ABSTRACT:

The restructuring and reformation process in Indian electricity sector is going on since 1992. There were many problems in the existed power system like lake of transmission and distribution issues, power quality issues, non-availability of supply. After Electricity Act 2003, there has been tremendous improvement in power sector of the India. There is significant improvement in the areas of transmission and distribution, tariff rationalization and in availability of power supply, minimization of demand supply gap, contribution of renewable energy sources, etc. Electricity Act, 2003 was enacted to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and largely for taking measures conducive to development of electricity industry, promoting competition wherever feasible, efforts are being made, protecting interest of consumers and supply of electricity to all areas, ensuring transparent policies regarding subsidies, promotion of efficiency and environmentally benign policies.

KEYWORDS:

ELECTRICITY ACT 2003, REFORMED ENERGY, DISTRIBUTED GENERATION POWER SYSTEM.
INTRODUCTION

The India is developing country and the development and growth of the Nation significantly depends on availability of energy at economical prices, Electricity has become a part of our existence, due to increasing demand of electricity and power situation is not up to the mark yet. Hence there is a shortage of electricity, large demand and supply gap. Country like India having large living area long distance transmission and distribution (AC) networks so there is also issue of power quality and power availability. For successful power sector reform, the role of power planning is very important as well as economic growth of the country. The main objective of deregulation is to encourage competition in electricity market to provide reliable and good quality power supply at minimum cost. Implementation of new and renewable resources with enhanced technologies and distributed power generation for the improvement of generation and emission index.

The electricity sector is mainly governed by the MOP (ministry of power). Electricity sector has three major pillars (GENCO, TRANSCO and DISCO) generation, transmission and distribution companies. The generation is mainly divided into three sectors like central, state, and private sector. Central sector or PSUs involved in the generation of electricity include NHPC, NTPC, and NPCIL. Various state level corporations (earlier name SEBs) are also involved in the generation and intra-state distribution of electricity. Other than PSUs and state level corporations, private sector enterprises also play a major role in generation, transmission, and distribution. PGCIL is responsible for the inter-state transmission of electricity and the development of national grid.

LITERATURE REVIEW

1. In 2016 Samarendra Pratap Singh presents world-wide trend towards restructuring and deregulation of the power industry over the last fifteen years. The competition in the wholesale generation market and the retail market together with the open access to the transmission network can give many advantages to the consumers. These advantages are lower electricity prices and better services. However, this competition also brings many new technical problem...
and challenges to the operation of restructured power systems. This paper devoted to the development of computational tools for effectively and efficiently operating such restructured systems.

2. In 2016 Kunal M. Lokhande et al. discussed a case study of restructured power system of Punjab is shown which is in the Northern Part of India has been carried out. The Electricity Act 2003, there has been tremendous improvement in power sector of this state. There is significant improvement in the areas of transmission and distribution, tariff rationalization and in availability of power supply. The Electricity supply is traditionally viewed as a natural monopoly. There is growing dissatisfaction with limited incentives for efficient operation of a cost-of service regulated or government owned electric utility. As a consequence, regulators, worldwide, are now implementing new regulatory schemes and organizational reforms in an effort to improve the incentives for efficient operation of electricity utilities. All these reforms are consistent with the view that competition should be introduced into the electricity supply industry wherever it is technologically feasible. Recently Indian Electricity Act, 2003 was enacted to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and largely for taking measures conducive to development of electricity industry, promoting competition, protecting interest of consumers and supply of electricity to all areas rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficiency and environmentally benign policies. In this thesis various reformations made to the power system of Punjab state after restructuring are discussed. Transmission and Distribution losses, Commercial losses are discussed and the effect of restructuring is analyzed.

3. In 2017 Ram Naresh Mishra et al. shared experience of restructuring trend in many places of the world, the reform and restructuring process in Indian electricity sector is going on since 1992. To facilitate competition wherever feasible, efforts are being made. This paper presents current scenario of electricity sector in India and emphasizes the recent strategies and policies made by Government of India.
towards restructuring. With varying degree of success, various states of India have implemented several key elements of the reform program. The model for UPPCL restructuring is proposed. This model can be adopted at national level with suitable modifications, if needed.

4. In 2018 M. H. Albadi, Student Member, IEEE gives a review of the role of distributed generation (DG) in restructured power systems, and has two parts. The first part reviews reasons behind DG deployment for utilities and customers, as well as new issues and concerns arise once DG penetration level increases. The second part of the paper presents a case study simulating the effect of DG deployment in electricity markets.

