Fault Ride Protection of the Motor-Generator Pair System for Renewable Energy Systems

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Abstract
Nowadays, the world has reached a point when the integration of renewable energy sources like wind energy, solar energy, etc., with the country's electricity grid, will have a greater role when the global warming rate has reached a distressing rate in the world. Also, there will be problems while implementing the connection of wind turbines and any other renewable energy sources with the grid. One of the problems related to this is called 'Fault ride through disturbances' this work proposed asynchronous Motor and Generator Pair (MGP) system as a probable solution for the integration of renewable energy to recover inertia and improve network stability. This work analyses the Fault Ride briefly Through the scenario of wind energy conversion system (WECS) and solar system. This work establishes the Dynamic Voltage Restorer (DVR) configuration or management strategy. To compensate for power for each phase disjointedly, a closed-loop PI manage law is proposed in the d-q reference frame. The proposed technique provides fast response and effectual case recompense functions and runs a MATLAB/SIMULINK simulation of such type of Low Voltage Fault Ride through Scenario, as well as analyzing the results

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INTRODUCTION

The problem with the wind and solar is that it is not a constant source of electricity. It keeps on fluctuating based on the amount of wind in the region. Sometimes it is good, thus resulting in a good and adequate amount of energy production was as at times, it is less and produces a less inadequate amount of electricity; at times, it is not easy to store. In this thesis, the second scenario is considered a common and growing problem all over Europe and in major wind countries. There is a common problem in wind energy and solar called a fault ride-through which results in voltage sag if there is any disturbance or decrease in voltage. In this thesis, few scenarios of such a problem have been shown, and a conclusion is made.

For renewable energy in supply scale, a single step achieves manage objectives such as maximum power point tracking, synchronization with the grid, power management, and harmonic reduction of production present to achieve high efficiency or simple power converter topology. A high-power three-phase system related to the allotment complex has an improved management strategy, including the ability to compensate for mains voltage drops and reactive power injection in terms of control, monitoring, and protection, and it is important that interconnected. Active and reactive power is controlled by the "dq" component of mains power. The analysis stability examination of the grid-connected renewable energy system with a complete linearization model is executed to evaluate the robustness of control and the decoupling characteristics of the grid-connected renewable energy system. Dynamic performance must be appraised on the management side in real-time [17].

1 Stand-Alone and Hybrid Energy Grid-Connected Systems

Electricity is the most important commodity in any country or country's social and economic development. In the current situation, it plays an imperative role in all human behavior. The majority of electricity comes from fossil fuels such as coal, oil, or natural gas. These fossil fuels have a serious impact on the atmosphere in many ways. Even these fossil fuels are limited and will continue until the middle of this century. We need to implement renewable energy (RES) for green energy [3].

2 Solar PV Stand-Alone System

Solar cell systems or solar cell systems are power systems designed to deliver functional solar power through solar cells. It consists of many apparatuses, counting photovoltaic systems that absorb sunlight or convert it into electrical power, photovoltaic systems that convert electricity from direct present to alternating current, installation, wiring, or other electrical accessories to build a functioning classification. It can also use solar cell tracking systems to recover largely performance of classification and include integrated battery solutions as the price of storage devices is predicted to fall. Strictly speaking, a photovoltaic system includes the only synergy of photovoltaic systems, that is, the visible part of the photovoltaic system, excluding all other hardware, and is usually summarized as the balance of the system. The photovoltaic organization directly converts light into electrical energy or should not be mystified with other technologies, such as concentrated solar energy or solar heating for heating and cooling [4].

The annual solar energy that India receives is equivalent to more than 5,000 trillion kilowatt-hours, far exceeding its total annual consumption. The global daily radiation is approx. 5 kWh /

m2 day and most of India's annual sunshine time is between 2300 and 3200 hours. Despite the low energy density and discontinuous availability, this abundantly available energy can now be used very dependably for many purposes by converting it to usable heat or directly generating electricity. The conversion arrangement is modular or can be used appropriately for decentralized functions. A typical photovoltaic independent system consists of photovoltaic systems and battery connections, as shown in Figure 1.1. The array controls the load or indicts battery during the day. The battery supplies power to load after dark. The inverter converts the direct current of the array or battery to 60 or 50 Hz power [5].Most independent photovoltaic classification installed in increasing countries supply necessities such as lighting, hot water, or pumping.

