BATTERY ENERGY STORAGE

INDUSTRY OVERVIEW SEGMENTS

ENERGY & MANUFACTURING in Appalachia

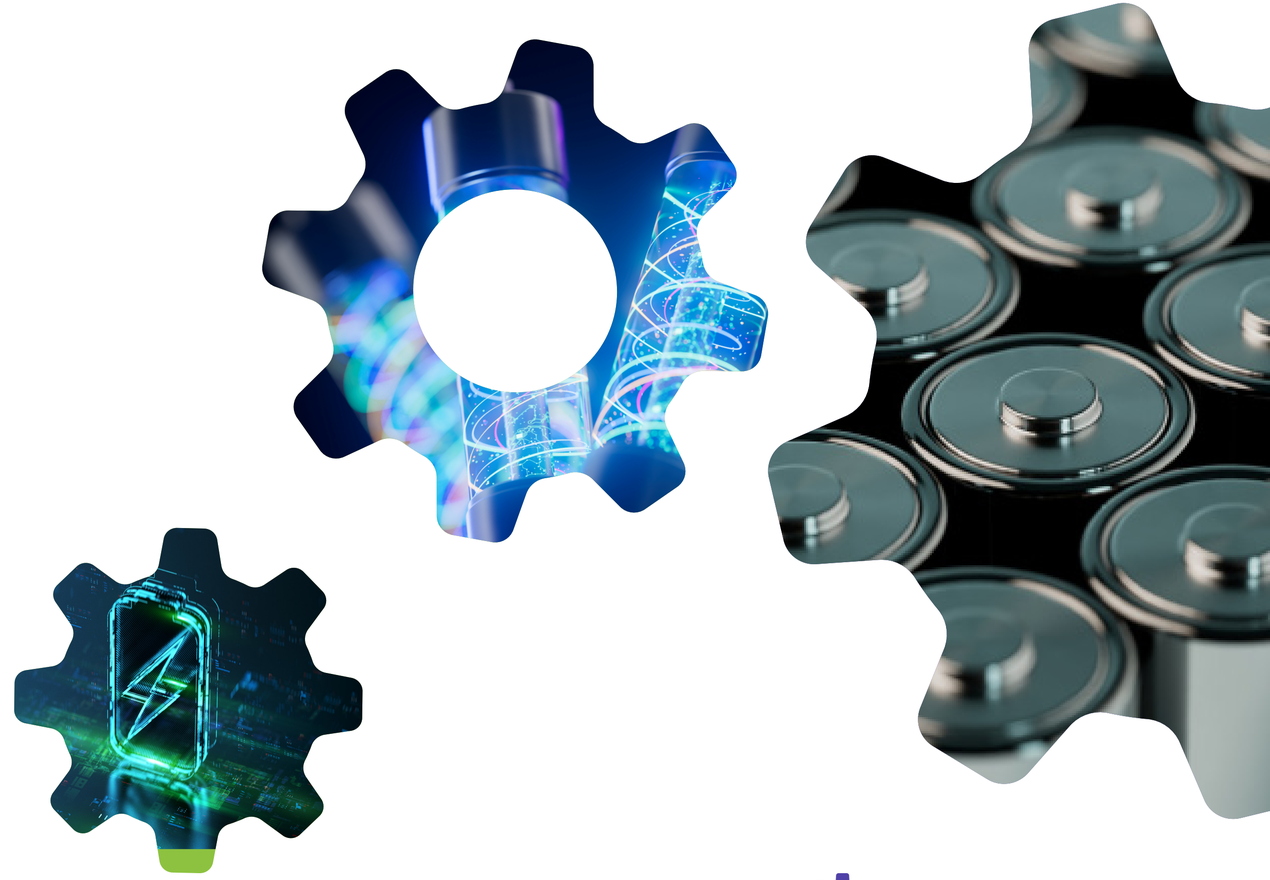
Table of Contents

ENERGY & MANUFACTURING in Appalachia

Abstract

This research provides a comprehensive industry overview of Battery Energy Storage Systems (BESS), with a focus on supply chain opportunities for manufacturers.

As global demand for energy storage accelerates—driven by the integration of renewable energy, grid modernization, and decarbonization policies—BESS is emerging as a cornerstone of 21st-century energy infrastructure. This research examines key market drivers, growth forecasts, dominant technologies, and leading regions in deployment. It also outlines the structure of the BESS supply chain, detailing component categories such as battery cells, thermal systems, enclosures, wiring, control systems, and more. Using recent data from government sources, industry reports, and market intelligence platforms, this research helps manufacturers identify where their capabilities align with BESS needs, and how they can participate in this fast-growing sector. Other storage technologies also exist, such as Flow Batteries, Pumped-storage Hydro (PSH), Compressed Air Energy Storage (CAES), Thermal Energy Storage (TES), and Flywheels, but are not covered in this report.



Executive Summary

This report provides a comprehensive overview of the Battery Energy Storage System (BESS) industry, outlining the significant opportunities and challenges for manufacturers looking to participate in this rapidly expanding market. Driven by renewable energy integration, grid modernization, decarbonization initiatives, and technology improvements, global BESS installations are projected to increase from 200 GWh in 2024 to approximately 1194 GWh by 2030, reflecting a compound annual growth rate (CAGR) of around 34%. Key global markets include China, the United States, Germany, the United Kingdom, Australia, and South Korea.

