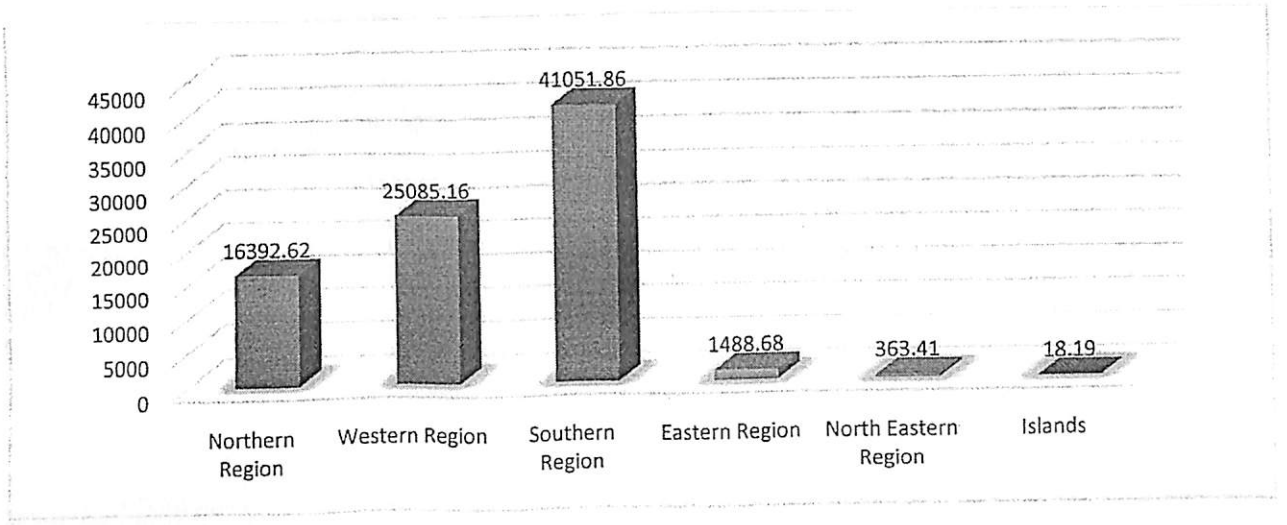
In terms of Nuclear power plant capacity, Southern region has highest installed capacity of 3.32 GW. Western region has installed capacity of 1.84 GW and Northern region has installed capacity of 1.62 GW. The installed capacity of Eastern, North Eastern and Islands are zero.

Figure 4.5:Region wise installed Capacity of Hydro Plants in MW



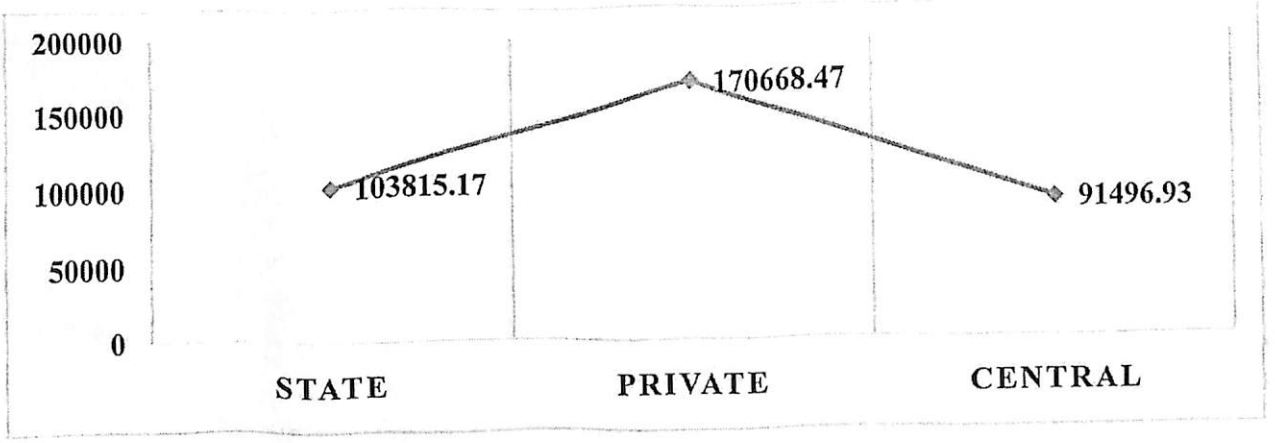
Northern region has highest capacity of Hydro with 1.971 GW followed by Southern region having capacity of 11.775 GW, Western region with 7.55 GW, Eastern region with 4.94 GW and North Eastern region with 1.43 GW. Hydro capacity of Islands is zero.

Figure 4.6: Region Wise installed Capacity of Renewable Energy Sources



From the above figure it can be clearly derived that Southern region has highest installed capacity of Renewable energy sources with 41.05 GW followed by Western region having capacity of 25.01 GW, Northern region having capacity of 16.39 GW, Eastern region having installed capacity of 1.49 GW, North Eastern having capacity of only 363.41 MW and Islands with installed capacity of 18.19 MW.

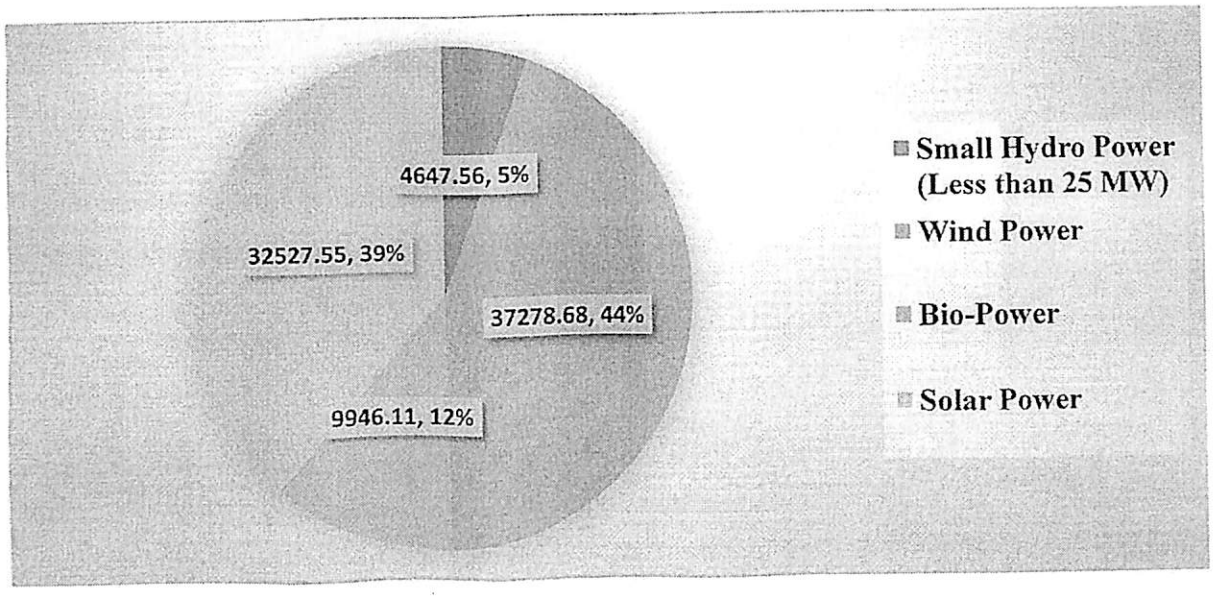
Figure 4.7: Sector Wise All India Installed Capacity in MW



From sector point of view, Private sector has highest installed capacity of 170.69 GW. State sector and Central sector installed capacity is 103.815 GW and 91.50 GW respectively.

