iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** XI **Month of publication:** November 2021

DOI: https://doi.org/10.22214/ijraset.2021.38800

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue XI Nov 2021- Available at www.ijraset.com

Potential and Achievement of Renewable Energy sources in India

Ayush Bansal[1], Ayush Jha[2], J. P. Kesari[3]
[1, 2]*Department of Applied Physics, Delhi Technological University*
[3]*Department of Mechanical Engineering, Delhi Technological University*

Abstract: ***Pure and environmentally friendly energy is of significant interest these days. It is one of the key enablements in achieving the Sustainable Development Goals (SDGs), accelerating social progress, and raising the standard of living. This work seeks broad insights into the Indian renewable energy framework, policy, approach, and socio-economic challenges. These include grid-independent and specific activities such as 'Utility-Scale Power Generation, Potential Multiple Geographies in India' and the Government of India's current achievements in advancing renewable energy production. Although much progress and progress has been made in the last decade of alternative energy maturation and expansion, improvements can be sought to increase the use of solar energy for conventional energy sources in India.***
Keywords: Solar Panels, Solar Energy, Renewable Energy, Sustainable Development Goals, power generation, cleaner fuels

I. INTRODUCTION

India is home to 1.3 billion people and is projected to surpass China's population by 2025 and become the most populous globally. Is meeting the growing energy demand of an increasing population. India's total primary energy consumption doubled from 326.77 million tonnes of oil equivalent (MTOE) in 2002 to 753.3 MTOE in 2017. [4] Over the past decade, India has increased its renewable energy capacity, especially from solar and wind. There is a significant increase in this regard, representing a significant portion of the renewable product in the country. [4]

India is very close to an "energy revolution" where critical sectors of the Economy are increasing their technology to reduce carbon emissions while driving sustainable growth. [8] India has big potential for solar energy, which is undoubtedly the largest renewable energy supply among Asian countries. As the third-largest energy consumer globally, India wants a healthy mix of all industrial energy sources. [8]

The Indian Renewable power generation Sector is the 4th most attractive renewable energy market in the world. By 2020, India will rank fourth in wind power, fifth in solar energy, and fourth in renewable energy efficiency. -3% barren land, bioenergy - 3%, small hydro - 2.2% [2]

The installed renewable energy generation capacity has been booming over the years, with the CAGR being 17.33 percent between FY16-20. With increasing government support and a better economy, the world is more attracted to investors' perspectives. Renewable energy will play an essential role as India, which is expected to achieve 15,820 TWh by 2040, begins to meet its energy demand on its own. According to the Paris Agreement, the Government of India is reaching its one hundred and seventy-five GW target by 2022 to reach 227 GW of renewable energy capacity (including 114 GW of solar capacity & 67 GW of wind generation capacity). The government plans to set a renewable energy capacity of 523 GW (including hydro to seventy GW) by 2030. [7]

Energy demand in India is growing rapidly, and by 2030, India's total energy demand will more than double, but electricity demand will almost triple compared to today. In addition, current specific resources have a climate and limited potential. Therefore, another kind of pure and unlimited generation is inevitable.

As of July 2019, the share of RE in India's total installed capacity for power generation is 22.5%. India, which has abundant natural resources, has a vast potential to generate electricity through RE sources. Current technologies have made it possible to use these renewable resources more efficiently to generate electricity. Fortunately, India has abundant natural resources for the industrial production of electricity through renewable energy. Commercially available mixed renewable sources of electricity in India are wind, solar, micro-water, biomass, tidal, geothermal energy. [2]

India has tremendous energy potential, and despite the difficulties it faces, it is addressing the growing demand for power generation standards and meeting those aspirations through renewable energy sources. Electricity demand in India is growing at one of the fastest rates in the world due to growth and economic growth.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue XI Nov 2021- Available at www.ijraset.com

