ELECTRICITY LOSSES AND ACTION TAKEN IN KOLHAPUR AND SANGLI DISTRICTS

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ABSTRACT

Economic Progress of any country depends on the fundamental amenities, skilled and available employees. India is immemerging nation with respect to industrial and economic developments. Electricity is one of the basic infrastructures which accelerate the growth rate. But from 2004-05 intensity of shortage is increased and people of western Maharashtra are facing severe load shedding implemented by Mahavitran. Author we scrutinize that there is approximately 20 to 25 %electricity shortage is experienced by consumers. Government and responsible agencies are tackling the problem with care. Actually the power sector is overwhelmed with rising viable losses due to various inefficient, massive, and technical losses. These shortages have had a very harmful effect on the overall economic growth of the state. Today transmission and distribution system losses are nothing but the technical and non technical losses. Technical losses may be corrected by replacing old machines by new innovative equipments. More important is detection of non-technical losses includes detection of deceptive users. Author has studied the losses in Kolhapur and Sangli districts of western Maharashtra. In order to study non technical losses which constitute a portion of the total losses in electrical power systems, the logical first step is to understand the complete picture of power systems losses. The rationale of the paper is to execute a preliminary exploration of Technical Losses and non technical losses with the help of a case study in power systems of both the districts (Sangli and Kolhapur). Electricity theft is also known as “Non-Technical Losses” The author has analyzed collected information of the theft for more discussions in the readers and consumers  

Key Words: Electricity, Losses, theft, shortage, and Progress.
INTRODUCTION

Authors have proposed to visualize the how electricity losses are not only killing the capital investment but also creating severe shortage of electricity which gives psychological and physical harassment to honest customers of electricity. Difference between the metered units of electricity incoming the distribution network and those exiting the network paid for through electricity systems, whether estimated or metered, in a well defined period of time. Technical losses are nothing but the electrical system losses which are rooted by system impedance, current flows and secondary supplies. The sources of technical losses may be directly driven by network investment or by network operation. Non-technical losses, sometimes referred to as commercial losses, arise from several areas including theft, un-billed accounts [13].

Study on Mounting T&D losses, warned that almost one third of the Rs. 810000 crore of investments envisaged in the 11th Five Year Plan may go down the drain if immediate steps are not taken to reduce these losses. Given this situation, India would not be able to come out of the power crisis as the financial health of the utilities would go on deteriorating. The AEP Study findings suggest that every one per cent reduction in T&D loss can save additional capacity of 800 MW. Reduction of technical losses by 6,000–7,000 MW is expected to obviate the need of fresh capacity addition to an extent of 9,000 to 11,000 MW avoiding investments to the tune of Rs.40,000 crore to Rs.60,000 crore. India is far from the global standards of T&D losses which are about 5-10 per cent. Since India is a federal country, while The Electricity Act 2003, provided the overarching framework there were many interesting variations in the unbundling structures experimented with. Some in fact were thought of in detail but not wholly implemented.

Persistence of high transmission and distribution losses would effectively mean pouring of funds in a bottomless bit. Maharashtra recorded the highest peak demand of 17,455 MW during Apr-Mar 2007; the peak met was 12,679 MW. However, the T&D losses of the state are close to 32 per cent. The deficit of 4,776 MW was almost equivalent to the peak demand of West Bengal during the same period [1]. A majority of the T&D losses are due to rampant theft. As the Prime Minister Manmohan Singh pointed out in his address at the Conference of Chief Ministers on the Power Sector on May 28, 2007 at New Delhi, “Theft is the cancer of the power sector”. To combat the power crisis being faced by the country adequate measures must be taken to minimize theft at the earliest.

Literature Review

This paper was originally designed to provide a general framework for this discussion, but later was mandated to discuss these issues in the context of experience in two district of western Maharashtra (Sangli and Kolhapur).

