

# Generation of Electric Power in India Using Machine Learning: A Review

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**Abstract:** With the rapid growth of the global economy, more people are living in urban areas than in rural areas, which has led to greater growth in energy demand, especially in developing countries. The recognition that there is a shortage of available fuel sources for electricity generation and climate change due to carbon emissions has strengthened concerns about energy conservation and global protection. Climate change, electricity consumption, and foreign oil prices have become a global focus, among other recent issues. Sustainable energy sources are currently the fastest growing market for electricity mixing and offer significant opportunities to address concerns about energy efficiency and sustainability. Both countries are striving to meet the Kyoto Protocol's goal of reducing greenhouse gas emissions by focusing on their energy policies for clean energy while others have become more common in energy production. The energy we are currently using is based on unlimited use not only in global face-to-face calculations, but also in the process of converting energy into tangible and intangible waste that has a significant impact on the global environment. To ensure safe electricity supply, improve energy efficiency, reduce dependence on fossil fuels and reduce greenhouse gas emissions, the rise in clean energy is now a major challenge to our economic and environmental growth. This paper review of power generation in India using machine learning.

**Keywords:** Analysis and Prediction, Power Generation, Machine Learning

## I. INTRODUCTION

### Sustainable energy in India

The produces the highest green energy. 38% of India's energy capacity comes from sustainable sources on 27 November 2020. They agreed a goal 40% output fuels. In the Central Electricity Authority program, the country aims to achieve a further per cent. The 2027 roadmap shows that India plans to have 275 GW of wind power, 72 GW of hydro, 15 GW of nuclear power, and 100 GW of 'almost zero emission'. The Indian government has launched the 40GW Rooftop Solar Project (RTP) by 2022, including the installation of roofs.

### Sustainable energy overview and targets

The working on aggressive growth projects in the world of green energy. At the 2019 UN climate summit, India announced its target for more than twice as much clean energy by 2022 from 175GW to in. New green energy expected to increase significantly for the near future by 2022, with India's double off power by almost 15 times as much as in April 2016. These targets will make India a world leader in put heart it. of the "Sunshine Countries" campaign which promotes solar growth and production in more than 120 countries around the world. growth size, accounting for 17 percent of the country's population. Rising living standards and population in India give India the highest energy consumption in the world.

Electricity targets for 2022 include 227.0 GW (from 175.0 GW) of sustainable energy sources, including approximately 113.0 GW of solar, 66 GW of air, 10.0 GW of biomass, 5.0 GW of low power electricity, and 31 GW of ocean. By end of 2019-2020, the 0 more required the installed energy set for January 2018 will be finalized. Between 2017 and 2022, the government has said no new power from more than 50.0 GW coal will be needed. Due to their low purchasing power, improved green energy production raises residual payment obligations for energy consumers.

Unlike several nations, India did not count major power plants as a clean energy target until 2019 as hydropower was under the previous energy department, not for modern and sustainable energy funds. The program has been developed in 2019 and has re-evaluated the capacity of major power projects. This is done to aid the export of electricity from major power stations, and this re-classification enables these plants to sell their energy without being bound by the requirement to purchase sustainable energy. The Green Energy Purchase Duty project requires state DISCOMs to get their energy in ways: non-solar green energy is often used to describe the power of large hydroelectric dams.

### Sustainable Energy

Sustainable energy, also called sustainable energy, comes from the continuous filling of natural resources or systems. Sunlight or cool air, for example, continues to glow and explode, but temperature. Although green widely regarded modern concept, the use of natural energy for heating, transportation and lighting has long been used. The wind blows the ocean-going mills and windmills. The sun emitted gasoline throughout the day and contributed to the blaze. However, people have gradually changed over the past five hundred years into cheap, polluting energy sources such as coal and fried gas.

Renewables have become the most important source of electricity, more than eight generations of the US generation now as wind power and solar energy have had enough and cheap changes in capture and storage. From solar-powered roofs to large-scale overseas power plants, the expansion of sustainable energy is now taking place in various sizes. Even the most complete rural regions are dependent on sustainable energy for heat and lighting. With the continuous improvement in the use of sustainable energy, making the modern American power grid to make it smarter, cleaner and more orderly in all regions will be a critical goal.

