# NOVONIX

## Set for Growth

Business Update, October 2023

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# Providing Revolutionary Solutions to the Battery Industry

## Investment Highlights

- Leading U.S. based battery materials and technology Company with lower carbon footprint
- Large and growing market for battery materials supported by localization efforts
- Intellectual property portfolio for synthetic graphite manufacturing and all-dry, zero-waste NMC cathode synthesis
- Battery Technology Solutions provides competitive advantage to accelerate innovation
- Customer and government financing support paving a path to profitability as a sector leader

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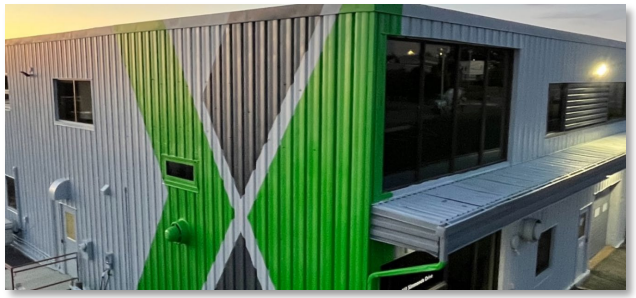
*Riverside Facility in Tennessee*

# Competitive Advantage Through Synergistic Operating Structure

NOVONIX
ANODE MATERIALS

- Leading domestic supplier of battery-grade synthetic graphite
- Large scale and sustainable production to advance North American battery supply chain
- Strategically positioned to accelerate clean energy transition through proprietary technology, advanced R&D and partnerships



NOVONIX
BATTERY TECHNOLOGY SOLUTIONS

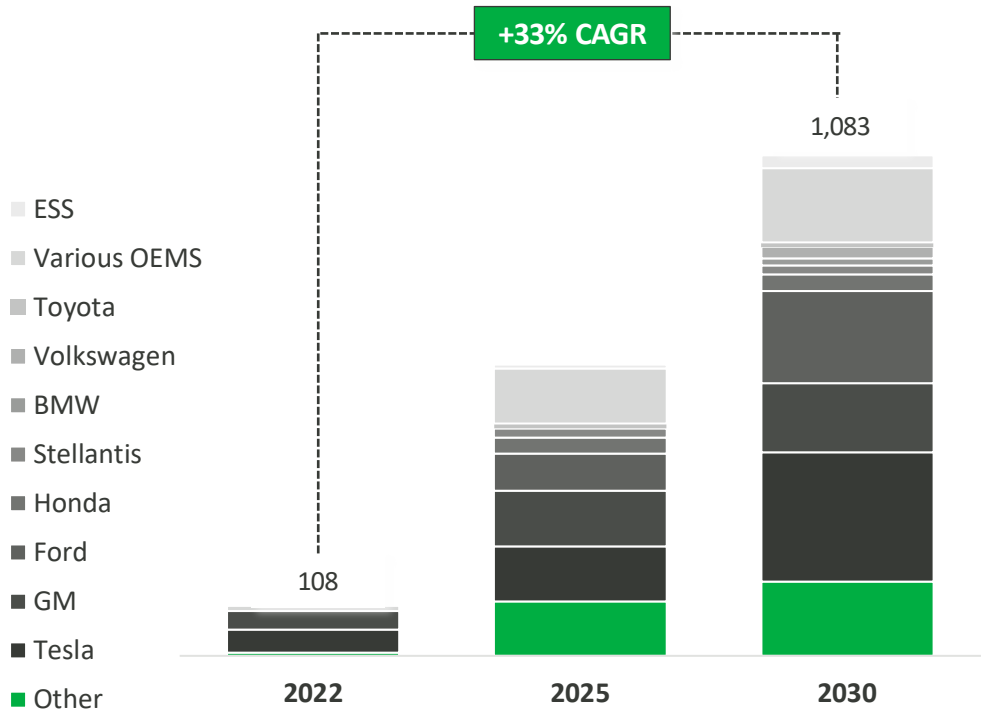
- Develops industry leading lithium-ion battery testing equipment while providing R&D services
- Competitive intelligence from unparalleled visibility across the entire industry drive value-add opportunities
- In-house testing technology & data solutions accelerates rapid advancements compared to industry standard

NOVONIX
CATHODE MATERIALS

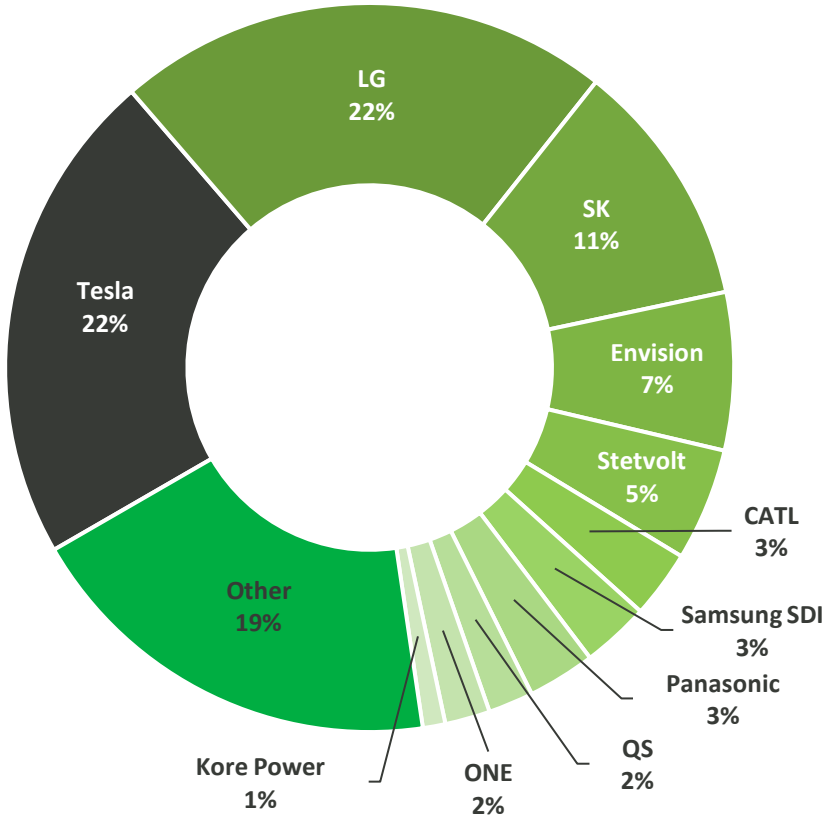
- Commercializing proprietary All-Dry Zero-Waste Cathode Synthesis technology
- Process technology minimizes environmental impact while producing high performance materials
- Pilot line will demonstrate large-scale production of up to 10 tpa

# Auto and Cell Manufacturing Driving Market Demand

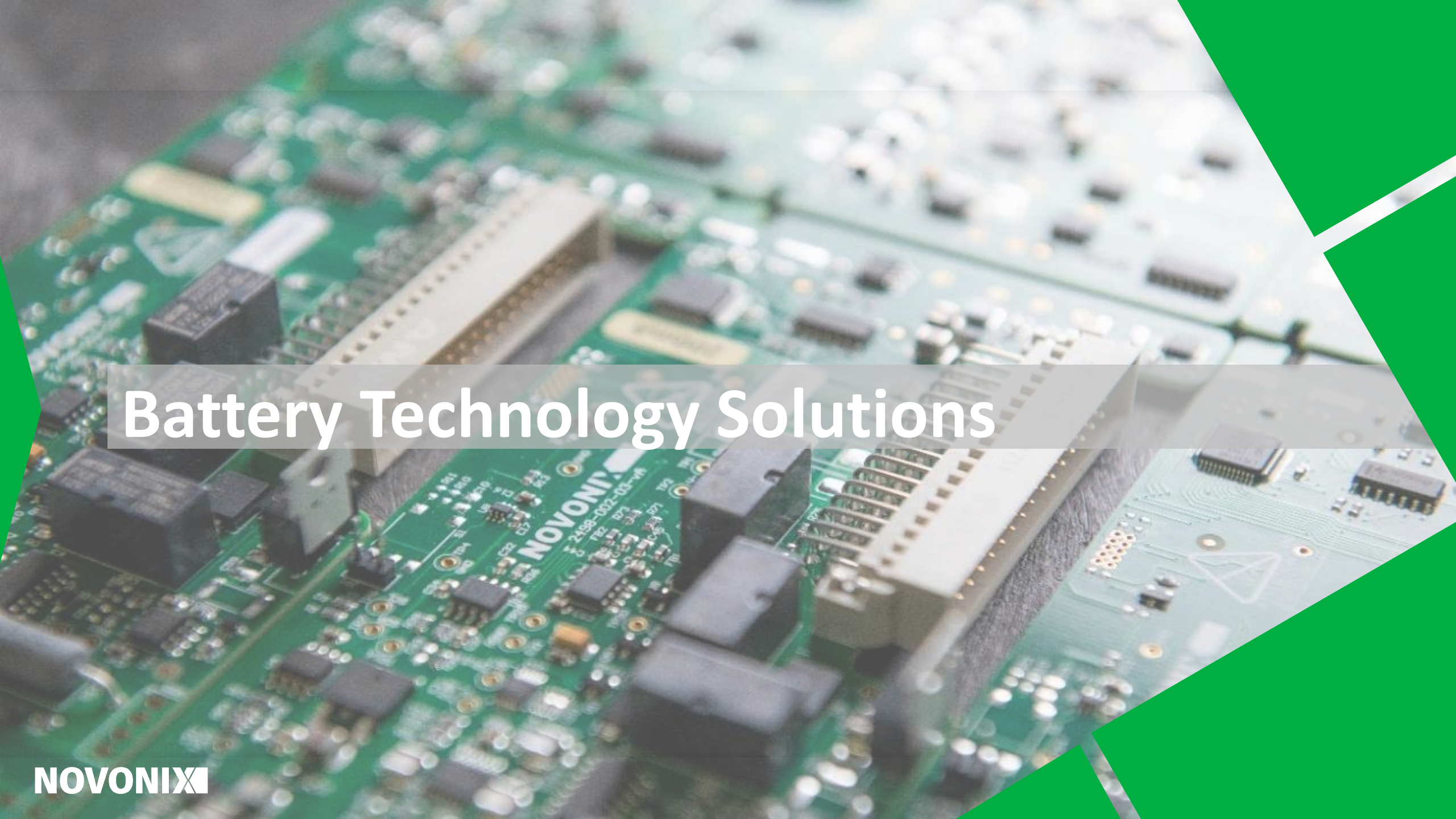
## U.S. Auto OEMs Battery Mfg. Capacity (GWh)




## 2030 U.S. Cell Mfg. Capacities




**Source:** Credit Suisse, Benchmark Minerals Intelligence, Company Reports



# Battery Technology Solutions

NOVONIX

# NOVONIX is at the Forefront of Battery Technology

## UHPC Hardware

**Enables quick reliable predictions of battery lifetime**


**UHPC**

## R&D Services

### Materials Development and Characterization

**Analytical materials lab**

### Cell Design and Prototyping

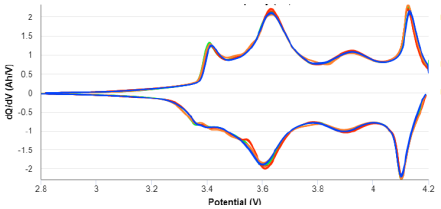
**Pouch and cylindrical cell manufacturing pilot line**

