



IMPORTANCE OF ENERGY SECTOR IN PRESENT WORLD
(AN EMPIRICAL STUDY BASED ON IMPORTANCE OF ELECTRICITY
IN SELECTED COUNTRIES)

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Abstract

There is direct relationship between input and the output. Quantum of the input directly affects the quantum of the output. This relationship is also true in case of economic performance of countries. But there are some differences in the performance of various economies. It may be due to the method of using of inputs or the difference in the role of inputs in various economies. Present manuscript is an attempt to enlighten the importance and role of electricity as an input in selected economies.

Introduction

The growth and operation of the modern economies is directly depending on the sources of energy. For development of economy and higher rate of growth, it is needed to strengthen the energy sector of the country. Need is the mother of invention. It is true for the energy sector of

the India. A well-developed sector has very less scope of the development but a less developed sector has much scope of development. Future of energy sector of India is very bright as India is producing only half of electricity requirement on the basis of GDP. Per capita electricity situation is very worse, but India is developing or growing about 7% to 8% per year. It is very fast rate of growth in present world. It is making various opportunities for various industries as well as for energy sector of India. The importance of energy sector for a developing country can be shown by the relationship of the Electricity and GDP of the country.

Objectives

Main objectives of study are as under.

1. To find out the degree of correlation between electricity consumption and GDP (PPP) in various group of economies.
2. Regression equation for electricity on GDP (PPP)
3. Regression equation for GDP (PPP) on Electricity.
4. Differences in relationship of Electricity and GDP (PPP) in undeveloped economy, developing economy and in Developed economy.
5. Ratio of GDP and Electricity consumed by various economies.

Research Methodology

Research is based on secondary data collected from various sources. Electricity consumption is taken as independent variable while Gross Domestic Production (PPP) is taken as dependent variable. GDP (PPP) is used in the study as it is better for international comparison. Countries are included in the study on convenience basis which are jointly representing more than 75% population of the world. Pearson correlation coefficient and regression equations are the main tools of the study. Accuracy of the study is depending on the accuracy of the data used in the study.

Data Presentation and Analysis

Table (1) - Electricity Usage and GDP (PPP) of countries

S.N.	Name of Country	(X) Electricity Usage (IN Billion kwh per year)	(Y) GDP (PPP) (In Billion USD)
1	China	5919	23194
2	U.S.A.	3913	19417
3	India	1002	9489
4	Japan	934	5420
5	Germany	533	4135
6	Russia	1065	3938
7	Indonesia	195	3257
8	Brazil	518	3216
9	United Kingdom	309	2905
10	France	431	2833
11	Mexico	238	2406
12	Italy	291	2303
13	Turkey	207	2082
14	South Korea	495	2030
15	Saudi Arabia	272	1796
16	Spain	234	1769
17	Canada	528	1753
18	Iran	218	1535
19	Australia	224	1251
20	Thailand	164	1226
21	Egypt	143	1198
22	Taiwan	250	1177
23	Nigeria	24	1124
24	Poland	142	1114
25	Pakistan	82	1061
26	Malaysia	131	922
27	Argentina	116	913

28	Netherlands	108	907
29	Philippines	91	879
30	South Africa	212	762
Total		18989	106012

Source

https://en.wikipedia.org/wiki/List_of_countries_by_electricity_consumption

(visited as on 16.09.017 at 10:30

IST)&[https://en.wikipedia.org/wiki/List_of_countries_by_GDP_\(PPP\)](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP)) (Visited

as on 16.09.017 at 10:00 IST)

Above table is showing electricity usage and gross domestic production (Adjusted with USD in purchasing power parity) of selected countries. Electricity usage is shown in billion units (KWH) and GDP is shown in billion USD.

Table (2) – Computation for Pearson’s correlation and regression equation and other calculations.

S.N.	Name of Country	(X)	(Y)	(X ²)	(Y ²)	(X.Y)	(Y/X) Ratio of GDP and Electricity
1	China	5919	23194	35034561	537961636	137285286	3.92
2	U.S.A.	3913	19417	15311569	377019889	75978721	4.96
3	India	1002	9489	1004004	90041121	9507978	9.47
4	Japan	934	5420	872356	29376400	5062280	5.80
5	Germany	533	4135	284089	17098225	2203955	7.76
6	Russia	1065	3938	1134225	15507844	4193970	3.70
7	Indonesia	195	3257	38025	10608049	635115	16.70
8	Brazil	518	3216	268324	10342656	1665888	6.21
9	United Kingdom	309	2905	95481	8439025	897645	9.40
10	France	431	2833	185761	8025889	1221023	6.57
11	Mexico	238	2406	56644	5788836	572628	10.11
12	Italy	291	2303	84681	5303809	670173	7.91

13	Turkey	207	2082	42849	4334724	430974	10.06
14	South Korea	495	2030	245025	4120900	1004850	4.10
15	Saudi Arabia	272	1796	73984	3225616	488512	6.60
16	Spain	234	1769	54756	3129361	413946	7.56
17	Canada	528	1753	278784	3073009	925584	3.32
18	Iran	218	1535	47524	2356225	334630	7.04
19	Australia	224	1251	50176	1565001	280224	5.58
20	Thailand	164	1226	26896	1503076	201064	7.48
21	Egypt	143	1198	20449	1435204	171314	8.38
22	Taiwan	250	1177	62500	1385329	294250	4.71
23	Nigeria	24	1124	576	1263376	26976	46.83
24	Poland	142	1114	20164	1240996	158188	7.85
25	Pakistan	82	1061	6724	1125721	87002	12.94
26	Malaysia	131	922	17161	850084	120782	7.04
27	Argentina	116	913	13456	833569	105908	7.87
28	Netherlands	108	907	11664	822649	97956	8.40
29	Philippines	91	879	8281	772641	79989	9.66
30	South Africa	212	762	44944	580644	161544	3.59
Total		18989	106012	55395633	1149131504	245278355	Average = 5.58

Source-Calculated from table (1)

Above table is showing basic calculation, used for analysis of data. Electricity usage is taken as independent variable and it is denoted by X. GDP (PPP) is taken as dependent variable and it is denoted by Y.

