A Survey on Uninterrupted Power Supply Using Four Different Sources

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Abstract-*In present time's electric supply is very essential to the human beings. Uninterrupted power supplies are needed in almost all of the areas in our life-in household applications, research institutions, hospitals etc. Due to the increased demand of power and large consumption of conventional energy sources, which are limited in nature, there is a need to shift from conventional methods of energy production to a better approach using hybrid systems to economically use the conventional and non-conventional sources.This paper deals with the automation of switching between different sources so as to get uninterrupted power supply and that to at low economical cost.Multiple sources increase the reliability of the system and the system is more robust to power failures and faults.The project implements micro controller based circuit with relays to facilitate automatic prudent shift of power supply from the various available sources.*

Keyword: ***Micro controller, Relay, Uninterrupted supply, Multiple Sources***.

1. INTRODUCTION

Electricity is most needed in our day to day life. Now a day's electricalenergy is generated by the conventional sources like coal, diesel, nuclear etc. and soon the will be exhausted and then we will need other alternatives to generate electricity. But we can extend the life of fossil fuels by managing our demands and using other sources to fulfill our need of electricity.There are many non-conventional energy sources like solar, wind etc. These non-conventional energy sources are costlier than the conventional sources so, completely replacing the use of conventional sources is not the best option. Not only we need to use both of the sources of electricity, we also need to prioritize the selection of sources prudently. The project is based on the idea that power demands will always increase and we need uninterrupted power supply. Since every source of electricity has its limitation as far as their availability is concerned. Microprocessor based programming is used to shift between different sources of electricity (solar, mains, inverter, wind etc).The paper is divided into five sections.

2. LITERATURE REVIEW

Aleksey et al. [1] proposed method to design a standalone hybrid system with solar and diesel generators. The paper dealt with designing and analysis of complexities in the hybrid system for electric supply in Russia.

According to the paper that he proposed, Construction of decentralized power supply system needs independent sources of electric power using fossil fuels, most common and versatile of which are diesel power plants (DG). Analysis of wind maps and solar opportunities in Russia shows that an alternative to the use of DG is the use of renewable electrical energy, by including own photoelectric and wind power station (PhG and WG) into the scheme of power supply for electric consumer's scheme as primary or auxiliary power source. However, in order to increase DG fuel efficiency within complex, batteries and super-capacitors should be included.

Manzar et al. [2] Presented model for a microgrid with solar, wind, inverter etc.according to the paper the main components of Microgrid are mini-hydro, solar cell, wind energy, fuel cell and energy storage system. These are integrated for electricity generation, energy storage, and a load that normally operates connected to a main grid (macro grid). Microgrid can operate in two modes: one is grid-connected and the other is stand-alone mode. The main benefit of Microgrid is that it can operate in standalone mode or main grid disconnection mode. The Microgrid can then function autonomously. Generation and loads in a Microgrid are usually interconnected at low voltage. But one issue related to Microgrid is that operator should be very vigilant because numbers of power system are connected to Microgrid. In the past, there was single entity to control. In Microgrid generation resources can include such as fuel cells, wind, solar, or other energy sources as shown in Figure 1. These multiple different electric power supply generation resources have ability to isolate the Microgrid from a large network and will provide highly reliable electric power.

Hans-Peter et al. [3] proposed an invention which delas with the continuous supply of n loads with n+1 inverters .In the context of these existing modular inverter architectures the critical load is always connected to the energy source via the static switch, in off line as Well as in on line mode. Therefore, if the static switch fails the power supply for the critical load is interrupted. This susceptibility to single point failures of the static switch constitutes a major drawback or the known architecture. Such single point failures may be caused by a number of reasons such as microcontroller resets, defects of the quartz clock circuit for the microcontroller or the microcontroller itself, defects in the circuit, which may short circuit the auxiliary supply, a defect of the auxiliary supply or many other reasons. But on using n+1 inverters the single point faliures no longer remain a critical event.

Aaron M. Jungreis, Cary's paper [4] presents the system using multiple auxiliary sources.According to Aaron, An electronic circuit, such as a UPS, interfaces a main ac power source and at least one secondary power source to a load. The secondary power source(s) may include one or more auxiliary generators, a flywheel motor generator Or micro turbine with high speed motor generator, and/or any of a variety of dc storage devices. The electronic circuit includes a dc bus, an uncontrolled rectifer in combination for coupling the main ac power supply to the dc bus, one or more additional uncontrolled rectifer(s) and filter(s) for coupling the auxiliary generator(s) to the dc bus, and a dc-to-ac inverter (between the dc bus and the load) for providing ac output power to the load. The advantages of reduced parts count, increased

compatibility between the generator(s) and the electronic circuit, and a simpler method for paralleling many storage and generation devices with a very high power factor to the sources, regardless of the load power factor are provided.

Pragya et al. in their paper [5] titled "A current and future state of art development of hybrid energy system using wind and PV-solar" proposed that - The wind and solar energy are omnipresent, freely available, and environmental friendly. The wind energy systems may not be technically viable at all sites because of low wind speeds and being more unpredictable than solar energy. The combined utilization of these renewable energy sources are therefore becoming increasingly attractive and are being widely used as alternative of oil-produced energy. Economic aspects of these renewable energy technologies are sufficiently promising to include them for rising power generation capability in developing countries. A renewable hybrid energy system consists of two or more energy sources, a power conditioning equipment, a controller and an optional energy storage system. These hybrid energy systems are becoming popular in power generation applications due to advancements in renewable energy technologies and substantial rise in prices of petroleum products. Research and development efforts in solar, wind, and other renewable energy technologies are required to continue for, improving their performance, establishing techniques for accurately predicting their output and reliably integrating them with other conventional generating sources. The objective of the paper was to review the current state of the design, operation and control requirement of the stand-alone PV solar–wind hybrid energy systems with conventional backup source i.e. diesel or grid. This Paper also highlights the future developments, which have the potential to increase the economic attractiveness of such systems and their acceptance by the user.

