Battery Tech Expo

ilika

Solid State Battery Development – A Progress Update

John Tinson, VP Sales & Marketing

25th April 2024

Ilika at a Glance

Pioneer in Solid State Batteries (SSBs)

- **Product lines:**
  - **Stereax** miniature cells used primarily to power miniature medical devices and industrial IoT
  - **Goliath** large format cells targeting the automotive industry and cordless consumer appliances
- Developing SSBs for EV use with an oxide electrolyte and silicon anode which reduces raw material costs and increases cell life

Key Statistics

2004
Company Founded
in Southampton, U.K.

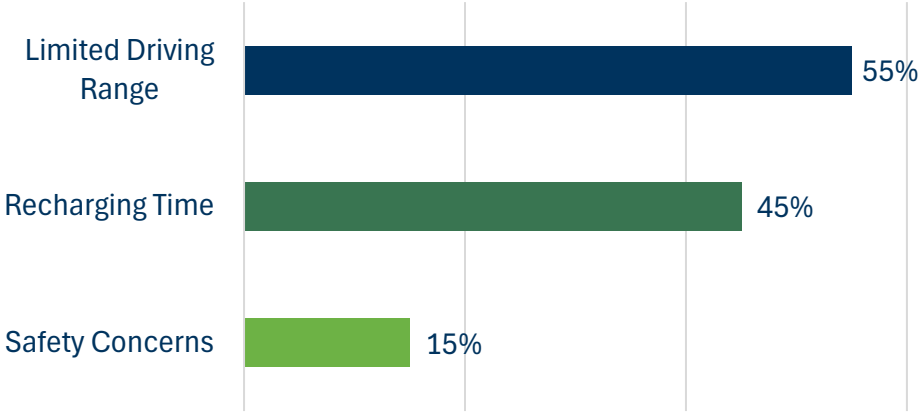
62
Patents

2 Production Sites
70 Staff

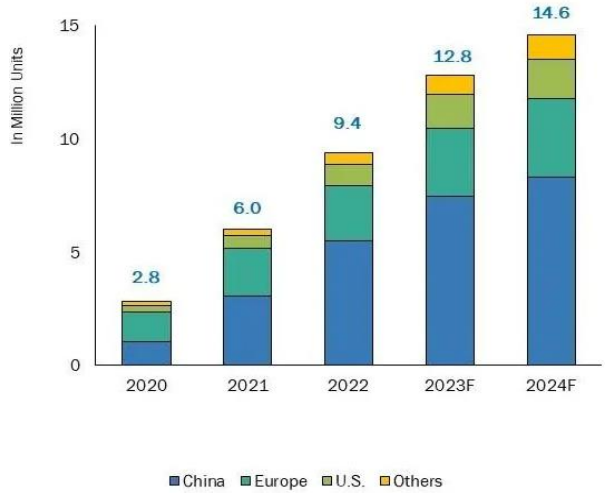
AIM Listed
Since 2012

Enabling Further EV Sector Growth

Reasons for not purchasing an Electric Vehicle [1]



EV sales momentum growing but slowing [2]



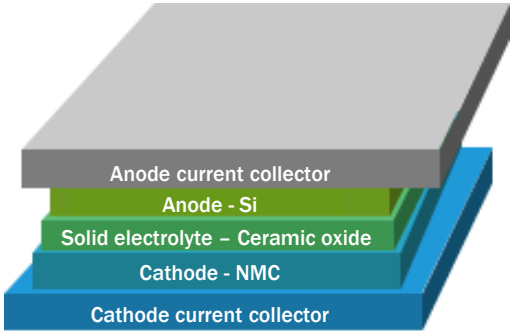
1 Adapted from CVMA, 2021
2 Forbes, 2024

Our SSB Solution

Goliath

A Rechargeable Solid State Lithium Ion Pouch Cell with:

- **Performance of NMC**
- **Safety of LFP**



- 50 Ah
- 30x10x1cm
- > 310 Wh/kg
- > 750 Wh/L
- 1000 cycles
- 15 min charge

FEATURES

Non-flammable
No liquid

Competitive performance vs Li-ion

Can operate to higher temperature

BENEFITS

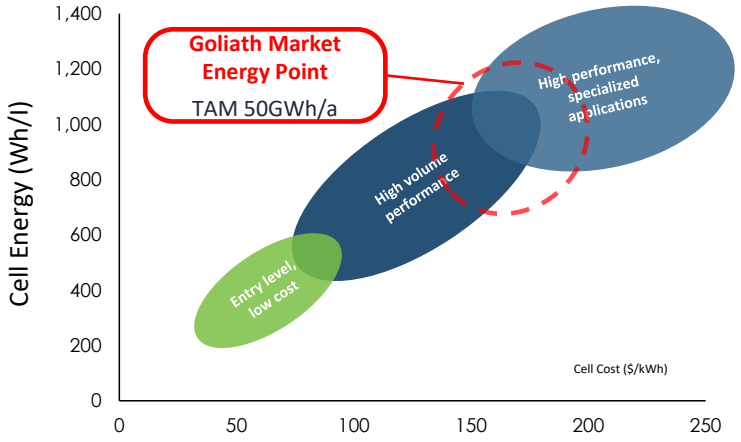
Lighter vehicle
High cell-to-pack ratio

Longer range

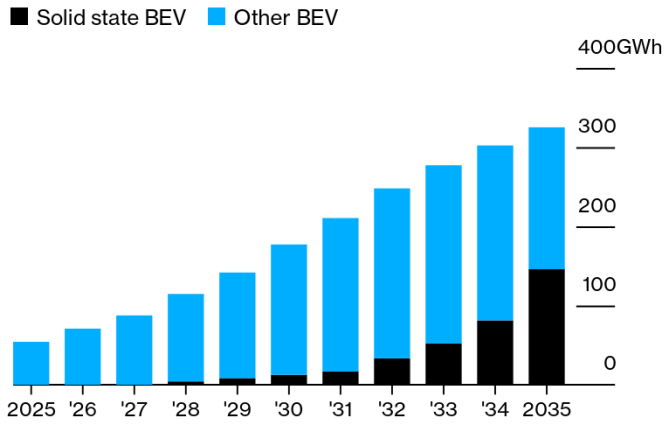
Safe in manufacture, use and recycling

Addressable Market

Ilika Targets Performance Market



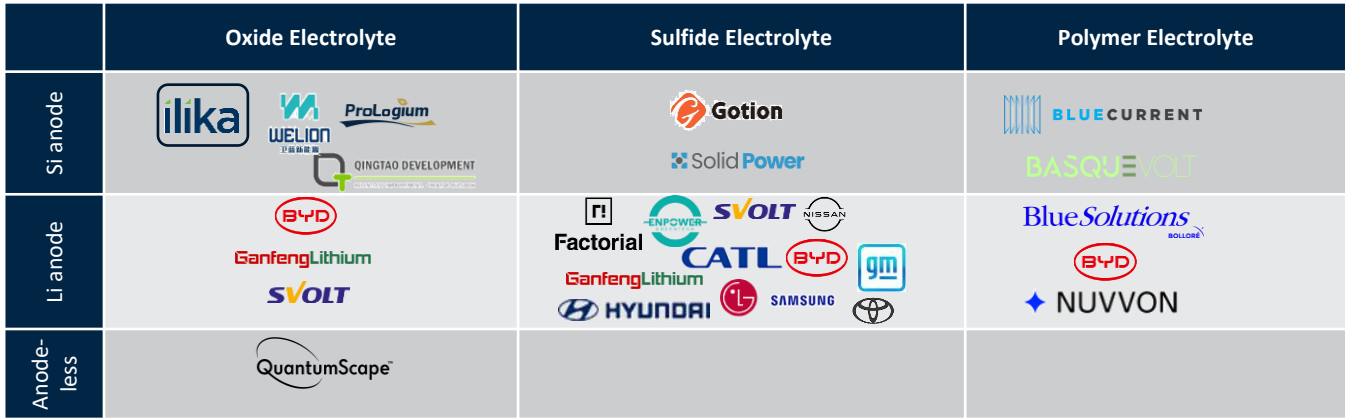
Attractive SSB Market Forecast [1]