## II. LITERATURE REVIEW

Deshmukh et al. (2021), India has set targets for the impressive 2030 installation of more than 400 GW of wind and solar energy production by more than two-thirds of solar energy. This paper examines the cost of utilizing India's grid for energy reduction and carbon offset by 2030 for many winds and solar targets (300 GW to 500 GW) and the most effective solutions to those costs. We have found that the lowest carbon offset costs in most cases are systems where solar photovoltaics represents only 26 to 55 percent of the sustainable goal. This result requires a review of the existing objectives of the majority working in India. We also find that, in relation to other regions and contrary to common expectations, the achievement of higher sustainable targets will prevent the construction of very few mineral plants (coal and gas) due to the Indian climate and the need to meet the high demand for electricity. But building 600 GW of sustainable energy, most of which is wind power, reduces the frequency of fossil fuels, and that capacity will keep India's pollution of 2030 below 2018 levels below the cost of public carbon. With the possible reduction in wind and solar prices and higher coal energy costs, sustainable energy systems with a moderate or wind turbine could result in electricity costs equivalent to the mineral energy system. As an option to satisfy the high demand for energy, battery storage will limit the demand for gasoline power but can only cost the lower capital cost (up to US \$ 150 per kWh).

Saraswat & Digalwar (2021), This paper explores the traditional and sustainable energy sources of sustainable energy production in India from a variety of perspectives, including economic, engineering, social, environmental, political, and diverse approaches. In the testing and evaluation of these stores the Shannon Multi-Criteria Decision-making (MCDM) entropy method was used. Other options in the decision model are thermal, coal, nuclear, solar, wind, biomass and energy solutions. To determine the weight of the decision parameters, Shannon's law of entropy is used, and the AHP method is used to prioritize alternative sustainable energy methods. The study then established 14 conditions, taking into account five sustainable energy sources (solar, wind, hydroelectric, biomass and gas) to determine the optimal energy mix to support India's sustainable energy growth. The heroic production of solar power, wind power and hydro power with a centre that cuts through imports and exports is part of the mix of electricity mix by 2030.

Arumraj & Shereef (2021), In this section, analyse the redox flow battery (RFB) in EVs in conjunction with the new flow and energy storage system. The suitability of RFB insertion into the same battery is tested against the Li-ion battery. For example, India uses the budget allocated to the green corridor project as a condition for conducting financial performance reviews. The integrated approach makes it easier to use EVs, grid utility programs and absorb RE. Research shows the need for studies focused on improving the viscosity low RFB electrolyte to achieve greater technological power.

Wang & Liu (2021), India's state of power as a developing nation continues to be plagued by problems such as power shortages, energy defense challenges and poor energy production. Sustainable energy supply is a major way in India to solve this problem. The development of successful policies in the green energy sector requires a holistic view of evolution and driving the use of India's sustainable energy. However, the advent of globalization has made India's green energy use less important in foreign exchange. Developing countries into major regions and sustainable energy sources are exported and produced from India. Looking at domestic consumption, the direct impact of unit growth on India's individual needs has also declined. In terms of exports and imports are affected, there has been a lot of inclusion compared to developed countries in terms of energy impact and the individual impact of sustainable demand in developing countries.

Li & Wang (2021), As a combination of various energy systems, hybrid green energy systems offer a promising way to collect the highest sustainable energy. It has become a common and growing phenomenon in the field of science over the past decade. This paper examines the current application and the latest developments in the development and implementation of continuous hybrid energy systems.

Elavarasan (2020), In view of the growing public interest in climate change concerns, the share of sustainable energy production is growing daily. The increased sustainable energy allocation will provide us with powerful, reliable and environmentally friendly electricity services. The influx of sustainable energy into existing energy systems requires a great deal of study, preparation and growth which is a global priority right now. In this report, a comprehensive analysis of the Gujarat state of India is detailed in depth, unlike India, in the case study.

Ramesh & Saini (2020), Most Indians live in rural areas and some live in rural areas that are not connected to the grid. It is not possible to extend the grid link to supply electricity to these areas, but a stand-alone hybrid sustainable system is a viable option. The current cost of a lithium-ion battery device is 30 to 35 percent lower than a plumb acid-based battery system. Energy costs are reduced by 34 percent in the use of lithium-ion cells, 25 percent and 37 percent in the following charging, cycle charging and integrated shipping methods. It is evident from the findings that a Lithium-Ion energy solution based on a solar energy battery offers the best operating costs under the Combined Dispatch scheme. This study also includes a national overview with different input parameters such as discount rate, photovoltaic cost, battery cost, energy cost, wind speed and design flow rate. Changes in discount rates and fuel costs dramatically change energy costs and total current costs.

