



Energy Storage Solutions e-conference



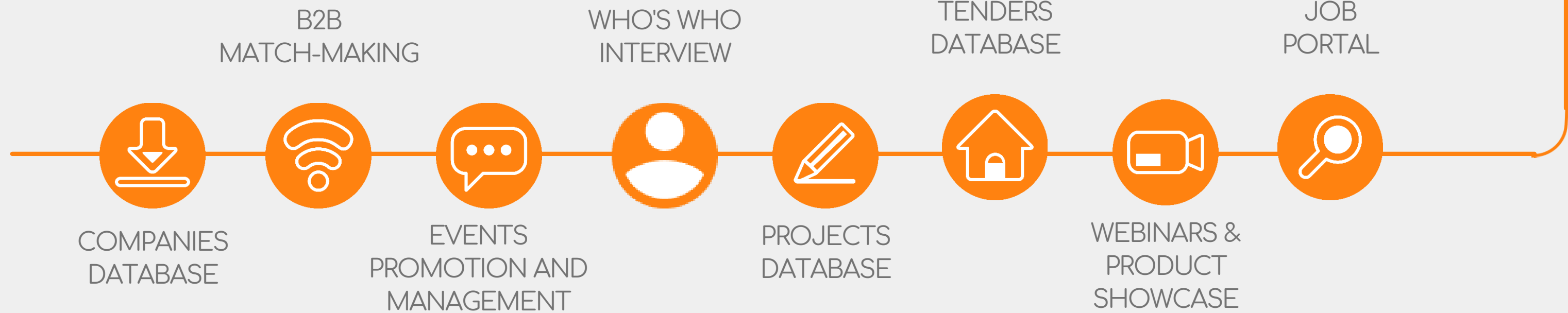
6 & 7 June 2023

Thanks to our
Conference
Partners



MEMBER'S RESOURCES AND BENEFITS

AFSIA SERVICES





AFSIA
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FOUNDING



CROSSBOUND
ENERGY



LONGI

Trinasolar



PARTNER



JASOLAR



SEETEK
皓见科技

STRATEGIC



CORPORATE MEMBERS





THE TEAM

JOHN



CEO

ALINE



MARKET
INTELLIGENCE
MANAGER

VESTINE



RESEARCH &
NEW PROGRAMS
MANAGER

JOSÉE



COMMUNITY
MANAGER

KERSY



RESEARCH
ASSOCIATE

EUGÉNIE



EVENT MANAGER



AFSIA ACTIVITIES 2023



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PRIME EVENTS	18 JAN Launch Annual Outlook report 2023									4-6 OCT Renewables Investment Forum (Nairobi)	5 OCT AFSIA Solar Awards 2022 (Nairobi)	30 NOV – 12 DEC COP 28 (Dubai)
E-CONFERENCE & SHOWCASE			21-22-23 MAR GREEN H2 e-conference		4 MAY Focus on PUE – Launch of PUE catalog	6-7 JUN STORAGE e-conference	Digital Solution Summer Series		TBD White Paper Net-metering & Wheeling for Africa			
EXTERNAL EVENTS	16-18 JAN World Future Energy Summit (Abu Dhabi)	8-10 FEB Solar Power Africa (Cape Town)	7-9 MAR Africa Energy Indaba (Cape Town) 27-29 MAR Powerlec Nigeria (Lagos)	25-26-APR The solar Show (Joburg)	16-18 MAY ENLIT Africa (Cape Town) 31 MAY & 1 JUN USC 2023 (Kampala)	13-16 JUN InterSolar (Munich)				TBC Nigeria Energy (Lagos)	04-06 OCT Powerlec Kenya (Nairobi)	
WEBINAR TBD	Solar e-waste management	Focus on PUE – Solar refrigeration	Focus on PUE – Trending PUE applications	Focus on PUE – Solar irrigation	Focus on C&I – Solar for telecom	Focus on C&I – Solar for mining	Solar Street Lighting	MG in Nigeria	Carbon Credit Mechanisms			



ONLINE EVENTS
PHYSICAL EVENTS
AFSIA PRESENCE

UPDATED 05 MAY 2023



Senior Project Development Manager, in charge of large RE projects for C&I customers

10+ years experience in energy in developing countries

Previously Engineering Manager at Aggreko in Western and Central Africa

Master in Energy Engineering from National Polytechnic Institute from Yamoussoukro



Jean-Philippe Seya |



CROSSBOUNDARY
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AFSIA e-storage conference



Storage Technologies



Jun 6th, 2023

We can build a disruptive, distributed utility that provides a clean path to growth in Africa and beyond

WE PROVIDE CHEAPER, CLEANER POWER



CBE'S CUSTOMERS CAN IMMEDIATELY SAVE 10% OR MORE AGAINST THEIR CURRENT COST OF POWER

WE PROVIDE MORE RELIABLE POWER

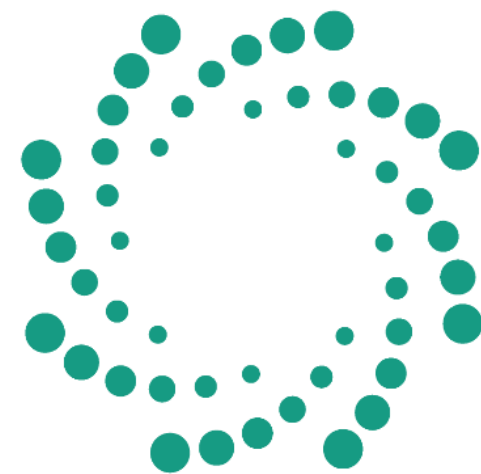


ADDING BATTERIES CAN PROVIDE CLOSE TO 100% UPTIME, WITH IMMEDIATE REDUCTIONS IN CARBON EMISSIONS

WE PROVIDE INTEGRATED ENERGY SOLUTIONS



WE FINANCE, PLAN, AND MANAGE NETWORK IMPROVEMENTS, ALLOWING BUSINESSES TO MAKE THE MOST OF THEIR POWER



CrossBoundary Energy

Introduction

Energy storage plays a crucial role in our modern world, allowing us to capture and utilize excess energy generated from renewable sources, such as solar and wind power.

Objective:

- ✓ Provide a holistic view of the various Energy Storage technologies available worldwide
- ✓ Share knowledge on Battery Energy Storage Systems
- ✓ Matching Battery technologies and applications



CBE QIT Madagascar Minerals (Rio Tinto) Project
Fort Dauphin, Madagascar
8MW solar, 8.25MWh BESS

Energy Storage Technologies have evolved Throughout the Eras

- 1 Ancient times: Greeks and Romans used gravity-powered water clocks to store and release energy.
- 2 Industrial Revolution: mechanical flywheels were used to store rotational energy.
- 3 20th century: development of electrical energy storage technologies - Lead-acid batteries.
- 4 Modern Era: Lithium-ion batteries have emerged as a dominant solution. Other innovative technologies: flow batteries, compressed air energy storage, thermal energy storage, hydrogen, etc.

Battery Energy Storage Systems

Battery energy storage systems, such as lithium-ion batteries, are widely used to store and release electricity.

BESS can be designed to provide a variety of services:



Replacing thermal spinning reserve with battery spinning reserve to provide fuel savings



Reducing overall genset runtime

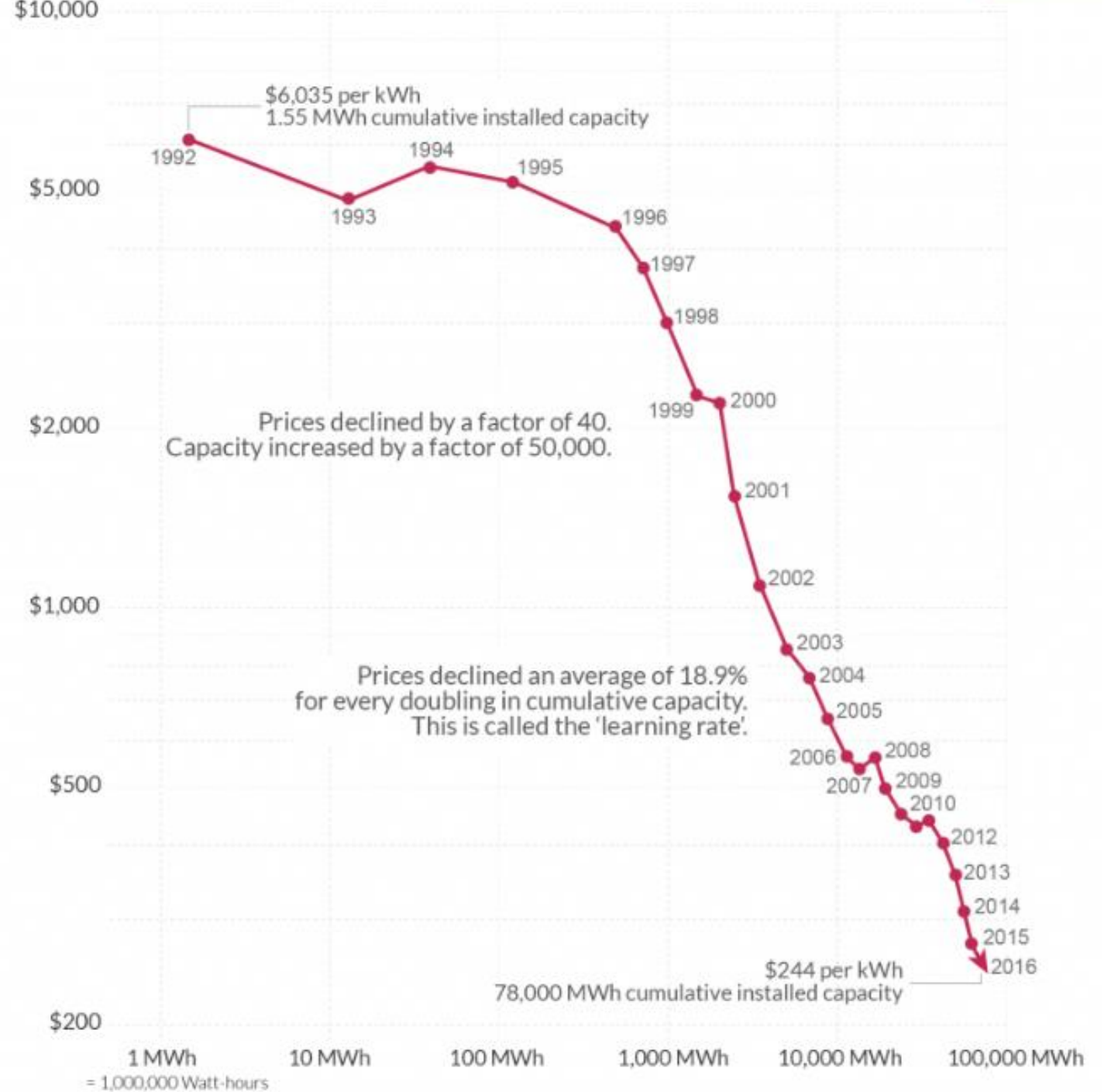


Smoothing load or supply volatility for more stable power

Price and market size of lithium-ion batteries since 1992



Price per kilowatt-hour; kWh (logarithmic axis)
\$10,000



Chemistry	Abbreviation	Rating (1-5, 5 Best)					Summary
		Safety	Energy	Power	Life	Cost	
Lithium Manganese Oxide	LMO	3	4	4	4	4	Versatile technology with good overall performance
Lithium Iron Phosphate	LFP	3	4	4	2	3	Similar to LMO, but lower power capabilities so less flexible
Lithium Nickel Cobalt Aluminium	NCA	1	3	4	4	2	Good for power applications; historical safety concerns & high cost
Lithium Titanate	LTO	5	2	5	5	1	Excellent power and cycle life; highest cost technology
Sodium	Na	3	5	1	4	2	Great for energy applications but low power capabilities
Advanced Lead Acid	PbA	5	1	4	1	5	Very safe and inexpensive, but low cycle life and poor energy

A BESS employs smaller energy capacities at sub-second response time, rapidly charging or discharging to help existing networks cope with power stability fluctuations.

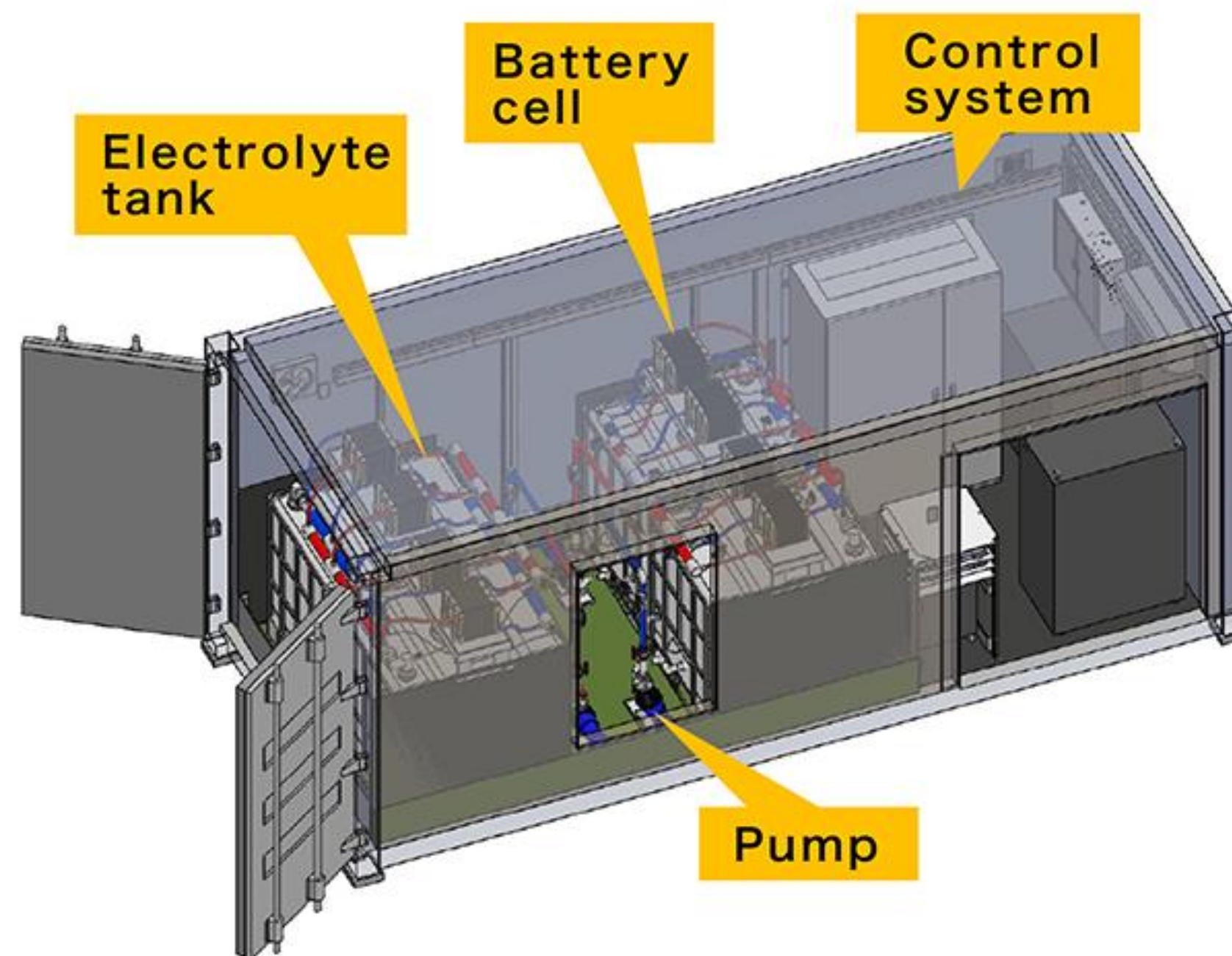
BESS can smooth the integration of intermittent renewable energy sources.

Vanadium Redox Flow Battery Technologies

Vanadium Redox Flow Batteries (VRFBs) are a type of rechargeable flow battery that offer unique advantages for energy storage. They use vanadium ions in different oxidation states to store and release electrical energy.

Key features of VRFB technologies include:

- **High Scalability:** VRFBs can be easily scaled up or down to meet various energy storage requirements, making them suitable for both small and large-scale applications.
- **Long Cycle Life**
- **Decoupled Power and Energy:** VRFBs have separate power and energy components, allowing independent scaling of power and energy capacity.
- **Deep Discharge Capability**
- **Rapid Response Time**
- **Enhanced Safety:** The use of vanadium electrolytes eliminates the risk of thermal runaway or combustion, enhancing the safety of VRFB systems.
- **High Efficiency**





CROSSBOUNDARY
ENERGY

crossboundary.com/energy



Technical Services Manager with 10 yrs exp

Previously worked with SolarGen Technology, African Solar Design, SolarKiosk Solutions and Centurion Systems

Managed the development of a number of renewable energy projects (PV + diesel + energy storage) in Africa

MSc. in Renewable Energy Enterprise and Management (REEM)



Titus Koech | **Jinko**^{Solar}

AFSIA e-Conference: Energy Storage Solutions



Latest Innovations for Large Scale Energy Storage

Titus Koech | Technical Service Manager | SSA

Jinko ESS Portfolio



Residential ESS
($<50\text{kWh}$)

SUNTANK

C&I
($50\text{kWh}-2\text{MWh}$)

SUNGIGA

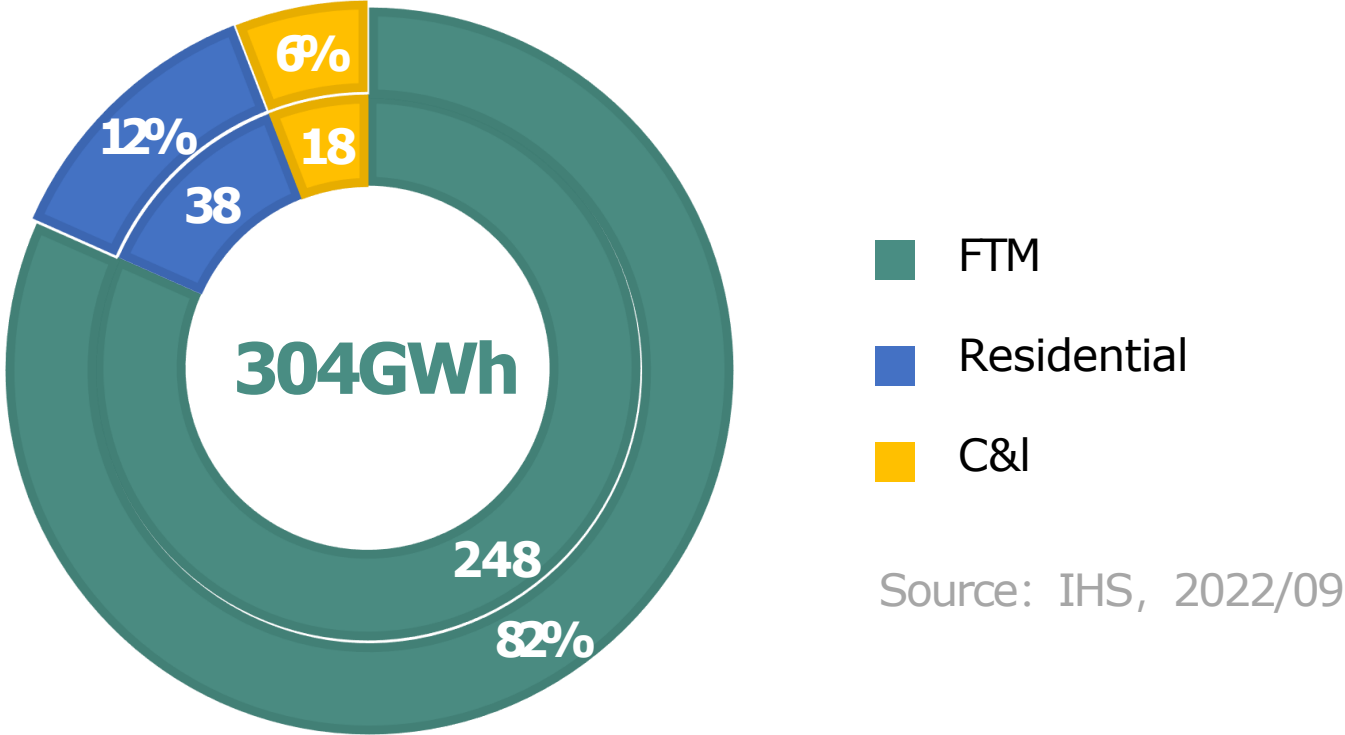
Utility
($\geq 2\text{MWh}$)

SUNTERA

Introduction

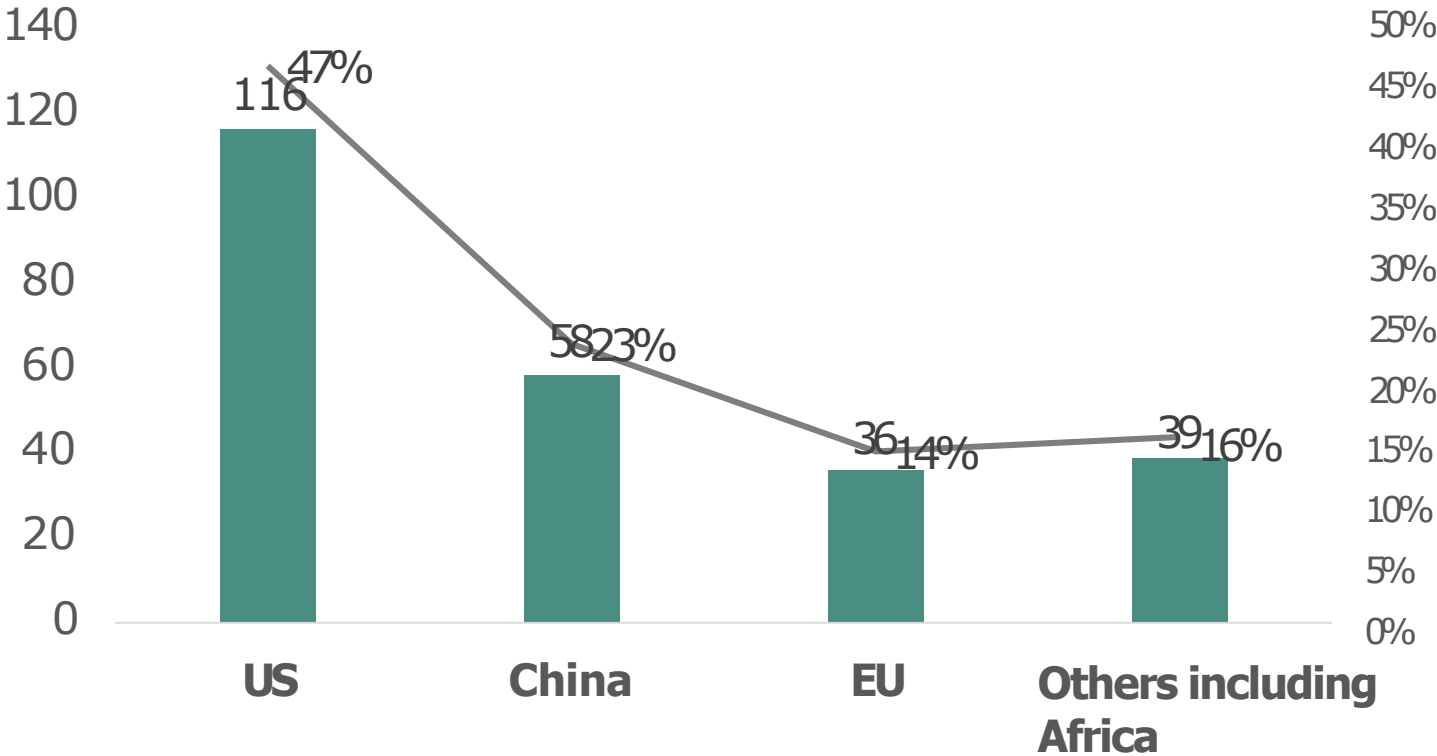


2022-2025 Cumulative Energy Storage Installation by Application



- IHS forecast: the cumulative installed capacity of global energy storage from 2022 to 2025 is expected to be 304GWh, CAGR 51%.
- 2022-2025 cumulative energy storage installation, FTM/RESS/C&I installation account for 82%/12%/6% by GWh.

FTM (GWh)



Market Barriers



It is estimated that the energy storage market is approximately 1.6GW will approx., 80% being from pumped hydro. LFP has been on the rise owing to it's modularity and cost reduction.

