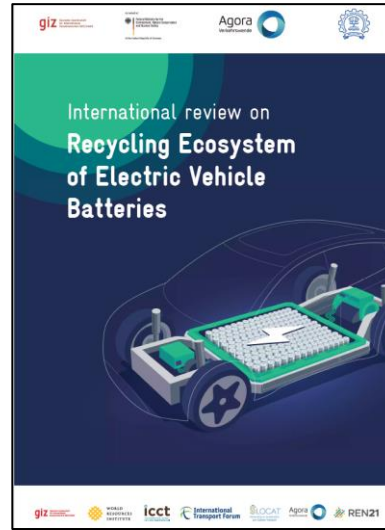
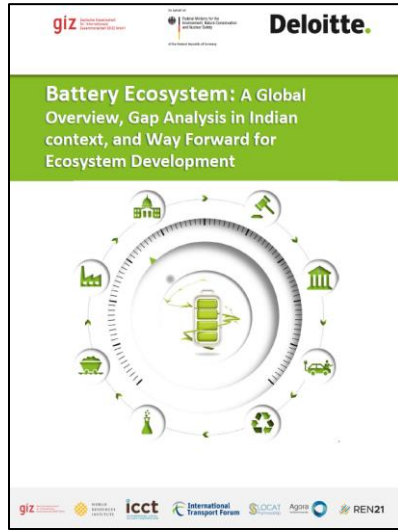




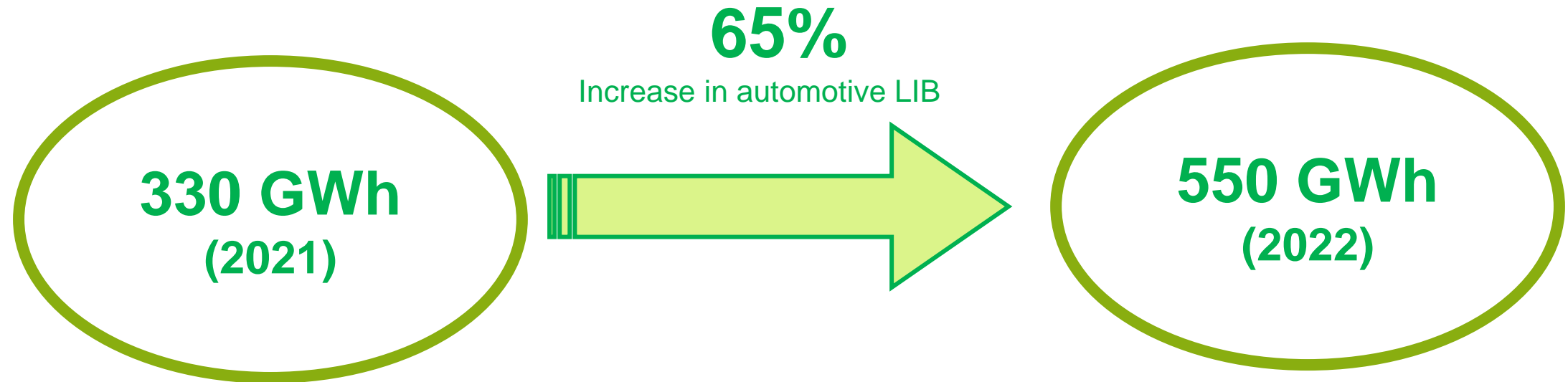
# Overview of Battery recycling ecosystem in India

