Grid tie inverter specifications

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A grid-tie inverter converts direct current (DC) into an alternating current (AC) suitable for injecting into an electrical power grid, at the same voltage and frequency of that power grid. Grid-tie inverters are used between local electrical power generators: solar panel, wind turbine, hydro-electric, and the grid. [1]

To inject electrical power efficiently and safely into the grid, grid-tie inverters must accurately match the voltage, frequency and phase of the grid sine wave AC waveform.

With net metering the electricity company pays for the net power injected into the grid, as recorded by a meter on the customer''s premises. For example, a customer may consume 400 kilowatt-hours over a month and may return 500 kilowatt-hours to the grid in the same month. In this case the electricity company would pay for the 100 kilowatt hours balance of power fed back into the grid. In the US, net metering policies vary by jurisdiction.

Feed-in tariff, based on a contract with a distribution company or other power authority, is where the customer is paid for electrical power injected into the grid.

In the United States, grid-interactive power systems are specified in the National Electric Code (NEC), which also mandates requirements for grid-interactive inverters.

Grid-tie inverters are designed to disconnect quickly from the grid if the utility grid goes down. In the United States, there is an NEC requirement[2] that in the event of a blackout, the grid tie inverter shut down to prevent the electricity it generates from harming persons repairing the power grid.

Properly configured, a grid tie inverter enables a building to use an alternative power generation system such as solar or wind power without extensive rewiring and without batteries. If the system produces insufficient power, the utility grid makes up the deficit.

Grid-tie inverters include conventional low-frequency types with transformer coupling, newer high-frequency types, also with transformer coupling, and transformerless types.[3] Instead of converting direct current directly into AC suitable for the grid, high-frequency transformers types use a computer process to convert the power to a high-frequency and then back to DC and then to the final AC output voltage suitable for the grid.[4]

Transformerless inverters, which are popular in Europe, are lighter, smaller, and more efficient than inverters with transformers. But transformerless inverters have been slow to enter the US market because of concerns that transformerless inverters, which do not have galvanic isolation between the DC side and grid, could inject dangerous DC voltages and currents into the grid under fault conditions.[5]

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However, since 2005, the NFPA"s NEC allows transformerless, or non-galvanically isolated, inverters by removing the requirement that all solar electric systems be negative grounded and specifying new safety requirements. Amendments to VDE 0126-1-1 and IEC 6210 define the design and procedures needed for such systems: primarily, ground current measurement and DC to grid isolation tests.