

The logo for 'ilika' is centered on a dark blue background. The text 'ilika' is in a white, lowercase, sans-serif font. The first 'i' and the second 'i' have a small green triangle above them. A thin white diagonal line runs from the top left towards the center. A thin green diagonal line runs from the bottom right towards the center. The background features faint, repeating patterns of circuitry and battery icons.

ilika



Development and manufacturing of solid- state batteries in the UK

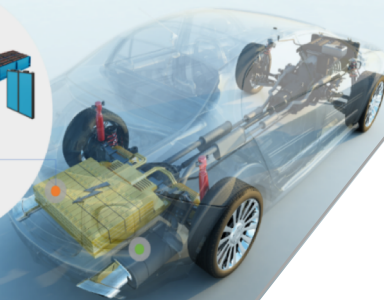
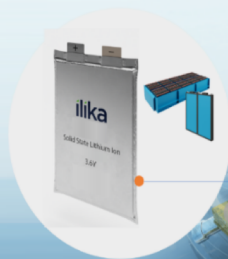
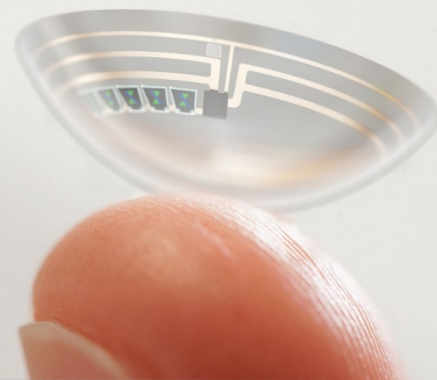
Graeme Purdy
CEO
9th November 2021

Institution of
**MECHANICAL
ENGINEERS**



Stereax[®]

Miniature battery
technology for MedTech
and Industrial IoT

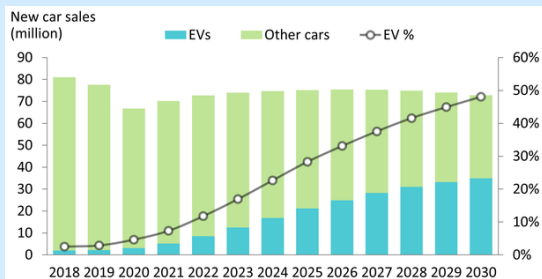


Goliath

Large format battery technology
for Electric Vehicles and
Consumer Appliances

Why Solid State Batteries for EVs?

Rapid adoption of EV



Source: Canalys / Business Wire

Limitations of LIB

- + Lead on cost
- + Mature technology
- Specs will plateau
- Specs won't meet demand (energy density, charging time, operating temperature, cycle life)
- Flammable
- Difficult to recycle

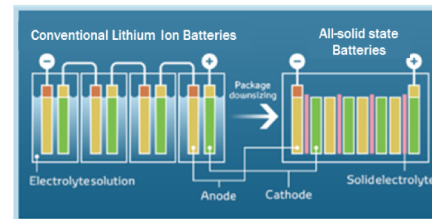


SOLID STATE BATTERIES

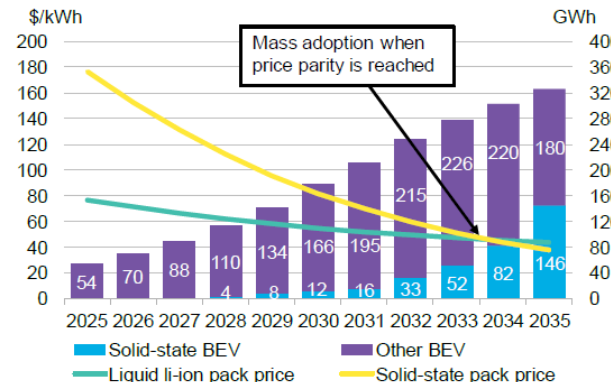
Contain no liquid parts

Will only reach mass adoption with price parity and GWh-level production

In the meantime, markets that can absorb prices for unique specs (hypercars, consumer electronics)



