Governance and State of Electricity in India

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Abstract **- Electrical power is the capital required for engaging in any enterprise. The last two decades have witnessed a massive addition to net installed capacity without much emphasis on quality of transmission, distribution, and revenue generation. The Electricity Act 2003 was the first stance to relieve power sector from lagging and make it a profitable business. The soaring rise in consumption of power has forced policy makers to shift focus from generation to overall power management. High level of cross-subsidy T&D losses, organised theft, and surge tariff are detrimental for every stratum of power.**

Two of our study reveal uncommon phenomena, states with the shortage of power-maintained GDP higher than others, while with the rise of electricity generation, the cost of power has increased. The accessibility to reliable power can only be assured by a development of an ecosystem. This can be achieved by managing existing capacity before expansion, coupled with accountability of regulators and an efficient billing mechanism. Implementing smart grid along with a choice of the carriage to end user by the portability of utilities will bring in new companies. Hence, a better quality of power with competitive tariff will be available to the user.

Index Terms **- Indian Electricity Act; Problems in power sector; power sector in India; Indian electricity laws.**

I.INTRODUCTION

Electricity is the most viable option for supplying power across the globe. The rate of doing work is generally termed as power. This can be attributed to the lower cost of generation, easier transmission and conversion from one form to another. The first half of eighteen century marked the age of industrial revolution in Europe. Fossil fuels powered this era. Later, it was realised that electrical energy was the future fuel. Scientific development catalysed this fact. The advent of generator and transformer, working on electromechanical principles led to production and distribution of electricity on a massive scale. United States was the first country to start commercial production of electricity, UK followed. Calcutta, (now Kolkata) was the first place in India to have electrical power delivered to a household consumer, followed by Bombay. The need for regulations through legal enactment and byelaws was needed in the early 1900s. The first act to govern the Indian power sector was The Indian Electricity Act, 1910.

Development of electrical industry through private licensees was envisaged through this Act.

This created the basic framework for installation of wires and other related works of electric supply industry. It was a colonial act that was weighed in favour of rulers. One of the outcomes of the Electricity (Supply) Act, 1948 was the creation of State Electricity Boards. This was aimed at making states independent of arranging supply for respective geographical territory. Eventually, the performance of State Electricity Boards declined over a span of time. The 1990s marked an important milestone in the electricity sector of India. A series of changes introduced since the year 1991 began the transformation of the industry. Issues such as cross-subsidies and tariff fixation were addressed through the Electricity Regulatory Commissions Act, 1998. A major change in the electricity regulatory norms was brought down with the emanation of The Electricity Act, 2003. This was a concentrated effort to define and earmark the rights and duties of the regulator, producer and consumer on a pro-rata basis. Since then, more than a decade has passed, and it is a high time to access the present situation of laws that will decide the future of Indian electricity industry. At the time of independence, India had 1362 MW installed capacity of power, today the total installed capacity has shot up to 288004.97 Megawatt of power.[1] Electricity generation and distribution is subdivided into 5 geographical regions. Western region tops the table with 36% of total generating capacity installed, while North-Eastern region has the least, with only 1% of entire generating capacity [2]. A major breakthrough in electricity sector was brought in with the introduction of Electricity Act, 2003.

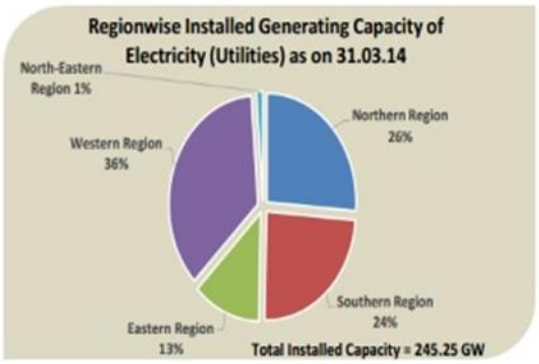


Fig.1 Region wise installed capacity [3]

Before the year 2003, state and central government were totally managing and controlling the power sectors in their respective regimes. Mismanagement of power sector resulted in loss-making state electricity boards SEBs, unreliable power supply, hence adversely affecting the growth and economy of the nation.

II. IMPLICATIONS OF ELECTRICITY ACT 2003

The Electricity Act 2003 was envisaged to bring a series of changes by consolidating then present laws.

