



ilika

The logo for 'ilika' is centered on a dark blue background. The text 'ilika' is in a white, lowercase, sans-serif font. The two 'i's are stylized with small green triangles above them. The background features faint, repeating patterns of circuit boards and battery icons. Two diagonal lines, one white and one green, cross the image.



Solid State Batteries for Electric Vehicles

Denis Pasero
Product Commercialisation Manager

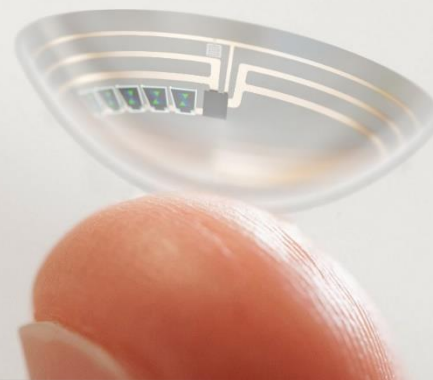
18th October 2021

rho
motion



Stereax®

Miniature battery
technology for MedTech
and Industrial IoT

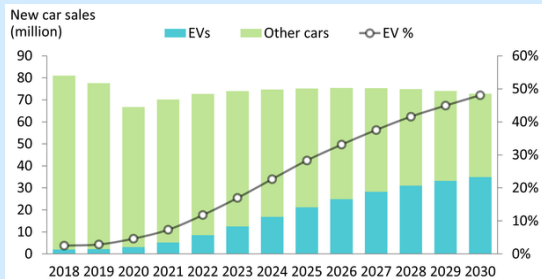


Goliath

Large format battery technology
for Electric Vehicles, Consumer
Electronics, Aerospace, Military

Why Solid State Batteries for EVs?

Rapid adoption of EV



Source: Canalys / Business Wire

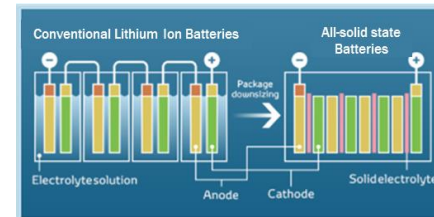
Limitations of LIB

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



SOLID STATE BATTERIES

Contain no liquid parts

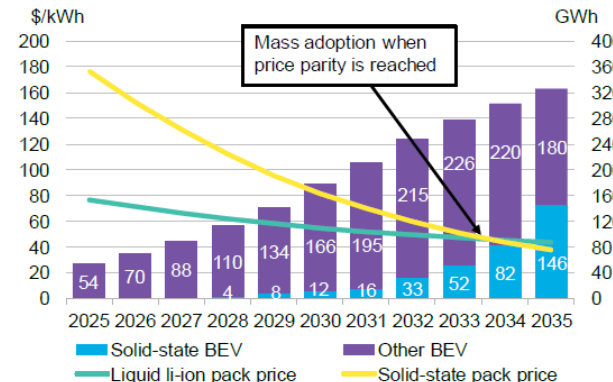


Source: Toyota



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: BNEF

Features & Benefits



Feature

High Operating Temperature

Non flammable

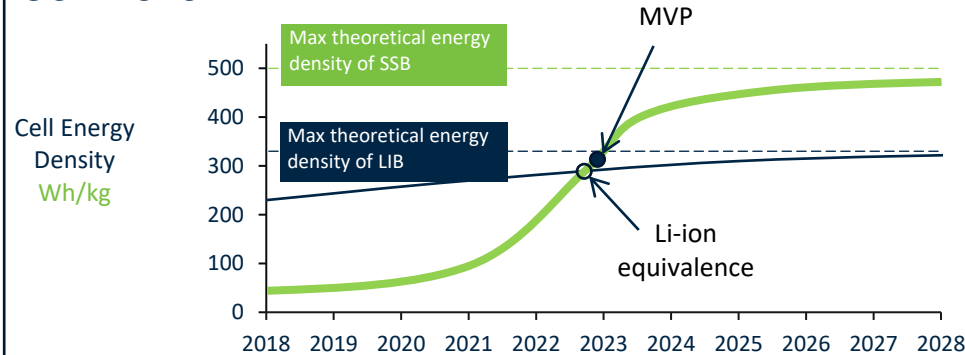
No liquid part

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; enhance reputation of company

Pain reliever

▲ Toyota sets its budget!