12<sup>th</sup> September 2023, TCCW



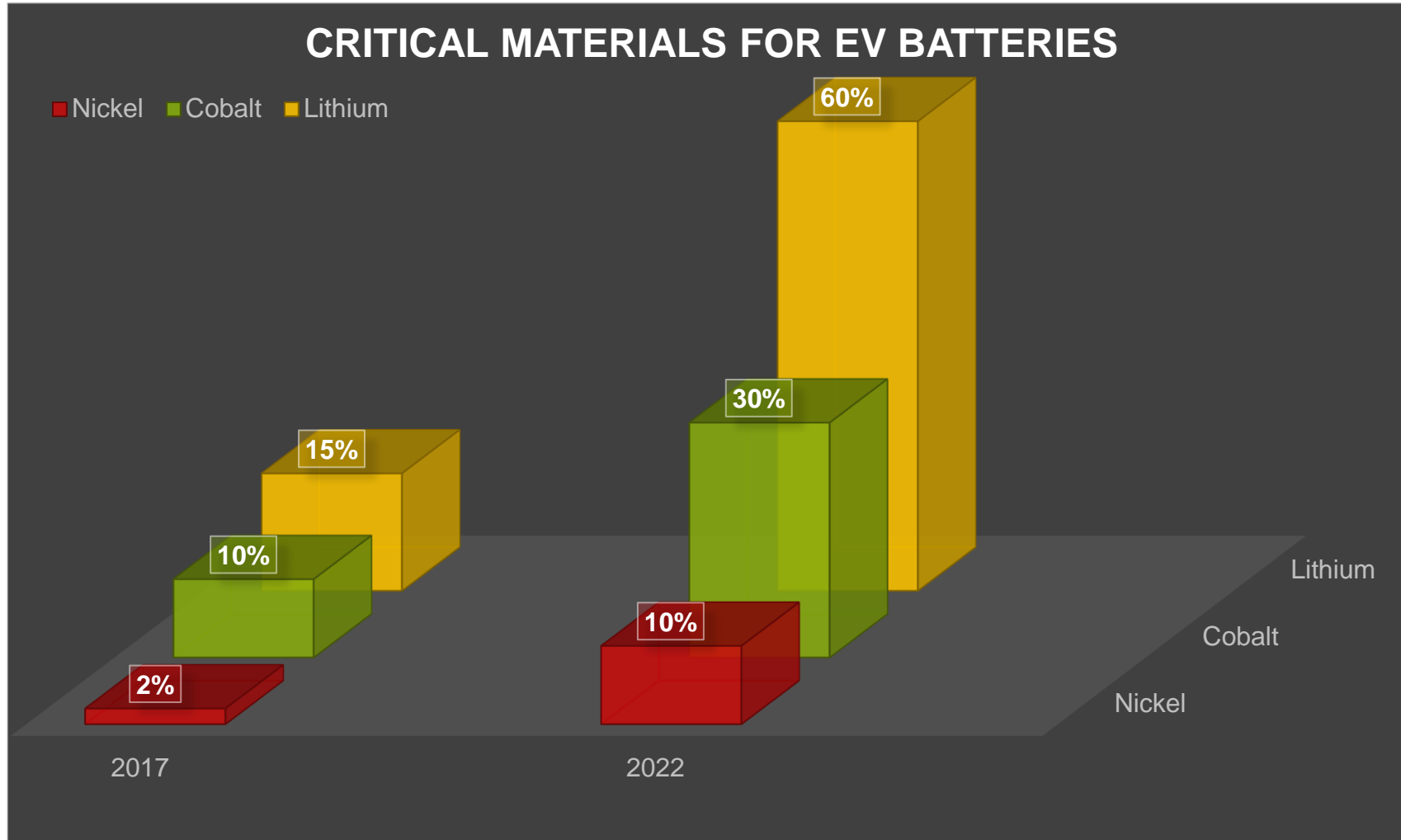


# Global battery demand for EVs continues to rise\*



\* : primarily as a result of growth in electric passenger car sales, with new registrations increasing by 55% in 2022 relative to 2021.(IEA GEVO23)