C. Delicensing of power generation

The Electricity Act 2003 provides generation to be de-licensed. In the present scenario, only setting up solar power plant does not need any license, while generating power from rest other renewable and non-renewable sources requires stringent checks from the government and concerned authorities. The captive generation and co-generation of power is freely permitted for thermal power, upon approval from Central Electricity Authority. Carriers also levy an additional surcharge for transmission.

B. Provision of private transmission licensees

Power Grid Corporation of India (PGCIL) is a state-owned company involved in the interstate transmission of power. To supplement its work, Government of India, through legal framework allowed private players into transmission business. Under the directives of Central Electricity Regulatory Commission (CERC), Power Grid call for bids under PPP mode and finance, build, operate and transfer modes [4]. As a result of which more than 30 private licensees are holding the license for power transmission [5]

C. Cross subsidy

Cross-subsidisation is a tariff design issue. The Government claims to have no role to play in determining cross subsidy. Unfortunately, it is not considered an element of cost but just as redesigning of the tariff. Subsidy, in essence, is a privilege, which can either be given or not given. The Supreme Court of India says actual expenditure has to be the basis of tariff and not the hypothetical ideal situation. An ideal situation is essentially contemplation of the future. Additionally, the computation of input is the actual cost of per unit basis.[6]

III. ISSUES

Our study shows that even after enforcement of the Act of 2003, some serious issues are still unresolved. These include:

A. Phasing out of cross-subsidy

One of the features of Electricity Act 2003 was to gradually phase out cross subsidy. This was included because of degrading condition of state electricity boards, who waived off power bill arrears on behalf of state governments.

Political decisions to waive off power bills without compensating for it, as a popular promise to lure voters was practiced. As of now, the governments are compensating to state discoms in event of waiving a power bill. Still incessant subsidy as freebie persists as a populist election promise. [7] [8] [9]

B. Surge tariff

State discoms directly or through their licensees have been empowered to distribute electricity to consumers. It has been observed that surge or over pricing in some states had a detrimental effect on the growth of industries. This, in turn, has counter effect on the revenue of the state utilities also. For instance, in Kerala, Hindalco (then INDAL), is been forced to shut down due to high charges levied on it by state discom. Recently as per report submitted by the Maharashtra State Electricity Distribution Company Limited (MahaDiscom) to the Maharashtra Electricity Regulatory Commission (MERC) 500 industrial consumers have shifted to other carriers due to high power tariff over the past two years. The report proposes an increase from 19 per cent to 27 per cent in power tariff for industrial, residential, farming consumers in the next four years, 2019-2020. [10]

Another independent study shows that consumers such as Raymond's, Bharat Forge and the Railways have, along with 500 industrial consumers, had shifted to an 'open grid' access since 2012.

Charges - States	Maharashtra	Karnataka	Gujrat	Goa	MP
High-tension tariff ?/unit	8.23	6.8	6	4.8	6.7
Low-tension tariff ?/unit	8.39	6.45	5.8	3.8	6.6

Fig. 2 Tariff chart of rapid developing states 2016

Although industries have an option of open grid access but is limited to consumers with a large use of power 1 megawatt (1 MW) and above. This came after the Central government amended the Electricity Act, 2003. An open grid is a mechanism that permits a consumer to buy cheaper power from other companies or suppliers in the market.

In the Union of India through GM Northern Railways vs. Chairman U.P.S.E.B. [11], the Supreme Court held that the Railways found the tariff of UPSEB to be excessive and therefore, they decided to construct their own transmission lines, which was perfectly legal — hence quashed the notice issued by UPSEB.

Comparison of average shortage of electricity & rate of GSDP

Decentralisation of power has provided opportunities like open access on one hand, but the non-scientific demarcation of states as regional grids merely on geographical basis is still distressing states. India will be a Union of States, says constitution [12]. A state has to be treated as an individual entity at par with a region. This demarcation of region is encumbering states to withdraw or export cheaper power from other regions/states. Hence, conceding to lower growth of a state on the cost of a regional division. A graphical comparison of our study is illustrated in Figure 3. It compares the growth-rate of Gross State Domestic Product [13], with the power deficit [14].