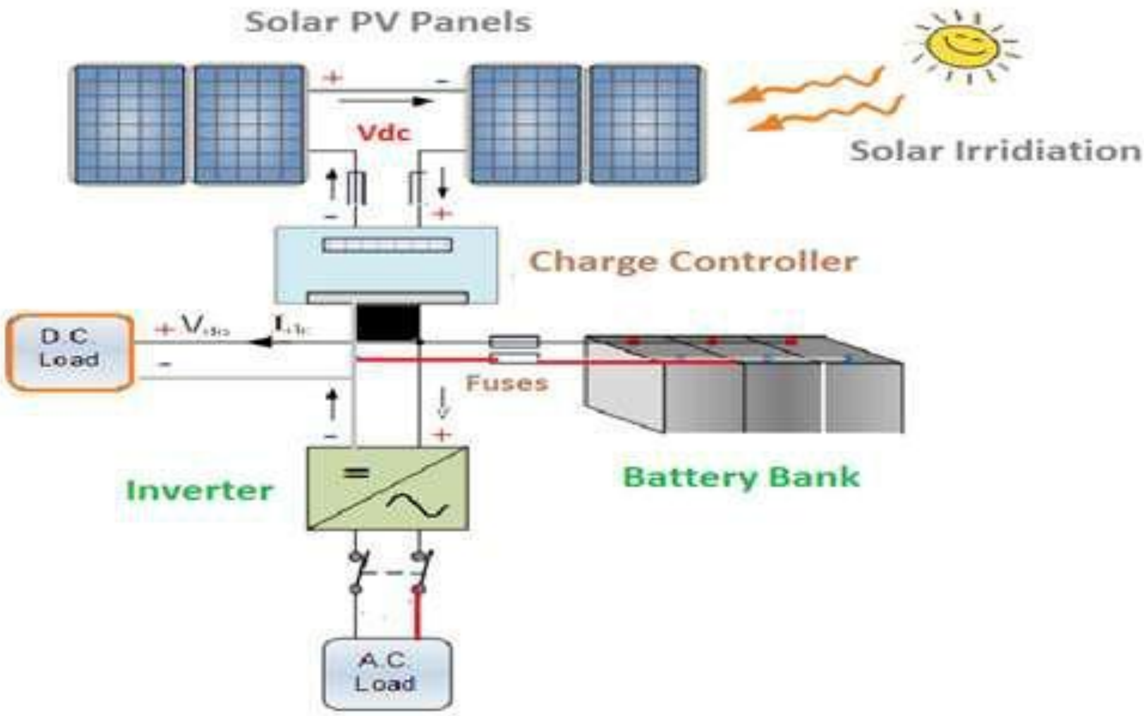

Figure 1: Solar PV Stand-Alone Power System

REVIEW OF LITERATURE

1 Grid Interconnected Individual Renewable Energy Source

SaverioBolognani et al. (2011)focus on a specific problem: dynamic models used to achieve correlations between simulation methods and the most relevant phenomena evolving due to interconnection of simpler non-linear loads; simulation models are intended to assist in distribution networks. The algorithm design of the service has important perceptions and strategies because it approximates the propagation time and the settlement time after the system is iteratively operated. More detailed experimental test benches need to be explored to verify the model where loads with different steady-state characteristics and different active behaviors occur [18].

FerdinandaPonci et al. (2011) various forms of simulation are proposed to support the outline and the devices for smart grid design. The original capability that entertainment must-have is focused on the integration of communication into the design process. Make demands on model design. Then outline the strategic process on an abstract level [19].

2 Grid Integration with Multiple RES

DiptiSrinivasan et al. (2012) Research shows that demand-side management (DSM) is one of the significant aspects of smart grids. It allows consumers to make conversant choices about their energy intake and helps energy suppliers reduce peak demand and reform load plans. This will improve the sustainability of the smart grid or reduce overall operating costs and carbon production levels. The current demand-side management strategies used in traditional energy management systems use schema-specific technologies and algorithms. In addition, existing methods handle only an incomplete number of limited types of controllable loads. The demand-side management strategy is based on load transfer technology used in the future smart grid DSM, with many devices of different types. The technique transferred to load transfer the day before is accurately expressed as a minimization problem. It developed an easily adaptable heuristic evolutionary algorithm to solve this minimization problem and simulated it on a smart network containing different loads in 3 service areas, one for private and the other for profitable customers. The third is with industrial customers. The replication results show that the DSM strategy has achieved significant savings while reducing the maximum load demand for the smart grid [28].