A number of challenges have resulted in limited

energy storage market activity in Sub-Saharan Africa

to date:

- ✓ Cost
- ✓ Access to affordable **financing**
- ✓ **Political** and **economic** instability
- ✓ Lack of local **technical expertise**
- ✓ Underdeveloped **grid infrastructure**
- ✓ Limited **renewable energy development** to date



ESS Main Challenges



CAPEX



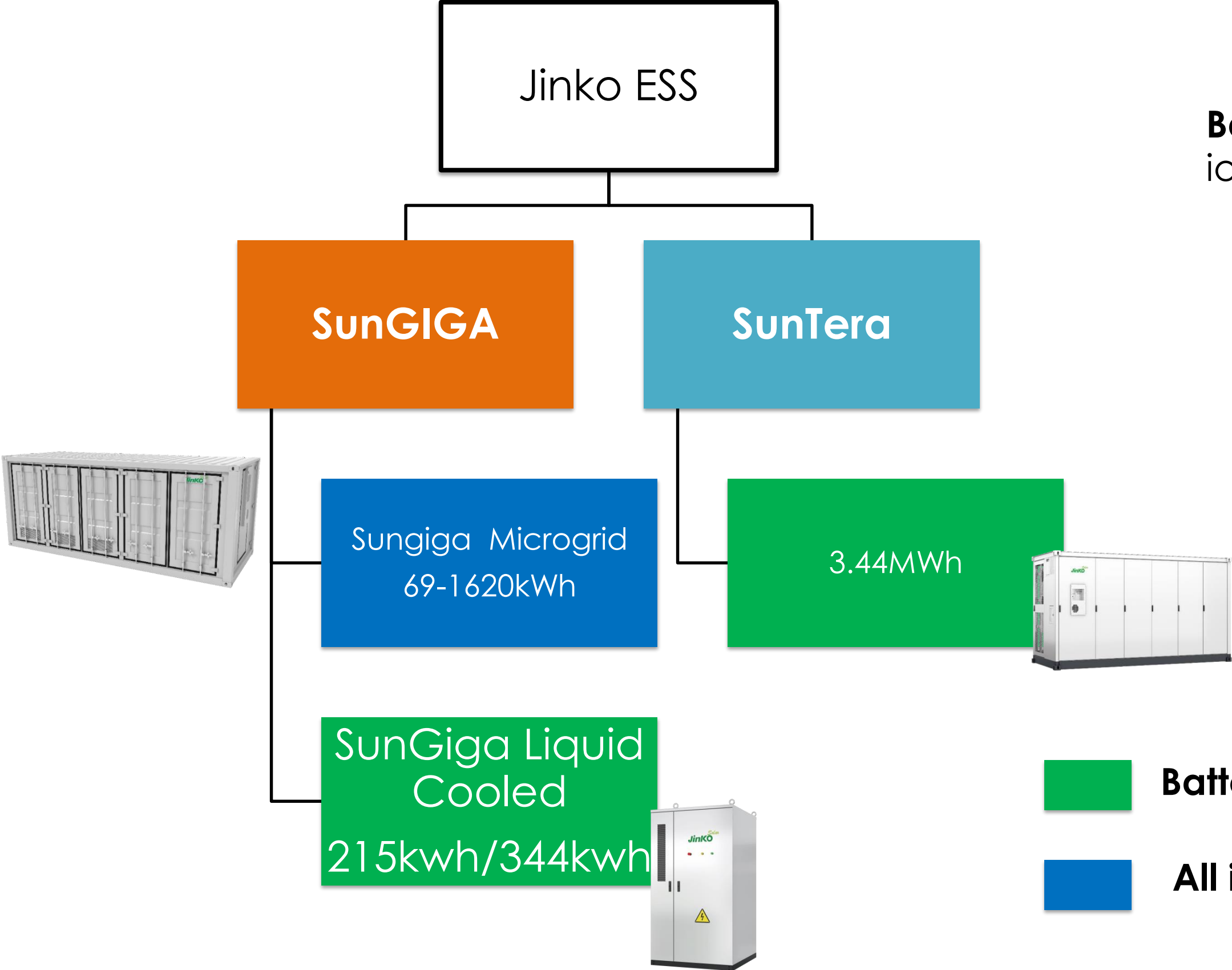
OPEX



Safety

Jinko's ESS innovation is geared to addressing mainly above challenges.

Jinko's Large Scale ESS



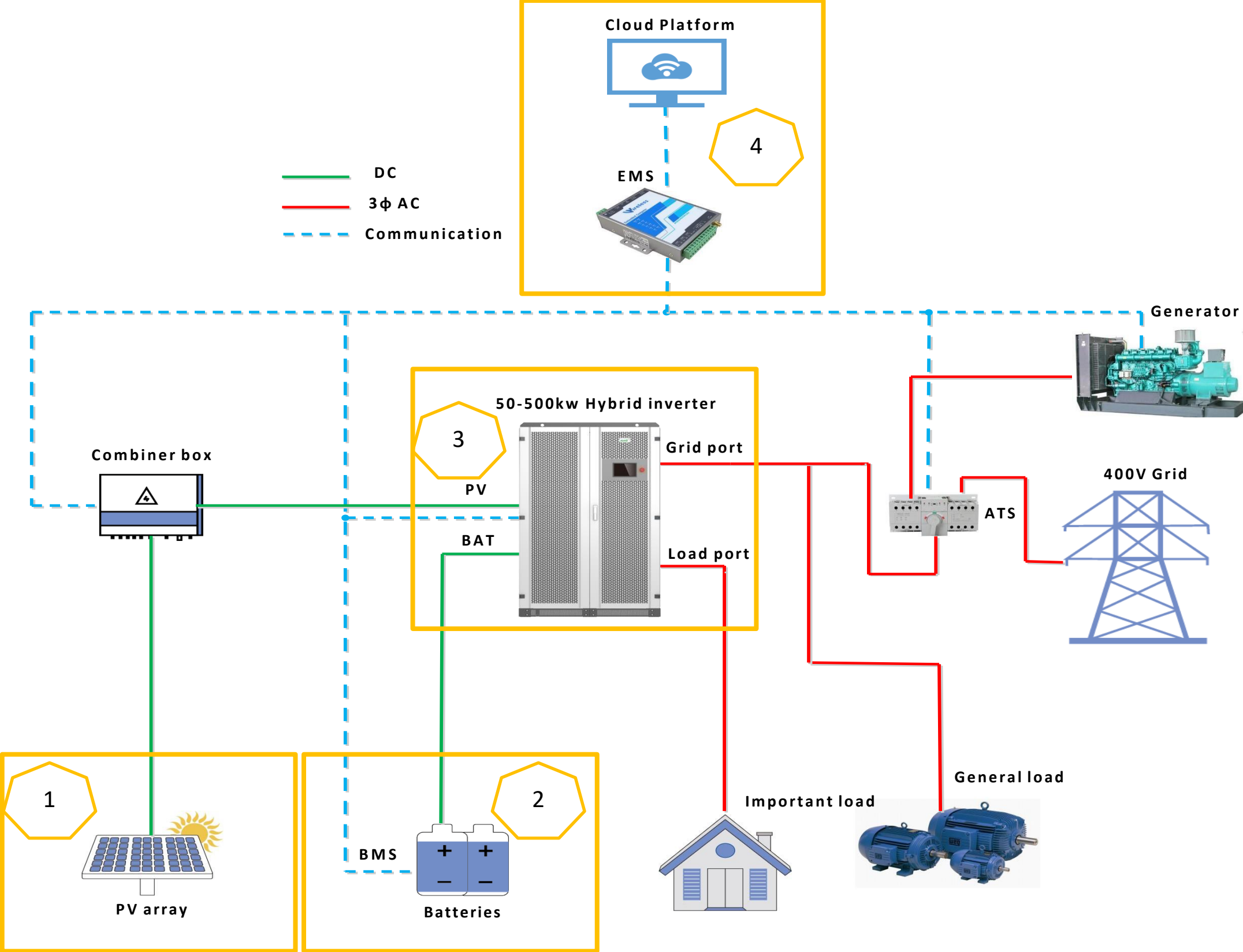
Battery Cell Chemistry: Lithium ion Phosphate (LFP)



- ✓ Energy Density
- ✓ Power Density
- ✓ Cost.
- ✓ Optimal cycle life

 **Battery Cabinet**
 **All in one solution**

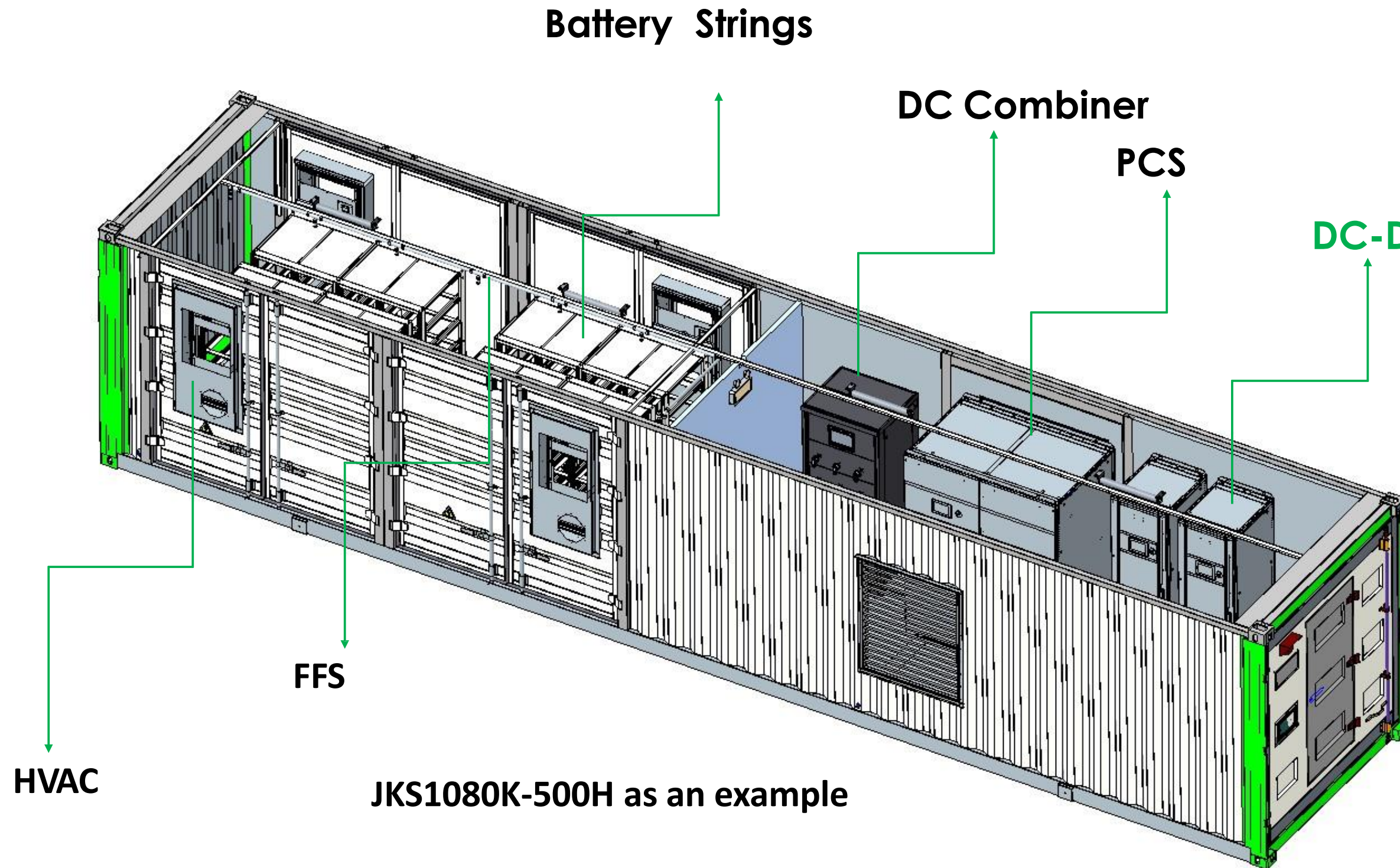
SunGiga –Micro Grid



Notes:

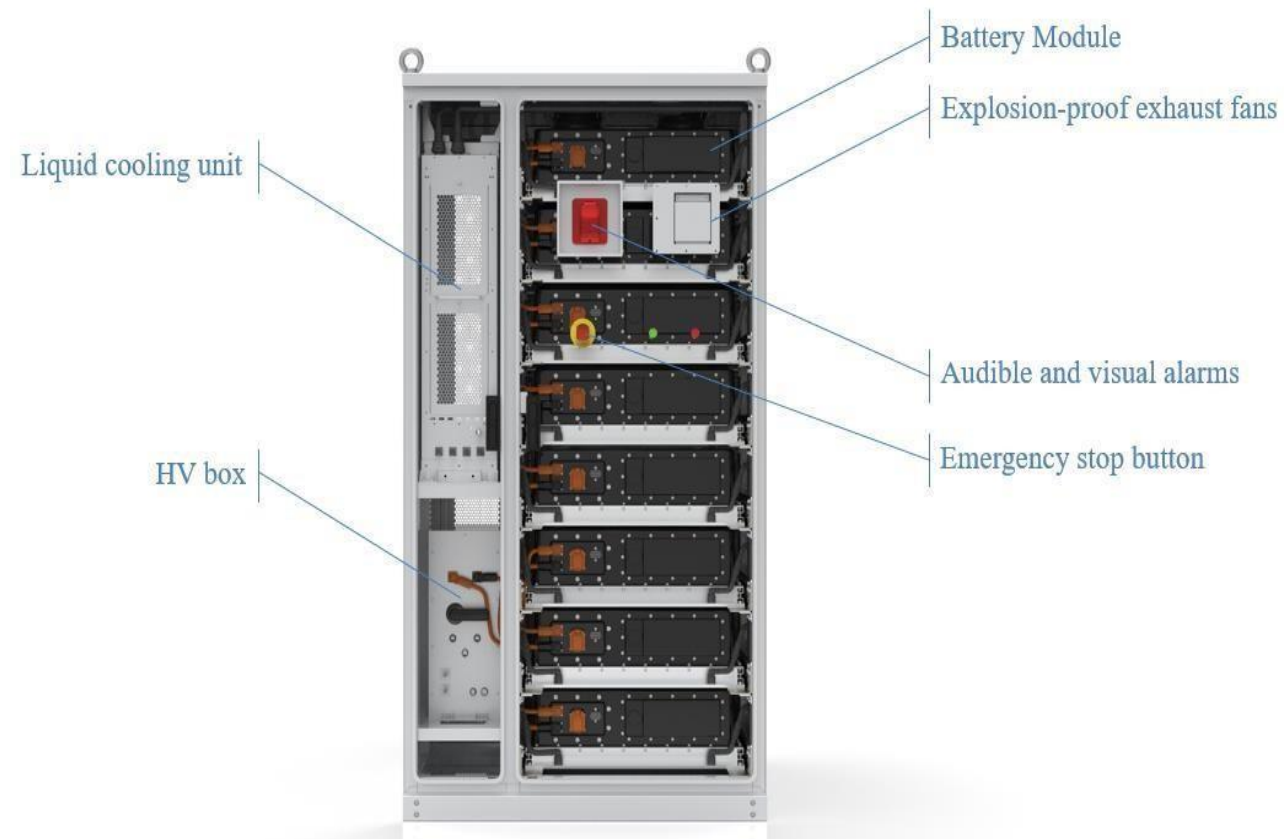
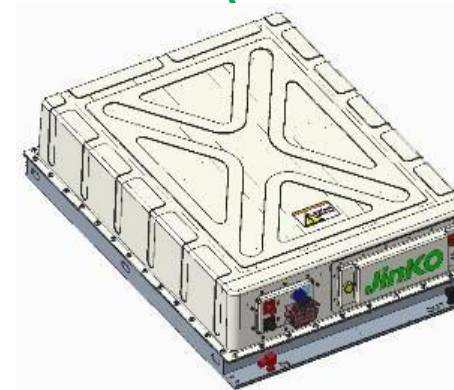
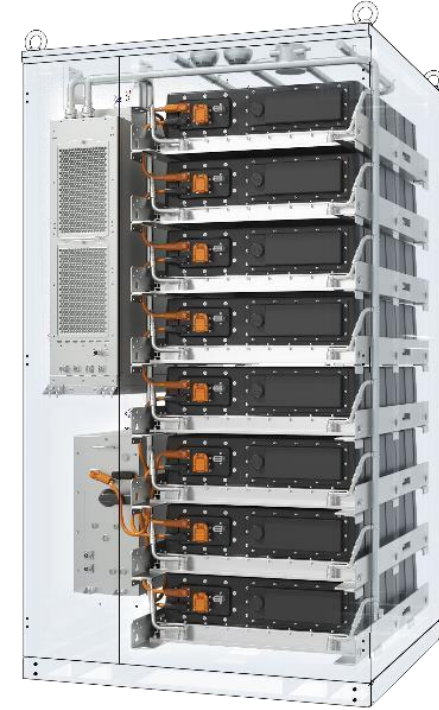
- DG and Grid transfer will be by ATS.
- Seamless on/off transfer will be achieved by static transfer switch
- PV can directly connect to ESS through DC combiner box.
- Load will be supported by PV and batteries together when grid is not available.
- Suitable for **small ESS** system (Less than **2MWh** for one block).

Sungiga Microgrid Configuration



- **5 or 10** Years complete product warranty.
- 3.2V , 96Ah LFP cell.
- **5000 cycles @90% DOD.**
- DC or AC coupled
- **IP54**
- **Air Cooled**

SUNGIGA- Liquid Cooling Battery Cabinet



Cell Specification	
Cell Type	LFP
Nominal Capacity	280Ah
Rated Voltage	3.2V
Voltage Range	2.8V~3.6V
Rated Capacity	896Wh
Charging/discharging rate	≤0.5C

Pack Specification	
Configuration	1P48S
Rated Voltage	153.6V
Voltage Range	134.4V~172.8V
Nominal Capacity	43kWh
Protection Level	IP67
Cooling Concept	Liquid Cooling
Dimensions(W*D*H)	800*1080*240mm
Weight	310kg

Rack Specification	
Configuration	1P384S
Rated Voltage	1228V
Voltage Range	1075V~1382V
Nominal Capacity	344kWh
Charging/discharging rate	≤0.5C
Cooling Concept	Liquid Cooling
Dimensions(W*D*H)	930*1090*2450mm
Weight	≈3T




SUNGIGA- DC 1000V/1500V Liquid Cooling Battery Cabinet






Difference

	DC 1500V System	DC 1000V System
Cell type	LFP-3.2V/280Ah	LFP-3.2V/280Ah
Nominal capacity	344kWh	215kWh
Voltage range	1075V~1382V	672V~864V
Cooling concept	Liquid Cooling	Liquid Cooling
Number of battery pack	8	5
IP level	IP54	IP54
Fire Protection	Aerosols	Aerosols
Anticorrosion grade	C5	C5
Dimensions (W*D*H)	1300×1300×2300mm	1300×1300×2300mm
Weight	≈3T	≈2T
Certificates	IEC62619,UL9540A,UL1973,IEC61000.etc	

Product Advantage

-  Both 1000V/1500V systems, **more flexible application scenarios** ;
-  Flexible application and **easy expansion** ;
-  Pack unique design, **lower temperature difference $\leq 2^{\circ}\text{C}$**

Professional Fire Suppression Design

-  Aerosol and Novec 1230 compatible
-  Built-in combustible gas detection, external explosion-proof exhaust fans
-  External audible and visual alarms



SunGiga –Liquid Cooled Cabinet Application Scenario



(215KWh*N)

Master



Slave



Slave



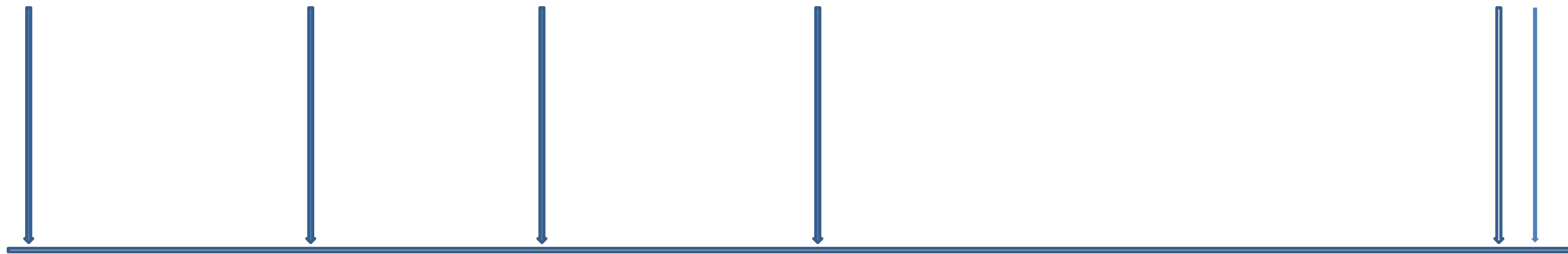
Slave



MAX 10 UNITS ONE PCS



Slave



1000V PCS – DC side

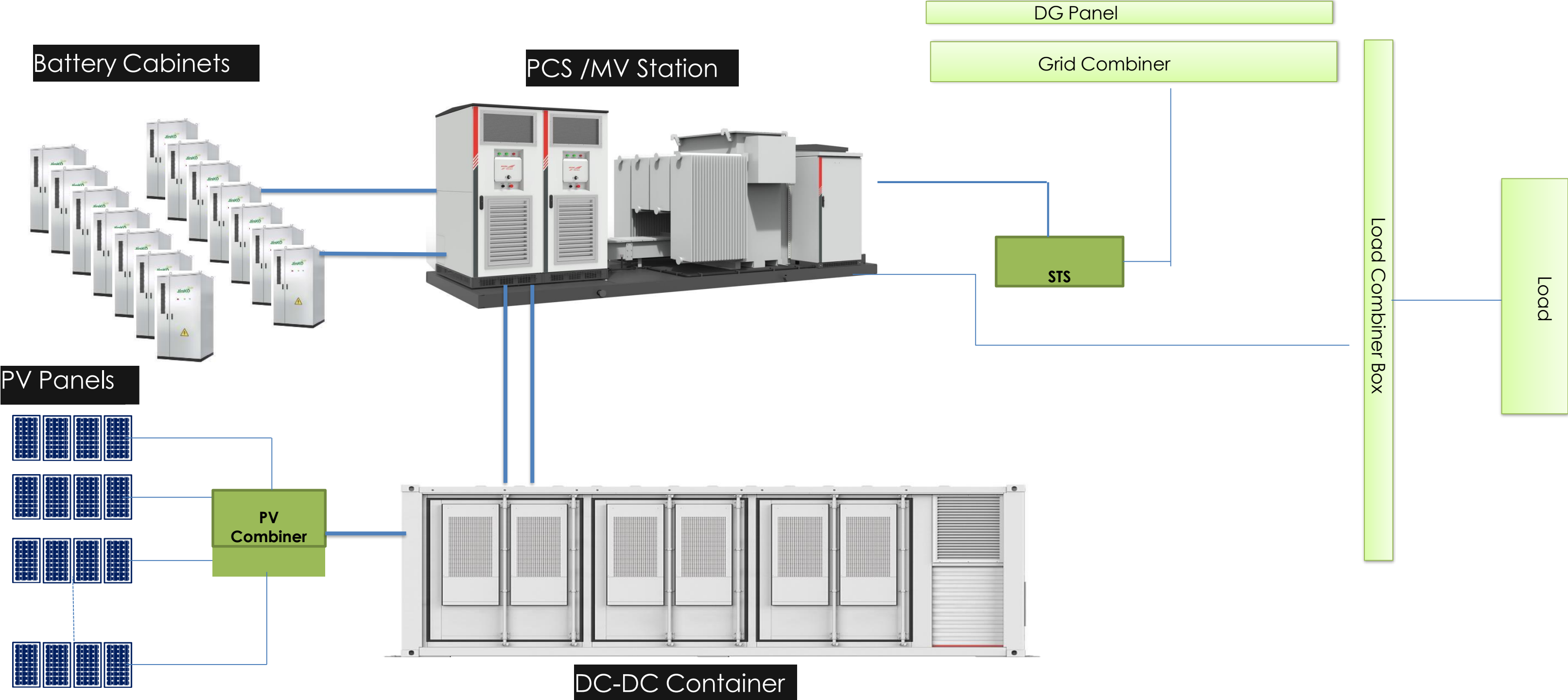


POWER ELECTRONICS



++ Any other PCS Brand

DC coupling 3.01MWh-3MW(3MW DCDC)



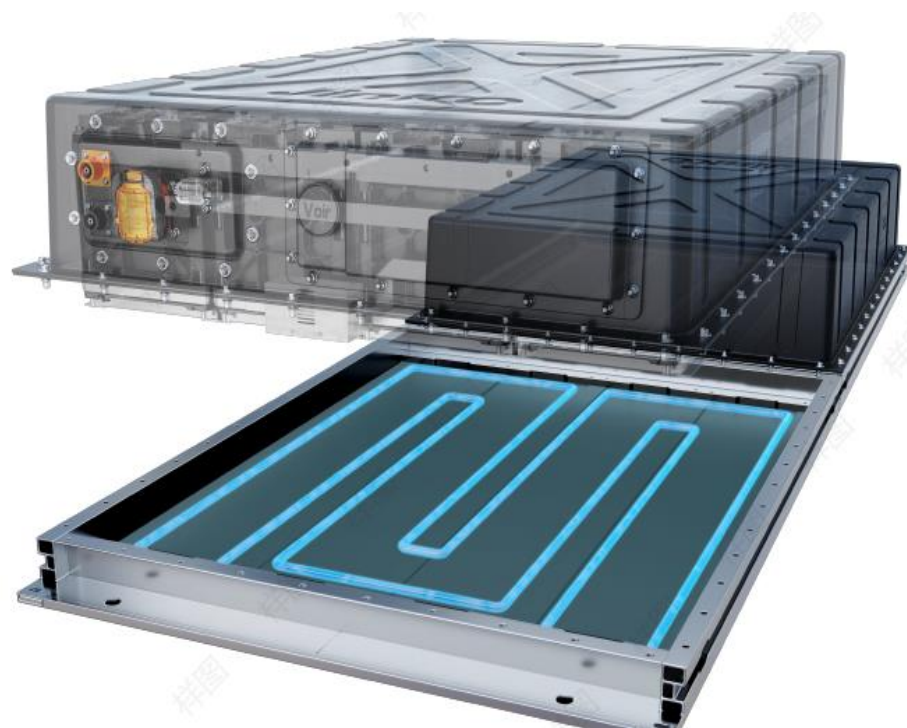
Liquid Cooling

What is Liquid Cooling?

The advanced liquid-cooling technology allows the coolant flows through the pipe to evenly cooling the packs. This will ensure uniform cooling in all packs in the container.

