

# Power Quality Expansion for Grid Connected Wind Power System using Permanent Magnet Synchronous Generator and Trans-Z Source Inverter

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*Abstract:* - This paper presents the expansion of power quality for variable speed Wind Power System (WPS) using Permanent Magnet Synchronous Generator (PMSG) and Trans Z-Source Inverter. The PMSG is having compact collection and dimensions, compare to Induction Generator. Induction Generator needs the grid power, then only start the power production. But without take up the grid power PMSG should produce the power. The impedance-source (Z-source) inverters idea to the Transformer-based Z-Source Inverter (Trans-ZSI) is implemented. The unique Z-Source Inverter (ZSI) employs an impedance network of two inductors and two capacitors coupled in an exceptional preparation to accessing the dc source. In the proposed Fuzzy Logic Controller (FLC) based trans-Z-Source Inverters, the entire impedance networks structure consists of a two transformers and capacitor. While maintaining the major quality of the earlier accessible Z-source network, the new networks demonstrate some unique compensation, such as the enlarged voltage gain, compact voltage stress, privileged inversion capability and very less harmonics content.

*Key-words:*-Wind Power System (WPS), Permanent Magnet Synchronous Generator (PMSG), Transformer-based Z-Source Inverter (Trans-ZSI) and Fuzzy Logic Controller (FLC).

## 1 Introduction

In present year's renewable energy source playing major role in our country (India) and world, mainly WPS moreover making a clean environmental i.e. Eco friendly. Now days global warming is a major focussed area, whenever WPS is used avoided the entire global warming processes. Compare to other generation methods, WPS is having huge advantages such as avoid the CO<sub>2</sub> gases, Air Pollution, Water Pollution and Land Pollution etc.

In progress years, a group of occupation has been done in Expansion of power quality using variable generators and power electronic strategy. Unfortunately, most of these systems are not catching power at every wind speed particularly small wind speeds which are short in power but this is can be very common. But clean permanent magnet synchronous generator technology gives high effectiveness power conversion that is mechanical energy into electrical power.

In addition, it allows for exceptional machine plan with very short speed e.g. in gearless wind and

hydro occupation and at very high speed for micro-gas turbines, which is of interest for some regenerative or co-generative power translation technologies. An investigation already realized prototypes or in use PM generator systems is presented for that purpose. Compare to other generators that are used in wind turbines the PMSG's have the uppermost compensation because they are steady and protected during normal operation. But do not need an additional AC supply for the excitation circuit (winding). Initially used only for small and medium powers the PMSG's are now used also for higher powers.

In the conventional voltage-source inverter (VSI) and current source inverter (CSI) are used to convert DC to AC and act as a [1], [2] boost or a buck converter. However the DC side cannot be boosted in the predictable inverters. That is, their accessible output voltage range is limited to either greater or smaller than the input voltage. Compare to conventional VSI and CSI [3], [4] in standard Z-Source Inverter (ZSI) voltages boost up level high, because Shoot through state is implemented. The











