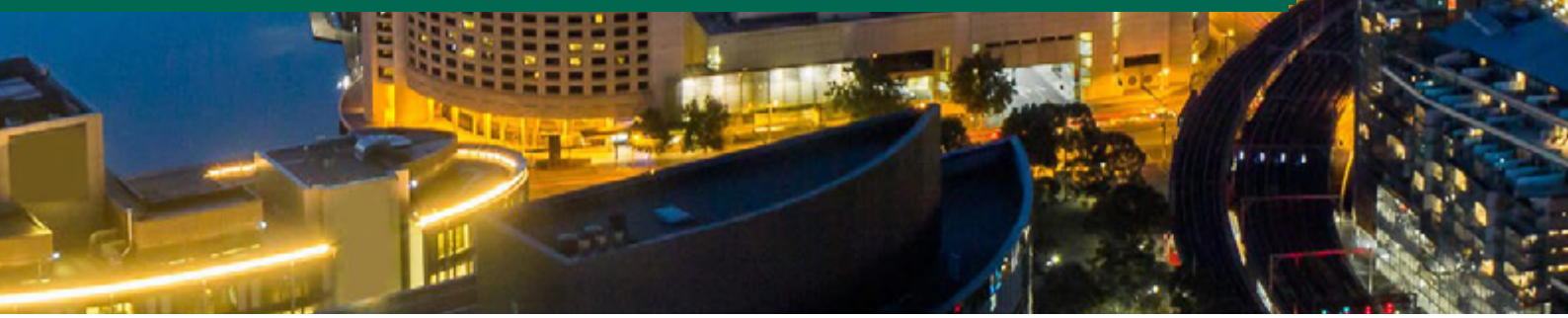
CLEAN FUTURES | CATAPULT Connected Places

CLEAN FUTURES ACCELERATOR

COHORT BROCHURE



Lead Partner:

CATAPULT Connected Places

Partners:

BCIMO™ BLACK COUNTRY INNOVATIVE MANUFACTURING ORGANISATION

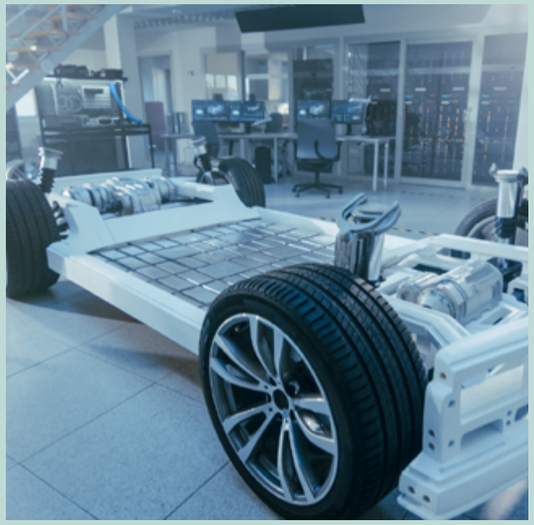
Coventry University | Coventry University and Coventry University Services Ltd

ABOUT THE PROGRAMME

Clean Futures will support the West Midlands' transport sector as it transitions away from fossil fuels towards clean tech. The programme will also drive economic growth in the region by accelerating the route to market for SMEs in the sector.

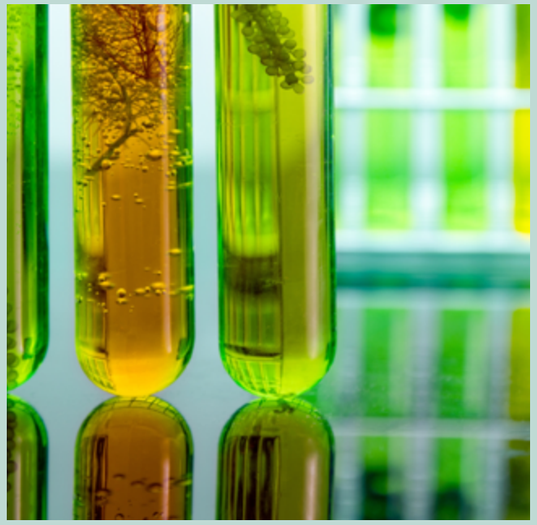
19 start-up companies have been chosen as part of the second year of the Clean Futures Accelerator programme. The SMEs will be focusing their projects around the rail and automotive manufacturing sectors, along with related supply chains.

