

Application Note:
Three-Phase String Inverters' Parallel Solution

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This inverter application note addresses key points that should be taken into account for planning and implementation of decentralized large-scale PV plants. These recommendations are limited to inverter performance and inverter operation when multiple inverters are installed in parallel. This application note addresses inverter performance only and does not consider other system design and responsible project engineering factors, including the reliability of other system components.

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Solectria's 1000VDC three-phase string inverters (PVI 23TL, PVI 28TL and PVI 36TL) may be installed in parallel with the AC output at a single point of connection creating a low voltage building block. The low voltage blocks may then be connected directly to a 480VAC grid for the inverters without a step up transformer. The requirements for this set-up are:

1. The grid's voltage/frequency performance and variation range should follow U.S. grid standard/code.
2. System voltage drop between the inverter's output and grid connection point should not affect the grid voltage at the inverter. If the system voltage drop is too high, the inverter will disconnect from the grid due to excessive voltage. The AC side wiring voltage drop should be limited to minimize the power loss in the wires. **Therefore, Solectria recommends the voltage drop be < 2% of Vnom (nominal AC voltage) at maximum power production.** The temperature rise in cables and the ambient temperature should be considered in the voltage drop calculation.

If the connection to the grid uses a transformer, additional requirements to be considered are:

1. **Short-circuit impedance of each transformer is recommended to be no greater than 6%.**
2. **Each transformer is recommended to be at least 105% of total power rating of paralleled inverters before taking into consideration the additional safety margin for the reliability of transformer.** The oversizing recommendation of 105% of an inverter rating is the manufacturers' guide for systems with a high DC to AC power ratio. This recommendation is related to inverter performance and operation only and does not take other system parameters into account. It is the responsibility of the system designer to determine the reliability of the transformer and other system parameters.

Solectria's three-phase string inverters may be connected in parallel to one common point of connection in a single building block up to 70 inverters.

Example: 1MW building block with 28kW and 36kW inverters

A transformer with a **minimum** rating of 1.05MVA may be used with (27) PVI 36TL and (1) PVI 28TL inverters connected in parallel to a secondary window or to the low voltage side of this transformer. This transformer rating would need to be adjusted for safety margin according to the operating environment as stated in points 1 & 2 above.

System designs that follow the above recommendations may utilize many string inverters in parallel. Solectria recommends its customers contact a Solectria Application Engineer to review any projects with complex AC system design or with multiple inverters designed in parallel.