

Leading the Energy Transition through

Storage



The Need for Batteries

The world's energy infrastructure is undergoing a rapid transformation.

Globally, efforts are being made to reduce CO₂ emissions. Renewable energy generation, especially solar energy, is the most economic and sustainable form of power generation across most parts of the world. It represents a free, unlimited, and environmentally friendly source of energy.

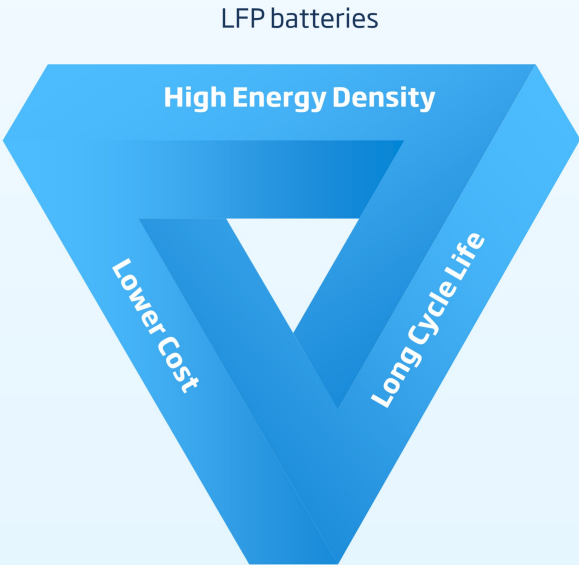
However, the global expansion of solar energy generation capacity is limited due to local (grid) constraints and intermittent generation. The rapid growth of both solar and wind energy generation capacity over the last 10 to 20 years has forced the sectors to think of new ways to meet the growing need for flexibility.



BATTERIES are flexible grid assets as they can provide a wide range of services to the electricity grid depending on the needs of the grid at any given time ensuring the reliable and efficient operation of the electricity system.

Tailored solutions for specialized ESS applications

Lithium iron phosphate (LFP) batteries have become increasingly popular in recent years due to their high energy density, long cycle life, and low cost compared to other types of lithium-ion batteries.



LFP batteries have been widely adopted for grid services applications such as frequency regulation, peak shaving, and load shifting. The demand for LFP batteries in grid services is expected to grow due to the increasing adoption of renewable energy sources to balance intermittent generation with demand.



Further, EV applications are also adopting LFP as the cost of LFP batteries continues to decrease.

High Safety

Competitive Costs

High Depth of Discharge

Improved Cycle life

Enhanced battery performance

5 key considerations for developing ESS batteries

Vertical Integration as core competence

**Within the battery storage industry,
supply chain is a critical topic.**

With EV demand pulling the lion's share of the LFP capacity, the ESS or stationary storage industry is struggling to meet demand, often faced with price increases and longer lead times.



Trina Storage as part of its vertical integration strategy has developed in-house battery cell R&D, integration, testing as well as manufacturing capability.



**R&D
Capability**



**Integration
Capability**



**Testing
Capability**



**Manufacturing
Capability**

We are further ramping up R&D, and battery manufacturing capacity to strengthen vertical integration, lower average cost through economies of scale as well as improve cell performance with better control over production process. In addition, these batteries are especially designed to meet grid service KPIs.

Leading New Technology

Trina Storage Elementa 2 is a new generation, cutting-edge, grid-scale battery storage system built from the ground up using Trina's vertically integrated LFP cells.



The new design incorporates advanced features including a unique pack design, precise thermal management enabled by smart liquid cooling technology, and a robust fire mitigation and suppression system to ensure unparalleled efficiency, comprehensive safety, and long-term reliability.

Engineered for adaptability, rapid deployment, and smooth operational and maintenance processes, the product not only minimizes project costs but also enhances overall system performance.

