ENERGY SECURITY IN INDIA

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Abstract: ***India is a country with more than 1.4 billion people accounting for more than 18% of world's population. India has 28 states and 7 union territories. It faces difficulty in providing adequate and sustainable energy supplies to users at a reasonable cost. It is anticipated that India's nominal GDP will exceed US $3 trillion by March 2020. The annual growth rate of nominal GDP during the period is stupendous 7.2%. Energy Security has long term aspects in a country's economy and growth. Integrated Energy Policy Report of Planning Commission of India, 2006, estimate the country is to progress on the path of this sustained GDP growth rate during the next 25 years, it would imply quadrupling of its energy needs over 2013-14 levels with a six-fold increase in the requirement of electricity and quadrupling in the requirement of crude oil. India has one of the world's fastest growing energy markets and is expected to be the second largest contributor to the increase in global energy demand by 2035, accounting for 18% of the rise in global energy consumption. India has increasing energy demands and depleting fossil fuel reserves, the country has aimed to expand its renewable and nuclear power industries.***

Keywords: Energy Security, Energy demand-supply, Renewable energy, Dependency, Growth, Power Generation.

I. INTRODUCTION

Energy security is always defined in terms of reasonable assurance of access to energy and relevant technologies with an ability to cope with sudden shocks. Dynamic linkages between energy security, foreign direct investment (FDI), economic output, carbon emissions, and trade openness in India spanning the period from 1978 to 2016 in a multidimensional framework based on the theoretical premise of an Environmental Kuznets Curve. Econometric modelling on time series based on the ARDL model and VECM Granger causality tests are employed for this purpose. The process outcome confirms the presence of a relationship and finds a strong energy-output. Increase in FDI results in a 0.013% reduction in energy use. Energy use is found by output, carbon emissions, FDI and trade openness for coming future. The Government of Indian aimed to galvanize FDI inflow in the renewable energy sectors by adequate facility provide to investors to achieve favourable outcomes and ensure sustainable economic development [1].

Financial year from 2002 to 2012, the energy security index has increased by around 10% which indicates a growth in the sustainability and security of the energy demand. Energy Security index is around 0.7 (against aimed target of1.0), this indicates a large scope for improvement in the performance of the India's energy demand sub-system [2]. The world's energy demand is growing day by day around 33 percent during the next 15 years and by 45 percent in the next 20 years. India and China, these two Asian countries accounted for huge increases in energy demand. India's energy resources and needs, particularly in terms of oil and gas satisfy its own demand. India is taking to meet the looming energy crisis and to assure security of supply by diversification. It then examines India's current approach to renewable energy, including nuclear, and concludes with some policy suggestions [3]. Energy security does not mean complete energy independence, it only means an ability to meet reasonable requirements with reasonable assurance of stable supply or an ability to pay for import needs. According to the Twelfth Plan (12 FYP) projections, total domestic energy production will reach 669.6 million tonne of oil equivalent (MTOE) by 2016-17 and 844 MTOE by 2021-22. Import dependence for coal is also projected to increase from 18.8% in 2011-12 to 22.4% by the end of the Twelfth Plan [4]. It is further estimated that import dependence for coal, liquefied natural gas (LNG), and crude oil taken together in the terminal year of the Twelfth Plan is likely to remain at the Eleventh Plan level of 36% [5]. According to the Ministry of Statistics and Programme Implementation (MOSPI) Flash Report for February 2014, of 239 central-sector infrastructure projects costing 1000 crore and above,99 are delayed with respect to the latest schedule and 11 have reported additional delays with respect to the date of completion reported in the previous month. The additional delays in respect to projects relating to the petroleum, power, steel, and coal sectors are in the range of 1 to 26 months. The total original cost of implementation of these 239 projects was about 7,39,882 crore and their anticipated completion cost is likely to be 8,97,684 crores, implying an overall cost overrun of 1,57,802 crore (21.3% of the original cost). The expenditure incurred on these projects till February 2019 was 4,10,684 crores, which is 45.7% of the total anticipated cost [6].

