Upcoming Technological Advancement in Renewable Energy Sources (Solar, Wind & Fuel Cell)

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The demand of renewable energy generating resources are increasing drastically due to rapid increase in global energy demand. Renewable energy based resources provide green energy which protects the environment and make our living sustainable. The renewable energy based resources decreases our dependency to limited resources such as: coal, fossil fuels etc. It is economically good and decreases our dependency to foreign energy sources also. The recent trending renewable energy generating resources are: Solar, Wind & Fuel Cell.

The Solar Photovoltaic Technique converts light into electricity with help of semiconductor materials. Currently, Silicon-Germanium based Monocrystalline /Polycrystalline solar cells are installed in various power plants and rooftops with average on field efficiency of 17-21%. However, lots of research is going to enhance the overall running efficiency at economic rate. Due to the advancements in thin film technology, the efficiency of solar cell will be enhanced in near future. Various types of solar cells which can be enhanced further in upcoming future are: Amorphous Silicon (A-Si) cell, Biohybrid Cell, Buried Contact Cell, Cadmium Telluride Solar Cell (CdTe), Concentrated PV Cell (CPV), Copper Indium Gallium Selenide Solar Cell (CI(G)S), Dye Sensitized Solar Cell (DSSC), Gallium Arsenide Solar Cell (GaAs), Hybrid Solar Cell, Nanocrystalline Solar Cell, Pervoskite Solar Cell & Quantum Dot Solar Cell. Various research are also going to enhance the life cycle of a solar power plants which is currently ~30 years along with the recycling of pv cell materials.

The wind energy generating systems uses the power of wind which rotates the turbine blades, which are coupled to alternator with help of gear system mechanism and produces AC electricity. HAWT (Horizontal Axis Wind Turbine) and VAWT (Vertical Axis Wind Turbine) are the two types of wind turbine, which are installed nowadays. Due to the variable wind speed, its energy generation are not constant and makes the system intermittent. In order to overcome this, various data driven forecasting techniques can be utilized in near future to predict the energy generation with respect to predicted wind speed. Due to its intermittent nature, it is coupled with another constant power generating resources with hybrid mode. Proper planning and database prediction can avoid this in upcoming future. Also, research can be done in – noise reduction of wind plant along with lifesaving of flying creatures, such as: birds, bats which got hit by the wind blades and looses their life.

The Fuel Cell is an electrochemical cell that converts chemical energy of a fuel (hydrogen) and oxidising agent with help of redox reaction. Fuel Cell consists, anode, cathode and an electrolyte which allows ions. Currently, there are various types of fuel cell available in a market such as: Proton Exchange Membrane Fuel Cell (PEMFCs), Phosphoric Acid Fuel Cell (PAFC), Solid Acid Fuel Cell (SAFC), Alkaline Fuel Cell (AFC), High Temperature Fuel Cell (HTFC) & Molten Carbonate Fuel Cell (MCFC). Onboard hydrogen storage, fuel cell based vehicle cost, its durability & reliability along with public safety of fuel cells are few challenges which can be mitigated in near future by proper Research & Development.

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