Gulagi (2020), In the case of Bangladesh, this analysis analyses energy transfer mechanisms. The process of implementing a temporary high-level space adjustment system, LUT Energy System Transformation, is being used to model Bangladesh's 2015 to 2050 transformation plan. Four scenarios have been developed to analyse various climate strategies to mimic current and alternative

policies on clean energy without the cost of greenhouse gases. These findings suggest that the cost of pollution increases the transition to a fully sustainable energy system, but eliminating those costs would not have a significant impact on the energy system, as 94 percent of electricity production will still be generated by sustainable by 2050. The current policy situation greatly increases energy costs and greenhouse gas emissions from 2025. The results show that countries such as Bangladesh are at risk of serious and complex domestic hazards leading to various risks, such as high electricity prices, increased greenhouse gas emissions, power instability and low political confidence in the pursuit of current energy policies. Focusing on indigenous sustainable resources, however, can help eliminate this risk and provide social and economic benefits.

Elavarasan (2020), Sustainable energy can be the undisputed future of humanity, where the demands of carbon are met, and non-sustainable partners, necessarily, temporarily reside in the great system of things. Arguments are like hitting a dead horse, but now it's time to refine some tools. The study looks at India's technological advances in the area of sustainable energy in recent decades. At the same time, that can be compared to the pace of employment in the same field in other lands. The purpose of this analysis is to describe the basic methods of generating electricity when India is far behind and in need of national reconstruction efforts. It focuses not only on the technical aspects of various sustainable energy but also on the challenges they face while in use. Policies to address these barriers are often addressed. In addition to China, India is the only country with a population of over 1.3 billion and more than 382 people per person per km<sup>2</sup> with the most population. India now has a population growth rate of 1.10%, up from 0.39% in China. His current model of energy use may seem unsustainable and should soon become a basic source of sustainable energy for survival.

Madurai Elavarasan (2020), With sustainable development in the electricity sector, a good mix of sustainable energy sources (RES) is needed. In terms of RES production, India is considered one of the fastest growing countries. The main objective of this study is to examine the dynamic nature of the Maharashtra state in a critical manner in order to identify its pitfalls, barriers and threats and to make recommendations and recommendations for achieving the RES objective by 2022. This thesis begins with a debate over the development of RES in various developed countries. It then examines the power imposed on India and reports that Maharashtra State has played a major role in India's power mix. The State Energy Mix is further evaluated by comparing the current and potential objectives of the State Program of Action. Achieving the capacity of the RES for 2022 is a major challenge for government. In this case, consideration is given to all the skills, obstacles and threats of the State. In addition, strong feedback and advice were made to clear the path to the intended goal. In government institutions, the science sector, institutional developers, decision makers and stakeholders who are interested in building sustainable energy infrastructure, this can help.

Rani (2020), The selection of suitable sustainable energy sources has become a major issue in recent years and affects environmental and economic growth. To solve this problem, some scholars have focused on the application of decision-making techniques using various fuzzy processes. A new mathematical line of measurement and selection of sustainable energy sources is proposed in this regard in this analysis on many decision-making issues focused on TOPSIS complex and compared to some of the current methods. Many experts in green energy were then selected to explore possible solutions between conflicting boundaries. In addition, abnormal resolution matrix and parameter weights are calculated using language values that are converted into liquids. In addition, the weight of each energy source expert is measured in the recommended manner. Then a wide range of variations amplified inspired by the fluid variation rate calculates the number of parameters. Finally, the challenge of choosing a green energy source is to show the difficult implementation of the adopted approach. The value of the proposed method lies in its ability to have other practical methods where more information is lacking.

