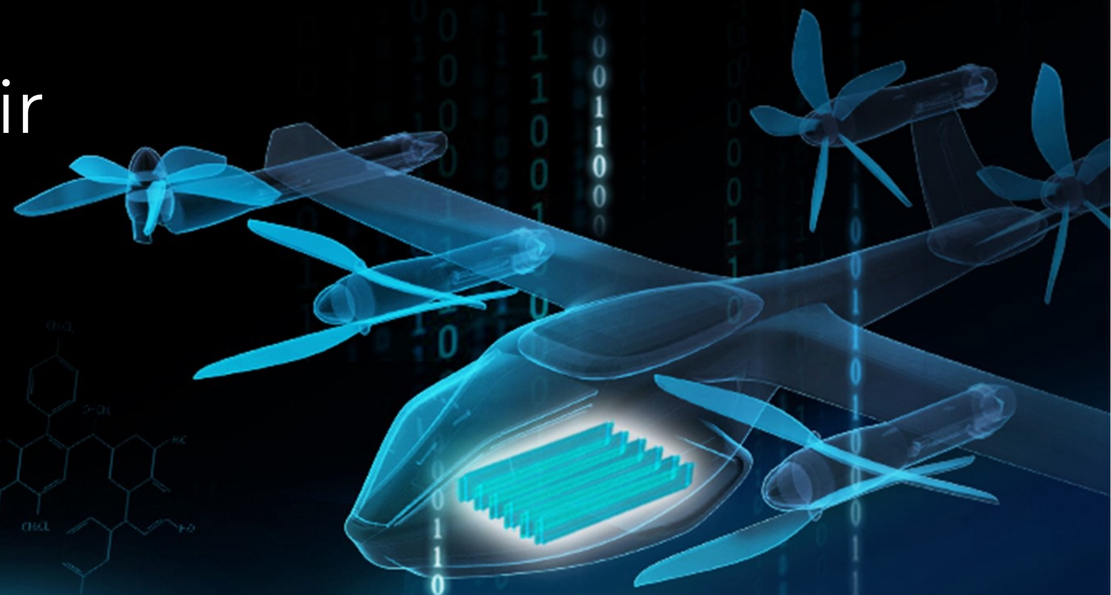
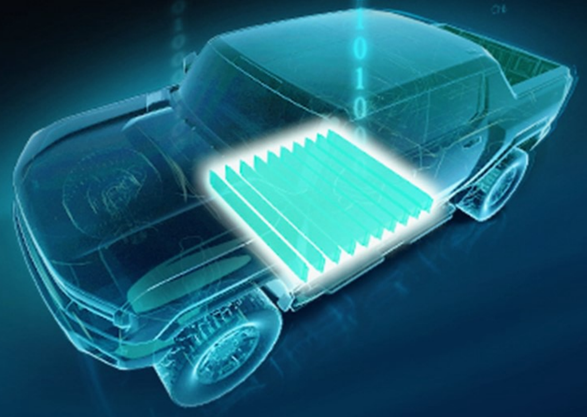
Powering a New Era of Electric Transportation on Land and in the Air with Li-Metal Batteries

AI for Science & Safety

Investor Presentation
May 2024





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The SES AI Opportunity

DIFFERENTIATED BATTERY TECHNOLOGY PLATFORM

Leading Energy Density with Proven Safety Characteristics and Supported by AI

VALIDATED BY OEM PARTNERS

Partnerships with Leading Auto and Urban Air Mobility OEMs

DESIGNED FOR MANUFACTURING AT SCALE

Industry-Leading Manufacturing Maturity Among Li-Metal Cells Today

LARGE AND GROWING TAM IN BOTH EV AND UAM

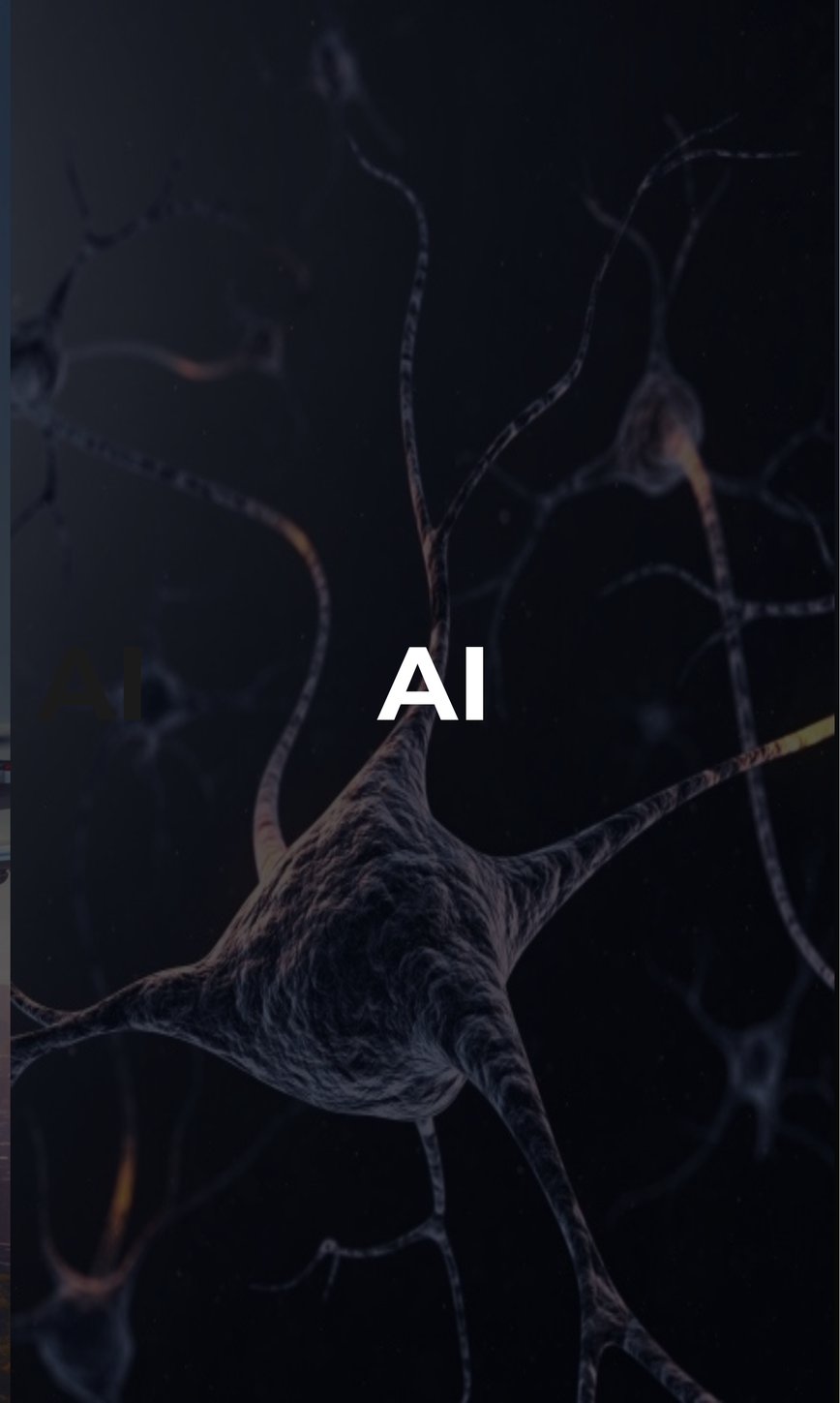
Substantial Opportunity to Increase Market Share Today and Over Longer Term

WORLD-CLASS MANAGEMENT TEAM

SES Possesses Significant Thought Leadership in EV/UAM Battery and AI Development Experience


EV


UAM


AI

Battery <> AI for Science & Safety

Prometheus
AI for Science

Mapping the universe of small molecules, building and training new deep learning foundation models, and identifying suitable candidates for next generation battery materials

Hermes
Human R&D

Mapping the solar system of small molecules, validating new candidate materials developed by both humans and AI using Electrolyte Foundry

Apollo
Human Engineering

Developing cell design rules, manufacturing process and equipment, for both internal platform and specific customer requirements (UAM, EV A/B)

Avatar
AI for Safety

Developing modules, ensuring near 100% safety guarantee in the field by building and training deep learning models with mfg quality and vehicle data

Battery <> AI for Science & Safety (Our Team)



DR. QICHAO HU

Founder, Chairman & CEO

HARVARD UNIVERSITY MIT

Forbes 30 Under 30

MIT Technology Review Innovators Under 35

PhD in Applied Physics from Harvard

BS in Physics from MIT



JING NEALIS

Chief Financial Officer

view SUNPOWER

18 years of finance experience, including at public companies.

Previously worked at View, SunPower, Shunfeng, Suntech Power and Deloitte.



DR. HONG GAN

Chief Science Officer

BROOKHAVEN NATIONAL LABORATORY ENEVATE

25 years of battery R&D experience.

Key contribution in silicon-based Li-ion and Li-S technologies.

PhD in Chemistry from Uni. of Chicago and PostDoc from Uni. of Rochester.



DANIEL LI

Chief Manufacturing Officer

A123 SYSTEMS

15 years of experience working in the lithium-ion battery industry, including in senior roles at A123.

Rich experience and perspective in cell engineering, manufacturing, quality, management and operation.



DR. KANG XU

Chief Scientist

MRS Fellow, ECS Fellow, emeritus ARL Fellow and one of the world leading researchers in electrolyte materials and interfacial science.

Published more than 350 papers in this field, with an h-index of 118, and has been recognized with many awards for the discovery of new electrolyte materials and understanding of the fundamental mechanisms.



DR. WINSTON WANG

SVP of Product Development

DJI

Managed battery R&D at DJI. Responsible for DJI's key drone smart battery and power systems launch.

PhD in Mechanical Engineering from the University of Hong Kong.



KYLE PILKINGTON

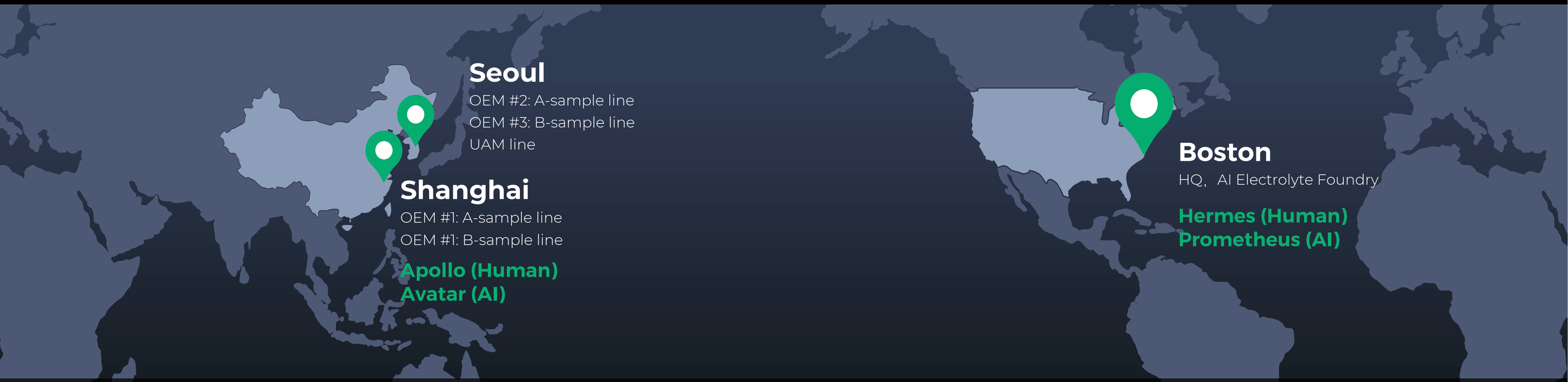
Chief Legal Officer

IGT SULLIVAN & CROMWELL

16 years of international legal experience, including in capital markets, securities law, corporate governance and M&A.

Previously worked at International Game Technology, Sullivan & Cromwell, Gibson Dunn and Baker McKenzie.