1 BloombergNEF, 2022

40+ Solid Sate Cell Developers World-Wide

Solid-State Battery Technology Landscape

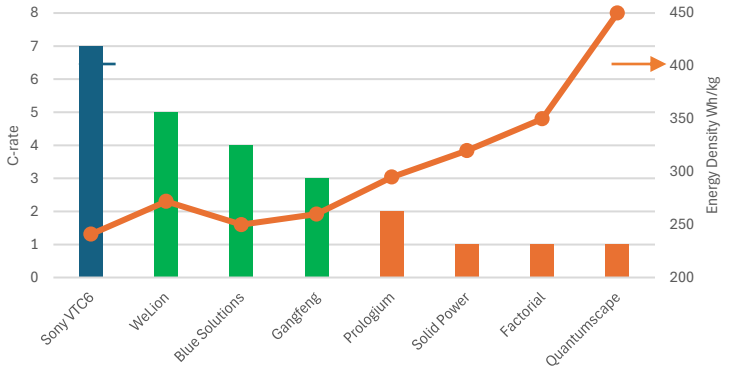


Chemistry

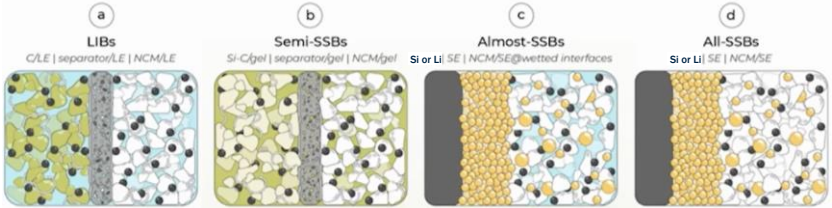
Sulfide Electrolyte	Oxide Electrolyte	Polymer Electrolyte	Lithium Anode	Silicon Anode	Anode-less
+ High ionic conductivity	+ Stable in air	+ High ionic conductivity	+ Constant cell voltage	+ Longer cell life	+ Cheaper than lithium anode
+ Malleable	– More difficult to manage interfacial resistance	– Needs pre-heating to 50-60°C	+ High energy density	+ Less expensive that lithium	+ Very high energy density
– Reacts easily with O_2 and moisture to make toxic H_2S			– Expensive	– Can lead to volumetric expansion	– Cell life compromise
– Expensive to manufacture			– Dendrite formation can lead to short life		– Volumetric expansion

Other SSB Developers

- SSB developers mostly pre A-Sample
- High C-rate data may not be published yet (more to come?)
- All are developing for automotive market
- All face different technical and manufacturing challenges determined by their chemistries



Li-ion batteries now → Where most SSB companies likely are → Direction of travel to get better safety specs → Holy Grail; best specs; Academic R&D



Partnerships for Technology Deployment

Faraday Battery Challenge Round 5: HISTORY

- A 24-month FBC Collaborative R&D programme
- Duration: 1 Feb 23 until 31 Jan 25
- Total programme value: £8M/Ilika grant £2.8M
- Nine Collaborative and steering partners
- Objective: delivery of a multi-layer, solid state pouch cell with specifications aligned with automotive requirements

HISTORY

Solid State Battery for Electric Vehicles

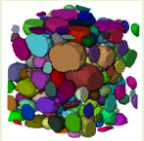
nexeon

NSP-2 Si Technology Platform

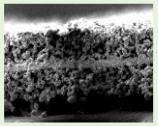
cpi

Scaled Coating and Mixing

Imperial College London

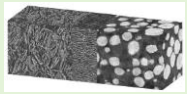


Materials and Battery Modelling



University of St Andrews

Advanced Characterisation and Materials Compatibility Testing



UCL

Micron-scale Characterisation and Material Interaction

HSSMI

Full Life-cycle Analysis of Battery Production and Materials

Steering Committee

BMW GROUP

WAE
A Forlescue Company

Partnering for Manufacturing Scale-up

2018 2024 2025 2027 2030

Ilika Pre-Pilot line: 50 kWh

Faraday Battery Challenge — Delivered by Innovate UK

Supported by FBC through PowerDrive Line

Ilika Pilot line: 1.5 MWh

Mpac — UK BATTERY INDUSTRIALISATION CENTRE

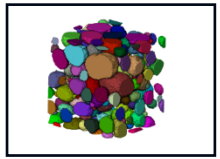
Supported by ATF through STEP and SiSTEM

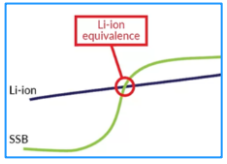
Licensee's Large Scale Pilot line: 50-100MWh to Giga scale

Under Manufacturing licence

M0 P1 P2 A Sample B – C Sample SSB Pack

Strong Progress to Date





8.2m HISTORY program award

Li-ion Parity Achieved

D4 Milestone Achieved

Faraday Institution safety project award

TECHNOLOGY

2023 2024 2025

MANUFACTURING

Trials at equipment vendors

R2R coating in-house

Design of Assembly Line

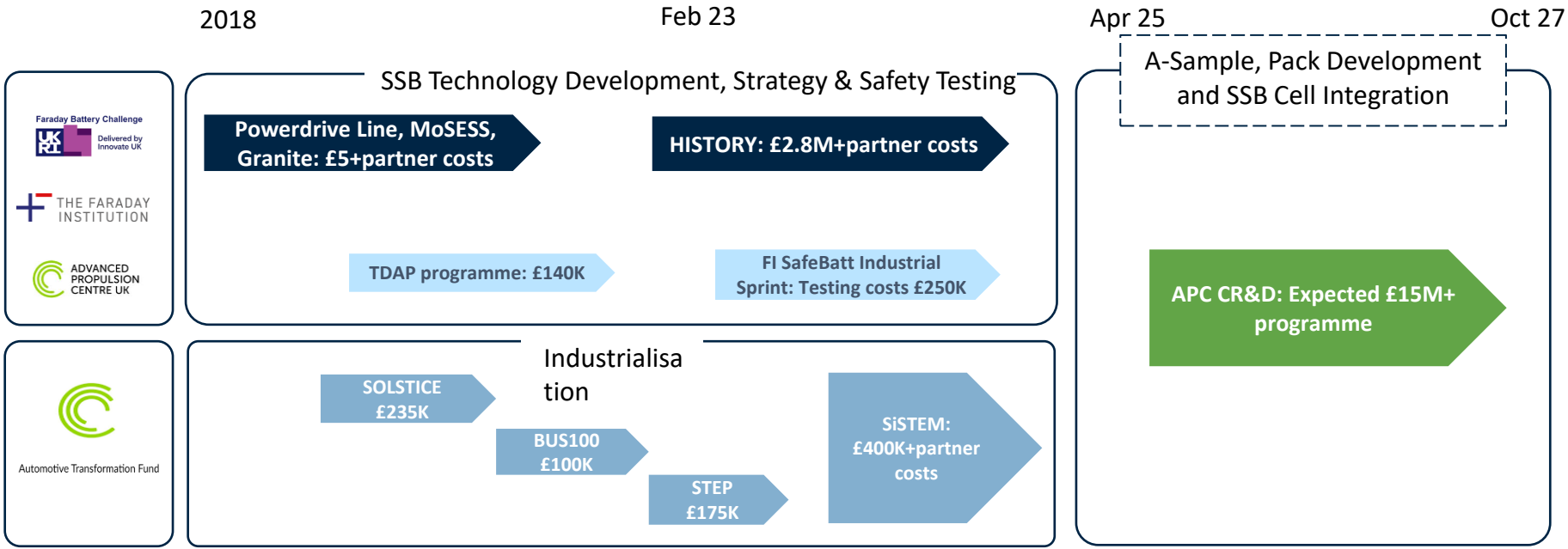
SiSTEM

UK BATTERY INDUSTRIALISATION CENTRE

Mpac

Delivery of MVP

UK Grant Funding in Support of Goliath



Initial Prototype (P1)

Parameter	Unit	Target
Capacity	Ah	2
Energy	Wh	7
Fast Charge Time 10-80%	Min	30
Peak Discharge Power	W	20
Upper Operation Limit	°C	85
Demonstrably Dry	-	Dry

“Effective area” used for calculations (cathode area, 56.1 cm^2)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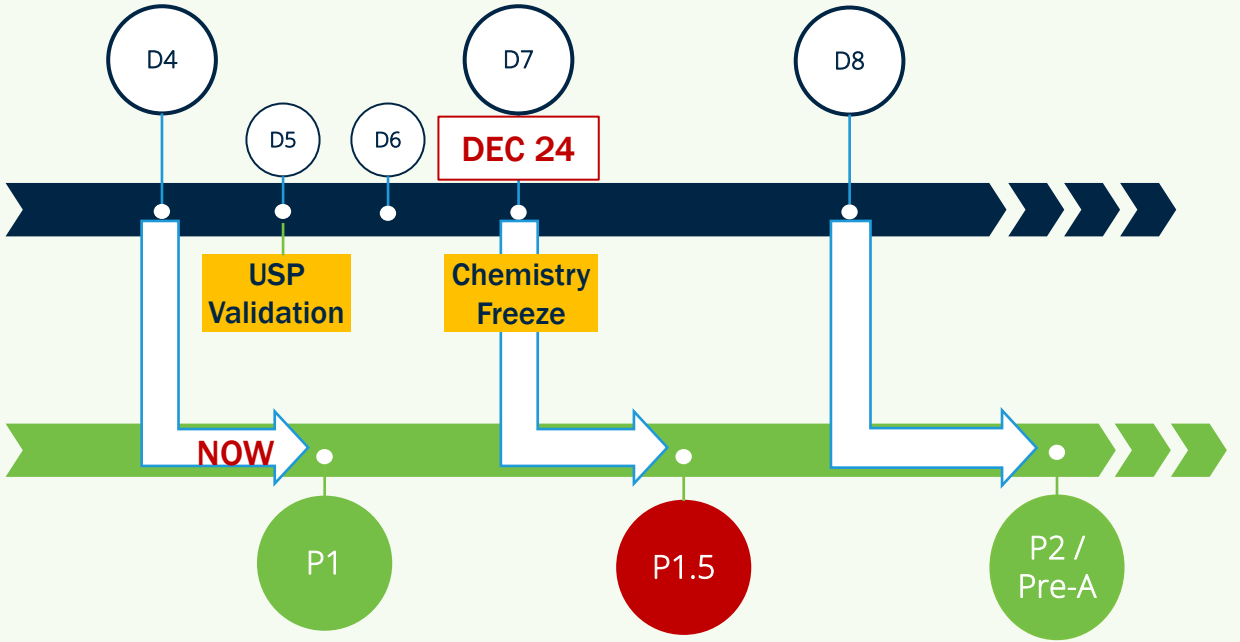
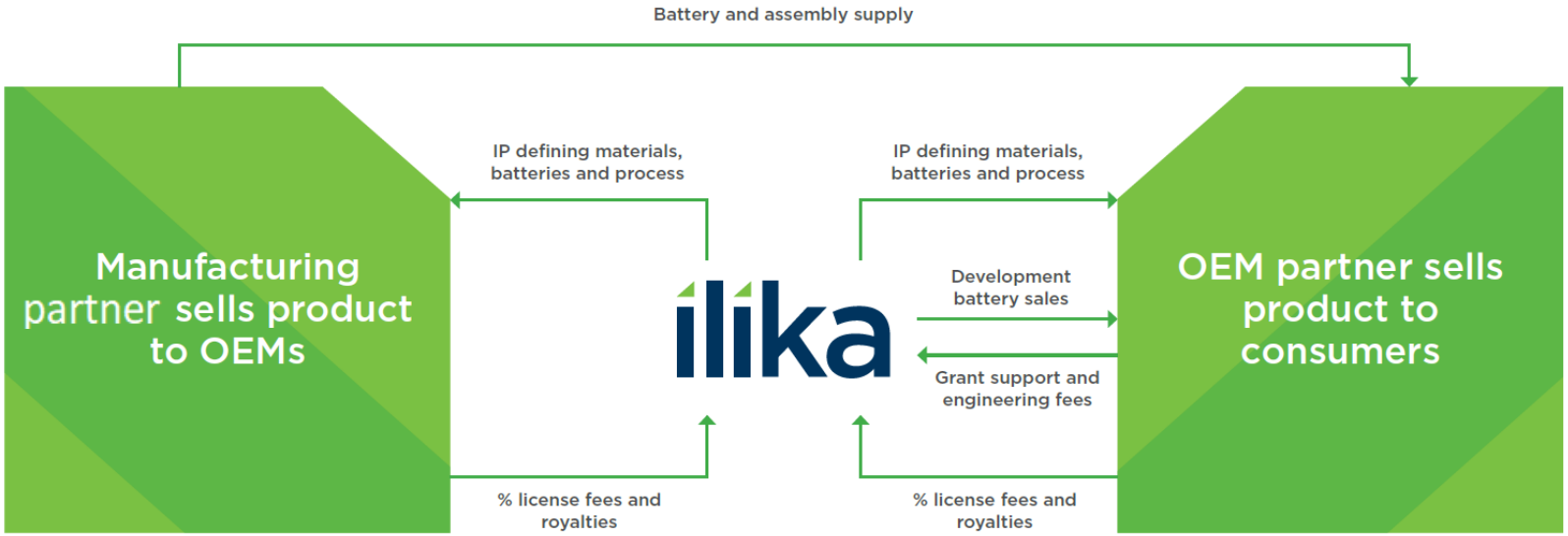
Evaluation Timeline

R&D Team
"D" Data Point

Prototyping Team
"P" = Physical item available for evaluation

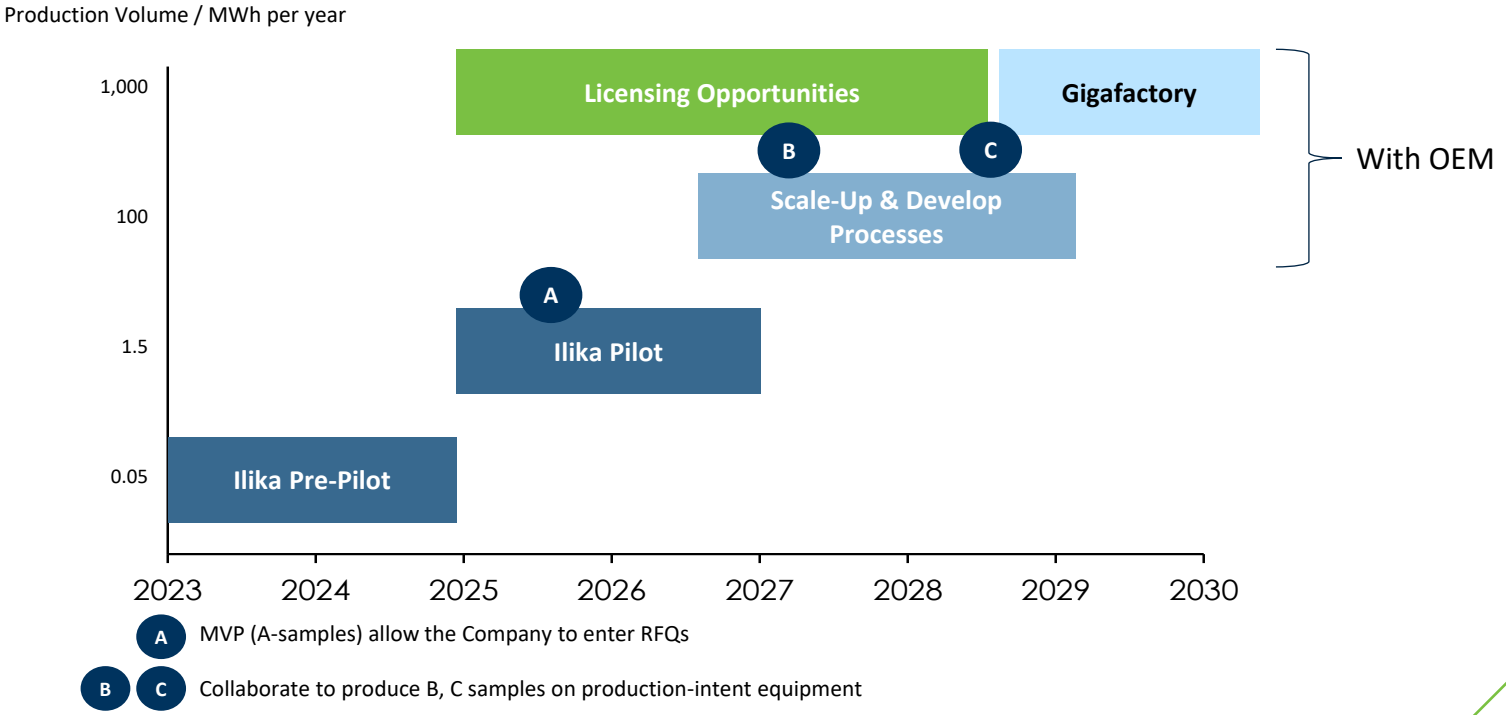


Ilika Business Model



Production Scale-Up

Ilika Scale-up Plan and Business Model



Keep in touch!

Thanks a lot for your time and attention!

Any questions and/or comments?

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