From table 4.2, breakup of renewable energy sources relation derived is shown in form of pie chart given below in figure 4.8:

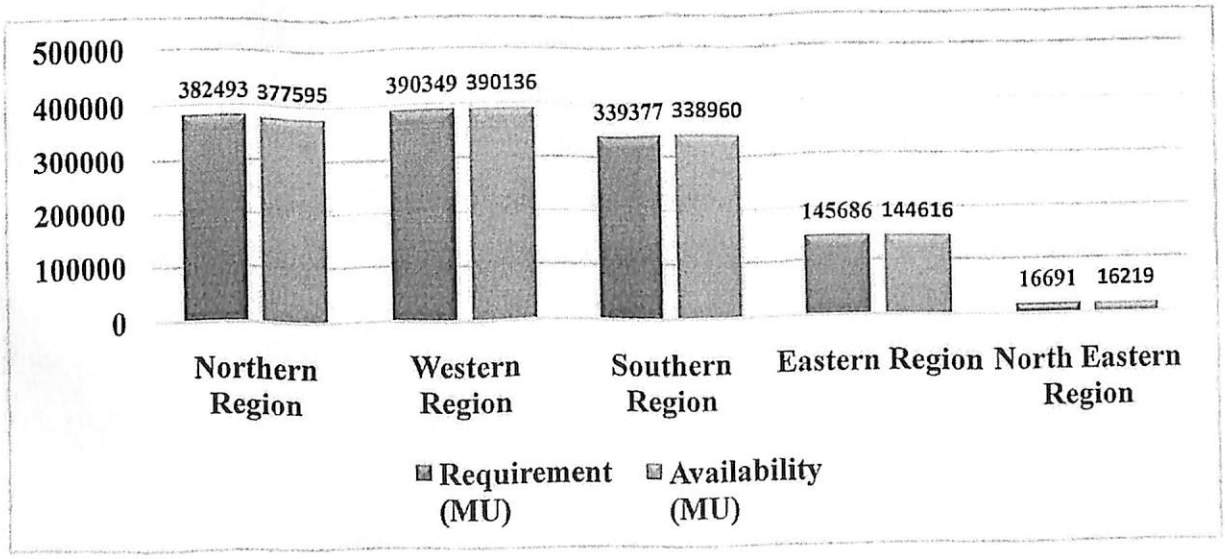
Figure 4.8:Source wise Installed Capacity of Renewable Energy Sources in MW



Wind power has highest share of 44% with capacity of 37.28 GW in Renewable Energy installed capacity. Solar has share of 39% with 32.52 GW of capacity in the market. Bio power has share of 12% with installed capacity of 9.95 GW and Small hydro (Less than 25 MW) has share of 5% with capacity of 4.65 GW.

From table4.3actual power supply position in terms of energy requirement during the Year 2018-19 relation derived in shown in figure.4.9:

Figure 4.9:Region wise Requirement and Availability

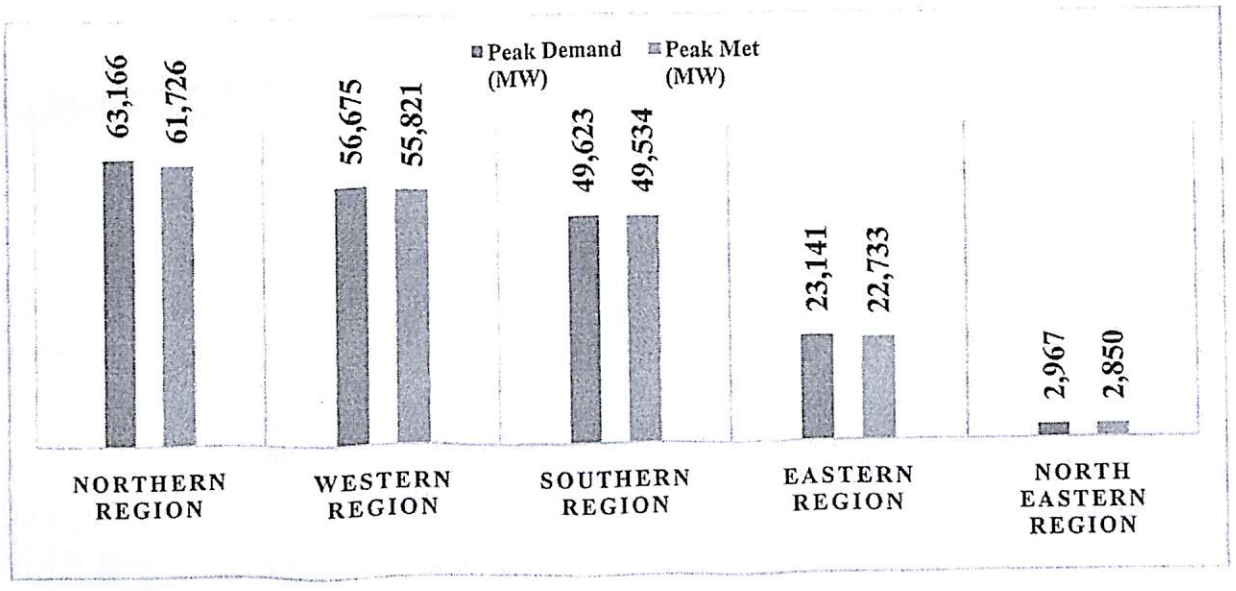


Western region has highest requirement of 390.349 BU followed by Northern region with requirement of 382.493 BU, Southern region with requirement of 339.377 BU, Eastern region with capacity of 145.686 BU and North Eastern region with capacity of 16.691 BU.

Availability of Western region is 390.136 BU, thus deficit of 0.21 BU. Availability of Northern region is 377.595 BU, thus deficit of 4.90 BU. Availability of Southern region is 338.960 BU with deficit of 0.42 BU. Availability of Eastern region is 144.616 BU with deficit of 1.07 BU. Availability of North Eastern region is 16.22 BU with deficit of 0.47 BU.

From table 4.4 Actual Power Supply Position in terms of Peak Demand during the year 2018-19 relation derived is shown in figure 4.10:

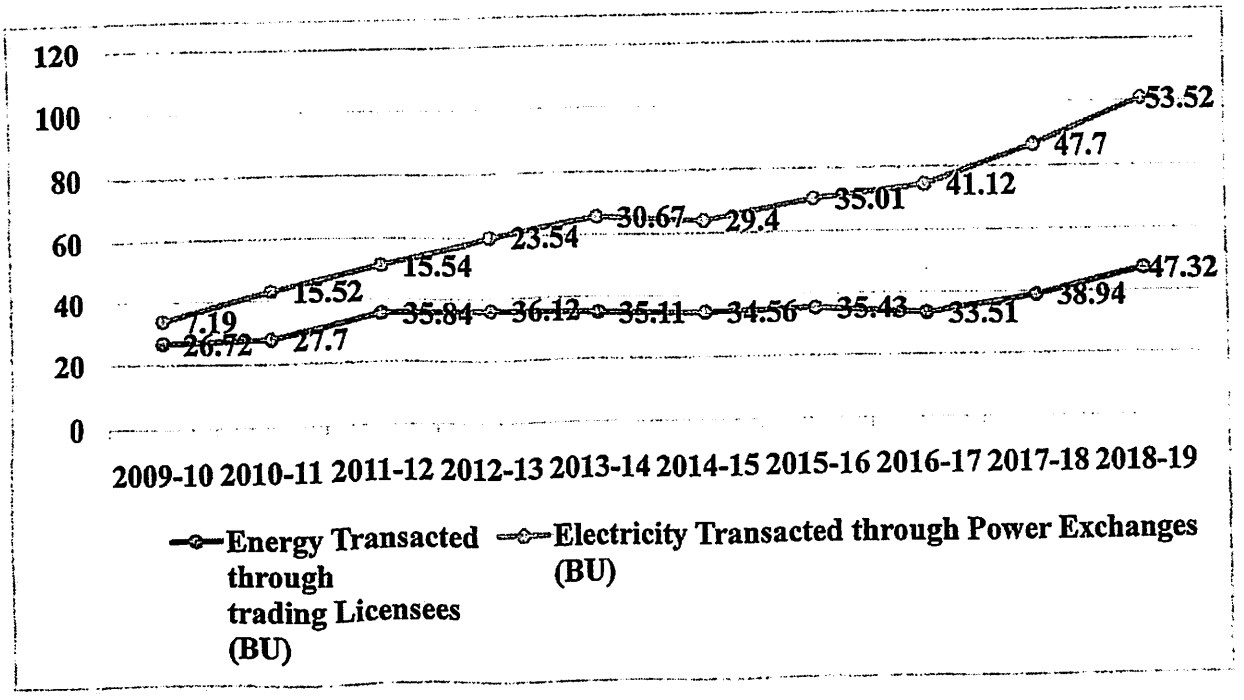
Figure 4.10: Power Supply Position in terms of Peak Demand in MW



Peak demand of Northern region has reached to 63,166 MW with peak demand met of 61,726 MW, thus deficit of 1440 MW. Peak demand of Western region has reached to 56,675 MW with demand met of 55,581 MW, thus deficit of 853 MW. Peak demand of Southern region has reached to 49,623 MW with demand met of 49,534 MW and deficit of only 89 MW. Eastern region peak demand is 23,141 MW with demand met of 22,733 MW and deficit of 408 MW. Peak demand of North Eastern region has reached to 2,967 MW with demand met of 2,850MW and deficit of 117 MW.

From table 4.5 , Size of Short-term Power Market (Bilateral and Power Exchange) during the year 2018-19 relation derived is shown below in figure 4.11:

Figure 4.11: Comparison of Short Term Energy Transacted through Trading Licensees v/s Power Exchange

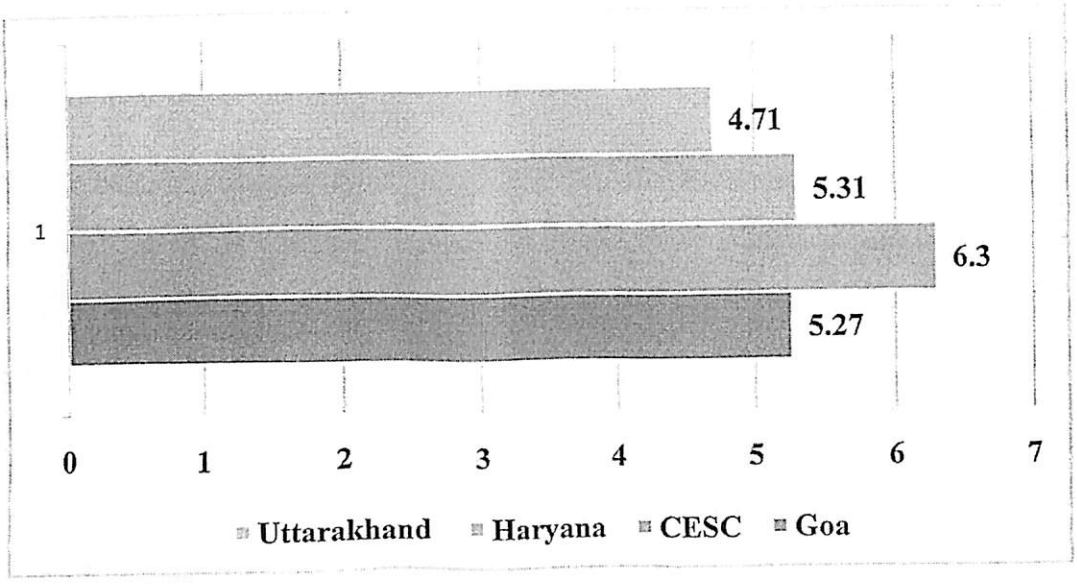


From the above figure it can be derived that short term transaction of energy in terms of Billion Unit (BU) is increasing in both segment that is through trading Licensees and through Power Exchanges clearly showing increase in short term demand in the market.

Short term market rates through trading licensees and through power exchanges is shown in table 4.5.From year 2009-10 to 2016-17 price of electricity through trading licensees is quite higher than that of electricity price through power exchanges. But from year 2017-18 to 2018-19 electricity price through power exchanges is almost equal to electricity price transacted through trading licensees. In the year 2018-19 electricity price is on higher side in both the segment.

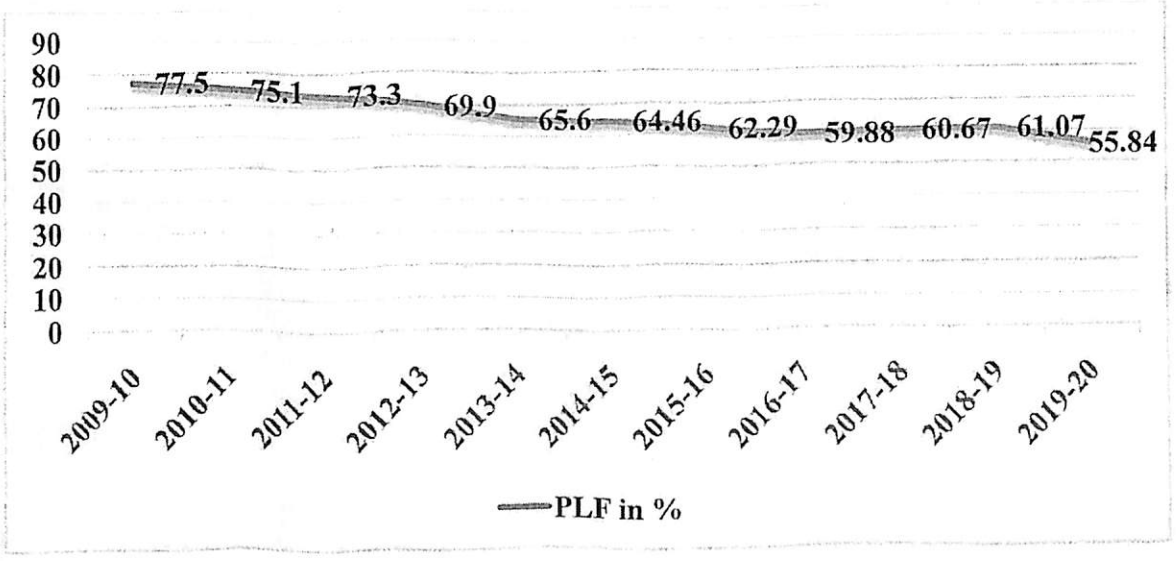
From table 4.7, recent tender rates discovered at deep e-bidding portal for purchase of RE power, relation derived is shown in below figure 4.12

Figure 4.12: Renewable Power Rate in Rs/Kwh at Deep e-bidding Portal



Renewable Power rate in short term market discovered at deep e-bidding portal is in higher side.From table 4.8, PLF in the Country (Coal & Lignite based) from 2009-10 to 2019-20 ,relation derived is shown in below figure 4.13:

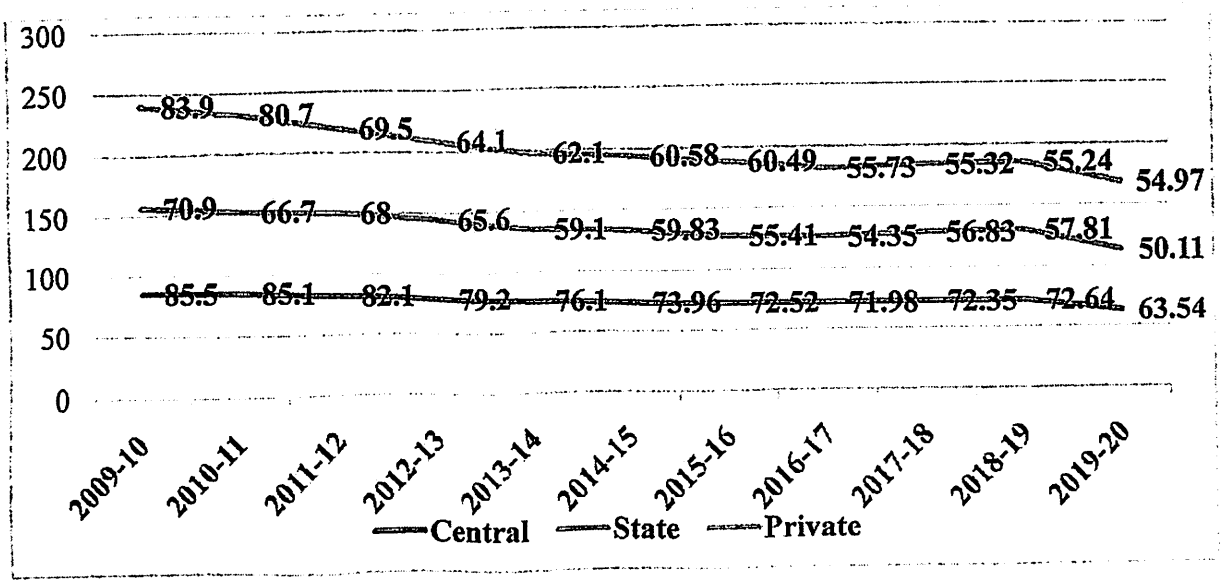
Figure 4.13: All India Yearly PLF



All India Plant Load Factor (PLF) is decreasing from year 2009-10 to 2019-20. PLF for year 2019-20 is 55.84% as compared to 77.5% for year 2009-10.

The below figure shows yearly sector wise PLF:

Figure 4.14: All India Sector wise PLF



In all three sector that is Central, State and Private PLF is decreasing. PLF of Central sector is 85.5% , State sector is 70.9% and Private sector is 83.9% during the year 2009-10. PLF of Central sector is 63.54%, State sector is 50.11% and private sector is 54.97% during the year 2019-20 clearly showing downward trend.

Chapter 5: Interpretation of Results

5.1 Interpretation of Results

In this section results are interpreted from various chapters of this report.

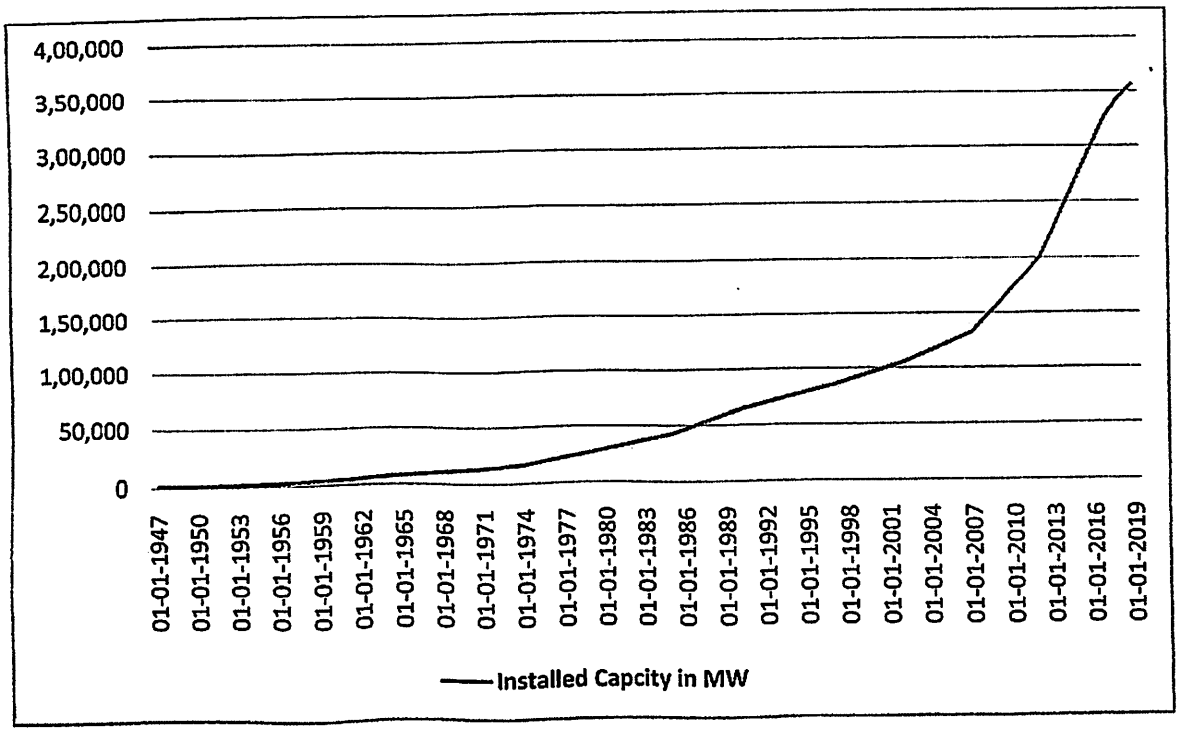
5.1.1 Present Scenario of Indian Power Market

All India installed capacity has reached to 366 GW which can be clearly seen from figure 4.1. Contribution of thermal plants is 229 GW with 62.68% share in the market, Nuclear power plants is 6.780 GW with only 1.85% share in the market, Hydro power plants is 45.40 GW with 12.40% share in the market and Renewable Energy Sources is 84.40 GW with 23.06% share in the market. Yearly increase in installed capacity is shown in table below:

Table 5.1: Yearly Growth in Installed Capacity

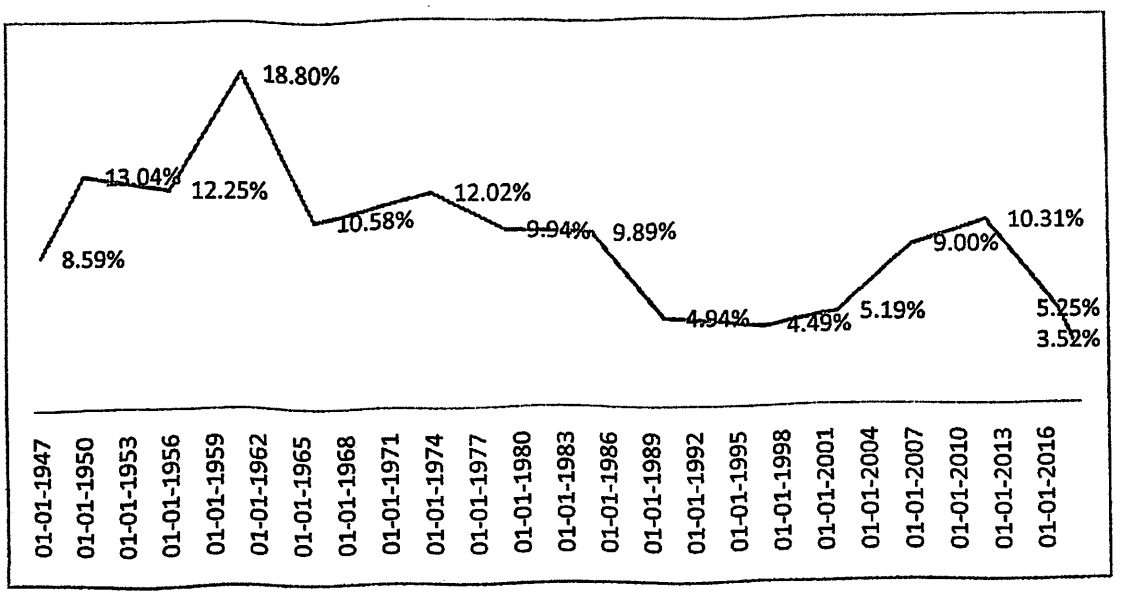
Growth of Installed Capacity					Total (MW)	% Growth (On yearly basis)
Installed Capacity as on	Thermal (MW)	Nuclear (MW)	Hydro (MW)	RES (MW)		
31-12-1947	854	-	508	-	1,362	-
31-12-1950	1,153	-	560	-	1,713	8.59%
31-03-1956	1,825	-	1,061	-	2,886	13.04%
31-03-1961	2,736	-	1,917	-	4,653	12.25%
31-03-1966	4,903	-	4,124	-	9,027	18.80%
31-03-1974	9,058	640	6,966	-	16,664	10.58%
31-03-1979	15,207	640	10,833	-	26,680	12.02%
31-03-1985	27,030	1,095	14,460	-	42,585	9.94%
31-03-1990	43,764	1,565	18,307	-	63,636	9.89%
31-03-1997	61,010	2,225	21,658	902	85,795	4.94%
31-03-2002	74,429	2,720	26,269	1,628	1,05,046	4.49%
31-03-2007	86,015	3,900	34,654	7,760	1,32,329	5.19%
31-03-2012	1,31,603	4,780	38,990	24,503	1,99,877	9.00%
31-03-2017	2,18,330	6,780	44,478	57,260	3,26,841	10.31%
31-03-2018	2,22,906	6,780	45,293	69,022	3,44,002	5.25%
31-03-2019	2,26,279	6,780	45,399	77,641	3,56,100	3.52%

Figure 5.1: All India Installed Capacity in MW from all types of Energy Sources



Installed capacity of India has increased in a significant way to meet the rising demand of states as proposed by government.The Electricity Act of 2003 liberalised the electricity generation through a license-free regime. As a result, the entry of private players into the generation segment significantly increased their share in the total electricity generation.

Figure 5.2: Yearly Percentage Growth of Installed Capacity



From figure 5.2, it can be interpreted that growth percentage of capacity addition has declined over the last few years.

It can also be interpreted that from figure 4.8 that under renewable energy sources market share of wind power is maximum with 44.17%. Market share of Solar power is 38.54%,Bio-power is 11.78% and Hydro power (less than 25 MW) is 5.51% only.

Energy requirement of India has reached to 1274 BU with peak demand of 177 GW in the year 2018-19. Below figures show yearly rise in requirement with peak demand and availability with percentage of energy not met:

Table 5.2: Yearly Energy Requirement and Availability

Year	Requirement (MU)	Availability (MU)	Deficit	
			(MU)	(%)
1997-98	4,24,505	3,90,330	34,175	8.1%
1998-99	4,46,584	4,20,235	26,349	5.9%
1999-00	4,80,430	4,50,594	29,836	6.2%
2000-01	5,07,216	4,67,400	39,816	7.8%
2001-02	5,22,537	4,83,350	39,187	7.5%
2002-03	5,45,983	4,97,890	48,093	8.8%
2003-04	5,59,264	5,19,398	39,866	7.1%
2004-05	5,91,373	5,48,115	43,258	7.3%
2005-06	6,31,554	5,78,819	52,735	8.4%
2006-07	6,90,587	6,24,495	66,092	9.6%
2007-08	7,39,343	6,66,007	73,336	9.9%
2008-09	7,77,039	6,91,038	86,001	11.1%
2009-10	8,30,594	7,46,644	83,950	10.1%
2010-11	8,61,591	7,88,355	73,236	8.5%
2011-12	9,37,199	8,57,886	79,313	8.5%
2012-13	9,95,557	9,08,652	86,905	8.7%
2013-14	10,02,257	9,59,829	42,428	4.2%
2014-15	10,68,923	10,30,785	38,138	3.6%
2015-16	11,14,408	10,90,850	23,558	2.1%
2016-17	11,42,928	11,35,332	7,596	0.7%
2017-18	12,13,326	12,04,697	8,629	0.7%
2018-19	12,74,595	12,67,526	7,069	0.6%

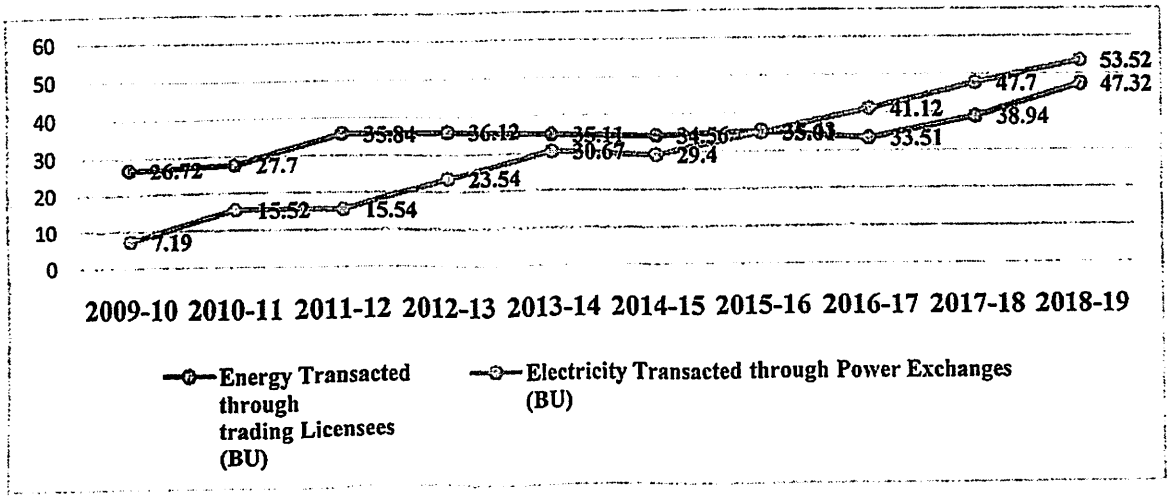
Table 5.3: Yearly Peak Demand and Peak Demand Met

Year	Peak Demand (MW)	Peak Met (MW)	Deficit	
			(MW)	(%)
1997-98	65,435	58,042	7,393	11.3%
1998-99	67,905	58,445	9,460	13.9%
1999-00	72,669	63,691	8,978	12.4%
2000-01	78,037	67,880	10,157	13.0%
2001-02	78,441	69,189	9,252	11.8%
2002-03	81,492	71,547	9,945	12.2%
2003-04	84,574	75,066	9,508	11.2%
2004-05	87,906	77,652	10,254	11.7%
2005-06	93,255	81,792	11,463	12.3%
2006-07	1,00,715	86,818	13,897	13.8%
2007-08	1,08,866	90,793	18,073	16.6%
2008-09	1,09,809	96,785	13,024	11.9%
2009-10	1,19,166	1,04,009	15,157	12.7%
2010-11	1,22,287	1,10,256	12,031	9.8%
2011-12	1,30,006	1,16,191	13,815	10.6%
2012-13	1,35,453	1,23,294	12,159	9.0%
2013-14	1,35,918	1,29,815	6,103	4.5%
2014-15	1,48,166	1,41,160	7,006	4.7%
2015-16	1,53,366	1,48,463	4,903	3.2%
2016-17	1,59,542	1,56,934	2,608	1.6%
2017-18	1,64,066	1,60,752	3,314	2.0%
2018-19	1,77,022	1,75,528	1,494	0.8%

Above figures clearly depicts that all India demand with peak has risen significantly with decrease in deficit percentage. This describes that capacity addition is line with overall demand with peak demand forecasted by Government.Electricity demand is counted as the amount of electricity that distribution utilities buy.

From figure 5.3 following interpretation can be derived:

Figure 5.3: Comparison between Energy Transaction through Trading Licensees and through Power Exchanges in Short Term Market



It is observed from the above figure that the volume of electricity transacted through traders was relatively high when compared with the volume of electricity transacted through power exchanges during 2008-09 to 2015-16. During the latest three years, i.e. in 2016-17 and 2018-19, the volume of electricity transacted through power exchanges was relatively high when compared with the volume of electricity transacted through traders. This shows that there was more demand for electricity through power exchanges than the bilateral transactions through traders. The volume of electricity transacted through power exchanges increased at an annual growth rate of 34% whereas the volume of electricity transacted through traders grew at 8% during 2009-10 to 2018-19.The size of the bilateral and power exchange market increased from 17,617 Crore in 2009-10 to 43,064 Crore in 2018-19 and the size of this market increased at an annual growth rate of 10% . Variation in volume and price affected the size of bilateral and power exchange market. During 2009-10 to 2018-19, the volume of electricity transacted through bilateral and power exchange registered a positive growth of 7% and 25% respectively, while the price of electricity transacted through both bilateral and power exchange registered a negative growth of 5%. During 2018-19, due to increase in volume and price, the size of bilateral and power exchange market increased by 42% over the previous year.

DEEP (Discovery of Efficient Electricity Price) portal was launched with the objective to promote competitive procurement of bilateral power by Distribution Licensees and reduction of overall power procurement cost through a transparent manner. But recent tender result clearly shows that price discovered at DEEP portal for procurement of renewable power is in

higher side. This also means that if DISCOMs cancel tenders for RE power purchase due to higher per unit cost, then they have to purchase REC to fulfil their renewable purchase obligation which also increases the cost of power purchase since these are in addition to the total conventional power that needs to be produced and consumed by licensees. Present forbearance price of Solar and Non-Solar REC is Rs 2.4/Kwh and Rs 3/Kwh respectively and floor price of Solar and Non-Solar REC is Rs 1/Kwh.

All India PLF of power plants is also decreased and stand at 55.85% during year 2019-20.PLF is a measure of average capacity utilization. Main reasons for low PLF are non-availability of fuel, unplanned shut-down, forced break down, no offtake by distribution companies due to tepid power demand, lack of enough PPA by states, inability of the promoter to infuse equity and working capital, delay in project implementations result in cost overrun, contractual and tariff related disputes. The PLF is decreased in all the three sectors that is Central, State and Private.

Further in both regulatory and policy point of view Government is continuously trying to reform Indian power sector to ease the transactions in the market so that ultimately the end consumers receive reliable and uninterrupted electricity with economical rate and also fulfil the overall fast growing demand of the nation. Central Electricity Regulatory Commission (CERC), a quasi judicial body formed under Electricity Act 2003 forming/amending regulations time to time to promote competition, efficiency and economy in bulk power markets, improve the quality of supply, promote investments and advise government on the removal of institutional barriers to bridge the demand supply gap and thus foster the interests of consumers. With this idea CERC issued many regulations related to open access to provide the consumers right to procure power from any source with competitive rate. To formulate an efficient tariff setting mechanism CERC issued Tariff regulations which promotes competition, economy and efficiency in the pricing of bulk power and transmission services and ensures least cost investments. To facilitate inter-state trading, CERC came up with regulations related to issuances of trading licence with capping of trading margin with a view to balance the interests of buyers as well as the traders due to the volatility of short term prices which has a direct impact on the finances of the trader. With Government's ambitious target of achieving 175 GW renewable capacity CERC published regulations for issuance of REC to renewable generators giving support to the government vision.Further to facilitate cross border trade of electricity between India and neighbouring countries and meet the demand of the participating countries by utilising the available resources and reliable grid operation and transmission of electricity across the borders CERC issued regulation for cross

border trade of electricity.Further for improvement of the industry Government continuously issues policy directives and guidelines with various schemes like SAUBHAGYA, UDAY to provide assistance for improvement of operational efficiency, rural electrification, competitive bidding guidelines, scheme for coal allocation through transparent process etc.

In spite of government initiatives to improve the market still there are many issues which need to be addressed. Approximately 65,000 MW of capacity is stressed due to reduction in power procurement demand, lack of enough PPAs, inability of the promoters to infuse equity and working capital, absence of long term fuel supply which ultimately reduced the overall PLF of plant. Moreover dismantle financial condition of the DISCOMs lead to inadequate investment in the distribution sector. This financial burden of DISCOMs makes them unable to release timely payment to power plants for energy supplied by them. To achieve the renewable target and reduction of carbon emission RPO is introduced whichmake it compulsory for all large consumers of energy to ensure that a certain percentage of that energy mix is from renewable sources which ultimately increases the overall power procurement cost.

5.2 Comparison of Result with Assumptions (Hypothesis)

At starting of the report, a hypothesis is developed on whether the government initiatives are sufficient to reach the objective or still some loopholes or issues exist which need to be addressed and eliminated. Below is the comparison of result in support of the hypothesis:

5.2.1 Policy Issues:

Though Government issued many policies to uplift the power market but these are still far behind in achieving the desired result. Government has achieved almost 100% electrification in rural household but fails to provide uninterrupted quality services.However, there are underlying structural problems with SAUBHAGYA scheme. It does not provide any subsidy for electricity consumption and relies heavily on installing pre-paid meters in order to create a demand for electricity. The logic being that this will incentivise the distribution companies to supply electricity to the villages. The problem with this approach is twofold. Firstly, it puts enormous burden on households to pay the recurring costs of electricity consumption. For many poor households, the high recurring costs of electricity consumption provides an incentive to indulge in electricity theft, which is not addressed by this scheme. Therefore, only those households who can afford to pay for regular electricity consumption will benefit from the scheme. Secondly, the discoms have been incurring huge financial losses and need

to be bailed out before they can be counted upon to provide reliable electricity supply to rural and urban areas.

At the end of UDAY scheme which is implemented to improve the operational efficiency of discoms, state-level achievements remained fragmented with respect to operational parameters and no substantial financial turnaround was observed. The fiscal condition of the states and their growing outstanding liabilities raise concern about the future availability of such bailout packages to DISCOMs.The precarious financial health of DISCOMs poses a significant risk to demand growth and new investments. Total outstanding dues of discoms still remains around Rs 7,26,721 Crore as on 31st March, 2016 and AT&C losses around 20% clearly failing the desired motive of Government. About one-third of the total power sold by utilities lost due to AT&C losses.

Moreover different policies failed to address the issue of dismantle financial health of discoms. States produce commercial loss, and that distribution companies selling electricity directly to consumers cause most of the loss. This loss is the result of irregularity of payment of subsidy by the state government which ultimately lead to cash flow issue and discoms are not able to purchase power even when the demand is high. The aggregate losses of State Utilities have reached to Rs 89,603 Crore in FY 2015-16.Another key concern is cross subsidies between different consumer categories. 24 percent of power supplied flows to the agricultural sector but yields less than 6 percent of revenues.

With increase in capacity addition stressed capacity also increases. As on date India's installed capacity has reached to 365 GW out of which 86.86 GW of thermal source is owned by private sector but already 65GW of capacity of private sector is stressed which almost accounts to 76%.Lenders have exposure ofapproximately INR 3 Lakh Crore to such assets and it is imperilled due to slowresolution process and tepid power procurement demand from discoms in last 3 to 4years. This results in poor PLF of power plants which has already reached to 55.84% as compared to 61.07% in the year 2018-19.The main reasons for this stressed capacity are coal linkage related issues, delay in implementation of projects due to various reasons, non-availability of fuel, delay in land/environment clearances, inability of promoters to infuse additional funds, lower power generation due to restrictions on release of water etc. Weak financial health of Distribution Companies (DISCOMS) have led to substantial increase in receivables of borrowing groups, thus impacting their liquidity position.

Ministry of Power (MoP) with the objective of competitive prices launched DEEP portal but it also fails to deliver the desired result as rates discovered at portal is far higher than expected. Moreover many long and medium term tenders are not yet finalized after the bidding process due to issue with rate and ambiguity in standard bidding documents issued by Ministry. In recent tenders for renewable power, rates are at higher side. Moreover for reduction in carbon emission Government introduced RPO which make it compulsory for all large consumers of energy to ensure that a certain percentage of that energy mix is from renewable sources which ultimately increases the overall power procurement cost as the cost of renewable power is high and it is not available 24x7 like base load power plants.

Government also issued guidelines for transparent allocation of long-term fuel linkage under SHAKTI scheme but according market players, the supply of coal has been far from satisfactory.The winners have not been getting the desired coal supplies even months after being awarded the bids.

5.2.2 Regulatory Issues

One of the main regulatory issue is to liquidate regulatory assets, a gap between projected and actual revenue recovery, worth around Rs 77,000 crore, as estimated. Regulatory assets are legitimate Discom expenses which state power regulators are required to liquidate the same by revising appropriate tariff hikes, but are deferred on account of one reason or other.Additionally, untimely payments from bulk consumers such as local bodies and state departments have put additional pressure on them.

Power sector being the regulated sector does not enjoy the advantage of fixing selling price according to current cost and is a subject matter of Regulator. Although, the Electricity Act 2003 followed by regulations mandates recovery of prudently incurred cost for supply of power but in real sense does not happen strictly in line with that. Delays and deferment have become practice in recovery of cost incurred to supply the power.

Many states have implemented power purchase adjustment mechanism which permits discoms to recover variation in long-term power purchase cost but there is a need to modify the formula so that entire variation in the power purchase cost including short-term power purchase an be recovered immediately.

Similarly, retail supply tariff is fixed based on the projected revenue and approved cost and if the Discom is able to recover revenue in line with the projected revenue it is a comfortable situation. But in the current scenario, several states Discoms have huge Regulatory Assets.

Presently most of the states are sitting on huge regulatory asset combined around Rs 77,000 crore which is a big concern looking at the limited funding options available for the sector.The top three states including Uttar Pradesh, Maharashtra and Jharkhand, account for around 87 per cent of the current regulatory assets market.

Moreover, due to difference in regulation by CERC and SERCs make it difficult for different market players to maintain operational efficiency and grid security.

5.2.3 Demographic Issues

The power sector is unable to use at least 10 per cent of its capacity due to the choked transmission network in the country. Inadequate transmission has kept about 25,000 MW of generation capacity idle, making the problem comparable to the issue of acute fuel scarcity that has hit about 30,000 MW of new capacity. In addition to the inadequate capacity, regulatory authorities impose strict restrictions on the utilisation of existing networks and keep a large amount of transmission capacity idle as a safeguard against grid collapse.Power producers are unable to sell electricity in shortterm markets due to congestions and restrictions. Transmission bottlenecks prevent the supply of power to deficit regions in summer and monsoon seasons when demand peaks. Southern states of Tamil Nadu, Kerala, Karnataka and Telangana would not have been facing power shortages if there was adequate transmission capacity available with generating firms in Madhya Pradesh, Odisha and Chhattisgarh.Indian Energy Exchange could not allow trade of close to 11 billion units of electricity in past three financial years due to congestion in transmission network.Lack of transmission infrastructure has been a growing concern for renewables also. With a plethora of mega solar tenders announced in the solar sector, including interstate transmission system (ISTS) connected projects, the evacuation infrastructure availability has been the biggest challenge.The most challenging issue the transmission sector in India facing today is the Right of way (ROW), land acquisition, regulatory and environmental clearances for the transmission lines. With the increased awareness of farmers, land owners, reserved forest, bird centuries, religious structures, it has become increasingly difficult to get smooth and timely ROW clearances. Narrow corridors like chicken neck, multiple Extra High Voltage (EHV) lines have created congestion around existing sub stations, leaving almost no space for the future expansion. Engineers have been, therefore left with no option but to work on Ultra High Voltage (UHV) lines or use the existing corridors for up gradation by higher voltages, such that cost of MW power transfer/metre of ROW is the most optimum.

Similarly metros and densely populated cities have created serious problems for getting new corridors, hence up gradation of lines need to be done in the existing ROW. Since the generating stations are confined to four boundaries quite dispersed and concentrated in pockets far away from the consumption centres, engineers have been forced to think on alternative solutions, which are reliable, technically sound and easy to execute. The future growth in power generation will require many more transmission lines to be constructed and on the other hand much tougher challenges in ROW will need a support of advance technology to minimise ROW requirements. Some of the transmission lines in India have been waiting to be commissioned for long time since small sections are stuck up due to forest clearances and some locations are in dispute.

Railways today explicitly over-priced coal freight by about 31 per cent to offset its coaching losses. In FY 2017, this "overcharge" from coal to thermal power pants increases the cost of power, on an average, by about 10 paisa per kWh on the basis of all electricity generated in India. For coal carried by railways, on average, this number is Rs. 0.21/kWh in FY 2017. For power plants in distant states, which inherently rely on railways for coal, this number can be three times higher. Another main issue is the availability of rakes to supply coal for thermal power plants. Ministry of Railway issued a directive stating not to provide rail rakes for transportation of coal within the 60 kilometre radius from the mines to the power units which severely impact on the stock of coal at power units.

5.2.4 Economical Issues

India's electricity requirement has reached to 1274.595 BU and will increase in future but the capacity addition is not sufficient to meet this rising demand. Moreover capacity addition in 2017-18 and 2018-19 is less than the target which is shown in below tables:

Table 5.4: Capacity Addition Target and Achievement for 2017-18

	Thermal		Nuclear		Hydro		Total	
Sector	**Target (MW)**	**Achieved (MW)**	**Target (MW)**	**Achieved (MW)**	**Target (MW)**	**Achieved (MW)**	**Target (MW)**	**Achieved (MW)**
Central	4880	3170	500	0	800	390	6180	3560
State	3546	1760	0	0	300	200	3846	1960
Private	2940	3780	0	0	205	205	3145	3985
All India	11366	8710	500	0	1305	795	13171	9505

Table 5.5: Capacity Addition Target and Achievement for 2018-19

Sector	Thermal		Nuclear		Hydro		Total	
	Target (MW)	Achieved (MW)	Target (MW)	Achieved (MW)	Target (MW)	Achieved (MW)	Target (MW)	Achieved (MW)
Central	2760	1960	0	0	710	110	3470	2070
State	4506	2850	0	0	130	30	4636	2880
Private	0	972	0	0	0	0	0	972
All India	7266	5782	0	0	840	140	8106	5922

India's energy consumption is increased by 7.39% whereas electricity generation is increased by only 5.71% during the period 2017-18, clearly depicts that present trend of generation will not meet growing electricity demand.

