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Tigo[®]


Smart Module Optimizer Technology

❖ Tigo is a Silicon Valley company founded in 2007 by a team of experienced technologists. Combining a unique systems-level approach with expertise in semiconductors, power electronics, and solar energy, the Tigo team developed the first-generation Smart Module Optimizer technology for the solar industry.

❖ SMA, took a 27 percent stake in Tigo Energy, along with exclusive rights for worldwide sales of the "smart module technology TS4 Retrofit" and a seat on Tigo's board of directors.

Mission:

- ✓ Selective Deployment
- ✓ Modularity
- ✓ Predictive IV (PIV)

Lowest Cost  Greatest ROI

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TIGO Functionality



Diodes

- Similar to a standard junction box
- Standardized TS4 baseplate



Monitoring

- Module level monitoring
- Fleet management



Shutdown

- NEC 2014 rapid shutdown compliant
- NEC 2017 module level shutdown compliant



Optimization

- Shade and age tolerance
- Improved energy yield
- Maximized roof usage



Long Strings

- Increase string lengths up to 30%
- Lower line losses



What is a Tigo Optimizer?

- ❖ In today's PV systems, panels are serially connected in strings, with several of these strings connected in parallel to form an array. Thereby, the lowest-performing module will impact the performance of the entire array unless optimized.
- ❖ The Tigo TS4 based optimization solution utilizes revolutionary Predictive IV, allowing it to quickly respond to changing conditions. It brings each module to its optimal power output point, recaptures energy lost due to mismatch, and increases total energy production.
- ❖ The Tigo system architecture is identical to a string inverter's architecture, allowing the optimizers to remain in a complete bypass mode until mismatch occurs that requires its intervention.
- ❖ Tigo optimizers achieve maximum energy harvest with 99.5% conversion efficiency and the lowest heat dissipation at the back of the module.

The logo for 'evolve India' is centered within a white circle with an orange border. The word 'evolve' is written in a lowercase, sans-serif font, with a stylized 'o' that incorporates a blue and orange arc. Below 'evolve', the word 'India' is written in a smaller, lowercase, sans-serif font.

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(Evolve India Group)