Battery <> AI for Science & Safety (Our Sites)



Seoul
OEM #2: A-sample line
OEM #3: B-sample line
UAM line

Shanghai
OEM #1: A-sample line
OEM #1: B-sample line

Apollo (Human)
Avatar (AI)

Boston
HQ, AI Electrolyte Foundry

Hermes (Human)
Prometheus (AI)



Test bunker for large automotive Li-Metal cells

2012
Est. (MIT spinoff)

Start Hermes

2017
Start Avatar

2021
Sign world's first EV A-sample (GM, Hyundai, Honda)
Start Apollo

2022
NYSE listing (NYSE: SES)

2023
Sign world's first EV B-sample

Start Prometheus

2024
Build 2 EV B-sample lines and 1 UAM line

2025
Sign world's first EV C-sample

Ship UAM cells and modules

2026
Sign world's first EV SOP

Partner with Leading Automakers

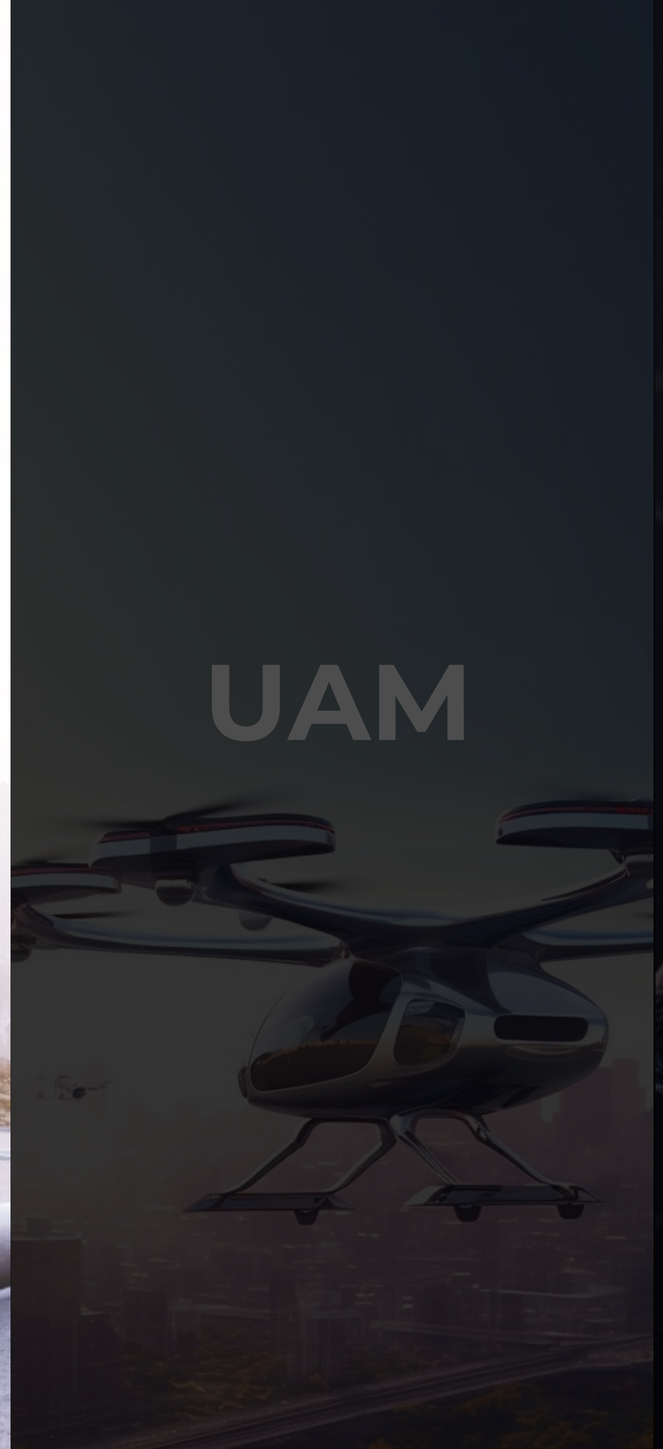
- $50MM+ JDA (March 2021)
- $60MM equity investment (since 2015)
- Joint pre-production facility (going forward)
- GM's CTO serves as a director on our Board

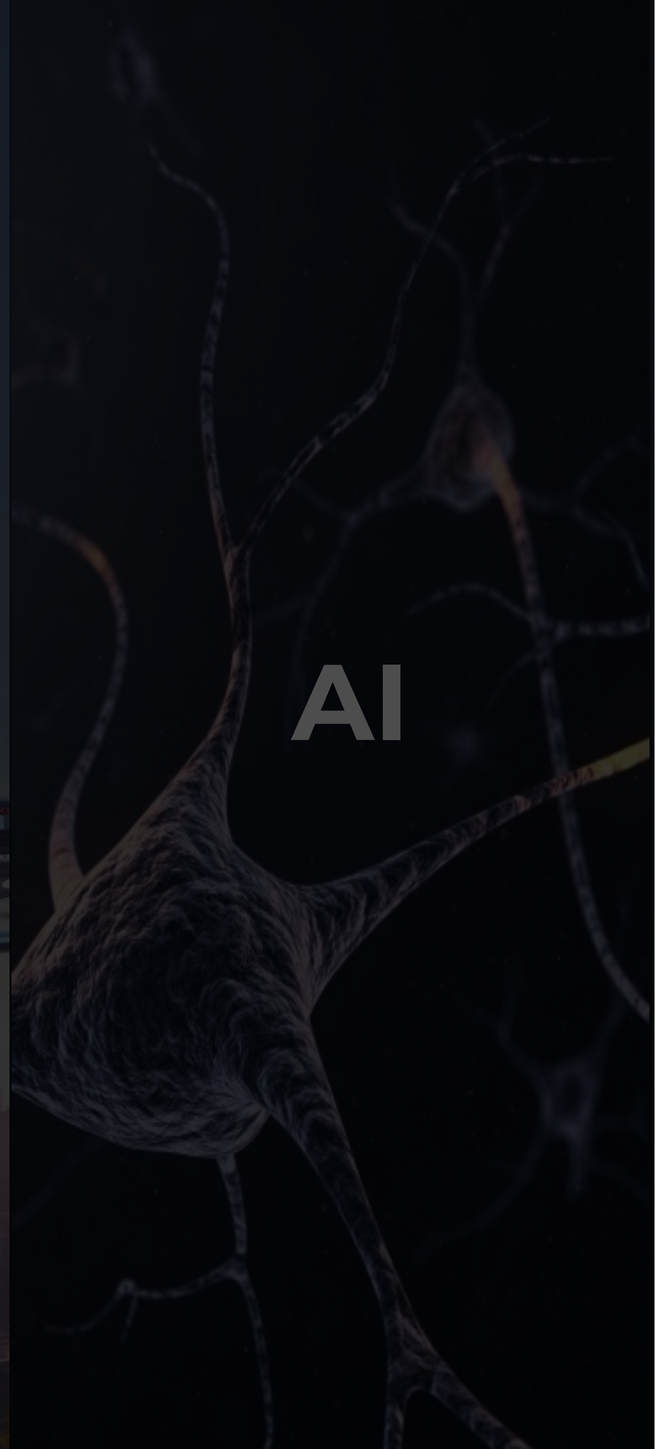
- JDA (May 2021)
- $50MM equity investment (May 2021)
- $50MM PIPE commitment (June 2021)
- Joint pre-production facility (going forward)

- JDA (January 2022)
- Largest single investor in PIPE financing -- $75 million
- 6th major global car manufacturer to invest in SES

