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IMPORTANCE AND PROSPECTS OF RENEWABLE ENERGY: EMERGING ISSUES IN INDIA

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Abstract- India has a vast population and very limited natural resources especially for meeting its energy requirements. If the country needs to maintain its momentum of rapid growth it is possible only with a clear strategy for best possible use of energy options available. Energy is vital for development and this means that if India is to move to a higher growth trajectory than is now feasible, it must ensure the reliable availability of energy. The present energy scenario in India is not satisfactory and there is a large scope of improvement.

The present paper reviews the importance and prospects of renewable energy of India and extrapolates the future developments keeping in view the demand, consumption, production and supply of power. Most of the power generation in India is carried out by conventional energy sources, coal and mineral oil-based power plants which contribute heavily to environmental degradation. Setting up new power plants requires inevitable import of highly volatile fossil fuels. The paper focuses on the solution of the energy crisis on judicious utilization of abundant renewable energy resources, such as biomass, solar, wind, geothermal and ocean energy. Due to the inequality in energy distribution, renewable energy has the possibility of becoming the foundation for the country's future energy requirements.

1. INTRODUCTION

Energy has been universally recognized as one of the most essential inputs for economic growth and human development. There is a strong two-way relationship between economic development and energy consumption. On one hand, growth of an economy, with its global competitiveness, hinges on the availability of cost-effective and environmentally benign energy sources, and on the other hand, the level of economic development is reliant on the energy demand.

The energy sector in India has been receiving high priority in the planning process. Power generation (utilities + captive) has grown at 5.8 per cent per annum during the period 1990-91 to 2010-11 and the implicit elasticity with respect to GDP is 0.87. This is much lower than 1.09 per cent recorded in the period 1993-94 to 2003-04.

It is estimated that, in order to sustain GDP growth at 9.0 per cent, the demand for grid power will grow by 6.0 per cent per annum to 1,200 billion units (BU) by the end of the Twelfth Plan. (Planning Commission, GOI 2011) The Government of India recognizes the fact that under-performance of the energy sector can be a major constraint in delivering a growth rate of 8% GDP during the plan period. There is a need for acceleration of the reforms process and adoption of an integrated energy policy. 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. Given its growing energy demands and limited domestic fossil fuel reserves, the country has ambitious plans to expand its renewable and nuclear power industries. India has the world's fifth largest wind power market and plans to add about 100GW of solar power capacity by 2022. It also envisages increasing the contribution of nuclear power to overall electricity generation capacity from 4.2% to 9% within next 25 years. (Energy Policy of India, GOI)

Energy both renewable and non renewable is of utmost importance for the fast and sustained growth of India. An assessment of the strengths, weakness of the energy sector has been carried out by various scholars, scientists, government and non government agencies. A brief review of literature reveals that if India has to sustain its growth rate it must increase its use of renewable energy and decrease its dependence on fossil fuels. Keeping this in mind the related literature that directly or indirectly influences the study has been reviewed.

MNRE Secretary Upendra Tripathy recently said that renewable energy is contributing about 6.5 per cent in the electricity mix of the country and it is the first follow up on 'Make in India' initiative. UNDP (2012) stated that increasing renewable energy usage in India has been undertaken through pilot projects under Jawaharlal Nehru Mission and by UNDP to accelerate clean energy access. According to World Wide Fund for Nature (WWF), while India has no estimates of its offshore wind potential, up to 170 GW could be installed by 2050 along the 7,500 km coastline. Hydropower could generate an estimated 148 GW, Geothermal around 10.7 GW and Tidal power about 15 GW. The planning commission (2006) observed that even though 85 percent of villages are considered electrified, around 57 percent of the rural households and 12 percent of the urban households i.e. 84 million households (over 44.2% of the total) in the country did not have electricity in 2000. Improvement in human development is also strongly associated with access to electricity. Lal (2012) emphasized that wide spread energy

poverty condemns millions to darkness, ill health and to missed opportunities for education and prosperity. Renewable energy is important for India to end this poverty. Besides these a number of studies have also been carried out by Indian Renewable Energy Development Agency (IREDA), Ministry of New and Renewable Energy, The Energy and Resources Institute, National Environmental Engineering Research Institute (NEERI) etc.
The present paper has been entitled "**IMPORTANCE AND PROSPECTS OF RENEWABLE ENERGY: EMERGING ISSUES IN INDIA".** The paper is classified in five sections viz; Section I - Present Status of Energy in India, Section II - Gap between Energy Consumption and Actual Supply, Section III - Importance of Renewable Energy Sources India, Section - IV Challenge of Adopting Renewable Energy Sources, Section V- Future Prospects and Suggestions.

