International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 6 No. 19 March - April - 2025

"Viksit Bharat" By Means Of Energy Transition And Striking Equilibrium Between Sustainable And Economic Development

Maheshwari Prakash Jadhav
Asst. Prof. (M.A. SET Economics)
Annasaheb Magar Mahavidyalaya, Hadapsar, Pune-28
Corresponding Author – Maheshwari Prakash Jadhav
DOI - 10.5281/zenodo.15108615

Abstract:

"Viksit Bharat": A notion for the Sustainable Development of India serves as a revolutionary growth and development strategy for the country. Sustainable development and economic development are both possible with cleaner energy sources. As the world struggles with the increasing effects of climate change, clean & renewable sources of energy are more crucial than ever. It is now essential for the world to switch to clean energy, which comes from renewable resources like hydropower, wind, and solar. In addition to lessening the negative consequences of climate change, the transition promotes societal well-being, increases energy security, and creates economic opportunities. In keeping with India's vision of "Viksit Bharat," this paper discusses the Sustainable Development Goal of providing sustainable, affordable, and dependable energy for everyone (Goal 7) through the transition to renewable energy as an approach toward a sustainable future for economic development. India stands at Third in the world's renewable energy markets owing to ambitious government commitments, competent policymaking, and growing economic opportunities. To achieve carbon neutrality in India by 2070, the private sector, the central and state governments, and others are embarking on massive renewable energy projects. India is privileged to have an abundance of renewable energy sources despite its lack of traditional energy sources. It has been demonstrated that using renewable energy for overall development is essential to achieving sustainable economic development.

Keywords: Viksit Bharat, Renewable Energy, Sustainable Economic Development, Energy Transition, Governmental policies, Green Hydrogen.

Introduction:

"Developed India," or "Viksit Bharat 2047," is the government's goal to make the country a self-sufficient and thriving economy by 2047, when it commemorates its 100th anniversary of independence. Four pillars form the foundation of the vision: Annadata (Farmers), Mahilayen (Women), Garib (Poor), and Yuva (Youth). The program's criteria encompass social empowerment, infrastructure development, economic growth, technical advancement, and sustainability. Renewable energy transition can help India realize its ambition for "VIKSIT BHARAT". With a major objective of acquiring 50% of its energy from renewable sources by 2030 and reducing the GDP's carbon intensity by 45% from 2005 levels by the same year, India has committed to reaching net-zero emissions by 2070 under the terms of the Paris Agreement. This commitment is frequently referred to as the "Panchamrit" (five nectar ingredients) pledge of the Indian government.

India is quickly becoming the global leader in the clean energy transition under the direction of Prime Minister Shri Narendra Modi. The Indian government is making significant investments in renewable energy projects including solar parks, green corridors, green hydrogen, and battery storage in order to ensure a sustainable and equitable future. In its 1987

report "Our Common Future" the Brundtland Commission highlighted sustainable development and said that energy is required for daily living. Its long-term supply in growing amount from reliable, secure and ecological friendly resources is essential for future growth. The nation's economic and social progress has been greatly aided by the energy industry, while over usage of fossil fuels has resulted in an increase in greenhouse gas emissions.

Reliable and clean energy is essential for sustainable development, which is the ability to meet present generational requirements without endangering the ability of future generations to meet their own. Clean and dependable energy sources safeguard the environment while fostering economic expansion and development. People's standard of living is reflected in economic development. It focuses on citizens' social and economic growth. Literacy and health care facilities, sanitary facilities, job opportunities, investment facilities, cultural freedom, etc. are all part of people's overall development.

The field of renewable energy is always developing with the aim of replacing fossil fuels with sustainable alternatives including hydroelectric, solar, and wind power. This transition helps achieve climate change (Goal 13) and affordable, reliable energy for all (Goal 7) of sustainable development, which in turn helps reduce greenhouse gas emissions. Additionally, from an environmental standpoint, it helps reduce pollutants and carbon emissions, which promotes a healthier atmosphere. In terms of the economy, it reduces dependency on fossil fuels, stimulates innovation, and creates jobs. By reducing air and water pollution and providing cleaner energy options, energy adoption can improve health on a social level.

Objectives:

1. To understand Renewable energy sources and Sustainable development.
2. To understand the Potential for Renewable Energy in India
3. To highlight the Indian Government initiatives for Renewable energy transition.
4. To identify the challenges in the Indian economy's energy transition.
5. To examine the equilibrium between Sustainable and Economic Development by means of Renewable Energy Transition.

