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# Distributed Generation Systems- Literature Survey

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**ABSTRACT**

**The necessity for smart electrical systems having minimum technical loss and environmental impact is providing impetus to go for distributed generation(DG) which may offer several other advantages such as reduce transmission and distribution resources, increase reliability, better power quality. However, depending on the system configuration and management, these advantages may not be true. Due to structural and managerial changes in low/ medium voltage network has gained importance. This paper focuses on different distributed system and their methods proposed in the literature.**

***Keywords--*** Distributed generation, smart grid, power converter

## I. INTRODUCTION

Distributed generation has gained worldwide attention because of growing energy demands, reduction of fossil fuels. Distributed generation means electricity is generated at site close to consumer. The current model for electricity generation and distribution is dominated by centralized power plants. The power at these plants is typically combustion (coal, oil, and natural) or nuclear generated. Centralized power models, like this, require distribution from the center to outlying consumers. Current substations can be anywhere from 10s to 100s of miles away from the actual users of the power generated. This requires transmission across the distance. This system of centralized power plants has many disadvantages. In addition to the transmission distance issues, these systems contribute to greenhouse gas emission, the production of nuclear waste, inefficiencies and power loss over the lengthy transmission lines, environmental distribution where the power lines are constructed, and security related issues. By locating, the source near or at the end-user location the transmission line issues are rendered obsolete.

## II. LITERATURE SURVEY

**a.** ***An Efficient Wind–Photovoltaic Hybrid Generation System Using Doubly Excited Permanent-Magnet Brushless Machine:***

Chunhua Liu, K. T. Chau, Xiaodong Zhang, [1], in their hybrid generation system a new stand-alone wind–PV hybrid generation system is proposed for application to remote and isolated areas. For the wind power generation branch, a new doubly excited permanent-magnet brushless machine is used to capture the maximum wind power by using online flux control. For the PV power generation branch, a single-ended primary inductance converter is adopted to harness the maximum solar power by tuning the duty cycle.

***b. Inverter with Reduced Switching Device Count for Independent AC Motor Control:***

Tsutomu Kominami, Yasutaka Fujimoto[2], proposes a novel inverter named nineswitchinverter. The inverter has nine switching devices and can control two loads. First, the configuration of the inverter is introduced. Then, a PWM method for the inverter is elaborated. In addition, this paper proposes a 3N+3-switch inverter, which is an extension of the nine-switch inverter. This inverter has 3N+3 switches and can control N loads independently.

**c.** ***A Hybrid Energy Storage System Based on Compressed Air and Super capacitors With Maximum Efficiency Point Tracking (MEPT):***

Sylvain Lemofouet and Alfred Rufer,[3], presents a hybrid energy storage system with high life cycle, which is mainly based on compressed air, where the storage and discharge are done within maximum efficiency conditions. As the maximum efficiency conditions impose the level of converted power, an intermittent time-modulated operation mode is applied to the thermodynamic converter to obtain a variable converted mean power. A smoothly variable output power is achieved with the help of a super capacitive auxiliary storage device used as a filter. This paper describes the concept of the system, the power–electronic interface circuits, and especially the maximum efficiency point tracking (MEPT) algorithm and the strategy used to vary the output power. In addition, this paper presents the characteristics of high-efficiency storage systems where the pneumatic machine is

replaced by an oil-hydraulic and pneumatic converter, which is used under isothermal conditions.

**d. *Bi-Directional AC-DC/DC-AC Converter for Power Sharing of Hybrid AC/DC Systems***

A. Mohamed, M. Elshaer, and O. Mohammed, The described system is dependent mainly on sustainable energy sources. Certain features had to be maintained in the system in order to assure efficient integration of different sources such as, efficient and reliable load-feeding capability and full controllability of voltage and power flow among various buses in the system. Two different converters have been investigated; firstly, a fully controlled rectifier has been designed to tie the DC grid with the AC one. A vector decoupling controlled sinusoidal pulse width modulation (SPWM) technique has been used to allow the designed rectifier to maintain a constant output voltage while being able to control the active and reactive power drawn from the grid independently. Hence, this controlled rectifier acts as a voltage regulator for the DC microgrid and has a uni-directional power flow capability from the AC grid to the DC microgrid. Moreover, in order to allow bi-directional power flow, a bi-directional ACDC/ DC-AC converter has also been designed. The Bi-directional AC-DC/DC-AC converter controls the active power transferred from the DC grid to the AC grid while operating at unity power factor.

**e. *A Reduced-Switch-Count Five-Level Inverter With Common-Mode Voltage Elimination for an Open-End Winding Induction Motor Drive***

Gopal Mondal, K. Gopa kumar, P. N. Tekwani, and Emil Levi, presents a five-level inverter scheme withreduced power circuit complexity for an induction motor drive.The scheme is realized by cascading conventional two-level andthree-level neutral point clamped inverters in conjunction with anopen-end winding three-phase induction motor drive. An invertercontrol scheme with common-mode voltage (CMV) elimination,along with a simple dc link voltage control, is developed by usingonly switching states with zero CMV for the entire modulationrange.

**f. *Nine Switch Bidirectional Converter for Hybrid AC/DC Microgrid System***

R. D. Thombare, N. B. Deshmukh, D. S. More presentsa nine switch bidirectional powerconverter is proposed for Hybrid AC/DC microgrid system with battery energy storage. By using distributed generation (DG) and energy storage system, it overcomes the existing power system capacity limitations and simultaneously handles local AC/DC load along with grid. The proposed bidirectional power converter reduces the switch count and controls power flow with higher reliability. To control the bidirectional power flow, carrier based sinusoidal pulse width modulation (SPWM) is used with only one PI controller. A novel buck –boost circuit for battery charging and discharging is developed. The proposed converter is integrated with impedance source network to obtain their unique advantages such as shoot through stability, buck-boost operation from DC link and reduced inrush current during starting.

**g. *Reduced Switch-Count Six-Phase AC MotorDrive Systems Without Input Reactor***

Cursino Brandão Jacobina, Isaac Soares de Freitas, Clayton Ricarte da Silva, MaurícioBeltrão de Rossiter Corrêa, and Edison Roberto Cabral da Silva, presents two reduced switch-count six-phase acmotor drives . The first configuration considered has six legs (configuration 6L), and the second one has five legs (configuration 5L) and uses the capacitor dc-link midpoint connection. Both configurations operate without input reactors and provide both bidirectional power flow and power-factor control. Both 60◦and 30◦six-phase induction-machine windings are employed. Operating principles and control strategies for the topologies are presented. The proposed configurations are compared with the full-bridge (nine legs) and the half-bridge (six legs) topologies, which use the capacitor dc-link midpoint connection. These drive systems are suitable for applications where the size of the system is a critical factor.

## III. CONCLUSION

Different distributed generation systems are discussed in this paper. Properly installed distributed system is beneficial to consumers and environment. Distributed Generation has the potential to play an important role in fulfilling the future energy demand but still there are some technical barriers as well as economical and operation that are limiting the introduction and use of DG.

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