2. SECTION - I **PRESENT STATUS OF ENERGY IN INDIA**

India faces formidable challenges in meeting its energy needs and in providing adequate energy of desired quality in various forms in a sustainable manner and at competitive prices. India needs to sustain an 8% to 10% economic growth rate, over the next 25 years, if it is to eradicate poverty and meet its human development goals. To deliver a sustained growth rate of 8% through 2031-32 and to meet the lifelong energy needs of all citizens, it needs, to increase its primary energy supply by 3 to 4 times and, its electricity generation capacity/supply by 5 to 6 times of their 2003-04 levels. With 2003-04 as the base, India's commercial energy supply would need to grow from 5.2% to 6.1% per annum while its total primary energy supply would need to grow from 4.3% to 5.1% annually. By 2031-32 power generation capacity must increase to nearly 8, 00,000 MW from the current capacity of around 1, 60,000 MW inclusive of all captive plants. (Integrated Energy Policy Report, GOI, 2001)

The total electricity generated in India during the financial year 2014-15 is 1043 billion Kwh which excludes electricity generated by renewable energy sources and the captive power stations feeding into the utility power grid. All India per capita consumption of electricity was nearly 957 Kwh during the financial year 2013-14. (Planning Commission, GOI) The rapid growth in electricity generation over the next couple of decades is expected to be largely met by thermal power plants as coal. The present energy scenario in India is such that most of its energy requirements are fulfilled by non renewable sources. The most important ones are, oil, coal, thermal power, natural gas etc.

India was the fourth largest consumer of crude oil in the world and the third largest crude oil consumer in the Asia-Pacific region after China and Japan. The estimated reserves of crude oil in India as on 31.03.2014 stood at 762.74 million tons. Net imports of crude oil have increased from 99.41MTs during 2005-06 to 189.24 MTs during 2013-14. There has been an increase of 2.41% in the net imports of crude oil during 2013-14 over 2012-13, as the net import increased from 184.80 MTs to 189.24 MTs. The availability of crude oil in the country increased from 131.60 MTs during 2005-06 to 227.03 MTs during 2013-14. During this period crude oil production increased from 32.19 MTs to 37.79 MTs and the net import increased from 99.41 MTs to 189.24 MTs during period from 2005-06 to 2013-14. Although more than 70% of its crude oil requirements and part of the petroleumϖ products is met from imports, India has developed sufficient processing capacity over the years to produce different petroleum products so as to become a net exporter of petroleum products. (Energy Policy of India, GOI)

A large part of Indian coal reserve is of low calorific value and high ash content. The iron content is low in India's coal, and toxic trace element concentrations are negligible. The natural fuel value of Indian coal is poor. On average, the Indian power plants using India's coal supply consume about 0.7 kg of coal to generate a kWh, whereas United States thermal power plants consume about 0.45 kg of coal per kWh. This is because of the difference in the quality of the coal, as measured by the Gross Calorific Value (GCV). On average, Indian coal has a GCV of about 4500 Kcal/kg, whereas the quality elsewhere in the world is much better; for example, in Australia, the GCV is 6500 Kcal/kg approximately. India imported nearly 95 Mtoe of steam coal and coking coal which is 29% of total consumption to meet the demand in electricity, cement and steel production. (Mugunthan 2013)

Another important source of energy is natural gas. The installed capacity of natural gas based power plants was 21,727 MW at the end of financial year 2013-14. These base load power plants are operating at overall PLF of 25% only due to severe shortage of Natural gas in the country. Imported Liquefied Natural Gas (LNG) is too costly for the power generation. Many of these power stations are shut down throughout the year for lack of natural gas supply. Natural gas shortage for power sector alone is nearly 100 MMSCMD. (Energy Policy of India, GOI)

