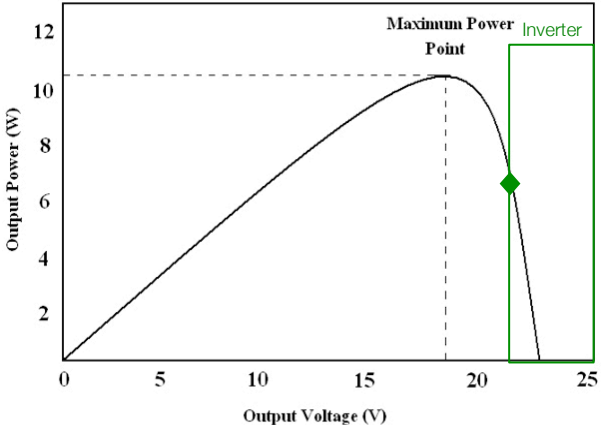
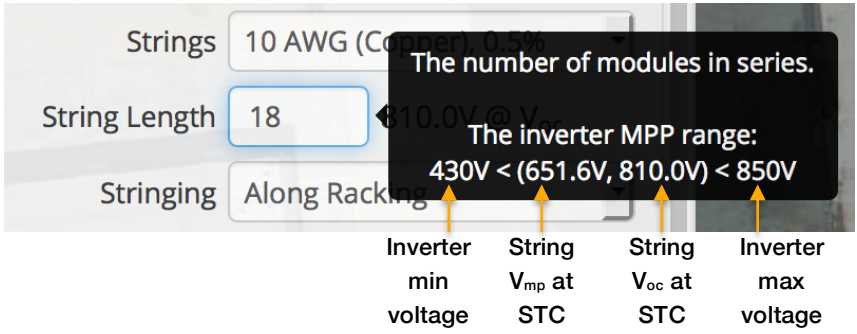
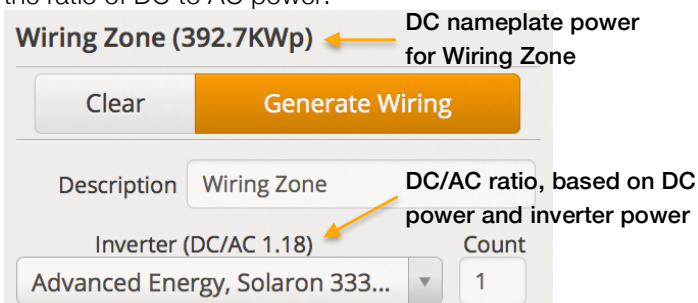
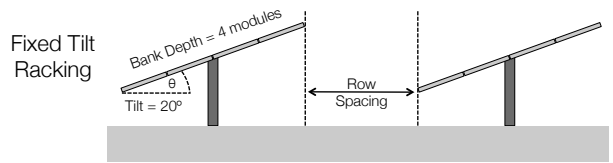
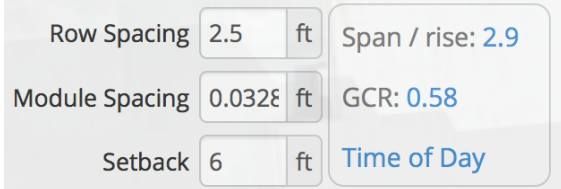


## Troubleshooting Low Energy Yield in HelioScope

HelioScope may not always generate the expected energy yield for an array: because the yield of HelioScope is based on simulating the actual system design, if the array design is off, that can reduce the production of the array. This guide shows the most common design problems, the way they show up in the yield calculations, and the steps to diagnose and troubleshoot.

Issue	Losses seen	Details	Solution
<p><b>Low String Voltage</b></p>	<p>Mismatch Loss</p>	<p>The string voltage needs to be within the inverter's operating voltage in order to produce power.</p>  <p><i>Figure: low-voltage situation where the modules' maximum power point is below the inverter's minimum voltage</i></p>	<p><b>Ensure that the string <math>V_{mp}</math> at STC is within the inverter's range, and ideally 10-15% larger than the inverter's minimum voltage.</b></p> <p>This is controlled by the "String Length" value in the electrical designer. When the cursor is in the cell, a pop-up will show a number of key voltage values:</p>  <p>While the string voltages are shown for STC values, the voltage will change with the array's temperature, and temperatures hotter than 25°C / 77°F will reduce the voltage. This is why the string <math>V_{mp}</math> (651.6V in the example above) should ideally be at least 10% larger than the inverter's minimum voltage (430V in the example above).</p>

Issue	Losses seen	Details	Solution
<p><b>High DC-to-AC Ratio</b></p>	<p>Mismatch Loss</p>	<p>The total module rated power (also known as “DC power”) and inverter rated power (also known as “AC power”) should be roughly similar, typically with the DC power 10% to 20% larger than the AC power.</p>	<p><b>Ensure the DC/AC ratio is in a normal range, typically 1.00 to 1.25.</b></p> <p>After the module quantity is determined in the Mechanical step of HelioScope, the electrical Design defines the inverter size and quantity (for example, two 30kW inverters would be a total AC power of 60kW). HelioScope then shows the ratio of DC to AC power.</p>  <p>Typical values for the DC-to-AC ratio are between 1.0 and 1.25.</p>
<p><b>Inadequate Module Spacing</b></p>	<p>Shading Loss Mismatch Loss</p>	<p>When modules in HelioScope are oriented as fixed-tilt, the Row Spacing value is the front-to-back distance between rows.</p>  <p>If row spacing is set to 0 for a fixed-tilt design, the modules will shade each other for much of the year.</p>	<p><b>If the modules are flush-mounted to a roof, change the racking type to flush-mount.</b> <b>If fixed-tilt, increase row spacing, either based on the racking design, or to ensure a span-to-rise of greater than 2.0. Never use spacing of zero with fixed-tilt racking</b></p> <p>Near the Row Spacing control, HelioScope shows related metrics, including Span / Rise, and Ground Coverage Ratio (GCR).</p>  <p>Typical span-to-rise values are 2.0 to 3.0.</p>