MOTORTREND | NEWS

Toyota Outlines Solid-State Battery Tech, \$13.6 Billion Investment

Toyota isn't putting all its eggs in one pouch, so to speak. But the investment is huge.

▲ GM joins the race!

OCTOBER 5

GM announces new battery facility to develop lithium-metal and solid-state cells

Fred Lambert - Oct. 5th 2021 7:13 am PT [@FredericLambert](#)

▲ New UK Consortium named (based on sulfide technology and Li metal anode)

MOU signed between Johnson Matthey, Faraday Institution, Britishvolt, Oxford University, UK Battery Industrialisation Centre, Emerson & Renwick and University of Warwick.

A consortium of seven UK-based organisations has signed a memorandum of understanding to combine ambitions to develop world-leading prototype solid-state battery technology, targeting automotive applications.

▲ Munich Uni/P3 Paper published on SSB production methods

FULL PAPER

Energy Technology
www.entechnol.de

Solid versus Liquid—A Bottom-Up Calculation Model to Analyze the Manufacturing Cost of Future High-Energy Batteries

Joscha Schnell,* Heiko Kröner, Anna Julia Imbsweiler, and Gunther Reinhart

UK-based SSB Ecosystem



UK Government Objectives



Increase uptake of EV to meet 2030 targets

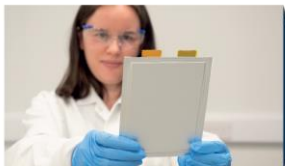


Create a UK EV manufacturing and supply chain hub



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
£21M

x4 Multiplier

A Focus for Collaborations in the UK



PowerDrive Line

HONDA



MoSESS

McLaren

A123
SYSTEMS

WMG
THE UNIVERSITY OF WARWICK

Granite



amte
power

exawatt

Solstice

COMAU



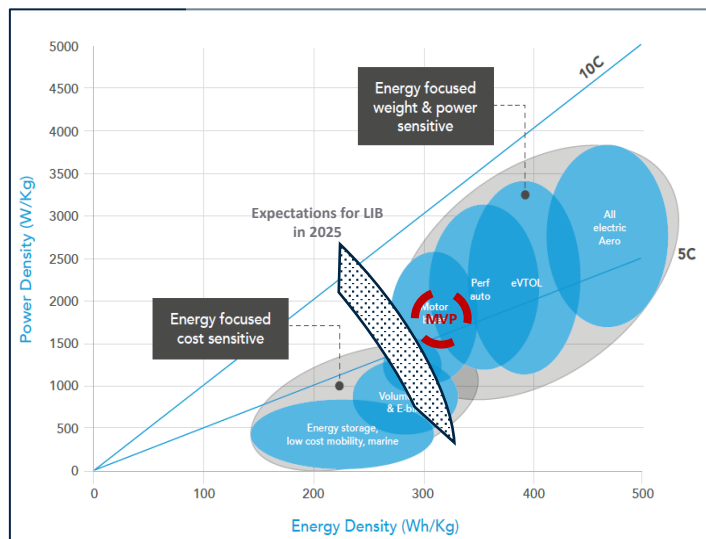
UK BATTERY
INDUSTRIALISATION
CENTRE

TDAP

**ADVANCED
PROPULSION
CENTRE UK**

ENDED

Power Cells for High Performance Cars (SuperCars, HyperCars)