### Cell Testing


**Diagnostic tools and performance testing**

## Data Solutions

**Customer Research & Development Services**




**Battery technology insights driven by AI & advanced data analytics with SandBoxAQ**

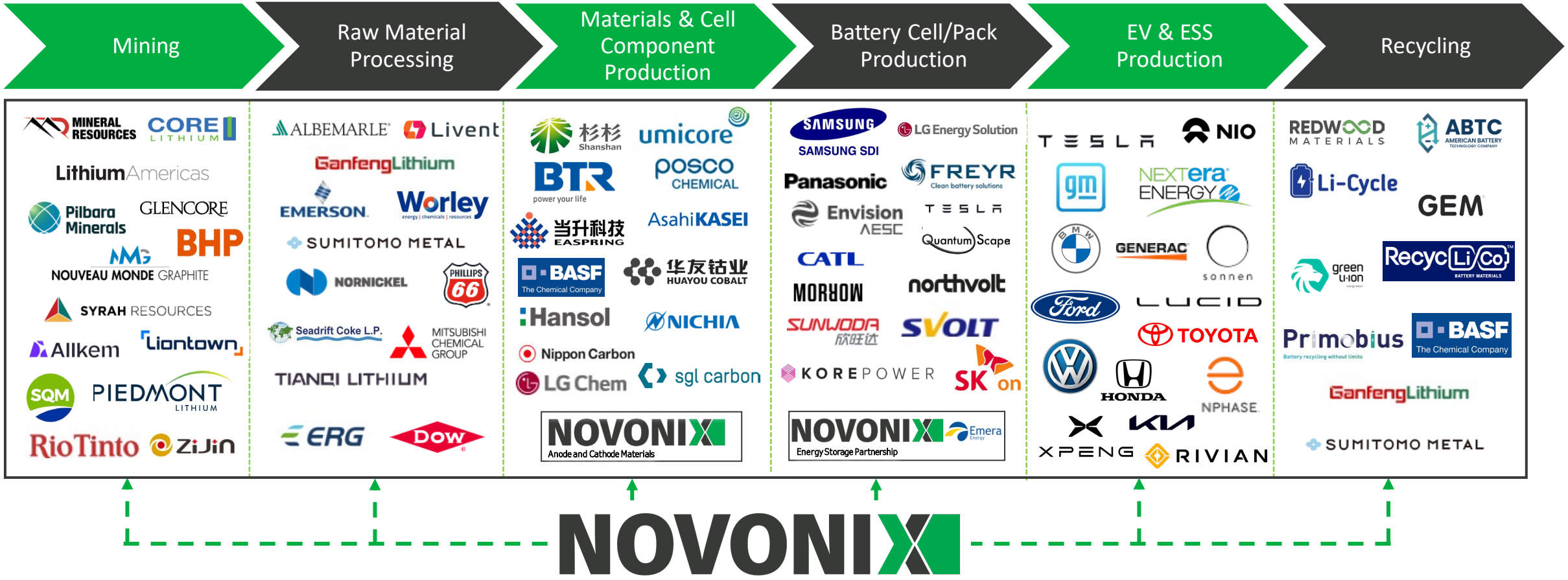
**NOVONIX Battery Technology Solutions (BTS) provides cutting edge technology that is highly sought after for R&D services to create the next generation battery — potentially accelerating R&D from years to weeks with proprietary technology**

# Our BTS Team Has Nearly Two Centuries of Battery Experience

**NOVONIX BTS has over 90 employees contributing to a wide array of expertise across lithium-ion technologies, electronics engineering, manufacturing, and materials synthesis.**

- Over **180 years** of lithium ion and energy storage research and engineering experience
- Dr. Jeff Dahn and Dr. Mark Obrovac, professors at Dalhousie University, serve as scientific and technical advisors
- > 30 PhD, M.Sc., and P.Eng.
- Experienced researchers from **BAK, CATL, Moli Energy, Rivian, and Tesla**

# NOVONIX Plays a Critical Role in the Lithium-Ion Battery Value Chain




**Visibility across the entire battery value chain provides competitive intelligence and attractive opportunities for NOVONIX**

**Note:** Companies presented above are for indicative purposes only and not a representation of customer relationships.

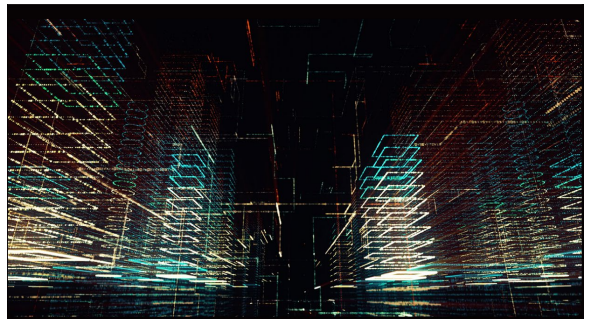
# Industry Leading R&D Powered by Artificial Intelligence

NOVONIX
BATTERY TECHNOLOGY SOLUTIONS

- Leading lithium-ion battery testing equipment and R&D services
- Unparalleled visibility across the entire industry driving value-add opportunities

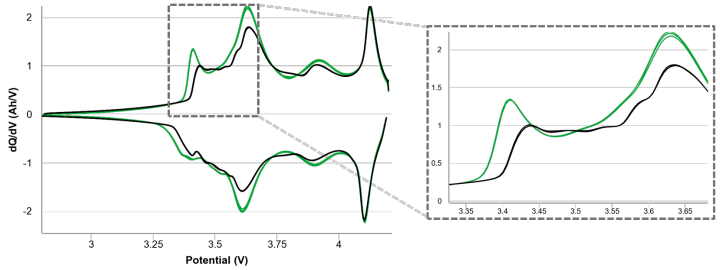
SANDBOXAQ™

- Enterprise SaaS company that combines artificial intelligence (AI) with quantum analysis (AQ) to address some of the world's most challenging problems
- Alphabet spin-out



**New Product Overview:**

- Machine learning algorithms and quantum simulations for battery R&D
  - Data Processing/Visualization
  - Analysis and Report Automation
  - AI and ML tools
  - Materials discovery
  - Cell performance prediction




**NOVONIX AI powered Data Solutions platform will not only be bring a new NOVONIX SaaS product, but will also help enable and optimize ongoing materials development**


# Anode Materials

NOVONIX

# NOVONIX is Localizing the Synthetic Graphite Supply Chain

## NOVONIX Anode Material Progress & Advantages

### Domestic Supply
Producing high-performance synthetic graphite materials sustainably for local supply of Tier 1 battery and OEM customers

### High Performance
Our products are developed to meet or exceed Tier 1 EV OEMs specifications

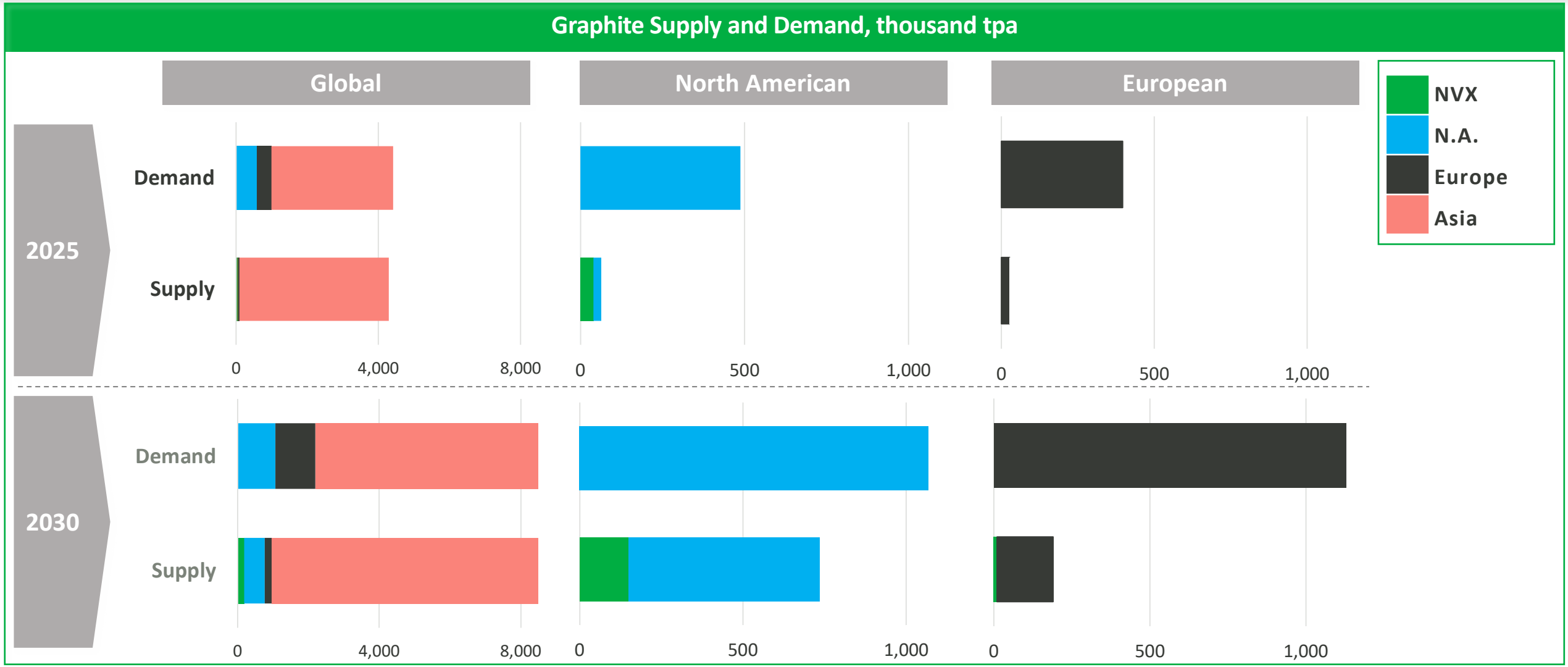
### Cleaner, More Efficient Technology
Produced with cleaner energy sources with virtually zero emissions and uses no harmful chemicals

### Strategic Relationships
Leveraging close collaboration with partners and customers to bring our anode materials to market

## Key Strategic Relationships & Highlights

- Signed a Joint Research and Development Agreement (JDA) with LGES in June 2023
  - Upon completion of JDA, LGES has the option to purchase up to 50,000 tonnes of artificial graphite anode material over a 10-year period
  - LGES invested $30M in convertible notes
- Supply Agreement with KORE Power scaling to ~12,000 tpa of anode material
- MOU agreements with both Panasonic Energy and Samsung SDI for evaluation of NOVONIX materials
- In August 2021, Phillips 66 made a $150 million strategic investment to become NOVONIX's largest shareholder and engaged PSX in technology development agreement
- Partnership with Harper International, a domestic specialized furnace technology leader, developing and supplying NOVONIX with proprietary systems for thermal processing

