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A More Efficient Transmission and Distribution System

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Abstract:- This paper presents that how can we improve the efficiency of transmission by improving the efficiency of Transmission and Distribution system. It has been a very big problem to the electricity departments of various states to improve the efficiency of transmission and distribution system. But we can achieve it by changing some of the equipments in the transmission as well as distribution systems. it will also be helpful in saving the fuel.

Keywords:- Gkwh- Giga kilowatthour, T&D- Transmission and Distribution, HVDC-High Voltage Direct Current, FACTS-Flexible AC Transmission System, HVAC-High Voltage Alternate Current, KVA- Kilo Volt Amperes. KVAr- Kilo Volt Amperes Reactive.

I. INTRODUCTION

After the generation of Electricity, it has to be moved to the areas where it will be used/Consumed. This is known as transmission of moving large amounts of electrical power over very very long distances and so it is separate from distribution, which means to the process of delivering electric energy from the high voltage transmission grid to specific locations such as a residential street or commercial park. Low voltage Distribution is usually considered to encompass the substations and feeder lines that take power from the high voltage grid and progressively step down the voltage, eventually to the 230 Volts level at which power enters our homes, where it has to be consumed.

The transmission and distribution (T&D) system includes everything between a generation plants to end- user sites. Along the way, some of the energy supplied by the generator is lost due to the resistance of the wires that is known as line loss and equipment that the electricity passes through. Most of this energy is converted to heat.

how much energy is taken up as losses in the T&D system depends greatly on the physical characteristics of the system.

II. ELECTRICITY DISTRIBUTION IN INDIA

- Total No. of Distribution Utilities – 72 in the year 2011-12
- Total energy billed by these utilities increased from 846,284 Gwh in the year 2010-11 to 848,846 Gwh in the year 2011-12 registering a growth of 3.10%.[1]
- All India AT&C losses were 18.68% in the year 2010-11 which reduced to 17.47% in the year 2011-12.
- The utilities incurred losses of 10.04% of the revenue earned by direct sales to consumers during 2008-09.
- Metering Status:

A 24 States have achieved 100% Metering at 11 KV Feeder level [3].
B 10 States have achieved 100% consumers metering [3].

III. POWER SALE IN INDIA

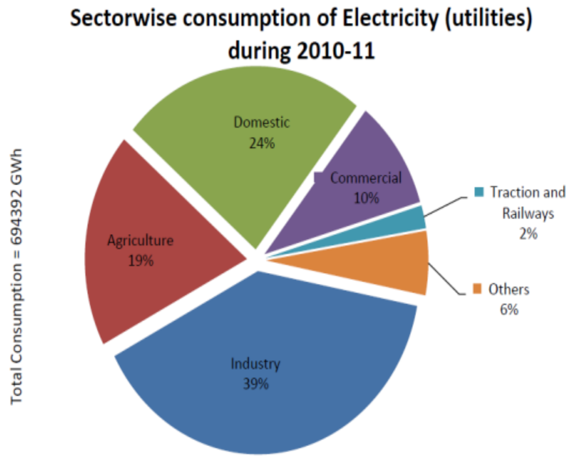

Figure 1: sectorwise power consumption in india [1]

IV. ELECTRICITY GENERATED (FROM UTILITIES), DISTRIBUTED,. SOLD IN INDIA (IN GWH)

Year	Gross Electricity Generated from Utilities	Consum-ption in Power Station Auxiliaries
1	2	3
1970-71	55,828	2,863
1975-76	79,231	4,556
1980-81	110,844	7,230
1985-86	170,350	13,157
1990-91	264,329	19,604
1995-96	379,877	27,220
2000-01	501,204	34,932
2005-06	623,819	41,970
2006-07	670,654	43,577
2007-08	722,626	45,531
2008-09	746,626	47,573
2009-10	796,281	49,706
2010-11(p)	844,846	52,380
Growth rate of 2010-11 over 2009-10(%)	**6.10**	**5.38**
CAGR 1970-71 to 2010-11(%)	**6.85**	**7.35**

Source : Central Electricity Authority.

Table 1: power distribution in india[1]

V. DEMAND-SIDE ENERGY EFFICIENCY

The average person would likely point to energy consumption as the point where “efficiency” measures can be applied, and while our focus here is mainly on the supply side, it’s worth noting a few examples to illustrate the impact of demand-side efficiency efforts.

Most people are probably familiar with the Energy Star program, or with the increasing popularity of compact fluorescent light bulbs that use a fraction of the electricity used in conventional bulbs to produce the same amount of light intensity. But the single largest consumer of electric power is the industrial motor, which is used to run everything from assembly lines to compressors to the fans that blow air into the combustion chamber of a coal-fired generator.

It is estimated that fully 65% of industrial power is used in motors of various sizes, most of which run at full speed whenever they are turned on, even if they don't need to. This is because the vast majority of industrial motors are controlled by drives that cannot alter the speed of the motor. Variable speed drives, also known as variable frequency drives, ramp the motor's speed up or down to meet the requirements at a given moment in time. The resulting energy savings can be enormous. VSDs can reduce consumption by as much as 60%, which in energy-intensive facilities can equate to millions of dollars a year in energy costs.
What's important to note here is the leverage that demand-side efficiency improvements can have when they
a) Greatly impact a small number of large energy consumers (e.g., VSDs), or
b) Have a more modest impact that is multiplied across many smaller energy consumers (compact fluorescent bulbs).

Obviously, the former case is more easily realized than the latter, if only because there are relatively few people who need to be convinced of the value of the new approach. Consider, then, the potential of measures that enjoy the best of both worlds a multiplicative effect combined with a small number of decision makers. That, in essence, is the main selling point for supply-side efficiency in the power system, and is where ABB has focused much of its technology and expertise. If a single utility implements a given technology across its entire system, thousands if not millions of customers come along for the ride [5].

VI. IMPROVING EFFICIENCY IN THE TRANSMISSION AND DISTRIBUTION SYSTEM

There are other initiatives at the distribution level, but if we focus our attention on the measures that have the greatest potential for improving efficiency, we inevitably must look to transmission. There are numerous technologies that are already being applied to boost efficiency in transmission, and still more that have yet to reach full commercial implementation. In the following sections, we explore some of these technologies. [5]

A. HVDC Transmission

Most of the transmission lines are high-voltage alternating current (HVAC) lines. Direct current (DC) transmission offers great advantages over AC, that is
25% lower line losses, two to five times the capacity of an AC line at similar voltage, plus the ability to precisely control the flow of power. Historically, the relatively high cost of HVDC terminal stations relegated the technology to being used only in long Transmission applications
With the advent of a new type of HVDC, invented by ABB and dubbed HVDC Light, the benefits of DC transmission are now being realized on much shorter distances. The Cross-Sound Cable connecting Long Island and Connecticut is one example of this technology [5].

B.FACTS Devices

Flexible AC Transmission Systems, or FACTS, is a family of power electronics devices provides a variety of benefits for increasing transmission efficiency.

Perhaps the most immediate is their ability to allow existing AC lines to be loaded more heavily without increasing the risk of disturbances on the system. Actual results vary with the characteristics of each installation, but industry experience has shown FACTS devices to enhance transmission capacity by 20-40%. FACTS devices stabilize voltage, and in so doing remove some of the operational safety constraints that prevent operators from loading a given line more heavily. In addition to the efficiency gains, these devices also deliver a clear reliability benefit [5].

C. Gas-Insulated Substations

Most substations occupy large areas of land to accommodate the design requirements of the given facility. However, each time power flows through a substation to step down the voltage, more energy is lost in the transformers, switches and other equipments. The efficiency of the lower-voltage lines coming out of the substation is also markedly lower than their high-voltage counterparts. If power can be transmitted at higher voltage to a substation that is closer to where the energy will be consumed, significant efficiency improvements are possible.

Gas-insulated substations essentially take all of the equipment you would find in an outdoor substation and encapsulate it inside of a metal housing. The air inside is replaced with a special inert gas, which allows all of the components to be placed very closer together without any risk of a flashover. The result is that it is now possible to locate a substation in the basement of a building or other confined space so that the efficiency of high-voltage transmission can be exploited to the fullest extent [5].

D. Superconductors

Super conducting materials near liquid nitrogen temperatures have the ability to conduct electricity with near-zero resistance. High temperature superconducting (HTS) cables now under development, which still require some refrigeration, the HTS cables can carry three to five times the power of normal cables. The losses in HTS cables are lower than the losses in conventional lines, even when the refrigeration costs are included. A major vendor of superconducting conductors claims that the HTS cable losses are only 0.5% of the transmitted power compared to 5-8% for traditional power cables. Superconducting materials can also be used to replace the copper windings of transformers to reduce losses by as up to 70% compared to current designs[5].

VII. LIST OF OTHER PATHS TO IMPROVED EFFICIENCY

The technologies outlined above represent only a few of the many available options for improving energy efficiency in the T&D system. The Business Roundtable’s Energy Task Force T&D working Group, which ABB chairs, recently published a list of efficiency- enhancing actions and technologies, some of which include [5]:

- Distributed generation/Microgrids
- Underground distribution lines
- Intelligent grid design (smart grids via automation)
- Reduction of overall T&D transformer MVA
- Energy storage devices
- Three phase design for distribution
- Ground wire loss reduction techniques
- Higher transmission operating voltages
- Voltage optimization through reactive power compensation
- Asset replacement schedule optimization
- Distribution loss reduction via distribution automation
- Power factor improvement
- Load management (e.g., smart metering or price-sensitive load control)
- Power electronic transformers

These options vary in terms of expense and the changes they imply for equipment purchasing or operational practices. We list all of them here simply to illustrate the many ways in which greater energy efficiency in the power grid can be achieved.

VIII. CONCLUSION

The transmission and distribution (T&D) system includes everything between a generation plants to end- use site. Along the way, some of the energy supplied by the generator is lost due to the resistance of the wires that is line loss and equipment that the electricity passes through. The loss is mainly depends upon the type of transmission and wire resistance. For better transmission we need some special transmission method and good conductor that’s what here we are showing some better methods for transmission and distribution from this all methods we can reduce the T&D losses.

REFERENCES

[1]. The Electricity Economy New Opportunities from the Transformation of the Electric Power Sector, August 2012
[2]. energy statistics 2012, central statistics office national statistical organisation ministry of statistics and
[3]. programme implementation government of india www.mospi.gov.in electricity distribution in india an overview
[4]. www.globalsmartenergy.com
[5]. www.abb.com
[6]. www.mpcz.co.in