Source: Toyota



Source: BNEF

Feature

High Operating Temperature

Non flammable

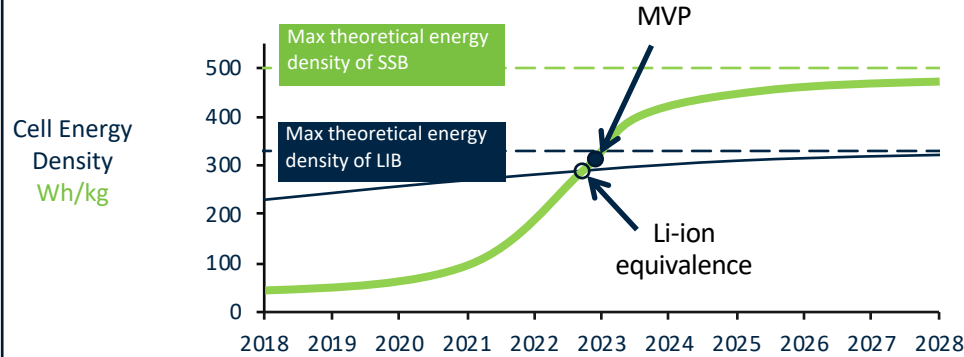
No liquid

Higher energy density

Higher power

Faster charge

Cell Level



Pack level



Gctp: Gravimetric Cell-to-Pack ratio

Benefit

Less complex cooling system

Less packaging at pack level

Lighter pack or more batteries to provide higher range

More attractive to end user; enhancing reputation of OEM

UK-based SSB Ecosystem



UK Government Objectives



Increase uptake of EV to meet 2030 targets

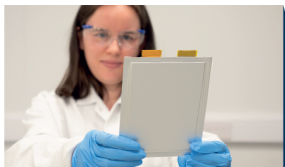


Create a UK EV manufacturing and supply chain hub



Increase private investment in R&D

Dedicated Solid State Battery Facilities



750m² footprint, including over 600m² of battery development laboratories and production equipment

Production of 1kWh per week
Expansion to 10kWh/wk in 2022

Effective use of Funding

2018-21:
Grant Funding
£5.6M

2021:
Ilika raised
£24M

x4 Multiplier

A Focus for Collaborations in the UK



PowerDrive Line

HONDA



MoSESS

McLaren



Granite



Solstice

COMAU



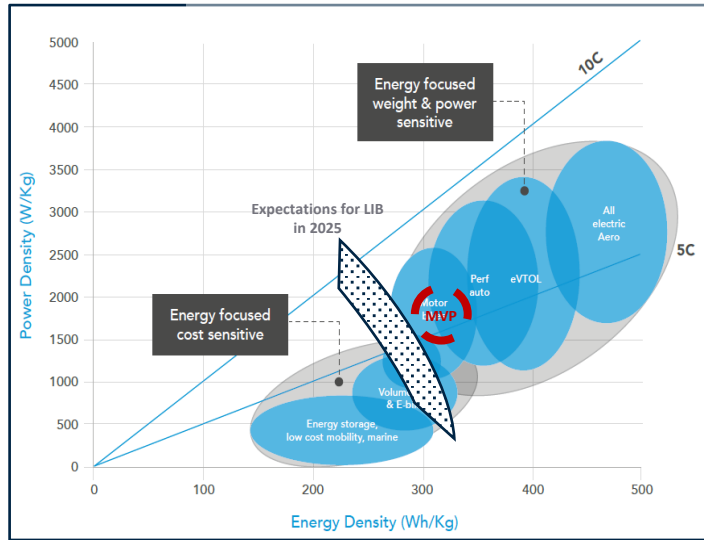
UK BATTERY INDUSTRIALISATION CENTRE

TDAP



Faraday Rounds II and III

Power Cells for High Performance Cars (SuperCars, HyperCars)



