



Next steps in UK Research for Lithium-Ion Battery Safety

Marion Randall

Project Manager – 3M

Brian Cooper

Manager for Electrification Research – JLR

Session Sponsor:



#JaguarElectrifies



Next Steps in Lithium Ion Battery Research for the UK
PreLIBS to LIBRIS
4th September 2019

Brian Cooper
Electrification Research
Jaguar Land Rover



PreLIBS: Preliminary Feasibility Study of Lithium Ion Battery Safety

– Faraday Battery Challenge Round 2

PreLIBS Main Objectives:

1. Conduct a thorough literature review – focusing on thermal runaway (TR) propagation
2. Investigate cell TR triggered by different initiation methods
3. Analysis of TR sensing and early detection methods
4. Develop test methods and guidelines
5. Develop CFD models for TR and its propagation

WP1 Project Management

Science.
Applied to Life.™

WP2 Review of Literature and Current Technologies



WP3 Testing and Test Methods



WP4 Sensing Methods for Early Thermal Runaway Detection



WP5 Thermal Propagation Mitigation Solutions



WP6 CFD Modelling



Innovate UK
Knowledge Transfer Network

Total Value: £0.5 million
Timeline: Sept 2018 – May 2019

PreLIBS: Preliminary Feasibility Study of Lithium Ion Battery Safety

Project successes:

- Single cell characteristic testing & preliminary computational modelling
- BMS candidate CO2 sensors identified
- A literature review highly sought after by the Fire Industry Association (FIA)
- Dissemination of information at CENEX18
- Participation at Faraday R&D Cohort Nov 2018
- Information exchange Fire Industry Association Special Interest Group for Thermal Runaway



Started: 1/9/18
Ended: 30/6/19



Significant improvements are necessary and possible in 20 year horizon



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
1st 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)



LIBRIS - Lithium Ion Battery Research In Safety Faraday Challenge

Our Consortium Members



LIBRIS Objectives

- Deliver solutions which prevent thermal runaway propagation at minimum penalty
- Deliver improved sensing and early detection of thermal runaway
- Improved battery storage and thermal runaway containment
- Develop test methodologies and modelling techniques which enhance test and design rules