II. POWER GENERATION & PRESENT SCENARIO

Electricity generation by power utilities during 2021-22 was targeted to go up by 6.9% to 975 billion units. The growth in power generation during 2020-21 (April-March) was 6.0%.as compared to 4,0 % during April 2018 to March 2019.Generation capacity as Jan 2022 as below 3rd largest producer of electricity in the world 4th biggest consumer [7].

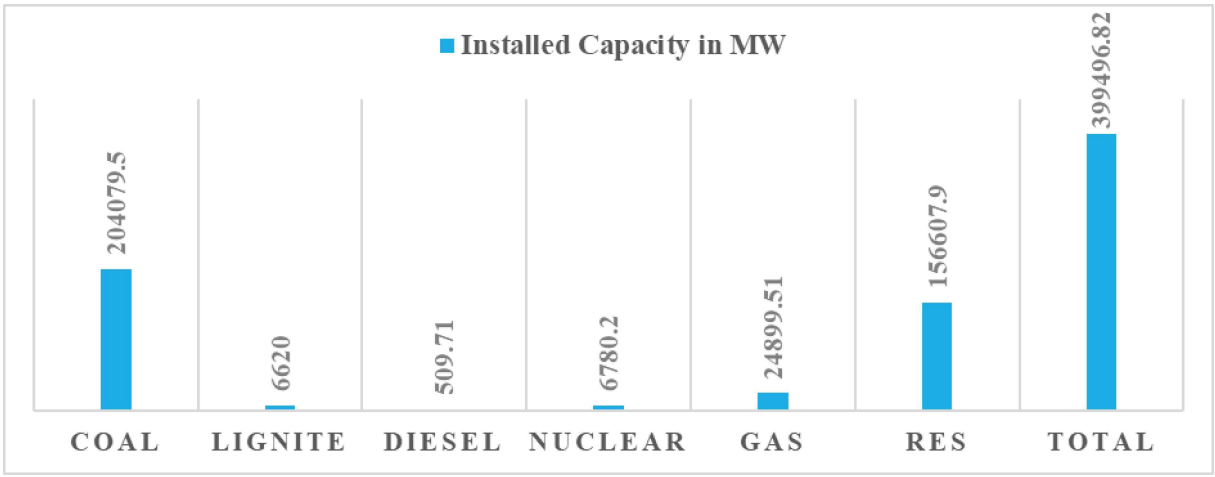

Fig.:1 All India installed capacity resource wise as on 31.03.2022

The Overall generation (Including generation from grid connected renewable sources) in India has been increased from 1110.458 BU during 2014-15 to 1491.859 BU during 2021-22. The performance of Category wise generation during the year 2021-22 was as follows [7]: -

Table No.1: Category wise generation during the year 2021-22

Source of Energy	Percentage of Increase / decrease	
Thermal	Increased by	7.96%
Nuclear	Increased by	9.49%
Hydro	Increased by	0.88%
Bhutan Import	Reduced by	14.51%
Solar Wind & Other RES	Increased by	16.07%
Overall Generation	**Increased by**	**7.96%**