Source: Adapted from WMG



5Ah

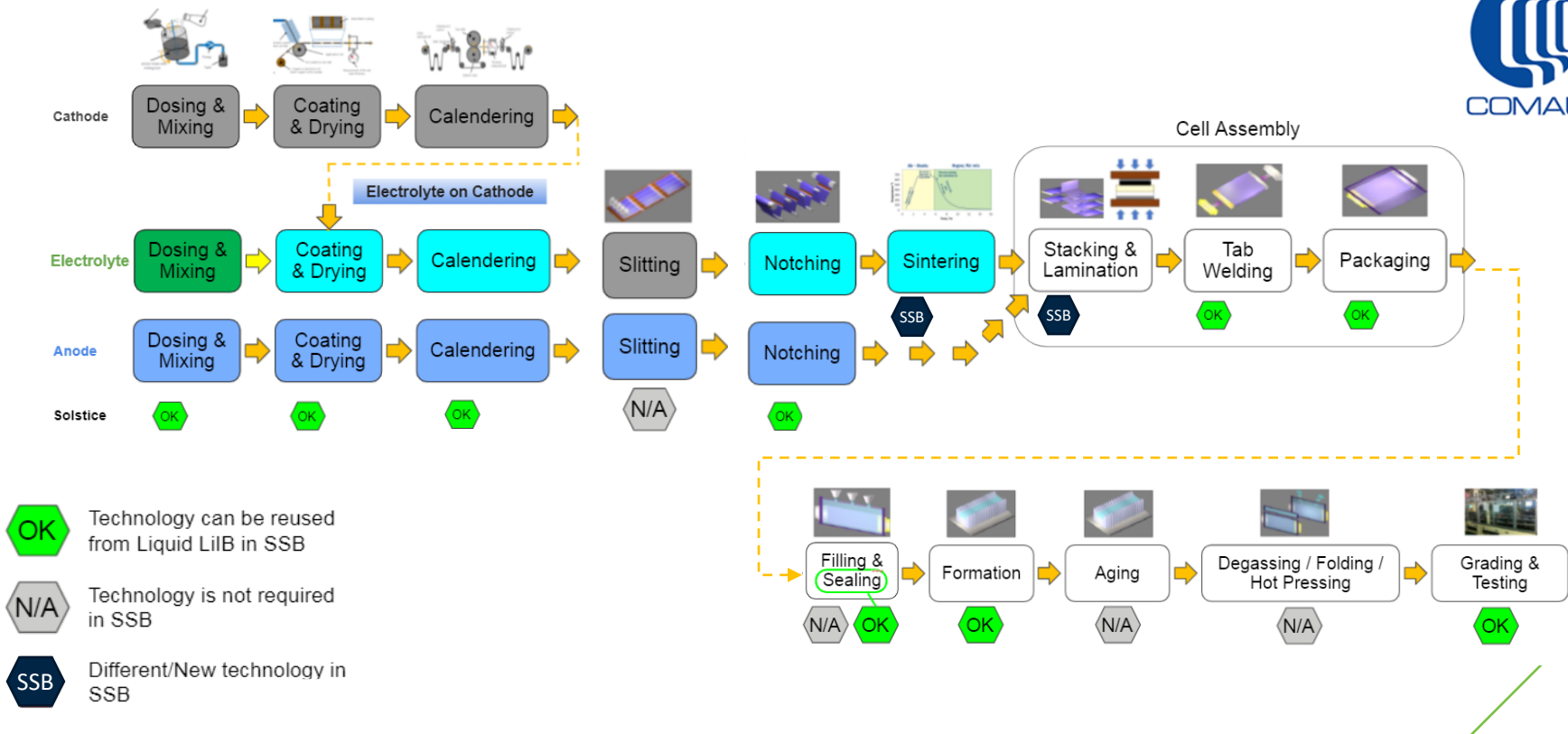


21700: 4 Ah

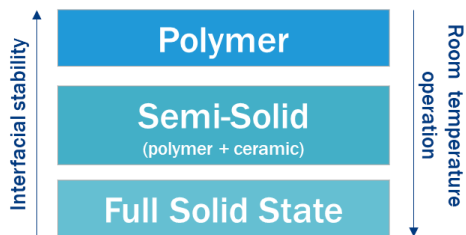


High Power 21700 replacement for Consumer Electronics

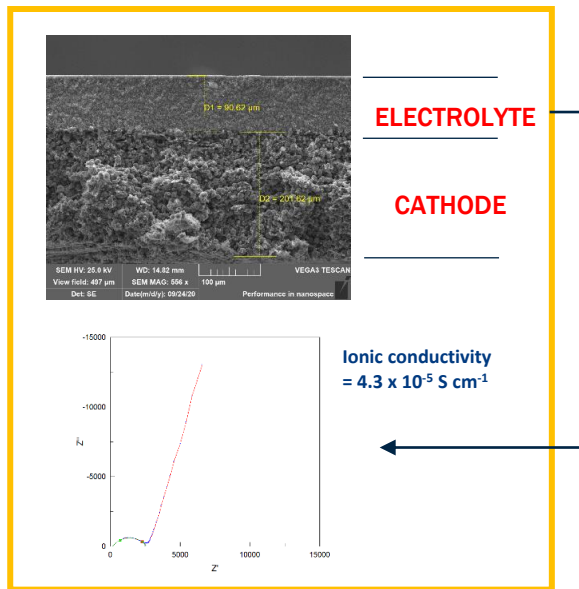
Manufacturing Processes



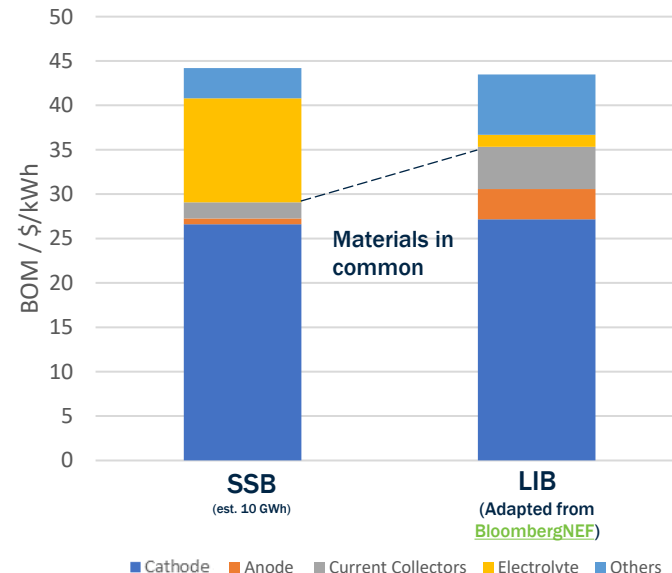
Various definitions of “Solid State”



Solid state electrolytes



BOM cell cost forecast



Iluka is developing:

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