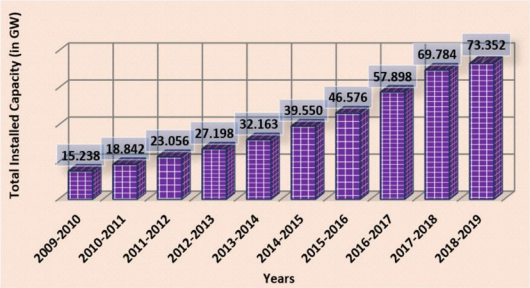


FIGURE 1. Growth of renewable energy over the past decade in India

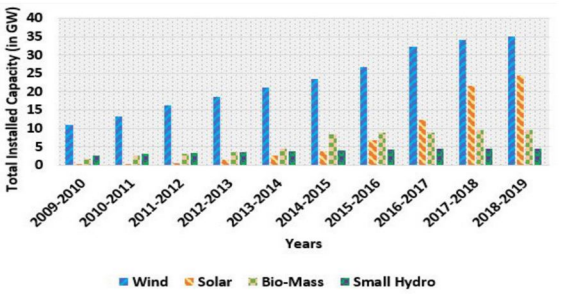


FIGURE 2. RE installed capacity (in GW) of various sources in recent years

To promote tremendous economic growth, it is necessary to switch to renewable cleaners, more cost-effective, and sustainable forms of energy from solar, wind, and nuclear sources. In fact, in recent years, we have seen a more drastic shift in government priority from promoting fossil fuel-based energy to solar and wind power through our various policies, programs, and incentives. Thus renewable energy is also at the forefront of empowering people at the grassroots level. The technology to implement alternative energy systems is widely available in India and needs to be brought in to meet the country's needs. [1]

II. RELATED WORKS

There have been many studies on India's opportunities and achievements in the field of renewable energy.

The study [2] covers India's perspective and perspective on solar energy consumption and undermines the country's potential for solar power generation. It covers schemes used by the government and essential measures to produce solar energy better. They also capture progress and incentives for solar energy production and consumption. This paper analyzes government policies, programs, and incentives for developing and developing the solar-wind sector in India and outlines potential limitations and solutions. It also reviews the development of an "offshore wind" that will be added to the nation's energy mix over the next decade. [4]

Another study is based on a comprehensive review of the policies of leading Indian states with renewable energy development, challenges, and international perspective. The Indian contrast in the global energy scenario is discussed in detail. In addition, barriers to the development of renewable energy production and policies of the Government of India to promote renewable energy production across India as well as globally are discussed in detail, as the challenges are similar to those of other countries.

Many news articles focused on India's recent achievements in the renewable energy sector in the past few years, which projected a healthy growth in renewable energy generation in the coming years/

III. DEVELOPMENT, ACHIEVEMENTS, AND INVESTMENTS

The Department for Promotion of Industry and Internal Trade (DPIIT) suggested data that showed that FDI inflows into the Indian non-conventional energy sector stood at US $ 9.83 billion between 2000 and 2020. More than US $ 42 billion has been invested. Has been investing in India's renewable energy sector since 2014. New investment in clean energy in the country reached US $ 11.1 billion in 2018. According to British Business Energy, an analytics firm, India ranks third globally in renewable energy investments and plans by 2020. Some of the significant investments and developments in the Indian renewable energy sector are as follows:

National Thermal Power Corporation Renewable Energy Limited (NTPC REL), a wholly-owned subsidiary of NTPC, has launched a tender for domestic manufacturers to build India's first green hydrogen filling station in Ladakh.
Reliance Industries has Rs. 750.00 crore ($ 10,070 million) of green energy.
Tata Power Solar Contract Rs. Rs 686 crore NTPC for the construction of 210 MW projects in Gujarat.
Adani Green Energy Limited (AGEL) has signed share purchase agreements with Softbank Group (SBG) and Bharti Group, planning to acquire a hundred percent stake in SB Energy India. India has a renewable energy portfolio of 4,954 MW, spread across four states.
The Central Electricity Authority has approved the expansion of the JSW Energy Karcham Wangtu hydropower plant from 1,000 MW to 1,091 MW (MW).