GDP is an active indicator of growth. India has witnessed a considerable growth rate in the last 2 decades. Common conception says power sector fuels the growth. Hence, states with severe deficiency of power should have low Gross State Domestic Product, as compared to states having adequate power. But, the trends observed in our study indicate, Bihar, Tamil Nadu and Uttar Pradesh have positive hence better growth rate of GSDP, in spite of deficit power supply.

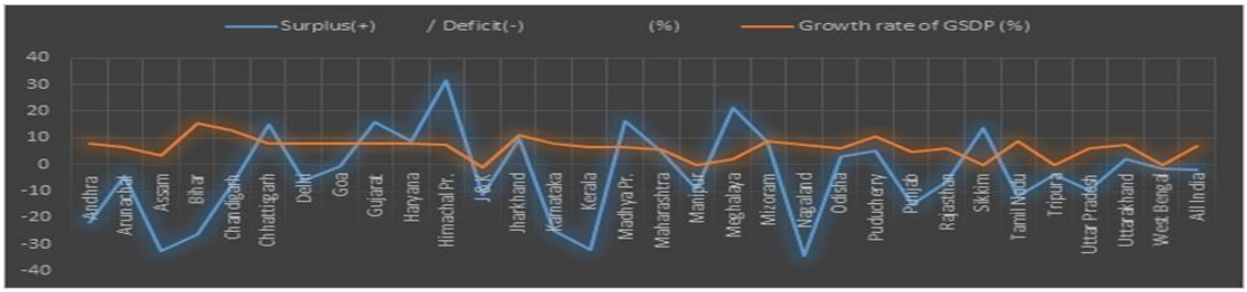


Fig. 3 Average Shortage of Electricity vs. GSDP

C. Line losses

The losses occurred after generation that is, during transmission and distribution is generally known as T & D losses. When a fault occurs due to short circuit, mains or live wire getting connect to Earth, results in wastage of electrical power. Power theft also adds to T & D loss. It has two components, transmission and distribution. Distribution part has higher share than transmission, on the account of loss. As the distribution, system for electric power is far more inefficient contributing to actual losses during distribution. This is due to radial model of distribution, which is most widely used type of distribution. Although it is very easy to realise but it accounts for higher losses as conductors carry large current, has lesser voltage regulation and hence poor reliability.

Use of ring main type, in distribution system makes the overall system more efficient as in this the current carried by the conductor is less; hence, ohmic losses are quite small. Location of consumer too far away from generating station also increases T & D loss.

Remote villages are far off from the distribution substation, hence the losses are much more which resulting in an inefficient system. A data from World Bank, illustrates, that T & D loss, after dipping up to a level below 7.2 percent in the late 1980s has risen up to 8.2 percent around 2015.

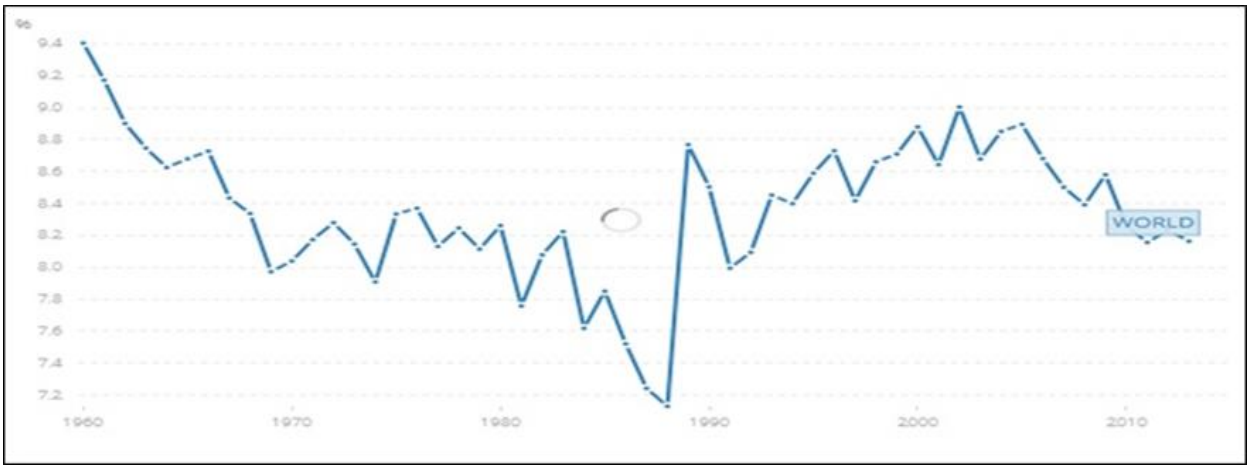


Fig. 4 Line losses across globe World Bank

While a no different picture of India, can be realised from records of World Bank. It reveals, that line loss was about 17 percent in 1975, rose to a record all-time high 28 percent in the year 2002-03 and is still above 18% mark in 2015-16. It is ironical to note that even the use of modern technology and equipment as claimed by utilities has resulted in overall increase of T&D loss beyond India, across the globe.