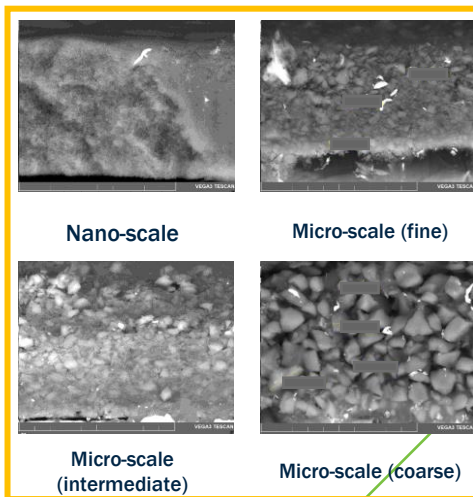
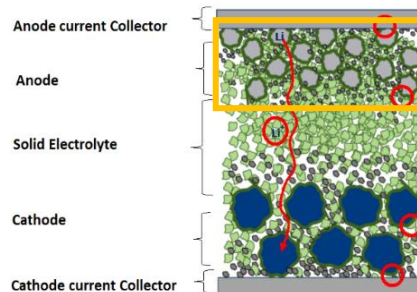
Pros	Cons
High energy density	Li energy density is higher
No dendrite formation	Volume expansion
Larger range of compatible electrolytes	Loss of contact due to contraction
Reduced materials, handling and processing costs	Decrepitation through SEI formation in liquid electrolytes
Easier to recycle	Rates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



