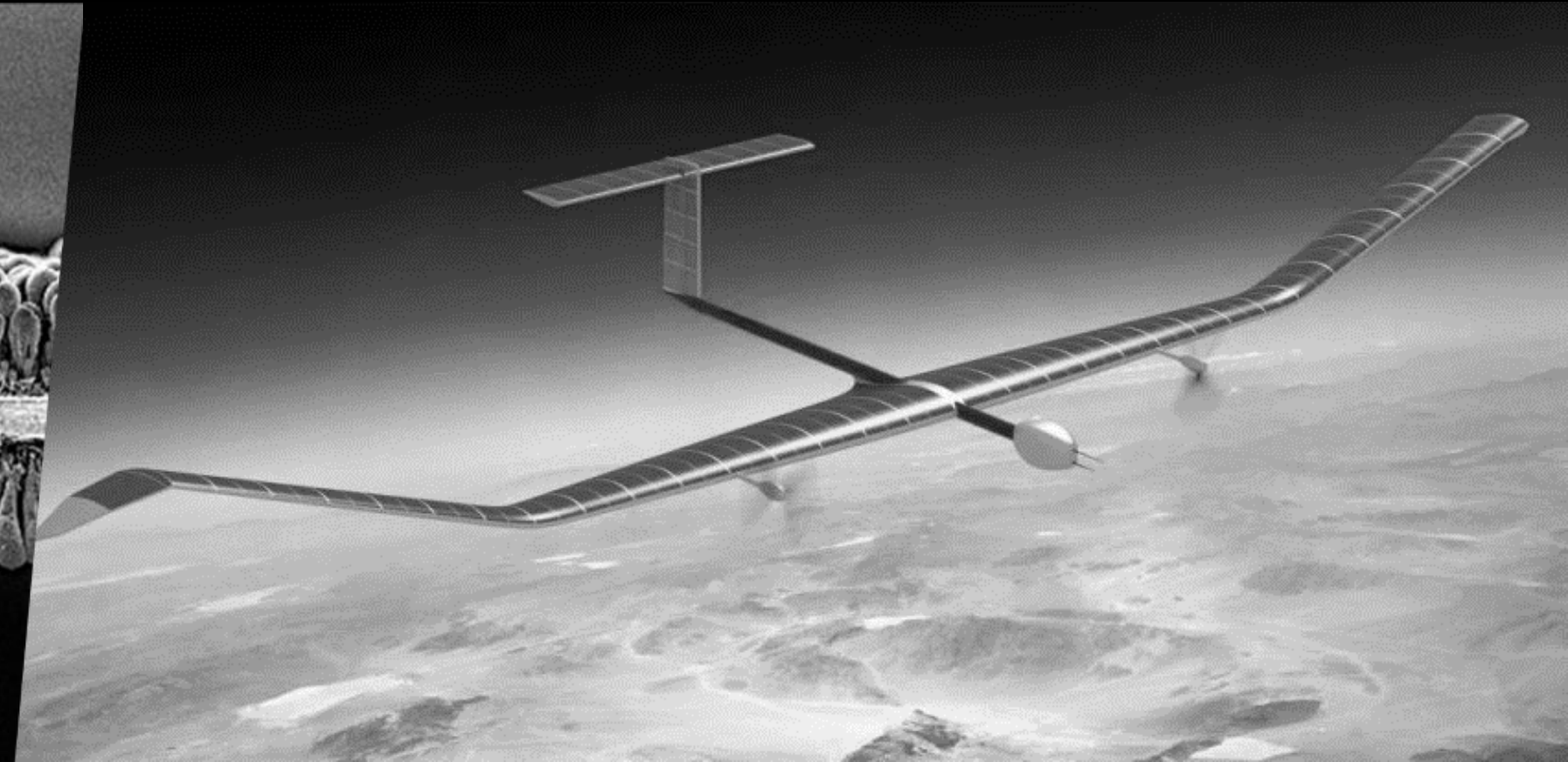
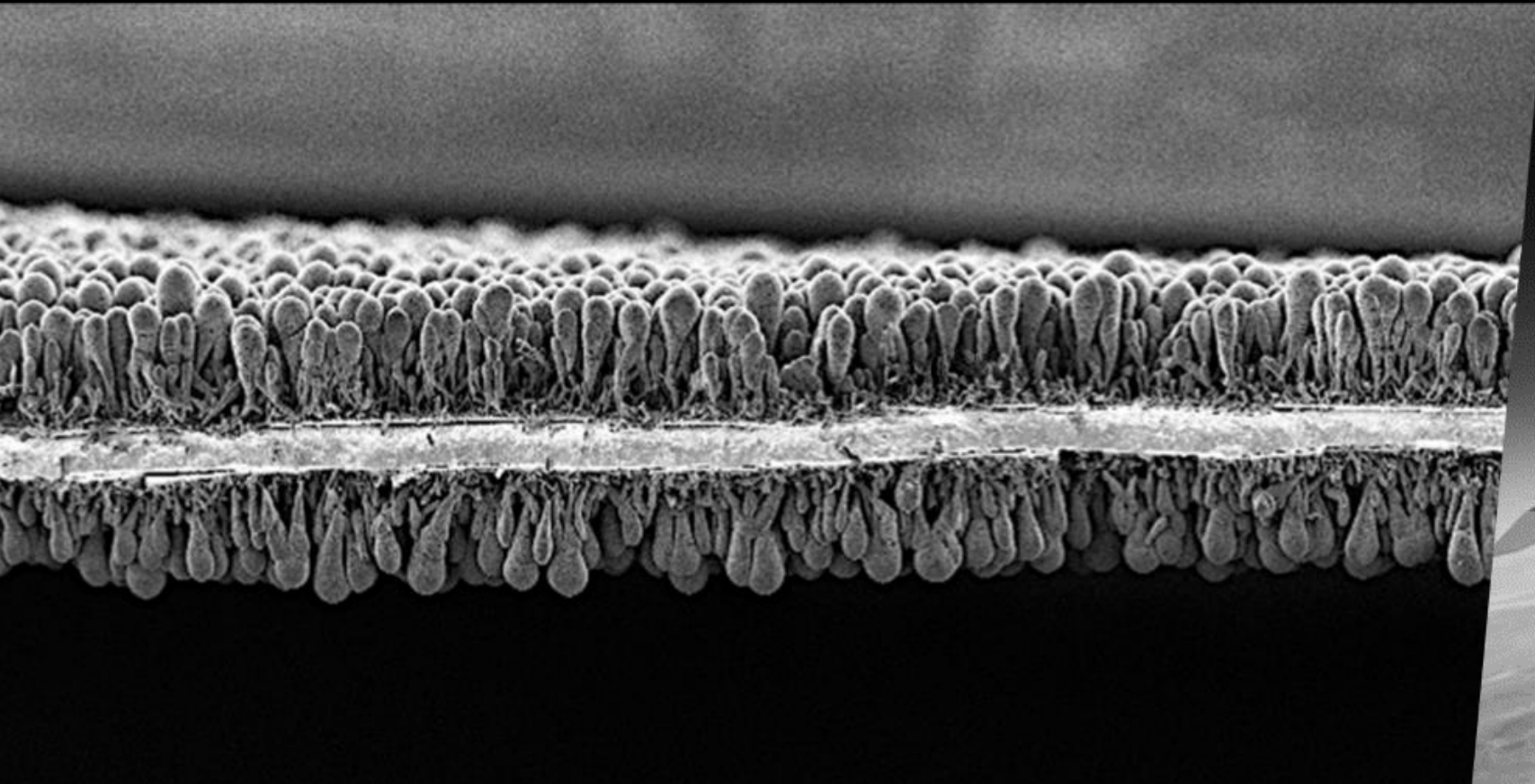


Transforming Electric Mobility



Ionel Stefan
CTO, Amprius Technologies, Inc.
1180 Page Ave., Fremont, CA

10th Annual Electric VTOL Symposium

January 2023

We Enable the Future of Electric Mobility Today

Innovation

100% silicon anode battery⁽¹⁾

Superior Battery Performance

- **High Energy Density**
Up to 450 Wh/kg⁽²⁾ and 1,150 Wh/L⁽²⁾⁽³⁾
- **High Power Density**
Up to 10C
- **Fast Charge Rate Capability**
80% charge in <6 minutes
- **Wide Operating Temperature**
-30°C to 55°C

Commercially Proven

Tested and validated by industry leading partners

Note: Certain performance metrics are based on specific Amprius products.

(1) Actual percentage of silicon is 99.5-99.9% which is within the range of acceptable purity levels for materials that are considered 100%.

