Renewable Energy Resources

MS Lokhande Dnyaneshwari Santosh[1], Prof.Shahuraj Yevate[2]
[1]*Student, MCA, Department of Master of Computer, RSPM's Institute of Computer and Management Research, Savitribai Phule Pune University*
[2]*Project Guide, RSPM's Institute of Computer and Management Research, Savitribai Phule Pune University*

Abstract- Renewable energy is cleaner, more sustainable. renewable energy comes from natural resources, nonrenewable energy comes from finite resources such as coal, natural gas, Renewable energy resources are energy sources that are naturally replenished on a human timescale. Solar energy is energy which get from the sun and converted it into the electricity or other energy resources it is clean, abundant and renewable energy resource to generate electricity from sunlight Geothermal energy is heat, which comes from interior structure of earth This heat energy can be used for electricity generation, direct heating, and even cooling through systems like geothermal heat pumps. Wind energy is a form of renewable energy which is used to generate electricity by the use of wind or fast air. Tidal energy is acquired from the rise and fall of tides due to the gravitational pull of the moon and son. Biomas energy is renewable energy source biomass energy is derived from organic materials such as agricultural waste, plants, animal dung. Hydro power plant, getting energy from the flowing water and generating the electricity with the help of turbines; Solar, wind, hydro, geothermal, and biomass energy sources each bring unique advantages and challenges, but together they form a diversified portfolio capable of supporting a cleaner and more resilient energy future.

Index Terms - Renewable energy comes from natural resources, nonrenewable energy comes from finite resources such as coal, natural gas, Renewable energy resources are energy sources that are naturally replenished on a human timescale. renewable energy is cleaner, more sustainable.

I.MAIN TYPES OF RENEWABLE ENERGY RESOURCES

Solar energy
**source* – sunlight
**uses*-electricity, heating, lightning

Geothermal energy
**source* -heat from beneath of earth surface
**uses*-electricity, heating, and cooling

Wind energy
**source* -wind
**uses*-generating electricity

Tidal and wave energy
**source* -ocean tides and waves
**uses*-generating electricity

Biomass energy
**source* -organic materials
**uses*- heating, electricity ,fuel

Hydro power plant
**source* -flowing water, for example, dams
**uses*-generating electricity

II.LITERATURE REVIEW

Solar Energy
Solar energy is one of the most researched and rapidly growing renewable energy sources. According to *International Renewable Energy Agency (IRENA, 2023), solar photovoltaic (PV) technology has seen exponential growth due to falling costs, improved efficiency, and favorable policy frameworks. Research by **Green et al. (2020)* explores advancements in perovskite solar cells, emphasizing their potential to surpass silicon-based systems in efficiency and cost-effectiveness. However, issues related to energy storage, land use, and intermittency remain challenges for widespread solar adoption (*Tsiropoulos et al., 2018*).

Wind Energy
Wind energy has become a cornerstone of renewable energy deployment, especially in regions with consistent wind patterns. Offshore wind farms, as discussed by *Musial and Ram (2019), offer higher and more stable energy output compared to onshore systems, though they require significant investment and environmental considerations. Integration of wind energy into power grids, especially in developing economies, poses technical and infrastructural challenges (Lund et al., 2020*).

Hydroelectric power plant
Hydropower is the most established form of renewable energy, accounting for over 50% of global renewable electricity generation (*IEA, 2022). While large-scale dams offer high energy output, they often raise ecological and social concerns. New research focuses on **small hydropower systems* and *run-of-the-river projects* as more sustainable alternatives (*Kaunda et al., 2012). Climate change impacts on water availability and seasonal variability are also critical concerns for long-term hydropower reliability (Zhou et al., 2019*).

Biomass and Bioenergy
Biomass energy, derived from organic materials, has received attention for its potential to provide a carbon-neutral alternative to fossil fuels. Studies by *Demirbas (2017)* highlight the role of second-generation biofuels and waste-to-energy technologies in enhancing the sustainability of biomass systems. However, concerns over food security, land competition, and emissions from biomass combustion remain topics of debate (*Searchinger et al., 2008*).

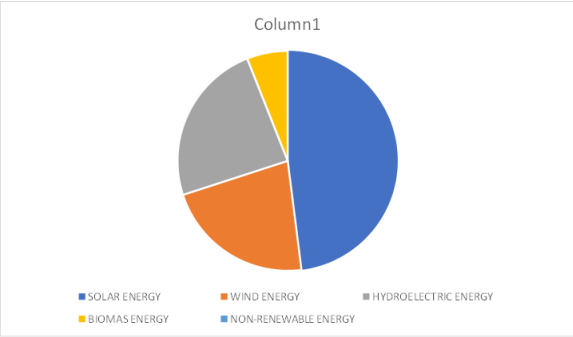
Geothermal Energy

Geothermal energy offers a reliable and constant source of heat and power, particularly in geologically active regions. Research by *Lund and Boyd (2016)* notes increased global capacity and improved drilling technologies. However, high initial costs and location-specific limitations continue to restrict geothermal adoption on a broader scale.

