SolarEdge - Single string design guidelines - Application Note – North America

This application note establishes guidelines for implementing the single string design topology in North America. It applies to residential P-series and S-series Power Optimizers.

Revision history

- Version 1.0, February 2024 – Initial release.

Design Guidelines

NOTES:

- In case of a conflict between these guidelines and local regulations, local regulations shall prevail.
- When using a single string design on multi-facet roofs, yield losses greater than 2% can be recovered by installing higher output voltage Power Optimizers or multiple strings where possible.

When the inverter AC nameplate is lower or equal to the maximum usable power delivered per string for the connected inverter (as mentioned in the Power Optimizer's datasheet), all Power Optimizers can be connected in a single string if the following conditions are met:

- The connected string power does not exceed the total allowed inverter DC/AC oversizing ratio as mentioned in the inverter's datasheet.
- The maximum allowed number of Power Optimizers per string does not exceed 25 Power Optimizers for a single-phase inverter.

Systems that include batteries

Inverters rated less than 5700W

If a single string is connected and its power is above the inverter rating, the battery is charged from clipped PV power (clipped string PV power occurs at 5700W).

Inverters rated above 5700W

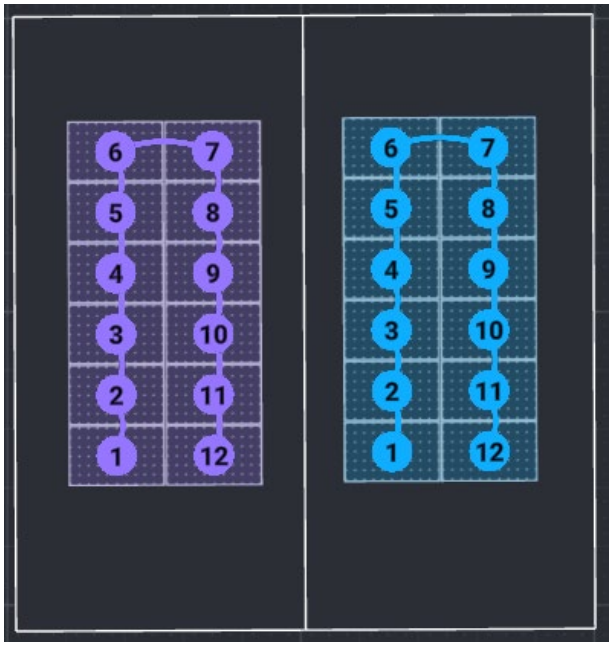
It is recommended to avoid string oversizing to reduce the potential for string-level clipping (clipped string PV power occurs at 5700W). For example, it is better to install two strings even if all the rules are met. This allows for maximizing battery charging and inverter production.

Example one – single-phase inverters – valid use

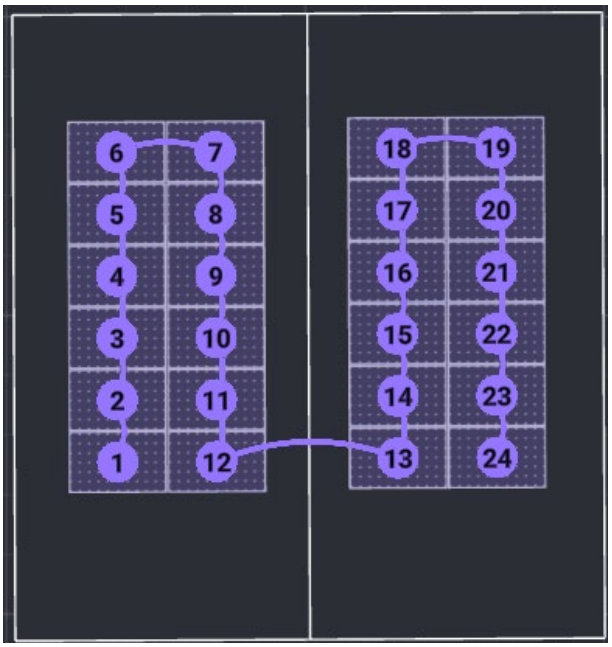
The AC nameplate for a single-phase SE5700H Home Hub inverter is 5.7kW$_{AC}$. This rating is equal to the maximum usable power delivered per string of 5.7kW (15A x 380V) for S440 Power Optimizers with a single-phase Home Hub inverter. Installing 24 x 400W modules connected to S440 Power Optimizers provides an installed DC capacity of 9.6kW (STC).