VahidSalehi et al. (2012) introduce the design and development of hardware-based laboratory test benches. The system was developed by the Energy Research Laboratory at Florida International University. The software-based equipment/software system operates a power plant control method and the transmission of loads through the laboratory, with AC power up to 35 kW, renewable energy, and renewable energy up to 36 kW. Appropriate software is designed to monitor all aspects of the system and operate and control the various interconnected components of the communication architecture. Interactions with other energy sources such as energy simulators, solar energy, and fuel cell simulators were implemented, studied, and integrated. Real-time efficiency and flexibility provide a platform to consider many complex aspects of a highly intelligent power system. This includes component development, equipment implementation, and control and communication functions [29].

3 Fault Ride

Yan Li et al. (2020) the integration of renewable power in the VSC-HVDC network will become a major problem detrimental to the operation of the network. Specifically, the complex exchange between renewable energy production and power cables poses new challenges in addressing the shortcomings of renewable energy production and VSC-HVDC power cords. Therefore, it is required to consider the risk-taking strategy in the VSC-HVDC system that can be upgraded. Given the operational efficiency and adaptability of the renewable energy clusters in the VSC-HVDC network under dissimilar conditions, high and low technical requirements are proposed for power supply. Renewable concerning the island. An analysis of the key technologies in renewable energy production to deal with AC faults at the end of the network transmission in the island-connected mains. It is hoped that the combined renewable energy or VSC-HVDC power lines will be realized, thereby improving the availability of the arrangement, contributing to the safe operation of renewable energy and VSC- HVDC, and provides technical support for the fabrication of great power cords. Multiple renewable power transmission techniques lead to efficient design and design of renewable energy and VSC-HVDC power cords [42].

3 Islanding Detection

Zheng Zhang et al. (2018) proposed safety and fault measures and isolation methods for open faults in the current remote supply system to realize efficient and effective operation. Assurance of underwater information networks. By exploring the protection zone, the protection of the large node power switch model is accomplished. Based on an electrical switch that can be controlled at the main node of the main line, an isolation system for fault is designed, and a new open method is proposed dedicating a place of fault. The research content is of particular importance in the design and construction of future underwater information networks [47].

AdilAyub Sheikh et al. (2019) developed a central protection system for DC Microgrid (DCMG). The novelty of the security algorithm is based not only on the combination of the various fault locations but also on the nature of the fault. The protection system is being developed to control the power and current at various locations in the DCMG. According to the fault detection standard, a safety measure is in place, and the reverse signal is sent to the appropriate circuit breaker (SSCB) to separate the faulty part. The simulation results show that the method is effective in identifying DCMG faults [48].

METHODOLOGY of PROPOSED SYSTEM

Wind, solar energy, or other renewable energies themselves have irregular fluctuations, and the load on the power system is not constant. The high penetration control system solves the problem of cause load fluctuations. Otherwise, the arrangement will not run stably. Fundamentally, wind or solar power modifies over time, but the nesting of wind and solar power in other areas is essentially stable. On many days solar and wind farms compensate each other. Although the load in the load side area is not stable, the total power in the world is stable. Global power grids can be connected for suppression. Equipment used to mitigate variability in this work.

This proposal introduces the dynamic voltage restorer (DVR) configuration or control strategy of the dynamic voltage restorer (DVR). To recompense voltage on each individually, we propose a closed-loop PI manage law from a dq reference frame. The proposed method provides a fast response or efficient deflection compensation. It also uses SVM (Space Vector Modulation) to estimate the three-phase voltage to detect the drop. With SVM, voltage drops can be detected faster than other traditional methods. Then, the voltage drop of DVR can be adjusted quickly and accurately. The attain results simulated in Matlab/Simulink show that the proposed technique can effectively reduce the allotment network's balanced and unbalanced power drop types.

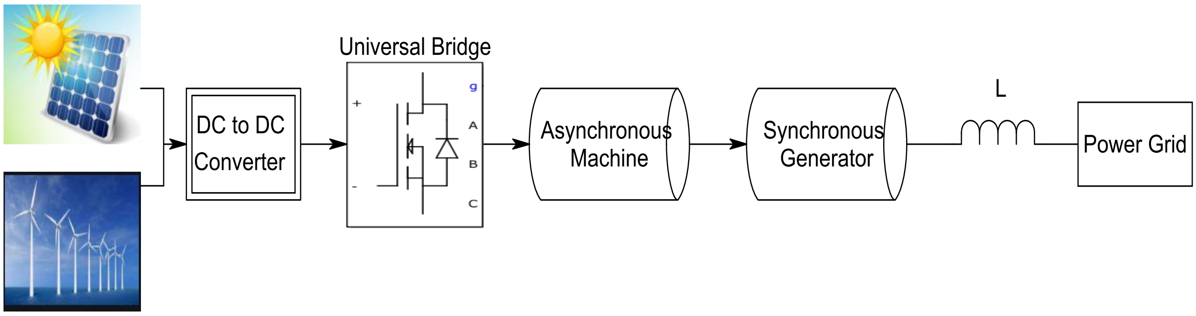

Figure 2: Proposed method block diagram

MGP system

Figure 3 shows the configuration of an MGP system that connects renewable energy or the grid to asynchronous and generator pairs. This method can provide inertia to have asynchronous machines that can connect renewable energy to the power grid. Given that the grid capacity of renewables typically reaches the MW scale, both generator and motor are designed using an asynchronous system.DVR fact device used to mitigate fluctuations. The results attained are imitations in Matlab/Simulink. This shows that the planned technique can efficiently reduce voltage fluctuations or imbalances in the allotment complex.

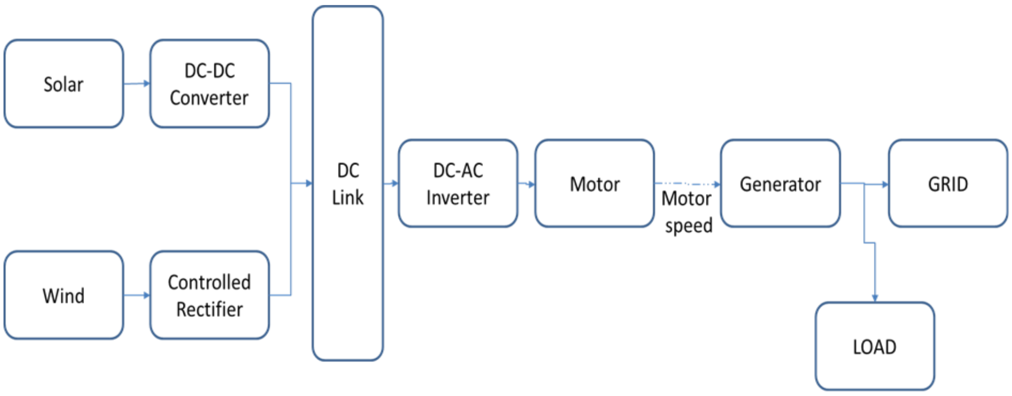

Figure 3: Proposed Block Diagram

Results

This work proposes a synchronization machine based on the MGP system, provides a future power grid solution with high penetration of renewable energy, and improves reliability. First, we describe the inertia and damping levels and effectiveness of MGPs. In a grid failure, the MGP system can engrave the failure on the generator side and protect the regenerative unit from cutting.

1) MGP is feasible in principle due to its solid physics base to operate in a steady-state with load and gridconnection. MGP can make a significant contribution to the stability of the grid.

2) Its inertia and damping level, which exists, is about 65% of the thermal power unit under the same capacity. It can effectively provide inertia for frequency response and improve small-signal stability.

3) MGP has an acceptable cost and high efficiency.

4) MGP has some other distinct merits. A power grid dominated by synchronous machines makes it reliable and capable of supporting higher short circuit current and voltage control. MGP is a possible technical solution for the stability of renewable energy power systems with high penetration levels.

5) Further studies will focus on, for example, stable operation and feedback control strategies of MGP to deal with random renewable energy, quantitative cost estimation compared with other solutions, capacity optimization for renewable energy using MGP to achieve grid-connection, excitation system, and reactive power control for both sides, coordination control of MGPs, and models and analysis of small-signal and transient stability for the large grid and a range of different cases.

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