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STATE OF ART TECHNOLOGIES IN POWER DISTRIBUTION

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Abstract - *Power transmission is an integral part of the power sector and as vital as power generation. There is no value of generating power until the power reaches to the destination to final consumer efficiently et all[1]. After reviewing all the developments in the planning technology of power distribution, we also have to implement smart power distribution pole and check out all other hurdle to improve the efficiency and reduce losses.The distribution of power generation through different sources, however, is uneven in India.*

Indian government has made heavy investments in the distribution sector through the Rajiv Gandhi Grameen Vidyutikaran Yojna (RGGVY) now replaced by Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY).Tata Power Delhi Distribution is a front runner in implementing state-of-the art technologies [4].UDAY is going to help transform India's Power Distribution System, Oct 25, 2016 according to [3]. DC Power Distribution, Need to Think of Current Situation, done at academic buildings of Matoshri College of Engineering, Nashik[5].

Although, Indian government was not able to fully devote due to many obstacles and conflicts in implementing above programs. But there has been a significant development in availing electricity in the rural areas of country. In these paper, we have discussed about electricity production in India from 1950 to 2012 and technologies for it's distribution. Also, how Indian government has been trying to cope up the problem of proper distribution of power throughout the country?

Key Words: **Generation, Destination, Planning, Distribution, RGGVY, DDUGJY, APDRP, UDAY, TPDDL, Discoms.**

1. INTRODUCTION

The huge amount of power generated in power station is to be transported over a long distance to the load centers to cater to the consumers with the help of transmission lines and transmission towers. Though India has adequate power generation capacity, it has a substantial proportion of population having limited access to electricity mostly because of lack of proper transmission infrastructure. In order to achieve target of affordable electricity for all by 2019 or even by 2022, India seriously needs to have robust power transmission network et all [1]. From[2] The purpose of this survey is to present a comprehensive review of all the developments in the planning technology of power distribution, which includes all the reported optimization models and solution strategies. This state-of-the art survey is systematically organized to serve as a stepping stone for future researchers as well as a planning guide for the engineers in the field of power distribution. The various planning models are generally grouped in a three-level classification structure starting with two broad categories, i.e., planning without and with reliability considerations. The last level of this classification consists of different planning models and solution strategies.

Power distribution system planning is the rise in installation/reinforcement and maintenance costs of power distribution systems enforces the planner to adopt an optimal strategy during system planning. The planning should be such that the designed system should economically and reliably take care of spatial and temporal load growth, and service area expansion in the planning horizon. Mathematically, this planning is a multivariable multi-objective optimization problem. During the past decade or so, several planning algorithms have been developed [2].

2. TRENDS IN POWER GENERATION

This section present the electricity power generation in India and the article reviews. It is for this section we will propose the past of articles presented.

India's electricity generation from 1950 to 1985 were very low when compared to developed nations. Since 1990, India has recorded faster growth in electricity generation. India's electricity generation has increased from 179 TW-hr in 1985 to 1,057 TW-hr in 2012. Power generation by coal fired plants and non-conventional renewal energy sources (RES) has mainly contributed to the growth in the total electricity generation whereas the contribution from natural gas, oil and hydro plants has decreased in last five years (2012-2017). The gross utility electricity generation (excluding imports from Bhutan) is 1,236 billion kWh during the year 2016-17 against the corresponding actual generation of 1,168 billion Kwh during the year 2015-16 with 5.81%

annual growth. The utility electricity sector in India has one National Grid with an installed capacity of 329.23 GW as on 31 August 2017. Renewable power plants constituted 30.8% of total installed capacity. [8] During the fiscal year 2016-17, the gross electricity generated by utilities in India was 1,236.39 TWh and the total electricity generation (utilities and non utilities) in the country was 1,433.4 TWh [7][9]. The gross electricity consumption was 1,122 kWh per capita in the year 2016-17. [7] India is the world's third largest producer and fourth largest consumer of electricity [9][10]. Electric energy consumption in agriculture was recorded highest (17.89%) in 2015-16 among all countries [7]. The per capita electricity consumption is low compared to many countries despite cheaper electricity tariff in India [11].

In order to address the lack of adequate electricity availability to all the people in the country by March 2019, the Government of India launched a scheme called Power for All. [12] This scheme will ensure continuous and uninterrupted electricity supply to all households, industries and commercial establishments by creating and improving necessary infrastructure. Its a joint collaboration of the Government of India with states to share funding and create overall economic growth [13][14].

Draft National Electricity Plan, 2016 prepared by the Government of India states that India does not need additional non-renewable power plants till 2027 with the commissioning of 50,025 MW coal based power plants under construction and additional 100,000 MW renewable power capacity [14][15].

3. GOVERNMENT INITIATIVES

From [4] Power grid Corporation of India (heart of national grid system), a pioneering initiative towards implementing latest smart grid technologies for power distribution utilities can be a revolutionary step if implemented properly. Main ideas behind PGCIL are:-

- Sharing concept i.e. to distribute the resources all throughout India.
- Whole country connected using EHV transmission lines, above 383,000 circuit km.
- Power generating stations hooked onto an interconnected network of transmission lines and substations.
- Exchange of surplus and compensation of deficit power becomes possible.

The purpose of TPDDL's smart grid lab is to test and operationalize the implementation of advanced technologies before they are deployed in the field and also to serve as a forum to demonstrate advanced technologies to national and regional regulators, state discos, etc. The company also allows its partners to use the smart grid lab to showcase their products and solutions to other Indian power utilities. The World Bank Doing Business 2016 report states that Tata Power Delhi Distribution (TPDDL) played a significant role in enhancing India's ranking in the report. India's ranking rose from 137 to 70 in the parameter of 'ease of getting an electricity connection' in 2016 which seems to be quite significant [4].

UDAY (Ujwal DISCOM Assurance Yojna) established in Nov, 2015 seeks to empower loss making Discoms to break even in two-three years by helping them in improving their operational efficiencies (compulsory smart metering, up gradation of transformers, popularizing LED bulbs), reducing the cost of power (increased supply of cheaper domestic coal, liberal coal swaps from inefficient to efficient plants, supply of washed and crushed coal, faster completion of transmission lines), minimizing their interest cost (states to take over 75% of Discom debt as on 30 September 2015. Over two years 50% of Discom debt to be taken over by states in 2015-16 and 25% in 2016-17, Discom debt not taken over by the state to be converted and enforcing financial discipline on them through their alignment with state finances [3].

According to [5], In India, power distribution infrastructure is not well extended in rural areas. However, with advanced development in power electronics switching and control devices, it is now possible to replace an existing AC power distribution network with a DC power supply for better energy efficiency. For this, a case study of actual load data has been done at academic buildings of Matoshri College of Engineering, Nashik. Energy-efficiency analysis on different loads has shown that, if an existing AC power distribution network is replaced by a DC distribution network, considerable amount of energy can be saved.

4. STATE OF ART TECHNOLOGIES

While modernizing, simply replacing the copper wire in our transmission grids will not improve it's efficiency. We need technological overhaul in our power system. It can be fulfilled by smart grids as it:-

- Integrates isolated technologies and also enables better energy management.
- Proactive management of electrical network during emergency situations.
- Enhances demand supply management and power quality.
- Reduces carbon emissions.
- Automatic distribution, Integrated voltage/VAR control.
- Demand Optimization- Selective load control

SMART METER - A smart meter is usually an electronic meter that records consumption of electrical energy in intervals of an hour or less and communicates that

information at least daily back to the utility for monitoring and billing purpose. It will make the task of following data of consumption very easy and facilitate the consumer as well as distributor both. Smart meters use a secure national communication network (called the DCC) to automatically and wirelessly send your actual energy usage to your supplier. This means households will no longer rely on estimated energy bills or have to provide their own regular readings [16].

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