

# Keynote:

*Battery industry  
developments in North  
America after the Inflation  
Reduction Act and the  
future of EU-Asia  
cooperation in the battery  
field*

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# AGENDA

- ▶ **Battery Companies become economic powerhouses**
- ▶ **USA Legislation which impacts Battery Product and Raw Materials**
- ▶ **Labor Union Impact on Legislation Intended to Increase EV Production**
- ▶ **Geopolitical Retaliation: Chinese Graphite Supply**



# Moving Into the Terawatt Era: Current state of Lithium-Ion Battery Manufacturers and EV market

Market Cap comparison of mobility sector companies and battery manufacturers as of 6/4/2023

- \$678 B Tesla #9
- \$198 B Toyota #53
- **\$145 B CATL #78**
- \$128 B Boeing #91
- \$109 B Airbus #120
- **\$105 B LG Energy Sol #129**
- **\$100 BYD #138**
- \$74 B Volkswagen #190
- \$50 B Stellantis #325
- \$50 B Ford #327
- \$49 B GM #347
- **\$36 B Samsung SDI #477**
- \$31 B Cummins #576
- **\$26 B Panasonic #691**
- \$23 B Great Wall Motors #773
- \$23 B SAIC Motor #789



# USA Legislation which impacts Battery Product and Raw Materials: IRA

- The **Inflation Reduction Act (IRA)** is a legislation that aims to reduce inflation and promote economic growth in the United States. It includes provisions that support the domestic production of batteries and other components used in electric vehicles.
- The IRA has had a positive impact on the battery industry in the USA.
  - The act provides tax credits to consumers who purchase new or used EVs that use minerals and battery components from the United States and its allies.
  - The act also requires EV manufacturers to source 40% of critical battery minerals domestically or with free trade partners by 2024, which increases to 80% in 2026.
  - These measures are expected to increase demand for domestically produced batteries, solar energy equipment, wind power systems, heat pumps, and materials needed to support these products.
- This includes influencing international politics of climate change and galvanizing American climate leadership. The US Inflation Reduction Act (IRA) earmarks approximately \$370 billion for clean energy, which has important climate, trade, security, and foreign policy implications for Europe and the world.