India's natural gas reserves have been estimated 1075 Billion Cubic meters or about 0.5% of the world total. Most of these reserves lie offshore northwest of Mumbai in the Arabian Sea and onshore in Gujarat state. India does not yet rank in the top 20 of the world's greatest natural gas consumers, but that will soon change. At present, India is producing about 32202 million cubic meters of natural gas annually. (Ministry Of Petroleum and Natural Gas)

India is endowed with economically exploitable and viable hydro potential assessed to be about 84,000 MW at 60% load factor. In addition, 6,780 MW in terms of installed capacity from small, mini, and micro hydel schemes have been assessed. Also, 56 sites for pumped storage schemes with an aggregate installed capacity of 94,000 MW

are identified. It is the most widely used form of renewable energy. India is blessed with immense amount of hydro-electric potential and ranks 5th in terms of exploitable hydro-potential on global scenario. (Electric Sector in India) India's share of nuclear power plant generation capacity is just 1.2% of worldwide nuclear power production capacity. Nuclear power provided 3% of the country's total electricity generation in 2011. India aims to supply 9% of it electricity needs with nuclear power by 2032. (Mugunthan 2013) Table 1 gives an overview of the present status of energy in India.

TABLE 1 - TOTAL INSTALLED POWER GENERATION CAPACITY (MARCH 2015)

Source	**Total capacity (mw)**	**Percentage**
Coal	164,635.88	61.51
Hydroelectricity	41,267.43,	15.42
Renewable energy source	31,692.15	11.84
Natural gas	23,.62.15	8.61
Nuclear	5,780.00	2.16
Oil	1,199.75	0.44
Total	**267,637.35**	-

Source – Electricity Sector in India, 2015

3. SECTION - II **GAP BETWEEN ENERGY CONSUMPTION AND SUPPLY**

Industrialization, urbanization, population, economic growth, improvement in per capita consumption of electricity, depletion of coal reserve, increasing import of coal, crude oil and other energy sources and the rising concern over climate change have put India in a critical position. It has to take a tough stance to balance between economic development and environmental sustainability.

The electricity sector in India had an installed capacity of 267.637GW as of end March 2015 and generated around 1048.5 BU for the period April 2014 - March 2015. India became the world's third largest producer of electricity in the year 2013 with 4.8% global share in electricity generation surpassing Japan and Russia. Renewable power plants constituted 27.25% of total installed capacity and non-renewable power plants constituted the remaining 72.75%. India generated around 967 TWh (967,150.32 GWh) of electricity (excluding electricity generated from renewable and captive power plants) during the 2013–14 fiscal. The total annual generation of electricity from all types of sources was 1102.9 Tera Watt-hours (TWh) in 2013.

The per capita average annual domestic electricity consumption in India in 2009 was 96 kWh in rural areas and 288 kWh in urban areas for those with access to electricity in contrast to the worldwide per capita annual average of 2,600 kWh and 6,200 kWh in the European Union. The per capita electricity consumption is lower compared to many countries despite cheaper electricity in India. (Mugunthan 2013)

TABLE 2 – POWER SUPPLY POSITION

Period	**Energy Requirement (MU)**	**Energy Availability (MU)**	**Energy Deficit (MU)**	**Energy Deficit (%)**
9th Plan End	522537	483350	-39187	-7.5
10th Plan End	690587	624495	-66092	-9.6
11th Plan End	4145768	3749930	-395838	-48.1
Feb.2015	80988	78968	-2020	-2.5

Source- Ministry of Power, Central Electricity Authority, New Delhi, Government of India

India's substantial and sustained economic growth is placing enormous demand on its energy resources. The demand and supply imbalance in energy sources is pervasive requiring serious efforts by Government of India to augment energy supplies. India imports about 80% of its oil. There is a threat of this increasing further, creating serious problem for India's future energy security. There is also a significant risk of lesser thermal capacity being installed on account of lack of indigenous coal in the coming years because of both production and logistic constraints, and increased dependence on imported coal. Significant accretion of gas reserves and production in recent years is likely to mitigate power needs only to a limited extent. Difficulties of large hydro are increasing and nuclear power also has problems. The country thus faces severe energy supply constraints. Already, in the electricity sector, official peak deficits are of the order of 12.7%, which could increase over the long term.

