



# ION+

DPEC Presentation

June 4<sup>th</sup>, 2024

Global Li-ion battery demand cannot be unlocked relying on today's performance metrics.

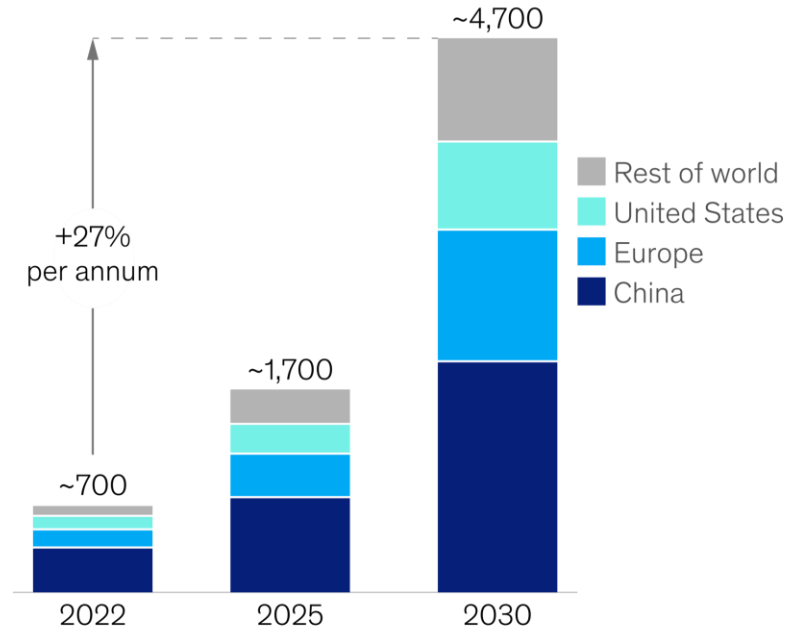
A new benchmark for energy storage is needed:

- (1) Battery performance
- (2) Battery safety
- (3) Supply chain resilience
- (4) U.S. work force development
- (5) U.S. competitiveness

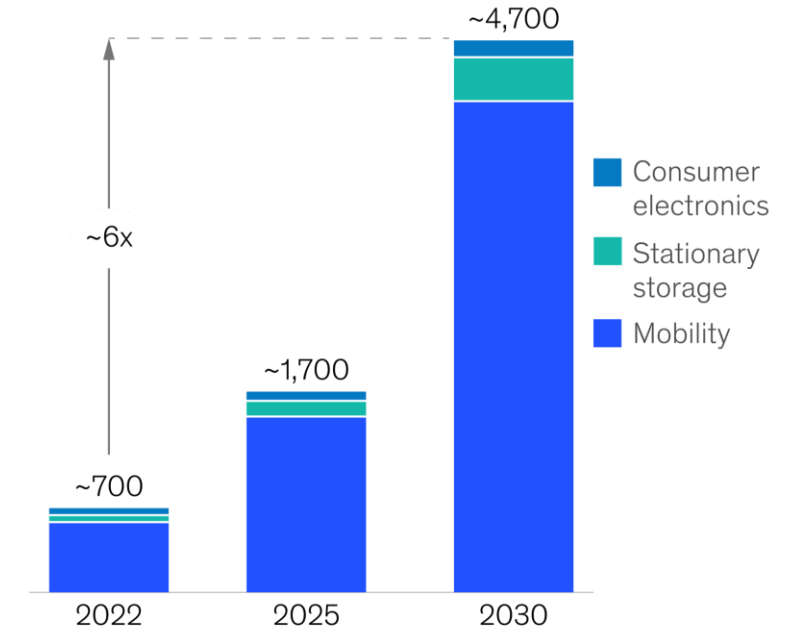
**Li-ion battery demand is expected to grow by about 27 percent annually to reach around 4,700 GWh by 2030.**

Global Li-ion battery cell demand, GWh, Base case

By region



By sector



<sup>1</sup>Including passenger cars, commercial vehicles, two-to-three wheelers, off-highway vehicles, and aviation.  
Source: McKinsey Battery Insights Demand Model

