STUDY ON AGGREGATE TECHNICAL & COMMERCIAL LOSSES IN POWER DISTRIBUTION SYSTEM

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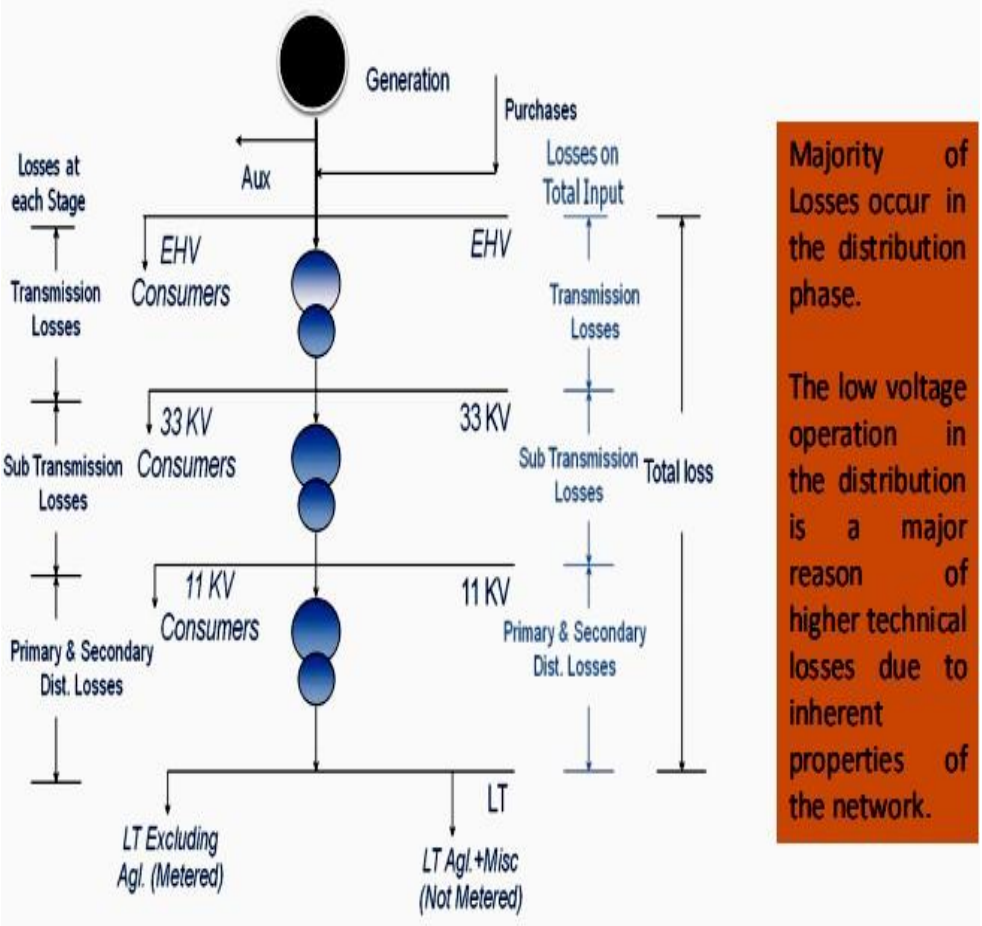
Abstract: In India, power distribution system faced a lot of challenges and has to follows new benchmarks on daily basis. The reduction of revenue loss is one of major challenge for the electrical utilities in India. In the electrical system the power distribution is final and most critical link. Due to high AT&C loss the direct impact on the Discoms commercial viability and also on the stake holders who pay for the electricity in the form of tariff. Due to the high AT&C the distribution companies have not been able to undertake corresponding investments in infrastructure enhancement. This paper facilitates the improvement of overall efficiency and revenues of the power distribution system. The paper gives an overview of the different advances of the technology in AT&C reduction methods and poses some of the challenges have to face during the working time.