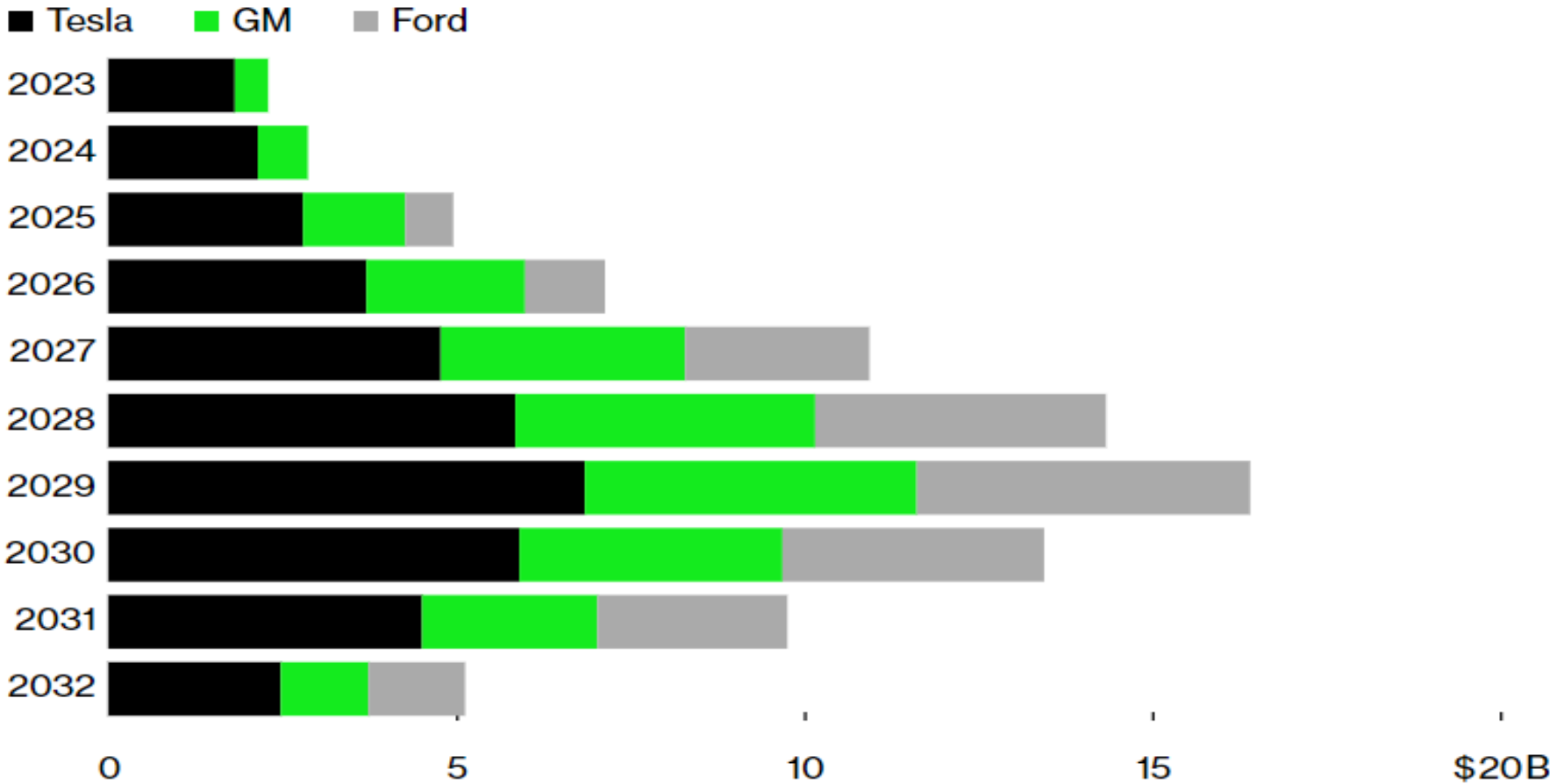
# IRA: Clean Energy Manufacturing Credit

Credit	Credit Amount		Requirements
Advanced Energy Project Credit	Total Amount: \$10 Billion For Each Project: 6~30% of project cost		<ul style="list-style-type: none"> <li>The credit is 6% of the qualifying basis , or 30% if the project meets the prevailing wage and apprenticeship requirements</li> <li>“qualifying advanced energy project” means a project which re-equips, expands or establishes an industrial or manufacturing facility which is used to produce or recycle a wide range of clean energy technologies (including EV components and ESS).</li> <li>Not later than 180 days after the date of enactment, the Secretary shall establish a qualifying advanced energy project.</li> </ul>
Advanced Manufacturing Production Credit	Active material	10% of costs/yr	Cathode and anode materials, anode foils, electrochemically active materials, including solvents, additives, and electrolyte salts
	Battery cell	\$35/kWh	Energy density $\geq$ 100wh/L, capacity $\geq$ 20wh, capacity-to-power $\leq$ 100:1
	Battery Module	\$10/kWh (or \$45/kWh)	capacity $\geq$ 7kWh, capacity-to-power $\leq$ 100:1; In the case of a battery module which does not use battery cells, credit increase to \$45.kWh
	Critical Material	10% of costs/yr	Including: aluminum, cobalt, graphite, lithium, manganese, nickel, etc.
<ul style="list-style-type: none"> <li>Can only apply for one of the above two credits.</li> </ul>			

# Tesla to Be Big Winner from IRA Production Tax Credit:

The automaker and its battery partner could receive \$41 billion in credits by the end of 2032, far more than key Detroit rivals