Saiprasad (2019), India's main goal is to prioritize the use of sustainable energy (RE) to achieve technological and economic equality and to produce beneficial environmental effects. In this report, many opportunities are being explored by studying the technological and environmental impact of young people in India on the discovery of RE by expanding the hybrid sustainable energy (HRES) system. This concept is an example of how RE is understood and evaluated, tested in detail in the latest RE environment and explored the benefits and disadvantages of the new RE status in a small group. Compared to the Multiple Energy Resource (HOMER) software for Hybrid Optimization, IHOGA is still being studied extensively in literature, especially in grid-related applications. The current study provides a report of the desired site performance of RE grid-connected networks. HHOGA represents 15 results with standard load rates and various HRES acquisition costs. According to Aralvaimozhi tradition, at least 70% of the RE can be included in the lowest NPC HRES value. TBL research will reduce CO<sub>2</sub> pollution and provide local communities with job opportunities by including HRES on a small grid; however, the economic impact could be eliminated if the cost of purchasing HRES is reduced, as indicated by the report.

Das et al. (2019), The development of the hybrid green energy system has been a major challenge to address the disruption of sustainable energy and the wide range (eg technical and economic) environment of hybrid systems. Although many research projects have been carried out on the use of green energy systems, there is little research on practical models or effective methods. In streamlining complex systems such as hybrid sustainable energy systems, metaheuristic expertise finds its potential to provide fast, accurate and efficient solutions. The purpose of this concept is to achieve the optimal technological development of solar photovoltaic storage, biogas / hydro pumped energy and battery hydropower hybrid off-grid device using metaheuristic methods of radio broadcasting in India. The findings suggest that metaheuristics research should be well-structured; however, there are slightly stronger water cycle algorithms than the other two algorithms. Moreover, by comparing the findings with the literature, the current development of metaheuristics has led to the creation of a green energy system that is successfully implemented at low technological and economic costs.

Pursiheimo et al. (2019), From the point of view of integration, the future of sustainable energy is analysed using a global system model. Four opportunities, excluding biomass volume and the market share of electric vehicles, are being considered in the energy sector with a strong sustainable energy allocation. On the contrary, the company model as usual is used for carbon fines but without the absence of non-sustainable fuel. In the green case, high taxes for the year 2050 do not include non-sustainable energy sources and enable the model to find an inexpensive route from 2010 to 2050. The results show that a large proportion of sustainable energy

in each sector of the energy system is changing, especially in power generation, industry and transport. Extensive use of biomass is needed, and increasing energy for energy systems, especially in the industrial sector, is needed for strong solar and wind infiltration. Solar photovoltaic (PV) accounts for 39-44% of sustainable energy and 75% share of global energy production, as the promising growth of photovoltaic technology in Asia leads to solar energy in particular.

Bose & Sarkar (2019), During the 2017-18 cycle, 23,375 GW of solar, wind and hybrid track were sold by central and government agencies. Due to the low cost of large products such as solar panels, auctions have historically led to lower supply. On average the most successful supply of solar auction is 36.49 percent less than the ongoing FIT of solar auction in countries with e-reverse auction. FIT is then switched down. When an auction costs money, project outsourcing remains a crime. At the end of 2018, only 58.6 percent of the solar energy stored by the 2017 auctions was exported. The developers of the project are facing the curse of the winner due to the increase in the cost of importing solar modules. Bids were upgraded in 2018 due to the expected cost increase associated with the imported protection function by solar panels. In FY 2018-19, 8 GW solar bids were cancelled. Strategic submissions were hampered by distributors' efforts to force the auctioneers to meet the lowest prices at the next auction. This document analyses auction that is held back by the result of their price, implementation and project funding.

Singh, R. (2018), India's power situation has always suffered from problems such as power shortages, power imbalances and energy security challenges. Ordinary energy sources such as coal, oil and gas, large hydroelectric and nuclear power sources are born out of shortages, especially in the Indian context. This paper explores the feasibility of a guarantee introduced by this concept with clean energy technology. Similarly, limited long-term energy demand is limited using material models. Two conditions of sustainable development and three conditions of utilization growth are combined to create the six desired sustainable growth conditions combined. Analysis of this paper shows that, in the most desirable demand for sustainable energy, the share of sustainable energy in the general Indian energy mix grows from 6% to 43 to 44% by 2031-32, and then decreases to about 26-27 % in 2063-2065, while that may be the case. This allows policymakers to think more deeply about the potential for alternatives in long-term energy planning and emphasizes the need for cross-cutting research and development in the sector.

