



ELECTRICITY DEMAND VS ELECTRICITY PRICE *by* Sarwat Said

Domestic users have the maximum electricity consumption in Pakistan. According to Pakistan Economic Survey 2012-2013 in the total consumption of electricity the share of household is 46.5%. This paper is a study to understand the degree of responsiveness of electricity users to the tariff rates in Pakistan, particularly the residential electricity consumers in Islamabad. For this purpose the electricity distribution company IESCO is considered. Price elasticity is examined for the period 2010-2014 to find out the effect of price revisions on consumption.

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Introduction:

This paper is a study to understand the degree of responsiveness of electricity users to the tariff rates in Pakistan, particularly the residential electricity consumers in Islamabad. For this purpose the electricity distribution company IESCO is considered. Price elasticities are examined for the period 2010-2014 to find out the effect of price revisions on consumption.

In Pakistan the government has directed National Electric Power Regulatory Authority (NEPRA) for power tariff determination among the DISCOs. The tariff structure formulation is one of the prime responsibilities of NEPRA. Different sectors like industrial, agriculture, commercial and residential have different tariff charges. Residential consumers are studied since they are the biggest consumers of electricity. Domestic users have the maximum electricity consumption in Pakistan. According to Pakistan Economic Survey 2012-2013 in the total consumption of electricity the share of household is 46.5%. The objective in this study is to examine the tariff rates and to evaluate the role played by price in electricity consumption.

Hypothesis:

“The demand of electricity is insensitive to the changes in electricity prices”

Objectives:

- To find out how domestic electricity consumption respond to change in electricity price.

Data and methodology:

The main objective of the paper is to examine the effect of price change in electricity demand at residential level in Pakistan. For this purpose we took unit prices, sales of units and number of customers as main determinants of electricity demand. Data is collected from the official websites of NEPRA and IESCO. The data used for calculation is from period 2010-2014. Elasticities is calculated by using the formula given below:

Where Quantity shows the number of units sold under different slabs and price represents the charges of different units consumed.

Price elasticity is basically a measure of consumers' sensitivity to price changes. Demand elasticity are of two types *inelastic* and *elastic* and the range of each type differs. The range of inelastic demand is between 0 and 1, and the elastic range initiates with the value larger than 1. A demand for a commodity is said to be inelastic when there is less than proportional change in demand for a given change in the price. In the elastic range consumer demand responds with a greater than proportional change for a given price change.

$$\text{Elasticity} = \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Price}}$$

IESCO Statistics

Tariff Category (for peak load)	YEARS															
	2010-2011				2011*-2012				2012-2013				2013-2014			
	CHARGES (Rs/unit)	SALES (MkWh)	CONSUMERS (Million)	REVENUE (Million)	CHARGES (Rs/unit)	SALES (MkWh)	CONSUMERS (Million)	REVENUE (Million)	CHARGES (Rs/unit)	SALES (MkWh)	CONSUMERS (Million)	REVENUE (Million)	CHARGES (Rs/unit)	SALES (MkWh)	CONSUMERS (Million)	REVENUE (Million)
UPTO 50 UNITS	2.00	264,764	6,782,757 (32%)	529,528	3.00	233,024	6,726,968 (31%)	699,072	4.00	219,000	6,607,077 (35%)	876,000	8.50	263,780	6,894,816 (30%)	2,242,130
001-100 UNITS	6.27	1,456,203	3,943,901 (19%)	9,130,392.81	8.70	1,424,852	3,291,292 (15%)	12,396,212.4	11.00	1,261,000	3,958,043 (21%)	13,871,000	11.00	1,370,429	3,045,568 (13%)	15,074,719
101-300 UNITS	7.20	1,079,631	8,389,038 (39.8%)	7,773,343.2	10.20	1,227,088	9,258,332 (43%)	12,516,297.6	15.00	1,036,000	6,419,116 (34%)	15,540,000	13.00	982,605	11,311,513 (49%)	12,773,865
301-700 UNITS	10.65	317,542	1,698,213 (8%)	3,381,822.3	14.00	330,078	2,179,790 (10%)	4,621,092	17.00	297,000	1,704,302 (9%)	5,049,000	21.00	227,945	1,601,782 (7%)	4,786,845
ABOVE 700	13.30	157,227	238,892 (1%)	2,091,119.1	16.50	100,264	214,430 (1%)	1,654,356	18.00	137,000	239,749 (1%)	2,466,000	24.50	79,759	107,318 (0.4%)	1,954,095.5
TOTAL	--	3,275,367	21,052,801 (100%)	22,906,205	--	3,315,306	21,670,812 (100%)	31,887,030	--	2,950,000	18,928,287 (100%)	37,802,000	--	2,924,518	22,960,997 (100%)	36,831,655

