TECHNICAL ARTICLE

Sizing Solar Duty Transformers

There are two main effects to consider when sizing transformers fed from inverters powered by PV arrays.

1. Type of current/voltage waveform the PV inverter will deliver to the transformer
2. Environmental considerations, usually ambient temperature

Modern PV inverters normally put out a sinusoidal voltage and current waveform that is close to an ideal sine wave. Therefore, grid-tie transformers typically don't have to be oversized if they are powered by solar inverters and general purpose transformers are often specified.

Non-linear loads may induce current and voltage "Total Harmonic Distortion" (THD) which could affect the transformer and increase heating. Generally, a K=4 transformer is sufficient to handle typical distortion caused by non-linear loads if it is a concern. Rapid changes in load should have little to no effect on the performance of dry-type transformers.

Environmental conditions, such as ambient temperature, also should be considered. Most grid-tie transformers will not see a maximum load. If it does occur, it will last for less than an hour following typical solar facility load curves. Standard dry-type transformers utilizing 220°C insulation and 150°C temperature rise are designed to supply their maximum load continuously provided that the ambient temperature doesn't exceed 40°C and averages 30°C in any 24 hour period.

In regions with high ambient temperatures, lower temperature rises for dry-type transformers should be considered

- 130°C temperature rise increases the maximum ambient to 60°C and the average ambient to 50°C over a 24-hour period
- 115°C temperature rise would be able to handle even higher ambient temperatures, if needed. Generally, it is more cost effective to specify transformers with lower temperature rises than to manually oversize the kVA of the transformer.

HPS offers a line of easy to apply dry-type Solar Duty transformers with the HPS Sentinel Solar Duty low voltage distribution line. The Solar Duty transformers have nameplates specifically designed for solar applications including the clear indication of the primary and the ability to handle bi-directional flow of power.

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