Manufacturers can leverage significant government support and favorable investment trends, particularly within the U.S., where federal incentives such as the Investment Tax Credit (ITC) and state programs bolster market attractiveness. However, challenges including regulatory complexities, environmental impacts, resource constraints, safety risks, grid integration complexities, and recycling issues require proactive mitigation strategies.

Strategically aligning capabilities with emerging battery chemistries, technological advancements, and a detailed understanding of the supply chain, as outlined in this document, will enable manufacturers to successfully navigate and capitalize on opportunities within the BESS industry.

Industry Overview

MARKET SIZE & GROWTH FORECASTS

1. Installed Capacity

As of 2024, the United States (U.S.) has over 26 GW of installed battery storage capacity. It is one of the largest markets globally, second in line behind China. Globally, the installed capacity is more than 200 GWh. Other global leaders following the U.S. are Germany– 19.8 GWh, the United Kingdom (U.K.) – 7.5 GWh, Australia – 5.6 GWh, and Chile – 3.8 GWh.

2. Market Value

The estimated market size is between 10 billion and 16 billion USD just in the U.S., which includes Utility Scale Battery systems (primarily Lithium-ion), residential and commercial storage (Tesla Powerwall, etc.), installation, integration, and maintenance activities. Different battery energy storage systems (BESS) are categorized by scale and application: Utility-scale systems (e.g., grid-connected lithium-ion arrays) are large (>1 MW) and support grid stability whereas commercial and residential systems (like Tesla Powerwall) are smaller (5 kWh–1 MW) and used for backup power, peak shaving, or solar integration. They often use similar core technologies (primarily lithium-ion), but differ in size, form factor, integration needs, and supply chain complexity.

Globally, the market size is $35 billion to $50 billion USD. The largest region is China, being the largest installer, followed by the U.S., Germany, the U.K. and Spain in Europe, and South Korea and Japan in Asia.

3. Future Expansion

The market is expected to grow at a compound annual growth rate (CAGR) of approximately 32% according to various sources like Bloomberg NEF and Wood Mackenzie. The global installed capacity is expected to grow from 200 GWh levels in 2024 to 1194 GWh in 2030, leading to a CAGR of 34%. The U.S. is slightly behind China. Other leading countries are Germany, U.K., Australia, and South Korea.

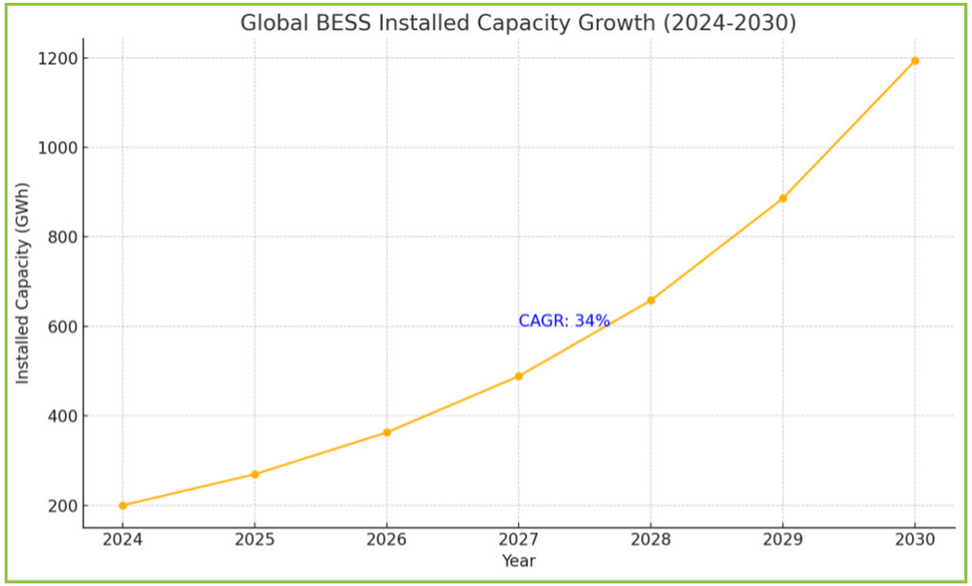


Figure 1 Global BESS Installed Capacity Growth

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Industry Overview

4. Investment Trends

Expansion of U.S. Federal incentives, covering 30% investment Tax Credit (ITC) for standalone BESS, has led to increased investment. Many state level programs like the Self-Generation Incentive Program (SGIP) in California, New York Battery and Energy StorageTechnology (NY-BEST) and New York State Energy Research & Development Authority (NYSERDA) in New York and Solar Massachusetts Renewable Target (SMART) program in Massachusetts provide rebates and technical assistance in BESS to support the investment at the state level. Furthermore, grid operators like California Independent System Operator (CAISO) and Electric Reliability Council of Texas (ERCOT) are increasingly compensating BESS for ancillary services, improving project economics. The Department of Energy (DOE) also provides funding for large-scale projects through low-interest loans. While some incentives are at risk at various times, the diversity of incentive types and sources should help sustain the overall trend.

5. Leading States

As of the end of 2024, the installed capacity and the projects in progress for the leading states are:

1. California - Installed capacity: ~11.7 GW (In Progress 8 GW)
2. Texas - Installed capacity: ~7.5 GW (In Progress 27 GW)
3. Arizona - Installed capacity: ~2.1 GW (In Progress 6.6 GW)
4. Nevada - Installed capacity: ~1.1 GW (In Progress 3.1 GW)
5. New York - Installed capacity: ~0.2 GW (In Progress 1.7 GW)

6. Emerging Markets

States like Oregon (~7.5 GW), North Carolina (~1.6 GW), and Georgia (~1 GW) have big projects in the pipeline whereas others have storage mandates, incentives, and resilience focused goals.

