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### RESEARCH ARTICLE

#### GREEN ENERGY IS A PANACEA FOR GLOBAL WARMING

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#### Abstract

Green energy is a powerful and quick fix remedy to combat global warming by tackling its primary cause i.e. greenhouse gas emissions. Traditional energy sources, such as coal, oil, and natural gas, release large amounts of carbon dioxide (CO<sub>2</sub>) and other harmful pollutants during combustion. These emissions accumulate heat, leads to rising global temperatures and several climate consequences. Green energy is primarily comes from natural resources and is generated using renewable energy technologies such as solar energy, wind power, geothermal energy, biomass and hydroelectric power including tidal power.

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#### Introduction:-

Green energy is a powerful and quick fix remedy to combat global warming by tackling its primary cause i.e. atmospheric Greenhouse gas (Carbon Dioxide-CO<sub>2</sub>, Methane-CH<sub>4</sub>, Nitrous Oxide-N<sub>2</sub>O and Fluorinated Gases) emissions. It impact on the global temperature, Ocean acidification, Agricultural productivity and Social displacement. In CSIRO-2024<sup>1</sup> report global carbon dioxide (CO<sub>2</sub>) emissions reached record high marked as a 0.8%

increases compared to 2023. CO<sub>2</sub> is a greenhouse gas that accelerates the heat in the atmosphere and rising global warming causes melting polar glacial ice resultant rising sea levels and threatening coastal areas, harms marine ecosystems, ocean acidification. Further, CO<sub>2</sub> influences on agriculture such as shifts in seasons and extreme weather conditions can decrease crop yields. Higher temperatures can aggravate droughts and floods. This affects on food security. It also impact on human's life like health issues, extreme weather conditions creates climate refugees inequality i.e. vulnerable population in developing countries.

Conventional energy sources like coal, oil, and natural gas, release enormous amounts of carbon dioxide (CO<sub>2</sub>) and other harmful pollutants in to the atmosphere during combustion. These emissions accumulate heat, leads to rising global temperatures and several climate consequences. Green energy is primarily comes from natural resources and is generated using, Renewable energy technologies which includes solar intensity, wind power, geothermal energy, biomass and hydroelectricity including tidal power. The aforementioned technologies operate in various practices i.e. by apprehend power from the sun with solar electric panels or utilize wind energy by turbines or the stream of water to generate electricity through hydroelectric power.

In accordance with IPCC (2023)<sup>2</sup> the energy sector extremely depend on fossil fuels, it leads to 34% of greenhouse gas (GHG) emissions, add up to 20 gigatons (Gt) annually. To achieve the Paris Agreement goals global CO<sub>2</sub> emissions must be reduced by 50% by 2030. This highlights the urgent need for transition to renewable energy sources, to improving energy efficiency and essential steps adopting sustainable technologies to effectually combat against Global Warming and minimize GHG emissions.

As per IMEO data Methane levels in the atmosphere have surged to around 2.5 times their pre-industrial levels. This awful trend point out the urgent need for targeted to reduce methane emissions particularly from sectors like agriculture, energy and waste management, as a powerful greenhouse gas with significant interim warming impacts, reducing methane emissions are essential for slowing the advancement of climate change.

Manfredi Caltagirone<sup>3</sup>, head of International Methane Emissions Observatory (IMEO) stated that “Now countries need to turn their ambitions into targeted and verifiable action”.

All the above ideas strongly suggest that green energy is a unique and highly effective solution for reducing greenhouse gas (GHG) emissions. By using renewable energy sources such as solar, wind, hydropower and geothermal, we can notably decrease our dependence on fossil fuels, which are the core drivers of GHG emissions. Green energy put forward a sustainable and low-carbon alternative to fossil fuels, helping to alleviate climate change and diminish the environmental impact of energy production.

The main sources of green energy are renewable and sustainable designed to operating with these energy derivatives that bring out diminutive to no greenhouse gas emissions.

They are mainly classified as

1. Solar Energy
2. Wind Power
3. Hydropower
4. Geothermal Energy
5. Biomass
6. Bio fuels

In these resources, solar and wind power are most versatile to generate on a limited production at household level to provide clean energy and they can also produced on a larger industrial level to meet energy demands efficiently. Hydroelectric power is the largest energy source globally which contributes 16% electricity generation and 6-7% global energy. Other energy sources like geothermal, bio mass and bio fuels are contributes 2-3% in global energy composition. These renewable energy sources are significant in the global move to cleaner energy with some regions depend on more heavily on certain types based on geographic and technological factors.