Source: Adapted from WMG

5Ah

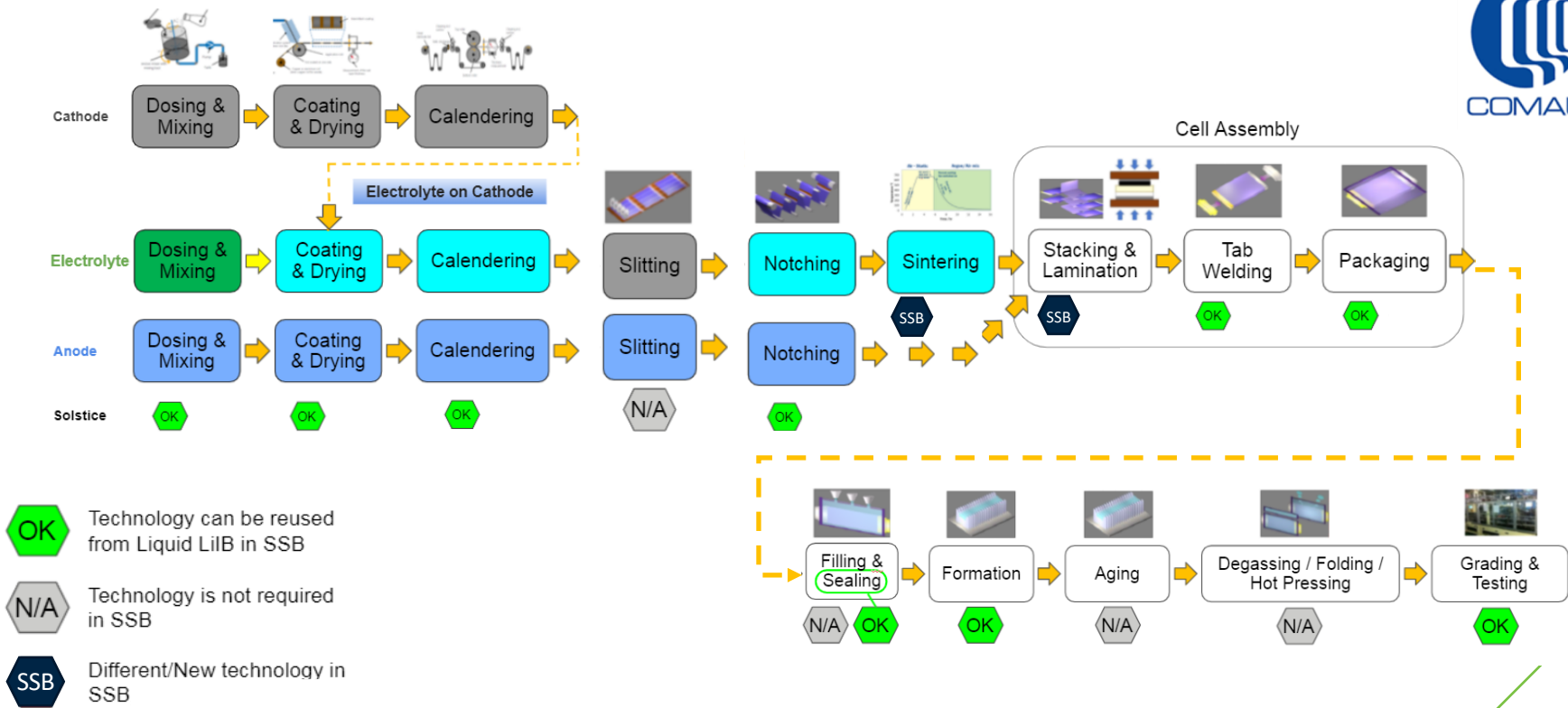


21700: 4 Ah

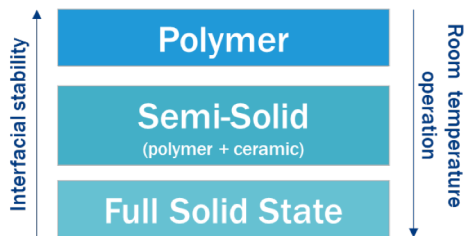


High Power 21700 replacement for Consumer Appliances

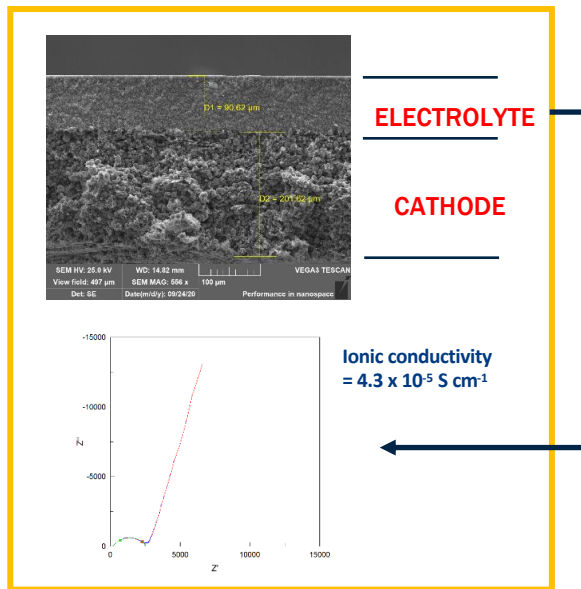
Manufacturing Processes



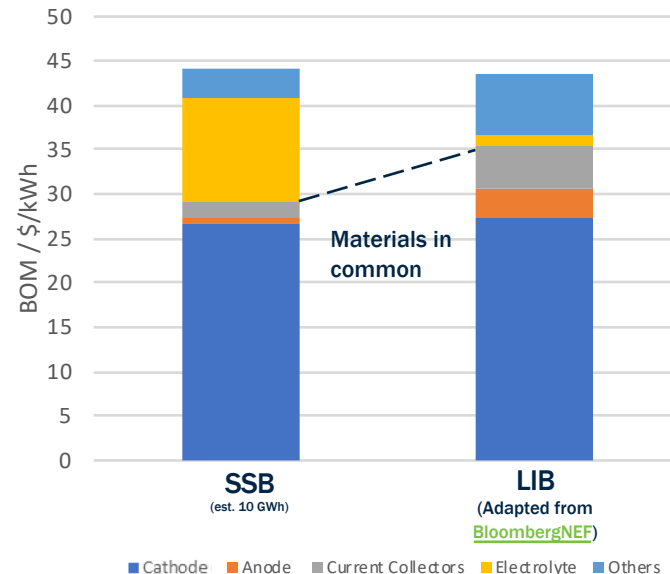
Various definitions of “Solid State”



Solid state electrolytes



BOM cell cost forecast



Iluka is developing:

- High density defect-free solid oxide electrolyte layers