Research Gaps and Future Directions

- Long-term environmental impacts of large-scale renewable installations.
- Lifecycle analyses of emerging technologies.
- Integration of decentralized renewable systems in developing regions.
- Cross-sectoral research *connecting energy with water, food, and land systems (the "nexus" approach).*

III. PRPOSED AREA



Solar energy

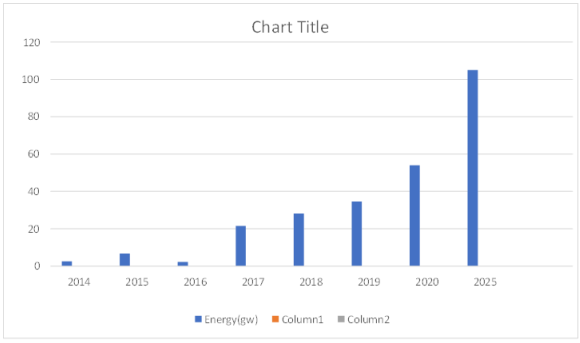
Solar energy is energy which get from the sun and converted it into the electricity or other energy resources it is clean, abundant and renewable energy resource to generate electricity from sunlight Technologies like photovoltaic panels and solar thermal collectors are used

Benefits

- Clean renewable
- Cost-effective
- Abundant
- Low maintenance
- Environment friendly

Top producers-

- India
- Germany
- Japan
- US
- Brazil
- China



Geothermal energy

Geothermal energy is heat, which comes from interior structure of earth This heat energy can be used for electricity generation, direct heating, and even cooling through systems like geothermal heat pumps.

It is possible in high volcanic activity places

Benefits–

- Renewable
- Sustainable
- Low vision
- Small land footprint

Top producers:

- USA
- Indonesia
- Philippines
- Iceland
- Kenya

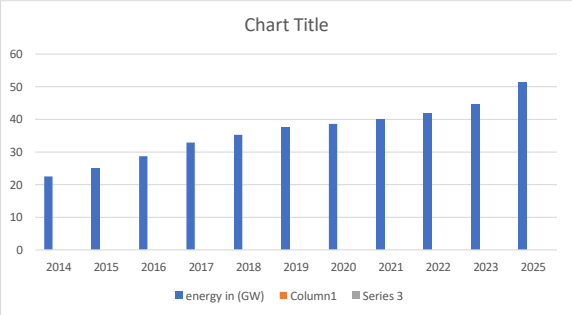
Wind Energy

Wind energy is a form of renewable energy which is used to generate electricity by the use of wind or fast air. This is typically done by using wine turbines. It has fan like structure that moving with the help of air and convert the wind energy into electrical energy

Benefits:

- clean
- sustainable
- low operating cost
- scalable

Top producers –
- China
- US
- Germany
- India
- Spain

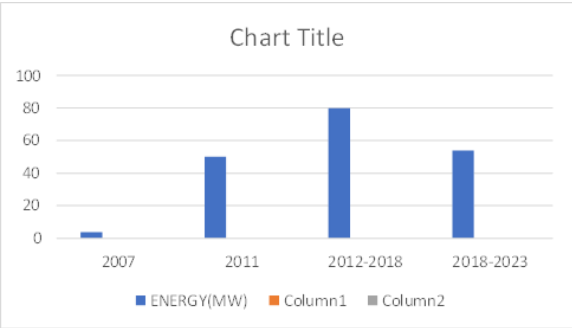


Tidal and wave energy

Tidal energy is acquired from the rise and fall of tides due to the gravitational pull of the moon and sun. Waves are the form of energy originates from the sun. Tides are the form of energy originates from moon. It is formed due to the movement of the wind over the surface of the ocean. Tidal Energy is caused by tides.

