



***tenKsolar's Commercial Rooftop PV system is a third-generation PV system, and therefore very different from traditional PV. Below are some common questions those familiar with traditional PV may have about tenKsolar.***

**Q: How is it different?**

A: We sell a fully intelligent module that is capable of maximizing the power delivered by individual cells within the module, eliminating the series dependencies that plague traditional solar modules -- even those equipped with micro-inverters. This eliminates the classic solar shading issues not just from panel-to-panel, but within panel as well. Just watch the LED (or use our digital LED reader) on the face of each tenKsolar panel to confirm how smart it is -- it will tell you all about itself including peak power, radiation levels, temperature, energy produced over its lifetime, safety status, etc.

**Q: How will your system perform over time?**

A: Better than any traditional PV system -- because we have completely eliminated from the design the most significant causes of power degradation and failures in a traditional PV system. NREL data shows that over 80% of failures in PV modules are due to failures in cell interconnections, internal corrosion, cell cracking, module-to-module connectors, and bypass diode failure. tenKsolar modules have eliminated the internal series dependencies that all other modules have, and we do not use bypass diodes anywhere in the system. So, whereas other solar panels are like a set of old-style Christmas lights where a single bad element will bring down the whole string -- tenKsolar modules are immune to this problem. A crack in a cell or damage to a single solder joint will not bring down the output of the entire system. What's more, tenKsolar offers the only system including a redundant inverter configuration, so even an inverter failure will not significantly cut power output from the system. No other system that we know of offers this.

In addition to designing the cell connections differently inside tenKsolar modules, the cells and interconnections are also sealed between glass and aluminum. Other modules use plastic over the back which lets water in, or glass which is good for eliminating water ingress but doubles the weight of the module. Double glass construction also keeps heat in, reducing the energy production of the module. Aluminum is an outstanding water barrier and has a very high heat conduction value, so the module runs cooler and it's lightweight. We can use aluminum where others cannot, due to our safety design discussed later.

**Q: What racking and inverters should I purchase with a tenKsolar system?**

A: tenKsolar requires no additional racking, our modules and reflectors make up the racking, simplifying installation and eliminating steps and cost (no pre-assembly). Likewise, we offer an integrated low voltage inverter which we supply as part of the package. Because tenKsolar's intelligent modules handle all the MPPT and voltage regulation functions onboard, the inverter's job is significantly simplified. Because our configuration wires the inverters redundantly, in parallel, the system will keep producing



most of its output even in the event of an inverter failure, allowing for a five year or greater repair cycle, rather than costly downtime or unscheduled repair events.

**Q: Do I need to use roof penetrations or ballast with tenKsolar RAIS® Wave ?**

A: We have designed the RAIS® Wave to eliminate roof penetrations and minimize ballast needs in most conditions for 90 mph wind zones and validated the design in wind tunnel tests. In nearly every situation you should experience significantly less weight per square foot (typically < 4lb) while at the same time achieving better energy output per square foot than you can with even the highest efficiency conventional PV system.

**Q: What about shading?**

A: Traditional PV systems are very sensitive to shading because the cells within a single module are dependent on other modules, so a “shade” event on one cell in one module can cause issues with the entire array. Bypass diodes are not effective at subtle shading events such as dirt, bird excrement, etc, where only part of the light is diminished, and when they are activated in more catastrophic situations, they end up cutting out large areas of perfectly good cells. Micro-inverters still use diodes and traditional panels, so they are subject to the same limitations within the panel.

Our modules use all the energy available from the cells, so dirt collected at the base of a module, a dirty end module, bird excrement, a soil stack, etc., all have no impact on the remaining areas of a tenKsolar array.

**Q: What about snow?**

A: We are from Minnesota, and no strangers to snow. The tenKsolar RAIS Wave is designed to shed snow from the wind. With our steep angles and aluminum backsheet efficiently distributing heat under the exposed areas, we clear what snow does collect very quickly. Finally, we make the maximum energy possible even when some of the PV regions are covered, due to our cell-level independence. Other modules require virtually all snow be removed from all areas of the array to produce any significant power.