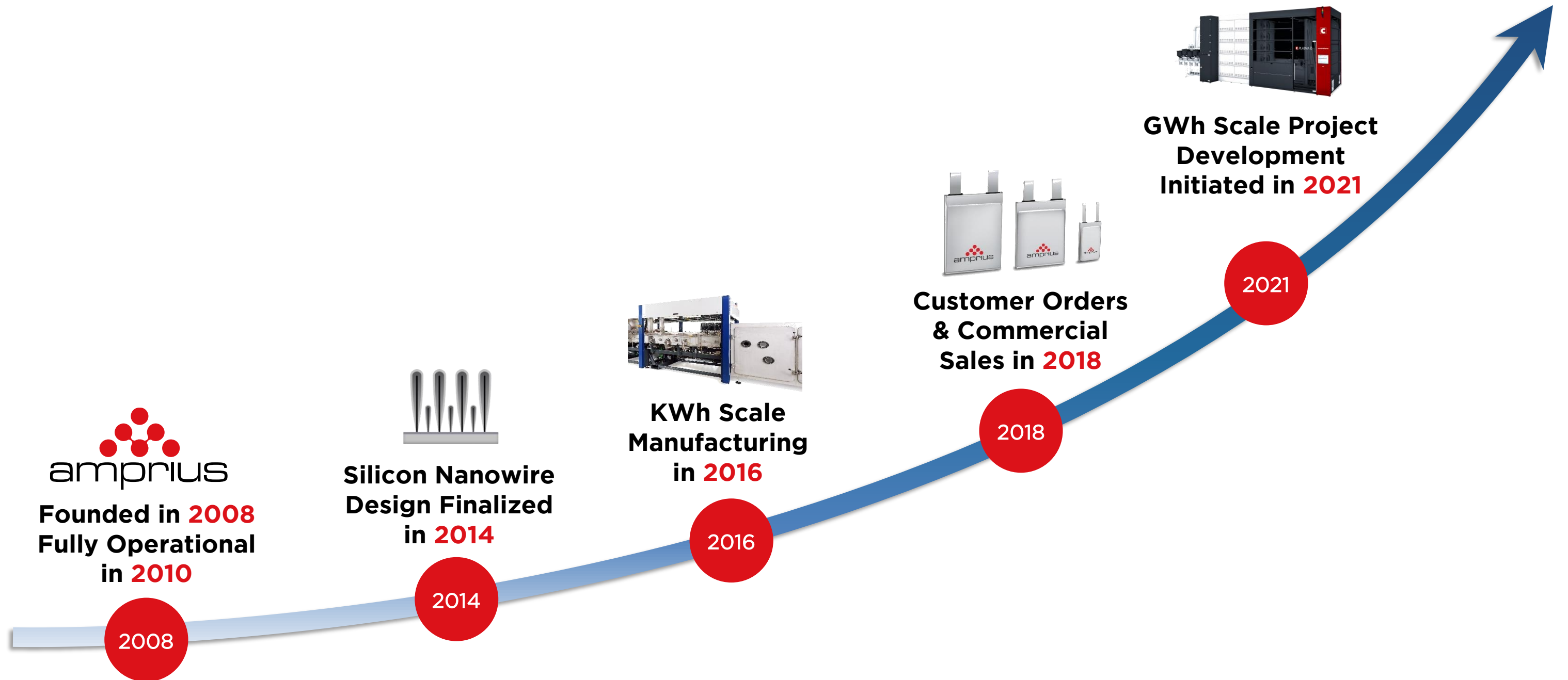
(2) At C/10 and 23°C.

(3) Volumetric energy density is calculated using body dimensions at 30% state of charge ("SoC").



