TECHNICAL PAPER

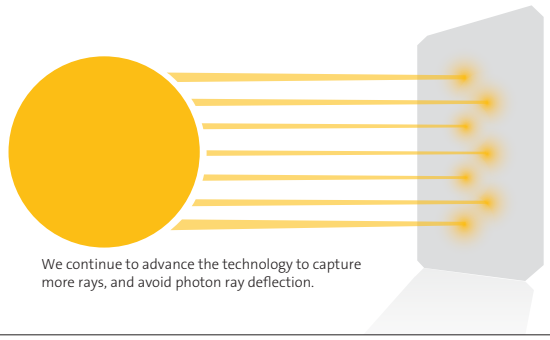
LIGHT CAPTURE TECHNOLOGY

February 3, 2015

The more light you can capture, the more light you can convert. That's why SolarWorld is on a never-ending mission to attract and harness power from every ray of sun that hits our planet. This is our SolarWorld light capture technology.

By constantly advancing the components within the solar cell and module, we're striving to improve and optimize our spectral response. From developing the ideal coatings for our glass and cells to sourcing the highest-quality materials, **SolarWorld is continuing to push the limits of how much light can be captured and transformed into the sustainable energy of our future.**

We continue to advance the technology to capture more rays, and avoid photon ray deflection.



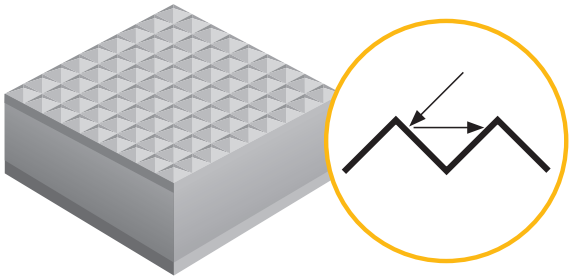
We continue to advance the technology to capture more rays, and avoid photon ray deflection.

No Photon Left Behind

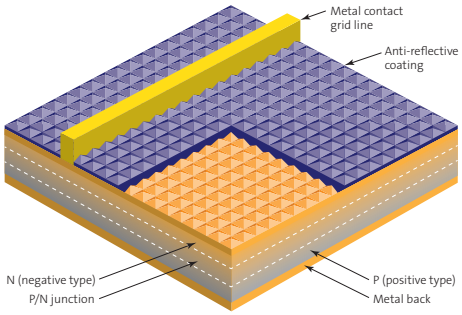
Cell level

On the cell level, we work to capture more sunlight by reducing the amount of light that can be reflected from or pass through the cell.

Pyramidal surface – The SolarWorld light capture technology includes chemically etching the wafers to create a jagged surface of pyramids that rebound reflected light back into the cell. We are continuously improving the process to optimize the pyramidal shapes and increase the wavelengths of light rebounded back into the cell.



Through our light capture technology, SolarWorld has advanced our cell architecture by several generations beyond the original design. We continue to build on a strong foundation that has been proven over time.

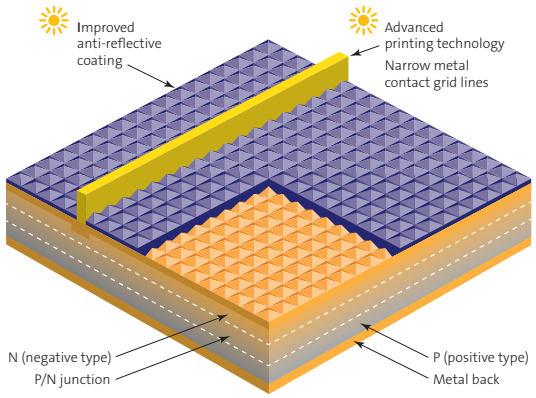


Our 2nd and 3rd generation cell architectures incorporate new features and innovative re-engineered components and coatings to capture more wavelengths of light.

