THE FARADAY INSTITUTION

The UK's flagship programme for electrochemical energy storage research, skills development, market analysis and early-stage commercialisation.

Peter Bruce
Materials Oxford
Chief Scientist Faraday Institution
Physical Secretary Royal Society

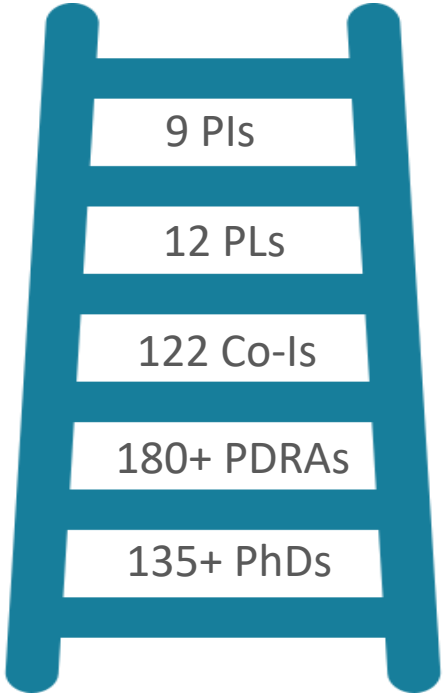
ASSEMBLED A WORLD-CLASS ENERGY STORAGE RESEARCH COMMUNITY

50+

Industry partners

20+

Academic & research partners



470+

Researchers from many disciplines

Grown interest and excitement

- Increasing reach across UK
- 30% female
- 74% under 40
- 65% new to battery research

THE FARADAY INSTITUTION RESEARCH PROGRAMME

Application-inspired programme focused on technical targets

RESEARCH STREAM 1

Lithium-ion

Nearer-term market challenges

Projects optimising current generation lithium-ion based batteries where there are still considerable gains to be made and where breakthroughs could start to be realised in commercial settings within 3-4 years.

In addition, our recycling and reuse project is focused on battery end-of-life and the circular economy.

- DEGRADATION
- MULTISCALE MODELLING
- RELIB
- FUTURECAT
- CATMAT
- NEXTRODE
- SAFEBATT

RESEARCH STREAM 2

Beyond Lithium-ion

Longer-term market challenges

Projects that are higher risk, higher reward and could facilitate the long-term commercialisation of next-generation battery technology that still require considerable research in materials discovery and optimisation.

- SOLBAT
- LISTAR
- NEXGENNA

RESEARCH STREAM 3

Batteries for Emerging Economies

Shorter-term projects focused on reducing the cost and improving the performance of battery technologies for use in developing countries and emerging economies. Funded from UK Aid as part of its Transforming Energy Access (TEA) programme

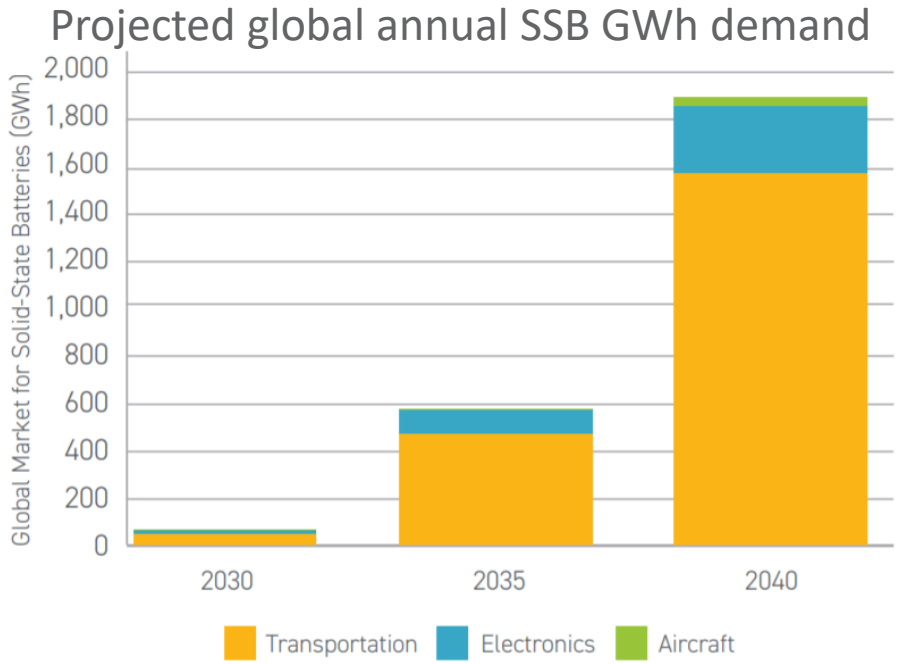
- RELCo-Bat
- Low-Cost Graphite Polysulphide Single Liquid Flow Battery