The Liquid Cooling design of SunTera

Cooling Plate of Pack



Liquid Flow at System Level



SunTera Overview



ITEM	PARAMETERS
Cell	LFP, 3.2V/280Ah
Charge/Discharge Rate	0.5P
Configurations	1P384S×10racks
Rated Energy	3.44 MWh
Rated Voltage	1228.8V
Cooling Method	Liquid Cooling
Ambient Humidity	≤95%RH, No condensation
Altitude	≤2000m/4000m (Optional)
Noise	< 80dB(A)@1m
Protection Grade	IP54
Dimensions (L×W×H)	6058×2438×2896mm(20ft HC)
Weight	≈35000 kg

Higher
Safety

Higher
Energy
Density

Higher
Discharge
Efficiency

Less
Power
Consumption

Longer
Service
Life

Less
O&M Cost

Safety First

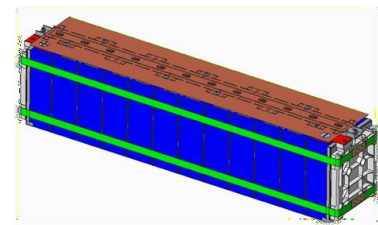
**Ultimate Safe &
Reliable from Cell to System**



Ultimate Safe & Reliable from Cell to System

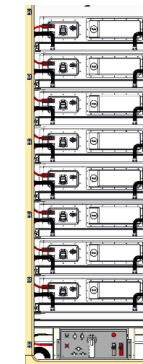
Cell Level

- LFP Technology
- Pre-alarmed Abnormal Cells



Pack Level

- Insulated Heating Coat
- Explosion Protective Valve
- Fire Suppression Agent (optional)



System Level

- Gas Fire Suppression
- Water Fire Protection
- Explosion Protection

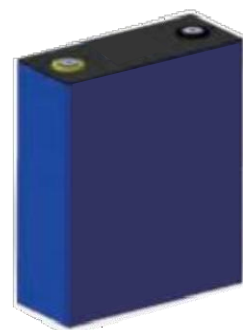
CELL

MODULE

PACK

RACK

SYSTEM



Module Level

- Thermal Material
- CCS Protection Board



Rack Level

- Insulation Detection
- Cluster Management



The Fire Suppression System

Flammable gas detection Auto start the fire suppression, reducing losses



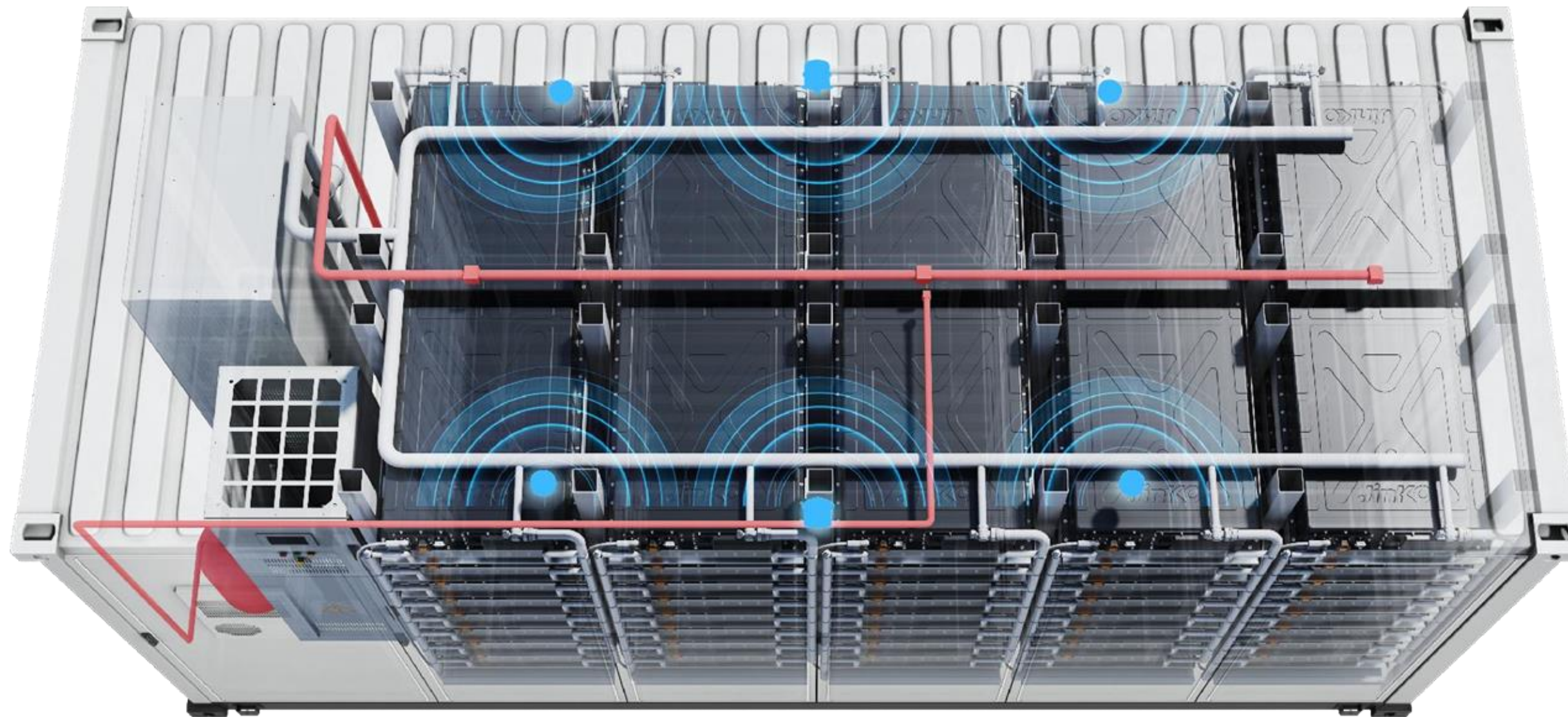
Compliance with NFPA855/69/68/15

Standard for the insulation of stationary ESS
World's first international safety standard for ESS put forward by the National Fire Protection Association

Standard requirement	PowerEvo
Smoke detector	✓
Thermal detector	✓
Flammable gas detector	✓
Deflagration System	✓
Fire Suppression System	✓

The Fire Suppression System

Temperature & Smoke Detectors distributed among the system



SunTera Utility-Scale ESS by Jinko Solar

Artificial Intelligence at its finest

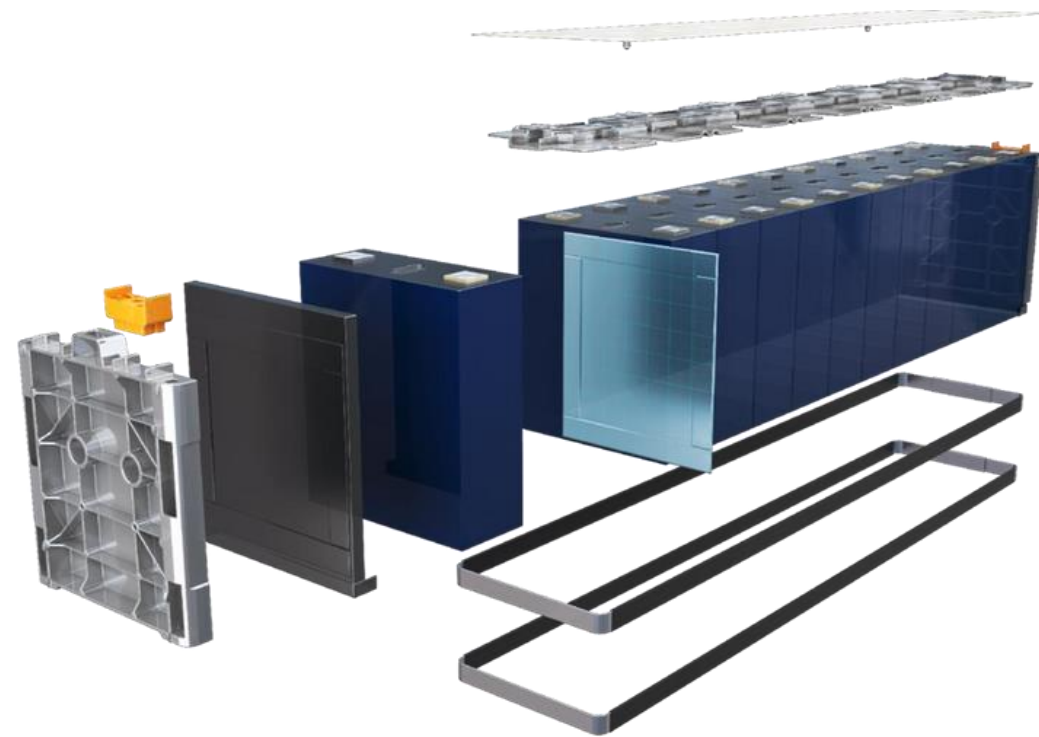
- AI-based intelligent detection and location of under-performance or abnormal cells in advance.
- Mass sensors for high accuracy detection:
 - Combustible gas sensors
 - Smoke detectors
 - Temperature sensors



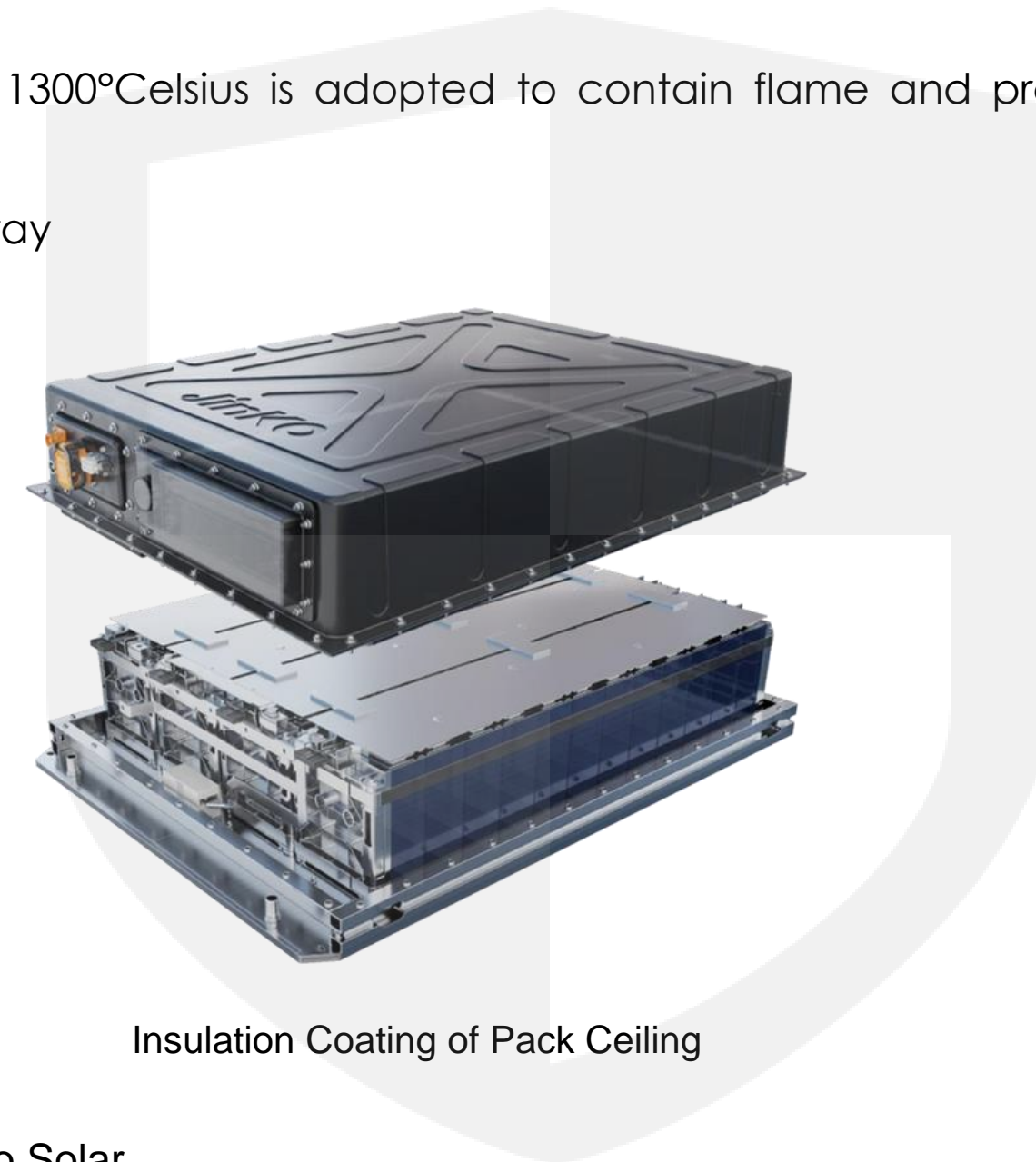
Early Identification of Abnormal Cells

Cell & Pack Level Comprehensive Insulation

- Cell: Heat insulation mica sheets are equipped between cells
- Module: Electronic protection board are added to module
- Pack: High temperature insulation coating of 30-minutes heat-resistance of 1300°Celsius is adopted to contain flame and prevent propagation
- System: Separate battery compartments to avoid the spread of thermal runaway



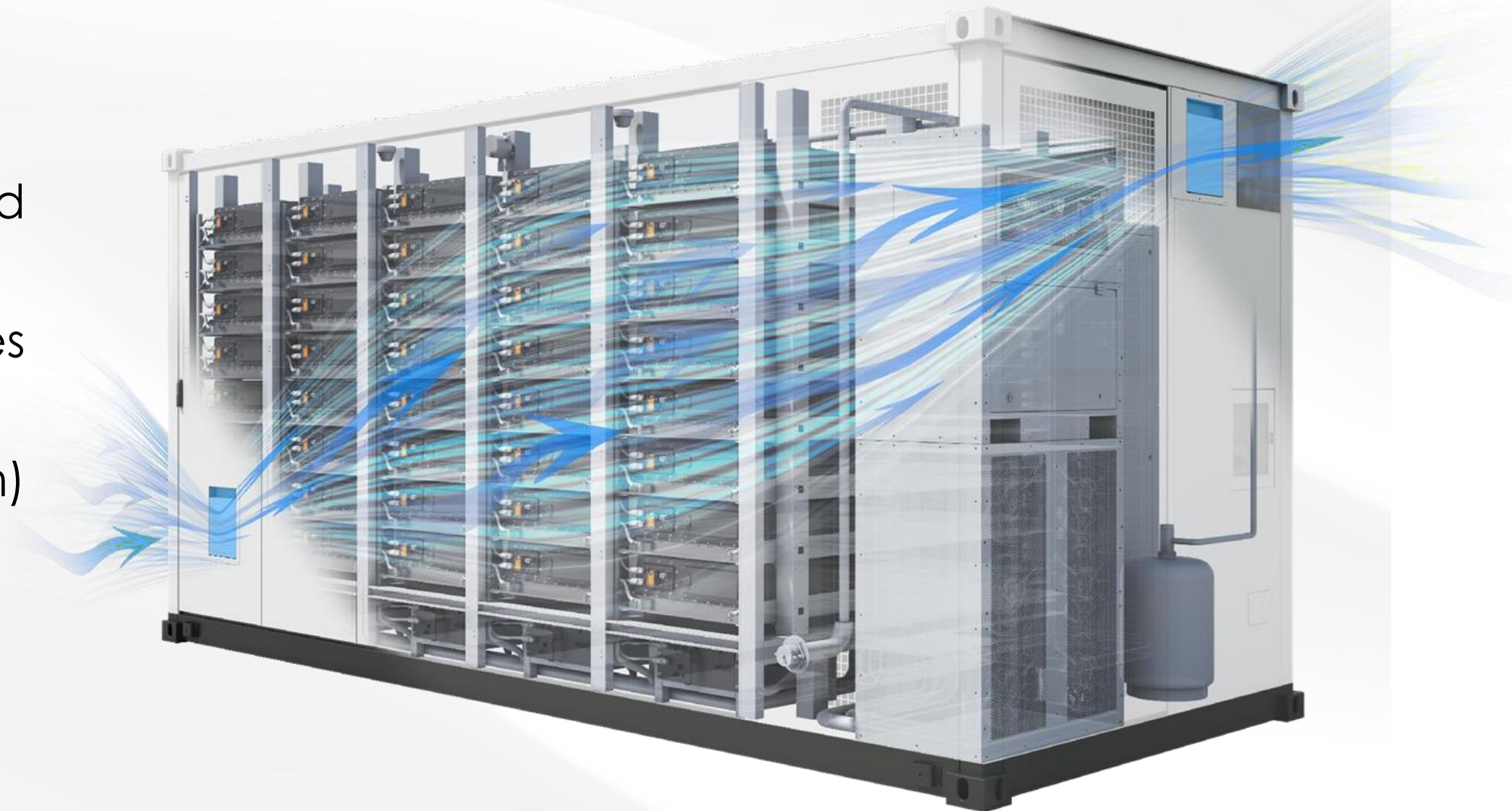
Insulation Sheets Between Cells



Insulation Coating of Pack Ceiling

Deflagration Venting

- Deflagration venting equipped to avoid explosions
- Fire extinguisher system guarantees rapid suppression to thermal runaway
- Plus water FSS (Fire Suppression System) ensures final safety



Lower LCOE

**Innovative integration,
LCOE down by 20%**



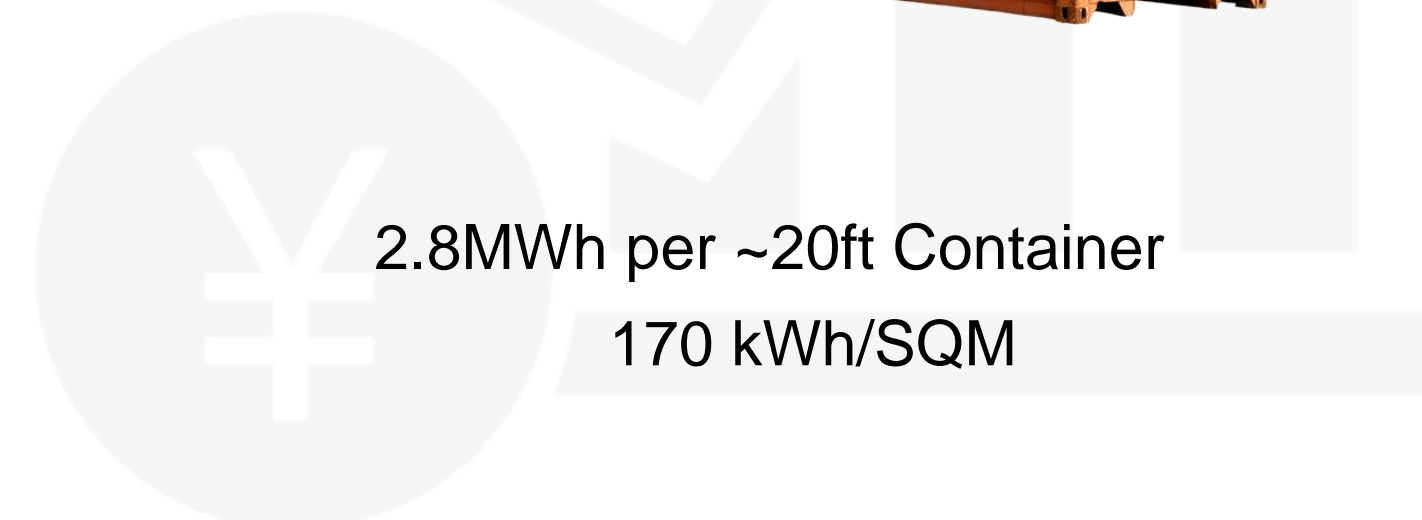
Over 20% Increased Energy Density Compared to Other Liquid Cooled Solutions



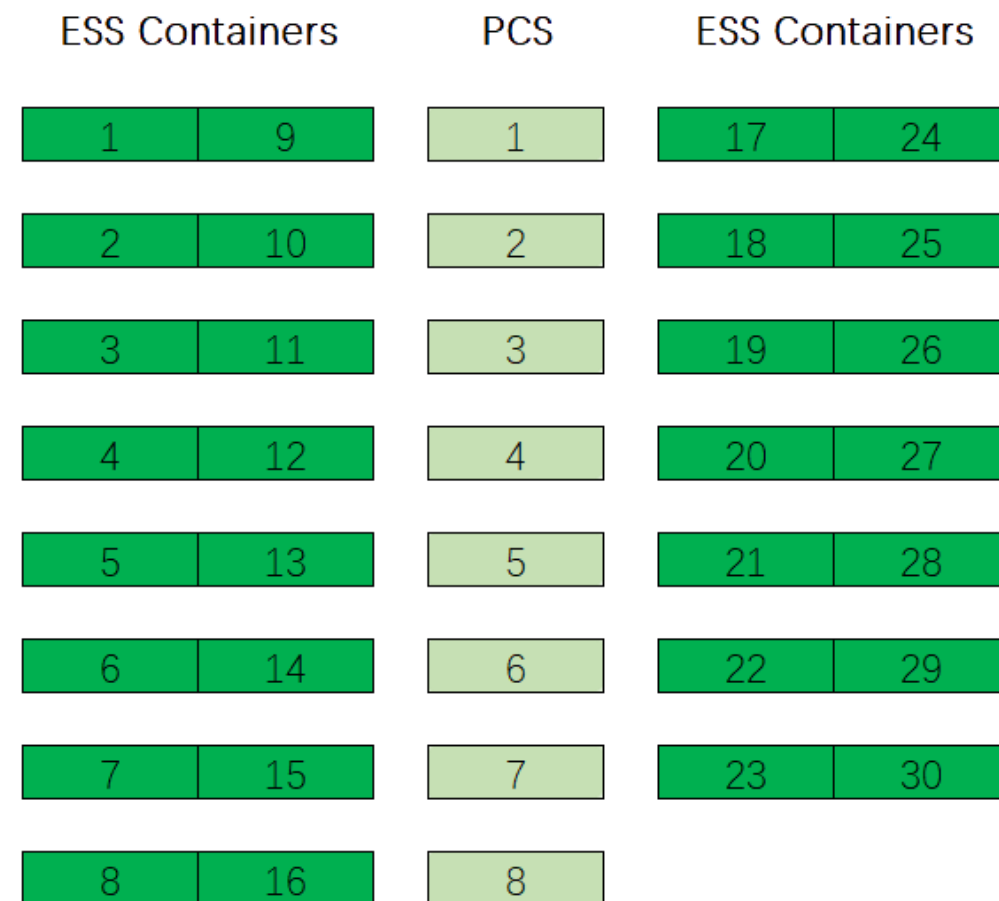
3.44MWh per 20ft Container
210 kWh/SQM



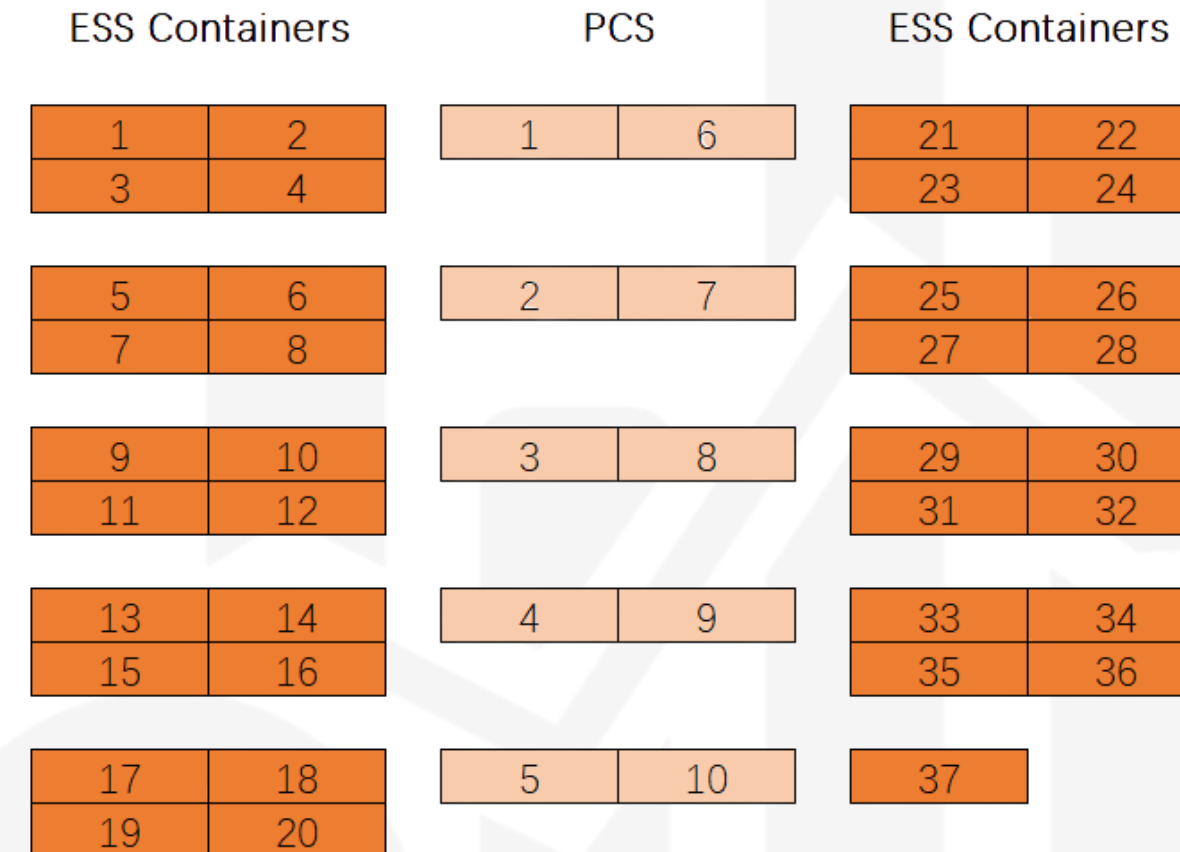
2.8MWh per ~20ft Container
170 kWh/SQM



100MWh Project Example



Total 100MWh Project Area	1715.26 Sqm
Total PCS Capacity	51.75 MW
Total ESS Capacity	103.20 MWh
C-Rate	0.50

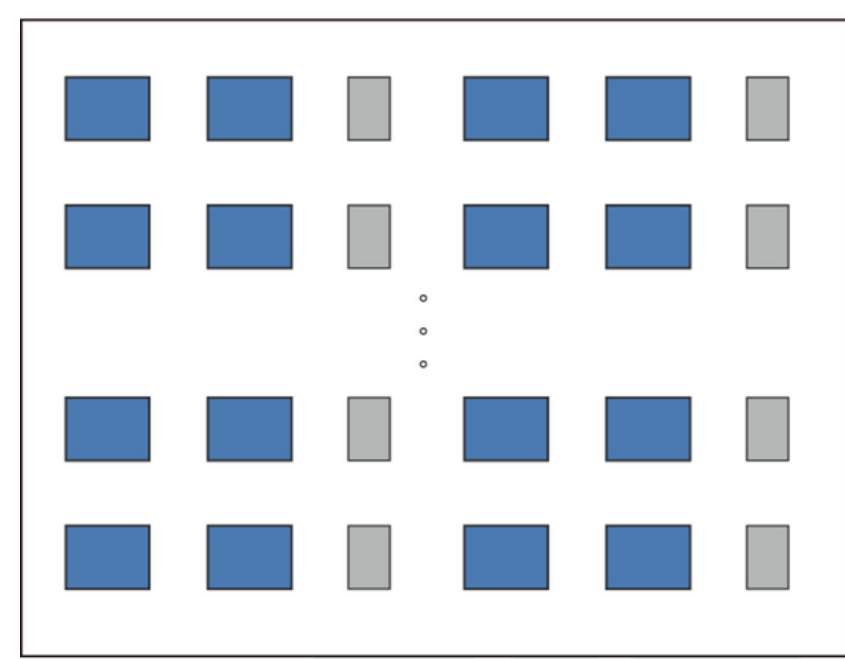


Total 100MWh Project Area	2095.06 Sqm
Total PCS Capacity	55.00 MW
Total ESS Capacity	101.82 MWh
C-Rate	0.54

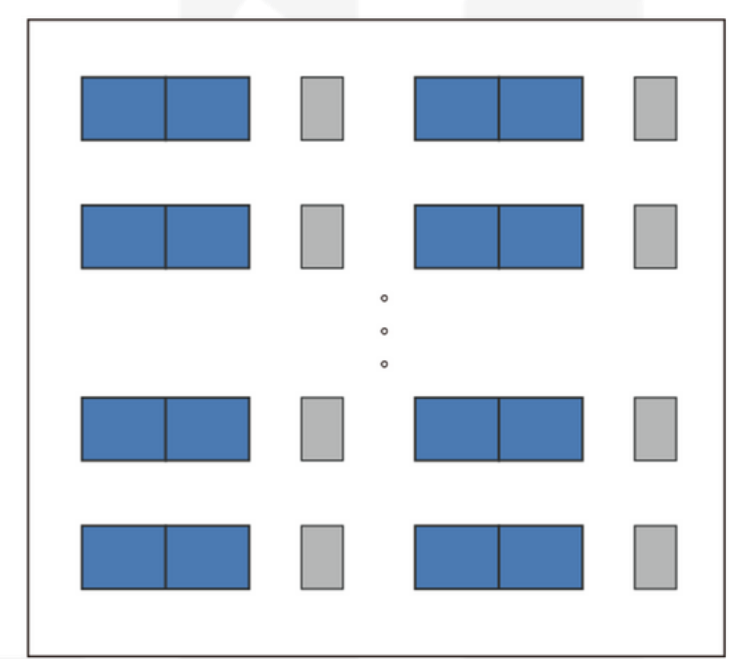
15% Higher Energy Density Compared to Air-Cooled ESS



Supporting Side by Side Layout



Traditional



SunTera

10% Longer Service Life

The advanced liquid-cooling technology allows the coolant flow through the pipes to evenly cooling the packs, adding 10% service life to the whole unit.