COMPANY DEVELOPMENT

Turning a Transformational Technology Into a Commercial Reality



AMPRIUS AT A GLANCE

High Performance Battery Offerings

Commercially Available Today and Validated by Blue Chip Partners

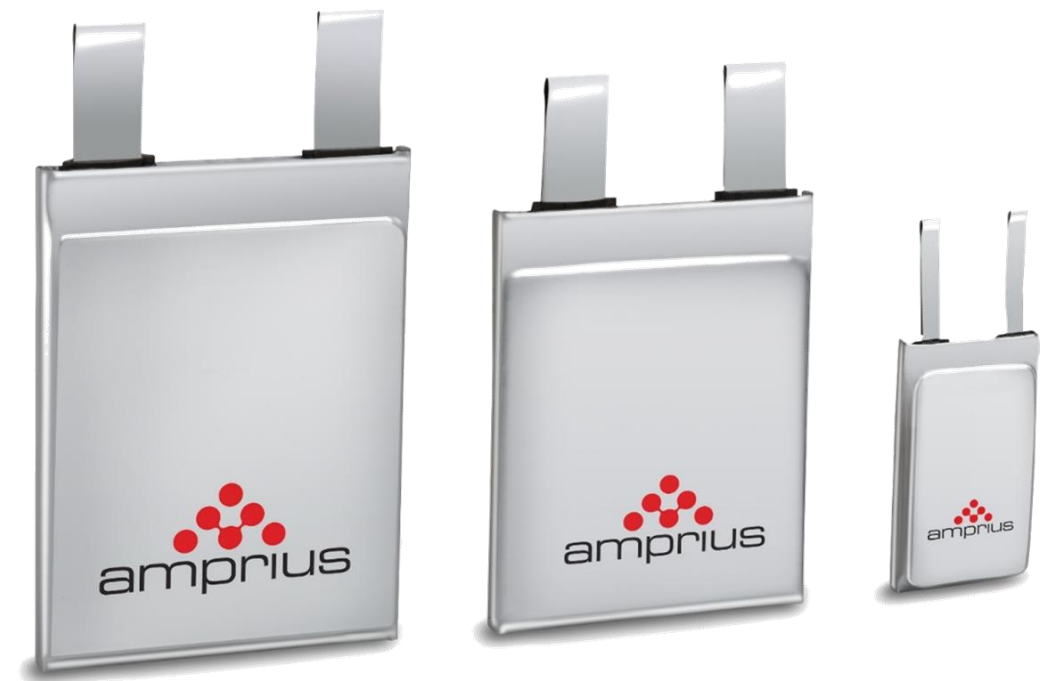
100%
Silicon Anode
Technology⁽¹⁾

30+
Customers
Validated
Performance

Up to **80%**
Higher Energy
Density than
Conventional
Batteries

75
Patents⁽²⁾

AIRBUS Airbus Defence and Space
2021 Innovative Supplier of
the Year Award



World Changing Ideas
2022 Finalist
Fast Company

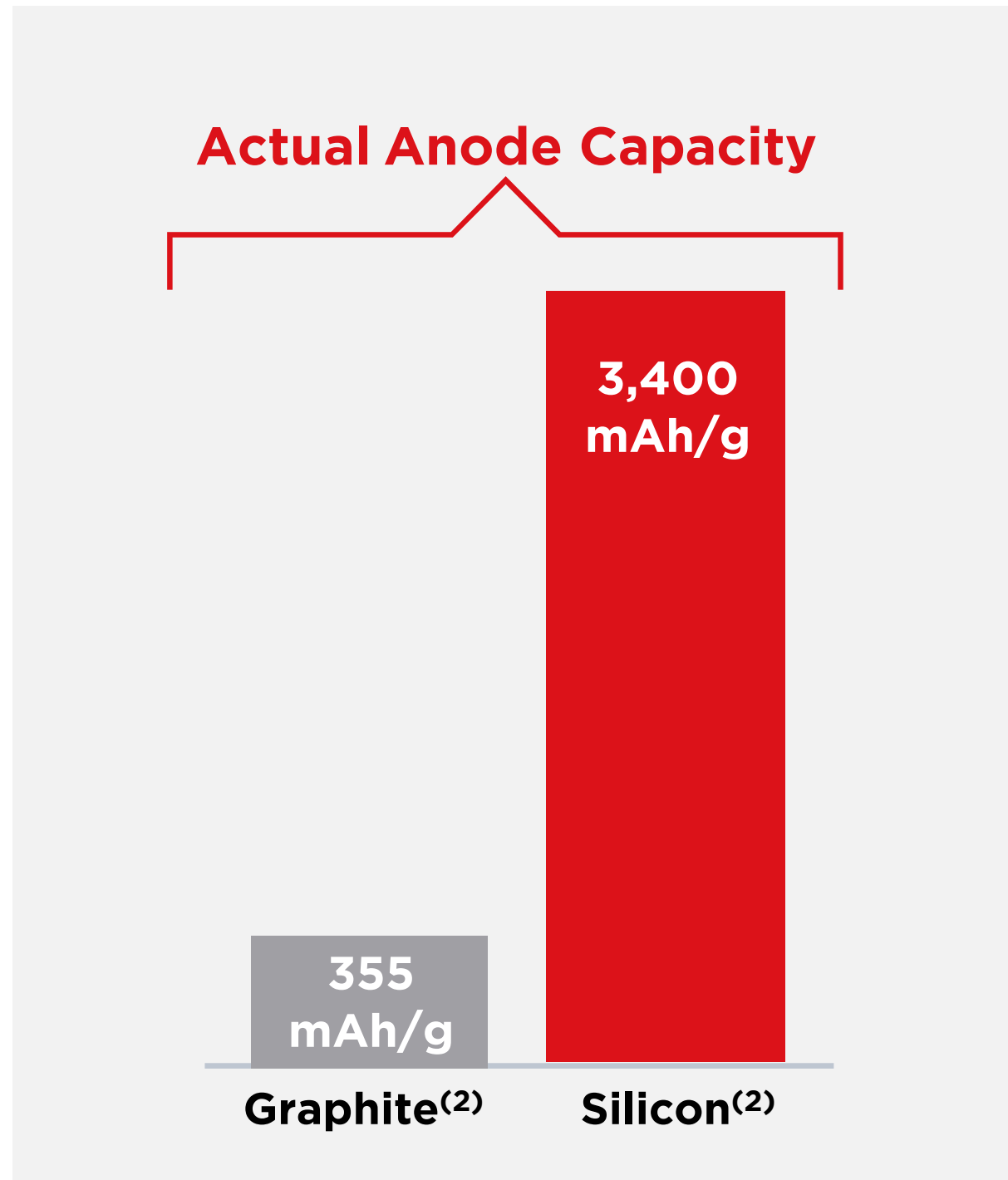


USABC Low Cost, Fast Charging
Silicon Nanowire Cell Technology
Contract Award

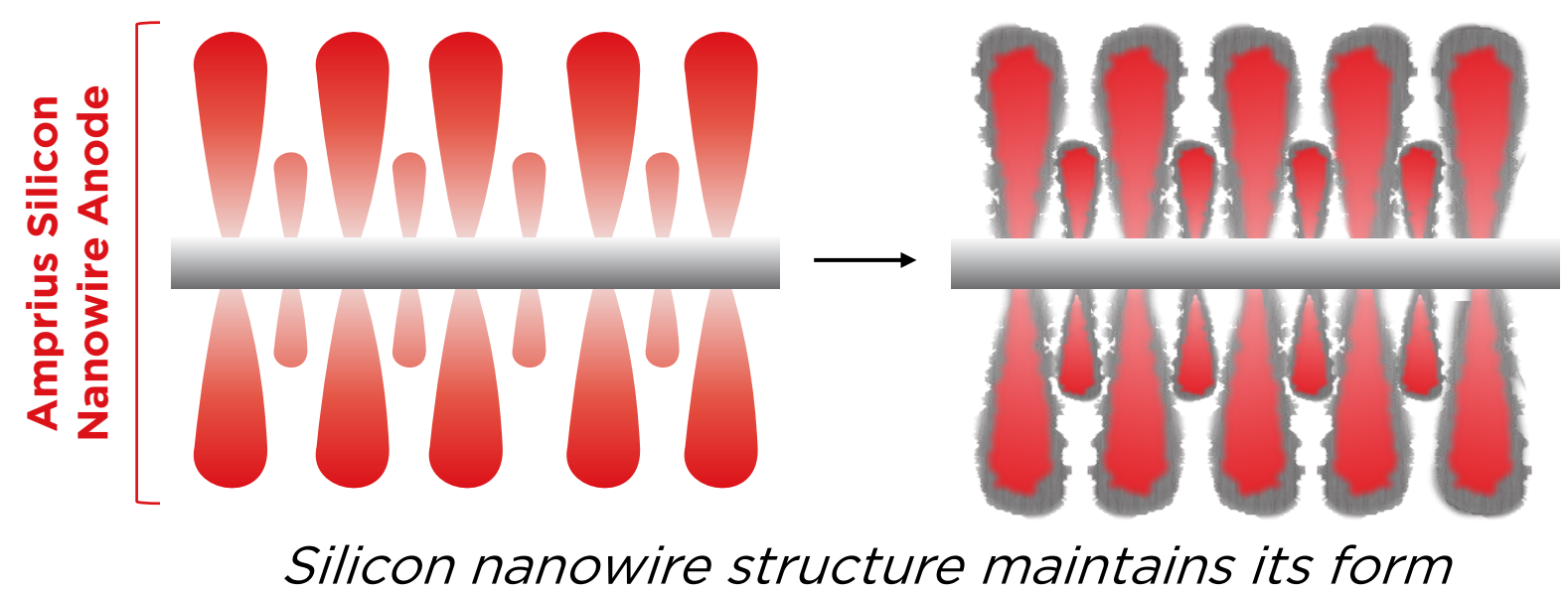
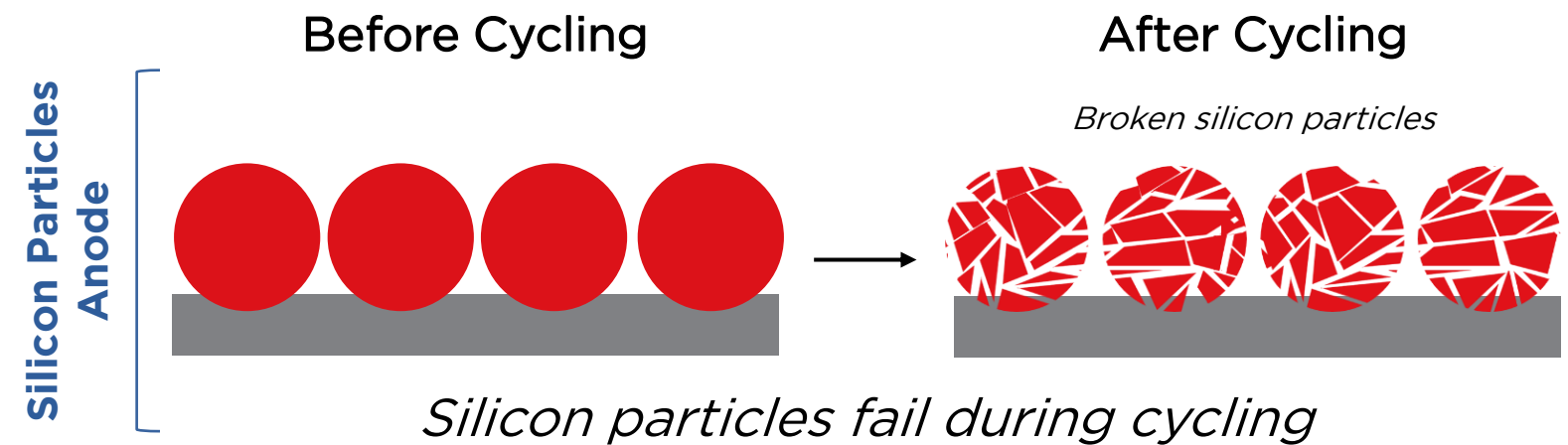
(1) Actual percentage of silicon is 99.5-99.9% which is within the range of acceptable purity levels for materials that are considered 100%.

(2) As of April 28, 2022, 62 patents had been issued (29 in the U.S. and 33 in the EU, Korea, Japan, China, Taiwan and Israel), 11 patents are pending (6 in the U.S. and 5 in the EU, Japan, Korea, Taiwan and China) and 2 issued U.S. patents are licensed from Stanford University.

Why Silicon? 100% Silicon Anode⁽¹⁾ Has ~10x Capacity vs. Graphite



Silicon anode can swell up to ~300% causing battery damage after a few cycles



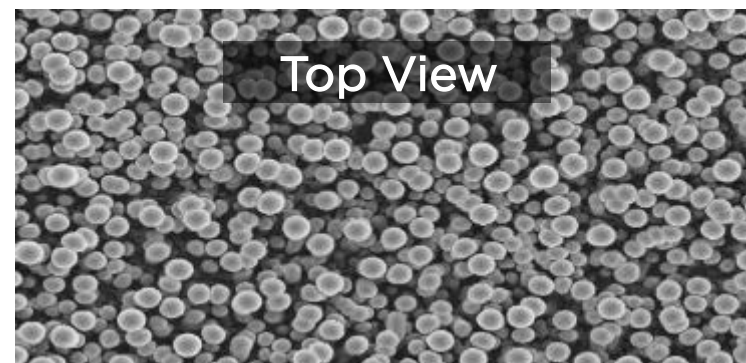
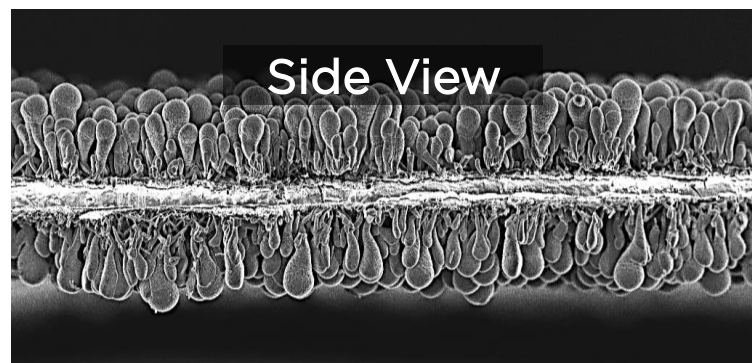
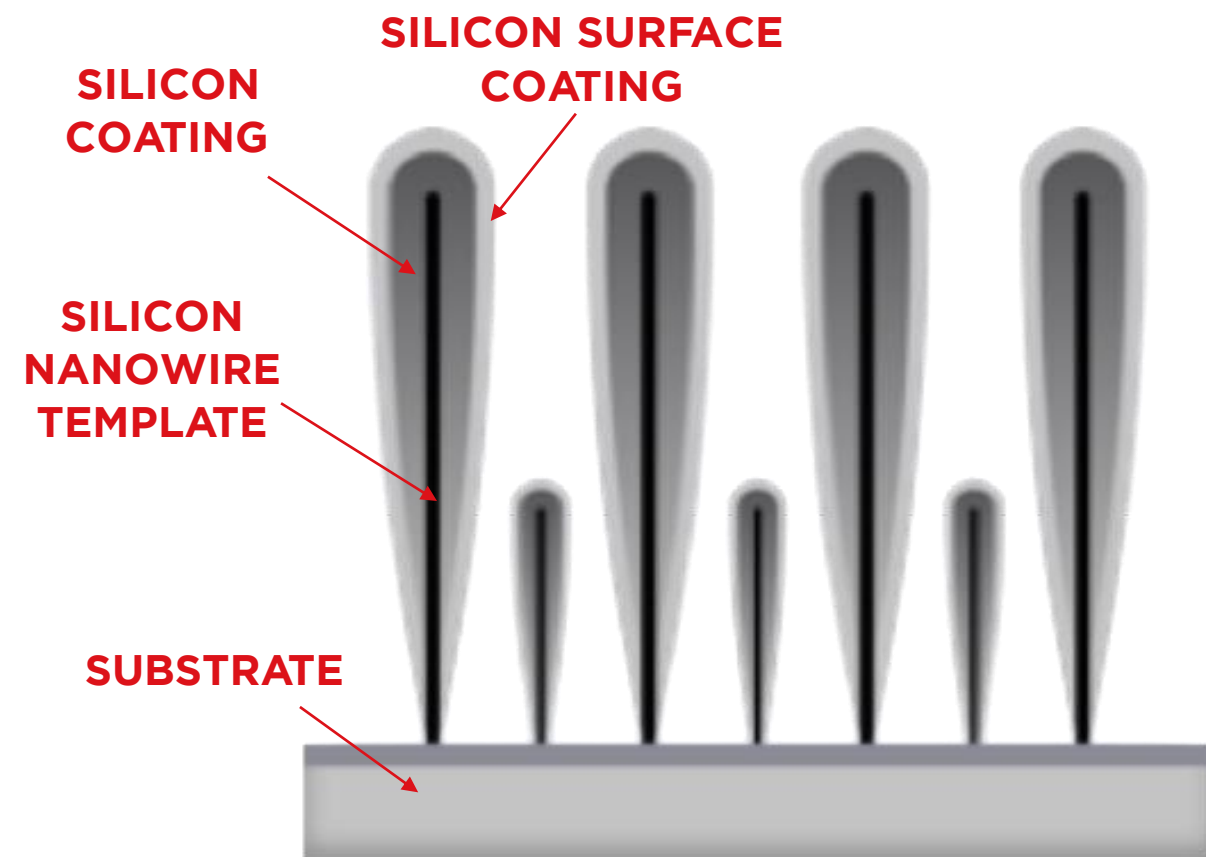
(1) Actual percentage of silicon is 99.5-99.9% which is within the range of acceptable purity levels for materials that are considered 100%.

(2) Based on Ampricus measurements in half cells.

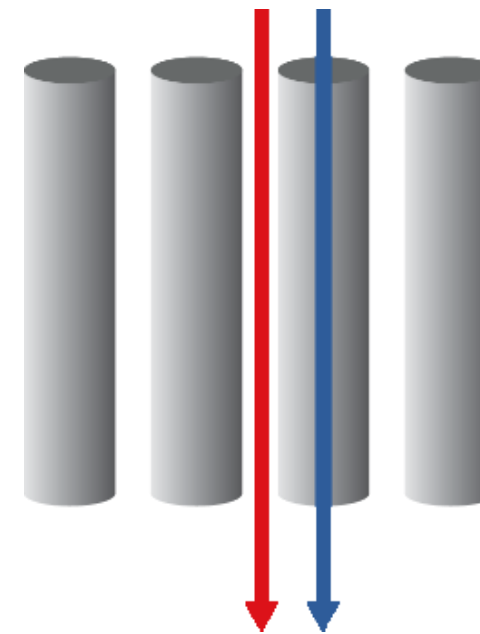
SILICON ANODE STRUCTURE

Amprius Solved the #1 Problem with Silicon Anodes

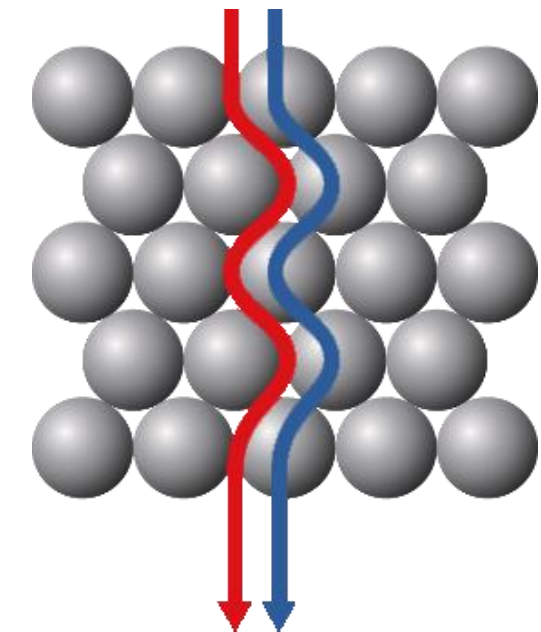
100% Silicon Nanowires⁽¹⁾ Allow Volume Expansion without Binders, Graphite or any Inactive Materials



Silicon Nanowires



Conventional Graphite (and/or Silicon) Particles



- *Spacing between nanowires and silicon porosity accommodate silicon volume expansion*
- *Ions and electrons travel straight paths*
- *Most conductive path for ions and electrons results in **high power capability and fast charge rate***

(1) Actual percentage of silicon is 99.5-99.9% which is within the range of acceptable purity levels for materials that are considered 100%.

MANUFACTURING PROCESS

Amprius Utilizes Existing Commercial Manufacturing Processes

Cathode and Assembly Processes are Unchanged; the Only Change is to the Anode Manufacturing Line

SILICON NANOWIRE ANODE



SILICON NANOWIRE ANODE BATTERY ASSEMBLY



Slitting



Stacking



Formation



BATTERY CATHODE



Mixing



Coating



Calendaring

SILICON NANOWIRE ANODE MANUFACTURING LINE

TRADITIONAL BATTERY MANUFACTURING LINE

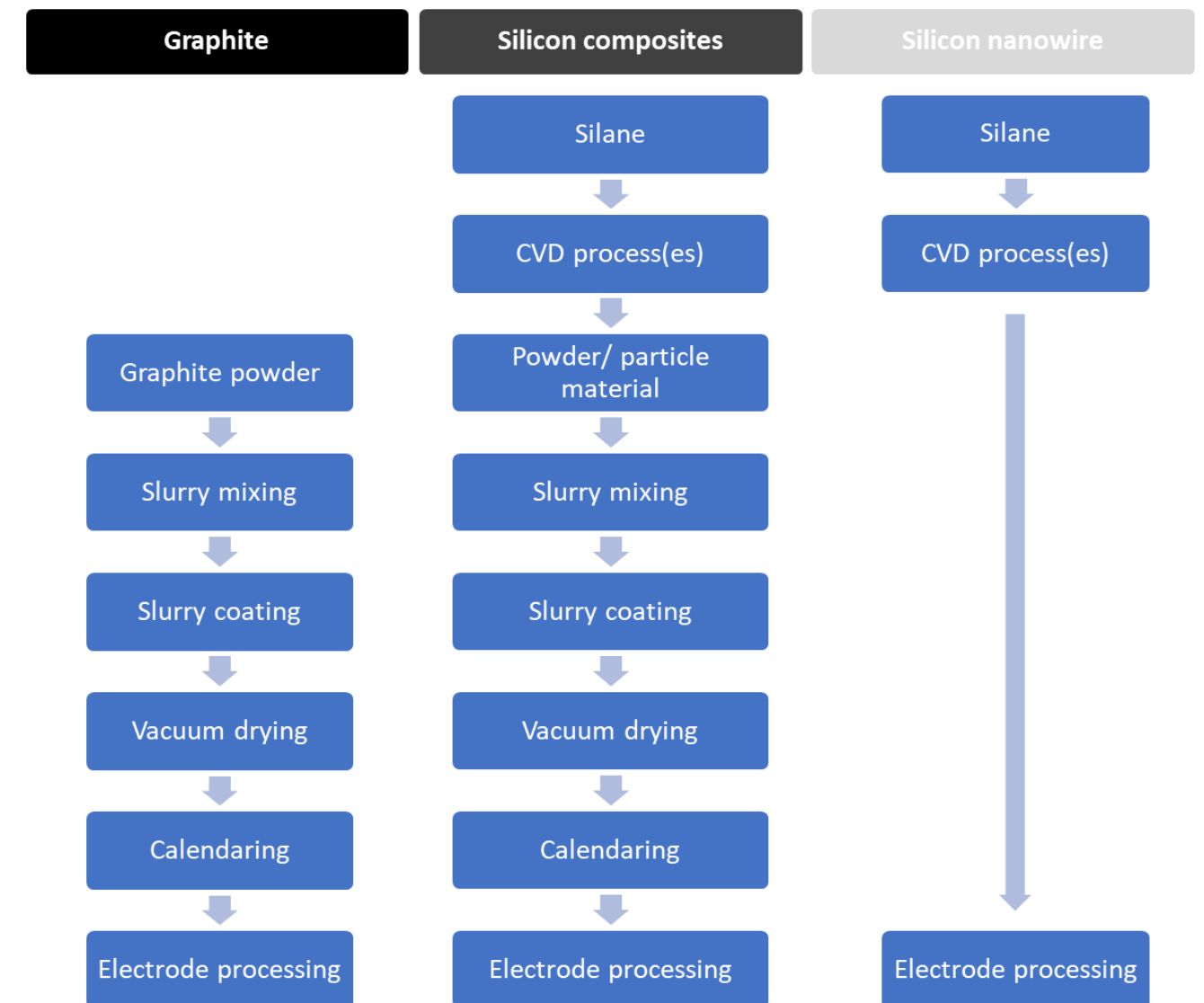
HIGH-VOLUME MANUFACTURING: DIRECT GAS-TO-ELECTRODE ANODE PRODUCTION

Equipment Designed for GWh-Scale Production

Foil + Gases = Finished Anode



Centrotherm equipment, well-established equipment provider



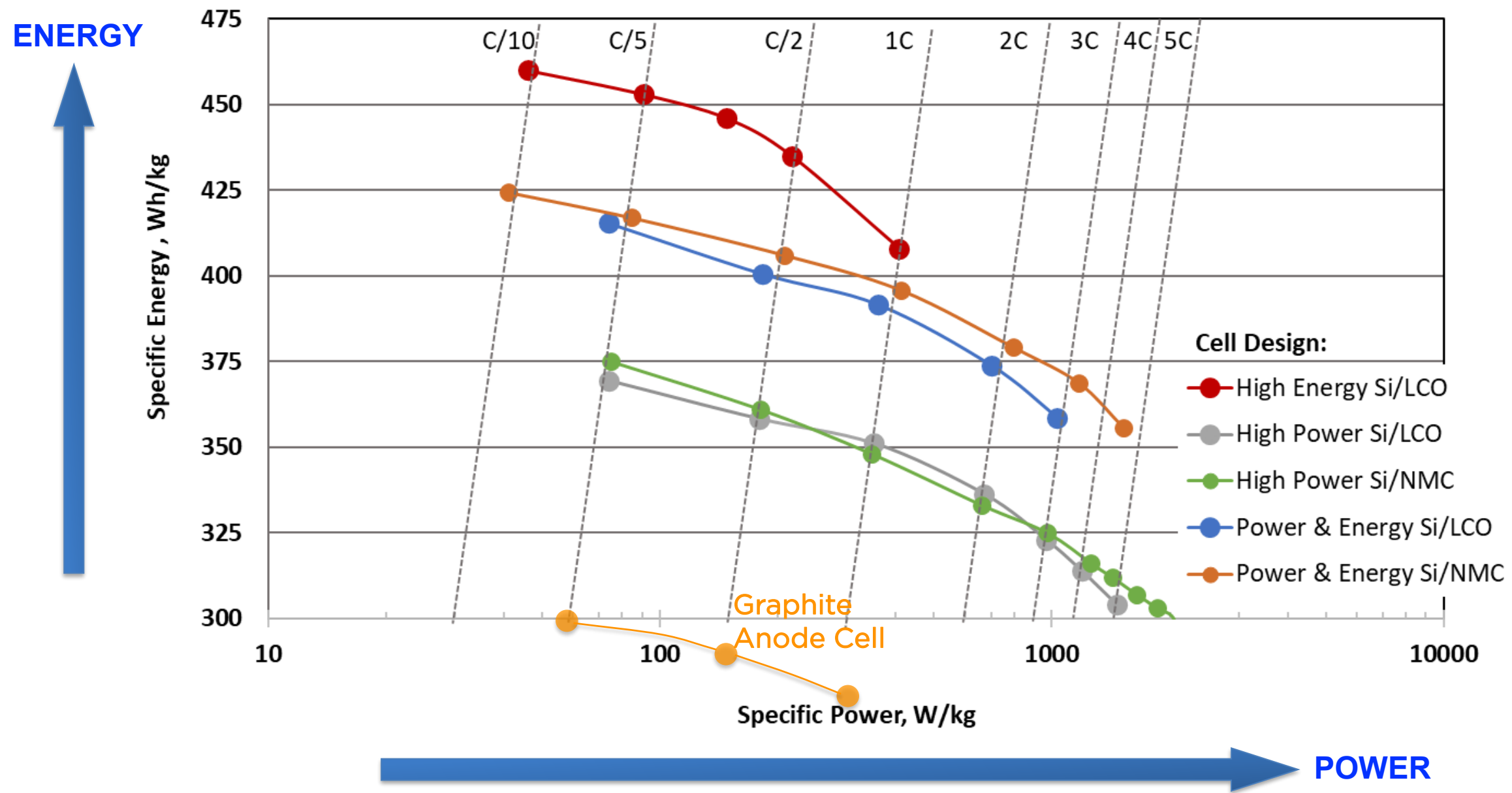
Simple process steps with high precursor utilization