The challenges are:



Clean and Efficient Vehicle Manufacturing and Assembly

Design or production of cost-effective solutions for a clean transportation infrastructure



Future Fuels: Produce, transport, or store alternative fuels such as hydrogen or biofuels

Open Challenge

Introducing the Cohort

AeroForge is an aerodynamics consultancy specialising in decarbonising transport and increasing efficiency through AI driven software.

AeroForge has developed an AI driven computational fluid dynamics package which recognises shapes to aid increasing efficiency in movement. An app assists cyclists and triathletes to improve their positions and prioritise the choice of equipment without the need for expensive wind tunnel testing. Work is also taking place to improve efficiencies within the automotive and rail sectors. Over the duration of the project, the company will be validating data on both haulage and rail applications to ensure its software is aligned with use cases. Ultimately, the aim is to design a system whereby a vehicle could be scanned and changes suggested to ensure maximum aerodynamic performance for that vehicle. Specifically, it will be looking at trucks and trailers to reduce fuel consumption and validating software to minimise wind disturbance on rail freight systems.

www.aeroforge.co.uk

Alucast is a foundry and machine-shop based in the Black Country making aluminium parts used in automotive and many other transport industries. Alucast made the brake calipers for the fastest car in the world, the Bugatti Veyron. The Alucast team has a proven track record as we also made parts for the UK Olympic Torch. The business provides light components that reduce energy consumption.

Alucast has developed a new high strength aluminium material based on an aluminium material used in forgings. By modifying this material, by additions to the melt and advanced heat treatment techniques, the company has improved the material properties available to users in a cast process. Complex shapes including hollow sections can be achieved by the casting process which is an advantage over the forging process.

Many users are now looking to save weight in their products to save energy, particularly in transport systems. Users still require high strength, hard-wearing components, so there is a desire to improve the existing mechanical properties of aluminium as it is one third of the weight of a similar part in iron. By using the new alloy and improving its capabilities both in the casting process and in the field, the objective of weight saving can be achieved without substantially reducing strength when compared to the iron equivalent.

The material can be used in the transport industry, manufacturing and a host of other industries including material movement.

The solution works by reducing weight and thereby carbon emissions but without substantially reducing strength.

For the trial, we will develop new parts for a rapid loader system which allows freight to be added to passenger trains. The system requires high strength components that will be made by Alucast. This will involve replacing existing parts with superior components with a long life.

About two years ago Alucast was approached by a number of companies and developed higher strength material components for them. We wish to develop this process further.

Alucast has a unique facility in that it can produce castings from all the four main processes: gravity, sand, low pressure and high pressure.

It has machine-shops and many other facilities all on one site and can offer a single source solution to customers.

www.alucast.co.uk

Composite Braiding Ltd helps deliver net zero through manufacturing more sustainable, light weight, high-volume, lower cost structural advanced composite components.

Through this programme Composite Braiding Ltd is demonstrating the use of its composites in an OLE (Overhead Line Equipment) structure for mainline rail. We are doing this to show how we can help reduce overall CO2 emissions on the route to net zero, how time and money can be saved in the construction of these structures and how safety can be improved through shorter installation times, with lighter structures using less equipment. Previous demonstrations have shown the huge weight saving benefits achievable but have not been able to demonstrate this at a reasonable cost. We have revolutionary manufacturing techniques that make UK production globally cost competitive, while maintaining high quality and capabilities, and providing much improved sustainability over traditional composite structures. With this programme we have assembled an advisory board, made of several tier 1 suppliers to Network Rail, who will be supporting us with both the design and installation phases to ensure we meet all the requirements and to compare the installation of our solution to that of a traditional steel structure currently used. We will be reporting on the full benefits from reductions in scope 1-3 emissions, improvements in health and safety and reduction in ongoing maintenance needs

www.compositebraiding.com

EnginSoft UK is a reseller of, and experts in, the CETOL 6σ 3D tolerance analysis software designed to optimise manufacturing cost against functionality in all possible engineering industries.