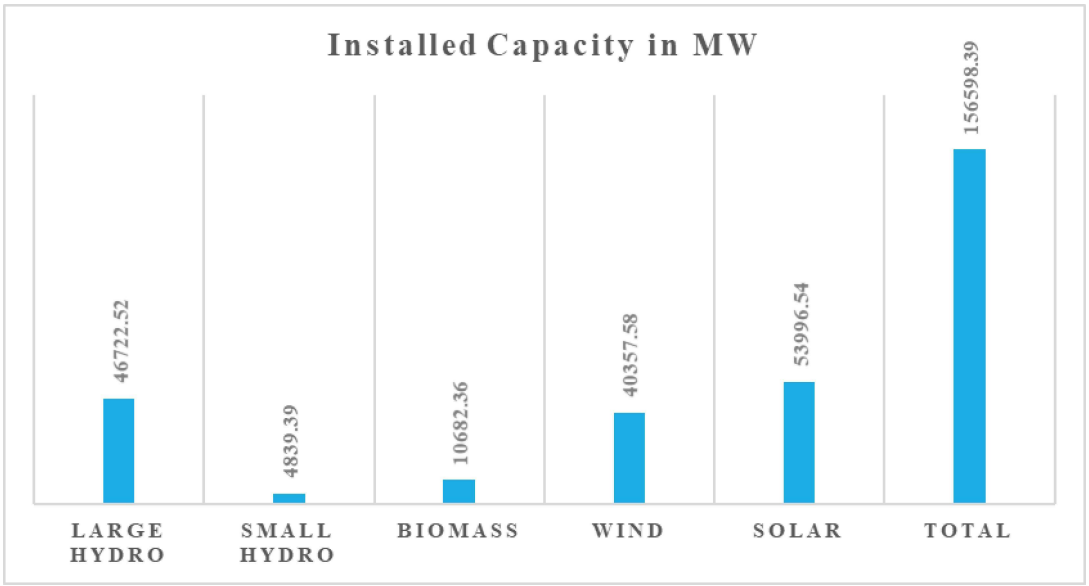

Fig.:2 – All India Sector Wise Renewable Energy Capacity [8]

III. ENERGY CONSUMPTION

The percentage share is increased of renewable consumption in 2016 was 2% and it is assumed to increase by 13% by 2040. According to Central Electricity Authority of India (CEA), energy demand for year of 2022-23 is at least 11,35,192MU [7][9].