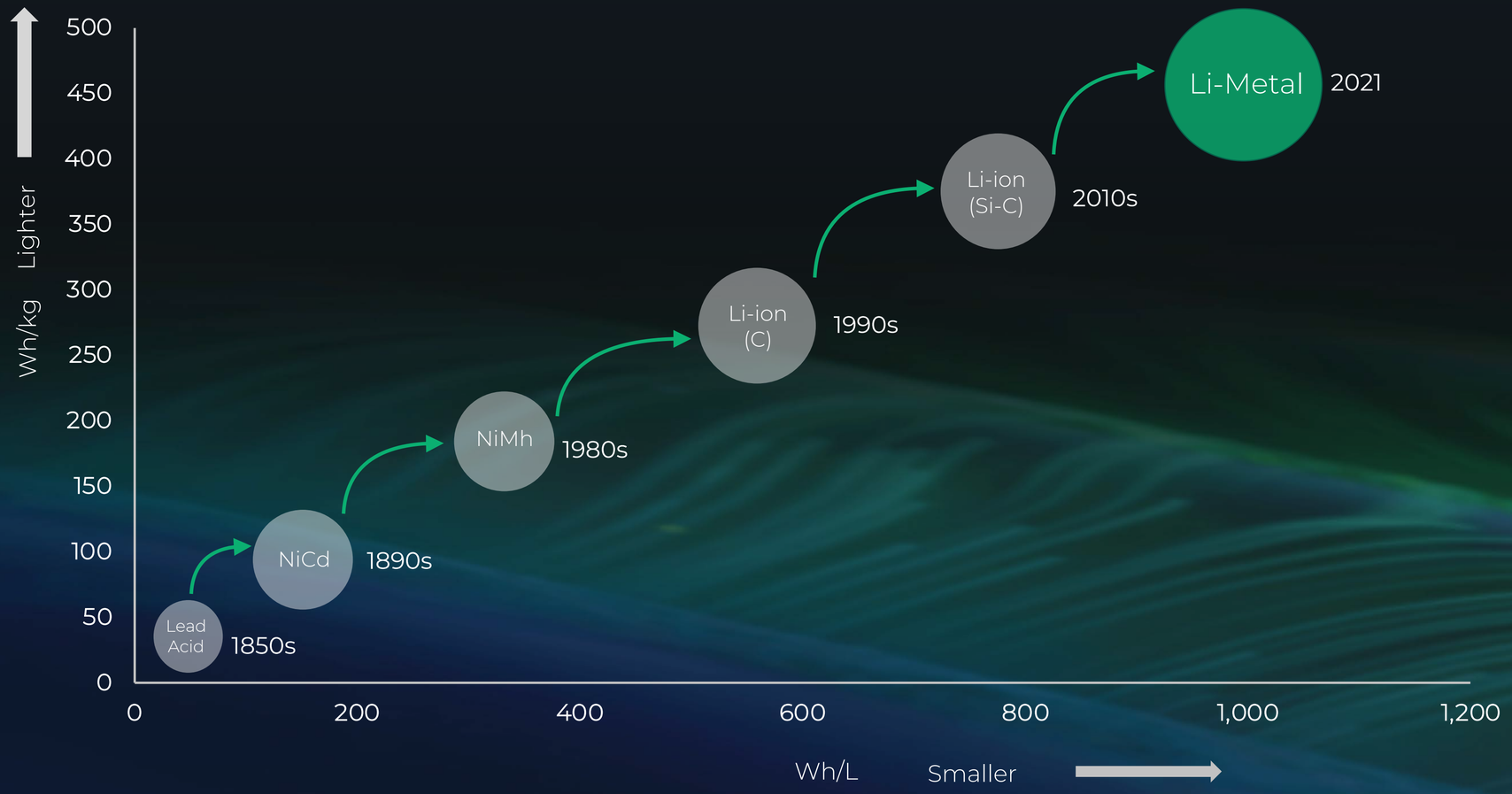
Other Investors


EV


UAM


AI

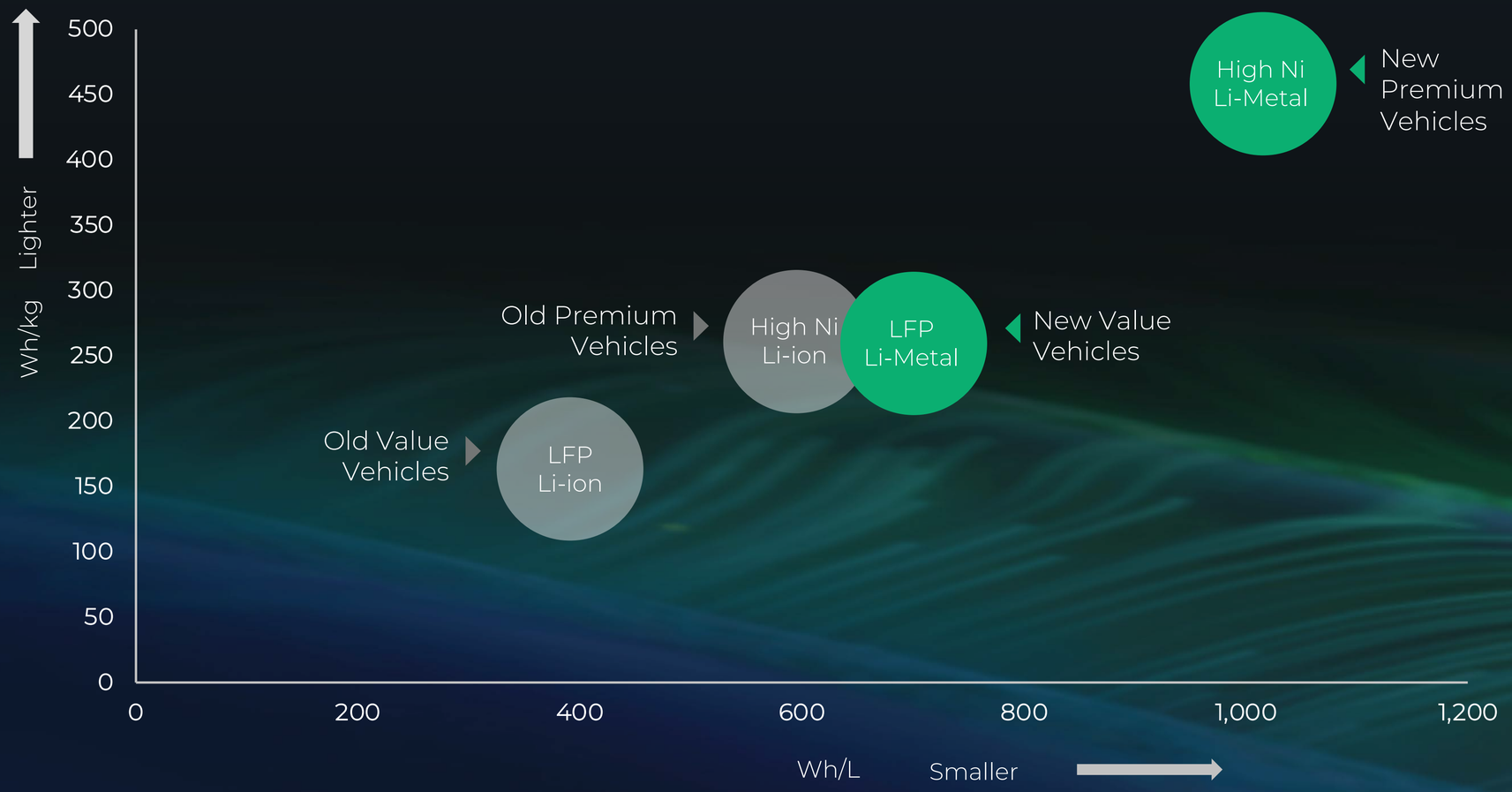
A Step-change from Li-ion Batteries



Transistor areal density: 2X every 18 months

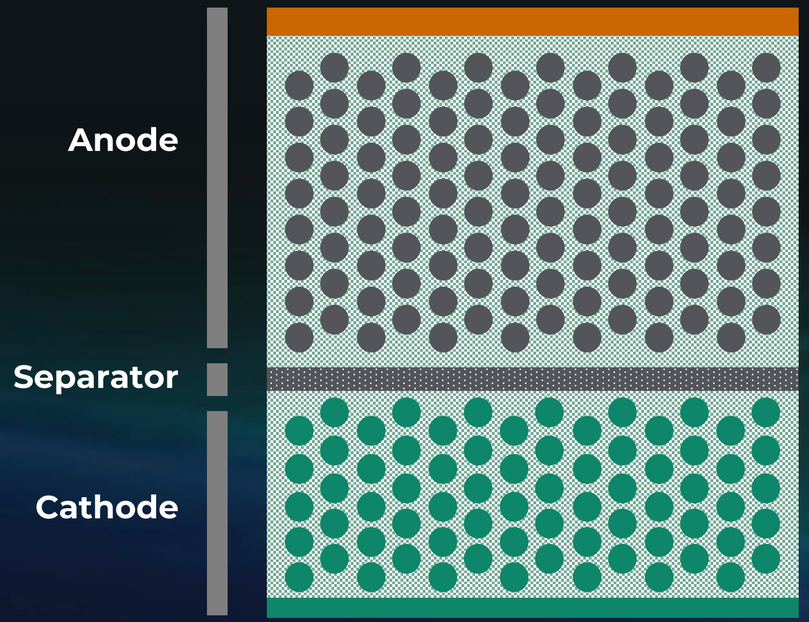
Battery energy density: 2X every 30 years

Li-Metal is the “End-Game” for EV



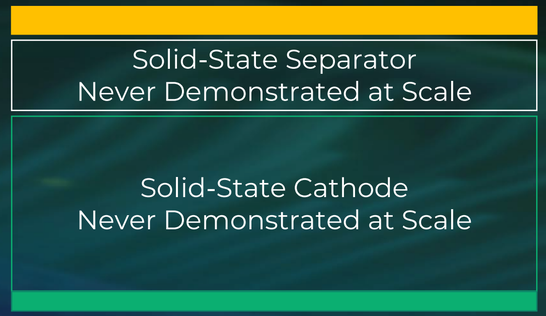
Why Liquid Li-Metal

Conventional Li-ion



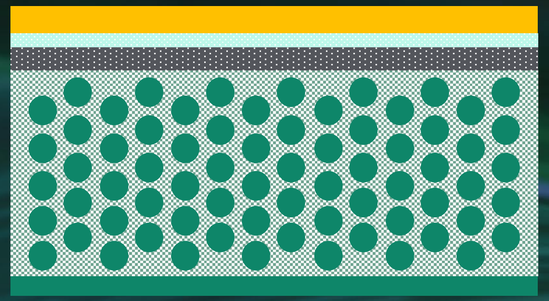
✗ Energy Density
✓ Manufacturability

All-Solid-State **Li-Metal**



✓ Energy Density
✗ Manufacturability

SES Li-Metal



✓ Energy Density
✓ Manufacturability

Li-Metal Batteries

DENSER
>400 Wh/kg and 1,000 Wh/L, providing longer range for EVs and eVTOLs

SCALABLE
Manufacturable at scale using existing Li-ion processes

LIGHTER
Ultra-thin Li-Metal anode reduces battery weight

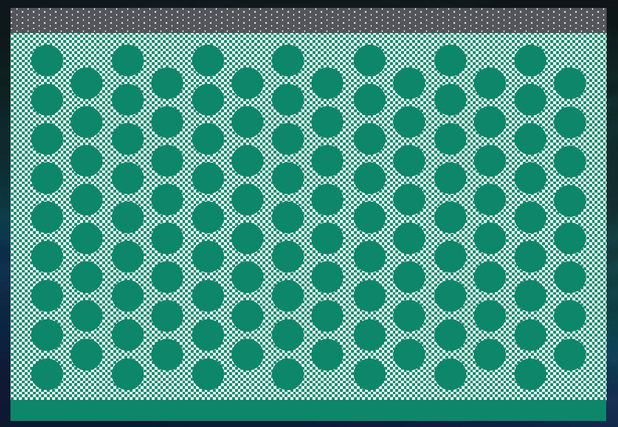
SMARTER
AI-powered algorithm monitors battery health

Superior Technology, Safety and Manufacturability



Li-Metal Batteries





Wide Format Li-Metal Anode

Composite Anode Coating

Polymer-Based Separator

Solvent-in-Salt Liquid Electrolyte Formula

- High stability on lithium metal anode and allows for high manufacturability

High-Capacity Cathode

Combined in a Proprietary Cell Design for Optimized Performance and Safety

Our Intellectual Properties

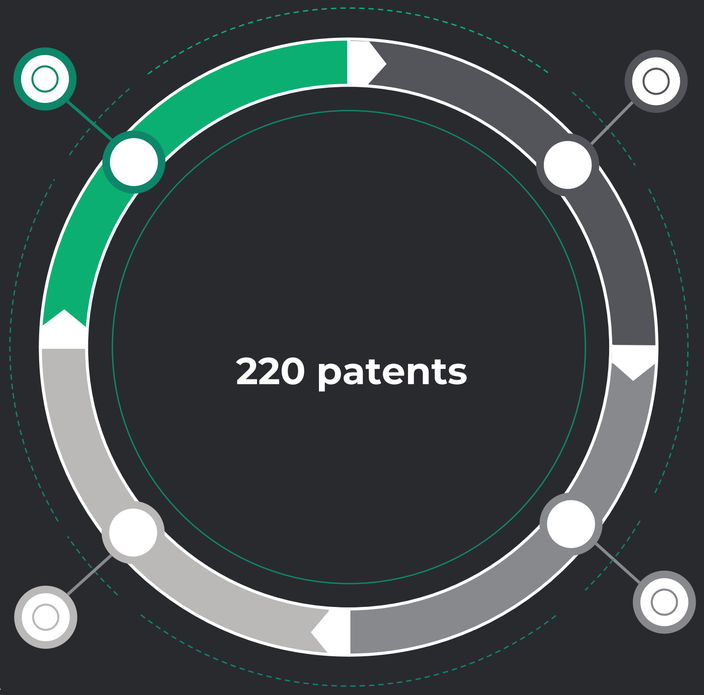


Materials

- Electrolyte
- Salt
- Anode
- Separator

AI Powered BMS

- Safety Algorithm
- Monitoring & Diagnostics



Cells/Packs/Modules

- Anode-Free
- Anode-Light
- High Energy Density
- Packs / Modules (Expandable & Constrained)

Recycling

- Mossy Lithium Recovery
- Lithium Metal Extraction

Hyundai Partnership Enters Next Phase

HYUNDAI MOTOR GROUP × SES

Hyundai has announced it will spend $51 billion over three years to bolster is growth potential in EVs and new mobility business. More than half of the investment will be for R&D infrastructure and assembly lines for EVs, including software and battery technology.

Source: Reuters, March 27, 2024

SES AI, Hyundai and Kia enter next phase of joint development

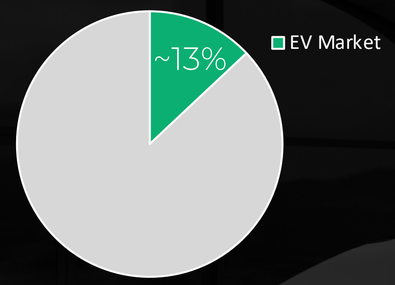
Two firsts for SES AI>>

- ***First time** a Li-Metal battery manufacturer agree to build a line within an automotive OEM's facility.*
- ***Only Li-Metal battery company** to have two B-sample development JDAs underway.*

EV TAM

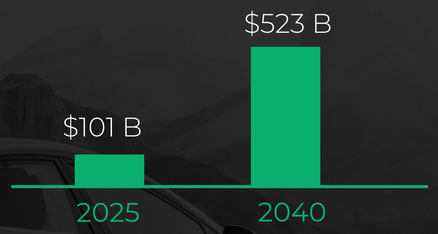
- The passenger EV battery TAM is massive with commercial EVs, drones and other applications further expanding the opportunity