1. New York has a 6000 MW energy storage target by 2030, tied to its Climate Leadership and Community Protection Act (CLCPA).
2. New Jersey has a goal of 2000 MW by 2030 as per the Clean Energy Act.
3. Connecticut has a 1000 MW goal by 2030 and is supported by CT Green Bank.

A hybrid Renewable system including Wind + Solar + Storage is emerging as a national Trend and led by developers like Nextera. Invenergy and AES.

7. International Markets

Asia: China is leading the global market dominated by domestic battery giants like CATL, BYD, and Hithium. China is estimated to have added ~12 to 15 GW in 2024 alone. India is an Emerging market in Asia with 4+ GW of BESS tenders awarded by SECI.

Europe: Germany (added ~6.5 GW in 2024) leads in Europe, followed by the U.K. (~5 GW), Spain (~1.5 GW), and Italy (~1 GW).

Australia: Australia is also leading in BESS projects with 16.8 GW of large-scale BESS coming online in the National Electric Market (NEM) by 2027.

South America: Chile, Brazil, and Mexico are emerging markets in South America.

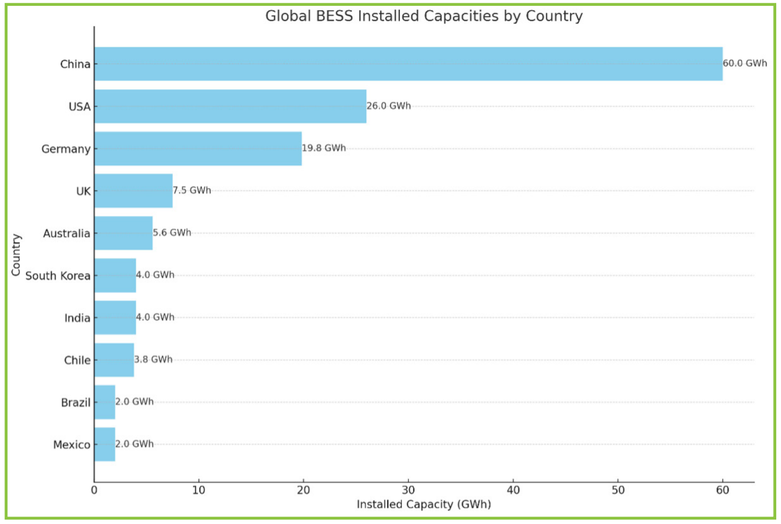

Figure 2 Global BESS Installed Capacity by Country

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Industry Overview

MARKET DRIVERS

1. Government Support

- Investment Tax Credit (ITC) for Standalone Storage - Enacted via the Inflation Reduction Act (IRA, 2022). Previously, storage could only qualify if paired with solar. Now, standalone storage (≥5 kWh) qualifies for a 30% federal ITC. Bonus credits available: +10% for project in low-income or energy communities, +10% for using domestic content, up to 50% total credit possible.
- The DOE Loan Programs Office (LPO) provides low-interest loans and loan guarantees for large-scale storage projects. As of 2023, over $2 billion in loans were committed to energy storage (e.g., Form Energy, Redwood Materials).
- Energy Storage Grand Challenge: A DOE-wide initiative launched to accelerate commercialization of BESS technologies, includes R&D funding, cost targets (e.g., $100/kWh), and performance benchmarks.
- Grid Modernization Support (via Bipartisan Infrastructure Law) - $3+ billion allocated for grid resilience and energy storage pilot programs, encourages utilities to invest in storage for reliability, backup power, and renewable integration.
- State-Level Add-ons: Many states offer additional incentives (rebates, grants, mandates), which stack with federal credit. Examples: California (SGIP), New York (NYSERDA), and Massachusetts (SMART & Clean Peak).

2. High Demand

In the U.S., high energy demand from new industries + weak grid infrastructure in growth regions is driving utilities, regulators, and private users to deploy BESS for:

- Grid support and congestion relief.
- Demand charge management.
- Transmission deferral
- Improved resilience and power quality.

The data centers consumed about 4.4% of total U.S. electricity in 2023 and are expected to consume approximately 6.7% to 12.0% of total U.S. electricity by 2028. The report indicates that total data center electricity usage climbed from 58 TWh in 2014 to 176 TWh in 2023 and estimates an increase between 325 to 580 TWh by 2028.

3. Environmental Goals

Governments and corporations aiming for net-zero carbon emissions rely heavily on intermittent renewables (solar, wind) and BESS is essential for balancing these resources.
Examples:

- U.S. federal and state climate goals (e.g., California's SB100) mandate 100% clean electricity, pushing utilities to add BESS.
- New York has a 6 GW energy storage target by 2030, tied to its Climate Leadership and Community Protection Act (CLCPA).
- Corporate ESG targets: Amazon, Google, and Microsoft are deploying BESS to meet Scope 2 and 3 emissions goals.
- Puerto Rico is deploying BESS with solar for post-hurricane grid resilience.

4. Technological Advancements

Technology is making BESS more affordable, efficient, safe, and grid-responsive—unlocking applications across residential, commercial, and utility-scale markets.