# Local Anode Material Supply Shortfalls Foreseen Globally




**Source**: Benchmark Mineral Intelligence, Company Reports, NVX estimates.

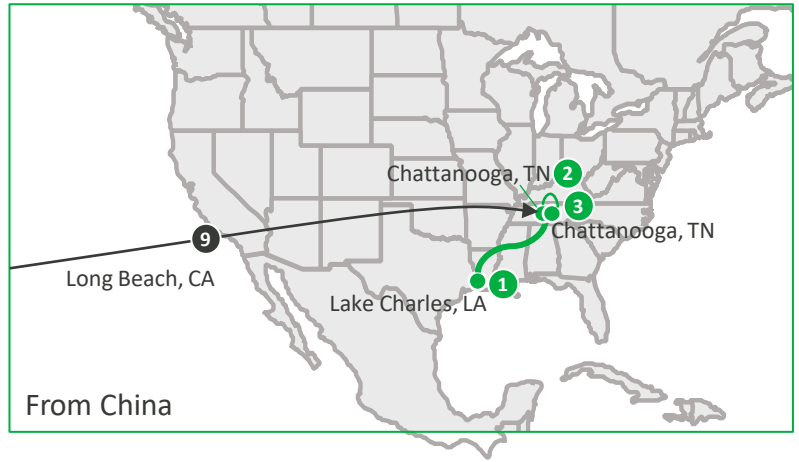
# NOVONIX Enables a Fully Domestic US Supply Chain for EV Battery Grade Synthetic Graphite

## Chinese Synthetic Graphite Supply Chain

1. Needle coke ships to Qingdao from Humber, UK **(12,500 miles)**
2. Road transport of precursor to grinding site near Shanghai **(450 miles)**
3. Road transport of ground needle coke to Inner Mongolia **(1,050 miles)**
4. Graphitization in Inner Mongolia powered by brown coal with no environmental standards or emissions controls
5. Road transport of graphite to southern China **(1,500 miles)**
6. Processing of graphite into BAM
7. Land transport of BAM to China port **(50 miles)**
8. BAM ships to US port in CA **(7,300 miles)**
9. Land transport of BAM to end-user in TN **(1,800 miles)**

**24,650 Total Miles**


## NOVONIX Supply Chain




1. Needle coke transported from Lake Charles, LA to Chattanooga, TN **(670 miles)**
2. All processing of precursor to BAM in Chattanooga under strict environmental standards
3. Delivery of BAM to end-user in Chattanooga, TN **(34 miles)**

*LGES, for illustrative purposes*

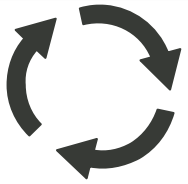
**704 Total Miles**

**NOVONIX facilitates a cleaner, more secure, supply chain of high-quality synthetic anode material to the North American market vs. Chinese competitors**

# NOVONIX's Proprietary Graphitization Process is Leading the Clean Energy Transformation

## Inputs

- Clean Power Sources[1]
  - Energy input 57% carbon-free (15% renewable) with target to be net-zero by 2050
- Highest Purity Input Materials
  - Minimizes emissions and contaminants
- Sourcing Input Materials to use in Electric Vehicles and Energy Storage System Applications that would Otherwise be Used in Higher Emission Sectors



## Process

- Proprietary Furnace Technology
  - Increased energy efficiency
  - No chemical purification

## Outputs

- NOVONIX's Anode Materials Support Higher Performance Lithium-Ion Batteries Resulting in the Need for Less Future Input Materials
- Negligible Facility Emissions

**The Life Cycle Assessment (LCA) conducted by Minviro Ltd. demonstrated a ~60% decrease in global warming potential (GWP) relative to conventional anode grade synthetic graphite produced in Inner Mongolia, China and a ~30% decrease in GWP when compared to the anode grade natural graphite in Heilongjiang Province, China**

1. May FY2021 figures from https://www.tva.com/newsroom/press-releases/tva-issues-one-of-the-nation-s-largest-requests-for-carbon-free-energy.

# NOVONIX has Optimized Synthetic Graphite Manufacturing and Attracted Tier-1 Partnerships

## Strategic Partnerships Supporting Product and Process R&D

- Partnership with Harper International, a domestic specialized furnace technology leader, developing and supplying NVX with proprietary systems for thermal processing
- Signed a Joint Research and Development Agreement (JDA) with LGES in June 2023
- Engaged with PSX in technology development agreement to collaborate on optimization of feedstock ad anode processing with the goal of higher performance lower carbon intensity materials

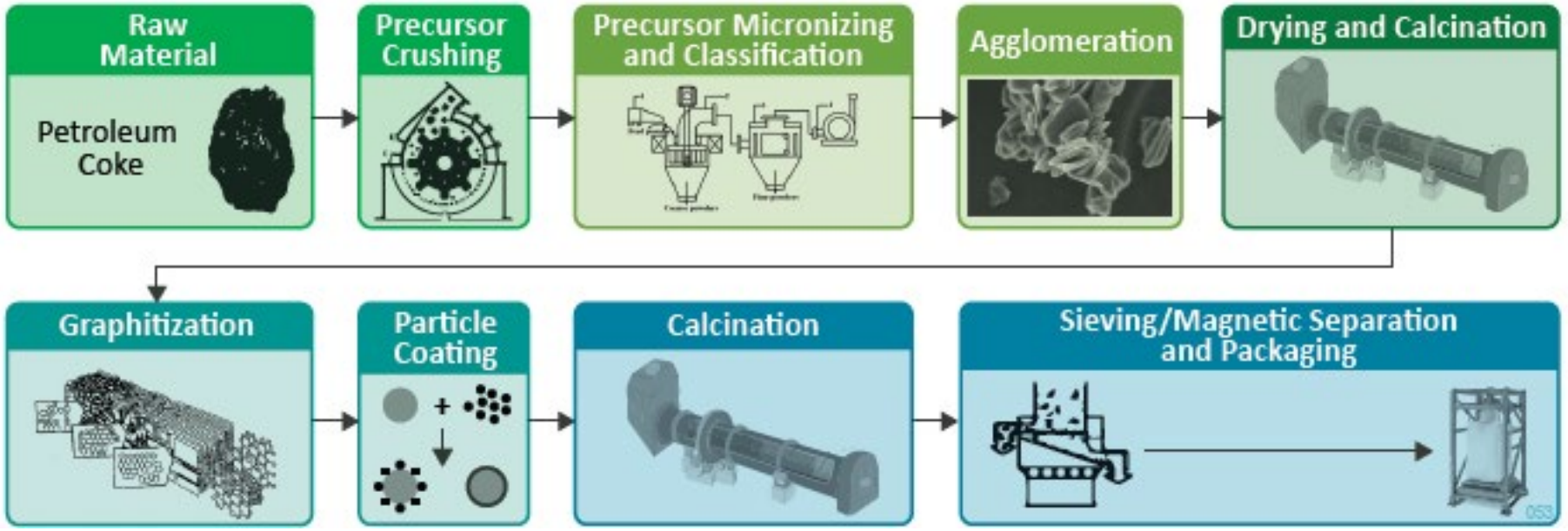
PHILLIPS 66

LG Energy Solution

Harper International

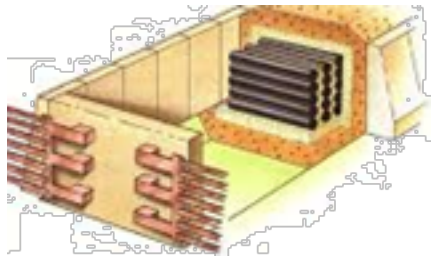
## NOVONIX Graphitization Process Offers End-User Advantages

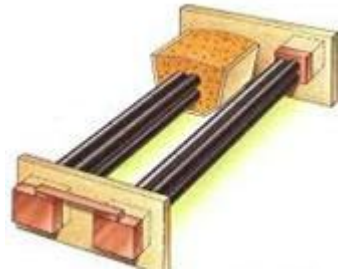
- Energy efficient systems reducing environmental permitting requirements
- Integrated and strong collaboration with precursor material and equipment providers
- Customizable processing equipment to match various customer requirements




*Incumbent technology standard process*

# NOVONIX has Validated a Differentiated Technology Ready to Scale





| | Acheson Furnace | Length-Wise Graphitization Furnace | Induction Furnace | NOVONIX Continuous Induction Furnace |
|---|---|---|---|---|
| Energy Efficiency | ✗ | O | ✓ | ✓ |
| Processing Time | ✗ | O | ✓ | ✓ |
| Emissions Control | ✗ | ✗ | ✓ | ✓ |
| Atmospheric Control | ✗ | ✗ | ✓ | ✓ |
| Product Quality | O | O | O | ✓ |
| Throughput/Scalability | ✓ | ✓ | O | ✓ |

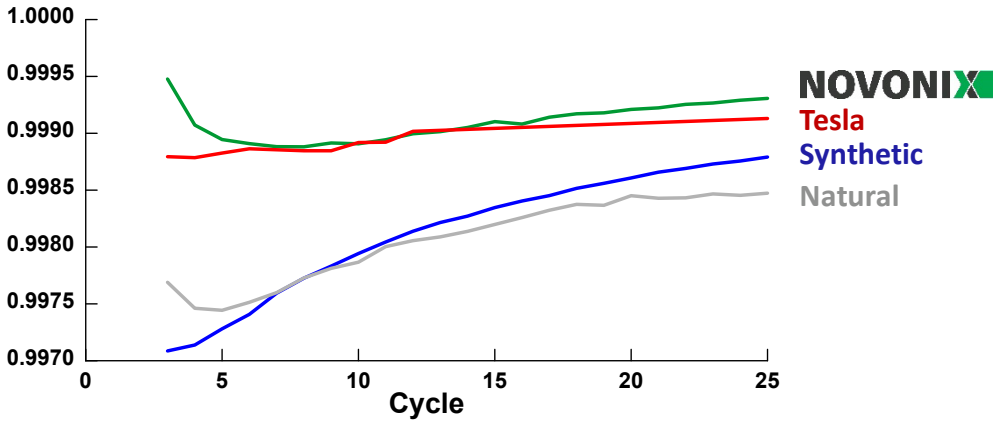
# NOVONIX has Demonstrated Breakthrough Technology at Mass Production Scale

## Acheson Furnace Facility, China

## NOVONIX Generation 3 Continuous Induction Furnace Systems, Chattanooga, TN

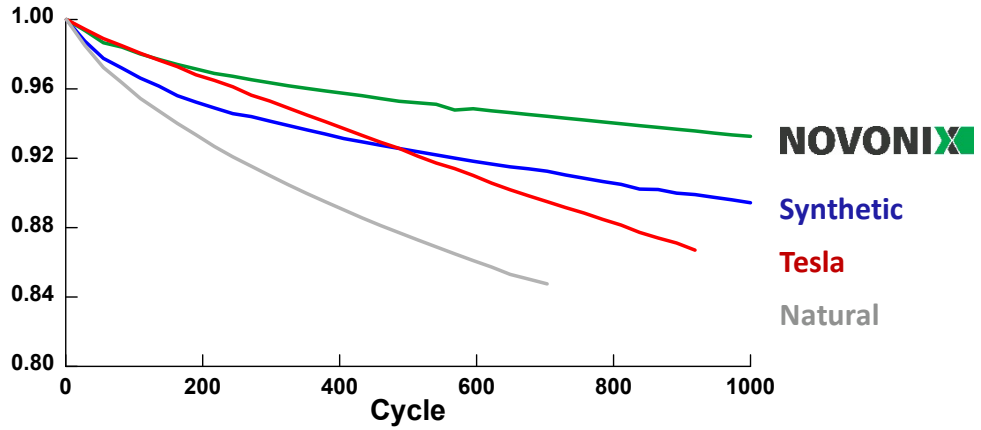
# NOVONIX Anode Material Outperforms in Head-to-Head Testing

**Improved Coulombic Efficiency (CE)[1]**




- NOVONIX offers improved Coulombic Efficiency (CE) compared to industry leading materials (including a Tesla Model S cell used as a reference benchmark)
- CE measures the electrochemical stability of the materials in the battery
- The higher the CE, the longer the battery life

**Improved Capacity Retention[1]**




- NOVONIX offers improved capacity retention compared to industry leading materials (including a Tesla Model S cell used as a reference benchmark) as expected from higher coulombic efficiency
- Better capacity retention means less range loss over time for an electric vehicle

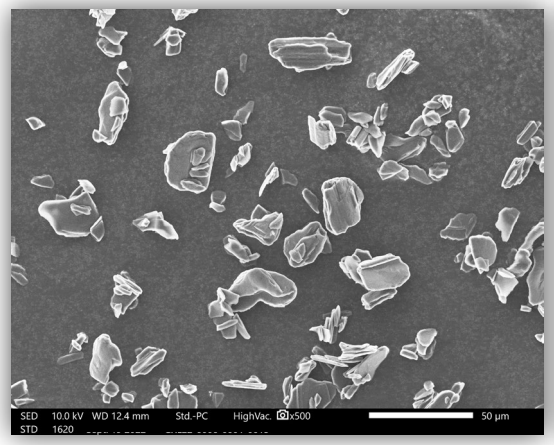
1. Data based on internal measurements taken as part of product verification process.