This is possible since 200% DC/AC oversizing (up to 11.52kW in this case) is allowed. In addition, 24 Power Optimizers is permissible according to the maximum number of Power Optimizers allowed per string with a single-phase inverter. The inverter nameplate limit ensures that the maximum usable power delivered per string is not exceeded.

Regular Design



Single String Design

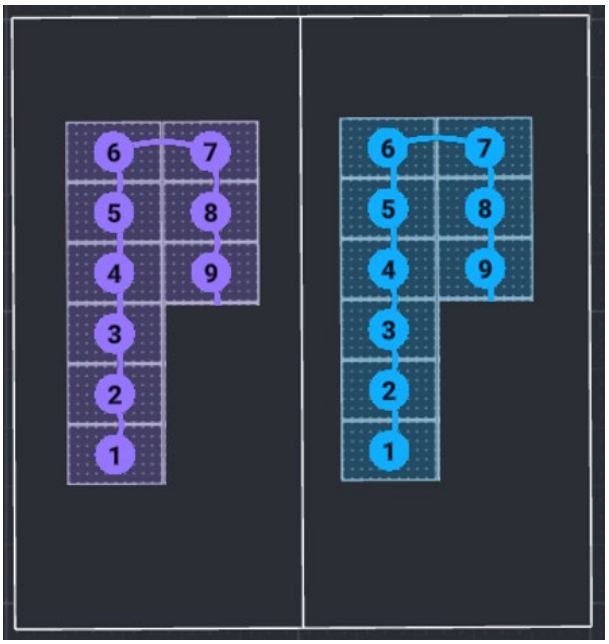


Example two – single-phase inverters – valid use

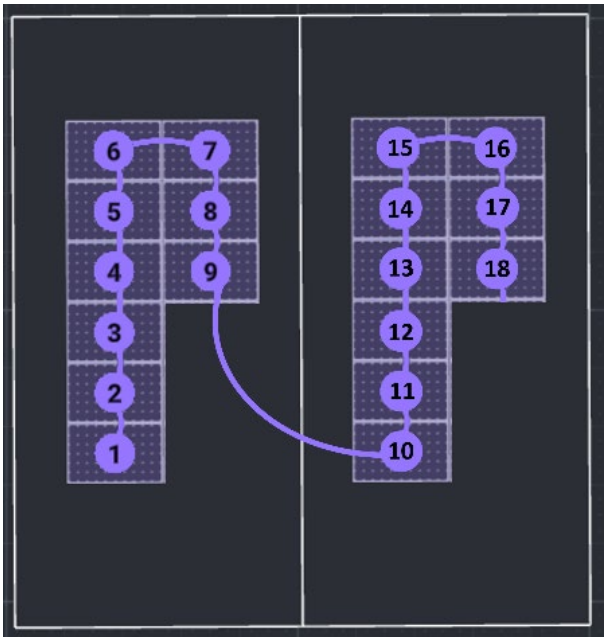
The AC nameplate for a single-phase SE5000H Home Wave inverter is 5kW$_{AC}$. This rating is lower than the maximum usable power delivered per string of 5.7kW (15A x 380V) for S440 Power Optimizers with a single-phase Home Wave inverter. Installing 18 x 400W modules connected to S440 Power Optimizers provides an installed DC capacity of 7.2kW (STC).