McKinsey & Company

**Battery-related  
DOD Operational  
Gaps**



DEFENSE SYSTEMS

**Powering today's soldier: Wearable  
batteries will be stronger, yet safer for  
combat**

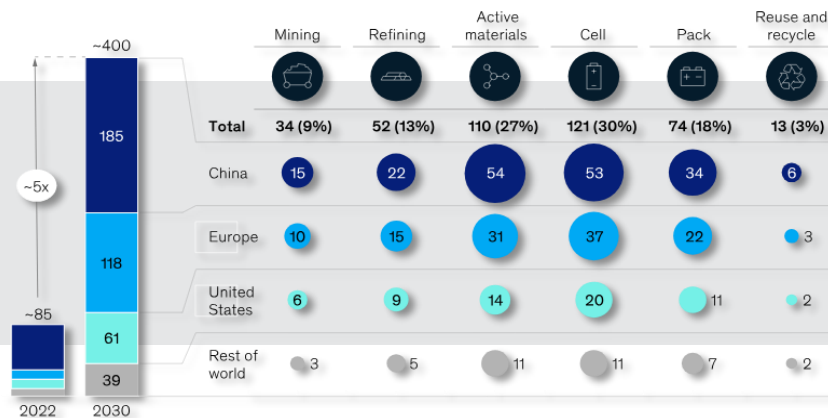
Soldiers need a lightweight power source for multiday missions that doesn't put them in harm's way in a firefight.

**Battlefield Logistical Challenges**

**Soldier Safety Risks**

**National Security  
Risks**

Revenues, base case 2030, \$ billion McKinsey Battery Insights, 2022



**Foreign-Dominated Supply Chain**

**Emerging Superior Technologies**

**Defense and Other Electronics**

**2025 TAM**

**Total: 22 GWh**

**2025-2035 CAGR: 4.5%**

**Projected 2035 Market Size: 33 GWh**

**ION+**

2025 Targeted U.S. Defense Segments

Soldier Power: 50MWh

Other defense products: 38MWh

Aviation: 23MWh

Space: 19MWh

Munitions: 22MWh

Up to 700 MWh purchased by DOD annually; mostly non-Li-ion chemistries

# How do we prepare for a GWh-scale defense advanced battery market?

- High performance
- Multi-application capability
- Secure supply chain



## Safety



## Operating Temps

**SAFETY WARNING**

- Do not bend or deform this battery.
- Please use the original charger to get faster storage of electricity.
- To prevent battery fluid leaking out, keep away from eyes and skin.
- To prevent the battery from exploding at a high temperature, keep it at a normal temperature (32°F/0°C~95°F/35°C).
- Do not disassemble, puncture, crush, heat, or short circuit this battery.

**Warning**

Your phone is overheating. Close the current application to help your phone cool down.

Cancel      OK

## Energy Density



## Charge time



12:59

**AccuBattery Pro**

**Charge time estimate**

Battery level	11%
Charge time to 83%	46m (1:45 PM)
Charge time to 100%	57m (1:56 PM)

**Li-ion battery limits are further tested by demanding and varied DOD use cases**

# What does a lithium-ion successor need to be?

Batteries with unrivaled **performance**, engineered **simplicity**, uncompromising **safety**

