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Technical Product Notes

NV7600 PV Input limitations

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Review the limitations of the NV7600 max PV input and the options to oversize for specific applications.

DEFINITION

Roof Plane: A roof that has different roof orientations and pitch

*Note: The printed MPPT specs are physical maximums of the MPPTs, but do not indicate the max total PV input.

he PV string Voc must stay below 500 V when calculated for the coldest expected temperature.

The NV7600's allowable PV input is limited to 11,400 W per the system's software. This limit exists for two key reasons:

1. The power conversion components, namely the DC/DC stage on the battery side and the DC/AC inverter module, are only capable of handling up to 11,400 W of PV input power.
2. Operating beyond this level exceeds the inverter's thermal management capabilities. High input power leads to increased heat generation, which could surpass the system's current heat dissipation capacity and result in overheating.

The 7600 W AC output limit refers to the maximum power capability of the DC/AC inverter module. However, the total grid back feed could exceed 7600 W in certain scenarios such as when using AC-coupled string inverters, where additional AC power feeds directly into the grid outside the internal inverter's power path.

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The maximum PV input power is limited to 11,400 W while the DC/AC inverter module can output up to 7,600 W AC. The system prioritizes the 11,400 W DC power allocation as follows:

- Excess PV power beyond the inverter's 7,600 W AC output limit can be used to charge the battery if there's available capacity.
- Alternatively, up to 7,600 W of PV power may be allocated for charging the battery first, then any remaining input is converted to AC power by the inverter, as long as the thermal and operational limits are not exceeded.

The power flow is dynamically managed to optimize utilization while maintaining system safety and efficiency.

Best Practice MPPT String Connection:

When connecting two PV strings to a single MPPT input, keep these items in mind to maintain performance, safety, and reliability:

Electrical Compatibility

- **Same string voltage and current:** Both PV strings should have similar **open-circuit voltages (Voc)** and **short-circuit currents (Isc)** to ensure they track properly and to avoid imbalance or mismatch losses.
- **Same module type and orientation:** Mixing modules of different characteristics, orientations, or shading conditions on the same MPPT can cause the MPPT to operate inefficiently.

Total Power Within MPPT Limits

- The **combined power of both strings** must stay within the MPPT's allowable input range for **voltage, current, and power**. If the total exceeds these limits, it may trigger derating or even damage the inverter.

Conclusion:

Oversizing PV Input on the NV7600: Practical Design Strategy

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1. Understanding Inverter Limits:

- Max PV input (software limit): 11,400 W
- Max DC/AC output: 7,600 W
- MPPT inputs: 2 independent trackers

This means the inverter will accept up to 11.4 kW of total PV input but not necessarily deliver it all at once due to internal power and thermal constraints.

2. Why Oversize With Differently Oriented Strings:

If you install one PV string east-facing and the other west- or south-facing, their peak production times won't coincide, so:

- The system rarely, if ever, hits the 11.4 kW limit
- You maximize energy harvest throughout the day
- The inverter simply clips occasional surges above its capacity

For example, you might install two strings rated at 7.2 kW each, totaling 14.4 kW resulting in 126% oversizing. This often yields higher daily kWh with minimal performance loss.

3. Design Considerations for the NV7600:

- Distributed by MPPT: Assign the east- and west-facing strings to separate MPPT inputs for optimal energy tracking.
- Verify current limits: Ensure that the operating current of each string t does not exceed MPPT input limits, even if they won't peak simultaneously.
- Thermal and firmware protections: NV7600 firmware will limit input and output to prevent thermal stress, so oversizing within 125–130% is typically safe.

4. Real-World Use Case
Let's say:

- East-facing string: 7.2 kW (oversized morning gain)
- West-facing string: 6.6 kW (strong afternoon return)
- Combined: 13.8 kW DC on 11.4 kW max input

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You'd gain longer production windows, smoother midday loading, and improved total yield, even if brief midday clipping occurs.

Version	Revision Date	Brief Description of Change
V1.0	12/16/2025	Document numbering updated from TN-001 to TN-NV7600-001. Updated formatting.