5. In 2013 Vikash Singh Badoriya et al. gives a Review on Distributed Generation Definitions and DG Impacts on Distribution System. Rapidly increasing the power consumption and shortage in generating and transmission capacities have set the trend towards the Distributed Generation (DG) sources. Still there is not a universal definition of DG. This paper discusses the different definitions proposed in the literature. Further DG system to become a major stake holder in the current power scenario it needs to be connected with the existing grid system. This integration will cause some technical, operational and economic impacts on distribution systems. This paper also summarizes these different impacts of DG on distribution system. (PDF) A Review on Distributed Generation Definitions and DG Impacts on Distribution System.

6. In 2015 Haruna Musa discussed the emergence of Distributed Generation (DG) in distribution network has changed the configuration of this century’s power system in terms of power flow. The reason for this is that DG affects the power flow and voltage conditions in the distribution system; contrary to its traditional unidirectional nature in radial configuration. It is worth mentioning that the change in the direction of power flow is not limited to the distribution network, but can as well extend to the transmission or sub-transmission systems, especially when DG penetration is high. This paper gives an overview of DG types and modeling techniques of the DG for power flow analysis during planning and operations. Various DG technologies are highlighted, different models of DGs are presented and some key challenges ahead.
with current drive towards smart grid networks is also discussed.

7. In 2001 Thomas Ackermann proposed Distributed generation (DG) is expected to become more important in the future generation system. The current literature, however, does not use a consistent definition of DG. This paper discusses the relevant issues and aims at providing a general definition for distributed power generation in competitive electricity markets. In general, DG can be defined as electric power generation within distribution networks or on the customer side of the network. In addition, the terms distributed resources; distributed capacity and distributed utility are discussed. Network and connection issues of distributed generation are presented, too.

8. In 2005 G. Pepermans et al. discussed about Distributed Generation: Definition, benefits and issues from the observation that there is a renewed interest in small-scale electricity generation. The authors start with a survey of existing small-scale generation technologies and then move on with a discussion of the major benefits and issues of small-scale electricity generation. Different technologies are evaluated in terms of their possible contribution to the listed benefits and issues. Small-scale generation is also commonly called distributed generation, embedded generation or decentralized generation. In a final section, an attempt is made to define the latter concepts more precisely. It appears that there is no consensus on a precise definition as the concept encompasses many technologies and applications.

9. In 2002 RC Chouhan et al. presents the role of electric energy in our daily life is increasing exponentially. There is a rapid increase of productivity in industrial as well as agricultural sectors. It is of paramount importance to provide an economical as well as well-managed substitute of electric energy to the society. The renewable energy can be the only solution for energy crisis in this new millennium. This type of energy can boost the socioeconomic of the nation and can be safely managed at individual level by the society. There is no rational argument as to why 100% of our power needs could not be met from renewable energy source.
RESTRUCTURED POWER SYSTEM

Power system mainly includes the generation, transmission and distribution of Electrical power. In the country like India there is large and long distance living areas and now a day electricity becomes a part of our existence and day by day increasing demand of electricity, existed power system suffers with some of serious issues like power quality, availability according to demand, long distance transmission and distribution losses, from of all available sources of electricity generation a major part fulfilled by traditionally coal fired power plants having efficiency near about 40 %. To overcome above issues restructuring of power system needed which includes adoption and implementation of new technologies, Optimum utilization of available renewable energy sources, Installation of distributed power generation plants, that’s resulting the most reliable, secure and better in economical and also environmental manner.

DISTRIBUTED GENERATION

The Distributed generation or on-site generation (OSG) of electrical power that’s may include Conventional power stations, such as coal-fired, gas, and nuclear powered plants, as well as hydroelectric dams and large-scale solar power stations, are centralized and often require electric energy to be transmitted over long distances. These systems can comprise multiple generation and storage components; in this instance they are referred to as hybrid power systems. Although DG can be easily defined as a small scale generation located near or at load, there are many definitions for DG in the literature. Sometimes distributed generation defined as relatively small generation units of 30MW or less. DG distributed power generation source connected directly to the distribution network or on the customer side of the meter. The International Energy Agency (IEA) defines DG plants as those producing power on a customer’s site or within local distribution utilities, and supplying power directly to the local distribution network [3]. The IEEE defines distributed generations as electric generation facilities connected to an area electric power system (local grid) through a point of common coupling [7]. As seen from the above definitions, there are many
differences between DG and the conventional central power stations. These differences include, but are not limited to

- Location: DG units are located near loads and connected to distribution networks, unlike the central plants, which are far away and, therefore, connected to load centers via transmission networks;
- Generation capacity: The generation capacity of DG units is much smaller than that of the massive central plants;
- Technology used: New cleaner technologies, including renewable energy sources, are used as DG units;
- Ownership: DG units can be owned by utilities, customers or a third party.

