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A Techno-Economic Assessment of Pv And Diesel Based Hybrid Energy System For Cellular Base Station In Southern Somalia

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Abstract: The scope of Renewable energy sources are increasing day by day due to conservational pollution in the environment. As a result of this, the role of renewable energy sources in the operation of electrical systems is becoming increasingly important. The challenge of renewable energies lies in the problems of continuity and reliability linked to their operation. Most of the renewable energy generating sources such as wind and wave generators depends on climate and weather conditions. Thus, it is very important to decide most economical strategies for effective utilization of these renewable based energy sources in modern power system. The intended research is proposed to develop a Techno-Economic Assessment of Solar and Diesel Based Hybrid Energy System for Cellular Base Station in Southern Somalia.

Keywords: Hybrid Energy System, Cellular Base Station, Techno-Economic Assessment.

1. INTRODUCTION

Somalia is a modern and incomplete alliance with regional governments. Federal government access outside the capital, Mogadishu, is limited. As a result, the federal district, although governed by the Constitution of the Federal Government of Somalia, has considerable autonomy in regional relations and security forces. This means that there are still significant regional regulatory controls in various countries. The Somali government is an autonomous and self-proclaimed country (although not yet internationally recognized) and has the broadest legal framework, although it is not a comprehensive legal framework. Since the overthrow of the Somali central government in 1991, only electricity has become an important part of the Somali private sector. Currently, the installed capacity is approximately 106 megawatts (MW). Although most organizations use diesel generators to generate electricity, the interest in solar and wind hybrid systems and investment in this area is growing. According to the latest research from the African Development Bank, Somalia has the greatest offshore wind power potential in Africa, generating between 30,000 and 45,000 megawatts of electricity. Solar energy can produce more than 2000 kW / m. 2. Only 16% of the population can use electricity. Somali prices are higher than those of neighboring Kenya and Ethiopia. Commercial electricity is vital for businessmen and customers. He is responsible for the various equipment and machines needed to continue the work. Each job has different requirements. Given the widespread use of technology in all areas, even with lighting or heating to create the right atmosphere for employees and visitors, access to reliable energy is a top priority. The quality of energy consumption in the business and home environment is exactly the same, but since contractors often have to buy a lot of electricity, the utility provides different definitions to meet the variables at take into account in the diet. For home use Commercial electricity bills generally allow employers to buy electricity at a lower price because the electricity they have to consume allows the utility to obtain enough money to exchange electricity.

The energy sector in Somalia faces major challenges such as lack of skilled labor, weak regulation, high investment costs, energy supply shortages and poor quality infrastructures. Due to the lack of traditional financing for local Islamic financing projects and practices, Somalia has put in place its own funding mechanism to develop infrastructure projects as the size and scale of the project

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

increases. These companies are able to raise large sums for their energy projects from US and foreign citizens. Although the private sector has recently taken important steps to increase energy production and distribution, annual per capita energy consumption remains one of the lowest in Africa. In Kenya, customers pay a high rate of 0.15 cents / kWh, while in Ethiopia they pay 0.5 to 1.25 cents / kWh for 0.6 cents / kWh.

2. ECONOMIC LOAD DISPATCH

The most important thing in the design and operation of electrical systems is the efficient design of all generators to meet the needs of a single system. ELD is a phenomenon that selects the optimal plant range to meet load requirements and various operational constraints to reduce total fuel costs. In the fixed electricity market improving economic transport is of major economic importance for grid operators. The main objective of the ELD problem is to reduce operating costs by covering different operating conditions to meet billing requirements. Many traditional algorithms are used to improve ELD problems. However these methods assume that the incremental unit cost curve adds a monotonic linear function while the actual system is not linear. The main objective of the Economic Load Transfer (ELD) is to determine the electricity bills of all plants in order to minimize electricity generation costs while meeting unequal conditions. The main objective of energy production is to produce the necessary energy at the lowest cost. The economic charge transfer means that the active and reactive power of the generator varies within a certain range and responds to the load demand at a lower fuel cost. The distribution of the load is subject to certain restrictions. The scale of the electrical system is growing rapidly to meet the demand for energy. As a result the number of plants varies in parallel to provide a higher system load than the number of plants. In a network system the production units must operate more economically. The purpose of sending economic charges to produce electricity is to program a promising production capacity to meet the demand for freight at the lowest cost of ownership while respecting all the constraints of module and operation of production. The transfer of financial burden is one of the most important technologies in network management. The main objective of the ELD problem is to reduce the costs of producing calories and increase the overall efficiency of the system to meet the demands of load equal stresses and inequalities. Over the last ten years the cost function was an OPE problem represented by a single square function. The problem was transmitted using a series of derived methods (such as the Lagrange multiplier) and many mathematical emphasis techniques (such as Lambda, Degree, Newton's method, linear programming). And inner point methods and dynamic planning.

3. LITERATURE REVIEW

In the proposed research, the overall literature survey has been divided into the four diffent sub-sections viz. conventional power system, solar based power system, diesel based power plant and hybrid power plant. The detail description of varuious literature has been presented in the below headings:

3.1 Conventional Power System

F. N.Al Farsi *et al.* [1]discussed Economic dispatch is a crucial tending to significant problems in the power system planning. This paper describes the issue of economic transmission, how the issues between vertically incorporated markets and changed market situations are exhibited and looked at. In vertically incorporated markets, transmission and distribution have a place with a single element, for example, the governments with this model, providers don’t need to contend to offer their clients lowest price effort, excellent power in light of the fact that there is no other contender available. The disadvantage of a vertically incorporated power system is its effort and security. The weakness of vertically incorporated energy power system is that advancement is commonly feeble except if the administration tries extraordinary endeavors to help vitality innovative work in a manageable way. Then again, the progression of the market condition rectifies the shortcomings of the vertical resolution model regarding wastefulness, absence of advancement and in some cases significant costs. Energy suppliers must be focused to compete to power provide vitality investment method.