In view of electricity supply shortages, huge quantities of diesel and furnace oil are being used by all sectors-industrial, commercial, institutional and residential. Lack of rural lighting is leading to large-scale use of kerosene. This usage needs to be reduced, as it is leading to enormous costs in form of subsidies and increasing the country's import dependence. At the same time, a very large proportion of the citizens continue to live with no access to electricity and other forms of commercial energy. More than 50% of the population has little or no commercial energy access for their living and livelihood. Others with access often have to cope with poor and erratic availability of electricity and other fuels. With constraints faced in resource availability and in delivery mechanisms, traditional

means of energy supply are falling short. This is likely to be the case in the future so that energy access will continue to remain a problem. (MNRE, GOI, 2011)

The gap between supply and demand can be bridged only with structural reforms in the energy sector. These reforms will however take time to be implemented considering the numerous challenges involved.

4. SECTION – III IMPORTANCE OF RENEWABLE ENERGY SOURCES IN INDIA

The increased demand and constrained supply, is intensified by pursuing a fossil fuel-led growth strategy, especially due to environmental degradation, global warming and climate change. The challenge is to meet our increasing energy needs while minimizing the damage to the environment. This is why, while striving to bridge our energy deficit, the government is stressing on the need to increase the share of clean, sustainable, new and renewable energy sources.

TABLE 3- PLAN PERIOD WISE CAPACITY ADDITION IN GRID CONNECTED RENEWABLE ENERGY BASED POWER GENERATION INSTALLED CAPACITY

Resources	Estimated Potential (MW)	Capacity addition (in MW)			
		Upto to 2002 (IXth Plan)	During 2002-2007 (Xth Plan)	During 2007-2012 (XIth Plan)	Target for 2012-17 (XIIth Plan)
Wind Power	48,500	1,667	5,427	10,2600	15,000
Small Hydropower	15,000	1,438	538	1419	2100
Bio Power*	23,700	390	795	2042	2,700
Solar Power	20-30MW/Sq.km	2	1	940	10,000
Total		3,475	6,761	107,001	29,800
*Note – *Including biomass power, bagasse cogeneration, urban and industrial waste to energy.*					

Source: "Ministry of New and Renewable Energy Government of India, 2013

India today stands among the top five countries in the world in terms of renewable energy capacity. We have an installed base of over 15 GW, which is around 9% of India's total power generation capacity and contributes about 3% in the electricity mix. The importance of renewable energy from the point of view of energy security and environmental sustainability is quite obvious; however it has another advantage viz its capacity to bring energy access for all, including the most disadvantaged and the remotest of our habitations. The decentralization of renewable energy is the most obvious, achievable and optimal solution for providing power to thousands of remote villages and underdeveloped areas. Even today, millions of decentralized energy systems, solar lighting systems, irrigation pumps, aero-generators, biogas plants, solar cookers, biomass gasifiers, and improved cook stoves, are being used in the remotest, inaccessible areas of the country. Providing energy access to the most disadvantaged and poor communities can become one the biggest drivers of inclusive growth. (Farooq Abdullah 2011)

A. HYDRO ENERGY

India has a huge hydro power potential, out of which around 20% has been realized so far. New hydro projects are facing serious resistance from environmentalists. Resettlements of the displaced people with their lands become major issue. Hydroelectric power generation in India started much before Independence in 1897 at Darjeeling. In 1902 another power station was set up at Sivasamudram in Karnataka. Over 25 percent of electricity produced by India today is from hydropower. Some of the major states generating hydroelectricity are Himanchal Pradesh, Karnataka, Kerala, Jammu & Kashmir, Meghalaya, Tripura and Sikkim.

