CHAPTER - 3

POWER SECTOR REFORMS IN INDIA AND HARYANA

Reforms of power sector at the national level triggered the power sector reforms in Haryana also. The understanding of the national level reforms in this sector will enable us to understand the power sector reforms in Haryana in a better way. Orissa was the first state to introduce reforms in this sector by passing Orissa Act 1995. Under this Act, Orissa Generating Company, Grid Company and Orissa Electricity Regulatory Commission were established. Haryana government also followed suit and embarked upon the process of reforms in the power sector by breaking up the electricity board into different companies and Haryana Electricity Regulatory Commission was constituted.

State Electricity Regulatory commission Act was passed, leading to the establishment of central Electricity Regulatory Commission at the national level and State Electricity Regulatory Commission in the states. The purpose of this commission was to rationalize tariff and other matters related thereto. The enactment of ERC Act 1998 has induced more and more states to go ahead with the reform programmes. The governments of Uttar Pradesh, Rajasthan, Madhya Pradesh, Goa, Karnataka and Maharashtra are going to establish their independent regulatory mechanisms.

3.1 History of Power Plants in India

It is not clear when the first power plant was established in British India. Despite there being no reliable reports, it is said that in Jan. 1887, Kilburn and Co. as a representative of the Indian Electric company Limited received a license for electrification. But very soon it changed its nomenclature to Calcutta Electric supply Corporation. The first power generation company was established in Calcutta in 1899. But the first diesel power plant was established in Delhi in 1905. It was a private plant established by an Englishman on behalf of M/s John Fleming. This very company set up a small 2MW diesel set at Lahori Gate in New Delhi. Later this company became Delhi Electric supply and Traction Company. It was Sivasamudram in Mysore where the first hydroelectric power plant was set up in 1902.
Electrification was generally carried out in big cities only. The power needs of the densely populated areas was catered to, but there was no cooperation or coordination between the different suppliers. Investments in the private and public sector plants varied from state to state, but the domination of the private plants in the beginning was obvious. Apart from private and public sector power plants, a number of plants were owned by railways and industries. India had a colossal shortage of electricity. Demand for electric power always outstripped supply. The growth of plant capacity has always been way behind the rise in demand since 1940. Bombay, Delhi, parts of Uttar Pradesh West Bengal and Madras witness acute dearth of power – some restrictions were impressed of new consumers of electricity. Moreover, the condition of the plants was also very pathetic, some of them being as many as 25 years old.

**Initial legislatures and the Electricity Supply Act, 1948**

The first legislation in the power sector was Indian electricity Act, 1887. Its aim was to protect people and property from injury and risks involved in the process of supplying of electric power to the users. This law was rescinded and was supplanted by the Indian Electricity Act 1903. This was comprehensive in nature and covered the whole country. The commercial community required this type of Act. The government passed regulations generously with regard to those issues where the interests of the state and the community were not in conflict. This Act suffered from a number of inadequacies. Under this Act, there was no provision for bulk sale of electricity. There was a double control system both the local government and the government of India had a say on the matter. To resolve the difficulties faced by the people, a commission was appointed. This resulted into the drafting of the Indian Electricity Bill 1909, which paved the way for the enactment of the Indian Electricity Act 1910. Under this law, dual control system was done away with by vesting the power of giving licence in the control of government only. Later the concept of issuing license for bulk supply was introduced. This implied that bulk supply could be sold to other distributors, who, in turn would sell it to small consumers under a different license.

In 1948, the Government passed the Electricity Supply Act, 1948. Consequently the SEBS were formed. This Act was passed to accelerate the pace of electrification, which was moving at a tardy pace. This Act, on the one hand, paved
the way for the creation of SEBS, on the other constitution for the establishment of Central Electricity was enacted. The State Electricity Boards were supposed to discharge the following obligations:

(i) To coordinate the activities of the generating companies operating in the state to supply power to meet its requirements.
(ii) To provide power to a license or any other person requiring it at the earliest.
(iii) To gather data on the demand and use of electricity to formulate an appropriate policy in this regard.

According to this Act, Power Boards were supposed to earn three percent return at the beginning of each year. Tariffs were to be changed by SEB with this objective in view. In the early years SEBS were financially sound. But very soon the financial condition of the SEBS suffered setbacks. In the period 1948, 1956, private licenses once they expired were not renewed. Although, there was a tremendous growth of power sector in the private sector. The Industrial Policy Revolution of 1956 reserved the generation and distribution of electricity exclusively for the public sector, but existing private power utilities were allowed to continue. No new private licenses were issued. The electricity sector being a concurrent subject and the central government is responsible for policy and statutory and organizational field work.

Despite the establishment of the State Electricity Boards being mandatory under the Electricity supply Act 1948, it took a very long time for all states to set them up. Delhi was the first in setting up SEB in 1951. Bombay set it up in 1954, West Bengal in 1955, Kerala Tamil Nadu and Rajasthan all in 1957, Assam and Bihar in 1958, Punjab in 1959, Gujarat in 1960, etc. Some states were not ready to part with the powers and privileges associated with the administration of such a key sector. That is why they delayed the setting up of SEBS deliberately. The delay in the establishment of SEBS was responsible for delay in the rural electrification programme.

Other Institutional Developments

The Regional Electricity Councils were constituted in several regions of the country to facilitate integrated operations and energy exchange within the country. Inter-state lines were laid for the exchange of such power under centrally sponsored
schemes and states were provided interest free loans outside the state plan. All this was done to encourage the states to build the infrastructure for this purpose. Fifty five inter-governmental lines were constructed, country’s generation resources were unevenly distributed. So the development of lines of region became essential. Water resources mainly exist near the Himalayan region while coal was in the area of Bihar Jharkhand, West Bengal. Some reserves thereof are also found in Andhra Pradesh and Madhya Pradesh. Lignite is found in Tamil Nadu and Rajasthan.