*Data is approximated for the year

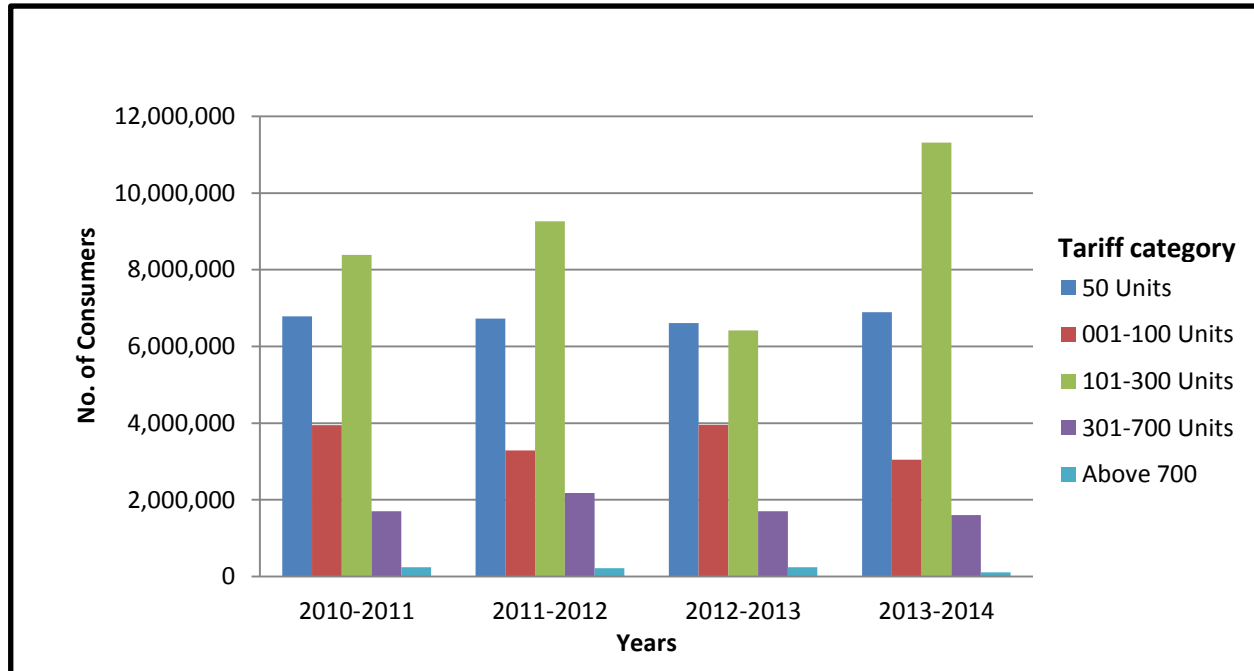
Data is collected from NEPRA and IESCO website

Revenue is calculated by multiplying unit charges with the quantity sold

Results and Analysis:

This section explores the results and their interpretations. Historical records of number

Figure 1: Number of consumers



of consumers within the IESCO service area are given in the figure above. Figure 1 shows the number of consumers falling into different tariff slabs. 32% of the consumers were consuming 50 units of electricity in year 2010-2011. The percentage fell to 31% in 2011-2012. Highest percentage was seen in 2012-2013 with 35% of the users using 50 units. However, the lowest percentage is reported at 30% in 2013-2014.

Under 1-100 unit slab the lowest percentage of users was noted in year 2014 at 13% followed by 15% in 2010. The highest percentage was observed in 2013 with 21% of the customers in 100 units block.