Interstate trade in power started on large scale in 1997/98 and soon after merit order pricing also started. Agencies were mandated to back up interregional power trade and a retail market in power was underway. But the institutional systemic backup was weak. Before we discuss transmission and distribution reform, reform of the traditional system of electricity generation and supply was attempted from 1991. The evolution and main features of the process in terms of facts have been summarized well in a monograph by Kandula Subrahmaniam published by the Center for the Advanced Study of India (CASI) of the University of Pennsylvania 7 (K.Subrahmaniam, 2004). Titled “Thirteen Years of Power
Sector Reform in India: Are We Still Groping in the Dark?” highlights of the reform process in that period were listed.

Today policy system is administered through Electricity Act, 2003. The Act substituted all previous electricity acts and offered open access, competition, development of market mechanisms and independent tariff setting and regulation. It also paved the way for greater private sector participation into a hitherto public sector dominated space. The bulk of power distribution in India consists of the erstwhile SEBs and is still state owned. This state owned power distribution continues to lose large sums of money every year as we saw and have high AT&C losses. A key intent of the unbundling mandate of the Act was to eventually privatize distribution in order to speed up their return to health [2].

For transmission the entire country has been divided into five regions-Northern Region, North Eastern Region, Eastern Region, Southern Region and Western Region. Power supply to end consumers such as domestic residential connections, industrial load, agriculture load, public street lighting etc is made by Distribution Companies (Discoms) which hold license to make such supply within a specified geographical area [1].

To manage electricity load of a different areas in Maharashtra Load Dispatch Centre is established at Kalwa, Maharashtra. Load dispatch center is a coordinating organization for Maharashtra state electricity boards for assuring a system for safe and sound and protected grid operation. Load dispatch center is a significant connection between generation and transmission, which harmonizes the provisions of electricity to consumers. This is the nerve centre for the operation, planning, monitoring and control of the power system. Electricity cannot be stored and has to be produced when it is needed. It is therefore essential that power system is planned and operated optimally & economically.

Energy losses occur in the process of supplying electricity to consumers due to technical and commercial losses. The technical losses are due to energy dissipated in the conductors and equipment used for transmission, transformation, sub- transmission and distribution of power. These technical losses are inherent in a system and can be reduced to an optimum level. The losses can be further sub grouped depending upon the stage of power transformation & transmission system as Transmission Losses (400kV/220kV/132kV/66kV), as Sub transmission losses (33kV /11kV) and Distribution losses (11kV/0.4kv) [8].

A contract between Millennium Challenge Account – Tanzania and AZOROM Ltd (Ireland), in association with AETS (France), for a technical and commercial loss-reduction study was signed on the 9th November 2010. The three objectives as outlined in the Project RFP like Reduce the current total level of technical and non-technical losses to 18% by 2013 in TANESCO from an estimated 24% and to 20% by 2013 in ZECO from an estimated 27.5%

Establish the level of system losses for both TANESCO and ZECO and accurately allocate these losses into technical and non-technical, and also identify the main sources and causes of these losses. Derive the value of system capacity (MW) and energy (MWh) for both entities and identify the cost benefit of reducing losses (Electricity Loss Reduction Study - TANESCO & ZECO, 2011) [4].

“Although the power transmission segment has been opened to private investment in 1998 there has been only a limited success in attracting private investment [7].”
Once electric energy is generated, it must be moved to areas where it will be used. This is known as transmission—moving large amounts of power over sometimes very long distances—and is separate from distribution, which refers to the process of delivering electric energy from the high voltage transmission grid to specific locations such as a residential street or commercial park. 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 120v level at which power enters our homes.

The transmission and distribution or “T&D” system, then, includes everything between a generation plant and an end-use site. Along the way, some of the energy supplied by the generator is lost due to the resistance of the wires and equipment that the electricity passes through. Most of this energy is converted to heat. Just how much energy is taken up as losses in the T&D system depends greatly on the physical characteristics of the system in question as well as how it is operated. Generally speaking, T&D losses between 6% and 8% are considered normal.