Energy Scenario By 2002 Solar

PV systems of about 47 MW aggregate capacity (about 600,000 systems) have been installed for various applications in the country. Under the PV program of MNES (ministry of non-conventional energy sources), about 3,80,000 systems aggregating to over 13 MW have been installed. This includes 2,45,000 solar lanterns; 95,000 home lighting systems; 37,000 street lighting systems, 3,100 water pumping systems and of about 1 MW aggregate capacity of stand alone power plants / packs. Solar power systems are considered to have a significant potential in Telecommunication. An experimental system of small size has been installed at Tongpal rural telephone exchange. There are 825 kW of PV power units installed. There are also 954 PV community lights / TV and community facilities; 85,000 PV domestic lighting units / Lanterns; 32,872 PV street lights; and 1,373 PV water pumps. [9]

Potential and Achievement By 2002

<table>
<thead>
<tr>
<th>Sector</th>
<th>Potential</th>
<th>Achievement</th>
</tr>
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<tbody>
<tr>
<td>Biogas plants</td>
<td>12 millions</td>
<td>3.128 millions</td>
</tr>
<tr>
<td>Wind</td>
<td>45000 MW</td>
<td>1267 MW</td>
</tr>
<tr>
<td>Small Hydro</td>
<td>15000 MW</td>
<td>1341 MW</td>
</tr>
<tr>
<td>Biomass power/ cogeneration</td>
<td>19500 MW</td>
<td>273 MW</td>
</tr>
<tr>
<td>Solar PV</td>
<td>20 MW/ sq.</td>
<td>Km 47 MWp</td>
</tr>
<tr>
<td>Waste to Energy</td>
<td>1700Mwe</td>
<td>15.15 Mwe</td>
</tr>
<tr>
<td>Solar Water Heating</td>
<td>140 Million sq. m</td>
<td>0.55 Million sq. m</td>
</tr>
<tr>
<td>Biomass Gasifiers</td>
<td></td>
<td>35 MW</td>
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</tbody>
</table>

Biomass

16 MW of biomass-based cogeneration was operating, as well as 10 MW of biomass combustion-based power, and 20 MW of biomass gasifiers/sterling engines. There are 148 alcohol-operated vehicles.
Wind Energy
India has a wind power potential of 20,000 MW according to initial estimates which has been scaled up recently to 35,000 MW at 30 meters hub height and 45,000 MW at 50 meters hub height. 557 MW of wind turbines have been installed. Nearly 3300 wind pumps have been installed in various parts of the country.
Several large wind farm projects, with a total capacity of 1,800 MW are under progress in the various states as: Gujarat (955 MW), Andhra Pradesh (347 MW), Karnataka (339 MW), Tamil Nadu (100 MW), Kerala (50 MW), Madhya Pradesh (15 MW).[^9]

Reformed Energy Scenario by March 2018
India is one of the countries with the largest production of energy from renewable sources. In the electricity sector, renewable energy (excluding large hydro) accounted for 20% of the total installed power capacity (71.325 GW) as of 30 June 2018.[^2] Large hydro installed capacity was 45.29 GW as of 31 March 2018, contributing to 13% of the total power capacity.[^2] Renewable energy including large scale hydro-power currently adds up to more than 33% of the total installed power capacity in India.
Wind power capacity was 34,046 MW as of 31 March 2018, making India the fourth-largest wind power producer in the world. The country has a strong manufacturing base in wind power with 20 manufactures of 53 different wind turbine models of international quality up to 3 MW. The government target of installing 20 GW of solar power by 2022 was achieved four year ahead of schedule in January 2018, through both solar parks as well as roof-top solar panels.[^2] India has set a new target of achieving 100 GW of solar power by 2022. Four of the top seven largest solar parks worldwide are in India including the second largest solar park in the world at Kurnool, Andhra Pradesh, with a capacity of 1000 MW. The world's largest solar power plant, Bhadla Solar Park is being constructed in Rajasthan with a capacity of 2255 MW and is expected to be completed by the end of 2018.
Biomass power from biomass combustion, biomass gasification and bagasse cogeneration reached 8.3 GW installed capacity as of 31 March 2018.[^2] Family type biogas plants reached 3.98 million
By the above graphical representation of the installed capacity of renewable energy sources in India is continuously growing after Electricity Act 2003.

**CONCLUSION**

This paper concludes that after enacting electricity Act 2003 there is tremendous growth in the field of renewable energy installation with new technologies in all over the India by the contribution of government as well as private parties in energy sector. Now a day’s quality power is supplied without interruption, in recent year’s power system losses are minimized, the most of rural areas street lighting and some government offices lighting loads are solar powered instead of dependency on distribution agencies. With the help of distributed generation the utilization of all types of renewable sources become possible which results quality power supply in remote rural areas.

**REFERENCES**

2. Internet: http://www.mnre.gov.in


