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Research Article



A Study on Trends in Energy Supply and Demand in India (2015–16 To 2024–25)

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Abstract

Energy has always been of key importance for the sustenance of life. It is more so for present-day living. It is of crucial significance for furthering the development process in several ways. The prime concern of this study is on energy resources – supply and demand factors in India since 1991. The trend of energy supply and demand in India is analysed across the central, state, and private sectors. The total energy generation in the country has shown a significant and continuous increase over time. In recent years, the total energy requirement has risen from 11,14,408 MU in 2015–16 to 16,93,959 MU in 2024–25, while energy availability has also increased from 10,90,360 MU to 16,92,369 MU during the same period. This reflects substantial growth in overall power generation capacity contributed by the central, state, and private sectors. At the same time, the energy shortage has declined sharply from 24,048 MU (2.1%) in 2015–16 to 1,590 MU (0.1%) in 2024–25 in India. The study has two objectives: to track the trend of energy supply in India and the trend of energy demand in India. Data are collected from the secondary data available from the Ministry of Power in India. Economic Appraisal was published in various years by the Government of India. The reasons for the study continued high energy demand, increased economic activities and rapid economic development in India.

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KEYWORDS: Energy Demand, Energy Supply, Peak electricity, Climate change, Green Economy.

1. INTRODUCTION

Energy is a key input in economic growth. There is a close link between the availability of energy and the future growth of a nation. However, in a developing country like India, the greater the availability of energy, the greater its shortage. Despite the increase in power generating capacity from 2000 MW in 1950 to 91,190 MW by the end of 2000, the peak shortage is expected to touch 30 per cent.

Energy is consumed in a variety of forms in India. Fuel wood, animal waste and agricultural residues are traditional sources of energy that continue to meet the bulk of energy requirements in rural India. These non-commercial fuels are gradually getting replaced by commercial fuels such as coal, lignite, petroleum products, natural gas and electricity. Commercial fuel accounts for 60 per cent of the total primary energy supply in India, with the remaining 40 per cent coming from non-commercial fuels. Of the total commercial energy produced in the form of power or electricity, 69% is from coal or thermal power, 25% is from hydel power, 2% is from nuclear power, 4% is from diesel and gas, and less than 1% is from non-conventional sources like solar, wind, bio-gas, mini hydel, etc. Petroleum and its products are the other large sources of energy.

Statement of the problem:

Climate change, renewable energy, energy efficiency, and the green economy are issues that are faced by everyone, including India. Many of today's global problems arise from the availability and use of natural resources, which depend on the size of the human population, putting pressure on them. But population is more than just an external factor influencing energy consumption. Energy consumption patterns can also influence population growth through their effect on the desired number of births in a family and the relative benefits and costs of fertility. Energy is linked to urbanisation through its implications for land use, transportation, industry, construction, infrastructure, domestic appliances and products, biomass consumption, and gender. Energy strategies can be designed to improve the urban environment, particularly for transport, industrialisation, mitigation of heat island effects, and construction. Although energy devices (houses, vehicles, appliances) have become much more efficient in industrialised countries, the number and use of these devices have increased markedly. If appliances and their use (the material basis of lifestyles) are taken as determinants of energy consumption, then strategies can be devised based on reducing the number and use of energy-intensive appliances. Almost every industrialised country has poor and disadvantaged populations. But the energy aspects of poverty are radically different for industrialised and developing countries. Energy exacerbates poverty in industrialised countries, for example, through the disconnection of energy services or the absence in cold countries of universal, affordable warmth.

Different energy sources

The Energy Resources are classified into two ways, i.e., Renewable energy sources and non-Renewable energy sources.

- ❖ The Renewable energy from various sources, wind energy, solar energy, small hydro energy, geothermal energy and

biomass. Will not pollute the environment and can be rapidly consumed to mainly make electricity.

- ❖ The supply of non-renewable energy sources is limited, including coal, lignite, Petroleum, and Natural gas. It cannot be replaced, are used to make electricity to heat our homes, to move our cars and to manufacture all kinds of products.

