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## **New low carbon vehicle programme to deliver a REEVolution in performance of premium electric cars**

The Technology Strategy Board alongside the Department for Business Innovation and Skills (BIS) and the Office for Low Emissions Vehicles (OLEV) has today announced funding for the next stage of its Integrated Delivery Programme (IDP) Competition for Low Carbon Vehicles. A consortium of automotive partners has been awarded £9.5million to expand and enhance technology for range extended electric vehicles (REEV) in the premium sector in a research project called REEVolution.

The consortium partners – Jaguar Land Rover, Lotus Engineering, Nissan Motor Co. Ltd, THINK, Axeon, EVO Electric and Xtrac – will contribute between them a total of £11million to the programme which, in addition to the competition funding makes a £20million project investment in the future of low carbon vehicle technologies. The consortium companies will collaborate over the next two years to develop advanced electric powertrains and a greater understanding of the commercial requirements needed for high performance electric and range extended electric vehicles. The work will accelerate the development of new technologies and key commodities whilst laying the foundations for a globally competitive supply base.

The REEVolution programme is the next phase of a previously successful project led by Jaguar Land Rover and involving Lotus Engineering called Limo Green, a series hybrid range extended electric Jaguar XJ. The project was part funded by the Technology Strategy Board and the concept demonstrator delivered sub 120g/km tailpipe CO<sub>2</sub>, had fuel consumption bettering 57mpg, a top speed of 180kph, an overall range of 600 miles and in Electric Vehicle (EV) mode, an impressive 30 miles. This new project will develop components and systems, as demonstrated on Limo Green, onto global levels of quality and reliability as required by production vehicles.



Speaking on behalf of the consortium, Pete Richings, Chief Engineer of Hybrid Technology at lead partner Jaguar Land Rover said: “REEvolution is going to take us to the next level of understanding in delivering high end performance on premium and desirable electric and hybrid cars. With three demonstration vehicle programmes from three companies, Jaguar Land Rover, Lotus and Nissan, the learning and feedback from this project will be invaluable on the road to vehicle electrification.”

The REEvolution target is to deliver advanced Jaguar, Lotus and Nissan engineering demonstrator vehicles with a sub 50g/km tailpipe CO<sub>2</sub> emissions, which is typically a 70-75% saving over a similar vehicle with a conventional powertrain. These vehicles will benefit from technology developed by each of the consortium partners in the project and further the EV and HEV competency in the UK. The knowledge and results from this REEvolution project will also feed into the development of next generation components from the emerging UK supply base.

Iain Gray, Chief Executive of the Technology Strategy Board, said: “The work that we are doing through the Low Carbon Vehicles Integrated Delivery Programme reinforces the Automotive Council’s focus on both supply chain and technology. Both these areas will be vital if the mass production of low carbon vehicles in the UK is to become a reality. We are delighted to support the REEvolution project, which will develop new technologies while helping to build a globally competitive supply base.”

The funding for REEvolution was awarded as part of Stage 4 of the Technology Strategy Board’s Low Carbon Vehicle Integrated Delivery Programme Competition.

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**Notes to editors:**

**Technology Strategy Board: Integrated Delivery Programme**



The Integrated Delivery Programme is a £200m investment programme, jointly funded by Government and business that will help to speed up the introduction of new low carbon vehicles onto Britain's roads. The Programme will co-ordinate the UK's low carbon vehicle activity from initial strategic research through collaborative research and development, leading to the production of demonstration vehicles.

REEvolution was awarded as part of Stage 4 of the Integrated Delivery Programme Competition: <http://www.innovateuk.org/content/competition/integrated-delivery-programme-competition-4-.ashx>.

### **Consortium Member's Contribution Summary**

#### **Jaguar Land Rover**

Jaguar Land Rover will be lead partner on the REEVolution project and coordinate activity through its advance research team, which developed the Limo Green concept demonstrator. With more than 100 engineers working on electric and hybrid technologies the company is developing a number of projects to power environmentally sustainable, commercially viable premium vehicles.

#### **Lotus Engineering**

Lotus Engineering is responsible for the design and integration of two hybrid Lotus Evora demonstrator vehicles based around the Lotus Evora 414E concept and the integration of series hybrid vehicles for Nissan Both the Lotus and Nissan vehicles will feature the Lotus Range Extender engine as part of the series hybrid drivetrain using the systems from other partners within the consortium.

