Powering a Second Life: Unlocking the Business Case for Battery Repurposing

Transitioning from a linear "take-make-dispose" battery model to one built on reuse, repurposing, and recycling is vital for capturing maximum value across a battery's life. While recycling is essential, a more immediate economic opportunity lies in repurposing batteries in their original form—before they are broken down. Keeping the battery's form factor intact for as long as feasible maximizes residual value. In fact repurposing and recycling should be viewed as sequential steps in a layered circular system.

In electric vehicles (EVs), batteries are often replaced once their state of health (SOH) drops to around 80%, in order to preserve driving range. Yet even at that stage, they retain substantial capacity and energy throughput potential. By disassembling, repairing, and reconfiguring these "end-of-vehicle" batteries, they can serve secondary roles, such as stationary storage. Although energy throughput and charge/discharge efficiency decline, oversizing the pack enables reliable performance even with lower SOH batteries.

The economic potential of repurposing batteries is significant. Second-life batteries represent a value recovered from what would otherwise be scrap, offering a clear residual value gain and an arbitrage opportunity with a 30–40% margin. The business model is relatively straightforward: refurbishers collect used batteries, disassemble and test them, replace degraded components, and then reassemble the batteries for reuse.

While this emerging market holds strong potential, its growth depends on regulatory and policy support. Governments can help shape demand, lower entry barriers, and enable the safe reuse of batteries. Moving from pilots to a functioning second-life market will require coordinated action across four key pillars:

- **Circular by Design:** Promote designs that enable easy disassembly and secondary use through standardized, modular formats and cell innovations (e.g., prismatic or pouch cells) that improve interchangeability and flexibility.
- **Diagnostics:** Develop specialized labs and testing infrastructure to assess the SOH accurately, remaining useful life (RUL), and thermal performance across battery chemistries and configurations.
- **Data Access:** Ensure authorized refurbishers can securely access key battery management system (BMS) by establishing minimum data-sharing standards and encrypted platforms, strengthening traceability and buyer confidence.
- **Collection and Logistics:** Invest in reverse logistics infrastructure and formalize collection networks. Reclassifying used batteries, reducing tax disparities (e.g., India's 18% GST on used batteries versus lower rates on raw metals), and including repurposers in scrappage schemes can lower acquisition costs and improve margins.