



Sustainable Energy Consumption and Production in the Power Sector - A Study from the Developing Country Context

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ABSTRACT

Energy is treated as a key source of economic development because production and consumption of different activities involve energy as a vital ingredient. In order to improve energy consumption patterns, it is vital to improve productivity and efficiency to transfer energy from the point of sufficiency to the point of deficiency. Developing and emerging economies like India face numerous energy challenge to meet the basic requirements of billions of people. Present study tries to assess sustainable energy consumption and production in the power sector from developing country context.

INTRODUCTION

Energy is the most essential indicator of sustainable economic growth. The usage of energy resources is indispensable for the existence of human beings on earth. By providing energy resources to satisfying the basic requirements of needy people implies the responsibility to produce and care our resources effectively. The sufficient supply of various energy forms is the key requisite for accelerating the sustainable economic growth. If the production and consumption of energy is not balancing that endanger the sustainability of nature and also threatens the human survival.

Sustainable energy is defined as energy that minimizes harm to the environment and protects energy sources for current and future generations through its production, supply, and consumption. Thus, in order to protect the environment and guarantee energy supplies for future generations, sustainable modes

of energy production and use are crucial. All renewable energy sources, including electricity, biomass, geothermal, wind and solar energy, are considered for most of sustainable energy. The evaluation of power generation systems' sustainability also becomes essential and is expected to be crucial for all productive applications. The guiding idea for the power sector's regulations is sustainable power access for all sectors of the economy. Power comes from both practical non-conventional and traditional sources. Approximately 80% of India's energy needs

REVIEW OF LITERATURE

To provide necessary background for the present study, an attempt is made here to review briefly important research studies.

Behera (2015) conducted a study on the topic “Energy Consumption and Economic Growth in India: A Reconciliation of Disaggregate Analysis”. He tries to study the relationship between energy consumption and economic development. For that purpose he collected data from 1970-2011. For testing relevant data Granger Causality test was used. He suggested that reduction in natural gas and oil consumption is essential for economic growth in the country.

Mallick (2009) conducted a study on the topic “Examining the Linkage between Energy Consumption and Economic Growth in India”. Various statistical tests like Granger Causality Test and Variance Decomposition Analysis of Vector Auto-regression (VAR) were used to examine linkage between energy consumption and economic growth. Study focused on natural gas and crude oil consumption. On the basis of application of these two statistical tools, the study suggested for reducing crude oil and natural gas consumption at least in the consumption sectors for achieving higher rate of growth in the economy.

Mainali and Silveria, (2015) conducted a study on the topic” Using a sustainability index to assess energy technologies for rural electrification.” They tried to assess the sustainability of 10 rural electrification alternatives. For that purpose energy technology sustainability index (ETSI) was analysed through principal component analysis (PCA). The sustainability was assessed using eleven variables like technical, social, environmental, economic, and institutional aspect. Secondary data was used for this purpose. The study concluded that better sustainability performance is needed in all the power generation sectors for their successful implementation all the projects.

Narula (2016) conducted a study on the topic “Is Sustainable Energy Security of India Increasing or Decreasing?” For the descriptive analysis he divided energy system into different categories such as supply, conversion, distribution, demand subsystems. He found that the demand subsystem is the major factor to attain sustainable energy and economic development in India.

Paul and Bhattacharya (2004) conducted a study on the topic “Causality between Energy Consumption and Economic Growth in India: a Note on Conflicting Results”. The study tries to examine the causal relationship between energy consumption and economic growth in India. For studying the relationship, Engle Granger Co-integration Approach combined with the standard Granger Causality Test was applied. The study found that the same direction of causality existed between energy consumption and economic growth.

Rufael (2010) conducted a study on the topic “Bounds Test Approach to Co-integration and Causality between Nuclear Energy Consumption and Economic Growth in India”. He tries to analyse the dynamic relationship between economic growth, nuclear energy consumption, labour and capital. He mentioned in his study that there was a short- and a long-run relationship between nuclear energy consumption and economic growth.

STATEMENT OF THE PROBLEM

India has a diverse mix of power sources, including **coal, natural gas, oil, hydro, nuclear power, wind, solar, and even agricultural and domestic waste**. The demand for electricity in India is increasing rapidly. Yet the factor remains the same, several power plants in India are old and are struggling to work efficiently and even to survive . But one of the major problem is 80 per cent of power generation in India relies on thermal power that derived from fossil fuels like natural gas, coal and diesel. Inadequacy of fossil fuels affects power generations. In these circumstances it is necessary to assess sustainable energy consumption and production in the power sector.