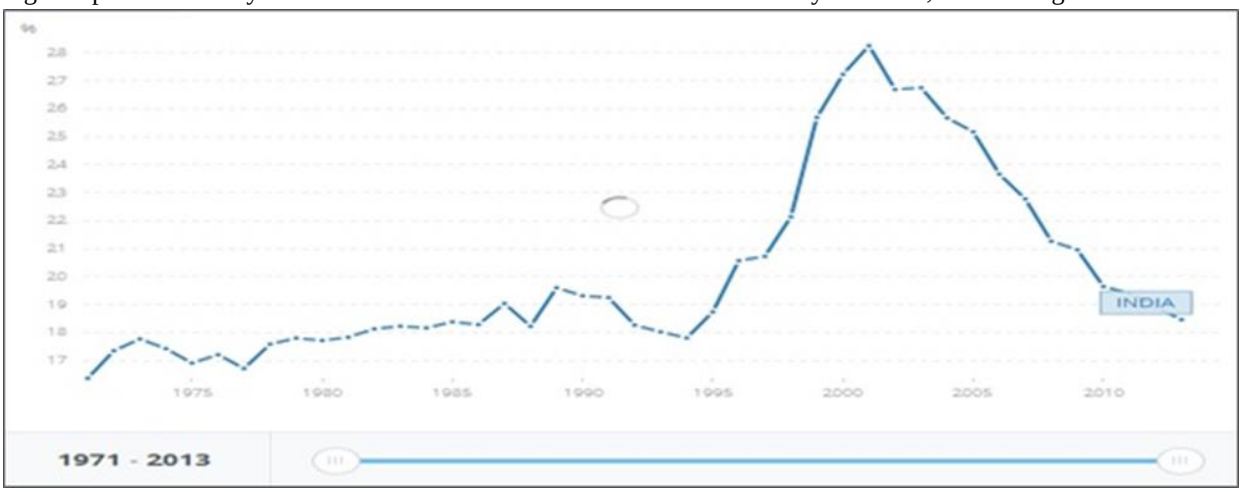


Fig.5 Line losses in India [15]

S. No.	State	2009-10 (Actual Unit)	2010-11 (Actual Unit)	2011-12 (Prov. Unit)	2012-13 (RE) Unit	2013-14 (AP)Unit
1	Uttar Pradesh	18966	20365	23326	23067	23510
2	Maharashtra	21533	19062	18530	19075	22327
3	Tamil Nadu	12662	15469	12414	14286	17687
4	Madhya Pradesh	13011	13441	14484	15249	16805
5	Andhra Pradesh	13261	12622	13487	13264	15899
6	Rajasthan	13031	12602	12212	12660	13090

Comparison of electricity price, generation, losses over the last decade

This comparative study of wholesale price index, electricity generated and lost reveals an interesting phenomenon.

Market principles, illustrate that quantity of an object has inverse relation with its price. However, in case of electricity here, the wholesale price index has shot up by 160 percent in 2014-15, as compared 100 percent to 2004-05 level. The hybrid graph displays, with the rise in electricity generation, losses in transmission increase, which subsequently, adds up to the cost of power.

Fig.6 Electricity price, generation, and losses

According to the Constitution of India, Electricity is placed in concurrent list i.e., subject to both the central and state governments are responsible for the development of the electricity sector. NTPC, NHPC, NPCIL, THDC, NEEPCO, SJVNL, NLC etc. are the central generation utilities and POWERGRID is the Central Transmission Utility. At the State level, there are Genco and Transco in the respective States.