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

F. R.Pazheri *et al.* [2] developed a component of this examination; worldwide interest for power is developing quickly to fulfill the needs of present day human advancement for continuous power. Along these lines, so as to meet burden prerequisites, appropriate activity of the unit committed (CU) is significant for the plant administrator. Economic dispatch (ED) issues add to the advancement of proper working procedures to decrease the fuel expenses of the CU without trading off system and unit limitations. The effective utilization of sustainable power sources assumes a significant role in decrease fuel costs when setting orders. Vitality stockpiling gadgets have a high entrance rate for sustainable power sources. In this paper, we talk about the issue of erectile brokenness in a half breed vitality power system utilizing sustainable power sources and vitality holds with various degrees of penetration. MATLAB simulations test information from three makers to exhibit the advantages of utilizing vitality stockpiling to reduce fuel costs and accomplish elevated levels of sustainable power source infiltration. This report proposes enhancements to reduce fuel creation costs. Utilize MAT LAB reproduction to break down the entrance of sustainable power sources at various levels. By putting away, clean vitality utilization can be expanded during times of high power energy request. With the spread of sustainable power source at unique interest costs, fuel expenses have additionally diminished. What's more, with low energy necessities, less sustainable power source is expected to improve traffic, which lessens the measure of vitality put away sought after.

SohadAbu-elzait *et al.* [3] discussed distributed production operation is one of the best and most practical ways to get a reliable power supply. The best way to achieve this is to use distributed power in small intelligent networks where these adjacent loads and resources can be efficiently controlled by a microgrid controller consisting of a microgrid core. From the typical fossil fuel manufacturers to the newest renewable energy systems, the distributed energy can be of any generation. The purpose of this study was to demonstrate the economic benefits of renewable microgrid compared to conventional microgrid using only conventional fossil fuel based energy sources. This avoids large amounts of CO2 emissions and increases the benefits to the environment. The simulation results of the four case studies show the economics of renewable microwaves in microwave diesel systems. The economic analysis shows that the inclusion of renewable energy systems in microsystems reduces the current net cost of small traditional networks by 44%. Great for Yuma/Arizona/USA, Boston/ Massachusetts / US, Ma'an / Jordan and Plymouth / UK smartphones. Microgrids for renewable energy sources are more economical than micgrid using only conventional power systems. The results from all operational cases indicate that the net cost of micro-objects using renewable energy systems is reduced in the same micro-grid using only conventional power generation. This is mainly due to the overall price decline of photovoltaic systems. In the case considered, the number of members of the People's Assembly was 29.69% and 44.25% of the House of Representatives. Equipment shrinkage went from 29.5% to 44.07% and CO2 emissions from 68.2% to 83.04%. Other future research topics may exceed this range. Although the initial investment costs of renewable-based microprocessors are high, the operating and maintenance costs of these very small assets are significantly lower than those of small conventional installations, particularly because of photovoltaic systems and fuels requiring no maintenance. When terminations or incentives are changed, renewable energy incentives are ignored to ensure immunity to results. It is clear that increasing renewable energy stocks, including incentives for renewable energy and / or sanctions for carbon dioxide emissions, will improve results. Other simulations show that in long-term diesel contracts, renewable energy tariffs are lowered by lower prices for diesel at the most favorable prices. However, the economic aspects of renewable energy micro-projects still in some cases reach USD 0.24 / liter of diesel compared to the conventional microgrid type described in this paper. The next step is to find an appropriate control method that economically integrates renewable energy production into a given gridgrid, even at low diesel prices.

Sayak Mukherjee*et al.* [4]discussed microgrid system play an increasing important role in the development and operation of electrical power systems. This paper discusses the best strategy for using traditional renewable micro-grids with storage facilities. Here, the proposed economic transmission is solved with the introduction of a water pump storage unit. A cost optimization process involving the use of particle pumping technology optimized for pumping tumors. The cost function of the micro-network was created throughout the day. This article presents a new algorithm that

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

improves costs through a good energy balance, including the use of conventional pumps and generators to store and store solar and wind energy on a single proportional charge curve. The results show that its production costs are lower than those of the microgrid function without pumping capacity. Evaluate the results and make a reasonable analysis. Micro-grids take into account renewable energies, conventional generators and pumped hydro devices. Constraints have been additional to the optimization problem to reflect the actual situation, so that the energy contribution of all units remains within the specified capacity limits. Hydraulic pumping equipment involves investment and maintenance costs, but helps to reduce fuel production costs. In the long term, investment and maintenance costs will be offset and the process will be profitable. The solution directly provides a full-day execution program that demonstrates that it is reasonable to use scalable optimization techniques such as optical systems. The design innovation lies in the fact that the proposed algorithm includes a hydraulic pump unit that significantly reduces overall production costs, as well as an optimized overall search using an economical binary coded transmission and a PSO and binary encoding.

Lucian Loan Dulau *et al.* [5]developed an ideal solution for loading microgrid to minimize the total cost of production. The power source may be powered by a network or a micrgrid generating unit. This micro-grid includes seven production units (renewable energies), load-based energy management systems and controllers. Improvements will be made to determine which units will be powered, thereby minimizing the energy costs generated by the microgrid equipment. According to the results of the optimization, the total cost of the energy supplied by the renewable energy is compared with the cost of the energy savings of the network. The cost of electricity supplied by the grid depends on the price of the two energy markets: the energy market for two centuries and the energy market. Micro-grids include decentralized power plants (renewables), energy packing systems and loads. Power management system based on a controller. The generator, the storage and charging systems are connected via a low or medium voltage network and a communication system, particular. The main advantage of the microarray network lies in the low loss in the power line: the plant can provide uninterrupted power, improve reliability and local voltage levels, and reduce power losses and power losses. You can send power directly from the generator to the grid. Improvements were made to the case study. The microgrid includes seven distributed generation units, a load and an energy management system (controller), so that the distributed generation unit generates the lowest energy cost. These costs are then compared to bilateral energy market contracts and energy costs in the energy market the next day. In contrast, the best option is to send the microgrid of the binary market based on the results of the case study. The energy provided by the micro-network will be exported to the network.

XIA Shiwei *et al.* [6] in order to solve the constraints of central economic transmission (ED), this article appropriately designs the energy distribution algorithm by defining the increased cost of the generator as a consensus variable to solve the problem of electricity and energy. Of the failure of the central ED. In the case of different technologies, the proposed distributed algorithm is more able than the traditional centralized algorithm. In addition, the convergence rate in various communication topologies described in this paper has been examined as an important performance indicator of the distribution algorithm. Given the proposed wind algorithm, this algorithm has been tested in 10 wind generator systems. Distribution in the middle is more efficient. Based on the determination of the generator differential cost as a variable, this article proposes a distributed ED algorithm that can be adapted to the network topology and energy fluctuations over time. In a distributed ED scheme, each energy generating unit communicates with neighboring units only to equalize the consensus variables while complying with full load balancing constraints and equal constraints within the generator output limits. The proposed distributed ED system was obtained from three case studies. First, in the first case where the load and the wind force are variable, the proposed distributed ED can dissipate the luminous flux in a very short time. Third, the algorithm may well combine under the topology of different networks to work effectively. The simulation of these case studies proves that the distributed ED method can effectively solve the power transmission problem of the power system and that there is a time difference between load / output and topology.

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

Chenye Wu *et al.* [7]discussed next ten years, the growth of renewable energy transmission should immediate the energy market to offer more specific and flexible products to deal with fluctuations and losses of renewable energy. Transmission systems that reduce economic risks offer a way to improve the delivery and delivery of these products. In this study, we investigated the possibility of extending condition loss as a definition of risk. First, we evaluate how new products are converted to get the best financial transfer, and then compare the situation without these products. In particular, we use a standard analysis to determine the relationship between the minimum production cost and the two main parameters of the new product: steep slope requirements, upward and downward slope. This relationship leads to new procedures that correct the imbalance of financial risk transfers and therefore limit risks. Theoretical analysis and simulation results show that our method can significantly reduce the costs of integrating new products. We believe that our approach can help ISO to take full advantage of the system's potential for reducing costs. The functional analysis to analyze the limits of the relationship between production costs and the basic standards for flexible ramp products. We introduce new procedures to effectively perform import operations. Such a program allows us to efficiently manage financial transfers that minimize risk. Theoretical analysis provides valuable information about these relationships and the results of the simulation show how the method can be applied in practice. This article can be developed in different directions. For example, we have not fully explored the relationship between degradation costs and total capacity payments. It is also important to analyze the strong behavior of the electricity market with new products: is it easy to generate electricity in such a model? More detailed experimental evaluations should include the effects of existing products such as frequency control, rotating inventory and non-rotating inventory. The integration of these existing products will reduce the number of Min functions (or associated DS functions), so our approach suggests that this is more promising. Our approach captures quotes for flexible conical products. When the supply structure exists on the energy market, it will be a new empirical assessment of our high-value approach. Although we consider a simple summary of the problem when T = 3 in unit VII-D, it is often a more complex arrangement in which all the parameters may be different. However, this generalization will probably provide more information on the impact of renewable energy dynamics on the electricity market.

3.2 Solar Based Power System

Falah I. Mustafa *et al.* [8] discussed the main goal of increasing efficiency is to maximize the energy of the solar panels. The project aims to design and implement simple and cost-effective solar energy tracking systems (azimuth and elevation) use real size light components (LDRs). The project includes a solar panel, a satellite dish with two motors, a gun unit, an LDR sensor unit and an electronic circuit. This study was compared to solid-state solar panels and the results showed that solar panels have higher output power than solid-state solar panels. The project is divided into two parts. The hardware part usually consists of a solar module and a dual current box with LDR sensor. The second part is an electronic circuit. In this project, the detection of the solar position takes place in two steps, either directly or through a series of LDR sensors (for example, LDR sensors). Reduce the azimuth and height by adjusting the output. In the second stage, when the weather is cloudy, dusty or severe, the surveillance system will stop functioning as long as there is no sun, but according to Jeep Kelly, the Iraqi energy will be completely reduced - Baghdad The weather is about 10-15 days of rain, cloudy and rainy days every day (2-4) available. The energy of a photovoltaic module (PV) or a solar gather depends on solar radiation. To optimize solar recovery, solar panels must always be natural to avoid accidental radiation. The solar tracker moves the solar collector to track the solar path and maintain the solar collector direction at an optimal angle of inclination. Solar tracking systems increase the energy efficiency of photovoltaic modules. In this paper, a two-axis automatic solar tracking system using a light-resistant motor (LDR) and a DC motor in a mechanical transmission chassis was designed and developed. The results show that the solar automatic tracking system is more reliable and more efficient than the fixed system. As solar energy is a major energy source in the near future, we briefly summarize the solar tracking mechanisms used to improve the costs of solar energy and solar operation and maintenance. In this article, the design and application of a two-axis solar tracker accurately monitors sunlight on the satellite antenna of the motor and determines the intensity of the light using a LDR sensor. The sun we found that solar tracking systems are more efficient than fixed

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

solar modules. The energy obtained from the dual-follower solar module exceeds 35% of the energy of the solar module in the solid state. The dual-axis solar tracking system can be placed anywhere to ensure high efficiency and high energy performance.

Isha M. Shirbhate *et al.* [9] discoverd solar power energy is one of the cleanest sources of renewable energy and has no impact on greenhouse gases. Solar PV is currently the third largest provider of renewable energy after water and wind. As a result, solar vitality is the quickest developing vitality source on the planet. The management of photovoltaic systems is fundamental to improve the efficiency of solar systems. The proposed system is implemented in two stages: the first step is the monitoring system at the panel level and the second step is the solar radiation forecasting system. We use the Internet of Things to control the production of solar energy. This significantly improves the performance, monitoring and maintenance of solar power plants. The solar monitoring system incorporates certain limitations that are evaluated by sensors to analyze performance at the panel level. The monitoring system monitors the production of solar energy based on environmental conditions such as temperature and humidity at a specific location. The monitoring system predicts the error and time criteria as well as the severity of the matrix. The second step is to estimate solar energy using a hidden Markov model. An accurate estimate can be made by considering the relationship between the first value and the next value in the time series. The output is then compared to the current forecast module, which displays the suggested module with good forecasting accuracy. Solar energy is global friendly and reliable, and the system consumes a constant amount of money and is profitable. The proposed system includes monitoring and forecasting. The Internet of Things provides an effective way to get accurate results. To monitor solar energy, we take into account standards such as temperature, humidity and solar energy based on IoT. The planned system will monitor the PCU and detect card errors. We can consult the weekly and monthly performance reports of the monitoring system. For estimation, we use a secret Markov model to estimate solar energy. We have developed a weather forecasting system. HMM examines historical data to accurately estimate energy production over a time series. Statistical results show that the proposed model has a higher predictive accuracy than the simple linear regression model.

Krisna Neupane *et al.* [10] given the concept that the combination of little solar power system into the system is actually mind boggling and prompts cost and excluded exchanges for everyone. This document describes an intelligent controller-based design that uses digital signal processing to economically manage a combined solar panel system. Hybrid systems can change the size of the connected system and implement its operational strategy to ensure efficient use of solar energy. Synchronization is not required because this method can be effectively changed using condition forecasts. It offers economical, efficient, reliable and economical action. The system was tested on a 120 watt solar panel with a spare battery and maintained efficiently. Ensures battery operation when the mains or power source is disconnected from the solar network. From the database to the algorithms to the intelligent solar energy management system and replacement systems, there is a system of replacement of the environmental protection system, associated with a system of management of the energy, solar energy and solar energy. All about Technologies, Program Options, Programs, Hybrid Programs, Hybrid Systems, Program Programs, Singapore, Singapore Werden den Anwendungsbereich and Anwendbarkeit of Gegenwegher.

Anupam Sharma *et al.* [11] in their research discussed that solar energy must provide people with pure, environmentally friendly and sustainable energy. Two different technologies can be used to generate solar power energy: the solar energy (PV) and concentrated solar energy (CSP). Compared to photovoltaic systems, solar storage systems can use thermal energy storage technology to store energy to generate electricity, which offers the flexibility of energy in the energy networks. Cloud or night Electricity The main problem in the energy market is competitive energy costs. The price of energy from a PV plant is lower than the energy price of a centralized solar power plant. A centralized solar system with thermal energy storage can effectively solve the problem of overlapping photovoltaic systems, improving the current while stabilizing it. The energy produced this article aims to study the energy produced by solar technology and to determine how to improve it to reduce carbon emissions. In addition, PV and CSP systems were compared at two sites in tropical India and simulated and

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

plotted in the System Guide (SAM) model. The global radiation of Panaji is higher than that of Dehradun throughout the year, which results in an increase in the energy produced by the photovoltaic and photovoltaic systems of Panaji. In July, due to strong wind and low radiation, Panaji's average summertime was short and had to be monitored optimally to increase energy production. To get the most out of the power and energy of solar PV systems and CSPs, the location should be chosen according to the weather (especially sunlight). The performance rate depends on the environmental conditions and varies according to electrical design, climate and installation conditions. They are very useful for monthly, daily or short-term emergency measures of PV and CSP services. The maximum energy can be obtained by continuously adjusting the inclination angle in the solar path at regular intervals. Energy costs can be minimized by using an efficient monitoring system and maintaining a very high power factor for photovoltaic and CSP systems, thus reducing operating and maintenance costs.

Nuizhigi Kuttybay *et al.* [12]in this report consider an intelligent solar automatic monitoring system designed to growth efficiency of solar power generation. The determine cloud detection method modifies the angle of the solar panel, allowing the system to adapt to different weather situations in real time. As we all know, the cloudy sun is more effective than the sun. The solar tracker is a two-axis solar with two small additional solar modules. One of the units is placed horizontally. The second unit is a two-axis solar tracker. The algorithm used to locate solar cells is based on the known history of solar cells recorded on the memory card during the year and monitors the energy of small solar cells integrated into the system. As the cloud layer increases, the current generated by the small elements of the horizontal solar cell exceeds the current of the exposed solar cell module. Then, the large solar panels will go into landscape mode. The system has been extended to LoRa AS32 TTL wireless data transmission for remote monitoring of solar energy requirements. Experimental results show that the method produces 18% more energy in cloudy weather than the energy collected by the biaxial sunscreen. The result of this research was the development of an intelligent solar tracking system. An algorithm was developed to detect the sunlit cloud layer and to investigate the difference between the current values of small solar cells. The architecture and transmission technology software for the remote monitoring system was developed on the basis of the TTL radio module LoRa AS32. Experimental data on system operation was obtained using advanced rain weather algorithms and remote monitoring systems. In cloudy weather, adaptive sun monitoring generates 18% more energy than biaxial solar observation. In factories, advanced algorithms can be used to increase the efficiency of solar monitoring systems.

Frank Dimroth *et al.* [13] presentedthe four connected devices guarantee the highest conversion efficiency of solar cells in the presence of sunlight. Different battery configurations are in development, each with an ideal bandwidth of 1.9, 1.4, 1.0 and 0.7 volts. In this study, platelet binding was used to bind substances with significant network incompatibility. On the basis of germanium, GaSb or GaInAs in InP, three unitary structures are presented with the same GaInP / GaAs bond, but with different infrared absorption. For these three devices, typical efficiency potentials of less than 500 solar cells range from 49% to 54%, while InP batteries are expected to achieve maximum efficiency. Japan's AIST measured GaInP / GaAs // GaInAsP / GaInAs at 46% of solar efficiency 508, the highest efficiency previously approved, and is currently developing Ge and GaSb solar cells for Fraunhofer ISE. This article describes the functional components for the first time. A multifunctional solar cell with four or more seals is required to achieve conversion efficiency greater than 50% in concentrated sunlight. Detailed balance calculations show that a combination of absorbers of 1.9, 1.4, 1.0 and 0.5 volts can achieve 65% efficiency at a concentration of 500x. The reflection of the front surface, the absorption of interference in the barrier layer, the retinal shadow, the electrical losses due to recombination and the optical losses due to the difference in resistance make the actual efficiency even lower. This value we developed a more realistic model than the measured material data and calculated the absorption rate using the transfer matrix. The voltage characteristics come from a single diode model for each connector. We discuss three architectures with four connected devices based on InP, Ge and GaSb. The model predicts efficiency up to 53.8%.

3.3 Hybrid Power System

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

Yuriy Varetsky *et al.* [14] this article describes the show of a selected microwave hybrid renewable energy system connected to a PDS. The purpose of the research was to combine solar panels, wind turbines and widespread energy storage technologies. The proposed sample usages statistical indicators of solar radiation and wind hurry to simulate the flow of energy in the system. Considering the possible models of interactive control of the wind energy, the difference of tension between the points is analyzed. Given the reduction of voltage fluctuations, the best requirements for reactive power control are presented. The purpose of this document is to provide a tool to assess the operational viability of components of a hybrid system and to provide appropriate control strategies to ensure its effectiveness. As part of this project, hybrid renewable energy systems, including wind turbines and photovoltaic turbines, were tested, along with conventional storage. The effects of the energy resistance of a hybrid wind turbine on the fluctuation behavior of the voltage in the microwave connected to the energy distribution system were studied. The results indicate that, due to climate change, significant variations in voltage at the user's touch points may result in a microchip change in the functional quantity of the hybrid system. In addition, the behavior of the voltage fluctuations strongly depends on the reactive power of the wind turbine, the photovoltaic unit and the hybrid system, which is determined by the type of storage and control operation. The power cord settings that connect the microwave oven to the barbecue have a significant effect on the magnitude of the voltage fluctuations. Therefore, application characteristics and resistance control characteristics must be taken into account in the design and selection of equipment for a hybrid renewable energy network for a local area network.

Yiqing Zhang *et al.* [15] in their research provided dynamic modeling and a coordinated control strategy for hybrid photovoltaic TES systems operating in the early stages of power system recovery. First, a coordinated hybrid system control strategy has been developed that takes into account the dynamic balance between system power problems and power quality during recovery. Secondly, the CSP is controlled by TES and dynamic control to minimize system power variations due to lighting variations. The initial storage capacity of the TES has been fully evaluated to restore more severe systems. Finally, photovoltaic systems with STATCOM must guarantee the stability of the voltage and frequency at the PV / CSP termination points. In Matlab/Simulink, a model is designed to simulate the temporary operation of PV / CSP automation by charging the adapter without charging or establishing a long-distance connection. The results show that the proposed method can effectively reduce voltage and frequency fluctuations and achieve the goal of power system normalization. This paper proposes a TES-based coordinated control strategy for hybrid photovoltaic and CSP systems to address energy balance and energy quality issues in the recycling process. The TES system can reduce power fluctuations due to clarifications and load variations in order to stabilize voltage and frequency and to avoid recovery errors due to insufficient power. The Hybrid PV/CSP Hybrid Power Management strategy is designed to balance the system when restoring the power system. The results show that the photovoltaic / photovoltaic system with TES can effectively reduce the frequency and voltage changes during the maintenance of the electrical structure and that auxiliary terminals meet the control requirements. Coordinate active and passive actions.

Md. Habibur Rahman *et al.* [16] showed that the world demand for electricity is increasing. In this case, conventional power sources may not meet the requirements. Today, the importance of renewable energy sources has been considered a substitute. This article refers to a simulated solar power station as the main source and containing backup energy for fuel cells. As a result, no storage device will be shipped. The proposed method consists of four main components: a primary solar cell source, a fuel cell as an alternative source, a controller to convert the energy from the primary sources to an alternative source and vice versa, the last part being the end point. Solar energy is directly driven by the control unit. If solar energy is insufficient to meet the demand, the fuel cell feeds the load via the controller. However, if solar energy is sufficient to power the load, the control switch switches between the fuel source and the solar cell. The results of the simulation show that the load always receives a continuous energy. A full simulation was performed in the MATLAB Simulink environment (Math Works, Inc., USA). In this study, a hybrid solar cell system was built and the model was validated by analyzing the voltage and current levels of the sources used in the model. For

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Vol-22-Issue-17-September-2019

hybrid vehicles, the report must be able to provide power for continuous charging. In this model, a source of change in conditions maintains the continuity of pregnancy care.

Iqbal *et al.* [17]discussed that the Hybrid solar and solar systems are more practical in areas where both exporters may be interested. These sources complement each other and allow autonomy without a single source. In Pakistan, many isolated villages are not electrified and the current energy crisis is failing to integrate these areas into the national grid. Even in areas connected to the grid, a large number of shutdowns (up to 16 hours a day) can take place and it is necessary to integrate rich renewable energy into the country's energy mix. Therefore, a hybrid system with grid, solar PV and wind will help avoid emissions, but the cost of these systems should be limited to the economy. Therefore, in this article, we use HOMER (Mixed Renewable Energy Optimization Model) software to simulate and analyze various hybrid energy systems to compare current levels of net cost and energy cost (LCOE) available. Studies have shown that the most economical system for NPC and LCOE is the photovoltaic solar wind hybrid system (E configuration). The use of autonomous hybrid systems in remote areas or the installation of transmission lines for the connection to the national grid were the two scenarios considered in this study. The results show that the most economical distributed system has a higher LCOE than a hybrid system connected to the grid. However, to obtain a fair comparison between the two systems, two factors must be taken into account. First, installing a transmission line is expensive to ensure that the network is connected to a remote location. Once installed, this can also lead to a significant loss of performance (up to 20%) and is not taken into account in HOMER. Secondly, in the network system, a large contain of excess energy was sold to the grid, thus increasing efficiency of the system. However, in an autonomous system, the remaining power generated is limited, which corresponds to the capacity of the battery. This means that when the battery is fully charged, no energy can be stored, although renewable conditions generate more energy. In addition, extending the battery increases investment and maintenance costs. Therefore, although the results of the simulation show opposite results, the economy of the connected system and that of the independent network may have minimal differences when considering these factors in remote areas.

D.B. Chia *et al.* [18] in their research discussed that as renewable technologies mature, renewable hybrid energy systems are expected to replace the energy of traditional fossil fuel generation. This document proposes a hybrid photovoltaic / wind system connected to a bus shared by a battery and to a source of conventional telecommunication charging fuse. The proposed hybrid system model was developed on the PSCAD / EMTDC platform. Based on Malaysia's global energy and climate management strategies, many models have been developed to increase the efficiency of hybrid power systems. The mixed response of the system to actual data on pregnancy and climate has been analyzed and discussed. The document explains that a hybrid system with a recommended mode can permanently save energy for the load. This paper proposes a hybrid PV / wind system for the operation of telecommunication towers in remote areas of Sandakan. Given the weather conditions, the PSCAD / EMTEC program is used to simulate model and system performance. The results of the simulation show that a flexible energy transfer is carried out between the different subsystems that still meet the requirements of the load. The proposed system is very promising and viable to increase the burden of telecommunications in rural areas. By properly adjusting the power management policies described in this document, you can use the same system configuration to handle different types of workloads.

Minshuo chen *et al.* [19] discussed in their research that many islands in China are far from the mainland and electricity is difficult to cover or expensive because wind, waves and solar energy can be used to meet the island's energy needs. Island However, these renewable energy sources have low energy density and low stability, which can cause fluctuations in power supply. To solve this problem, a Hybrid multi-action system based on wind and wave energy has been introduced to improve the stability and quality of the energy supply. Based on waves and wind energy, this article creates a multi-hybrid system. The entire system model, the risk control strategy, is analyzed and analyzed. And the investor control strategy for the network. The PSCAD simulation model was designed for the entire system and a simulated analysis was performed. The results show that wind and wave energy

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

can be used to produce electricity that the power output is constant and that energy can be monitored. Based on wind power and waves, a hybrid multi-action system has been designed. Inverter and PWM control strategies are introduced in DC power conversion systems and wind turbines. The hybrid multi-supply system model was designed using the PSCAD simulation platform and the performance of the hybrid multi-supply system was analyzed. The results of the simulation show that the wind turbine and the wave generator are working properly, the DC voltage is set at 600 V and the current d in the rectifier circuit of the system is rapidly following the reference value. The fully hybrid drive system works well.

D. Lapez Del Moral *et al.* [20]in their research studies discussed that in a regenerative charging system, a bidirectional transformer is used to control the flow of energy between the power source and the load. This article describes the dynamic performance of a synchronous buck-buck hybrid electric vehicle. Some simple design rules are provided to optimize dynamic system performance, regardless of the direction of the power flow. Dynamic analysis of modern transformers used in hybrid power generation systems. Theoretical expressions were obtained by simulation and analyzed and verified. As long as these conditions are met, the synchronization of the inverter at the factory is the same regardless of the direction of the power flow. As a result, a single controller achieves optimal dynamic performance by simplifying the design of the drive control. In addition, an optimum dynamic response is obtained when the overcurrent voltage is greater than the carrier voltage. It should be noted that the high voltage capacitor can be selected without changing the power that the device can withstand, and its size and cost. The only way to remove the battery sequentially or parallel to the superconductor is to determine the voltage level of the superconductor. Some restrictions are related to the design of the previous requirements. Increasing the SC voltage above the bus voltage causes a high voltage in the DC-DC converter assembly. Therefore, the design described here to improve the dynamic performance of SB transformers is better suited to low bus voltages when people are operating in small and medium HEV systems of less than 20 kW.

3.4 Diesel Based Power System

Kazuhito Suzuki *et al.*[21]in recent years discussed that the environmental problems have become increasingly serious and renewable energy systems especially wind power generation have attracted attention and introduced energy systems. The power of the wind turbine is interrupted, which causes frequency fluctuations in the electrical system of the connected vehicle. In this work, we have proposed a DFIG (Dual Diesel Induction) system that eliminates frequency variations in small electrical systems by installing a windshield (SCIG) for the chassis induction generator. The simulation analysis was performed using the PSCAD / EMTDC software. The results of the simulation show that the DIFG diesel production system can eliminate the frequency fluctuations of the energy system compared to the traditional modern diesel system (SG system. This article presents a DFIG-based diesel generator system for controlling the frequency of a small wind turbine equipped with a wind turbine. The results of the simulation show that, compared to conventional diesel generators, the proposed strategy allows for better control of frequency fluctuations in small energy systems. In his future research, the author's goal is to explore more detailed models of oil portfolios and more complex models of energy systems, including photovoltaic systems.

Ginas Alvianingsih *et al.* [22]discussedIntensive and use of fossil fuels has a negative impact on the environment and efforts need to be made to address these issues. One possibility is to replace fossil fuels with palm oil with similar properties to diesel. However, palm oil has a higher viscosity than diesel, which may result in incomplete dissolution of the nozzle. As a result, heating is required to change the viscosity of the palm oil to match the viscosity of the diesel. In order to integrate the heating system into the diesel engine, the fuel flow must be adjusted to control the viscosity level according to the diesel engine standard. The purpose of this study was to design and analyze the performance of the heating system in a small diesel unit composed of a mixture of palm oil and diesel. The method used consisted of designing a system consisting of a fuel heater, a fuel quantity regulator and various components of the truck, based on a review of the literature and fuel gauge measurements. The complete performance of the heating system and the diesel generator under certain test conditions. The study concluded that the fuel generator operates under certain conditions,

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

such as a fuel temperature of up to 70 ° C and a concentration of CPM in the mixture. The application of this system generates electricity and produces noise levels similar to those of diesel fuel. Due to the lower heat of palm oil, the fuel consumption and the mixture of palm oil and exhaust gas are higher than those of diesel. Analysis of the system's performance will be a valuable reference for future technological development. A few points can be drawn from this study: the heating system can heat a mixture of palm oil and diesel at 70 ° C. The diesel generator can operate with a 50% oil concentration fuel. The application of this system generates electricity and produces noise levels similar to those of diesel fuel. Because palm oil has a lower temperature coefficient, fuel consumption and a mixture of palm oil and exhaust are higher than those of diesel.

Gireesh Kumar A.*et al.* [23]in this article discussed, off-network hybrid systems are increasingly used in remote applications. This article describes the hybrid system, which is not the energy storage element of a variable speed solar diesel generator. This setting maintains a strategic distance from the high installation costs of the battery and the associated complex controls. The inclusion of a variable speed diesel generator in a hybrid propulsion system has more advantages than a conventional fixed speed diesel generator. Variable speed diesel generators provide energy efficiency and economical operation. PV and VSDG can be delivered immediately without battery conversion, increasing the efficiency of the system. This article presents the theoretical analysis, modeling and simulation of a high performance system with a variable speed diesel generator. System simulation is provided by MATLAB / Simulink. The proposed PV VSDG Hybrid system configuration offers a potential alternative to the power system for remote applications without the use of energy storage components. During the lifetime of the product, the initial investment cost and the cost of replacing the battery must be reduced. It is important to note that since PV and VSDG power supplies are delivered non-periodically to primary and optional loads via the energy storage elements, energy efficiency is increased. The benefits of such a less battery consuming system can be improved over a standalone hybrid energy system with energy storage and DG constant speed systems. By applying VSDG to a distributed distribution system, problems caused by constant and constant speed diesel generators can be avoided. In addition, the variable speed function of the proposed production system saves a lot of fuel, especially at low load.

Kostin V.N.*et al.* [24] designed a model for wind turbines operating in parallel with diesel generators. Simulated different modes of operation of the generator. Simulation results of the operating characteristics of the wind turbine operating with the diesel generator were obtained and compared to wind turbines connected to a high performance network. Table 1 gives the distribution values of DMe, Ds21 and square root and ds21 for uncontrolled generators with different power ratios. A comparative analysis of the results in Table 1 shows that, in systems where the working group is parallel to the high-power grid, the average square root of electromagnetic torque and load angle is significantly greater than that of the independent system WG-DG. The calculation also shows that the power ratio does not exceed 0.02% of the nominal voltage of the load node. Even for generators without PWG / PDG warning = 1: 1, the power ratio is 0.05% (PWG / PDG = 1: 2).

SuithS.*et al.* [25] in their report described the implementation of the Flywheel Energy Storage System (FESS) to reduce the diesel consumption of isolated hybrid wind systems during periods of high winds. The combination of a diesel generator (DG) and a wind turbine (WG) provides continuous active power to the system and can be used effectively in bioenergy applications. However, in the already installed WDHS system, diesel is neither economical nor environmentally friendly. It is imperative to reduce energy dependence without compromising the current regime. Flywheel energy storage systems are very efficient for specific tasks, especially when vibrations are high. This document describes some FESS applications and validates the system using the Matlab/Simulink software. The results of the simulation show that the maximum value exceeds the maximum DG power of 21% during the specified transition period and that its power is generally reduced by more than 35%. This document describes the use of a flywheel energy storage system to increase the penetration of a wind turbine. This will help reduce energy consumption without affecting the reliability of the power system. A brief description of the main components of the power system will be realized and system performance will be verified using the Matlab/Simulink software. The results

ISSN: 0971-1260
Vol-22-Issue-17-September-2019

of the simulation show that FESS can provide an efficient WDHS energy storage system to reduce the dependence of unnecessary DC applications on oil. As a result, the trend to reduce reliance on non-renewable energy sources while reducing the demand for uninterruptible energy sources has been demonstrated.

3.5 Cellular Base Station

Mohamed Habash *et al.* [26] presented that the development of novel cellular base stations is used as an effective thaw for the rapid growth of mobile phones. However this solution is expensive because of the temporal evolution of the service, because the mobile operators must provide base stations able to function during a limited period of the day. UAS base stations are a promising alternative to reduce network operating costs, while offering increased productivity due to their flexibility, reduced installation time and ease of use across multiple sites. Superior to the classical method. In this article we look at the effect of utilizing free base stations on portable system execution. We consider a heterogeneous structure comprising of enormous base stations secured by base stations serving little cells. For little cells two states are looked at: the main case relates to a fixed number of little fixed base stations and the second case to a variable number of unmanned base stations serving little cells. The outcomes show that few UAV base stations can supplant countless fixed stations. Furthermore utilizing less UAS base stations can build the throughput and execution of each base station control supply by 75 and 78 points individually. In this article we look at the consequences of utilizing little vacant base stations as little cells for organize execution. The utilization of a fixed number of little fixed base stations and a variable number of little unassisted base stations that can work at various areas is looked at. The outcomes show that few UAV base stations can supplant countless fixed stations. Use fewer UAS base stations to increase the throughput and capacity of each PSU by 75 percentages and 78 percentages respectively. Relative to the fixed station. In the future our goal is to analyze the use of drones taking into account the flight times of drones and the need to recharge their batteries.

Mohamed Habash *et al.* [27] in their research finding presented that Green energy have recently become one of the most promising wireless solutions to reduce energy consumption in terms of reducing its carbon footprint. One of the biggest challenges is finding the best wireless solution, especially heterogeneous networks, while maintaining quality of service (QoS) communications. This article explores several ways to find the best solution for heterogeneous networks, including cellular base stations and small base stations (SBS) using renewable energy. We briefly present modern methods and guidelines for the best solution. Finally, we present ideas that can effectively improve the performance of existing solutions while maintaining the quality of service. In this study, we analyze the latest green energy challenges for wireless communications, including SBS and BS. All challenges have one thing in common: consider the minimal energy consumption of coffee, such as satisfaction of wireless demand. For best performance, we recommend combining multiple goals into a complete solution.

Yasunori Suzuki *et al.* [28]tin their article described the historical evolution of linear power amplification techniques for trilateral cell base stations. The first is to reduce the saturation level of the power amplifier at the multicarrier base station in the second generation mobile communication system. The second is to reduce the power amplifier consumption of broadband base stations in 3G and 4G mobile communications systems. Third, the distortion and phase amplifier of the power amplifier of the MIMO base station in the 5G mobile communication system is reduced. This paper describes the historical evolution of the use of linear techniques for power amplifiers in cellular base stations. Linear technology continuously provides new solutions for the implementation of European cellular base stations in the new era. This article describes the historical evolution of 2G to 5G mobile base stations in protected areas. Our base station activities have two problems: the first concerns the high performance linear protection regions for FFPA and DPDL. The second is an excellent sound system for MIMO stations. According to these studies, linear techniques can reduce energy consumption in protected areas. In the future, we expect that linearity will become a single chip, while base station equipment will become common due to reduced power consumption and linear

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Vol-22-Issue-17-September-2019

miniaturization (such as RFIC and MMIC). The realization of the equipment of the future factory faces many technical challenges. Linear technology will be an important step in a new era.

Zheng Guo *et al.* [29] in their research findingdiscussed a network of renewable energy base stations where energy can be transmitted over a network via electric or wireless transmission lines. In particular, we study a two-cell system with a different number of cell users and determine its direction and transmission energy in order to maximize the total number of users with a power transmission efficiency of 2 [0, 1]. We have formulated this general problem based on the FDMA configuration and solved the problem by examining the power to be transmitted in two stages and using each water to find the optimal bandwidth and distribution. Consider the ideal and equal bandwidth distribution and record the corresponding power curve. There is also a simple and naive technique that uses the power distribution and the same bandwidth in each unit. The results of the simulation show that the naive method works well in the highest periods and that the benefit of the channel of all users is the same. This paper examines a new approach to BS-based energy collaboration that enables BE's renewable energy stations to efficiently transfer their available energy to optimize the (average) quality of service across the network. We formulate this problem with a simple FDMA configuration and solve it numerically. The same allocations and bandwidth optimizations were evaluated and the corresponding power curves were recorded. A simple and abstract approach has been proposed: if it is high enough and the channel of all users has the same benefits, the simulation can be simulated as an almost completely viable strategy. We also evaluated the percentage increase of several available energy ratios and found that this increase increased with increasing Ea /Eb ratio. Our structure can be easily extended to OFDMA downlink systems for right angle rectangles and multi-frequency links, and the results can be applied to more realistic network models of more than two vessels. Time must also be taken into account in future work.

4. CONCLUSION AND FUTURE SCOPE

In the proposed research, the authors has successfully presented a Technical and Economic Assessment of Solar and Diesel Based Hybrid Energy System for Cellular Base Station in Southern Somalia. Simulation studies show that the utilization of hybrid PV /diesel frameworks (5.4 kW photovoltaic plants, 8.8 kW diesel generators and 48 batteries) considerably reduces the use of available batteries. Diesel resources when a hybrid photovoltaic /battery diesel system is used, the NPC and COE levels can be significantly reduced compared to independent diesel in one or two banks. It can decrease its reliance on diesel. It likewise diminishes contaminations for example carbon dioxide outflows which lessens the nursery impact. Then again it has likewise been indicated that if the cost of diesel increments strongly it is less expensive to utilize a cross breed PV/diesel framework with two batteries. During the 25-year figure period, it was resolved that the utilization of a crossover PV/diesel framework could fundamentally decrease the COE/NPC proportion contrasted with a different diesel framework. In summary, double-row diesel / PV hybrid battery storage systems can be deployed in isolated locations, including Somalia, replacing automatic diesel systems.

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