- Global Light Vehicle Market



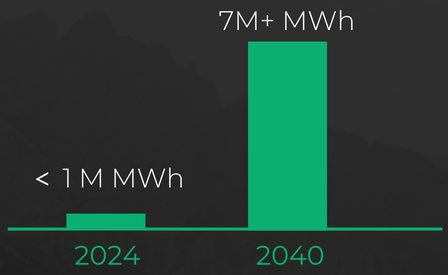
Source: Morgan Stanley, 2024

- Projected Global EV Battery TAM



Source: Morgan Stanley, 2021

- EV-Specific Battery Cell Demand Forecast



Source: Benchmark Mineral Intelligence

EV

UAM



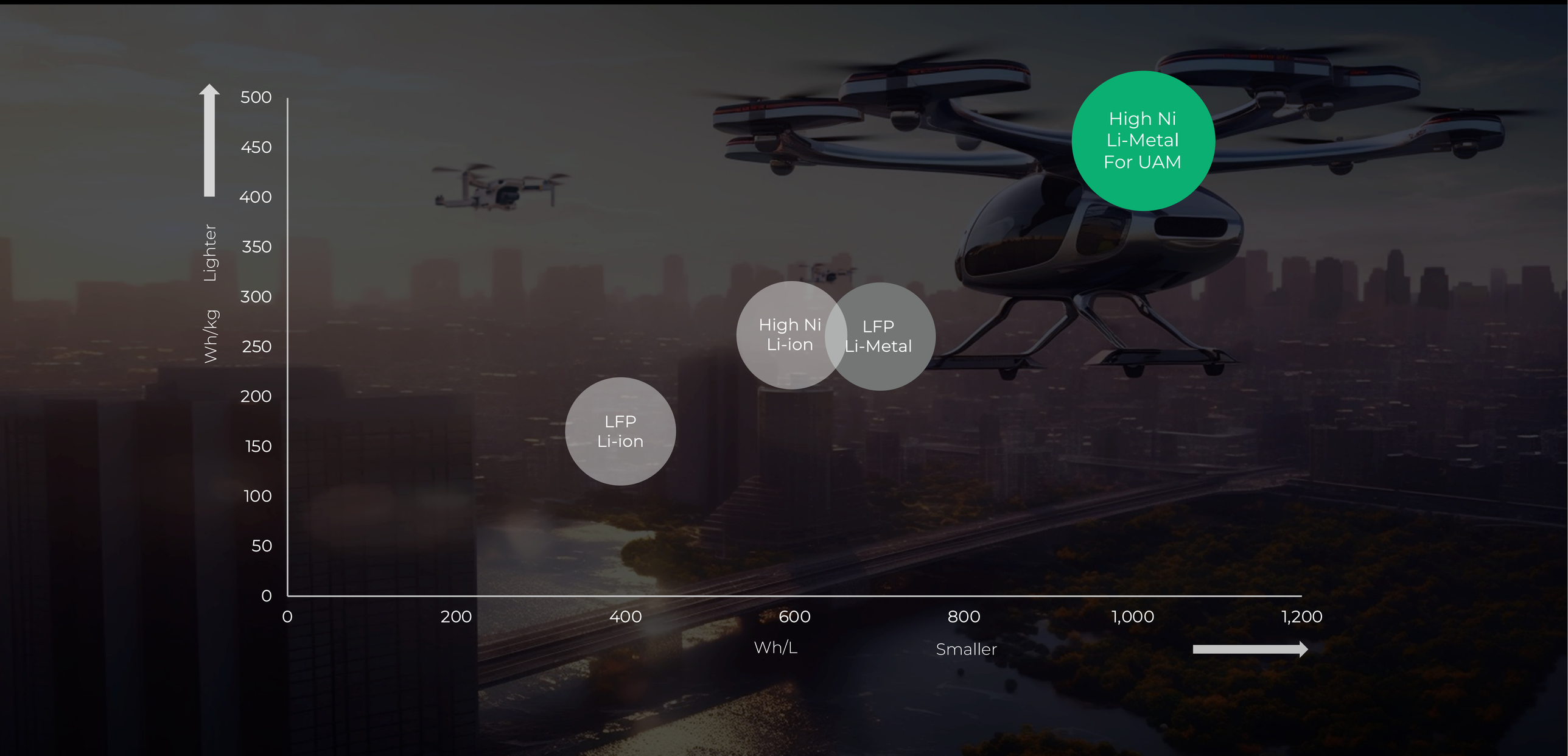
AI

UAM is an Adjacent Growth Opportunity

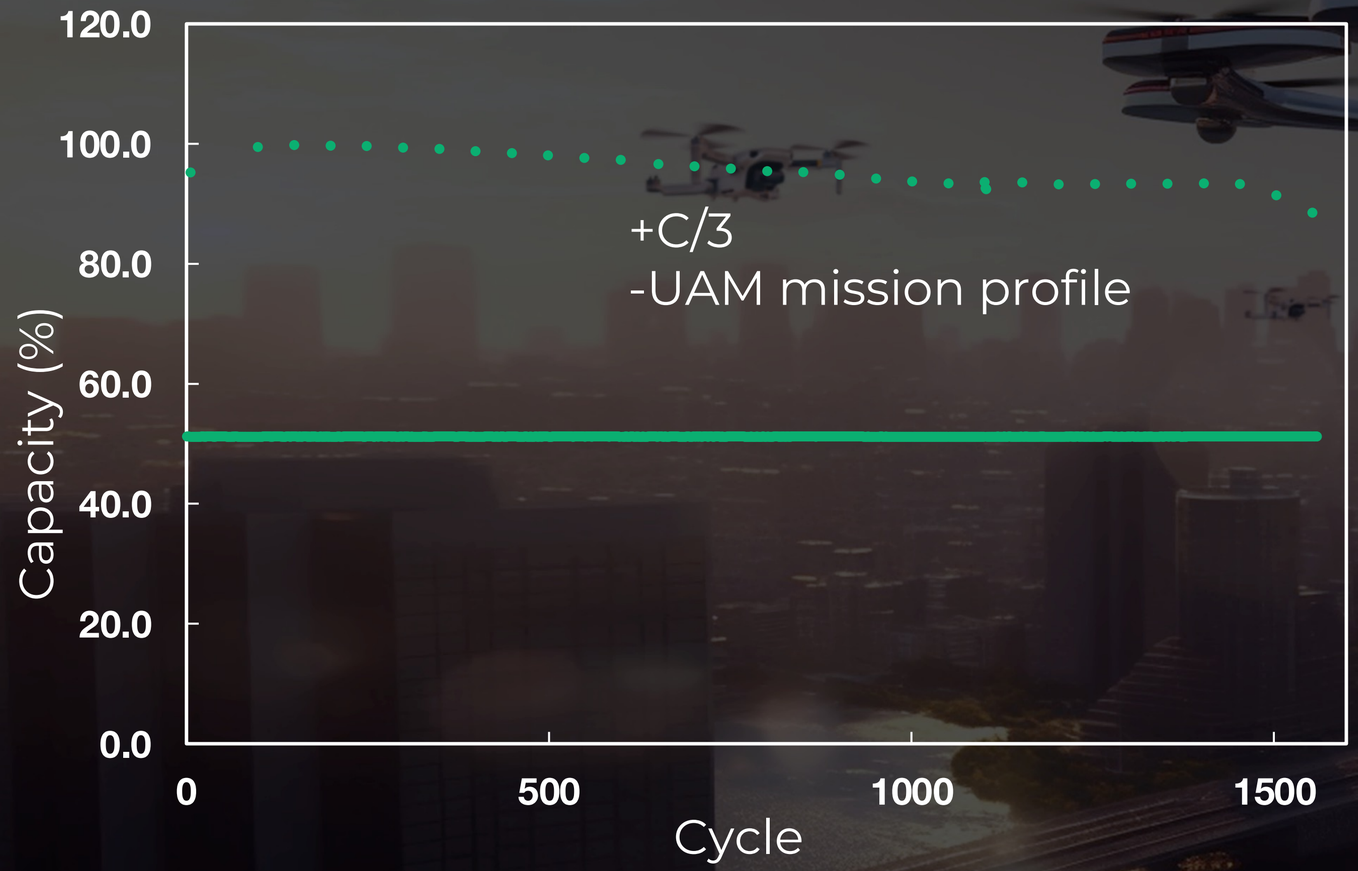
- Opportunity to be a first mover in Li-Metal for UAM, define industry standards and “make the market;” Li-Metal fundamentally changes the UAM market economics.
- A natural extension of current technological milestone and R&D achievements with automotive OEMs; EV B-samples are equivalent to UAM commercialization.
- Synergy with EV roadmap opens an additional TAM of $30bn by 2030 with relatively low incremental investment.
- Generates revenue earlier than anticipated in 2025 while providing proof of concept for EV + data collection and training of Avatar AI.
- Signed a growing number of cell sampling and supply agreements with the top 5 UAM OEMs; working with OEMs on pack development and certification.



Why Li-Metal for UAM



Li-Metal is a Perfect Fit for UAM



UAM

→ *A steppingstone to EV for Li-Metal*

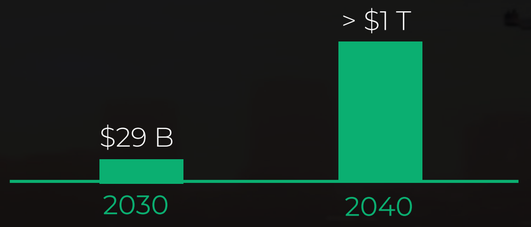
Rigorous safety & performance testing in UAM

→ *More data to train Avatar AI for both UAM and EV*

A Large Growing TAM for UAM

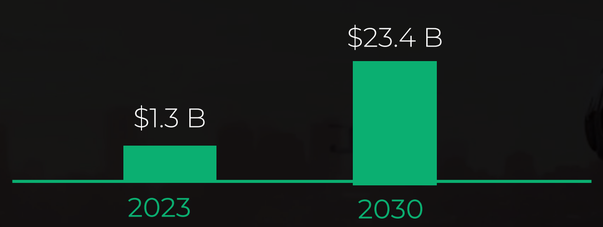
- TAM estimates vary depending on the sources, but most are extremely large.