**Q: tenKsolar promotes “low voltage safety”. What does that mean and does it really matter?**

A: In our PV modules, we never go above 10VDC. In our array, we never go above 60VDC. When you disconnect any part of our system, the energy production stops inside the module and the entire array is safe. All AC from our system is entirely housed in conduit from the parallel inverters to the grid. In our installations, we don’t have any non-raceway encased, un-switched 600VDC or 240VAC flexible rubber cord power leads looped around the back of our solar panels.

The safety issues are a big deal and the PV industry knows it. The new NEC2011 code (adoption starting this summer) is now requiring arc fault detection and additional remote disconnections on all systems over 80 VDC, recognizing that:



- The high voltage used creates a real risk of sustaining an arc fault and causing a fire within the PV system (panels or wiring).
- The panels and conductors will make power when the sun is on – making the building unsafe for fire fighters who cannot disable the base PV system to fight the fire.

Even with a de-energized disconnect near an array, a traditional solar system still produces 600VDC in the sun, making it hazardous to fire-fighters. Best practices with traditional PV help to reduce these risks, but they cannot be eliminated due to the basic topology of the system.

**Q: One of the advantages of tenKsolar’s module is ability to use non-uniform reflected light for added power. Do you warranty the power output with reflection? Should I worry about it degrading over time?**

A: Our power warranty applies to our full rated output, including reflection. The reflector contains a highly engineered, reflective film produced by 3M which is composed of a UV stabilized material containing no metals. As tested in accelerated UV testing in several large laboratories and under field weatherability conditions, it can be used directly in the sun with no protective barrier. For added stability and robustness, the reflective film used in our reflector is encapsulated behind both glass and a PV encapsulating material, both which greatly reduce the UV exposure of the film even further.

Our estimates based on accelerated aging, is that the reflector will maintain > 98% of its initial reflectivity for a minimum of 50 years.

**Q: Does your module run hotter because of the added power from the reflector?**

A: No, it actually runs slightly cooler than a traditional module. Our base module Normal Operating Cell Temperature (NOCT) rating of our base module is 40°C as reported in our IEC 61215 test report. Because our reflector is spectroscopic (only reflects the sunlight that is useful for generating electricity onto the module), the added heat from reflection is very low. With maximum reflection, our NOCT is 46°C. Traditional modules have NOCT ratings from 45°C to over 60°C.

**Q: How does power production vary based on the time of year? How do you estimate energy production using the reflector?**

A: Power production from our system is higher in the summer and lower in the winter (like all solar PV). We have designed the RAIS® Wave and its mounting angles to maximize the annual KWH production. Part of becoming a tenKsolar Certified Reseller is learning to use estimating tools we provide, and have verified with third-party engineering firms.

**Q: Does tenKsolar really give me more energy per rooftop?**



A: Absolutely! The combination of our reflector/module uses the entire roof area, resulting in as much as double the energy output per square foot. Also, to increase “density” some installers of conventional PV lay modules flat or close to flat. Laid flat, modules lose production due to soiling (and snow in some climates), are at a less-than-ideal angle to the sun and increase the overall weight per square foot. The unique angles of the RAIS Wave provide stability, wind resistance, soil and snow shedding and still provide best-in-class energy output per square foot.

**Q: Can I mount a tenKsolar array on my home? What about ground mount?**

A: We do have a highly area-efficient ground mount array option available. We do not currently offer a product for houses.

**Q: Where did the name tenKsolar originate?**

A: The engineers and scientists who founded tenKsolar were the people behind creating one of the most reliable, high volume technology products in the world – the 10,000 RPM enterprise-class hard disc drive. By an FTC estimate, over 80% of the entire world’s banking information is stored on these so-called “10K” disc drives. The name reminds us that technology revolutions that do more, work better and cost less can change the world.

**More questions? We are at your service. Service is at the core of what we do, so drop a note to [info@tenksolar.com](mailto:info@tenksolar.com) and we will be happy to tell you more.**