Kaurav et al. [6] stated that Wind turbine is that system which extracts energy from wind by rotation of the blades of the wind turbine. Basically wind turbine has two types one is vertical and another is horizontal. As the wind speed increases power generation is also increases. The power generated from wind is not continuous its fluctuating. For obtain the non-fluctuating powerwe have to store in battery and then provide it to the load. The main objective is to assess the feasibility and economic viability of utilizing hybrid Solar-Wind-battery based standalone power supply systems to meet the load requirements. Hybrid energy generation is more important because the wind not floe continuously and sun radiation is only present approx. 8 to 10 hours in a day. So for continuous power it is important to hybridize the solar and wind power with the storage batteries.

Sivaramakrishna et al. [7] proposed 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. The Solar-Wind with Nano-antenna Power Generation System 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. The aim of this work is design a new electricity or

power generating system by integrating the wind energy sources, Photo voltaic solar energy and Solar energy with Nano-antenna simultaneously.

In the paper by author Nfah et al. [8] it has been stated that the supply of diesel fuel becomes so expensive that hybrid diesel/photovoltaic generation becomes competitive with diesel-only generation. Photovoltaic/diesel hybrid systems have more reliability for electricity production than photovoltaic-only systems, and often represent the best solution for electrifying remote areas. The diesel generator reduces the photovoltaic component, while the photovoltaic system decreases the operating time of the generator, reducing the running costs of the diesel generator.The addition of battery storage reduces the number of start/stop cycles of diesel generators thus minimizing fuel consumption considerably.Photovoltaic arrays and battery banks are connected in series with string and battery inverters, respectively, to the AC bus, while the diesel generator is directly coupled to it; The direct coupling of the diesel generator necessitates that the generator be sized to meet the peak-load demand.

Koutroulis et al. [9] stated that Photovoltaic (PV) and Wind Generator (WG) power sources are widely used in order to supply power to consumers in remote areas. Due to their almost complementary power production characteristics, they are usually used in hybrid system configurations.Battery chargers, connected to a common DC bus, are used to charge the battery bank from the respective PV and WG input power sources, which are usually configured in multiple power generation blocks according to the devices nominal power ratings and the redundancy requirements. Depending on the battery charger technology, the maximum available power can be extracted from PG and WG power sources.Due to the intermittent solar irradiation and wind speed characteristics, which highly influence the resulting energy production, the major aspects in the design of PV and WG power generation systems are the reliable power supply of the consume under varying atmospheric conditions and corresponding total system cost. Common disadvantage of the methods described above 18 that the proposed sizing methodologies do not take into account system design characteristics such as the number of battery chargers, the PV module's tilt angle and the WG installation height, which highly affect both, the resulting energy production and the installation and maintenance costs.

According to author Thilagavathy et al. [10] using multiple sources to supply in an automatic uninterrupted power supply provides greater system reliability.Multiple sources can be combined and integrated with the microcontroller for automatic changeover. Manual changeovers are loud noisy and may be accompanied by sparks.Manual change overs require high maintenance cost.Also manual switching wastes a lot of manpower and time. The author proposed a model to provide continuous power supply using different types of sources.

The following table shows the relative comparison between various sources according to their availability, generation economy and scale of application.

Table 1: Ease and economy of implementation of various sources of electricity

Name Of Source Of Electricity	Availability (Abundant/Limited)	Economy in Production	Application
1. Supply Mains	Limited	Moderately costly	Small & Large
2. Solar	Abundant	Cheap	Large
3. Thermal Power	Limited	Moderate	Large
4. Wind	Abundant	Costly	Large
5. Nuclear	Limited	Costly	Large
6. Tidal Energy	Abundant	Costly	Large

Among the above stated sources of electricity few sources are costly and are applicable to very large scale electricity generations.An economic usage strategy is required to make the system reliable and cheaper.The following table discusses the priority assigned to different sources of electricity on the basis of economy and availability.

Table 2 : Priority of available choices of sources of electricity.

Name Of Source Of Electricity	Priority(High/Med/Low)		
	Summer	Rainy	Winter
a) Supply Mains	High	High	High
b) Solar	High	Low	Low
c) Thermal Power	Med	Med	Med
d) Wind	Med	Med	Med
e) Nuclear	Med	High	Med
f) Tidal Energy	Low	High	Low

3. CONCLUSION:

The demand of energy worldwide grows rapidly, because energy generation is low but energy consumption is on a high rate. Electricity companies cannot satisfy the demand and must use non-conventional energy system. Use of renewable energy along with the non-conventional sources not only increases the reliability of the system but also allows higher power demands to be fed. Prioritizing the various available sources makes the selection and utilization economic. The priorities may be decided according to the availability of source, usage cost, its effects on the operation of other equipment (noise due to generators, smokes etc). The selection algorithm can be coded into a microcontroller which will automatically shift between different sources using relays through the relay driver. The project involves four different sources with different parameters to allow microcontroller to judge the selection of best available source to use.

4. FUTURE ENHANCEMENT:

The future work primarily focuses on increasing the number of sources to increase the reliability of the system and provide uninterrupted power supply to the load at all times. The new sources will be selected according to their cost of implementation and availability during a particular season.More automation via microcontroller can be provided to minimize noise issues and

sparking in changeover from one source to another.The future scope of this paper is in large application like standalone hybrid micro grid systems.

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