[https://www.bloomberg.com/news/articles/2023-06-02/tesla-s-ev-price-war-padded-by-windfall-from-biden-s-ira?re\\_source=boa\\_related](https://www.bloomberg.com/news/articles/2023-06-02/tesla-s-ev-price-war-padded-by-windfall-from-biden-s-ira?re_source=boa_related)

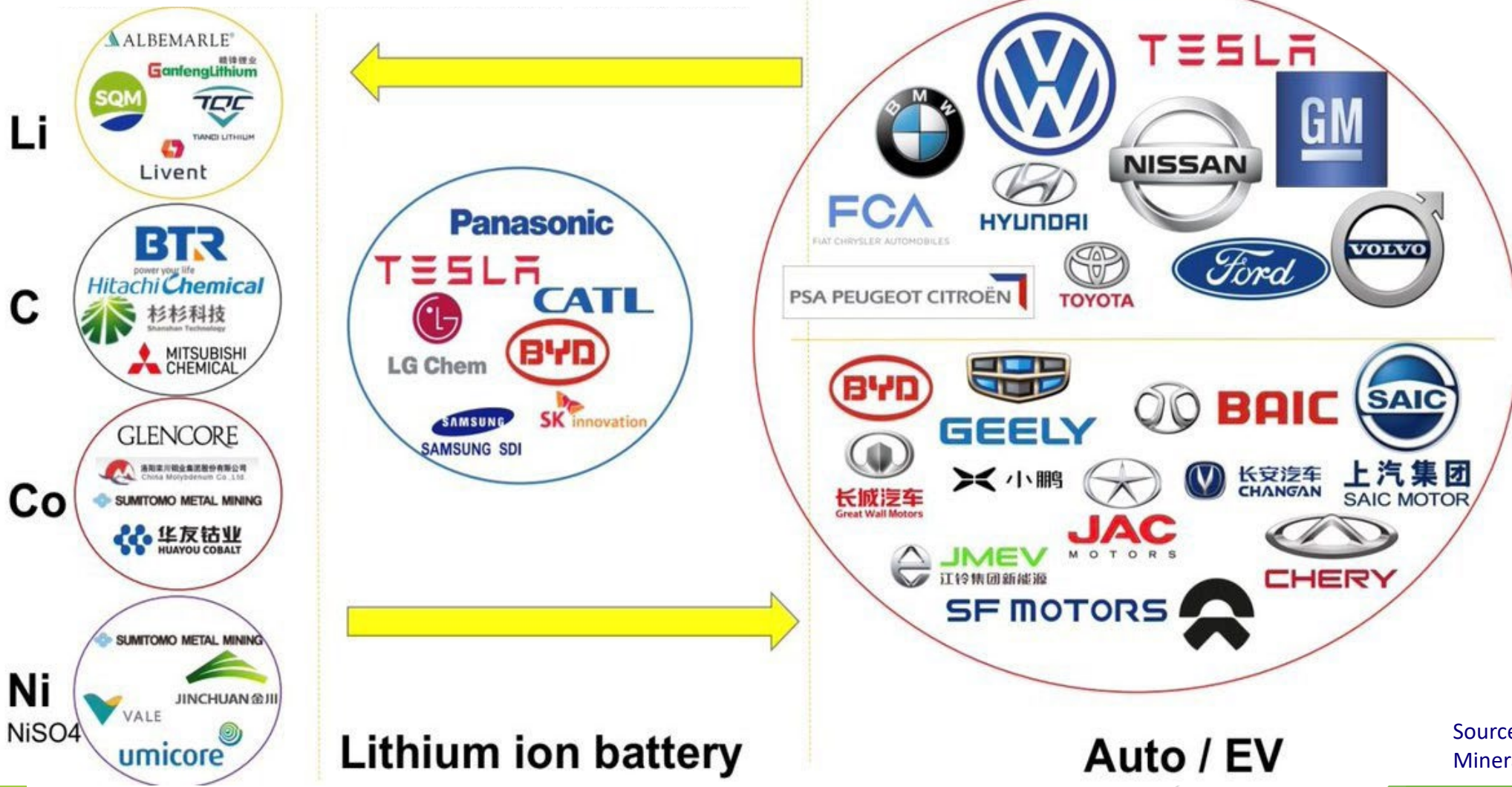


Source: Manish Dua, Benchmark Mineral Intelligence  
Note: Data is based on Benchmark 1Q 2023 production forecasts. Revenue forecast based on individual plant production, and does not reflect revenue split among battery JV partners.

# USA Legislation which impacts Battery Product and Raw Materials: ABMI & BIL

- Furthermore, the Biden-Harris administration has launched the **American Battery Materials Initiative (ABMI)** to strengthen critical mineral supply chains and mobilize the entire government in securing a reliable and sustainable supply of critical minerals used for power, electricity, and EV's.
- The Department of Energy is awarding \$2.8 billion in grants from the **Bipartisan Infrastructure Law (BIL)** to 20 manufacturing and processing companies for projects across 12 states <sup>1</sup>. These actions will improve America's energy independence, strengthen national security, support good-paying jobs across battery supply chains, and lower costs for working families <sup>1</sup>.
- Overall, the IRA has helped boost domestic manufacturing of batteries and other components used in EVs. It has also created new jobs and strengthened critical mineral supply chains in the USA.

# New Era of Vertical Integration and Strategic Partnerships



Source: Benchmark Minerals Intelligence

# European Perspective on IRA

- According to a recent article by **CEPR**, the volume of the Inflation Reduction Act appears small, as will be its aggregate macroeconomic effects, especially for the EU.
- However, the Inflation Reduction Act has drawn substantial criticism from the EU for its “buy American” conditions enshrined in some of the act’s subsidies. The IRA itself has stirred a strong debate about the future of European industrial policy.
- The EU has estimated that the market for batteries will be worth as much as €250bn by 2025, and several of its member states are offering large subsidies to attract investments by carmakers and battery companies,