The vehicles will include a highly complex drivetrain managed by the Lotus T6 controller with other systems to enhance the driving experience, demonstrating the expert capability of Lotus Engineering to integrate and develop advanced technologies for exciting and efficient hybrid vehicles

Dr Robert Hentschel, Director of Lotus Engineering, said: "The REEVolution Project furthers the UK's EV and HEV capabilities and stimulates the UK manufacturing base for green niche vehicles. Each of Lotus Engineering's core competencies: lightweight architectures, efficient performance, electrical and electronics integration and driving dynamics are illustrated by the advanced REEVolution Project.

#### **Nissan Motor Co. Ltd**

As the UK's largest car manufacturer, Nissan, with a factory in Sunderland, technical Centre based in Cranfield, and Design Centre in London, is ideally situated to work alongside UK-based companies to examine this opportunity for range extended electric vehicles. It complements Nissan's already substantial investment in bringing European production of the world's first mass-market EV, Nissan LEAF to the UK alongside the European production plant for batteries in Sunderland.

Says Nissan's Senior Vice President of Global Products, Andy Palmer: "As a technical innovator and leader in bringing Zero-emission cars such as the Nissan LEAF to market, Nissan sees no compromise between delivering a great driving experience and being environmentally friendly.

"We believe that we should look at as many different alternatives and specialized technologies as possible as we move towards a truly low-carbon automotive future. This collaboration provides an ideal opportunity to further develop and expand the contribution that our workforce in the UK has towards developing global innovations that support this environmental goal. The support that UK



Government is providing through TSB has encouraged us to enter in to this development activity specifically in the UK against competition from other regional development centres.”

### **THINK**

Scandinavian electric vehicle pioneer, THINK, will develop the traction inverter module, DC-DC converter and the motor control module interface for its part in the consortium to deliver high performance, luxury electric vehicles with extended range generation technology.

THINK CEO, Richard Canny, said: “We are very proud to have been chosen to play a vital role in this pioneering project, alongside some of the UK’s industry leaders. This is great validation that THINK’s experience and pioneering developments in the electric vehicle industry, which we’ve perfected over two decades and 30 million miles of real world knowledge of EVs, can help improve the performance of high end sports and luxury models. Having just delivered the world’s most advanced commercially available drive-train in our fourth-generation controller, we are looking forward to continuing our technical development with the backing of the UK Government. This should provide the perfect environment to take this industry and its technologies to the next level, including exciting opportunities to utilize this technology in our own future products.”

### **AXEON**

Axeon has a strong track record in EV battery design, development and manufacture, with increasing expertise in hybrid batteries. This programme will enable Axeon to develop into batteries capable of accepting and discharging higher currents, a specific requirement for REEV applications, giving them wider market exposure. Axeon’s part in the programme is to design, develop and deliver validated battery systems, which can be productionised.

Lawrence Berns, Axeon CEO, said: "Axeon is proud to be working with such established and respected OEMs as JLR, Lotus and Nissan on this important and specialised programme. Our involvement in this project is testament to our proven expertise, capabilities and success in the development and supply of advanced automotive battery systems."

### **EVO Electric**

EVO Electric will supply advanced electric motors and generators to the consortium, drawing on its expertise in Axial Flux machines – a technology with the potential to dramatically lower the weight, volume and cost of hybrid and electric powertrains. Among other benefits, EVO Electric’s motors and generators provide greater power and torque density, allowing for innovative, cost-effective approaches to vehicle electrification and hybridisation.

David Latimer, CEO, said: “EVO Electric’s Axial Flux technology provides a revolutionary departure from conventional electric motor designs, which have not progressed as fast as other components of hybrid and electric vehicles. This TSB project will help bring this exciting technology to market and by doing so further accelerate the global trend toward low carbon vehicles.”

### **Xtrac Limited**

As a pioneer for the past decade in energy efficient motorsport initiatives, Xtrac is proud to be a Reevolution consortium member and is looking forward to its participation in this programme. “The UK benefits considerably from its multi-million pound motorsport industry, which exemplifies the rapid technical innovation we need to help tackle the problem of energy efficiency,” says Adrian Moore, technical director. Xtrac has been heavily involved in the design and manufacture of more than 100 prototype gearboxes for advanced hybrid and electric vehicles intended for the automotive mainstream.



“The space available in electric and hybrid vehicles to package all the driveline components is at an absolute premium,” says Moore. “To help develop an optimum solution, we can utilise our years of experience of packaging high performance powertrains within the compact dimensions of a race car. This is but one example of where our engineering expertise and experience can help.”

With increasing focus by the automotive industry on electric powertrains, Xtrac has applied many of the high precision techniques learnt in motor racing to design transmission systems suitable for electric drives, and has successfully demonstrated its rapid product design and development capability in several mainstream projects.