D. Organised theft

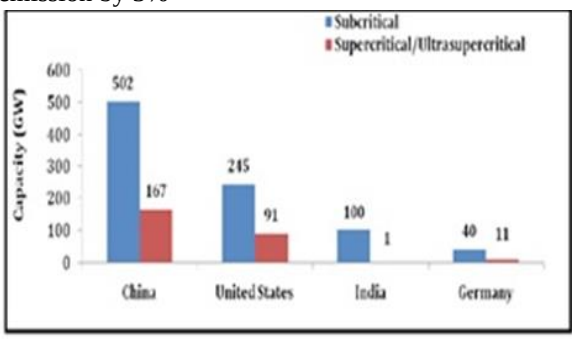
The use of electrical power without a contract with distributor with partial or total bypassing of energy metering system is theft of electricity. This refers to interfering an electrical system with an intention to adulterate its measurement. Its causes includes:

1. Absence of accountability: Illegal consumer (not a registered customer) steals directly from distribution line, from another legal customer, registered customer bypasses, or tampers the meter in order to hide actual usage of power, a nexus between consumer and employee of utility to lessen the bill as compared to actual use.
2. Inefficient enforcement of law: Presently, on reporting a case of theft of electricity, discoms act swiftly in cities and metropolitan areas. However, in rural areas, employees of discoms deployed to catch such thieves are publically boycotted and even ruthlessly beaten. [17] [18] [19]
3. Absence of sufficient laws: The section 154 of Electricity Act, 2003, empowers a special court for speedy trial of person/s accused of theft of electricity. This section should include a clause of non-bail able warrant and non-compoundable offence, for habitual offenders.
4. Political protection to customers: It is a common observation that influential consumers of a utility company, receives political protection from local leaders, resulting in nonpayment of electricity bills. [20]
5. Unethical attitude of person in authority: “If a king plucks away an apple from the public garden, commoners will even take away roots.” [21] It is a common feature of VIPs in our country, wherein they are in a habit of not paying electricity bills. [22]

E. Lack of use of modern technology

In comparison with the top energy consuming countries, India is at the bottom. The generation capacity of power plant deteriorates, with increasing age, inadequate operation and maintenance adds to this. This is significantly visible in among old state-owned plants. Only 18 per cent of Indian power plants are younger than 10 years and have capacity exceeding 300 MW. Whereas in China, a relatively young fleet of plants are built in the last decade.

Use of supercritical and ultra-super critical technology in thermal power plants uplift efficiency. Apart from more power output from same quantity of fuel consumption, this has a positive impact on environment, as it also reduces GHG emission. Every percent of efficiency improvement reduces GHG emission by 3%



Source: Matthias Finkenrath, Julian Smith, Dennis Volk, 2012, CCS retrofit: Analysis of the Globally Installed Coal-Fired Power Plant Fleet, International Energy Agency, p34

Fig.7 Analysis of Globally installed coal-fired power plant fleet

F. Constraints of raw material

As per data provided by ministry of power, Government of India, the generation loss due to due to shortage of coal during the last three years i.e. 2012-13, 2013-14 and 2014-15 are 15.054 Billion Unit (BU), 8.082 BU and 2.678 BU respectively.

Today India has to run through many bottlenecks for unleashing the full potential of power sector. Abundant availability of fuel is an important concern. Government owned company Coal India Limited (CIL) is able to supply only 65% of total coal required by thermal plants. Evidently, resulting in increased dependence on imports. This further leads to higher generation costs. The unavailability of domestic uranium, along with stringent checks on its import, high costs, is the reason behind our languished atomic power program.

India has a rich deposit of Thorium, a radioactive element, which offers safer and cheaper electricity. As per an estimate, India has a deposit of 846,000 tons of Thorium largest than any country. Thorium is a fertile raw material, and hence, can only be used as a fuel in conjunction with a fissile material like plutonium. Still, it has a huge potential become a full-fledged main raw material for nuclear power. There has also been a steep rise in the price of coal and petroleum in recent years, especially in India. In such a scenario, a constant price offered by abundant and indigenous Thorium fuel for nuclear power can be a decisive approach for India in a highly competitive global market. India plans to expand its nuclear sector to provide about 63GW of power by 2032 and gradually increase it to 25% by 2050.