Importance of energy and economic development:

The energy is at the core of economic and social activity in our country. The energy is improving efficiencies in agriculture, leading to an increase in the food supply while minimising the amount of labour required to cultivate crops. The improving agriculture efficiencies leads to population growth and an available labour force. The energy growth is directly linked to well – being and prosperity across the globe. Meeting the growing demand for energy in a safe and environmentally responsible manner is a key challenge. The energy in everyday lives, from Cars to cell phones, from pharmaceuticals to plastics and from air conditioning to Water heating, energy is part of people's Lives more than ever before. The energy in everyday lives, in addition, many familiar elements of modern life would not exist without the Plastics, chemicals, and Fertilizers made from Oil and Natural gas. In modern energy life, there are seven billion people on earth who use energy each day to make their lives richer, more productive, safer and healthier.

2. OBJECTIVES OF THE STUDY

1. To study the trend of energy demand position in India.
2. To study the trend of energy supply position in India.
3. To examine the relationship between energy consumption and Economic development.

3. METHODOLOGY

This study pertains to the energy resources supply and demand position in India. The data are collected from secondary sources, namely, records of the Ministry of Power and Economic Appraisal published in various years by the Government of India. The study covers a period of ten years from 2015 to 2025.

Energy crisis in India

The economic development to take place, quality of life is to be improved, we should have enough energy like electricity, petroleum, etc. Ever since the invention of the engine, mankind has become increasingly dependent on energy sources like coal, petroleum and natural gas. Of late, uranium too is being increasingly used to generate nuclear power. The energy crisis that is looming large is to be averted in a few hundred years; we should switch over to renewable energy sources like solar power, biomass power and wind power in a big way. The source of energy or fuels that are mined from the earth are renewable and may be exhausted within a few more centuries if we conserve these precious energy sources and ensure that they last longer. We should increasingly use renewable sources of energy like solar power, wind power and so on. Cutting down the petroleum imports to conserve the foreign exchange and not putting renewable energy sources in place before doing so, our country will face a major energy crisis, as coal alone cannot

take care of our energy needs, so the switch over to the renewable energy sources is a better option.

Table No 1: Trend in energy supply and demand position in India (MU = Million Units)

Year	Energy Requirement (MU)	Energy Availability (MU)	Energy Shortage (MU)	Energy Shortage (%)
2015-16	1114408	1090360	24048	2.1
2016-17	1142929	1135334	7595	0.7
2017-18	1213326	1204697	8629	0.7
2018-19	1274595	1267526	7069	0.6
2019-20	1291010	1284444	6566	0.5
2020-21	1275534	1270663	4871	0.4
2021-22	1379812	1374024	5787	0.4
2022-23	1513497	1505914	7583	0.5
2023-24	1626132	1622020	4112	0.3
2024-25	1693959	1692369	1590	0.1

Sources: Ministry of Power and the Central Electricity Authority (CEA) (Annual Report 2025-26)

Table 1 presents the trend in energy demand and supply in India from 2015–16 to 2024–25. The energy requirement increased steadily from 1114408 MU in 2015–16 to 1693959 MU in 2024–25, showing a continuous rise in electricity demand. Similarly, energy availability also increased from 1090360 MU to 1692369 MU during the same period, indicating improvements in power generation and supply.

However, a gap between demand and supply existed throughout the period. The energy shortage was highest in 2015–16 at 24048 MU (2.1%). It then declined significantly to 7,595 MU (0.7%) in 2016–17 and remained around 0.7% to 0.5% up to 2019–20. In 2020–21, the shortage further reduced to 4871 MU

(0.4%), and a similar level was maintained in 2021–22 (5787MU, 0.4%). A slight increase is observed in 2022–23 with 7,583 MU (0.5%), but it again declined to 4112 MU (0.3%) in 2023–24. The lowest shortage was recorded in 2024–25 at 1590 MU (0.1%), indicating a near balance between demand and supply.

Overall, the table shows that although electricity demand has increased significantly over the years, the energy shortage has reduced drastically from 2.1 per cent to 0.1 per cent, reflecting improved efficiency, increased generation capacity, and better management in the power sector in India.