This is possible since 155% DC/AC oversizing (up to 7.75kW in this case) is allowed. In addition, 18 Power Optimizers is permissible according to the maximum number of Power Optimizers allowed per string with a single-phase inverter. The inverter nameplate limit ensures that the maximum usable power delivered per string is not exceeded.

Regular Design



Single String Design



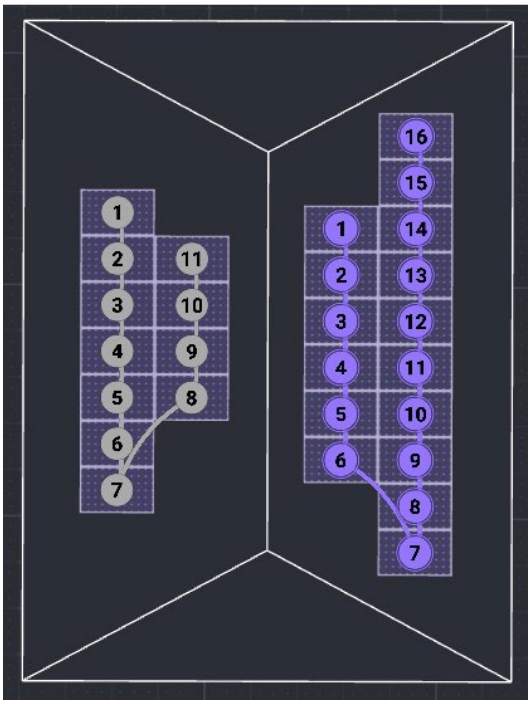
Example three – single-phase inverters – invalid use

In a system with a single-phase SE5700H Home Hub inverter installed, the inverter AC nameplate is 5.7kW$_{AC}$. This rating is equal to or lower than the maximum usable power delivered per string of 5.7kW (15A x 380V) for S440 Power Optimizers with a single-phase Home Hub inverter.

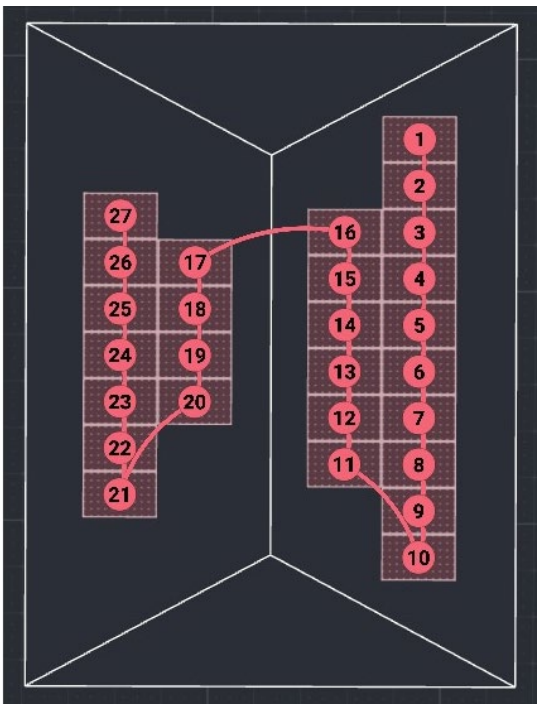
Installing 27 x 370W modules connected to S440 Power Optimizers provides an installed DC capacity of 9.99kW (STC). This is possible since 200% DC/AC oversizing (up to 11.52kW in this case) is allowed.

However, the number of Power Optimizers (27) exceeds the maximum number of Power Optimizers allowed per string (25) with a single-phase inverter and therefore the DC capacity of 9.99kW STC must be installed **in two strings.**

Regular Design - Valid



Single String Design - Invalid



Applicable inverters

These guidelines apply to the following SolarEdge inverters:

- Single-phase Home Wave inverters SE5700 and lower.
- Single-phase Home Hub inverters SE5700 and lower.