SIGNIFICANCE OF THE STUDY

Economic growth causes optimal energy consumption or optimal energy consumption acts as a stimulus for economic growth. Energy is the most important indicator of sustainable development. In India's case, the idea of energy security is now in its infancy. The relationship between the availability of natural resources for energy consumption and national security is known as energy security. In order to protect the environment and guarantee energy supplies for future generations, sustainable types of

energy production and consumption are crucial.. Unsustainable energy consumption increases environmental damages and not preserves energy sources for present and future generations. In these circumstances it is necessary to assess sustainable energy consumption and production in the power sector.

OBJECTIVES OF THE STUDY

An objective of the present study is to assess sustainability of energy consumption and production in the power sector.

HYPOTHESIS OF THE STUDY

Hypothesis developed for the study is there is an increasing trend in the growth of power system.

METHODOLOGY

Present study is both descriptive and analytical in nature. Present study is based on secondary data. The Secondary data were collected from economic review, Journals, Magazines, Books, Publications and Reports. For a meaningful analyses data were collected for a past five year period from 2017-18 to 2021-22 from Kerala, the southern State of India. The data collected for the study were processed and analysed with the help of EXCEL. For analyzing the quantitative data AGR and AAGR were used.

RESULTS AND DISCUSSION

The mass production and consumption of energy resources consequently damage the ecology. There is an intimate link between energy and the environment. All energy resources are linked to a certain negative or positive environmental impact on the basis of the treatment of energy resources. An increase in the consumption of energy resources generates more carbon dioxide emissions directly into the environment. The Ministry of power is at work for replacing coal based power generation with renewable sources by introducing large number of thermal units with a view to avoid power crisis for future generations. In such a situations it is indispensable to study about sustainable energy consumption and production in the power sector.

Table No: 1
Growth of Power System during 2017-22

Particulars		Installed Capacity (MW)	Maximum Demand (MW)	Generation per annum (MU)	Annual Sales (MU)	per capita consumption (KWh)	Export per annum (MU)	Import per annum (MU)	Total revenue per annum (₹ in crore)
2017-18	N	2975.56	3884	5474.47	21159.19	613	166.89	18677.46	12260
	AGR	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
2018-19	N	3000.35	4242	7593.12	21750.25	626	1030.2	17982.15	14002.94
	AGR	0.833	9.217	38.701	2.793	2.121	517.293	-3.723	14.216
2019-20	N	3063.15	4316	5722.81	23058.91	657	323.84	20827.12	14718.59
	AGR	2.093	1.744	-24.632	3.0.16	4.952	-68.565	15.821	5.111
2020-21	N	3029.65	4284	7057.9	22540.3	619	633.39	18708.4	15169.39
	AGR	-1.094	-0.741	23.329	-2.249	-5.784	95.587	-10.173	3.063
2021-22	N	3145.82	4380.04	9742.29	23983.42	676	2244.73	19156.36	15664.92
	AGR	3.834	2.242	38.034	6.402	9.208	254.399	2.394	3.267
AAGR		1.417	3.116	18.858	3.241	2.624	199.679	1.08	6.414

Source: Economic Review

Table No.1 depicts the clear picture of the various aspects concerned with growth of power system during 2017-22. It can be seen that the highest AAGR is recorded in regard to export per annum with the value of 199.679 MU, this is followed by power generation (18.858 MU), total revenue (6.414 Rs.), annual sales (3.241 MU), maximum demand (3.116 MW), per capita consumption (2.624 Kwh), installed capacity (1.417 MW), and import per annum (1.08 MU).

The annual growth rate of installed capacity of power from 2017-18 to 2018-18 is 0.833 MW. The annual growth rate came to a maximum of 2.093 MW in 2019-20. There after it declined in 2020-21

at -1.094 MW and it increased by the end of 2021-22 at 3.834. The annual growth rate of maximum demand of power reached to a maximum of 9.217 MW in 2018-19. Then it is declined to 1.744 MW in 2019-20. Again it is declined to -0.741 MW in 2020-21 and it increased by the end of 2021-22 at 2.242 MW.

When we examining the annual growth rate of power generation, it can be seen that the value came to a maximum of 38.701 MU in 2018-19. There after it declined in 2019-20 at -24.632 MU and it increased by the end of 2020-21 at 23.329. During the last year it stood at 38.034 MU. It is clear that annual growth rate of sales stood at 2.7934 MU in 2018-19. By the end of 2019-20 it reached to 6.0168 MU. There after it declined at -2.2491 MU in 2020-21 and it increased by the end of 2021-22 at 6.4024 MU. Similarly annual growth rate of per capita consumption of power stood at 2.121 KWh in 2018-19. By the end of 2019-20 it reached to 4.952 KWh. There after it declined at -5.784 KWh in 2020-21 and it increased by the end of 2021-22 at 9.208 KWh.