Ultra Long-Life Trina Cells

Proprietary Lithium Iron Phosphate (LFP) cells
≥95% Energy Efficiency

Unique Pack Design

Intelligent liquid cooling technology - maintains $\Delta T < 2.5^{\circ}\text{C}$
Independent O&M window, two-way stop valve

Rack-Level Energy Management

Smart rack-level energy management
HV box at the rack level for cost optimization

Highly Integrated & Flexible Solution

Reduced CAPEX & OPEX
Improved TCO & Lower LCOS

Comprehensive Safety

State-of-the-art fire mitigation and suppression system
All international safety standards & certifications conformed

Easy Operation and Maintenance (O&M)

Designed for minimal downtime and simplified maintenance
Bankable warranties, guarantees & services

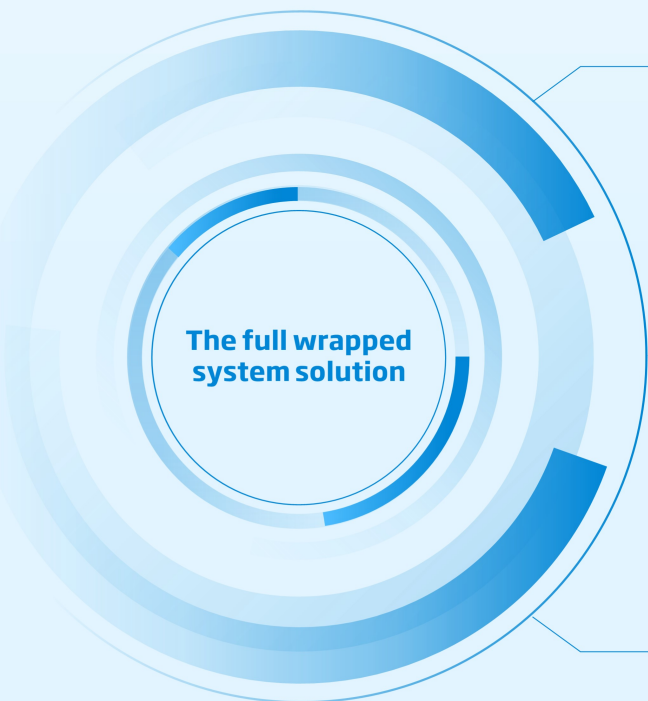
Integrated Battery System Solutions

Trina Storage is a business unit of Trina Solar, a company with over 26 years of solar manufacturing experience.

Supported by a Tier-1 supply chain, Trina Storage provides vertically integrated, bankable, highly scalable, easy-to-install energy storage solutions.

YEARS

26



Batteries

High quality, Tier-1 in house LFP modules, 0.25C to 1C chemistries, liquid cooled cells, highly configurable 3-level BMS, advanced fire suppression system

Software and Controls

Integrated battery and PCS controls, power plant controller, energy management system, SCADA

Power Conversion

State-of-the-art power electronics, DC- and AC-coupled solutions, air and liquid cooled solutions, high efficiency DC/DC and DC/AC

Key Solution Features



- Outstanding degradation and battery performance that run well with financial models
- Full wrapped system solution including product, warranties, and service
- Commercially competitive – cost-effective compared with other Tier-1 suppliers



- Strong supply chain and bulk buying power in key markets
- Strong partner relationship - PE strategic cooperation in 2022
- Improved solution pricing



- Customized solution with high flexibility
- Optimized performance and battery lifetime
- Flexible warranty and service terms



- Ranked among Top 5 bankable system integrators by BloombergNEF
- Recognized on BloombergNEF Q1 2024 Tier-1 Storage Integrators list
- Passed DNV Technical Due Diligence Test
- High technical bankability with qualified grid services
- Financial bankability with stable financial operation capability

Key Solution Features



Customer Orientation

- Smooth communication and active support during initial planning, BESS design and project delivery phases
- Great partner network - Strong relationship with third-party suppliers that further ensures smooth project implementation
- Solution oriented mindset when faced with price increases to provide added value to customers.



Intelligence

- Advanced PPC
- 3-level BMS controls to maximize usable capacity and power
- 100+ years of collective experience to make intelligent choices that maximize the power and usable capacity for maximized customer revenue



Project Delivery Capability

- Experienced team and outstanding local delivery & execution capability
- Strong engineering and design capability
- Proven track record of system integration and project deployment swiftly and effectively
- Smooth construction process
- Extensive quality control
- Effective risk management



Service

- Local and international service support
- Trusted service network of qualified service providers
- Planned and unplanned maintenance
- Unparalleled warranty commitment - only brand to survive its warranty period
- Performance guarantee tests

Solar + Storage

With a 26-year heritage in PV solutions, Trina Storage provides the most efficient and optimal energy storage systems for utility and grid operator customers. We deliver enhanced PV generation that achieves maximum consumption.

