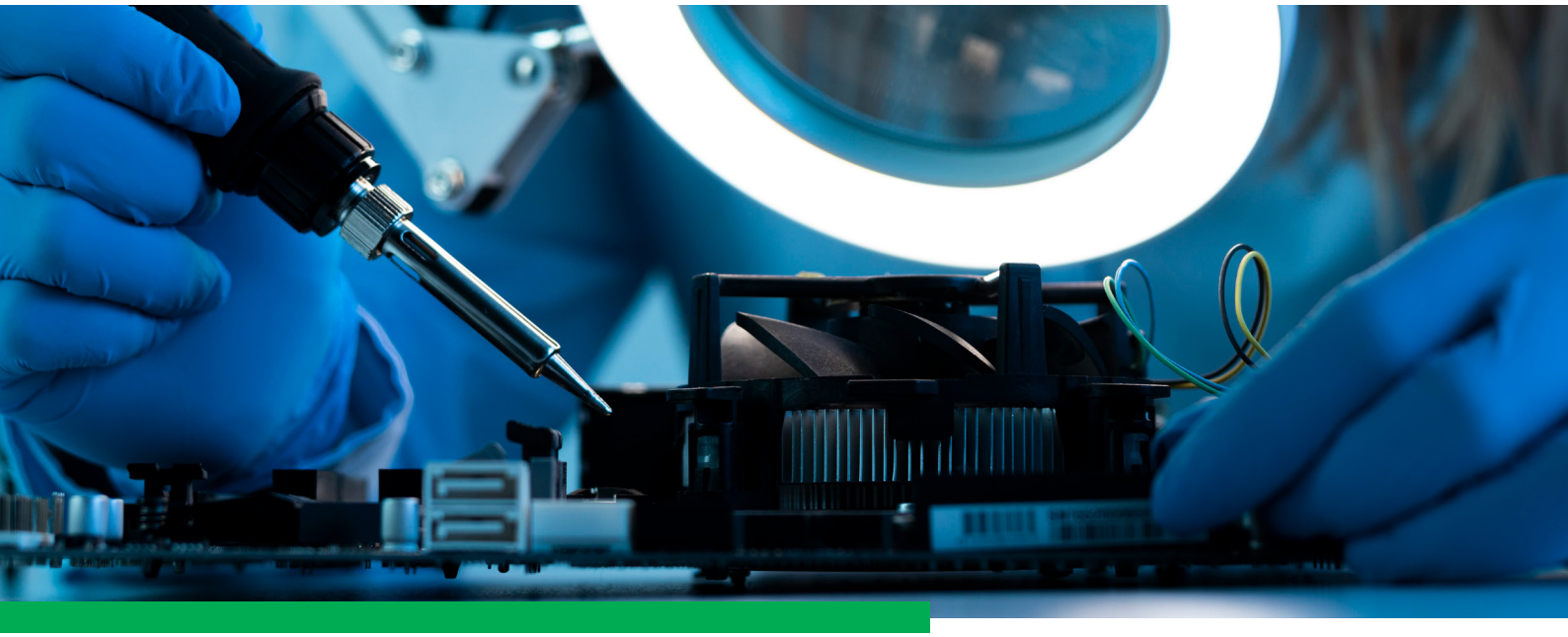
Moola

Battery Energy Storage System (BESS)

A Reliable and Promising Energy Storage Solution for a Smart Grid



INTEGRATED, TAILORED SOLUTIONS FROM MANUFACTURING TO SYSTEM OPTIMIZATION

Moola provides a comprehensive, vertically integrated solution for the energy sector. We control the entire lifecycle of the microgrid ecosystem, from the proprietary "Lead Ultra Carbon" battery chemistry to the final deployment of the **GRID Energy Storage Solution**. Our approach encompasses ***design, manufacturing, project management, and long-term asset performance management,*** ensuring a "one-stop" solution for utilities, commercial, and industrial clients.

Our R&D Capabilities

Driven by advanced research, our technology incorporates **"Engineered Carbon Nanomaterials"** into the negative active mass of our batteries. This R&D breakthrough creates a *"supercapacitor effect"* within the battery, significantly enhancing charge acceptance and cycle life compared to traditional chemistries.

Our innovations allow us to deliver batteries that are

- **Non-toxic,**
- **Non-flammable,**
- **Reduced supply-chain exposure** compared with lithium-ion systems.

01 **Our GRID solution** is a field-tested, *modular, and all-encompassing system* that allows for effective monitoring, tracking, and forecasting of load and generation resources within the network.

02 Each solution is **customized to meet the specific application requirements** and primary objectives of the customer, with a dedicated and experienced team that designs, delivers, and services customized GRID solutions for different applications. We can offer a comprehensive solution including ***feasibility studies, project management and design, primary and secondary equipment, controls and advanced visualization tools.***

CONTINUOUS INNOVATION THROUGH INTEGRATED SOLUTIONS

UNDERSTANDING ENERGY

We view energy as a dynamic ecosystem requiring precise orchestration. Our expertise lies in transforming intermittent renewables into reliable power through **Battery Energy Storage Systems (BESS).**

Using our proprietary GRID EMS, we ensure grid stability for both utility-scale and commercial applications.