Research Methodology:

Secondary data gathered from magazines, newspapers, news articles, government publications, business websites, Ministry of New and Renewable energy reports, and national & international review journals served as the foundation for this study.

Potential For Renewable Energy In India:

India is a becoming a global leader in renewable energy production, with solar, wind, and hydro power accounting for a significant share of its installed capacity. The nation has set ambitious targets to become a major role in the global clean energy transition by 2030, with plans to reach 500 GW of renewable energy capacity.

1. **Solar Energy**: India has a lot of potential for producing renewable energy, especially solar electricity because of its plentiful sunshine. As of February 2025, India had about 100.33 GW of installed solar power capacity, which comprises off-grid solar installations, hybrid projects, grid-connected rooftop solar, and ground-mounted solar plants. A robust pipeline for future growth and expansion in the solar sector is demonstrated by the nation's total installed and pipelined solar projects, including Solar Parks, PM-Surya Ghar: Muft Bijli Yojana, and numerous other programs.
2. **Wind Energy**: India has the fourth-largest wind power capacity in the world as of January 2025, with an installed wind energy output capacity of about 48.36 gigawatts (GW). The states of Maharashtra, Andhra Pradesh, and Tamil Nadu have substantial wind power

potential. The "National Offshore Wind Energy Policy" facilitates offshore wind projects, particularly in Gujarat and Tamil Nadu and the "Viability Gap Funding (VGF) scheme," which was recently approved by the Cabinet to support the development of India's first offshore wind energy projects and allocate a substantial sum towards the installation and commissioning of 1 GW capacity along these coastlines, are two important Indian schemes aimed at extracting more wind energy.

3. **Hydro Energy:** India is regarded as the world's fifth-largest generator of hydropower. India has a far larger potential for hydropower, estimated at about 148,700 MW with a 60% load factor. The country's installed hydro energy producing capacity is about 46,000 MW, or about 12% of its overall power generation capacity. Hydroelectric power, which draws on India's waterways and streams to provide a reliable and sustainable energy source, makes a substantial contribution. Minor hydro projects produce 5.07 GW, but large hydro projects create 46.93 GW.
4. **Bioenery & Biomass:** Bioenergy adds 11.32 GW to the renewable energy mix. These bioenergy projects are essential for increasing the variety of renewable energy sources available in India by using organic materials and agricultural waste to produce electricity. Industrial waste, municipal solid waste, and agricultural residues are the main sources of biomass used to generate bioenergy. To encourage the growth of bioenergy projects, the Indian government has put in place initiatives like the National Bioenergy Programme. In recent years, India's potential to produce bioenergy has gradually increased.
5. **Green Hydrogen:** India's energy transition and expanding energy demands can be supported by a green hydrogen ecosystem. India set a target to achieve net zero by 2070 during the 2021 UN Climate Change Conference in Glasgow (COP26). Water is divided using renewable electricity to create green hydrogen, a clean energy source. It can take the place of fossil fuels in industry and transportation. It is an eco-friendly and sustainable method of cutting carbon emissions. The National Green Hydrogen Mission was founded by the Indian government to promote the development of green hydrogen as a renewable energy source. By 2030, the initiative aims to generate a minimum of 5 million metric tons of green hydrogen per year.

Indian Government Initiatives For Renewable Energy Transition:

1. **Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM-KUSUM)** is a scheme run by the Indian government that assists farmers in installing solar panels for irrigation. March 2019 marked the launch of the program. Individual farmers, SHGs, JLGs, cooperatives, Panchayats, FPOs, and WUAs are all eligible to participate in the program. By enabling farmers to sell excess electricity to the government, it helps them become less dependent on diesel and boosts their revenue. makes irrigation more efficient and environmentally friendly while giving farmers access to clean electricity. India's electrical system now has more solar capacity through the program. Farmers have benefited from the scheme's solarized agricultural pumps, which have allowed them to irrigate their farms. India's power grid now has 100,329.83 MW of solar capacity as of January 31, 2025, owing to the program.
2. **PM Surya Ghar: Muft Bijli Yojana:** This innovative project, which was introduced by Prime Minister Narendra Modi on February 13, 2024, is to enable the construction of rooftop solar panels in order to supply families with free electricity. With the ambitious goal of providing solar power to one crore families by March 2027, the PMSGMBY, the largest domestic rooftop solar initiative in the world, is transforming India's energy landscape.
3. **National Green Hydrogen Mission:** The purpose of the National Green Hydrogen Mission is to position India as a leader in the global market for the production, use, and