GE Power India has completed the acquisition of 50% of the shares in NTPC GE Power Services Pvt Ltd. Ltd. agreed. For Rs.7.2 crore.
NTPC plans to commission India's largest floating solar power plant in Ramagundam in Telangana from May to June 2022. The total installed capacity is 447 MW.
The United States Agency for International Development (USAID) and the United States Finance Corporation for International Development (DFC) reported a $ 41 million loan guarantee program to help Indian SMEs invest in renewable energy.
Adani Green Energy announced plans to purchase a 250 MW solar power project in the northern state of Rajasthan (on behalf of Hero Future Energy). The estimated value of the deal is $ 10 billion ($ 136.20 million).
Adani Green Energy Limited (AGEL) has signed an agreement to acquire a 100 percent stake in Skypower Global's 50 MW solar power project. This increases the operational renewables capacity to 3,395 MW with a total renewables portfolio of 14,865 MW.
JICA (Japan International Cooperation Agency) signed a JPY 10 billion (US $ 90.31 million) loan agreement with Tata Cleantech Capital Limited (TCCL) to provide loans to companies in India for renewable energy generation and mobility solutions. Can bid. Moreover, energy saving to mitigate the effects of climate change by reducing greenhouse gas (GHG) emissions (in line with the principles of green credit).
India and the US agreed to restructure their strategic energy partnership to focus on clean energy sectors, including biofuels and hydrogen production.
India added 2,320 MW of solar capacity during the COVID19 epidemic.
The Solar Power Corporation of India (SECI) has started a massive central auction for solar parks and placed orders at 47 parks with a capacity of more than 25 GW.
The Adani Group is working to become the world's largest solar energy company by 2025 and the largest renewable energy company by 2030.

Chennai Railway Station is the first Indian railway station to reach the target of 100 percent daily energy demand through solar panels installed at the station platform shelters. SCR is first of the many Indian railway zones to adopt the idea of 'Energy Neutral' railway stations. To become the largest green railway network globally, Indian Railways is currently moving towards "net-zero carbon emissions" before 2030. To harness the gigantic potential of renewable energy, railways are increasingly moving towards solar-powered installations. Stations that contribute to environmental protection. [8]

Indian Railways already has a RE power capacity of 220 MW (MW) and a capacity of about 3,450 MW in the pipeline. The ministry says it has a capacity of twenty gigawatts of solar energy and aims to use its vacant land parcels to line up land-based solar plants for its traction power needs. A memorandum of Understanding(MOU) has been signed with the United Kingdom Foreign, Commonwealth, and Development Office (FCDO) for cooperation on energy and sustainability under its Power Sector Reforms Program. Indian Railways is also planning to integrate a type of solar plus storage hybrid pilot program with the Railway Traction Network in Dahod, Gujarat.

A report by the Ministry of Railways showed that one MW of solar capacity has been installed on the roofs of different stations and buildings by January 2021, namely: [8]

1) Three MW Roof Top Solar Plant at Howrah Railway Stations [8]
2) 1 MW Rooftop Solar at Katra Railway Stations [8]
3) 3 MW Solar Land-Based Project at Modern Coach Factory in Rae Bareli [8]
4) A 1.7 MW solar pilot project, was launched in June 2020 at Bina in Madhya Pradesh to power the Indian Railways' traction network directly through alternative energy. [8]

IV. POTENTIAL

Over the years, the renewable energy sector in India has become a significant player in power generation capacity. Energy is one of the important components of economic growth and the well-being of nations. The existence and development of a suitable energy sector are essential for the Indian Economy's sustainable growth. India's energy sector is one of the most diversified in the world. The sources of energy production range from conventional sources like coal, lignite, natural gas, and oil to workable unconventional sources like wind, sun, water, and nuclear power. The country's demand for electricity has risen rapidly and is expected to continue to grow in the years to come; To meet the country's increasing demand for electricity, a massive expansion of the installed generation capacity is necessary. Renewable Energy Influence on the Indian Economy in the Last Five Years The renewable energy sector in India has seen tremendous changes in the political framework in recent years. The contribution to the total energy contribution in India. India ranks third out of 40 countries in the Renewable Energy Country Attractiveness Index 2016, with a strong government focus on promoting renewable energies. India has an approximate renewable energy potential of around 900 GW from sources such as wind (102 GW, bioenergy) 25 GW, small hydropower

20 GW, and solar power 750 GW. Renewable energies account for 15.90% of the total installed capacity in India. In March 2017, the installed capacity of renewable energies was 57,260 MW. Renewable energies have grown by more than 20% in the last five years. from 38,822 MW in 2015 to 57,260 MW in 2017. Wind power continues to dominate India's renewable energy industry, accounting for 29,151.29 MW in March 2017 compared to 25,088 MW in December 2015.

The installed capacity of renewable energies has increased steadily over time. Total installed capacity for renewable energies. The capacities in India grew steadily in the financial year 200715, from 9389 MW in 2007 to 34,351 MW in 2015 Wind and solar energy dominate the full potential of renewable energies in India, according to estimates of the states of the possibility of wind energy suggests suggesting that their potential is much higher in Gujarat and Tamil Nadu. In comparison, the prospect of solar energy indicates that its potential is much higher in Jammu and Kashmir, and Andhra Pradesh.

