POWER QUALITY IMPROVEMENT OF AC/DC COUPLED HYBRID MICROGRID BY USING MULTILEVEL INVETER

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ABSTRACT : ***A hybrid power system functioning as an autonomous entity can provide almost the same quality and services as the national grid. But most of them suffering with Instability and power distortion and also having harmonics, its badly affect the systems thus in this project proposed Multilevel sinusoidal Pulse with modulation technique to control the stability problems. (PWM) inverters are among the most used power electronic circuits in practical applications. It is modified by the five level inverter These inverters are capable of producing ac voltages of variable magnitude as well as variable frequency. The quality of output voltage can also be greatly enhanced, by using this technique the stability problems can be solved and the distortion in the electric power can be solved.***

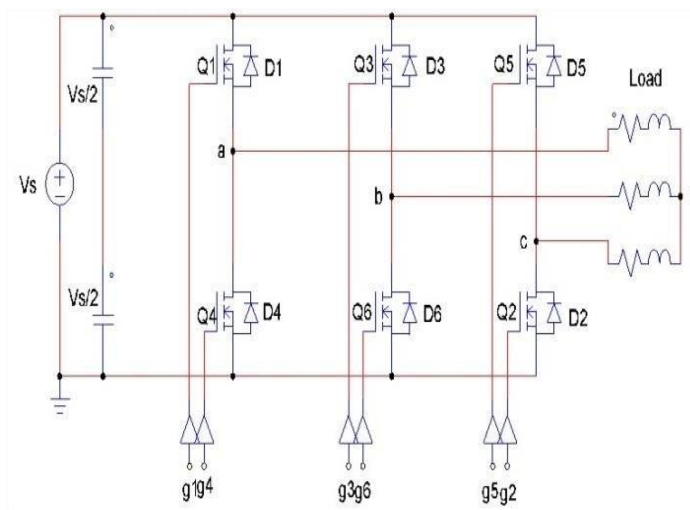
I. INTRODUCTION

A hybrid micro -grid having one or more different paths of technologies for energy generation. The combination of generation techniques and systems selected for a hybrid micro grid will have a real influence on the life time of the system and its affordability to consumers. Thus, the micro-grid is developed by a Mix of renewable energy sources (RES) and a basic unit, most commonly supplied with diesel, used as a back-up. It is developed and cost-effective technology solution that provides high quality and reliable electricity for lighting, communications, water supply, or motive power, among other services. A hybrid micro grid power system functioning as an autonomous entity can provide almost the same quality and services as the national grid. Using the proper technology, it is ideally possible to connect a micro-grid to the national grid. In the world where the national grid may provide users with only a few hours of electricity a day and often suffers from blackouts, rural communities served by a hybrid micro-grid conceivably could receive with more reliable service than their fellow urban consumers.

The hybrid ac-dc coupled distributed load based hybrid micro grid have combination of different technologies with different energy sources provides competitive advantages compared with using a single technology. The combination of renewable energy sources with a base units has proven to be the least-cost solution for rural communities as the benefits and advantages of each technology complement each other. Since renewable operate “fuel free,” they are not subject to fuel price or supply volatility. However, renewable systems are non-dispatch able, which means that they depend on the availability of the resource at a specified time. Diesel gen sets, in contrast, are dispatch able, and can deliver electricity when scheduled. By combining these two sources, a variety of shifting load profiles can be covered. Furthermore, the combination of various renewable sources simply makes sense in many scenarios. For example, a mix of energy sources can accommodate seasonal resource fluctuations, with solar PV collectors complementing wind power during the months with less wind, or picking up when hydro generation drops during the dry season. Where daily energy variations are concerned, solar energy has a production peak around noon, while wind power facilities can operate whenever the wind is blowing. Batteries add stability to the system by storing the energy for peak consumption when there is insufficient production from renewable sources

II. PWM TECHNIQUES

The schematic VSI PWM waveform shown in is only representative in nature. The logic described to select notch angles is also specific to one particular SPWM technique that is known as selective harmonic elimination technique, thus the set of notch angles for one frequency may be different from the notch angles at some other frequency. For satisfactory implementation of this technique, generally the desired output frequency range is divided in few discrete frequencies. For example, it may be desired to output a 3-phase balanced voltage in the frequency range of 5 Hz to 50 Hz with the constraint that the ratio between output voltage magnitude and output frequency should remain fixed to some predetermined value.