- UAM Global Total Addressable Market Forecast



Source: Morgan Stanley

- eVTOL Global Market Forecast



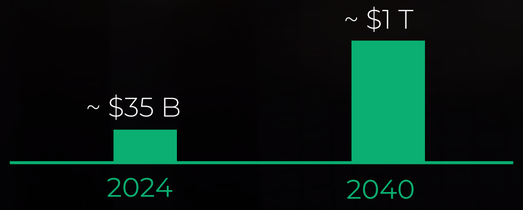
Source: One Markets and Markets report

- eVTOL Aircraft in Service by 2035



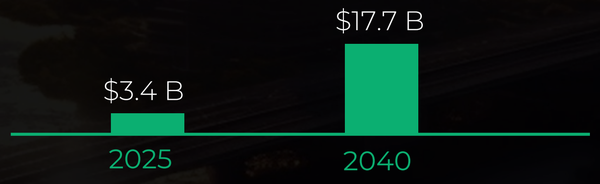
Source: Morgan Stanley

- Industry OEMs Estimate eVTOL TAM



Source: Morgan Stanley

- US Passenger eVTOL Expected Market



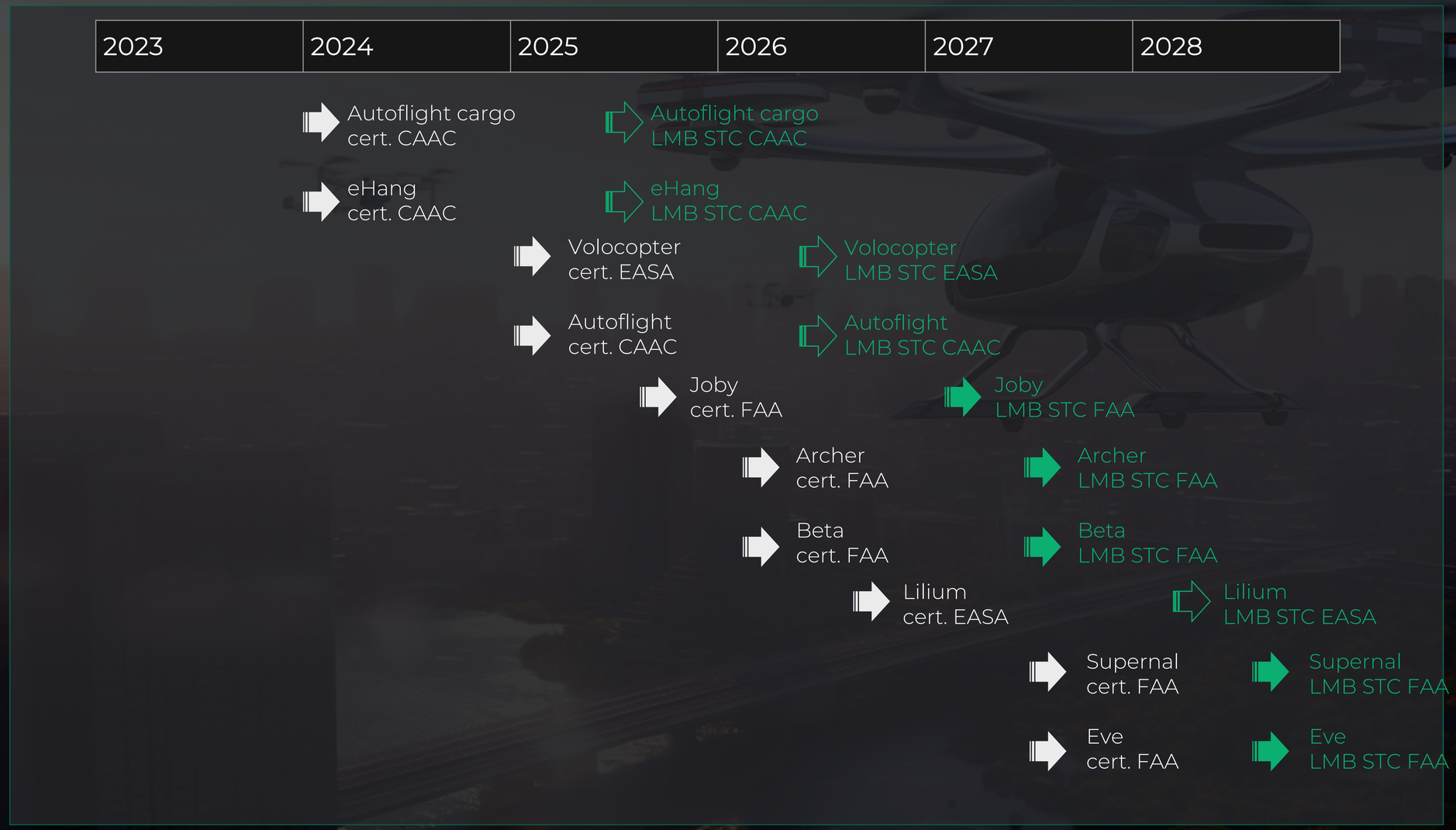
Source: Deloitte

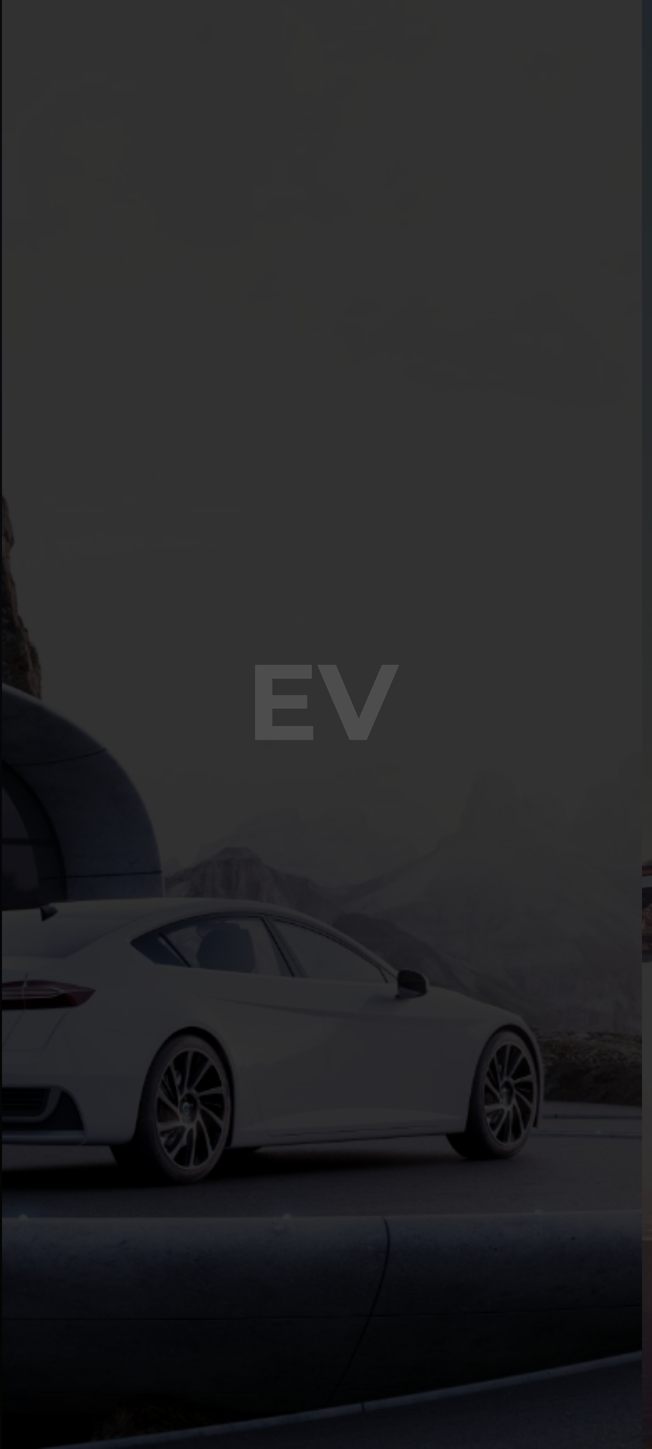
- Advanced Air Mobility (AAM) Estimated Market by 2025

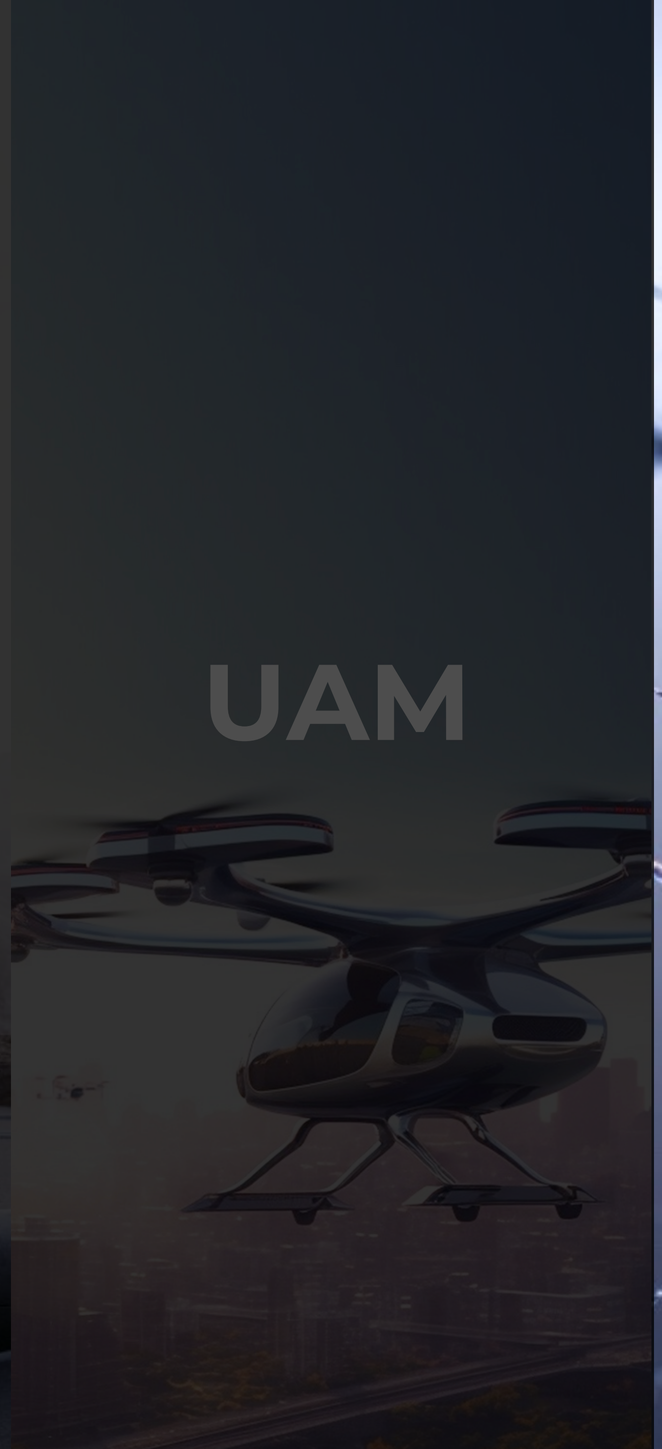


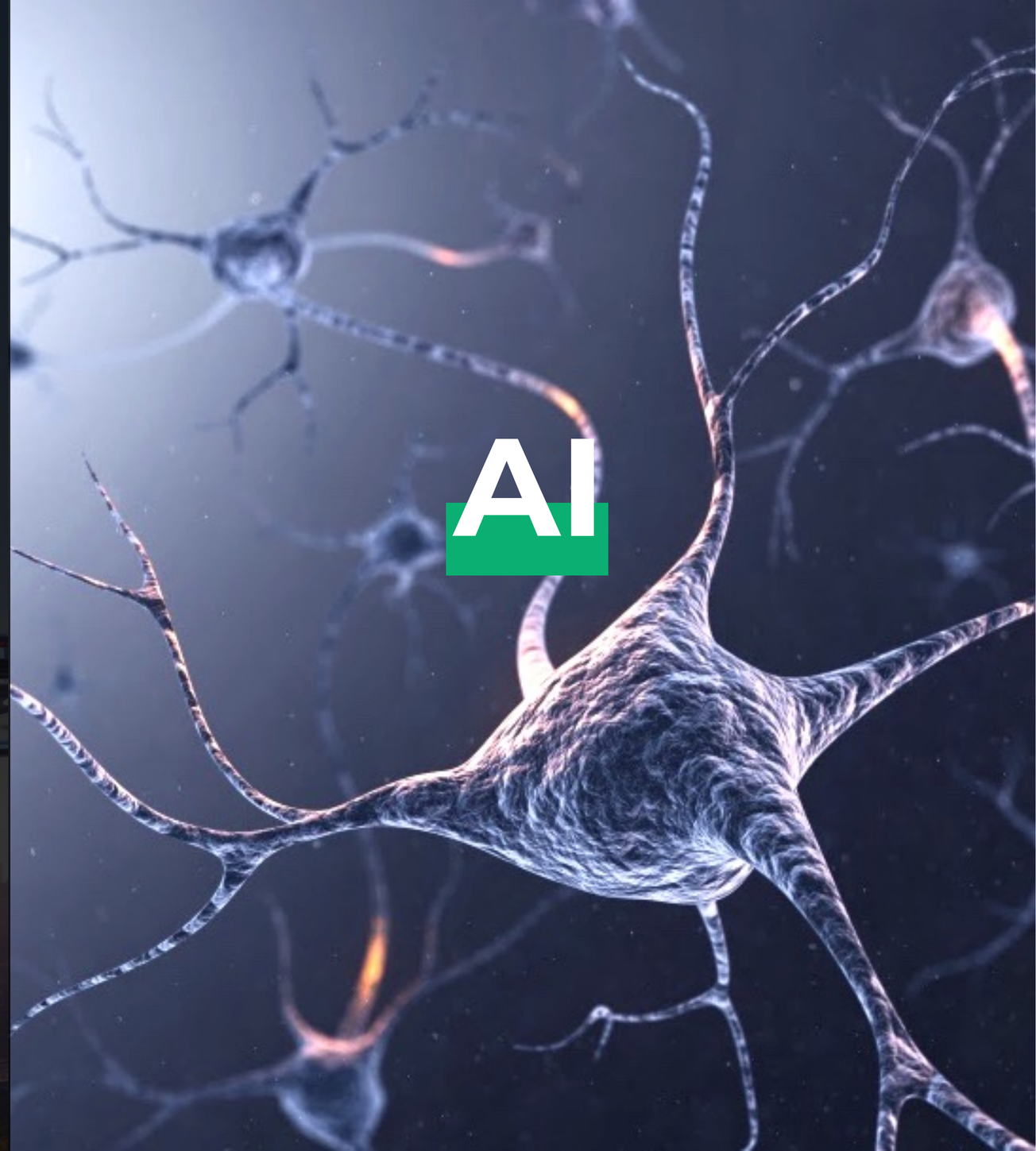
Source: Deloitte

UAM is Faster than EV for New Battery Technology




EV


UAM


AI

AI for Science and Safety

AI for Safety

AI → Predict incident and achieve near 100% safety guarantee for EV/UAM

AI for Science

AI → Accelerate development of future battery electrolyte material for EV/UAM

AI for Safety (Avatar)

Battery = Person

Genetics



Pregnancy



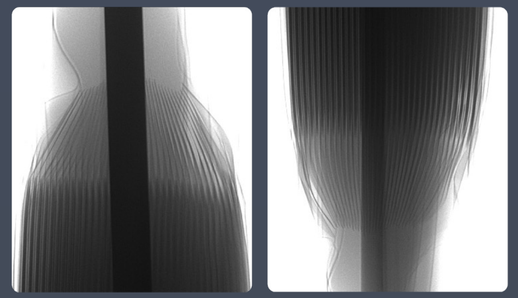
Lifestyle



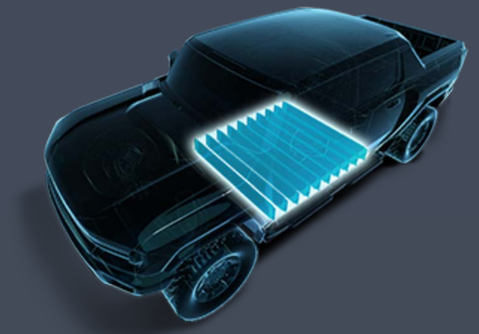
Cell Design



Manufacturing Quality



Vehicle Operation



AI for Safety (Avatar)

	2022	2023	**2024 (forecast)**
Cell manufacturing quantity	<1,000 per year	500-1,000 per month	**>1,000 per month per line**
Quality check points per cell	200	600	**1,500 (incl. imaging data)**
Avatar AI incident prediction accuracy	<60%	92%	**95%**

AI for Safety (Avatar) – SES AI Cares







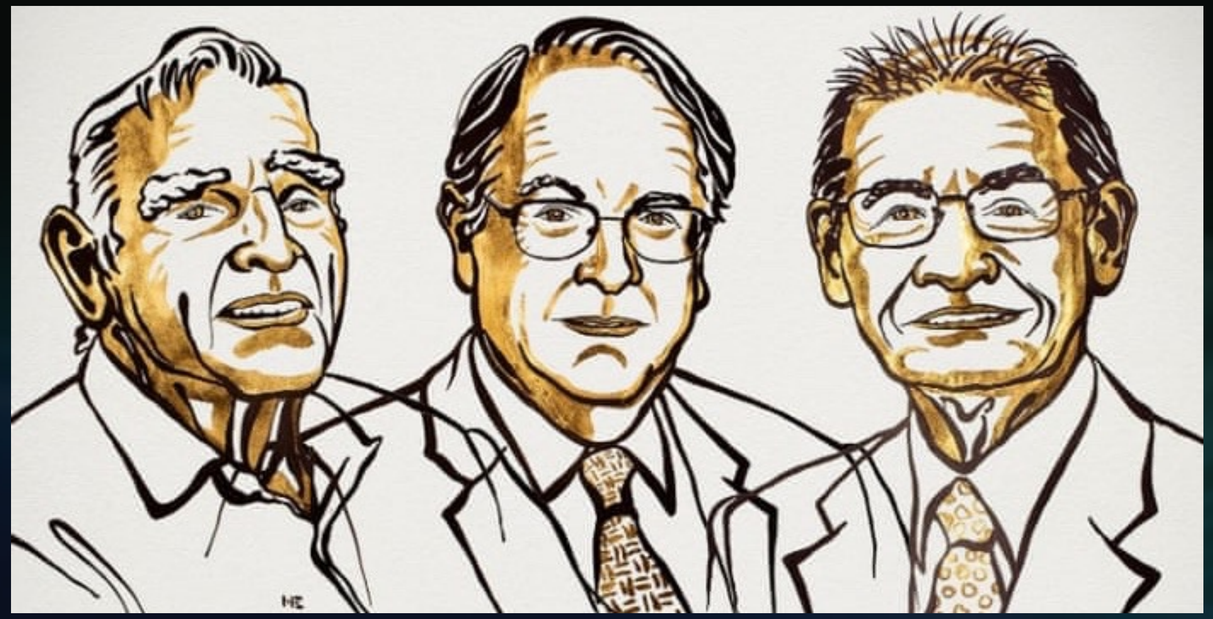


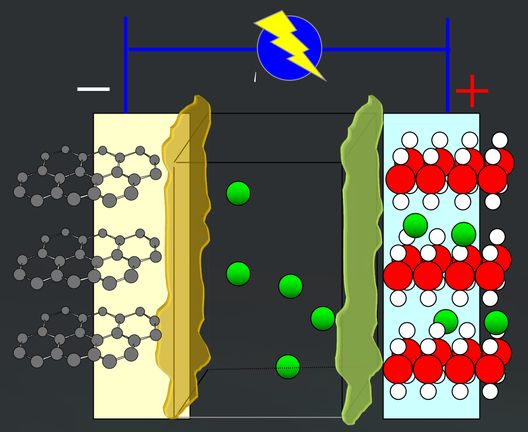
AI for Science (Prometheus)

1980 Goodenough
Transition M Oxides

1976 Whittingham
Sulfides & Intercalation Concept

1986 Yoshino
Carbonaceous Anode and Integration





"Lithium-ion batteries have revolutionized our lives ...laid the foundation of a wireless, fossil fuel-free society, and are of the greatest benefit to humankind."