- Interface and interactions with cathode components (buffers)

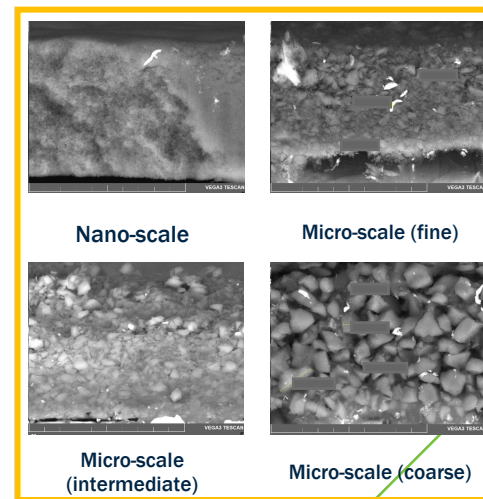
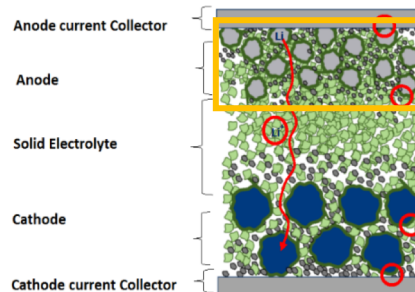
Pros	Cons
High energy density	Li energy density is higher
No dendrite formation	Volume expansion
Larger range of compatible electrolytes	Loss of contact due to contraction
Reduced materials, handling and processing costs	Decrepitation through SEI formation in liquid electrolytes
Easier to recycle	Rates limited in initial intercalation



