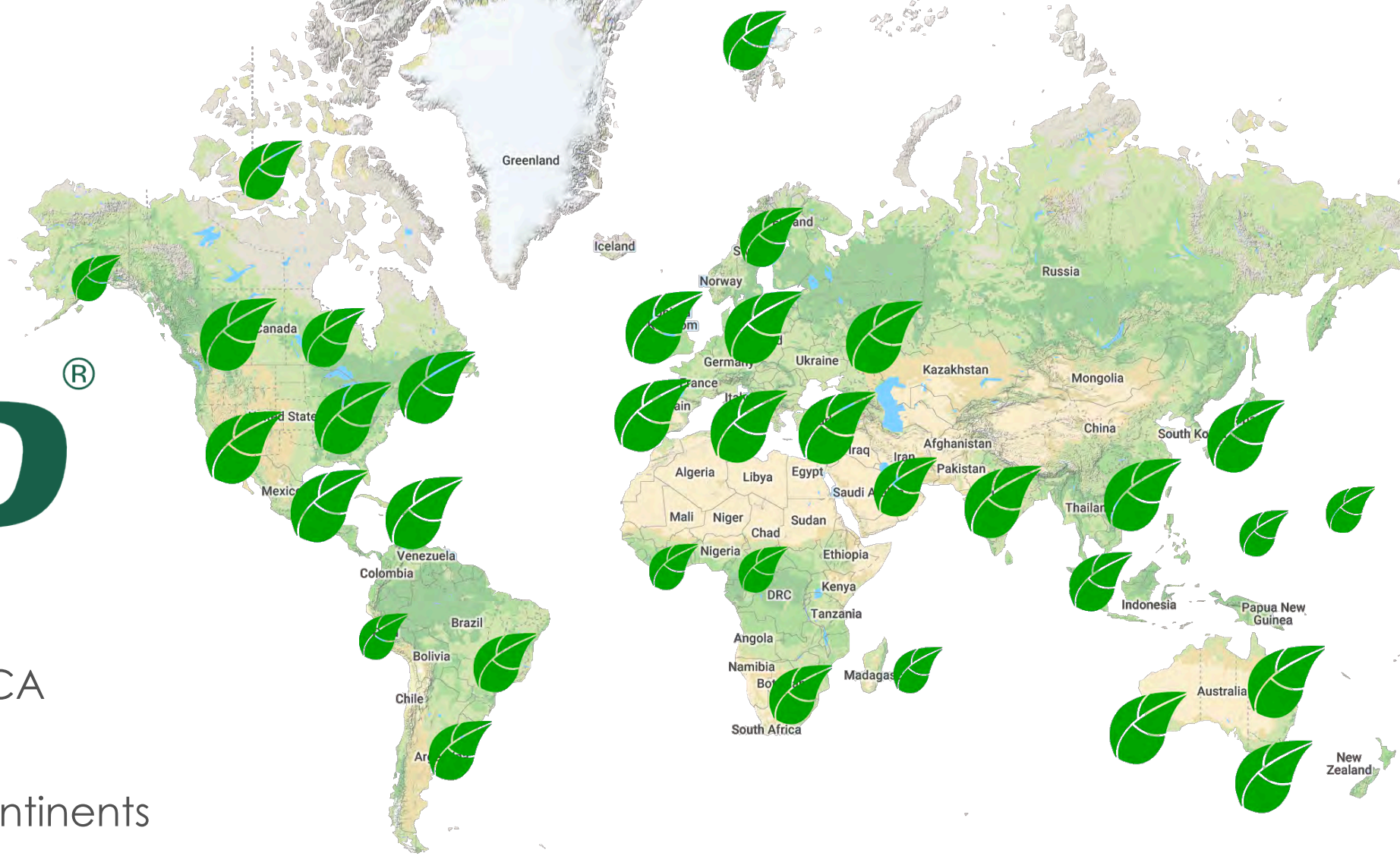
Tigo®

PV Safety and Rapid Shutdown Systems

Tigo®

- Founded in 2007
- HQ in Silicon Valley, CA
- Leader in MLPE
- Deployed on all 7 continents
- >1GWh daily PV production is monitored on Tigo systems



Tigo's mission is to deliver smart PV solutions that:

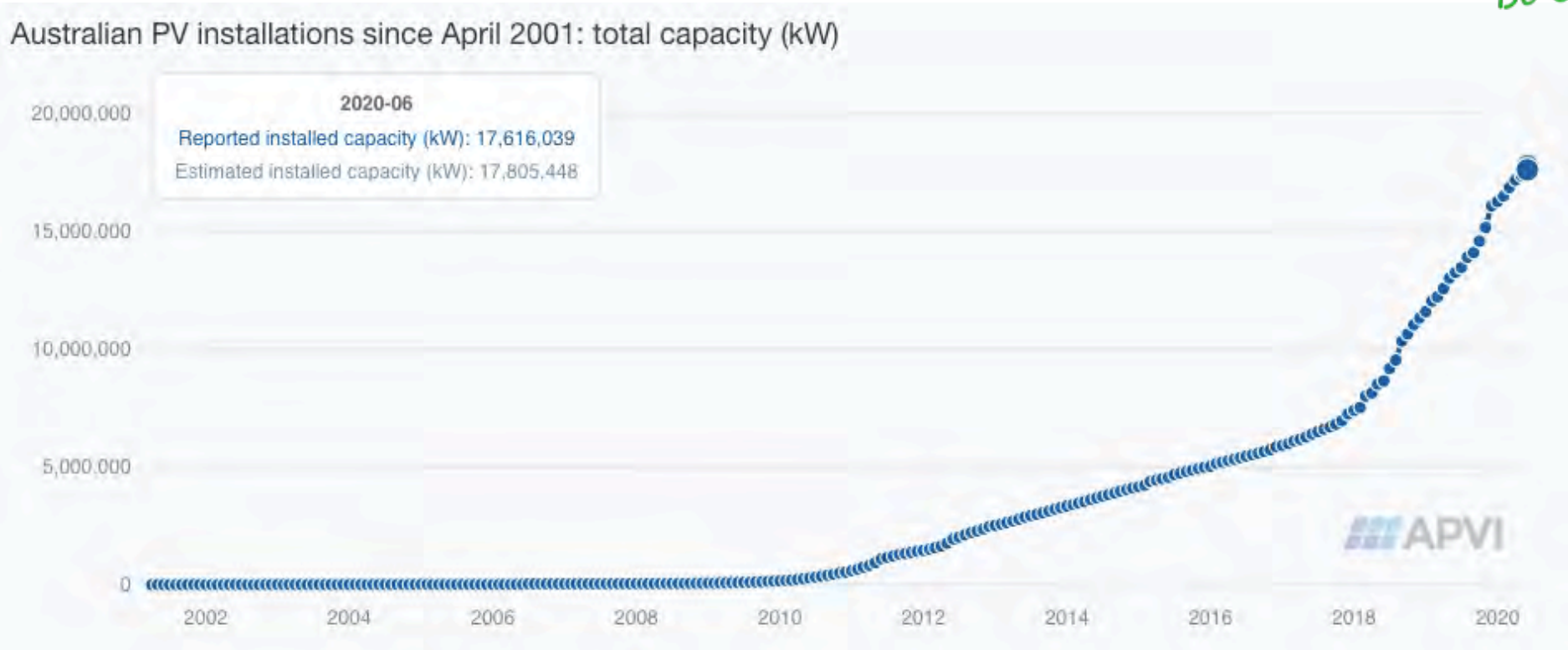
- enhance **safety**
- increase **energy output**
- ensure long term **visibility**

To maximize the ROI of PV projects.

Agnostic Approach to product architecture

Tigo®

PV system growth is surging in Australia



- As of 30 June 2020, there are over 2.46 million PV installations in Australia, 17.6 GW
- 2.1 GW of sub-100-kW solar systems installed on Australian homes
- About 1 in 5 Australian homes has installed rooftop solar

https://pv-map.apvi.org.au/analyses and PV Magazine | https://www.pv-magazine-australia.com/2020/01/15/australia-installs-2-13-gw-of-rooftop-solar-in-2019/ and https://www.abc.net.au/news/2019-05-27/australias-obsession-with-cheap-solar-derailing-market-insiders/11139856

El Nina is here!

- Bush fires
- Cyclones – WA/NT/Qld
- Flooding
- Hail storms

Photo by Neil Mark Thomas on Unsplash

These events present safety challenges for PV systems

Bush fires

- Electrocution risk to firefighters / first responders

Cyclones

- Water intrusion, solar asset damage from high winds and debris

Flooding

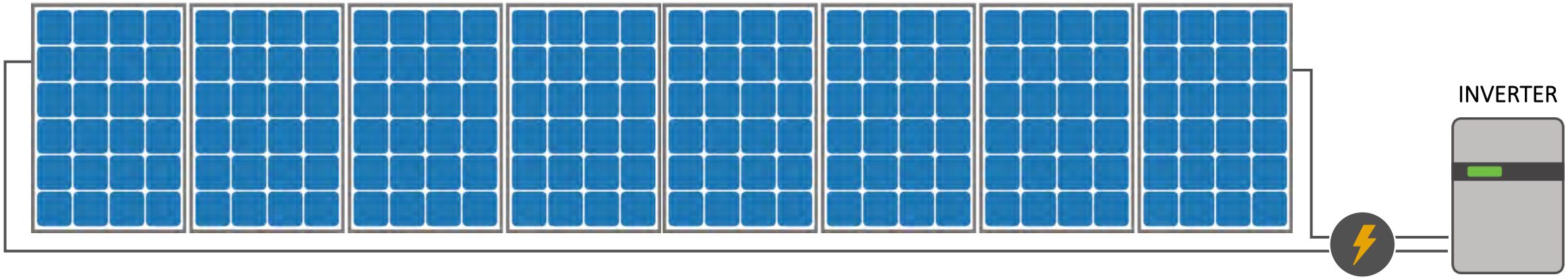
- Water intrusion. Sometimes you need to wait it out on your roof – shock hazard near modules

Hail

- Solar asset damage
- Cell cracking, interconnector damage, glass and frame

Common route causes of issues: high voltage DC

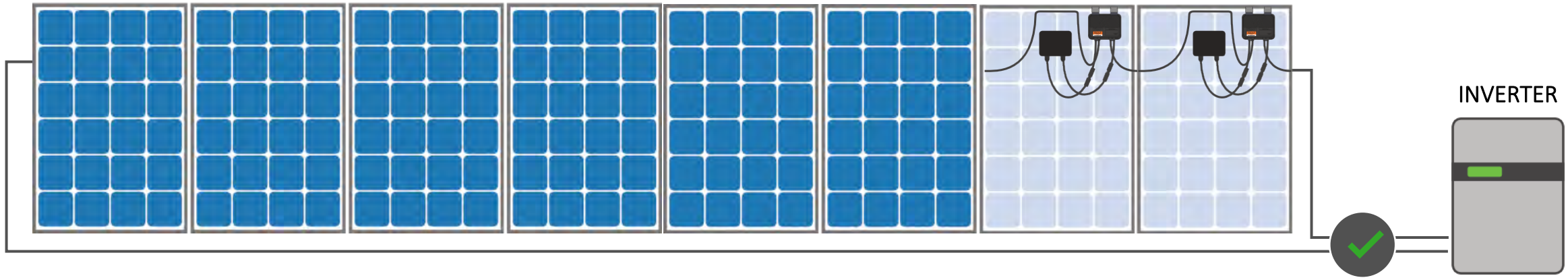
- Having solar modules connected in series results in dangerous unprotected DC voltage (200 to 1000V DC) fed from the solar modules on the roof down to the string inverter
- A fault on the DC cabling can produce a continuous arc, which can cause fire
- This arc has the ability to melt steel, glass and ignite most combustible building materials
- And poses a risk of electrocution



Source: AC Solar Warehouse. https://www.acsolarwarehouse.com/news/are-your-solar-systems-safe/#:~:text=Having%20solar%20modules%20connected%20together,often%20mounted%20on%20a%20wall.

Tigo makes your system safer – with module level shutdown

- Tigo's module level power electronics (MLPE) connect to each PV module
- Lower the voltage at the module level
- Maintains low voltage throughout the string



Source: AC Solar Warehouse. https://www.acsolarwarehouse.com/news/are-your-solar-systems-safe/#:~:text=Having%20solar%20modules%20connected%20together,often%20mounted%20on%20a%20wall.

In the US, module level rapid shutdown is required for rooftop PV

- National Electrical Code requirement
- Put in place for the safety of first responders
- Requires rapid shutdown at the module level for all rooftop PV systems
- Similar requirements are spreading to other countries (e.g. Panama, Philippines, Taiwan… Australia?)

Tigo®

Why rapid shutdown devices in Australia?

- Shuts PV system off at module level - manually or automatically with AC power loss
- Addresses issues associated with rooftop isolators (high voltage, failures, overheating, etc.)
- Can be part of your procedure during floods, fires, storms, etc.

Maintains low voltage during critical events…

- If you need to go on the roof (floods)
- For first responders / firefighters
- In case of flying debris, hail, water intrusion, etc.

Tigo®

Tigo is the leader in rapid shutdown

Trusted

Gigawatt hours of solar energy is produced every day using Tigo systems

Works anywhere

Residential, Commercial, Industrial, Floating, etc.

Freedom

Choose your inverter, choose your features

Tigo TS4: flexible, reliable MLPE at any scale

- Use with any PV module
- No grounding needed
- Plug and play out-of-the-box
- Highest reliability
- Low heat dissipation

Maximize your ROI

Select any functions from the different TS4's

TS4-A-O **Optimization**		Increase yield with shade and mismatch
TS4-A-S **Safety**		Rapid shutdown and monitoring
TS4-F **Fire Safety**		Module level rapid shutdown
TS4-2F **Fire Safety**		Same as the F but with half the hardware

Tigo®

Tigo TS4-F and TS4-2F (Fire Safety)

Dedicated rapid shutdown devices

Tigo's F-series architecture

The most reliable, cost effective way to meet rapid shutdown requirements

MLPE

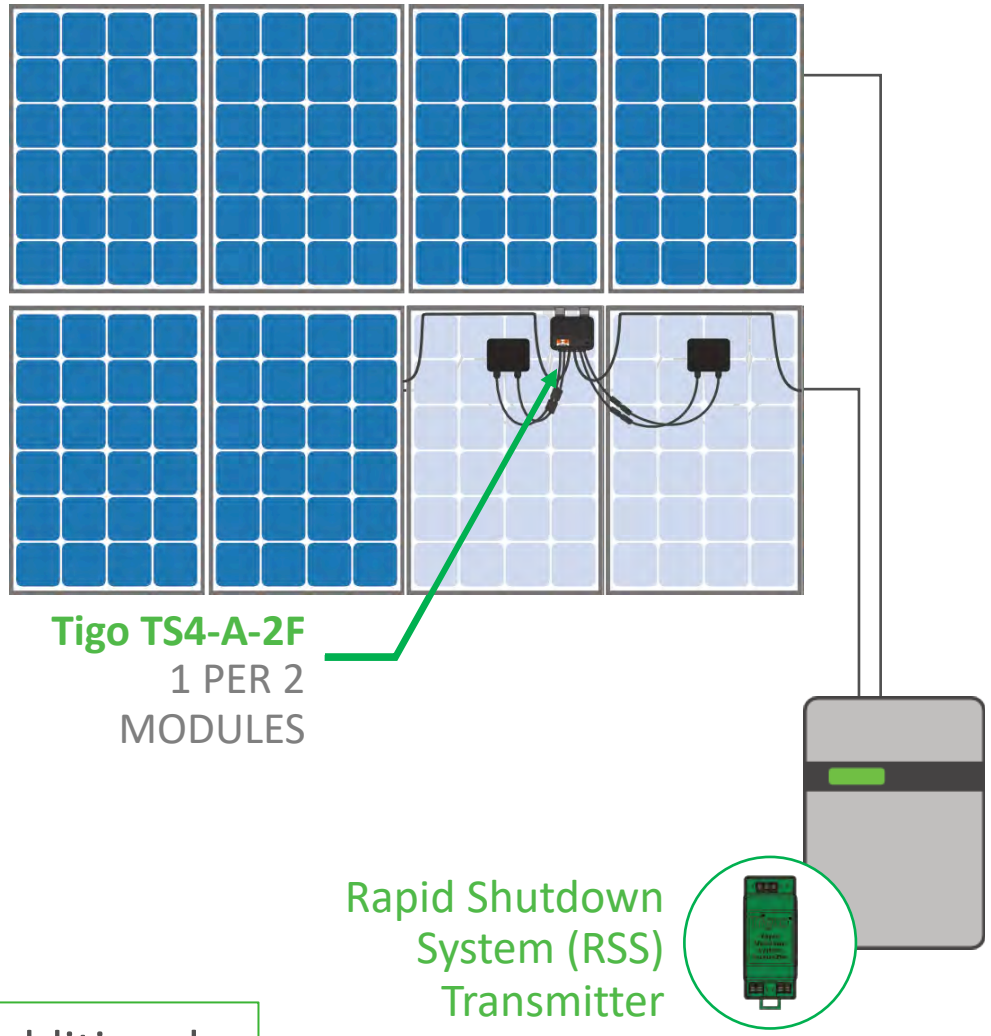
1x TS4-A-F for each module

AND / OR

TS4-A-2F for every 2 modules

COMMUNICATION

RSS Transmitter
(add on or integrated)



PLC communication with no additional ground wire required

Tigo®

1 STOP Warehouse

Be Clean, Be Green

TS4-A-2F specifications

- Like having 2x TS4-A-Fs in one package
- 1000W (500W per channel)
- 16-90V, 15A (per channel)
- MC4 (standard) connectors
- Snaps to module frame for easy mounting
- Does not require ground wire

Tigo®

RAPID SHUTDOWN DEVICE

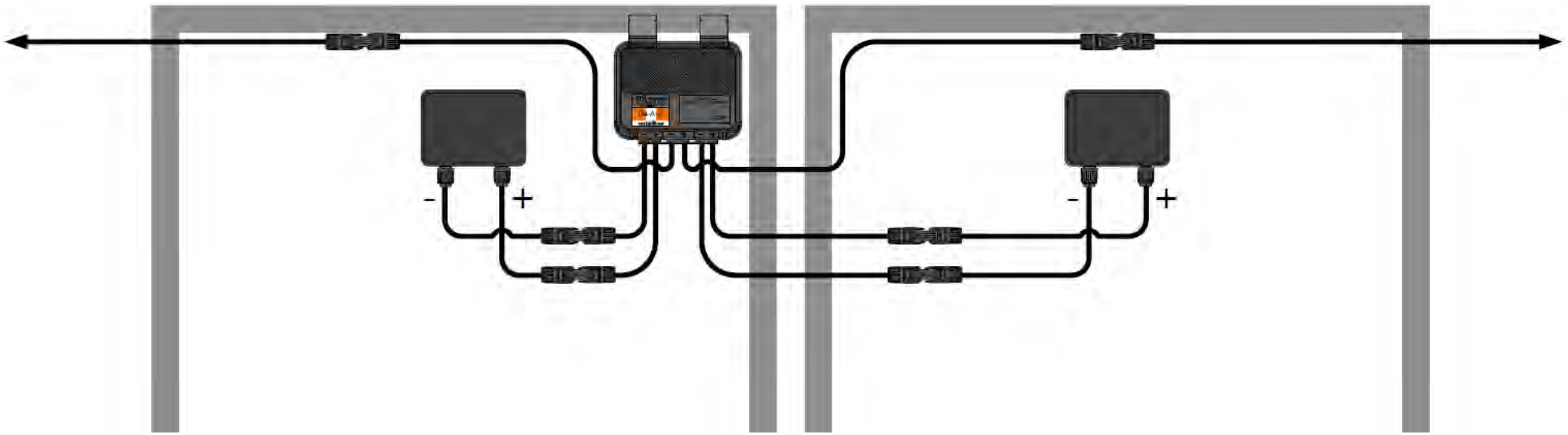
Maximize your PV ROI with the TS4-A-2F

HALF THE HARDWARE
One TS4-A-2F per 2 modules

FASTER INSTALLATIONS
16% fewer connections required on an average string of modules

RELIABLE PERFORMANCE
Built with same core tech as the F – proven around the world

BUILT TO SCALE
Works with commercial, residential, utility



Tigo®

1 STOP Warehouse

Be Clean, Be Green

Tigo TS4-S

Monitoring + Rapid Shutdown

Tigo Monitoring

1 STOP Warehouse
Be Clean, Be Green

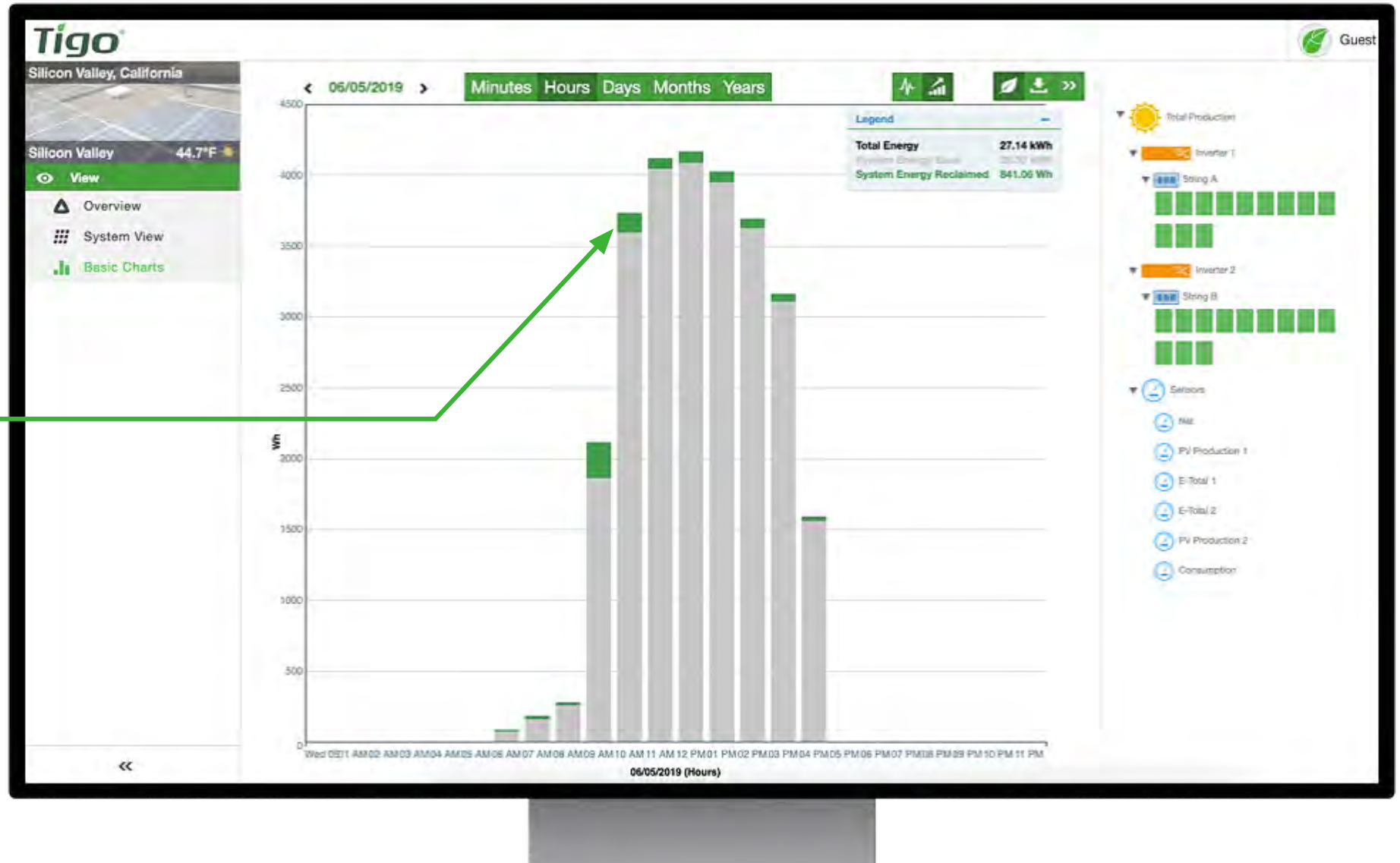
- Monitors key indicators at the module level
- Also monitor the inverters, meters, weather stations, and more all in one place
- Pinpoint issues without going on site
- Lower O&M costs from fewer truck rolls
- Highest granularity data in the industry
- Asset and fleet management

Displays data in 1 min intervals. & capable in Premium of 2 sec intervals

Tigo®

Visibility to increased energy output with Tigo monitoring

See energy reclaim amount in total, and even by module



Tigo

Monitoring | Safety

PV Off

Tigo Safety, the TS4-A-S

Safety is a Flex MLPE function that delivers rapid shutdown functionality and the most granular module level monitoring system available.

- This UL-certified Rapid Shutdown solution
- Works with almost all modules & inverters
- Automatic or manual shutdown
- Module-level deactivation
- Monitors key metrics (voltage, current, power) at the module level
- Lower O&M costs with alerts and insights

Tigo®

1 STOP Warehouse

Be Clean, Be Green

Tigo TS4-O

Optimization + Monitoring + Rapid Shutdown

Monitoring | Safety | Optimization

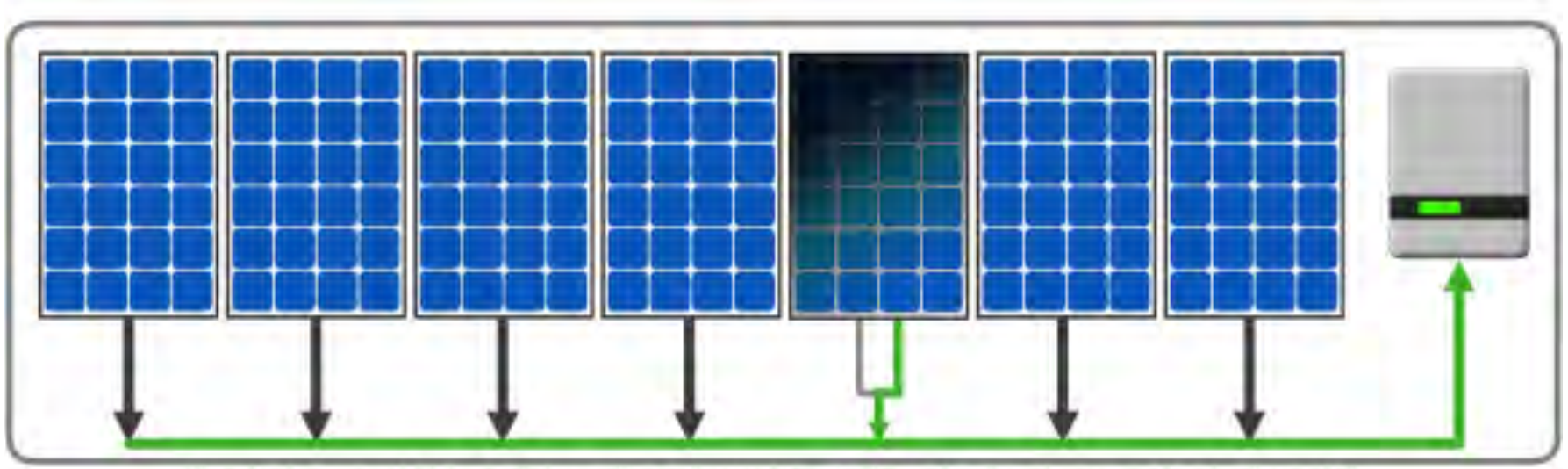
Tigo's Optimizer, the TS4-A-O

- Includes the benefits of Safety & Monitoring
- The higher performance optimizer with Predictive IV Technology (PIV)
- The ONLY optimizer with selective deployment
- Reduced equipment costs
- Optimizes right out of the box
- No central communication required
- Shade and age tolerance to maximize lifetime yield

PV Off

Tigo®

Increase energy output with Tigo Optimizers



Shaded array of PV modules with optimization, full production from unshaded modules

Tigo Optimizers increase energy yield

See the benefit quantified in the SMART portal

Tigo®

Tigo's O,S series architecture

Rapid shutdown, plus additional features:

- **O:** Monitoring & Optimization
- **S:** Monitoring

MLPE

TS4-A-O (Optimization) on each module

AND / OR

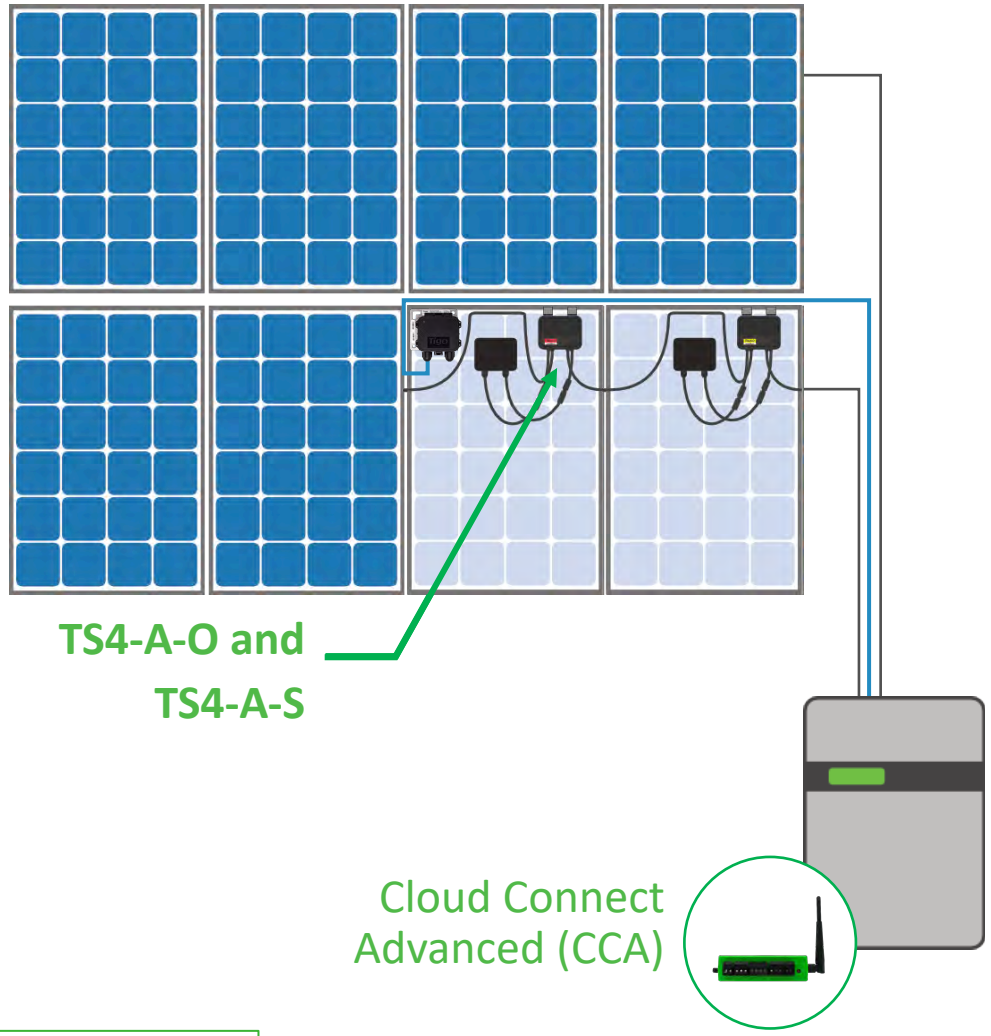
TS4-A-S (Safety) on each module

COMMUNICATION

Cloud Connect Advanced (CCA) integrated or add-on

AND

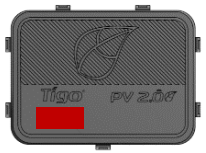
Tigo Access Point (TAP) connects to CCA via RS-485



Simple, flexible deployment options

Tigo®

Tigo's TS4 family with rapid shutdown

	TS4-O 	TS4-S 	TS4-F 	TS4-2F 
Module Level Optimization	✓			
Rapid Shutdown	✓	✓	✓	✓
Module Level Monitoring	✓	✓		
PV Modules per TS4	1	1	1	2
Pairs With	CCA & TAP	CCA & TAP	RSS Transmitter	RSS Transmitter

Tigo®


Safer homes use Safer Solar


Tigo®
Safer homes use Tigo

Thank you

Visit us at **tigoenergy.com**

Contacts:

- Sales: sales@tigoenergy.com
- Support: training@tigoenergy.com

Perth: sales@onestopwarehouse.com.au
South Aust: sa@onestopwarehouse.com.au
Queensland:qld@onestopwarehouse.com.au
Victoria: vic@onestopwarehouse.com.au

Tigo®