UNDERSTANDING BATTERIES

Our technological edge is defined by **Lead Ultra Carbon (LUCB) chemistry.**

By incorporating Engineered Carbon Nanomaterials, we create a ***"supercapacitor effect"*** that traditional batteries lack. This results in an ***ultra-high efficiency of 90-92%,*** superior thermal resilience, and a non-flammable, non-toxic design that eliminates common plate sulphation.

SMART COLLABORATION

We offer a vertically integrated partnership model, managing the entire lifecycle from raw cell chemistry to modular **"Plug and Play"** containerized systems.

Our collaboration extends beyond hardware; we provide strategic ***O&M support, remote monitoring, and technical training*** to ensure our partners achieve long-term decarbonization and energy security.

*Images are for illustrative purposes only, the real product may vary.

Fig : PLUG & PLAY SYSTEM

Our **GRID solution** follows a **modular hierarchy** designed for *rapid scalability and integration.*

Lvl 1
Chemistry

Lead Ultra Carbon Battery.
Uses ***engineered carbon nanomaterials*** for high power density.

Lvl 2
Storage

Modular Battery Racks.
Designed for easy identification and replacement of individual units to maintain the performance.

Lvl 3
Control

GRID Control System.
Control System with PLC functionality to ***customise operational models, dispatch, load commitment & frequency optimization***

Lvl 4
Enclosure

Containerized Solution.
Will remotely monitor the capability of system & batteries, embedded input & output protection devices and can integrate with Solar PV input including embedded MPPT.

Lvl 5
System

Integrated GRID.
Combines Solar PV input with MPPT, Input & Output protection devices & Multi source energy input including Solar, Wind, AC generation (diesel / biofuel) and Grid connection.
Supports both Grid connected & off grid applications with seamless transition mode. Highly integrable for various auxiliary functions.

GRID ENERGY STORAGE SOLUTION

WHY PLAN FOR GRID ENERGY STORAGE SOLUTION?

As global energy demands increase and environmental concerns become more pressing, innovative solutions are required to ensure sustainable and resilient energy systems. *Grids have emerged as a pivotal technology, offering a decentralized approach to energy production and distribution.*

A grid is a localized group of electricity sources and loads that operate independently or connected to the traditional grid. It comprises various energy sources, including renewable energy (solar, wind), traditional generators, and energy storage systems, all managed by an advanced control system. Grids can seamlessly switch between grid-connected and island mode, ensuring continuous power supply during outages.

01 Enhanced Reliability and Resilience

- **Continuous Power Supply:** *Grids ensure a steady power supply* during natural disasters or grid failures, maintaining critical services in hospitals, schools, and emergency facilities.
- **Grid Independence:** They can operate autonomously, *reducing dependence on centralized grids and mitigating risks* associated with widespread outages.

02 Sustainability and Environmental Impact

- **Integration of Renewable Energy:** Grid System facilitate the *integration of renewable energy sources*, significantly reducing greenhouse gas emissions and reliance on fossil fuels.

03 Economic Advantages

- **Cost Savings:** By utilizing local energy sources and reducing transmission losses, grids can *lower electricity costs for consumers.*
- **Reduced Peak Demand Charges:** Grids can manage and distribute energy more effectively, minimizing peak demand charges and *reducing strain on the main grid.*

04 Energy Security

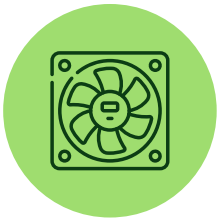
- **Local Energy Production:** *Grids enhance energy security* by producing energy locally, reducing vulnerabilities associated with long-distance transmission and geopolitical issues.

Stable Lead Ultra Carbon Battery

Fire Safety System

3000+ Lifecycles

Fast & High ROI



In-Built Air Circulation

Upto 10 Years Warranty

Free from Geopolitical Influence

Advanced Energy Management Software

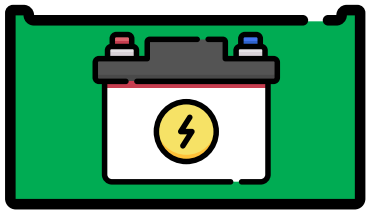
WHY IS IT NEEDED?

MOOLA prioritizes **flexibility, sustainability & reliability,** recognising that Battery Energy Storage Systems (BESS) are ideally suited for the evolving energy mix.