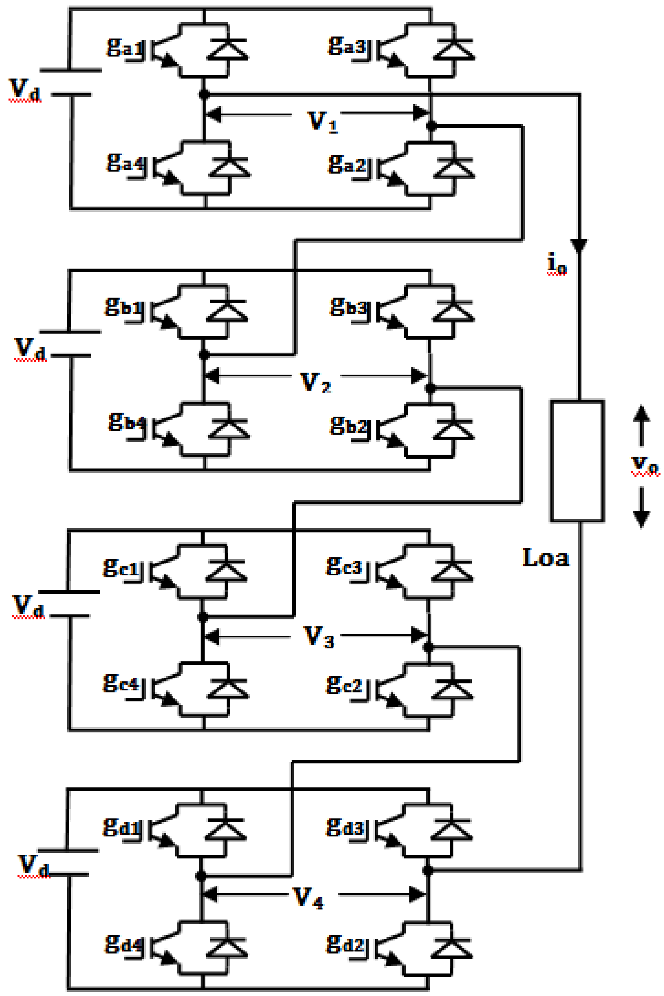


VSIs can be used as active power filters to provide this compensation. Based on measured line currents and voltages, a control system determines reference current signals for each phase. This is fed back through an outer loop and subtracted from actual current signals to create current signals for an inner loop to the inverter. These signals then cause the inverter to generate output currents that compensate for the harmonic content. This configuration requires no real power consumption, as it is fully fed by the line; the DC link is simply a capacitor that is kept at a constant voltage by the control system. In this configuration, output currents are in phase with line voltages to produce a unity power factor. Conversely, VAR compensation is possible in a similar configuration where output currents lead line voltages to improve the overall power factor. Electric power can be generated through photovoltaic cell by using power electronic devices. The produced power is usually then transformed by solar inverters. Inverters are divided into three different types: central, module-integrated and string. Central converters can be connected either in parallel or in series on the DC side of the system. For photovoltaic "farms", a single central converter is used for the entire system. Module-integrated converters are connected in series on either the DC or AC side. Normally several modules are used within a photovoltaic system, since the system requires these converters on both DC and AC terminals. A string converter is used in a system that utilizes photovoltaic cells that are facing different directions. It is used to convert the power generated to each string, or line, in which the photovoltaic cells are interacting.

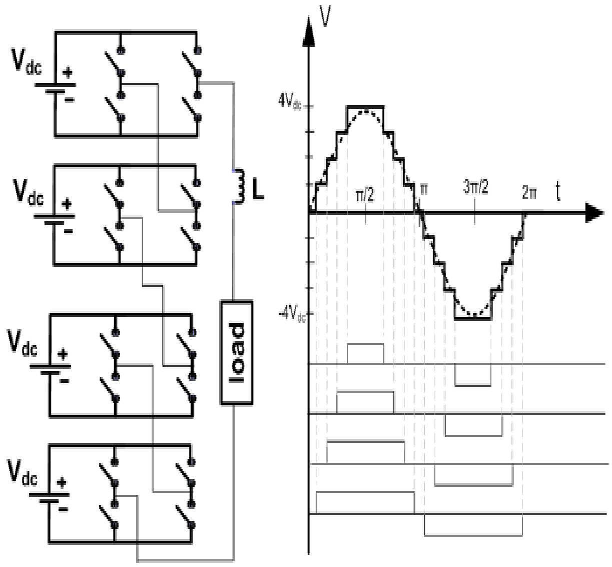
Power electronics can be used to help utilities adapt to the rapid increase in distributed residential/commercial solar power generation. Germany and parts of Hawaii, California and New Jersey require costly studies to be conducted before approving new solar installations. Relatively small-scale ground- or pole-mounted devices create the potential for a distributed control infrastructure to monitor and manage the flow of power. Traditional electromechanical systems, such as capacitor banks or voltage regulators at substations can take minutes to adjust voltage and can be distant from the solar installations where the problems originate. If voltage on a neighborhood circuit goes too high, it can endanger utility crews and cause damage to both utility and customer equipment. Further, a grid fault causes photovoltaic generators to shut down immediately, spiking demand for grid power. Smart grid-based regulators are more controllable than far more numerous consumer device