The total renewable energy potential from various sources in India is 2,49,188 MW , This is shown in chart -1

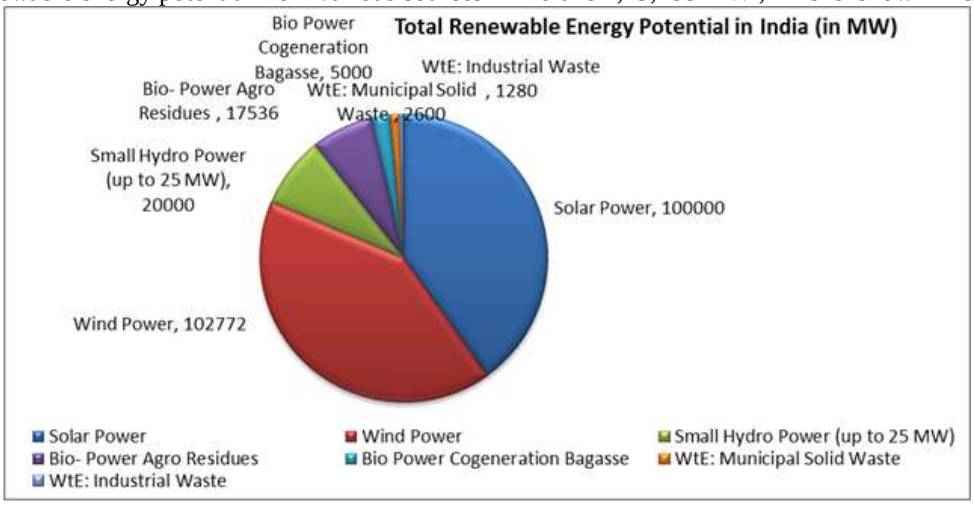

CHART-1**TOTAL RENEWABLE ENERGY POTENTIAL IN INDIA (IN MW)**

Source: MNRE, GOI - 2012.
As of 31st March 2014, the total installed capacity from renewable energy, both grid-interactive and off-grid/captive power, was 32,730 MW. Thus the untapped market potential for overall renewable energy in India is 2,15,922 MW. Some of the most coming source of renewable energy used in India and else where are as follows. www.novonous.com

B. BIOMASS ENERGY

Biomass is a renewable energy resource derived from the carbonaceous waste of various human and natural activities. It is derived from numerous sources, including the by-products from the timber industry, firewood, agricultural residues such as bagasse, crop straw, animal dung and wastes generated from agro-based industries. Biomass takes carbon out of the atmosphere while it is growing, and returns it as it is burned. If it is managed on a sustainable basis, biomass is harvested as part of a constantly replenished crop. Municipal solid wastes, animal and poultry wastes are also referred to as biomass as they are biodegradable in nature. In India, a total of 4,449 MW has been installed under bio energy, both in grid connected and off-grid capacities.

Biomass energy can play a major role in reducing India's reliance on fossil fuels by making use of thermo chemical conversion technologies. In addition, the more use of biomass based fuels will be instrumental in safeguarding the environment, creating new job opportunities, sustainable development and health improvements in rural areas. Biomass energy could also help in modernizing the agricultural economy.

C. SOLAR ENERGY

India being situated between the tropic of cancer and the equator has an average temperature of 25°C - 27.5°C and receives 260-300 clear sunny days per year making it the best solar resource in the world. India has an installed power capacity of 1686 MW, making it sixth largest consumer in the world. The solar power on the surface of earth is 1016W. The total worldwide power demand of all needs of civilization is 1013W. Therefore, the sun gives us 1000 times more power than we need. If we can use 5% of this energy, it will be 50 times what the world will require.

Solar energy, a clean renewable resource with zero emission, has got tremendous potential of energy which can be harnessed using a variety of devices. With recent developments, solar energy systems are easily available for industrial and domestic use with the added advantage of minimum maintenance. India has a very high density of population and has a high solar isolation, making it an ideal scenario for solar power in India. The first applications for solar power has been for water pumping to replace India's four to five million diesel powered water pumps. New projects are being undertaken and an area of 35,000 square km. has been set aside in the Thar for solar power projects. Central Government has initiated massive projects to popularize solar energy systems. It is estimated these projects will generate 200,000 megawatts by 2050. The government has taken steps to install small scale photovoltaic panels, commercial scale solar plants and solar lighting systems to give impetus to the domestic manufacturers.