Products and Applications

HIGH ENERGY AND POWER DENSITIES

Minimal trade off between specific energy and specific

Silicon Nanowire Power & Energy platforms



EXAMPLE AMPRIUS PRODUCTS

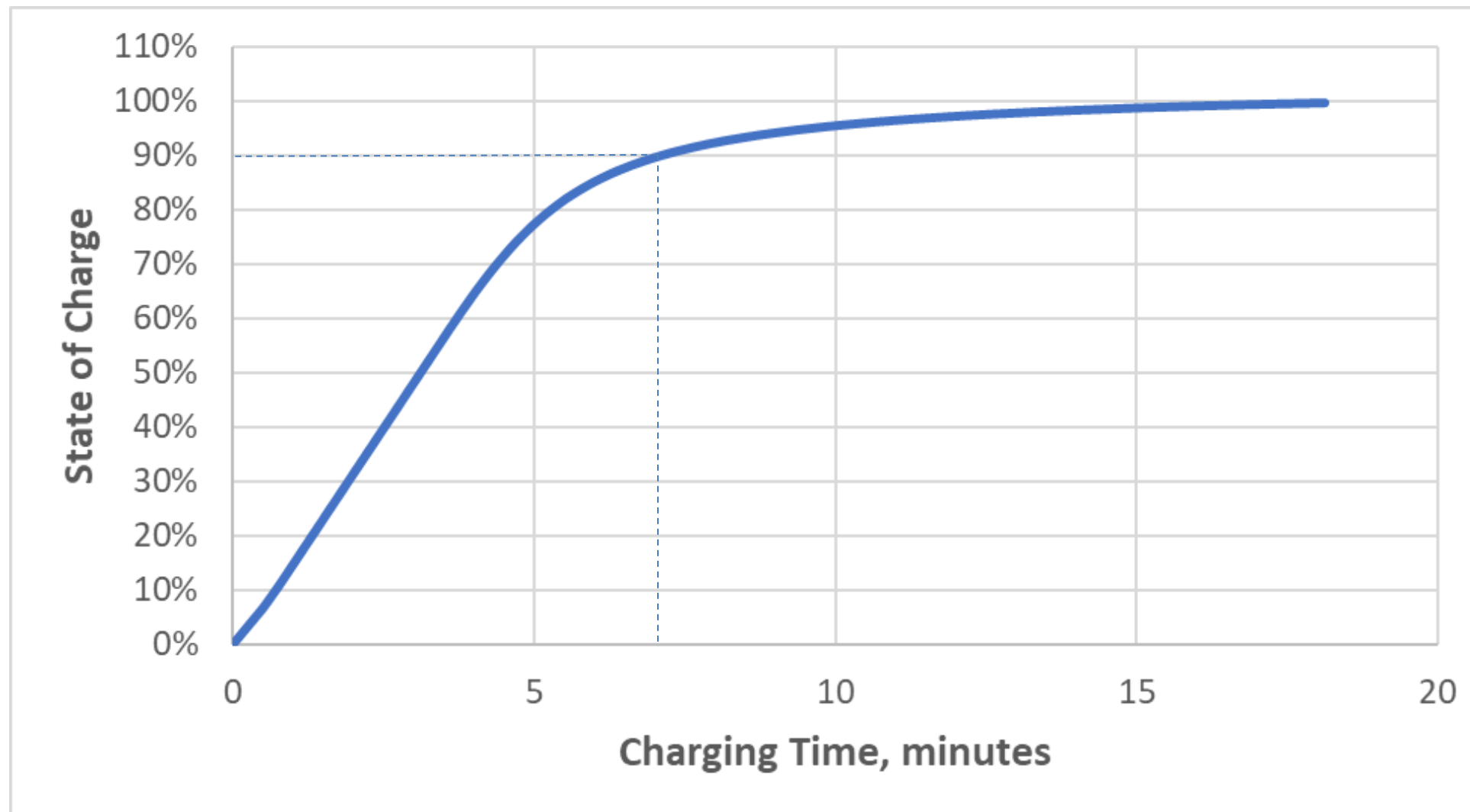
High Power capability with high energy density and specific energy

Applications	HAPS, portable power, CE	Long Endurance Drones, eVTOL, UAM	High power drones	EV, Electric Flight	High power drones, eVTOL
Dimensions (T x W x H) mm	Si/LCO Platforms			Si/NMC Platforms	
	High Energy 0.5C max rate	Power-Energy 3C max rate	High Power 5C max rate	Power-Energy 4C max rate	High Power 6C max rate
4.5 x 50 x 55	420 Wh/kg 1125 Wh/L	415 Wh/kg 1040 Wh/L	370 Wh/kg 920 Wh/L	410 Wh/kg 950 Wh/L	370 Wh/kg 820 Wh/L
5.4 x 54 x 65	450 Wh/kg 1150 Wh/L	420 Wh/kg 1050 Wh/L		420 Wh/kg 970 Wh/L	
4.5 x 50 x 105	430 Wh/kg 1240 Wh/L				

Operating temperature range: -30°C to 55°C. Cycle life 200-1200 cycles, depending on operating conditions

Enable Extreme Fast Charge (XFC) - 5-minute charging to 80%

2.8Ah cell, 370Wh/kg, 920Wh/L

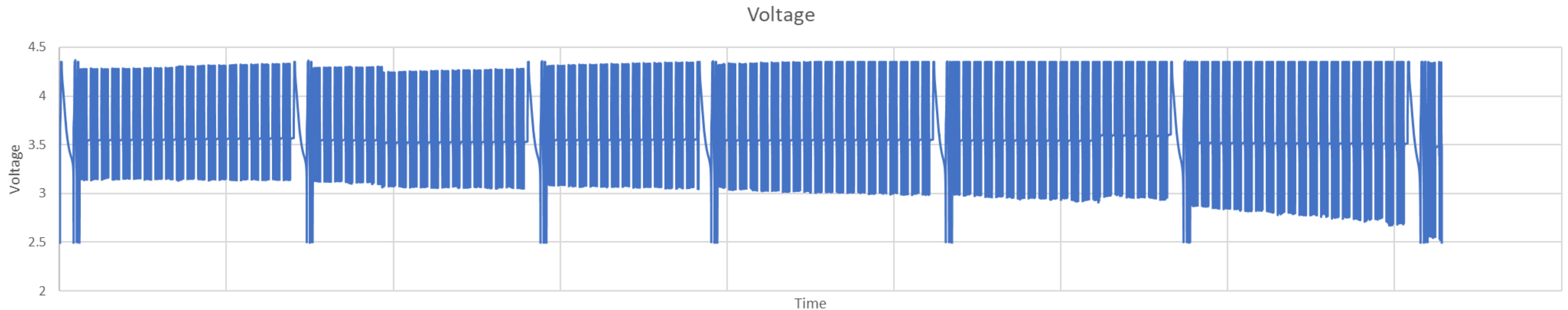


Time	SOC
5 min	78%
6 min	85%
7 min	90%
18 min	100%

Allows fast turn-around in UAM applications

Long cycle life in eVTOL flight protocol

30-45 minutes trips, 15 minutes charge, 8-12 trips per day

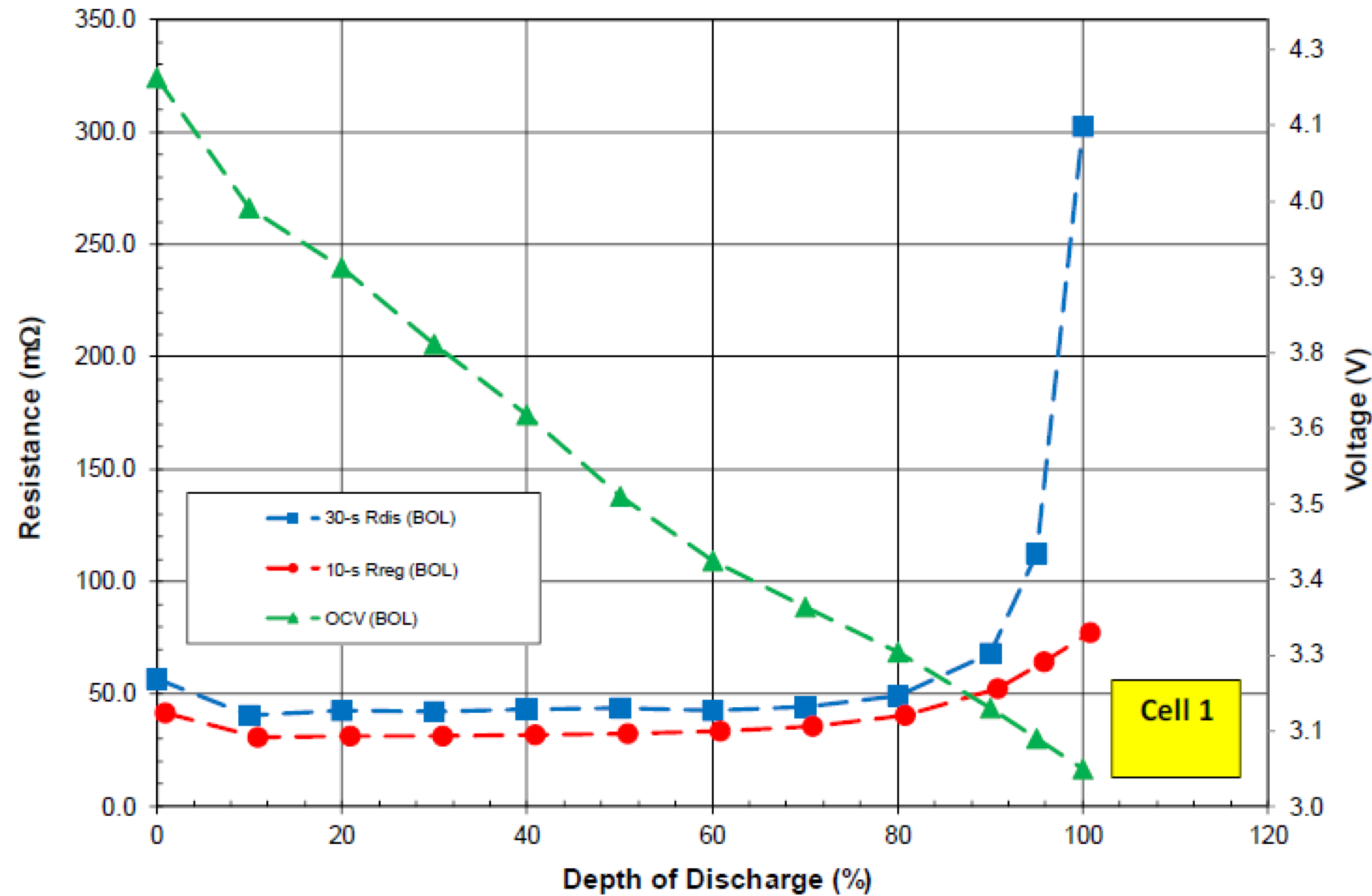


Constant power (eVTOL/Uber protocol): 2E charge, 1E discharge, 4E pulses (E=full energy), ~60% energy cycled; RPT every 200 cycles

1200 cycles performed with full power capability; 90% capacity available at end of test

Low DCIR, flat resistance profile

Pulse Resistance and OCV



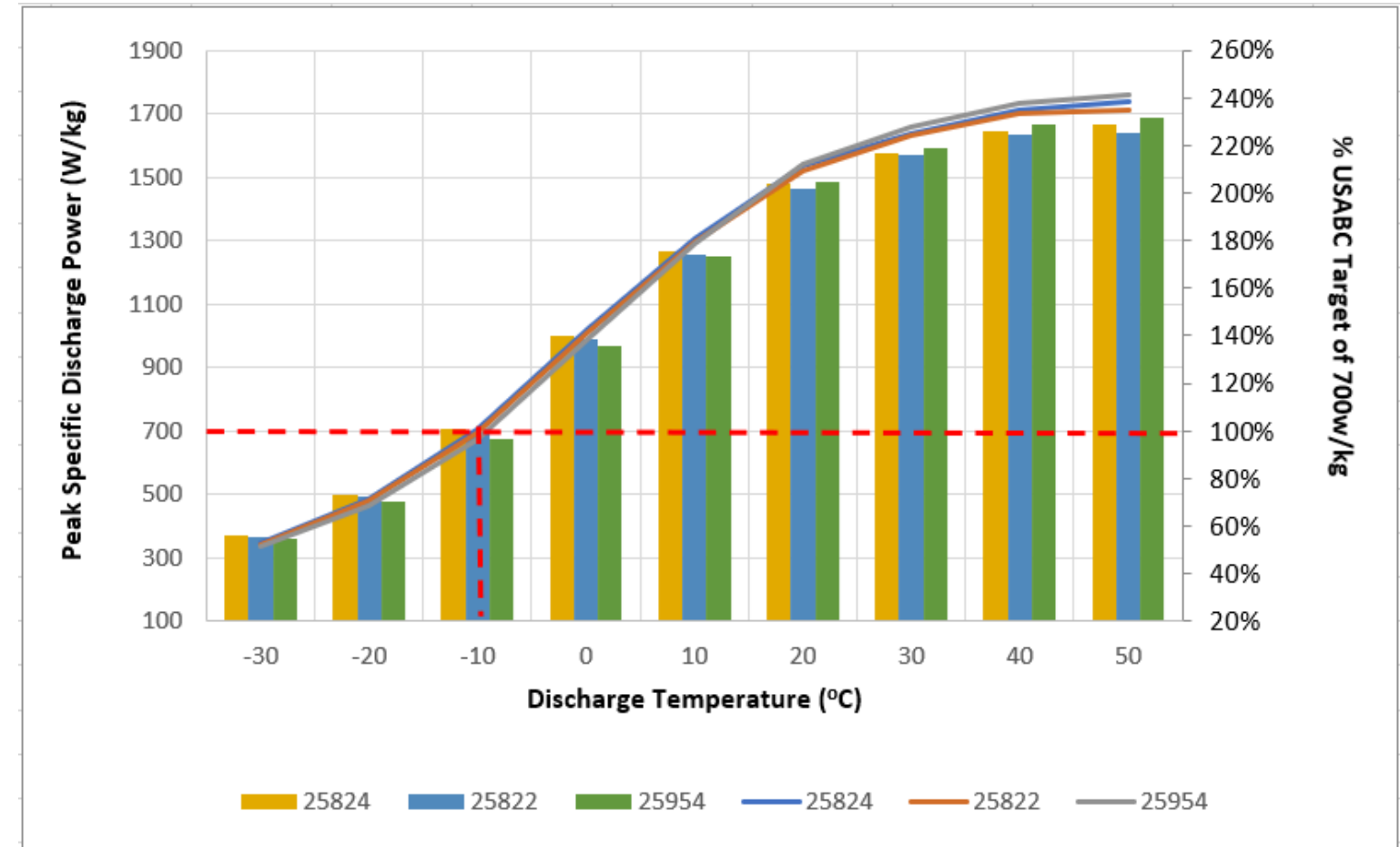
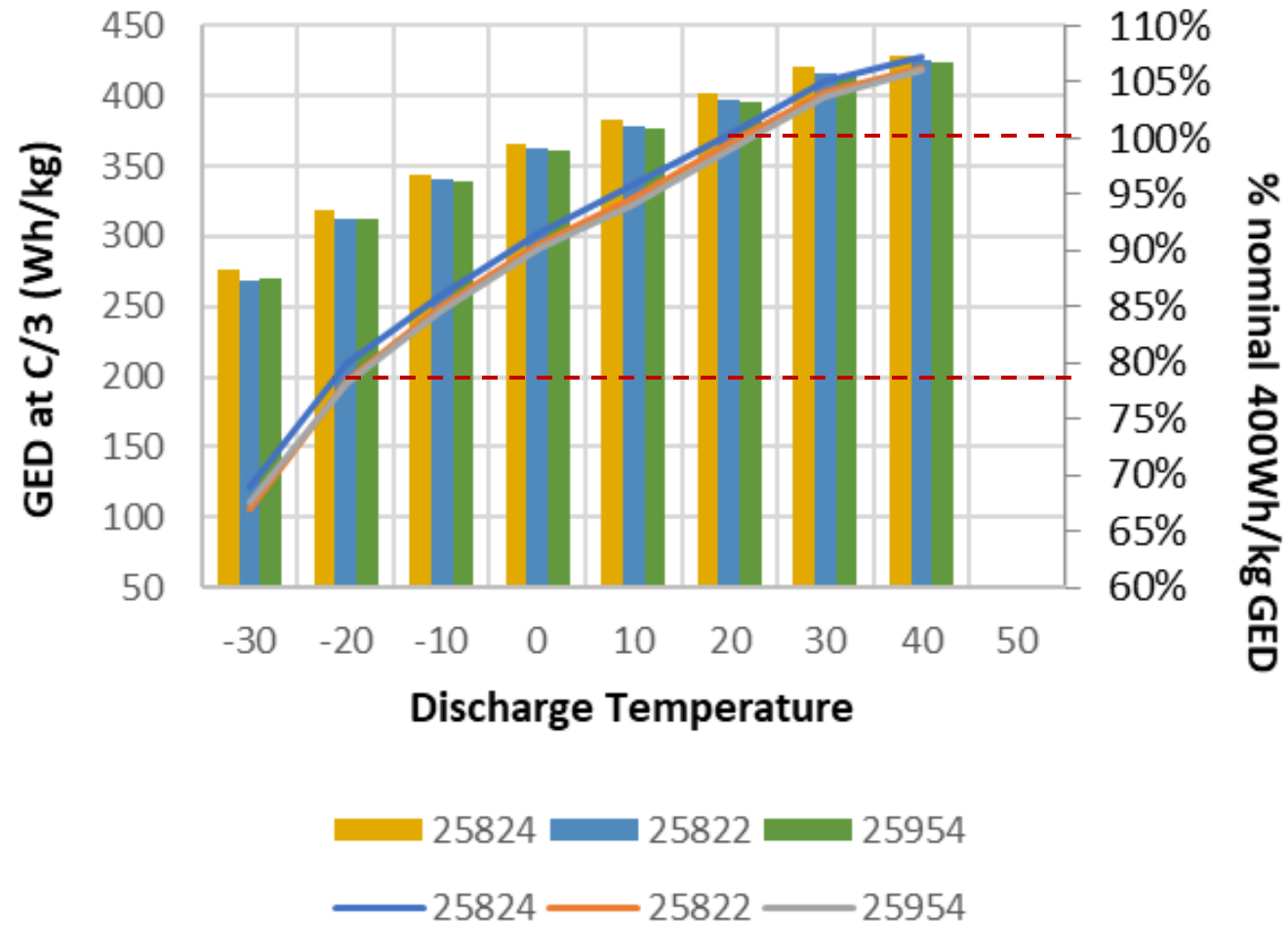
At 20% SOC:

1500 W/kg
3400 W/L

3.7Ah cell, Si/NMC811, 410 Wh/kg

AMPRIUS CELLS - LOW TEMPERATURE

Reduced loss at low temperature



~80% energy available at -20°C

700 W/kg power available at -10°C

3.7Ah cell, Si/NMC811, 410 Wh/kg

Nail Penetration Test (MIL-PRF-3288A) (third party data)

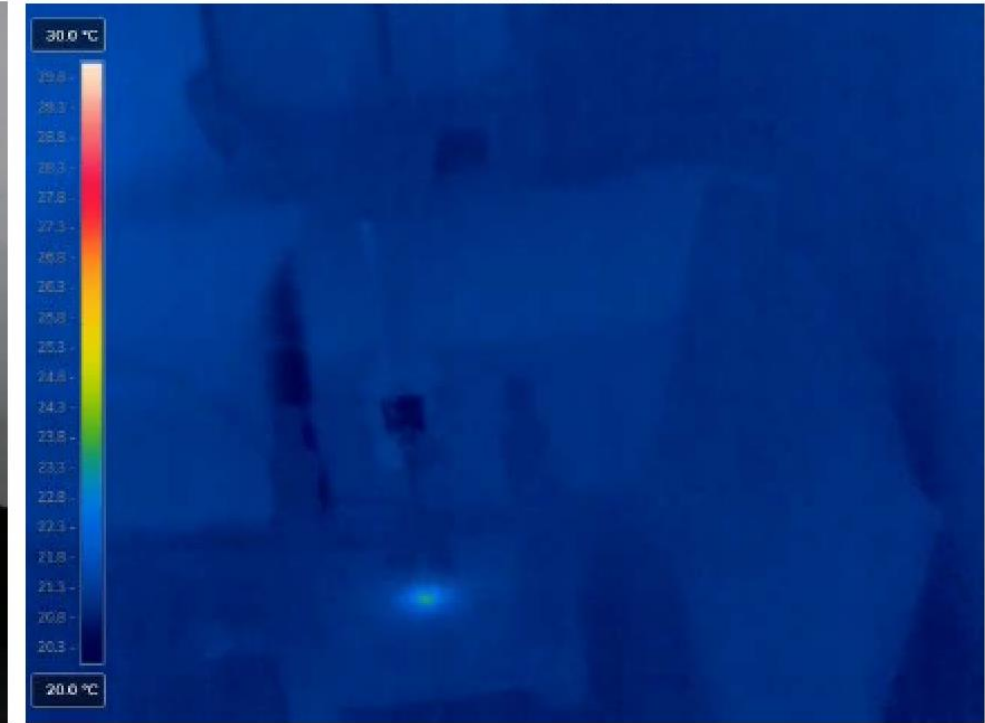
Front View



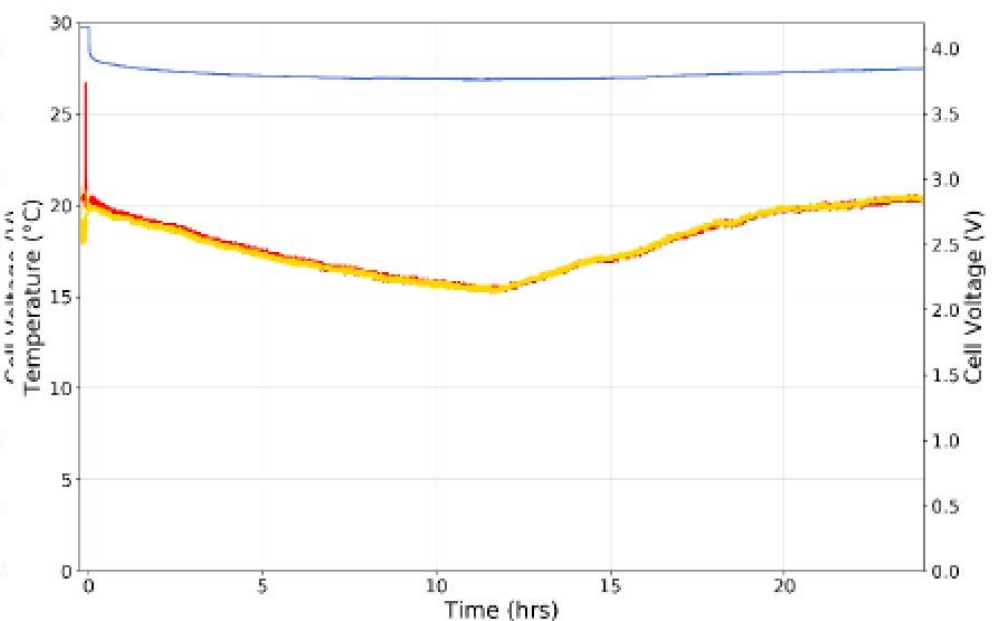
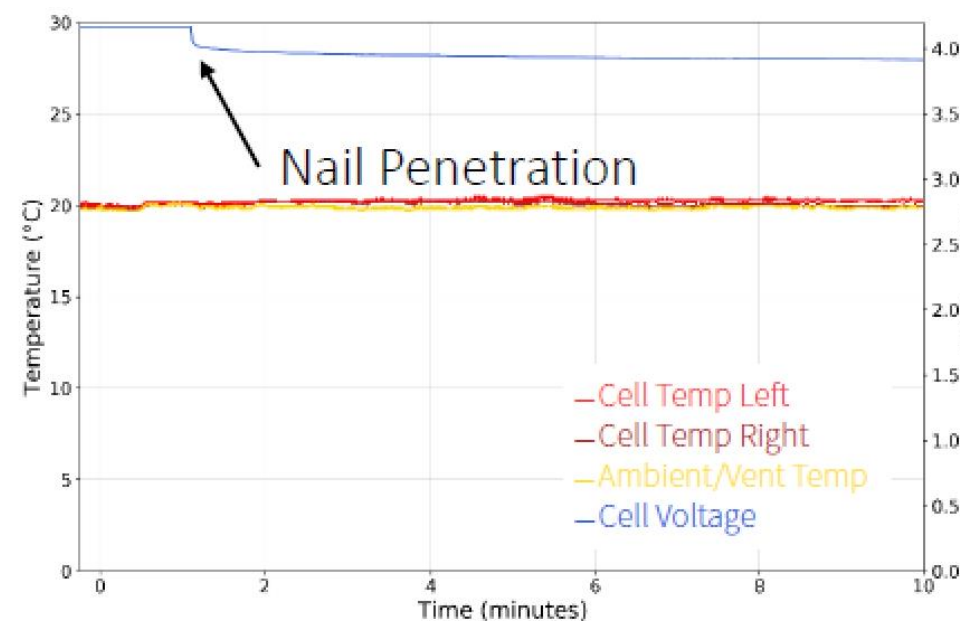
Side View



IR Camera



- Cell 33409 did not go into thermal runaway after nail penetration.
- The voltage decreased 266 mV to ~3.900 V upon nail penetration.
- No temperature increase was observed in the 10 minutes immediately after nail penetration.
 - The max temperature recorded over the 24 hour period was 26.7 °C, which occurred when the cell was moved from the test apparatus.



2.7Ah cell, Si/NMC811, 390 Wh/kg

Electric Flight Applications Enabled by Amprius' Batteries

	Unmanned Aerial Systems (Drones)	High Altitude Pseudo Satellites	Air Transportation
Product			
Application	Recon Drone	Stratospheric Satellite	eVTOL ⁽¹⁾
Amprius Product	<i>Balanced Energy/Power</i>	<i>High Energy</i>	<i>High Power</i>
Performance Specification	<i>1.4 Ah, 390 Wh/kg at C/5</i>	<i>5.8 Ah, 450 Wh/kg at C/10</i>	<i>15+ Ah, 380+ Wh/kg at C/5 with 6C long pulse</i>
End User Benefit	Very long endurance and increased capacity with no increase in weight or volume	Ultra long sustained flight at high altitude with max payload	eVTOL with extreme-fast charge and greatly extended service radius

(1) Actively sampling with OEMs and continuing to pursue joint development agreements.



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the support received from**

US Army, DOE, USABC, NASA, and ONR

Stay informed with Amprius news!