# Increase in battery demand further increases demand for critical materials

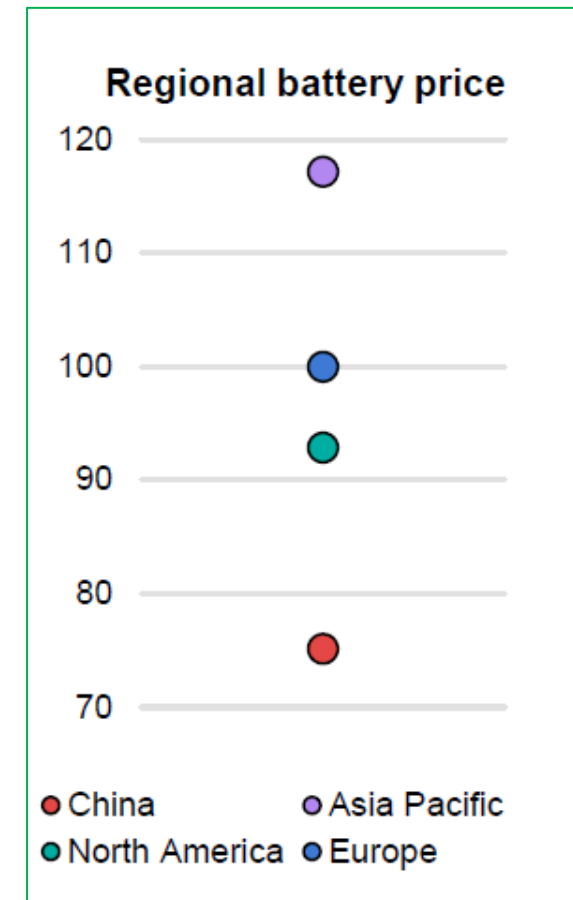
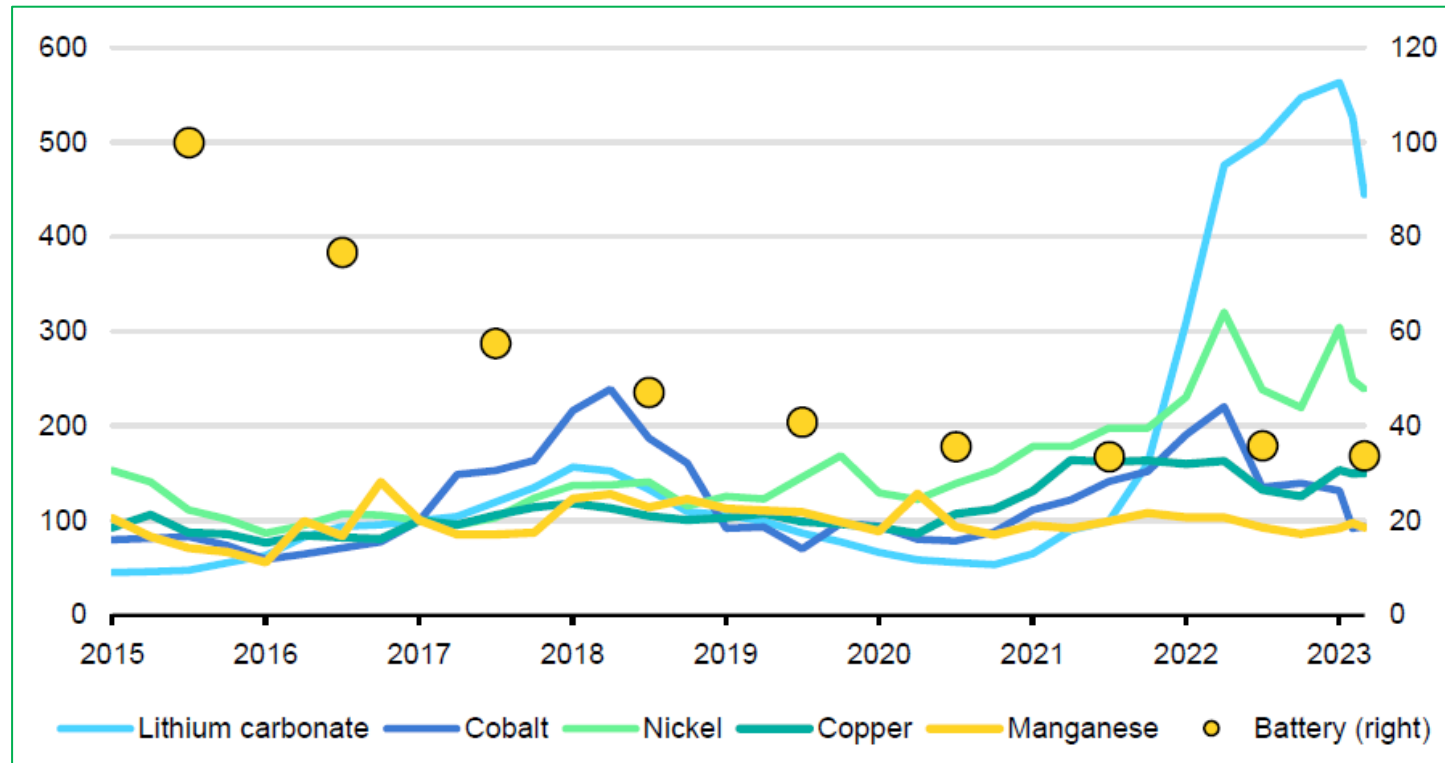


Despite the 180% increase in production since 2017, lithium demand exceeded supply in 2022.