Modularity and Selective Deployment

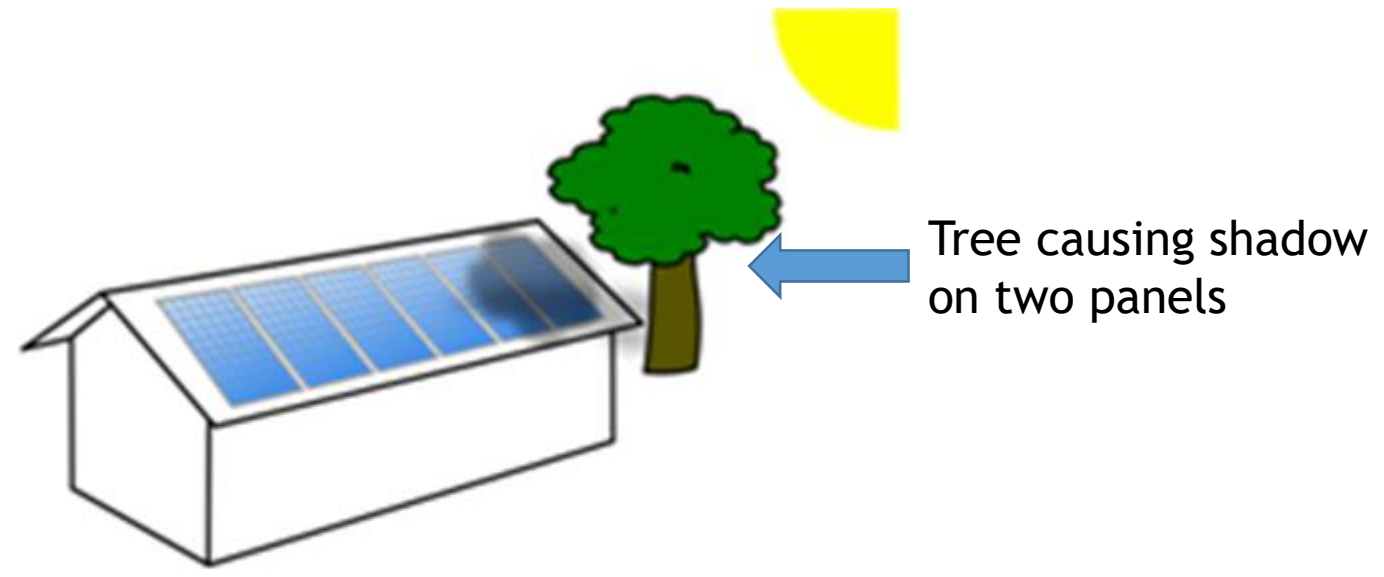
Optimization TS4-O

- Shade and age tolerance
- Maximized roof usage
- Enhanced energy yield
- Plus all the benefits of Safety and Monitoring
- Greater design flexibility

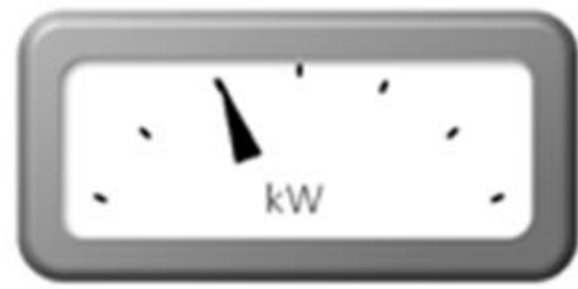


Modularity and Selective Deployment

Without Optimizer

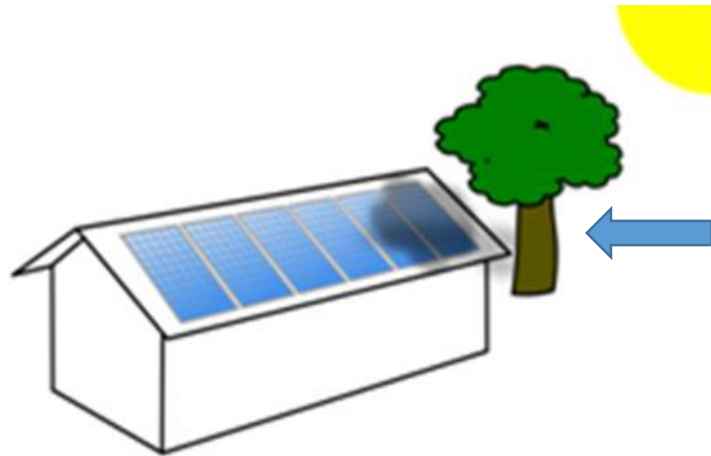


Loss in generation due to shadows on panels



Modularity and Selective Deployment

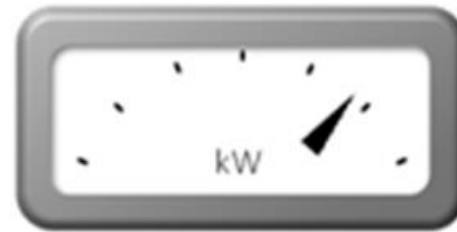
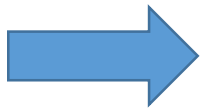
With Optimizer- 2 * TS4-0



(1) Trees causing shadow on two panels

Without optimization, any shaded module affects the whole string. Selective deployment of optimization on only the shaded modules improves performance for unshaded modules.

