Catapult Researchers in Residence (RiR) Programme: Opportunity Description

Analyse the energy and power requirements (duty cycle) of a potential vehicle application to perform battery sizing work for different charging scenarios

Name of the Catapult(s)	**High Value Manufacturing Catapult/Energy Systems Catapult**
Location(s)	**Birmingham (central)/ Warwick University WMG**
Description of the Catapult(s)	The Energy Systems Catapult (ESC) and the High Value Manufacturing Catapult (HVMC) are two of a network of elite technology and innovation centres set up by Innovate UK. The Energy Systems Catapult works with companies that are focused on exploiting the opportunities created by the need to transform global energy systems; not only playing a part in accelerating technology-based solutions, but also engaging with Government to address the market mechanisms and business models that will be required to enable such solutions. HVM Catapult is the catalyst for the growth and success of UK advanced manufacturing. Our 7 centres offer access to world-class equipment, expertise and collaborative opportunities. We work with manufacturing businesses of all sizes and from all sectors. We help turn ideas into commercial applications by addressing the gap between technology concept and commercialisation. **The HVM Catapult focuses on** the following key strategic themes :- • Digital manufacturing • Robotics and automation • Materials processing and new materials • Process engineering, biotechnology and biologics • Product design & verification Further information on the scope and capabilities of HVMC and its seven constituent centres is available via the HVMC website and via the associated links into the centre websites.

Description of the Challenge	Rail transport, particularly Light Rail (metro and tram), will increasingly become electrified to deliver air quality and low carbon emission goals. The method of electrification (e.g. overhead lines and pantographs, rail, battery or a combination) will depend on cost, the available rail and electricity infrastructure, space constraints, clearance, safety of the public and passengers, and duty of the vehicle. There is the potential to use batteries as either part of a hybrid propulsion system or as a pure electric vehicle to optimise the overall design. For example, a hybrid propulsion approach could be used to overcome difficult junctions or physical constraints. Where batteries are used, there is a design dependency between battery design, charging methodology and infrastructure to deliver clean energy to the vehicle. For example if it was more cost effective to build lower capacity charging points and charge more frequently, on the move or charge for longer periods of time then the battery capacity could be lower. Conversely, if charging times needed to be short and less frequent, the battery capacity and charging point capacity would need to be greater. Static batteries located at electricity substations could also help avoid electricity network overloads during charging periods for vehicles or other types of peak load and provision of electricity system requirements (e.g. frequency response). New or second life batteries could be used for this application depending on the cost benefit analysis. The work undertaken is also expected to be scalable to fully electric buses and potentially have applications in the electrification of freight / Heavy Goods Vehicles. The Researcher in Residence will: • Analyse the energy and power requirements (duty cycle) of a potential vehicle application • Perform battery sizing work for the vehicle for different charging scenarios • Analyse the impact of the battery charging demands on the electric network • Assess the potential for use of second life batteries • Develop a cost benefit analysis to include an integrated electricity network and vehicle view • Assess the manufacturing implications of the work • Develop relationships with potential manufacturing companies, DNOs, local authorities, Transport stakeholders, HVMC and ESC We would welcome prospective candidates' thoughts on any variations in scope and encourage the collaborative development of the scope of research between RIR, HVM and ESC. **Please contact us to discuss you project idea before you submit your application. This will ensure that it will be within the focus areas of both Catapults.** Michael Edgar at ESC : Michael.Edgar@es.catapult.org.uk Simon Broome at WMG: S.Broome@warwick.ac.uk Prof Mike Hinton at HVMC HQ: mike.hinton@hvm.catapult.org.uk
Researcher Specification	For this call, we are following EPSRC Eligibility Criteria. The candidate should possess enough specialist knowledge in the subject area to develop the existing work within the current academic work on the topic. They should also have an appreciation of good practice in systems engineering and / or systems thinking.

Other Details	The High Value Manufacturing Catapult and the Energy Systems Catapult in conjunction with EPSRC invites applications for its Systems Engineering Researcher in Residence (RiR) position. The successful candidate will be hosted at the Energy Systems Catapult in Birmingham and WMG at Warwick. The aims of the Researchers in Residence (RiR) Awards are to build connections, support pathways to impact and knowledge exchange between academia and the Catapult centres.
Closing Date for Applications	**17:00 (GMT) Friday, 21 September 2018**