Figure 1: Trend in energy supply and demand position in India (2015 to 2025)

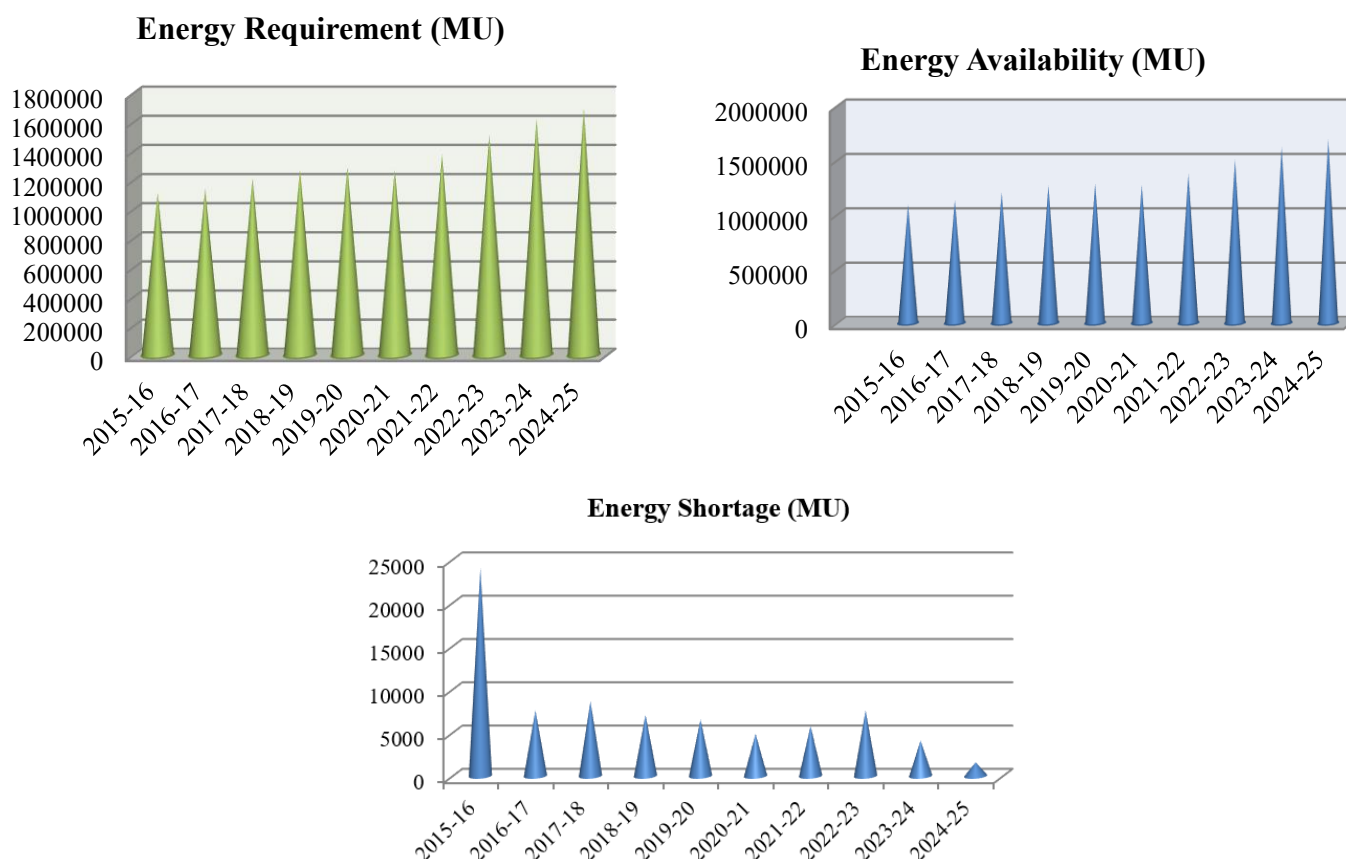


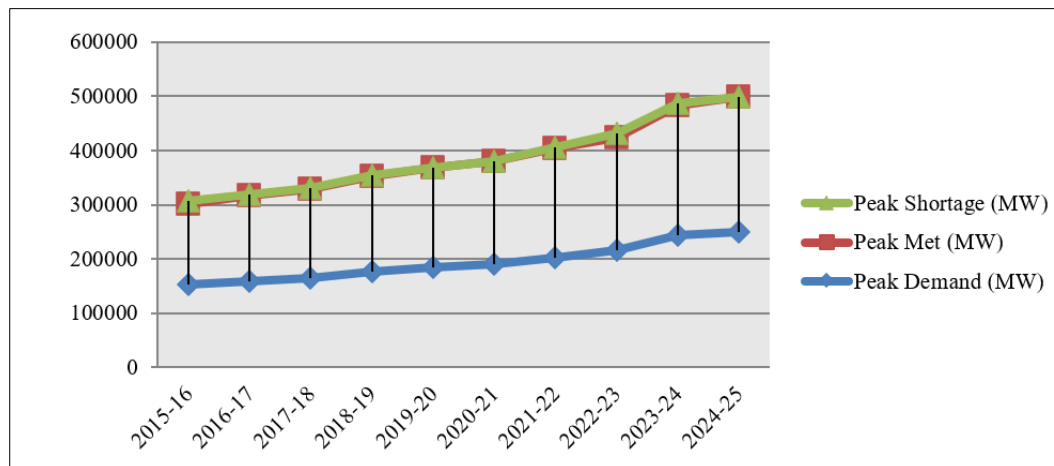
Table No: 2: Trend in the energy supply and demand position during peak period in India (MU = Million Units)

Year	Peak Demand (MW)	Peak Met (MW)	Peak Shortage (MW)	Peak Shortage (%)
2015-16	153366	148463	4903	3.2
2016-17	159542	156934	2608	1.6
2017-18	164066	164066	3,316	2.0
2018-19	177022	175528	1494	0.8
2019-20	183804	183804	1271	0.7
2020-21	190198	189395	802	0.4
2021-22	203014	200539	2475	1.2
2022-23	215888	207231	8653	4.0
2023-24	243271	239931	3340	1.4
2024-25	249856	249854	2	0

Sources: Ministry of Power / Press Information Bureau (PIB) (data from 2024-25 is up to February 2025)

Table 2 shows the peak demand and supply trend in India from 2015–16 to 2024–25. Peak demand increased from 153,366 MW to 249,856 MW, while peak supply also improved significantly. The peak shortage declined from 4,903 MW.

(3.2%) in 2015–16 to almost 0% in 2024–25, despite some fluctuations, especially in 2022–23 (8,653 MW, 4.0%). Overall, the data indicates rising demand but improved efficiency in meeting peak electricity requirements in India.

**Figure 2:** Trend in the energy supply and demand position during the peak period in India

Energy demand and GDP:

Energy demand is closely associated with economic development, as reflected in Gross Domestic Product (GDP) in India. In recent years, India's nominal GDP has increased significantly, reaching about 357.14 lakh crore in 2025–26, compared to much lower levels in earlier periods. Correspondingly, energy demand has also shown a substantial rise, with total electricity requirement increasing to around 1693959 MU in 2024–25, as seen in recent data. This