- A report from **The Guardian**, IRA subsidies put support from the EU or UK into the background. Across Europe, companies seeking to invest in green energy are weighing up the Inflation Reduction Act’s \$375 billion in benefits for renewable industries against a fragmented response that European leaders have been scrambling to patch together for months.
- While the Inflation Reduction Act has limited impact on European battery business, it has drawn substantial criticism from the EU for its “buy American” conditions enshrined in some of its subsidies.

# Labor Union Impact on Legislation Intended to Increase EV Production

- The recent actions of the **United Auto Workers (UAW)** have had a significant impact on the implementation of the **Inflation Reduction Act** in the USA battery industry. The UAW is currently in a standoff with the Detroit Three automakers over wages and union representation at future electric vehicle battery plants.
- The UAW is demanding that workers get a greater share of the \$35 per kilowatt-hour in US government battery cell manufacturing subsidies that the plants hope to reap from President Joe Biden's Inflation Reduction Act (IRA). For example: the GM Ultium LLC battery plant in Ohio (35GWh/1,300 employees/40 Hr work week) could generate \$454 in subsidies per worker per hour for wages starting at \$21/Hr.
- The UAW members are deeply concerned that factories for electric vehicles will not employ the same numbers as the current plants do; they are also concerned that the battery factories supplemented by the US government, many of which receive more than a billion dollars per year from the US government, will either offer low-paying jobs or be non-union shops.
- While the Inflation Reduction Act has enabled the US government to invest more than \$135 billion in building America's electric vehicle future, including critical minerals sourcing and processing and battery manufacturing, its implementation has been impacted by ongoing negotiations between UAW and Detroit Three automakers over wages and union representation at future electric vehicle battery plants.