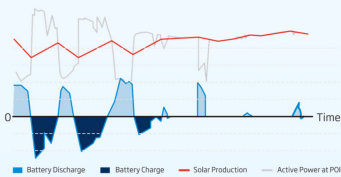
Smart design with an optimized and cost-efficient solution

Tier -1 hardware and software

Trustworthy, expert partner network and strong supply chain

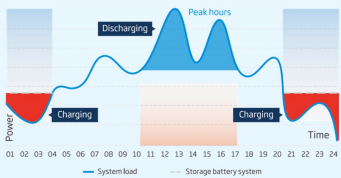
Up to 20-year warranty

Flexible solutions designed for each customer's needs



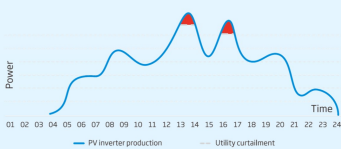
Renewable Integration

As wind and solar energy adoption continues to grow, energy grids can be impacted by the intermittent nature of RE sources. Incorporating battery storage technology is the most cost-effective option for the safe and successful integration of renewables. Other benefits of renewable integration include the management of short-term variability on the power grid and a modernization of the grid.



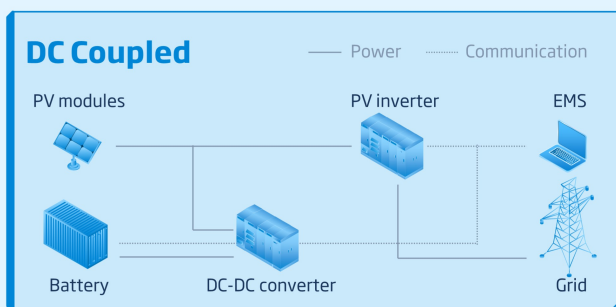
Energy Shifting

Energy storage can be utilized to shift the peak generation from the PV system as energy demand fluctuates. It saves energy during periods when demand is low. Installed storage captures solar energy and allows local utilities to be more independent in their energy mix. Energy shifting enables organizations to get the maximum revenue from their PV generator, enabling higher DC/AC ratios for PV plants as well as time-variant grid injection.

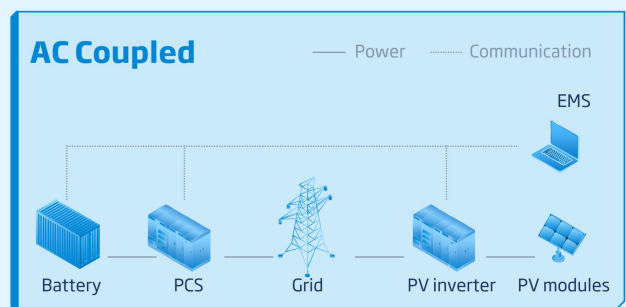


Renewables Curtailment Avoidance

Production may be curtailed by a grid operator for various reasons, such as increasing the stability of the network. At the same time, energy storage allows PV excess energy to be stored and delivered when needed.



Batteries and PV modules share one inverter: PV inverter with a direct connection to PV modules and connection via DC-DC converter to batteries
lower CAPEX due to less equipment



Batteries and PV modules have their own respective inverters and either share one point of connection (POC) or have separate POCs (ESS standalone)
more operational flexibility

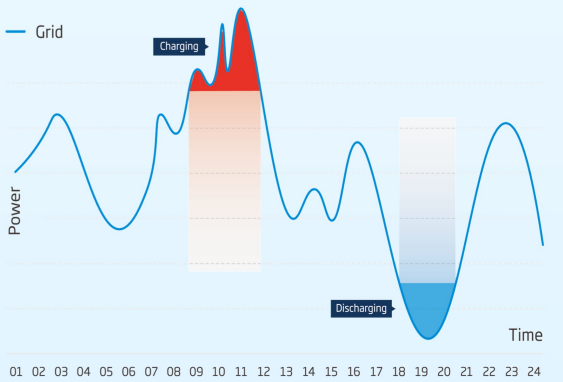
Standalone (Grid Service)

High efficiency, standalone utility-scale solutions for ultra-fast grid services, T&D deferral and market pooled assets.