export of green hydrogen. January 4, 2023, was the launch date of the mission. By 2030, the primary objective is to boost green hydrogen generation to 5 million metric tons annually. It will provide supply networks for the distribution and transportation of hydrogen. In addition to becoming more energy independent and reducing reliance on fossil fuels, it can cut carbon emissions by around 50 million tons annually. The mission's overall coordination and execution are under the purview of the Ministry of New and Renewable Energy. The mission involves numerous firms, such as Larsen & Toubro, National Thermal Power Corporation, Indian Oil Corporation, Gas Authority of India, and Reliance Industries.

4. **Production-Linked-Incentives Scheme:** The PLI Scheme, which was introduced in 2020, is a targeted step toward independence in domestic manufacturing, investment and exports. The PLI Scheme aims to balance growth and sustainability, improve the manufacturing foundation, and lessen dependency on imports, all of which are in line with the goals of Atmanirbhar Bharat and the broader Make in India campaign. It demonstrates the country's determination to set the standard for production excellence, encourage innovation, and establish a robust industrial ecosystem that drives both domestic development and international competitiveness. The government provides incentives to businesses who produce specific goods in India.
5. **The Green Term Ahead Market is** power trading platform that enables buyers to acquire green energy from sellers. Bilateral transactions are made possible via this section of the Power Exchange. Contracts like Green Intraday, Green Day Ahead Contingency, and Green Term Ahead are offered in this market segment. The G-TAM market is divided into three sub-segments: GTAM Solar, GTAM Non-Solar, and GTAM Hydro. States that have a lot of renewable energy can be encouraged by GTAM to increase their capacity and sell the extra to other states.
6. **Tax Incentives**: The purpose of tax incentives is to encourage investments in renewable energy projects by offering tax advantages. Incentives for renewable energy and tax breaks are available to encourage the manufacturing of electric vehicles. In order to encourage investments in the solar industry and the growth of renewable energy infrastructure, the government has extended tax holidays for solar power projects.
7. **Nuclear Energy Mission**: With an ambitious goal of 100 GW nuclear power capacity by 2047, the Nuclear Energy Mission for Viksit Bharat is well-positioned to accelerate the development of nuclear power and establish India as a global leader in sophisticated nuclear technology. The research and development of small modular reactors, or "SMRs," is the main goal of this project. By 2033, India hopes to have five SMRs up and running, adding an extra 1-2 GW of clean energy to the grid. India's long-term carbon neutrality aspirations will be aided by this endeavor since it will lessen reliance on fossil fuels and generate clean energy that is estimated to offset millions of tons of CO2 emissions.
8. **Green Energy Corridors:** A green energy corridor (GEC) is a transmission and distribution system that links renewable energy sources such as solar and wind to the power grid. A GEC aims to increase the accessibility and efficiency of renewable energy. In order to reduce carbon emissions and meet India's targets for renewable energy, the Green Energy Corridor Project is crucial. In order to enable the efficient and seamless movement of renewable energy from sources of supply to demand centers, a specialized transmission and distribution infrastructure must be established. The main goal of a Green Energy Corridor is to solve the problems brought on by the inconsistent and dispersed nature of renewable energy sources like solar and wind.

Challenges in the Indian Economy's Energy Transition:

Ministry of New and Renewable Energy and State Governments have been making massive efforts to improve the position of renewable energy in India. But during the transition process, a number of difficulties have emerged, mostly in the areas of finance, technology, the environment, and policy and regulation.

Technologies for renewable energy frequently require financial outlays. The cost of setting up panels, wind turbines, and other required infrastructure may be a barrier to entry. Overcoming these challenges involves obtaining funds and financial incentives. Renewable energy projects need funding to be accomplished, compared to initiatives based on fossil fuels, renewable energy projects initially have far higher expenses, which presents difficulties for new developers.

There are disparities because different state has quite different energy-related policies. Lack of long-term policies might deter investment and impede advancement. To encourage the expansion of renewable energy, a comprehensive policy is urgently needed.

The biggest challenge is to managing unpredictability Issues of Renewable energy. The energy-generating capabilities of solar and wind power are dependent on meteorological conditions. Because energy production fluctuates, this irregularity may lead to reliability problems. Ensuring a supply of electricity despite these changes is the most difficult task.

Finding energy storage technologies is crucial to addressing unpredictability issue. The capacity and power constraints of the current battery technologies limit their potential for expansion. To keep the supply and demand for energy in balance, storage solutions must be developed. There are difficulties in integrating energy sources with the current power grid architecture. It can be difficult to properly manage grid security and stability when compatibility issues occur. It is essential to upgrade the grid infrastructure in order to handle the increased input from sources.

Renewable energy can nevertheless have negative effects even when it is environmentally favorable. Wildlife habitats may be disturbed by the usage of land for wind turbines and farms. Concerns may also arise when resources are extracted for technologies.

Consumers, employees, communities, regions, and nations may experience both positive and negative effects from the shift away from the use of fossil fuels. This shift has the potential to create new sources of income, increase employment opportunities, disperse economic activity in renewable energy sectors. However, communities that depend on supply networks for fossil fuels may become more economically vulnerable as a result of energy transition, and individuals who work in the extraction of vital minerals may become more financially insecure.

Solution: Supportive policy frameworks to achieve energy creation capability can help to alleviate obstacles in the energy transition of the Indian economy. It is imperative that the public and private sectors increase their investment. A seamless transition process can be facilitated by combining research and development with cutting-edge technology and talent development. Increasing public knowledge of the advantages of renewable energy is crucial for gaining support at the grassroots level.

Striking Equilibrium Between Sustainable And Economic Development By Means Of Energy Transition:

A sustainable future depends on striking equilibrium between economic development and sustainable development by the means of energy transition. This can be achieved by smooth transition that benefits the economy and the environment by making investments in renewable energy technology, enacting laws and regulations that support them, and encouraging cooperation. Sustainable economic development requires collaboration between governments, corporations, financial institutions, and communities in order to exchange knowledge, creative

ideas, and best practices. By diversifying their energy mix and lowering their dependency on fossil fuels, India is increasing their energy security and decreasing their susceptibility to supply shocks. Distant energy resource transportation is less necessary with sustainable energy sources like solar and wind power because of their accessibility and local sourcing. This can reduce the likelihood of supply disruptions caused by political unrest or natural calamities.

New job opportunities are created by the advancement and use of renewable energy technology, particularly in rural areas. Since farmers and landowners can lease their property for renewable energy projects and get monthly payments, it can give them a new source of income and promote rural development. In the long term, sustainable energy is more affordable than fossil fuels because, after the initial investment, renewable energy sources are usually less expensive. Reducing their dependence on traditional energy sources can help mitigate the financial effects of climate change, such as decreased production, increased insurance premiums, and damage to infrastructure. Air, water, land & noise pollution and related health costs can be reduced by adopting renewable energy alternatives.

Renewable energy transition policy and laws have a big impact on how economic benefits and costs are distributed. Economic and social disparities can influence patterns of energy access and consumption, increasing energy costs and exposing low-income households to energy-related dangers such environmental pollution, energy poverty, energy insecurity and social inequality. It is evident that Indian government must create policy frameworks and focused initiatives to support affected communities and take advantage of the economic advantages offered by the energy transition, such as high-quality green jobs, better working conditions, and gender equality to strike an equilibrium between Sustainable and economic development to achieve the vision of "VIKSIT BHARAT"

Conclusion:

There are opportunities as well as obstacles in India's energy transition. Rapid action and large investments are needed to address the immediate need to cut down carbon footprints. However, accepting and accelerating this transition, decreases greenhouse gas emissions and creates energy security & jobs. Government of India supports the development of renewable energy by funding the industry and expanding the circular economy through various schemes and initiatives such as solar panels, green corridor, green hydrogen & nuclear mission etc. Given India's current state of development, future growth potential, industrialization, and human advancement, renewable energy sources are the only practical and sustainable means of meeting the country's expanding energy needs and achieve the vision of "VIKSIT BHARAT". India is global leader in green economy and sustainable development thanks to its advancements in renewable energy generation, sustainable energy storage potential, and expanding battery recycling and reuse industry.

References:

1. https://mnre.gov.in/en/
2. https://pib.gov.in/
3. https://cdnbbsr.s3waas.gov.in
4. https://www.icsi.edu/
5. Times of India news article- August 7, 2023