- The volume-weighted average price of lithium-ion battery packs across all sectors fell to $139/kWh in 2023, down 14% from 2022. Once prices fall below $100/kWh, the free market is expected to significantly accelerate adoption—especially in: EV markets (due to lifecycle cost parity), Grid storage (due to improved ROI for time-shifting and resilience), Off-grid and developing regions.
- Advancement of AI is helping with extending battery lifespan, enhancing efficiency through algorithms, and reducing cost.
- Second-life batteries from EVs are increasingly being used in stationary storage, especially for low-duty applications.

Industry Overview

CHALLENGES & CONCERNS

1. Regulatory Hurdles: Policies and regulations around permitting, interconnection, grid service eligibility, storage deployment, safety, recycling, and incentives are still evolving, creating uncertainty for investors and developers. This uncertainty can delay deployments and deter investment.

2. Environmental Concerns: Battery production and disposal can have significant environmental impacts, including mining for critical minerals like lithium, cobalt, and nickel often involves harmful ecological practices, while manufacturing contributes to greenhouse gas emissions and water use. Improper disposal of used batteries, may also lead to soil and water contamination.

3. Resource Availability: BESS technologies depend heavily on critical minerals such as lithium, cobalt, and nickel. These resources are geographically concentrated and subject to geopolitical, environmental, and ethical concerns. Disruptions in the supply chain can affect system costs and availability.

4. Safety Risks: Lithium-ion and other chemistries pose safety hazards such as thermal runaway, which can result in fires or explosions. These risks necessitate rigorous safety protocols, fire suppression systems, and emergency response planning.

5. Grid Integration: Integrating storage systems into existing grid infrastructure can be technically complex. It often requires updates to grid hardware, interoperability standards, and control systems to enable dynamic energy flows and support for distributed energy resources (DERs).

6. Recycling and Disposal: There is a lack of standardized, large-scale recycling infrastructure for batteries. As battery installations grow, so does the need for effective end-of-life management to recover valuable materials and reduce environmental harm. A weak recycling ecosystem limits the circular economy potential of battery storage.

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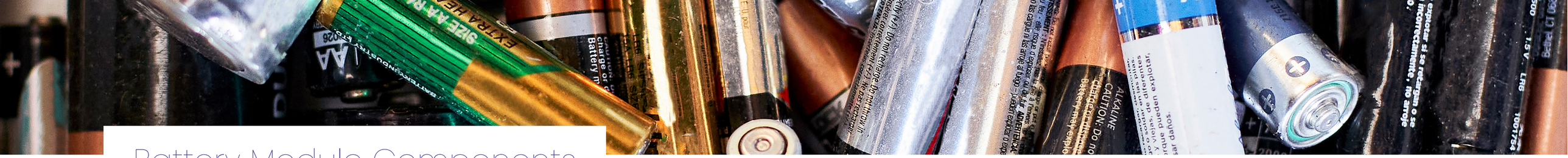


Battery Module Components

While several chemistries are used in BESS — including Nickel Manganese Cobalt (NMC), Nickel Cobalt Aluminum (NCA), and Sodium ion, this report emphasizes Lithium Iron Phosphate (LFP) due to its growing dominance in utility-scale applications. LFP offers advantages such as improved thermal stability, longer cycle life, and reduced reliance on critical minerals like cobalt and nickel.