Non-uniform and refined pipeline design

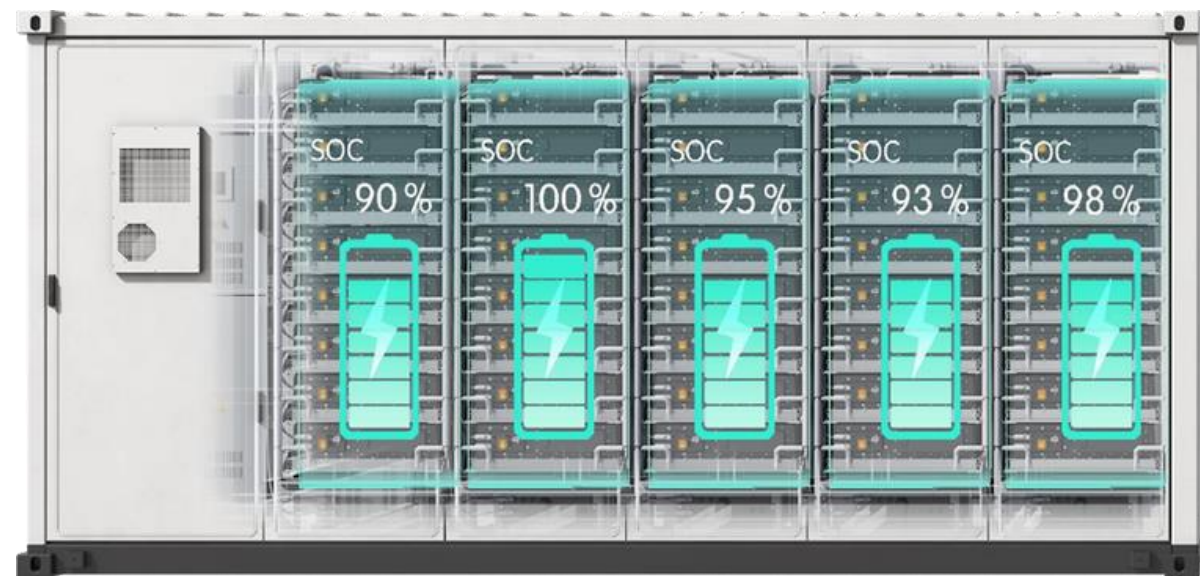


Uniform heat dissipation of all packs,
temperature difference ≤2.5°C

15 years Calendar life ; **7000** cycles @ **94%DOD**

1% Higher Round Trip Efficiency

Conventional ESS without Cluster Management



Traditional mode

When a cluster is fully charged, the charging process will be stopped at the same time

Our SunTera with Smart Cluster Management



Automatic drop out

Fully charged/discharged cluster drops out automatically while the remains keep charging/discharging

20% Lower Energy Consumption

1. 35% less consumption vs air cooling

Thermal management : 21.5X thermal conductivity of the air

Thermal conductivity of the coolant:

0.56

Thermal conductivity of the air:

0.026

2. 20% less consumption vs conventional liquid cooling

Multiple liquid cooling control modes, accurate liquid flow Monitor and control based on cell & operating temperatures



Smart O&M

Least Labor Intervention



50% Shorter On-site Installation Time & Least Labor Intervention **JinKO** Solar

Depending on size, on-Site installation could be done in less than 8 hours, as the systems which are delivered:

- Pre-wired
- Pre-assembled
- Pre-configured



Least Labor Intervention, this is achieved with the help of state of the art artificial intelligence; thanks to the:

- AI-Based BMS analysis of cycling curve bias, realizing online automatic calibration, remote O&M
- Automatic cooling liquid replenishment, 60% labor saving
- Cluster-level management, and easy software upgrade

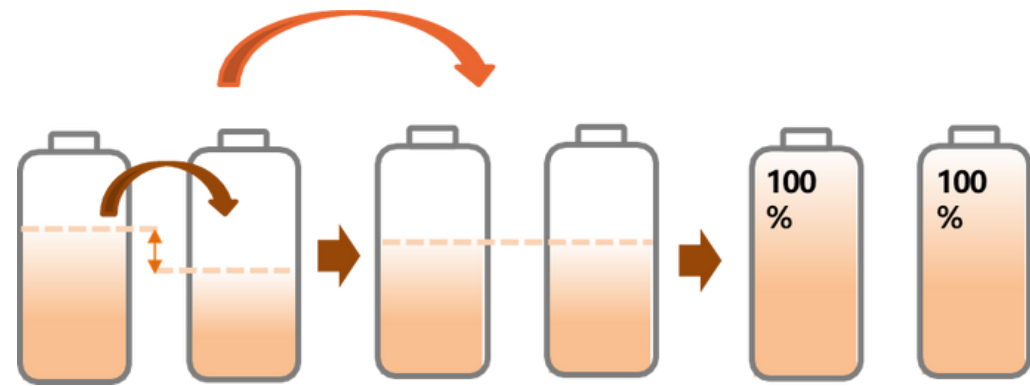


15% Lower O&M



SOC Auto Balancing - Passive & Active

No need for system shutdown or manual SOC calibration



Dynamic Coolant Replenishment

60% less replenishment workload

- No need for frequent manual coolant replenishment
- Keep the optimal heat dissipation

Online Monitoring

30% less inspection

- Online Inspecting Check
- Battery Safety Monitoring
- Liquid Leakage Monitoring
- Devices Status Monitoring

60%

Device Monitoring

Early warning

Data storage

Intelligent management

Remote support

The screenshot shows a comprehensive monitoring dashboard. It includes a sidebar with navigation options, a main data panel with various charts and gauges, and a map of China. A central circular graphic highlights key features like 'Device Monitoring', 'Early warning', 'Data storage', 'Intelligent management', and 'Remote support'. A '60%' annotation is placed near the 'Online Monitoring' section, and a '30% less inspection' callout points to a list of monitoring tasks.

Q&A





Project : 500MWh
Location : Middle East region
Project description : Renewable energy smoothing
In production, delivery 300Mwh from April to June 2023
200Mwh in December 2023



Project : 10MW/20MWh

Location : Haining, Zhejiang Province.

Project description : The project used Jinko energy storage system for peak shaving and frequency regulation. Peak shaving: Supply power to the load in the peak period and charge the battery in the low period, improve the economy and security of the power grid operation, and play the role of peak shaving and valley filling. Frequency modulation: Participate in frequency modulation of auxiliary power grid at the same time, and use its fast response characteristics to improve frequency modulation effect.

Kenya
1.1MWh-500kW
202209 COD
Refugee Camp Power Supply
hybrid with DG/PV





Thanks !

Email: Titus.Koech@jinkosolar.com



Chief RE Investment Specialist, leading the Green Baseload thematic at SEFA – Sustainable Energy Fund for Africa

Specializes in TA and concessional financing for grid-connected RE generation, utility-scale energy storage and transmission

Former CEO of SAPVIA

MBA and Electrical Engineering from University of the Witwatersrand



Moeketsi Thobela |



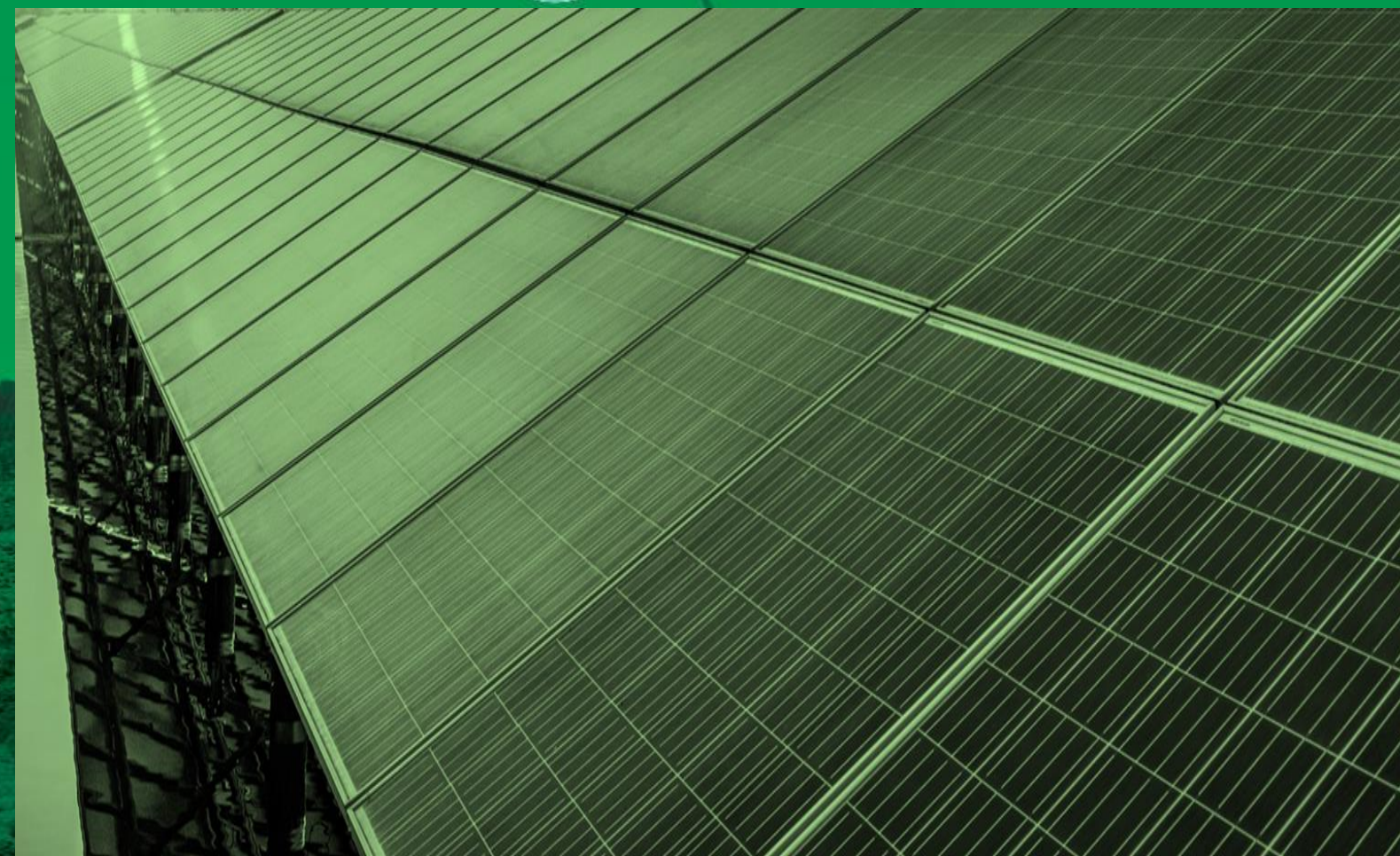
AFRICAN DEVELOPMENT BANK GROUP



AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE
DE DEVELOPPEMENT



Sustainable Energy
Fund for Africa



Overview

- Investment environment
- Salient sector-specific trends
- Bank's approach to BESS projects/programmes

AFSIA Energy Storage e-Conference

Approach to solar and
storage projects

6 June 2023

Moeketsi THOBELA

Investment environment Tough, but 'green shoots' appearing?

Some key considerations *

- **2022H2 debt costs 20% higher than 2022H1:** High inflation and associated central bank interest rate hikes.
- **Reduction in supply-chain constraints:** Easing post COVID-19 upward pressures on EPC costs.
- **RE remaining cost-competitive:** Global average LCOE for solar PV and wind power competitive against natural gas.
- **Upward tick in (4-hour) battery energy storage costs:** While still lower than US\$200/MWh, increases in the cost of critical materials resulting in a reversal of the downward trend seen since 2016 (when BESS costs were just above US\$600/MWh).



*Source: Bloomberg LCOE Update, 27 December 2022

Salient sector-specific trends

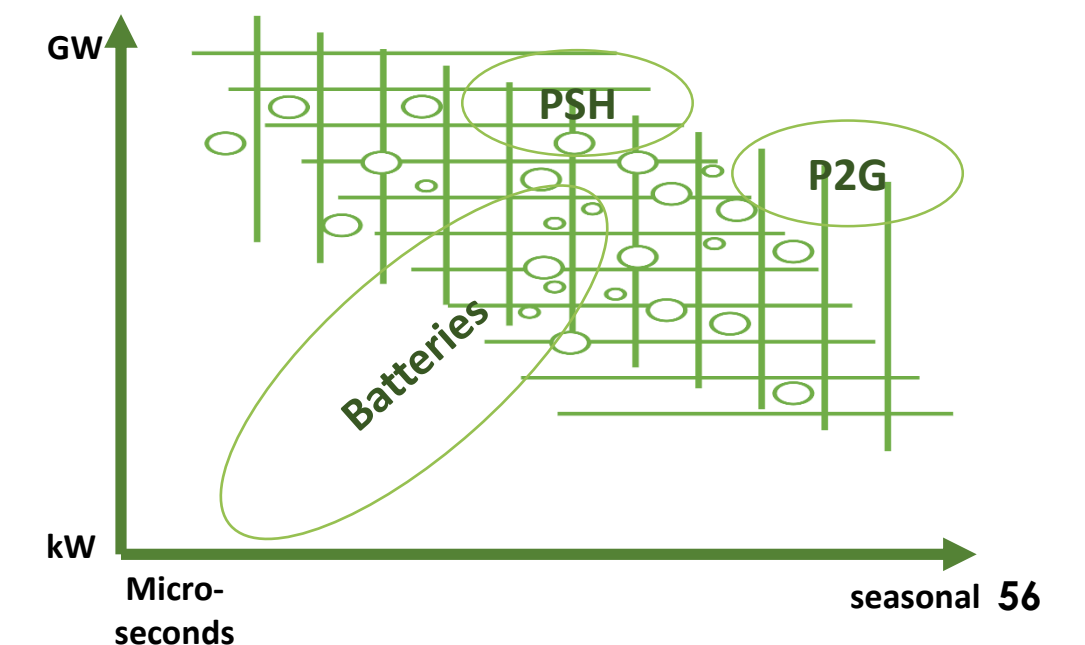
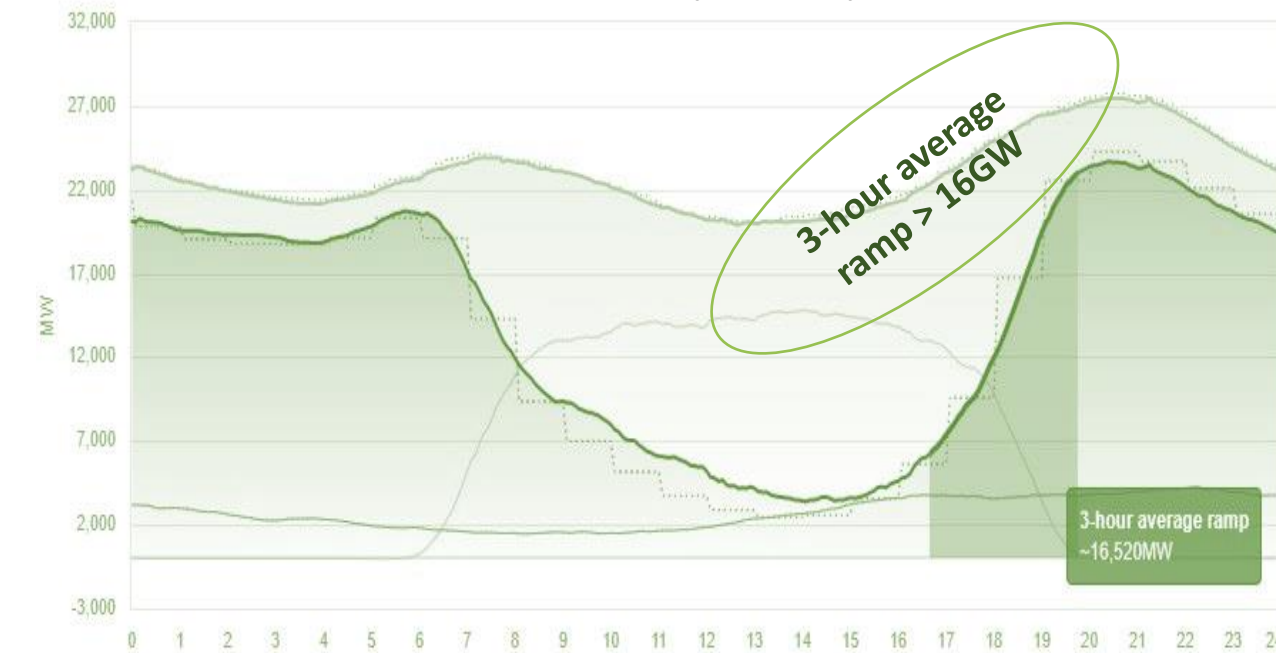
Enablers

- **Energy transition**, driving decarbonisation and sector electrification initiatives.
- Interest from governments, utilities, financing institutions, project developers, auto manufacturers, industry/commerce and consumers.
- Appreciation of the 'value of energy storage' in grid operations and evolution of business models.
- Flexible deployment of solar PV-storage solutions across electricity reticulation, distribution and transmission networks.
- Lower-cost BESS chemistries (e.g. LFP).

Hurdles

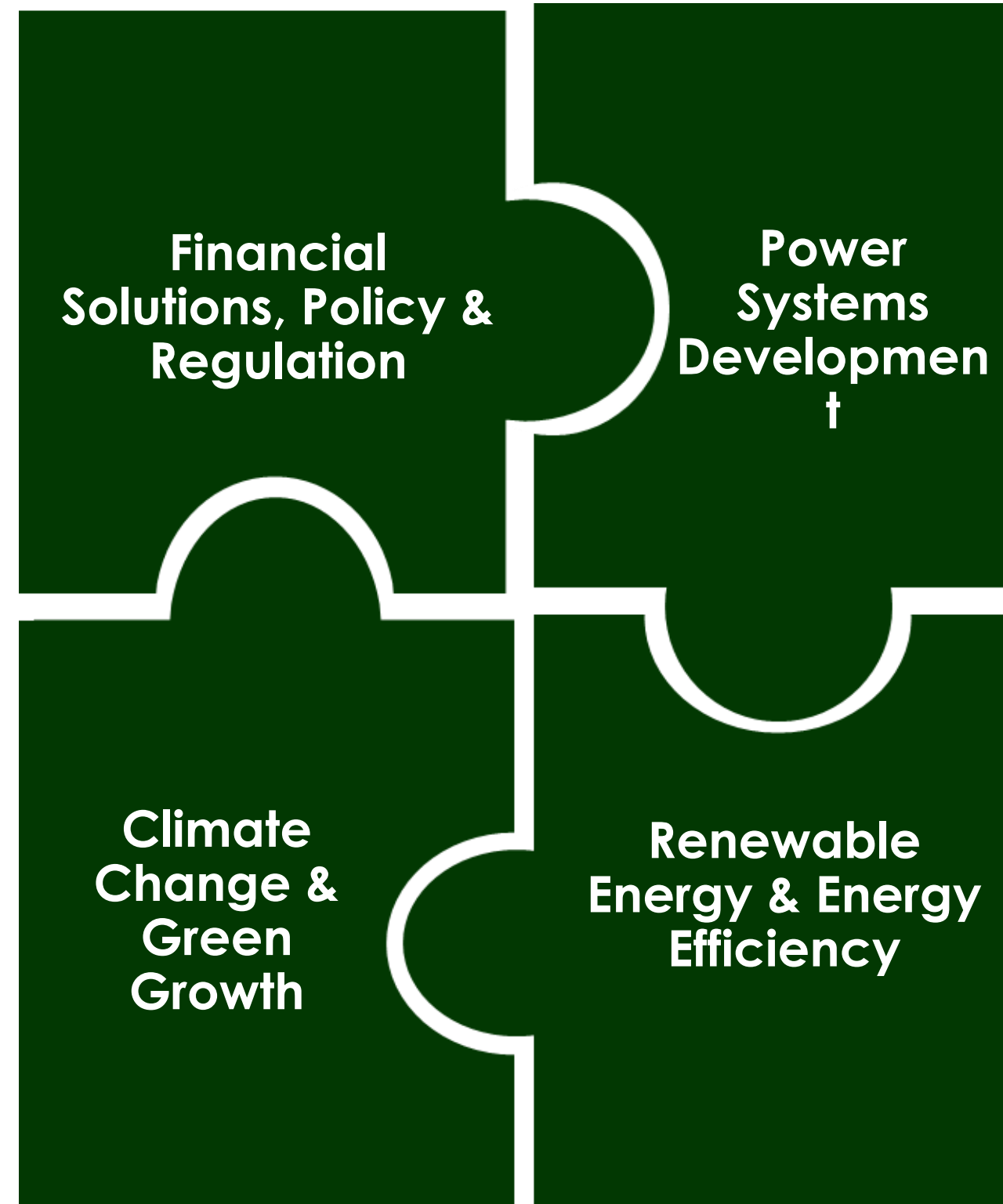
- Concerns about effects of solar/wind generation on power system stability.
- Inadequate institutional/regulatory frameworks and capacity.
- Weak utility balance sheets, constraining investments/off-take opportunities.
- Integrated solar/wind generation-storage projects not yet a 'default' option. **Why?**
- Concentration in the supply-chains of critical materials, limiting cost reductions
- Not to forget - the 'resource-curse'!

Source: CAISO (24052023)



The Power, Energy, Climate and Green Growth Complex

- Support governments with **technical assistance on policy and regulation**
 - Consolidate and analyze **power sector information and data**
 - Provide **financing solutions** to facilitate investments, notably guarantees, senior debt and equity
-
- Mobilize **climate and environmental finance**
 - Implement NDC commitments via the **Africa NDC Hub**
 - Strengthen the capacity of Africa's climate data centers to generate and **disseminate climate information for development** in Africa



- Development of **grid-based power systems**
 - Provide deep sector **technical expertise to power utilities** to facilitate corporate efficiency
 - Facilitation of **regional power system integration**
-
- **Off-Grid and Mini-Grid** transactions
 - Development **Energy Efficiency and Clean Cooking** sectors
 - Implementation of **special renewable energy initiatives**

Suite of mechanisms to facilitate energy sector investments

<p>African Development Bank</p>	<ul style="list-style-type: none"> • Lending instruments from the Sovereign and Non-Sovereign windows to provide long-term debt to public and private clients, with blended finance solutions and technical assistance. • Guarantees to mitigate the risks attached to investments. • Equity participation to bring scarce risk capital to transformative projects.
<p>Trust Funds</p>	<ul style="list-style-type: none"> • Sustainable Energy Fund for Africa (SEFA): technical assistance and concessional loans/reimbursable grants to grid-connected renewable energy generation, BESS and transmission projects; green mini-grids and energy efficiency. • Canada – African Development Bank Climate Fund (CACF): concessional debt and technical assistance to climate mitigation and adaptation projects, with emphasis on the empowerment of women and girls.
<p>African Legal Support Facility</p>	<ul style="list-style-type: none"> • Hosted by the African Development Bank, provides transaction advisory and capacity building services to African Governments and utilities. • Support in the negotiation of large-scale and small-scale projects on Sovereign Debt, Infrastructure investments (incl. power sector); extractives (mining, oil & gas, etc.); and Creditor Litigation Support.