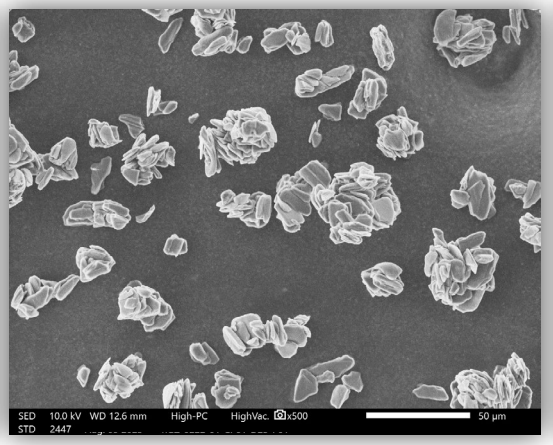
# NOVONIX's Product Technology Advantage

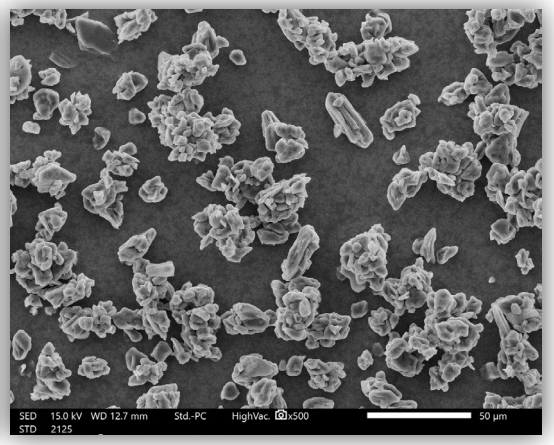
## NOVONIX Advantage

- Applications such as electric vehicles and energy storage systems require differing properties:
  - Fast Charge
  - High Energy Density
  - Long Cycle Life
- NOVONIX Anode Materials collaborates with customers, leveraging our BTS team to rapidly design, develop, produce and evaluate performance of customized materials
- NOVONIX's process provides consistent, high performance synthetic graphite, utilizing proprietary, low emissions processing

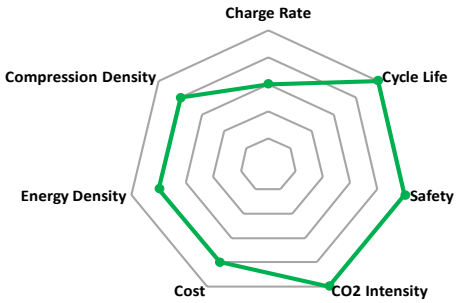
## Product Engineered Specifically for Customers Needs



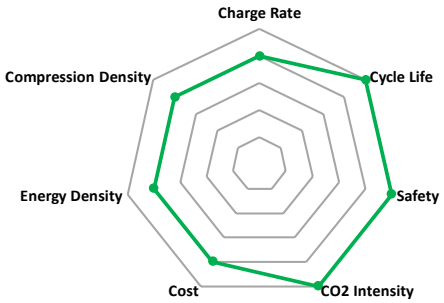



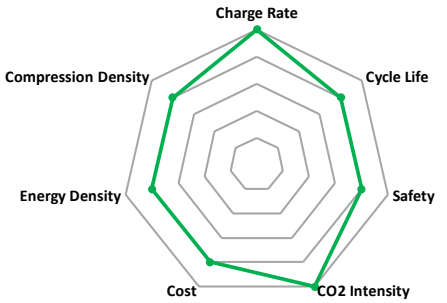

Long-Life ESS Focus




Long-Life EV Focus

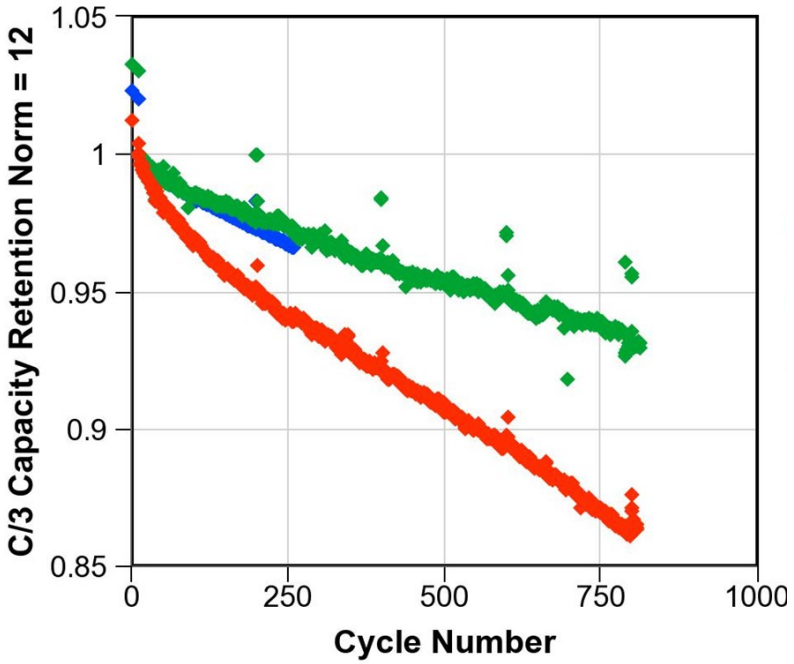



Fast-Charge EV Focus

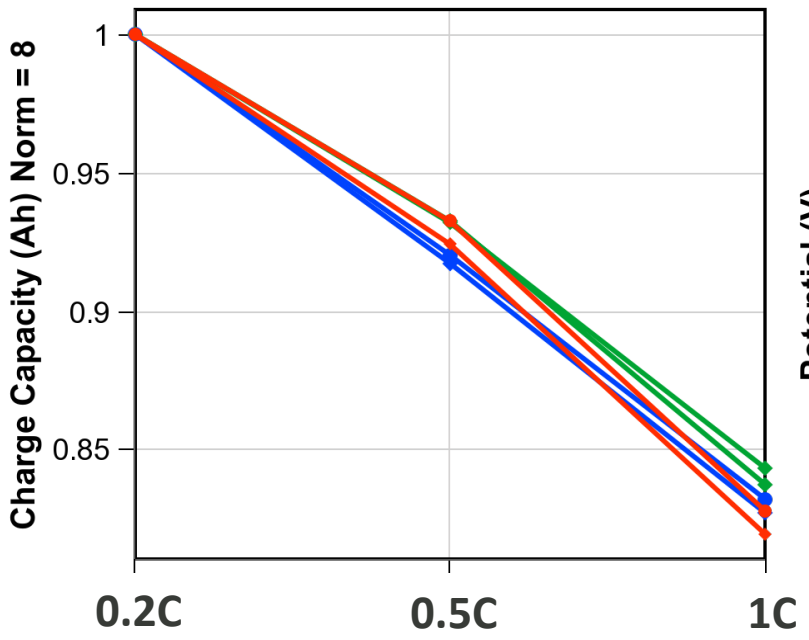


# Cycle Life and Rate Capability

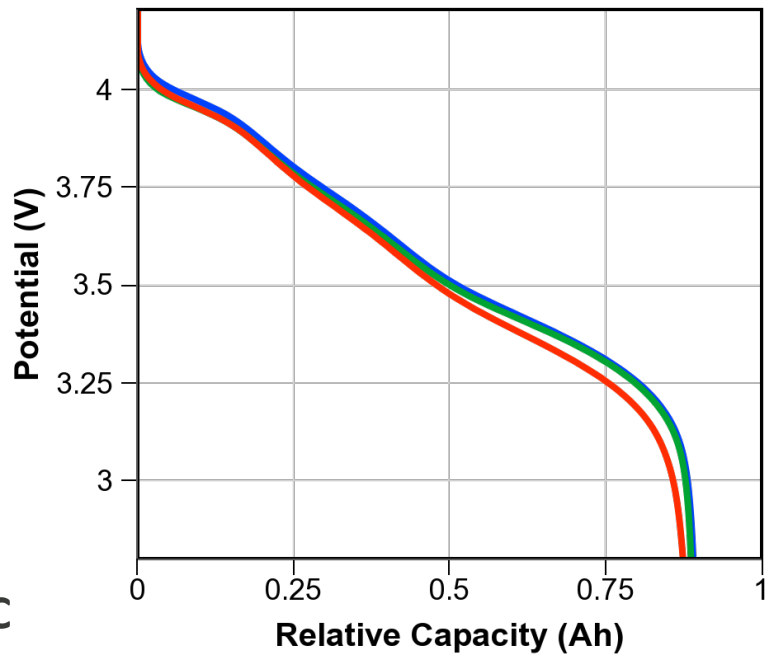
C/3-C/3, NMC811, 2.8-4.2V, 40°C
1.2M $LiPF_6$ EC:EMC:DMC (25:5:70) 2%VC