EV Charging stations & EV Showrooms

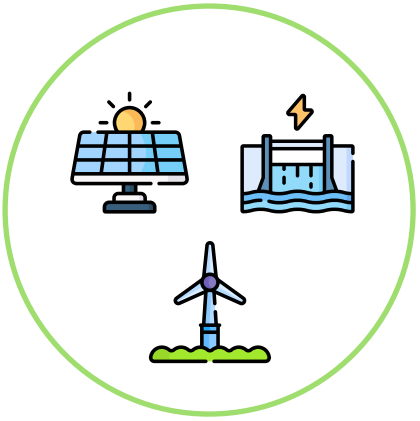
Telecommunications & Defense

Commercial & Industrial applications



Moola BESS

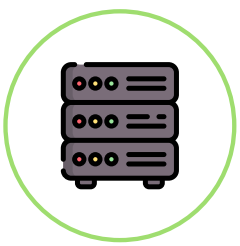
By capturing excess energy during periods of high generation & discharging it during peak demand, MOOLA ensures stable & resilient power supply.



PV System, Windmill & Hydro Energy

Healthcare Industry

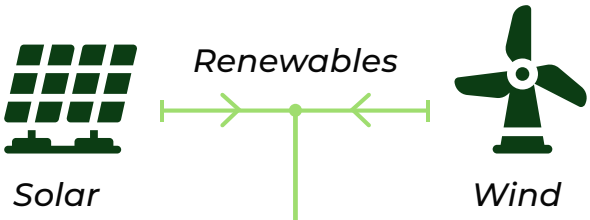
Residential Zones



Datacentres

Off-grid operations for remote areas

MOOLA's BATTERY ENERGY STORAGE SYSTEM INTERACTIONS



Interaction b/w PV Modules, Grid, DG, BESS
The Moola GRID *Energy Management System (EMS)* orchestrates the entire energy mix.

Combiner

Interconnected with other BESS Units

Renewables + BESS:
Maximizes the utilization of solar and wind energy. Excess generation is stored in the Lead Ultra Carbon batteries for later use (e.g., night loads).

BESS Storage System + Moola EMS

Diesel Gen-set Integration:
The BESS gains control over diesel generators, **optimizing their efficiency per liter of fuel and reducing runtime**, which lowers maintenance costs and carbon dioxide emissions.

Grid + BESS:
The system performs **"Peak Shaving"** and **"Arbitrage"** by charging during low-rate periods and discharging during peak demand.