III. 9-LEVEL CASCADED H-BRIDGE MULTILEVEL INVERTER

The invention of the 9-level cascaded H- bridge multilevel inverter is the one of the major invention in the field of power conversion , the previously used technologies also powerful systems , but they have some limitations and disabilities , so the further research in the field of pure power conversion is going on thus , here explaining the application and the merits of the 9-level cascaded H- bridge multilevel inverters,, the previously used systems are having some power loses and the quality issues due to the presence of the harmonics , thus by using this inverter here we can reduces the level of the power conversion and thus the quality of the power gets increased. in this paper cascaded H-bridge multilevel inverter (CHBMLI) has been investigated for the application of renewable energy generation. Energy sources like solar, wind, hydro, biomass or combination of these can be manipulated to obtain alternative sources for renewable energy generation. These renewable energy sources have different electrical characteristics like DC or AC level so it is challenging to use generated power by connecting to grid or load directly. The renewable energy source require specific power electronics converter as an interface for conditioning generated power .The multilevel inverter can be utilized for renewable energy sources in two different modes, the power generation mode (stand-alone mode), and compensator mode (statcom). The performance of the multilevel inverter has been compared with two level inverter. In power generation mode CHBMLI supplies the active and reactive power required by the different loads. For operation in compensator mode the indirect current control based on synchronous reference frame theory (SRFT) ensures the grid operating in unity power factor and compensate harmonics and reactive power. In this paper, a small signal model for a PV-DE micro grid with a dynamic load has been developed. The eigen value analysis of the system has been carried out to show the change in stability with the increased penetration of the PV source. Under such circumstances, while analyzing large systems, it cannot be assumed that the small micro grids will not have an effect on the stability of the overall system. An unstable micro grid can cause a cascading effect on the entire system thereby driving the en-tire system to instability. In addition, a comparison between the stability of the system both with and without an induction motor load has been shown to illustrate the effect of the induction motor on the system stability. An auxiliary control signal has been proposed to stabilize the system. The effect of this auxiliary signal has been validated from both the eigen values and a full blown nonlinear time-do-main simulation of the system. With the addition of the auxiliary signal, the PV array contributes some amount of damping torque to the system. The magnitude and sign of this torque is proportional to the value assumed for the variable k_1 in (17). Evaluation of this torque and its sensitivity to the value k is an area of future research.



Multilevel inverters have been widely used in many applications since the technology is advantageous to increase the converter capability as well as to improve the output voltage quality. According to the applied switching frequency, multilevel modulations can be subdivided into three classes, i.e: fundamental switching frequency, high switching frequency and mixed switching frequency. This paper investigates the performance of cascaded H-bridge (CHB) multilevel inverter that is modulated using mixed switching frequency (MSF) PWM with various dc-link voltage ratios. The simulation results show the nearly sinusoidal load output voltages are successfully achieved. It is revealed that there is improvement in output voltages quality in terms of THD and low-order harmonics content. The CHB inverter that is modulated using MSF PWM with equal dc-link voltage ratio (Â½ Vdc: Â½ Vdc) produces output voltage with the lowest low-order harmonics (less than 1% of fundamental) while the CHB inverter that is modulated using MSF PWM with un-equal dc-link voltage ratio (2/3 Vdc: 1/3 Vdc) produces a 9-level output voltage with the lowest THD (16.31%) compared to the other PWM methods. Improvement of the output voltage quality here is also in line with improvement of the number of available levels provided in the output voltage. Here only 2 cells H-bridge inverter (contain 8 switches) are needed to produce a 9-level output voltage, while in the conventional CHB inverter at least 3 cells of H-bridge inverter (contain 12 switches) are needed to produce a 7-level output voltage. Hence it is valuable in term of saving number of component.



IV. CONCLUSION

Mixing different technologies with different energy sources provides competitive advantages compared with using a single technology. The combination of renewable energy sources with a genset has proven to be the least-cost solution for rural communities as the benefits and advantages of each technology complement each other. The diesel power plant and another dc source like PV plant or wind power plant combined to get a ac-dc coupled system. Which had some stability issues like harmonics and the presence power distortion. By using the multicarriying PWM pulse width modulation technique) the switching frequency are gets small without changing the number of conversions. And also muticarriying PWM provides the high stable output power. Multilevel inverters have been widely used in many applications since the technology is advantageous to increase the converter capability as well as to improve the output voltage quality. According to the applied switching frequency, multilevel modulations can be subdivided into three classes, i.e: fundamental switching frequency, high switching frequency and mixed switching frequency. This paper investigates the performance of cascaded H-bridge (CHB) multilevel inverter that is modulated using mixed switching frequency (MSF) PWM with various dc-link voltage ratios. The simulation results show the nearly sinusoidal load output voltages are successfully achieved. It is revealed that there is improvement in output voltages quality in terms of THD and low-order harmonics content.

V. REFERANCE

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