



Status of Renewable Energy in India

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Abstract:

Renewable Energy Is Energy Obtained From Natural Sources That Regenerate At A Higher Rate Than They Consume. The Two Main Types Of Energy Are Renewable Energy And Non-Renewable Energy. On The Other Hand, Fossil Fuels Like Coal, Oil, And Gas Are Non-Renewable Resources That Take Hundreds Of Millions Of Years To Form. When Fossil Fuels Are Burned To Produce Energy, They Emit Harmful Greenhouse Gases Like Carbon Dioxide. The Solution To The Global Warming Crisis Lies In A Change Away From Fossil Fuels, Which Now Produce Most Emissions. Renewable Energy Sources Contribute A Lot To Reducing The Emission Of Greenhouse Gases. Renewable Energy Sources Are The Answer To India's Energy Demands, Having Several Socio-Economic Advantages Compared To Carbon-Based Fossil Fuels. Renewable Energy Plays An Important Role In Achieving Sustainable Development In The Future. Through The “Make In India” Initiative Of The Indian Government, Renewable Energy Will Account For Significant Job Creation In Urban Areas As Well As Rural Areas Along With Several Other Renewable Energy Policies Which Cover Solar Energy, Wind Energy Among Other Renewable Energy Sources. This Paper Aims To Analyze The Current Total Generation And Sector-Wise Distribution Of Renewable Energy In India. To Identify The Initiatives Undertaken By The Government Of India In The Field Of Renewable Energy.

Keywords: Renewable Energy, Renewable Energy Production, Solar Energy, Wind Energy, Government Effort.

Introduction:

India Is The Most Populated Country. Due To The Increasing Population In India, It Can Be Said That Providing Jobs To The People Is A Big Challenge For India. Strength Is A Basic Requirement In Any Field Of Work. Energy Is In Two Ways: Renewable And Non-Renewable Energy. Our Focus And Pursuit Are On Renewable Energy. Renewable Energy Has Its Source And Can Be Replenished From Time To Time. It Is Used In Any Field Like Power Generation, Transportation, Etc. Many In Today's Age Technologies Have Been Developed To Produce Solar Panels, Windmills, Wind Turbines, Etc. Renewable Energy Can Be Transmitted From Sunlight, Wind, Tides, Waves, Biomass, Etc. Today The World Is Moving Towards Renewable Energy Because Of Its Easy And Infinite

Availability In Nature. In The 19th Century, Coal Was Used As An Energy Displacement But In The Last Few Years Renewable Energy Coal, Petroleum, And Fossil Fuels Outpace Energy. As This Field Is Being Stressed Daily, Jobs Are Also Skyrocketing. Renewable Energy Sources Are Another Indicator Of Sustainable Economic Growth.

Current Scenario Of Renewable Energy In India:

India Currently Has The Fourth-Place Global Rank For Installed Renewable Energy Capacity. The Sector's Growth Has Particularly Impacted India's Electricity Generation Capacity Over The Years. This Contributes To The Government's Objective For Sustainable Development While Playing

A Crucial Role In Supplying The Country With Electricity.

The Importance Of New And Renewable Energy Has Grown In Recent Years As National Energy Security Has Been A Significant Concern. Following The Two Oil Crises Of The 1970s, Energy Self-Sufficiency Was Found To Be The Main Impetus For The Development Of New And Renewable Energy In The Nation. The Commission For Additional Sources Of Energy Was Established In The Department Of Science & Technology In March 1981 As A Result Of The Abrupt Rise In Oil Prices, Supply-Related Concerns, And Detrimental Effects On The Balance Of Payments Position. The Commission Was Responsible For Formulating Policies And Their Implementation, Programs For The Development Of New And Renewable Energy Apart From Coordinating And Intensifying R&D In The Sector. In 1982, A New Department, I.E., The Department Of Non-Conventional Energy Sources (DNES), That Incorporated CASE, Was Created In The Then Ministry Of Energy. In 1992, DNES Became The Ministry Of Non-Conventional Energy Sources. In October 2006, The Ministry Was Re-Christened As The Ministry Of New And Renewable Energy.

India, A Nation Of 1.4 Billion People With One Of The World's Fastest-Growing Economies, Recently Cemented Its Place As A Pioneer In Renewable Energy. India Will Rank Fourth In The World For Installed Renewable Energy Capacity In 2021 With 147 Gigawatts.

According To The 2021 COP26 Climate Summit In Glasgow, Prime Minister Narendra Modi Laid Out India's Plans For An Additional 500 GW Of Renewable Energy Capacity By 2030. This Goal Is To Be Met Mainly By Significant Increases In Nationwide Wind And Solar Installations.