\*(IEA GEVO23)



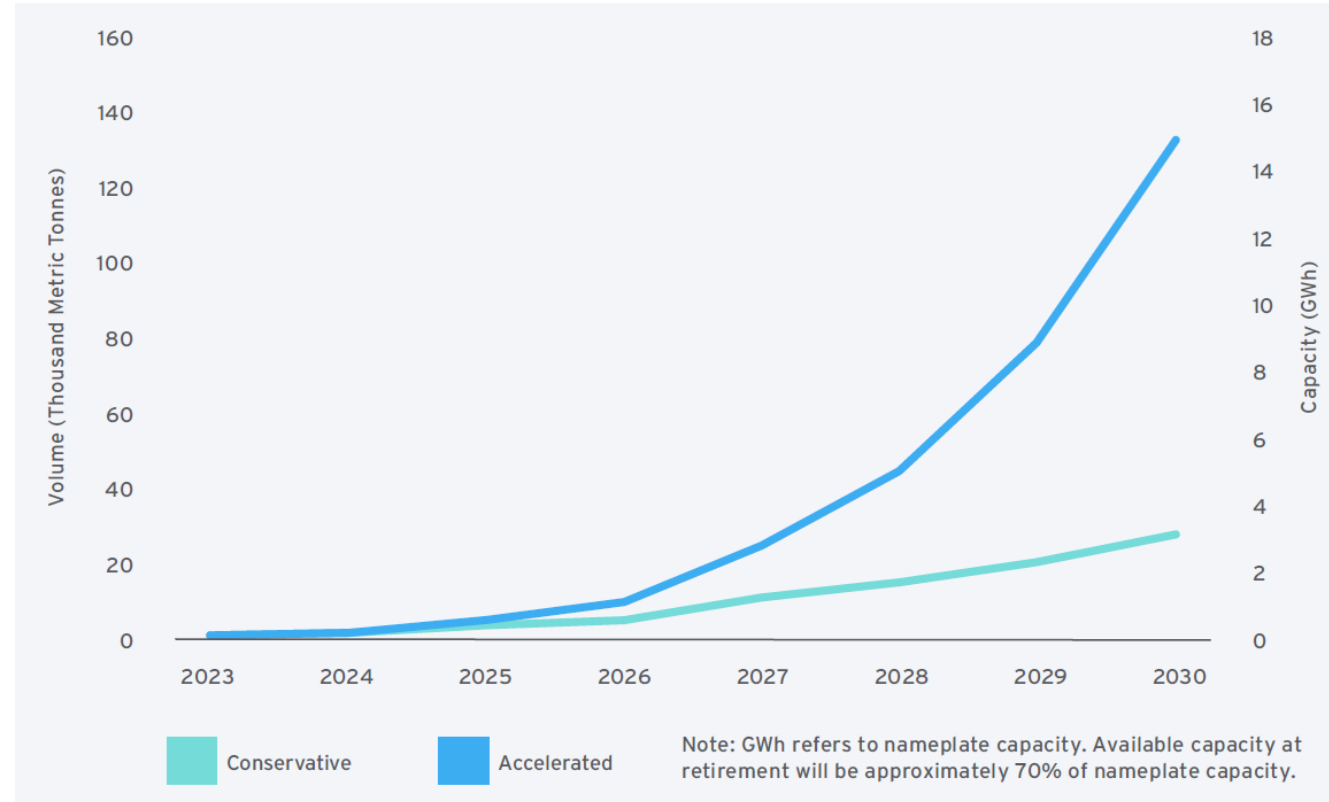
# Rising prices for upstream battery raw materials



The **price of batteries also varies across different regions**, with China having the lowest prices on average, and the rest of the Asia Pacific region having the highest. This price discrepancy is influenced by the fact that around 65% of battery cells and almost 80% of cathodes are manufactured in China.