A consistency can be seen in the consumption pattern of users consuming units above 700. The percentage of consumers under this slab remained unchanged from 2010 to 2013 and continued to stay at 1%. However, overall number of residential electricity users has increased over the years. A drastic increase can be seen in the consumers falling in 101-300 units category. The number rose from 39.6% in 2010 to 49.2% in 2014. The lowest percentage was recorded at 34% in year 2013.

Figure 2: Tariff charges for different unit slabs

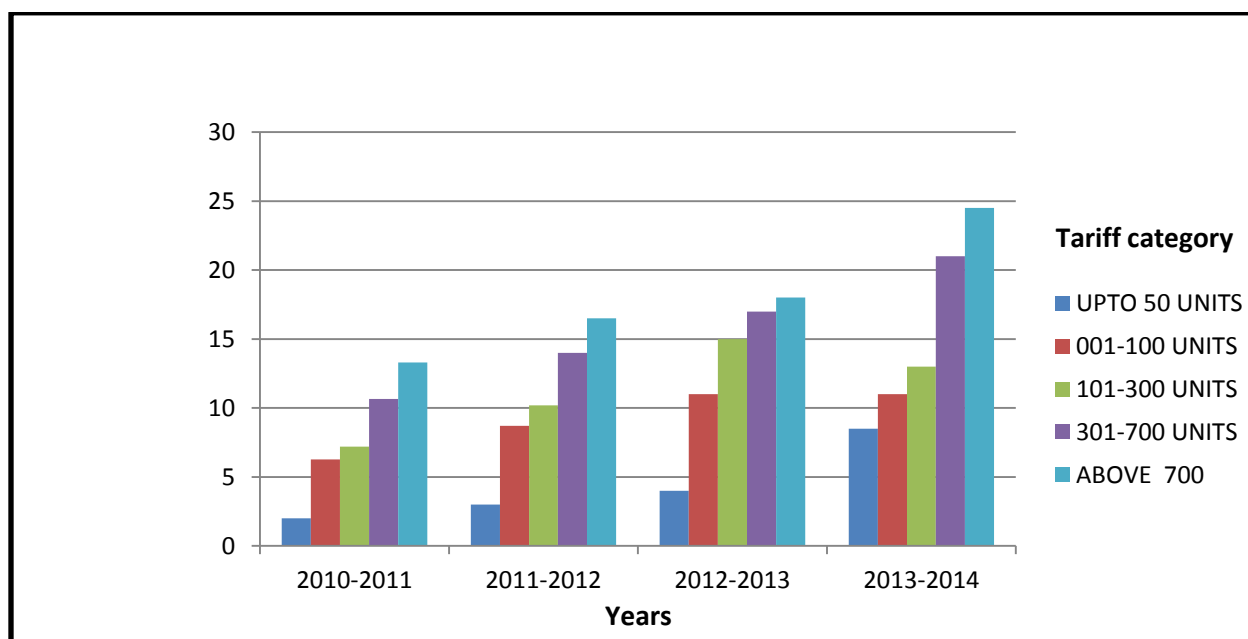


Figure 2 shows the changes in rate of units from 2010 to 2014. The graph displays an increasing trend. A sharp increase in electricity prices can be seen in year 2013-2014.

If we compare the year wise increase in unit prices of 50 units, we could see that from 2011 to 2013 the price increased by 50%. But in year 2014 the same slab price rose by 112.5%. Under 001-100 unit slab the percentage increase in unit price is 38.7% in 2012. The prices further increased by 26.4% in 2013. No change in price is seen in year 2014.

Price of units above 100 slab increased by 41.6% in 2012. The figure grew to 47% in 2013. There was a reduction in price by 13% in 2014. The percentage increase of unit price in 301-700 unit category is 31% in 2012. The prices further raised by 21% in 2013 and by 23% in 2014. The price alteration in units above 700 is calculated as 24% in 2012 followed by 9% increase in 2013. By the year 2014 the price evaluated greatly by 36%.