**More**

Energy Density

**Faster**

Charge time

**Safer**

100%

**Longer**

Cycle Life

**Lower**

Cost

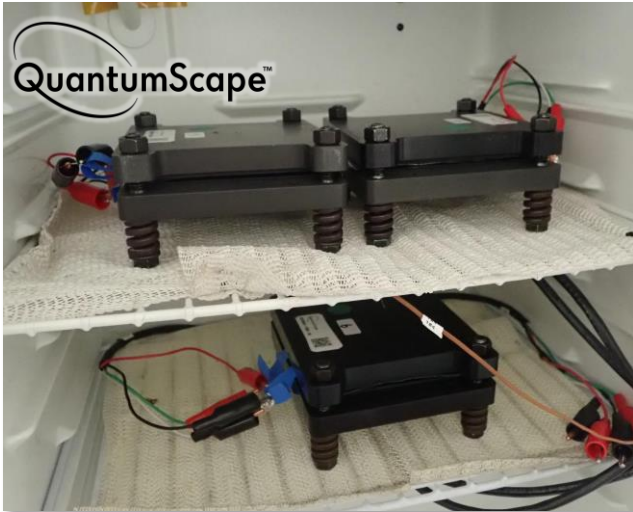
**Drop In**

Replacement



## Other Approaches

Compression fixtures and springs  
Requires a more complex and expensive pack



## ION Approach

Drop-in upgrade for customers  
No complex infrastructure required

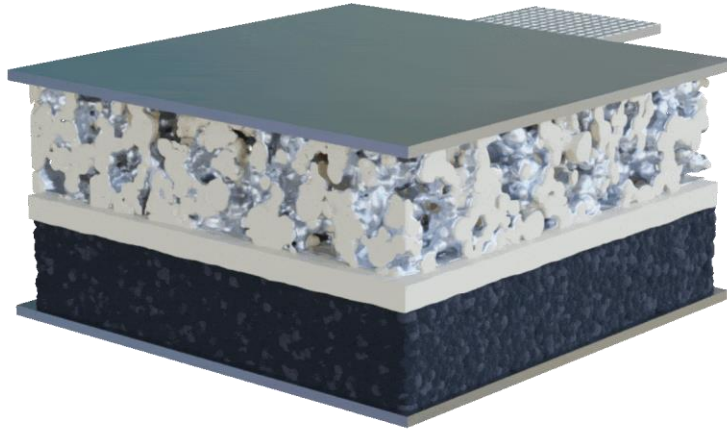


- ✓ No compression
- ✓ No heating
- ✓ Intrinsically safe
- ✓ Simplified pack
- ✓ Lithium free anode

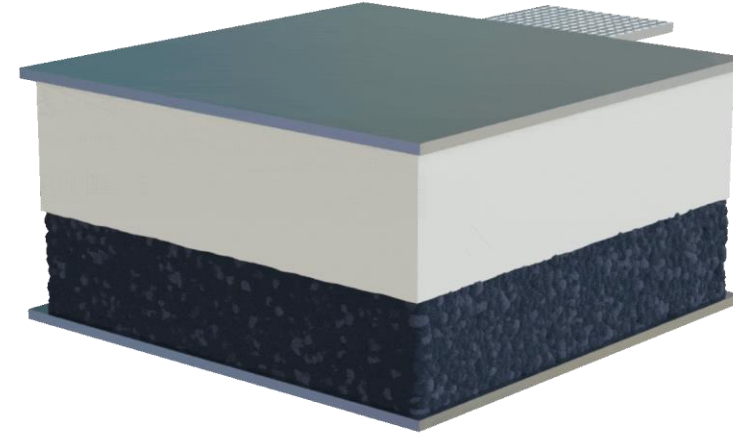
ION<sup>+</sup>



Others



VS



## Important for pack & product integration

- Efficient pack integration without compression fixtures
- Enables applications which can't accommodate engineered packs
- Simpler manufacturing

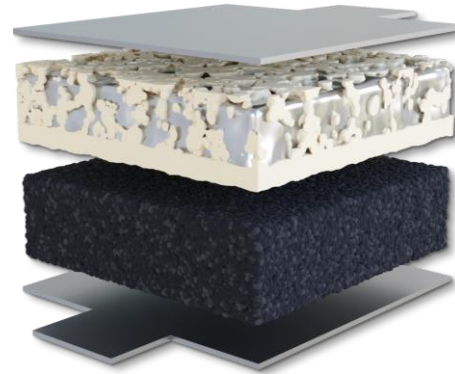






**1** Ceramic Bilayer

**High-rate lithium cycling for fast charge/discharge**  
50x more active area  
Ultra-thin dense layer



**2** Full Cell Assembly

**Highest energy density electrodes available**  
Lithium metal anode  
Next-gen cathodes



**3** Product Integration

**Drop-in Solution for all Li-ion applications**  
No swell allowance  
No safety risks

**ONLY** bilayer structure enables **compression free Li-metal** cell operation

Ion Storage Systems technology protected by 50+ patents and applications

Patent US10622666: Ion-conducting batteries with solid state electrolyte materials

