

An Ultimate approach to develop Hybrid Power Generator through Non-conventional Energy resources

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Abstract— In present scenario energy is vital for the progress of a nation and it has to be conserved in a most efficient manner. This paper will discuss an ultimate approach in generation of electricity and availability of natural resources without disturbing the ecological balance, which is available with a minimum cost and pollution free to anywhere in the world at all times. In recent years the hybrid power generation technologies have increased rapidly, so in this paper an ultimate and developing Electrical Power Generation mechanism has describe by integrating photovoltaic (PV) Solar Energy, solar Energy with Nano-antenna, Wind Energy. In this way we can have an uninterrupted power supply irrespective of the weather condition without any sort of environmental pollution for industries and domestic areas. Furthermore this process makes possible the electricity generation at minimum efforts and money, and pollution-free and eco-friendly also. Utilizing lightning energy for electricity generation reveals a advanced and ultimate step. The equipment consists of combination of PV solar-cell array & Nano-antenna array, a mast mounted wind generator, storage batteries (lead-acid),an inverter used to convert DC power to AC power, electrical lighting loads and electrical heating loads, several fuse and junction boxes and associated wiring, and test instruments for measuring voltages, power factors ,currents data throughout the system.

Index Terms— Photo-voltaic cell, Solar Cell, Carbon nanotubes, Wind Energy generator, Renewable Energy.

I. INTRODUCTION & NEED OF HYBRID ELECTRICITY GENERATOR

Present time and this century is the time of growth and challenges in power generation, delivery, and usage. Environmentally friendly (renewable and clean alternatives) power generation technologies will play an important role in future power supply due to increased global public awareness of the need for environmental protection and desire for less dependence on fossil fuels for energy production. These technologies include power generation from renewable

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energy (RE) resources, such as wind, photovoltaic (PV), micro hydro (MH), biomass, geo-thermal, ocean wave and tides, and clean alternative energy (AE) power generation technologies [such as fuel cells (FCs) and micro-turbines (MTs)]. RE/AE generations sources often come in the form of customized distributed. As thermal power stations are causing wide pollution which is dangerous to mankind and nature and causing many diseases. At the other hand natural resources will get extinct in near future. The power generating systems like Hydro-Electricity power generating plant cannot afford much power due to season based, although it causes less pollution. Therefore, there is necessity to go for non-conventional energy resources like solar energy which converts solar energy or solar radiation to electricity. Solar power generation system has limitation, that is, it cannot generate power in cloudy or rainy days, as it is entirely dependent on appearance of the sun in the sky. Moreover, it has limited capacity and we cannot take all available solar energy as its efficiency is much less. Therefore the aim of this research work is to develop a Hybrid power generation system using wind energy-solar energy- solar energy with ultimate approach an use of nanotechnology which may be graphene-based materials or nano-antenna. There are four major energy-related areas where graphene will have an impact: solar cells, super capacitors, lithium-ion batteries, and catalysis for fuel cells A Nano-antenna electromagnetic collector (NEC) is the devices target mid infrared wavelengths, where conventional photovoltaic (PV) solar cells are inefficient and where there is an abundance of solar energy. Nano-antenna arrays, would take in a wider range of frequencies and collect about 70 percent of the available energy in sunlight.

II. ENERGY RESOURCES AVAILABLE:

With high economic growth rates and over 17 percent of the world's population, India is a significant consumer of energy resources. Despite the global financial crisis, India's energy demand continues to rise. India consumes its maximum energy in Residential, commercial and agricultural purposes in comparison to China, Japan, and Russia. Solar energy is energy from the Sun. It is renewable, inexhaustible and environmental pollution free. Solar charged battery systems provide power supply for complete 24 hours a day irrespective of bad weather. By adopting the appropriate technology for the concerned geographical location, we can extract a large amount of power from solar radiations. More over solar energy is expected to be the most promising alternate source of energy. The global search and the rise in the cost of conventional fossil fuel is making supply-demand of electricity product almost impossible especially in some

