AI BOOST Optimal Electricity Cost & Active Safety

FusionSolar Residential Smart PV Solution

Huawei Smart PV Business Division
Smart PV Community
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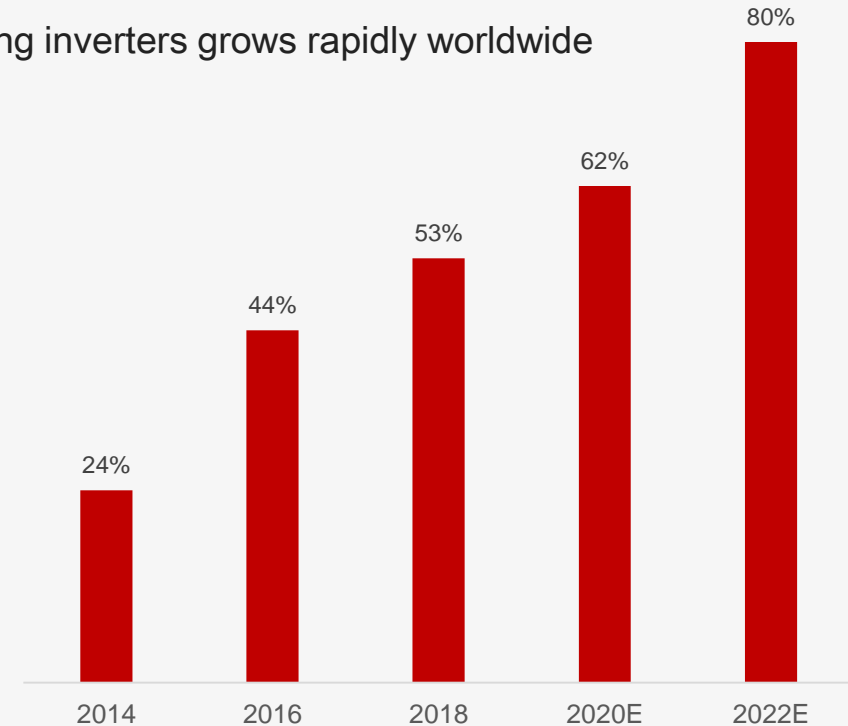
HUAWEI

Huawei Confidential

HUAWEI

Cumulative 130GW+ Global Sipments, Leading String Solution to become the Mainstream

The Leading Brand for Global Inverter Shipment

String Solution Becomes the MAINSTREAM in PV Industry

The Leading Brand
Global Inverter Shipment

2015 – 2016 – 2017 – 2018 - 2019

IHS Markit

String inverters grows rapidly worldwide

- 2014: 24%
- 2016: 44%
- 2018: 53%
- 2020E: 62%
- 2022E: 80%

Data Source: Third Parity Consultant Company

Leading Smart String Solution for All PV Scenarios

Commercial & Industrial

12~20kW   30~40kW

50/60kW   100kW

Residential

2~6kW   3~10kW

Utility-scale

215kW   100kW

Smart & String for All PV Scenarios

01 Company Introduction

02 FusionSolar Residential Smart PV Solution

03 Summary

HUAWEI

FusionSolar Residential Smart PV Solution

Optimal Electricity Cost   Active Safety   Better Experience

FusionSolar Residential Smart PV Solution

WLAN/Ethernet/4G/3G/2G

FusionSolar Smart PV
Management system

Residential
(<=10kW)

Full Optimizer
1. Module level optimization
2. High voltage rapid shutdown
3. Module level monitoring
4. Flexible long string design

Smart String ESS

Smart Energy Center

RS485

Smart Power Sensor

Smart Energy Center
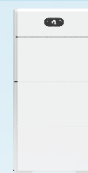
SUN2000-2/3/3.68/4/4.6/5/6KTL-L1

Single Phase

Smart Energy Center

SUN2000-3/4/5/6/8/10KTL-M1

Three Phase

Smart String ESS

LUNA2000-5/10/15-S0

Support 2 ESS operating in parallel, up to 30kWh

Backup Box

Backup Box-B0/B1

Smart PV Optimizer

SUN2000-450W-P

Smart Dongle

Smart Dongle-WLAN-FE
Smart Dongle-4G

Smart Power Sensor

DDSU666-H (Single Phase)
DTSU666-H 100A(Three Phase)
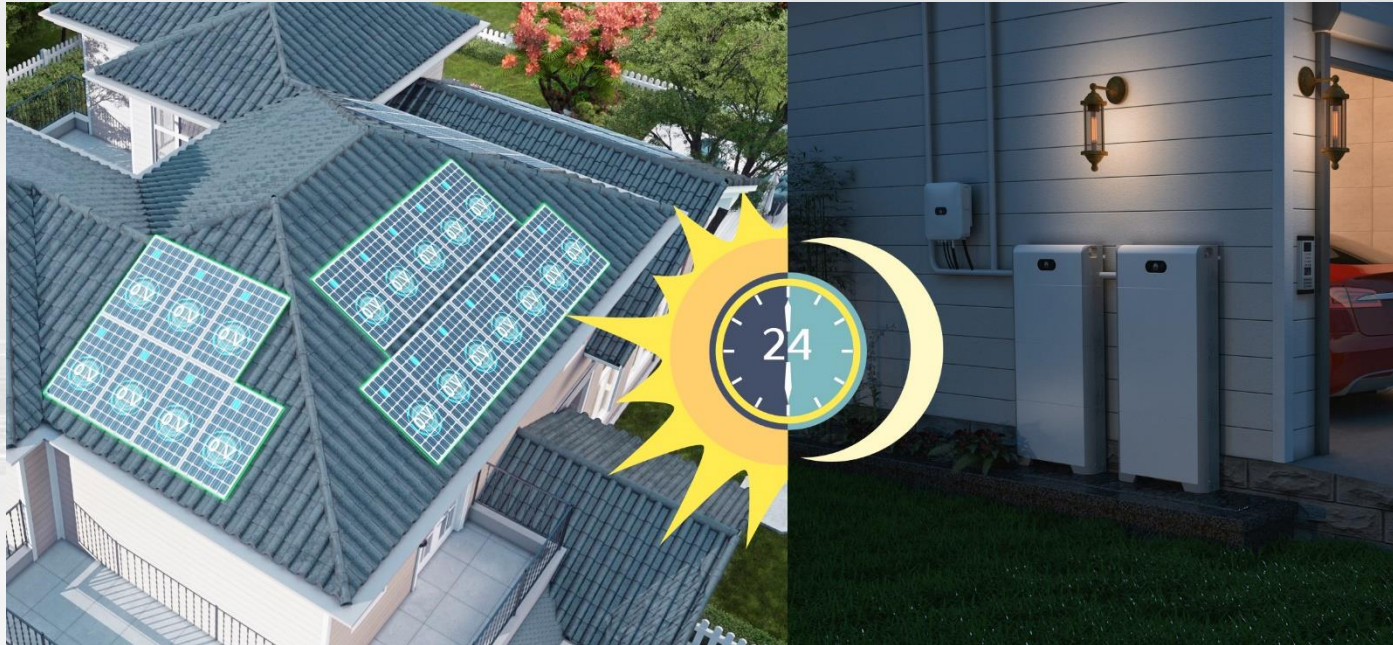DTSU666-H 250A (Three Phase)

Monitoring Portal

FusionSolar Cloud & APP

Generate more PV energy for **daytime** consumption
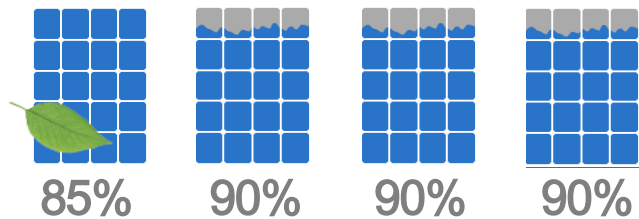
Store more PV energy for **nighttime** consumption
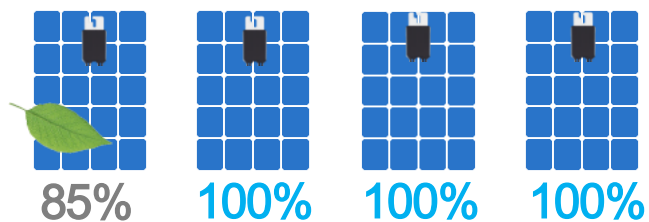
Maximized PV Power Self-Consumption

Up to 30%
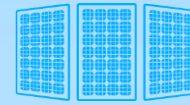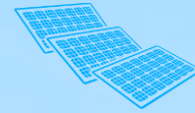## More Energy by Optimizing Each Module's Performance

Shading

Different Azimuth

Different Tilt

Without optimizer

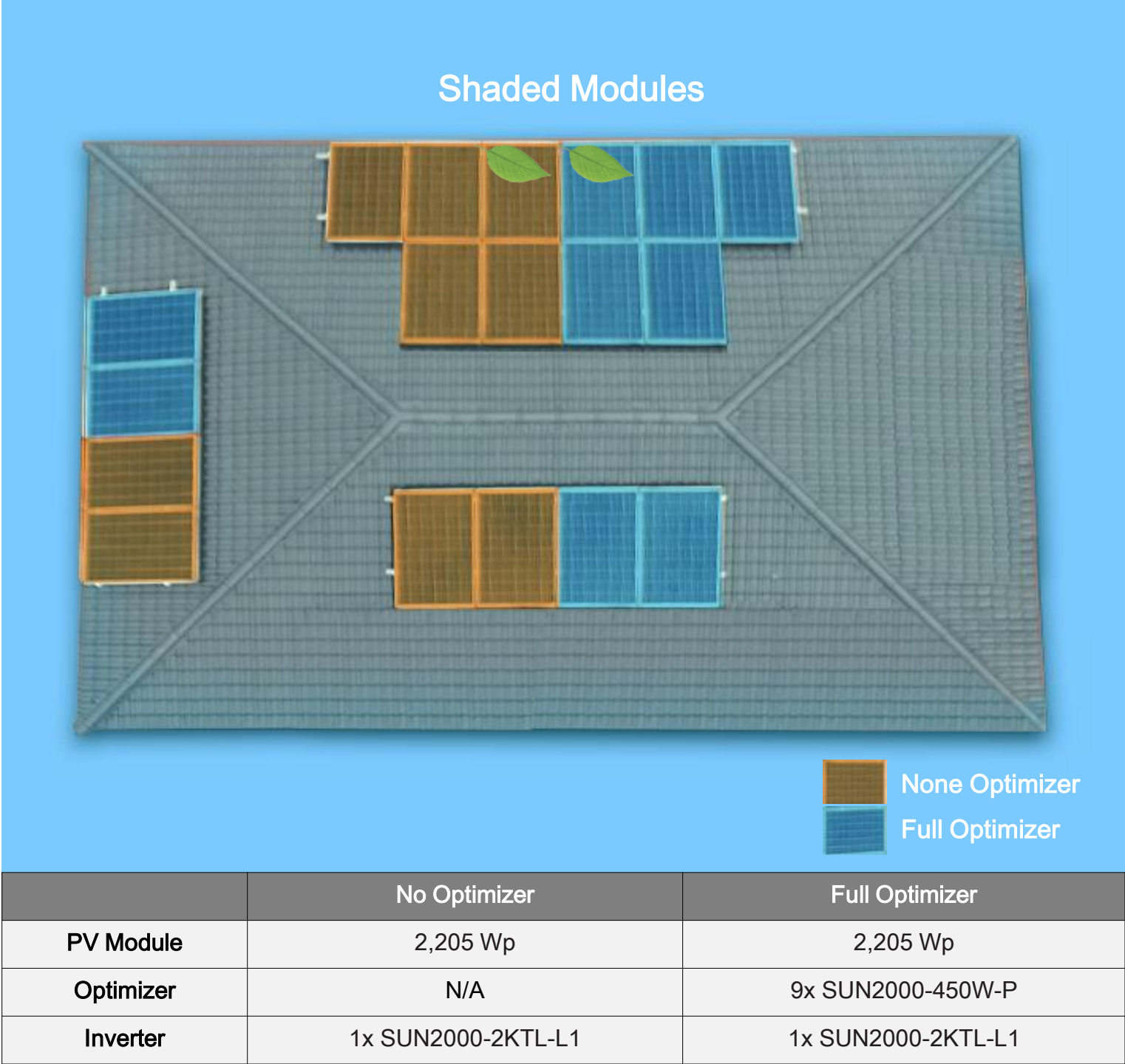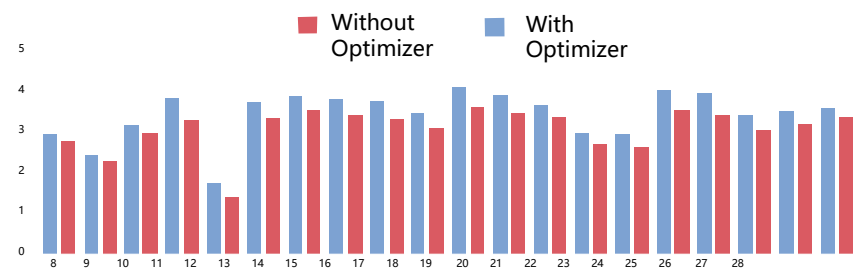85%   90%   90%   90%

With optimizer

85%   100%   100%   100%

Comparison Case
of Energy Yields

Full optimizer system generates average **10%-13%** more energy per day than no optimizer system

Shaded Modules

None Optimizer

Full Optimizer

	No Optimizer	Full Optimizer
PV Module	2,205 Wp	2,205 Wp
Optimizer	N/A	9x SUN2000-450W-P
Inverter	1x SUN2000-2KTL-L1	1x SUN2000-2KTL-L1

More Modules

with Long & Flexible String Design

Comparison Case

11   7   7

Other
Solution

25

HUAWEI
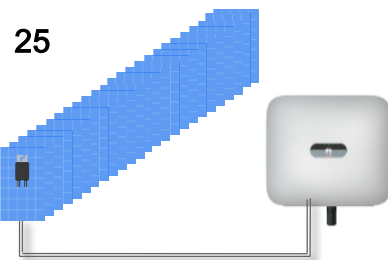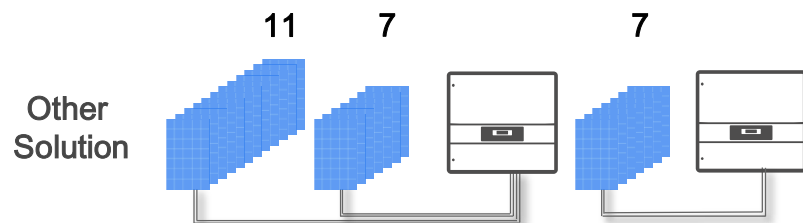
·Max. **200%** DC/AC oversizing for SUN2000- 5KTL-L1 & 10KTL-M1

	SUN2000-2-6KTL-L1	SUN2000-3-10KTL-M1
Maximum DC power per string	5,000 W	10,000 W

Smart String ESS
with Energy Optimizer

A string of battery modules for flexible expansion

Energy optimizer to manage charge/discharge per module independently, supports new and old battery module mixed in one system without usable energy restriction

Power Module

Battery Module
(Built in Energy Optimizer)

LUNA2000-5/10/15-S0

Smart String ESS Solution

Other Modular Battery

HUAWEI

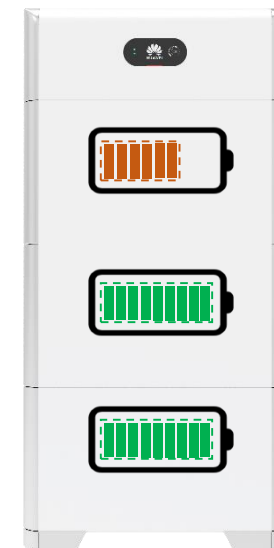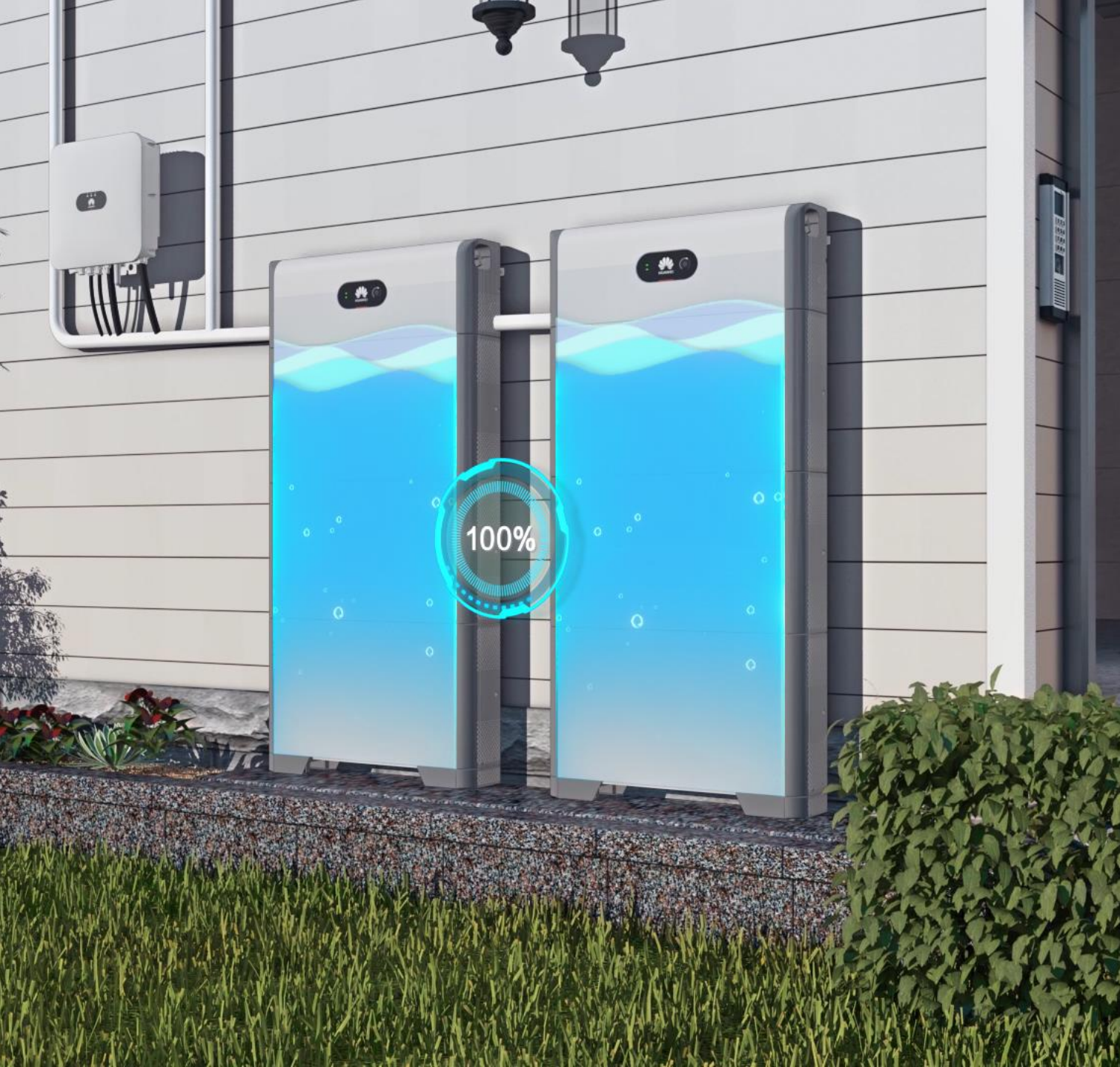|		
60%		60%
60%		100%
60%		100%
60%		
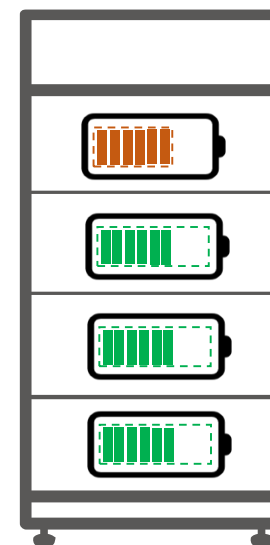
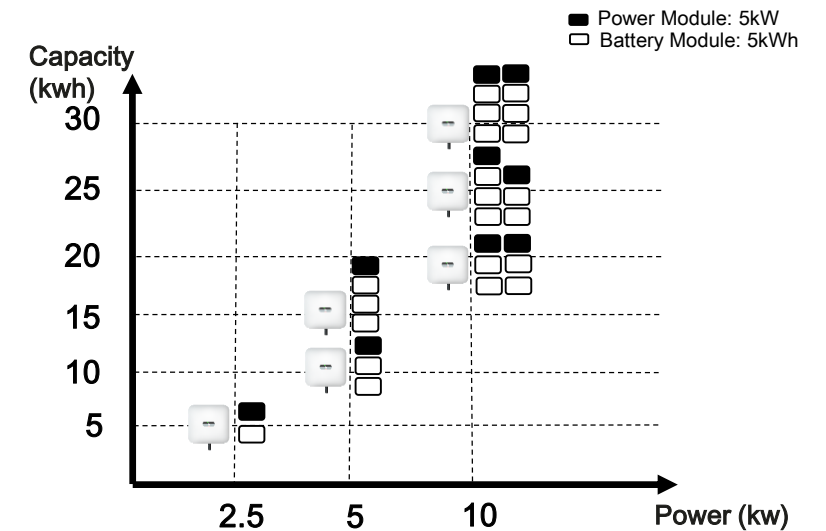SOH   SOC

5-30kWh ESS

50kg Battery Module
Easy for two people installation without extra lift tools

100% DoD
100% depth of discharge, use as much energy as you pay for

Parallel Operating
Supports Max 2 Storage System Operating in Parallel, 5-30kWh

■ Power Module: 5kW
□ Battery Module: 5kWh

2x POWER
Battery Ready
For More Energy

A 5KTL inverter allows **5KW** full power AC output plus **5KW** full power battery charge.

More Daytime Consumption

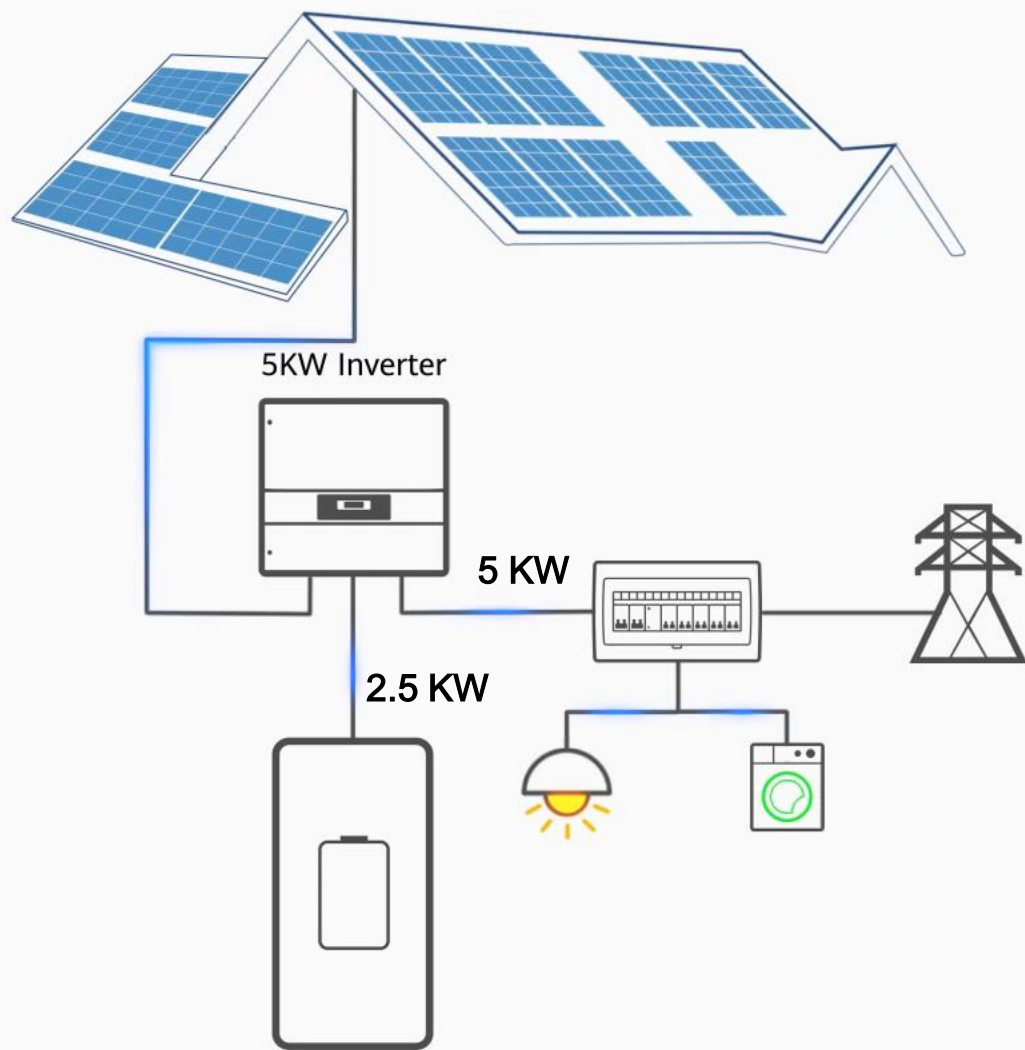- Inverter output full power for daytime energy consumption

More Nighttime Consumption

- Inverter chargers ESS at full power for more nighttime energy consumption

Other PV + Storage Solution
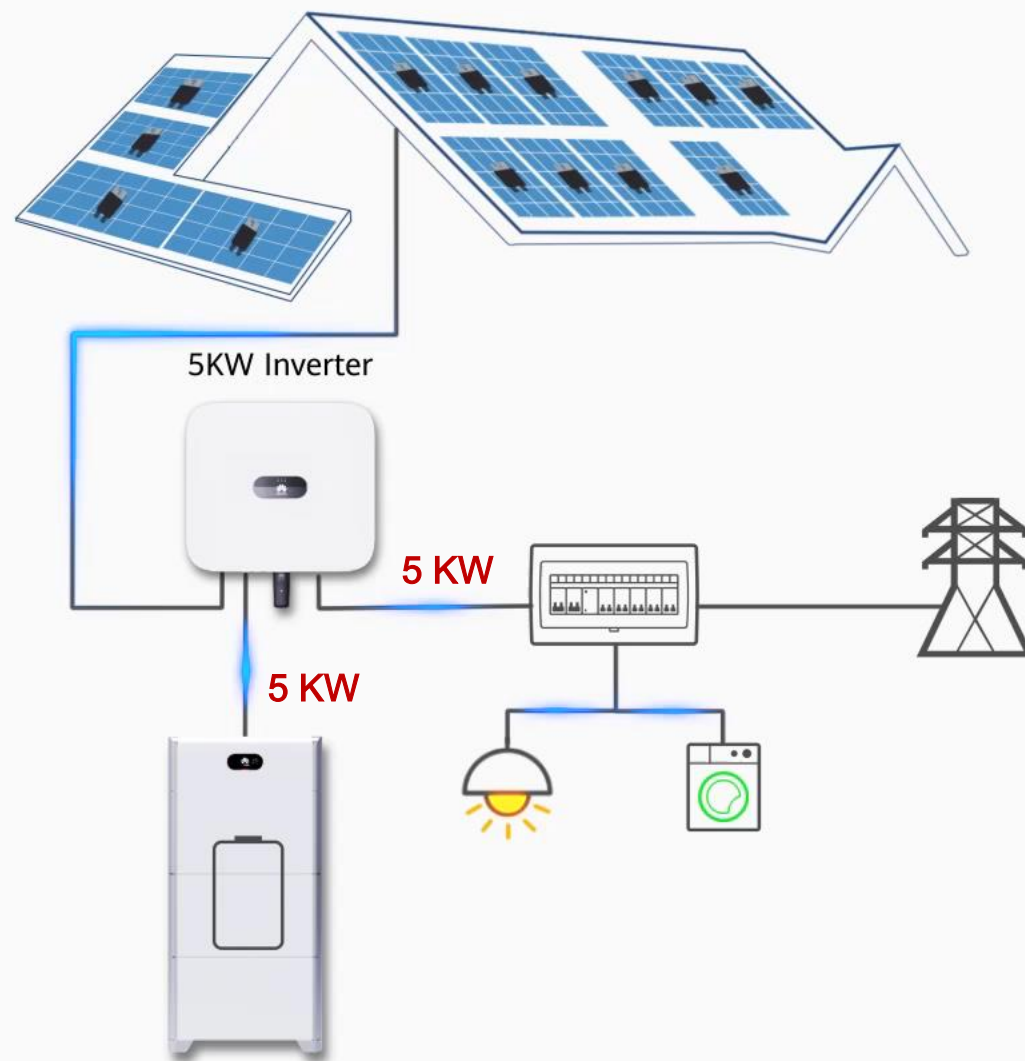
10 KWp PV

5KW Inverter

5 KW

2.5 KW

Battery Energy: 15 kWh

HUAWEI 2x POWER Battery Ready

10 KWp PV

5KW Inverter

5 KW

5 KW

Battery Energy: 15 kWh

Optimal Electricity Cost   **Active Safety**   Better Experience

Electric Arcing Is Threatening the Safety of PV System & Underlying Buildings

What is it?

- electrical breakdown of air that produces an prolonged electrical discharge

What causes Electric Arcing?

- Unreliable soldered joints within modules
- Broken PV cables
- Loosen PV connectors

What is the harm?

Can reach temperature of over 3000°C & easily start a fire

Arc Detection Challenges

Arc noise is generally weak and only accounts for 0.1% of the normal current signal, it is difficult to detect and often leads to missing detection

Inverter/Loads/Grid interference signals, as well as spectral overlay with normal current signal leads to faulty detection

AI Powered

Active Arcing Protection

What is AI Powered AFCI?

- HUAWEI inverter keeps self-learning new arc feature to accurately protect system from arc fault, even under complex noise

Self-learning new arc features with AI model

Accurate arc fault detection via local neural network algorithm

Speedy arc fault protection by inverter shutdown in 0.5s

Arc Feature
Self-learning

Accurate Arc
Fault Detection

Speedy Arc
Fault interruption

Pinpoint Arc
Fault Positioning

AI BOOST

Dc Arc Detection Of PV System (AFCI) TUV Technical Reports (IEC 63027 Draft)

SUN2000-2-6KTL-L1

Comparison	Adaptable Maximum Arc Current	Shutdown Time	Arc Energy	Arc Detection Accuracy	Pinpoint Arc Fault Positioning
IEC Standard	Imax (only 318V)	< 2.5 S	750 J	100%	Not Require
Huawei	Imax (All Voltage Range)	< 0.5 S	500 J	100%	Support*

Huawei AFCI Performance Test Results

1) Meets the IEC 63027 Drafts (TUV Technical Reports).
2) Meets the UL 1699B-2018 Standard.
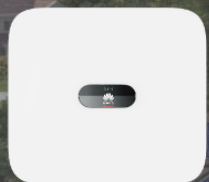
SUN2000-3-10KTL-M1

Projects	Results
Detectable Arc Type	Series Arc
Detectable Arc Fault Position	All Range
System Mode	With Or Without Optimizer
Pinpoint Arc Fault Positioning	Support*

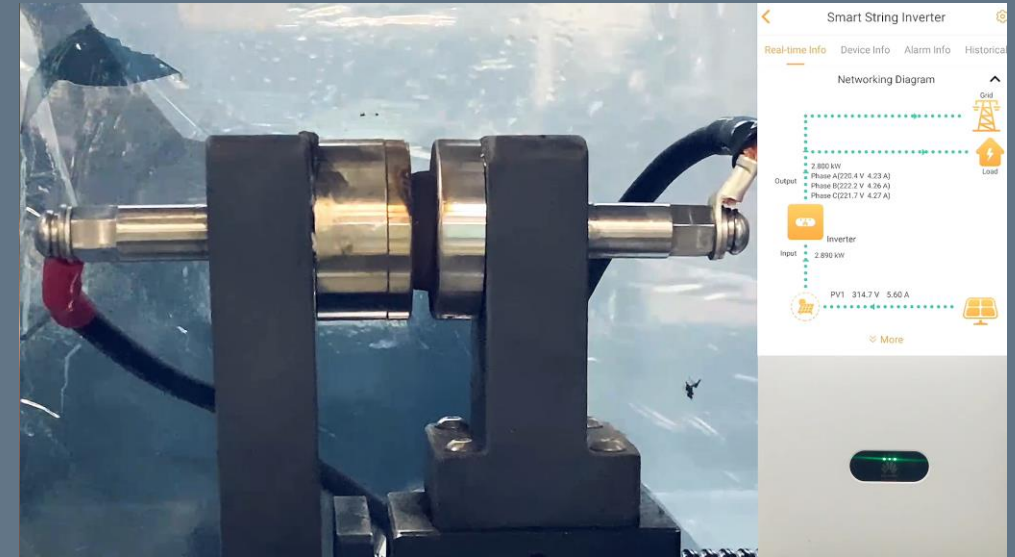| Projects	Results
Adaptable Maximum Arc Current	Imax
Arc Detection Accuracy	100%
Arc Energy	< 500 J
Shutdown Time	0.5 S

* With Optimizer

AI BOOST

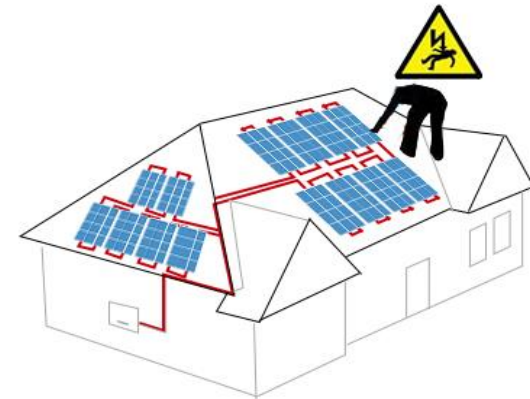AFCI disabled, arcing continuously posing fire risks

VS

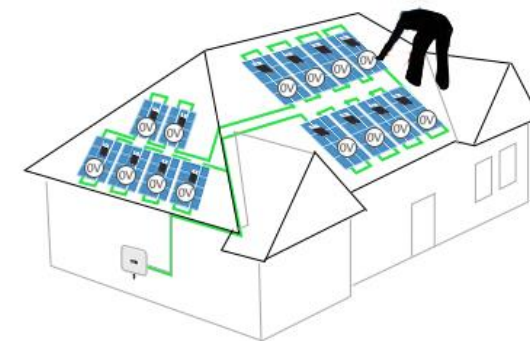AFCI function enabled, arcing extinguished in < 0.5sec

PV Arcing with/without AFCI Comparison

Safe House
with Smart PV Optimizer

Without optimizer: High DC voltage when system shuts down

With optimizer: Each optimizer outputting oV when system shuts down

Pinpoint
Arc Fault Positioning for Easier Troubleshooting

Saving 80% onsite troubleshooting time and cost with accurate arc fault positioning
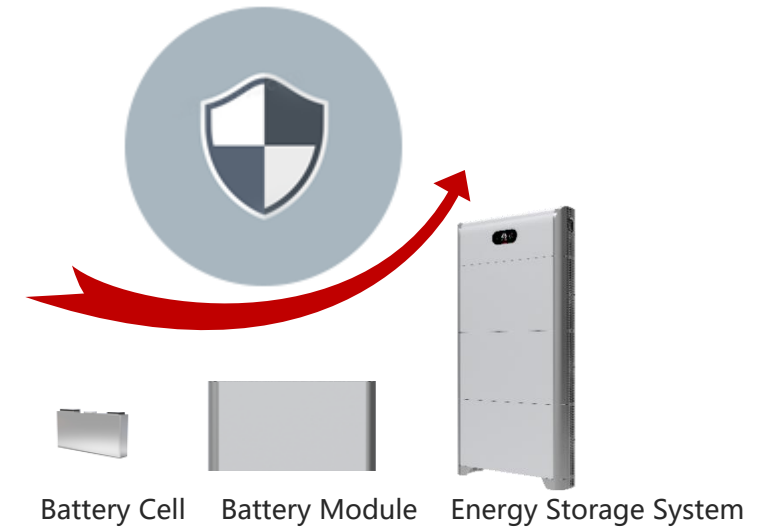
* Manually detection of DC arc fault in a 10KWp residential system usually costs 5hrs. Pinpoint arc fault position report lead to resolve the problem within 30 mins.

Less power loss because of shorter system tripping

3-Layer Protection

Battery Cell   Battery Module   Energy Storage System

Cell Level Protection

- Lithium iron phosphate cell for safe and stable performance

Pack Level Protection

- 8 sensors per pack to supervise operating status

15kWh Battery	HUAWEI	A	B
Sensors per pack	3 x 8 = 24	3	4 x 4 = 16

System Level Protection

- Faulty pack auto isolation, touch safe
- Compliance to the most rigorous safety standard VDE2510
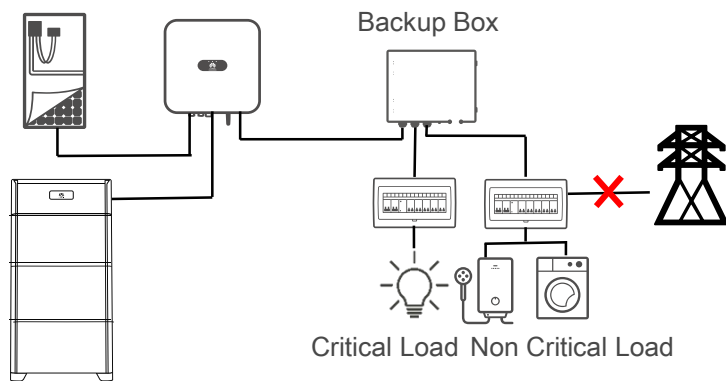
No Worry About Power Outage

With Backup Power

A System switches to backup mode to supply emergent power to critical load automatically when power outage

Smart string ESS supports black start from blackout to restore system operating

Backup Box

Critical Load Non Critical Load

Optimal Electricity Cost   Active Safety   **Better Experience**
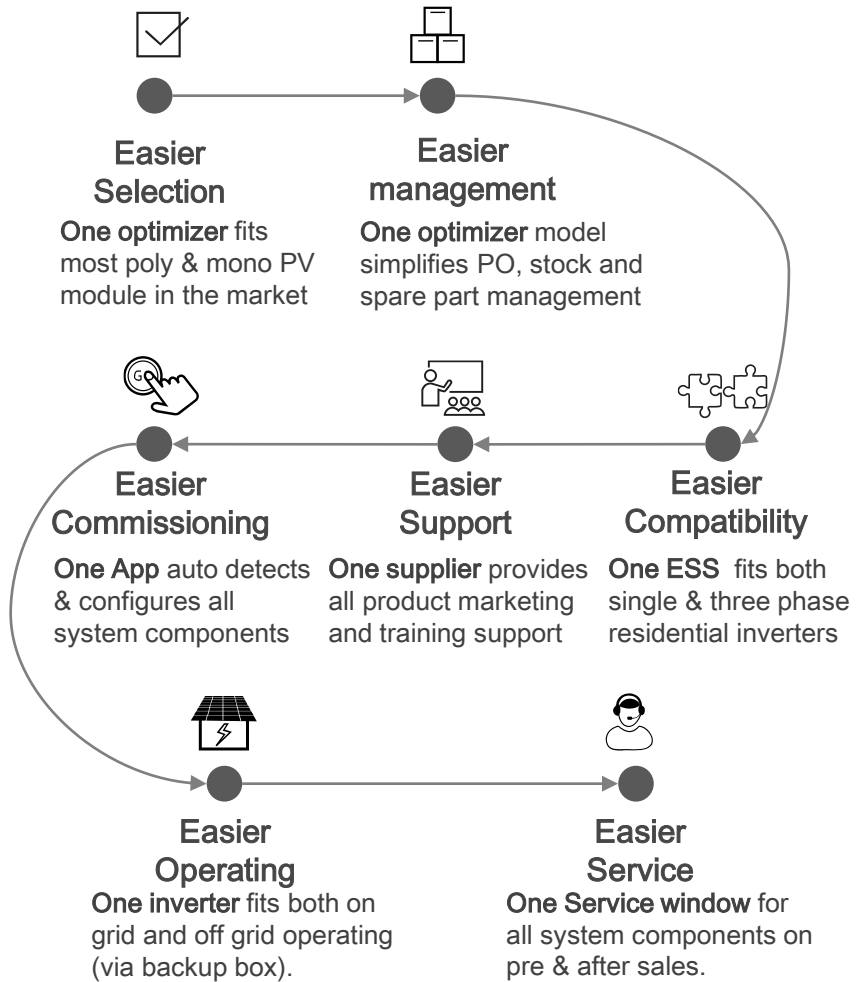
Sleek Design - Waterfall

Smart String ESS
LUNA2000-15-S0

Sleek Design -
Snowbergs surround the lake

Smart Energy Center
SUN2000-2-5-KTL-L1

One-Fits-All

Solution, Easier Business

Easier Selection
One optimizer fits most poly & mono PV module in the market

Easier management
One optimizer model simplifies PO, stock and spare part management

Easier Commissioning
One App auto detects & configures all system components

Easier Support
One supplier provides all product marketing and training support

Easier Compatibility
One ESS fits both single & three phase residential inverters

Easier Operating
One inverter fits both on grid and off grid operating (via backup box).

Easier Service
One Service window for all system components on pre & after sales.

1. One Optimizer

2. One Battery

3. One Inverter

One-Fits-All

4. One APP

5. One Service Window

HUAWEI

Auto Detection
of All System Devices

All inverter connected devices can be automatically detected in FusionSolar app

	HUAWEI Solution	Other Solution
System Setting up Duration	**1.5-3 mins** (Device Auto Detected in App)	15-20 mins (Separated Apps or web tools to add devices manually)

AI BOOST
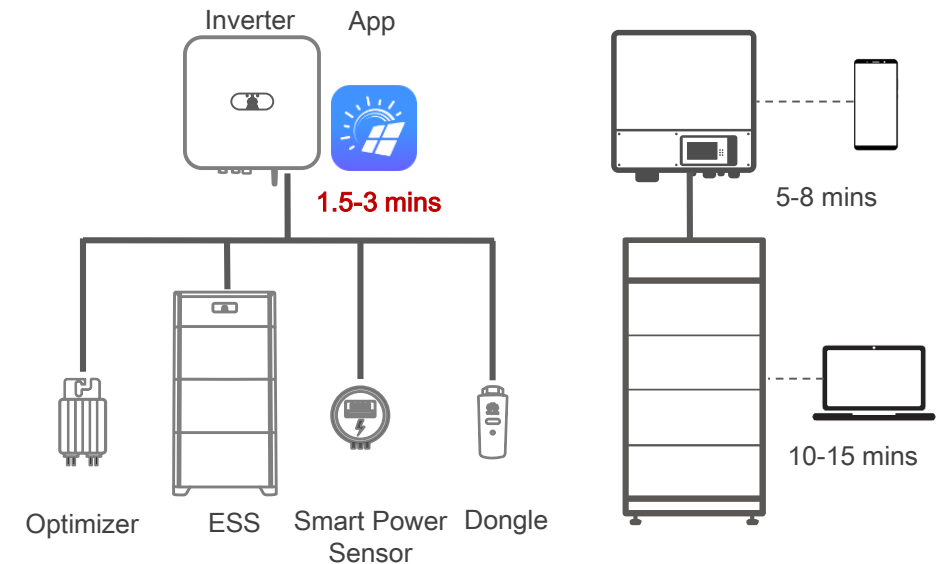
<5sec
Module Auto-Mapping

Operating Steps	HUAWEI Solution	Other Solutions
2D barcode paste on template	Same	Same
Physical layout creation	<5sec (AI powered)	6.5min (manual)
Total configuration time	<1min	6.5min

@15KW system with 40 pcs of PV modules

Saving **86%** configuration time compared with other solutions

Flexible Communication & Power Control for All Scenarios

WLAN-FE Dongle
2 in 1 smart dongle, flexible communication option at Home

4G Dongle
Independent and stable operation , without location and communication constraints

Social Housing

Power Purchase Agreement

Apartment Roof

No Fuse or Other Quick-wear Parts, Inverter Touch Free

Natural Cooling Verified by Telecom & Solar Application*

No Fuse

No LCD

No Button

* For 3–10KTL inverter models

TUV verified: annual failure rate < 0.5%
Inverter availability up to 99.996%

Station Phase II, 200 units, 963 running days	Station Phase III, 4939 units, 583 running days	Station Phase IV, 1790 units, 207 running days
Failure Rate:	**Failure Rate:**	**Failure Rate:**
0.189%	0.252%	0.390%

HUAWEI

Technical Report
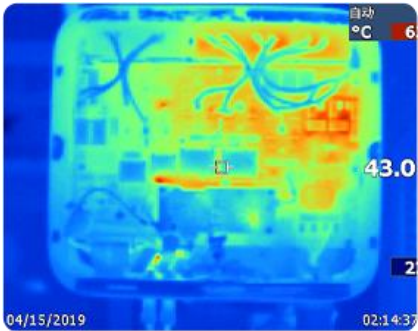
High efficient thermal design to ensure low temperature within enclosure

04/15/2019   02:14:37

- **Visible Power Flow**
- **Module-Level Monitoring**
- **Statistical Indicator**

Real-Time Power Flow   Module Level Monitoring   Self-Consumption & Sufficiency Indicator
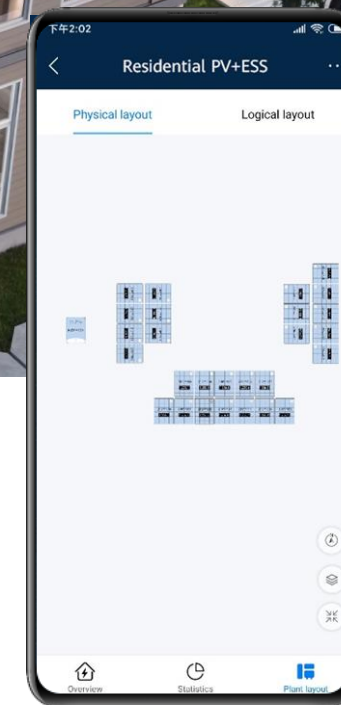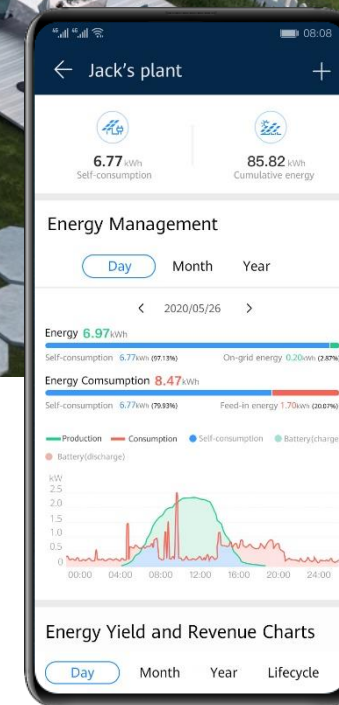
01 Company Introduction

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HUAWEI

Nine Innovative Features of Solution

① Up to 30% More Energy by Optimizers

② String ESS with Energy Optimizer

③ 2x POWER Battery Ready

④ AI Powered Active Arcing Protection

⑤ 0V Module-Level Voltage Shutdown, Touch Safe

⑥ Pinpoint Arc Fault Positioning

⑦ One-Fits-All Solution, Easier Business

⑧ <5s, Module Auto-Mapping

⑨ Natural Cooling, Inverter Touch Free
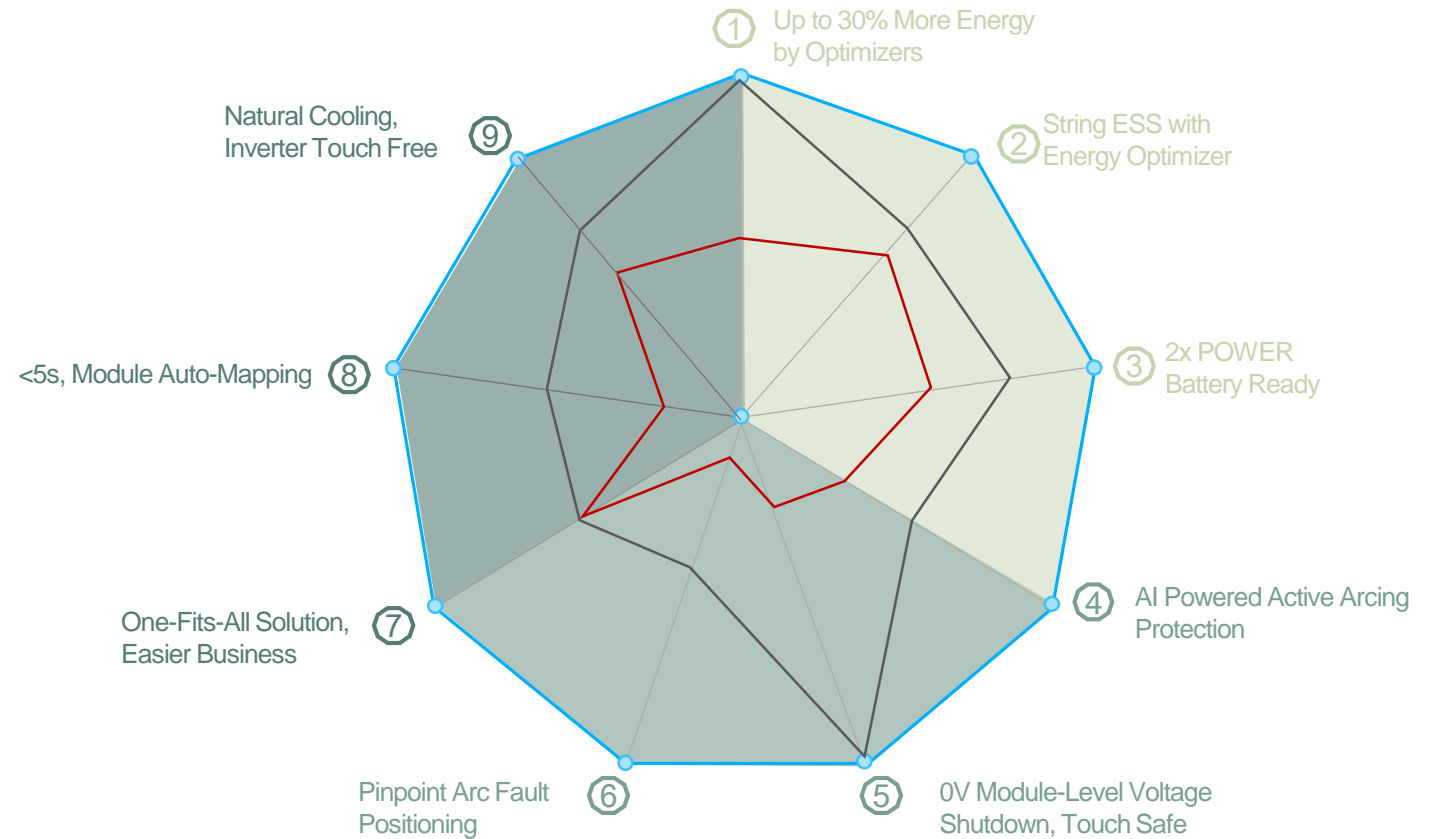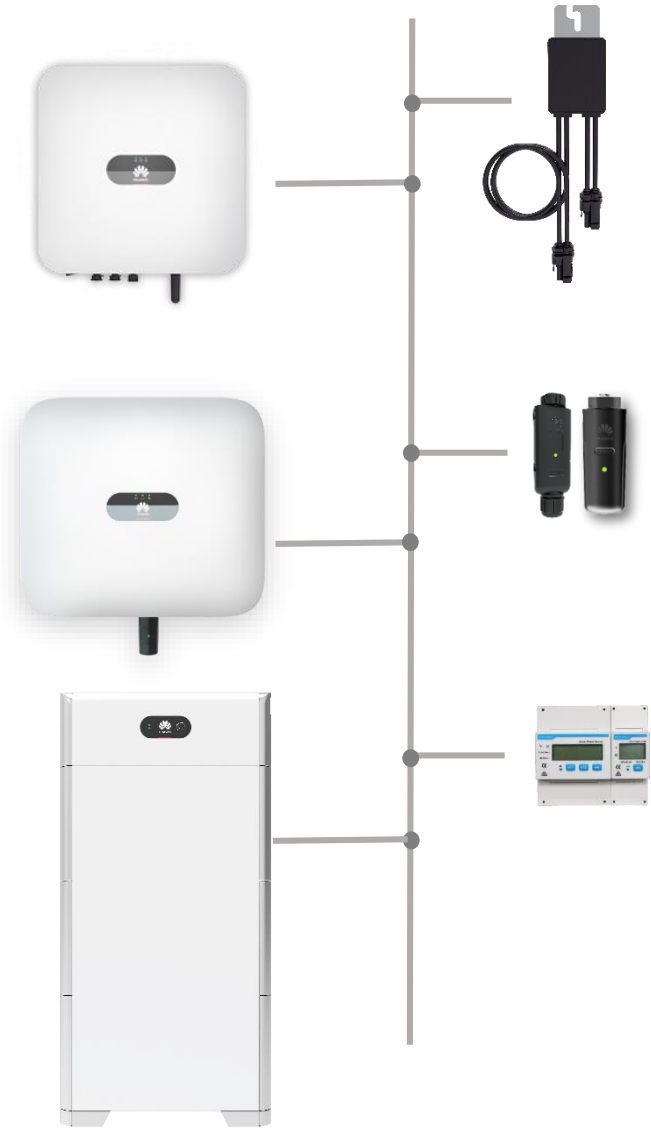
Huawei Solution

A   Other Optimizer Solutions

B   Other Inverter Solutions

Smart Energy Center	Smart Energy Center	Smart String ESS	Smart PV Optimizer	Backup Box	Smart Dongle	Smart Power Sensor	App	Monitoring Portal
SUN2000-2-6KTL-L1	SUN2000-3-10KTL-M1	LUNA2000-5/10/15-S0	SUN2000-450W-P	Backup Box-B0/B1	Smart Dongle-WLAN-FE Smart Dongle-4G	DTSU666-H DTSU666-H 100A DTSU666-H 250A/50mA	FusionSolar App	FusionSolar Cloud

Main Feature Difference	SUN2000-2-6KTL-L1	SUN2000-3-10KTL-M1
Available Time for Shipment	Already Available	Already Available
Compatible with HUAWEI new optimizer SUN2000-450W-P	√	√
LG Chem battery compatible	√	
HUAWEI LUNA2000 string battery compatible	√	√
WLAN-FE dongle compatible	√	√
4G dongle compatible	√	√
Active arc fault protection	√	√
Pinpoint arc fault positioning	√	√
Integrated PID recovery		√
Backup function availability	√	√

Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。

Bring digital to every person, home, and
organization for a fully connected,
intelligent world.