**Ceramic**

**Cell**

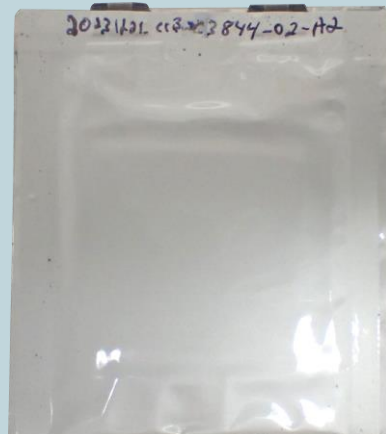
**R&D cells**

✓ **100's made weekly**  
 1 cm x 1 cm ceramic  
 Exceeding perf. targets



**1<sup>st</sup> customer footprint cells**

✓ **Q4 2023**  
 4 cm x 4 cm ceramic  
 R&D hand builds  
 Outperforming 1x1 cells



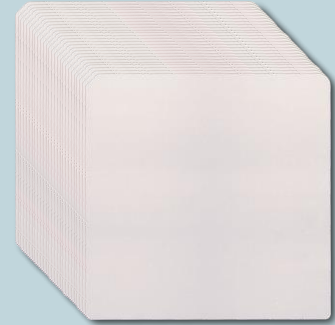
**Multilayer cells**

✗ **Q2 2024**  
 2x 4 cm x 4 cm ceramic  
 Partially pilot line built  
 Fully pilot line built in Q2  
 80% mechanical yield



**1<sup>st</sup> customer capacity (2 Ah cells)**

✗ **Q3 2024**  
 26x 4 cm x 4 cm ceramic  
 Fully automated pilot line  
 >98% yield w/ inert ceramic  
 Pilot line: 100's/wk