**Charge Rate Map**, NMC811, 2.8-4.2V, 40°C
1.2M $LiPF_6$ EC:EMC:DMC (25:5:70) 2%VC




**2C Discharge**, NMC811, 2.8-4.2V, 40°C
1.2M $LiPF_6$ EC:EMC:DMC (25:5:70) 2%VC



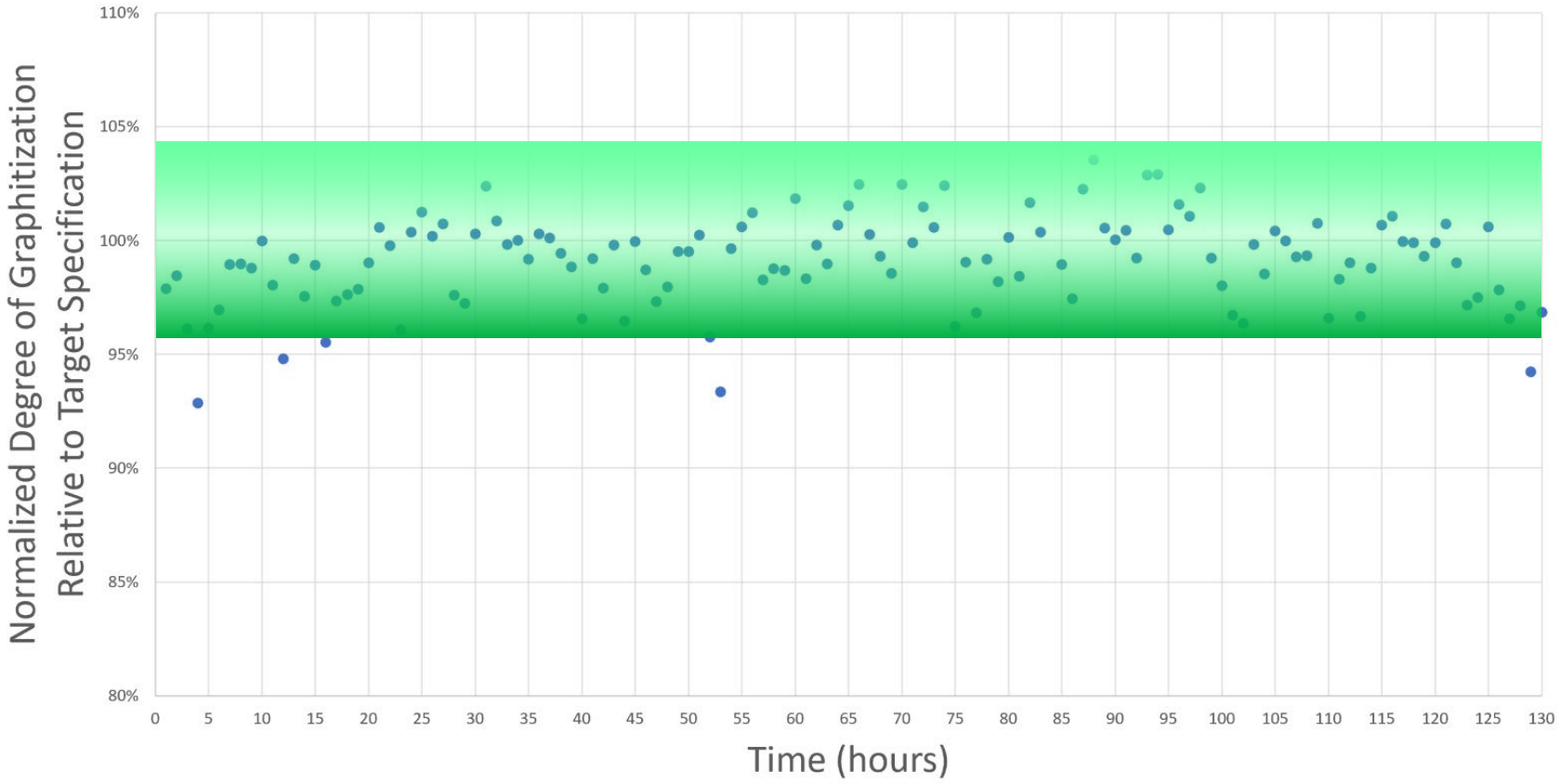

**Commercial Anode 1**

**Commercial Anode 2**

**NOVONIX Long-Life EV Anode**

# NOVONIX has Demonstrated Meeting Target Product Specifications

## Product Quality vs. Hours of Operation




## Highlighted Achievements

- GX-23 was analyzed and met all it target physical and electrochemical specifications in a recent production campaign, data shown in the chart demonstrating 130 hours of in-spec material
- The continuous output from a single Generation 3 Furnace, producing multiple tonnes of material, was confirmed to meet the target for the degree of graphitization for the product
- Meeting production targets at competitive cost while reaching our high-energy efficiency target with a near zero-emission process

# Riverside Facility Begins Production in 2024

## Riverside Facility Overview

- In 2021 celebrated opening of NOVONIX's new Riverside facility attended by US Secretary of Energy, Jennifer Granholm
- NOVONIX has been running Generation 3 Furnaces campaigns through 2023 to better understand furnace performance and provide customer samples
- Supply Agreement with KORE Power to begin deliveries in late 2024 scaling to 12,000 tpa for their KOREplex Facility


*Riverside Facility in Chattanooga, Tennessee*

## Riverside Update & Next Steps

- Demonstrated successful production with the Company's Generation 3 Furnaces meeting design targets, including throughput, cost, and sustainability targets
- Increased production capacity target from 10,000 tpa to up to 20,000 tpa for Tennessee Facility
- Expected capital and operating costs for future facilities projected to be lower than the Company's initial estimates
- Engineering anticipated by Q1 2024 to support ordering of mass production equipment for Riverside buildout and supports potential future expansions

*NOVONIX Generation 3 Continuous Induction Furnace Systems*

# NOVONIX has Demonstrated a Pathway to Profitable Production in the USA

## Riverside Facility Unit Economics Overview


## Highlights

- Recent production campaigns validate furnace throughput and demonstrate improved unit economics for Riverside
- Unit economics expected to improve with increased scale of facility
- Pricing to range dependent on
  - Product specification
  - Localization premium
  - Government programs
    - Section 301 Tariffs
    - IRA 30D Compliance, 45X, 48C

# U.S. Legislation Providing Direct Support to NOVONIX's Business Plan

**Section 301 Tariffs**

- In August 2017, the Office of the United States Trade Representative (USTR) launched an investigation into China's allegedly unreasonable and discriminatory trade practices under Section 301 of the Trade Act of 1974. The tariff exclusion "necessity review" was extended to December 2023
- **Section 301 includes a 25% tariff on artificial graphite imported from China** to help remove unfair market distortions imposed by China's anticompetitive behaviors and size advantage in the battery materials sector

**IRA Tax Credits & Consumer Credit**

- **Inflation Reduction Act of 2022 ("IRA") includes an estimated $369 billion in investments** related to "climate change and energy security," including tax and other incentives to promote U.S. production of electric vehicles ("EVs"), renewable energy technologies, and critical minerals, representing the single biggest climate investment in U.S. history. IRA includes a **$7,500 federal consumer tax credit for qualifying electric vehicles, starting in 2023 based on the origin of materials and localization of manufacturing**
  - **$3,750 of the credit must meet critical minerals requirement** - The critical mineral credit requires certain thresholds of the percentage of the value[1] of the critical minerals in the vehicle's battery to be extracted or processed in the United States or from a country which has a free trade agreement in effect with the U.S. EV credit eligibility is disqualified if materials are used from foreign entities of concern starting in 2025
  - **$3,750 from battery components** - The battery component requirement will be met if the percentage of the value of the components in the vehicle's battery that were manufactured or assembled in North America is equal to or greater than 50 percent in 2023 and increasing from that time

**DOE MESC Grant & DOE LPO Loan**

- **NOVONIX was selected for US$150 million of grant funding** by the Department of Energy (DOE) Office of Manufacturing and Energy Supply Chains (MESC) to expand NAM's domestic production of high-performance, synthetic graphite anode materials – one of 21 winners across 12 categories
- **Invited to Phase 3 of DOE LPO Loan process in May 2023**. The loan, if received, would contribute toward funding the company's current expansion of battery materials capacity

# Strategic Relationship with KORE Power

## Highlights of Agreements




KORE Power to invest $1B in Buckeye

*www.westvalleyview.com*

- KORE Power is a leading U.S. based developer of battery cell technology for clean energy industries
- NOVONIX and KORE Power have worked together since 2019 through NOVONIX's BTS division to improve and validate KORE's battery technology
- KORE announced on 29 July 2021 the intention to build KOREPlex, a one million square foot manufacturing that will support up to 12 GWh of battery cell production in Buckeye, AZ
- KOREPlex scheduled to begin production in 2024
- Through the signed Supply Agreement, NOVONIX will be the exclusive supplier of graphite anode material to KOREPlex which, when in full production, will be close to 12,000 tonnes per year of material
- NOVONIX invested $25M USD to acquire a roughly 5% stake in KORE Power

# NOVONIX Establishes Strategic Relationship with LG Energy Solution

## LG Energy Solution (LGES) Overview


LGES has 7 plants in North America built or planned for completion in 2025

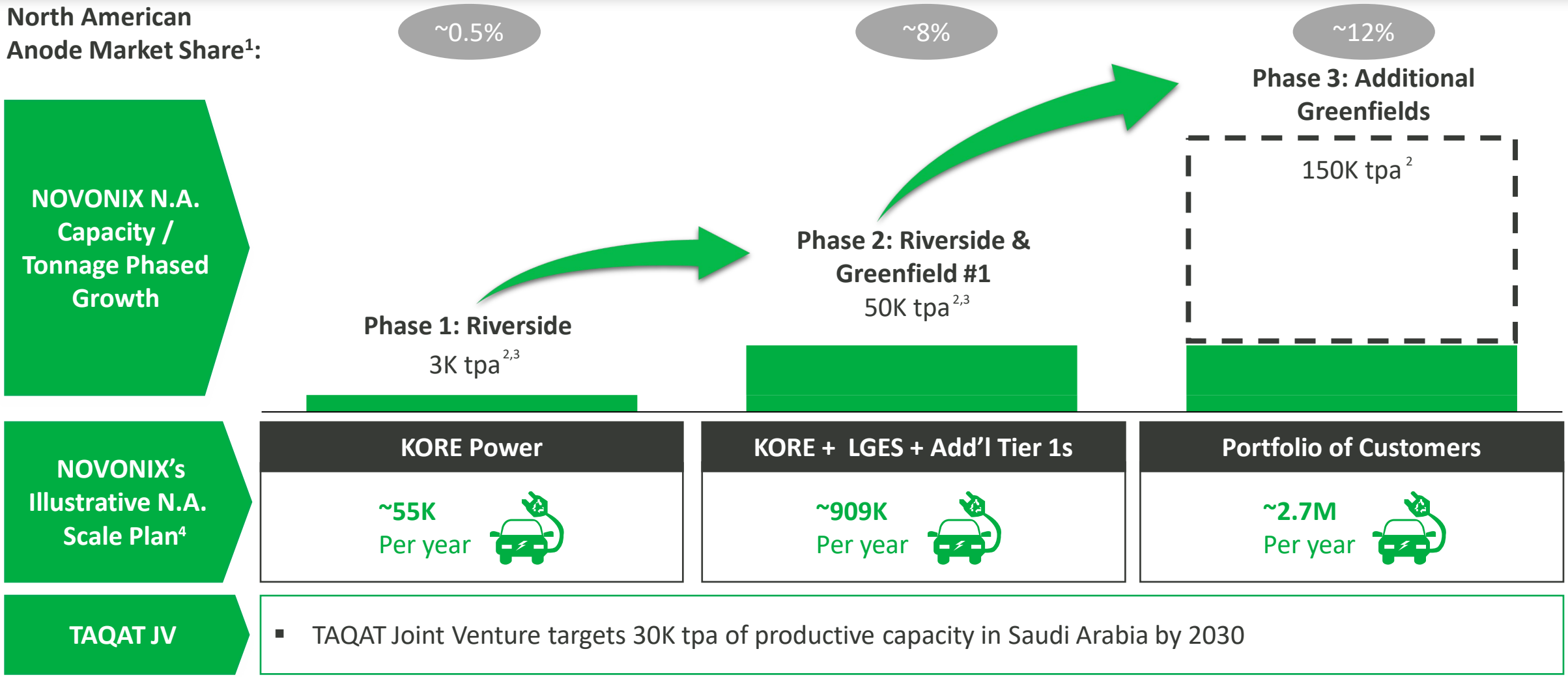
- LGES is a leading U.S. based developer of battery cell technology for EV and ESS Batteries
- LGES has developed relationships with GM, Honda, Hyundai and Stellantis in North America to supply EV batteries
- LGES plans to have ~250 GWh of gigafactories in North America

## Highlights of JDA & Investment Agreements

- NOVONIX and LGES recently signed a Joint Research and Development Agreement (JDA) in June 2023
- Upon successful completion of JDA, LGES has the option to purchase up to 50,000 tonnes of artificial graphite anode material over a 10-year period from the start of mass production in a separate supply agreement
- LGES invested US$30M in convertible notes issued by NOVONIX

# Phased Growth Plan Matches Customer Demands

**North American Anode Market Share[1]:**




1. Market share based off implied North American graphite demand in 2025, and 2030. Source: Benchmark Mineral Intelligence Gigafactory Assessment – April 2023. Based on announced capacity. Assumes full utilization.
2. Company expectations aligned with customer contracts and anticipated customer demand , which may or may not materialize
3. KORE Power agreement to supply Koreplex anticipates a ~3,000 tpa delivery rate in 2H 2024 ramping to ~12,000 tpa rate in 2028.
4. Assumes 55kg of graphite per EV.