# Geopolitical Retaliation: Chinese Graphite

- The recent announcement by the **Chinese Government** to restrict exports of graphite, an essential ingredient in building batteries for electric vehicles, on national security grounds, is expected to impact the implementation of the **Inflation Reduction Act** in the USA battery industry. China is the world's most prominent producer and processor of graphite, accounting for an estimated 65% of total production. The move is a threat to President Joe Biden's goals for electrifying the U.S. car fleet.
- Under the Inflation Reduction Act, any EVs made after 2025 that contain materials coming from China, however small a fraction, will be excluded from federal tax credits. The bill lists more than 30 battery minerals subject to the manufacturing percentage requirements. It's almost impossible for EV makers to cut ties with China in the near future.
- However, the Inflation Reduction Act could help cut Chinese battery metals ties in the long run. At least 40 percent of the critical metals in the battery - lithium, nickel, cobalt and manganese - must come from the US or a Free Trade Agreement (FTA) partner. In conclusion, while the recent announcement by China to restrict exports of graphite could iThat percentage rises to 80 percent in 2026.
- Although this impacts the implementation of the Inflation Reduction Act in the USA battery industry, it could also help cut Chinese battery metals ties in the long run.

# Key Materials in an EV Battery: Nearly all systems use Graphite today

CELL PART: ● ANODE ● CURRENT COLLECTORS  
● CATHODE ● CELL CASING

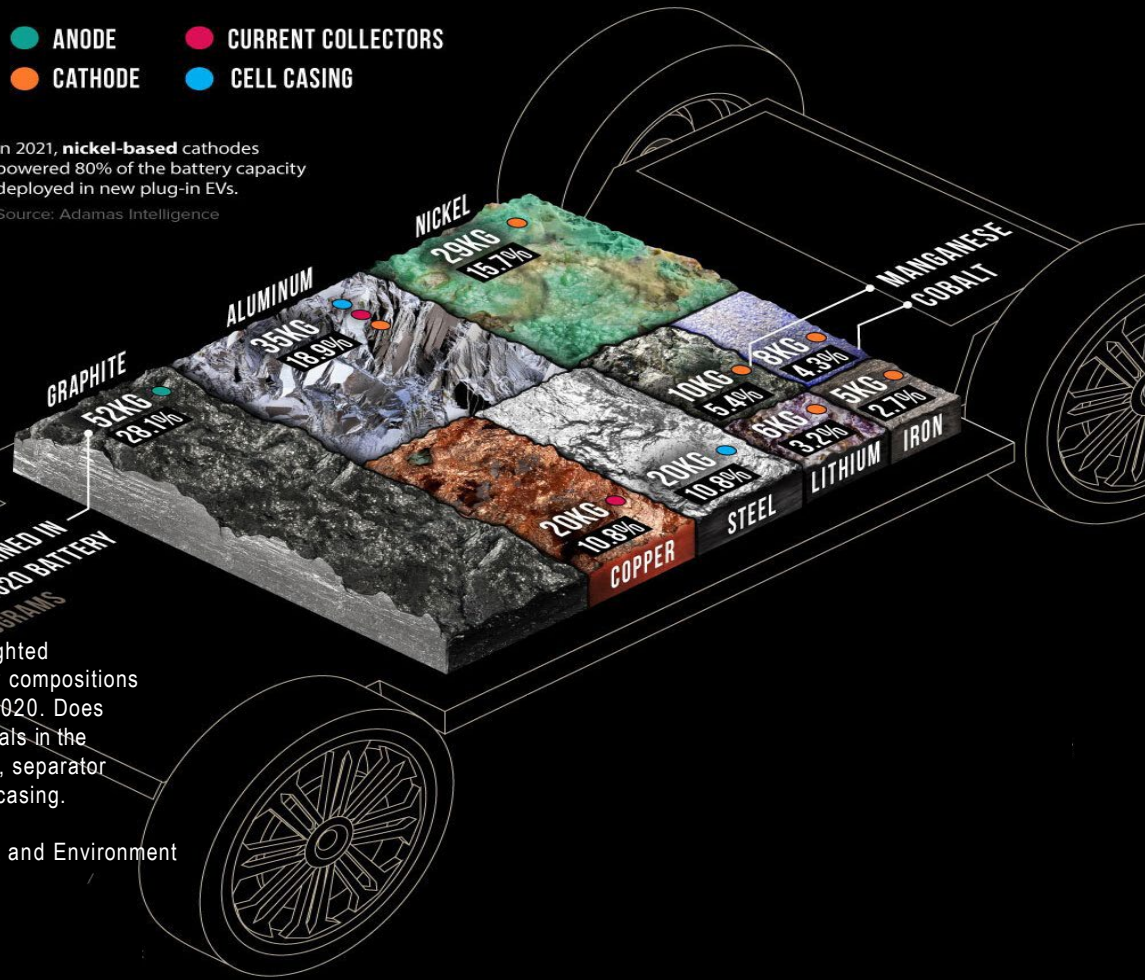


In 2021, nickel-based cathodes powered 80% of the battery capacity deployed in new plug-in EVs.  
 Source: Adamas Intelligence

AMOUNT CONTAINED IN THE AVG. 2020 BATTERY

Based on the weighted average of battery compositions on the market in 2020. Does not include materials in the electrolyte, binder, separator and battery pack casing.

Source: Transport and Environment



Elements in a ~2020 vintage 60 kWh EV battery (various chemistry scenarios)