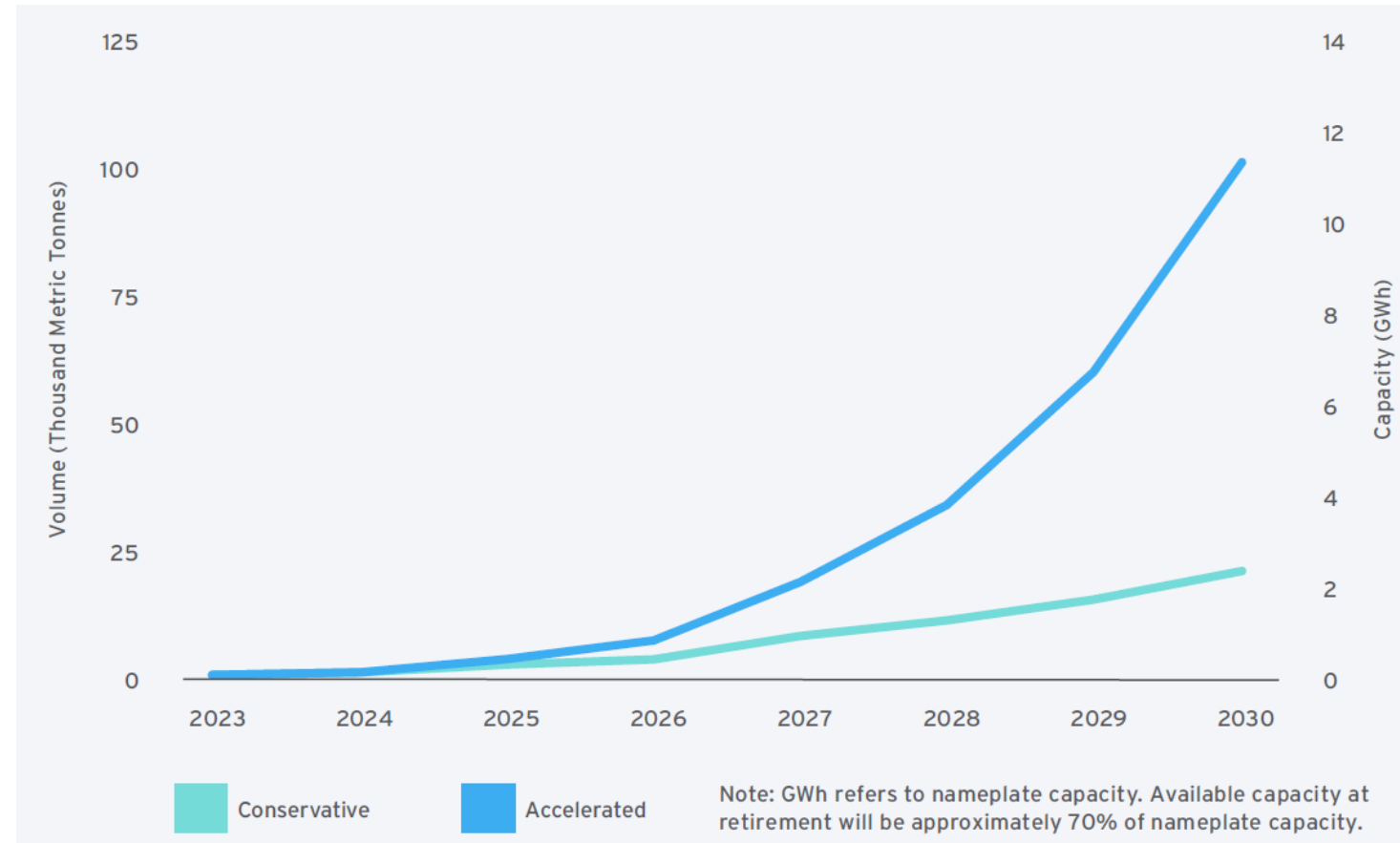
# Projected battery demand and EOL capacity in India

- ❖ Total demand for LIBs in India could be **between 105 and 263 GWh annually by 2030** largely in the transportation sector.
- ❖ By 2030, EV LIB retirements could range **between 3.5 and 17 GWh of nameplate capacity (30,000 and 145,000 tonnes)**, depending on the level of EV penetration.