**Reasons for high technical losses**

The following are the major reasons for high technical losses in our country:

- Inadequate investment on transmission and distribution, particularly in sub-transmission and distribution. While the desired investment ratio between generation and T&D should be 1:1, during the period 1956-97 it decreased to 1:0.45. Low investment has resulted in overloading of the distribution system without commensurate strengthening and augmentation.
- Haphazard growths of sub-transmission and distribution system with the short-term objective of extension of power supply to new areas.
- Large scale rural electrification through long 11kV and LT lines.
- Too many stages of transformations.
- Improper load management.
- Inadequate reactive compensation.
- Poor quality of equipment used in agricultural pumping in rural areas, cooler air-conditioners and industrial loads in urban areas.

**Reasons for commercial losses**

Theft and malpractices account for a considerable part of the high transmission and distribution losses in India. Theft / pilferage of energy is mainly committed by two categories of consumers i.e. non-consumers and bonafide consumers. Antisocial elements avail unauthorized/unrecorded supply by hooking or tapping the bare conductors of L.T. feeder or tampered service wires. Some of the bonafide consumers willfully commit the pilferage by way of damaging and / or creating disturbances to measuring equipment installed at their premises. Some of the modes for illegal abstraction or consumption of electricity are given below:

- Making unauthorized extensions of loads, especially those having “H.P.” tariff.
- Tampering the meter readings by mechanical jerks, placement of powerful magnets or disturbing the disc rotation with foreign matters.
- Stopping the meters by remote control.
- Willful burning of meters.
- Changing the sequence of terminal wiring.
DATA ANALYSIS AND DISCUSSION

Demand and supply studies, spot visits analysis and photograph, T & D Loss measurements, were carried out for sample networks in two districts, Also RTI act used for collection of authentic information.

- Analysis was carried out to assess the total intensity of losses and the total network loss are divided between technical and nontechnical losses and sources of both identified.
- An analysis of all technical losses on both systems was carried out using data from the field surveys and from utility metering.
- Commercial losses are the residual when technical losses are deducted from System losses. Valuable data on the extent and sources of these losses was derived from Metering Inspections carried out by Mahavitran staff on the spot visits.
- Extensive discussions were held with managers officers and staff in Mahavitaran to understand strategies and approaches in managing commercial and technical losses.

Load flow studies are used to ensure that electrical power transfer from generators to consumers through the grid system is stable, reliable and economic. The information about the power sources and loads are needed to determine expected losses in the power system using load-flow analysis software. The actual losses are the difference between outgoing energy recorded by the source (e.g., at a substation) and energy consumed by the consumers, which is shown on the bills. The discrepancy between expected losses and actual losses would yield the extent of nontechnical losses in that system.

It is indeed alarming to know the level of losses in Indian electricity and transmission business. These losses not only eat the revenues of the companies but also hinder the financing of future projects, which require huge capital, because of increased risk. It is observed that today T and D losses are more than 20 %. The losses in electrical energy systems can be broadly classified as follows:

- Electrical losses in power generating, transmitting, and distributing equipments.
- Mechanical losses in rotating systems.
- Transmission and distribution line / cable losses. Losses in cooling systems.
- Commercial, metering, VAR loading etc losses.
- Loss due to interruption of supply and breakdown.
- Losses due to poor earthings.
- Losses within consumers / industrial premises.
- Corona losses in EHV voltage levels and above. The above mentioned causes are major but in practice we would found other few are affecting on losses of electricity.