Timeline: July 2019 - Dec 2020
 Duration: 18 months
 Total value: £6.8m

WP1 Real Life Hazard Mapping

WP2 Sensing Methods for Early Thermal Runaway Detection

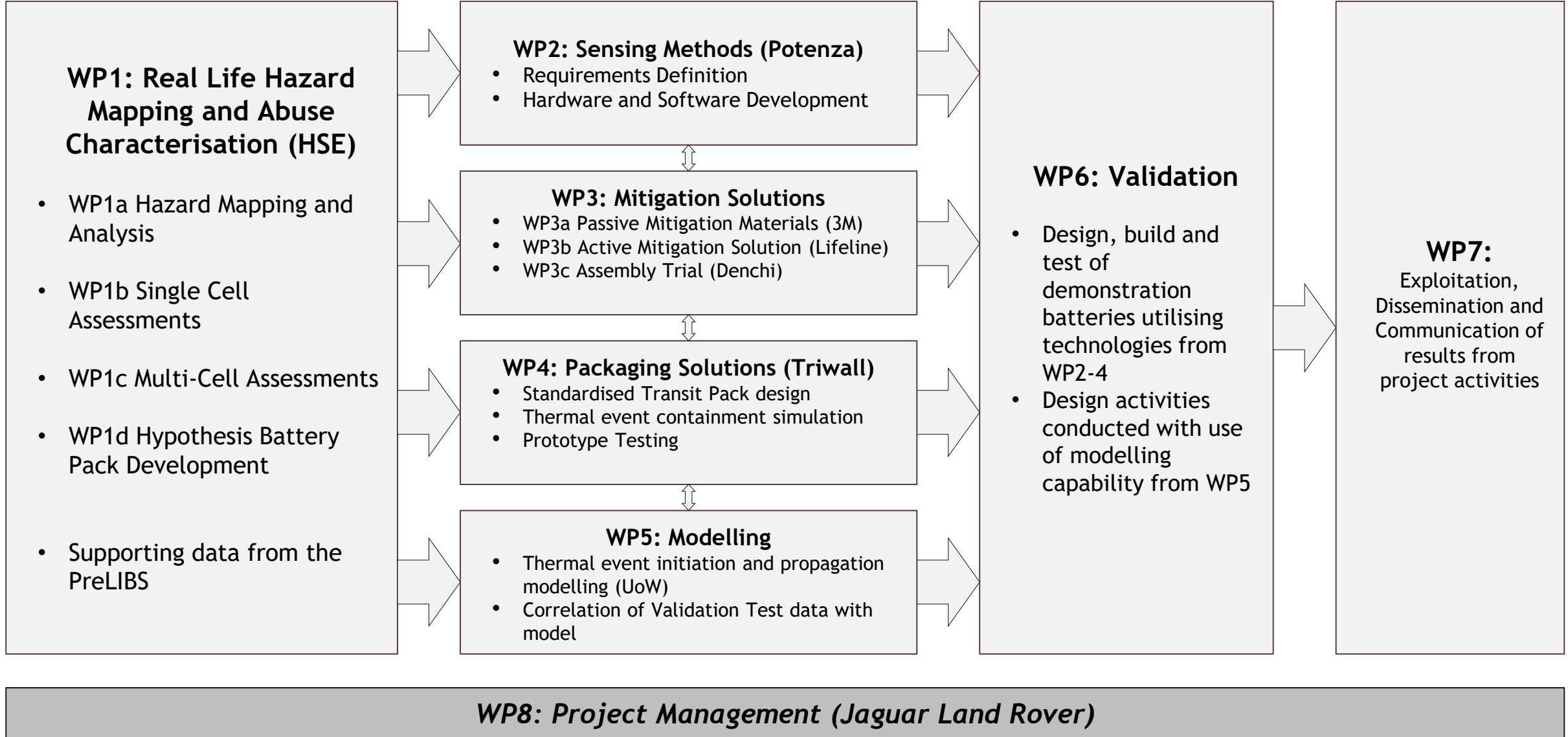
WP3 Mitigation Solutions

WP4 Packaging

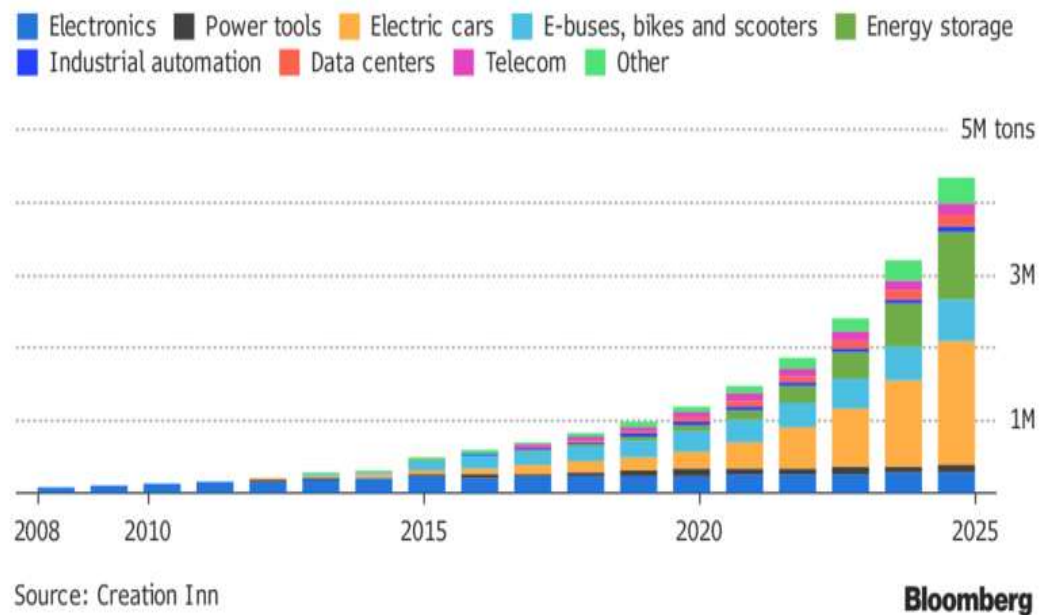
WP5 Modelling

WP6 Validation

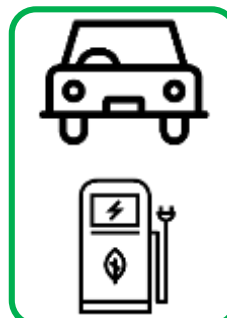
WP7 Exploitation and Knowledge Dissemination
WP8 PM



Battery safety and related legislation offers exciting business opportunities



Significant growth in primary markets targeted by project partners, with opportunities arising in a wider segments



Accelerated uptake of EVs growing to a 400GWh/annum market by 2025 and 800GWh/annum by 2030. This could be as high as 2.3TWh/annum if the EV30@30 scenario is achieved

Home and commercial energy storage solutions will provide improved infrastructure and balancing capability - UK growth from 3GW in 2017 to 9GW in 2030



Growth opportunities through decarbonisation of the rail network, cost-advantageous over overhead cabling

Short-haul aviation opportunities (such as Orkney Islands targeting island hopping service by 2021)

UK Military Vehicle market worth £21m. Growth to other markets could open a further £270m revenue opportunity

Opportunities to enable growth of LIBs into markets where safety and low emissions are critical (such as mining)



THANK YOU