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REVIEW ON DESIGN OF A STAND-ALONE HYBRID MICROGRID SYSTEM INCORPORATING DIESEL GENERATOR AND SOLAR ENERGY SOURCE FOR IRRIGATION PURPOSES

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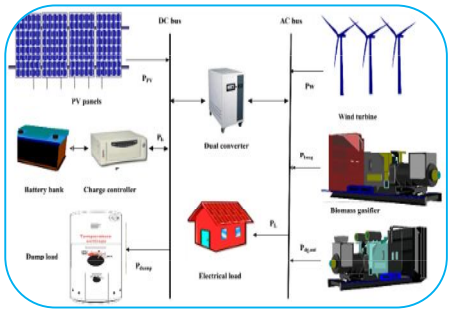
ABSTRACT :



Researching renewable energy is a new direction, and technical advancement will be crucial in changing the energy dynamics of society and lowering dependency on fossil fuels. The goal is to effectively capture renewable energy and transform it into electrical power for irrigation system for agriculture. One of the most important parts of this transformation is connecting this green power to the main grid. The design, modelling, control, and modelling of a hybrid microgrid with PV energy with Diesel Generator are thoroughly examined irrigation for agriculture work, with a focus on power transformers diesel generators (DGs)and photovoltaic systems (PV). An in-depth analysis of the electrical system model that mimics a photovoltaic system's functioning is carried out. The MPPT (Maximum Power Point Tracking) control method is used in the study to maximize the performance of the PV system.

KEY WORDS: *Solar, grid connectivity, diesel generators , voltage source converter, maximum power point tracking (MPPT), irrigation work etc.*

I.INTRODUCTION:

There are usually very few commercial buildings that use solar energy and other heating purposes such as water heating. But this is a very limited use of solar energy, because solar energy is found all over the world. We must utilise more solar energy and less energy that may be produced by burning coal as well as other coal-based fuels. The commercial building is intended to accommodate the highest quality PV solar power plants and diesel generators (DGs). That buildings use more electricity for daily use in the form of cooling, lighting, heating etc. We would like to install a solar power project in commercial buildings to share the energy needs of different applications.

Microgrid within each commercial and agricuylture area creates a solar energy sharing network nowdays. The most potent energy source on the planet, diesel generators are also used to fulfill demand of electricity. Solar energy is a type of natural energy as well as the solution to the current energy crisis. Photovoltaic production is an effective way to use solar energy. Solar energy is available worldwide and many countries can use solar energy on a daily basis in a variety of ways. Photovoltaic (PV) panels are widely used to generate electricity and that electricity can be used to install electricity. Electrical installation means 24 * 7 electricity supply, but solar radiation is only available during the day and PV solar panels only generate electricity during the day. We can share the store's battery backup and use

the energy at night to fix this issue. Equilibrium generation and storage, high distribution efficiency due to distributed production and widespread distribution of low line loss.

II.EXISTING SYSTEM

Research is currently underway. Due to environmental pollution solar panels get dusty and polluted resulting in low electricity production. The dignity of any objects such as buildings, tree etc. we can block the sun's rays and cannot reach the solar panel. That causes a decrease in the production of solar panels.

III.PROPOSED SYSTEM

Nowadays renewable energy sources have been developed to meet future energy efficiency and are now widely marketed. However, unknown problems arise with large numbers of systems based on the electronics used in an existing AC distribution network. Everyone needs electricity and a high amount of energy used in everyday life. This project of electricity through solar energy. In irrigation for agriculture area there is space available for installing the project and solar panels that receive additional power during the day.

IV.OBJECTIVE

The following succinctly describes the primary goals of this investigation:

- Learning the microgrid distribution network and control system.
- An in-depth understanding of the hybrid model concept of a solar energy with diesel generator system for irrigation pump.
- Understanding the concept of green energy in the form of solar energy.
- Study of energy-saving units according to the need for electricity.
- Combine main grid , diesel generators and solar system to optimize output for irrigation pump, its design and results.

V. LITERATURE SURVEY

Drs. Jayeshkumar Pitroda, Lalakiya Biraj, Naghera Dhiraj, Narodiya Jay, Patel Harsh Proposed Volume 2, Issue 5 of the International Journal of Creative Research on Civil Engineering (IJCRCE). The current society uses electrical energy for free. This energy source is mainly generated by burning fossil fuels. These fats slow down and contribute to pollution. Throughout the daily solar cycle of the year, thereby reducing the dependence on energy-efficient heating and cooling systems. It is clear from evaluating the data that passive solar house design is essential for reducing energy use by using solar energy. This environmentally friendly design idea makes strategic use of solar heat, highlighting the use of elements like thoughtfully placed windows, walls, and flooring to retain heat from the sun in the winter and release it in the summer. The literature evaluations that follow highlight the many benefits that come with having a solar-powered system.