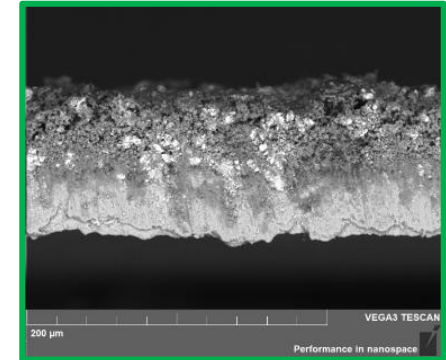
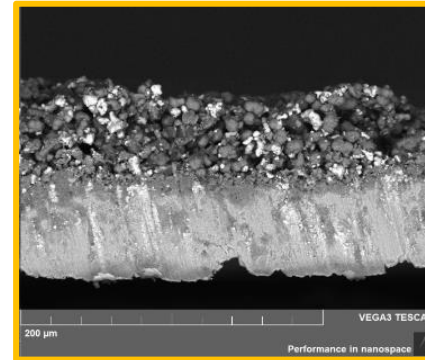
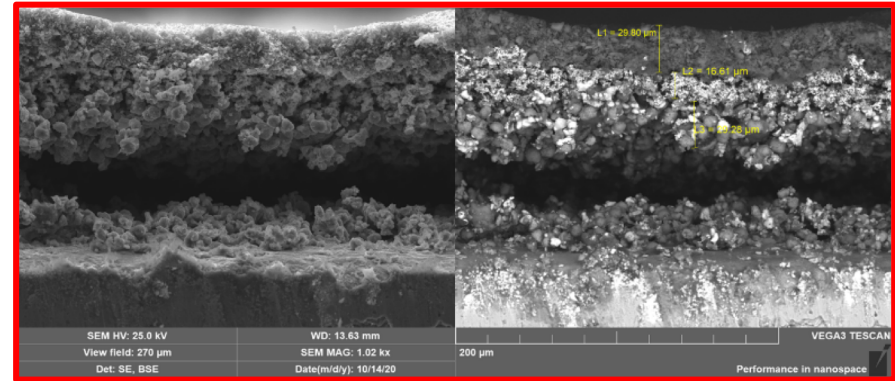
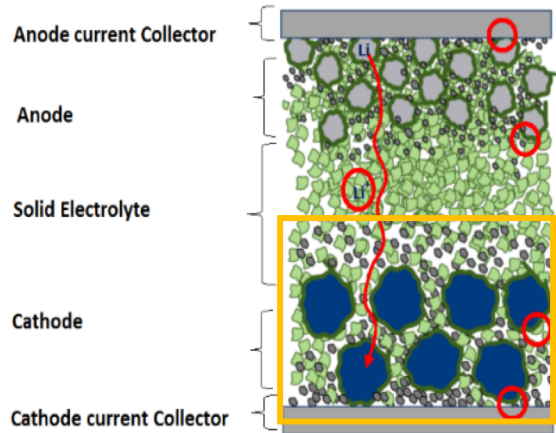
Solutions for the Use of Silicon in SSB

Selection of optimum silicon phases and particle morphologies
Disperse silicon in a flexible composite structure
Contain additives that provide mechanical strength to the electrode
System designed to form an incorruptible SEI
Optimum compression to support throughout cycling
Control cycling to limit change in volume during normal operation

Optimum particle sizes and distribution of particle sizes for composite silicon anodes

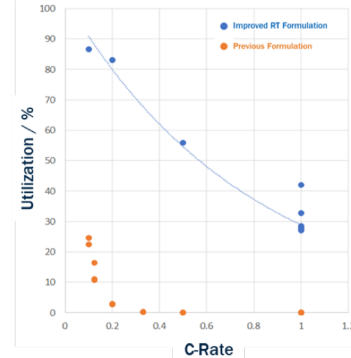
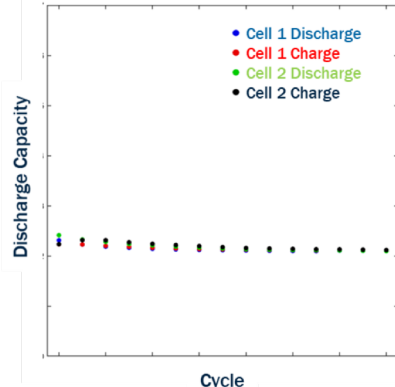
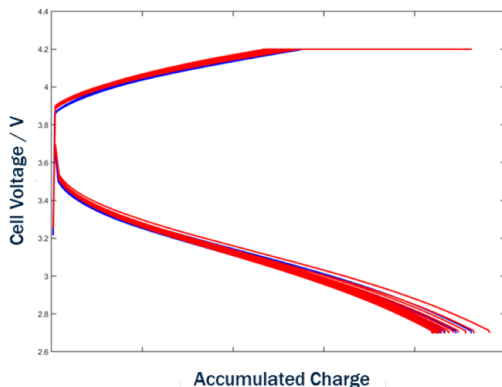


