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A review of the "Essentials for Grid Integration of Hybrid Renewable Energy Systems"

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Abstract

If a significant portion of the power is generated by renewable sources, power electronic equipment plays a significant role in power quality problems of integrated systems. This essay examines the prerequisites for a seamless integration of HRES into the grid. When HRES are connected to the grid, it primarily focuses on the examination of DC/DC converters, inverters, control methods, and power quality issues. Each methodology or procedure is thoroughly explained along with its benefits, drawbacks, and potential applications.

BRIEF REVIEW OF HRES

Francois Giraud, Zyiad M. Salameh has investigated the integration of Wind-PV power system and the system performance with energy storing and concluded that wind is best potential source than solar and provides energy during the absence of solar energy[1].

Photovoltaic Technology:

Solar Energy is available abundant in nature all over the world and playing an important role in the conversion of energy which is in the form of irradiance into electrical energy which is free from pollution using promising technology called Photo Voltaic [2]. This technology is especially more useful in rural areas where there is no possibility of generation, transmission and distribution of energy which makes use of conventional sources [3]. The structure of direct coupled PV system is shown in Fig.1 [4].

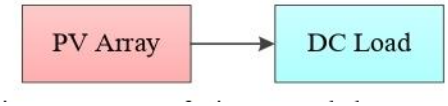

Fig. Structure of Direct Coupled PV System

Standalone Photovoltaic system:

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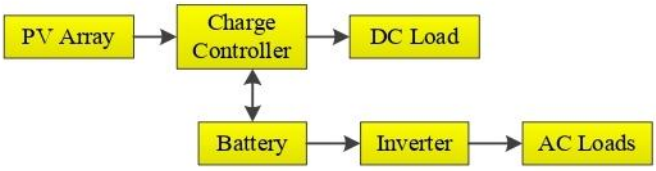
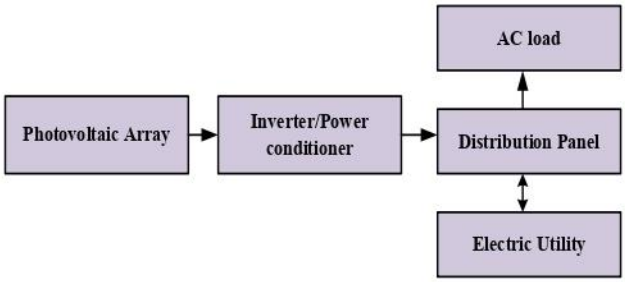


Structure of Standalone PV System

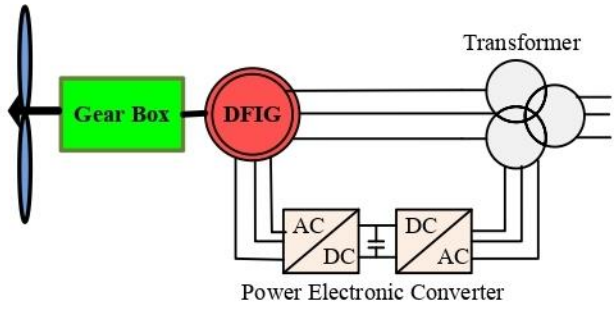
Grid Connected PV system:



Architecture of Grid Connected PV system

Wind Turbine Technology

Doubly Fed Induction Generator:



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Block Diagram of DFIG

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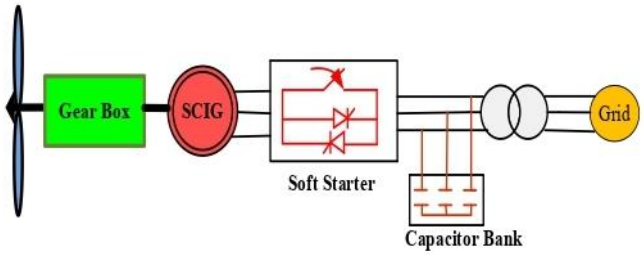
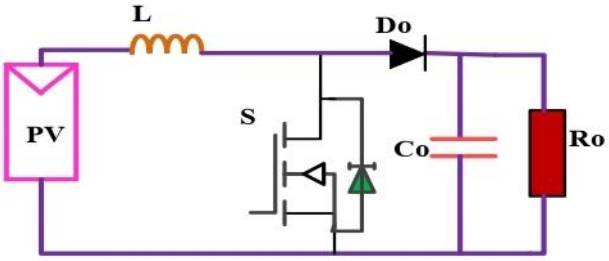