Ahmad & Alam (2018), Electricity and easy access serve as a symbol of progress and the gateway to all circular prosperity. There will be no centralized financial follow-up without adequate and consistent power supply. The study provides an overview of government actions, programs, missions, schemes and awards since the year 2000, global spending on India's energy to promote the provision of sustainable energy and solar and wind power systems across India. In addition, this study provides an integrated framework for microgrid implementation in the Indian context. To test the structure of the presentation, microgrid is used by Homer® as a model to simulate and improve the current framework, including environmental boundary and grid availability parameter

Teske et al. (2018), These findings parallel the conditions of the IPCC AR5 450 ppm, which are important in metropolitan areas in terms of 2050 electric power with high forecasting power and storage capacity and transport and construction needs. These findings are also addressed in terms of the impact on urban infrastructure and the shape of large cities in the global context of energy use. Global energy demand is expected to increase by more than 60% by 2050 under the REF in the transport sector where the deep-seated reduction (TMP) route will reduce the demand for transport energy on an annual basis to 70 EJ per year. This is a significant reduction, or compared to the other 450 ppm models, which can be addressed with significant changes in the flow of electricity in response to the reliability requirements of vehicles and the elimination of fire engines delivered by 2030 and the change of roads allowing cities for public transport. The global energy market of the construction industry in the ADV shows a lower variance than that of the transport industry according to some 450 ppm cases.

Gulagi et al. (2017), The emerging SAARC region (South Asia Regional Cooperation Association) is home to many citizens living in poverty. The ultimate goal for the future may be to make the area cheaper, more global, safer, and less carbon dioxide. The following scenario illustrates the benefits of combining industrial gas production with marine disinfection, indicating device costs that are reduced by 5 percent and total energy consumption by one percent. The results show that a 100% sustainable energy system in the SAARC area with cost-effectiveness measures can be realistic, making it more efficient than the options for the capture and storage of nuclear and residual carbon (CCS). The cost of land to build sustainable energy products that are not included in the LCOE standards and are considered small additions are one of the errors of this report.

Manju & Sagar (2017), The main sources of energy for the past have been fossil fuels such as tar, petrol and natural gas. However, the negative environmental effects associated with greenhouse gas emissions from traditional energy sources have led to a significant increase in the availability of clean energy. At the same time, India's growing population requires a growing annual supply of clean water for basic needs. This could lead to water shortages, given that India's population is expected to rise to 1.60 billion by 2050. By 2040, India is expected to reach 40th place in the world with water scarcity. To meet the growing demand for freshwater, goat transport is a smart and sustainable Indian solution, with a coastline of 7,517 km long. In this article, an in-depth study of India's water scarcity was proposed and another method was proposed to use seawater removal technology in combination with sustainable energy options. This paper looks at the state of groundwater in India and the global industry. With various salt extraction methods, we summarize energy consumption and include a brief overview of salt extraction techniques in India. In addition, the use of unconventional sources such as solar, wind and geothermal resources is being improved. In addition, environmental considerations are being raised due to the reduction of salt in the water and the measures against them. The purpose of this analysis is to raise awareness of the expected water shortages in India in the coming decades and to enable policy makers to select appropriate mussel removal technologies.

Gupta et al. (2017), India has a population of 1.25 billion. More than 200 million people live in rural areas and have no grid electricity. In 2012, India's power grid collapsed, and more than 600 million people were completely displaced. Hybrid power systems can be an easy and cost-effective way not only relying on grid reliability but also improving stability. There are some basic barriers to the construction of the solar and wind system in India. Our region, however, has sufficient sunlight and a moderate wind

speed. There is also a better chance of solar and wind energy projects taking place in India. The total cost can be determined by analysing the life cycle costs and recovery time of the hybrid device.

### III. CONCLUSION AND FUTURE SCOPE

Sustainable energy has the ability to play a significant role in the development of the country's industry and economic growth. In the foreseeable future, the demand for general residual energy is anticipated to increase substantially as a consequence of sustainable development and economic expansion, among other factors. Sustainable technology will not only assist India in meeting its energy needs, but it will also aid the nation in its efforts to combat climate change. Sustainable energy is becoming more readily available as a result of the expansion of goods from carbon offset awards under the Clean Growth Management initiative.

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