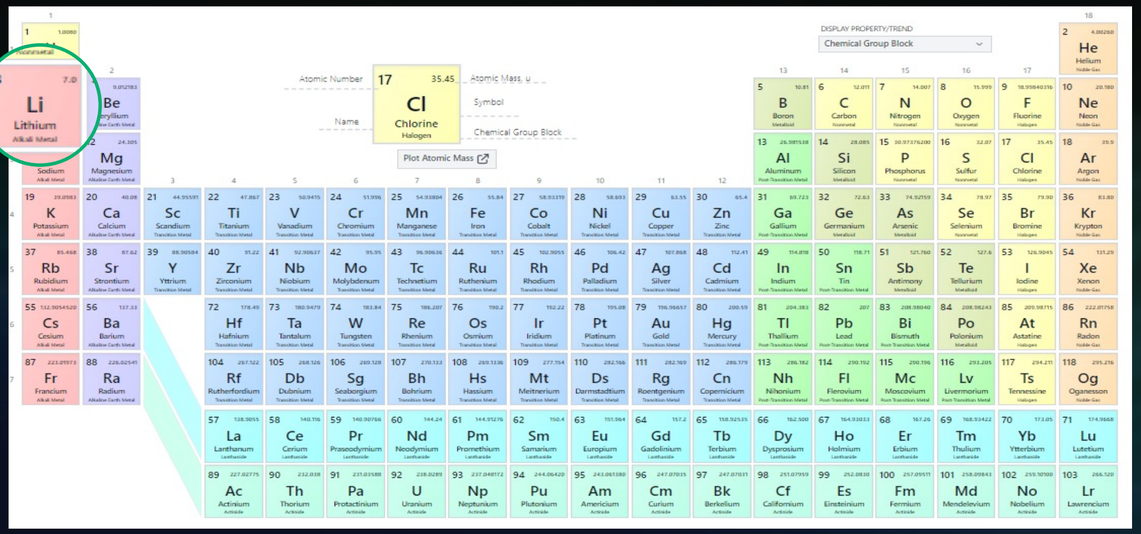
Nobel Committee Announcement
October 9, 2019

Accelerate the development of future battery electrolyte materials for EV/UAM

It took 30+ years to develop the current Li-ion batteries. Progress by human (without AI/ML) is slow

AI for Science (Prometheus)

The building blocks were already given…



The 1st - Principle: Li^0 is the ultimate anode

- The 1st metal on the periodic table
- The lowest electrochemical potential
- The highest specific capacity
  - ✓ The lowest density
  - ✓ The smallest atomic #

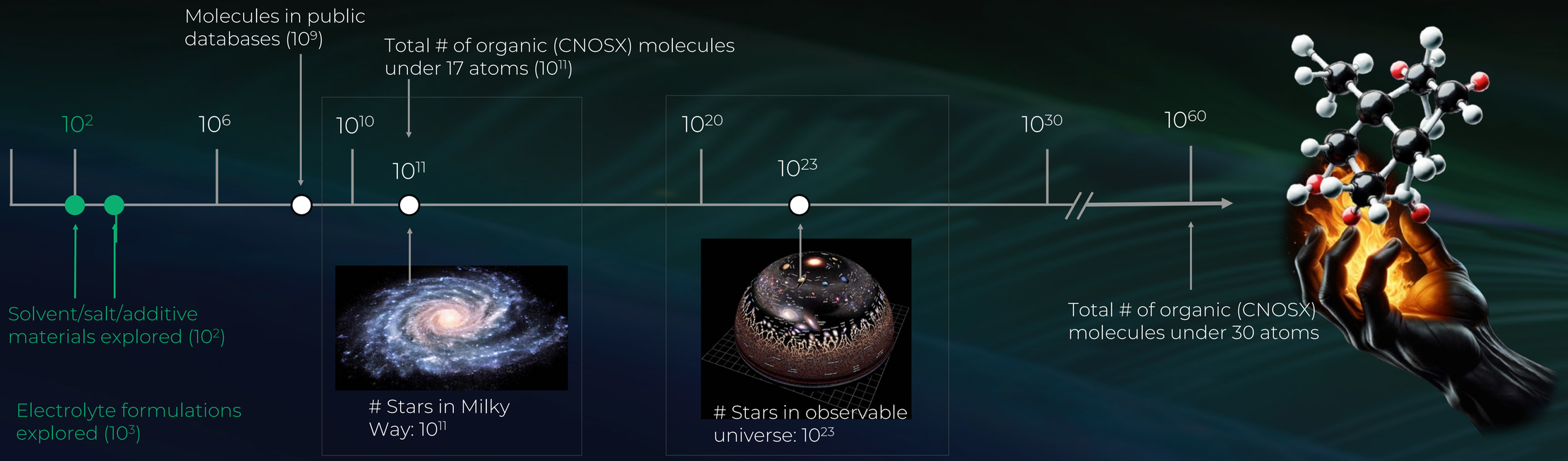
The Challenge: Li^0 is too reactive

- Need to discover new electrolyte materials

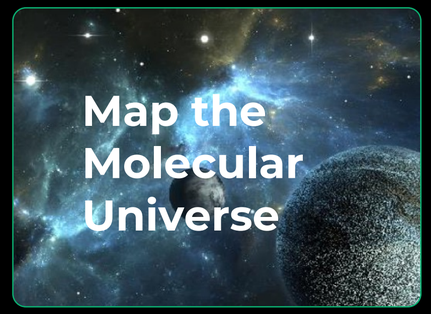
AI for Science (Prometheus)

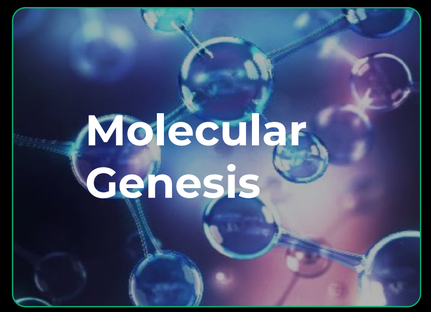
Accelerate the development of future battery electrolyte materials for EV/UAM

If we can achieve world record Coulombic Efficiency (99.65%) by exploring 10^2, imagine what we can achieve if we map the entire 10^{11}



AI for Science (Prometheus)





Domain Expertise

Domain Expertise / AI

Validation

Curated Database
(molecular + ionic)

$> 10^{11}$

DFT on All 10^{11}
(huge computing resource needed)

DFT on All 10^{8}
(1/1000)

GNN

- HOMO/LUMO
- Solubility
- Melting Point

Molecular
Dynamics
Force Field

Curated Database
(books +
publications)

$> 10^{6}$

LLM

Electrolyte
Foundry

- Experiments
- Synthesis
- Test in cells

$10^{2\text{-}3}$

2024 – A Key Year in Commercialization of Li-Metal Batteries



Focus on EV B-sample JDAs

Build and operate new B-sample lines; address cell manufacturing quality; improve cell practical safety; accelerate future roadmap electrolyte development

Build and ship UAM cells to customers

UAM cells will be our first commercial products and we are building a dedicated UAM Li-Metal line and expect to ship our first batch of cells to customers

Improve Avatar AI incident prediction

Our ultimate goal is a nearly 100% safety guarantee for EV and UAM applications and we expect to achieve 95% and continue to pre-train our Avatar models with all EV A-sample Li-Metal cells and train with new EV B-sample and UAM cells

APPENDIX



Cell Test Data Summary Table (4Ah vs. 50Ah vs. 100Ah)







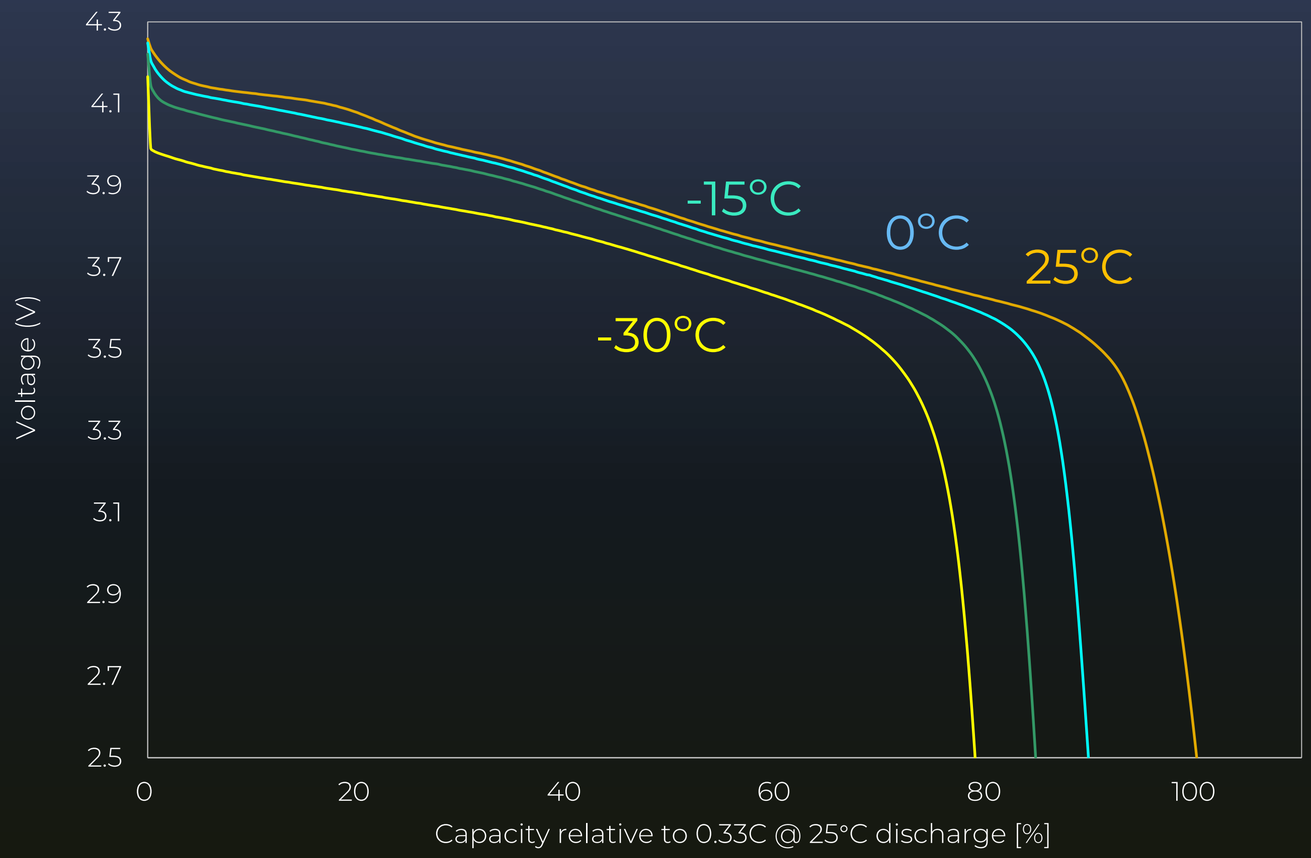
	Cell Type	4.2Ah (25+ layer) at 25°C	50.7Ah (16+ layer) at 25°C	105.8Ah (32+ layer) at 25°C
Room Temperature (25℃) Energy Density	Low power C/20	>375 Wh/Kg	-	-
	Low power C/10	375 Wh/Kg (= 700 Wh/L at SOC 0%)	357 Wh/Kg (= 773 Wh/L at SOC 30%)	399 Wh/Kg (= 862 Wh/L at SOC 30%)
	Medium power C/3	-	342 Wh/Kg (=743 Wh/L)	390 Wh/Kg (= 842 Wh/L)
	Medium power 1C	339 Wh/Kg	-	370 Wh/Kg
	High power 3C	-	303 Wh/Kg	351 Wh/Kg
	High power 5C	321 Wh/Kg	-	-
Low Temperature (0℃) Energy Density	Low power C/10	324 Wh/Kg	-	-
	Medium power C/3	-	305 Wh/Kg	346 Wh/Kg
	Medium power 1C	298 Wh/Kg	-	-
	High power 5C	282 Wh/Kg	-	-
Lifetime (Ch-Dch)	C/10 – C/3	600 cycles (80% retention)	>200 cycles (Ongoing)	>300 ongoing
	C/3 – C/3	300 cycles (80% retention)	210 cycles (80% retention)	>250 ongoing
	C/5 - 1C	700 cycles (80% retention)	-	-
Fast Charging	Charge at 4C	80% in <15min	-	-
Safety	Thermal	Electrolyte is stable with Li above Li melting point	PASS TEST	PASS TEST
	Nail Penetration	PASS TEST	PASS TEST	PASS TEST
	Overcharge	PASS TEST	PASS TEST	PASS TEST
	External Short Circuit	PASS TEST	PASS TEST	PASS TEST
Certification		UN38.3	UN38.3, IATF16949	UN38.3
Manufacturability		***(highly similar process to Li-ion)***		
Tested Operating Temperature		-30 °C to 60 °C	-10 °C to 45 °C	-10 °C to 45 °C

Low Temperature Performance (100Ah Cell)



Excellent performance in cold weather

Retains 80% capacity (C/3 at 25°C) even at -30°C

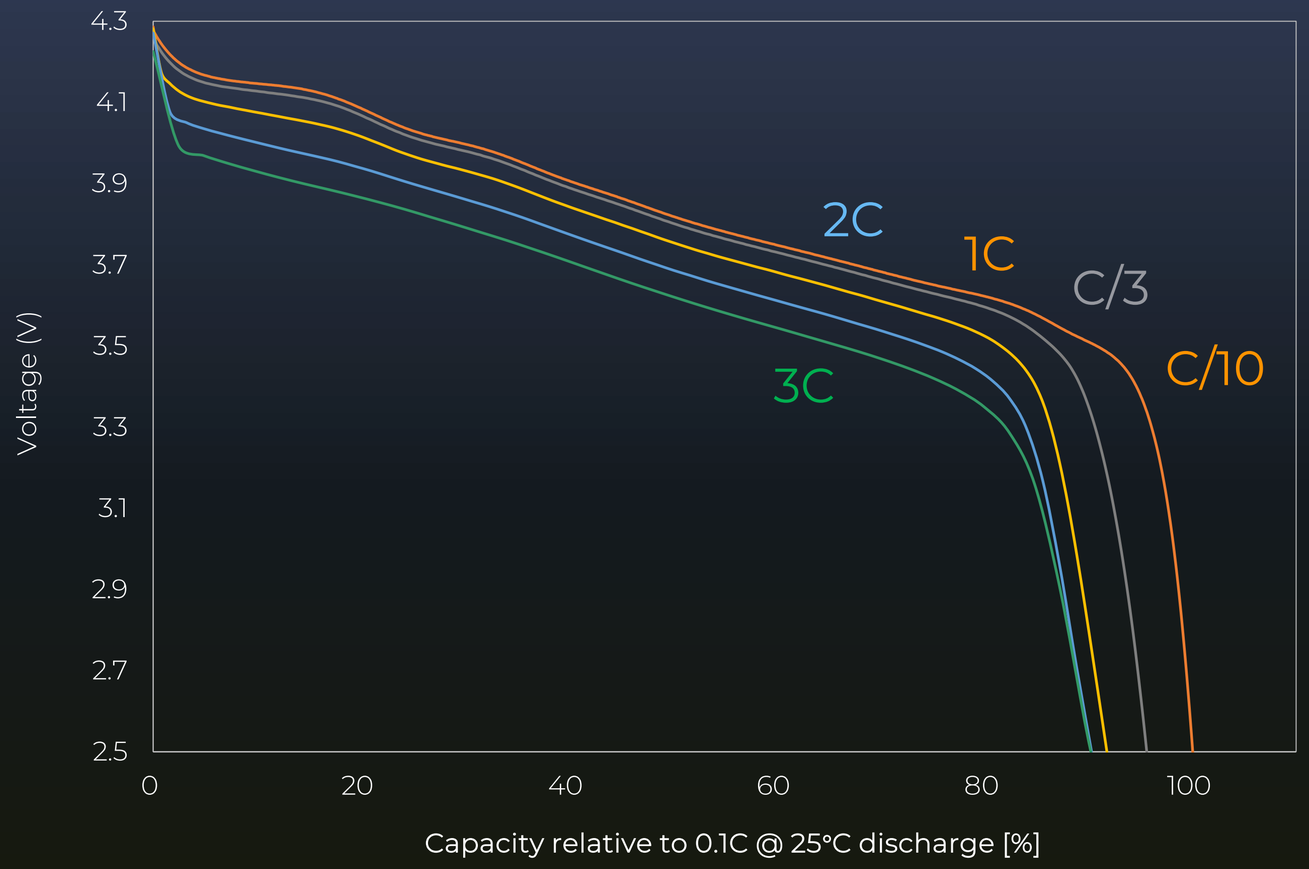


High Power Performance (100Ah Cell)



Excellent performance in high power requirements

Retains 90% capacity (C/3 at 25°C) even at 3C



Safety Performance (100Ah Cell)

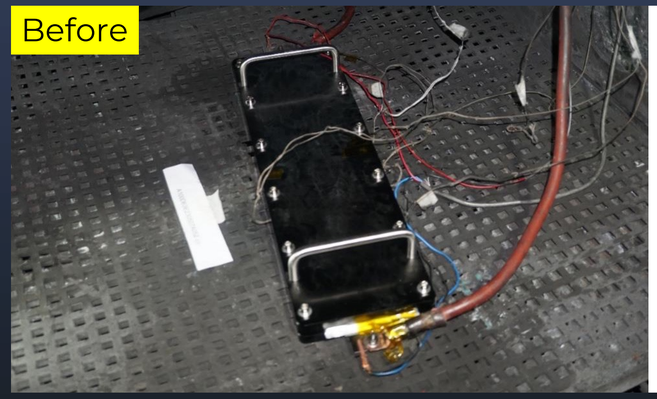


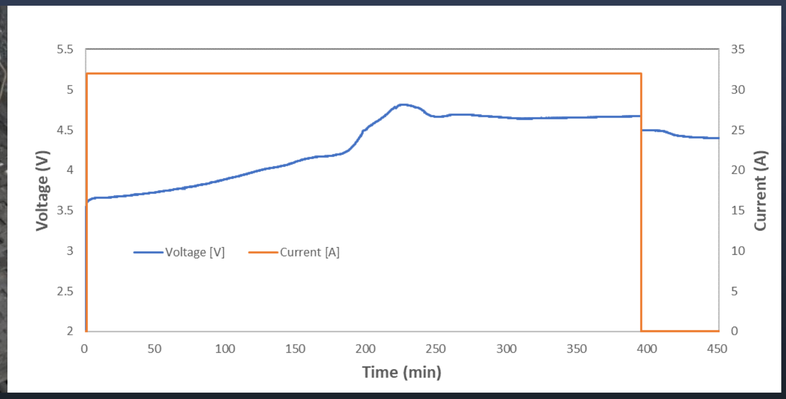
Overcharge

✓ **Passed**

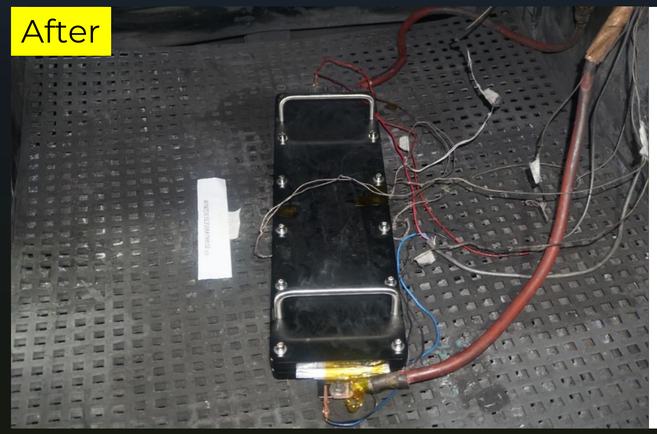
(3rd party test)

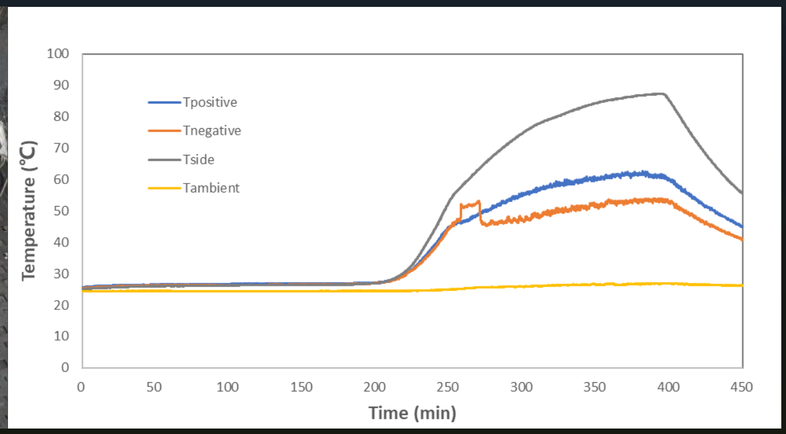
Before





After





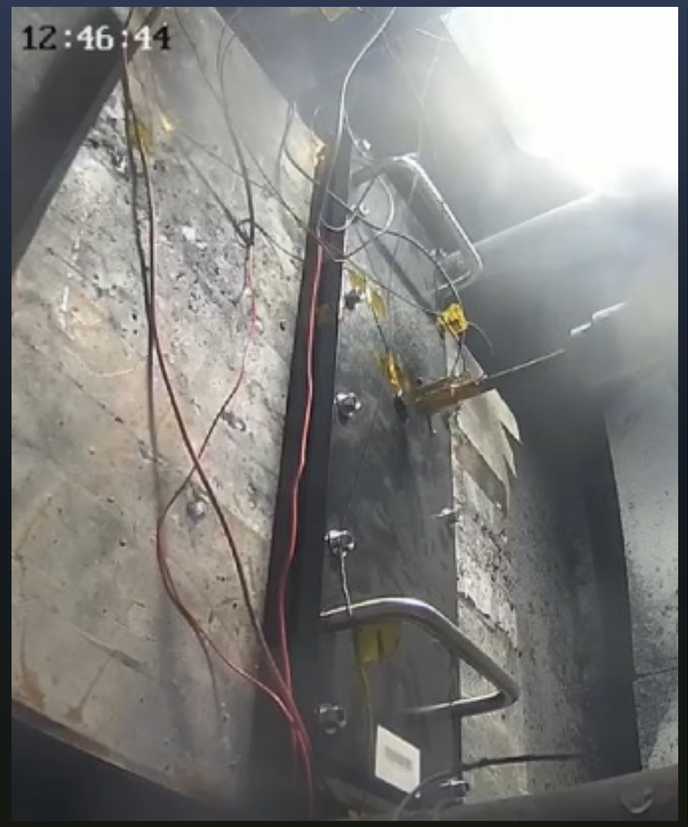
Safety Performance (100Ah Cell)

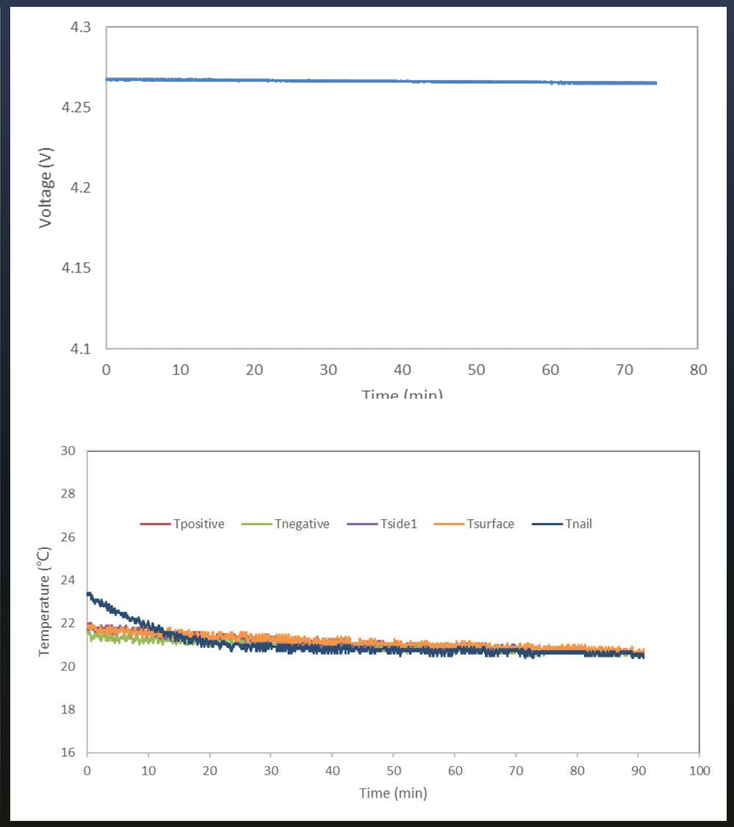


Nail Penetration

✓ **Passed**

(3rd party test)