Block diagram of SCIG

DC/DC CONVERTERS

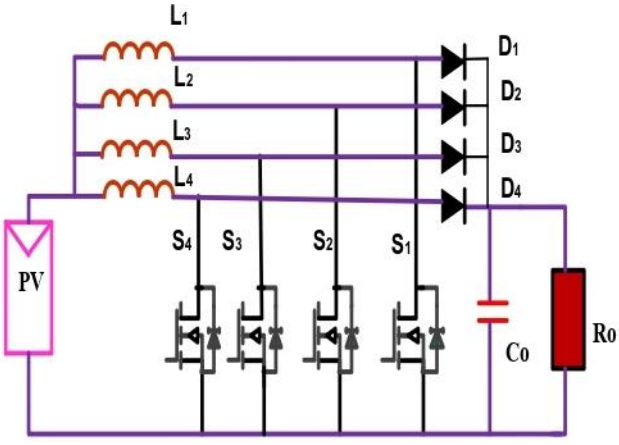
Renewable power generation systems are more attracted by the government and industries because of their advantageslike pollution-free and availability with free of cost [5].

Conventional boost converter



Single switch boost converter

Interleaved step-up converter



Soft switching high step up DC/DC Converter

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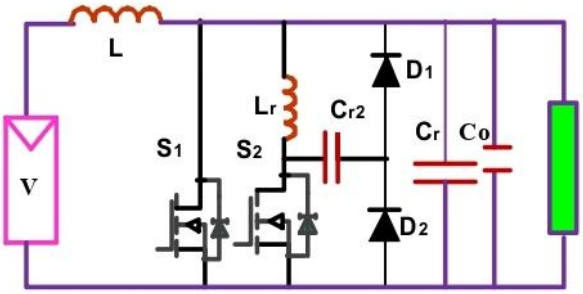
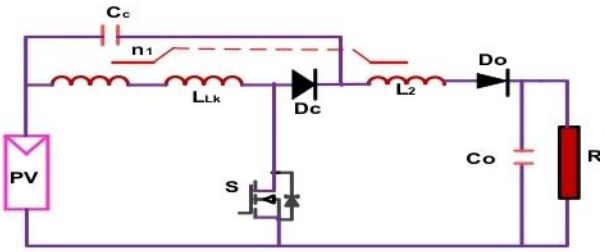
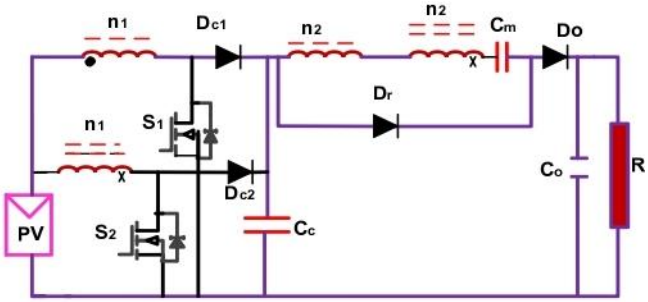


Coupled inductor based boost converter

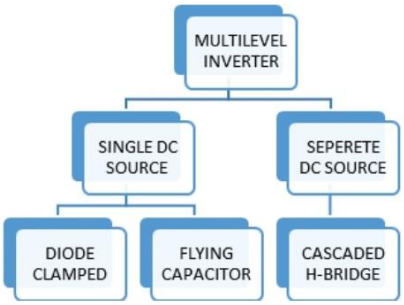


Non isolated converter with inbuilt transformer

Half bridge resonant converter



INVERTERS



The two-level inverters produce more harmonic currents at the output which produces more losses. To overcome this problem multilevel inverters are developed.

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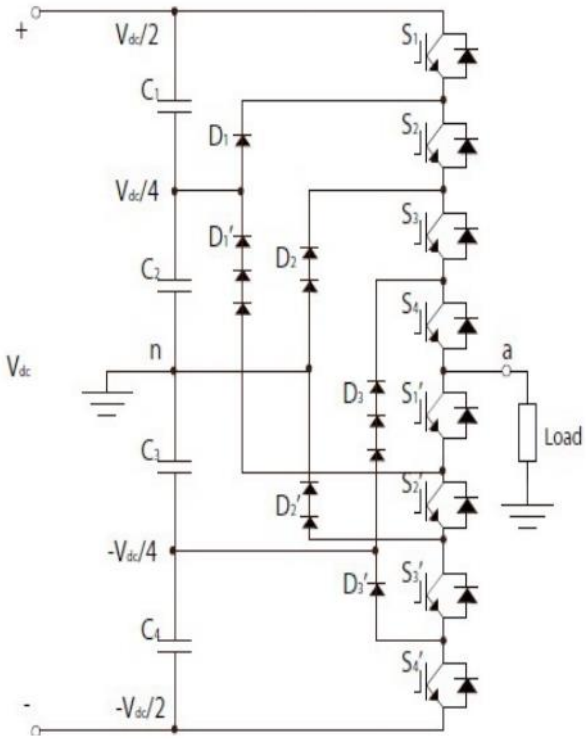
Diode clamped multilevel inverter



CONTROL METHODS

The general structure of DG integrated grid with the controller

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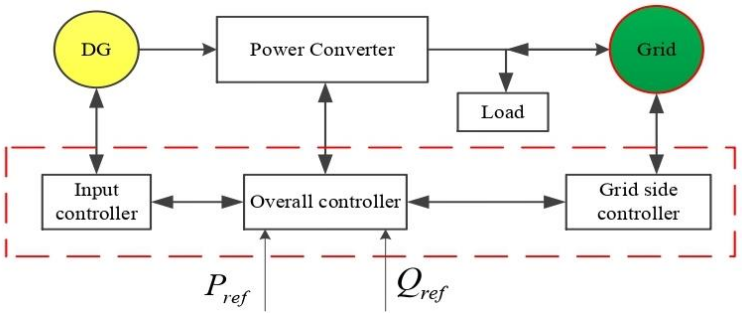
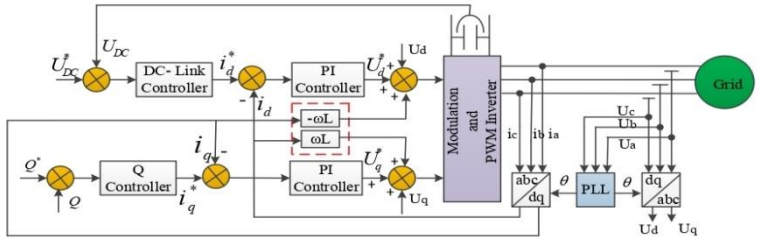
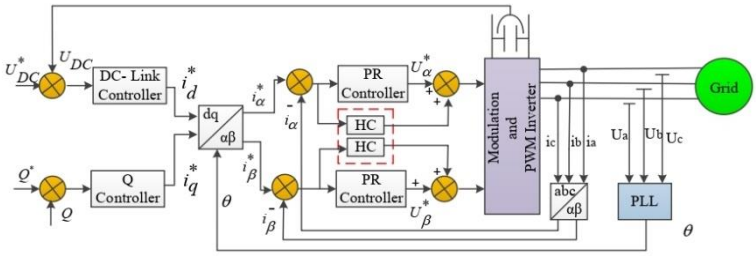


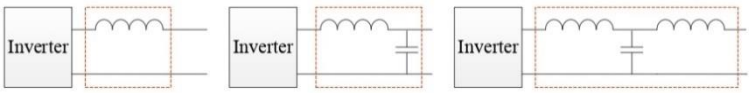
Synchronous rotating reference frame controller



Stationary reference frame controller



Various types of filters



CONCLUSION

various advanced DC converters, inverters, and controllers for hybrid grid integration using renewable energy sources and their applications. They were explained briefly and examined with the most important features.

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