3. Materials And Methods:

To Achieve Its Goals, This Study Uses Secondary Data Sources From Yearly Reports Of The State And Union Governments, Including Those From The Department Of Renewable Energy, The Indian Economic Survey, Statistics Database, Publications, And Magazines. Additional Sources Of Data From The IEA And MNRE Were Used To Create This Analysis.

4. Review Of Literature:

Sidharth Jain(2020): Renewable Energy For Sustainable Development India:Current

Status,

Prospects,Challenges,Employment,And Investment Opportunities. In This Paper, India Will Analyze Renewable Energy Wide Supply. Renewable Energy Refers To Economic Social And Environmental Impact Factors. The Main Objective Of The Study Of This Paper Is To Point Out The Challenges Related To Renewable Energy And Suggest Some Recommendations For Promotion.

Srihari Manikandan (2022): Renewable Energy Resources: Current Status And Future Prospects. The Authors Of This Study Examined Environmental And Renewable Energy Challenges In India. The Article Examines The Effects Of Electricity Supply On The Growth Of Rural And Small-Scale Industries. The Overall Level Of Pollution In The World Has Dropped As A Result. Energy Utilization Has Been Demonstrated To Significantly Increase The Nation's Economic Growth.

Swati And Gaikwad (2015): Current Status And The Future Potentials Of Renewable Energy In India - A Review. In This Article, India Claims That It Is Essential To Experience Growth In A Rapidly Expanding Economy Is Energy. Moreover, About 33% Of India's Primary Energy Consumption Is Derived From Renewable Sources. According To Researchers, It Is Appropriate To Take Initiatives That Will Reduce Carbon Emissions And Improve Renewable Energy Technology. The Paper Analyses The Possibilities For Future Renewable Energy Initiatives As Well As Their Existing Viability.

Adesh Srivastava And Patel (2019): Present Status And Future Scope Of Renewable Energies In India. In This Paper, The Researcher Has Analyzed Renewable Energy In India And How Energy Generation And Renewable Energy Have Played A Role In The Public Sector. This Article Examines Solar Energy, Wind Energy, Hydroelectricity, Biomass, And Biogas Energy.

Bhattacharya (2009): Renewable Energy In India: Historical Developments And Prospects. According To The Researcher, Coal Contributes The Biggest Share Of India's Within The Country Energy Demand Because Of Its Economic Growth Rate Due To The Use Of Renewable Energy. This Paper Analyses How Renewable Energy Has Played A Role In The Use Of Some Of The Latest Technologies. This Article Describes

The Use Of Solar Energy And Rural Electrification Intensification Programs For Future Oil Crises And The Import Of Hydroelectric Power To Neighboring Countries.

Jagdeep Saxena (2022): Renewable Energy: Transforming The Face Of Rural India. According To This Research Paper, Renewable Energy Has Fulfilled A Critical Role In The Creation Of Rural Development Programs. Rural Transformation Has Been A Prevalent Subject Throughout India's Progressive Renewable Energy Journey. India's Goal Is To Reach 450 GW Capacity By 2030. India Has Set An Objective To Produce Electricity From Non-Fossil Fuels In A Few Decades.

5. Objectives:

1. To Know The Renewable Energy Production In India.
2. To Examine The Sector-Wise Distribution Of Renewable Energy In India.

5.1 Renewable Energy In India

India Has A Huge Demand For Energy To Fuel Its Rapidly-Growing Economy With A Population Of 1.3 Billion. India Was Power-Deficient At The Time Of Independence, And Efforts To Make India Energy-Independent Have Been Going On For Seven Decades, To Overcome The Power Shortage. At Present, We Are A Total Power Surplus Nation With A Power Capacity Of Over Four Lakh Megawatts. With Sustainable Development Goals In Mind, India's Power Generation Mix Is Rapidly Shifting To A More Significant Share Of Renewable Energy. Today, India Is The World's Third-Largest Producer Of Renewable Energy, With 40% Of Its Installed Electricity Capacity Coming From Non-Fossil Fuel Sources.

Solar Power: Solar Energy Is Created By Nuclear Fusion That Takes Place In The Sun. It Is Necessary For Life On Earth And Can Be Harvested For Human Uses Such As Electricity. We Currently Use Solar Energy To Heat Buildings, Warm Water, And Power Our Devices. The Power Is Collected Using Solar, Or Photovoltaic (PV), Cells Made From Silicon Or Other Materials. Recently, India Ranked 4th In Solar PV Deployment Globally By The End Of 2021. The Installed Capacity Of Solar Power Reached About 61.97 GW As On 30 November 2022. Currently, Solar

Tariff In India Is Very Competitive And Has Achieved Grid Parity.

