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Sungrow

18 September 2023

10:00 am – 11:00 am | BST, London

11:00 am – 12:00 pm | CEST, Berlin, Paris

12:00 pm – 1:00 pm | EEST, Athens



Tristan Rayner

Editor
pv magazine

pv magazine
webinars

Evolution of the “1+X” modular inverter




Glen Sochackyj

Product Manager
Sungrow Europe

Welcome!

Do you have any questions? ? 

Send them in via the Q&A tab.  We aim to answer as many as we can today!

You can also let us know of any tech problems there.

We are recording this webinar today. 

We'll let you know by email where to find it and the slide deck, so you can re-watch it at your convenience.  



SUNGROW
Clean power for all



SUNGROW EUROPE

GET TO KNOW A LEADER
IN CLEAN POWER CONVERSION TECHNOLOGY



THE WORLD'S NO.1

IN BANKABILITY*

For 4 consecutive years

*BloombergNEF, 2022

SUNGROW
Clean power for all

Mission For A Cleaner Future



297* mil. Ton/Year

CO₂ Reduction



119* mil. Ton/Year

Coal Equivalence



371,300* GWh /Year

Clean Power Generation



405 GW

All inverters Installed

* Data as of June 2022

RE100

All production covered by Clean Energy in 2028

EP100

Energy Productivity increase before 2028



Join UNGC Campaign



Realizing Sustainable Development Goals

WHAT WE DO

CLEAN TECH ENERGY TO POWER THE WORLD



PV
INVERTERS



ENERGY
STORAGE
SYSTEMS



PROJECT
DEVELOPMENT



EV
CHARGING
SOLUTIONS



HYDROGEN

SUNGROW EMEA EXPERTISE

SUNGROW EMEA R&D



GLOBAL PRESENCE

20+

Subsidiaries

370+

Service Outlets

405 GW





Inverters Installed

150+

Countries

100000+

Employees

-  Headquarters
-  Factories
-  R&D Centers
-  Branches



SUNGROW EUROPE


20 GW DEPLOYED IN THE REGION

3 
Repair Centres

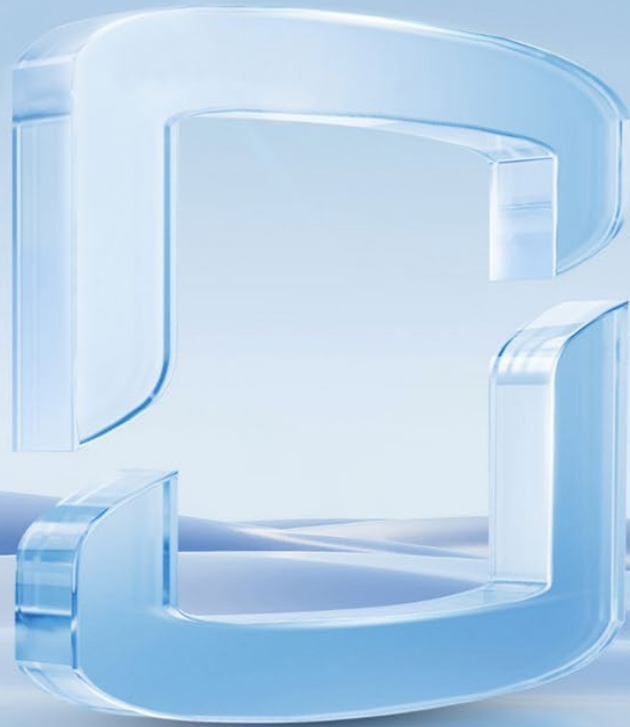
7 
Local warehouses

2 
Training Academies

10 
Subsidiaries

 Local offices or representatives





“1+X” Modular Inverter

Lecturer : Glen Sochackyj 2023.09.18

DEVELOPMENT ORIENTATION OF THE PV INDUSTRY

REDUCING COSTS AND IMPROVING EFFICIENCY

High LCOE

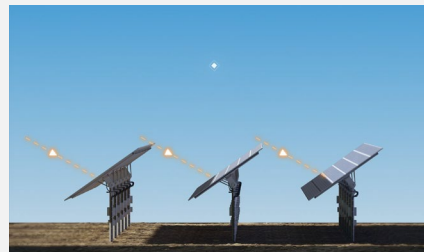
Traditional Scheme



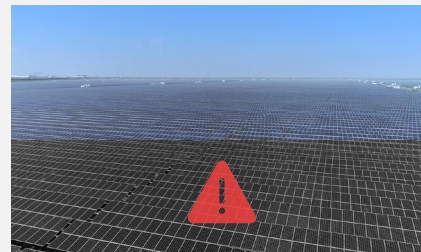
High Cost



Difficult to Build Plants
on Rough Terrains



Low Generating
Efficiency



Huge Fault Loss



“1+X” MODULAR INVERTER

BOASTING THE ADVANTAGES OF BOTH STRING INVERTERS AND CENTRALIZED INVERTERS

The power of a single unit is 1.1MW. Users can configure 1.1 MW–8.8 MW subarrays through parallel connection of multiple units, which enables flexible plant building and convenient O&M.