Figure 3: sales of units under different slabs

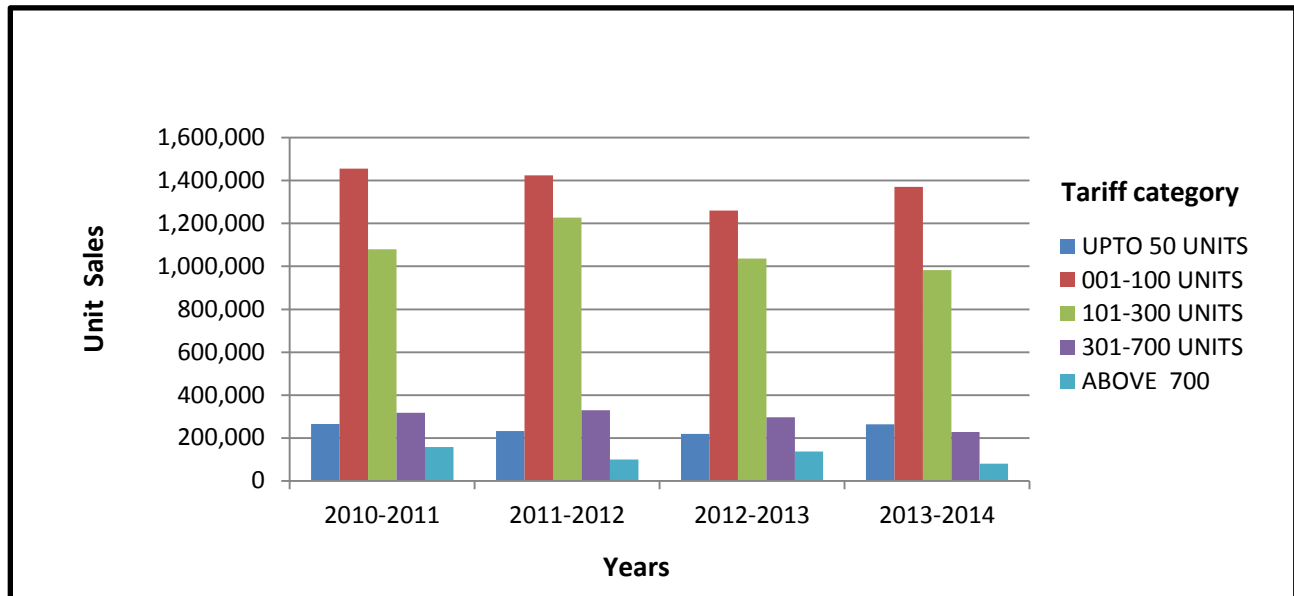


Figure 3 depicts the number of units sold under different unit categories. The graph illustrates that most of the sold units falls collectively under 001-300 category. Out of the total old units, 50 unit slab contributed 8% in the year 2011. The sale remained at 7% in year 2012 and 2013. In year 2014 its input in sale increased to 9%.

The largest impact on sales is made by 001-100 unit slab users. The maximum number of sold units belongs to this category. The share fluctuated between 43% - 47% from 2011-2014. The second highest contributor to sale is the 101-300 unit slabs. The percentage varies from 33% to 37% in year 2011-2014. The sale remained unmoved at 10% from 2011-2013 and it further plunged to 8% in 2014. The graph illustrates that the sale of units above 700 continued to be the lowest. 5% units were sold in 2011 followed by 3% in 2012. Again the figure rose to 5% in 2013 but dropped back to 3% in 2014.

