

Demonstrate

Design it, deliver it,
demo it



DRIVE35

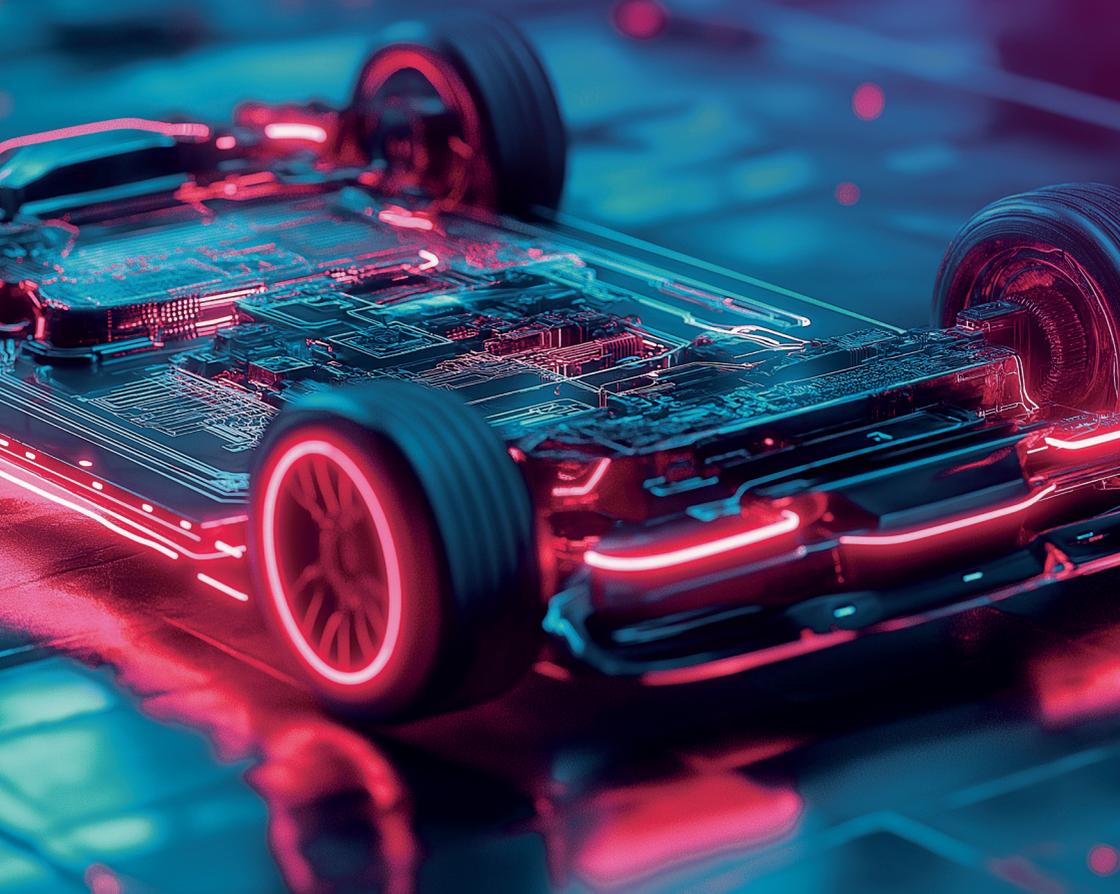


**ADVANCED
PROPULSION
CENTRE UK**

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Introducing ten outstanding innovations supported by the Advanced Propulsion Centre UK



Contents

Welcome	4
Stand map	5

Exhibitors

Altilium	6
Botanic energy	7
Equipmake	8
Intelligent Energy	9
Magtec	10
Metier	11
RAM	12
Renewable Metals	13
Triumph	14
Zircotec	15

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Welcome

Rik Adams

Innovation Delivery Director, APC UK



In July this year the UK Government made an unprecedented £2.5 billion commitment to its automotive sector, designed to bolster thousands of associated jobs and help ensure the UK remains at the forefront of zero-emission vehicle development.

With an established decades' worth of experience facilitating funding to the wider automotive sector, the Advanced Propulsion Centre UK is delighted to be able to continue as the chosen delivery partner for this new programme. The delivery mechanism is known as DRIVE35.

Focused on three core pillars, Innovation, Scale-up and Transformation, DRIVE35 helps businesses bring pioneering zero-emission technology to market, whether at concept stage, early or late-stage R&D, scale-up phase or large-scale capital transformation.

Simpler and easier to access

Never before has the funding journey been this well-defined or easy to access. Although a new programme, it's built on a legacy of experience and consultation with industry. *Demonstrate* is the new

incarnation of the Advanced Route to Market Demonstrator Programme, it enables companies to accelerate their R&D programme by building a product or process demonstrator in under 12 months to showcase at Cenex Expo.