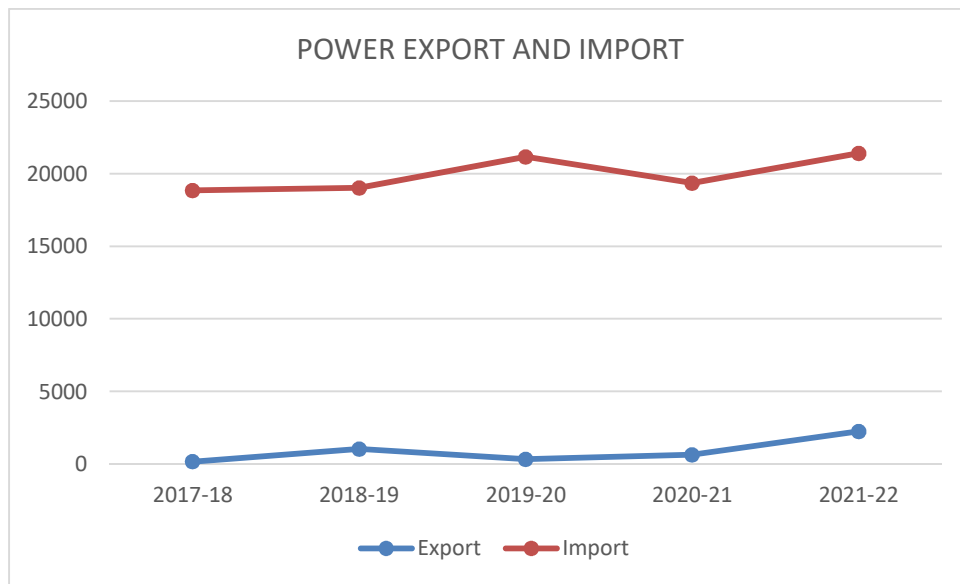


Figure No: 1 Power export and import

From the above figure it can be seen that annual growth rate of export of power stood at 517.293 MU in 2018-19. By the end of 2019-20 it declined to -68.565 MU. There after it increased at -95.587 in 2020-21 and again it increased by the end of 2021-22 at 254.399 MU. In case of annual growth rate of

import of power, from 2017-18 to 2018-18 is -3.723 MU. There after it increased at 15.821 MU in 2019-20. By the end of 2020-21 it declined to -10.173 MU. There after it increased at 2.394 in 2021-22.

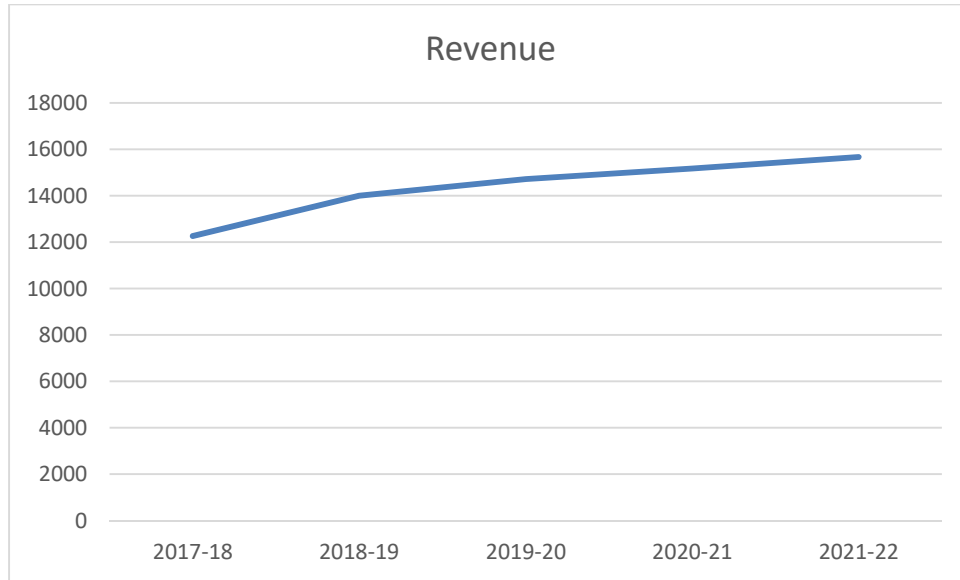


Figure No: 2 Total Revenue from power sector

From the above figure it is clear that the annual growth rate of total revenue came to a maximum of 14.216 crore in 2018-19. Growth rate is more or less stable during the last 3 years.

CONCLUSION

The energy consumption in India has increased fastest rates due to population growth and economic development. India has great possibility for energy renewal that balancing the linkage between energy demand and energy supply. This effort tries to take advantage of energy saving with improved technologies for the conservation of energy for future generations. The growing need for energy in India put pressure on its limited resources and optimal use of these resources. The study examined that demand for electricity or power in the developing country like India is increasing rapidly. So more power plants need to be built to meet this demand.

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