simultaneous growth in GDP and energy consumption clearly indicates a strong positive correlation between economic expansion and energy demand. As industrialisation, urbanisation, and infrastructure development accelerate, the electricity demand continues to rise, emphasising the crucial role of the energy sector in sustaining economic growth.

Findings and Suggestion:

1. The study finds that energy requirement in India increased from 1114408 MU (2015–16) to 1693959 MU (2024–25), while availability also improved. The energy shortage declined from 2.1% to 0.1%, indicating better supply, though demand continues to grow.

2. The study finds that peak demand in India increased from 153,366 MW (2015–16) to 249,856 MW (2024–25), while peak demand met also improved significantly. The peak shortage declined from 3.2% to nearly 0%, despite some fluctuations, indicating improved capacity to meet peak electricity demand.
3. The study finds a strong positive relationship between energy demand and economic growth in India. As GDP increased to 357.14 lakh crore (2025–26), electricity demand also rose to 1693959 MU (2024–25), indicating that economic expansion significantly drives energy consumption.

4. CONCLUSION

The paper examined the trends in energy resources- supply and demand position in India. The energy sector in India is characterised by a shortage. Therefore, there exists a huge challenge in front of power companies to produce, regulate and integrate the power system in India. The increase in energy consumption shows a high demand for energy in the future. The energy supply and demand are also increasing in absolute terms, so planned storage is needed to meet this challenge in the future.

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