## Soldier Portable Batteries



Lower weight

Mission readiness

Standardizing power supply

## Military Grade Electronics



Safety, no thermal runaway risk

Operation at extreme temperatures

Longer mission time

## ION<sup>+</sup> Gen<sup>1</sup>

First market product cell: SPBs, small devices, microgrid



**Safety-central applications**

*Development w/ Partners*



## ION<sup>+</sup> Gen<sup>2</sup>

EV, drone, aircraft capable cell



**High-power and energy applications**

## Hummer EV



Electrical recharge  
vs.  
Fuel resupply

Wider operational  
environments

Improved safety

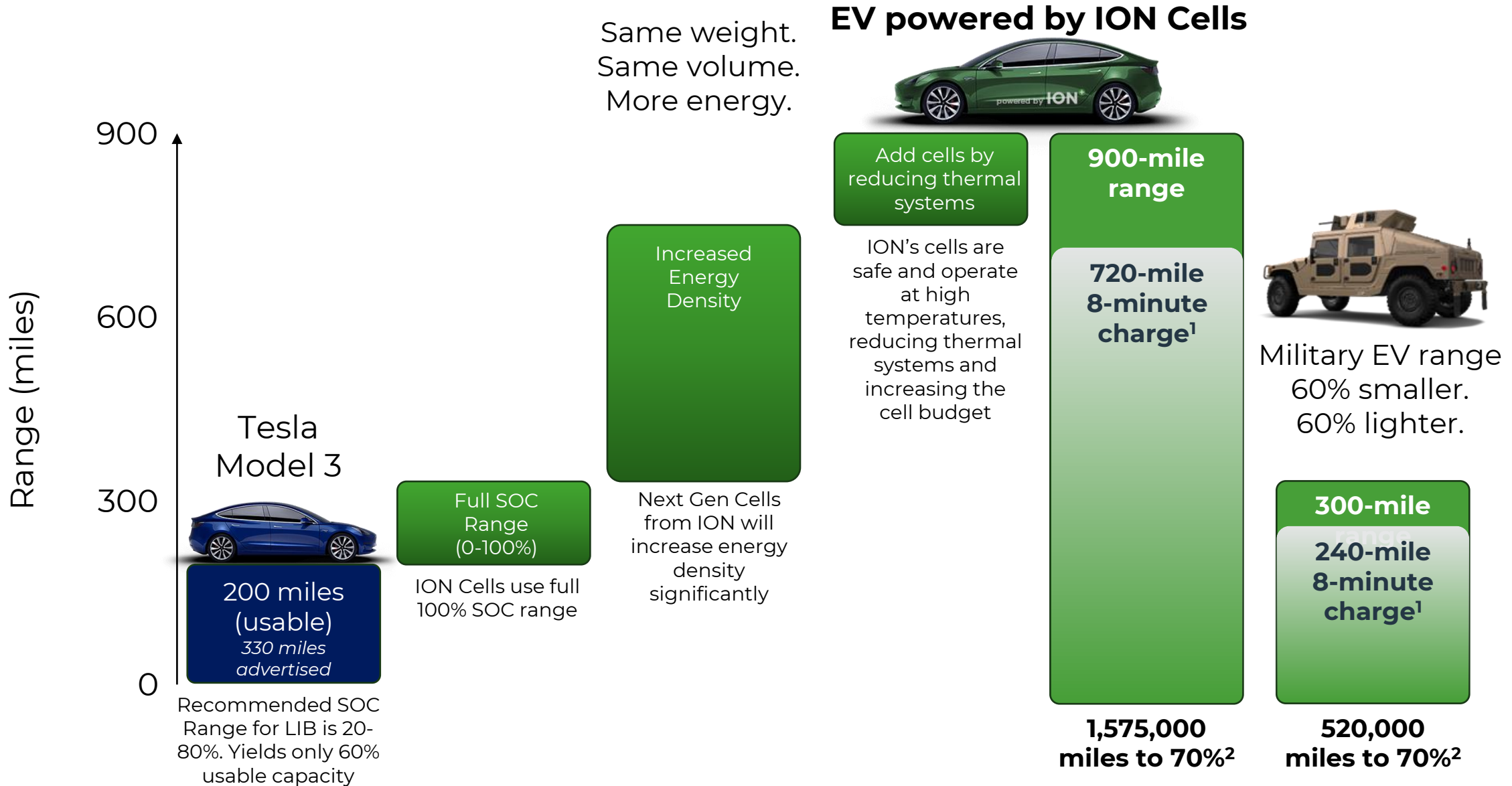
## Helicopters



Li-ion installation  
restrictions, less cargo  
space

Lower moment of  
inertia, better agility  
Improved safety

# More energy, greater mission capability





**1 MWh capabilities to date for delivering cells for evaluation by partners**

**Evaluation partners include companies across defense, consumer electronics, and EV sectors**

A silhouette of a soldier in full combat gear stands on the left, holding a rifle. In the center, a helicopter is in flight with its rotors blurred. On the right, a large military vehicle is parked. The background is a sunset over a field with mountains in the distance. The sky transitions from a bright orange near the horizon to a clear blue at the top.