remote areas. Generators which are often used as an alternative to conventional power supply systems are known to be run only during certain hours of the day, and the cost of fueling them is increasingly becoming difficult if they are to be used for commercial purposes. Wind energy is the kinetic energy associated with the movement of atmospheric air. It has been used for hundreds of years for sailing, grinding grain and for irrigation. Wind energy systems convert this kinetic energy to more useful forms of power. Wind energy systems for irrigation and milling have been in use since ancient times and at the beginning of the 20th century it is being used to generate electric power. Windmills for water pumping have been installed in many countries particularly in the rural areas. Wind turbines transform the energy in the wind into mechanical power, which can then be used directly for grinding etc. or further converting to electric power to generate electricity. Wind turbines can be used singly or in clusters called 'wind farms.

III. DIFFERENT RE/AE POWER GENERATION TECHNOLOGIES AND ENERGY STORAGE DEVICES

Main RE/AE technologies	Energy storage types
Biomass	Battery
Geothermal	Compressed air
Hydro/microhydro	Flywheel
Ocean tidal/wave	Hydrogen
Solar PV/thermal	Pumped hydro
Wind	SMES
Fuel cell	Supercapacitor
Microturbine	Thermal

Fig.1: Different technology and devices

IV. HYBRID SYSTEM

Researchers on non-grid-connected wind power/water electrolytic hydrogen production system showed that wind power grid connection is the only application of large-scale renewable sources in the world. The random effects of wind affect the quality of wind power and the contribution rate of wind power on the grid is hardly beyond 10%. The wind power red generator needs to meet the requirements of power grid such as stabilization of frequency, voltage and phase, which increases complexity. As a result, the "Non-grid-connected wind power was invented. Research showed that hybrid systems e.g. wind and solar complement each other effectively that is saying, "either the sun is shining or the wind is blowing, so there is always something producing power". Many rural areas have benefited from hybrid power systems. Although wind power has been widely used in the many areas, the systems were unreliable during the summer when wind resources were low. A Solar/Wind hybrid system has been determined to be the most reliable and cost effective system for most regions where there is unreliable supply of grid based electricity.

The scientists evaluate and analyzing the merits of hybrid wind/photovoltaic concept for stand-alone systems. A method was developed for evaluating the merits of hybrid wind/photovoltaic systems for use in stand-alone applications. It was found that the optimum mix of wind and photovoltaic power with an electromechanical storage system, with or without fossil fuel generator back, depends upon the individual subsystems economics. A computer code was developed to calculate the optimum sub-system sizes that minimize the levelized energy cost. The actual merits of a hybrid system over a pure photovoltaic or wind system depend upon these factors; load profile; wind regime; installation; costs and availability of backup power ; solar panel costs, size and efficiency; wind rotor area; array area and storage; and subsystem efficiency factors . A feasibility study of wind and solar hybrid system results from the cold winter months in some selected areas showed that the hybrid contributed 28-36% of the required space and water service heating load.

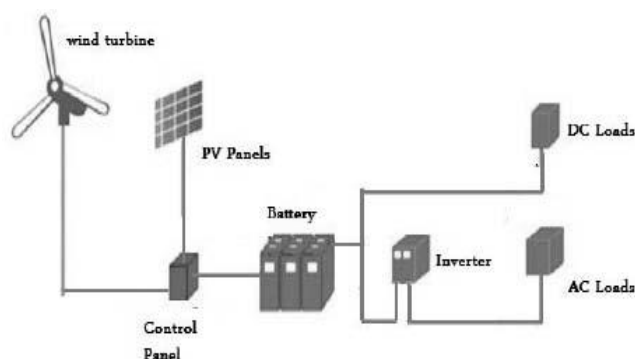


Fig.2. Schematic for a solar-wind hybrid energy system.