A. Growth Drivers

1) Through the Government of India, Ministry of New and Renewable Energy (MNRE), Generation Based Incentives (GBI), Capital and Interest Subsidies, Profitability Gap Financing (VGF). , Financing on favorable terms, tax incentives, etc.
2) The National Solar Mission is dedicated to promote the development and use of solar energy for power generation and other purposes with the ultimate goal of making solar energy competitive with fossil-based energy alternatives.
3) The National Solar Mission aims to reduce the cost of solar power generation through long-term action, large-scale implementation goals, aggressive RandD, and national production of raw materials, components, and critical products.
4) The government has provided a liberal environment for foreign investment in renewable energy projects. The establishment of its financial institution, the Indian Renewable Energy Development Agency (IREDA), provides new impetus to promote, develop and expand financial assistance for renewable energy. And energy-saving / efficiency projects.
5) Renewable energies are becoming very competitive than fossil energy generation, as the prices of solar modules have fallen by almost 80% since 2008.
6) The Reserve Bank of India (RBI) revised the guidelines for all scheduled commercial banks, including renewable energy in priority sector categories, in addition to the existing categories making significant progress for renewable energy in the priority sector of lending, as well as bank lending for rooftop solar as part of a Treat mortgage loan/home loan with a subsequent tax break.
7) Focus on the development of workforce qualifications: "SuryaMitra Scheme" was launched in May 2015 to create 0.05 million trained staff over a period of 5 years (201516 to 201920). In February 2017, almost 6653 SuryaMitra were trained under the program and created jobs. Opportunities for unemployed young people.

V. IMPACT ON HEALTHCARE SECTOR

The health care sector produces massive amounts of greenhouse gas emissions. The big machines and instrumentation that require to be operational all day long have enormous energy needs. Reducing the healthcare sector's emissions is a remarkable advancement in sustainability in healthcare. Renewable energy has the ability to facilitate the healthcare business lower expenses, leading to lower medical prices. Considering what amount of power the healthcare sector must operate daily, a marginal modification in energy bills would signify tangible savings. By reducing overhead costs with renewable energy sources, hospitals might be able to create very affordable patient care. Renewable energy sources can facilitate making health care more accessible. one of the significant essential problems. People in some parts of India still face is not having access to dependable energy sources.

The result of that is usually inadequate healthcare provisions. These energy sources don't need a nexus to an electrical grid, creating energy more flexible. They'll conjointly help convey medical provides safely. For example, vaccines often require temperature-sensitive storage, which can be difficult to care for over long trips. Solar panels on transport equipment guarantee cooling and transportable solar cold storage units do not scatter electricity, keeping them safe as companies distribute them with zero power requirement. Renewable energy-dependent hospitals show improved performance. Analysis administered by the Council on Energy Environment and Water (CEEW), Supported by Oxfam India, evaluated the role of electricity access on health care consequences in rural India. The research suggested that, on average, health facilities with solar energy panels attended up to 50% additional out-patients every month, addressed up to 50% more institutional deliveries, accepted a more comprehensive range of in-patients, and enforced day-and-night services. This was correct even for health centers with electricity provided for fewer than twenty hours per day. In addition, staff from the health centers had positive perceptions of Such systems. For example, approximately 98% of employees reported lower disruptions in daily functioning, and 80% reported savings in electricity prices.

While shifting to renewable energy sources will help save the health care industry money, it's conjointly proven to help build the healthcare sector a lot of sustainability and lower its carbon footprint within the long run. In addition, renewable energy sources have proven to help cut back the rising cost of healthcare and empower more individuals to access the healthcare they need.

VI. GOVERNMENT INITIATIVES AND POLICIES

Indian authorities, through the Ministry of New and Renewable Energy (MNRE), are actively working to encourage the adoption of renewable energy sources by offering a variety of incentives such as product-based incentives (GBIs), capital and interest rebates, and possibilities. Gap funding (VGF), discount finance, monetary incentives, etc.

1) The National Solar Mission works with the final goal of creating sun power compete with fossil-based electricity options. Another intention is to lessen the cost of solar energy generation withinside the country via long-time period policy, large-scale deployment goals, competitive R&D, and the local manufacturing of critical raw materials, components, and products.

2) The status quo of a committed monetary institution – the Indian Renewable Energy Development Agency (IREDA), makes for renewed impetus at the promotion, improvement, and extension of monetary assistance for renewable electricity and power efficiency/conservation projects.

3) Reserve Bank of India revised the pointers for all scheduled industrial banks, which include renewable power in the categories priority area, further to existing categories making massive inroads for renewable power in the priority area lending, additionally financial institution loans for solar rooftop structures to be dealt with as part of home or home improvement loan with subsequent tax benefits.

4) Focus on ability improvement of the workforce: "SuryaMitra Scheme" was released in May 2015 to create 0.05 million educated employees within a length of five years (2015-sixteen to 2019-20).

A. Sector Policies

1) The mandate of SECI (Solar Energy Corporation of India) allows to carrying out of a wide range of functions to facilitate the implementation of the National Solar Mission. SECI aims to improve Renewable Energy (RE) technology and ensure inclusive RE power reform across India.

2) The Ministry of New & Renewable Energy (MNRE) released the National Offshore Wind Energy Policy, 2015, which authorize MNRE to discover and promote the deployment of offshore wind farms withinside the Exclusive Economic Zone (EEZ) of India, and the National Institute of Wind Energy (NIWE) has been authorized as the Nodal Agency for improvement of offshore wind power in the country and to perform allocation of offshore wind power blocks, coordination and allied capabilities with associated ministries and agencies. It is deliberate to install an introductory offshore wind energy venture off the Gujarat coast soon.

3) The Policy for Grid-connected Solar Roof-top Projects: Joint Electricity Regulatory Commission (JERC)/State Electricity Regulatory Commissions (SERC) of 29 States/UTs, has notified regulations/tariff order for grid-related sun rooftop projects.

State Programs: The State Electricity Regulatory Commissions in Andhra Pradesh, Haryana, Punjab, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Gujarat, Kerala, Punjab, Orissa, and West Bengal have introduced priority tariffs to purchase energy from wind power projects.

New Solar Policy in 2016 - Delhi, Himachal Pradesh, and Haryana.

New Solar Policy in 2015 - Telangana Jharkhand, Gujarat, and Andhra Pradesh

VII. CHALLENGES

Renewable energies have grown significantly over the past decade, but there is still a long way to go to reach their full potential. Other obstacles/restrictions to the promotion of renewable energies are national and international guidelines, the availability of land for renewable power plants, political and social awareness as well as financial and technical considerations. As well as related guidelines and emphasis on economic energy consumption.
Some of the Major Barriers are:

A. *High Preliminary Cost*

1) The investment costs for installing renewable power plants are higher than for non-renewable power plants.
2) Prohibits consumers from adopting them as they prefer to keep primary costs low rather than lowering maintenance and operating costs.
3) The lack of access to favorable capital parameters such as inflation rate and interest rate during the installation of the renewable energy source also contributes significantly to the total acquisition costs.
4) The framework for the commitment to purchase renewable energy is not convincing, and most of the guidelines only apply to existing technologies.

B. *Economic and Financial Barriers*

1) Commercial banks are the ones that help finance RE projects. Although the banks offered their support, awareness did not spread, and the lack of information on many social power projects made it impossible for the banks to help.
2) Funding for renewable energy projects depends on issues such as project size, development, and technology.
3) If debt or equity demand is too high, Financing becomes expensive. Most banks are more willing to finance smaller projects than large projects.
4) Financing is provided through external Financing, syndicated loans, and bridging loans, among other things.

C. *Transmission and Distribution Losses*

1) In the transmission, distribution, and use of electricity, an average of about 30% of the losses was observed.
2) If the generation of renewable energies takes place far from the load center, the losses will increase sharply.
3) These losses should be monitored by the government, which is establishing a separate power distribution management department to allow for more efficient management and integration of future renewable energy generation centers into the grid.
4) As the network becomes more complex, so does the number of inverters, and this leads to high switching losses; This can be reduced by using bidirectional switches.