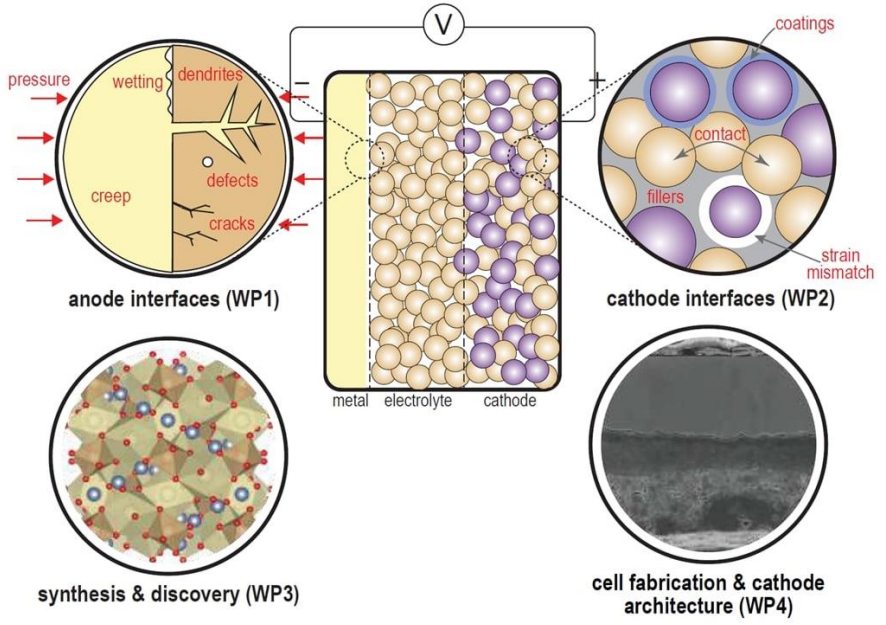
April 2018 start | Autumn 2019 start | Oct 2020 start | April 2021 start

SOLID STATE BATTERY (SSB) PROJECT - SOLBAT

- SOLBAT project (>£15m) collaboration of Universities of Oxford, Sheffield, Liverpool, Warwick, UCL
- Addressing fundamental scientific challenges that need to be overcome before high power SSBs can be commercialised
  - Improved understanding of cell failure by dendrite growth and void formation
- SSBs next generation tech for EVs:
  - 50% increased energy density at pack level
  - Increased range, safety, temperature range and faster charging
  - On roadmap for all automotive OEMs ~ 2030
- FI is establishing SPV and consortium with universities, 5 UK companies across the supply chain
  - Including Johnson Matthey and Britishvolt
  - Developing one-of-a-kind prototyping facility to enable SSB technology to emerge from UK university laboratories

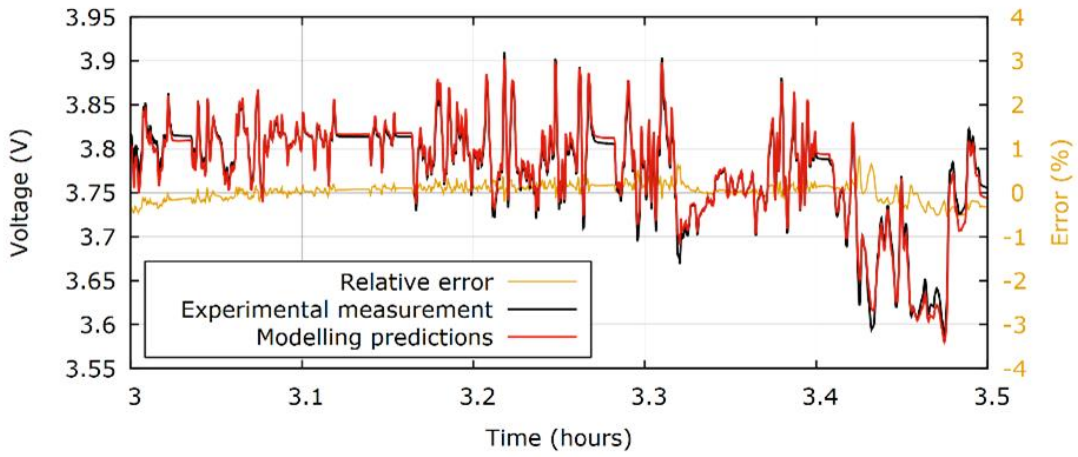
https://www.solbat-faraday.org/





MULTI SCALE MODELLING (MSM) PROJECT

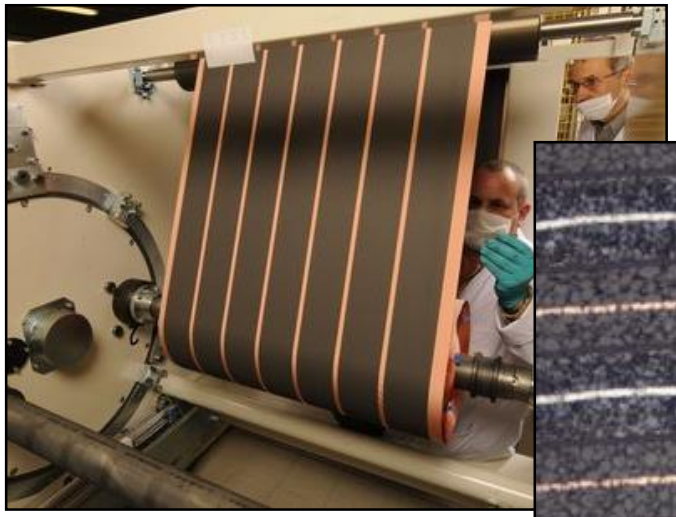
- A collaboration between Imperial, UCL, Southampton, Portsmouth, Warwick, Oxford, Lancaster, Birmingham, Bath and 15 industrial partners (£18m)
- Developed know-how and software tools that accelerate Li-ion battery system design and optimisation
- Reduces battery prototyping time and cost and performance of cells, materials, packs
- About:Energy, a battery parameterisation consulting company, spun out of Birmingham and Imperial, generating revenue with UK corporate customers
- Assessing potential for standards based thermal performance and degradation modelling tools with significant industrial applications
- Builds on open source data and models developed in the research project

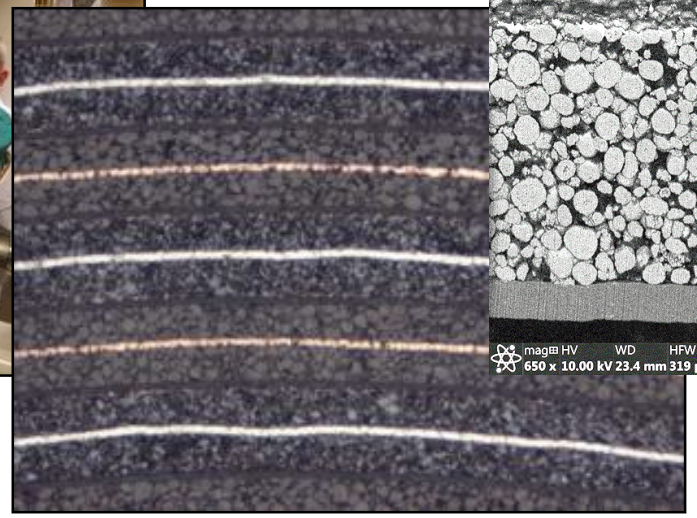


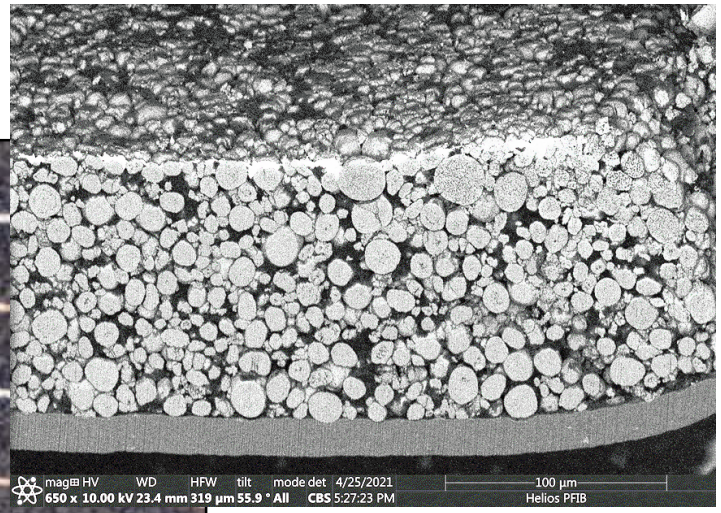
https://energysuperstore.org/esrn/multiscale-modelling/

Nextrode: consortium scope & team

To realise improvements in battery performance by smarter assembly of the different materials based on investigation, understanding and exploitation of the science of electrode manufacture

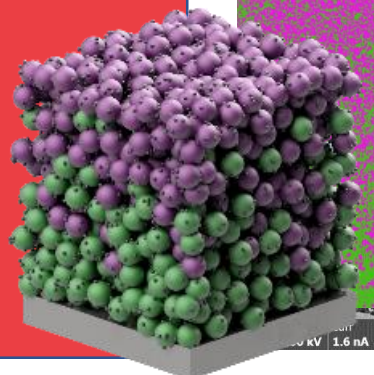


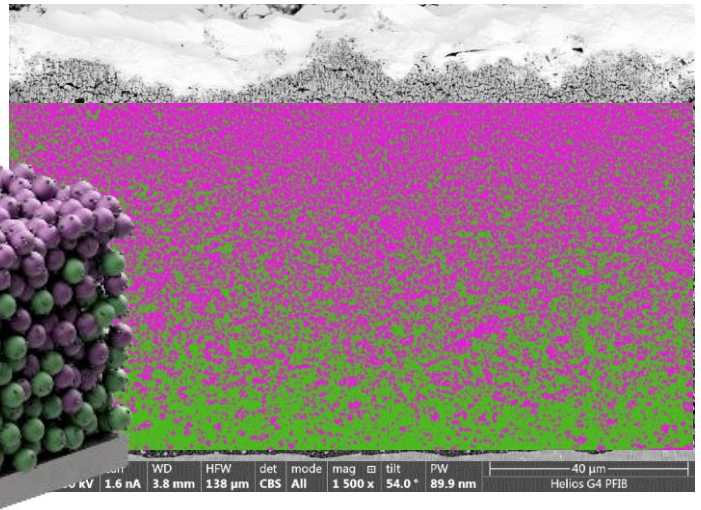




- Smarter particles & slurry casting (Sheffield & B'ham)
- New electrode structures & manufacturing methods (Oxford)
- Guided by simulation & structural characterisation (UCL)
- Optimised ML/AI & digital manufacturing (Warwick)

- Reduce trial and error ⇨ predictive understanding & modelling ⇨ electrode design
- New electrode structures (grading, layering)
- New processes (on-line metrology, data analytics, 3D structuring)
- Connect lab insights to manufacturing with scale-up partners e.g. BritishVolt, UKBIC, etc





Thank you

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