A demonstrator is a hugely effective way of accelerating innovation to market. Making ideas reality reduces or removes many barriers to adoption, and the new *Demonstrate* competition provides a much broader scope of technologies available for funding, including software defined vehicles, electronic architecture, circular economy and, manufacturing competitiveness.

Here at Cenex Expo 2025, we're proud to showcase the pioneering technologies of this year's participants. Discover innovative battery, electric motor, fuel cell, hydrogen, materials recovery, power electronics, and whole vehicle solutions.

Please take your time to explore these technologies, and if you feel you would like to join us at Cenex Expo in the near future, talk to our team about the latest round of *Demonstrate* funding.

DRIVE35



Stand map

Indoor

Outdoor



Visit our Cenex page on the APC website

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EcoCathode™



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EV battery pouch cells produced with recovered cathode active materials

Through this collaborative project, multilayer pouch cells were manufactured with cathode materials recovered from end-of-life EV batteries using Altilium's EcoCathode™ process, for validation with JLR.

By demonstrating that battery cells can be manufactured at scale using recovered materials, the project aimed to deliver a carbon reduction technology in BEVs, supporting OEMs in meeting their sustainability targets and building the foundations for a resilient battery supply chain for the UK.

Altilium's EcoCathode™ process can recover over 95% of the cathode metals from battery waste. These metals are then upcycled to produce high-nickel CAM, ready for direct reuse in new batteries.

Cells were manufactured with a mix of recovered and commercially available CAM, meeting the EU's minimum recovered content requirements for 2036 (26% cobalt, 12% lithium, 15% nickel). Following successful assembly trials, single-layer pouch cells were produced containing 100% recovered cathode and anode materials.

Initial electrochemical testing demonstrates comparable performance with conventional primary materials, underscoring the potential of recovered cathodes as a viable alternative to mined metals.

JLR has conducted comprehensive validation studies on the pouch cells at its battery testing facilities. A Life Cycle Assessment by Minviro confirms significant reductions in climate change impact compared to primary mined materials.



Multilayer pouch cell manufactured with recovered cathode active materials

Botanic Energy



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Solid-state cooling for cold-chain last-mile delivery, with validation by CRT and field testing with Sainsbury's

Botanic Energy has developed solid-state cooling and heating systems that are more efficient, with no moving parts or refrigerants, offering savings in upfront and operational costs, as well as reductions in energy use and emissions.

Botanic's thermoelectric core heat-transfer matrix is tailored to vehicular applications, being lighter and more compact than existing equipment, and simpler to manufacture with lower maintenance requirements.

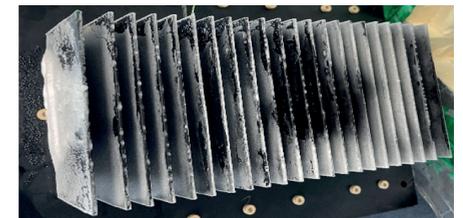
Soaring demand both in the UK and globally for perishables such as food and pharmaceuticals has led to a rapid expansion in cold-chain fleets. Current HVAC systems for transport refrigeration units have high-energy requirements, produce greater emissions, and rely upon damaging refrigerants with high global warming potential (GWP).

Replacing diesel-driven vapor compression transport refrigeration with Botanic's energy-efficient solid-state systems offers zero- and low-emission transport refrigeration units for cold chain logistics.

The Advanced Propulsion Centre UK is supporting Botanic Energy's development of a

last-mile goods online demonstration vehicle, providing key performance data to support scaling up and commercialisation of this novel transport cooling and heating system.

This automotive project brings together Botanic Energy (cooling, refrigeration, vehicle integration); Oxford University (lab support, testing); Cambridge Refrigeration Technology (independent validation); and Sainsbury's Supermarkets (refrigerated vehicles, compartments, field testing).



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Connecting vehicles together, allowing continuous operation of EV fire-pumping appliances

The Zero Emission Pumping Appliance 2 (ZEPA2) project was developed to deliver a fully operational, all-electric fire engine featuring advanced energy management technologies. Led by Equipmake, with support from Emergency One, London Fire Brigade, and Cenex, the project supports the transition to low-emission emergency fleets. A key innovation was the introduction of vehicle-to-vehicle (V2V) energy transfer, allowing appliances to stay powered on scene by drawing energy from another vehicle.



Emergency One EV0

Emergency One and Equipmake designed and built the ZEPA2 appliance specifically for zero-emission operations, while Cenex worked with blue light services to model real-world usage and operational needs.



