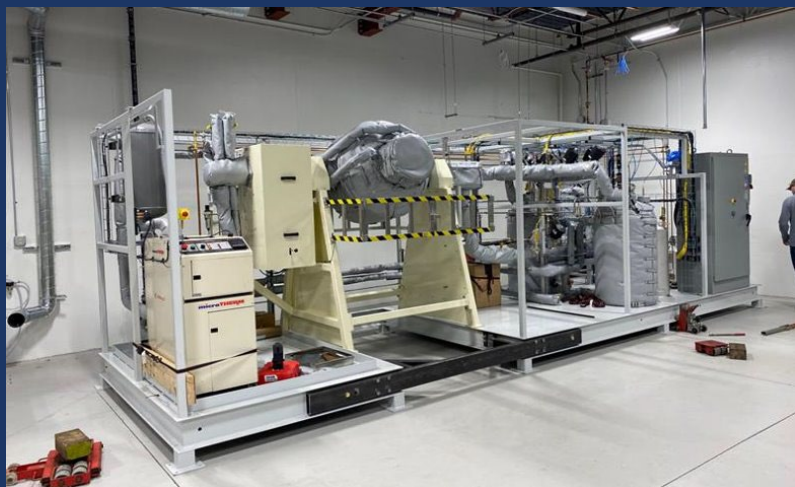




NAATBatt Panel: Breaking down the Barriers to Commercialization of U.S. Battery Innovation

James Trevey Ph.D
Chief Technology Officer

23 February 2023

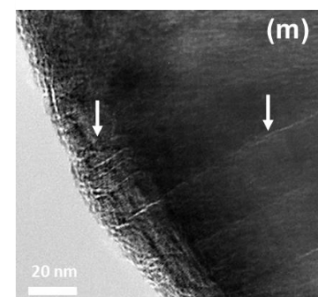
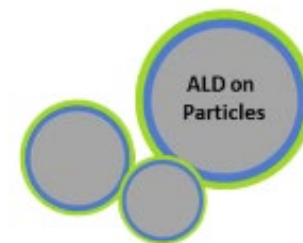
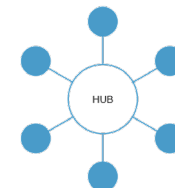


Founded in 2011, Headquarters in Denver, CO
 ~90 employees, 90% YoY growth past 4 years
 Typically engaged as a **materials innovation partner**
 Scaled a nano-coating technology called ALD
 Technology demonstrated at giga-factory scale
Core business is selling commercial equipment
Developed multiple market-leading Li-ion cells

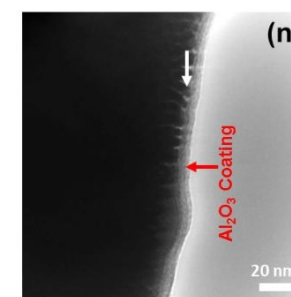
End-to-End Development Provider (grams-to-tons)

ALD R&D, Piloting, Tolling, and Commercial Integration

- In Li-ion/Beyond Li-ion Batteries
 - Increase energy density up to 20%
 - Increase power density for fast (dis)charge
 - Increase cycle life by 2-10x¹
 - Increase safety by 50%²
 - Decrease cost³
 - Future proof (any battery/chemistry)