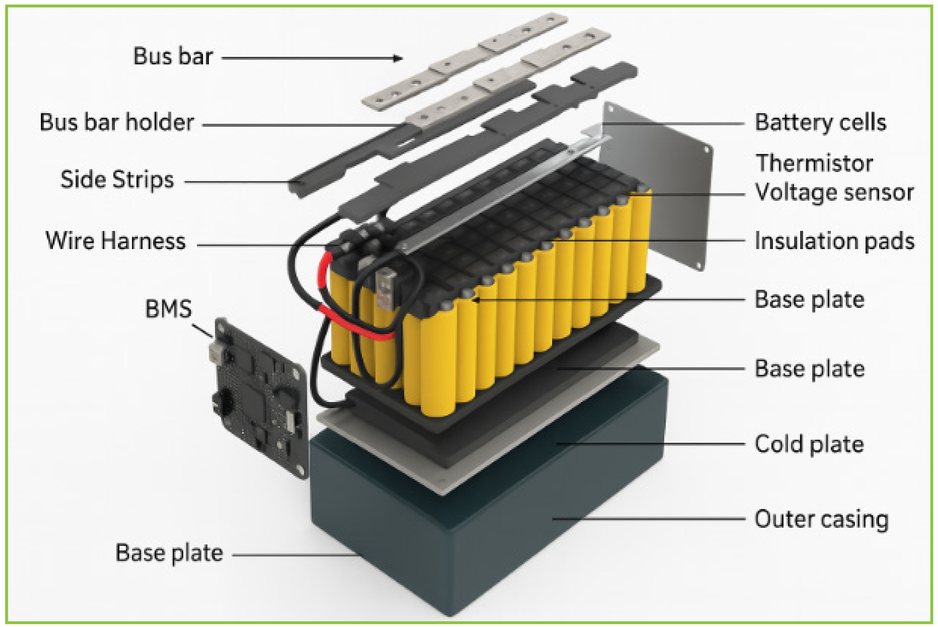


Figure 4 Battery Module Components - Exploded View

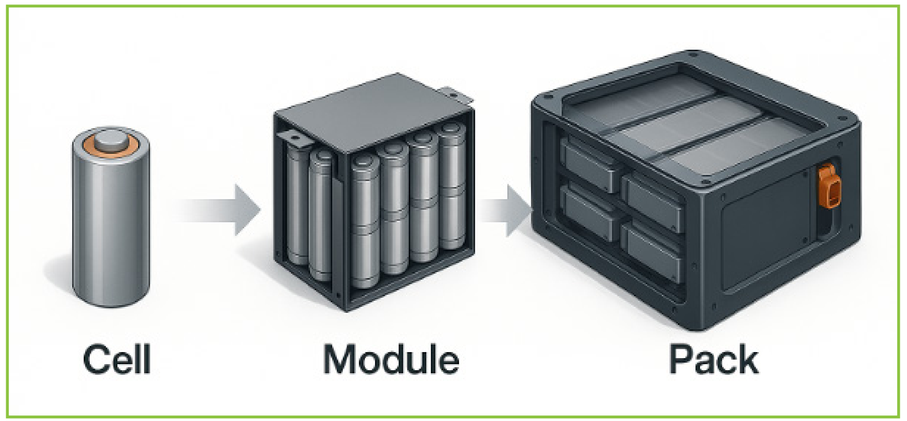


Figure 3 BESS: Cell to Pack

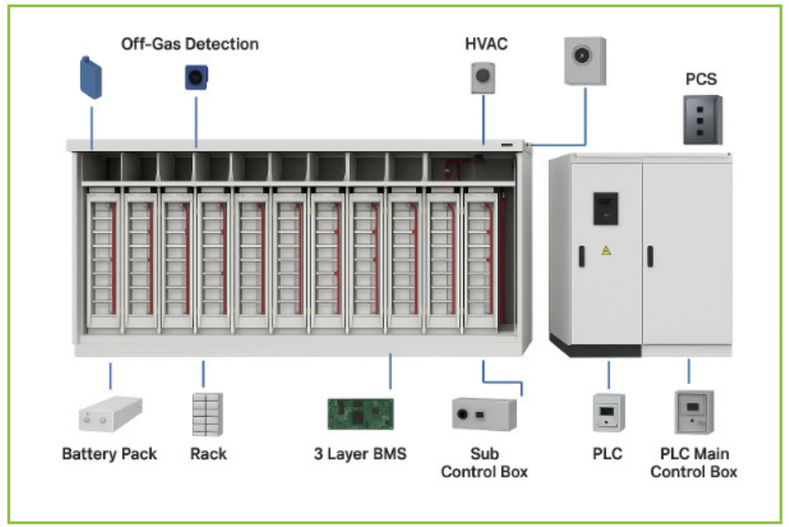
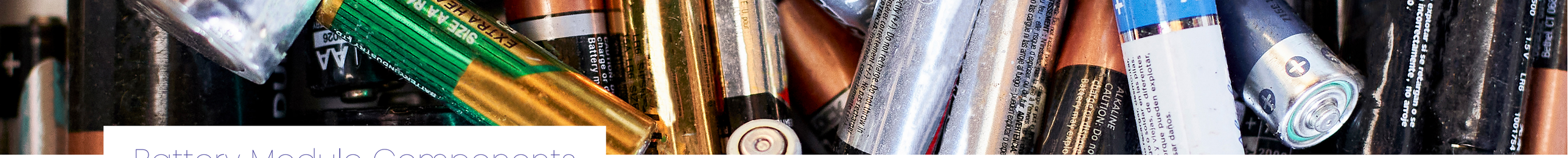


Figure 5 Key Components of a Battery Energy Storage System (BESS) Enclosure



Battery Module Components

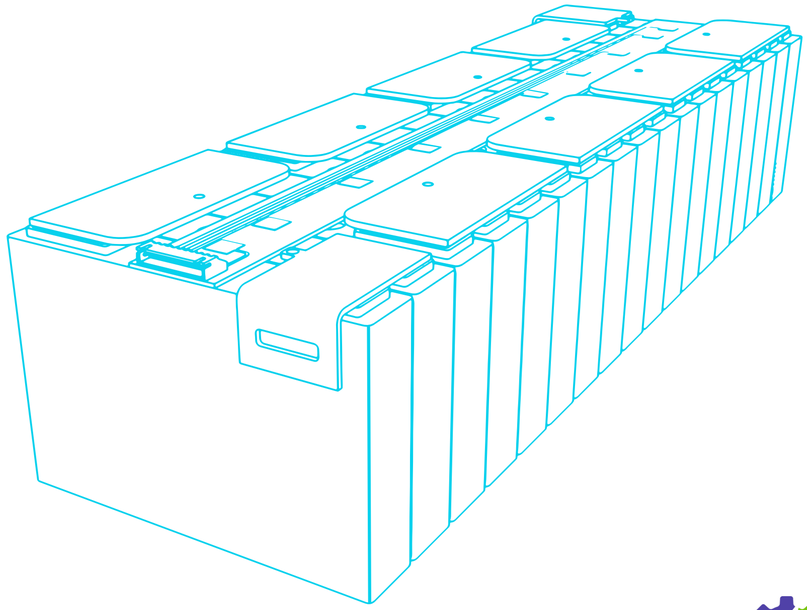
1. Electrical & Power Interface: Manages electrical flow between battery and grid.
- Power Conversion System (PCS): Converts AC<->DC for charging/discharging.
- Power Cables: Carry electrical energy between subsystems and external grid.
- Busbar / Data Connectors: Electrical and communication links between modules.
- Battery Connectors: Connect individual battery packs or modules electrically.
- Fuses: Protect against overcurrent by breaking circuit when needed.
- Copper Stud Terminals: Heavy-duty terminals for secure electrical connections.
- Copper Bus Bar: Conducts current between battery cells or modules.
- Voltage Sensor: Monitors voltage per cell or module to track performance.