Emergency One EV0

Following the fire appliance's debut at Cenex Expo 2025, ZEPA2 will be trialled by London Fire Brigade — marking a significant step forward in the decarbonisation of emergency response vehicles.

A new regulated-output 200kW+ fuel cell system suitable for use in the heavy-duty truck and bus market

Project ARCHER (Advanced Regulation and Conversion of Hydrogen Electrochemical Reactions) has developed a 200kW+ regulated voltage output fuel cell system designed for heavy-duty vehicles. The product has been developed to address three key issues to commercial scaling: certification, customer integration, and durability.

To achieve this, GEMS Performance Electronics has developed a robust, certification-ready ECU for fuel cell and other applications.

Using X-in-1 principles, Drive System Design have developed a DCDC converter, which in addition to regulating and combining the output from two fuel cell systems, also provides the necessary power supplies for operation of fuel cell balance of plant. The DCDC can also apply a variable-frequency AC voltage to the outputs from the fuel cells such that health monitoring can be carried out via electrochemical impedance spectroscopy (EIS).

Building on their IE-DRIVE hydrogen fuel cell product range, Intelligent Energy have developed the certification-ready fuel cell system to work with the GEMS ECU and DSD DCDC converter, whilst also improving life via optimised components such as the fuel cell coolant pump.



IE-DRIVE HD100 Fuel Cell System

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Magtec



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Next-generation driveline prototype to power 19t electric trucks, trialled by NHS Wales and Royal Mail

Magtec is a leading UK designer and manufacturer of drive systems and vehicles for commercial EVs, and has successfully delivered numerous innovation programmes. Based at its purpose-built manufacturing and innovation facility in Rotherham, the company has developed a next-generation electric propulsion system for medium-duty trucks.

As part of this work, Magtec has collaborated closely with Royal Mail and NHS Wales to refine its electric powertrain technology, conducting deep investigations into power efficiency and range performance for larger commercial vehicles. The engineering and research teams have operated dedicated road-ready homologated MEV190 – Magtec’s type-approved 19-tonne electric truck – to benchmark enhancements and optimise real-world vehicle performance.

Supported by the Advanced Propulsion Centre UK, this project has demonstrated the practical deployment of advanced battery electric drivetrains in demanding last-mile logistics and refrigerated delivery routes. The collaboration has contributed directly to the adoption of zero-emission vehicles in the UK’s largest delivery fleet and supports

national efforts toward decarbonising commercial transport.

Magtec is showcasing the MEV190 at Cenex Expo 2025, underlining its commitment to delivering scalable, safe, and sustainable transport solutions. The insights gained have positioned Magtec at the forefront of the UK’s transition to a cleaner, more efficient medium-duty vehicle sector.



Installation of the Magtec manufactured Traction Motor



MEV190 trucks picture at Magtec prior to the trial deployment

Metier Technologies



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Innovative components for onboard hydrogen fuel systems

Developing innovative subsystems for onboard hydrogen fuel systems, accelerating zero-emission vehicle adoption with reduced cost, improved reliability, and quality.

Designed and manufactured in the UK, Metier’s HyFusion project demonstrates an innovative On-Tank Valve (OTV) and Fuel Pressure Regulator for on/off-highway hydrogen fuel systems. Compatible with Fuel Cell or H₂-ICE and optimised for cost and automotive-level quality throughout, these components are available for field trials.



350bar OTV



350 & 700bar Regulators

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RAM Innovations



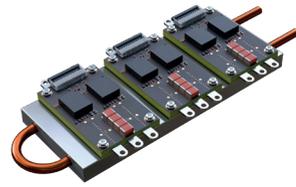
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GaN power modules, incorporated into an EV inverter demonstrating high-frequency switching

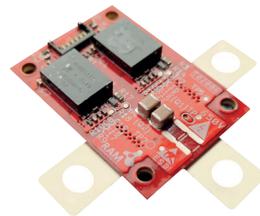
Verde is a collaboration between RAM Innovations, QPT and Russel Industries to develop the next generation of automotive powertrain systems utilising Gallium Nitride (GaN) transistors.

The electric powertrain industry is now evolving from Silicon to Silicon Carbide (SiC) as the core technology within power modules. However, GaN is inherently a better semiconductor material and although the technology has some challenges, GaN has the potential to outperform SiC.

Verde addresses some of the issues associated with GaN including thermal performance, reliability and EMI. Performance has been enhanced through RAM's novel heterogeneous packaging techniques and QPT's breakthrough high-speed (1MHz) switching technology.