Safety Performance (100Ah Cell)



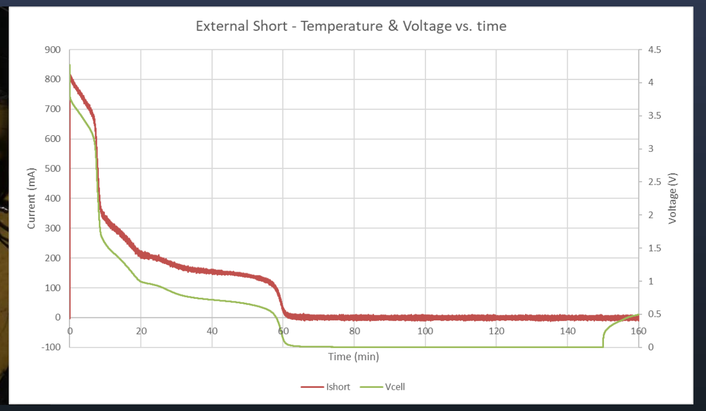
External Short Circuit

✓ **Passed**

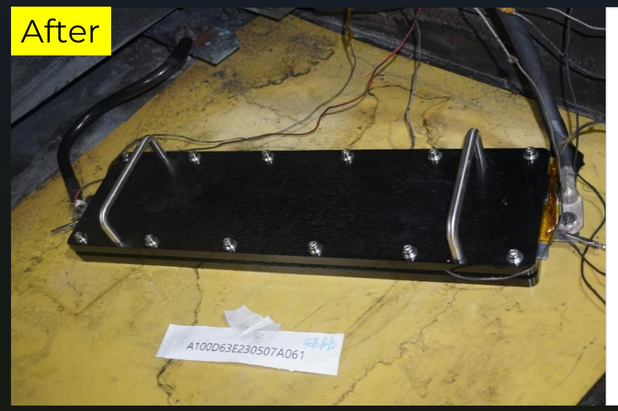
(3rd party test)

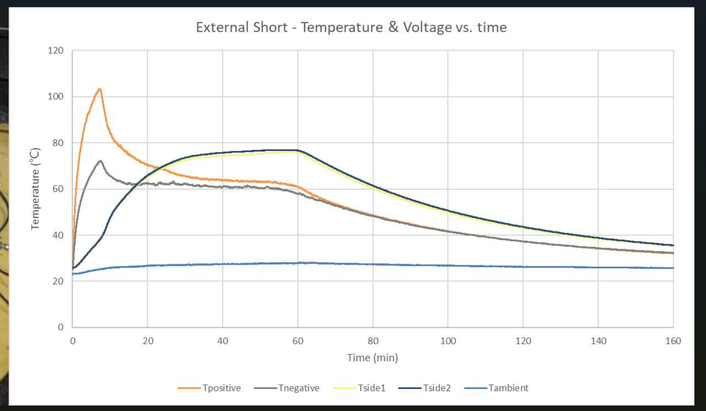
Before





After





Safety Performance (100Ah Cell)

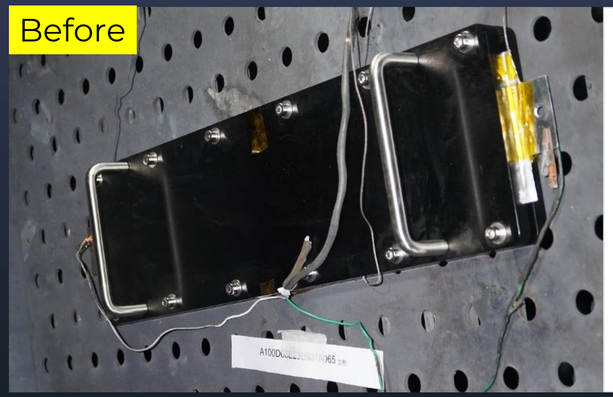


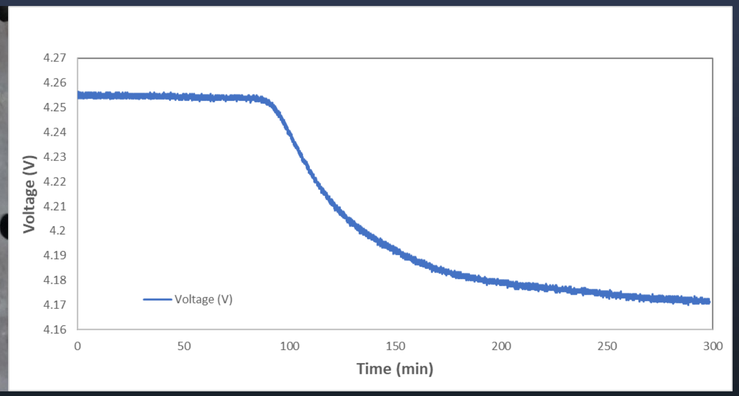
Thermal Stability

✓ **Passed**

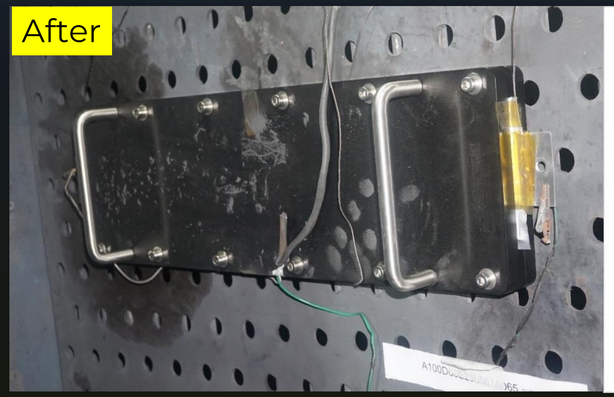
(3rd party test)

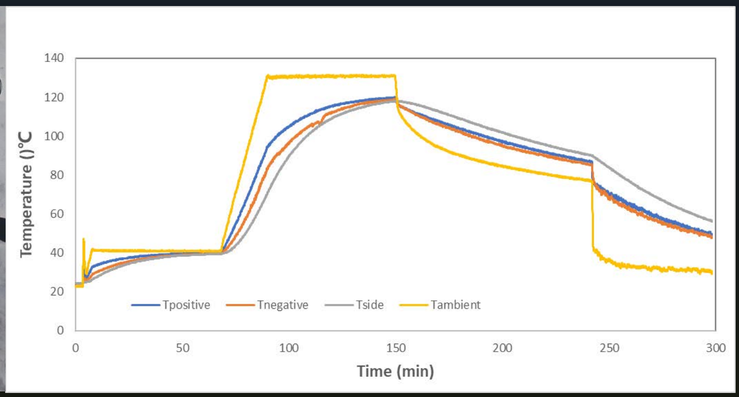
Before





After





UN38.3 Certification (50Ah & 100Ah Cell)



UN38.3 试验概要

LITHIUM CELLS OR BATTERIES TEST SUMMARY
IN ACCORDANCE WITH SUB-SECTION 38.3
OF UN MANUAL OF TESTS AND CRITERIA

NO. CQCIT2206J0297

样品描述(Sample Description)：

电池名称(Cell/battery Name)：
可充电二次锂电池芯
Rechargeable lithium battery cell
质量(Mass)：
0.51kg
规格参数(Specification Parameter)：
■锂离子电池/电芯 3.82 V 47.4 Ah 181 Wh
□锂金属电池/电芯 ___ V ___ Ah ___ g
物理形状(Physical Description)：
袋装电池 Pouch Cell
型号(Model Numbers)：
37B0582

委托单位(Applicant)：
麻省固能（上海）新能源科技有限公司
SES AI(Shanghai) Co., Ltd
上海市嘉定区招贤路 1581 号
Zhaoxian road 1581, Jiading district, Shanghai
021-59901136
victorsun@ses.ai
www.ses.ai

样品生产厂商(Sample Manufacturer)：
麻省固能（上海）新能源科技有限公司
SES AI(Shanghai) Co., Ltd
上海市嘉定区招贤路 1581 号
Zhaoxian road 1581, Jiading district, Shanghai
021-59901136
victorsun@ses.ai
www.ses.ai

UN38.3 测试实验室(UN38.3 Test Lab)：
中认英泰检测技术有限公司
CQC Intime Testing Technology Co., Ltd.
江苏省苏州市吴中区吴中大道 1368 号东太湖科技金融城
East Taihu Technology and Finance City, No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu.
0512-66303623 cqc_jszlb@126.com
http://www.cqc-it.com

样品测试信息(Sample Test Information)：

试验报告编号(Test Report Number)：
20220706J18449
试验报告签发日期(Date of Test Report)：
2022-09-06
所用《试验和标准手册》版本(Edition of UN Manual of Tests and Criteria Used)：
《关于危险货物运输的建议书 试验和标准手册》第七版修订 1 第 38.3 节
Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, ST/SG/AC.10/11/Rev.7/Amend.1/Section 38.3
所进行的试验及其结果(即：通过/未通过)一览表(List of Tests Conducted and Results(Pass/Fail))：

T1	高度模拟(Altitude simulation)	Pass
T2	温度试验(Thermal test)	Pass
T3	振动(Vibration)	Pass
T4	冲击(Shock)	Pass
T5	外部短路(External short circuit)	Pass
T6	撞击/挤压(Impact/Crush)	Pass
T7	过度充电(Overcharge)	Not applicable
T8	强制放电(Forced discharge)	Pass

是否符合集成锂电池的测试要求(Assembled Lithium Battery Test Requirement)：
□38.3.3(f) □38.3.3(g) ■不适用 N/A

技术负责人（Technical Leader）
签发日期（Date of issue）：2022-09-06

ITC-4-B-B028-B1 2021-08-17

50 Ah
UN 38.3: Passed

UN38.3 试验概要

LITHIUM CELLS OR BATTERIES TEST SUMMARY
IN ACCORDANCE WITH SUB-SECTION 38.3
OF UN MANUAL OF TESTS AND CRITERIA

NO. CQCIT2306J0442

样品描述(Sample Description)：

电池名称(Cell/battery Name)：
可充电二次锂电池芯
Rechargeable lithium battery cell
质量(Mass)：
0.98kg
规格参数(Specification Parameter)：
■锂离子电池/电芯 3.82 V 105.3 Ah 402 Wh
□锂金属电池/电芯 ___ V ___ Ah ___ g
物理形状(Physical Description)：
袋装电池 Pouch Cell
型号(Model Numbers)：
71B0582

委托单位(Applicant)：
麻省固能（上海）新能源科技有限公司
SES AI(Shanghai) Co., Ltd
上海市嘉定区福海路 1699 号
Fuhai road 1699, Jiading district, Shanghai
021-59901136
victorsun@ses.ai
www.ses.ai

样品生产厂商(Sample Manufacturer)：
麻省固能（上海）新能源科技有限公司
SES AI(Shanghai) Co., Ltd
上海市嘉定区福海路 1699 号
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UN38.3 测试实验室(UN38.3 Test Lab)：
中认英泰检测技术有限公司
CQC Intime Testing Technology Co., Ltd.
苏州市吴中经济开发区吴中大道 1368 号
No.1368 Wuzhong Dadao Road, Wuzhong Economic Development Zone, Suzhou, Jiangsu.
0512-66303621
jszlb@cqc-it.com
http://www.cqc-it.com

样品测试信息(Sample Test Information)：

试验报告编号(Test Report Number)：
20230805J23561
试验报告签发日期(Date of Test Report)：
2023-10-20
所用《试验和标准手册》版本(Edition of UN Manual of Tests and Criteria Used)：
《关于危险货物运输的建议书 试验和标准手册》第七版修订 1 第 38.3 节
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T1	高度模拟(Altitude simulation)	Pass
T2	温度试验(Thermal test)	Pass
T3	振动(Vibration)	Pass
T4	冲击(Shock)	Pass
T5	外部短路(External short circuit)	Pass
T6	撞击/挤压(Impact/Crush)	Pass
T7	过度充电(Overcharge)	Not applicable
T8	强制放电(Forced discharge)	Pass

是否符合集成锂电池的测试要求(Assembled Lithium Battery Test Requirement)：
□38.3.3(f) □38.3.3(g) ■不适用 N/A

技术负责人（Technical Leader）
签发日期（Date of issue）：2023-10-20

ITC-4-B-B028-B1 2021-08-17

100 Ah
UN 38.3: Passed

SES

Beyond Li-ion™