Lower LCOE

**Comprehensive
Safety Protection**

**Reliable Grid
Support**



01 LOWER LCOE

Lower Cost

- Large subarrays + DC MPLC
- Support long strings
- DC coupling of PV & ES
- Intelligent disconnection of MV transformers at night

Higher Yield

- Multiple MPPT improves yield on rough terrains
- Intelligent tracking bracket joint control algorithm improves yield by 1%
- Off-grid commissioning ensures earlier generation and higher yield

Easy O&M

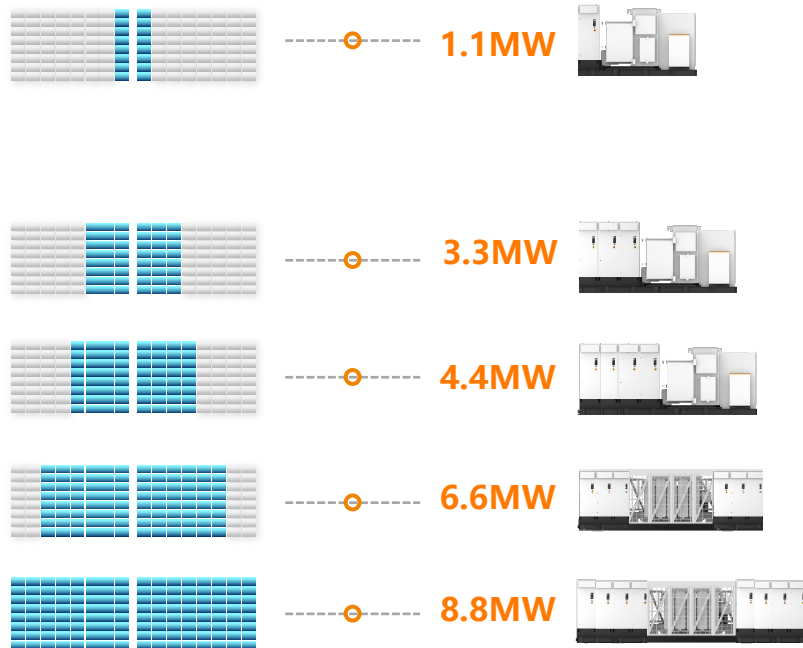
- Modular units reduce fault losses by 95%
- Modular components increase O&M efficiency by 70%
- Smart IV diagnosis, more accurate than manual inspection



MODULAR UNITS ENSURE FLEXIBLE PLANT BUILDING

Flexible Subarray Configuration

1.1MW single unit, supporting parallel connection
Flexible construction of 1.1~8.8MW subarrays in accordance with scheme requirements



Applicable to Multiple Terrains

Configure subarrays of different scales for various terrains
Dual optimization in subarray scale and system costs



Flat Ground ✓



Hills ✓



Water Surface ✓



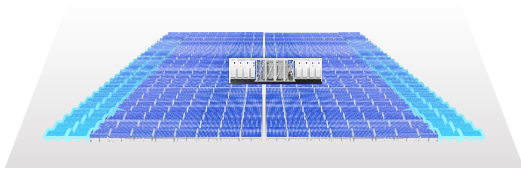
More Scenarios ✓



LARGER SUBARRAYS + DC MPLC, REDUCING INVESTMENT BY \$ 0.18 MILLION

Larger Subarrays

8.8MW Subarray



Compared with the 3.125MW system
It reduces transport, cable, and
construction costs

DC MPLC



High Adaptability & Reliability

- Support all mainstream cables
- No cross interference for host/client communication
- 1km far distance communication

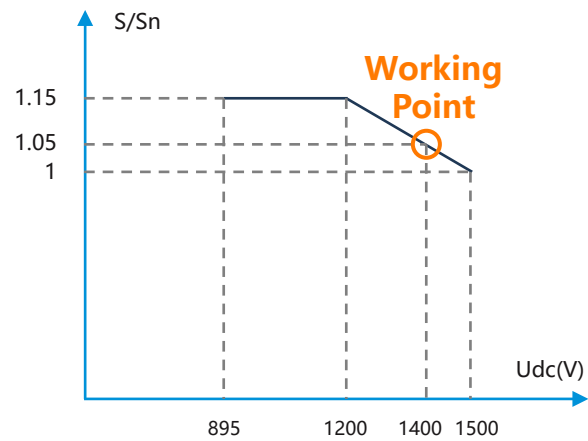
Shorter Construction Period

**Easy to Maintain
for over 25 years**



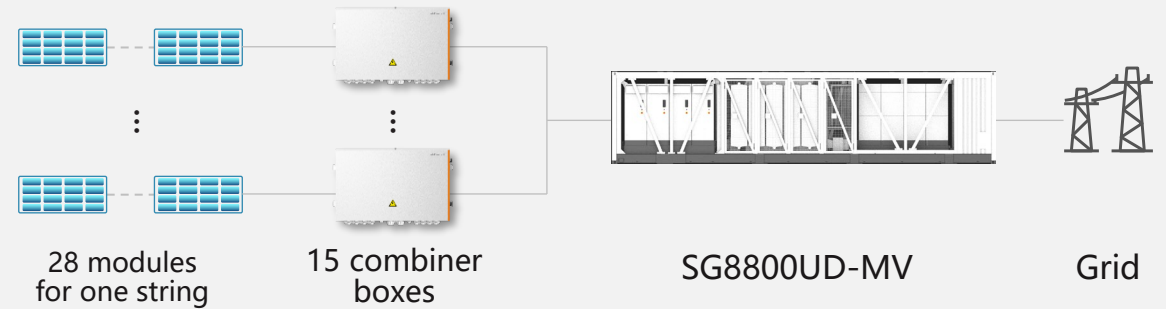
SUPPORT LONG STRINGS, SAVING INVESTMENT

No Derating Under High Voltage



DC Overvoltage Derating Curve

Long Strings



BOS Cost Reduced

Save the cost of combiners and cables

Bracket Cost Reduced

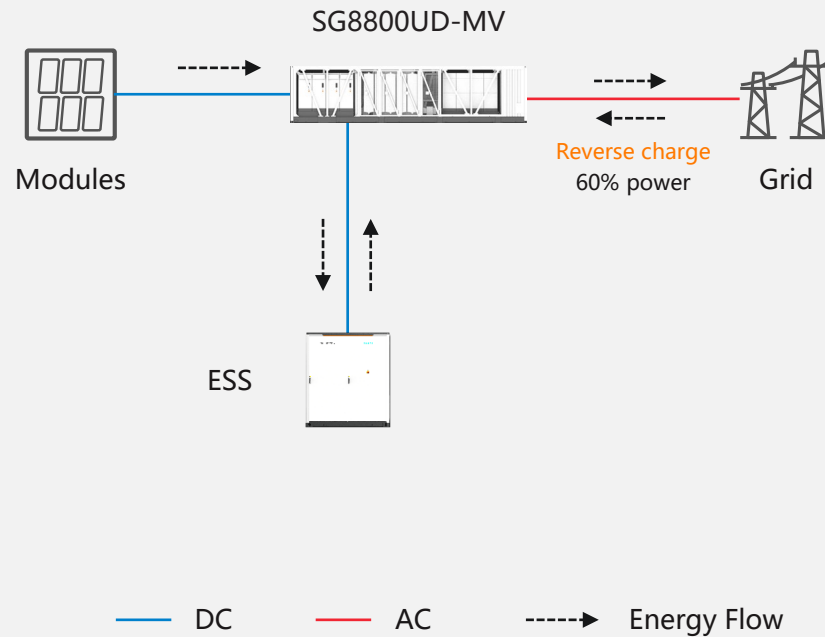
Reduce the number of brackets

DC COUPLING OF PV & ES SAVES COSTS

Support DC/AC ratio of **2.0**

Supported ES power configurations :
30%-95% (0.5C)
15%-95% (0.25C)

Supported ES capacity configurations:
60%-185% (0.5C)
60%-375% (0.25C)



Save Costs

No need of extra PCS and MV equipment
Save equipment and construction costs

Increase Cycle
Efficiency by **2-3%**

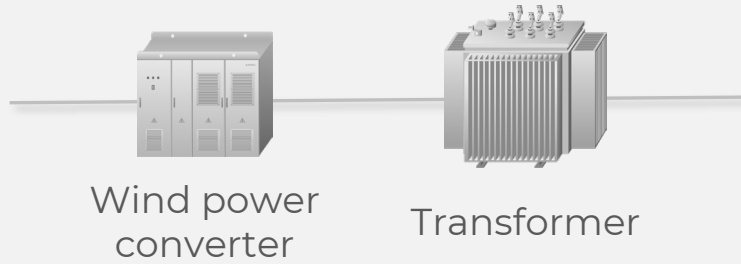
Smooth Output for
PV Generation

AC COUPLING OF PV & ES

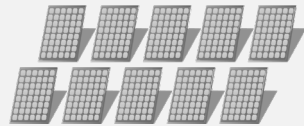
Wind power system



Wind turbine



PV system



Module



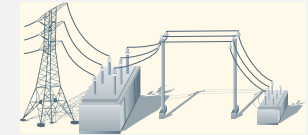
Energy storage system



Lithium battery system

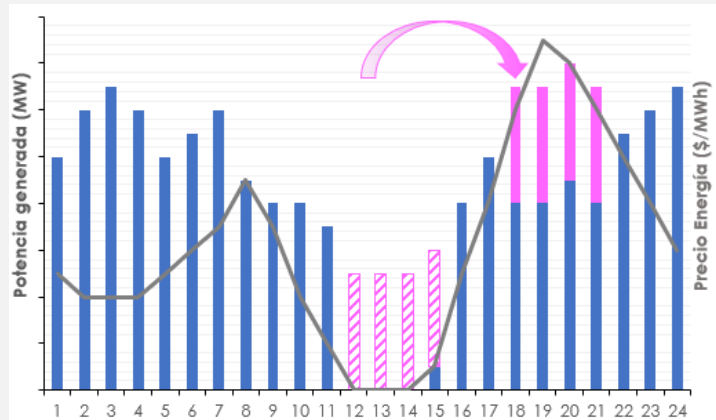


10 - 35 kV



BESS GENERAL APPLICATIONS

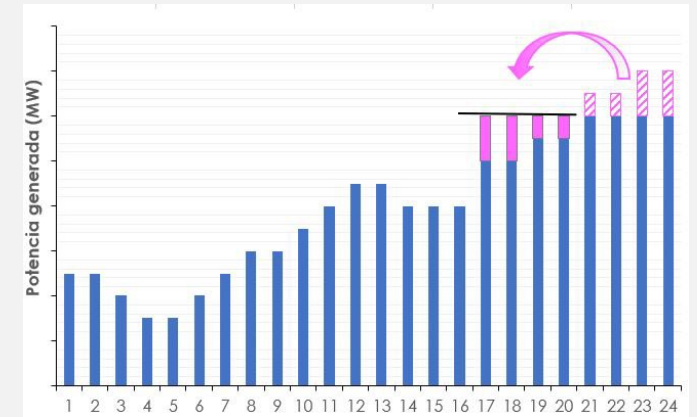
Energy Shifting



Curtailment



Firming



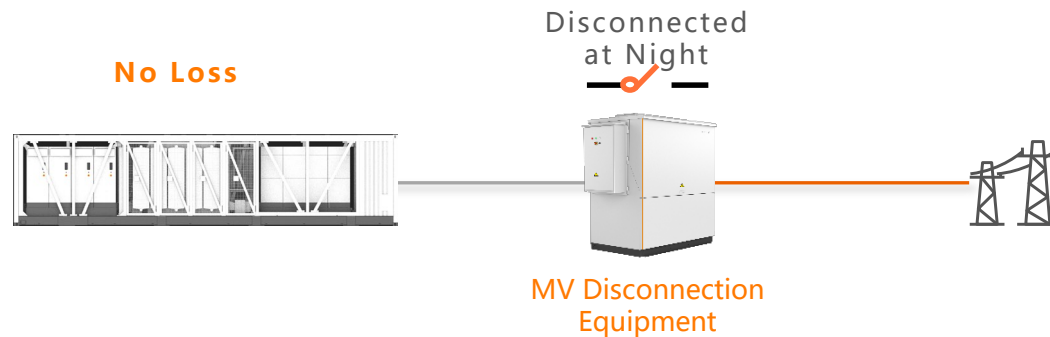
MV TRANSFORMER: INTELLIGENT DISCONNECTION

FOR COST SAVING DURING THE NIGHT

MV Disconnection

Save Electricity Cost

The MV transformer is disconnected at night, causing no power loss



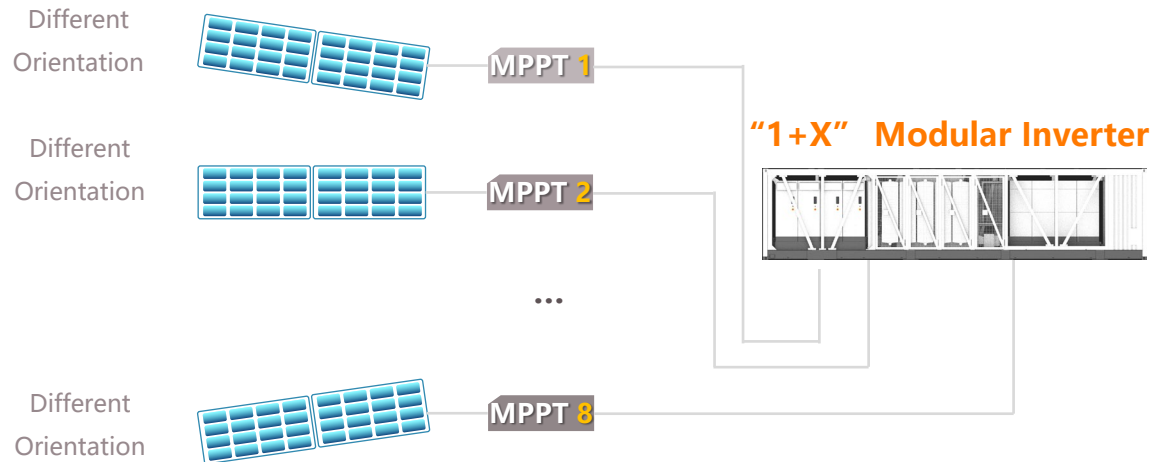
- ✔ "No inrush current" closing in the morning
- ✔ Service life: 25 years
- ✔ Reduce plant power consumption



HIGHER YIELD ON ROUGH TERRAINS

MULTIPLE MPPTS AS SOLUTION

8.8MW Subarray, 8 MPPTs



Module Orientation is not Affected by the Terrain

Orientation can be set in accordance with the terrain for each MPPT

**Independent Optimization
No Mutual Interference**

Occlusion of a single MPPT will not affect others



INTELLIGENT TRACKING

BRACKET JOINT CONTROL ALGORITHM IMPROVES YIELD BY 1%

Dynamic Verification Close-Loop Adjustment

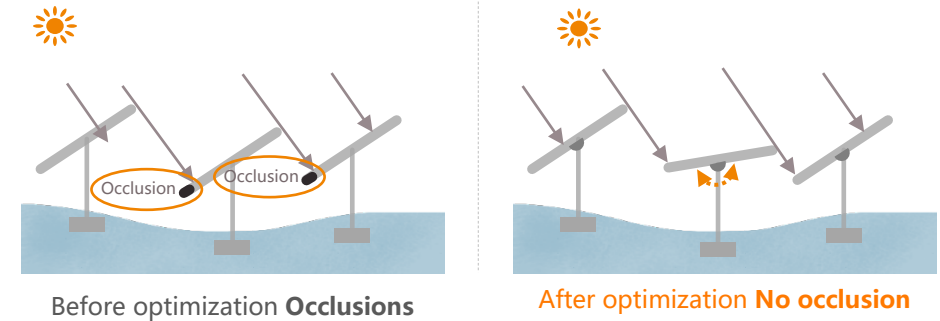
Verify the optimal angle in accordance with generation data
Correct angles dynamically, increase yield in multiple scenarios

Open Platform Distinct Responsibility

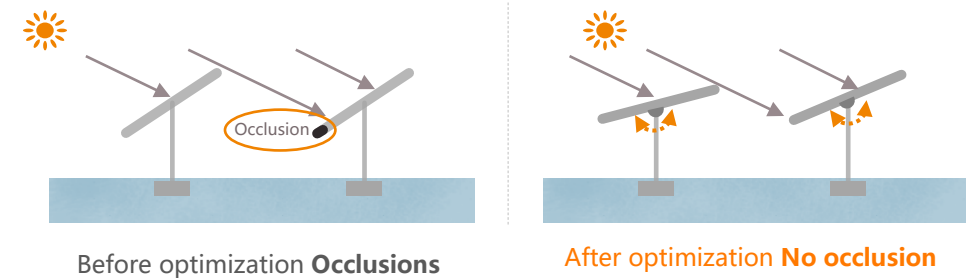
Bracket angles are provided by the inverter and adjusted by bracket controllers



Optimized algorithm can prevent occlusions in complex terrains



Optimized algorithm can prevent occlusions When solar elevation angles are small in mornings and evening



OFF-GRID COMMISSIONING

ENSURES EARLIER GENERATION AND HIGHER YIELD

Traditional Power Supply Modes



Purchase energy from the grid

Require extra wiring
difficult and time-consuming



Diesel gensets

Require frequent movement
laborsome and time-consuming

Sungrow Scheme: Off-grid Commissioning



L LV Mode

Supply power
for tools

H HV Mode

Equipment
commissioning

Shorten Plant Construction Periods

No need of diesel gensets
System commissioning in advance

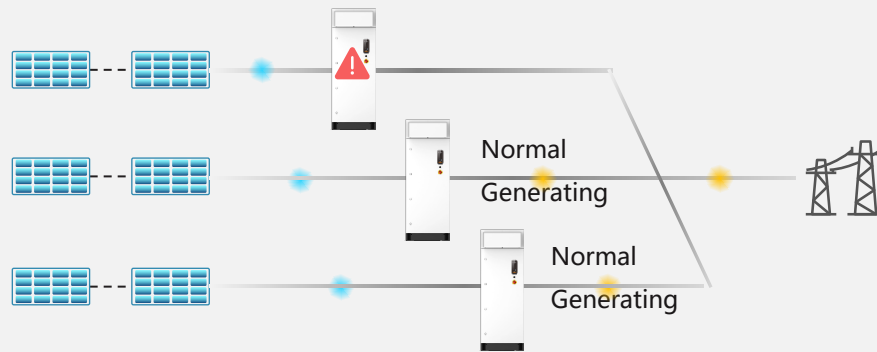
Increase O&M Efficiency

No need of extra voltage source
for inspection and maintenance

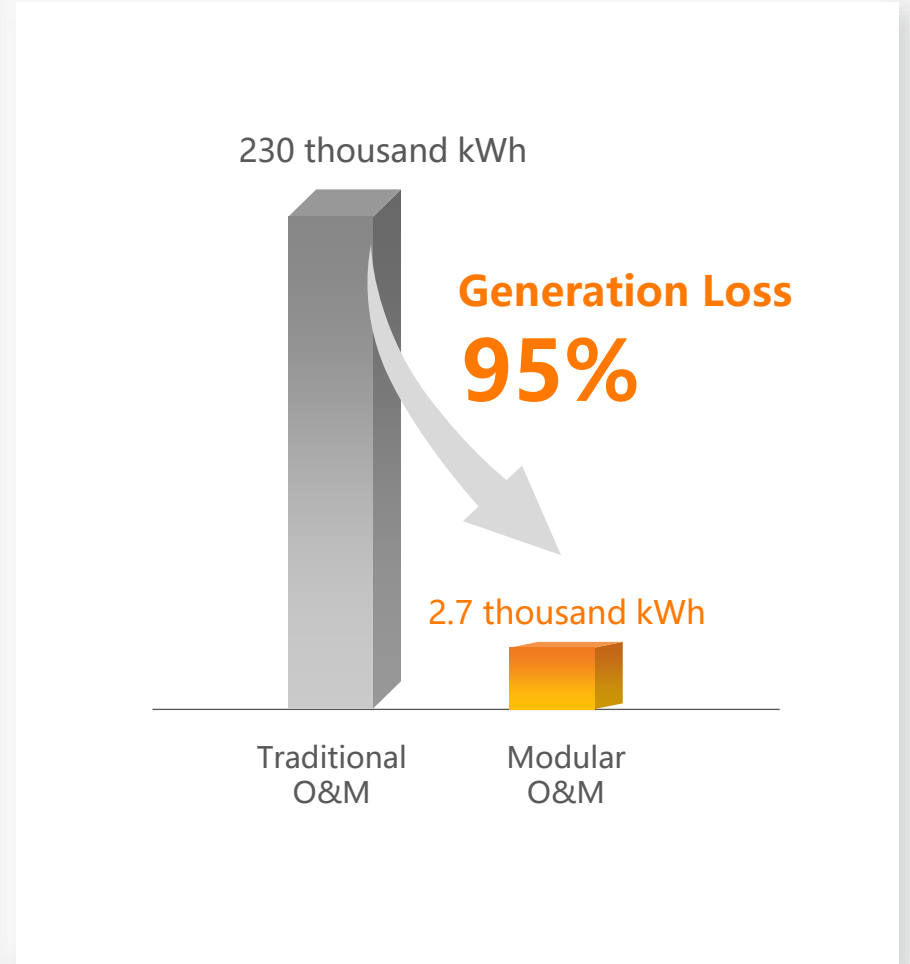
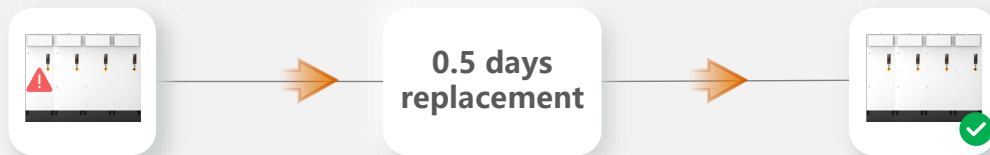


MODULAR UNITS REDUCE FAULT LOSSES BY 95%

1 Faults of a Single Unit Won't Affect Others



2 Fast Replacement with Standby Machines, Low Generation Loss



Note: the replacement time for tradition O&M is regarded as 15 days

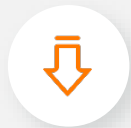
MODULAR COMPONENTS INCREASE O&M EFFICIENCY

Modular Component Design: **More Efficient O&M**



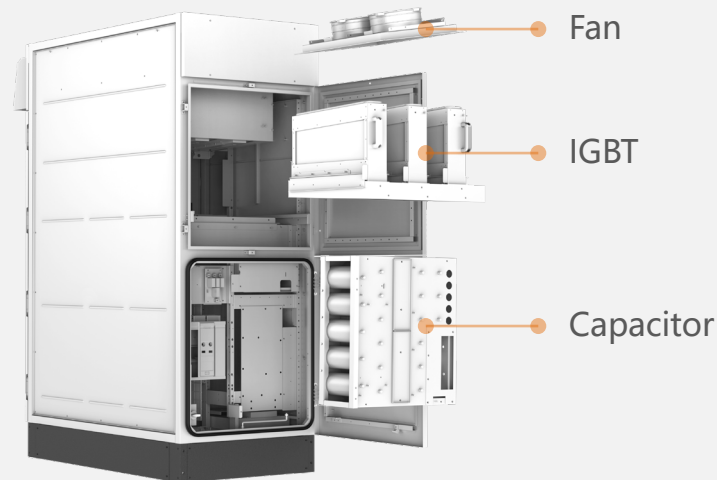
Plug and Play

No need of professional maintenance personnel



Less Time for Replacing

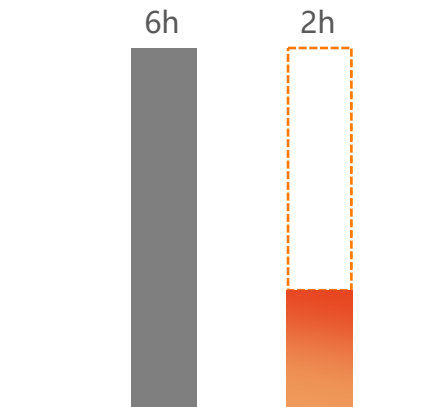
Shortened from 6h to within 2h



Replacing efficiency up by

▲ 70%

Time for changing spare parts



Traditional Modular

SMART IV DIAGNOSIS, MORE ACCURATE THAN MANUAL

Accurate and Efficient

- Support one-touch start, and analysis of 13 fault types
- Scan completed within 15 min, accuracy $\geq 95\%$



*Exemplified with a 100 MW plant

Improve Revenue

- No manual or downtime inspection
- Early discovery of hazards increases yield



Smart Detection

- ✓ No manual or downtime inspection

VS

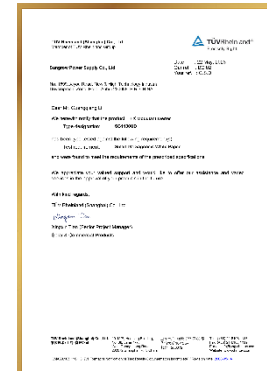


Manual Inspection

- Labor cost
- Generation loss

Safe and Reliable

- Support fault detection and alarms of short-circuit, hot spots
- Support data export, risk handling guidance, improving plant safety



TÜV Rheinland Certification

02 COMPREHENSIVE SAFETY PROTECTION

- Real-time DC parallel arc faults monitoring safeguards plant safety
- Fault pressure relief design ensures personal safety
- Independent cavity design ensures efficient heat dissipation
- IP65 protection, C5 anti-corrosion, applicable to all harsh weather conditions



REAL-TIME DC PARALLEL ARC FAULTS MONITORING SAFEGUARDS PLANT SAFETY

Real-Time Monitoring
Quick Disconnection

Synchronous Linkage
Risk Prevention



- Detect and eliminate arc faults

- Send Fault Signals to the Inverter

- Linked with Combiner Boxes in the Subarray

The First DC Parallel Arcing Detection Certificate

CGC L4 Certificate



FAULT PRESSURE RELIEF DESIGN

ENSURING PERSONAL SAFETY

Fault Pressure Relief Design **Safe and Reliable**



Strong Lock

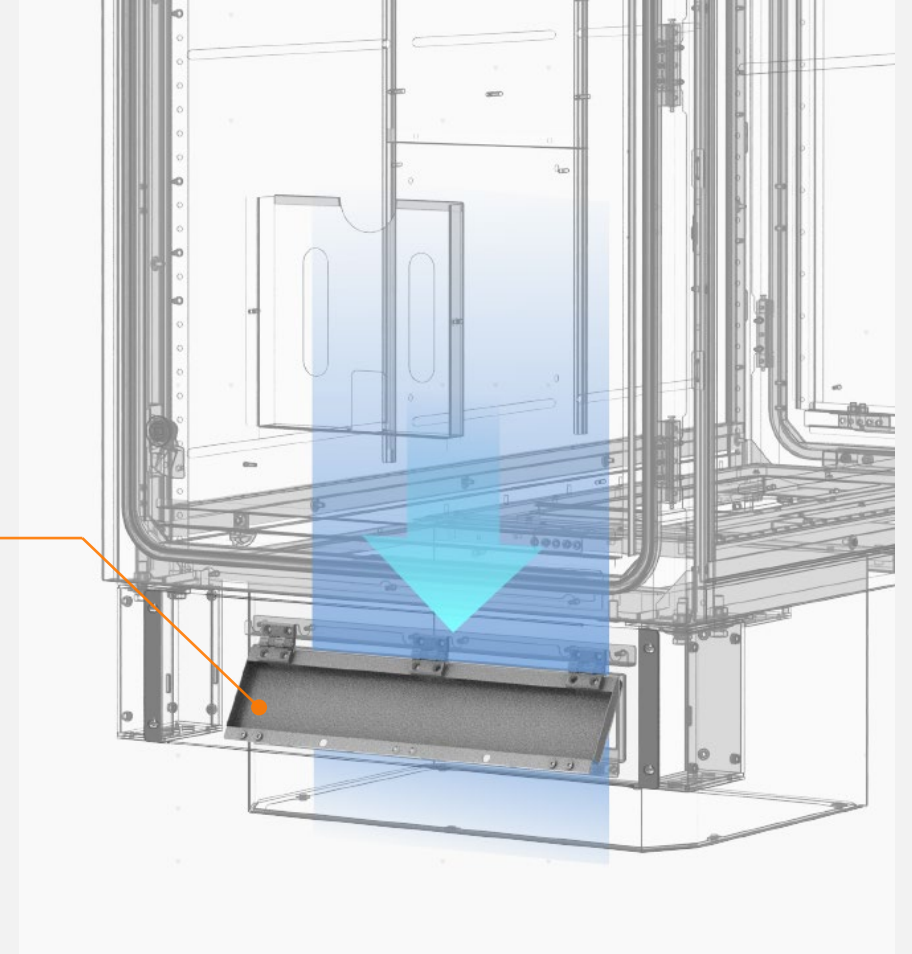
Explosion-proof lock can prevent cabinet doors from flying out



Reliable Fault Pressure Relief

Tailor-made doors ensure fast pressure relief when faults occur

Pressure relief door

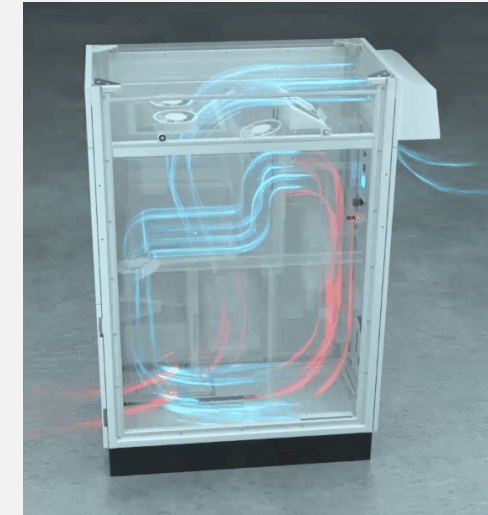
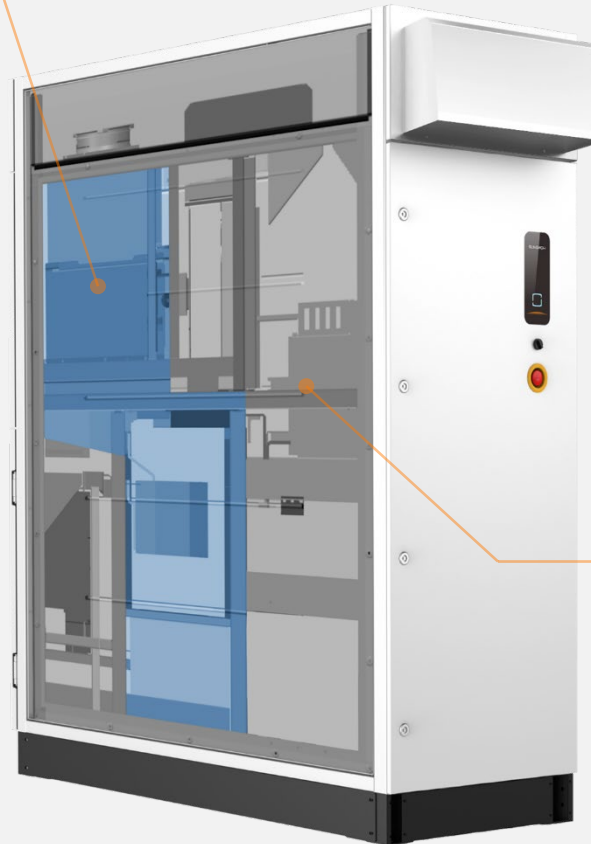


INDEPENDENT CAVITY DESIGN

ENSURING EFFICIENT HEAT DISSIPATION

Power Cavity: **Direct Ventilation**

- Front inlet and back outlet
- Separate ducts for cold and hot air
- Core module components are at the cold air zone



Electronic Cavity: **Heat Exchanger**

- Heat exchanger on the top
- Intelligent temperature control
- Independent internal and external heat dissipation cycle

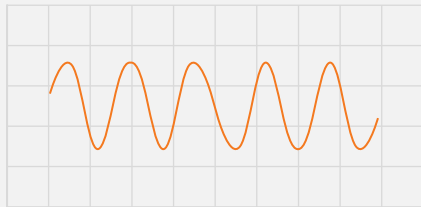


03 RELIABLE GRID SUPPORT

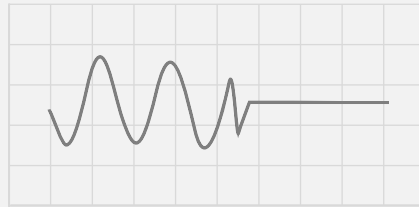
- Stable Operation Under SCR = 1.018 Weak Grid
- No Disconnections During UHV and Continuous HVRT and LVRT
- Quick Active/Reactive Power Response to Grid Dispatch within 20ms, Meet Panoramic Monitoring Requirements

STABLE OPERATION UNDER SCR = 1.018

WEAK GRID



Stable Grid Connection with this Technology



Oscillated Shutdown without this Technology

First Enterprise Passed CEPRI test

SCR=1.018

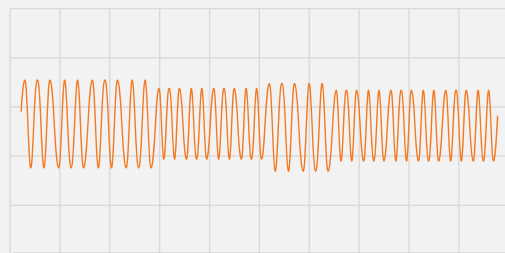
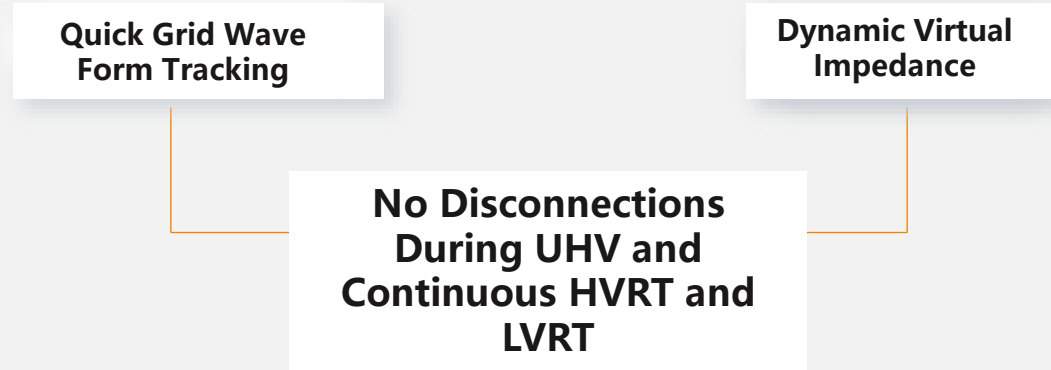
SUNGROW

- Low (zero) voltage ride through ✓
- High voltage ride through ✓
- Active power control ✓
- Current harmonic detection ✓



NO DISCONNECTIONS DURING UHV

AND CONTINUOUS HVRT AND LVRT



Stable operation under continuous H/LVRT with this technology



Oscillated shutdown without this technology



QUICK ACTIVE/REACTIVE POWER RESPONSE

TO GRID DISPATCH WITHIN 20MS TO MEET PANORAMIC MONITORING REQUIREMENTS



- Active response time $\leq 20\text{ms}$
- Reactive response time $\leq 20\text{ms}$
- Provide up to **60%** of reactive power

Meet Panoramic Monitoring Requirements

The response time is better than standard requirements

Meet Reactive Power Compensation Specifications

All inverters support SVG to provide reliable grid support whenever necessary, thereby avoiding losses



FOR MORE INFORMATION, DON'T HESITATE TO CONTACT ME:

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THANK YOU
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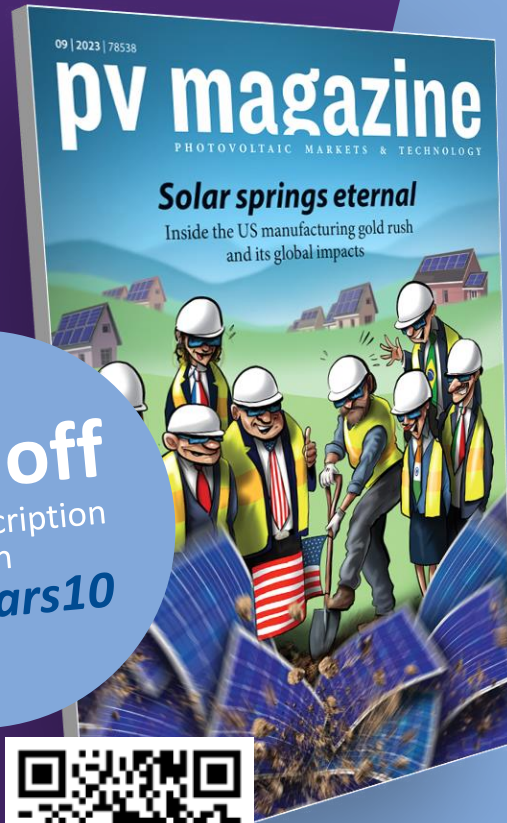
Q&A



Glen Sochackyj

Product Manager
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Wednesday, 20 September 2023

10:00 am – 11:00 am EDT, New York City

4:00 pm - 5:00 pm CEST, Berlin, Paris, Madrid

Monday, 25 September 2023

10:00 am – 11:00 am CEST, Berlin, Paris, Madrid

6:00 pm – 7:00 pm AEST, Sydney

Many more to come!

BESS
diagnostics for
holistic
lifecycle
management

**Prospects of
bringing
together PV,
storage and
EV charging**

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