

## **India must press accelerator on battery storage**

- *By Amitabh Kant\**

The lithium-ion battery is the backbone of modern energy, communication, and mobility systems in the 21st century. Their superior energy-to-weight ratio means devices can be smaller, lighter, and last longer, fundamentally transforming how we communicate, travel, and generate power. From powering smartphones and satellites to enabling electric vehicles (EVs) and stabilizing renewable energy grids, these batteries have quickly become the foundation of national power, mobility, and digital sovereignty. While India has made initial efforts through programs like the Advanced Chemistry Cell Production-Linked Incentive Scheme (ACC PLI), there is significant opportunity to further strengthen and accelerate the country's battery ecosystem.

Batteries now play a critical role in three national infrastructure layers:

- **Communication:** Ensuring reliable power for smartphones, laptops, 5G towers, and satellites.
- **Energy Storage:** Supporting renewable energy integration by stabilizing grids and enabling decentralised storage.
- **Transport:** Powering a growing fleet of electric vehicles across commercial, public, and personal transportation.

India's ambition for a clean, resilient energy future depends on developing reliable, affordable, and scalable battery solutions. With demand projected to reach 260 GWh annually by 2030, and potentially higher given the country's decarbonization commitments across transport, railways, and the power sector, India has a strategic opportunity to become a global leader in this sector.

### **Global Trends: LFP, China, and the Lithium-Ion Future**

For the past two decades, the world primarily relied on NMC (Nickel Manganese Cobalt) chemistry as the standard for lithium-ion batteries. This meant that the key components—the cathode—were built using nickel, manganese, and cobalt, materials chosen for their high energy density and performance. But now, the international landscape is witnessing a transformative shift towards Lithium Iron Phosphate (LFP) and advanced battery chemistries, which are inherently safer, have a longer cycle life, and use more environmentally friendly raw materials, making them especially suitable for large-scale storage and electric vehicles.

There is growing consensus across nations that for the near-future, our solution for short-duration energy storage is lithium-ion, and LFP is its workhorse.

Today, China dominates the lithium-ion battery value chain—raw materials, cell manufacturing, pack assembly, and crucially, the deep know-how in process engineering and IP protection. Over 75% of global battery production happens in China. With rising geopolitical tensions, China has also begun limiting the transfer of core technologies, making it harder for other countries to access high-efficiency manufacturing processes and machinery.

In response, the US, South Korea, and Europe are building regional value chains—investing in gigafactories, securing critical minerals, and reshoring R&D capabilities. While there are honest attempts by some industrial players like Tata, Reliance, Ola, Exide and Amararaja, Indian companies need additional support to build our first stabilized gigafactory and become truly independent of China's decisions.

In order to shift from a passive observer to a global player shaping this new energy order, the Department of Heavy Industries needs to adopt a more proactive and supportive approach to nurture the domestic battery industry. The current phased manufacturing program, including the ACC PLI scheme; which was crafted for a different geopolitical landscape; has not delivered desired results. It is now crucial for the department to reassess strategy and take inspiration from successful elements of the electronics PLI scheme, such as combining targeted subsidies with global marketing efforts and confidence-building measures to accelerate India's battery ecosystem.

### **India's Lithium-Ion Strategy Needs a Reboot**

India's current approach must evolve from focusing only on capacity targets to building deep industrial and design capabilities. Here's a five-point agenda to press the accelerator:

#### **1. From Capacity to Capability**

India must move beyond merely setting gigawatt-hour capacity targets and instead focus on developing deep expertise in battery product design and manufacturing processes, adopting models similar to East Asian countries like Japan, South Korea, and China. These nations have mastered the art of integrated, high-precision manufacturing, which includes advanced pack and cell design, sophisticated materials engineering, innovative coating techniques, electrode chemistry, and thermal management systems. Building this level of technical mastery will help India transform into a competitive producer of high-quality, competitive batteries, capable of meeting both domestic and global demand.

#### **2. Replicate the Electronics Playbook**

India's rise in electronics manufacturing was enabled by a blend of demand creation, software, marketing, shop floor, and industrial engineering talent, working in tandem with

foreign partners—particularly China. A similar collaborative approach in batteries—especially in the early phases—can help India climb the value chain faster.

### **3. Flexible and Risk-Sharing PLI Policies**

The current ACC PLI scheme is too rigid and needs greater operational flexibility to effectively support emerging domestic players. In its current form, early Indian entrants face higher technology, capital, and execution risk, which acts as a deterrent. Those who have not yet delivered should be carefully evaluated and weeded out, and a new, more agile process should be undertaken, focused on clear outcomes and consistent delivery. In tandem, the government should actively engage and support leading Indian industrial giants—such as Tata, Reliance, Ola, Amararaja, Exide, JSW, and L&T—and empower them to become world-class champions in battery product design and manufacturing, leveraging all available resources and policies to make this possible.

### **4. Focused Innovation in Battery Design:**

While India may be playing catch up in manufacturing, it has a prime opportunity to lead in battery design and innovation. Indian engineering institutions, startups, and automotive Original Equipment Manufacturers (OEMs) must focus on battery design, simulation, testing, and integration, covering everything from novel cell formats to advanced pack cooling. The government should organise a Grand Challenge for a ‘Bharat cell design’ that is better than any cell in the world.

### **5. Adaptive Duty Regimes:**

India should adopt a phased and flexible duty policy that supports initial local assembly of battery packs, then progressively expands to cell manufacturing and raw material processing. This approach must promote scale and competitiveness while carefully ensuring that barriers do not hinder the import of advanced technologies and innovation.

The next chapter for India’s energy landscape should not be about keeping pace but rather setting it. If we want to make the most of cutting-edge technologies, then our policies need to reflect a similar appetite for pushing the envelope. This requires a shift from reactive measures to proactive leadership: anticipating industry trends, investing in innovation, and creating an environment where home-grown solutions can thrive.

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