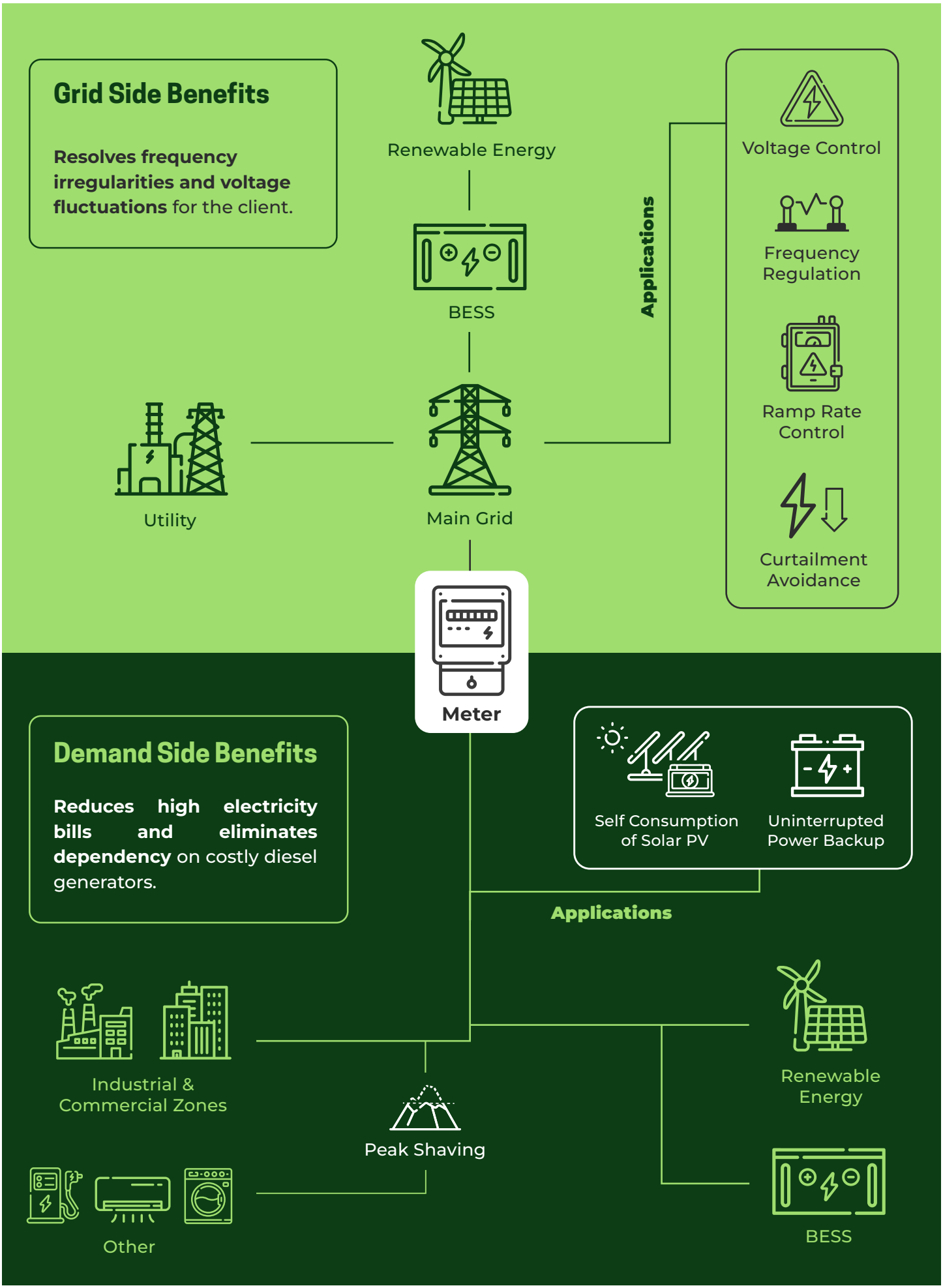


Fig : Grid Side & Demand Side Energy Distribution

BESS (BATTERY ENERGY STORAGE SYSTEM) **MODULE**

01

Moola's BESS technology helps **improve energy flow at every stage of the energy transmission chain.** Furthermore, energy from renewable sources can be integrated with BESS to optimize the energy mix.

02

At the end-user level, for Industrial applications, **BESS provides a reliable energy source for loads to proactively compensate for voltage flickers and short power outages**, leading to better Industrial Power Stability, thus avoiding any production outages due to a grid fault.

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03

Management of production peaks, ensuring optimal value from existing solar installations, monetise by selling stored energy & offering ancillary services such as frequency regulation to the grid, maximize savings through arbitrage and lower energy bills through shared community battery storage closer to the end users by harnessing more renewable power are some of the applications.

04

Future Proof :
Grid-connected grid forming operation with fault ride-through and synthetic inertia capabilities make *Moola's Power Conversion Systems ready to support grids in the face of ever increasing penetration of non-programmable power generation.*

Active Power Services

- Frequency Regulation
- Frequency Response
- Peak Shaving/Firming
- Remote Power Commands
- Ramp Rate Control
- Curtailment Avoidance
- Scheduled Dispatch/Shifting
- Scheduled Power Commands
- State of Charge Management
- Islanding
- Black Start