Wind Power: Wind Energy Is Emerging As The Most Promising Alternative Energy Technology Of The Future. Over The Years, There Has Been A Substantial Increase In The Amount Of Power Generated By Wind-Driven Turbines Due To Recent Advances In Turbine Technologies. Although India Is Relatively New To The Wind Industry Compared To Denmark Or The US, Domestic Policy Support For Wind Power Has Led India To Become The Country With The Fourth-Largest Installed Wind Power Capacity In The World.

Small Hydro Power: Small Hydro Power (SHP) Projects Are Environmentally Friendly Because They Do Not Encounter The Problems Of Large-Scale Land Acquisition/Deforestation And Displacement Of Human Settlements. India Is The 7th Largest Producer Of Hydroelectric Power In The World. Hydro Projects In India Under 25MW Capacity Are Classified As 'Small Hydro Power' And Are Considered As 'Renewable Energy'.

Biopower: Biomass Has Always Been An Important Source Of Energy For The Country, Considering The Benefits It Offers. It Is Renewable, Widely Available, Carbon Neutral, And Has The Potential To Provide Significant Employment In Rural Areas. Biomass Has The Potential To Provide Robust Energy. About 32% Of The Total Primary Energy Consumption In The Country Is Still Derived From Biomass And More Than 70% Of The Country's Population Depends On It For Its Energy Needs. As Of 31.10.2022, A Total Installed Capacity Of 10205.61 MW In The Biomass Power And Cogeneration Sector.

Nuclear: The Country's Current Installed Nuclear Power Capacity Is 6780 MW, Consisting Of 22 Operational Nuclear Power Reactors. Additionally, One Reactor, KAPP-3 (700 MW) Was Connected To The Grid In Jan- 2021. The Existing 6780 MW Nuclear Power Capacity Will Be Increased To 22480 MW By 2031 With Projects Under Construction And Sanctioned. More Nuclear Power Plants Are Also Planned In The Future.

5.2 Installed Capacity Of Renewable Sources Of Energy In India

Renewable Energy	MW	% Of Total
Hydro	46,850	11.3%
Wind, Solar& Other RE	125,160	30.1%
Wind	42,633	10.2%
Solar	66,780	16.1%
Biopower/Cogen	10,248	2.5%
Waste To Energy	554	0.1%
Small Hydro Power	4,944	1.2%
Nuclear	6,780	1.6%
Total Capacity	178,790	43%

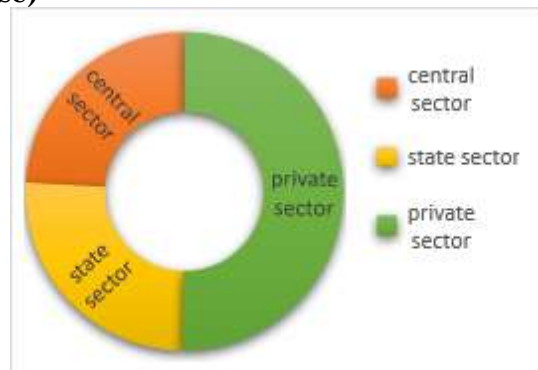
Source: CEA (As On 12 April 2023)

Renewable Energy Sources, Including Large Hydropower, Have A Combined Installed Capacity Of 178,790 MW. The Above Table Shows Wind Power: 42,633 MW, Solar Power: 66,780 MW, Biomass/Cogeneration: 10,248 MW, Small Hydro: 4,944 MW, And Energy From Waste: 554 MW. The Renewable Energy Capacity Shown In The Above Table Has Increased Year-On-Year And The Increase In Renewable Energy Capacity In

India Has Been Complementary To India's Economic Growth. India Aims To Reduce The Carbon Intensity Of The Nation's Economy Below 45% By The End Of The Decade, Achieve 50 Percent Of Installed Cumulative Electricity From Renewables By 2030, And Achieve Net-Zero Carbon Emissions By 2070. Carbon Technologies Could Create An \$80 Billion Market In India By 2030, Says The Indian Government.

5.3 Installed Generation Capacity (Sector-Wise)

Sector	MW	% Of Total
Central Sector	1,00,055	24%
State Sector	1,05,726	25.4%
Private Sector	2,10,278	50.5%
Total	4,16,059	



Source: CEA

Job Creation: Due To The Neoteric Underlay Of The Renewable Energy Field, There Are Agglomeration Jobs In This Sector Which Not Only Lead To Power Avulsions But Also A Good Realm For The Deputation Of Indian Youth In The Energy Sector. Energy Is The Initial Thing That All Industries Require, No Machine Or Doohickey Can Run Without Energy (Except Manual Machines). So, For The Generation Of Energy Companies And Government Must Employ The Roustabout. The

Government has Taken Umpteen Initiatives For The Development Of Renewable Energy In India Through The “MAKE IN INDIA” Project. Tata Power Solar Systems, Ware Solar, Etc. Are The Major Companies That Are Outbidding The Solar Energy Sector In India. Vestas India, Inox Wind Etc. Are The Major Companies That Are Superinducing The Wind Energy Sector In India. Institutional & Domestic Biogas Plant, FRD Biotech, Etc. Are The Major Companies That Are Developing The Biogas Energy Sector In India.