D. *Technical Barriers*

1) The main problem is that consumers are unaware of new technologies due to a lack of advertising. For example, solar technologies are misleading from the customer's point of view because they are available in abundance during the solar period, and they are not aware that some technologies make them very reliable in combination with hybrid photovoltaic systems.
2) Most of the generation of renewable energy is seasonal, and hydropower is dependent on rainfall and the availability of water.
3) The radiation that hits the globe depends on geographic locations, atmospheric conditions, are and the movement of the earth.
4) In some places, the data required to commission a system is not available, so there is a need in the country to set up stations that help to collect data on solar radiation and thus influence the progress of solar energy projects.
5) Communication between states on renewable energies should aim to overcome barriers. Hence, information support is essential to achieve the perfect articulation of efficient TERs, which will also propel and increase production.

E. *Research and development*

1) The research will require enormous government funding, but this is not currently available. In addition, companies that assume the market risk of introducing new technologies cannot take full advantage of their developments.
2) Technically trained candidates with specific management and development skills are unavailable due to insufficient training institutes.
3) There is insufficient guidance and technical support for engineers, resulting in inefficient use of renewable energy resources.

F. Land Clearance Problems

1) Hydropower generation requires the evacuation of people from areas with enormous water potential for dam construction, leading to the destruction of the habitats and animals in that area.

2) Wind turbines are placed on a farm that represents the habitat of birds and also leads to deforestation. Most of the birds died due to the turbine blades, but some measures were taken to protect the birds by placing birds. Radars detect birds in this area and stop the turbine if the turbines pose a potential threat to the birds.

3) Building a solar park requires a considerable area, and the main problem is getting the radiation data and identifying the hotspots.

4) In biomass, there exists a risk with untested fuel supply and conversion technologies, and the production costs are very high compared to other production methods. Another problem is the lack of government support to give developers free land to build plants.

VIII. CONCLUSION

GOVERNMENT'S INITIATIVE	DATE
In July 2021, to encourage rooftop solar (RTS) throughout the country, notably in rural regions, the Ministry of New and Renewable Energy plans to undertake Rooftop Solar Programme Phase II, which aims to install RTS capacity of 4,000 MW in the residential sector by 2022 with a provision of subsidy.	July 2021
In July 2021, the Ministry of New and Renewable Energy (MNRE) gave the go ahead to NTPC Renewable Energy Ltd., a 100% subsidiary of NTPC, to build a 4,750 MW renewable energy park at the Rann of Kutch in Khavada, Gujarat. This will be India's largest solar park to be developed by the country's leading power producer.	July 2021
In June 2021, Indian Renewable Energy Development Agency Ltd. (IREDA) has invited bids from solar module manufacturers for setting up solar manufacturing units under the central government's Rs. 4,500 crore (US$ 616.76 million) Production Linked Incentive (PLI) scheme.	June 2021
As of March 2021, State Bank of India financed Rs. 319.18 billion (US$ 4.28 billion) in renewable energy projects in India, wherein the bank financed 752 renewable energy projects, with a total installed capacity of 13.8 GW.	March 2021
In June 2021, the Competition Commission of India (CCI) approved ReNew Power to exchange equity shareholding by its existing shareholders with shares of ReNew Global. Along with this, the CCI also approved a reverse triangular merger of ReNew Global's subsidiary with RMG II.	June 2021
In April 2021, the Central Electricity Authority (CEA) and CEEW's Centre for Energy Finance (CEEW-CEF) jointly launched the India Renewables Dashboard that provides detailed operational information on renewable energy (RE) projects in India.	April 2021
In April 2021, the Ministry of Power (MoP) released the draft National Electricity Policy (NEP) 2021 and has invited suggestions from all stakeholders such as Central Public Sector Undertakings, Solar Energy Corporation of India, power transmission companies, financial institutions like Reserve Bank of India, Indian Renewable Energy Development Agency, HDFC Bank, ICICI Bank, industrial, solar, and wind associations, and state governments.	April 2021
In March 2021, the Union Cabinet approved a Memorandum of Understanding (MoU) in the field of renewable energy cooperation between India and the French Republic.	March 2021
In March 2021, Haryana announced a scheme with a 40% subsidy for a 3 KW plant in homes, in accordance with the Ministry of New and Renewable Energy's guidelines, to encourage solar energy in the state. For solar systems of 4-10 KW, a 20% subsidy would be available for installation from specified companies.	March 2021
In March 2021, India introduced Gram Ujala, an ambitious programme to include the world's cheapest LED bulbs in rural areas for Rs. 10 (US$ 0.14), advancing its climate change policy and bolstering its self-reliance credentials.	March 2021
In the Union Budget 2021-22, Ministry for New and Renewable Energy was allocated Rs. 5,753 crore (US$ 788.45 million) and Rs. 300 crore (US$ 41.12 million) for the 'Green Energy Corridor' scheme.	March 2021
Under Union Budget 2021-22, the government has provided an additional capital infusion of Rs. 1,000 crore (US$ 137.04 million) to Solar Energy Corporation of India (SECI) and Rs. 1,500 crore (US$ 205.57 million) to Indian Renewable Energy Development Agency.	March 2021
To encourage domestic production, customs duty on solar inverters has been increased from 5% to 20%, and on solar lanterns from 5% to 15%.	March 2021
In November 2020, Ladakh got the largest solar power project set-up under the central government's 'Make In India' initiative at Leh Indian Air Force Station with a capacity of 1.5 MW.	November 2020
In November 2020, the government announced production-linked incentive (PLI) scheme worth Rs. 4,500 crore (US$ 610.23 million) for high-efficiency solar PV modules manufacturing over a five-year period.	November 2020
On November 17, Energy Efficiency Services Limited (EESL), a joint venture of PSUs under the Ministry of Power and the Department of New & Renewable Energy (DNRE), Goa, signed a memorandum of understanding to discuss roll-out of India's first Convergence Project in the state.	November 2020
In October 2020, the government announced a plan to set up an inter-ministerial committee under NITI Aayog to forefront research and study on energy modelling. This, along with a steering committee, will serve the India Energy Modelling Forum (IEMF), which was jointly launched by NITI Aayog and the United States Agency for International Development (USAID).	October 2020
India plans to add 30 GW of renewable energy capacity along a desert on its western border such as Gujarat and Rajasthan.	2020
Delhi Government decided to shut down thermal power plant in Rajghat and develop it into 5,000 KW solar park	2020
The Government of India has announced plans to implement a US$ 238 million National Mission on advanced ultra-supercritical technologies for cleaner coal utilisation.	2020
Indian Railways is taking increased efforts through sustained energy efficient measures and maximum use of clean fuel to cut down emission level by 33% by 2030.	2020