To augment the availability of electricity and to improve the quality of life of the rural and semi-urban people, the Rural Electrification Corporation (REC) was established in 1969. In 1975, the government of India established the National Hydroelectric Power Corporation (NHPC) and National thermal Power Corporation (NTPC) to enhance power generation. These companies established large regional generation plants and the States in the region were benefitted. By awarding more than half of US $ 700000000 loan to NTPC, the World Bank played a crucial role in augmenting installed capacity. The Power Finance Corporation (PFC) was established in 1980 to support the raising of new capacity and in 1989 the government of India established the Power Grid Corporation of India Ltd. (PGCIL) by removing transmission lines of various generating stations. Until that time, the transmission system had been planned in the country on the basis of regional self sufficiency and the initial series of inter-regional links was developed and this program was sponsored by the centre.

**Electricity Act, 1998**

Electricity Act (Amendment) 1998 was passed to make transmission as a separate entity and to invite substantial amount of investment from the public and private sectors. In this regard the government of Karnataka was the first state in attracting the private sector investment in transmission of power. Other Indian states are also affecting reforms in the transmission sector. Realizing the urgent need to reduce losses in transmission and distribution and to ensure the availability of good quality regular power supply to consumers, reforms in the distribution of power are also in progress. Establishment of distribution companies are being contemplated in different regions of the country. The entry of private investors will be encouraged and these reforms are going to be made in a phased manner. The Orissa and Haryana
governments have already started reforms in the distribution sector by establishing sales companies for the individual areas within their states.

**Electricity Regulation Act, 2003**

The Electricity Act (EA), 2003. All existing current laws such as the Indian Electricity Act, 1910, the Electricity Supply Act, 1948 and the Electricity Regulatory Commission Act 1998 etc. were abrogated, but several Reform Acts were not annulled.

The main purpose of the EA 2003 was to promote competition in every link of the power supply chain to enhance efficiency and reduce costs. For promoting competition a large number of sellers and buyers are required and this act seats to do it through its various provisions. It is EA 2003, which particularly focused on the timely restructuring of existing SEBS. Under this law, all SEBs have to be separated in generation, transmission and distribution. The model would be similar to that of the “World Bank” which was at first followed by Orissa and then copied by some other states.

This type of model is called the “single buyer’ MODEL. This directive of EA 2003 was criticized and opined that restructuring should not be necessary as the vertical utilities are giving good results in some cases in India and abroad. Licensing has been completely abolished to improve generation. Only techno-economic clearance for hydro projects is needed. Open access in distribution will be introduced, enabling the majority of consumers to access power from another source, provided certain conditions are fulfilled. The pricing determination task has been delivered to regulatory commission. The constitution of State Regulatory commissions is compulsory. Electricity trade has been recognized as a distinct activity, but the regulatory commissions have the right to fix ceiling on trading margins if necessary. Consumer Redressed Forum Appellate Body and the Ombudsman have been established to safeguard the interests of consumers. 100 percent meeting is compulsory to minimize revenue losses.

**Reforms of the Power Sector in India**

**First Phase**

The Indian power sector was in a bad shape by 1980. The total losses of SEBS without subsidies were piling up and were over Rs. 3000 crore. Some of stringent measures were required to tide over the crisis. There was an acute shortage of power
in various parts of the country and the state governments had to bear huge financial burden due to the dismal performance of SEBs. The requests’ for loans from developing countries to the World Bank were to the tune of $100 Billion and only about 20 billion US $ from multilateral sources. But the World Bank was not ready to finance this sector adequately. Furthermore, even the industry could not spare funds for investment in this sector.

But only the 1991 economic reforms led to amendment in the current law to encourage private participation in generation of power. At that time India was facing worst balance of payment crisis and was on the verge of default. Other changes were made in 1998 when private investment in transmission sector was also allowed but with the prior approval of the Central Government utility. The government maintained that with the additional generation capacity made possible with the help of the private investment would mitigate the distress caused by acute shortage. Several incentives were offered to the private investors to attract their investment – Eight projects were on the ‘fast track’ route. Some of the banks like State Bank of India, which gave overdraft facilities to SEBS refused to raise it security interest. IPPs had to encounter numerous problems such as the problem of obtaining contracts for coal directly to getting wagons from the Railways. The failure of the policies could be attributed to some other factors such as litigation in some projects, reluctance of financing institutions to finance them because of long location period, etc. Moreover, the bankruptcy of the SEBs was the basic problem which was intractable. Electricity from the new plants was likely to be more expensive than that from the existing ones. Some economists found that the energy costs would escalate to one-and-half to two times. A number of factors were responsible for high costs such as high guaranteed PLF, high return on equity, high capital costs of equipment of plants, high variable costs due to administrative expenses, testing fee, insurance costs etc.

In the meantime, a kind of political consensus was emerging over the reforms in the electricity sector. It all started in 1991, when a committee was constituted to fix a common agricultural minimum tariff. It got a further impetus when in 1996 the Chief Ministers conference suggested that agriculture tariff should be increased to at least 50% of the average cost of supply within a period of three years. But no state implemented this suggestion. Small farmers thought that the lower agricultural tariffs
benefitted large farmers the most, since they have access to power driven irrigation facilities. According to a study, the farming community is willing to pay higher tariffs if they are assured of regular quality power supply.

**Second Phase of Reforms**

Orissa was the first state to pass its own Reform Act. This was followed by other states like Haryana (1997) Andhra Pradesh (1998) Uttar Pradesh (1999), Karnataka (1999), Rajasthan (1999), New Delhi (2000), Madhya Pradesh (2000) and Gujarat (2003). Each of these states after passing its Reforms Act divided its SEB into separate units of generation, transmission and distribution. Orissa and Delhi moved further in the sense they privatized their distribution sectors also. In the meantime, during mid 1990s the Indian government decided to address the problems in the distribution sector because better distribution of power will bring in more investment. Therefore, the Indian government passed the Electricity Regulatory Commissions Act, 1998. It led to the establishment Central Electricity Regulatory Commission. On the basis of this Act, the states can also create their own state commissions or pass their own Act in this regard. The functions of CERC and SERCS were clearly spelled out. While the CERC was responsible for all centrally owned stations, the SERC were to look after their in state stations. The primary objective for the establishment of regulatory commissions was to set the entire electricity department free from political interference and fix the tariffs on economic principles. The government should play the role of a facilitator only and design the general principles of the policy.

The adoption of the Electricity Regulatory Commission Act, 1998 was only a initial step towards reforms. The Indian government had been working on a comprehension Reform Act, which would multiply all existing power lower. The first drafts of the Bill was prepared in 2000. But during this period the government took some steps to improve the operation of the distribution sector. Of the three steps taken in this regard, the first was the introduction of the Accelerated Power Development Program (APDP) which provided for a loan or grant to improve the infrastructure of electricity distribution companies.

In 2000-03, acting upon the recommendations of the Deepak Parikh Committee, the structure was amended and an incentive component was included. The scheme was rechristened Accelerated Power Development and Reform Programme (APDRP) and the funding was liberalized.
The second important step was the constitution of a commission for the settlement of long outstanding dues and the formulation of a strategy for capital restructuring of SEBS. Sh. Montek Singh Ahluwalia the then member (Energy) planning commission chaired the committee. It recommended that 50 percent of interest on arrears will be waived. The rest of the dues aggregating Rs. 33600 crore are to be collected from the bonds to be issued by the respective state governments.

As a third initiative, memorandum of understanding (MOU) was signed with the state governments to accelerate the reform process. State governments were motivated to set up their own electricity commissions to ensure 100 percent metering, audits as level 11 KV to introduce minimum agricultural wages and to pay subsidies on time etc. In return, the centre has promised to augment the share of the state from the central generating station, update the inter-state transmission lines through APDRP funding, to help the rural electrification program of the State and providing other financial benefits.

The World Bank and Reforms

During the 1980s and early 1990s, the World Bank loans were influenced by the “Washington Games” according to which, processes of development of the bank were stopped less by lack of capital and more by economic policies that hindered the forces of the market. So privatization came to be preferred. The World Bank extended support to various power sector projects, particularly when NTPC was created in 1974. It is believed that the World Bank was interested in the foundation of NTPC to make its loans safer. Coal being the main fuel for electricity generation, it caused rise to de-gradation to the environment. However, the World Bank was ready to support projects, which aimed at reforms through restructuring of the sector. From this viewpoint, hydroelectric projects were also started. Orissa was the first state to receive World Bank assistance for restructuring. In Orissa, the plants were running at 36 per cent PLF in 1993-1994, transmission and distribution accounted for losses were 43 per cent and the collection of bills was only 17 per cent. The whole project of Orissa was divided into three phases and the total project cost was US $ 997.2 million. The World Bank gave $ 350 million and the UK Overseas Development Agency provided
$110 million. There were reasons for it. It is said that the World Bank was already negotiating a loan for the development of a hydroelectric project. Support for the project was linked to reforms in the sector, leaving the state government with no other option. Moreover, Orissa was ideal for reforms because their farm share in sales amounted to most 6 per cent (in contrast to 40 per cent in some other countries), which implied that the form lobby was not strong enough. The “Model of Orissa”, involved the restructuring of SEB in separate Generation, Transmission and Distribution. In particular, the distribution entity of the Orissa Electric State Board (OESB) was divided into four regional utilities which were privatized later. Transmission assets have remained in public ownership with Grid Corporation of Orissa (GRIDCO). Existing hydropower assets were transferred to Orissa Hydro Power Corporation (OHPC) and the OSEB had to be transferred to NTPC to clear the dues which the OSEB owed to the NTPC. This restructuring followed the Orissa Electricity Reform Act, 1995.

The Growth of the Power Sector in India

The table 3.1 shows the growth of electricity sector in India. To make the Growth of Electricity Sector in India explicit, we have analysed it in terms of CAGR. India is the world’s 6th largest energy consumer and consumes 3.4 per cent of global energy. India’s economic growth has led to rise in demand for energy at the average of 3.6 percent yearly over the last 30 years. The installed power generation capacity of India was 1362 MW in 1947-48 and has escalated to 255664 (MW) in 2014-15. Mission of power for all by 2012, enunciated by the government of India could materialise only if India has installed generation capacity of at least 20,000 Mw by 2013. That requirement was also fulfilled. For the entire period under study, the installed capacity increased at a CAGR of 8.09 per cent.

In absolute terms, the total fully electrified villages in 1949-1950 were 3061 which rose to 597464 in 2014-15. Village electrification increased at a CAGR of 8.51 per cent. A village is presumed to be electrified if it has a basic infrastructure comprising of transformers and distribution lines; electricity is provided at public places and the number of houses electrified should be at least 10 per cent of the total number of households in the village.
Table 3.1
Growth of Power Sector in India Utilities

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Year</th>
<th>Installed Capacity (MW)</th>
<th>Number of Villages Electrified</th>
<th>Length of T &amp; D Lines (kms.) #</th>
<th>Per Capita Consumption ($) (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1947-48</td>
<td>1362</td>
<td>NA</td>
<td>23238</td>
<td>16.30</td>
</tr>
<tr>
<td>2</td>
<td>1949-50</td>
<td>1713</td>
<td>3061</td>
<td>29271</td>
<td>18.20</td>
</tr>
<tr>
<td>3</td>
<td>1955-56</td>
<td>2886</td>
<td>7294</td>
<td>85427</td>
<td>30.90</td>
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<tr>
<td>4</td>
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<td>4653</td>
<td>21754</td>
<td>157887</td>
<td>45.90</td>
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<tr>
<td>5</td>
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<td>45148</td>
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<td>6</td>
<td>1968-69</td>
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<td>1973-74</td>
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<td>1546097</td>
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</tr>
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<td>249799</td>
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<td>4407501</td>
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<td>12</td>
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<td>487170</td>
<td>4574200</td>
<td>347.50</td>
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<td>13</td>
<td>1998-99</td>
<td>85795</td>
<td>498836</td>
<td>5141413</td>
<td>464.60</td>
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<td>14</td>
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<td>512153</td>
<td>6030148</td>
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<tr>
<td>15</td>
<td>2006-07</td>
<td>132329</td>
<td>482864</td>
<td>6939894</td>
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<td>16</td>
<td>2012-13</td>
<td>199877</td>
<td>556633</td>
<td>8726092</td>
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<td>17</td>
<td>2013-14</td>
<td>223344</td>
<td>593732</td>
<td>8970112</td>
<td>917.20</td>
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<tr>
<td>18</td>
<td>2014-15</td>
<td>255664</td>
<td>597464</td>
<td>9090501</td>
<td>957.50</td>
</tr>
<tr>
<td></td>
<td>Growth Rate 1947-48 to 2014-15</td>
<td>8.09</td>
<td>8.51</td>
<td>9.25</td>
<td>6.21</td>
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</tbody>
</table>

Source: Haryana Statistical Abstract: 2015-16
N A: Not Available.

$ Per Capita Consumption: Gross Electrical Energy Availability/Mid year Population
(#): Includes 440 Volts Distribution Lines.
The Government of India has undertaken a number of policies and programs for being qualified as an electrified village. National Electricity Policy, 2005 and the National Policy for Rural Electrification, 2006, Rural electrification programs, Deen Dayal Upadhyaya Jyoti Gram Yojana, Rajeev Gandhi Grameen Vidyutikaran Yojana, remote village electrification program, village energy security programs, etc. are the government policies for rural electrification.

Transmission of electricity is defined as bulk transfer of power over a long distance at high voltage, generally of 132 (KV) and above. In absolute term, the length of transmission and distribution lines were 23238 (Km) in 1947-48 and are now 9090501 (Km) in 2014-15. For the period under study, it has increased at a CAGR of 9.25 per cent.

The fast growth of Indian Economy has triggered escalating demand for energy at an average of 3.6 per cent yearly over the last 30 years. The per capita consumption of electricity has gone up from 16.3 (KWH) in 1947-48 to 957.2 (KWH) in 2014-15. From the above given table, it can be deduced that the per capita consumption of electricity has increased at a CAGR of 6.21 per cent.

The table 3.2 given below highlights the pace of growth in the installed generation capacity since 1947-48 to 2014-15. This table also shows the growth in installed generation capacity in terms of CAGR. It is worth noting may be noted that total installed generation capacity increased from 1362 (MW) to 255664 in from 1947-48 to 2014-15. The Hydel generation capacity increased from 508 (MW) to 40456 (MW) from 1947 to 2015. The total thermal generation capacity was 854 (MW) in 1947-48 and it has gone up to 206358 (MW) till 2014-15. During the period under consideration, it was coal which has registered the maximum escalation in generation capacity from 756 (MW) in 1947-48 to 175857 (MW) in 2014-15. In the year 1947-48, renewable generation started only in the year 1991-92 with the capacity of 32 9MW) and has gone up to 38821 (MW) in 2014-15.
Table 3.2
Growth Installed Generation Capacity in India:
Mode Utilities wise

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Year</th>
<th>Hydro</th>
<th>Thermal</th>
<th>Nuclear</th>
<th>RES #</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Coal/Lignite</td>
<td>Gas</td>
<td>Diesel</td>
<td>Total</td>
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<tr>
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<td>508</td>
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<td>4</td>
<td>1960-61</td>
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<td>300</td>
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<td>5</td>
<td>1965-66</td>
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<td>29508</td>
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<td>Growth Rate 1947-48 to 2014-15</td>
<td>6.61</td>
<td>8.31</td>
<td>11.6</td>
<td>3.51</td>
<td>8.45</td>
<td>5.51</td>
</tr>
</tbody>
</table>

Source: Haryana Statistical Abstract : 2015-16

{#} RES: Renewable Energy Sources includes Hydro capacity of 25.00 MW and below.
In terms of CAGR, for the entire period under study, the total installed
generation capacity increased at a rate of 8.02 per cent. The hydro generation capacity
increased at a CAGR of 6.61 per cent. In case of nuclear generation capacity, it
increased at a CAGR of 45.51 per cent.

**Figure 3.1 Installed Generating Capacity (in 2014-15)**

![Pie chart showing installed generating capacity](image)

Source: Haryana Statistical Abstract: 2015-16

The above pie chart shows the installed Generating capacity across all India as
in 2014-15. The total installed generating capacity as on 31.3.2015 was 255664
(MW). Coal generating capacity accounts for 58 per cent of the total installed
generating capacity at 130331 (MW), the highest of all categories of installed
capacity. After coal, it was Hydro with capacity of 39491 (MW) and accounts for
18 per cent of the total capacity. Renewable Energy, which has a rising trend to
generate electricity has share of 38821 (MW) i.e. 12 per cent total installed generating
capacity.

Table 3.3 given below showcases the Growth of electricity consumption in
India in absolute and CAGR terms. India’s per capita consumption has been growing
over the years from 4181 (GWH) in 1947-48 to 919985 GWH in 2014-15. There has
been a substantial change in the electricity consumption pattern across different
consumer groups. The share of domestic sector has shot up from 423 (GWH) 1947-48
to 201189 (GWH) in 2014-15. The share of commercial sector is lowest of all the
sectors. Its share in the total electricity consumption was 178 (GWH) in 1947-48 and
has spiraled up to 73421 (GWH) in 2014-15. The share of industrial sector in
Electricity consumption is highest of all the sectors at 404532 (GWH) in 2014-15 from 2960 (GWH) in 1947-48. The Per capita consumption of electricity in agriculture sector has been rising over the years. It has escalated up from 125 (GWH) in 1947-48 to 156712 (GWH) in 2014-15.

Table 3.3
Growth of Electricity Consumption in India: Utilities and Non-Utilities

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Year</th>
<th>Domestic</th>
<th>Percent to Total</th>
<th>Commercial</th>
<th>Percent to Total</th>
<th>Industrial</th>
<th>Percent to Total</th>
<th>Agriculture</th>
<th>Percent to Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1947-48</td>
<td>423</td>
<td>10.11</td>
<td>178</td>
<td>4.26</td>
<td>2960</td>
<td>70.78</td>
<td>125</td>
<td>2.99</td>
<td>4182</td>
</tr>
<tr>
<td>2</td>
<td>1949-50</td>
<td>525</td>
<td>9.36</td>
<td>309</td>
<td>5.31</td>
<td>4057</td>
<td>72.32</td>
<td>162</td>
<td>2.39</td>
<td>5610</td>
</tr>
<tr>
<td>3</td>
<td>1955-56</td>
<td>934</td>
<td>9.30</td>
<td>546</td>
<td>5.38</td>
<td>7514</td>
<td>74.63</td>
<td>316</td>
<td>3.11</td>
<td>10150</td>
</tr>
<tr>
<td>4</td>
<td>1960-61</td>
<td>1492</td>
<td>8.88</td>
<td>848</td>
<td>5.05</td>
<td>12547</td>
<td>74.67</td>
<td>833</td>
<td>4.96</td>
<td>16804</td>
</tr>
<tr>
<td>5</td>
<td>1965-66</td>
<td>2355</td>
<td>7.73</td>
<td>1650</td>
<td>5.42</td>
<td>22596</td>
<td>74.13</td>
<td>1892</td>
<td>6.21</td>
<td>30455</td>
</tr>
<tr>
<td>6</td>
<td>1968-69</td>
<td>3184</td>
<td>7.65</td>
<td>2126</td>
<td>5.14</td>
<td>29931</td>
<td>72.31</td>
<td>3463</td>
<td>8.37</td>
<td>41392</td>
</tr>
<tr>
<td>7</td>
<td>1973-74</td>
<td>4645</td>
<td>8.36</td>
<td>2988</td>
<td>5.36</td>
<td>37791</td>
<td>68.02</td>
<td>6310</td>
<td>11.36</td>
<td>55557</td>
</tr>
<tr>
<td>8</td>
<td>1978-79</td>
<td>7576</td>
<td>9.32</td>
<td>4330</td>
<td>5.15</td>
<td>54440</td>
<td>64.81</td>
<td>12628</td>
<td>14.32</td>
<td>84005</td>
</tr>
<tr>
<td>9</td>
<td>1979-80</td>
<td>8482</td>
<td>9.35</td>
<td>4657</td>
<td>5.46</td>
<td>33206</td>
<td>62.35</td>
<td>13452</td>
<td>15.76</td>
<td>85334</td>
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<tr>
<td>10</td>
<td>1984-85</td>
<td>15306</td>
<td>12.45</td>
<td>6537</td>
<td>5.37</td>
<td>73520</td>
<td>59.02</td>
<td>20961</td>
<td>16.83</td>
<td>124569</td>
</tr>
<tr>
<td>11</td>
<td>1989-90</td>
<td>25577</td>
<td>15.16</td>
<td>9540</td>
<td>4.89</td>
<td>100373</td>
<td>51.45</td>
<td>44056</td>
<td>22.58</td>
<td>195098</td>
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<td>12</td>
<td>1991-92</td>
<td>35854</td>
<td>15.31</td>
<td>12633</td>
<td>5.20</td>
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<td>47.94</td>
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<td>231201</td>
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<tr>
<td>13</td>
<td>1996-97</td>
<td>55267</td>
<td>17.53</td>
<td>17519</td>
<td>5.36</td>
<td>139253</td>
<td>44.17</td>
<td>84015</td>
<td>26.65</td>
<td>315294</td>
</tr>
<tr>
<td>14</td>
<td>2001-02</td>
<td>75654</td>
<td>21.27</td>
<td>24139</td>
<td>6.44</td>
<td>159567</td>
<td>42.57</td>
<td>81673</td>
<td>21.80</td>
<td>374670</td>
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<tr>
<td>15</td>
<td>2006-07</td>
<td>111002</td>
<td>21.12</td>
<td>40220</td>
<td>7.35</td>
<td>241216</td>
<td>45.39</td>
<td>99023</td>
<td>18.34</td>
<td>525673</td>
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<tr>
<td>16</td>
<td>2012-13</td>
<td>171104</td>
<td>21.79</td>
<td>65381</td>
<td>8.33</td>
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<td>2013-14</td>
<td>185058</td>
<td>21.79</td>
<td>71019</td>
<td>6.33</td>
<td>382670</td>
<td>44.37</td>
<td>153116</td>
<td>17.95</td>
<td>852903</td>
</tr>
<tr>
<td>18</td>
<td>2014-15</td>
<td>201189</td>
<td>21.86</td>
<td>73421</td>
<td>7.98</td>
<td>404532</td>
<td>43.9</td>
<td>156712</td>
<td>17.03</td>
<td>919985</td>
</tr>
<tr>
<td>Growth Rate 1947-48 to 2014-15</td>
<td>9.55</td>
<td>1.14</td>
<td>9.21</td>
<td>0.75</td>
<td>7.41</td>
<td>6.27</td>
<td>11.02</td>
<td>2.67</td>
<td>8.33</td>
<td></td>
</tr>
</tbody>
</table>

Source: Haryana Statistical Abstract: 2015-16
For the entire period under study, the total electricity consumption of all sections increased at a CAGR of 8.33 per cent. For domestic consumer, the electricity consumption increased at a CAGR of 9.55 per cent. In case of commercial consumers the consumption increased at a CAGR of 9.21 per cent. The consumption of Industrial and Agriculture consumers increased at a CAGR of 7.41 and 11.02 per cent respectively.

**Table 3.4**  
Transmission and Distribution loss in India (Percent)

<table>
<thead>
<tr>
<th>Year</th>
<th>Transmission and Distribution Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947-48</td>
<td>14.88</td>
</tr>
<tr>
<td>1948-50</td>
<td>15.20</td>
</tr>
<tr>
<td>1955-56</td>
<td>13.80</td>
</tr>
<tr>
<td>1960-61</td>
<td>15.20</td>
</tr>
<tr>
<td>1965-66</td>
<td>14.60</td>
</tr>
<tr>
<td>1968-69</td>
<td>14.00</td>
</tr>
<tr>
<td>1973-74</td>
<td>20.50</td>
</tr>
<tr>
<td>1978-79</td>
<td>17.00</td>
</tr>
<tr>
<td>1979-80</td>
<td>20.40</td>
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<tr>
<td>1984-85</td>
<td>21.50</td>
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<tr>
<td>1989-90</td>
<td>23.30</td>
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<td>2013-14</td>
<td>23.65</td>
</tr>
<tr>
<td>2014-15</td>
<td>23.10</td>
</tr>
<tr>
<td>Growth Rate 1947-48 to 2014-15</td>
<td>6.61</td>
</tr>
</tbody>
</table>

Source: Haryana Statistical Abstract: 2015-16
Figure 3.2: Transmission and Distribution loss in India (1947-48 to 2014-15)

Source: Haryana Statistical Abstract: 2015-16

Above given bar diagram depicts the transmission and distribution losses from the whole India in 1947-48 at the time of independence, it was only 14.88 per cent, which spurred to about 20.40 per cent in 1979-80. As far as figure is concerned, during 1980-2000 there was no major increase in T & D loss. It was only in the year 2001-02, that T & D loss went up to 33.98 per cent. But due to the positive impact of reforms on the power sector the T & D loss started declining and plummeted to 23.10 per cent in 2014-15.

Power Transmission

Power Transmission is defined as transmission of power in Bulk over a long distance with high voltage, usually from 132 (kV) and above. In India bulk transmission increased from 3708 (km) in 1950 to more than 166,000 km, of which 75556 (km) is transmitted by Power Grid Corporation of India. The whole country is split into five regions for transmission systems, namely, North, North East Region, Eastern Region, Southern Region and Western Region. The transmission system interconnected within the region is also known as regional network.

The planning of the transmission system in the country in the past was traditionally linked to generation projects as part of the evacuation system. Capacity of the power system to tide over an emergency without generation rescheduling or
outages was the main criterion for planning the transmission system. However, for a number of reasons, such as spatial development of load in the network, non-commissioning load centre generating units originally anticipated and deficit in reactive compensation, certain pockets in the power system cannot work even under normal conditions. Transmission planning therefore moved away from the previous generation system planning to integrated system planning.

While the main technology for transmission and distribution of energy was alternating current technology (AC), High Voltage Direct Current technology (HVDC) interconnect all regional networks across the country and for bulk power transmission at long distances has also been used.

Certain provisions in the Electricity Act, 2003 are access to the transmission and distribution networks, the recognition of the electricity trade as an independent activity, the liberal definition of a generating plant and power supply in rural areas are expected to introduce and enhance competition in the electricity sector. It is expected that all the above mentioned measures for the generation, transmission and distribution of power would result in the building up of a robust power grid in the country.

**Rural Electrification in India**

Rural electrification aims to supply energy for two types of programmes: (a) production-oriented activities like minor irrigation, rural industries etc. and (b) electrification of villages. Rural Electrification Corporation (REC) was constituted in July 1969 to finance different projects of rural electrification. REC is a Public Financial Institution under section 4A of the Companies Act, 1956. REC is also registered as a Non-Banking Financial Company (NBFC) under section 451A of RBI Act, 1934. At present REC is a 'Navratna' Company. The current mission of REC is to facilitate the availability of electricity to increase the pace of growth and for improvement of quality of life of rural and semi-urban population and also to act as a competitive, client-friendly and development oriented organisation to finance and promote projects covering power generation, power conservation, power transmission and power distribution network in the country. To give impetus to rural electrification, the Government has given special attention to creation and augmentation of Rural Electricity Distribution Backbone and Village Electricity Infrastructure so as to
provide electricity to all villages and rural households in a period of five years. Rural Electricity Supply Technological Mission (REST) has been established to monitor the implementation of schemes under Accelerated Rural Electrification Programme.

**Rural Electrification Policy**

On August 23, 2006, Government notified Rural Electrification Policy under section 4 and 5 of the Electricity Act, 2003. The policy aims to provide access to electricity to all households by year 2009. It will also ensure that quality and reliable power supply is made available at reasonable rates with minimum lifeline consumption of 1 unit per household per day as a merit good by year 2012.

**Revised Norms for a Village to be treated as Electrified**

The government has revised the criterion for a village to be regarded as electrified. The revised norms are:

- A **village** can now be declared electrified only if basic infrastructure such as distribution transformers and lines are provided in the locality.

- **The number** of electrified households would be at least 10 per cent of the total households.

- **A majority** of public places in the village should have access to electricity.

  According to the new definition of village electrification, there are 1,25,000 unelectrified villages, the number of electrified rural households is 6,01,80,685 i.e. 43-52 per cent as per 2001 census.

**Rajeev Gandhi Gramin Vidyutikaran Yojana (RGGVY)**

To ensure the electrification of all villages and habitations, and to provide electricity to all rural houses and providing free electricity connection to families below the poverty line, Prime Minister Dr. Manmohan Singh launched a new Scheme RGGVY on April 4, 2005. To achieve the targets, minimum one 33/11 K.V. or 66/11 K.V sub-station will be established in each block as a Rural Electricity Distribution Backbone (REDB) and also minimum one distribution transformer will be established in each village as Village Electrification Infrastructure (VEI). The places where electric supply is not possible/cost effective through grid, Decentralised Distribution Generation (DDG) Systems will be under under the new scheme 90 per cent of capital cost will be provided by the centre as subsidy.
The scheme aims at completing electrification of all un-electrified villages and un-electrified hamlets in the next five years.

The scheme provides for financing of electrification of all unelectrified Below Poverty Line (BPL) households in the country with 100 per cent capital subsidy as per norms of Kutir Jyoti Programme in all rural habitations.

For projects to be eligible for capital subsidy under this scheme before sanctioning the projects, prior commitment of the state would be taken for: (i) deployment of franchisees for the management of rural distribution in projects financed under this scheme (ii) provision of requisite revenue subsidy to the State utilities as required under the Electricity Act, 2003.

**Remote Village Electrification Programme**

To provide basic lighting electricity facilities through renewable energy sources under Remote Village Electrification (RVE) Programme, special priority has been accorded to villages affected by internal disturbances. During 2010-11, 1537 remote villages and hamlets were provided solar home-lighting systems under the programme, taking the cumulative achievement to 8,104 remote villages and remote hamlets.

### 3.2 Power Sector Reforms in Haryana

The power sector paves way for progress in each state. Power circumstances were previously in bad shape in the state. Demand for energy was rising by the day but generation capacity was not adequate enough to match the requirement. As a result of this situation, the conditions for reforms in the electricity sector become imperative and Haryana became the second state after Orissa to implement energy sector reforms.

