Technology Strategy Board
Driving Innovation

Results of competition: IDP 9 - Technology challenge in low carbon vehicles

Total funding available for this competition was £17.3m, provided by the Technology Strategy Board, EPSRC and the Office for Low Emission Vehicles (OLEV).

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Ashwoods Automotive Limited (lead) Tata Motors European Technical Centre PLC University of Bath	Low Cost Auxiliary Power Unit (LowCAP)	£2,916,238	£2,015,952
Project description (provided by applicants)			
The project will design, model, develop and evaluate an industry first Low Cost Auxiliary Power Unit (LowCAP) for Range Extended Electric Vehicles (REEVs). Tata Motors European Technical Centre (TMETC) plc, Ashwoods Automotive Ltd (Ashwoods), and University of Bath (Bath) combine to offer the set of skills to develop, evaluate and exploit the outputs in global mass market volumes. The project will result in UK intellectual property being technically and commercially tied into one of the lowest cost modern internal combustion engines (ICE) on the market which is built by Tata Motors and is anticipated to be exploited globally within the Tata Motors Group and beyond to the global OEM marketplace. The project will be focused from day one towards the low cost REEV market. The motors and controllers will be an exploitation of the low cost electric motor technology developed by Ashwoods through previous Technology Strategy Board funded projects involving Ashwoods and Bath. The project will see further innovations for low cost motor and inverter IP that will enable the development of a highly efficient, low cost, fully integrated, lightweight APU built from sustainable materials. Successful outputs will be sold and distributed by Tata Motors Group within their own vehicles and as a standard LowCAP unit to global OEMs.			

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Caterpillar UK Engines Co Limited (lead) Mahle Powertrain Limited	Mobile Organic Rankine Cycle Powersystem with Electrified Ancillaries for Reduced Parasitics	£4,899,206	£2,449,603
Project description (provided by applicants)			
In a project co-funded by the Technology Strategy Board, Caterpillar UK Engines Company Ltd. and MAHLE Powertrain Ltd will collaborate to demonstrate a highly efficient diesel-electric hybrid powertrain in which waste heat energy from the engine is recovered through an Organic Rankine Cycle system. When coupled with electrification of the engine's ancillary devices (coolant and oil pumps, for example) to reduce the parasitic loads on the engine, the system is expected to deliver significant fuel consumption reductions over real-world operating conditions. This £4.9M, 3-year project encompasses software, hardware, and control system design and development and will culminate with an on-engine demonstration using the Perkins-built 7.1L Tier 4Final-compliant diesel engine. Three UK-based small to medium enterprises will also contribute to this research and advanced engineering effort, scheduled to start in the first quarter of 2014.			

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FAR-UK Limited (lead) Tata Motors European Technical Centre PLC Expert Tooling and Automation Limited University of Warwick University of Bristol- National Composites Centre	High Volume Lightweight Technologies for Vehicle Structures (HiLiTe)	£2,921,811	£1,910,706

Project description (provided by applicants)

The project is a collaboration between Tata Motors European Technical Centre, a wholly owned subsidiary of Tata Motors, India's largest automotive company and owner of Jaguar Land Rover, two higher educational establishments: Warwick Manufacturing Group part of the University of Warwick and the National Composites Centre, and two SMEs: Expert Tooling and Automation a leading supplier of automation and assembly systems to automotive OEMs and Tier 1 suppliers and FAR-UK a new design and manufacturing consultancy but with over 20 years of automotive composites experience.

The programme will address the current limitations preventing high volume usage of composite components in the automotive industry. These limitations are:

1. Material and processing cost – making them uncompetitive compared to metallic solutions
2. Processing time - currently too long by an order of magnitude.
3. Lower volume techniques generate a high percentage of waste material.
4. Incompatibility with post production processes used in high volumes e.g. the high temperatures used in E coat and paint application.

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Jaguar Land Rover Limited (lead) Ricardo Mtc Limited Tata Steel UK Limited GRM Consulting Ltd Lubrizol Limited Albion Automotive Limited University of Southampton Newcastle University University of Warwick	ULTRAN - Ultra-Lightweight Transmission & Driveline	£5,213,710	£3,143,867
Project description (provided by applicants)			
The ULTRAN transmission & driveline research project will develop complementary lightweight technologies in order to deliver a step-change in transmission and driveline weight. Using the latest developments in sustainable materials, coupled with novel manufacturing processes and pioneering computer aided analysis techniques, an optimised passenger car drivetrain will be developed. In addition to delivering reduced fuel consumption and CO2 emissions the technology will contribute to improved vehicle performance, handling and agility at an equivalent cost to today's technology. The project partnership consists of an automotive manufacturer (JLR), material suppliers (Tata Steel , Lubrizol), design and analysis consultancies (GRM Consulting Ltd, Ricardo), a tier one component supplier (American Axle Manufacturing) and the Universities of Southampton, Newcastle and Warwick.			