Adequate investment in capacity and efficient working of transmission and distribution systems in developing economies with high growth of electricity demand are important objectives. Market oriented reform processes are required both for the creation of capacity and for electricity as a product. Problems of technical management of efficient transmission...
and distribution systems and in particular of integrating decentralized generation through mini hydel, wind or photovoltaic sustainable generation mechanisms with grids are of interest[2]. The reasons cited for such high losses are; lack of adequate T & D capacity, too many transformation stages, improper load distribution and extensive rural electrification etc. A non-technical loss is defined as any consumed energy or service which is not billed because of measurement equipment failure or ill intentioned and fraudulent manipulation of said equipment.

Table No. 2: Cumulative total of EHV substations, transformers, transformation capacity, and transmission line lengths (CKT- Kms) in Maharashtra.

<table>
<thead>
<tr>
<th>SR NO.</th>
<th>PARTICULARS</th>
<th>EHV SUBSTATIONS NOS.</th>
<th>TRANSFORMATION CAPACITY MVA</th>
<th>EHV LINES CKT KM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500 KV HVDC</td>
<td>2</td>
<td>3582</td>
<td>1504</td>
</tr>
<tr>
<td>2</td>
<td>400 KV</td>
<td>18</td>
<td>12350</td>
<td>6505</td>
</tr>
<tr>
<td>3</td>
<td>220 KV</td>
<td>147</td>
<td>25561</td>
<td>12099</td>
</tr>
<tr>
<td>4</td>
<td>132 KV</td>
<td>231</td>
<td>15055</td>
<td>10573</td>
</tr>
<tr>
<td>5</td>
<td>110 KV</td>
<td>33</td>
<td>1888</td>
<td>1657</td>
</tr>
<tr>
<td>6</td>
<td>100 KV</td>
<td>25</td>
<td>1955</td>
<td>679</td>
</tr>
<tr>
<td>7</td>
<td>66 KV</td>
<td>42</td>
<td>1139</td>
<td>3270</td>
</tr>
<tr>
<td>TOTAL</td>
<td>498</td>
<td></td>
<td>61530</td>
<td>36287</td>
</tr>
</tbody>
</table>

Source [6]

The Maharashtra State Electricity Distribution Company Ltd's (MSEDCL) 15-day drive against power thefts in the state exposed 26,286 instances of theft involving Rs 20 crore. Such action is significant as it helps reduce transmission and distribution losses. A statement issued by MSEDCL managing director Ajay Mehta said 2.36 lakh sites falling in various consumer categories were visited. "The focus was on checking industries, traders, hotels, dhabas, construction sites with temporary connections, farmhouses and small consumers," The Pune zone of the MSEDCL exposed thefts of Rs 5.62 crore, the highest in the state (value-wise). Pune zone officials checked 13,194 locations to detect 2,890 cases of power theft. The most number of thefts were unearthed in Nashik zone, which exposed 5,437 cases involving Rs 2.34 crore. The maximum number of first information reports (FIRs) with the police 485 was lodged by the Aurangabad zone. The zone exposed power thefts entailing Rs 1.75 crore. The Kolhapur zone checked the maximum number of consumers 52,382 to find 2,694 theft cases involving Rs 96 lakh. Kalyan (which detected power thefts involving Rs 1.65 crore), Bhandup (Rs 1.60 crore), Amravati (Rs 1.46 crore) and Latur (Rs 2.15 crore) also performed well during the drive. Mehta said such action has been made part of the routine tasks of MSEDCL staff, which will help reduce transmission and distribution losses and improve service.

Table no 2: Electricity loss in Kolhapur and Sangli Districts

<table>
<thead>
<tr>
<th>Year</th>
<th>Kolhapur District</th>
<th>Sangli District</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity Supply MU</td>
<td>Electricity Loss MU</td>
</tr>
<tr>
<td>2008</td>
<td>7.81</td>
<td>1.09</td>
</tr>
<tr>
<td>2009</td>
<td>8.05</td>
<td>1.19</td>
</tr>
<tr>
<td>2010</td>
<td>8089</td>
<td>1.18</td>
</tr>
<tr>
<td>2011</td>
<td>9.65</td>
<td>1.167</td>
</tr>
</tbody>
</table>
From the above table it is clear that the total losses take place in both the districts. It is found that Kolhapur district consumes more electricity but successfully controlling the T & D losses (13.52 % avg.) as compared to Sangli districts (29.83 % avg.).