REFERENCES

[1] Y. P. Chandra, A. Singh, V. Kannojiya, and J. P. Kesari, "Solar Energy a Path to India's Prosperity," J. Inst. Eng. Ser. C, vol. 100, no. 3, pp. 539–546, 2019, doi: 10.1007/s40032-018-0454-6.

[2] R. M. Elavarasan et al., "A Comprehensive Review on Renewable Energy Development, Challenges, and Policies of Leading Indian States With an International Perspective," in IEEE Access, vol. 8, pp. 74432-74457, 2020, doi: 10.1109/ACCESS.2020.2988011.

[3] Kiesecker, J.; Baruch-Mordo, S.; Heiner, M.; Negandhi, D.; Oakleaf, J.; Kennedy, C.; Chauhan, P. Renewable Energy and Land Use in India: A Vision to Facilitate Sustainable Development. Sustainability 2020, 12, 281. https://doi.org/10.3390/su12010281

[4] Singh, A.K., Idrisi, A.H. Evolution of Renewable Energy in India: Wind and Solar. J. Inst. Eng. India Ser. C 101, 415–427 (2020). https://doi.org/10.1007/s40032-019-00545-7

[5] Manna, U. (2017, June 27). Renewable Energy In India: Potential, Growth And Policies. Envecologic. Retrieved October 21, 2021, from https://envecologic.com/renewable-energy-in-india-potential-growth-and-policies/