Result of Analysis

Average of (X) = 18989/30

= 633 Billion KWH,

Average of (Y) = 106012/30

= 3534 Billion USD

N = 30

Standard Deviation of (X)

= 1202.44633 Billion KWH

Standard Deviation of (Y)

= 5081.05Billion USD

C.V. (X) (Electricity Usage) = 189.96 %

C.V. (Y) (GDP) = 143.78 %

Pearson's Correlation Coefficient (r) = 0.9721

byx = 4.107722 and bxy = 0.230049

Regression Equation (Y on X)

$Y = 4.107722 * X + 934$

Regression Equation (X on Y)

$X = 0.230049 * Y - 180$

Table (3) – Top 3 Countries having Highest Ratio of GDP and Electricity usage

S.N.	Name of Country	((X) Actual Electricity Usage (IN Billion kwh per year))	(Y) GDP (PPP) (In Billion USD	Ratio of GDP and Electricity usage (Y/X)
1	Nigeria	24	1124	46.83
2	Indonesia	195	3257	16.70
3	Pakistan	82	1061	12.94

Source-Calculated from table (2)

Table (4) – Top 3 Countries having Lowest Ratio of GDP and Electricity usage

S.N.	Name of Country	((X) Actual Electricity Usage (IN Billion kwh per year))	Y) GDP (PPP) (In Billion USD	Ratio of GDP and Electricity usage (Y/X)
1	Canada	528	1753	3.32
2	South Africa	212	762	3.59
3	Russia	1065	3938	3.70

Source-Calculated from table (2)

Table (5) – Top 3 Countries nearest to Moderate (Average) Ratio of GDP and Electricity usage

S.N.	Name of Country	((X) Actual Electricity Usage (IN Billion kwh per year))	Y) GDP (PPP) (In Billion USD	Ratio of GDP and Electricity usage (Y/X)
1	Australia	224	1251	5.58
2	Japan	934	5420	5.80
3	U.S.A.	3913	19417	4.96

Source-Calculated from table (2)

Interpretation

1. The degree of correlation between electricity consumption and GDP (PPP) is Very high i.e. is 0.9721, It means GDP of various economy is highly related to production and consumption of electricity.
2. Regression equation for Electricity on GDP (PPP) is calculated as $X = 0.230049*Y - 180$
3. Regression equation for GDP (PPP) on Electricity is calculated as $Y = 4.107722*X + 934$
4. In case of undeveloped economies Ratio of GDP and Electricity consumed is very high, which is showing least usage of electricity in production of GDP in undeveloped economies, while in case of developed economies Ratio of GDP and Electricity consumed is very low, which is showing higher usage of electricity in production of GDP in undeveloped economies.

5. Ratio of GDP and Electricity consumed are as under. For undeveloped economies it is above 10 in most of the cases. It is 3 to 5 for developed economies in most of the cases. It is 5 to 7 for other countries.
6. Ratio of GDP and Electricity consumed on Average basis is **5.58**, on average basis GDP (PPP) of USD 5.58 is produced is related with the production of one unit (Kwh) of electricity. OR GDP (PPP) valued to USD 5.58 is related with usage of one unit (Kwh) of electricity.
- 7.

Application of result (regression equation) on India

Actual electricity consumed in India= 1002 Billion Kwh per year

Regression Equation (X on Y): $X = 0.230049 * Y - 180$

Standard Electricity consumption according to regression equation =
 $0.230049 * 9489 - 180 = 2003$ Billion Kwh per year

In the context of India actual electricity consumed is 1002 Billion Kwh per year. While standard electricity consumption on the basis of regression equation, it is 2003 Billion Kwh. It is showing that India is consuming only one half of electricity on the basis of GDP (PPP) standards.

Main Reasons of less (less than average of the world) consumption of electricity in India

1. **Rural Population** - In India only 1/3 population is residing in urban areas. As the majority of the population of India is residing in rural areas, India is consuming less electricity on the basis of GDP (PPP).
2. **Poverty** -About 25% of Indian population is below the poverty line. Their (BPL population) per capita earning is only one USD. It affects their daily demand of Goods and services badly. It also decreases their demand of electricity also.
3. **Agriculture based economy and less Industrial development** – India’s industrial sector provides employment about to ¼ of the population of the country. About half of the

population is employed in primary sector of the country. Less industrial growth also reduce the demand of electricity in India.

4. **Lack of modern technology** - Labor intensive technique is the technique of the production in India. It employs heavy labor force but less use electricity for production. It is also responsible for less use of electricity in India.

Conclusion

Electricity has become the essential input for each economy. No economy can operate without use of electricity. It is just like as blood for the body of modern economies. It is used for production as input as well as for direct consumption. There is very high correlation between electricity and GDP; it is showing highly dependence of production on electricity in present world. The main reason of importance of electricity in present world is its movability. Easy movement and usage of electricity made it best mode of usage of energy. India is growing about 7% to 8% per year. It is very fast rate of growth in present world. It is making various opportunities for various industries as well as for energy sector of India. Finally it can be said that future of the energy sector is very bright in India.

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