JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

GREEN ENERGY PLAY KEE ROLE IN SUSTAINABLE DEVELOPMENT OF INDIA: CHALLENGES AND SOLUTION

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Abstract: - Energy is crucial to both human existence and the growth of economies. Due to India's rapidly rising energy demand and growing concern over the potential economic and environmental effects, effective and comprehensive energy governance in India is now necessary. The policy objectives and the context in which they are placed must therefore be understood in order to comprehend the dynamics of the energy policy framework governing India's energy sector. The Indian government has been working on regulations and related policies to promote the production of environmentally friendly renewable energy as well as innovative technological advancements and conservation techniques. Creating sustainable energy policies and offering end users pertinent and useful policy recommendations are crucial.

This study introduces the evolution of Indian energy policy before reviewing sustainable development strategy for the promotion of renewable energy (green energy). The funding of renewable energy in India is critically examined in the current research. The purpose of this study is to establish a comprehensive understanding of the structure and patterns of financing renewable energy in India's sustainable development and to pinpoint the key obstacles to obtaining the necessary funding for the industry.

Key Words:- Green Energy (Renewal Energy), Sustainable Development, Green Energy Policy

Introduction: - Energy connectivity can assist countries boost the sustainability of the energy sector while also helping to satisfy rising energy demand. By improving the efficiency of energy delivery and the sustainability of power generation, energy connection can assist reduce the percentage of the population without access to energy services and the region's carbon footprint. While overall energy demand is expected to rise significantly between 2010 and 2035, electricity demand is expected to more than quadruple, highlighting the growing importance of electricity in a time when sustainability of energy is a developing concern. It will get harder to meet this future need for power with domestic resources. Since interconnected grids are more flexible and thus better able to integrate

variable sources of energy, the need for increased Trans boundary energy trade becomes more apparent as the cost of power generation from wind and solar continues to fall and financing for renewable becomes easier to obtain.

With 1.24 billion people as of 2011 (WDI, 2012), India has the second-largest population in the world and the seventh-largest landmass (IEA, 2011c) [1, 2, 3, 4]. The Arabian Sea and the Bay of Bengal both border the Indian subcontinent, which is situated in Southern Asia. There are 23 official languages in this multiethnic and multi religious nation, with English serving as a secondary official language (IEA, 2007).[1] India's economy has developed remarkably quickly over the previous 20 years, and in 2011 it ranked as the tenth largest economy in the world. With a median age of 26.2 years and a relatively young population, India is predicted to surpass China as the world's most populous country by 2025.

India is a parliamentary federal republic with a democratically elected government. The head of state is the president, while the head of the government is the prime minister. The transition from a one-party-dominated government to a multi-party coalition system is the most significant trend to have emerged in Indian politics during the past ten years. Since India's declaration of independence in 1947, the Indian National Congress party has dominated politics. Its loss by the Bharatiya Janata Party (BJP) in 1999 was a turning point for India. No party has been strong enough to alone form a majority in the Lok Sabha since 1999. The Concurrent list refers to the areas for which the constitution assigned joint authority to the centre and the states. Given that both federal and state entities have authority over the same matter, this could lead to dispute. If there is a disagreement on a matter of national importance that is concurrent, the central law takes precedence over the laws of the states (MOLJ, 2012).

Objective of the Study

1. Growing demand and role of green energy in India's sustainable development in the present century.
2. Challenges of Green Energy in Sustainable Development of India in the present scenario.

Green Energy (Renewal Energy)

Green power is a term for strength that comes from renewable sources. Green power is often referred to as clean, sustainable or renewable energy. Green electricity manufacturing does now not launch toxic greenhouse gases into the atmosphere, which potential it has little or no influence on the environment. Green strength obtained its title due to the fact it comes from the natural resources furnished to us via the earth. Green is regularly related with health, nature and stability, so it makes experience that renewable electricity is related to a color that symbolizes nature. Let's take a nearer seem at each green energy supply and how they work:

• Solar power: Solar panels use silicon sheets with energy-absorbing cells to convert daylight into electricity. Solar electricity is an exceedingly handy resource, and people can use solar power industrially or personally by means of installing photo voltaic panels on structures and homes.

• Wind power: Wind turbines generate kinetic power which we then use to make electricity. Harnessing wind energy does now not require plenty human labor, and is recognised as one of the most environmentally friendly resources.

• Hydroelectricity: Hydroelectric vegetation captures kinetic electricity from streams and streams flowing in rivers. This is carried out thru the use of a turbine built into a dam. According to the International Energy Agency (IEA), in 2008, approximately 16% of the world's electricity was produced by water power.[5] Hydropower can be a cheap source of renewable energy when the conditions are right, often cheaper than fossil fuels. As a result, numerous regions of the world have already extensively developed hydropower.

• Biomass: Energy can be generated from agricultural, city and industrial waste. Biomass can be used through burning timber and energy crops specifically grown for this purpose. Wheat, sugar beet, sugarcane and maize are frequently fermented to produce bio-ethanol. Due to the fact that a large portion of the world's population cooks with wood, charcoal, straw, or animal dung (IEA 2012), it continues to make up 10% of the world's primary energy supply and is the world's largest single renewable energy source.[6]

• Geothermal: Fluids under the Earth's crust and heat saved inside rocks can generate energy. To harness geothermal electricity from steam and hot water, workers dig mile-deep wells in underground reservoirs. They then use this steam and warm water to electricity generators linked to an electric powered generator. Temperatures high enough to boil water can be found close to the earth's surface, making this method of using geothermal energy the purest and most cost-effective.

Green power is additionally higher for our bodily health as it is far much less accountable for polluting our air and water. According to the World Health Organization, family and ambient air air pollution causes 4.2 million deaths around the world annually. Most of these deaths happened in low- to middle-income countries, specifically Southeast Asia and the Western Pacific regions. Another benefit of green strength is that the naturally going on assets used to harness this renewable electricity will no longer deplete over time. Solar power is available as lengthy as the sun continues to shine, wind strength is feasible as long as the wind is blowing, and hydropower will exist as long as lakes, streams and rivers proceed to flow. Each resource's consistency and reliability depend on the location; for example, the U.S. is better appropriate to generate solar energy than other nations that receive less direct sunlight. Similarly, windy areas such as plains and the coast will possibly yield better strength technology outcomes for wind farms. For a power source to be viewed inexperienced energy, it should fall inside the levels of zero, low or impartial in greenhouse gas emissions in the course of energy era and operation. A zero greenhouse emissions green strength source is exactly what it sounds like; no greenhouse gases are created throughout the power source's generation. A neutral greenhouse emission strength source, like biomass, for example, produces some greenhouse emissions when it is used. Its emissions are balanced out by the reality that the biomass absorbs carbon dioxide at some point of the growing process. A low greenhouse fuel emissions power source will

nonetheless create some greenhouse gases; however the amount might also be minimal, especially when compared to burning coal or natural gas.

Here's a description of some of these disadvantages:

• Unreliability: Some sources of renewable electricity depend on climate and atmospheric conditions to function. Hydroelectric dams require sufficient rainfall to fill the dam and a non-stop furnish of walking water. Wind mills require wind to blow at a minimum wind velocity to cross the blades. The skies must be clear and full of ample sunlight for the solar panels to generate electricity. Also solar panels can't generate electrical energy at night.

• Low Efficiency: More work nonetheless wants to be accomplished to make renewable electricity extra environment friendly at storing energy and converting it into electricity. Because of this, set up projects and preservation of some renewable strength sources can be very expensive at times, discouraging funding from groups and governments.

• Space: Compared to other sources of energy, renewable electricity sources take up area to generate energy. Solar strength can use more than a hundred acres of photo voltaic panels to produce about 20 MW of electricity. In comparison, a 650-acre nuclear facility may want to produce about 1,000 MW of electricity, whilst a solar plant of the identical dimension would only have 200 MW. A two MW wind turbine requires 1.5 acres of space.

• Storage can be expensive: Renewable strength often wants to be stored in batteries. The cost of just one battery can range from Rs10, 000 to Rs. 25,000.

• Generation Capacity Still Low: Currently, renewable strength era capability is not ample to meet our strength demands. As renewable electricity technologies improve and power consumption decreases due to more efficient appliances, electronics, and lighting, there can also come a time when we construct new and extra renewable power plants to meet our energy needs. Will get caught. We are not there yet, and till then we will be the usage of fossil fuels and nuclear power to grant a proper portion of our energy.

Even though inexperienced power is wanted for the future, a lot greater work needs to be achieved to make renewable energy our primary electricity source.