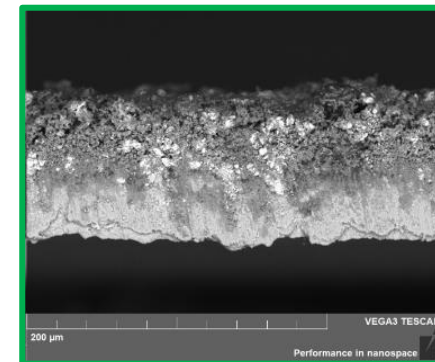
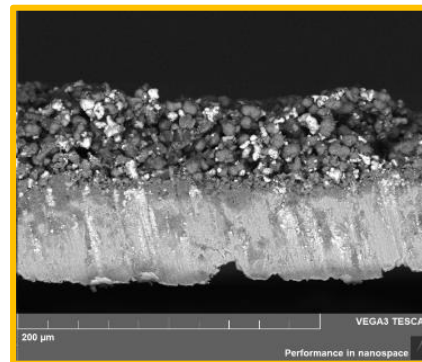
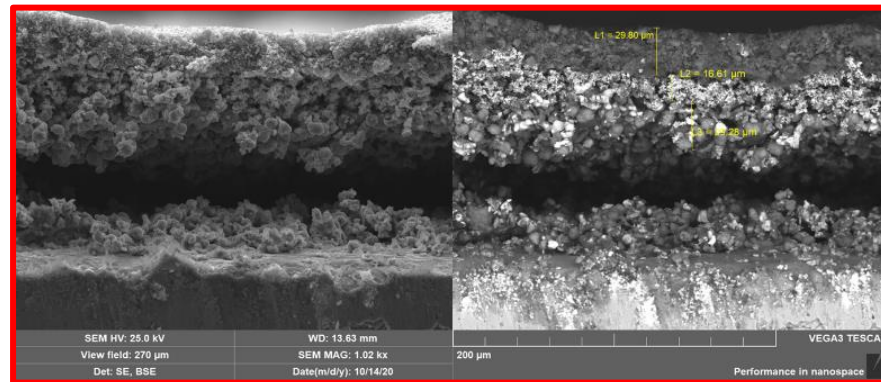
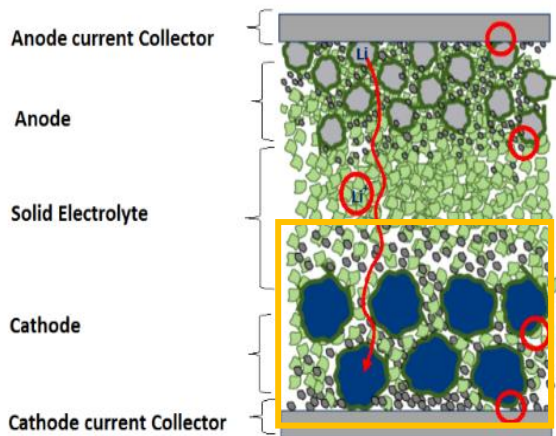
Solutions for the Use of Silicon in SSB