Benefits-
- renewable
- Clean
- High energy density
- Efficient
- Environmentally friendly

Top producers:
- Uk
- Us
- South koria
- India

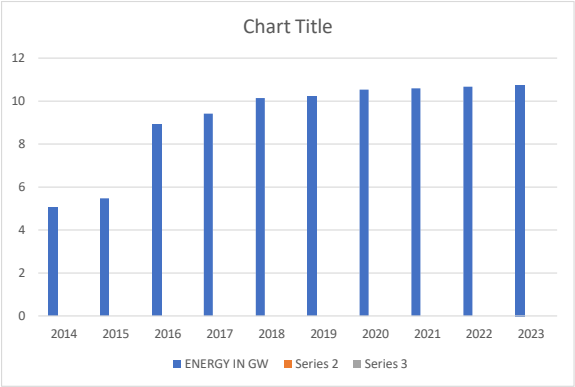


Biomass energy

Biomas energy is renewable energy source biomass energy is derived from organic materials such as agricultural waste, plants, animal dung etc Biomass energy is used to produce electricity, biomass, fuels, and heat. We can use biomass energy as an alternative source of fossil fuel.

Benefits-
- Renewable
- Sustainable
- Clean
- Carbon neutrality
- Waste management

Top producers:
- China
- Brazil
- US



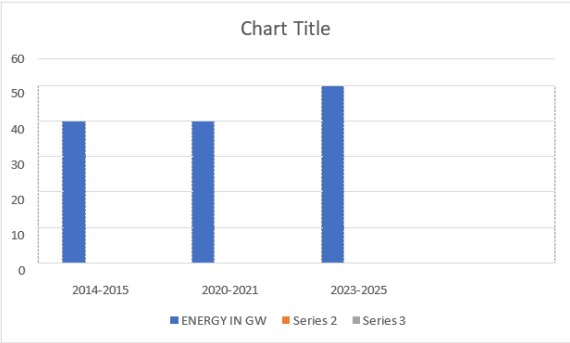
Hydro power plant

Hydro power plant, getting energy from the flowing water and generating the electricity with the help of turbines. Water is released from dams or Reservoir then turbine is going to Spin and electricity is produced.

Benefit:
- Clean
- Clear
- Renewable
- Reliable
- Less costly
- Gridstability

Top producer:
- China
- Brazil

- Canada
- US



IV.RESULT

Renewable energy has significant positive effects by the use of renewable energy sources it reducing air pollution and improving public health, greenhouse gas emission, lowering long-term energy costs. It also enhances energy independence, provides a sustainable and inexhaustible energy source

Advantages-
Zero Emissions
Cleaner Air and Water
Resource Conservation
Cheaper Form of Electricity
Reduced Pollution
Job Creation
Technological Innovation

Disadvantages-
Higher Capital Cost
Electricity Production Can Be Unreliable
Energy Storage Is a Challenge
It's Impacted by Environmental Conditions
Location and landmass requirements

V.CONCLUSION

In conclusion, renewable energy resources offer a sustainable and essential pathway toward meeting the world's growing energy demands while mitigating the environmental impacts of fossil fuels. Solar, wind, hydro, geothermal, and biomass energy sources each bring unique advantages and challenges, but together they form a diversified portfolio capable of supporting a cleaner and more resilient energy future. As technology advances and costs continue to decline, the global transition to renewables becomes increasingly feasible. However, this transition also requires strong policy support, investment in infrastructure, and public awareness. By embracing renewable energy, we not only protect our environment but also foster economic growth, energy security, and long-term sustainability for future generations.

VI.ACKNOWLEDGEMENT

It gives us immense pleasure in presenting the report on RENEWABLE ENERGY RESOURCES. We wish to express our sincere thanks to prof.SONALI VALASE, Director, RJSPM's Institute of Computer and Management Research, Pune, for providing us all the necessary facilities.

We would like to place on record our deep sense of gratitude to Prof.Shahuraj Yevate, HOD, Department of Master of Computer Application, for his stimulating guidance and continuous encouragement.

We are extremely thankful to Prof. Shahuraj Yevate for her insightful comments and constructive suggestion to improve the quality of project work.

Lastly, we are thankful to teaching and non-teaching faculty of the Department for their continuous co-operation.

REFERENCE

[1] ScienceDirect.com and IEEE Xplore for peer-reviewed articles on renewable energy trends and technologies
[2] IRENA. (2023). Renewable Energy Statistics.
[3] Green, M. A., et al. (2020). Solar cell efficiency tables (version 56).
[4] Musial, W., & Ram, B. (2019). Offshore wind market report.
[5] Lund, H., et al. (2020). Smart energy systems for 100% renewable energy.
[6] Refer to reports from organizations like the IEA – International Energy Agency and the Library of Congress Research Guides (.gov) for data and insights, as well as government websites like NREL (.gov) for practical project guidelines
[7] Demirbas, A. (2017). Biofuels and bioenergy.
[8] Schmidt, O., et al. (2019). The future cost of

electrical energy storage.
[9] Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation.