Grid tied inverter meaning

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Solar systems are also backed by inverters for converting the direct current generated by solar panels to alternating current. Solar systems need a solar inverter to work efficiently in connection with or without the grid. Today we will learn about the grid tie inverter, its price, and ways to connect it to mains. But before that we will begin with the grid tie inverter working principle.

It is an electronic component used to harness solar energy by solar panel systems. A GTI or grid-tied inverter is connected to solar panels for converting direct current (DC) generated by solar panels into alternating current (AC). A grid system works without batteries and grid-tied inverters can be used for solar panels, wind turbines, and hydroelectric plants.

Grid-tied inverters can suitably convert current for power grid frequency from 60Hz-50 Hz commonly used for local electrical generators. A GTI takes a variable unregulated voltage from a solar panel array to invert it to AC synchronized with the mains. But when the grid is down a GTI should automatically stop the electric supply to power lines.

Before learning about the working principle of a grid tie inverter, you need to understand its circuit. Capacitors (C), diodes (D), inductors (L), transformers (T), and MOSFETs (Q), are the components of its circuit. The entire process is divided into three steps of conversion. A grid-tied inverter has to synchronize its frequency, amplitude, and wave with the utility and feed a sine wave current into the load.

At this point, direct current (DC) input is converted into 60 Hz alternating current (AC). Input voltage is initially raised by a boost converter formed with C2 (capacitor), Q1 (MOSFET), L1 (inductor), and D1 (diode). One of the inputs direct current buses should be grounded for a photovoltaic array of more than 50V. Theoretically, either of two buses can be connected to the Earth, usually the negative one.

Obtained alternating current is then converted to the required level by a low-frequency step-up transformer. This is a pulse-width modulated DC-to-DC converter stage, basically an H-bridge, with isolating converter. This stage comprises C3 (capacitor), Q2-Q5 (MOSFET), T1 (transformer), L2 (inductor), and D2-D5 (diode). A half-bridge or forward converter can also be used for power levels less than 1000 watts.

A DC linkto the output AC inverter is provided, and its value must be higher than the peak of utility AC voltage. For example, for 120VAC the VDC should be >120? ?^?2 = 168V, typically between 180V and 200 V, and for a 240VAC you would require 350-400 VDC. Another important step in grid tie inverter working principle.

Low-frequency (LF) transformers are also used in some commercial inverter models in the output stage instead of a high-frequency one in the DC-DC section. In this method, input is converted to 60 Hz AC and a

transformer changes it to required levels, providing isolation simultaneously.

However, with a step-up T1 (transformer) boost, the converted stage (1st stage) can be omitted. But this may lead to large leakage inductance leading to voltage spikes on rectifiers and FETs and other undesirable effects. This is mostly the case with transformer-less systems.

After learning about grid tie inverter working principle get to know about its components. Being easy to install and maintain grid-tied inverters requires minimum equipment and average maintenance. A few onsite components and wiring needed during the installation of GTI are as follows.

They are key electronic components used in solar inverters as they enable communication between low-voltage sensitive control circuits (microcontrollers) and high-voltage components (power transistors).

It is like a tracking system that monitors power exchange between the home and the main utility grid. It calculates and credits the owners of solar panel systems for the electricity supplied to the grid from their solar power system.

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