	Energy requirement(MU)	Energy Availability(MU)	Peak Demand(MW)	Peak Met(MW)
2010-11	861591	788355	122287	110256
2011-12	937199	857886	130006	116191
2012-13	995557	908652	135453	123294
2013-14	1002257	959829	135918	129815
2014-15	1068923	1030785	148166	141160

Fig. 8 Electricity demand per year in India during 2010-2015

IV. FEATURES OF AMENDMENT BILL, 2014

The Union Government after exhaustive consultations has brought certain amendments to the Electricity Act, 2003, through Electricity Amendment Bill, 2014. Its salient features include:

a. Choice of carriage- The concept of multiple supply licensees is proposed in clause 49; this will be done by segregating the carriage from content in the distribution sector, to enhance efficiency while giving choice to consumers through competition in different segments of the electricity market.
b. Regular revision of tariff- A tariff must be based on viable financial principles for the sustainability of the distribution sector accompanied by continuous recovery of revenue by licensees. Provisions of Tariff Policy are proposed in clause 38.
c. Promotion of renewable energy- The part II, clause 3(1) calls for series of actions for the promotion of renewable energy. As per National Renewable Energy Policy, renewable generation obligation on coal fueled thermal power stations, exemption from open access surcharge for renewable power generation plants, development of industry are the prime steps.
d. Other noteworthy points- Security of grid, is described in 16th clause, as the grid is vulnerable to attack by anti-national elements. While restructuring of regulatory commissions is

mentioned in clause 60. Also, accountability of companies is substituted in section 42 of the principal Act.

V. RECOMMENDATIONS: THE WAY AHEAD

A. Accountability of regulatory bodies

In S.V.A. Steel Re-rolling Mills Ltd. Appellants vs. the State of Kerala the state government of Kerala was to give continuous electricity supply at a particular rate to certain new manufacturing units. Failing to which the Supreme Court of India ordered— the respondents to calculate the period during which 100% electricity supply was not given to the appellants and extend the period of incentive accordingly [23]. This indicates that states must execute power generation/purchase and distribution through their companies instead of direct dealing with industries. The Electricity Act, 2003, was instrumental in bringing phenomenal changes in electricity sector. Regulatory commissions were formed and made custodian of consumer interest. New formulas were introduced for determining, fixing and revising power tariffs.

However, financial performance of utilities indicates, that regulatory bodies have failed in holding the accountability, which in turn is hazardous for end consumers. Meanwhile, intervention of state governments, has affected their independence to hamper their normal functioning.

Regulatory commissions have achieved limited success so far, in most of the states. Mechanism of public hearing and Ombudsman has not been effective. Suo-moto revision of tariff, reflect lack of public participation. Orders in favour of public are being challenged by utilities before a court of law, verifies that regulators have been unsuccessful in safeguarding interest of public. Regulators have to fulfil the bivalent objective of protecting consumers' interest and recovering cost of electricity.

B. Sustainability of Discoms

One of the primary goals of reforms was to make distribution business economically viable. But, debt-ridden and loss-making discoms are evident of the fact that governments have failed in making sustainable environment for discoms operation. CRISIL estimated ₹ 80,000 Crore loss has been borne by discoms in the year 2014-15[24]. However, this is just an estimation and actual loss incurred could be graver. This is because there is no valid assessment of these losses. Still, research suggests that losses including short-term liabilities have soared 4 times as compared to the fiscal 2009-10. This must force government to assess Electricity Act, 2003. UDAY Scheme, has been introduced for financial turnaround and revival of discoms but its impact has to be observed in long run.

C. Portability of Utilities

The regulatory environment is steadily moving towards increasing competition in the electricity market allowing several new players in addition to traditional utilities and independent power producers such as captive power producers, merchant power producers, renewable energy generators, etc., on the one hand and customers requiring access to the grid on a non-discriminatory basis on the other. With full open access in the distribution segment, the consumer will no longer be captive to one discom but will have greater choice in getting power from any of the new entities connected to the grid. The regulatory environment has now become stable with multi-year tariffs becoming a norm in states.

D. Expanding transmission lines

It is a known fact that inadequate transmission structure to transmit power from one region to the other is one of the main constraints for power shortage in southern states though surplus power from different sources is available in other regions.

[25] The expansion of the transmission system in the country has not matched with the capacity addition.

E Efficient billing mechanism

The discoms need to ensure 100 % energy metering for the rural and well as urban consumers. Audit of energy through walk in and detailed audit accounting system should be implemented. A mandatory energy audit of HT consumers through a third party must be enacted through regulations.

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