### **1. Solar Energy**

Solar Power is the most common type of renewable energy is produced by using photovoltaic cells that capture sunlight and turn it into electricity. Solar power is also used to heat buildings and providing hot water as well as for cooking and lighting. By its affordability it accessible for domestic purposes including garden lighting, it is also utilized on a larger scale to provide energy to entire neighbourhoods. In 2023, solar energy contributed 5.5% to overall global electricity generation tagging a significant increase to compare with 4.6% in 2022. Solar photovoltaic (PV) generation increased by 270 TWh (up 26%) in 2022 which represents a 26% growth compared to the previous year reaching almost 1 300 TWh. This growth rate aligns with the expected to increase in solar PV generation from 2023 to 2030 as part of the Net Zero Emissions by 2050. This highlighting the rapid progress toward cleaner energy systems. This growth stresses the further adoption of solar power as a key renewable energy source, driven by advancements in technology. China is the global leader with over 400 GW of installed solar capacity contributing more than 40% of global needs, after United States, India, Japan, and Germany are other major contributors to the solar energy sector.

### **2. Wind Power**

This was the second highest growth among all renewable power technologies. Wind energy uses the power of the air flow to rotate turbines and converting the wind's kinetic energy into electricity. Wind Power is particularly effectual in offshore and high altitude areas. As per the Global Wind Report – 2023<sup>4</sup> released by Global Wind Energy Council the Global Wind industry put in place a record of the global wind power capacity was 1,021 gigawatts (GW), which was a 13% increase from the previous year 2022, Surpassing wind for the first time in history. Notably it exhibits the largest absolute generation growth of all renewable technologies in 2022. China is the largest country of wind power capacity leads in both onshore and offshore sectors. Later, the United States, Germany, and India are also major players in wind energy deployment.

### **3. Hydroelectricity**

Hydroelectric power is a form of green energy by utilizing flow of water in rivers, streams, dams or other source natural flow of a river or other body of water to create a source of falling water. The falling water turns a turbine, which then spins a metal shaft in an electric generator to produce electricity. Hydropower can also works on a small scale by using the flow of water through pipes in homes or come from natural phenomena of evaporation, rainfall or the tides of oceans. Hydropower supplies 15% of the world's electricity, almost 4,210 TWh in 2023, which is more than all other renewable sources combined and more than nuclear power. It can provide large

amounts of low-carbon electricity on demand, making it a key element for creating secure and clean electricity supply systems. Major growth came from large-scale projects in countries like China, India, and Brazil.

#### 4. Geothermal Energy

Geothermal energy has been stockpiled under the outer layer of *the Earth* (i.e. earth crust). While accessing this resource requires drilling, which raises solicitude about environmental repercussions, it is considered a potential source once tapped. Geothermal energy has been used for thousands of years and this resource can produce steam to spin the turbines to generate electricity. This energy stored under the United States alone is estimated 10 times to be capable as much electricity as coal currently provides. Some nations like Iceland, benefit from geothermal resources, but it is practically dependent on the location for ease of use, and geothermal energy is fully green and the drilling process must be careful, it is to be closely monitored. United States is the largest producer of geothermal electricity with 3.7 GW of capacity. Later, Indonesia rapidly expanded geothermal capacity with 2.8 GW from its volcanic resources. Other major contributors are Philippines, Turkey, New Zealand, and Kenya.

#### 5. Biomass

Biomass power plants use wood waste, sawdust and combustible agricultural waste to generate energy. While the burning of these materials releases CO<sub>2</sub> is offset by the CO<sub>2</sub> absorbed by plants during their growth cycle, creating a closed carbon loop releases greenhouse gas these emissions are still far lower than those from petroleum-based fuels. Biomass contributes about 2-3% for global electricity generation and overall 5-6% of global energy supply. This renewable resource also needs to be carefully managed in order to be truly labelled as a 'green energy' source. Brazil is a leader in bagasse (sugarcane residue) for electricity and heat generation. Later, Germany and India are key players in biogas and small-scale biomass systems.



#### 6. Bio fuels

Bio fuels are renewable fuels obtained from biological (organic) materials (biomass) can be metamorphosed into fuel like ethanol primarily made from crops such as corn, sugarcane, or wheat through fermentation, biodiesel produced from vegetable oils (soybean, palm, canola) animal fats or algae, Biogas produced by the anaerobic digestion of organic waste (agricultural residues, food waste, sewage), bio butanol and algal bio fuels. Bio fuels represent approximately 2-3% of global energy use. These can serve as alternatives to fossil fuels, primarily in the transportation sector to reduce GHG emissions and to improve energy security. The bio fuels are projected to have the scope to accommodate 25% of global shipment fuel demand by 2050.

However, Green energy is the keystone of an imperishable future, with clean, renewable, and environment affable alternative to fossil fuels. It is pathway to achieving global climate goals, protecting our ecosystems, and ensures a clean, healthy, and rebounding planet for future generations. The changing to green energy must be carefully managed to address challenges such as resource recurrent land use conflicts, and the need for sustainable practices in biomass and hydroelectric power. Technological advancements, policy support, and global collaboration are essential to overcome hurdle and accelerating the acceptance of green energy.

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Ref:

1. CSIRO report 2024
2. IPCC report 2024
3. IMEO report 2024
4. Global Wind report 2024