Index Terms **– Technical losses and commercial losses in Distribution system**

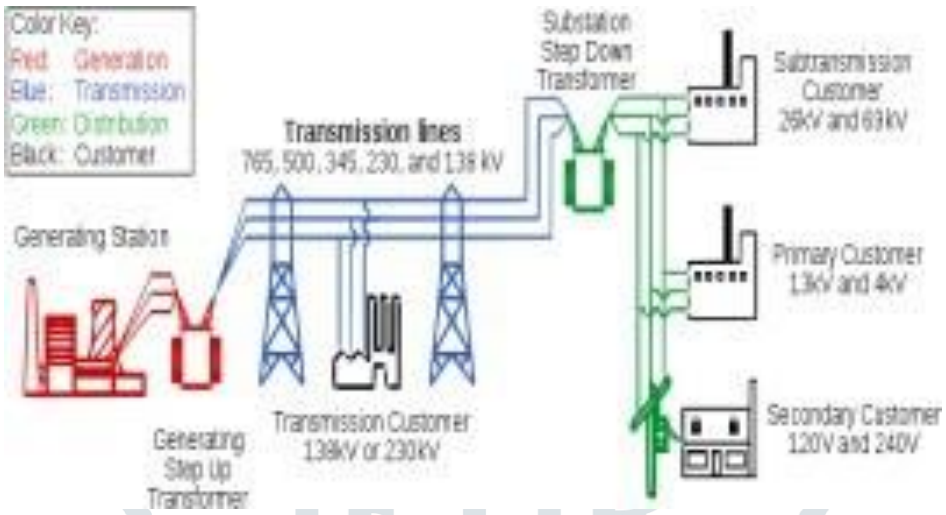
I. INTRODUCTION

Recently India has one National Grid added with an installed capacity of 330.26 GW as on 31 May 2017. Renewable power plants constituted 30.8% of total installed capacity. During the fiscal year 2015-16, the gross electricity generated by utilities in India was 1,116.84 TWh and the total electricity generation (utilities and non utilities) in the country was 1,352 TWh or 1,075.64 kWh per capita. India is the world's third largest producer and fourth largest consumer of electricity. consumption in agriculture was recorded highest (17.89%) in 2015-16 among all countries. The per capita electricity consumption is low compared to many countries despite cheaper electricity tariff in India. In order to provide the electricity GOI identified the not electrified areas and launch a scheme of "Power to all" by March2019.

II. POWER DISTRIBUTION SYSTEM

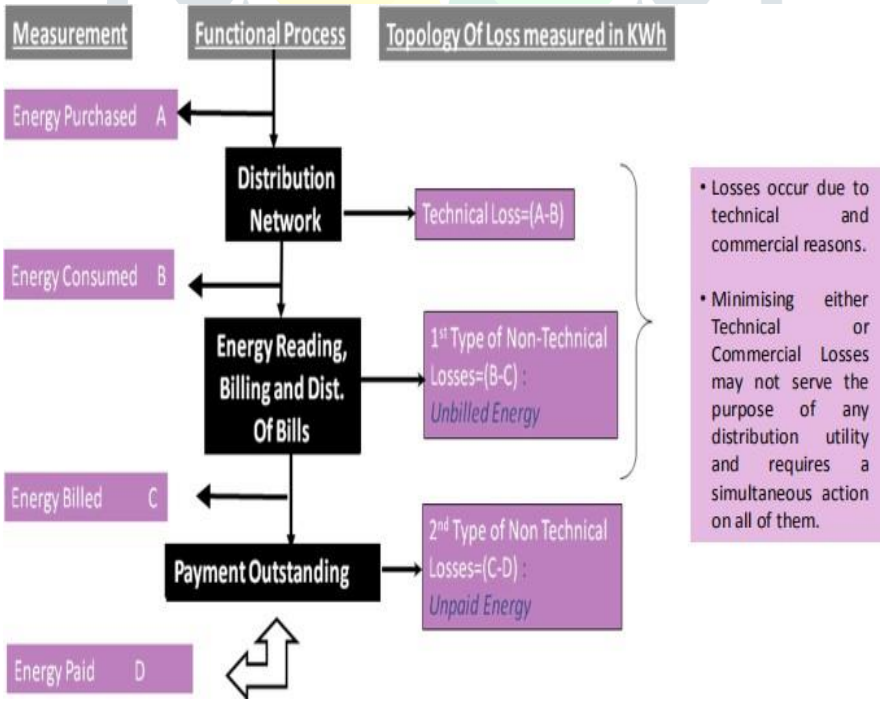


Electric power distribution is the final stage in the electrical power system. It carries electricity from the transmission system to individual consumers. Distribution substations connect to the transmission system and lower the transmission voltage to medium voltage 11 KV in india with the use of transformers. Primary distribution lines carry this medium voltage power to distribution transformers located near the customer's premises. Distribution transformers again lower the voltage to the utilization voltage used by lighting, industrial equipment or household appliances. Often several customers are supplied from one transformer through secondary distribution lines. Commercial and residential customers are connected to the secondary distribution lines through service drops. Customers demanding a much larger amount of power may be connected directly to the primary distribution level or the sub transmission level.



III. Concept of AT&C Losses

The concept of Aggregate Technical and Commercial (AT&C) losses was introduced by some state regulatory commissions in past decade. As the T&D loss was not able to capture all the losses in the net work, concept of Aggregate Technical and Commercial loss was introduced. The commercial losses are mainly due to low metering efficiency, theft and pilferages. This may be eliminated by improving metering efficiency, proper energy accounting & auditing and improved billing and collection efficiency. Fixing of accountability of the personnel (feeder managers) may help considerably in reduction of AT&C loss. The advantage of this parameter is that it provides a realistic picture of energy & revenue loss situation. The AT&C Losses comprise of two elements namely;



i. Technical Losses

The technical losses primarily take place due to the following factors;

a) Transformation Losses (at various transformation levels)

b) High I2 R losses (Copper loss) on distribution lines due to inherent resistance and poor power factor in the electrical network (where I is the current flowing in the conductor and R the resistance of the conductor. With I inamperes and R in ohms, the calculated power loss is given in watts)
The level of technical losses varies with type of conductors used, transformation capacity of Transformers and reactive loads among other factors. There are number of software packages available in market through which losses can be Summer Internship Society Volume III Issue-II July 2011 8 computed. The essential requirements for calculating technical loss on power distribution network of any project areas are:-
The 33V and below HT network Line Diagrams. Line Diagrams for each of distribution transformers and LT circuits up to poles/feeder pillars.
Voltage levels, Power factor and Current loading on HT/LT network & network equipments.
Line lengths, cross section & nature of material, network equipment's load curve.
ii. Commercial Losses

Any illegal consumption of electrical energy, which is not correctly metered, billed and revenue collected, causes commercial losses to the utilities. The commercial losses are primarily attributable to discrepancies in;

a) Meter Reading

Commercial losses occur due to discrepancy in meter reading. Meter reading problems are manifested in form of zero consumption in meter reading books which may be due to premises found locked, untraceable consumers, stopped/defective meters, temporarily disconnected consumers continuing in billing solution etc. Further, coffee shop reading, collusion with consumers is also source of commercial losses to utilities which are primarily due to meter reading.

b) Metering

Most of utilities are using either electromechanical or electronic meters for consumer metering. Commercial losses through metering can be in form of meter tampering in various forms, bypassing of meters, usage of magnets to slow down the meters, tampering etc.

c) Theft by direct hooking

This is most common and visible form of commercial losses in which people tend to tap LT lines to indulge in theft through direct hooking.

d) Collection Efficiency

Typically in a billing cycle, a distribution utility issues bills against metered energy an assessed (generally in case of agricultural loads and temporary connections) energy. However, in most of instances utility is not able to collect the complete amount billed by it. The ratio of amount collected to total amount billed is termed as collection efficiency. It is needless to say that low collection efficiency implies higher commercial losses. The revenue collected shall exclude the arrears. However in case figures of arrears not available separately; there is possibility to getting collection efficiency figures of more than 100 per cent. In such cases efficiency shall be restricted to 100 per cent and shall be used for computation of AT&C losses. The amount attributing collection efficiency higher than 100 per cent shall be treated as collection against arrears.

Reasons for Technical losses
The main reasons are ,ill maintained equipment and substations, ageing transformers. Inadequate investments for infrastructure improvement. Overloading of system elements like transformers, feeders, conductors, etc.
Insufficient reactive compensation, e.g., non inclusion of appropriate capacitor banks at appropriate places.
No re-configuration of feeder lines & distribution transformers so as to reduce the length of LT lines.
Non usage of smaller size energy efficient distribution transformers.

Reasons for Commercial losses
Theft and pilferage, Low metering efficiency, Non-reading of meters, Faulty meter reading, Inefficient billing, Under billing, Faulty bill distribution, Software errors, Prolonged disputes, Inadequate revenue collection, Revenue accounts not updated regularly, Insufficient collection avenues.
AT&C Loss Calculation

The aggregate technical and commercial loss is calculated using the following formula

The Technical loss = Loss found from load flow in electrical lines + Transformation loss in transformers

Commercial loss = Total loss - Technical loss where total loss=Input Energy x AT&C loss

Billing Efficiency = Total Units Sold/Billed (kWh) / Total Input(kWh)

Collection Efficiency = Revenue Collected / BilledAmount

IV. CONCLUSION

The propose to achieve the following AT&C Loss reduction trajectory with the technical, commercial, and managerial interventions explained in detail in this document

The biggest plus point of R-APDRP is its linkage of the disbursement of Central government funds to states to actual reduction in AT&C losses. The West Bengal State Electricity Distribution Co Ltd, which has managed to significantly reduce AT&C losses, has been an R-APDRP success story. This is a clear testimony of the efficiency of a performance-linked incentive approach in reforming power distribution — anindication

We can reduce the AT&C losses to some extent but We cannot eliminate them completely we can reduce them to below 10% so that the gap between the generation and utilization will be reduced hence government sector will be ahead in the competition with the private sectors which in turn helps to improve our Indian economy.

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