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Johnson Matthey Technology Centre (lead) Queens University Belfast Liverpool University Axeon Power Limited Jaguar Land Rover Limited Air Products Public Limited Company	Practical Lithium Air Batteries	£1,146,619	£778,339

Project description (provided by applicants)

The Practical Lithium Air Batteries project brings together a range of academic and industrial partners with complementary skills to work on improved lithium air battery single cells and assess their feasibility in the wider context of future battery pack and system design, compact air purification approaches and general viability for use in automotive applications. Finding an improved stable electrolyte that survives the operating conditions at the lithium air cathode is a key enabler for this technology. Thus substantial efforts will focus on synthesis and investigation of new liquid electrolytes and gels and the optimisation of electrode structures containing these often viscous media, to achieve maximum cell performance. Academic partners Queens University Belfast and Liverpool University will work on synthesising and characterising the new electrolytes, whilst Johnson Matthey Technology Centre will produce novel cathode and anode materials, optimise electrode structures and perform electrochemical testing.

The participation of Jaguar Land Rover as an end user, Air Products as a component manufacturer and Axeon (a Johnson Matthey Company) will provide an applications focussed approach. These industrial partners will perform a paper feasibility study on how high performing lithium air single cells would be incorporated into automotive systems in the future, assessing the mechanical and ancillary system integration and low weight/cost/volume options for on board air purification. The final output will assess the feasibility for lithium air battery systems to achieve a 400Wh/kg power density.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
OXIS Energy Limited (lead) Lotus Cars Limited Imperial College London Cranfield University	Revolutionary Electric Vehicle Battery (REVB)	£3,540,993	£2,561,184

Project description (provided by applicants)

The Revolutionary Electric Vehicle Battery (REVB) project aims to develop a revolutionary Lithium Sulphur (Li-S) vehicle battery and Battery Energy Management (BEM) system which will provide breakthrough improvements in energy density, cost, range and safety of electric vehicle batteries and put the UK in a world leading position to exploit this.

The project intends to double the rate of improvement of the OXIS Li-S battery, by developing and embedding a model-led R&D culture within OXIS, using a deep understanding of the underlying science which will be developed with Imperial College to inform product development. It is a proven approach within other sectors (such as crash testing) within the automotive industry, but rarely adopted by battery developers. The project will also develop a battery energy manager, working with Lotus and Cranfield, in order to be able to push the chemistry to its limits and achieve 400Wh/kg cell energy density with practical cycle life and performance metrics.

The output of the project will offer a battery system for automotive applications that can not only store more energy than today's technology but can also harness significantly more of that energy, resulting in a compound improvement for next generation Electric Vehicles.

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Ricardo UK Limited (lead) Ford Motor Company Limited Controlled Power Technologies Limited European Advanced Lead-Acid Battery Consortium EEIG Faurecia Automotive Ltd University of Nottingham	Low Carbon Mild Hybrid Electrified Diesel Optimised Powertrain – HyBoost 2	£3,231,902	£1,790,702
Project description (provided by applicants)			
HyBoost 2 takes on the benefits shown from the original Technology Strategy Board HyBoost "Intelligent Electrification" project and moves to the next generation of electrification of mild hybrid technology to deliver a Diesel engine Ford Focus vehicle to less than 70 g/km as measured on European Drive Cycle CO2 at a cost still significantly lower than a Hybrid Electric Vehicle. Application of 48V technology combined with synergistic 48V ancillaries and advanced thermal systems and waste heat recovery technologies will enhance base engine efficiency and assist in achieving extremely challenging emissions targets. Vehicle driveability and performance attributes will be optimised through effective application of BSG torque assist and IP around driving modes enabled with 48V mild hybrid technology.			

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Richmond Design & Marketing Limited (lead) Infineon Technologies UK Ltd Newcastle University Loughborough University Tata Steel UK Limited Productiv Limited Libralato Limited	48V Town & Country Hybrid Powertrain (TC48)	£3,558,938	£2,481,055

Project description (provided by applicants)

The 48V Town & Country Powertrain Project aims to develop the most cost-effective xEV powertrain in the world, converting a small car to be capable of 15 miles all electric range (EV in Town), 112 mpge, 52g/km CO2, (HEV in the Country) for a marginal cost of £1,745, repaid from fuel savings in under 2 years without subsidy.

The project brings together world leaders in the development of switched reluctance motors, which do not use rare earth magnets (Newcastle University) and automotive microcontrollers (Infineon Technologies); working with Tata Steel and the Advanced Manufacturing Supply Chain Initiative (AMSCI) Proving Factory, to produce a plug-in hybrid powertrain that will set a new benchmark for cost reduction and is designed for volume manufacture and assembly.

The 48V Town & Country hybrid vehicle seamlessly switches between the electric motor (<35mph) and a novel rotary engine (>35mph), providing an exceptionally efficient driving experience, whilst also achieving high levels of refinement to meet NVH and drivability targets expected by savvy automotive customers - Say ‘hello’ to EV driving in towns and cities; say ‘goodbye’ to high fuel costs!