(2) Use 2 optimizer for the 2 shaded panels



(3) Increase in generation



Modularity and Selective Deployment

For example



Only 3 Modules are shaded, in need for optimization



3 modules in need for optimization





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Modularity and Selective Deployment

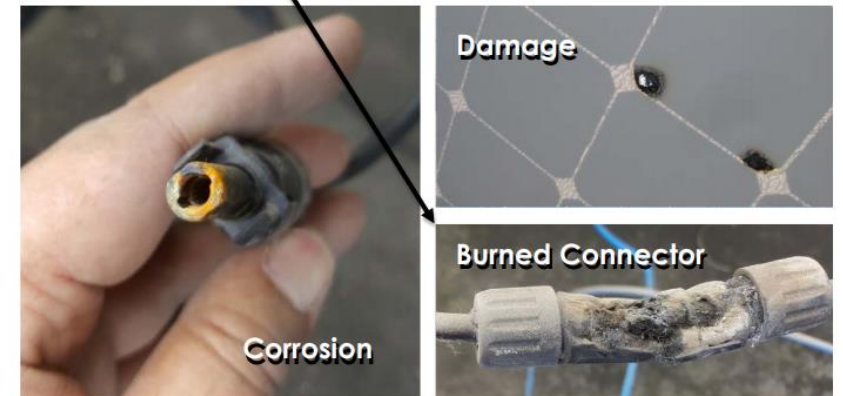
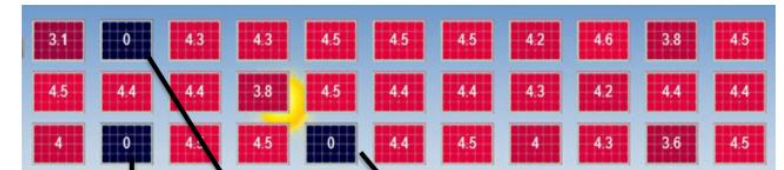
Monitoring TS4-M

- Reduced O&M costs
- CRM integration
- Warranty tracking
- Module bar code tracking
- Team management
- Fleet management
- PV-2.0 data synchronization



ISOLATING HIDDEN PROBLEMS

- String-level monitoring often reveals hidden problems, such as the three dead strings as shown in the picture.
- Without string monitoring, these problems can be very difficult to isolate.





Diodes

+



Monitoring

+



Safety
TS4-S

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Modularity and Selective Deployment

Safety TS4-S

- For Rapid shutdown
- Over-temperature protection
- Module-level deactivation
- Automatic/manual shutdown
- All the benefits of Monitoring
- NEC 690.12 rapid shutdown compliant



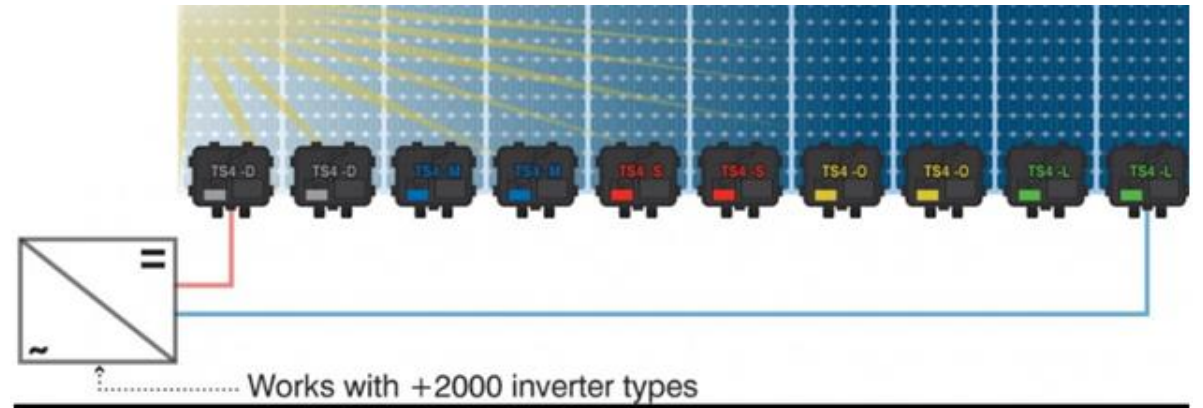
CONFIDENTIAL

TS4-Why-Rapid Shutdown

System Safety- Prevents Business Disruptions

- During an unexpected fire accident, the solar plant shuts down rapidly, when TS4- S is used.





Compatibility

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Any queries . .