Deepak Purohit, Goverdhan Singh, Udit Mamodiya, investigated "The technique of using solar panels to capture solar energy is covered in "Review Paper on Solar Energy Systems," which was published in the International Journal for Engineering Research & General Sciences (volume 5, Issue 5, September-October, 2017). The process by which sunlight is transformed into electrical energy by these panels—which are made up of several solar cells—is referred to as solar energy conversion. The solar plant is made up of linked solar panels, each of which has several cells organised according to unique metal lines. By creating a quadrilateral shape, these lines efficiently trap light over a vast surface area. Electrons can be released from the complex metal arrangement and travel along tiny lines to the metal frame. The resultant current passes via the supply cables and into the diode box, which is located behind the panel.

L.G. Meegahapola, Member, IEEE, D. Robinson, A.P. Agalgaonkar, Senior Member, IEEE proposed "The expanding importance of Sustainable Mobility is explored in the article "Solar Energy at Cars: Ideas, Opportunities, & Problems," which was given at the GTAA Meeting on Mulhouse of May 26–27,

2010. The significant influence that automobile systems have on the release of carbon dioxide emissions, global warming, and the urgent need to cut back on the use of fossil fuels are the main causes of this increased attention. Recently, there have been significant efforts made to incorporate solar energy in electric and hybrid cars, prompted by improvements in the efficiency and affordability of photovoltaic panels. Even with these advancements, there is still disagreement about whether it is practical to use solar energy in automobiles. The goal of the article is to explore the potential concepts, possibilities, and difficulties related to solar energy integration in cars while addressing frequently asked issues and concerns. The information offered is based on the writers' own research, specifically in relation to hybrid solar vehicles.

Kumaresh.V, Mridul Malhotra, Ramakrishna N and Saravana Prabu. R reviewed and reviewed in "The paper "Solar MPPT Systems," which was published from Volume 4, Number 3 (2014) under ISSN 2231-1297, examines the growing need for power in a variety of fields. The necessity to capture solar energy and transform it into energy has become more apparent as a way to reduce fuel usage, as electricity is essential to many industries. Cost and efficiency concerns have historically prevented solar cells from being widely used in electrical applications. However, recent developments have significantly increased the effectiveness of solar cells, especially with the use of MPPT (Maximum Power Point Tracking) algorithms. In order to shed light on the revolutionary influence of many MPPT algorithms in the field of solar energy utilisation, the study carefully analyses and explores the applications of each method.

X. Q. Zhai, R. Z. Wang, Y. J. Dai, J. Y. Wu, Y. X. Xu, L. H. Deng develops Design And Experimental Analysis Of Solar-Powered Hybrid Hybrid System In The Ecological Building "2005 International Building Conference, Tokyo, 27-29 September 2005. The importance of environmental building as a new design idea has increased dramatically on a worldwide scale, making it a crucial issue for the construction sector. With the help of natural energy sources like wind and solar electricity, this strategy seeks to attain the goal of significantly lowering dependency on fossil fuels. This paradigm change has made solar systems increasingly important. Modern solar systems, in contrast to their more traditional predecessors, are integrated into building designs rather than existing in the binary as either inactive or working. The concepts of halting and starting become redundant when solar components are seamlessly integrated into contemporary constructions. Notable are the performance parameters of solar collecting systems, which average about 40%. These systems show an average warming capacity of 12 kW when it comes to solar cooling, along with a COP of 0.28. Through the use of redesigned tubes, the natural air intake operating mode further improves efficiency by lowering the air temperature differential between the inlet and output. The typical working mode is reduced by four times as a result of this adjustment, which doubles the natural air velocity. Moreover, under winter conditions, the low-temperature rooms that are outfitted with a solar-powered low-temperature system record temperatures that are 9.3°C and 3°C greater, respectively, below ground and in the air, above their counterparts.

Qianwen Xu, Student Member, IEEE, Jianfang Xiao, Member, IEEE, Peng Wang, Senior Member, IEEE, Xuewei Pan, Member, IEEE, and Changyun Wen, Fellow, IEEE Sakshi Gupta, Neha Sharma proposes " A Decentralized Control Strategy for Autonomous Shared Power Sharing and Reimbursement of Costs in Integrated Energy Conservation Systems ". A power management approach is outlined that utilises integrated energy storage devices to accomplish both state-of-charge (SoC) acquisition and temporary power sharing at the same time. Using a stand-alone SoC recover loop, a unique virtual capacitance droop management approach is presented in this framework to maximise power conservation in an energy storage (ES) system with variable response characteristics. Furthermore, ES is controlled using a typical virtual resistance decrease control technique, which has a sluggish and flexible response. An example of the suggested method is used using a hybrid battery/supercapacitor system (SC). Interestingly, to adequately account for the SC and battery, the load capacity is automatically divided into the higher and lower frequency components. This design allows for uninterrupted operation as a power saving without requiring mode switching or operating transitions because the SC's SoC is immediately identified. A thorough design guide is being developed

to guarantee smooth cooperation in order to attain the intended short-term capacity and ease the procurement of SoCs. In order to verify the effectiveness of the suggested approach, a number of thorough simulations and assessments have been carried out, with positive outcomes.

Yanzhi Wang, Student Member, IEEE, Xue Lin, Student Member, IEEE, and Massoud Pedram, Companion, IEEE. The idea is to include energy storage and solar (PV) power generation into the Smart Grid, which will effectively reduce the amount of fossil fuels used. This is especially important now that variable energy pricing are in place since customers may use power-control devices and PV-based power generation to optimise their energy demand profiles and lower their electricity costs. During the recurring payment period, the energy price that demand amount are considered, together with the real role of the power price. PV power production and power consumption estimates are used in the household storage control algorithm due to the complexity of the electricity pricing function the energy storage capacity. It deals with a variety of power losses that occur during system operation, such as those caused by the rotating power conversion cycle's breakdown rate and system failure rate. In order to efficiently regulate the charge/discharge of the system of storage with polynomial time complexities at the start of each day, a proximal technique is presented to compute these properties. In order to improve the system even further, at the conclusion of each day during the payment period, a reinforcement learning technique is added to stochastically estimate the remaining energy in the system for storage.

Powell et al. 2013, IEEE, studied renewable energy use in sugarcane agriculture to reduce costs and carbon emissions. Off-grid solutions are required to supply energy in the Queensland region of Australia, where sugarcane agriculture accounts for 90% of electricity demand, because of the region's substantial development into isolated regions. In these areas, installing a solar cell system up to 40kW is permitted, reducing carbon dioxide emissions to 1245 tCO2-eq (tons of CO2-equivalent) from 1314 tCO2- eq per installation over 25 years. The study also shows that because irrigation networks lose 60% of their battery value, battery solutions are thought to be highly costly and inefficient and should be avoided.

Project Description

Primarily, the static synchronous compensation feeds power into the grid by acting as a regulated voltage source inverter (VSI). It balances the supply current such that, in relation to the supply voltage, it is in line with the intended phase-angle value. The reactive part is the current that is injected from the inverter; some of this electrical energy can be used to offset the reactive part and harmonics that are created by induction generators and non-linear loads. By increasing the power factor, this process raises the quality of the electricity.

In order to accomplish these goals, the electrical converter's current command is generated by subtracting and synchronizing the grid voltage. In order to improve power quality at normal connection at the point common coupling (PCC), grid connection methods have been inverted. An illustration of the grid-connected system,

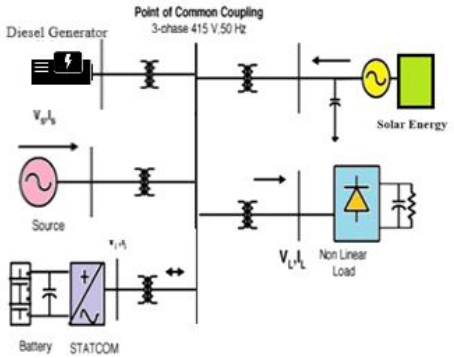


Fig.1.Grid Connected Solar and DG generator System

In this project we use DG generator and PV solar panels on irrigation for agriculture. electrical power generated from solar panels is provided by the charging controller. The charging control provides some power to the solar tracking system. The solar tracking device is used to properly align the solar panel with respect to the sun's location. The remaining power can be used for loading and battery charging. Battery backup is used for night time. DC supply is transmitted via DC distribution cable and distributed via DCDB (DC Distribution Box). For longer transmission we can use the boost converter. Whenever an error occurs the microgrid network is disconnected using a single button. The microgrid network is repeated simultaneously to expand the microgrid network.

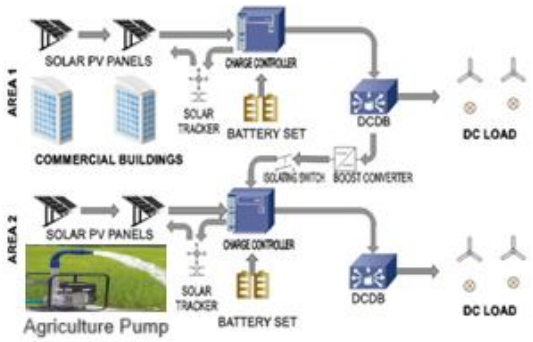


Fig.2.Solar PV based Microgrid for Buildings

Solar power generation can also be used in irrigation and commercial buildings to meet all electrical needs.