Trigger for the reforms is traceable to the overall economic reforms. Trust got reinforced from the results abroad and back home too. World Bank too, encouraged reforms by proposing financial bailouts. Consequently, the whole gamut of power reforms took off in power sector in Haryana in 1997. It began thanks to the enabling environment for the market economy paradigm: Reform Bill was passed July 7, 1997. This Act is known as The Haryana Electricity Reform Act, 1997. However, gazette notification for it was done on August 10, 1998.
**Haryana Electricity Act, 1997:** The objectives of this Act reads like this, "to provide for the constitution of Electricity Regulatory Commission, restructuring of the electricity industry, rationalization of the generation, transmission, distribution and supply of electricity, avenues for participation of private sector entrepreneurs in the electricity industry and generally taking measures conducive to the development and management of the electricity industry in an efficient, economic and competitive manner and for matters connected therewith or incidental thereto". Thus the Act is aimed at effecting a qualitative improvement of the state power sector through the new liberal policy design. This was a shift from the traditional approach of managing electricity business from state owned to private owned and regulated by an independent regulator. The Act of 1997 provides for among other provisions:

- Creation of Haryana Electricity Regulatory Commission, HERC, an independent regulatory body.
- Restructuring of the power sector in the state,
- Splitting of the then HSEB into separate entities for generation, transmission, and distribution, and
- Corporatisation and privatization of electricity

**The Institutional Developments**

The State Government split the old Haryana State Electricity Board (HSEB) in August 1998 in separate functional units as follows:

- Haryana Power Generation Corporation Limited (HPGCL)
- Haryana Vidyut Prasaran Nigam Limited (HVPNL)
- Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL)
- Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL)

Haryana Power Generation Corporation Limited (HPGCL) was for the Generation of electricity and Haryana Vidyut Prasaran Nigam Limited (HVPNL) set for Transmission and supply of electricity in the state. Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) and Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL) were established for power distribution in the state.
As part of the reorganization of the Haryana State Electricity Board (HSEB) all property invested in real estate interests, rights and obligations of the Board were transferred to the state government on August 14, 1998, the state government, which in turn, transfers the same on the same day by the first transfer process to two new companies under the 1956 Companies Act. Haryana Power Generation Company Limited (HPGCL) took generating functions, while the transmission, distribution and operation of system functions Haryana State Electricity Board (HSEB) went to Haryana Vidyut Prasaran Nigam Limited (HVPNL). So Haryana State Electricity Board (HSEB) ceased to exit from August 14, 1998.

**Haryana Power Generation Corporation Limited (HPGCL)**

On March 17, 1997 Haryana Power Generation Corporation was established. It has the responsibility to work on the projects run by the state and maintaining and establishment of new electricity generation projects. Thus, the activities of generating were shifted from Haryana State Electricity Board (HSEB) to Haryana Power Generation Corporation Limited (HPGCL) with the objective of excellence in power Generation, the state's own generation plants.

Over time, Haryana Power Generation Corporation Limited (HPGCL) has established itself as a dynamic, growth oriented, world-class corporation. Even now, the company does not have enough generating capacity to fill up gap between supply and demand. There is a new standard in operation of existing projects and even the creation of new projects and tries to become more globally competitive. For its power plants it has also installed pollution control appliances on all its power plants. It has also tries to minimize the influence of fly ash on the environment and has also developed the “Green Belt” in the power plants and the surrounding areas to create eco-friendly power.

**Objectives of HPGCL**

- To provide affordable, uninterruptible quality power with maximum efficiency.
- To establish Haryana, a power surplus state by maximum generation from existing plants and by planning and executing of new generation projects.
- To explore all possible alternative sources of Electricity Generation
- To assess and minimise the impact of fly ash on the environment and develop green belt.
• To monitor stack emissions, air quality, noise level effluents, etc.
• To minimize damage to people, materials and machines.

**Power Plant Units of HPGCL**

The following thermal and Hydel units are active in power generation in the state:

• Thermal Power Panipat, Panipat
• Deen Bandhu Chhotu Ram thermal power project, Yamuna Nagar
• Rajiv Gandhi Thermal Power Project, Khedar, Hisar
• Indra Gandhi Super Thermal Power Project, Jhajjar
• WYC Hydroelectric Station, Yamuna Nagar
• Kakroi Micro Hydel Project, Kakroi, Sonepat.

**New Renewable Energy Projects**

In addition to the above mentioned measures, the government is committed to the following to increase the supply of clean energy:

• Six biomass power projects of 63 MW capacity, with an investment of `300 crore to be set up in the state's Independent Power Producer (IPP), two of which projects of about 20 MW are near completion.
• Electricity Generation from industrial waste, 11 projects of 24.95 MW capacity through cogeneration route has been set up in industries and four projects of 12.6 MW capacity are under installation. To produce the power from biogas in Sugar Mills through cogeneration six energy projects were created from 46.8 MW in the state sugar mills.
• Four small hydroelectric projects of 10.8 MW capacity with an investment of 112 crores in the State by independent producers of Power.
• Five small hydro projects of 10.90 MW capacity is under way.
• Solar energy project is going to install 5552 install SPV street lighting systems with an investment of 12:11 Crore in 369 villages of the state.
Haryana Vidyut Prasaran Nigam Limited (HVPNL)

On August 19, 1997, Haryana Vidyut Prasaran Nigam Limited (HVPNL) came to be incorporated as a company under the Companies Act. It started its operation on September 18, 1997 and the operation of HSEB was shifted to HVPNL on August 14, 1998 for distribution and transmission of power in the state. HVPNL was assigned the responsibility of accountability of Transmission and Distribution of electricity by relocating Government schemes and Haryana Electricity Regulatory Commission and was granted a license for the transmission and bulk delivery of electricity. The company was also related to property entrusted in two projects: BBMB and Power Station Indraprasth (Delhi Vidyut Board). Haryana Vidyut Prasaran Nigam Limited (HVPNL) was organized to maintain a network of integrated and efficient power transmission system related to planning, design, construction, manufacture and maintenance of lines, substations voltage levels of 66 kV and higher connection. It attempts to provide a quality service and to reduce transmission losses. The State Government has implemented a Second Transfer Scheme on July 1, 1999 for transferring assets and liabilities of HVPNL to two distribution companies, Uttri Haryana Bijli Vitaran Nigam Limited (UHBVNL) and Dakshin Haryana Bijli Vitaran Nigam Limited (DHBVNL).