Sustainable Development

Sustainable development is made possible by using sustainable energy and giving citizens access to affordable, reliable, sustainable and modern energy. Strong government support and improving economic conditions have positioned India as the world's most attractive renewable energy market leader. The government has developed policies, programs and a liberal environment to attract foreign investment and rapidly enter the country into the renewable energy market. The renewable energy sector is expected to create a large number of domestic jobs in the coming years. Energy demand is increasing in India to meet the economic development plans that are being implemented. Providing more energy is an essential prerequisite for a country's economic growth. Developed by the

Ministry of Energy (MoP), the National Electricity Plan [NEP] is a detailed 10-year action plan aimed at supplying electricity to the whole country and a plan to ensure that citizens are supplied with electricity efficiently and quickly.[5] According to World Resource Institute report 2017, India accounts for about 6.65% of total global CO2 emissions, ranking fourth after China (26.83%), US (14.36%) and EU (9.66%). Climate change can also change the balance of the world's ecosystems.[7,8]

India is one of the world's largest coal consumers and imports expensive fossil fuels. Nearly 74% of energy demand is met by coal and oil. According to a report by the Indian Center for Economic Monitoring, India saw 171 million tons in 2013-2014, 215 million tons in 2014-15, 207 million tons in 2015-16, and 207 million tons in 2016-17, we imported 195 million tons of coal in 2017-2018.[9] Therefore, there is an urgent need to find alternative sources of power generation. The country has developed sustainable methods for its energy supply in recent years. Energy conservation awareness was promoted among citizens to increase the use of solar, wind, biomass, waste and hydropower. Clearly, clean energy is less harmful and often cheaper. India aims to reach 175 GW of renewable energy by 2022. This will consist of 100 GW from solar, 10 GW from bio-power, 60 GW from wind and 5 GW from small hydro.[10] Investors have pledged more than 270 GW, well above the ambitious target. Here are our pledges: 58 GW from foreign companies, 191 GW from private companies, 18 GW from private sector, 5 GW from Indian Railways.[11] Recent estimates point to over 750 GW of solar potential and 410 GW of wind potential in 2047. [12, 13] To reach the ambitious goal of generating 175 GW of renewable energy by 2022, it will be essential for governments to create 330,000 new jobs and livelihoods.[14, 15]

Green Energy Policy

India is expected to become one of the fastest growing economies in the world. Central Electricity Authority (CEA) [16] estimates that India will need 3.5 Trillion Units (TU) of power. Availability of reliable and affordable energy is a fundamental requirement to ensure high economic growth in India. Achieving India's net-zero target for 2070 while supporting strong economic growth will be difficult and the options are many. Given the variability and lack of 24/7 energy from renewable sources such as wind and solar, these are supplemented by other sources such as gas and supported by storage systems need to do it. De-carbonization policies should therefore respect the parameters of reliability, affordability and energy independence.

Strategies to ensure large-scale De-carbonization in India

Every decision must satisfy two requirements. First, there is an urgent need to ensure that government policy on energy supply is technology agnostic. Second, we must continue to support the innovation, development and implementation of green energy projects. EY-GE's white paper lists the following strategies for large-scale De-carbonization in India:

- ❖ Maximize renewable energy production, including offshore wind farms, supported by locally manufactured equipment as part of various limited production schemes. When designing incentives, policies should aim to minimize the use of carbon embedded in equipment.
- ❖ Develop CO2 capture technology to harness domestically sourced coal-based energy, which is the largest primary energy source.
- ❖ Promote the use of renewable energy by promoting proven new storage technologies. The Department of Energy provides guidance on the use of energy storage systems operating as part of power generation, transmission, distribution or as a stand-alone energy project.
- ❖ Rapidly provide environmental impact assessments for pumped storage power plants (PSH) to become viable. The specific guidance for his PSH project from the Ministry of Environment, Forests and Climate Change is helpful.
- ❖ Leverage existing natural gas-based power generation capacity and increase use of natural gas to take advantage of energy supply flexibility and reduced carbon footprint.
- ❖ Recognizing that the transition to green hydrogen can be done through blue/gray hydrogen, promote green hydrogen through demand-side incentives and cost-cutting measures, through policy support such as incentives linked to electrolyser production.
- ❖ Support smart grid deployment by defining smart grid standards. Focus on Diskus capacity building and develop a model where costs can be shared between consumers, generators, Diskus and state governments.
- ❖ Take steps to transform the grid from a centralized one-way transport of power to a more decentralized grid that can transport power in both directions.
- ❖ Encourage large-scale commercial and industrial energy consumer de-carbonization initiatives by developing carbon markets and optimizing green open access.
- ❖ Support green finance by developing common green taxonomies and frameworks for investment financing.

Conclusion & Suggestion

Buildings, transportation networks, and manufacturing would be redesigned to use less energy with higher energy costs. Rather than introducing new energy sources, systems will likely be redesigned to consume less energy for the majority of the transition to renewable energy. Since energy conservation is optimized when the marginal cost of energy conservation is equal to the marginal cost of renewable energy, this would be prompted by the higher costs of renewable energy. The marginal cost of solar PV energy is a limit on all energy costs, and it can be obtained sustainably in almost any quantity. The question is how to best manage the transition to renewable energy while minimizing the total cost of energy services and damages caused by energy use. The current energy system, which is dominated by fossil fuels, will eventually be replaced by a combination of conservation and renewable energy sources. Climate change suggests that this should be done as soon as possible.