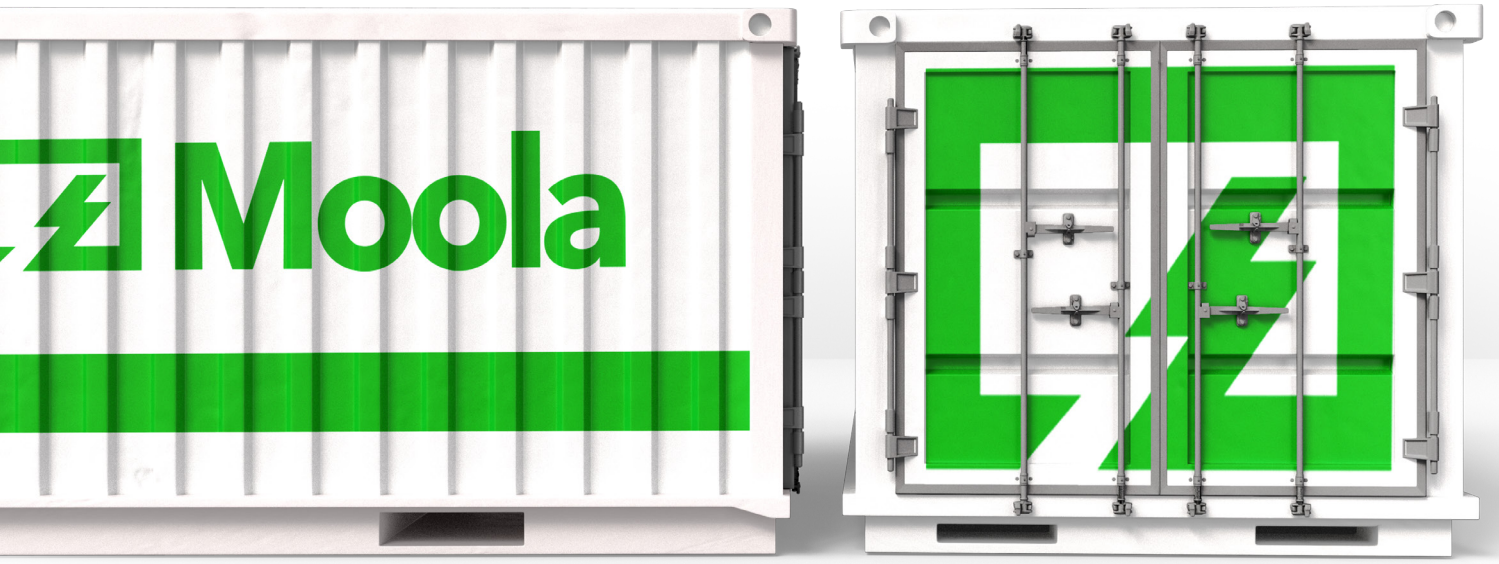
Reactive Power Services

- Voltage Control
- Voltage Droop
- Power Factor Control
- VAR Control

Energy Storage Application

- Peak Shaving
- Frequency & Voltage Regulation
- Microgrid Operation
- Power Factor & Ramp Rate Control
- Arbitrage Energy Trading & Time Shifting
- Backup Power & Load Following
- Renewable Capacity Firming
- Renewable Power Smoothing
- T & D Investment Deferral

Multiple Applications, One-Stop solution



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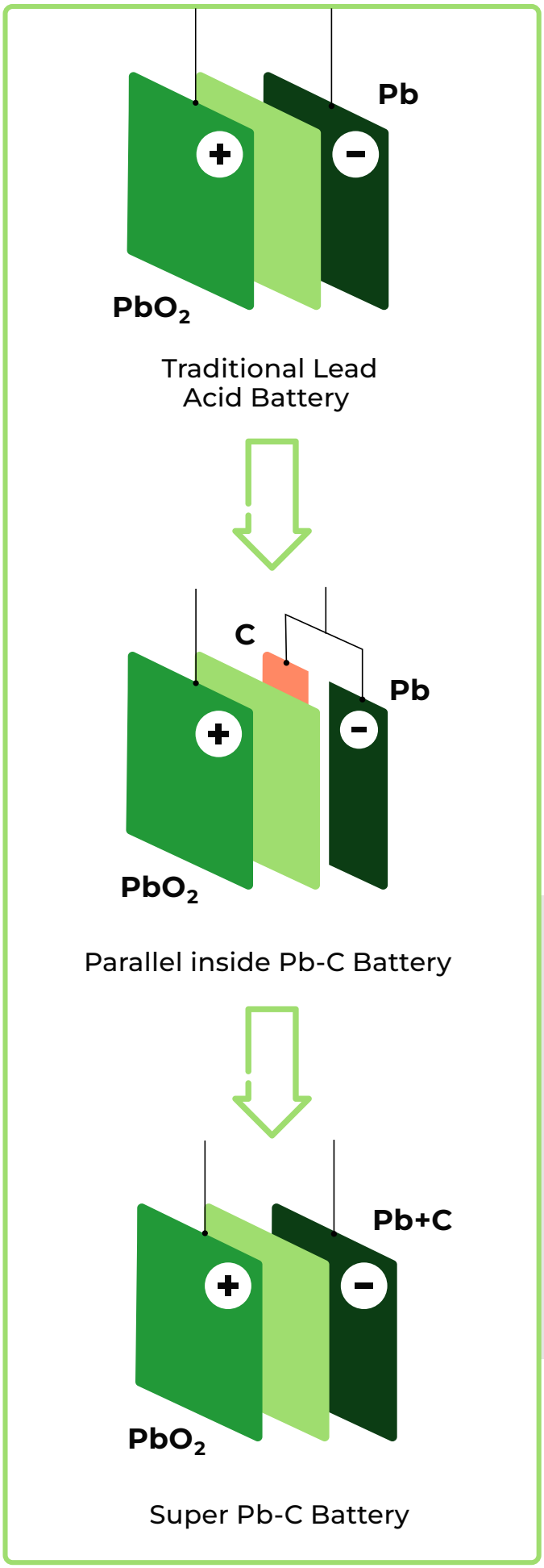


Fig : Lead carbon Working Principle

Battery is one of the most critical steps in developing the optimal BESS system.
Backed by years of R&D to manufacture high quality carbon based batteries through the use of ***Nano Scale Carbon*** which reduce acid volume requirements and maintenance frequency, while extending cycle life.

The electrical properties of the battery are consistent and achieve high reliable performance + longer life.

It effectively overcomes the disadvantages of Plate Sulphation, active material loss and water loss rate, and has good low temperature product life.

MOOLA batteries utilize 1D or 2D engineered carbons added into the negative plate instead of conventional carbon black / activated carbon, as a direct addition to the negative active mass, acting as an electrochemical pseudo-capacitor.

Engineered carbon Nano-materials yield substantial recharge performance gains.