2. Control & Monitoring System: Manages safety, performance, and communication.
- Battery Management System (BMS): Monitors cell voltages, temperature, and controls charge/discharge.
- PLC Main Control Box: Central control logic unit for overall system operation.
- Sub Control Box: Local control and data acquisition for subsystems.
- Displays: Interfaces showing system status and diagnostics.
- Circuit Boards and Harnesses: Electronics for control and signal transmission.
- Thermistor: Temperature sensor to ensure safe operation.
- Off Gas Detection: Detects hazardous gases released during battery faults.

3. Battery Modules, Packs & Support Structure: Core energy units and physical supports.
- Battery Cells: Individual electrochemical units storing energy.
- Battery Modules: Assembly of multiple cells into a single unit.
- Battery Pack: Assembly of multiple modules into a single pack.
- Rack: Structural frame housing multiple battery packs.
- Trays / Slides: Facilitate insertion/removal of battery packs.
- End Plate: Compresses and supports cells within a pack.
- Steel Rods for Cell Replacement: Assist with maintenance and swapping cells.
- Base Plate / Cold Plate: Provides structural support and thermal management.
- Insulation Pad: Electrical isolation and safety enhancement.
- Side Strips / Bus Bar Holder: Secure and guide bus bars and other components.
- Wire Harness: Bundled wiring connecting sensors, BMS, and power systems.

4. Thermal Management & Safety: Maintains safe temperature and environmental conditions.
- HVAC: Heating, ventilation, and cooling system for enclosure.
- Cold Plate: Transfers heat from battery cells to cooling system.
- Fire Suppression System: Detects and extinguishes fires or runaway thermal events.
- Safety Valve Outlet: Releases internal pressure gases to prevent damage.
- Terminal Cover: Prevents accidental shorts and contact with live terminals.
- M8 Anti Vibration Nuts: Secure components and reduce damage from vibrations.

5. Enclosure & Mechanical Assembly: Protective outer shell and structural organization.
- Outer Casing: Encloses the entire battery system for physical and environmental protection.
- Enclosures: Various housings protecting internal subsystems.



ENERGY & MANUFACTURING in Appalachia

Components of Typical BESS

NAICS Codes and Corresponding Components / Categories

NAICS CODE	NAICS DESCRIPTION	COMPONENT / SUB-ASSEMBLY	CATEGORY
326122	Plastics Pipe and Pipe Fitting Manufacturing	Injection Molded Plastics	Enclosure & Mechanical Assembly
326199	All Other Plastics Product Manufacturing	Injection Molded Plastics	Enclosure & Mechanical Assembly
327215	Glass Product Manufacturing Made of Purchased Glass	Switches, Keypads, & Displays	Control & Monitoring System
331221	Rolled Steel Shape Manufacturing	Roll-formed parts	Enclosure & Mechanical Assembly
331318	Other Aluminum Rolling, Drawing, and Extruding	Extrusions / Roll-formed parts	Enclosure & Mechanical Assembly
331420	Copper Rolling, Drawing, Extruding, and Alloying	Busbars	Electrical & Power Interface
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	Busbars	Electrical & Power Interface
331512	Steel Investment Foundries	Castings	Enclosure & Mechanical Assembly
331513	Steel Foundries (except Investment)	Castings	Enclosure & Mechanical Assembly
331521	Aluminum Die-Casting Foundries	Castings	Enclosure & Mechanical Assembly
331524	Aluminum Foundries (except Die-Casting)	Castings	Enclosure & Mechanical Assembly
332116	Metal Stamping	Stamped Parts	Enclosure & Mechanical Assembly
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)	Stamped Parts	Enclosure & Mechanical Assembly

Components of Typical BESS

NAICS CODE	NAICS DESCRIPTION	COMPONENT / SUB-ASSEMBLY	CATEGORY
332313	Plate Work Manufacturing	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332322	Sheet Metal Work Manufacturing	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332439	Other Metal Container Manufacturing	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332510	Hardware Manufacturing	Metal Fabricated Parts / Hardware	Enclosure & Mechanical Assembly
332618	Other Fabricated Wire Product Manufacturing	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332710	Machine Shops	Machined Parts /Metal Fabricated Machined Parts	Enclosure & Mechanical Assembly
332721	Precision Turned Product Manufacturing	Machined Parts	Enclosure & Mechanical Assembly
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	Metal Fabricated Parts / Hardware	Enclosure & Mechanical Assembly
332811	Metal Heat Treating	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	Metal Fabricated Parts	Enclosure & Mechanical Assembly
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	Machined Parts / Metal Fabricated Parts / Extrusions / Stamped Parts / Roll-formed parts / Hardware / Busbars	Enclosure & Mechanical Assembly

