Australia-UK Collaboration - Opening remarks and UK Battery landscape

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Faraday Battery Challenge

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Help determine how Innovate UK can best support UK businesses more effectively and efficiently when considering innovation partnerships with Australia.

Review technology and infrastructure gaps in both countries with a focus on critical material processing infrastructure, supply chain and manufacturing processes, business models and circular economy.

Provide insights into where there are synergies between the countries and determine whether there is an appetite for further collaboration.

Capture key UK R&I and emerging market opportunities/challenges for developing innovative products and services when considering collaboration with Australia.
UK is Investing Heavily into Electrification

The UK Government has invested over £6.8 billion in infrastructure, R&D, driving demand and supply-side support:

- Creating the right regulatory environment including 2030 Phase Out, ZEV mandate, infrastructure provision
- Learning from industry to understand and develop supply chain plans for key areas
- Encourage innovation, efficiency and keep costs low through funding

£610m - Faraday Battery Challenge ZEV battery development
£1.2bn - Advanced Propulsion Centre
£80m - Driving the Electric Revolution PEMD supply chain
£3.5bn - OZEV funding across R&D, infrastructure and purchase grants
Up to £1bn - Automotive Transformation Fund Capital investment
£446m - Connected Automated Vehicle Technology
UK battery demand growth - Automotive

Tata Group - Agratas
- Announced Capacity

Nissan and Envision AESC
- Committed Capacity
- Potential Capacity

Unfulfilled demand

2022
- ~4GWh/yr demand
- 2GWh/yr production

2030
- ~100 GWh/yr demand forecast
- 13 GWh/yr production committed
- 41 GWh/yr potential
2035 Projected Annual Battery Demand

### Sector
- **Light duty automotive**
- **Heavy duty automotive**
- **Energy storage**
- **Off highway**
- **Aerospace**
- **Maritime**
- **Rail**

#### Tata Group - Aqratas
- Announced Capacity

#### Nissan and Envision AESC
- Committed Capacity
- Potential Capacity

#### Unfulfilled demand
- <2 GWh

**2035 Demand**
- **140 GWh**
- **9 GWh**
- **4-8 GWh**
- **<2 GWh**
- **<2 GWh**
- **<2 GWh**
- **<2 GWh**
Battery Supply Chain Value

26% PACK MANUFACTURE
- BMS: 5%
- Module and pack materials: 17%
- Pack assembly: 4%

53% CELL MATERIALS
- Mining & materials extraction: 23%
- Primary processing: 8%
- Secondary processing: 11%
- Other materials: 11%

21% CELL MANUFACTURE
- Mixing
- Coating
- Drying
- Solvent recovery
- Stacking
- Vacuum drying
- Slitting
- Calendering
- Welding
- Enclosing
- Formation
- Ageing
Growth Potential in the UK is Huge

UK battery start-ups growing and competing at an international level

VC investment in EV Battery startups*
Cumulated investment 2018-2022

<table>
<thead>
<tr>
<th>Country</th>
<th>Cumulated Investment 2018-2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>$19.4B</td>
</tr>
<tr>
<td>Sweden</td>
<td>$6B</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>$1.2B</td>
</tr>
<tr>
<td>South Korea</td>
<td>$514M</td>
</tr>
<tr>
<td>Canada</td>
<td>$468M</td>
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<tr>
<td>Taiwan</td>
<td>$426M</td>
</tr>
<tr>
<td>Japan</td>
<td>$301M</td>
</tr>
<tr>
<td>Netherlands</td>
<td>$295M</td>
</tr>
<tr>
<td>Germany</td>
<td>$282M</td>
</tr>
<tr>
<td>France</td>
<td>$233M</td>
</tr>
</tbody>
</table>

2nd largest European ecosystem for EV Battery investment since 2018
4th highest EV battery ecosystem enterprise value globally*
2x growth since 2021
The Faraday Battery Challenge:

A £610 million investment to...

Faraday Battery Challenge

Building a Science Superpower

Scaling high-tech businesses

Open access scale up with Gigafactory capability
Why the need for intervention?

1. NET ZERO

To ensure the UK automotive industry meets its net zero commitments in the required timescale by enabling development and scale-up of sustainable battery technologies.

2.

To prosper from a just and fair transition to battery electrification across the nation through the development of a world class intellectual and physical supply chain.
Faraday Battery Challenge Activities: What else do we do?

**Infrastructure**
- Catapult Network
- Materials Scale Up Facility
- UKBIC FIL

**Skills**
- National Electrification Skills Framework and Forum
- Regional Battery Manufacturing Skills Centres
- STEM & Outreach

**Ecosystem Building**
- KTN Batteries Networking Hub
- UK landscape map (>450 organisations)

**Collaborative R&D**
- £118m projects
- >148 organisations
- 525 jobs created

**Policy, Regs & Standards**
- PAS 7060, 7061, 7062
- Sustainable Battery Steering Group
- Critical minerals

**Horizon Scanning**
- Future UK demand
- Next-gen technology road mapping

**Investors**
- Investor Readiness Programme
- Investor Partnerships
- Investor Engagement

**International Engagement**
- IUK Mission Programmes & bilateral competitions
Opportunities for collaboration

Policy
• Australia-UK Working Group on Critical Minerals
• UK-Australia Supply Chain Resilience Initiative
• Australia-UK Free Trade Agreement (FTA)

Supply chain - Across up, mid and downstream activities, for instance
• Opportunities to share early-stage research and scale-up facilities
• Supply chain transparency
• Australia-UK mid-stream development and collaboration
• Lower risk accelerated scale-up
• Bilateral R&D programme

But of course there are key challenges too!
• Barriers to markets
• Global competition
• Restrictive trade arrangements
UK Battery Strategy

**DESIGN:** Design and develop the batteries of the future that are smaller, lighter, and offer better capacity and value, building on UK world-leading research and innovation.

**BUILD:** Working closely with our domestic industry and international partners to secure a resilient UK battery manufacturing supply chain that supports our strong domestic growth and thriving export markets.

**SUSTAIN:** Enable the development of a thriving and sustainable sector, supported by proportionate regulations that drive investment across the supply chain, from raw materials through to end of life and recycling.

UK Battery Strategy (publishing.service.gov.uk)
### Bridging the Gap - Solution

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Characteristic</th>
<th>Cell Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gram Scale</td>
<td>- Typically used during material development to mix small amount of hand-made materials.</td>
<td>Coin Cells</td>
</tr>
<tr>
<td></td>
<td>- Typically used in applied research when the fundamentals designs, materials etc... have been established, for small quantities of cells 10s-100.</td>
<td>10s-100 Cells</td>
</tr>
<tr>
<td></td>
<td>- Key for validating designs at lower maturity, scale and cost.</td>
<td></td>
</tr>
<tr>
<td>Kilogram Scale</td>
<td>- Needs when during early stage commercial product development.</td>
<td>1000s Cells</td>
</tr>
<tr>
<td></td>
<td>- Capable of producing 100s-1000s of cells which are used to validate a product, for test and certification, or to secure commercial funding.</td>
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<td></td>
<td>- Automated material feed/dosing systems which improve accuracy at scale.</td>
<td>10,000s Cells</td>
</tr>
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<td></td>
<td>- Multiple tonne scale equipment are used to fulfil high volume demand.</td>
<td>1M0+ Cells</td>
</tr>
<tr>
<td>10s Kilogram Scale</td>
<td>- Processes are optimised for specific products or families, to offer high repeatability and quality.</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>100s Kilogram Scale</td>
<td>- Typically used during Scale-up development, for large quantities of cells &gt;1000-100,000s</td>
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<td></td>
<td></td>
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<tr>
<td>Kilotonne Scale</td>
<td>- Multiple tonne scale equipment are used to fulfil high volume demand.</td>
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- **10s Kilogram Scale:** 50 litre
- **100s Kilogram Scale:** 250 litre
- **Kilotonne Scale:** >1000 litre
£12m Advanced Materials Battery Industrialisation Centre (AMBIC)

AMBIC will bridge the gap between laboratory research and commercial production for battery material synthesis and processing, as well as facilitating equipment and skills development.

Dual located at CPI’s Sedgefield site in the North-East of England and WMG’s facilities at the University of Warwick.

Alongside UKBIC will enable “powder to pack” and “lab to factory” scale up support.
The Faraday Battery Challenge (FBC) has awarded Coventry University £700k to lead the National Electrification Skills Framework and Forum in collaboration with Enginuity, Warwick Manufacturing Group (WMG) and the UK Battery Industrialisation Centre (UKBIC).

NESFF will:
• Identify UK manufacturing competitive advantage in all aspects of electrification by ensuring that the right skills are available when and where they are needed across sectors and nations
• Coordinate a national approach to the development of workforce in parallel to technology to address the net zero agenda
• Champion the need for electrification workforce development programmes across all skills levels
• Advocate the expansion of the talent pool to encourage greater inclusion and diversity
The Battery Workforce Training Initiative

The Faraday Battery Challenge (FBC) has awarded £2.5m to Newcastle University and University College Birmingham to support the UK’s growing regional battery industries and to deliver innovative vocational and technical training that bolsters local workforces with enhanced skills, diversity and qualifications.

£1.2m The ‘Digital Enhanced Battery Ubiquitous Training-West Midlands’ (DEBUT-WM) project

University College Birmingham will lead a regional partnership that will deliver a training programme aimed at supporting the local workforce with skills development via a blend of traditional physical training alongside advanced immersive digital technologies such as augmented, virtual and mixed reality.

£1.3m National Battery Training and Skills Academy

Newcastle University will lead in supporting and engaging those in the North-east with education and skills initiatives, retraining schemes and battery degree apprenticeships.
Thank you

- Join the KTN Cross Sector Battery Systems Innovation Network!
  - [www.ukbatteriesnetwork.org](http://www.ukbatteriesnetwork.org)
  - Access resources such as: Cross Sector Targets, The Battery Gap Investment Report, Networking Hub, Battery Systems Landscape Map
  - Keep up to date with funding announcements!

- Contact the Faraday Battery Challenge
  - [Faradaybatterychallenge@innovateuk.ukri.org](mailto:Faradaybatterychallenge@innovateuk.ukri.org)