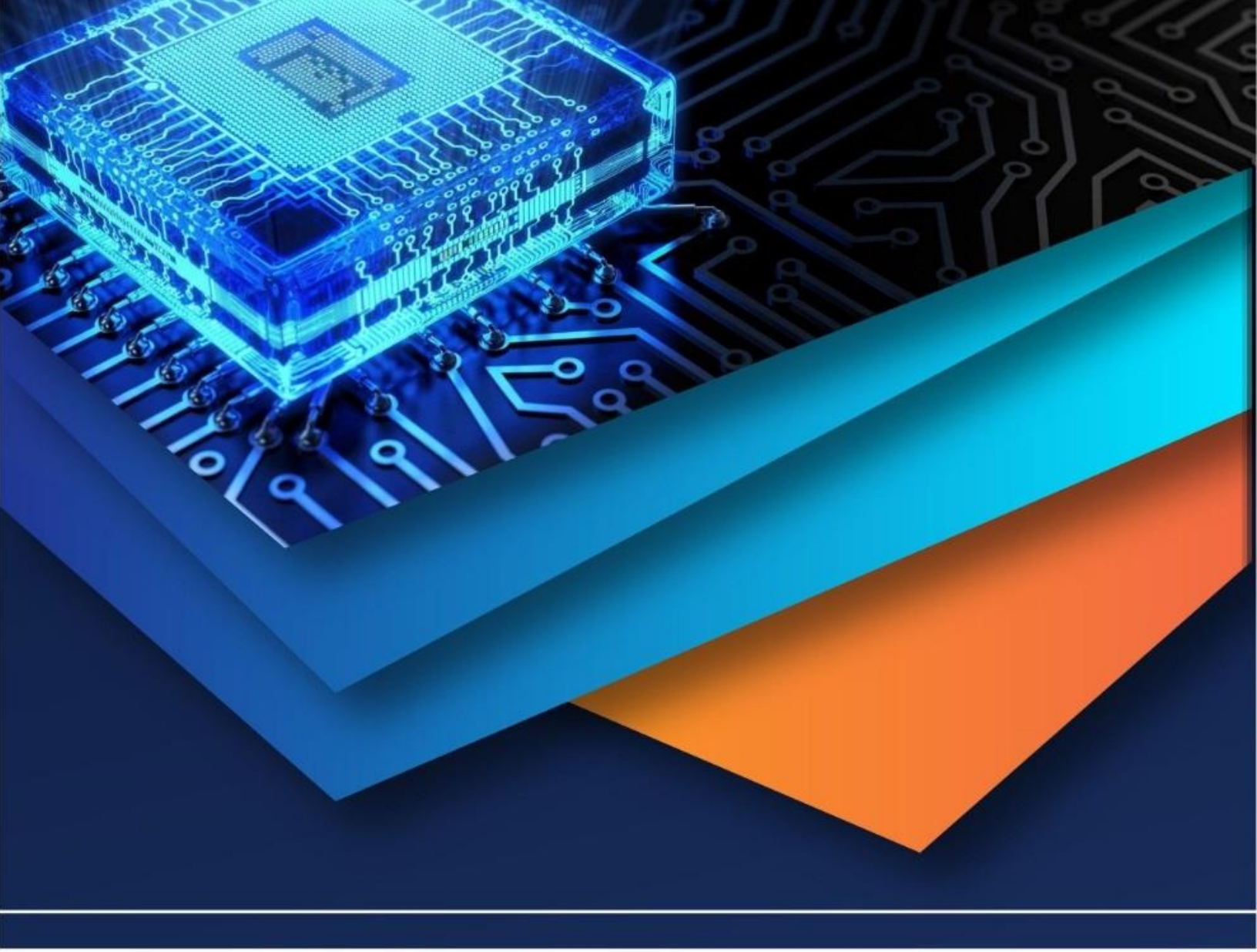
[6] Kumar. J, C.R., Majid, M.A. Renewable energy for sustainable development in India: current status, future prospects, challenges, employment, and investment opportunities. Energ Sustain Soc 10, 2 (2020). https://doi.org/10.1186/s13705-019-0232-1

[7] Renewable Energy Industry in India: Overview, Market Size & Growth | IBEF. (2021, October 12). IBEF. Retrieved October 21, 2021, from https://www.ibef.org/industry/renewable-energy.aspx

[8] PBNS (2021, September 26). Green Railways: Chennai's MGR Railway Station gets powered by solar energy. NewsOnAIR. Retrieved October 21, 2021, from https://newsonair.com/2021/09/26/green-railways-chennais-mgr-railway-station-gets-powered-by-solar-energy/

[9] Ashutosh Verma. (2021, September 21). How Renewable Energy can transform healthcare. ETHealthworld.Com. Retrieved October 21, 2021, from https://health.economictimes.indiatimes.com/news/industry/how-renewable-energy-can-transform-healthcare/86380608

[10] Press Trust of India. (2021, October 12). India set to achieve 450 GW renewable energy installed capacity by 2030: MNRE. India Today. Retrieved October 21, 2021, from https://www.indiatoday.in/india/story/india-450-gw-renewable-energy-installed-capacity-2030-mnre-1863724-2021-10-12



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY