OPTIMIZE YOUR SOLAR ROI

& GUARANTEE SAFETY IN THE CONTEXT OF SOUTH AFRICA'S NEW 100MW THRESHOLD

SPEAKER: SCOTT CORRY
MEMBER'S RESOURCES

AND BENEFITS

AFSIA SERVICES

B2B MATCH-MAKING
WHOS WHO INTERVIEW
TENDERS DATABASE
JOB PORTAL

COMPANIES DATABASE
EVENTS PROMOTION AND MANAGEMENT
PROJECTS DATABASE
WEBINARS & PRODUCT SHOWCASE
THE TEAM

INÈS
TEAM MANAGER
INDUSTRY NEWS

ALINE
MARKET
INTELLIGENCE

VESTINE
RESEARCH &
NEW PROGRAMS

JOSÉE
COMMUNITY
MANAGEMENT

LÉONCIE
EVENTS
MANAGEMENT
AFSIA ACTIVITIES HIGHLIGHTS - 2021

**Prime**
- Launch Annual Outlook Report
- Green Hydrogen opportunity for Africa
- Latest tech updates for large-scale solar (LONGi)
- POSTPON EDConference: DRC Solar Trade Mission
- 26 AUG Optimize ROI with SA 100MW threshold
- 20 SEP AFSIA Solar Quiz
- 16 NOV AFSIA Solar Awards
- 18 JAN Launch Annual Outlook Report

**Showcase**
- Innovative financing for African solar
- Sun meets Water
- Trina Solar
- Jinko Solar
- C&I in SADC countries (Segen Solar)
- PV-diesel hybrids in Nigeria (Elum)
- Irrigation solaire (FR)
- Solar for health care
- Studer Innotec
- SustainSolar
- MG Asset Financing
- 1 SEP Segen Solar Portal
- 28 OCT Antaisolar trackers
- 2-3-4 NOV Focus on Storage
- 14 DEC EV+PV in Africa

**Webinar**
- Irrigation solaire (FR)
- Latest tech updates for large-scale solar (LONGi)
- POSTPON EDConference: DRC Solar Trade Mission
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**External**
- WAPECC Africa Infrastructure
- 26 AUG Optimize ROI with SA 100MW threshold
- 20 SEP AFSIA Solar Quiz
- 16 NOV AFSIA Solar Awards
- 18 JAN Launch Annual Outlook Report

**Event Details**
- **Africa Energy Indaba**: UL MEA Conference
- **Solar Power in Africa**: WAPECC Africa Infrastructure
- **9th HOMER Microgrid and Hybrid Conference**: Microgrid Global Innovation Forum
- **AFSIA Solar Awards**: AFSIA Solar Awards
- **AFSIA Solar Quiz**: AFSIA Solar Quiz
- **Optimize ROI with SA 100MW threshold**: Optimizing ROI with SA 100MW threshold
- **AFSIA Solar Quiz**: AFSIA Solar Quiz
- **16 NOV AFSIA Solar Awards**: AFSIA Solar Awards
- **18 JAN Launch Annual Outlook Report**: Launch Annual Outlook Report
Optimize Your Solar ROI

& Guarantee Safety in the Context of South Africa's New 100MW Threshold

Speaker: Scott Corry

26 August
12PM SAST/CAT – 1PM EAT – 11AM WAT – 10AM GMT
Scott Corry
New Business and Sales Management
South Africa

- Founder of HearablesSa
- 17 years experience in Sales
- 5 years experience in Renewable Sectors
- He is committed to build customer and industry Relationship continuously working towards growth and sustainability.
Optimize Your Solar ROI and Guarantee Safety in the Context of South Africa's New 100MW Threshold
01 The 100MW Opportunity

02 Huawei "who are we"

03 Huawei C&I Smart PV Solution

04 Huawei Utility Smart PV Solution
South Africa 100MW License Threshold Policy

Statement of 100MW License Threshold Policy

**12 Aug 2021**: Minister Gwede Mantashe of Mineral Resources and Energy on amendment to Schedule Two of the Electricity Regulation Act, Government Gazette 44989

“Activities with a capacity of no more than 100MW, exempt from licensing and require registration”
Renewable Energy Development Planning in South Africa

- Emergency power procurement of 4,000 MW in 2021/22.
- Procurement of 3,200 MW of renewable IPPs in one window in 2021.
- Procurement of 10,000 MW of renewable IPPs in one window in 2022.

- The target for embedded generation investment will be increased from 4,000 to 5,000 MW.

- 800 – 1,000 MWh battery storage procured by 2023/24, of which 513 MWh battery storage procured by 2022.
Challenges this capacity and growth rate presents the market

Speed and ease of deployment
- End to end – Ecosystem
- Simplistic plant design – Modular
- Lowering BOS
- Third Party Integration

Guaranteed yields and reliability
- String Solutions more mainstream in Larger deployments
- Higher plant availability
- Quicker recovery time

More sites requiring management
- Larger capacity sites
- Larger number of sites
- Nationally based sites
- Dispersed teams
Carbon neutrality is the shared mission of the entire world.

In June 2021, Huawei Digital Power Technologies Co., Ltd. was established.

Vision
Integrate digital and power electronics technologies to drive energy revolution for a better, greener future.
Huawei South Africa Development Milestones

1998
Huawei SA founded

2005
Entered main carrier market

2007
Built Training Center

2008
1st LTE-A Commercial launch in SA

2014
Built Innovation Center

2015
Comprehensive FTTH deployment for Telkom, MTN, Vodacom.

2016
Built Open Lab and launched New Office Park

2017

2019
Launch First 5G network with RAIN in Africa

2020
Using technology to fight epidemics with government

2020: Innovation Center

We serve:

MTN
Telkom
Cell C
Liquid Telecom
RAIN
Eskom
prasa
Exxaro
SITA
SITA

...
Sustainable business growth with large operation scale & diversified business groups

- 170+ Countries and regions
- 49 in Fortune Global 500
- 96,000+ R&D employees
- 14 Research institutes/labs/centers
- 194,000 Employees
- No.5 in R&D Investment

2020H1 Sales Revenue US$65.7 Billion YoY increased by 13.1%

US$ billion

- 2013: 39.3
- 2014: 46.7
- 2015: 63.1
- 2016: 75.1
- 2017: 92.5
- 2018: 105.2
- 2019: 120.9
- 2020H1: 65.7
Smart PV: All-scenario PV & Storage Solution
Smart String Solution Covering from Residential, C&I to Utility

**Residential**
Smart PV Solution

- Smart ESS
- Smart Energy Center
- Smart PV Optimizer
- Smart PV Management System
- Smart Data Logger
- Smart PV Inverter
- Smart PV Management System

**Commercial & Industry**
Smart PV Solution

- Smart Transformer Station
- Smart PV Inverter
- Smart PV Management System

**Utility**
Smart PV Solution

- Smart PV Inverter
- Smart PV Management System

Huawei Confidential
Continuous Innovation, Leading Solar Industry Development

String solution has been the MAINSTREAM in utility

FusionSolar Smart PV 175GW
Accumulative Global Shipment by July 2021

Global Inverter Shipment

IHS Markit

Huawei Confidential
01 The 100MW Opportunity
02 Huawei “who are we”
03 Huawei C & I Smart PV Solution
04 Huawei Utility Smart PV Solution
FusionSolar Commercial & Industrial Smart PV Solution Overview

- **Smart Power Sensor**
  - Single phase: DDSU666
  - Three phase: DTSU666-H 250A /50mA

- **Energy Storage**
  - Compatible Solution
  - Available 2020

- **C&I 100kw**

- **Full Optimizer**
- **No Optimizer**

- **Smart PV Inverter**
  - SUN2000-12/15/17/20/29.9/30/36/40KTL-M2
  - SUN2000-450W-P

- **Smart PV Optimizer**
  - SUN2000-450W-P

- **Smart Dongle**
  - Supports up to 10 devices
  - WLAN/FE (Optional)
  - 4G (Optional)

- **Monitoring Portal**
  - FusionSolar Cloud & App
  - FusionSolar Smart PV Management system

- **Smart PV Inverter**
  - SUN2000-12/15/17/20KTL-M2
  - SUN2000-29.9/30/36/40KTL-M3

- **Smart Power Sensor**
  - DDSU666-H 250A /50mA
More Energy by Optimizing Each Module Performance

Up to 30%

If any shading on the rooftop, install optimizers

Smart PV Optimizer

Without Optimizer

Weak modules reduce the performance of all modules in the string

With Optimizer

Allows to install more modules and other modules’ performance is not impacted
More Modules

with Long & Flexible String Design

- Lower BoS Cost

Up to 10kW per string allows for more modules per string, this leads to fewer strings per inverter and therefore less wiring and connectors.

<table>
<thead>
<tr>
<th>Model</th>
<th>Maximum DC power per string</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUN2000-20KTL-M2</td>
<td>10,000 W</td>
</tr>
<tr>
<td>SUN2000-40KTL-M3</td>
<td>10,000 W</td>
</tr>
</tbody>
</table>

- Higher DC/AC Oversizing

<table>
<thead>
<tr>
<th>Model</th>
<th>String 1</th>
<th>String 2</th>
<th>String 3</th>
<th>String 4</th>
</tr>
</thead>
</table>

DC/AC oversizing ratio: 196%

* Takes JAM72S01-350V/SC/1000V module as reference.
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
0V Module-level

Voltage Shutdown, Touch Safe

*Full optimizer required

The output voltage of each module will be reduced to 0V in below cases:

1. During installation, when string is disconnected from inverter, or the inverter is turned off
2. During maintenance or emergency, when the inverter or AC connection is shutdown

Provide highest safety for installers, maintenance personnel and firefighters

Meet the most advanced safety standards, NEC 2014 & 2017, Rapid Shutdown Compliant

0V Voltage
Quick shutdown
Dc Arc Detection Of PV System (AFCI)

TUV Technical Reports (IEC 63027 Draft)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC Standard</td>
<td>80m</td>
<td>Imax (only 318V)</td>
<td>&lt; 2.5 S</td>
<td>750 J</td>
<td>100%</td>
<td>Not Require</td>
</tr>
<tr>
<td>Huawei</td>
<td>80 m (Single Phase)</td>
<td>Imax (All Voltage Range)</td>
<td>&lt; 0.5 S</td>
<td>500 J</td>
<td>100%</td>
<td>Support*</td>
</tr>
<tr>
<td>200 m (Three Phase)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Huawei AFCI Performance Test Results**

1. Meets the IEC 63027 Drafts (TUV Technical Reports).

<table>
<thead>
<tr>
<th>Projects</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detectable Arc Type</td>
<td>Series Arc</td>
</tr>
<tr>
<td>Detectable Arc Fault Position</td>
<td>All Range</td>
</tr>
<tr>
<td>System Mode</td>
<td>With Or Without Optimizer</td>
</tr>
<tr>
<td>Pinpoint Arc Fault Positioning</td>
<td>Support*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Projects</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arcing Detection Range</td>
<td>80 M (Single Phase)</td>
</tr>
<tr>
<td>Adaptable Maximum Arc Current</td>
<td>Imax</td>
</tr>
<tr>
<td>Arc Detection Accuracy</td>
<td>100%</td>
</tr>
<tr>
<td>Arc Energy</td>
<td>&lt; 500 J</td>
</tr>
<tr>
<td>Shutdown Time</td>
<td>0.5 S</td>
</tr>
</tbody>
</table>

* With Optimizer
Leading Technologies Brings Better Experience

- Module
- Smart Diagnosis
- Inverter
- Maintenance Free
- Module
- Auto-mapping
- Smart Diagnosis
- Power Electronics
- Natural Cooling
- Comm. Tech
- Big Data

AI Technology

Natural Cooling
<40 sec  
Module Auto-Mapping

<table>
<thead>
<tr>
<th>Operating Steps</th>
<th>HUAWEI Solution</th>
<th>Other Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D barcode paste on template</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>Physical layout creation</td>
<td>40 sec (AI powered)</td>
<td>30 min (manual)</td>
</tr>
<tr>
<td>Total configuration time</td>
<td>&lt;1 min</td>
<td>30 min</td>
</tr>
</tbody>
</table>

Note: for a typical 100kW system with 400 optimizers

Saving 95% configuration time compared with other solutions
No LCD
No Button

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

Station Phase II:
200 units, 963 running days
Failure Rate: 0.189%

Station Phase III:
4939 units, 583 running days
Failure Rate: 0.252%

Station Phase IV:
1790 units, 207 running days
Failure Rate: 0.390%

*For 12–60KTL inverter models

Natural Cooling Verified by Telecom & Solar Application*
Online Smart I-V Curve Diagnosis, Module Touch Free

*Applicable for inverter only (without optimizers)
**Smart I-V Curve Diagnosis with 7 GW+ Application Worldwide**

### 3.44 MW  Failure Rate 11.7%

- Solartron Rooftop Project
- 3.44MW, Ningbo, Zhejiang
- R brand PV Module: 280 W
- Huawei inverter: 50KTL-C1
- Total strings: 528, failed strings: 62

### Accurate Failure Diagnosis & Recovery Suggestion Case Study

#### String Short Circuit

**Step 1**
Inspect modules.

**Step 2**
If burning happens in connection points, replace the module.

**Step 3**
If not, use IR camera to find internal failures.

### Top 4 PV Module Failure

- Abnormal Output Current
- String Current Mismatch
- String Voltage Abnormal
- String Short Circuit

#### How to Solve

**String Short Circuit**

- Step 1: Inspect modules.
- Step 2: If burning happens in connection points, replace the module.
- Step 3: If not, use IR camera to find internal failures.

**Abnormal Output Current**

- Step 1: Inspect modules. If there are shades, eliminate them.
- Step 2: If not, check if there is dirt on the surface.
- Step 3: If not, check if any module has a broken glass panel.

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**Solartron Rooftop Project**

- 3.44MW, Ningbo, Zhejiang
- R brand PV Module: 280 W
- Huawei inverter: 50KTL-C1
- Total strings: 528, failed strings: 62
Eight Innovations to Support Optimal Electricity Cost

1. AI Powered Active Arcing Protection
2. DC Module-level Voltage Shutdown, Touch Safe
3. CSI Tailored Enhanced Active Arcing Protection (200mA/26A)
4. Up to 30% More Energy by Optimizing Each Module Performance
5. Built-in PID Recovery, Secure Better Module Performance
6. <60 sec Module Auto-Mapping Saving 95% configuration time
7. No Fuse & Other Quick-wear Parts, Mature Nature Cooling
8. Online Smart I-V Curve Diagnosis, Module Touch Free

Huawei Solution

S Solution

Other Solutions
01 The 100MW Opportunity

02 Huawei “who are we”

03 Huawei C&I Smart PV Solution

04 Huawei Utility Smart PV Solution
FusionSolar 6.0+ Utility Smart PV Solution Overview

- **AI BOOST**
  - Higher Yields
  - Smart O&M
  - Safe & Reliable
  - Grid Supporting
Multi-MPPT Design, 3% more Yields Effectively Minimizing the Mismatch of Bifacial

Central Solution VS Smart PV Solution

1st Year Yields of Central Solution 2333 kWh/kWp
1st Year Yields of FusionSolar 2403 kWh/kWp

Simulation Location: Seville, Spain

6.3MW Block, 324 MPPTs vs. 2 MPPTs

2 PV strings per MPPT
100 PV strings per MPPT

-3.1%
-0.8%
-1.1%
-3.1%
-0.8%

MPPT 1 MPPT 2 MPPT 3 MPPT 4 MPPT 5 MPPT 6 MPPT 7 MPPT 8 MPPT 9

Higher Yields
Availability, the Key to Measuring Power Generation

Top Three Factors Effecting Availability

1. Technology Route
   FusionSolar superior to Central
   No Combiners, 200kW vs. 3125kW

2. Failure Rate
   FusionSolar lower than Central
   <0.5% lower than 2%

3. Recovery Time
   FusionSolar less than Central
   0.5 day vs. 2~15 days

Central Solution

Smart PV Solution

Higher Yields
Higher Yields

**Inverter Availability**

\[ \text{Inverter Availability} = \left(1 - \frac{T_1 + T_2 + ... + T_n}{N \times T}\right) \times 100\% \]

- \(T_n\): the amount of down-time of No. ‘n’ inverter
- \(N\): the total amount of inverter used
- \(T\): the total of normal operation time

“Inverter Availability is an important target to assess the quality of products and services...”

**Technical Report**

**Inverter Model**

<table>
<thead>
<tr>
<th>Inverter Model</th>
<th>Installed volume</th>
<th>Running days</th>
<th>Annual failure rate</th>
<th>Inverter Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUN2000-20KTL</td>
<td>200 sets</td>
<td>963 days</td>
<td>0.189%</td>
<td>99.998%</td>
</tr>
<tr>
<td>SUN2000-28KTL</td>
<td>4933 sets</td>
<td>583 days</td>
<td>0.252%</td>
<td>99.996%</td>
</tr>
<tr>
<td>SUN2000-40KTL</td>
<td>1790 sets</td>
<td>207 days</td>
<td>0.390%</td>
<td>99.996%</td>
</tr>
<tr>
<td>SUN2000-50KTL</td>
<td>700 sets</td>
<td>Commissioning Period during this Assessment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Lower Failure Rate**

- Integrated Product Development
- Industry-proven string solution in utility projects
- Only inverter vendor with 10GW+ string shipment
- Quick onsite replacement & Service response
- 134+ Global Spare Parts Centers

**Less Recovery Time**
Fuse-free IP66 and MBUS Design make system Safe and Reliable

**Fuse-free Design**

- Reverse Current < 10A
- Only 2 strings into 1 MPPT
- Safe & reliable, No fuse, simpler O&M

**IP66 Fully Sealed Design**

- IP66, Complete Dust/waterproof
- More reliable for outdoor application & OPEX saving

**MBUS Solution**

- MBUS, No RS485 Cable, Easy O&M
- MBUS
- Smart Array Controller
- Smart Transformer Station
- Grid
- Power cable
- Data logger
- Central Inverter
- Transformer
- Power cable
- RS485

**RS485 Solution**

- No RS485 Cable, Easy O&M
- Data logger
- Central Inverter
- Transformer
- Grid
- Power cable
- RS485
Accurate detection & less mal-alarm with <0.5% high-accuracy data of each string
2 Auto-alarm & O&M advice generation, well-prepared for on-site failures
3 Instant failure locating & recovery based on logical & physical location of strings

Plug & Play, Rip & Replace

Quick Fault Recovery, No need of Experts

30-min Quick Replacement
Common Labors Onsite
thank you,