V. A SOLUTION TO PV BASED SOLAR CELL WITH NANOTECHNOLOGY

We have an alternative energy harvesting approach based on Nano-antennas that absorb the incident solar radiation. The Nano-antennas target mid-infrared rays, which the Earth continuously radiates as heat after absorbing energy from the sun during the day. In contrast, traditional solar cells can only use visible light, rendering them idle after dark. Infrared radiation is an especially rich energy source because it is also generated by industrial processes such as thermal plants. We have designed Nano-antenna elements that capture electromagnetic energy from solar radiation and geo thermal radiation. The size of the antenna is relative to the wavelength of light we intend to harvest. The basic theory of operation is as follows: The incident electromagnetic radiation produces a standing-wave electrical current in the finite antenna array structure. Absorption of the incoming Electro Magnetic radiation energy occurs at the designed resonant frequency of the antenna. Since objects give off heat as infrared rays, the nano antennas could collect those rays and re-emit the energy at harmless wavelengths. Such a system could cool down buildings and computers without the external power source required by air-conditioners and fans. It also provides designers another mechanism to increase the efficiency of antenna arrays through the expansion of the radial field. Antennas by themselves do not provide a means of converting the collected energy. This will need to be accomplished by

associated circuitry such as rectifiers. The Nano-antennas are tiny gold squares set in a specially treated form of polyethylene, a material used in plastic bags. A Nano-antenna array capable of collecting power from infrared energy that could be harvested in any weather. The cell production process is even supposed to be ridiculously cheap compared to making standard silicon photovoltaic cells, but, as always, there's a rub. The grid collects its oscillating IR energy at ten thousand billion times per second, which is proving to be a challenge to the nerds behind the tech, who are working on a way to convert that to the 50-60Hz power that the world uses. Nano-antennas, on the other hand, can be tweaked to pick up specific wavelengths depending on their shape and size. This flexibility would make it possible to create double-sided nanoantenna sheets that harvest energy from different parts of the sun's spectrum.

A. Structure of PV cell with Nano- antenna/graphene antenna
We're used to thinking of solar energy as something that we collect with panels. But even the latest-generation silicon panels can take in light from only a relatively narrow range of frequencies, amounting to about 20 percent of the available energy in the sun's rays. The panels then require separate equipment to convert the stored energy to useable electricity. But researchers are working on an entirely new approach, using tiny, nanoscale antenna arrays, which would take in a wider range of frequencies and collect about 70 percent of the available energy in sunlight. Additionally, the antenna arrays themselves could convert that energy to direct current, without need for additional gear. The structure of purposed design consist array of Nano antennas at the middle part of structure and boundary covered by Photovoltaic cells shown in figure 3. It also consist controlling circuit at the back side of panels.

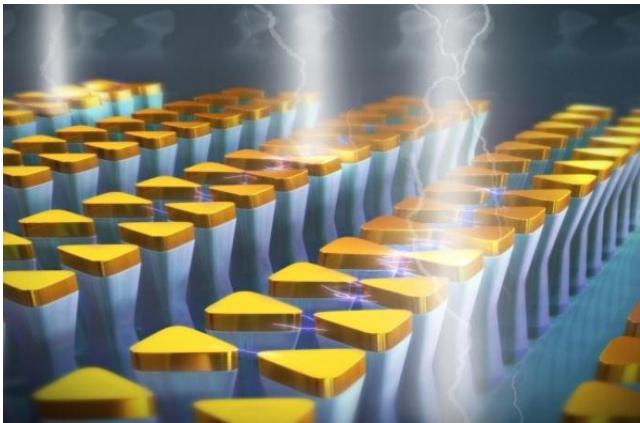


Fig 3 : Solar cell with nano antenna

VI. INTEGRATED POWER GENERATION SYSTEM BASED ON WIND ENERGY- PHOTOVOLTAIC SOLAR ENERGY- SOLAR PANEL WITH NANO-ANTENNA

To eliminate the above drawbacks of individual renewable power generation system like Solar and Wind, we design a new electricity or power generating system by integrating the wind energy sources, Photovoltaic solar energy and Solar energy with Nano-antenna simultaneously, so that power supply remains continuous without any sort of interruptions or load shedding. The aim of this work is design and

implementation of a Hybrid power generation system using wind energy photovoltaic solar energy- solar energy with Nano-antenna for continuous (24x7) power generation.

