



**Solid state battery technology**

**Growth and Innovation Forum**  
**11<sup>th</sup> February 2020**

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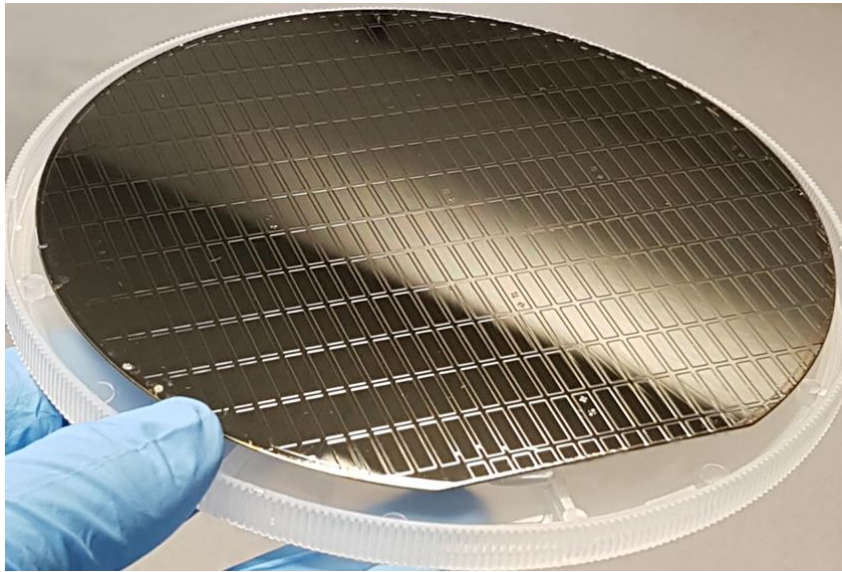
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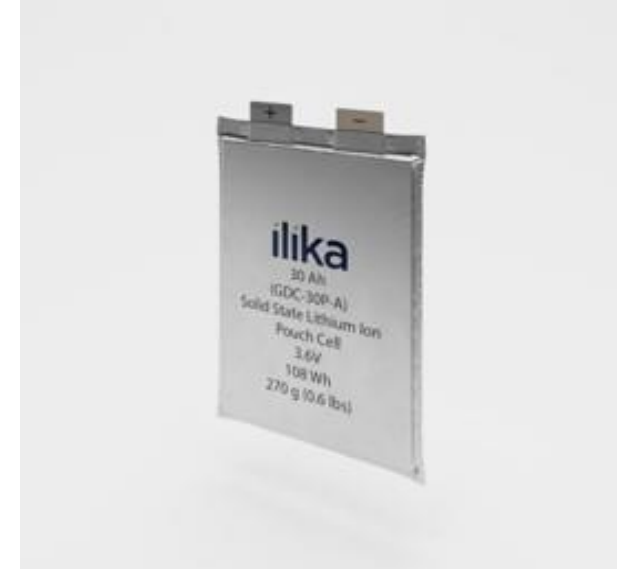
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# Business Overview



- Our mission is to rapidly develop leading-edge IP, manufacture and sell solid state batteries for high performance applications. We will achieve this using ceramic-based lithium-ion technology that is inherently safe in manufacture and usage.

- AIM Listed 2010
- Launched cm scale Stereax<sup>®</sup> technology in 2016 & mm scale in 2019
- Collaborating with auto industry partners & UK Government to develop solid state EV pouch cells