Anti-reflective coating on cells – In the 2nd and 3rd generation of cells launched by SolarWorld, the anti-reflective coating has been improved to make significant shifts in capturing more of the light spectrum and, therefore, considerably boosting the power output of the modules. We constantly work to improve the anti-reflective coating to capture more light.

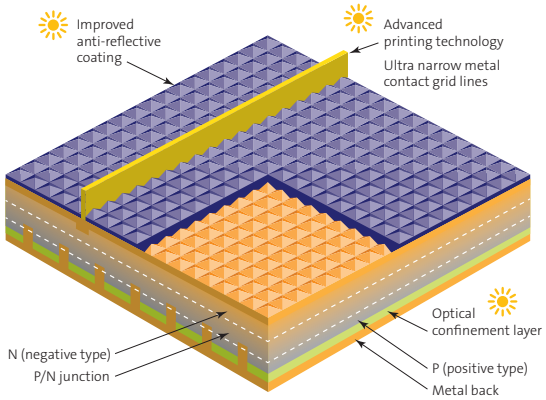
Advanced grid line printing technology – SolarWorld is making manufacturing process changes to print ever narrower grid-lines with each evolution of light capture technologies. Through this we will open up more of the cell surface to make it available to capture more light.

Generation 2



Optical confinement layer – The next advancement of the SolarWorld light capture technology will bring an additional layer to the backside of the cell. This layer will prevent wavelengths of light from passing through the cell. Instead, light will rebound back into the cell to knock loose electrons in the silicon molecular structure, generating electricity.

Generation 3



Module Level

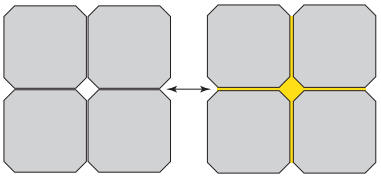
At the module level there are two key considerations for capturing more light. The first is to minimize the amount of reflection off of the glass. The second is to ensure that the design and layout of the module is optimized for light capture.

Anti-reflective coating on glass – SolarWorld uses solar glass that has been specially engineered to capture and transmit greater levels of light. This allows for more light to reach the cells and produce greater levels of energy.

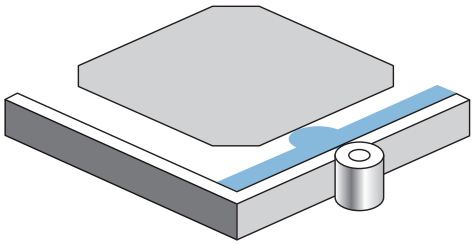
The glass and its anti-reflective coating were rigorously evaluated at SolarWorld Innovations and can withstand environmental testing that is 3 times that of the basic industry standard. This will ensure that the anti-reflective coating and glass will continue to transmit high levels of sunlight to the solar cells for the warranteed life of the solar panel.

Circuit Design – Not only does the SolarWorld light capture technology account for advancements on the cell and component level to increase light capture, but it also improves design to ensure our modules capture the most light possible.

On the surface, it seems that all modules are designed with the same circuit. It is true that most modules have 60 or 72 cells strung together in series, but how that is done can make an enormous difference in the real-world performance of the module. How the cells are spaced in the circuit relative to each other and to the frame of the module will affect the amount of light captured by the solar panel.

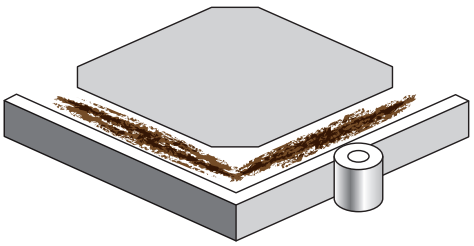


Mounting hardware used to affix the module to the mounting system can cause shadowing of the outer cells, if they are placed close to the frame.



SolarWorld modules avoid shadowing issues

Dirt and debris can build up along the frame of a module. This build-up can start to shade the outer cells, if they are placed close to the frame. Shading of the cells can reduce the overall output of a module and affect the performance of a string of modules.



Cell spacing on a SolarWorld module prevents soil shading

SW-02-5164US 02-2015