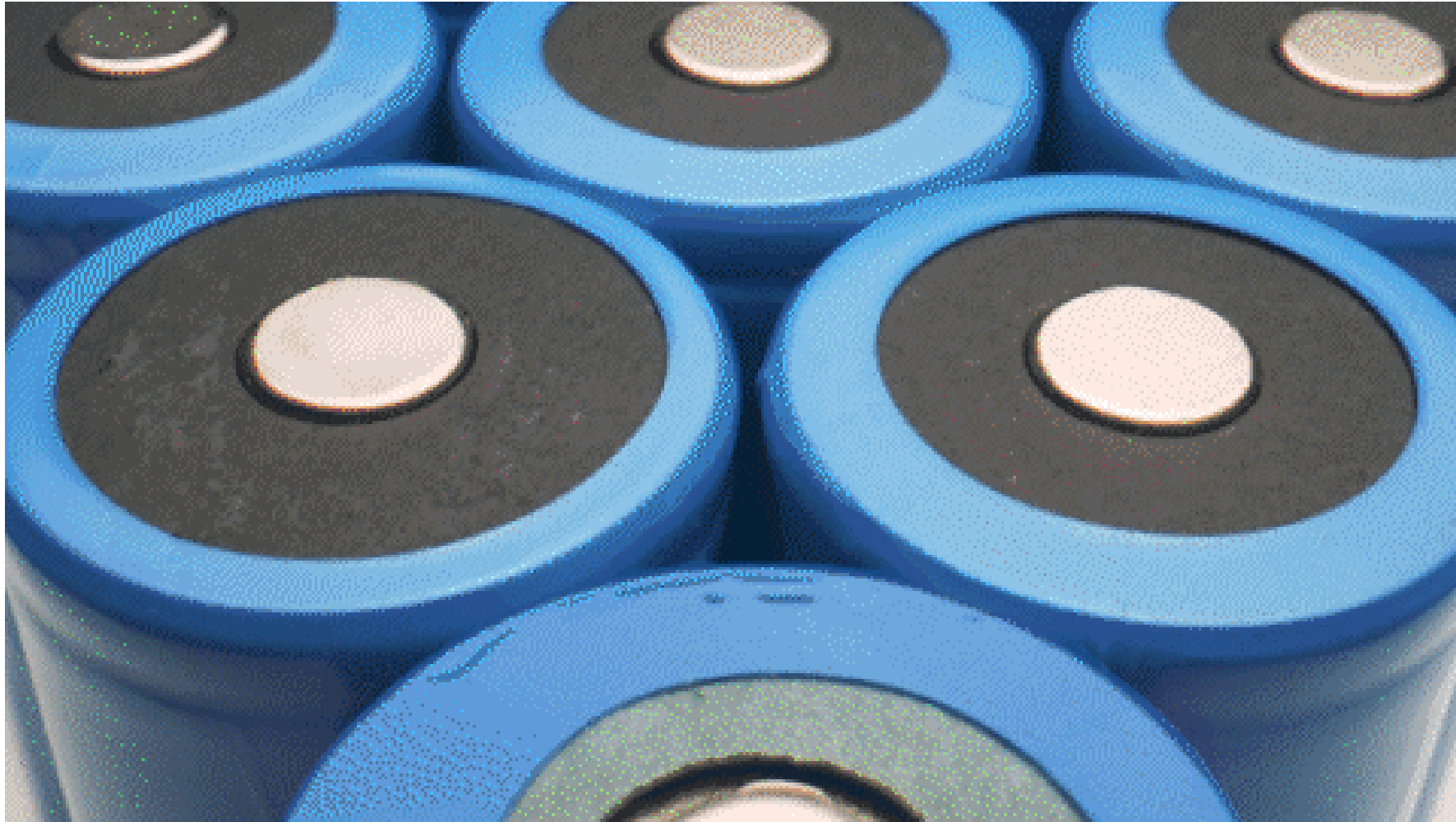
	NMC811 Nickel (80%) Manganese (10%) Cobalt (10%)	NMC523 Nickel (50%) Manganese (20%) Cobalt (30%)	NMC622 Nickel (60%) Manganese (20%) Cobalt (20%)	NCA+ Nickel Cobalt Aluminum Oxide	LFP Lithium iron phosphate
LITHIUM	5KG	7KG	6KG	6KG	6KG
COBALT	5KG	11KG	11KG	2KG	0KG
NICKEL	39KG	28KG	32KG	43KG	0KG
MANGANESE	5KG	16KG	10KG	0KG	0KG
GRAPHITE	45KG	53KG	50KG	44KG	66KG
ALUMINUM	30KG	35KG	33KG	30KG	44KG
COPPER	20KG	20KG	19KG	17KG	26KG
STEEL	20KG	20KG	19KG	17KG	26KG
IRON	0KG	0KG	0KG	0KG	41KG