D. WASTE TO ENERGY

Waste-to-energy plant offer two important benefits of environmentally sound waste management and disposal, as well as the generation of clean electric power. Waste-to-energy facilities produce clean, renewable energy through thermo-chemical, biochemical and physicochemical methods. Moreover, waste-to-energy plants are highly efficient in harnessing the untapped sources of energy from a variety of waste.

E. WIND ENERGY

Wind energy is one of the most promising alternative energy technologies of the future. During recent years, the amount of energy produced by wind-driven turbines has increased rapidly due to considerable advancement in turbine technologies, making wind power economically compatible with conventional sources of energy. The use of wind power in India has been gaining importance with rapid installation in the last few years. The share of wind energy is about 68 per cent of the total renewable energy capacity installed in India. Electrical and mechanical energy can both be produced by wind energy. India has 19051 MW of installed capacity and ranks 5th and has a potential of utilization up to 102772MW. Some of the major wind energy plants are located in Tamil Nadu (7160MW), Gujarat (3093MW) and Maharashtra (2976MW). (MNRE 2011)

F. GEOTHERMAL ENERGY

The Geothermal energy of the Earth's crust originates from the original formation of the planet (20%) and from radioactive decay of minerals (80%). The geothermal gradient, which is the difference in temperature between the core of the planet and its surface, drives a continuous conduction of thermal energy in the form of heat from the core to the surface.

At the core of the Earth, temperatures may reach over 5000 degrees celsius . Geothermal energy comes from the natural heat of the Earth primarily due to the decay of the naturally radioactive isotopes of uranium, thorium and potassium, due to the internal heat, the Earth's surface heat flow averages 82 mW/m2 which amounts to a total heat of about 42 million megawatts. According to its property, geothermal energy can be divided into four types: hydrothermal field, geo pressured geothermal resource, hot dry rock deposit and magma resource.

G. NUCLEAR ENERGY

The concern for environment protection and at the same time meet the increasing demand for power has resulted in the government focus on nuclear power. The department of atomic energy has proposed to use locally available uranium resources in Pressurized Heavy Water Reactor (PHWRs) followed by the recycling of spent fuel in Fast Breeder Reactors for generating nuclear power. Recycling of plutonium derived from the reprocessing of spent fuel gives us a very large energy resource. While the government is taking steps to increase the installed nuclear generation capacity, the setting up of a Light Water Reactor based on imported technology at Kudankulam in Tamil Nadu is a major step forward. At Bhabha Atomic Research Centre (BARC) technology to tap the vast thorium reserves in the country is being developed.

H. TIDAL / OCEAN ENERGY

There is a huge potential of tidal and marine energy in India which can be produced from ocean. The main tidal energy potential- locations are the Gulf of Cambay and the Gulf of Kutch on the west coast with maximum tidal range- 8m to 11m and average range- 5m to 7m .The Ganges Delta, Sunder Bans, West Bengal too has good locations for small scale tidal power development. The tidal power potential in India is 8000-9000 MW- 7000 MW in the Gulf of Cambay, 1200 MW in the Gulf of Kutch and less than 100 MW in Sunder bans. The marine energy potential- along the 6000 km of coast is about 40,000 MW.

TABLE- 3 TOTAL RENEWABLE ENERGY: INSTALLED CAPACITY 2015

Source	**Total Installed Capacity (MW)**
Waste to Power	107.58
Biomass Power	1,365.20
Bagasse Cogeneration	2,800.32
Solar Power (SPV)	3,062.68
Small Hydro Power	3,990.83
Wind Power	22,465.03
Total	33,791.74

Source: Ministry of New and Renewable Energy.