Chapter 6 :Conclusions and Scope for Future Work

The first Indian Electricity Act, 1910 provided the basicframework for electric supplyindustry in India and the legalframework for laying down ofwires and other works, envisaging growth of the sector throughprivate licensees. The Electricity Act 1948 was implemented after country gotindependent, but no significant results were there.Performance of power sector was deteriorating, developingthe need to reorganize the Indian electricity sector. Numerousadministrative changes were prepared since 1991, which brought dramatic changes in the power industry.The existing Electricity Act, 2003, consolidated the laws relating to generation, transmission, distribution, trade and use ofelectricity. The Electricity Act 2003aimed to move the sector toward enhanced competition, accountability, and commercialviability. Several policy measures followed the Electricity Act and elaborated provisions, including the National Electricity Policy, 2005, the National Tariff Policy, 2006, the Integrated Energy Policy, 2006 and the HydropowerPolicy, 2008.Reforms post Electricity Act, 2003 are delicensing of thermal generation, the introductionof power trading as a licensed activity, the strong emphasis on competition,the adoption of multiyear tariff frameworks, and the promotion of rural electrificationand renewable energy. Most important, the EA was predicatedon open access for transmission and distribution with the aim of creating anenvironment in which generators could sell to the highest bidder and consumers could buy power from the most economical source. Government issues many policy and regulatory reforms to fill the existing loopholes in the power market. With the development of reforms, exists challenges and issues. With increasing demand of electricity, government also proposed to add generation capacity to fulfill energy requirement. But during the last two years actual capacity addition is less than the proposed by government. Moreover, stressed capacity for thermal generation by private sector has reached to 65 GW. Availability of coal for generation is also a rising concern for generators. These factors result in lower PLF of power plants which has reached to 55.85%. With the objective to reform distribution sector, policy initiated by government to reduce AT&C losses, but AT&C losses is around 20% till date which is still higher than the target. Distribution segment still facing the financial crunch and total outstanding dues has reached to Rs. 7,26,721 Crore as on 31st March, 2016 with aggregate losses of State Utilities have reached to Rs 89,603 Crore in FY 2015-16. Government's various reforms for procurement of competitive power through Ministry portal also does not bring the desired result as the power purchase rates discovered in these competitive bidding portal is higher than the expected.

India's power sector is facing challenges in terms of expansion as well as its economic viability due to inefficiencies and mismanagement. India'saspiration to grow fast economically does require meeting the growingdemand of electricity for industrialization, agriculture, domestic andcommercial.Despite the encouraging growth trajectory in the energy space over the last few years, the Indian Power sector has still not been able to induce and sustain the required capacity addition matching the ever growing power demand of the country.There is a requirement to conduct further research in the areas of policies andregulations effectiveness and ground realities on a continuous basis to achieve fuel availability on sustainable basis to existing as well as new power plants by removing uncertainties for the entire period of plant life through more transparent policies and regulations, increased participation of private sector in coal production and easing of regulatory framework, clearances and approvals for allocation and development of coal blocks & gas infrastructure need to be addressed while formulating such reforms.Transmission and Distribution (T&D) losses is a major factor responsible for power crisis in India. The T&D losses resulted from power theft and faulty distribution system which could be controlled through stoppage of theft and up-gradation of existing distribution system. There is a dire need to develop both conventional and non-conventional forms of energy, wherein, three key factors must be kept in view for developing an energy mix: (i) the pattern of energy demand seen in the country (ii) the availability of fuels, and (iii) fuel production and import costs. It would be effective to adopt coal thermal as a fundamental component of the fuel mix for the next 20-30 years, with solar occupying 5-8 percent of the total mix.Main obstacle in promoting renewable technology has been the high capital cost. Among the renewable energy sources, bio-energy or biomass based power generation is a huge area of exploration as there is a huge amount biomass potential in India. On the policy front, the most important barrier is probably the present electricity pricing policy of the state electricity boards. The present pricing policy does not provide the consumers with the right signals and does not induce consumers to conserve electricity. A lack of utility commitment to demand side management (DSM) and to an integrated approach to power planning is also responsible for the slow progress in India's energy efficiency.Moreover,regulators need to be sensitized to the challenges faced by the sector and policy framework needs to be crafted and enforced to ensure a win-win situation for all the stakeholders. They must pro-actively intervene to resolve the immediate issues ailing the power sector. A robust and sustainable credit enhancement mechanism for funding in Energy Sector needs to be put in place through increased participation by global funding agencies like The World Bank, ADB etc. in the

entire value chain. There is a strong need to push for wider-scale implementation of public private partnership models. The private sector has been playing a key role in generating power, a more supportive environment will help in bridging the energy deficit of the country. More transparent and effective policies by government for procurement of cheap power by distribution companies through competitive bidding. With steady and gradual development of renewable energy sources (RES), mainly, wind power and solar-based, India is envisaged to have on this account its share of about 35% and 21% in terms of capacity and energy respectively by 2030 while more than 50% and 33% by 2050 similarly of the total generation of electricity. With such phenomenal harnessing of potential, mass-scale connectivity of RES to the grid, as already started in the last decade, will continue to grow with much rapid pace. On the other hand, reliability associated with such type of uncertain and intermittent generation being linked to weather condition against varying as well as growing demand poses a great challenge. Demand side management through technical and commercial mechanism, storage of electricity and other new means should be developed to make the overall system sustainable. It will enable balancing of supply and demand in the smart grid to deliver quantitatively electricity as demanded from time to time maintaining quality in terms voltage, frequency, and harmonic-free nature.

Glossary

Abbreviation	Extended Version
kWh	Kilo Watt Hour
CERC	Central Electricity Regulatory Commission
SERC	State Electricity Regulatory Commission
IPPs	Independent Power Producers
SEBs	State Electricity Boards
GW	Giga Watt
CEA	Central Electricity Authority
PPAs	Power Purchase Agreements
SAUBHAGYA	Pradhan Mantri Sahaj Bijli Har Ghar Yojana
UDAY	Ujwal DISCOM Assurance Yojana
MNRE	Ministry of New and Renewable Energy
MW	Mega Watt
SHAKTI	Scheme for Harnessing and Allocating Koyala Transparently in India
Gwh	Giga Watt Hour
PLF	Plant Load Factor
RPO	Renewable Purchase Obligation
BU	Billion Units
AT&C	Aggregate Technical and Commercial
MVA	Mega Volt Ampere
MU	Million Units
REC	Renewable Energy Certificate
RE	Renewable Energy

CPPs	Captive Power Plants
DEEP	Discovery of Efficient Electricity Price
NTP	National Tariff Policy
SPTPL	Saranyu Power Trading Pvt. Ltd.
OTC	Over the Counter
T&D	Transmission and Distribution
WBERC	West Bengal Electricity Regulatory Commission
MoP	Ministry of Power
MoC	Ministry of Coal
RLDC	Regional Load Despatch Center
PFC	Power Finance Corporation
NPA	Non Performing Asset
DISCOMs	Distribution Companies
GoI	Government of India
MWh	Mega Watt Hour
ISTS	Inter State Transmission System
ROW	Right of Way
EHV	Extra High Voltage
UHV	Ultra High Voltage
RES	Renewable Energy Sources
DSM	Demand Side Management

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