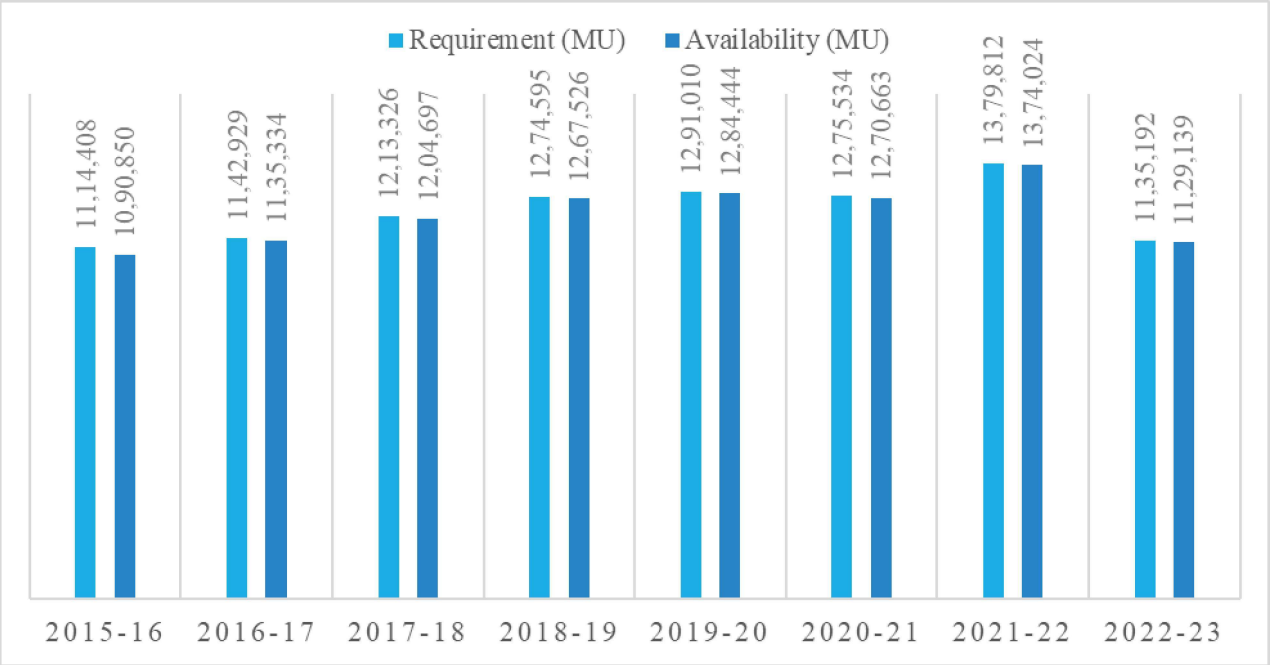

Fig.:3 - Year wise requirement and availability of energy position in India

IV. THE CHALLENGES OF UNMET ENERGY

According to World Bank estimates, around 35% of the country's population subsists below the poverty line ($1/day, 2000 PPP) and does not have access to basic amenities and clean energy forms. Even by 2001, around 44% of house-holds did not have access to electricity (Census of India, 2001). The country continues to face electricity shortages, with an overall power shortage of 8.4% and a peaking power shortage of 12.3% in 2020-21 [10]. Despite gradual urbanization, around 72% of the country's population resided in rural areas in 2011. The rural urban divide in India is manifest not only by the differences in the levels of energy requirement but also in the availability and choice of fuel and technologies to meet the same useful energy needs and services. Energy demands of several households, especially those in the rural areas, continue to be met primarily by inefficient traditional energy forms like fuel wood, crop residue, and animal waste as depicted in Figure 1. These fuels are not only inconvenient to use and cause indoor air pollution, but also adversely affect the health of women and children who are exposed to the use of these fuels. On a per capita basis, India's energy consumption is still a fraction of that in developed countries, in 2019; India's primary energy consumption was 439 ktoe per capita. Compared with 1090 in China 7835 in the US-and a world of

V. FUTURE ENERGY SCENARIO

Various estimates indicate that India would need to increase its primary energy supply by at lead 3 to 4 times and-its-electricity generation capacity by 5 to 6, times of the 2003/04 levels by the year 2031.

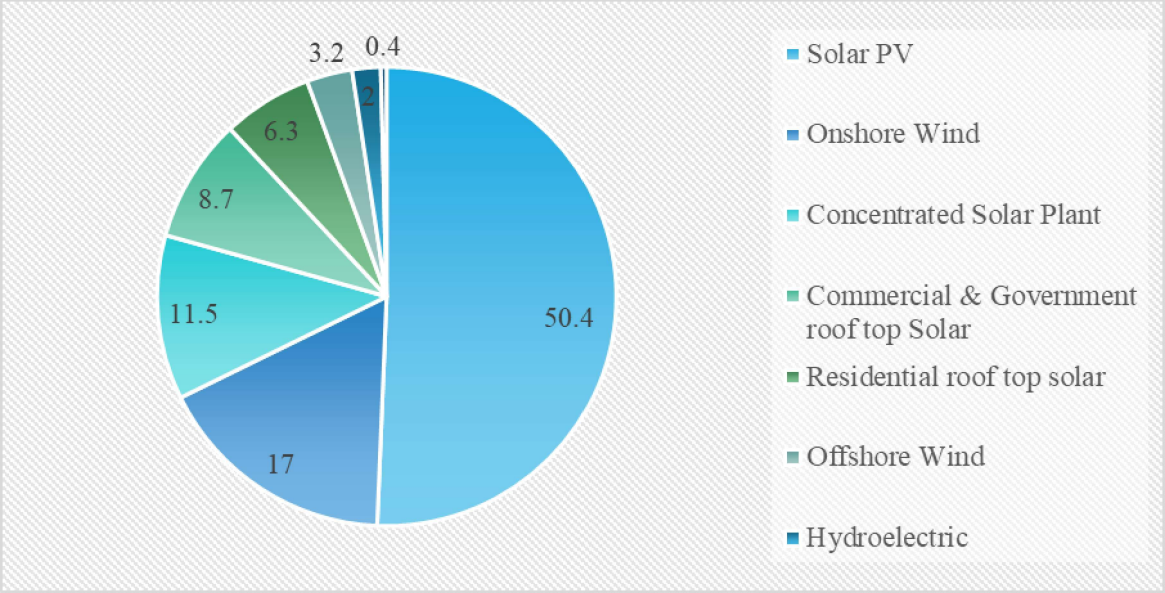

Fig.:4 -Projected energy mix in a 100% renewable energy transition in India in 2050

VI. CONCLUSION

Energy performs a vital role in the economic growth and security of any nation. Future economic growth depends on availability of energy from sources that are affordable, accessible and environmentally friendly. India is strongly dependent on the fossil fuels for its energy requirements which are also contributing significantly to greenhouse gases emissions. Future of human prosperity depends on how successful two central challenges, like securing the supply of reliable and affordable energy, and adopting a low carbon, efficient and environmentally benign system of energy supply, are addressed. Issues such as energy security, use of alternative fuels, and interchange ability of technology are vital to ensure that the mix of energy sources used in the economy is optimal and sustainable and that adequate quantities of economically priced clean and green fuels are made available to the Indian consumers.

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