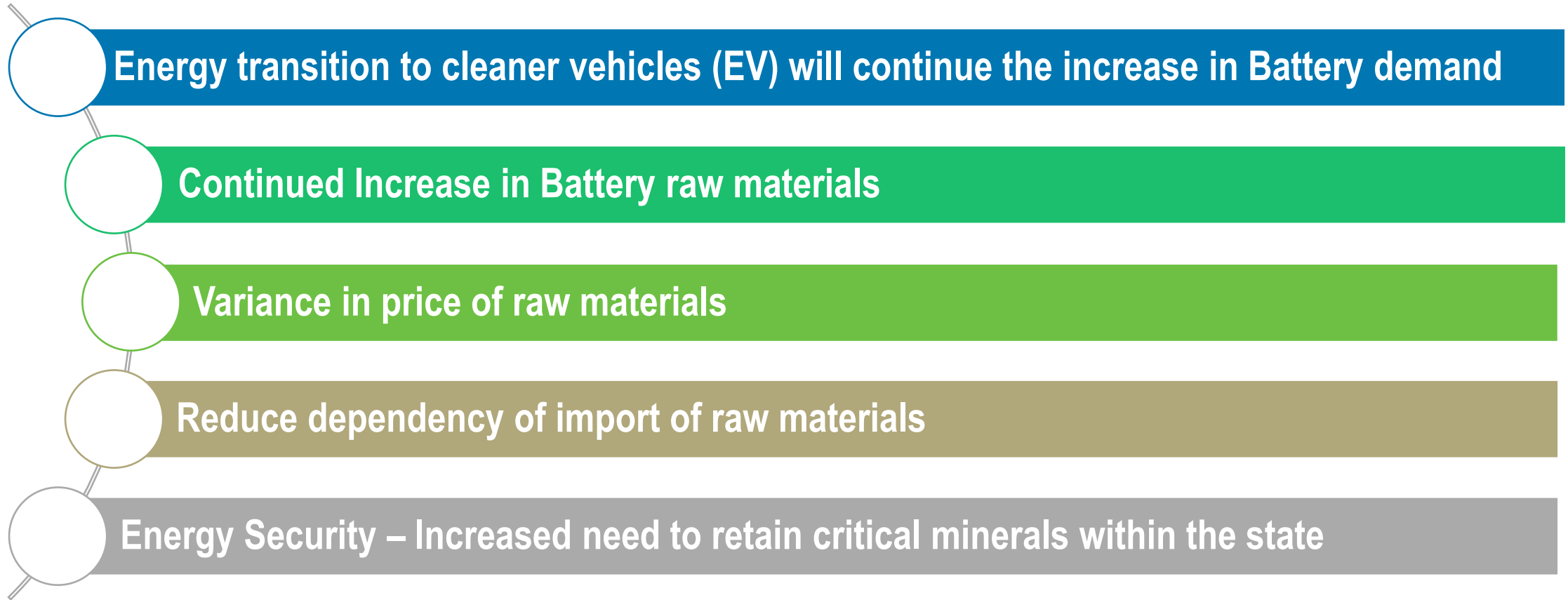


# Potential size of the EV battery recycling market in India

- ❖ Assuming the policy target of 30% is enacted by 2023, the required recycling capacity would need to be **between 20,000 and 102,000 tonnes (equivalent to between 2.4 and 11.7 GWh) by 2030**.
- ❖ This would require **recycling capacity to grow a minimum of 135% annually between 2021 and 2030** to meet EV LiBs in the base case.



# Necessity for Battery recycling





# Enablers for an efficient recycling ecosystem



# Evolution of Battery and E-waste Waste Management Rules in India

Batteries  
(Management and  
Handling) Rules  
2001

2001

2011

E-waste  
(Management and  
Handling) Rules  
2011

Battery Waste  
Management Rules,  
2020 (Draft)

2016

2022

E-waste (Management)  
Rules 2022  
(Notified)

Battery waste  
Management  
Rules, 2022  
(Notified)

2022

# Battery Waste Management Rules 2022

Notified by Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India

New additions to the rules: Applicable to all types of batteries regardless of chemistry (LIB/LAB), shape (Form factor), volume, weight, material composition and use. Included Lithium ion. Earlier only LAB.

New category of battery included: EV batteries.

The recycling of Waste Battery means recycling of Battery materials such as lead, nickel, lithium, nickel, cobalt, plastics, rubber, glass, etc.

The rules provides roles and responsibilities for: Producers, Consumers, Public waste management authorities (PWMA), entities involved in the collection, segregation, and treatment of waste batteries, Recyclers, Central and State Pollution Control Boards (CPCB/SPCB)

# Battery Waste Management Rules 2022

The rules works on the principle of EPR (Extended producer's responsibility)

EPR mandates collection of waste batteries for recycling or refurbishment by **setting collection targets and recycling targets** (schedule II)

EPR mandates **minimum use of domestically recycled materials** in new Battery

Collection target for EV batteries: **Extended Producer Responsibility** mandates **Producer** to meet the collection targets.

**Minimum 70% of the quantity of Battery placed in the market in 2021-22 and 100% of refurbishment or recycling of the collection target**

Producer will meet their EPR obligation through the Extended Producer Responsibility certificate made available by recycler or refurbisher. In case of non-availability of EPR certificates with recyclers or refurbishes, the Producer shall have the responsibility of collection as well.