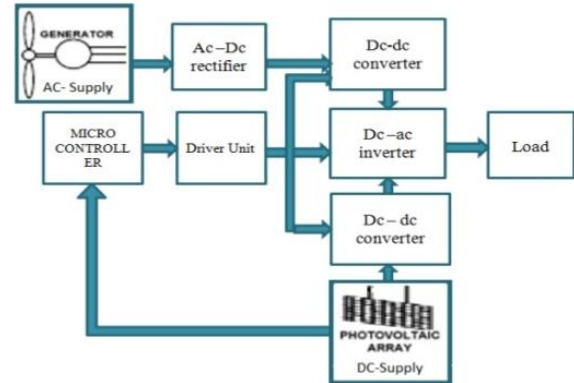


Fig.4: (a) Schematic diagram of Hybrid solar wind Electricity generator

The Solar-Wind with Nano-antenna Power Generation System is designed as shown in Fig 4. It has some special equipment to charge the battery or the power storage (accumulator) circuit. Control circuit ad-joint with electric power generating system provides necessary control functions such as adding or summing up electric power derived from more than one sources at a time i.e. solar and wind power simultaneously, solar with Nanoantenna and wind power.simultaneously, over voltage protection, amount of electric power directed to the load and the battery etc. Thus by implementing Solar with Nano-antenna Wind-Lightning Integrating Power Generation System in a compact package, we have an uninterrupted power supply at the minimum cost to all places at all times. Moreover, we can avoid the accidental risk and causes by lightning to human and nature both. This method ensures a highly practical oriented pollution free and accident free inventory for electric power generation system. The electric power afforded by this system is completely pure and secured form without any sort of environmental pollution. Also it does not produce any greenhouse effect or acid rain or emit any kind of poisonous gases or radiation etc.

VII. OPTIMIZATION TECHNIQUES FOR HYBRID ENERGY SYSTEMS

Different techniques used by researchers for the optimization of renewable based hybrid energy systems are reviewed along with PV-wind based hybrid system sizing methodology. Optimization studies during last 2.5 decades by researchers using traditional and new generation methods are analyzed and sixteen optimization methods including hybrid algorithms which can be used for this purpose. The trend shows that new generation artificial intelligence algorithms are mostly used during last decade as these require less computation time and have better accuracy, good convergence in comparison to traditional methods. The study suggests using hybridization of two or more algorithms to overcome the limitations of a single algorithm.

VIII. RESULTS

After applying the ultimate approach and precise application of nanotechnology a efficient hybrid generator can be

developed and with that it can also be optimize. The modeling and experimental measurements demonstrate that the individual nanoantennas can absorb close to 90 percent of the available in-band energy. Optimization techniques, such as, increasing the radial field size could potentially increase this efficiency to even higher percentages. The current and voltage values from the wind turbine, solar panels, battery group, and load are measured in the implemented system. Production and consumption of power for each module can be calculated.

IX. CONCLUSION AND FUTURE WORK

This hybrid generator of fused model of solar and wind energy of renewal Energy source will be highly effective in all types of areas and weather conditions. Such type of effort can be useful to rural and commercial areas where need of faultless suppl is required. It is ecofriendly i.e. pollution free, at the same time not proneness any kind of accident due to lightning. It is also useful to minimize power supply load i.e. cut short power charge. By using this system, we can save electricity charge because very less maintenance charge to this equipment is required. The designing of this equipment is done in such a way that it is very compact and acts as user friendly. When it is manufactured in a large scale, cost of this integrated natural resources power generation system is affordable. Moreover there is no power failure or load shedding situation at any times. Therefore, it is the most reliable renewable power or electricity resources with less expenditure. This research is at an intermediate stage and may take years to bring to fruition and into the market. The advances made by our research team have shown that some of the early barriers of this alternative PV concept have been crossed and this concept has the potential to be a disruptive and enabling technology.

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