An overview of approach to energy storage investments

Main considerations

- Alignment with the AfDB's **New Deal on Energy For Africa (NDEA)**, to **Light Up and Power Africa**.
- Focus on RE **integration** - implies energy storage is integral to scaling up investments.
- Traditional forms of energy storage (e.g. PSH/reservoir storage) tend to be location-specific.
- Solar and wind generation costs have fallen significantly, but BESS integration typically affects project economics.
- Establishment of **local value-chains?**

Key project-specific factors

- **Sectoral context** – generation mix; supply-demand; regulatory frameworks; etc.
- **Use cases** - voltage/frequency regulation; load shifting/following; black-start, etc.
- **Project economics** – equity IRRs/DSCR; cost-recovery/viability gaps; etc.
- **Blended finance principles** – minimum concessionality; crowding-in effects; commercial viability; high standards; reinforcing markets; and value-for-money.
- **Legal frameworks** – IAs, OAs, PPAs, EPC-O&M contracts (incl. efficiency guarantees); E&S requirements, etc.

Instruments

- **Sovereign/corporate loans** where governments/utilities are counterparts.
- **Long-term senior debt** as part of project finance for private sector-led projects.
- **Concessional debt or reimbursable grants** for blending with long-term senior debt.
- **Junior equity** to catalyse private capital in **investment funds/platforms**.
- Credit enhancement guarantees.
- **Technical assistance and project preparation support** to de-risk investments.



Sustainable Energy
Fund for Africa

Donors



MINISTRY OF
FOREIGN AFFAIRS
OF DENMARK
Danida



Foreign, Commonwealth
& Development Office



MINISTERO DELLA
TRANSIZIONE ECOLOGICA



Norad



Federal Ministry
for Economic Cooperation
and Development



Global Energy Alliance
for People and Planet



Leader of the BD team

12 years at Eskom with Distribution NetOps and Field Service Centre and Scatec with 40MWp in Mozambique

Passionate about electrifying Africa, now focusing on microgrid projects

MBA and BSc Electric and Electronic Engineering from the University of Stellenbosch



Anré Swart |

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| Energy Solutions to serve
Africa

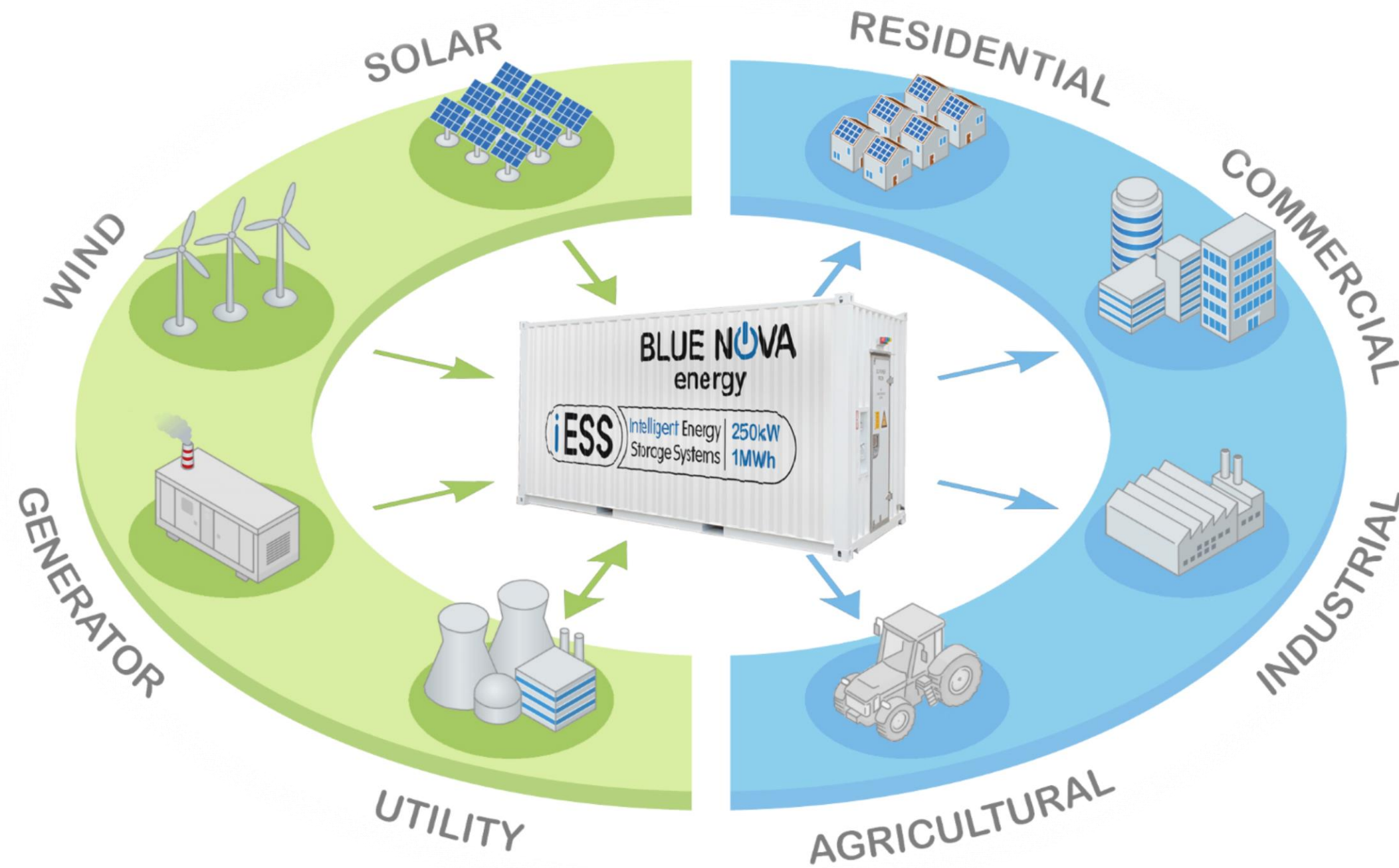


iESS

intelligent Energy Storage System

BLUE NOVA
energy

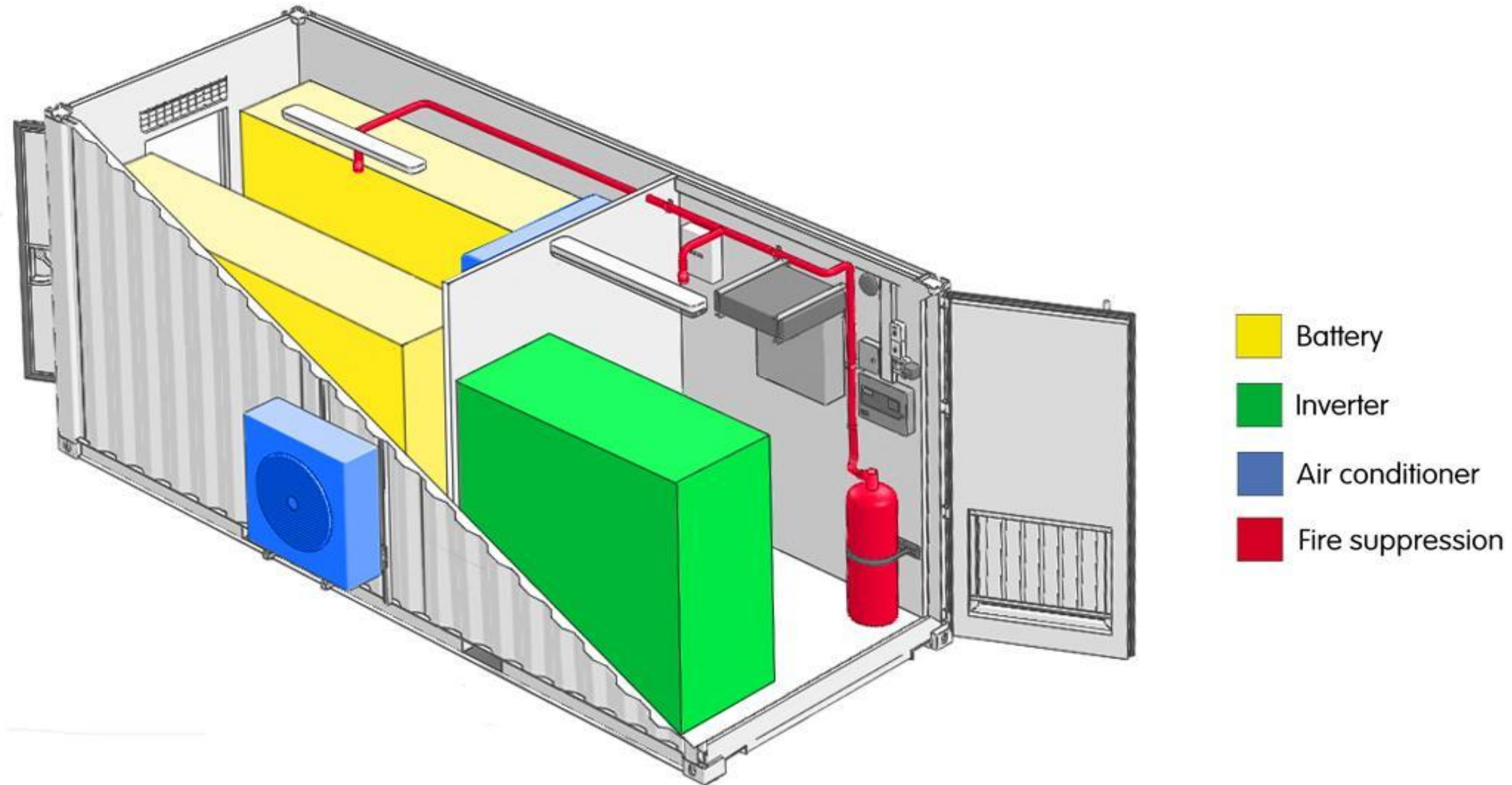
Introduction to iESS



Application:

- Peak shaving
- Load shifting
- Voltage and Frequency regulation
- Micro-grid component
- Backup

iESS layout



- Inverter
- Lithium ion battery pack
- BMS (Battery Management System)
- RMaC (Remote Monitoring and Control)
- HVAC

- Fire Suppression System (optional extra)
- Access Control (optional extra)
- UPS and emergency stop
- Internal electrical distribution

iESS Product Design

- Cell - selection criteria

- Performance Warranty

- %DoD (Depth of discharge)
- Capacity Retention (at End of Life [EoL])
- Cycles
- Temperature
- C-rating

- kWh delivered under Warranty

- Safety standards compliance – UL9540

- Transportability – UN3480



- >6000 cycles
- 10 year warranty

- Modules



BN52V-280-14.5k

Cells	16
Capacity	280 Ah
Energy	14,5 kWh
Nominal Voltage	3,25 V
Minimum Voltage	2,9 V
Maximum Voltage	3,5 V
Weight	± 100 kg



iESS Product Design

- Inverters and String selections in containers

Inverter size (kVA/kW ; PF=1)	Input Voltage Range (Vdc)	String selections
50	352 VDC – 600 VDC	8 – 10 modules 116 – 146 kWh
100		
150		
250	500VDC– 800 VDC	12 – 14 modules 174 – 204 kWh
500	600 VDC – 900 VDC	14 – 15 modules 204 – 218 kWh
1000		



- Maximum battery capacity
- 6m container – 1.7MWh
 - 12m container - 3.4MWh

BlueNova C&I iESS Product Design – Available HV Inverters



Kehua PCS series
100,250,500 kW



ARIO 230 kW



AEG SC Flex 1300 kW



ATESS HPS series 50,100,150kW
ATESS PCS series: 250, 500kW

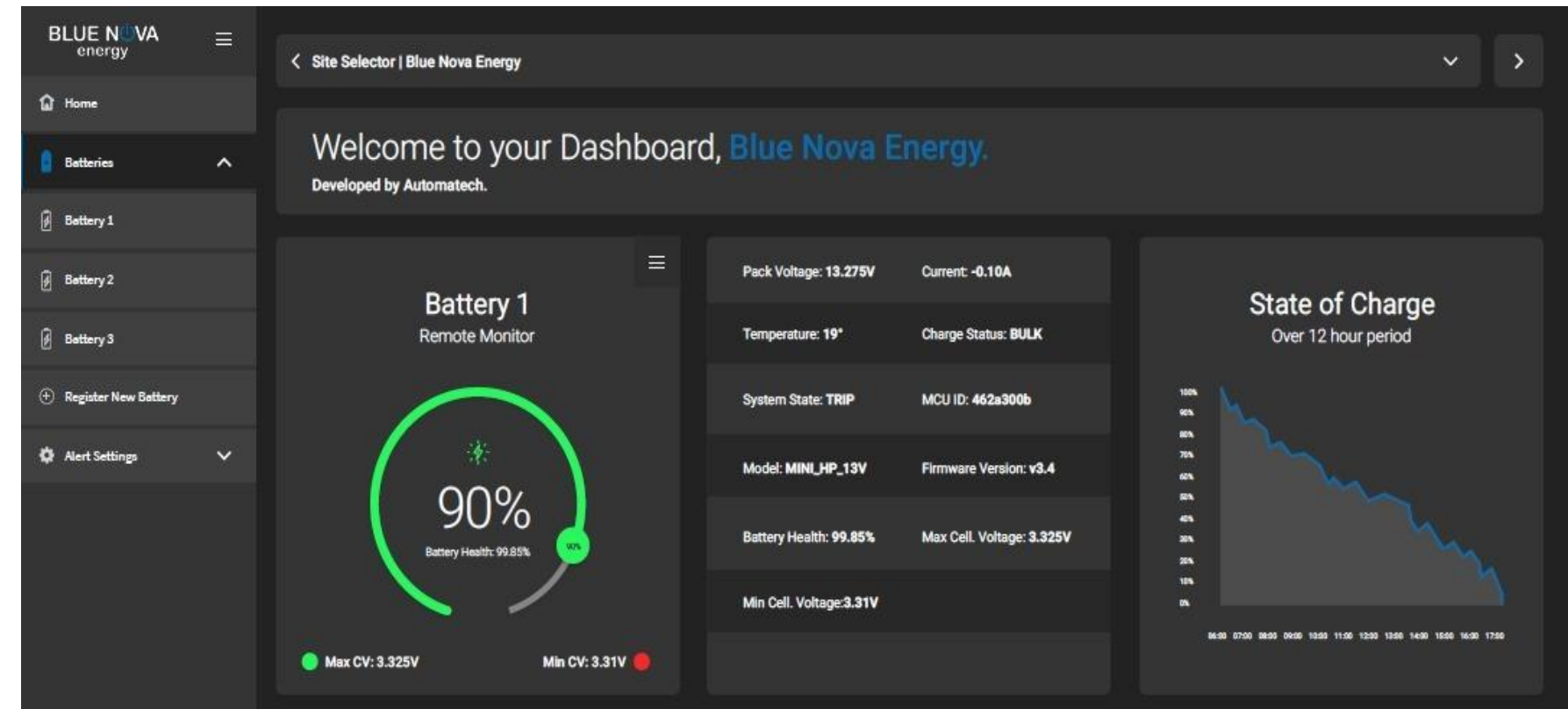
iESS Product Design

BMAC



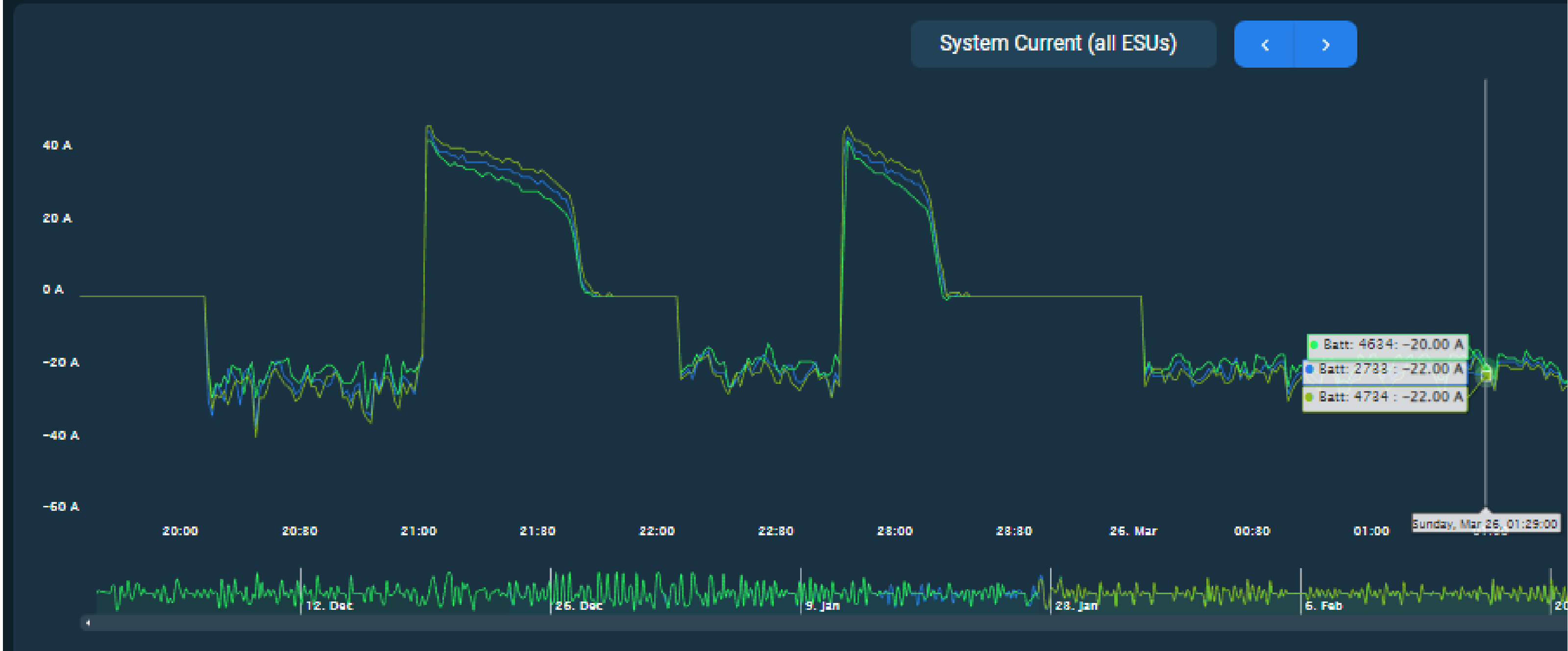
Product Features:

- Local and remote monitoring
- Over the air firmware upgrades
- Record full performance history (warranty claims)
- Webpage graphing interface
- Dual CANBUS
- RS485 interface
- High precision energy meter
- AC power monitor



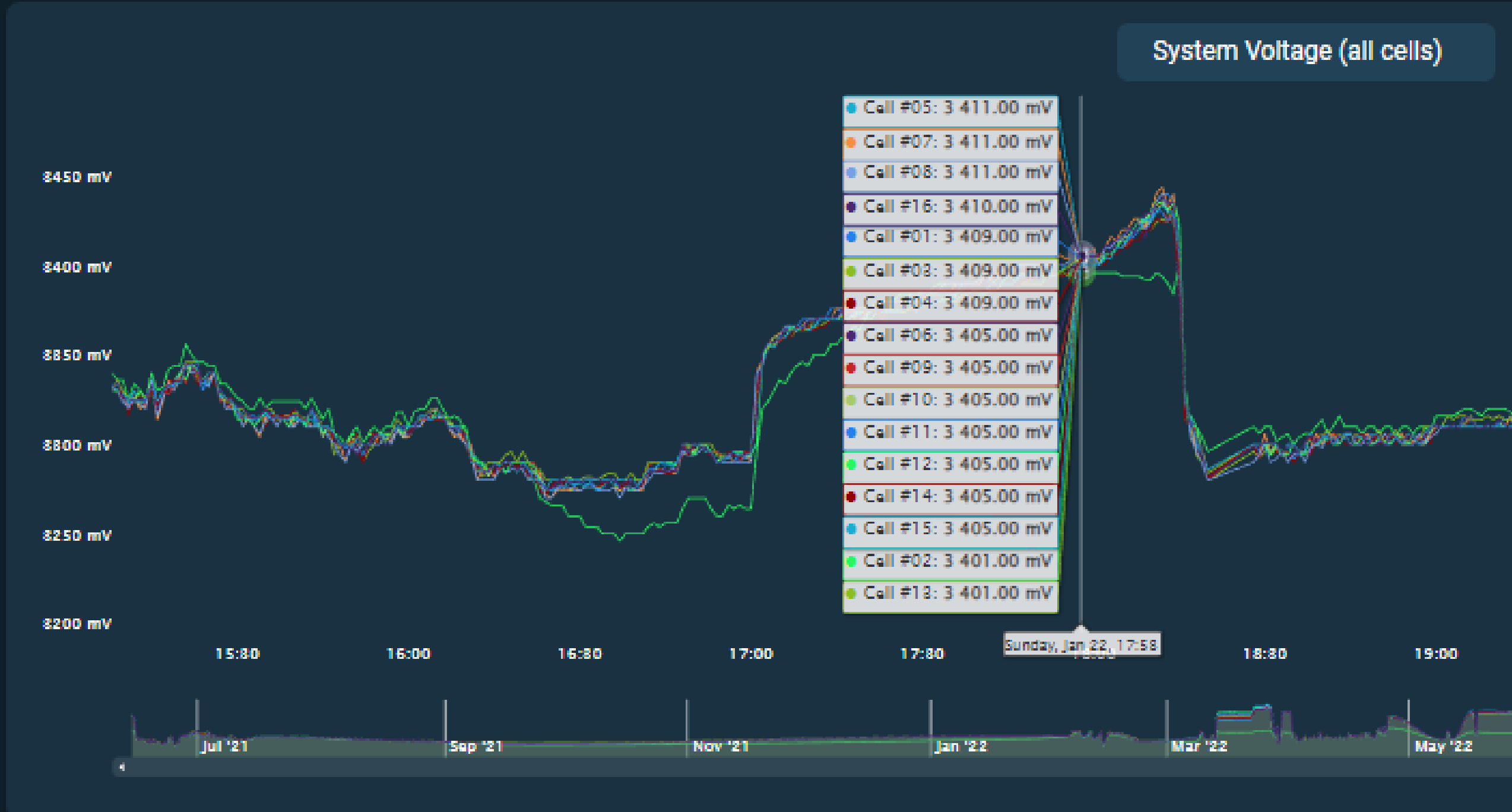
iESS Product Design

Shell Sedibeng



iESS Product Design

Blue Nova | James Verster Picasso BMAC | Batt: 2431300B



RMAC – Remote Monitor & Control

- Peak shaving
- Load shifting
- Voltage and Frequency regulation
- Micro-grid control
- Backup



TimBila Nature Reserve - Namibia



Installation: iESS 250kW / 975kWh
Supplying:

Lodge and residential units
(250km north of Windhoek)

Application:

- Off-grid
- Integration with
 - Generator (200kVA)
 - Integration PV string inverters (Huawei) (280kWp solar)

Generating power at less than
R2/kWh for 15years

BlueNova's 1st export into Africa



The Grove Mall, Pretoria – South Africa

Installation: iESS 500kW / 1,3MWh

Supplying:

Commercial

Application:

- Integration with
 - Generator
 - Integration PV string inverters (Huawei)
- Cost reduction (running of generator)
- Reliability of supply



Mozambique

Installation: iESS 150kW / 450kWh

Supplying:

Village

Application:

- Off-grid
- Integration with
 - Generator
 - Integration PV



iESS Business Cases

1. Arbitrage – Load shifting

2. Back-up

a) with PV optimization

b) No PV

3. Peak Shaving – Demand Management

- Direct-Grid Connection
- Indirect-Grid connection

4. Power Factor Correction



Business Case Arbitrage – Load shifting

Winter & Summer Tariff

	Off-Peak	Standard	Peak	PP-OP	PP-SP
Winter	1.50	2.49	7.11	5.61	4.62
Summer	1.37	1.73	2.40	1.04	0.67

LCOE 500kW/1500kWh - R1.40/kWh (6000 cycles)

Inflation 5%, Tariff increase 8% PA, 10 years, degradation and losses included
RTE 88%

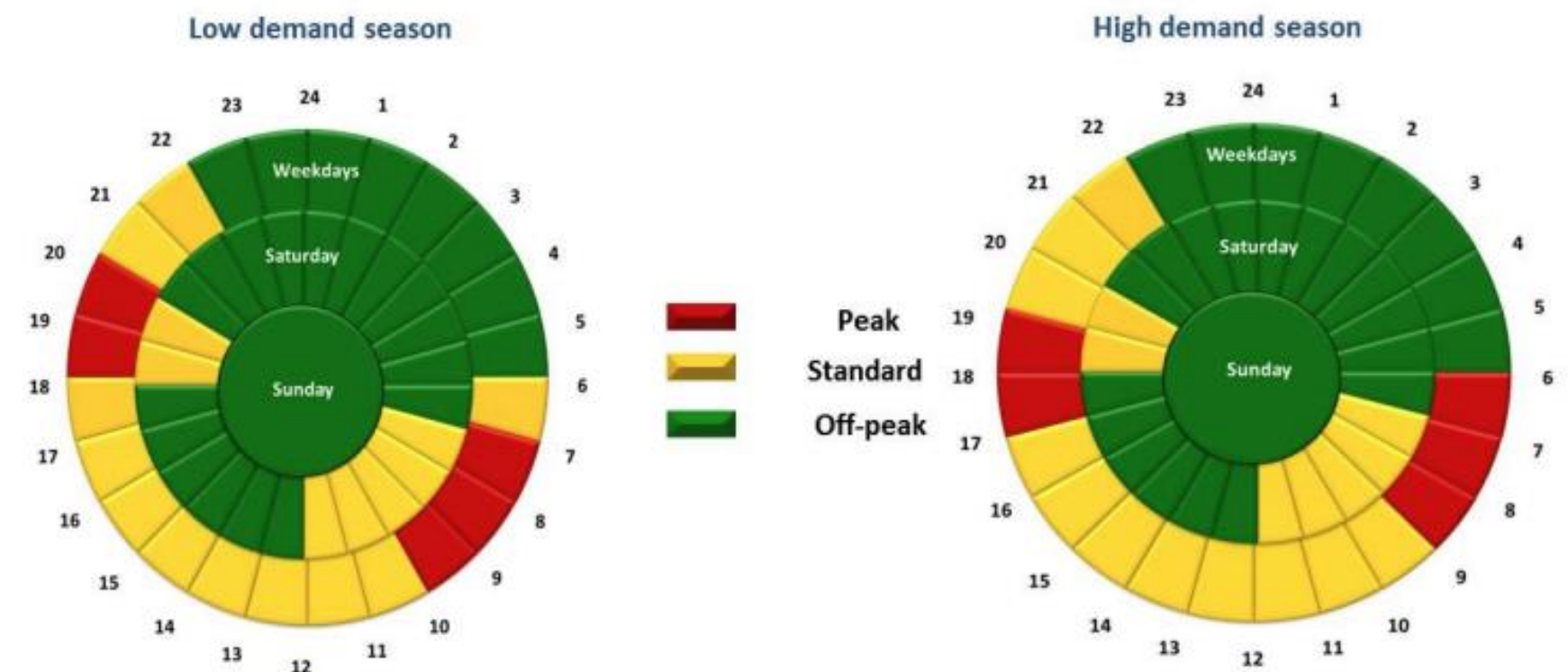
Saving

NPV > R11m

IRR > 23%

Only Arbitrage when it makes sense

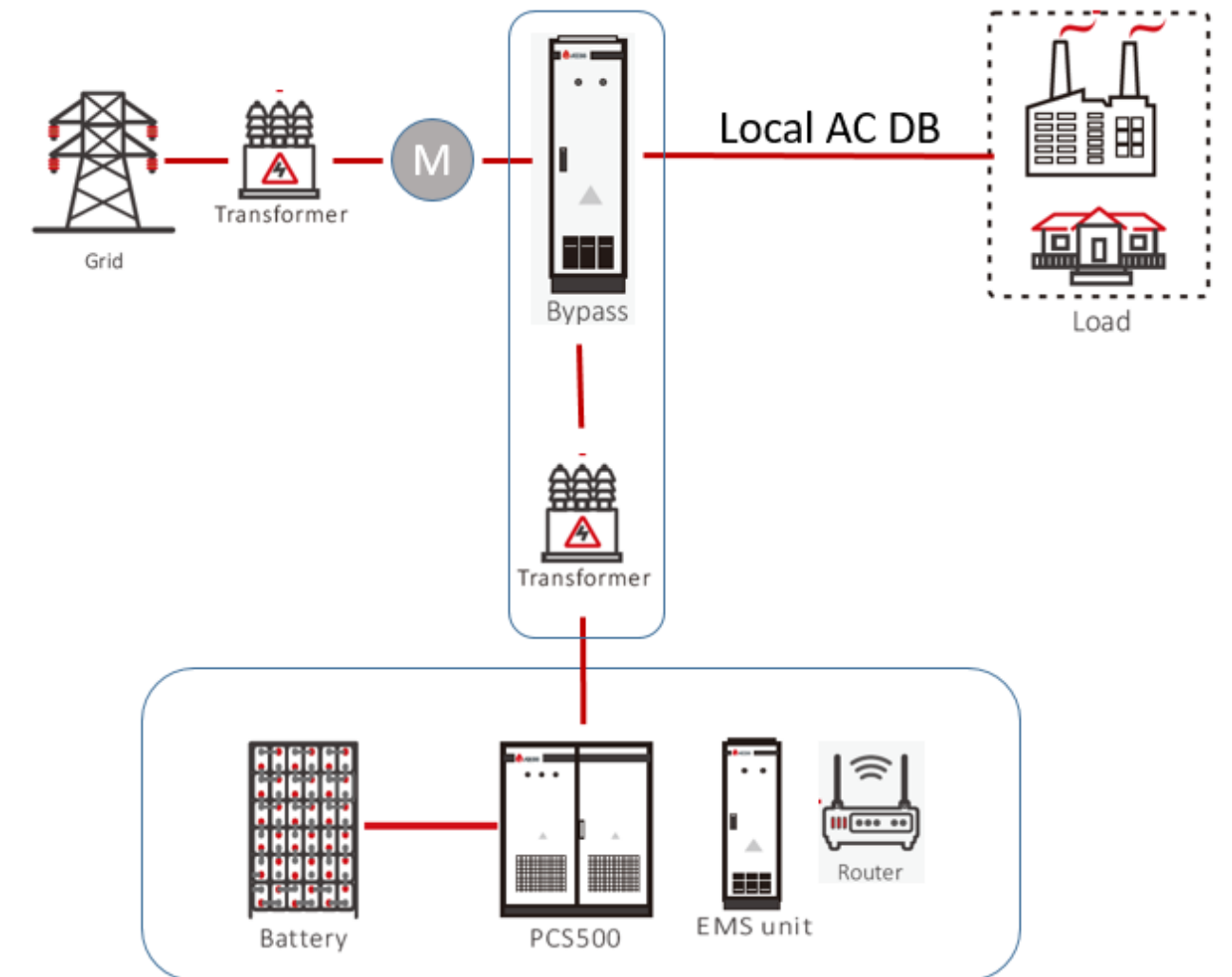
Savings increased with excess PV during the day



Back-up without PV

- 500kW/1500kWh storage (Cost circa R10m)
- Cost of Diesel > R10/kWh
- Stage 4 scenario (2 cycles per day, 2.5 hours per day)
- Diesel saving > R5m PA
- Breakeven under two years
- Minimization of production losses and impact of power cuts
- Significantly better scenario to Arbitrage

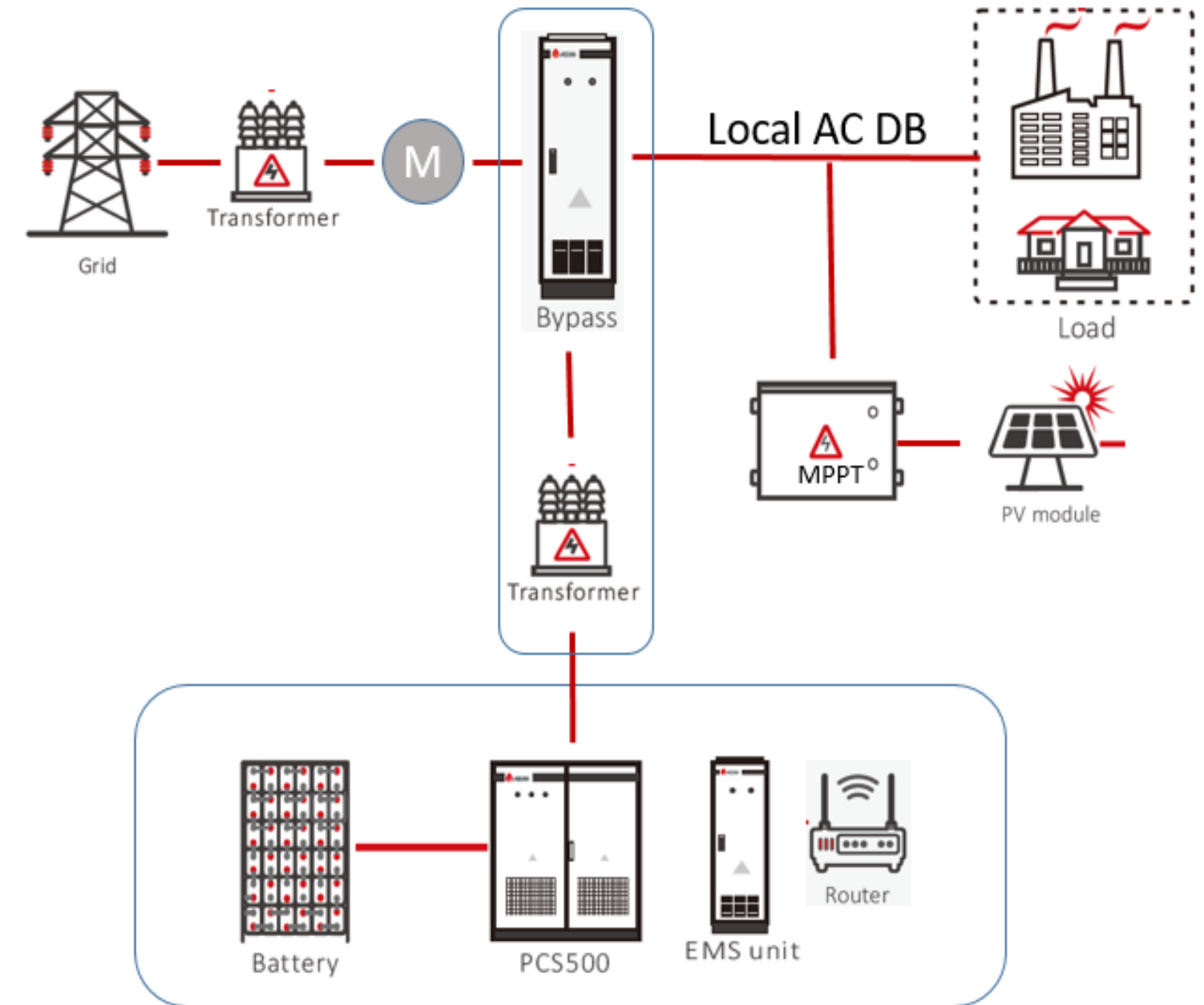
Note: When loadshedding stops then arbitrage continues – ongoing ROI



6m Container, 500kW PCS
1500kWh Battery, EMS

Back-up with PV

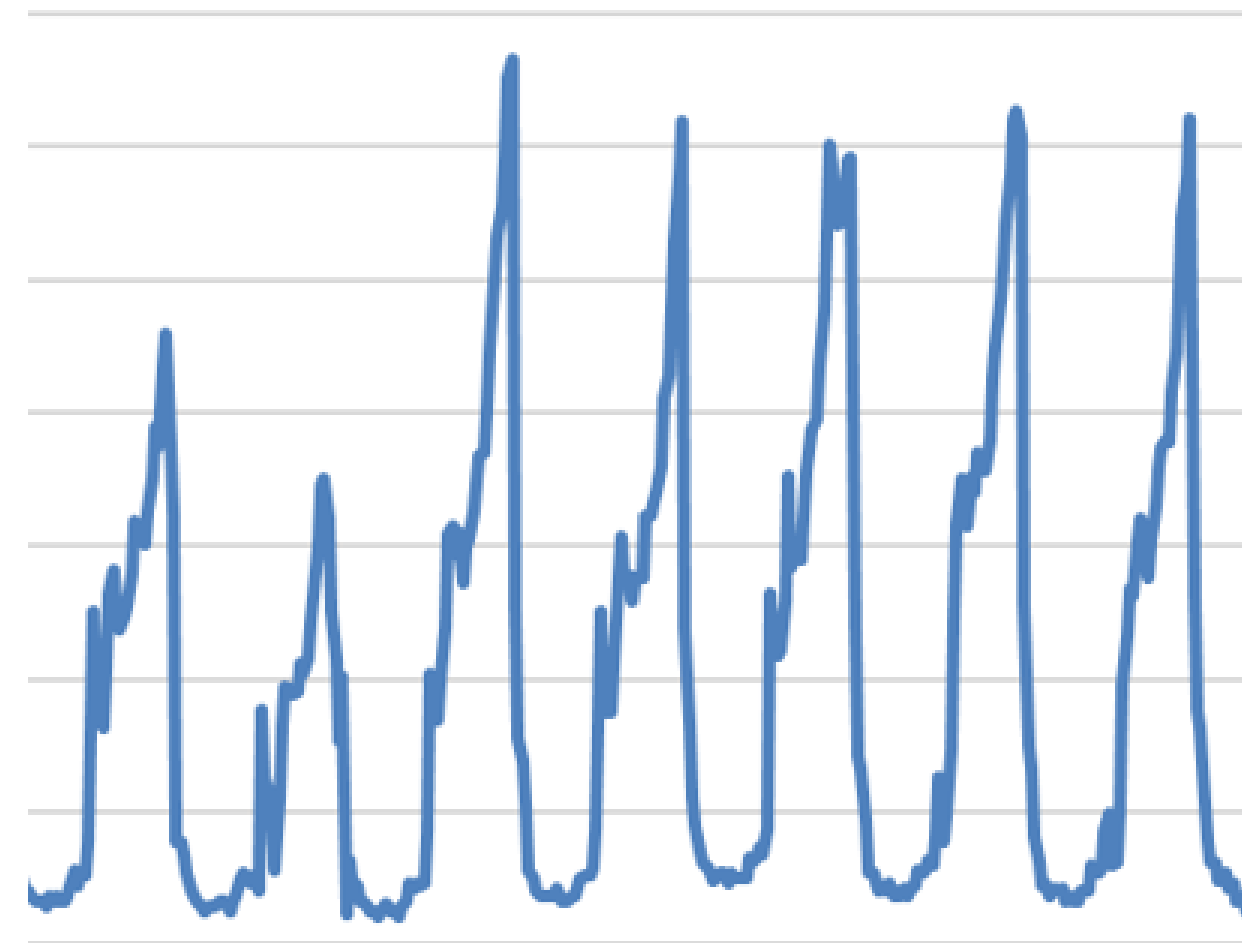
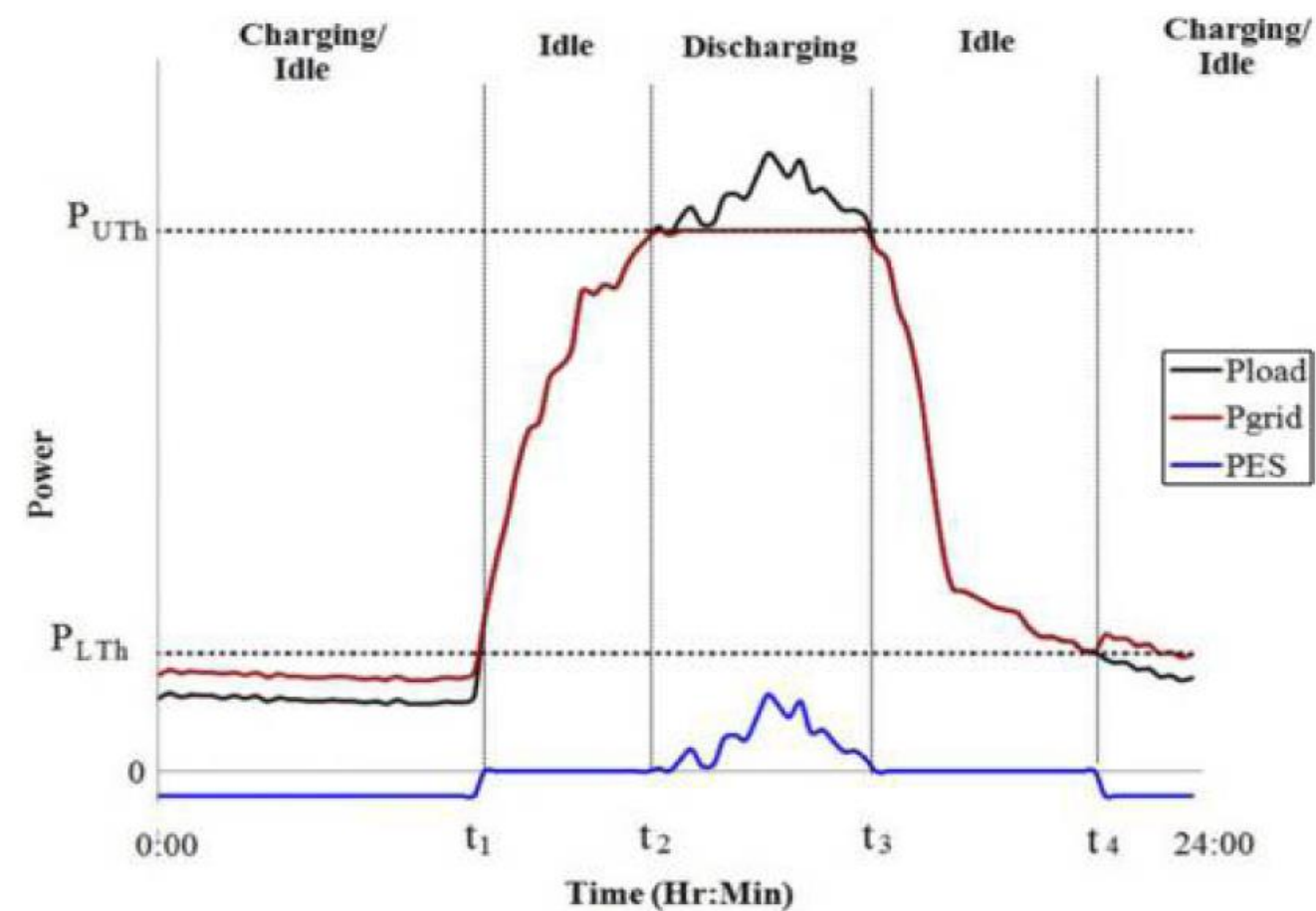
- 500kW/1500kWh storage
- Battery acts as a grid forming device during backup
- PV can now be utilized – leveraging PV investment
- Sufficient PV can also charge battery during the day



6m Container, 500kW PCS
1500kWh Battery, EMS

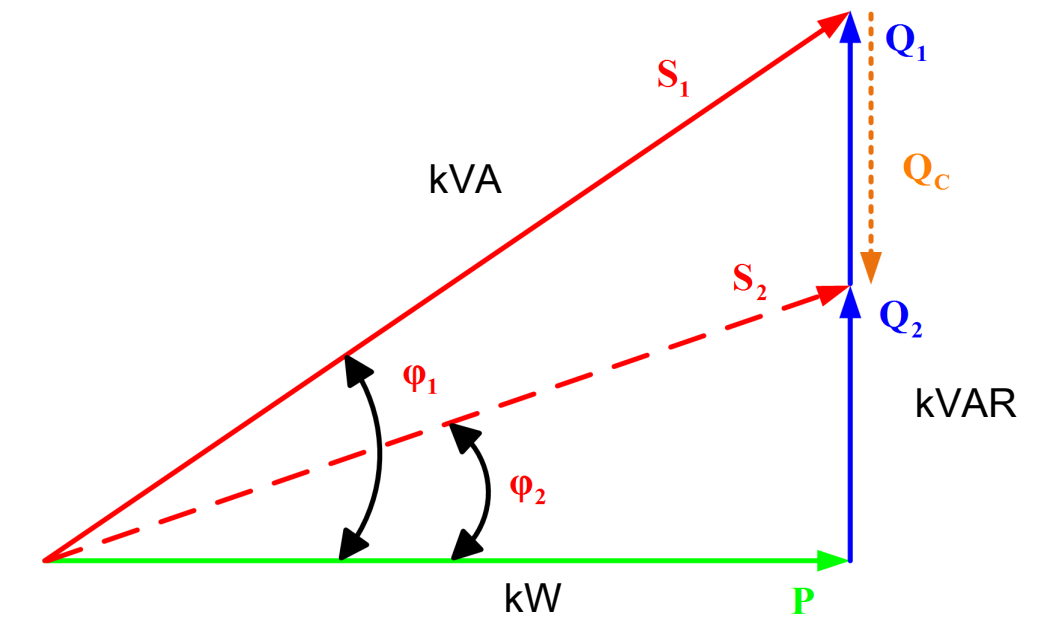
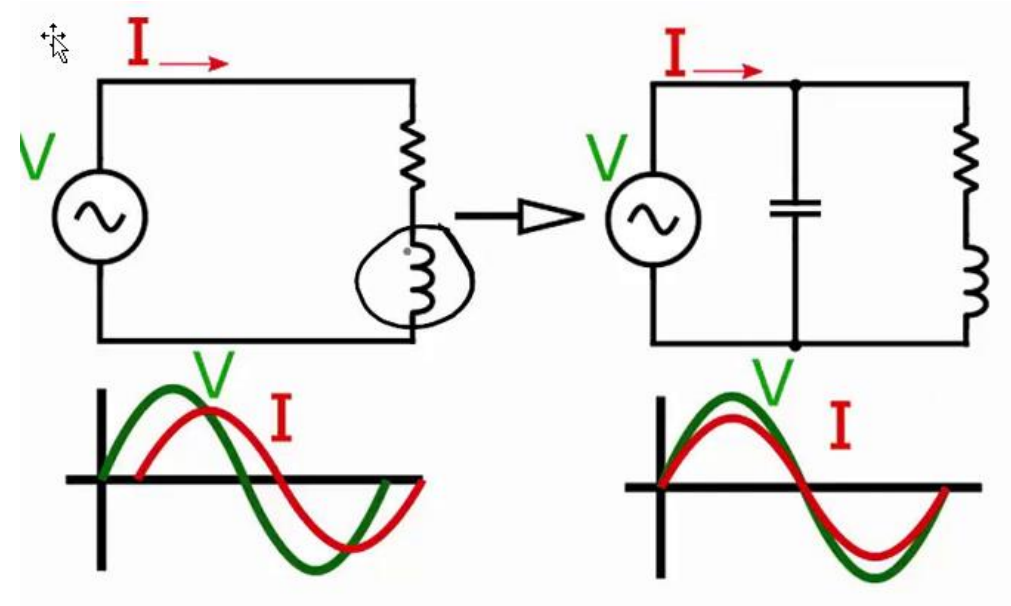
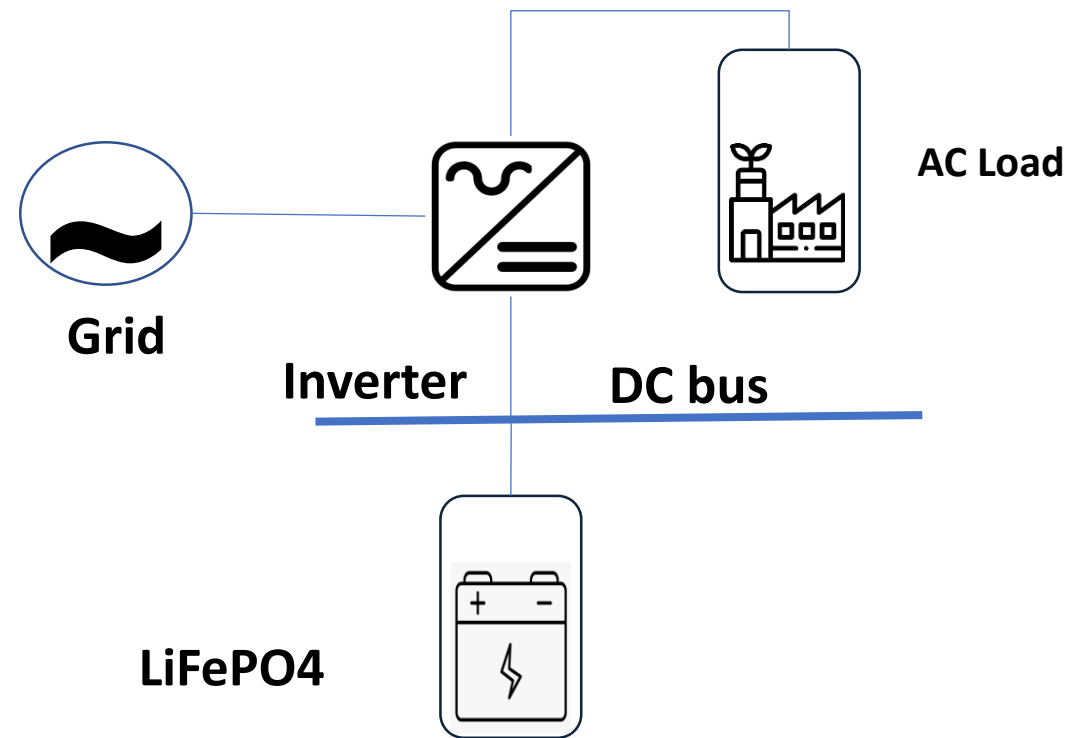
Peak Shaving – Demand Management Direct-Grid Connection

- iESS 500kW/1500 kWh (R10m)
- Original peak 1MVA
- New Peak 500kVA
- @R330/kVA – saving >R1.5m PA



kVA demand over a week
Evening peaks due to PV
Ideal opportunity to reduce peak by
up to 50%

Power Factor Correction



	Load (before)				Load (after)			
PF	kVA	kVAR	kW		PF	kVA	kVAR	kW
0.7	1000	720	700		1.0	720	0	700

- kVA demand reduction from 1000kVA to 720 kVA
- Saving @ R330 / kVA = R92.4k per month or R11 m over 10 years
Investment <R5m



BLUE NOVA

energy

Thank you





Board Member of SAESA

20 years experience automotive industry

Passion for e-mobility in Africa, Executive Director of e-Mission and Strategic Advisor for uYilo Electric Mobility Programme

Masters in Electrical and Electronics Engineering from Nelson Mandela University



Hiten Parmar |





Safety on battery energy storage systems

7 June 2023

By Hiten Parmar

South African Energy Storage Association (SAESA) seeks to guide policy to allow for the accessibility of storage projects and advocate and advance the energy storage industry in South Africa

SAESA's mission and vision are supported by its constitution

The SAESA Vision:

1. Guide policy to allow for the accessibility of storage projects;
2. Advocate and advance the energy storage industry in SA.


SAESA's Mission:

3. Create a more resilient, accessible, efficient, sustainable, and affordable energy system in Africa.
4. Educate stakeholders, advocate for public policies, accelerate energy storage growth, and add value to the energy storage industry.

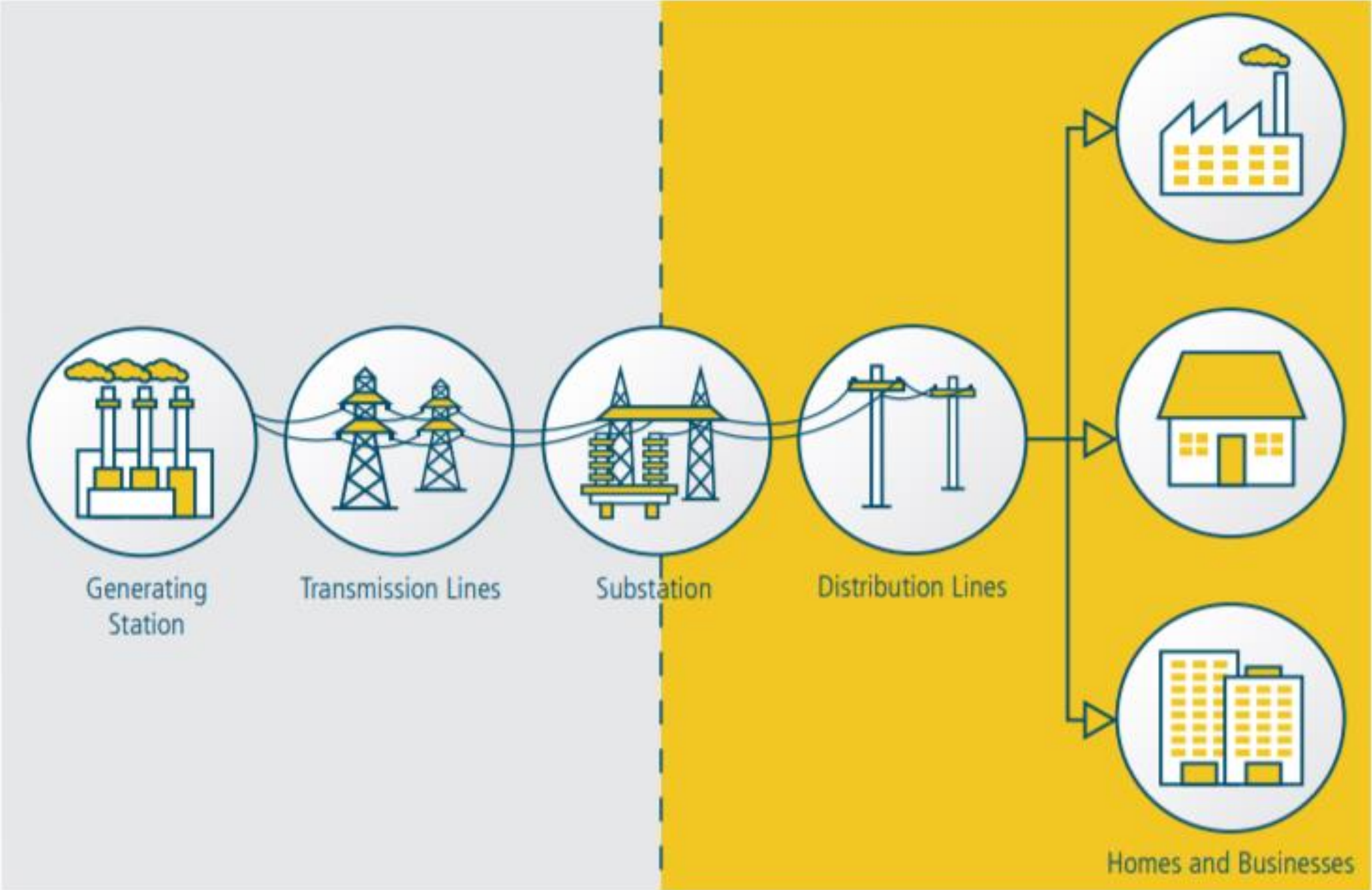
Objectives and Powers under SAESA Constitutions

The Association aims to promote Energy Storage in South Africa and Africa and to assist its Members in their business development in these markets by:

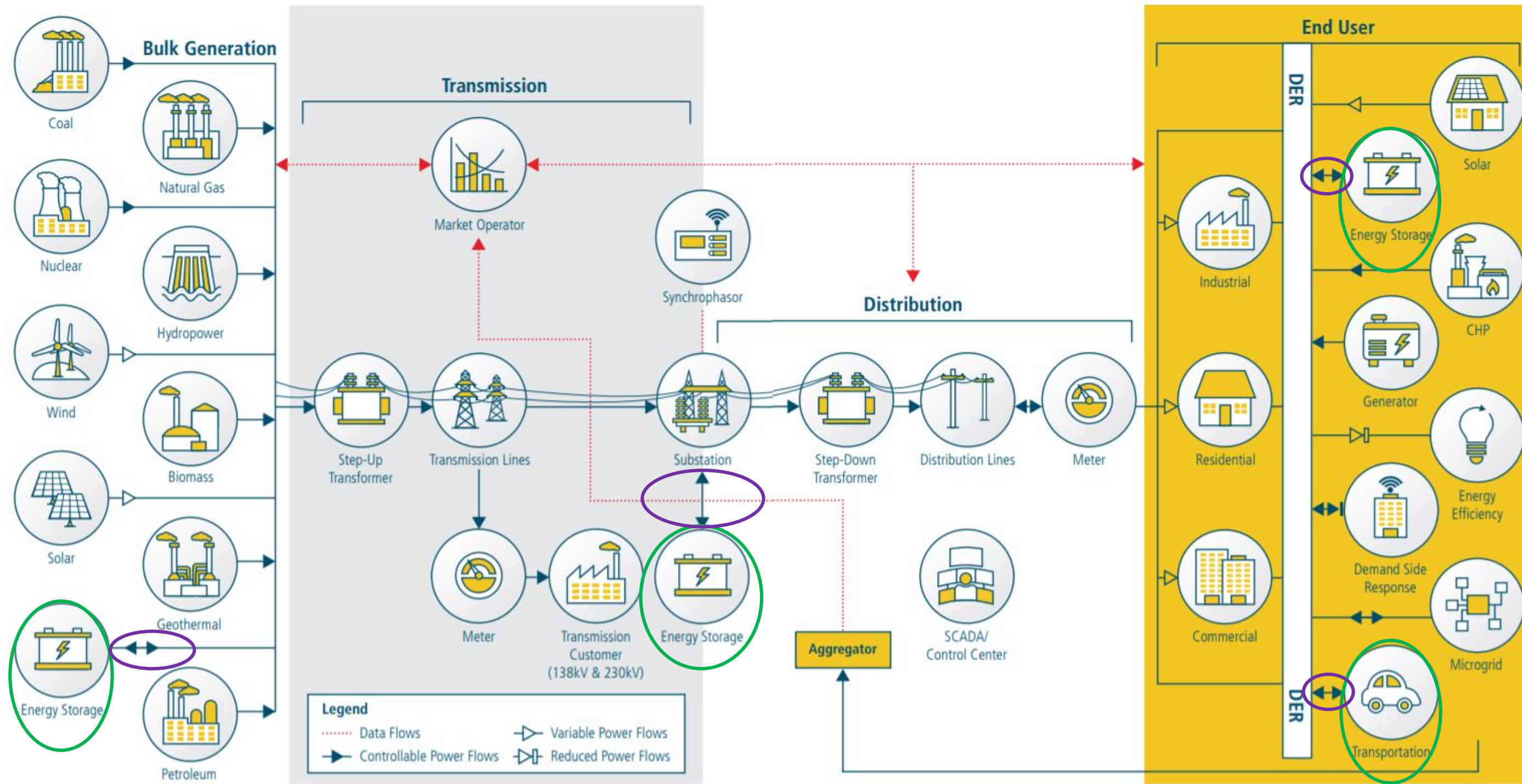
- Representing the Energy Storage Industry before political institutions in all forums within South Africa and assisting in an advisory role within the Southern African Development Community region and other African regions when requested to do so;
- Informing its Members on the latest legislative developments;
- anticipating legislation having a potential impact on the sector;
- Advising key decision makers on the most adequate policies to develop a sustainable Energy Storage Market;
- Mobilising the sector by way of working groups and workshops to define clear positions representing the views of the majority of the industry on political, technical and economic issues;
- Promoting a higher usage of the technology in the public and private sectors;
- Facilitating business-to-business contacts among industry stakeholders;
- Supporting national organisations in achieving their local objectives;
- Coordinating with other energy industry groups on increasing awareness and proactive interventions from government stakeholders around common issues; and
- Organising conferences where energy storage has strong potential and requires additional support.
- Liaising with energy storage organisations from other geographies to both export and import best practices in terms of policy, standards and market engagement;
- In pursuing its objectives, the Association shall have such powers as are normally associated with an *universitas personarum* under the common law of South Africa.

CONSTITUTION OF THE SOUTH AFRICAN ENERGY STORAGE ASSOCIATION	
	
CONSTITUTION OF THE SOUTH AFRICAN ENERGY STORAGE	
Name	3
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Traditional Energy Landscape



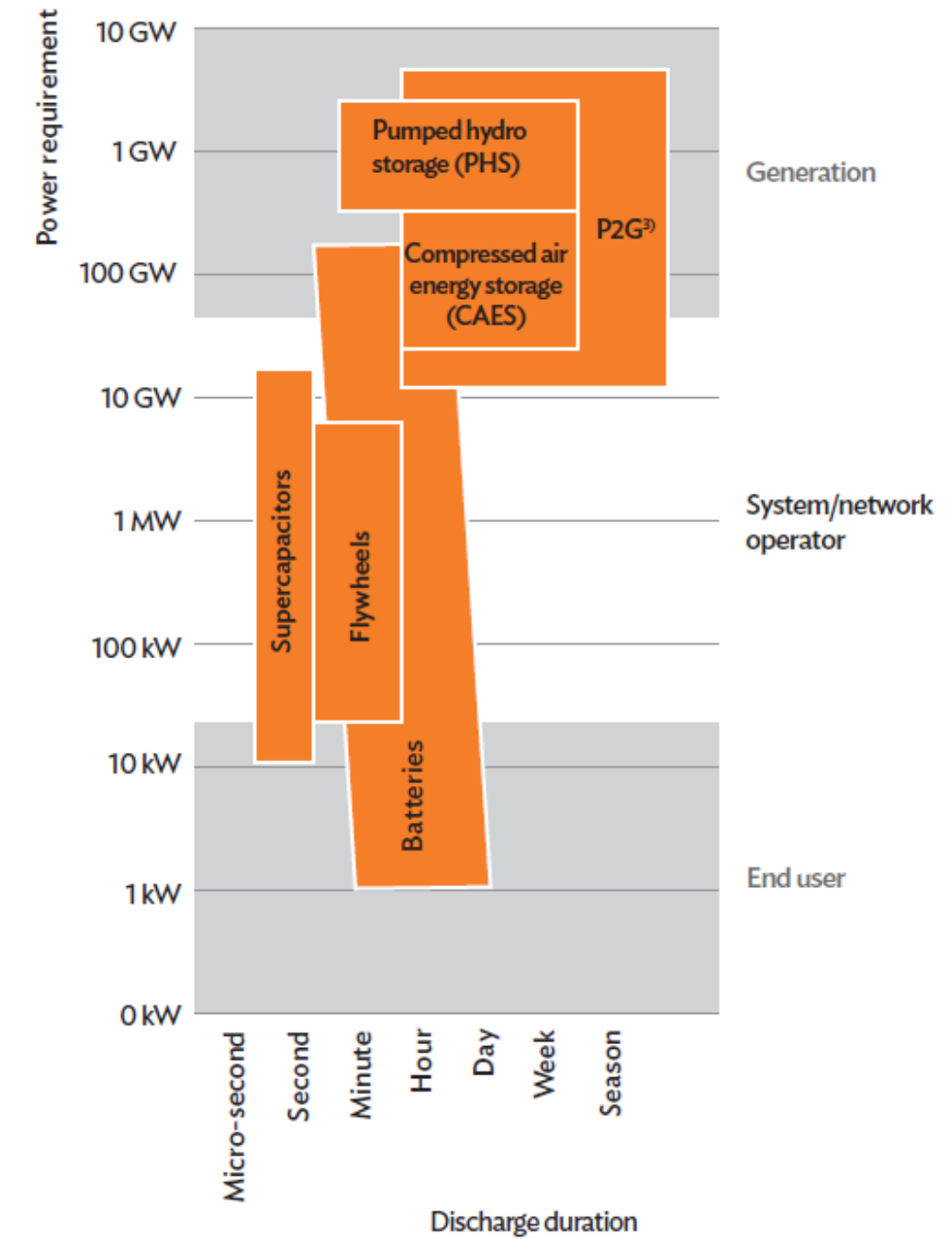
Future Energy Landscape: Energy Storage is common denominator



Types of Energy Storage Technologies



Types of Energy Storage Technologies and Use Case Examples



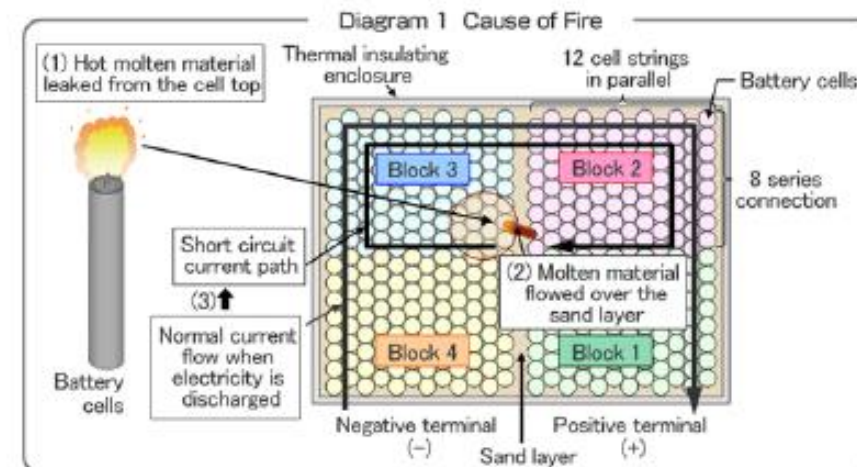
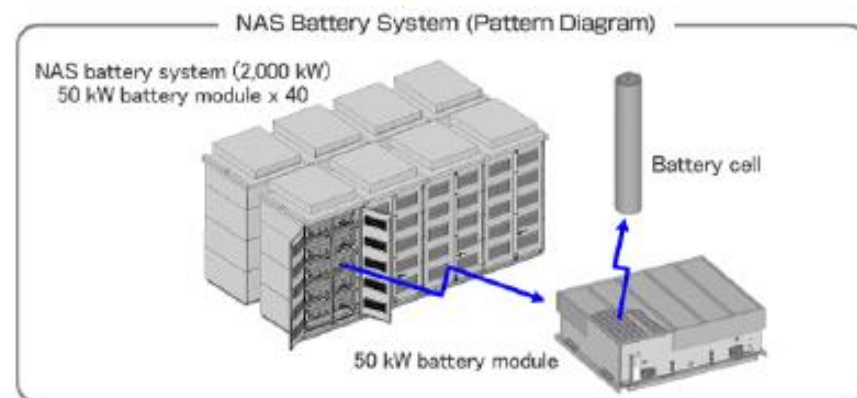
Safety on batteries

Why?

- Higher energy density than conventional systems
- Potential hazards if the energy is released at a fast, uncontrolled rate

Fire of a Na-S system in Japan (Joso City), September, 2011

2 MW NAS storage caught fire and burnt several days in Joso, Japan. NGK manufacturer ask its customers to stop their facilities during investigations.



Fire of a Li-ion system in US (Flagstaff), November, 2012

1.5 MWh Li-ion storage caught fire. The fire, initially reported as transformer fire is finally identified as a fire in the storage system Li-ion. The fire crew waited until the site operator APS (Arizona Public Service Company) has cut off all power source to extinguish the fire with water within 30 minutes. The fire did not spread to the related site facilities.



High voltage hazards

A number of factors influence the human body resistance, but IEC has provided 1 k Ω as an average value

	Bodily Effect	dc Current [mA]
12 mA @ 12 V	Feeling Sensation	1.0
	Pain is Felt	62
	"Let-Go" Threshold	76
300 mA @ 300 V	Severe Pain; Breathing Difficulties	90
	Heart Fibrillation Occurs	500

*0V dc must be considered High Voltage
ts are ~60 mA*

Types of battery failures (Lithium)

Internal short circuit and overheating could result from internal damage such as

- Dendrite growth
- Separator failure
- Lithium plating
- Nano-particles detaching from electrodes – others

Externally Causes (mechanical, electrical, thermal abuse)

- Mechanical Damage
- External Short Circuit
- Cell Overcharge
- Cell Over-discharge
- Low Temperature Recharging
- High Temperature Storage
- Improper Design
- Manufacturing contamination
- Sequential combinations of all of the above



Guidelines to ensure adequate safety

Prevention of major accidents

- Hazardous products

Occupational safety

- Staff safety measures as protection against electrical and mechanical hazards

Risk analysis and safety testing

- Product expected performances
- Some abuse conditions should be evaluated

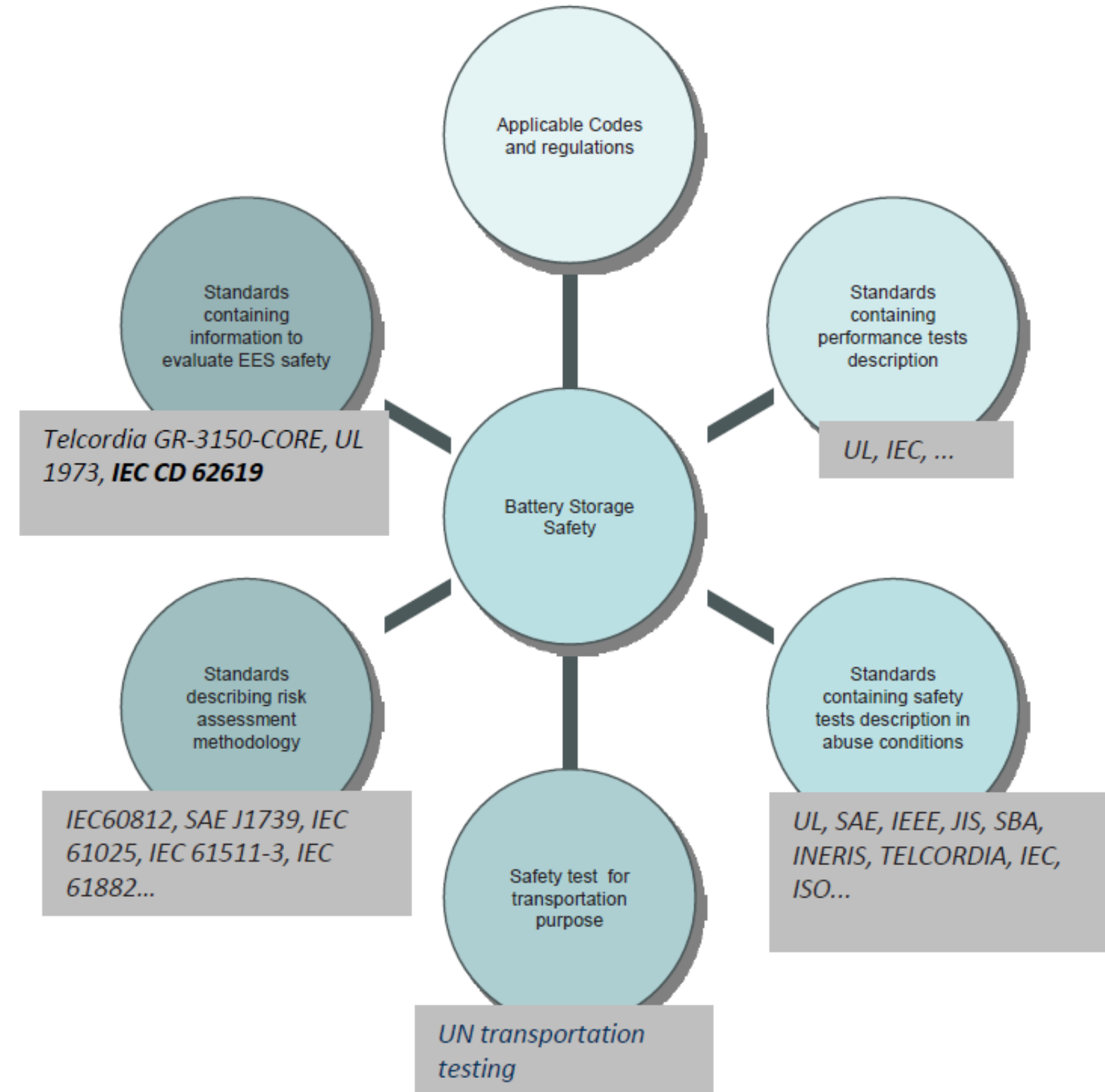
Mitigation measures

- Necessary measures must be taken to prevent accidents and limit their consequences

Identification of opportunities to develop new codes, standards, regulations

Safety recommendations for stationary storage

Standards related to stationary battery safety



Safety Guidelines

- Cell Acceptance Tests and Storage
- Battery Pack Assembly and Testing
- Battery Transportation
- Usage
- Battery Disposal

Environment

The decomposition of electrolyte is promoted by the presence of water/humidity



Leaching of metals into ground water (carcinogens)



Extended Producer Responsibility Regulation (South Africa)

GOVERNMENT NOTICES • GOEWERMENTSKENNISGEWINGS

DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES

NO. 1185

05 NOVEMBER 2020

**NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008
(ACT NO. 59 OF 2008)**

**EXTENDED PRODUCER RESPONSIBILITY SCHEME FOR THE ELECTRICAL & ELECTRONIC
EQUIPMENT SECTOR**

I, Barbara Dallas Creecy, Minister of Forestry, Fisheries and the Environment, hereby, under section 18(1) and (3) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), require the producers of the identified products to implement the specified extended producer responsibility measures, as set out in the Schedule hereto.



**BARBARA DALLAS CREECY
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT**

National e-waste landfill ban (23 August 2021)

As of August 2021 all hazardous e-waste is banned from disposal to landfill

National battery landfill ban (23 August 2021)

Lead acid batteries have been banned from landfill since 2013

As of August 2021 all other batteries are banned, including lithium ion batteries

Thank you



Contact for more info and membership:

Secretariat - secretariat@saesa.org.za

www.saesa.org.za



Business Development Manager

20+ years experience with solar and storage projects (backup, off-grid, PV-diesel hybrid, industrial Grid-tie solutions, solar thermal)

Designed and installed the 350 kWp system at Jomo Kenyatta airport in Nairobi

Bachelor in Business Administration from Management University Africa



Sammy Waite |





June 6 -7, 2023

CHLORIDE ENERGY STORAGE SOLUTIONS



Energy solutions for all

all

Summary

Application of Energy Storage

1. Power Backup Solutions
2. Off-Grid PV Solutions
3. On-Grid PV Solutions
4. Solar Water Heating
5. Solar Cooling Solutions
6. Products
 - PV
 - Batteries
 - Inverters
7. Our Services
8. Remote Monitoring
9. Brands We Associate With
10. Who we are

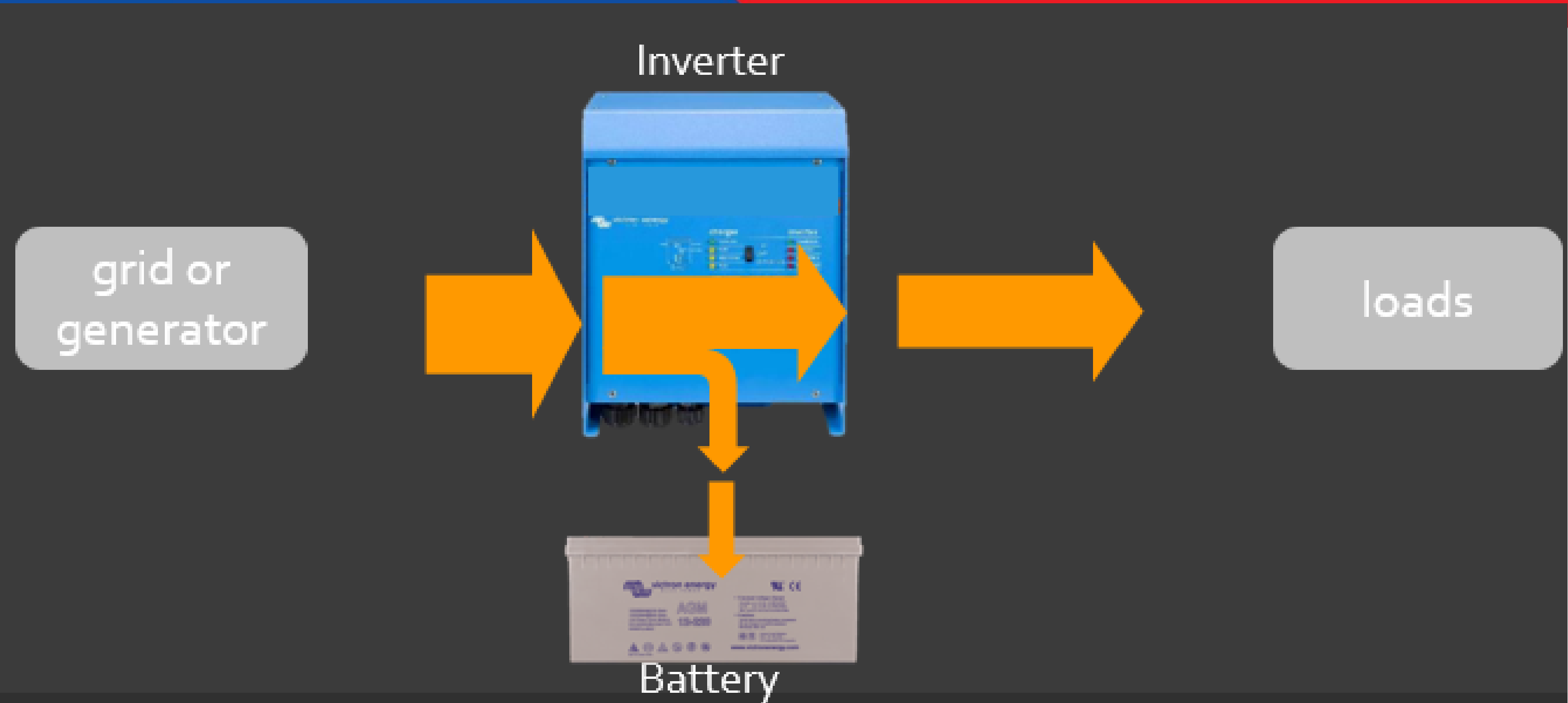


1. Power Backup

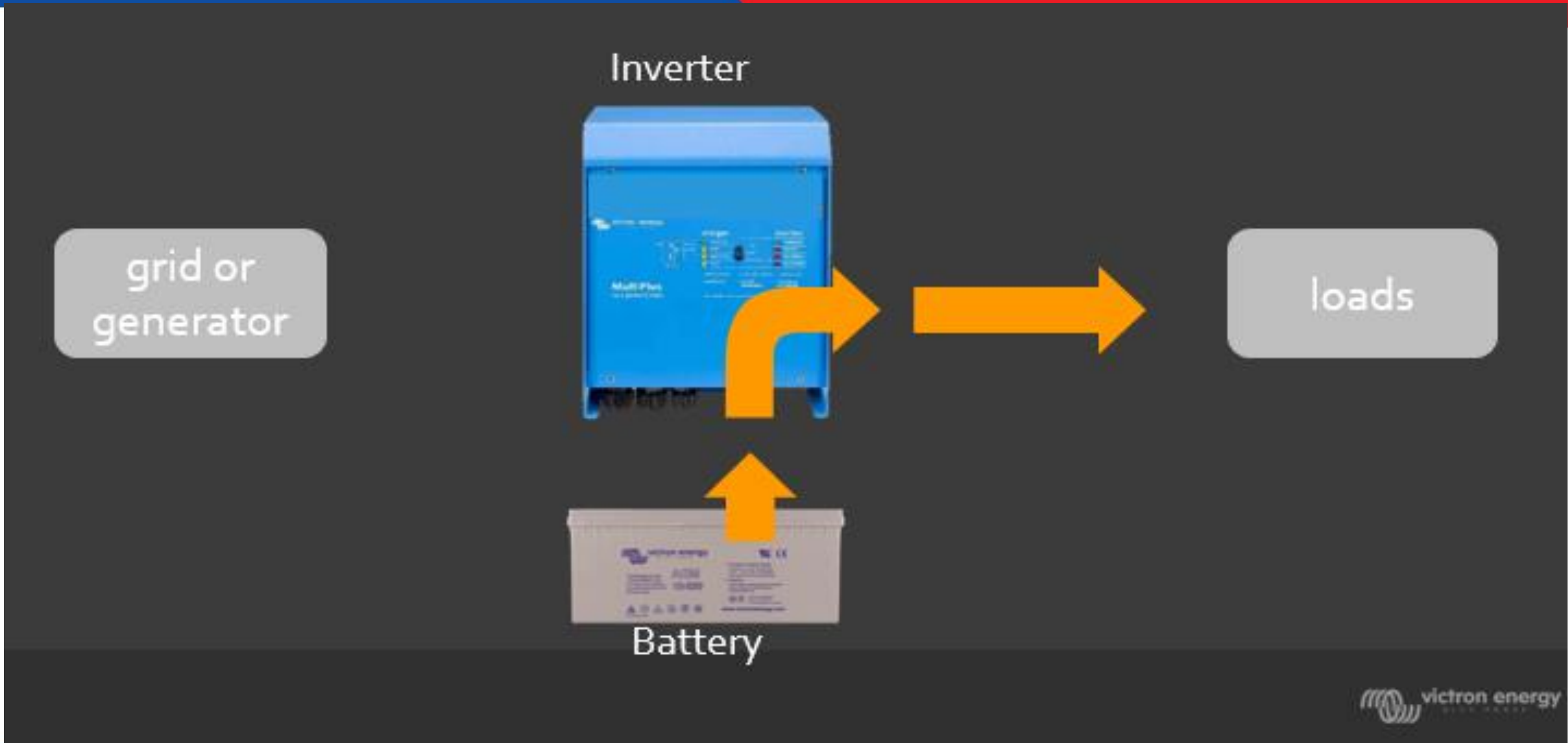
- Uninterrupted power supply is one of the key fundamentals in today's business
- We offer these solutions to quite a big market vertical, examples;
 - Banking industry
 - Server Rooms
 - Govt Institutions
 - Energy & Oil sector
 - Insurance
 - Construction
 - Hospitality
 - Residential e.t.c.



1. Power Backup – Grid/Generator ON



1. Power Backup – Grid/Generator OFF



Why Use Power Backup?

- Power Black outs
- Transition period between grid power and alternates source (e.g. generator)
- High running costs of alternate energy sources
- Noise pollution of generators

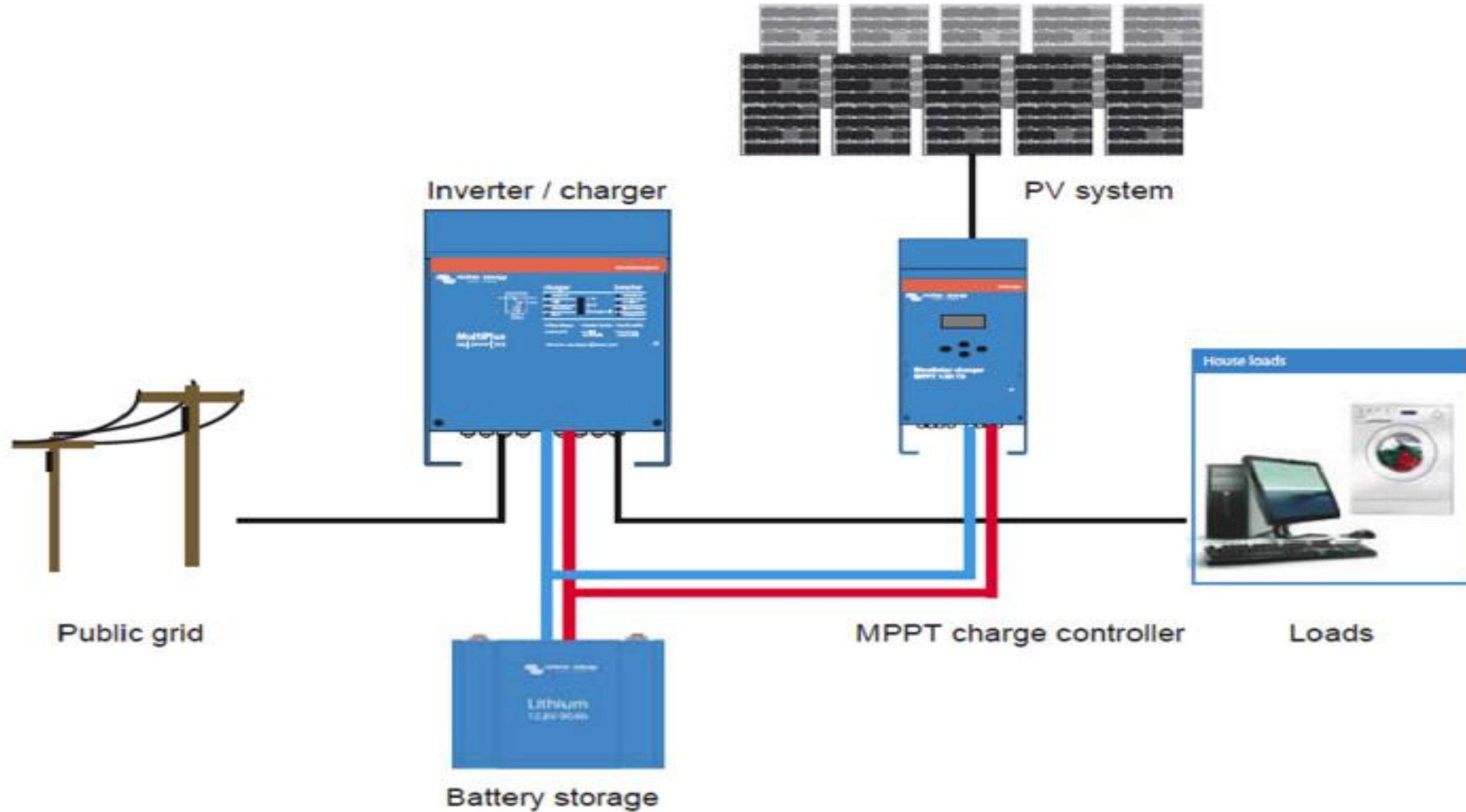


2. Off-Grid PV solutions



- Operating in off-grid sites at times is a very expensive venture
- We tailor make solutions that that reduce the operational expenses associated with high energy costs
- Some of our clients are in the following sector;
 - Hospitality
 - Banking industry
 - Govt Institutions
 - Agricultural
 - Insurance
 - Educational
 - Construction
 - Residential e.t.c.

2. Off-Grid PV solutions



3. Opportunities in On-Grid PV solutions

- The cost of electricity in our country is quite high and we offer solutions to reduce such high operational costs
- This solution targets heavy day time power consumers
- Some of our clients are in the following sector;
 - Industrial
 - Hospitality
 - Agricultural
 - Insurance
 - Govt Institutions
 - Real Estate
 - Educational



4. Thermal Storage solutions



- Solar Water Heating solutions are common for two main reasons;
 - a) Cost control
 - b) Reduction in Carbon Emission
- This solution targets mostly residential power consumers
- Some of our clients are in the following sector;
 - Residential
 - Hospitality
 - Agricultural
 - Govt Institutions
 - Real Estate
 - Industrial
 - Educational

5. Solar Cooling Application solutions

- Solar Fridges and Freezers are very common to off-grid clients
- The reason being, alternative to grid becomes very expensive especially from a OPEX point of view
- Some of our clients are in the following sector;
 - Hospitality
 - Agricultural
 - Govt Institutions
 - Real Estate
 - Industrial
 - Educational
 - Residential



6. Renewable Energy Products



- Other than custom made solutions, we also distribute products as components through our various distribution channels
- The components include:
 - Solar PV Modules
 - Batteries
 - Lead Acid Batteries
 - Lithium Ion
 - Charge Controllers
 - Inverters
 - Inverter Chargers
 - Grid Inverters
 - Water Pumping Inverters
 - DIY Water pumping Kits

7. Our Services



- We have a range of services from pre-purchase to post purchase of products and solutions
- They include:
 - System Design
 - Engineering
 - Procurement
 - System construction
 - After Sales Support
 - Call out Services
 - Preventative Maintenance Services
 - Workshop Repair Services



8. Remote Monitoring

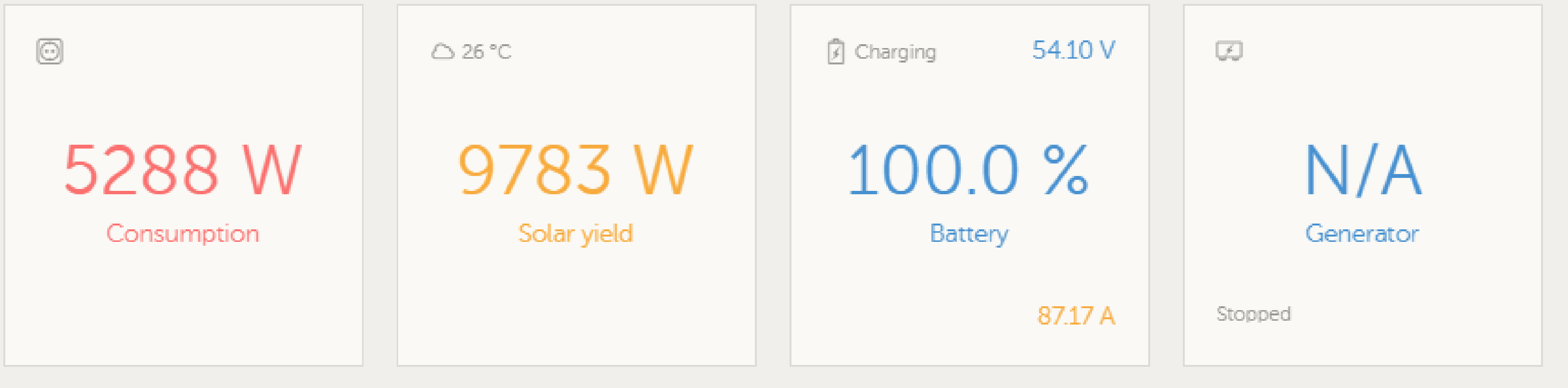
- Today's businesses are done on palm tops.
- At Chloride we provide custom made remote monitoring solutions
- From load profile, power outage, power outage, voltage surges, eventualities, occurrences, daily productivity, carbon saving etc.



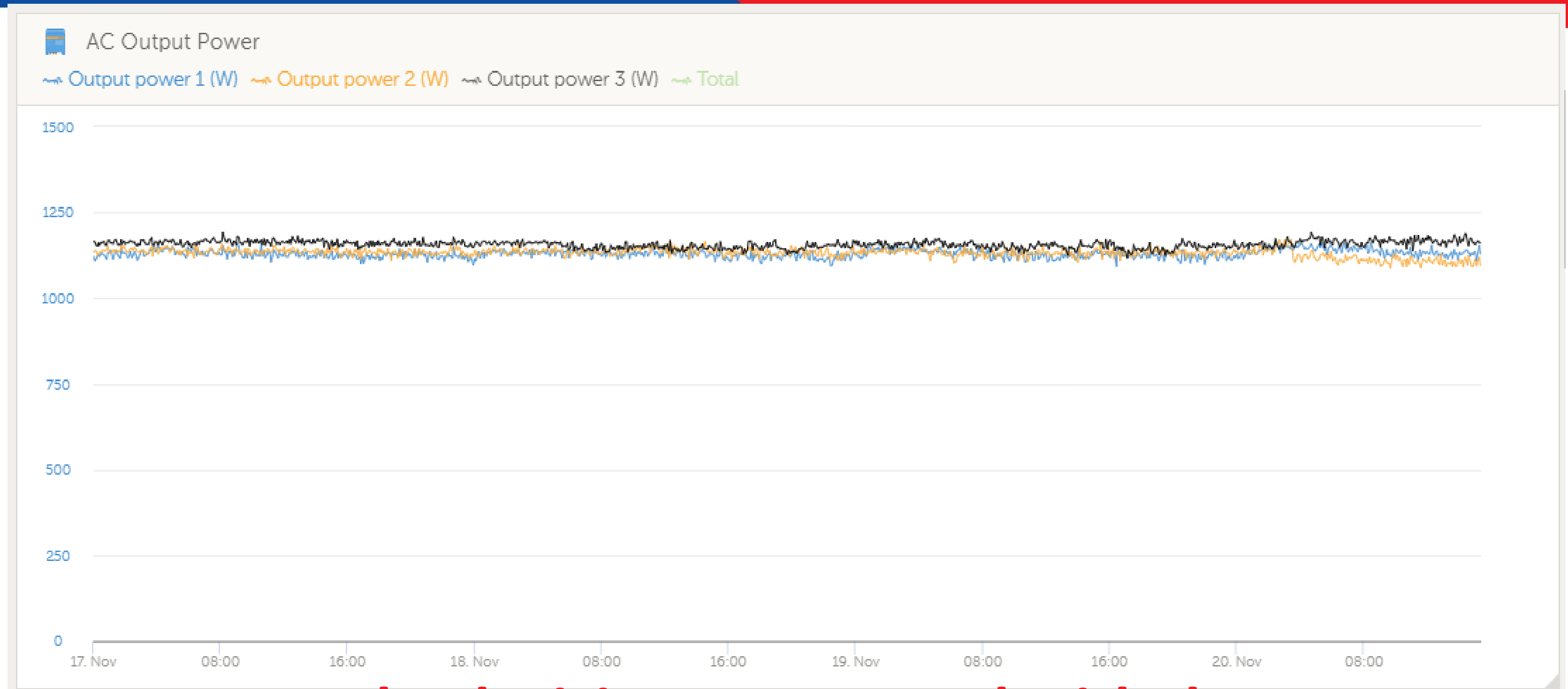
Real Time Status



System status in VRM



Track Trends & History on Various Parameters



Make decisions supported with data



Proactiveness, Don't be Reactive

Device	Triggered by	Description	Started at	Cleared after
VE.Bus System	Alarm rule	Active input	2019-11-01 10:36:32	Active
VE.Bus System	Alarm rule	Input current phase 3	2019-09-23 15:53:39	19h, 21m, 13s
VE.Bus System	Alarm rule	Input voltage phase 2	2019-09-23 15:51:38	19h, 23m, 5s
VE.Bus System	Alarm rule	Input voltage phase 1	2019-09-23 15:51:38	19h, 22m, 52s
VE.Bus System	Automatic monitoring	VE.Bus Error 3: Not all, or more than, the expected devices were found in the system: VE.Bus Error	2019-09-17 19:31:07	22s

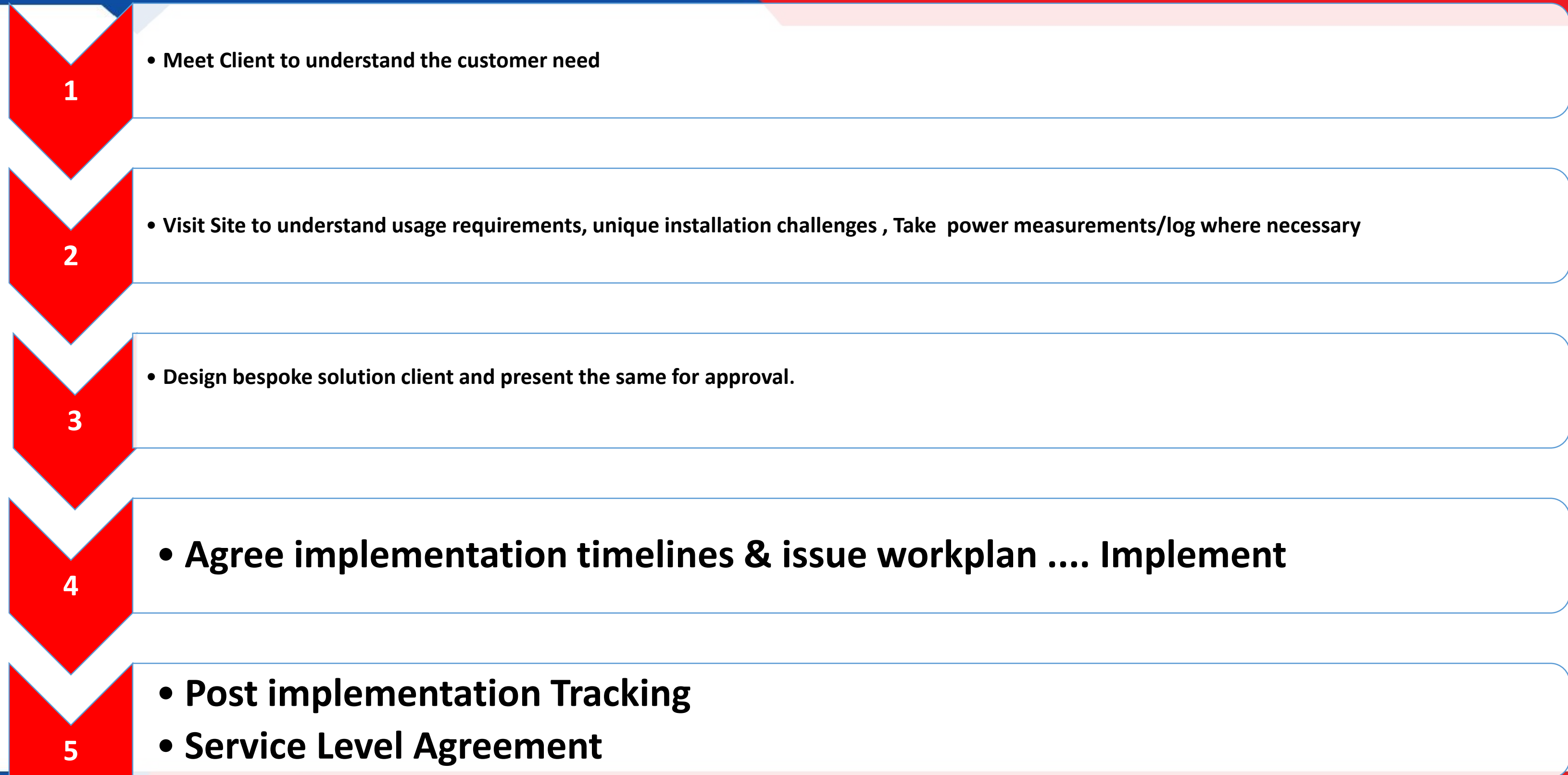
Get warnings on your devices as opposed to waiting for a breakdown,



9. Energy Storage Brands We Associate With



How Do We Engage – 5 Step Process



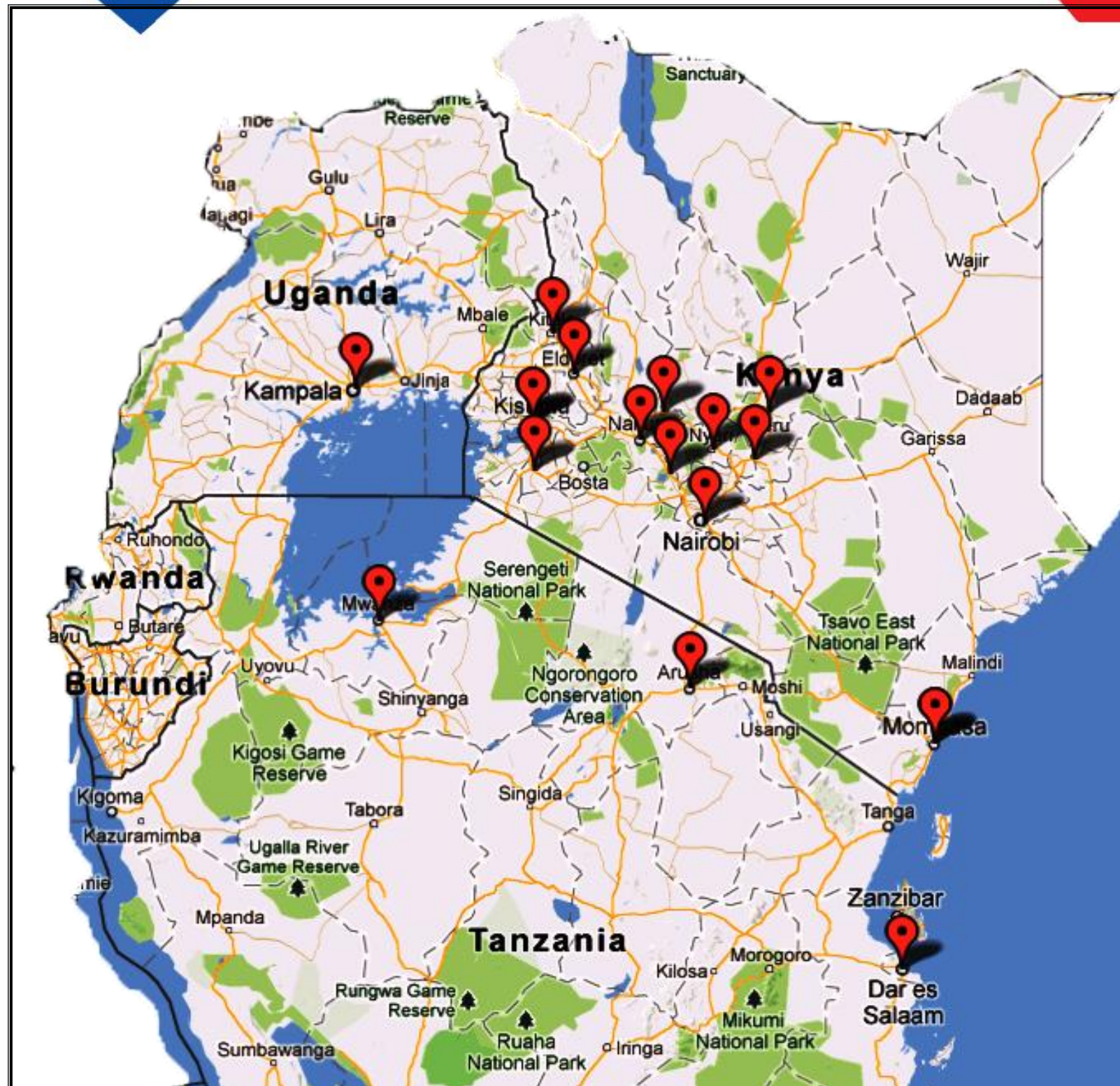


10. Who We Are

Born in 1963, Chloride Exide Limited is the longest-standing energy solutions provider in Kenya.

We are the regional leader in automotive batteries, solar solutions and emerging renewable energy products. One of our strengths is our country wide network so we are always close to serve you.

Our Service Centers - Footprint



KENYA

1. Nairobi
2. Karen
3. Kisumu
4. Mombasa
5. Eldoret
6. Nyeri
7. Nakuru
8. Meru
9. Embu
10. Kisii
11. Kitale
12. Nyahururu
13. Naivasha
14. Nanyuki
15. Machakos
16. Thika

TANZANIA

1. Dar es Saalam
2. Arusha
3. Mwanza
4. Mbeya
5. Songea

UGANDA

1. Kampala

COMESA

- Sudan
- Malawi
- Zimbabwe
- Eritrea
- DRC
- Rwanda



**CHLORIDE
EXIDE**



Energy solutions for all

**Thank You
From
Chloride Exide Kenya Limited**

Customer Support Centre

Kenya: +254 719 080 000, 020 400 8000 Uganda: +256 701 000 888 Dar es Salaam: +255 715 755 555

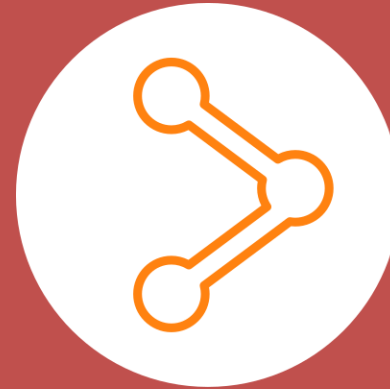
Email: customerservice@chlorideexide.com



MEDIA & REACH



- 37,000 FOLLOWERS
- +1,000/MONTH
- 180,000 IMPRESSIONS/MONTH
- 100 UPDATES/MONTH
- ALSO "AFSIA EN FRANÇAIS" AND "AFSIA EM PORTUGÊS"



- 85,000 SOLAR PROFESSIONALS REACH
- +2,000/MONTH
- AVERAGE OPEN RATE: 24,9%
- AVERAGE CLICK RATE: 19,6%
- AVERAGE UNSUBSCRIBES: 0.1%



- 49 ARTICLES IN 2020
- 33 ARTICLES IN 2021 H1
- PARTNERSHIPS WITH
- AFRIK21
- SUN-CONNECT
- PV MAGAZINE
- MINING AFRICA REVIEW

Thank you,