Energy efficiency is a high-value target for action and an opportunity both for Indian and international investors and other stakeholders if India shifts to a low-carbon path. India's National Energy Efficiency Mission includes the "Perform, Achieve, and Trade" program which sets a percentage by which companies must reduce energy intensity. Those that beat their targets receive tradable permits they can sell to plants that come up short and would otherwise face penalties. Other efficiency programs are directed at buildings, appliances, and vehicles. According to one study, by pursuing these efficiency gains, India can avoid 120 gigawatts of power capacity by 2030 and, with stronger measures, has the potential to achieve substantial additional gains. For India's growth it is important that investment in a more efficient electricity grid is made for energy security and the environment since its transmission and distribution losses are astounding. Buildings in India already consume over 30% of electricity and two-thirds of the buildings that will exist in 2030 will be built between now and that date.

5. SECTION **IV - CHALLENGE OF ADOPTING RENEWABLE ENERGY**

There are serious hurdles in the progress of renewable energy in India; the most important is the financial barrier as the initial cost of setting up renewable energy source is very high. However, nonfinancial barriers are equally important in limiting the growth of renewable energy. The main hurdles can be classified into three categories such as support infrastructure, financial viability, and regulatory approval. The challenges of adopting renewable energy on a large scale can be summarized by the following points viz.

- The limited availability of evacuation infrastructure and grid interconnections is one of the biggest obstacles to harnessing renewable energy potential.
- Economically viable wind and small hydropower potential remains untapped because of lack of adequate grid evacuation capacity and approach roads.
- India currently offers a wide variety of incentives, including feed-in tariffs; generation-based incentives; Renewable Purchase Obligations **(**RPOs); central, state, and regional capital subsidies; accelerated depreciation; and tax incentives. The lack of coordination between incentives and state programs makes it

difficult to adopt an economics-based least-cost development approach to tapping the country's renewable energy potential.

- The cost plus approach to tariff setting along with the technology-specific focus has led to incentives that hinder the economic development of India's renewable energy resources.
- In some cases multiple bottlenecks have been replaced by single, larger, and more powerful roadblocks, and significant delays are normal. In addition, speculative blocking of land has become common, leading to unsustainable price increases.
- Existing mechanisms including single-window clearances, facilitation by state nodal agencies, and simplified regulation for smaller renewable energy projects have proved to be of no success.

The challenges faced by the country in adopting renewable sources of energy can be overcome to a large extent by following the given suggestions. The government in its strategy 2012-2017 (MNRE) has stressed on these issues for increasing the use of clean energy.

- To reduce financial barriers, policymakers need to consider ways to bridge the higher costs that ensure least economic cost development of India's plentiful renewable resources and also need to simplify the numerous and overlapping financial incentives.
- Policies could be based on short- and long-term national targets and broken down into state-level RPOs that are mandatory and enforced. Technology-specific incentives could be supported by earmarking funds and increase allocations on a competitive basis.
- India needs to make renewable energy evacuation a high transmission priority. This is especially true for large-scale renewable energy plants.
- Dedicated funding should be allocated as part of existing programs, such as the government's rural electrification initiative - Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), or new green funds.
- Steps also need to be taken to address nonfinancial barriers that increase the cost of doing business. Making use of alternative energy has information technology and telecommunications and clean technology enormous growth potential and can transform the energy market in the world.
- India needs to streamline bureaucratic processes for clearances and approvals through the use of light-touch regulation.
- State nodal agencies, which are supposed to play a leading role in guiding renewable energy projects, need to be strengthened.
- A comprehensive capacity-building program on emerging regulatory, legal, and financing issues to facilitate grid-connected renewable energy should be structured.

6. SECTION – V FUTURE PROSPECTS AND SUGGESTIONS,

Besides sustainable development, renewable energy can promote development in the socio-economic areas of country. A good energy policy by government should ensure the adequate use of renewable sources of energy to cater to the needs of the people thereby leading to inclusive growth.

Energy is a major factor responsible for sustainable development and poverty reduction efforts. It affects all aspects of developmental issues such as health, population levels, education, social, economic, and environmental including livelihoods, access to water, agricultural productivity, and gender-related issues. None of the Millennium Development Goal (MDGs) can be met without major improvement in the quality and quantity of energy services in developing countries like India. It is estimated that approximately 1.3 billion people worldwide have no access to electricity. 2.7 billon people continue to rely on fuels such as traditional biomass and coal for cooking and heating and this is expected to rise to 2.8 billion in 2030.