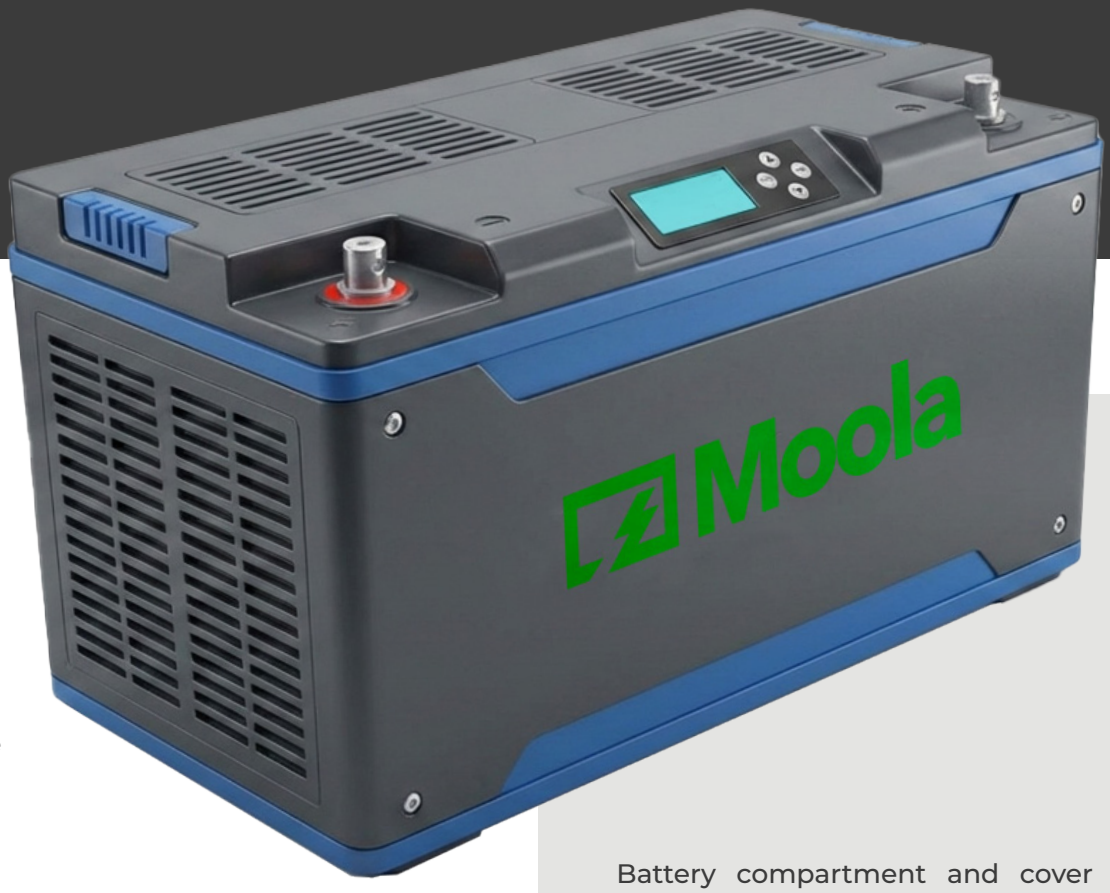
MOOLA'S LEAD CARBON BATTERY TECH & FEATURES

Ultra High Charge vs Discharge Efficiency Level :

Standard lead-type batteries usually have around a 50% charge vs discharge efficiency, so for every 1000w of solar / generator charge power you put into the battery (per hour) 50% of that is retained and 50% is wasted.

Over a day, week and year this equates to ALOT of wasted energy with standard lead acid / agm / gel batteries**. In turn a lead carbon battery operates typically between 90-92% charge vs discharge efficiency rating.**

This means for every 1000w of solar / generator charge power you put into the battery (per hour), more than ***90% of that is retained and only 10% is wasted.*** Over a day, week and year this means a **HUGE amount of savings**, especially if some of your charging power was coming from running a petrol / diesel generator.



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Battery compartment and cover are **seals made of rubber rings** and terminals that are dual-sealed. A sealing material that has small shrinkage is used to ensure that the terminal seals well.

TÜV INDIA
TÜV NORD GROUP

LEAD CARBON BATTERY BREAKDOWN

TECHNICAL DATA (MOOLA GRID SOLUTION)

01 LUCB BATTERY CHARACTERISTICS :

Parameter	Specification	Remarks
Model	ND 002	Tubular Posts / Flat Negative Plate, Lead Ultra Carbon Technology
Battery Chemistry	Lead Ultra Carbon Battery	Combines durability with high acceptance
Nominal Voltage	12 V	6 cells in series
Rated Capacity	165 Ah	@ 10-hour rate to cutoff voltage 10.8V @ 25°C
Energy Density	36 Wh/kg	
Specific Power Density	36 W/kg	
Maximum Charging Current	33 A	C5 Rate
Maximum Discharging Current	55 A	C3 Rate
Charge/Discharge Efficiency	90–95%	
Internal Resistance	4–5 mΩ	Fully charged @ 25°C
Operating Temperature	–10°C to +50°C	For optimal performance and lifespan
Self Discharge Rate	3% – 5% per month	@ 25°C
Depth of Discharge (DOD)	90% @ C10 rate; 80% @ C5 rate	Deep-cycle batteries can handle DOD up to 80%
C-Rate Performance	C10 → 148.75 Ah (90.15%); C5 → 113.74 Ah (68.03%); C3 → 83.68 Ah (50.7%)	Capacity decreases with higher discharge rate
C10 Rate capacity at different temperatures	–10°C → 72.5 Ah (43.72%); 0°C → 115 Ah (69.7%); 45°C → 120.14 Ah (72.81%)	Lower temperatures reduce performance
Cycle Life	3000 cycles	Excellent for deep cycling
Weight	58 kg	Filled with electrolyte (approximate)
Dimensions (L × W × H)	518 × 275 × 249 mm	±3 mm tolerance
Key Features	Nano Carbon Additive; Superior PSOC performance; Fast Charge Acceptance; Low Water Loss; High Efficiency (>90%)	Ideal for solar backup systems and grid storage

02 COMPARITIVE PERFORMANCE SUMMARY :

Below table illustrates the ***performance difference*** between normal flooded lead battery and improved version by adding carbon as special additive.

PERFORMANCE OF 12v 100ah & 12v 150ah NORMAL LEAD ACID BATTERY									
Capacity	**Type**	**Voltage**	**Cells**	**Terminal**	**Dimensions (MM)**				**Application**
					Length	**Width**	**Height**	**Weight (KG)**	
100Ah	Tubular	12	6	"L"/Stud-Type	417 + 2	191 + 2	417 + 2	30	Solar
150Ah	Tubular	12	6	"L"/Stud-Type	417 ± 2	191 ± 2	417 ± 2	32	Solar
Electrical Specifications :		**Capacity (Minutes)**			**Capacity Amp. Hrs**				**Energy (kWh)**
Capacity	**Type**	**25 amps**	**50 amps**	**75 amps**	**5 Hr**	**10 Hr**	**20 Hr**	**100 Hr**	**100 Hr**
100Ah	Tubular	148	60	35	89	100	105	115	1.2
150Ah	Tubular	250	101	60	133	150	157.6	165.75	1.5

PERFORMANCE OF IMPROVED VERSION OF 12v 100ah & 12v 150ah NORMAL LEAD ACID BATTERY AFTER ADDING OF ENGINEERED CARBON AS SPECIAL ADDITIVE									
Capacity	**Type**	**Voltage**	**Cells**	**Terminal**	**Dimensions (MM)**				**Application**
					Length	**Width**	**Height**	**Weight (KG)**	
100Ah	Tubular	12	6	"L"/Stud-Type	417 + 2	191 + 2	417 + 2	30	Solar
150Ah	Tubular	12	6	"L"/Stud-Type	417 ± 2	191 ± 2	417 ± 2	32	Solar
Electrical Specifications :		**Capacity (Minutes)**			**Capacity Amp. Hrs**				**Energy (kWh)**
Capacity	**Type**	**25 amps**	**50 amps**	**75 amps**	**5 Hr**	**10 Hr**	**20 Hr**	**100 Hr**	**100 Hr**
100Ah	Tubular	192	78	46	111	125	131	144	1.2
150Ah	Tubular	325	131	78	166	188	197	207	1.5

Switching over to Engineered carbon matrix from standard method of process control of manufacturing lead-acid battery amounts to **substantial increase in performance,** which in turn increases life cycle to almost double the normal battery life cycle. ***This will be equal to half the cost of normal lead acid battery in terms of lifecycle achieved.***

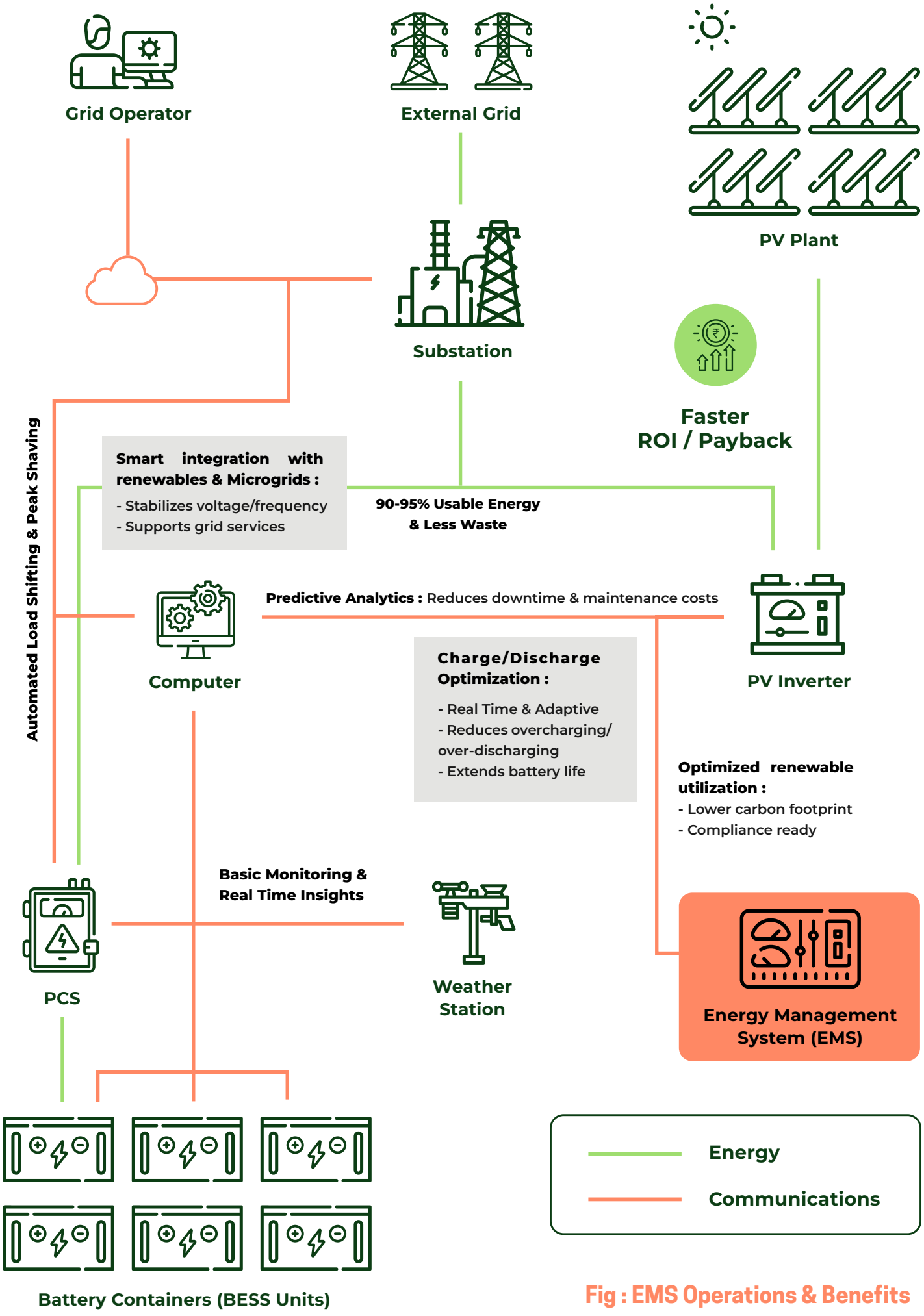

Fig : EMS Operations & Benefits

WHY MOOLA?

BESS Expertise – Proven success in LUCB battery deployment

Our expertise spans grid support, renewable integration, frequency regulation, and capacity management—making MOOLA a trusted partner for both utilities and industrial customers. ***We work closely with OEMs, regulators to optimize performance***, drawing on a proven track record in energy transition technologies.

Innovative Approach - Cutting-edge research in battery chemistry and performance.

MOOLA is dedicated to advancing battery storage technologies, particularly focusing on mature LUCB solutions. By investing in cutting-edge research and development, the company ***enhances battery performance, longevity, and efficiency,*** ensuring clients benefit from state-of-the-art energy storage systems.

Safety in Design - Protecting Reputations and Assets

At MOOLA, Safety in Design is a core principle for all BESS projects. **From technology selection to operations, we apply rigorous standards to prevent thermal, chemical, and operational risks.**
By embedding safety from the start, we protect people, assets, and the reputations of both MOOLA and our clients—ensuring trust, compliance, and long-term value.

Strategic Partnerships - Why Industrial Operators Choose Moola

- **Proven Lead Ultra Carbon battery architecture**
- **Conservative safety-in-design philosophy**
- **Modular containerized deployment**
- **Lifecycle support and monitoring**

Operation & Maintenance is an optional service that we provide to customers.

This service can be tailored to our customer's specific needs.

OPERATION & MAINTENANCE

- **MOOLA provides warranties with optional long term maintenance contracts** for full life cycle support. Our operating and maintenance philosophy represents our company's general partnership approach - the scope of work can be adapted to the customer's needs and requirements.

- *MOOLA is able to offer preventive and corrective maintenance programs as well as ensuring spare parts are always available* and up to date. Performance reporting includes periodic performance analysis with status updates. Yearly testing can also be included in the contract.

Moola personnel performing maintenance duties on a BESS Unit

Our maintenance programs/contracts include the following activities:

- First Level Intervention
- Preventive Maintenance
- Corrective Maintenance
- Remote Access Support

GLOBAL AMBITIONS

MOOLA continues to expand its global borders across the world, providing solutions in new countries to new customers.

Declaration:
This information is generally descriptive only and is not intended to make or imply any representation, guarantee or warranty with respect to any BESS, Cells and Batteries. Cell and Battery designs/specifications are subject to modification without notice, Contact MOOLA for the latest information.

Muladhara Energy Systems Pvt Ltd

CIN: U28162KA2024PTC189342

+91 99000 19269

41/7, 3rd floor, 15th cross, Malleswaram Road,
Bengaluru, Karnataka, India.

Pin - 560003

www.moolaenergy.com

Sales@moolaenergy.com

Moola

RoHS compliant