Figure 4: Revenue collection over the years

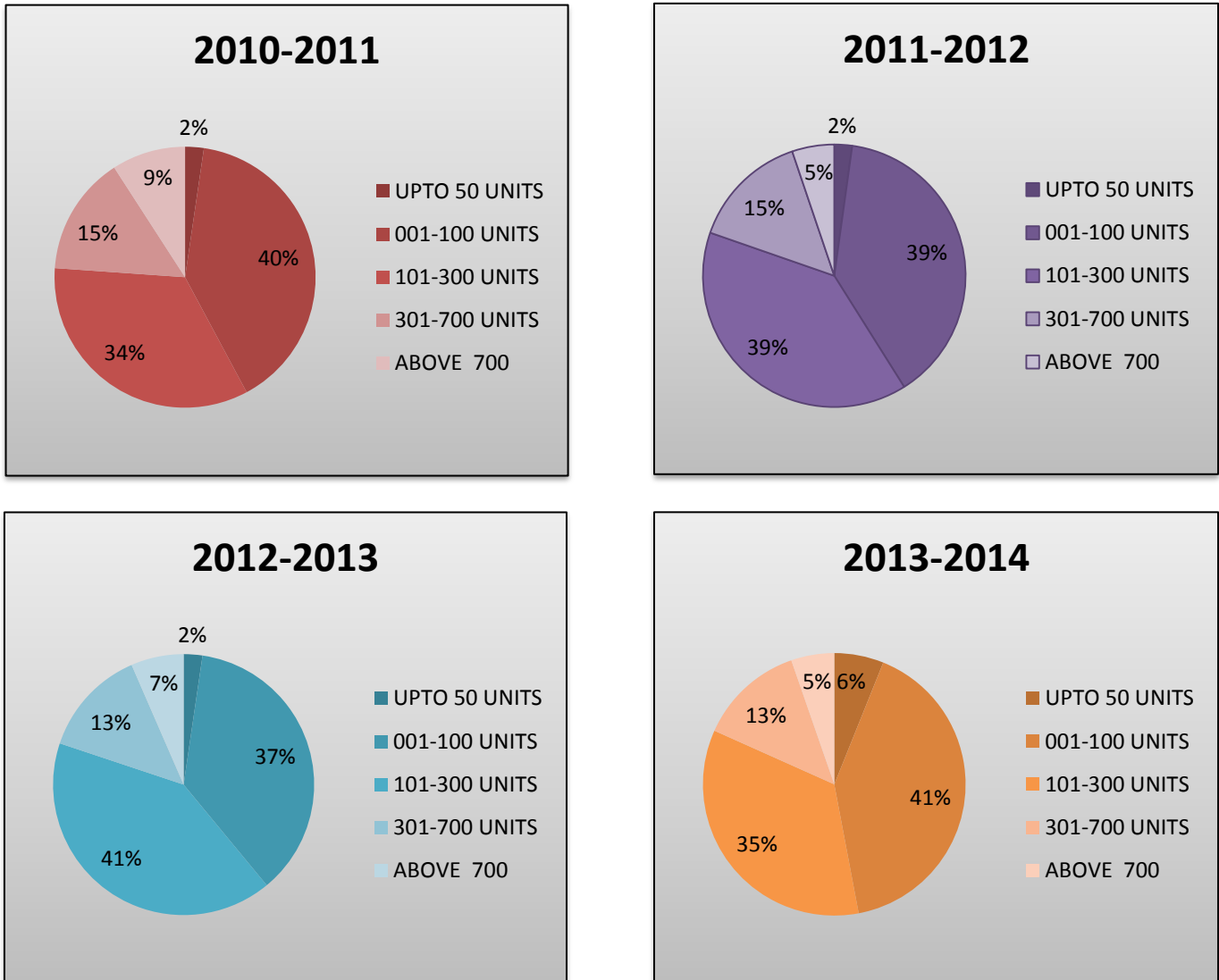


Figure 4 represents the year wise revenue collection. The biggest chunk of revenue is generated from 001-100 and 101-300 units which prove the point that major portion of electricity users falls under these categories. Almost 76% to 78% revenue is generated from these slabs collectively. 50 unit slab has the lowest contribution to the revenue. The total share in the revenue remained at 2% from 2010-2013 but eventually grew to 6% in 2014. 301-700 unit slab had 15% input in revenue from year 2010-2012. But it shrunk to 13% in the next two years. From 700 unit category the highest revenue was generated in 2010 at 9% which fell to 5% in 2011. Its share again rose to 7% in 2012-2013 but contracted back to 5% in 2014.