Uncoated NCA



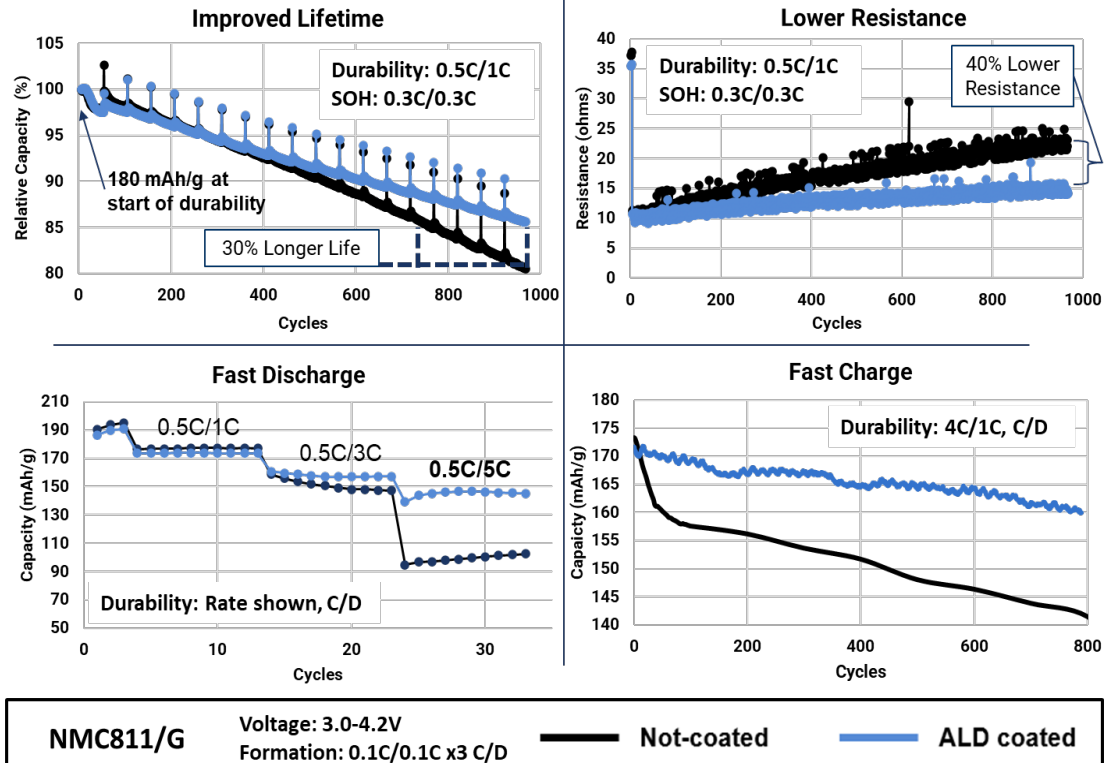
Al₂O₃-coated NCA

Any battery
 Any chemistry
 Any cathode
 Any anode
 Any separator
 Any... other?

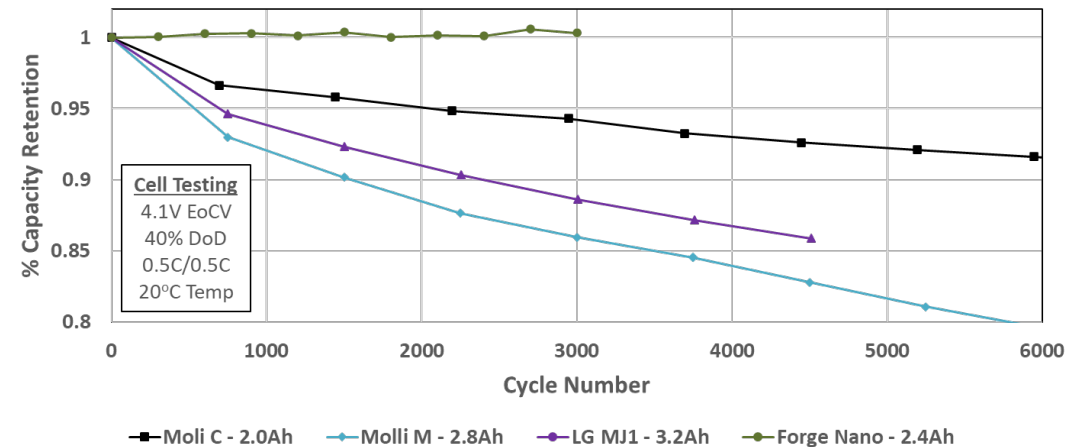
1. Independently validated by major auto manufacturer
2. Quantified by % reduction in exothermic energy from arc test
3. Projected for full-scale production based on detailed cost modeling.

ALD for Li-ion Batteries

Typical Result Comparison



18650 COTS vs. ALD for Spire Global Satellite



ALD precision coatings

Reduction of unwanted chemical and electrochemical reactions

Keep resistance low

Reduce the occurrence of key exothermic reactions

Forge Nano Super Cell Performance



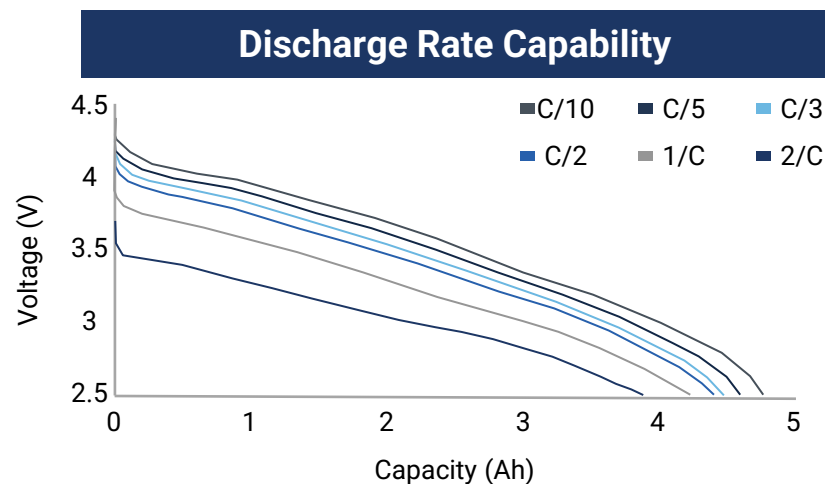
Gen 1 Cells

- 275 Wh/kg 21700s available now
- 260 Wh/kg 18650s available now



Gen 1.1 Cells:

- 300 Wh/kg 21700s in development
- 280 Wh/kg 18650s in development



Charge Capacity (Discharging at 0.2C)

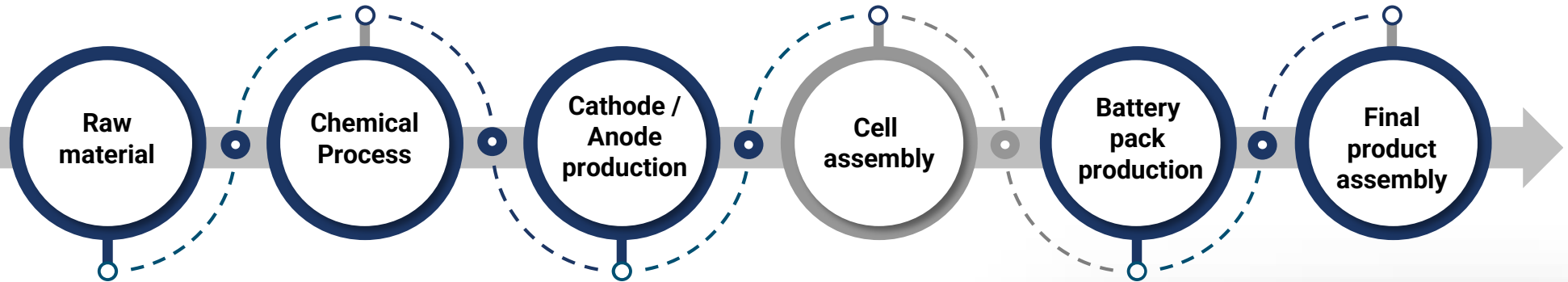
Charge Rate	% of C/10
0.1C	100%
0.2C	95%
0.33C	95%
0.5C	95%
1.0C	94%
2.0C	93%

Cell Comparison (Energy Cells)

Specification	LG M50T	Panasonic Model 3 21700	Samsung SDI 50E	Forge Nano 2149-10 (developed)	Forge Nano 2156-10 (developing)
Energy Density (Wh/kg)	260	250	260	275	300
Capacity (Ah)	4.8	4.8	4.9	4.9	5.6
Nominal Voltage (V)	3.6	3.6	3.6	3.6	3.6
Weight (g)	68.2	68.5	68	64.5	66.5

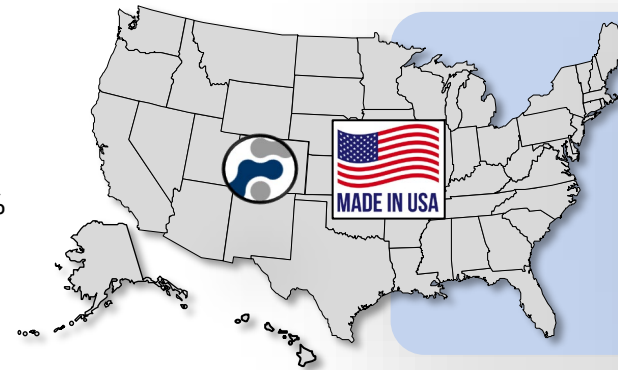
Forge Nano Super Cell Performance

Entry into Battery Value Chain



Cell Manufacturing

- 1MWh Innovation and lite-production line
- Highest quality/yield cells from digital integration
- Low risk adoption for OEMs
- 1GWh niche market production line
- Over 75% US-sourced with 0% from China, goal of 100%
- **Already have signed supply and offtake agreements**



Phased approach for 1GWh Target



Intent to Directly Serve a Broad Range of Niche Applications and Partner/License for Large Applications

Mobility
Trucking
Micro



Defense
All services within DOD



Consumer
Power tools
Consumer durables



Industrial
ESS, Marine, forklifts



Forge Nano Perceived Barriers to Commercialization: Effective Communication and

- Effective TRL Demonstration
- Effective MRL Demonstration
- Poor communication
 - Technology
 - Business development
- Large company adoption
 - Untouchable production lines
 - Competition benchmarking
- Industry 'Noise'
 - Company comparisons
 - Advertisement vs. Reality vs. Academia
 - Investor scars from other industries
- Cost of R&D vs. Cost of MFG
- Market perception
- Marketing vs. Problem Solving
- IP (All forms)

“There are liars, damned liars, and battery suppliers”





Thank you



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- Vice President, MPSC
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