**What does a US military powered  
by this technology look like?**

**A new era for US energy independence**

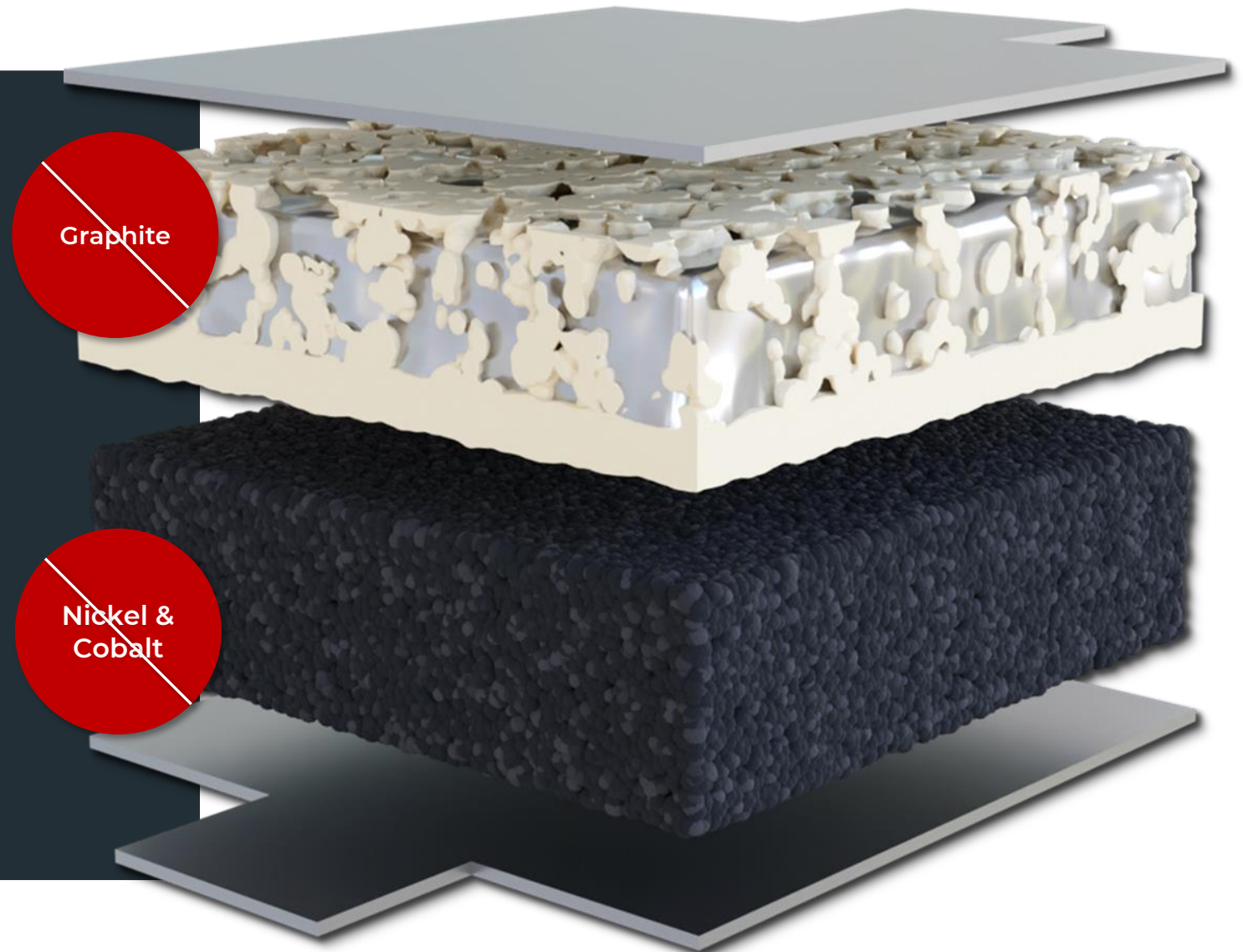


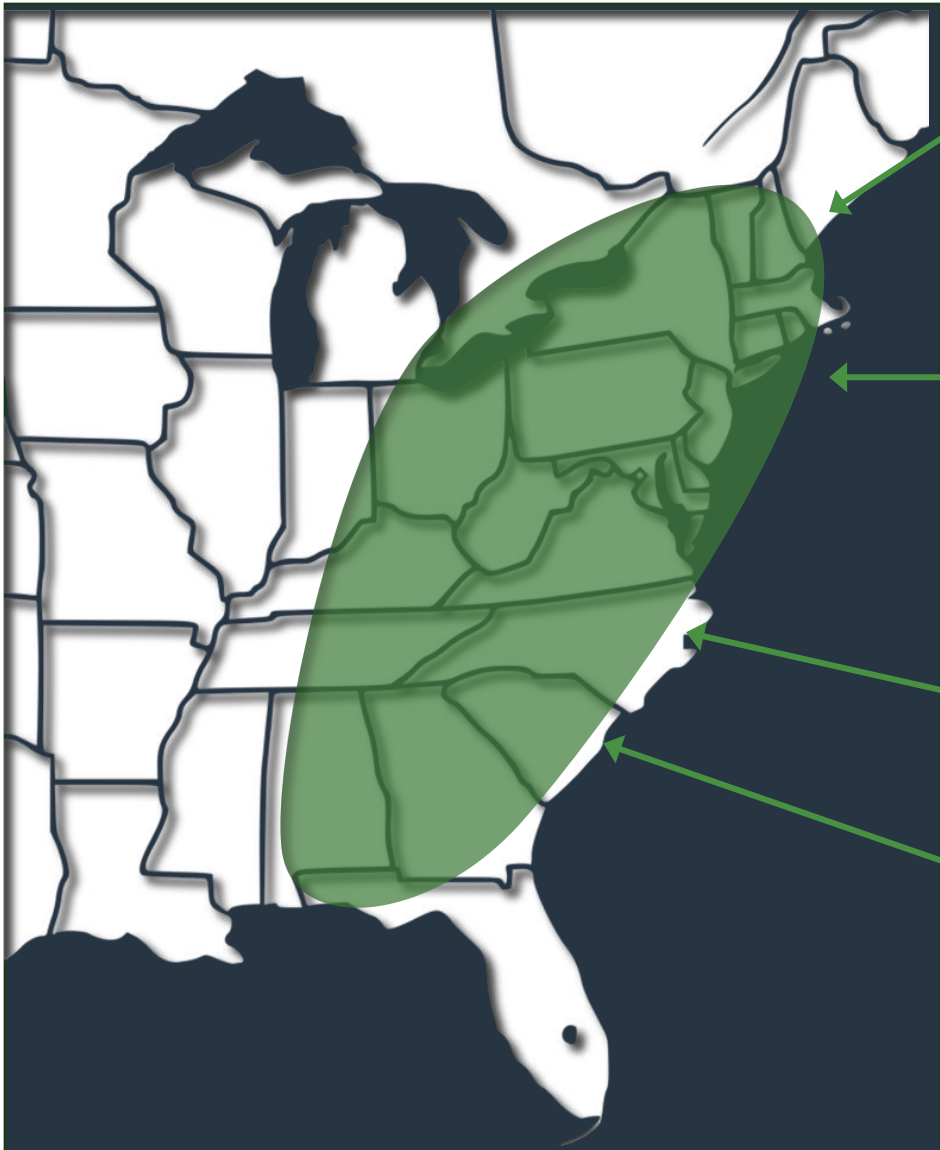
### Ceramic bilayer eliminates graphite

- *China controls 80% of anode graphite market*
- *ION's ceramic is manufactured in the US and fully recyclable*

### ION anode platform uniquely enables cathode flexibility

- *China controls 73% of NMC, 99% of LFP cathode markets*
- *Domestic, ethical sources for cathode materials available*





**LLZO Powder Synthesis**



**Ceramic green body casting**

**Partner**

**Ceramic Sintering**

**Partner**

**Ceramic