# Battery Waste Management Rules 2022

**Recycling target: Recovery of minimum percentage target is the percentage of total weight of all recovered materials out of dry weight of the Battery and recyclers shall be mandated for minimum recovery of Battery materials**

S.No.	Type of Battery	Recovery target for the year in percentage		
		2024-25	2025-26	2026-27 and onwards
1.	Portable	70	80	90
2.	Automotive	55	60	60
3.	Industrial	55	60	60
4.	Electric Vehicle	70	80	90

The recovery target may be reviewed by the Committee **once every four years to revisit the minimum levels** of recovered Battery materials in light of technical and scientific progress and emerging new technologies in waste management, and the Committee would recommend to Ministry of Environment, Forest and Climate Change in this regard.



# Battery Waste Management Rules 2022

Producer is mandated with respect to minimum use of domestically recycled materials in new Battery as per the Table below.

S.No.	Type of Battery	Minimum use of the recycled materials out of total dry weight of a Battery (in percentage)			
		2027-28	2028-29	2029-30	2030-31 and onwards
1.	Portable	5	10	15	20
2.	Electric Vehicle	5	10	15	20
		2024-25	2025-26	2026-27	2027-28 and onwards
3.	Automotive	35	35	40	40
4.	Industrial	35	35	40	40

# Policies to Incentivize Domestic Manufacturing

- ❖ Product Linked Incentives scheme – “National Programme on Advanced Chemistry Cell Battery Storage”
- ❖ The PLI Scheme is implemented by the Department of Heavy Industries and NITI Aayog.
- ❖ The PLI Scheme earmarks INR 18,100 crore (US\$2.49 billion), with the target of establishing local manufacturing capacity of 50 GWh for ACC.
- ❖ 29 Manufacturers under the PLI Scheme are eligible for an investment of up to INR 225 crore perGWh. The scheme aims to boost domestic manufacturing, cut down on import bills, and strengthen energy security.



## PLI-ACC

- Outlay of ₹18,100 crore
- (\$2.2 billion)
- Jun, 2021 – Dec, 2029

# Provisions available for Battery recycling

Stages	Parameters	India
<b>Battery Manufacturing</b>	Data Collection	✓
	Data Sharing	✓
	Data Monitoring	✓
	Data Labelling	✓
	Data Standardization	
<b>End-of-first life</b>	Sorting/Segregation	✓ Consumer
	Collection	✓ EPR
	Transportation	
	Storage	✓

# Provisions available for Battery recycling

Stages	Parameters	India
Recycling facilities	Guidelines/Standards	✓
Targets	Collection rate	✓ EPR
	Recycling rate	✓ Recyclers
Recycling (standards/guidelines)	Dismantling	
	Treatment/Recycling process	✓
Recycling & post recycling targets	Material recovery rate/ Recycling Efficiency	✓ Recyclers
	Recycled material purity	
	Recycled content in new batteries	✓ EPR

# Learnings from BMWR 2022

## ❖ New Business Opportunities:

- Mandating the minimum percentage of recovery of materials from waste batteries under the rules will **bring new technologies and investment in the recycling and refurbishment industry and create new business opportunities.**
- **Selling of EPR certificates** by recyclers to Producers helps the recycling ecosystem.

## ❖ Reduce Dependency on Raw Materials:

- Prescribing the use of a certain number of recycled materials in the making of new batteries will reduce the dependency on new raw materials and save natural resources.

## ❖ Online Registration:

- Online registration & reporting, auditing, and committee for monitoring the implementation of rules and taking measures helps easier monitoring of EoL batteries.

## ❖ Centralized EPR Portal:

- Government launched a new centralized online portal, allowing producers and recycling agencies or refurbishing agencies to exchange EPR certificates for complete transparency in the completion of the recycling cycle

# Gaps in the BWMR2022

**No provisions for data collection and sharing of repurposed batteries.**

**No provision for battery design standardization.**

**No assessment criteria for estimating Remaining Useful Life (RUL) of batteries.**

**No provisions for testing or evaluation of repurposed LIBs.**

**Lack of provision for collection and recycling targets mentioned for batteries placed in market before 2021**

**Standards for operating procedures and dismantling of modules from used battery packs.  
Specific test requirements, test procedures and methods for determining the residual charge in used batteries.**