Components of Typical BESS

NAICS CODE	NAICS DESCRIPTION	COMPONENT / SUB-ASSEMBLY	CATEGORY
333413	Manufacturing of Industrial and Commercial Fans, Blowers, and Air Purification Equipment	HVAC	Thermal Management & Safety
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and IndustrialRefrigeration Equipment Manufacturing	HVAC	Thermal Management & Safety
333511	Industrial Mold Manufacturing	Machined Parts	Enclosure & Mechanical Assembly
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	Machined Parts	Enclosure & Mechanical Assembly
334111	Computer and Peripheral Equipment	Switches, Keypads, & Displays	Control & Monitoring System
334112	Computer and Peripheral Equipment	Switches, Keypads, & Displays	Control & Monitoring System
334118	Computer and Peripheral Equipment	Switches, Keypads, & Displays	Control & Monitoring System
334290	Other Communications Equipment Manufacturing	Communication Systems	Control & Monitoring System
334412	Bare Printed Circuit Board Manufacturing	PCBAs	Control & Monitoring System
334413	Semiconductor and Related Device Manufacturing	Electrical Components	Control & Monitoring System
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	Electrical Components	Electrical & Power Interface
334417	Electronic Connector Manufacturing	Cabling and Harnesses	Electrical & Power Interface
334418	Printed Circuit Assembly(Electronic Assembly) Manufacturing	PCBAs	Control & Monitoring System

Components of Typical BESS

NAICS CODE	NAICS DESCRIPTION	COMPONENT / SUB-ASSEMBLY	CATEGORY
334419	Other Electronic Component Manufacturing	PCBAs	Control & Monitoring System
335311	Power, Distribution, and Specialty Transformer Manufacturing	Electrical Components / Transformers	Electrical & Power Interface
335313	Switchgear and Switchboard Apparatus Manufacturing	Busbars	Electrical & Power Interface
335314	Relay and Industrial Control Manufacturing	Electrical Components	Control & Monitoring System
335911	Storage Battery Manufacturing	Electrical Components / Battery Cells	Battery Modules, Packs & Support Structure
335912	Primary Battery Manufacturing	Electrical Components	Battery Modules, Packs & Support Structure
335931	Current-Carrying Wiring Device Manufacturing	Cabling and Harnesses	Electrical & Power Interface
335932	Noncurrent-Carrying Wiring Device Manufacturing	Cabling and Harnesses	Electrical & Power Interface
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	Cabling and Harnesses	Electrical & Power Interface

BESS Developers and Manufacturers

These Firms develop and/or deploy grid-scale energy storage systems.

1. Fluence – https://fluenceenergy.com/
a. Specialty: Turnkey energy storage systems + software (e.g., AI-based bidding).
b. Projects: Involved in hundreds globally; strong U.S. footprint.

2. Tesla Energy – https://www.tesla.com/energy
a. Specialty: Developer, integrator, and manufacturer
b. Projects: Moss Landing (California), Victoria Big Battery (Australia), and more.

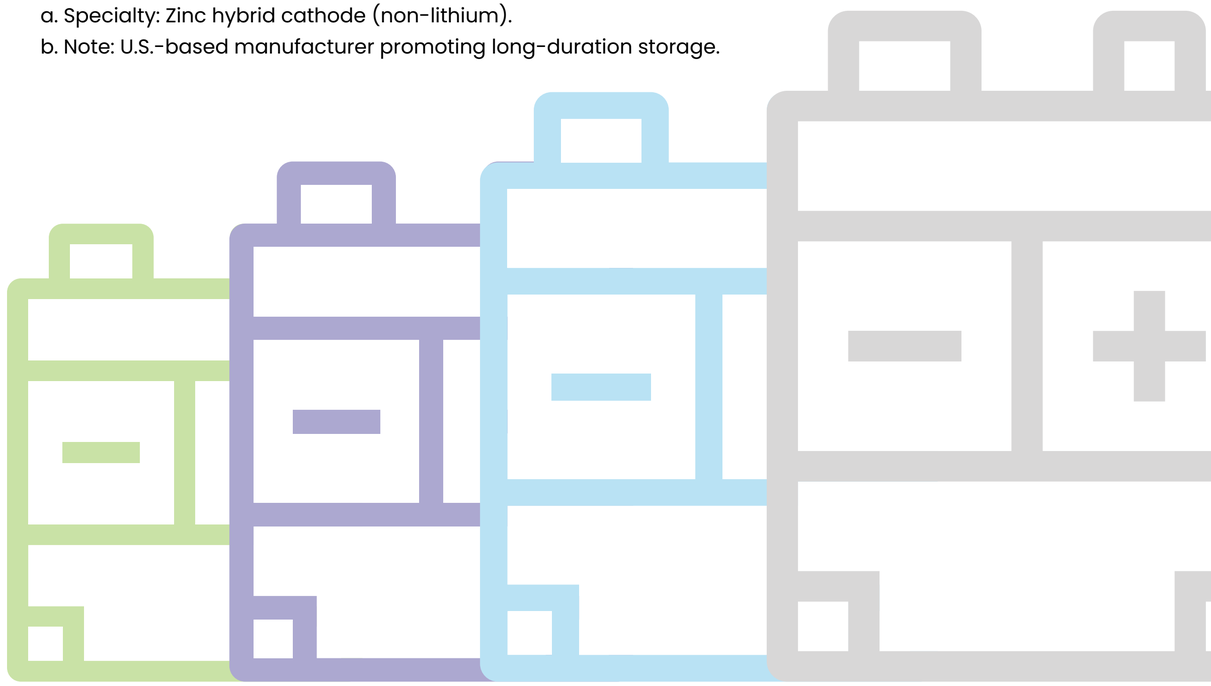
3. NextEra Energy Resources – https://www.nexteraenergyresources.com/
a. Specialty: Major utility-scale solar + storage developer
b. Note: Uses third-party batteries, sometimes Tesla.

