Power Distribution

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Abstract: **- Systems that comprise those parts of an electric power system between the subtransmission system and the consumers' service switches. It includes distribution substations; primary distribution feeders; distribution transformers; secondary circuits, including the services to the consumer; and appropriate protective and control devices. Sometimes, the subtransmission system is also included in the definition.**

The subtransmission circuits of a typical distribution system (see illustration) deliver electric power from bulk power sources to the distribution substations. The subtransmission voltage is usually between 34.5 and 138 kV. The distribution substation, which is made up of power transformers together with the necessary voltage-regulating apparatus, bus-bars, and switchgear, reduces the subtransmission voltage to a lower primary system voltage for local distribution.

Keywords: Transmission system.

I. INTRODUCTION

Electric-power transmission is the bulk transfer of electrical energy, from generating power plants to electrical substations located near demand centers. This is distinct from the local wiring between high-voltage substations and customers, which is typically referred to as electric power distribution. Transmission lines, when interconnected with each other, become transmission networks. The combined transmission and distribution network is known as the "power grid" in the United States, or just "the grid". In the United Kingdom, the network is known as the "National Grid"

A wide area synchronous grid, also known as an "interconnection" in North America, directly connects a large number of generators delivering AC power with the same relative phase, to a large number of consumers. For example, there are four major interconnections in North America (the Western Interconnection, the Eastern Interconnection, the Quebec Interconnection and the Electric Reliability Council of Texas (ERCOT) grid), and one large grid for most of continental Europe.The three-phase primary feeder, which usually operates at voltages from 4.16 to 34.5 kV, distributes electric power from the low-voltage bus of the substation to its load center, where it branches into three-phase subfeeders and three-phase and occasionally single-phase laterals. Most of the three-phase distribution system lines consist of three-phase conductors and a common or neutral conductor, making a total of four wires. Single-phase branches (made up of two wires) supplied from the three-phase mains provide power to residences, small stores, and farms. Loads are connected in parallel to common power-supply circuits.

II. TOTAL LOSSES IN POWER DISTRIBUTION AND TRANSMISSION LINES

Power generated in power stations pass through large and complex networks like transformers, overhead lines, cables and other equipment and reaches at the end users. It is fact that the unit of electric energy generated by Power Station does not match with the units distributed to the consumers. Some percentage of the units is lost in the distribution network.

This difference in the generated and distributed units is known as Transmission and Distribution loss. Transmission and Distribution loss are the amounts that are not paid for by users.

T&D Losses = (Energy Input to feeder(Kwh) – Billed Energy to Consumer(Kwh)) / Energy Input kwh x

There are two types of Transmission and Distribution Losses:

- Technical Losses
- Non Technical Losses (Commercial Losses)

Transmission (technical) losses are directly effected on electrical tariff, but commercial losses are not implemented to all consumers. Technical losses of the distribution line mostly depend upon electrical load, type and size of conductor, length of line etc.

III. UNMETERED SUPPLY

Unmetered supply to agricultural pumps and single point connections to small domestic consumers of weaker sections of the society is one of the major reasons for commercial losses. In most states, the agricultural tariff is based on the unit horsepower (H.P.) of the motors. Such power loads get sanctioned at the low load declarations. Once the connections are released, the consumers get into the habit of increasing their connected loads, without obtaining necessary sanction, for increased loading, from the utility.

IV. MEASURES FOR REDUCING TECHNICAL LOSSES

A. Mapping of complete primary and secondary distribution system clearly depicting the various parameters such as conductor size line lengths etc.
B. Installation of shunt capacitors for improvement of power factor.

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