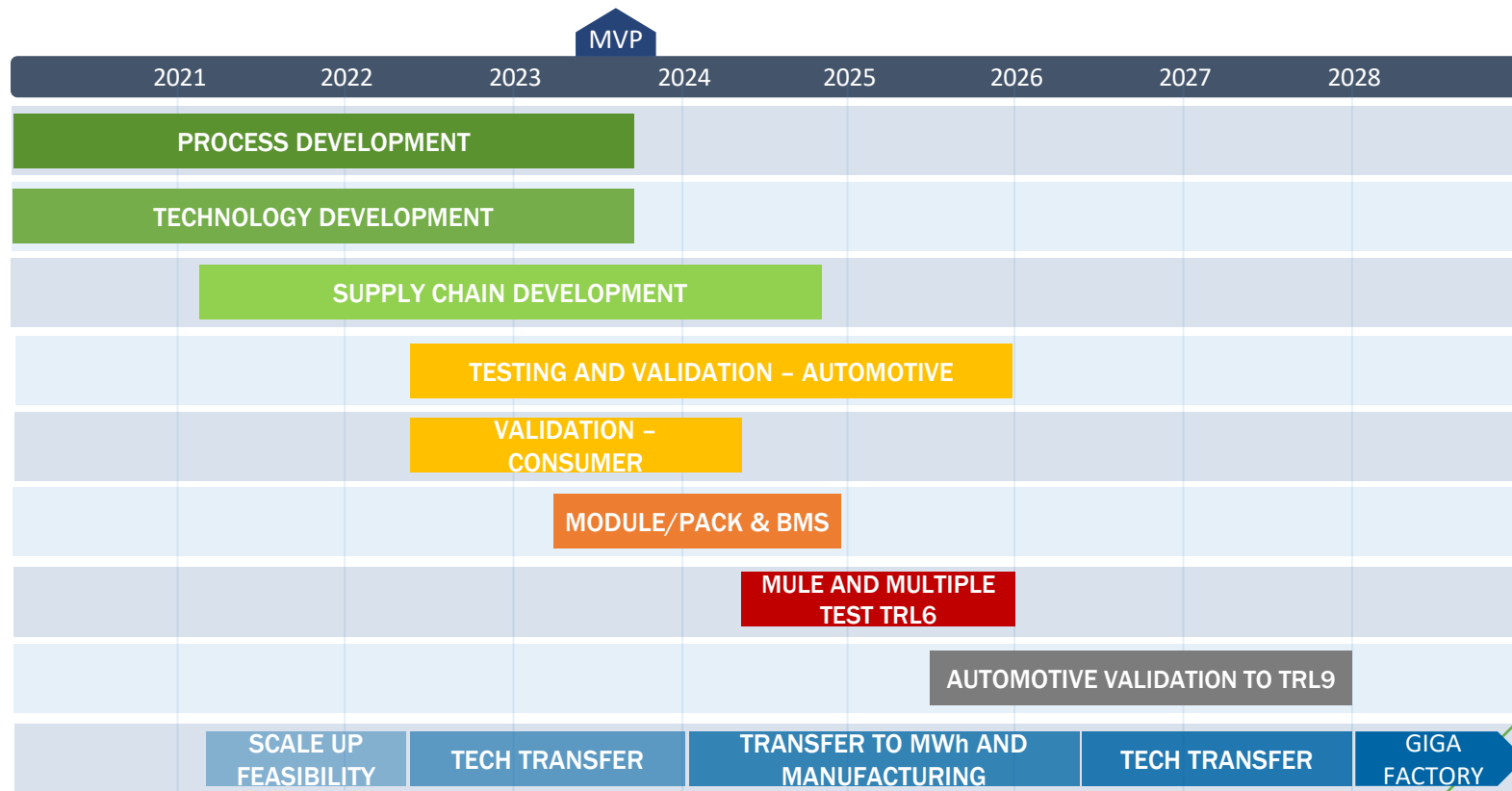
Selection of optimum silicon phases and particle morphologies
Disperse silicon in a flexible composite structure
Contain additives that provide mechanical strength to the electrode
System designed to form an incorruptible SEI
Optimum compression to support throughout cycling
Control cycling to limit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





Thanks a lot for your time and attention!

Any questions and/or comments?

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▲  @ilikapl

▲  /ilika-plc

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