Written evidence from Ilika Technologies Ltd (BEV0030)

Business, Energy and Industrial Strategy Committee
Commons Select Committee
Call for evidence: Batteries for electric vehicle manufacturing

This evidence paper has been produced by Ilika Technologies Ltd for consideration by the Business, Energy and Industrial Strategy Committee Commons Select Committee in its inquiry into Batteries for electric vehicle (EV) manufacturing.

1. Company information:

i. Ilika Technologies is a pioneer in Solid State Battery (SSB) technology, based in Hampshire and listed on the London Stock Exchange (LSE: AIM, IKA). The company was originally spun out of the University of Southampton in 2004 and has grown to be the UK's largest pure-play publicly-listed battery company. Ilika has two solid state product lines: Stereax ™ miniature batteries for Medtech applications and Goliath large format cells for EVs. SSB offer many benefits relative to conventional lithium-ion batteries (LIB) due to their tolerance of high temperature, high energy density and recyclability.

ii. Ilika began developing its large format Goliath batteries in 2018 with Faraday Battery Challenge (FBC) support. During the FBC programmes Ilika designed, built and commissioned a pre-pilot line capable of delivering 1kWh of single cells per week.

iii. Our £5.2m grant funding support from FBC enabled us to raise just under £25m in equity funding from the London capital market, increasing our R&D spend by a factor of 5.

iv. We have recently been awarded a FBC Round 5 grant to continue with our development. The objective of the programme is to integrate high silicon content electrodes into Ilika's Goliath SSB for EVs, to enable automotive level performance. We are partnering with a number of UK Universities as well as Nexeon Ltd, a UK battery materials company.

2. Why solid state technology?

v. Electrification will be crucial to achieving Net Zero, and battery technology is critical to the uptake of EV's needed to support electrification.

vi. Currently LIBs are the most widely used type of rechargeable battery in the world, due to their high energy density (270Wh/kg, 700 Wh/l) and long cycle-life (~1000 cycles). However, conventional LIBs are quickly reaching their maximum capabilities, with only small increments in energy and power densities possible over the coming 10-years. Other liquid-based technologies, such as Li-metal, could provide higher energy densities to 350Wh/kg but serious technical challenges still exist that may be hard to overcome.

vii. SSBs have the potential to exceed 400Wh/kg (1000Wh/l) over the next 3-5 years, surpassing LIBs, and eventually reaching an energy density of 500Wh/kg.

viii. Low-cost SSB with high cycle-life have the strong potential to power future electrified and sustainable mobility, once manufactured at scale. SSBs promise a leap forward with improved safety, higher energy density, faster charging times, and longer life. The technology is a potential cure-all for the drawbacks facing electric vehicles that run on conventional LIBs, including the relatively short distance traveled on a single charge, as well as charging times. In addition, the non-flammable solid electrolyte allows easier

thermal management and more efficient packing density going from cell to pack; SSBs are also intrinsically safer than LIBs.

ix. In addition to the cell level benefits of the technology, further significant benefits will be found at pack level as SSBs enable the energy density gain combined with the reduced need for packaging and thermal management systems to provide smaller, lighter battery packs or alternatively packs which offer increased range.

x. Ilika's SSB technology will be equally applicable to industrial and consumer markets.

3. Ilika Responses:

xi. The UK is very well placed to become a battery manufacturing centre of excellence. Much of the early battery technology development is generated within the academic institutions and SME's of the UK and the central issue is whether it can be retained and exploited from the UK through its gigafactories.

xii. The EV and battery industries, as well as the materials, skills, processing and equipment that supply into them, are inextricably linked and therefore must be viewed as a whole. It is essential that the UK creates the right climate to enable the growth of the gigafactory industry. Essential factors in **establishing** gigafactories are:

4. Mature battery manufacturing technology (ideally licensed from an established manufacturer such as Panasonic, LG Chem, Samsung, SK CATL)

a) In the short to mid-term the gigafactories must focus on mature battery technology, such as LIB, which emanated from Oxford in the 1970's. Entering this market will have challenges as overseas gigafactories are already producing these products in large quantities at an economical scale, however it will enable the UK to join the industry with a tried and tested product.

5. Off-take agreements with OEMs

b) Critical to securing funding for gigafactories is the support of the automotive OEM's by the placing of offtake orders.

c) The cost of operating gigafactories, particularly materials costs, means that they cannot remain idle once commissioned. We see this with the UK's only successful gigafactory, Envision, opened specifically in 2012 to produce batteries for Nissan and partners to produce cells to power its Leaf electric car. Its planned expansion is underpinned by growth in the industry.

6. Private sector project finance (£1bn/15 GWh) with co-investment from OEMs and government loan support (ca. 10%)

d) The very high costs and long lead times associated with the cost of developing the UK EV industry require a concerted 'package' approach, whereby there is committed government support which will in turn unlock private investor and OEM funding.

7. Inexpensive (ideally green) energy

e) Gigafactories use substantial amounts of energy during the various process steps, such as the drying process and the solvent recovery. It is estimated that the required energy to manufacture a Battery within a gigafactory is around 29 kWh of energy to manufacture 1 kWh of Battery. Whilst there is currently focus on the reduction of energy usage during production, and it's likely that SSBs will be much less energy intensive to produce, it is essential that inexpensive energy is procured by using green energy. We have seen in Norway that gigafactory startup FREYR Battery has signed a binding agreement with renewable energy group Statkraft covering 2024-31 for its first two gigafactories.

f) The UK battery industry must align with UK renewables companies to secure the energy it will need.

8. Ready supply of trained (or trainable) labour

g) We have seen the launch of the European Battery Academy to upskill EV workers, aimed at re-skilling and up-skilling workers in the battery industry across the EU, including in the electric-car sector. The European Commission is supporting the academy with a grant of €10 million.

h) Much has been done in the UK to analyse the gaps in skills but further work is needed to harmonise the training and qualifications to ensure alignment across the country. Initiatives such as apprenticeships are a good start, but much of the ICE workforce will need to be redeployed within the EV area and so skills and training must be approached from that perspective too.

9. Long term approach

i) In order to **sustain** the battery industry in the longer term, investment in next generation SSB technology is required. Here, the UK can potentially secure itself a leading commercial position. Essential to the ability to transition to next generation battery technology is a deep understanding of the materials, skills, processes and equipment requirements at an early stage, and in parallel with LIB production, in order to future-proof capital equipment and facility investment. The establishment of a gigafactory is a $1bn investment and it is essential that it can adapt to changes in the market.

j) Ilika has been the fortunate recipient of grant funding to support its battery development programme, however the current public funding structure offers relatively small amounts of funding available on an ad hoc basis, leading to insecurity and effectively decelerating the development phase.

k) There are three government policies which would further encourage financial support for next generation battery development:

xiii. Doubling both the lifetime limit on VCT/EIS funding an individual company can receive (currently £20m for knowledge-intensive businesses) and the gross asset limit (currently £15m) to reflect the significant cost of developing new hard-tech products

xiv. Reversing the recent decision to cut R&D tax credits to SMEs from 130% to 86%. It could be argued that SMEs are the ones in most need of it as they drive innovation

xv. Continuing to allocate funding to FBC and APC to support new product development