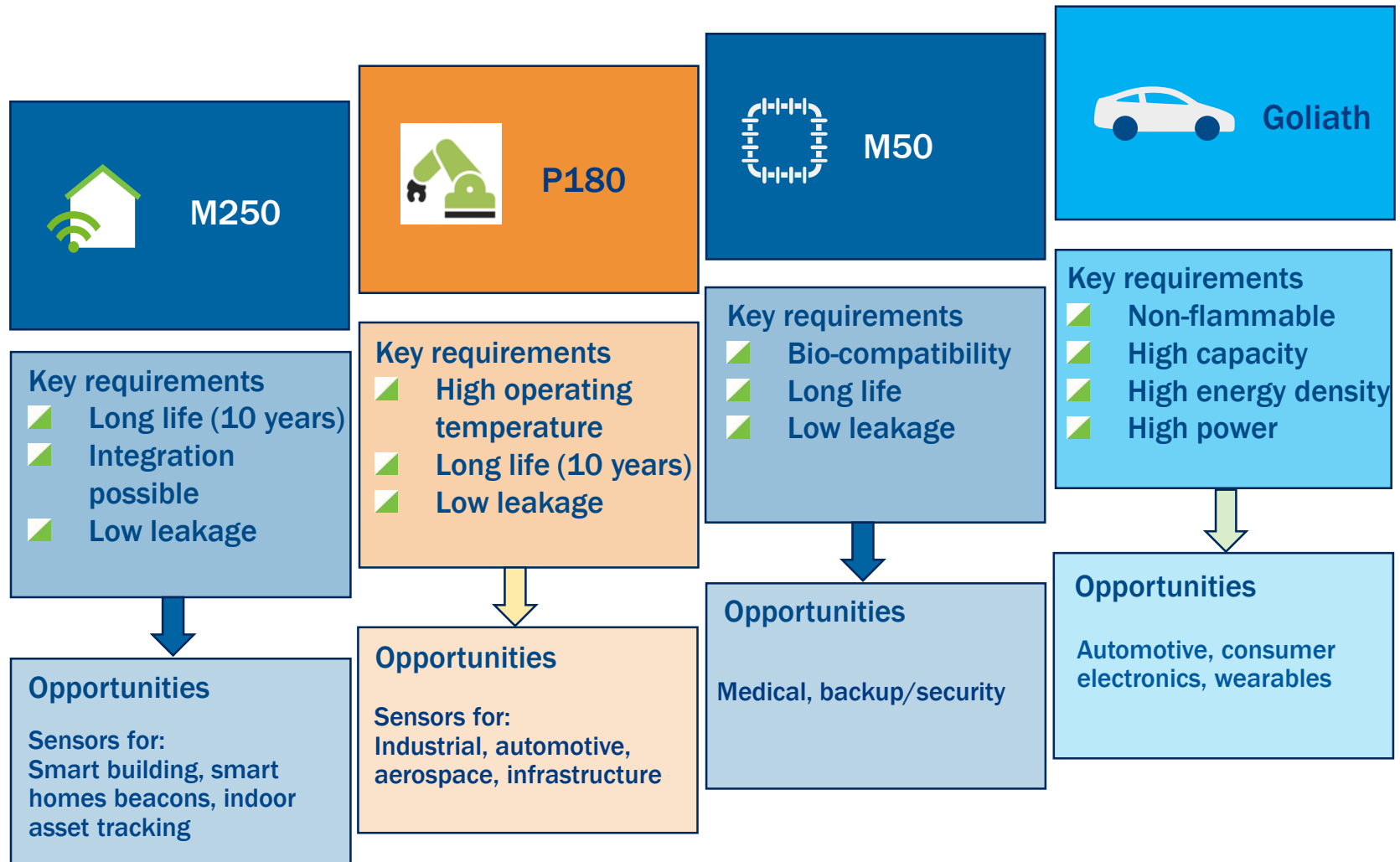
# Energy storage solutions



	Conventional Li-ion	Supercapacitors	Ilika Solid State Batteries
Temperature range			
Trickle-charging/ Low Leakage			
Fast charging			
Ultra-compact			
Safety Profile			

# Stereax<sup>®</sup> product to market mapping

ilika





# Goliath project



**Ilika is developing the Goliath solid state battery product line to address the growing demand for safe, high performance batteries for Electric Vehicles**