5.4 Indianguovernment (2022) Achievements:
Program/Scheme-Wise Cumulative Physical Progress As Of March 2023.

Achievements (April -March 2023)	Cumulative Achievements (As Of 31.03.2023)	
Installed RE Capacity (CAPACITIES IN MW)		
Wind Power	2275.55	42633.13
Solar Power*	12783.82	66780.34
Small Hydro Power	95.20	4944.30
Biomass (Bagasse) Cogeneration	0.00	9433.56
Biomass(Non- Bagasse)Cogeneratio n	42.40	814.45
Waste To Power	25.00	248.14
Waste To Energy (Off-Grid)	52.29	305.89
Total	15274.26	125159.81

Source: MNRE (Ministry Of New & Renewable Energy).

India Saw The Highest Year-On-Year Growth In Renewable Energy Additions Of 9.83% In 2022.The Installed Solar Energy Capacity Has Increased By 24.4 Times In The Last 9 Years And Stands At 63.3 GW As Of Feb 2023.

5.5 Indian Government Target:

India Has Set A Target To Reduce The Carbon Intensity Of The Nation's Economy By Less Than 45% By The End Of The Decade, Achieve 50 Percent Cumulative Electric Power Installed By 2030 From Renewables, And Achieve Net-Zero Carbon Emissions By 2070. Low-Carbon Technologies Could Create A Market Worth Up To \$80 Billion In India By 2030.

India 'S Target Is To Produce Five Million Tonnes Of Green Hydrogen By 2030. The Green Hydrogen Target Is Set At India's Electrolyzer Manufacturing Capacity Is Projected To Reach 8 GW Per Year By 2025. The Cumulative Value Of The Green Hydrogen Market In India Could Reach \$8 Bn By 2030 And India Will Require At Least 50 Gigawatts (GW) Of Electrolyzers Or More To Ramp Up Hydrogen Production.

1. India Currently Has A Total Renewable Energy Capacity Of 168.96 GW (As Of 28th February 2023) With About 82 GW At Various Stages Of Implementation And About 41 GW Under Tendering Stage. This Includes 64.38 GW Of Solar Power, 51.79 GW Of Hydro Power, 42.02

GW Of Wind Power, And 10.77 GW Of Biopower.

2. 59 Solar Parks Withan Aggregate Capacity Of 40 GW Have Been Approved In India.
3. Solar Parks In Pavagada (2 GW), Kurnool (1 GW), And Bhadla-II (648 MW) Are Included In The Top 5 Operational Solar Parks Of 7 GW Capacity In The Country.
4. The World's Largest Renewable Energy Park Of 30 GW Capacity Solar-Wind Hybrid Project Is Under Installation In Gujarat.
5. India Offers A Great Opportunity For Investments In The RE Sector; \$196.98 Bn Worth Of Projects Are Underway In India.
6. Wind Energy Has An Offshore Target Of 30 GW By 2030 With 3 Potential Sites Identified.

Union Budget 2023 Highlights

Green Growth Is Identified As One Of The Nodes In The SAPTARISHI (7 Priorities).

1. \$2.4 Bn National Hydrogen Mission For Production Of 5 MMT By 2030. \$36 Mn Additional In Budget.
2. 4 Gwh Battery Energy Storage Systems Supported Through Viability Gap Funding.
3. Pumped Storage Projects Has Received A Push With A Detailed Framework To Be Formulated.
4. \$1.02/2.5 Bn Central Sector Support For ISTS Infrastructure For 13 GW Renewable Energy From Ladakh.

Conclusion:

Renewable Energy In India Is The Largest And The Main Driver Of Economic Growth. The Installed Renewable Energy Capacity Of 11.9 GW In 2021 Will Increase To 14.21 GW By 2022. According To IRED, The Government Of India Has Decided To Target A Non-Fossil Fuel-Based Installed Capacity Of 500 Plants By 2023 As Part Of The Five Hundred Goals. The Result Of This Paper Analyzed The Renewable Energy Potential As It Currently Exists. Renewable Energy Has Made Its Own Major Contribution To Sustainable Development Soon And Has Led To The Creation Of Many Jobs In Rural And Urban Areas In India From Renewable Energy To Solar, Wind, Bio-Energy, And Other Energies. It Has Contributed Significantly To India's Economic Growth. It Can Be Said That Energy Is The Basic Focus Of Digital And Technologies.

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