When daily power usage is exceeded, the use of battery backup is necessary to meet the needs of irrigation. Among the main direct energy sources, solar energy is particularly noteworthy since it provides the basis for the production of additional sources of energy such as wind, wave, biomass, and hydropower. Although there are large latitude differences, a large area of the Earth absorbs sufficient solar radiation, which helps to heat the water and agriculture at lower elevations.

VI. CONCLUSION

Agriculture irrigation may easily satisfy their energy demands by generating electricity with DG generator and solar power. When the amount of power required exceeds what is consumed on a daily basis, using battery backup becomes essential to meet these structures' needs. As a major contributor to the development of other energy resources including biomass, wind, hydropower, & wave energy, solar power emerges as a massive source of immediately useable energy. Despite large changes in latitude, a major percentage of the surface of the planet gets adequate solar radiation, allowing for the low-grade heat of structures and water.

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REFERENCES

1. Dr. Jayeshkumar Pitroda, Lalakiya Biraj, Naghera Dhiraj, Narodiya Jay, Patel Harsh Proposed “A Critical Literature Review on Benefits Due to Passive Solar Energy System in Educational Building”,. International Journal of Constructive Research in Civil Engineering (IJCRCE) Volume 2, Issue 5, 2016.

2. Deepak Purohit, Goverdhan Singh, Udit Mamodiya, investigated "A Review Paper on Solar Energy System", International Journal of Engineering Research and General Science Volume 5, Issue 5, September-October, 2017
3. L.G. Meegahapola, *Member, IEEE,* D. Robinson, A.P. Agalgaonkar, *Senior Member, IEEE* proposed "Solar energy for cars: perspectives, opportunities and problems",. *GTAA Meeting, Mulhouse, 26-27 May, 2010*
4. Kumaresh.V, Mridul Malhotra, Ramakrishna N and Saravana Prabu. R evaluated and analyzed in " Literature Review on Solar MPPT Systems," *ISSN 2231-1297, Volume 4, Number 3 (2014),*
5. X. Q. Zhai, R. Z. Wang, Y. J. Dai, J. Y. Wu, Y. X. Xu,L. H. Deng developed Design And Experimental Analysis Of Solar-Powered Hybrid Energy System In The Ecological Building" *The 2005 World Sustainable Building Conference,Tokyo, 27-29 September 2005*.
6. Qianwen Xu*, Student Member, IEEE*, Jianfang Xiao*, Member, IEEE*, Peng Wang*, Senior Member, IEEE*, Xuewei Pan*, Member, IEEE*, and Changyun Wen*, Fellow, IEEE* Sakshi Gupta,Neha Sharma proposes "A Decentralized Control Strategy for Autonomous Transient Power Sharing and State-of-Charge Recovery in Hybrid Energy Storage Systems". *IEEE Transactions On Sustainable Energy, Vol. 8, No. 4, October 2017*
7. Yanzhi Wang, *Student Member, IEEE*, Xue Lin, *Student Member, IEEE*, and Massoud Pedram, *Fellow, IEEE*. Proposed Integrating residential photovoltaic (PV) power generation and energy storage systems into the Smart Grid is an effective way of reducing fossil fuel consumptions. *IEEE Transactions On Sustainable Energy, Vol. 7, No. 1, January 2016.*
8. Sanjeevikumar, P.; Grandi, G.; Blaabjerg, F.; Wheeler, P.; Hammami, M.; Siano, P. A Comprehensive Analysis and Hardware Implementation of Control Strategies for High Output Voltage DC-DC Boost Power Converter. Int. J. Comput. Intell. Syst. (IJCIS) 2018, 10, 140–152.
9. Hemanshu, R.; Hossain, M.J.; Mahmud, M.A.; Gadh, R. Control for Microgrids with Inverter Connected Renewable energy Resources. In Proceedings of the IEEE PES General Meeting, Washington, DC, USA, 27–31 July 2019.
10. Adhikari, S.; Li, F.X. Coordinated V-f and P-Q Control of Solar Photovoltaic Generators With MPPT and Battery Storage
11. WESSOF, E. IEA: Global installed PV Capacity Leaps to 303 Gigawatts. Green Tech Media. April 2017.[https://www.greentechmedia.com/articles/read/iea-global-installed-pv-capacity-leaps-to-303-gw#gs.yisqIQ8, 20th December 2017]
12. TSAGAS, I. Spain Approves 'Sun Tax', Discriminates Against Solar PV. Renewable Energy World. October 2018. [http://www.renewableenergyworld.com/articles/2015/10/spain- approves-sun-tax-discriminates-against-solar-pv.html,20th December 2018.