- Tier-1 products delivered (hardware, software, components)
- Instantaneous active and reactive power supply
- Smart design with an optimized and cost-efficient solution
- Flexible warranty package
- Trustworthy, expert partner network and strong supply chain
- Flexible solutions designed for each customer's needs
- Minimal response time thanks to advanced power plant controlling

Frequency Regulation System

Frequency regulation is known as a crucial method for stable power grid operation:



Grid over frequency

(when generation is higher than demand)
Inverter power output is curtailed and energy is stored through charging batteries

Grid underfrequency

(when generation is lower than demand)
Inverter power output is increased by discharging the batteries and injecting more power to the grid

Gas Peaker Replacement

Batteries are a good alternative when it comes to managing grid peaks and provide many benefits:

- Cost efficiencies
- CO₂ emission avoidance
- Better power quality

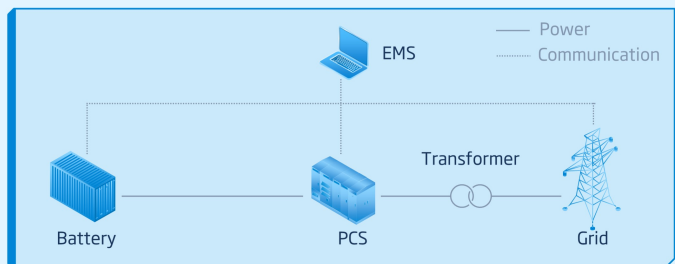
Transmission & Distribution Deferral

A small amount of storage can result in the delay or avoidance of a costly T&D upgrade. New RE assets lead to a change in power flows in distribution networks, allowing greater use of distribution networks. Energy Storage also prevent high costs generated by network upgrades.

Standalone

Battery is connected to the grid via PCS, transformer and substation

Highly efficient power plant controller guarantees fast response times complying with the highest grid standards



Other applications

Modular and easy-to-install solution with minimum onsite work.

High performance, high availability systems for electricity bill savings and minimum downtime for industrial customers;

Optimized off grid battery storage systems for Microgrids.

Micro-grid

Off-grid and grid-connected Microgrids

Industrial power supply is independent from oil price

Increasing RE penetration and sustainability

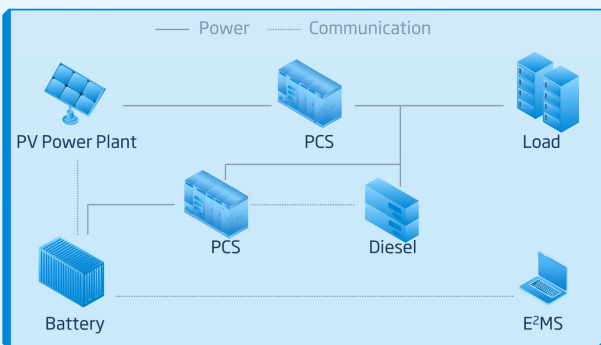
Ramp-up control for diesel allows the switching off of diesel generators in times of renewable energy generation

Site resiliency

Hedging against possible emission penalties

Green and sustainable power supply

Overcome planned and unplanned power outages



Grid forming PCS allows the power supply by only Battery, Battery+PV or both in parallel with Diesel

Ramp-rate control allows Diesel to be turned off in times of high renewable penetration and to be switched on when needed

Dispatch strategy controlled by advanced Energy Management System (EMS)

Large Industrial

Demand response

Site resiliency

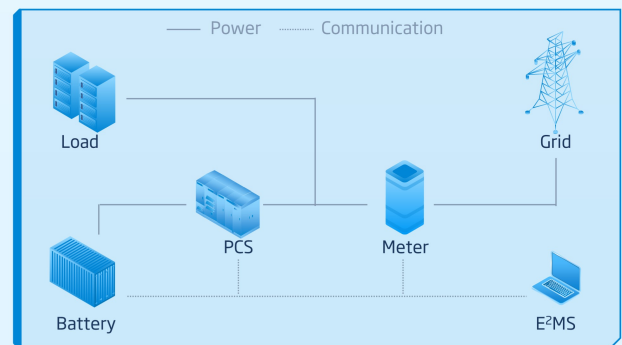
Lower demand charges

Potential addition of PV

Smart design with an optimized and cost-efficient solution Tier-1 hardware and software

Trustworthy, expert partner network and strong supply chain

Flexible solutions designed for each customer's needs



Battery is being charged from the grid in times of lower load consumption

When load consumption increases, battery can supply power to the load in order to limit power consumption from grid

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A Trina Solar
business division



Safety



26+ years of solar
manufacturing experience



Flexible solutions



Product Innovation



International presence



Products are 100% tested



Local market expertise