# New Technologies on the Horizon



# The LiNova Cell

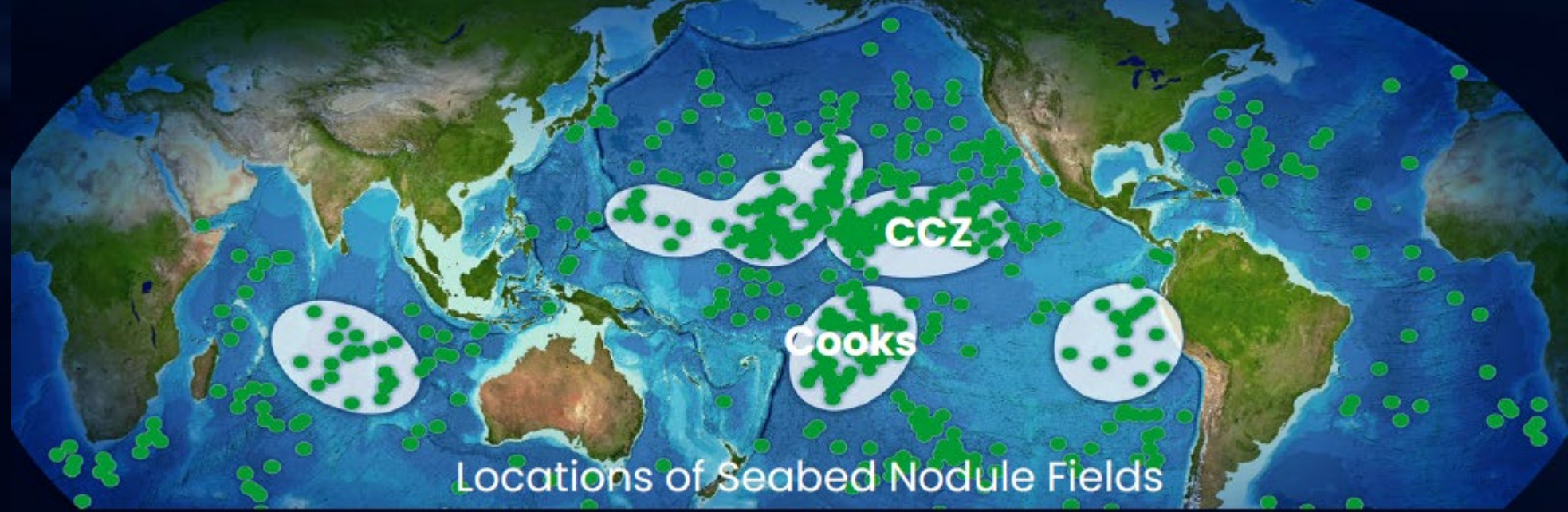


# Materials - Impossible Metals: Polymetallic Nodules on Ocean Floor



Seabed Nodule Field

- Headquarters in Los Angeles Basin
- First generation robot proven concept works
- Anticipated first operations 2025-6
- Seeking strategic partnerships



Locations of Seabed Nodule Fields



# UQ BATTERY NANOTECHNOLOGY SCIENCE

## Nanotechnology

UQ design uses nanotechnology to insert Aluminium-ions (atoms without some electrons) inside tiny perforations in GMG Graphene platelets.

## Spare Electrons

Aluminium atoms have 3 spare electrons vs Lithium atoms with 1 spare electron.

## Energy Density

Aluminium-Ion batteries have up to 3 times the energy density of Lithium-Ion batteries.

## Graphene Storage

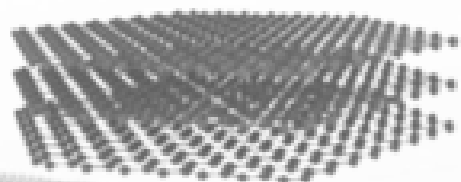
Graphene is used to store the Aluminium-ions (atoms without spare electrons).

## Supercapacitor

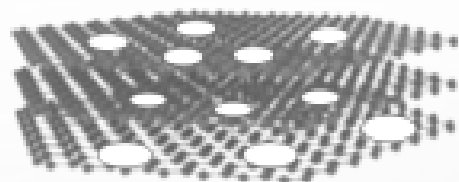
Extremely fast charging and discharging – called a hybrid **supercapacitor battery**.

## Construction Simplicity

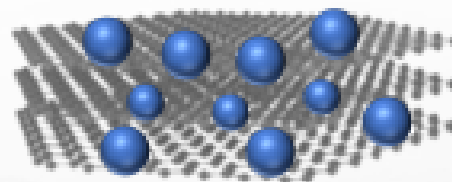
Simpler construction than Lithium-Ion batteries, predominantly Graphene and Aluminium.



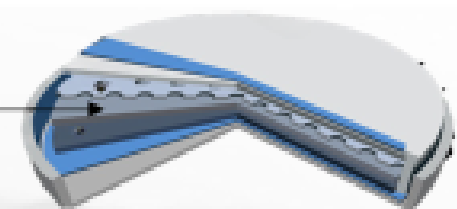
Graphene Platelets



Surface Perforation



Al-Ions inserted between Graphene Platelets



Coin Cell Mechanism  
Cathode = Perforated Graphene



# Thank You!

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