AVINYA VENTURES

We Enable the Innovators

Mentoring & investing in the next wave of innovative ideas

Avinya's perspective on investment in Battery space:

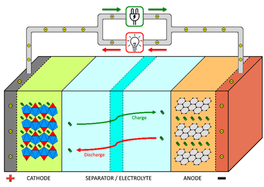
Market Overview: The global battery market, valued at USD 139.36 billion in 2024, is projected to grow at a CAGR of 15.20% over the next eight years. With the Asia-Pacific region poised to dominate this expansion, we see unprecedented opportunities emerging in this sector, particularly in lithium-ion technology—the fastest-growing cell chemistry due to its superior energy density and versatile applications across electric vehicles, consumer electronics, and energy storage systems.

Global Battery Market
USD 139.36Bn
Valued in 2024

Projected to Grow at
CAGR 15.20%
over the Next Eight Years

Understanding Battery Technology:

At its core, a battery converts chemical energy into electrical energy through a sophisticated interplay of components. Each battery comprises cells containing:
- A positive electrode (cathode)
- A negative electrode (anode)
- An electrolyte solution
- A separator



During discharge, electrons flow from anode to cathode, reversing during charging—a process that enables energy storage across multiple cycles.

Functions of different components of a cell:

Component	Material/Example	Function
Anode	Graphite (carbon)	Stores lithium ions during charging
Cathode	LiCoO2, LiFePO4, NMC, NCA	Stores lithium ions during discharge
Electrolyte	LiPF6 salt in EC, DMC, DEC, EMC	Medium for lithium-ion transport
Separator	Polyethylene (PE), Polypropylene (PP)	Prevents short circuits, allows ion flow
Binder	PVDF, CMC, SBR	Holds active materials in electrodes
Current Collector	Copper (anode), Aluminium (cathode)	Conducts electrons to the external circuit

Evolution of batteries:

- **1859**: Lead-acid battery, the oldest form of rechargeable battery was invented.
- **1866**: First dry-cell, Leclanche battery made of Zinc-Carbon was manufactured.
- **1899**: The first alkaline battery with higher energy density, the Ni-Cd battery was invented.
- **1960s**: Alkaline batteries replace Zn-C batteries supplying greater energy at high current.
  And finally,
- **1991**: The first Li-ion battery prototype was commercialized by Sony

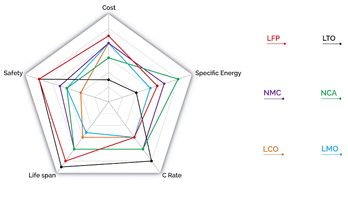
Different types of batteries are based on distinct cell chemistries, each with its own set of advantages and disadvantages.

Why Lithium-Ion Dominates:

Lithium-ion technology has become the industry standard, offering:
- **Superior Energy Density**: 240 Wh/Kg at cell level
- **Extended Lifecycle:** 500-1,000 cycles at 50% Depth of Discharge
- **Minimal Self-Discharge:** Only 1.5-2% per month
- **Rapid Charging Capabilities**

The LFP Opportunity:

Within the Li-ion family, we're particularly excited about Lithium Iron Phosphate (LFP) technology. Among the six main Li-ion chemistries—LCO, LMO, NMC, NCA, LFP, and LTO—LFP stands out for its exceptional safety profile and longevity. At Avinya, we believe LFP presents a compelling opportunity for Indian companies to capture significant market share.



Key Performance Metrics:

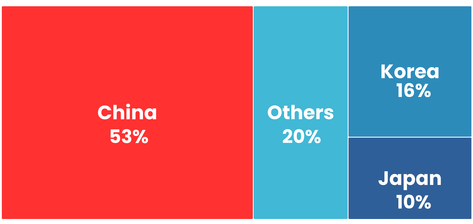
When evaluating battery technologies, we focus on:
- **Specific Energy (Wh/Kg)**: Energy-to-weight ratio
- **Safety & Thermal Stability**: Critical for commercial viability
- **C-Rate:** Charge/discharge capabilities
- **Lifecycle Performance:** Longevity and capacity retention

Use-Cases in EVs for various Lithium-Ion Chemistries

Anode	Cathode	Current user of the chemistry
Graphite	NCA	Tesla Model S/Model X
LTO	NMC	Honda Fit (US)
Graphite	NMC-LMO	Fiat 500
Graphite	LFP	Renault Zoe/BYD e6/Coda EV
Graphite	LMO-NMC	Mitsubishi / i-MiEV
Graphite	NMC	BMW i3/Chevrolet Bolt
Graphite	LMO-NCA	Nissan Leaf

China Dominance:

Today China dominates the EV battery space (see chart below), it has aggressively expanded in the EV battery space over the last 10 years, conquering each part of the supply chain to emerge as the dominant player. Large investments in R&D, favorable government policies, foreign direct investment inflows, and aggressive acquisition of raw material resources across geographies were key enablers for China's spectacular growth in Li-ion batteries. However, India with its collaboration between the government and industry is taking steps to attain self-sufficiency and become a leading exporter of lithium-ion (Li-ion) batteries.



Current Battery Manufacturing Landscape in India:

Established Leaders:

Exide Industries
- 12 GWh plant under construction in Karnataka
- ₹6,000 crore investment in Phase 1
- Partnership with SVOLT Energy for technology
- Expected completion: 2024-25

Amara Raja Batteries
- 16 GWh gigafactory in Telangana
- ₹9,500 crore planned investment
- Technology collaboration with Argonne National Laboratory
- First phase (5 GWh) operational by 2025

New Age Players:

Ola Electric
- 20 GWh facility in Tamil Nadu
- Phase 1 (2 GWh) operational
- In-house cell development and testing capabilities
- Plans to scale to 100 GWh by 2030

Ather Energy
- Advanced cell manufacturing facility in Chennai
- Focus on high-performance Li-ion cells
- Indigenous battery management system
- Current capacity: 120,000 battery packs annually

Other Significant Developments:

Tata Motors
Partnership with Tata Chemicals for cell manufacturing

Log9 Materials
Specialized in fast-charging battery technology

Reliance Industries
Announced plans for battery manufacturing through JV

ACC Energy Storage
Joint venture between Tata Motors and Tata Power

The combined planned capacity of these players is expected to exceed 70 GWh by 2027, positioning India to capture approximately 10% of the global battery manufacturing market.

Economic Potential in India:

The Indian battery sector presents compelling investment opportunities:
- Required Investment: >$10 billion by 2030 for Li-ion cell manufacturing
- Job Creation: Projected 1+ million new positions in manufacturing and allied sectors
- Strategic Position: Emerging as a potential global export hub

From the Managing Partner's desk:

GAURAV VK SINGHVI
Managing Partner,
Avinya Ventures

We see a significant opportunity emerging in the battery market, particularly in India. With the world moving away from China which currently controls a staggering 75% share of the lithium-ion battery manufacturing market, the global landscape is shifting as countries look to diversify their supply chains.

The recent introduction of the Inflation Reduction Act in the United States further emphasizes this trend, encouraging nations to seek alternatives to reliance on Chinese manufacturing. This presents a unique moment for Indian companies to step into this space and capitalize on the growing demand for batteries. The convergence of government support, technological advancements, and a burgeoning domestic market positions India as a potential leader in battery manufacturing.