Table no. 3: Electricity theft caught in Kolhapur and Sangli Districts

<table>
<thead>
<tr>
<th>Year</th>
<th>Kolhapur District</th>
<th>Sangli District</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of theft cases caught</td>
<td>Value collected RS</td>
</tr>
<tr>
<td>2008</td>
<td>342</td>
<td>5042000</td>
</tr>
<tr>
<td>2009</td>
<td>310</td>
<td>12391000</td>
</tr>
<tr>
<td>2010</td>
<td>1291</td>
<td>8299000</td>
</tr>
<tr>
<td>2011</td>
<td>403</td>
<td>3558000</td>
</tr>
</tbody>
</table>

Photographs show the action taken on Electricity thieves and caught them red hand in front of people.

Figure No. 1, 2, and 3: Action taken by Mahavitran to caught electricity theft.

CONCLUSION:

The most primitive step to challenge the power calamity of the state is to take preventive as well as corrective measures of stealing of electricity. Electricity theft done by consumer is the most destructive and uncivilized approach to the power sector. It is going to do the injustice to the honest & genuine consumer who pays the electricity bill regularly and in time. Heavy investment is required to generate, transfer and distribute the electricity to the consumer and if 20 % and above theft, T & D losses are burning up this investment it is necessary to take sever action and punishment to the misbehaviors.

All types of losses experienced by Mahavitaran and Mahatransco have an impact on a number of areas, including monetary and cost-effective outcomes and political firmness. Monetary impacts are the most serious to every one which declines the profits; already government has scarcity of resources up gradation of power system and its capacity. Actually increasing electricity losses are associated with corruption and forms of internal politics. Several alternative efforts have been made in other countries to minimize such problems. Most concentrate on onsite technical inspections, which have the similar limitation of high operational costs, as well as taking up much human resource time.

The total revenue
collected by both the districts is mentioned above. A team of officials visit at customers home/ industry/ commercial place and inspect the connection. As mentioned above due to this quick action the malpractices caught red hand and fined as per the rule. In both Kolhapur and Sangli districts approximately 15 lakh consumers are utilizing the electricity facility. And it is very difficult to find out consumer who is using electricity unlawfully. The state and both the districts are facing electricity shortage and heavy burden on concern authorities to fulfill and balance the situation. People are coming on the road for continuous and steady electricity supply. Innovative and delicate equipment using consumers want quality electric supply which is main challenge. Due to the electricity theft by few consumers, shortage is not controlling and officially area wise load shedding necessary to implement to sustain the responsibility.

In year 2009 -10 measures taken by Mahavitaran’s rapid action squad (Patak Squad) was prominent and honest consumers were happy on this measures more active. Last year once again action of the squad slowed down.

**Common observations to reduce all types of electricity losses:**

It is not only to make good rapport between Mahavitran staff and consumers to decrease the loss but also electricity provided must be qualitative. Task force with sufficient rights must be increased for proper inspection and action on consumers who do malpractice. It is necessary to consider following points for better management:

- Scheme like MSEB Mitra (Friend) must be implemented which will inform the district level officers about theft and malpractices.
- Photographs of theft must be published in that substation area (Photographs of connection place)
- Strict punishment and fine must be imposed on those malpractices with the meter seals etc.
- Energy audits should be introduced and personal responsibility should be fixed on the district and taluka officers
- Providing sufficient meter testing facilities. A three months agenda should be draft for inspecting the meters, and replacement of faulty meter with tested one.
- Perform annual review of loss performance across T&D networks
- Mahavitran staff may be demanding money for small work of consumer that must be stopped, which can create respectful pressure on consumers.

**REFERENCES**


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