# Cathode Materials

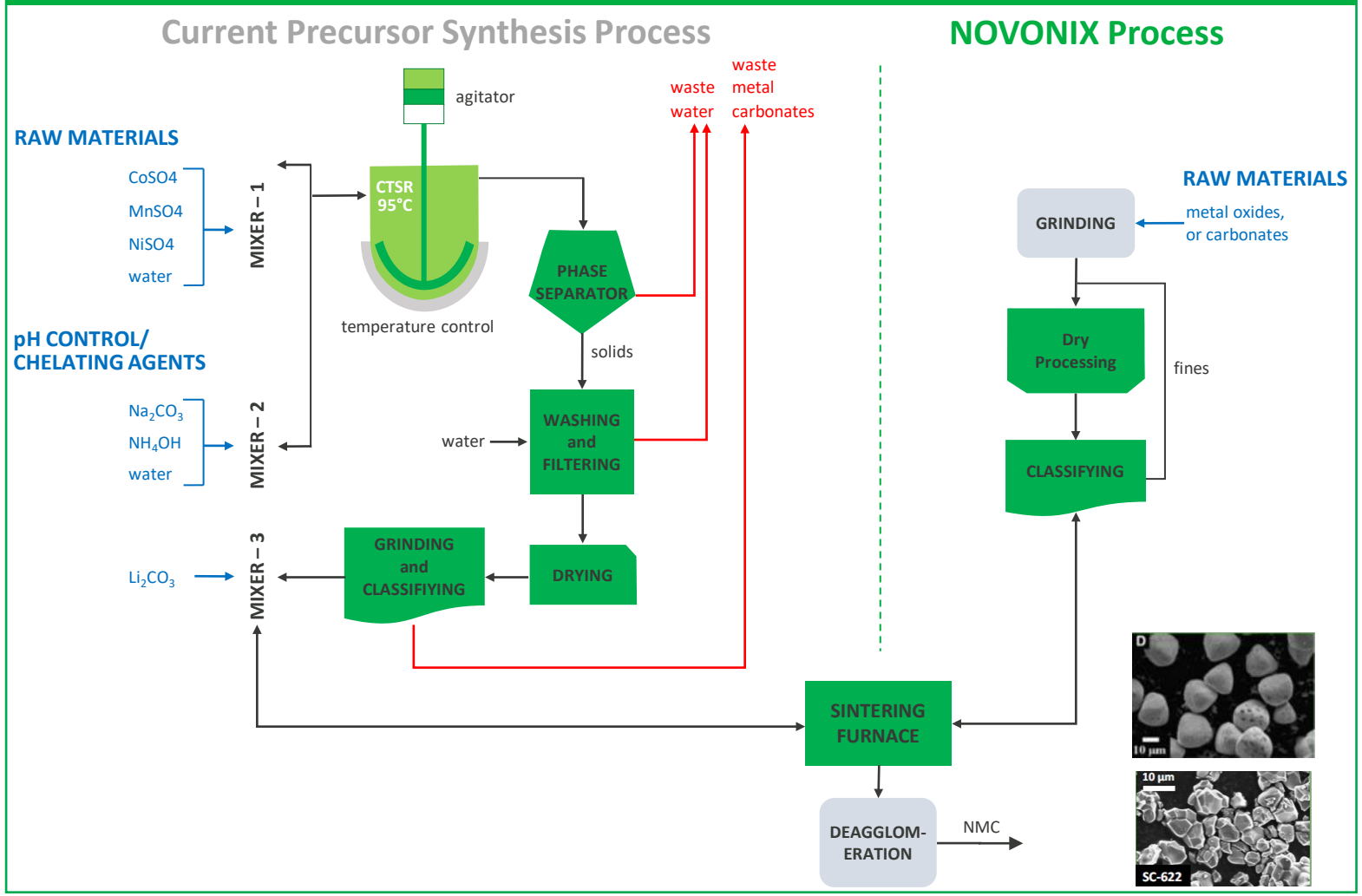
NOVONIX

# NOVONIX - Cathode Synthesis Provides Clean and Simple Process

## Opportunity Overview

- Cathode material represents about 30% of the cost of a battery cell
- In 2021 the global cathode market size value was US$19B, with a forecasted revenue of US$100B by 2030[1]
- Current synthesis process is complex, produces water waste and is costly
- Each tonne of cathode powder generates 15,000 liters of water waste[2] and 1.6 tonnes of sodium sulphate waste[1]
- With multiple patent applications filed, cathode synthesis technology provides high nickel cathode materials with:
  - Higher yields at lower costs
  - No water waste
  - Flexible input materials

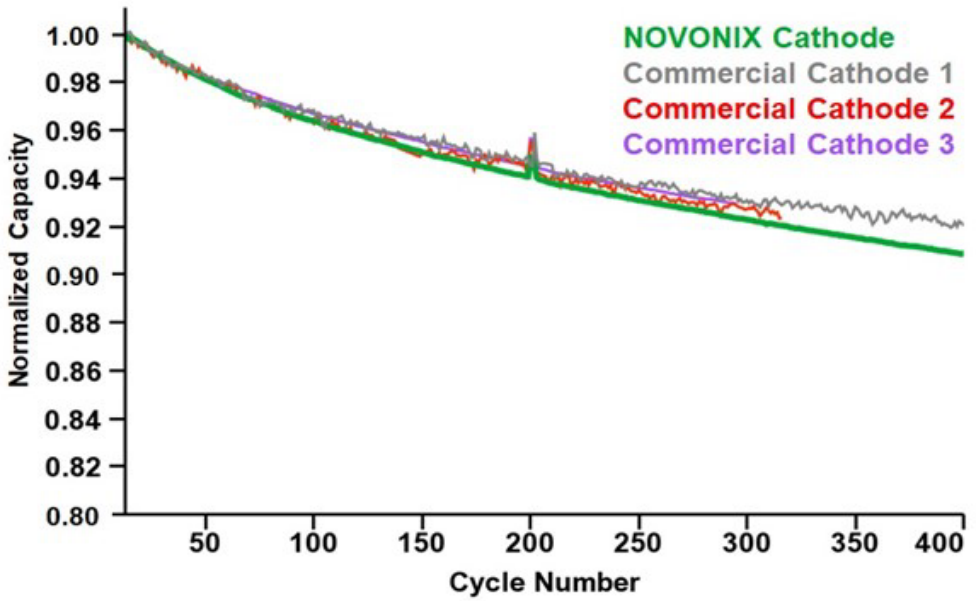
## Current Process vs. NOVONIX Process




1. Benchmark Minerals, various Equity Research reports including Bernstein and JP Morgan and NOVONIX estimates
2. J.Power Sources: S. Ahmed, P.A. Nelson, K.G. Gallagher, N. Susarla, D.W. Dees. Cost and energy demand of producing nickel manganese cobalt cathode material for lithium ion batteries

# Cathode Cycle Performance Matches Commercial Material

## Full Cell Cycling Performance of NOVONIX Single Crystal NMC622

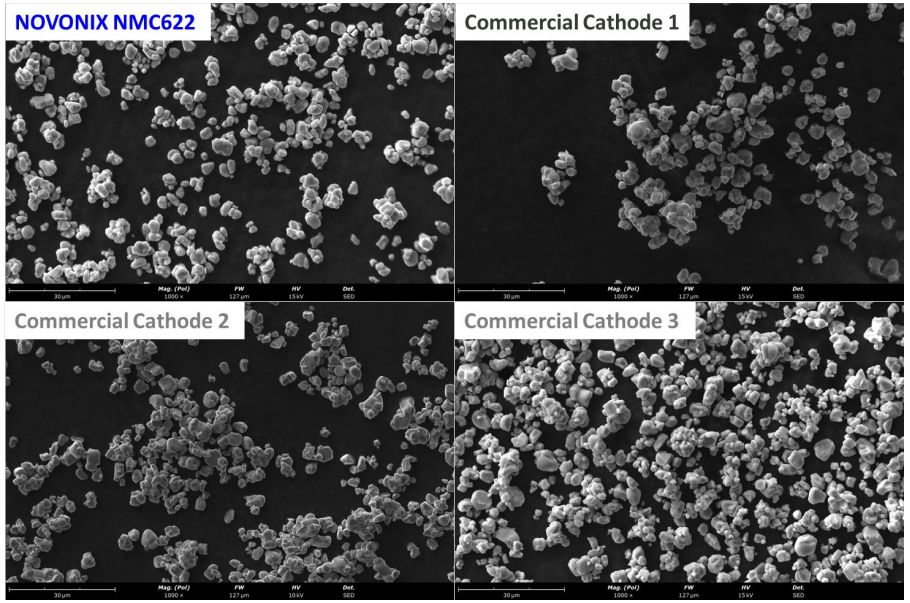



| Product | Reference NMC622 | NOVONIX NMC622 |
|---|---|---|
| Capacity at c300 (%) | 92.5% | 92.1% |
| First Cycle Efficiency (%) | 84.9% | 84.9% |

*40°C; 1.2M $LiPF_6$ EC:EMC:DMC(25:5:70)+3VC; [Charge] : CC-0.33C; [Discharge] : CC-0.33C*

## Enhanced Production Process Yields Consistent Performance

- Normalized electrochemical results in 1Ah pouch cell show that NOVONIX NMC622 has comparable electrochemical performance to commercial NMC materials
- NOVONIX all-dry zero-waste single crystal cathode materials share similar morphology to commercial NMC Powders

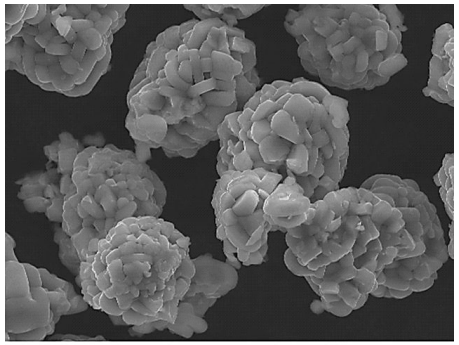



- Higher nickel and cobalt-free materials are also being made using our process technology