# Market needs

## Cost



**Now** \$130/kWh (cell)  
\$280/kWh (pack)

**2035** \$50/kWh (cell)  
\$100/kWh (pack)

## Energy Density



**Now** 700Wh/l,  
250Wh/kg (cell)

**2035** 1400Wh/l,  
500Wh/kg (cell)

## Power Density



**Now** 3 kW/kg (pack)

**2035** 12 kW/kg (pack)

## Safety



**2035** eliminate thermal runaway at pack level to reduce pack complexity

## 1<sup>st</sup> Life



**Now** 8 years (pack)

**2035** 15 years (pack)

## Temperature



**Now** -20° to +60°C (cell)

**2035** -40° to +80°C (cell)

## Predictability



**2035** full predictive models for performance and aging of battery

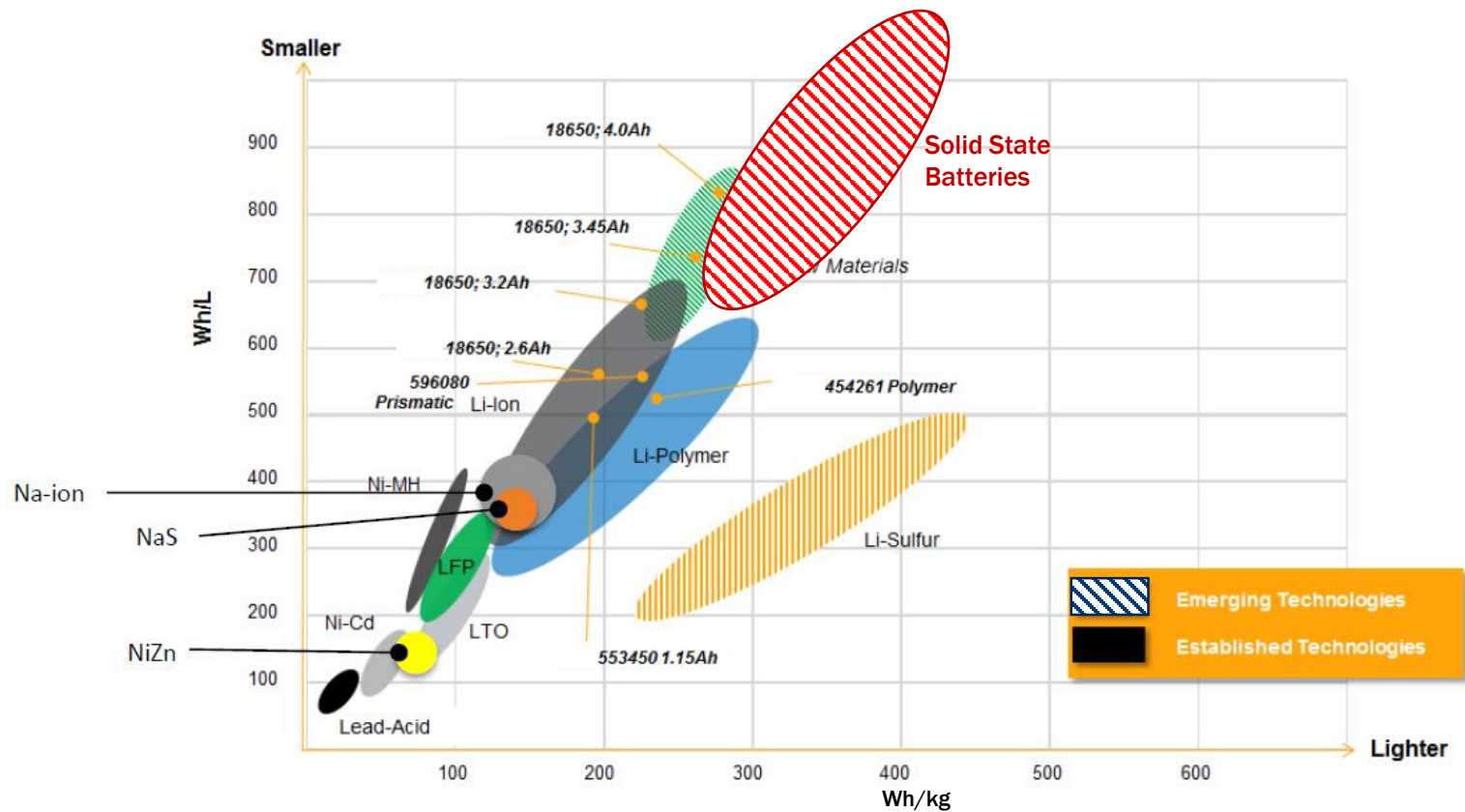
## Recyclability



**Now** 10-50% (pack)

**2035** 95% (pack)

# Battery technologies: size and weight



Source: Christophe Pillot - Avicenne



# Solid state batteries

## Advantages

Safety

Durability

Fast charge / discharge

High energy density (Wh/L)

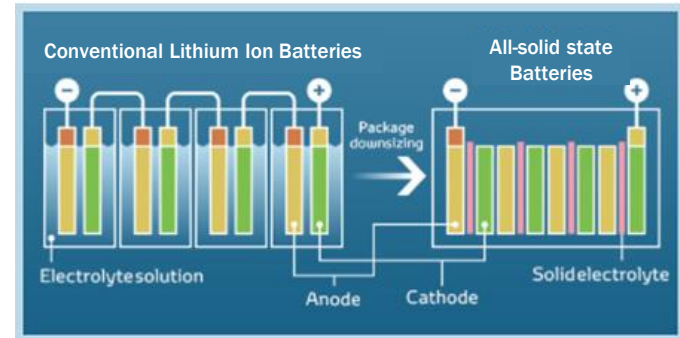
High energy density (Wh/kg)

Thermal stability

Simple construction

Low self-discharge

Efficient packaging



Source: Toyota

## Challenges

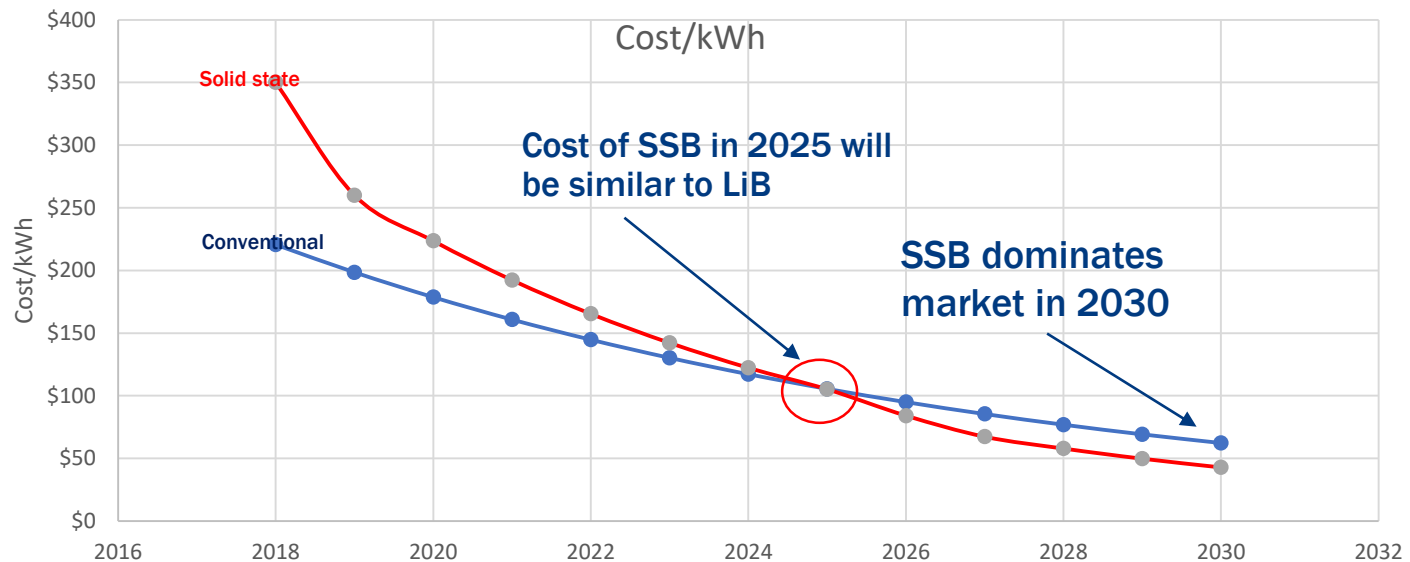
Materials conductivity

Interface reactions and resistance

Manufacturing Methods

Electromechanical Stability

# Unit cost analysis (cost/kWh)



- ▲ The unit cost of SSB is around 30-40% higher than LiB in 2021
- ▲ Cost expected to be similar to LiB in year 2025
- ▲ SSB will dominate market in 2030, taking over 70% market share.

# What differentiates Ilika's Goliath program?



- ▲ **Use of silicon as anode material**
  - ▲ Experiences gained from Stereax SSB program
- ▲ **10 years of materials innovation on solid electrolytes**
  - ▲ Extensive testing around sulphides and oxides
  - ▲ Selection of oxides
  - ▲ Development of specific oxides
- ▲ **Flexibility to use best in class cathode material**
  - ▲ Supply of advanced NMC grades will evolve over next 5-10 years and Ilika is positioned to take advantage of this

# Goliath Development Partnerships



## Goliath Development Programme:

- Establish Ilika as leader in development of manufacturing methods for production of solid state batteries
- Commercialise the large format solid state battery (Goliath)

POWER DRIVE  
LINE

Innovate UK

MOESS

Innovate UK

GRANITE

Innovate UK

Lead Partner  
Framework

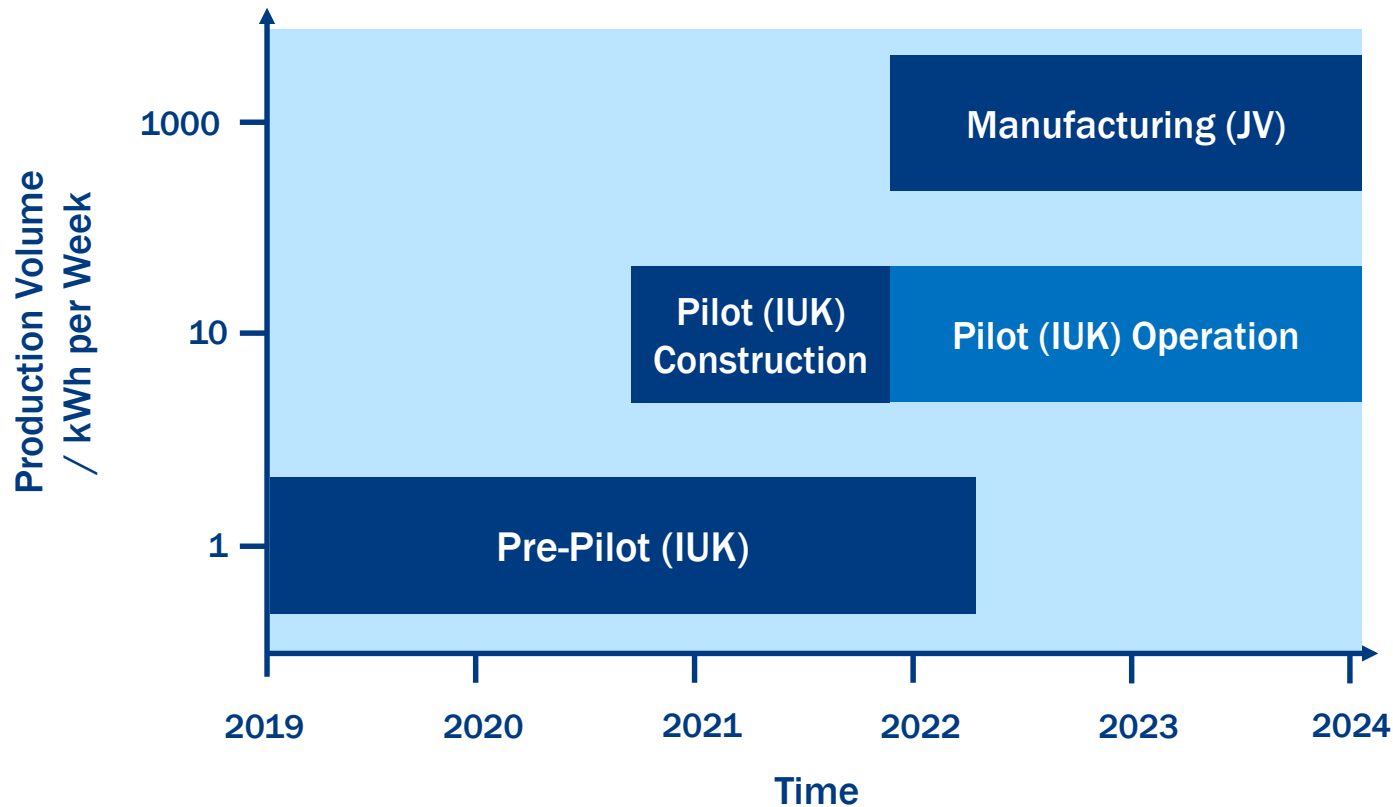


Including  
consumer cells

# Goliath manufacturing scale-up



- ▲ The technology will be developed and manufactured in three phases





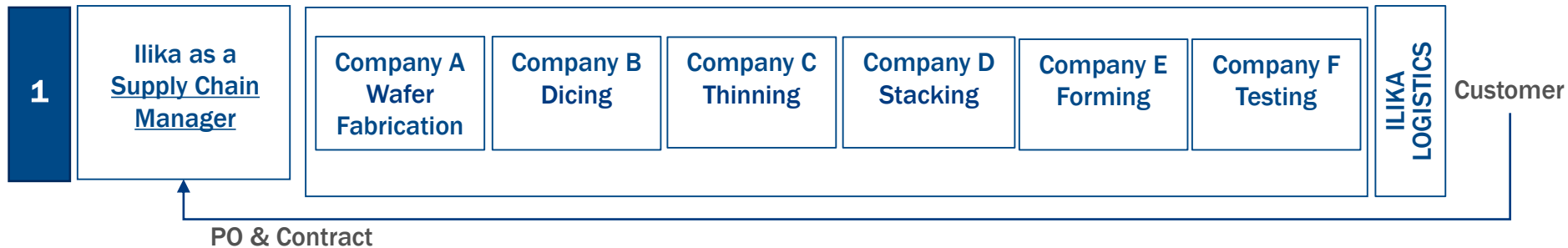
# Ilika Business Model



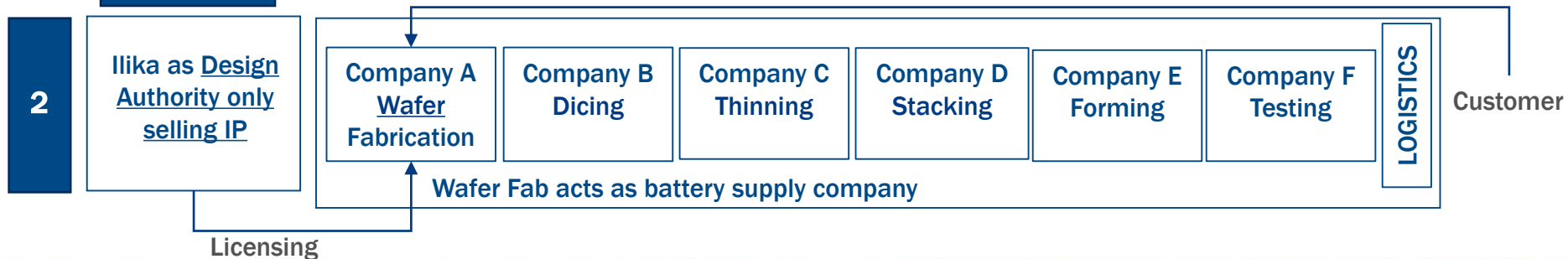
## Pilot



## Partnership



## Licensing



# Financial summary for the half year ended 31st October 2019



- ▲ Revenue £1.5m (H1 2018: £1.0m)
- ▲ EBITDA loss £1m (H1 2018: £1.3m)
- ▲ Cash £1.9m with £0.7m received post period end.

- ▲ **Solid state batteries will be a significantly disrupting technology**
- ▲ **Investors have been taking positions in the technology via investment in SME's**
- ▲ **Ilika offers a lower risk investment proposition because of:**
  - ▲ Its demonstrated ability to make miniature solid state batteries
  - ▲ Its capital light commercialisation model
  - ▲ Substantial grant support from IUK facilitating partnering and reducing reliance on shareholder capital

## Contact details



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