Quality**

350-year-old ceramics company and ION investor with industrialized high purity proprietary technique

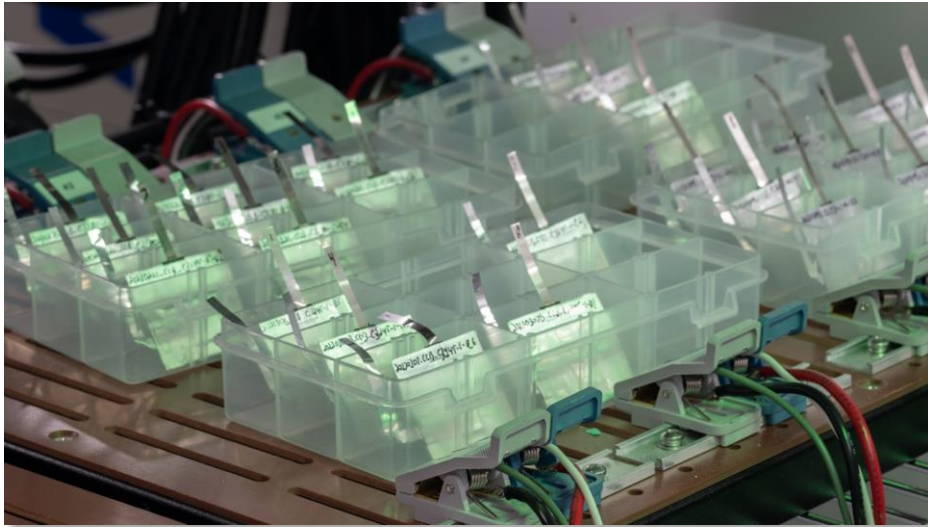
Fast curing solvent-free process (4,800X faster than traditional), development & design expertise for ceramic-to-cell processing.

World-leader in technical ceramics with high-throughput sintering capabilities

Quality and yield improvement leader, 100% inspection method in use for ION parts.



ION is building partnerships throughout the DOD battery value chain



Evaluation program open for  
DOD partners

# Thank you!



# ION<sup>+</sup>

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