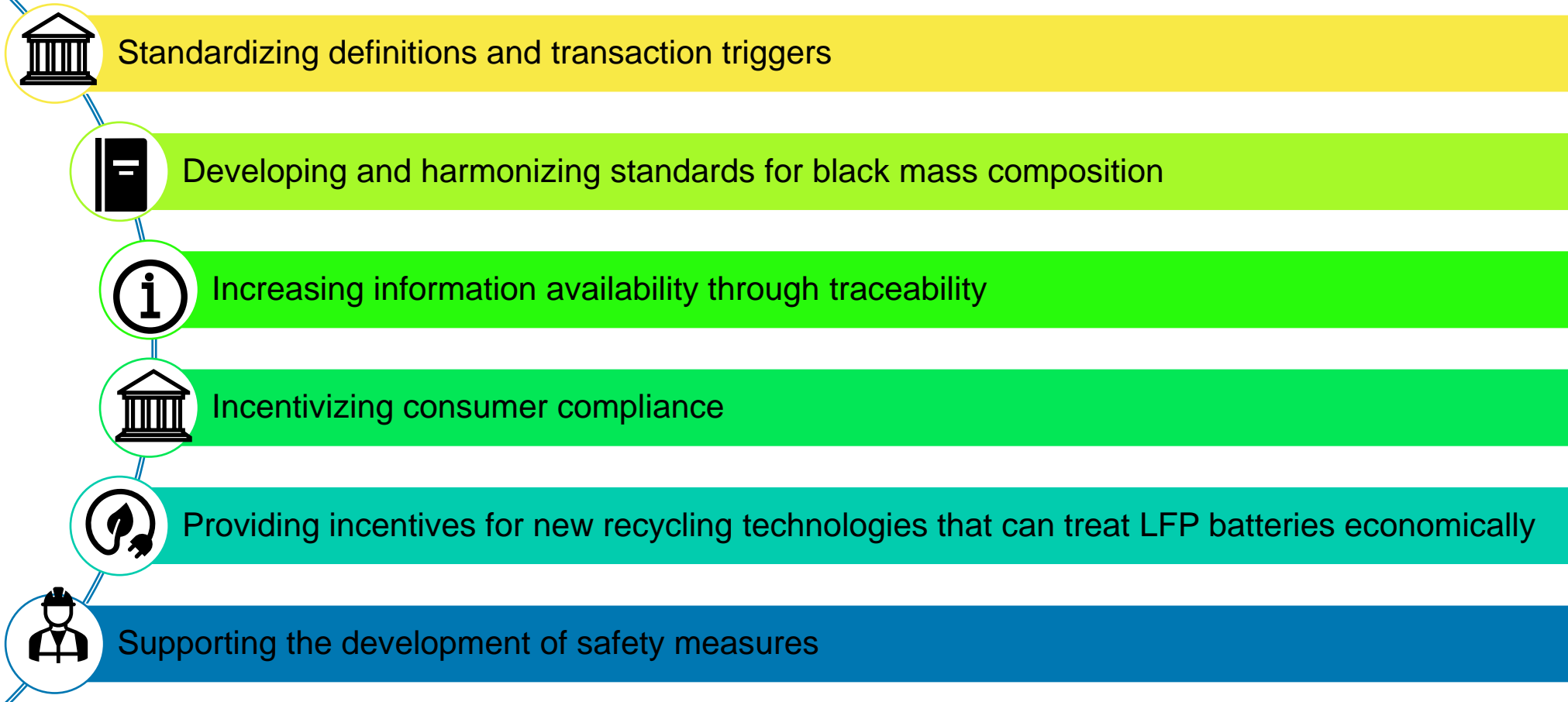
**No material recovery targets set for specific materials such as those present in China.**

**No provision for grants for carrying out R&D activities related to recycling ecosystem.**



# Recommendations to ensure efficient EV battery recycling Ecosystem

Policy-makers need to collaborate to enable a safe and clean transboundary movement and management of end-of-life batteries



# Battery recycling companies in India



Attero at present recycles 3,500 MT of Li-ion waste in India and is expanding the capacity to 11,000 MT by October 2022



LOHUM has been able to create the technology & infrastructure to recycle 2 GWh and reuse 300 MWh of battery capacity per annum.



BatX Energies aims to recycle approximately 1 billion lithium-ion cells over the next three years (2022) BATX produces annually up to 15,000 metric tons of black mass, a mixture of battery anode and cathode materials, with battery input of 30,000 metric tonnes