4. LS Energy Solutions – https://www.ls-es.com/
a. Specialty: System integrator with modular AC/DC solutions.
b. Note: U.S.-based with Korean parent (LS Group).

5. EDF Power Solutions – https://www.edf-re.com/
a. Specialty: Utility-scale developer; strong BESS pipeline.
b. Note: Often bundles with solar and wind.

6. Invenergy – https://invenergy.com/
a. Specialty: Independent power producer (IPP); BESS, solar, wind.
b. Note: Behind major U.S. energy storage projects.

7. Eos Energy Enterprises – https://www.eose.com/
a. Specialty: Zinc hybrid cathode (non-lithium).
b. Note: U.S.-based manufacturer promoting long-duration storage.



BESS Trade Associations

1. **NAATBatt – https://naatbatt.org/**
   a. Scope: Battery component of the clean energy transition in North America.
   b. Role: Advocacy, research, policy, industry collaboration on energy storage.

2. **New York Battery and Energy Storage Technology Consortium (NY-BEST) – https://ny-best.org/**
   a. Scope: Energy Storage in NY.
   b. Role: Largest and oldest state-based energy storage organization in the U.S. Focuses on advancing energy storage technologies and market development in NY.

3. **American Clean Power Association (ACP) – https://cleanpower.org/**
   a. Scope: Wind, solar, energy storage, transmission.
   b. Role: Federal/state policy advocacy, market design, permitting, interconnection, Policy recommendations, research, market education for BESS.

4. **National Renewable Energy Laboratory (NREL) – https://www.nrel.gov/**
   a. Scope: Not a trade group but a key technical resource in Energy Sector.
   b. Role: A major federal R&D lab focused on BESS research, grid modeling, and performance validation.

5. **Smart Electric Power Alliance (SEPA) – https://sepapower.org/**
   a. Scope: Grid modernization, distributed energy resources (DERs), including BESS for Utilities, grid operators, tech providers.
   b. Role: Working groups on storage integration, interconnection.

6. **California Energy Storage Alliance (CESA) – https://storagealliance.org/**
   a. Scope: Energy storage in California.
   b. Role: Influences CAISO market rules, SGIP incentives, and long-duration storage strategies.

7. **Long Duration Energy Storage Council (LDES Council) – https://www.ldescouncil.com/**
   a. Scope: Global scope for Energy Storage with U.S. members.
   b. Role: Focuses on storage technologies with durations of over 10 hours.

8. **National Electrical Manufacturers Association (NEMA) – https://www.makeitelectric.org/**
   a. Scope: Participates in regulatory bodies like NFPA and IEEE related to BESS safety and interoperability.
   b. Role: Develops technical standards for energy storage components.

9. **Electric Power Research Institute (EPRI) – https://www.epri.com/**
   a. Scope: Battery safety in the U.S.
   b. Role: Research organization focused on technical studies related to battery safety, degradation, fire risks, and grid integration.

US Map with BESS Installation

Figure 6 "US map showing installed (blue) and in-progress (orange) BESS projects."

ENERGY & MANUFACTURING in Appalachia

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BATTERY STORAGE: OVERVIEW

Figure 7 Grid Scale Deployment

This Battery Energy Storage System: Overview report was created under the Energy & Manufacturing in Appalachia (EMA) program made possible with grant funding from the Appalachian Regional Commission. EMA provides technical assistance and business support to small and medium manufacturers and enterprises seeking to expand business, production and jobs in the energy supply chains. Energy is a big expense for manufacturing companies.

EMA helps companies save money with energy efficiency and emissions reductions. The Battery Energy Storage System Overview was drafted by **Punit Shetty** and Ray Strauss. Punit Shetty is a Principal Consultant at the Alliance for Manufacturing and Technology (AMT), www.amt-mep.org, where he leads initiatives focused on energy efficiency, smart manufacturing, and emerging technologies. Punit has worked extensively with manufacturers across New York State to identify and implement innovative solutions that improve competitiveness, sustainability, and operational performance. His recent work includes detailed research into the BESS industry, with an emphasis on market trends and supply chain opportunities in BESS. **Ray Strauss** is also a Principal Consultant at AMT and a team member of the New Energy New York Supply Chain Development Team (NENY.ORG). Ray brings many years of extensive manufacturing experience in leadership roles with global manufacturing operations. As a member of the NENY team, he has expanded his experience to understand the BESS supply chain and how manufacturing companies can participate. Ray has supported numerous companies in navigating technical and financial pathways to engage in the supply chain of the BESS market.

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The EMA program supports Appalachia in 156 counties of Maryland, New York, Ohio, Pennsylvania, and West Virginia. This program was established to help small and medium manufacturers be a part of this Energy Economy.

This program is managed by Manufacturing Extension Partnership (MEP) organizations from five Appalachian states. The activities and intended outcomes of EMA align with the National Institute of Standards and Technology (NIST) MEP and its mission to enhance the productivity and technological performance of U.S. manufacturing.

Learn more about the Energy & Manufacturing in Appalachia program by visiting: https://www.wemakeithere.org/energy/ and join the EMA LinkedIn group. Contact EMA Program Manager, Tom Reed, directly at Tom@WeMakeItHere.org or (412) 918-4269 with any questions or assistance.

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