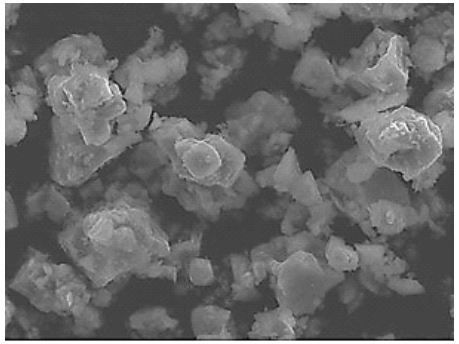
# Early ‘All-Dry’ Methods Were Cast Aside for Wet (Co-Precipitation) Processes

## Early all-dry ternary cathode synthesis methods resulted in poor intra-particle homogeneity

**Commercial NMC622**
**Conventional Process**




**Solid-State NMC622**
**All-Dry Process**



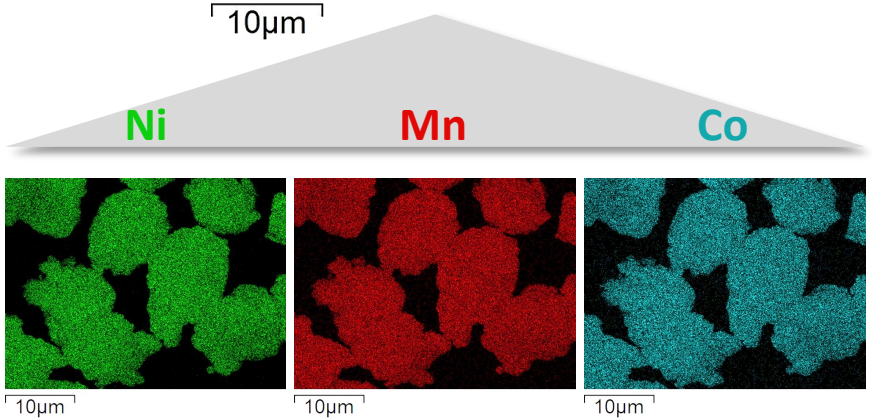

*Journal of The Electrochemical Society*, 2023 **170** 080519

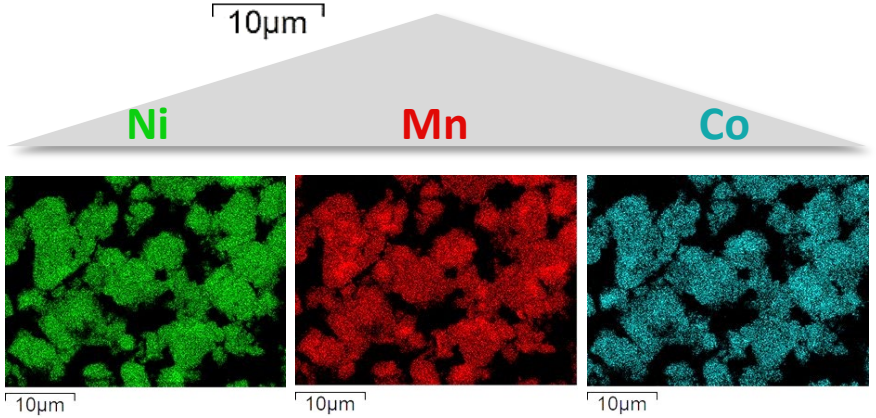
**Quantitative Measurement of Compositional Inhomogeneity in NMC Cathodes by X-ray Diffraction**

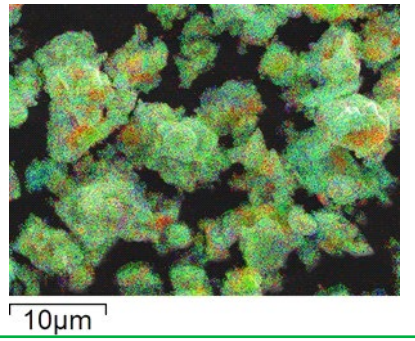
Mohammad H. Tahmasebi[1] and M. N. Obrovac[1,2,3,*,z]

[1]Department of Chemistry, Dalhousie University, Halifax, Nova Scotia B3H 4R2, Canada
[2]Department of Physics and Atmospheric Science, Dalhousie University, Halifax, Nova Scotia B3H 4R2, Canada
[3]Clean Technologies Research Institute, Dalhousie University, Halifax, Nova Scotia B3H 4R2, Canada

**Poor intraparticle homogeneity leads to strain within the particle and poor mechanical and electrochemical performance**



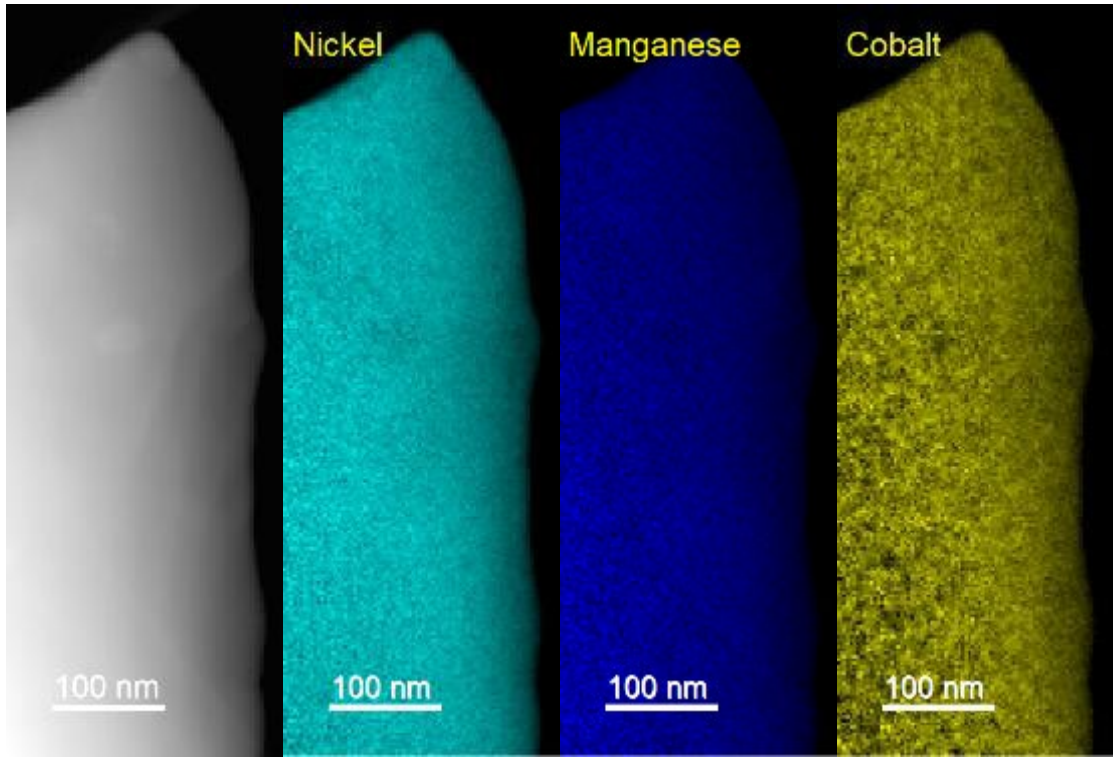




**Can this poor distribution of the constituent elements be overcome?**

# Advanced Imaging Diagnostics for NOVONIX All-Dry, Zero-Waste Cathode

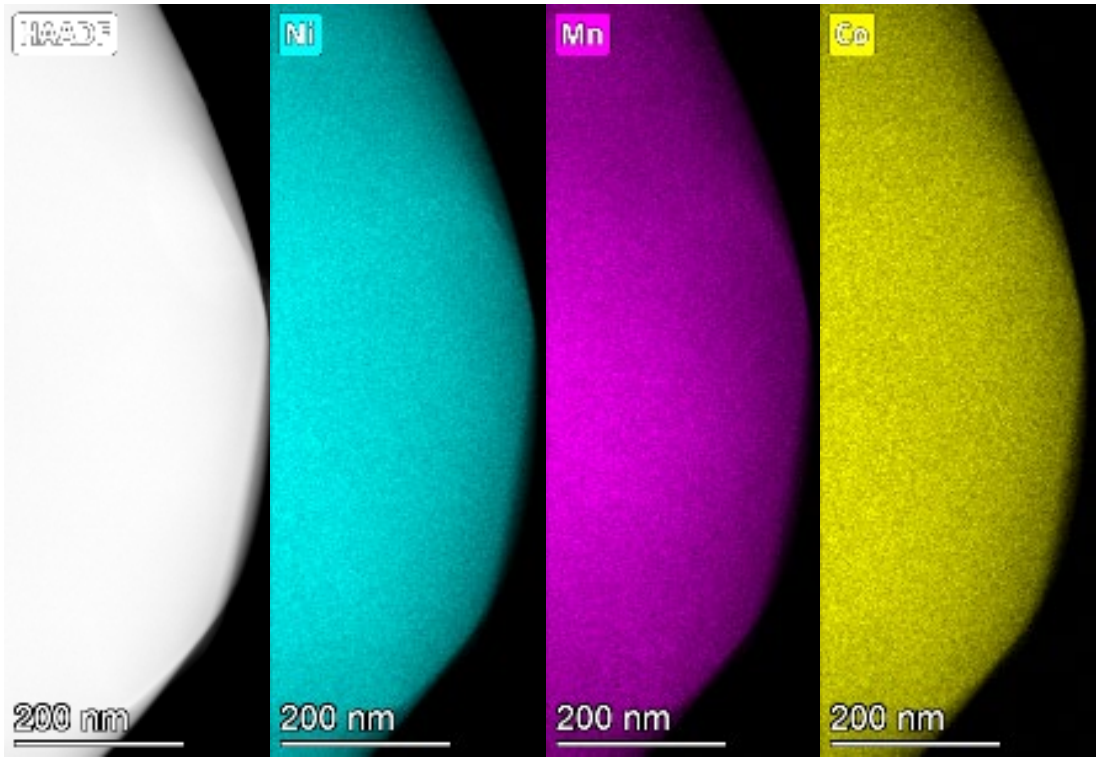
## Commercial Mid-Nickel Reference Powder

- Scanning Transmission Electron Microscopy (STEM) Imaging
  - Homogeneous metal distribution




## NOVONIX Mid-Nickel Powder

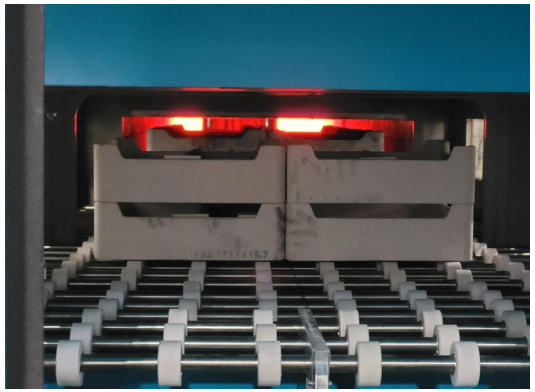
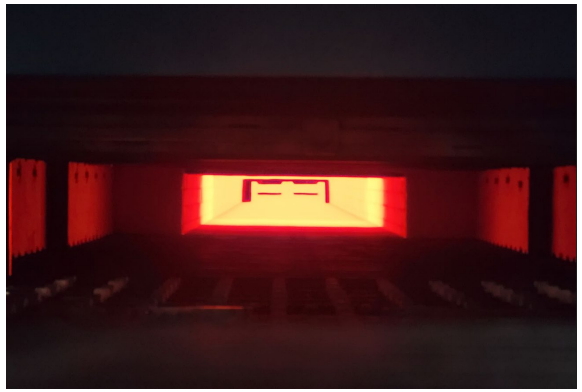
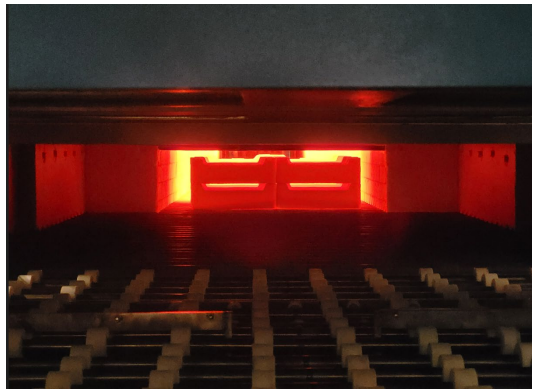
- Scanning Transmission Electron Microscopy (STEM) Imaging
  - Homogeneous metal distribution