GTx Range of GaN power modules



GT2 650V 60A GaN power module



QPT 1MHz Inverter Module

Renewable Metals



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Recovering critical minerals from battery waste with novel alkali-based hydrometallurgy

The Enhanced Material Recovery Operation (DEMO) project was designed to increase recovery, reduce cost, improve sustainability, and generate significant value from recovery of critical minerals (Ni, Cu, Li, Co, Mn, and graphite) from lithium-ion battery (LiB) waste. Lead partner Renewable Metals (RM) has developed a novel, alkali-based hydrometallurgical technology that can recycle all major lithium-ion battery chemistries, including lithium-iron-phosphate (LFP) together in a single processing line. The demonstrator can recover over 95% of lithium and other critical minerals (Ni, Cu, Co, Mn), with none of the sodium sulphate waste generated by conventional acid-leaching methods. RM is working with UK partners, the University of Birmingham, and the Manufacturing Technology Centre, to demonstrate improved graphite recovery techniques. The project also explores shredding whole battery packs to improve safety and reduce the costs of manual disassembly.

These innovations position the UK to benefit from cleaner, more efficient battery recycling technologies, and to build a resilient, onshore supply chain for electric vehicle materials.



Shredding creates fine fraction containing critical minerals



Primary leach circuit

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Triumph Motorcycles Limited



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An electric motorcycle software platform that offers riders a distinctive feel, style, character, and high levels of refinement

In 2022, Triumph Motorcycles revealed the award-winning TE-1 electric motorcycle prototype, a glimpse into its electric future and the result of a collaboration that drove significant innovation, capability, and originated new intellectual property.

In collaboration with the Advanced Propulsion Centre UK, Triumph has taken the next step in a journey towards developing its future approach to electric motorcycle technology. This new project reinforces Triumph's commitment to advancing British engineering, design, and manufacturing on a global stage.

Renowned worldwide for the distinctive feel, style, character, and high levels of refinement of its motorcycles, Triumph is focused on developing new methods to recreate this unique character as a core competence of its future electric motorcycles. This will require a sophisticated software and control platform capable of managing and regulating the propulsion system while delivering the performance and ride quality expected from a Triumph. The aim of this project was to develop a second-generation electric

motorcycle software platform which can deliver this, using a UK-based supply chain that enables compliance with international safety standards.

Here at Cenex Expo 2025, Triumph is showcasing the development of this platform, the new TU-SoP concept, with a fast-charge battery display and refreshed TE-1 motorcycle prototype.



TE-1 instruments hosting Tu-SoP SW suite



TE-1 Launch photo taken at Oulton Park

Zircotec



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Next-generation ceramic coatings to make electric vehicles lighter, safer, and more efficient

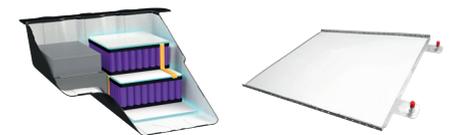
CeraBEV enables the use of lightweight materials in EV battery enclosures and cooling systems. The project has developed coatings that enhance the thermal, electrical, and safety performance of next-generation battery systems with high-performance thermally applied coatings.

The Zircotec and Cranfield teams have developed advanced coatings to address two major challenges faced by battery manufacturers and OEMs in their drive for more efficient BEVs. These are thermal runaway resistance in structural components and dielectric strength in the cooling components of the battery system.

Heavy-duty steel enclosures are traditionally used to provide a safety barrier in the case of a thermal runaway event; however, these enclosures are very heavy and substantially add to the total vehicle weight. By applying CeraBEV's coatings, lighter-weight materials such as aluminium and plastic composites can be used in the structural components of the battery, without compromising safety or performance.

Traditionally, electrically insulating components inside the battery system trap heat, affecting the performance and increasing the need for cooling. CeraBEV's coatings combine high thermal conductivity with strong dielectric properties, allowing for a more efficient and optimised battery cooling system.

Through CeraBEV, Zircotec is also expanding its battery coatings portfolio, advancing its proven range of dielectric polymer and EMI shielding technologies.



CeraBEV coating on composites proven to meet UL2596 standards



www.apcuk.co.uk

 Advanced Propulsion Centre UK



Department for
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The Advanced Propulsion Centre UK (APC) operational costs are funded by the UK Government's Department for Business and Trade (DBT) and industry contributions. DBT is the ministerial department for economic growth, supporting businesses to invest, grow, and export, creating jobs and opportunities across the country. Our combined mission is to accelerate the development of advanced propulsion technologies to reduce greenhouse gas emissions, minimise embedded carbon, and improve air quality.

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