Objectives of HVPNL

- Planning, design, construction, installation and maintenance of lines, substations of 66 kV voltage levels and above and communications facilities and related activities.
- Maintaining a network of integrated and efficient power transmission system.
- Transmitting of power according to the State Government and Haryana Electricity Regulatory Commission (HERC) policies and guidelines.
- Monitoring and maintenance of Grid, and to resolve issues.
- Resourcing funds for plan's implementation.
- To increase and strengthen power transmission capacity according to the requirements.
- To work as a State Transmission Utility.
- Ensuring adequate, safe and economical transmission of electricity, maintaining quality, availability and reliability of services.

**Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL)**

Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) distributes retail electricity supply in northern Haryana. Haryana Power Purchase Centre (HPPC) has been assigned the power of the retail offer, which is a joint forum of UHBVN and DHBVN. It is registered under the Companies Act 1956 as a company of the government of Haryana. On 1 July, 1999 it started its operations and is regulated by the Haryana Electricity Regulatory Commission. Then Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) holds the license to supply electricity issued by Haryana Electricity Regulatory Commission (HERC) on November 4, 2004, maintaining the adequacy of power supply in an efficient and economical way.

**Objectives of UHBVNL**

To supply electricity, in the areas under the jurisdiction of UHBVN efficiently, and in a cost effective manner, especial to those areas which for the time being are either supplied not or inadequately supplied with electricity

- To provide electricity as soon as possible to a licensee / other person requiring such supply.
- To achieve this control over the production, distribution and use of electricity in the district of UHBVN.
- To collect data on the demand for and use of electricity, devise plans in co-ordination with the generating company.
- To prepare and implement rules for the transmission, distribution and promotion of the use of electricity in the state in general.
- To ensure uninterrupted supply to consumers within the limits of declared voltage.

**Districts of Haryana State under the jurisdiction of UHBVNL**

1. Panchkula
2. Ambala
3. Yamuna Nagar
4. Kurukshetra
5. Kaithal
6. Karnal
7. Panipat
8. Sonipat
9. Rohtak
10. Jhajjar
11. Jind

**Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL)**

Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL) is a public company which manages the supply of electricity in the southern region of Haryana. It also started its operation in July 1999. This Nigam also tries to achieve goals and standards at work. Safe and Sound Power supply is the main objective of this Nigam. So it seeks to promote the development of the region by reducing transmission losses. An attempt has been made to modernise it through e-bill, e-tendering, network mapping, data logging, remote meter reading and electric power distribution automation, etc.

**Objectives of DHBVNL**

- To extend reliable, high quality, continuous, safe and clean power to consumers at affordable prices, to accelerate the pace of the agricultural, industrial and economic development in Haryana.

- To improve the collection, and work efficiently to bring about consistent growth and financial viability, and to reduce line losses.

- To ensure honesty, integrity and transparency in the actions for greater customer satisfaction.

- To promote energy conservation activities and demand side management to optimize the use of electricity.
• To effect modernization of management to bring about cost effectiveness and efficiency in functioning.

• To take initiatives with regard to new technology to improve efficiency, accounting and information level and consumer satisfaction.

Districts of Haryana State under the jurisdiction of DHBVNL:

1. Hisar
2. Fatehabad
3. Bhiwani
4. Sirsa
5. Faridabad
6. Gurgaon
7. Mewat
8. Rewari
9. Mahendergarh
10. Palwal

Haryana Regulatory Electricity Commission (HERC)

Haryana Regulatory Electricity Commission was established on August 17, 1998 as a public body in the wake of Haryana Reform Act of Energy, 1997. Haryana Regulatory Electricity Commission has the power to determine the tariff for Generation, Transmission and supply of electricity in bulk and retail.

Objectives of HERC

• To determine the wholesale and retail tariff for generation, supply, transmission and wheeling of electricity, within the State.

• To regulate the power purchase and procurement process of supply licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for purchase of power for distribution and supply within the State.
• To facilitate Intra-state transmission and wheeling of electricity.
• To issue licenses to people seeking broadcasting licenses, distribution licenses and electricity traders with respect to their operations in the State.
• To promote the generation and co-production of electricity from renewable energy sources through suitable measures for grid connection and sale of electricity to any person, and also to specify, for the purchase of electricity from such sources, a per cent of the total energy consumption in the area of a distribution license.
• To decide on disputes between licensees and generation companies and refer any dispute for settlement.
• To levy fee for the purposes of this Act.
• To set, State Grid code in accordance with the Grid code in pursuance with clause (h) of sub-section (1) of section 79.
• To set or enforce standards in terms of quality, continuity and reliability of service by licensees.
• To fix the trading margin in the intra-state trading of electricity, if necessary.
• To perform any other tasks that are assigned to it under this Act.

3.3 Conclusion

The power sector reforms were started at national level and States level in 1990s under the supervision of the World Bank. Although the reforms at the national level have also affected the power sectors at states level but the States have also started restructuring their electricity sectors. Haryana has taken a lead in restructuring the Electricity Board by dividing the works of generation, transmission and distribution among separate entities. The different utilities were further divided, for instance, the distribution function. The Haryana State is under a lot of pressure due to losses and indebtedness, which has not improved even after reforms. But, the task of tariff determination has been given to HERC. The HERC is supposed to involve all the stakeholders of electricity sector particularly the consumers. It has been observed that there are a number of changes in the physical infrastructure of the power sector in Haryana and India. It is also obvious that there has been a lot of growth in generation,
transmission and distribution. But, the growth in the power sector has not been able to match the pace of economic growth leading to rise in power consumption. This has created a gap between the demand and supply of power in the State. Whether the power sector reforms have succeeded in narrowing this gap and what the impact of power sector reforms is will be discussed in the next chapter.