**NOVONIX All-Dry, Zero-Waste Processing ensures homogeneous intraparticle metal distribution**

# NOVONIX All-Dry, Zero-Waste Cathode Production Pilot Line

- Lab scale synthesis demonstration is important, but clear path to production is critical
- Synthesizing revolutionary battery materials gets progressively more difficult from lab (grams), to pilot scale and ultimately to mass-production (multi-tonnes) scale
- NOVONIX has overcome these production challenges by demonstrating on our pilot line the synthesis process of meaningful quantities of materials (10 tpa) using readily-available equipment familiar to the cathode supply chain


**NOVONIX production process leverages developed and readily available battery equipment technologies**

# Cathode Synthesis: Engineering Scoping Study Results

NOVONIX engaged Hatch to provide a 'Process Comparison Study' by contrasting the **NOVONIX All-Dry, Zero-Waste Cathode Synthesis Process** against conventional cathode synthesis for comparative costs and environmental details

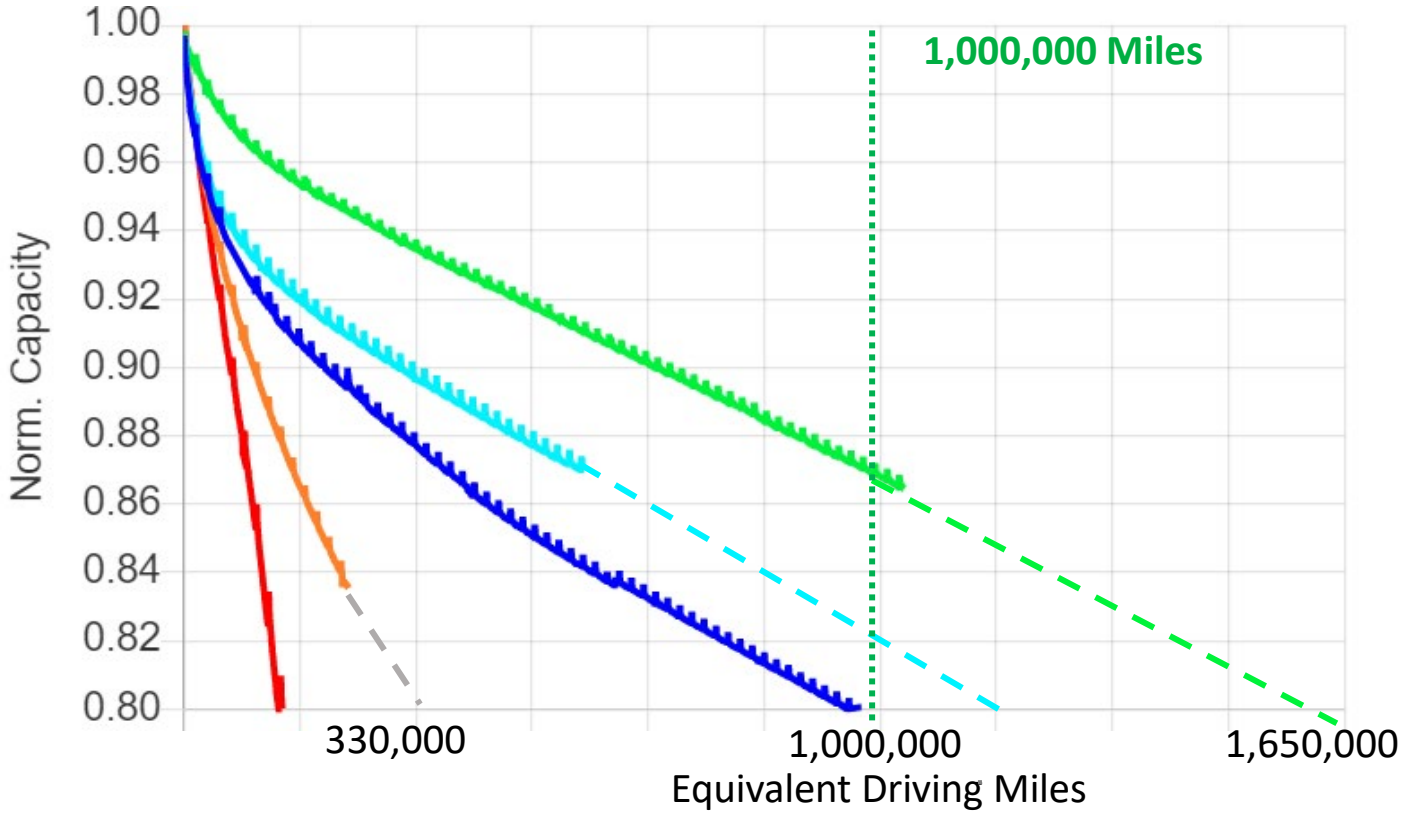
## Hatch Study Estimated Findings [FEL-1]

| | |
|---|---|
| **Capital Intensity Lowered by ~30 %** | ▪ Fewer unit operations leads to simplified flowsheet<br>▪ Higher mass feed rate due to 'hydroxide-free' feedstock |
| **Operational Process Expenses Lowered by ~50%** | ▪ Fewer unit operations leads to lower labour costs<br>▪ Low-to-no processing reagents<br>▪ Lower power consumption<br>  ▪ More efficient calcination<br>  ▪ Fewer processing steps<br>▪ Lower maintenance costs<br>▪ Lower waste treatment costs |
| **More Environmentally Friendly process** | ▪ ~27% lower power consumption & $CO_2$ intensity<br>▪ ~65% less water usage<br>▪ Eliminates production of sodium sulphate biproduct<br>▪ No ammonia required removing a significant safety risk |

Note: Please see Hatch disclaimer shown in Sept 12, 2023 press release on Study description and estimates.

# NOVONIX's Battery Technology Paves the Way for the Next Generation

## Demonstrated and Projected Performance Predicted to Exceed 1 Million Miles based on ~2 Years of Test Data[1]

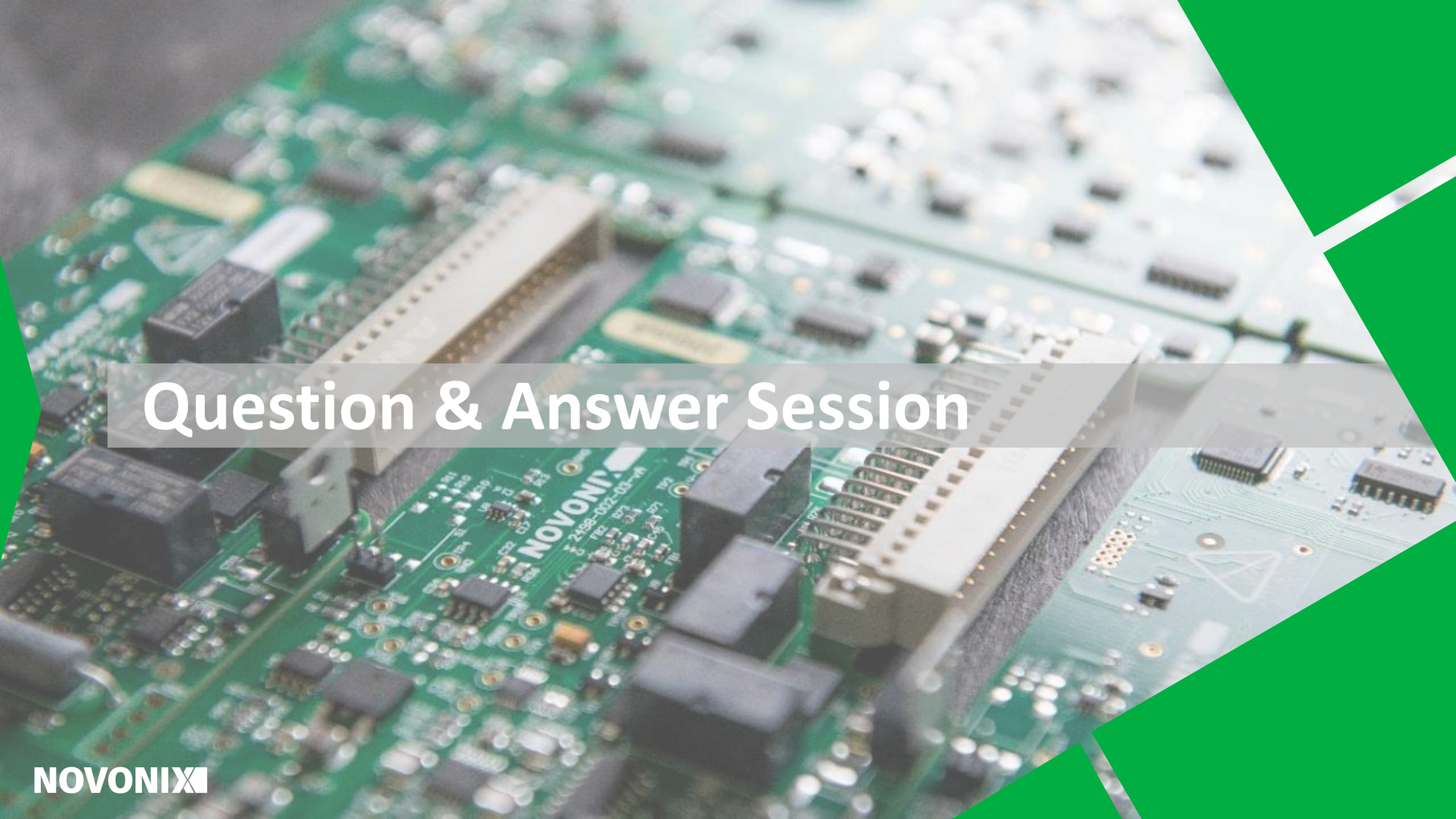



- PC622/Synthetic Graphite
- SC622/Natural Graphite
- SC622/Synthetic Graphite
- SC622/Synthetic Graphite + NOVONIX Advanced Electrolyte
- SC622/NOVONIX Anode Material + Advanced Electrolyte

**Building full cells for performance testing to demonstrate performance of NOVONIX anode, cathode, and electrolyte technologies in a single cell**

1. Data based on internal measurements taken as part of verification process. 40°C full depth of discharge cycling, Assumed 330-mile range. Projection lines shown for guidance. SC NCM622 shown here is Commercial SCC reference material.

# Goals for the Future of NOVONIX



# Question & Answer Session

NOVONIX

# NOVONIX

## Set for Growth

Business Update, October 2023