Table 1: Price Elasticity

TARIFF CATEGORY	E1 (2010-2011)	E2 (2011-2012)	E3 (2012-2013)
UPTO 50 UNITS	0.23 (Inelastic)	0.18 (Inelastic)	0.17 (Inelastic)
001-100 UNITS	0.05 (Inelastic)	0.43 (Inelastic)	∞ (Perfectly Elastic)*
101-300 UNITS	0.326 (Inelastic)	0.32 (Inelastic)	0.38 (Inelastic)
301-700 UNITS	0.123 (Inelastic)	0.46 (Inelastic)	0.9 (Inelastic)
ABOVE 700	1.49 (Elastic)	4.02 (Elastic)	1.13 (Elastic)

Table 1 shows the calculated elasticities. **The elasticities are calculated to find out how residential demand for electricity responds when unit prices show variation.** On the basis of the values the results are divided into elastic and inelastic types. Most of the results fall under the category of inelastic demand i.e. the effect of change in unit prices have a relatively small effect on the quantity of the electricity demanded. In less than 50 unit groups the price raise from 2 Rs. to 3 Rs. caused a slight fall in unit sales from 8% to 7%. Similarly under 100 units category a big increase in price from 8.7 Rs to 11 Rs triggered a slim fall in consumption of units from 43% to 42.7%. Thus, proving that demand is not reactive to price change.

*Demand is perfectly elastic since there is no change in unit price from 2012-2014

Few outcomes of our calculations are grouped as elastic i.e. changes in unit prices have larger effects on electricity consumption pattern. Quantities of units above 700 are all elastic. The increase in price from 13.30 Rs. to 16.50 Rs caused a major fall in unit sales from 5% to 3%. The further increase in prices caused even a bigger fall from 4.6% to 2% in year 2012 to 2014.

There has been a continuous increasing trend in the number of consumers and tariff rates. The swelling movement in demand is due to the rise in household income and production. The idea behind hike in the electricity tariff is to help government to generate revenue from the electricity consumers. Because electricity demand being inelastic in nature, economic law proves that when the price of an inelastic product increases the, total revenue increases. In Pakistan another reason for an increase in tariff rate is to recover the losses in revenues which occurred due to power theft and line losses (Haider, 2014).

Law of demand states that higher the price, the lower the quantity demanded and vice versa. Tariff could be an important tool for lessening the demand supply gap due to which Pakistan is facing a deep energy crisis. To shrink the electricity demand it is believed that increasing the unit price of electricity would help that's why the unit prices of electricity vary with different range of unit usage (Tariq et al. n.d.).

Conclusion:

The present study is conducted to find out impact of tariff increase on residential electricity consumption of IESCO users over the period 2010-2014. On the basis of our analysis we can conclude that a change in tariff rate has almost negligible impact on electricity consumption. It is evident from the results shown in Table 1 that consumption is not reactive to price changes. However the relation between price and consumption changes when number of units increases beyond certain level (above 700 Units). The demand no longer stays insensitive to price change and there is a major impact on consumption due to price variations.

The inelastic behavior of electricity users for tariff rate is due to the reason of monopoly of Power Company. One cannot simply disconnect from one power grid and connect to another when charges goes up. Moreover electricity has now become a necessity without which a comfortable life cannot be imagined. The findings suggest that because of the lack of alternatives to electricity, it is still utilized even under at increasing prices.

The insensitivity to price changes might disappear with the availability of more affordable forms of energy (Nasir et al. n.d.)

Tariff structure in Pakistan is based on cost plus basis [NEPRA].The cost includes generation cost, transmission cost and distribution cost. Due to the disorganizations of the distribution companies the losses in T & D adds unfair cost to the consumers. With every increase in loss there is an increase in consumer end tariff.

Another reason which forced the government to increase the electricity price is the shift from low cost natural to furnace oil for electricity generation. The costly energy source (Furnace oil) and its surging prices enforced the government to increase the electricity prices by 100 percent (Raza Ullah, 2014)

Rapidly increase in population, improvement in living standard of people; industrial development and expansion in houses are few reasons of continuous increase in electricity demand in spite of hike in electricity tariff in Pakistan.

Recommendations:

- Competition should be raised in electricity sector by encouraging the private sector.
- Tariff should be determined on the foundations of efficiency and productivity rather than on cost plus basis
- Electricity consumption and electricity price relation can be changed if cheap alternatives like coal and gas are made available.

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