In order to decrease our dependence on fossil-fuel energy and increase the use of renewable energy strong policy is required with a firm political will to implement the government policy. Also working on the Public-Private Partnership (PPP) model will not only increase the use of clean energy but also involve the general public and bring about inclusive growth. Thus to increase the use of renewable energy certain steps are recommended which will help in adoption of clean energy in India. The important suggestions are

- Aggressively expand large-scale deployment of both centralized and distributed renewable energy including solar, wind, hydro, biomass, and geothermal to ease the strain on the present transmission and distribution system and allow more off-grid populations to be reached. Facilitate growth in large scale deployment by installing 100 million solar roofs and large utility-scale solar generation, through both centralized and distributed energy within the next 20 years;
- Enact a National Renewable Energy Standard/Policy of 20% by 2020 to create demand, new industries and innovation, and a new wave of green jobs;

- Develop favorable government policies to ease the permitting process, and to provide start-up capital to promote the exponential growth of renewable energy. Create and fund a national smart infrastructure bank for renewable energy;
- Accelerate local demand for renewable energy by providing preferential Feed-in-Tariffs (FIT) and other incentives such as accelerated depreciation; tax holidays; renewable energy funds; initiatives for international partnerships/collaboration, incentives for new technologies; human resources development; zero import duty on capital equipment and raw materials; excise duty exemption; and low-interest rate loans.
- Phase out all conventional energy subsidies. Force petroleum products to compete with other fuels like biomass and biogas, etc.;
- Accelerate the development and implementation of cost-effective energy efficiency standards to reduce the long-term demand for energy. Engage States, industrial companies, utility companies, and other stakeholders to accelerate this investment;
- Initiate a move to electrify automotive transportation or develop Electric Vehicles plug in hybrids such as the Nissan Leaf, Tesla Model S, or Chevy Volt, etc.
- Aggressively invest in a smart, two-way grid (and micro-grid). Invest in smart meters, as well as reliable networks that can accommodate the two-way flow of electricity.
- Develop large-scale solar manufacturing in India and thereby transforming India into a global solar manufacturing hub. Also, establish R&D facilities within academia, research institutions, industry, government and private entities to guide technology development.
- Work towards a Hydrogen Economy development plan. Hydrogen can be fed into fuel cells for generating heat and electricity – as well as for powering fuel cell vehicles.

Thus to conclude it can be said that looking at the present scenario, a sustainable energy system in a country like India is essential/ for sustainable development. Due to the inequality in energy distribution, renewable energy has the possibility of becoming the foundation for the country's future energy requirements. It's use on a large scale will not only help in tackling issues like energy scarcity, variations in fuel prices but also help India to be self-sustainable and environment friendly.

REFRENCES

[1]. www.planningcommission.nic.in
[2]. Integrated Energy Policy Report Of The Expert Committee, Government Of India Planning Commission, New Delhi August 2006.
[3]. Energy Policy Of India, Goi,
[4]. Mugunthan C. (2013): "Electricity Generation Sector In India: Opportunities And Challenges" Indian Journal Of Applied Research Volume : 3 | Issue : 11 | Nov 2013 | Issn - 2249-555x
[5]. Ministry Of Petroleum And Natural Gas **(**Renewable Energy And Energy Efficiency Status In India Report Compiled By Iclei South Asia May 2007)
[6]. Strategic Plan For New And Renewable Energy Sector For The Period 2011-17, February 2011, Ministry Of New And Renewable Energy, Government Of India
[7]. Dr. Farooq Abdullah, (2011): "A Renewable Future For Mankind: Challenges And Prospects" India's Minister Of New And Renewable Energy, Wants His Country To Transform The Promise Of Boundless And Clean Energy Into Reality *13 January 2011* http://www.makingitmagazine.net/?p=2849
[8]. India Renewable Energy Status Report 2014 May 14
[9]. Renewable Energy And Their Usage In Indian Rural Sector, IMC-ERTF Economic Research & Training Foundation