The nation ought to take steps to entice private investors. R&D should be used to overcome inadequate technology and the lack of infrastructure needed to establish renewable technologies. The government should provide more

funding for this sector's research and innovation activities. Because there are not enough qualified individuals to train, demonstrate, maintain, and operate renewable energy structures, the institutions ought to take the lead in preparing the workforce. When compared to equipment made locally, imported equipment is more expensive; As a result, producing renewable energy becomes prohibitively expensive. As a result, the nation ought to become involved in the production of renewable products in order to reduce their prices. Renewables must be used in a hybrid configuration of two or more resources and conventional source and storage devices in order to achieve a reliable system. Standards and regulations for hybrid systems should be developed by regulatory authorities. In addition to the financial advantages, there will be benefits for society as a whole if effective policies and tax incentives are used to make investments feasible.

Biodiesel offers technical advantages over conventional petroleum diesel fuel or is technically competitive with it. Biodiesel's oxygen boosts combustion, lowering hydrocarbon, carbon monoxide, and particulate emissions; Oxidized fuels also tend to emit more nitrogen oxides. Wind energy also has a good chance of reducing greenhouse gas emissions when there is enough wind.

Abbreviations

WDI	World Development Indicator
IEA	International Energy Agency
MOLJ	Ministry of Law & Justice
BJP	Bhatiya Janta Party
MW	Mega Watt
GW	Gega Watt
MoP	Ministry of Power
NEP	National Electricity Plan
US	United States
EU	Europe Union
CEA	Central Electricity Authority
TU	Trillion Units
EY-GE's	General Electric & EY
R&D	Research & Development
Rs	Rupees

References:-

1. IEA. 2007. *Renewables in Global Energy Supply*. International Energy Agency and Organization for Economic Cooperation and Development
2. *IEA. 2012. Technology roadmap: bioenergy for heat and power. International Energy Agency, Paris.*
3. IEA. 2011c. *World Energy Outlook 2011 Factsheet*. International Energy Agency, Paris.
4. IEA. 2012. *Technology roadmap: bio energy for heat and power*. International Energy Agency, Paris.

5. IEA. 2013. *Key World Energy Statistics*. International Energy Agency.

6. National electricity plan (2016), Volume 1, Generation, Central Electricity Authority (CEA), Ministry of power, GOI .Available at http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf .

7. Canadian environmental sustainability indicators (2017), Global greenhouse gas emissions. Available at http://www.ec.gc.ca/indicateurs-indicators/54C061B5-44F7-4A93-A3EC-5F8B253A7235/ Global GH GEmissions_EN.pdf.
    a. Accessed 27 June.2017.

8. Pappas D (2017) Energy and Industrial Growth in India: The Next Emissions Superpower? Energy procedia 105:3656–3662

9. Blondeel M, Van de Graaf T (2018) Toward a global coal mining moratorium? A comparative analysis of coal mining policies in the USA, China, India and Australia. Climatic Change 150(1-2):89–101

10. Charles Rajesh Kumar. J, Mary Arunsi. B, Jenova. R, M.A.Majid (2019) Sustainable waste management through waste to energy technologies in India—opportunities and environmental impacts .International journal of renewable energy research 9(1): 309-342.

11. National Institution for Transforming India(2015), Government of India, Report of the Expert group on 175 GW RE by 2022,Available at http://niti. gov.in/writereaddata/files/writereaddata/files/document_publication/
    a. report-175-GW-RE.pdf.Accessed 31 Dec 2016.

12. Sholapurkar RB, Mahajan YS (2015) Review of wind energy development and policy in India. Energy Technology & Policy 2:122–132

13. India Energy scenarios 2047 (2015), ISGF for planning commission. Available at http://www.indiaenvironmentportal.org.in/files/file/ISGF_IES%202047%20 Documentation.pdf. Accessed 01 Jan 2017].

14. Harrison T, Kostka G (2014) Balancing priorities, aligning interests: developing mitigation capacity in China and India. Comparative Political Studies 47:450-480

15. Akash Kumar Shukl (2017) Renewable energy resources in South Asian countries: challenges, policy and recommendations. Resource-Efficient Technologies 3: 342-346.

16. CEA: Central Electricity Authority. *Executive Summary for March 2018.* New Delhi: Government of India, Ministry of Power, 2018.