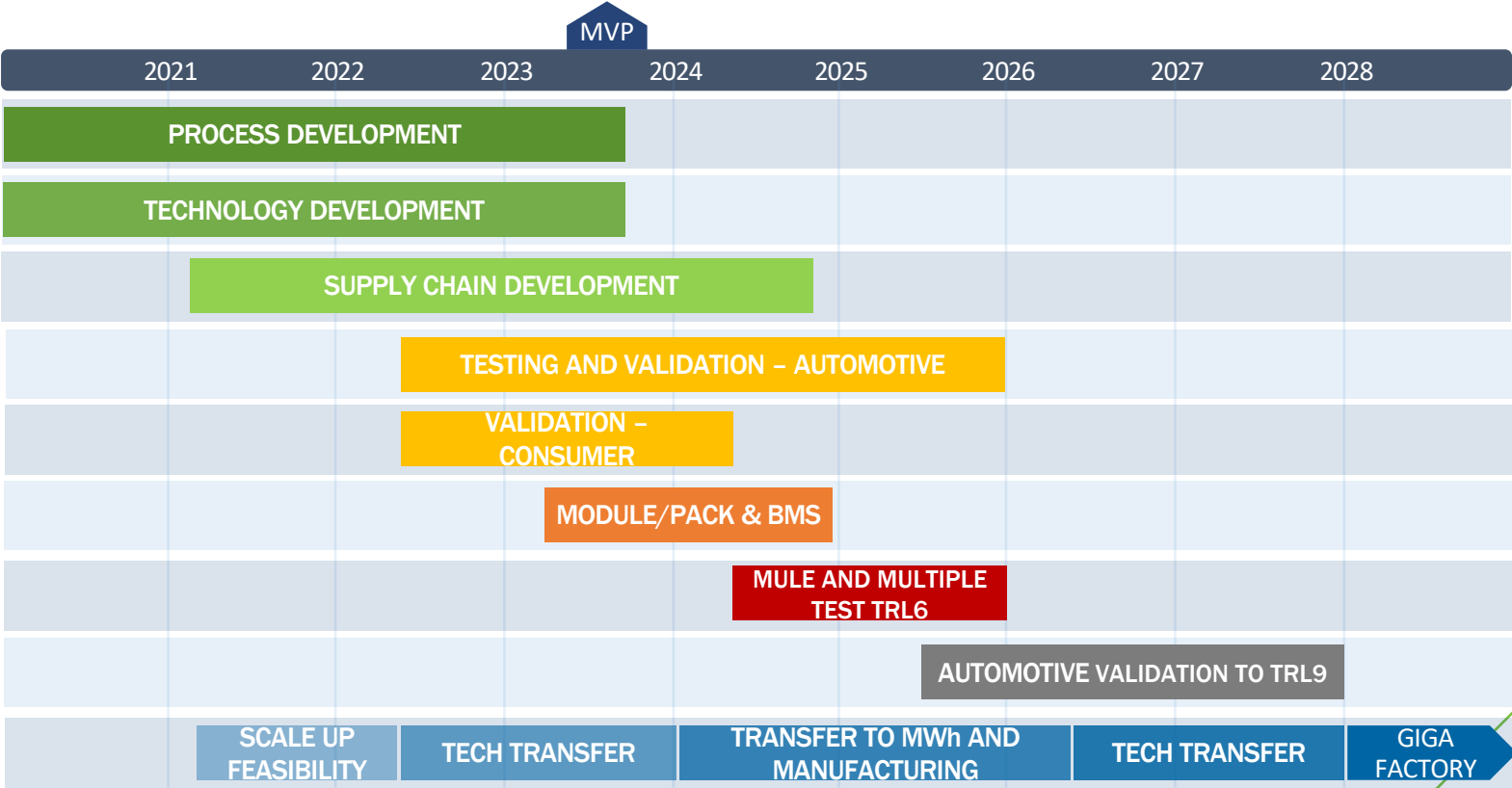
- High cohesion and density to achieve stable cathode



Continued Goliath Technical Progress

Milestones	Date	
> 100 Cycles without cell failure	Q4 2020	✓
Demonstrated conversion efficiency > 90 % in stable cells	Q4 2020	✓
Demonstrated reproducible baseline manufacturing process	Q1 2021	✓
> 500 Cycles without cell failure	Q2 2021	✓
Demonstrated room temp cycling with modified electrolyte	Q3 2021	✓
Increased cathode utilization/capacity	Q3 2021	✓
Demonstrated 1C discharge cycling at 25 °C	Q4 2021	✓





Thanks a lot for your time and attention!

Any questions and/or comments?

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▲  /ilika-plc

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