For the past 16 years, EnginSoft UK has been supporting companies with software solutions and expertise to analyse designs in a simulated environment prior to prototyping and manufacture to ensure right first time design. Using CETOL 6σ we have developed a methodology to analyse the impact of manufacturing variation on the functionality at a range of operating temperatures.

CETOL 6σ uses a CAD based implementation of the Second Order Tolerance Analysis method that uses real world interactions and assembly conditions to build relationships between each variable and the tolerance stack outcome. It has a proven track record in a range of industries, from aerospace to med-tech, and is a perfect fit for the clean energy and sustainability sector.

This trial includes a 3D tolerance stack up on a new flameless generator developed by IPG Energy as they look to ramp up production. Using CETOL 6σ's breakdown of the current functionality, explore GD&T methodologies and dimensional management practices to optimise cost and performance and provide IPG with a new design to aid in meeting their production goals.

CETOL 6σ's ability to include metrology data, account for thermal variation, and provide a breakdown of the key contributors to variation cements its place as the leading tolerance analysis software package.

www.tolerance-analysis.co.uk

www.enginsoft.com/uk

EXTEND ROBOTICS

Extend Robotics has developed fully immersive Human-robot Interface Software with Extended Reality technology. With the automation of real work tasks, we enable robotics and non-robotic experts to intuitively monitor, manage and train robots, with the goal to accelerate general purpose automation with data driven AI, boost productivity, reduce operations risks and improve lives.

The technology can help remove humans from hazardous areas of manufacturing which has high variability. The VR interface system uses off the shelf hardware which is easily accessible. Operators can intuitively operate robots using an immersive gesture control environment that can be operated in real time from anywhere in the world with a standard network.

Through the Clean Futures Accelerator programme, Extend Robotics aims to test and deploy its game-changing human-robot interface software in use cases which are highly variable and hazardous, where robots can provide value today, with human in the loop, while rapidly automate tasks by learning from human demonstrations. We will identify and choose the use case after careful validation with industry experts. We then look to test our software in the manufacturing setting, and extract real world data, on the utility of our software which is already being sold to customers. Our solution is unique as it has vastly improved depth perception with low latency and precise control in a digital twin VR environment. It is easy to integrate with various robotic systems, bringing robotics control to everyone's reach at an affordable cost

www.extendrobotics.com

GBR–RAIL

GBR Rail Ltd. (GBR) specialises in designing, supplying, and installing rail rolling stock maintenance systems. GBR provides the equipment needed to prepare passenger trains for daily service.

Cleartrak is an innovative system designed to recycle toilet wastewater and convert solid waste into harmless dry biosolids aboard a rail vehicle while in passenger service. This system eliminates the need for daily freshwater refilling and the hazardous removal of raw sewage, making it easier to maintain reliable on-train toilets for passengers.

Cleartrak has been in development for 5 years. The Clean Futures programme will support its successful conclusion through a dual trial approach: one trial to test its performance on a rail vehicle and another to demonstrate the operation of each subsystem.

Following the successful completion of trials supported by the Clean Futures programme, Cleartrak is scheduled to be introduced into the international railways industry in late 2025.

www.gbr-rail.com

GVL develop value-driven, high-innovation geospatial technology to deliver real-world solutions through cutting edge Research & Development and a commitment to deep stakeholder collaboration.

Geospatial Ventures Limited has developed the ASLAN (Automated Survey Localization and Navigation) system that integrates satellite connectivity, communications, and position, navigation, and timing (PNT) technologies in a modular design. It incorporates Global Navigation Satellite Systems (GNSS) and Inertial Measurement Units (IMU/INS) for precise, real-time positioning. ASLAN improves traditional positioning methods by offering enhanced, uninterrupted positioning even in challenging environments like tunnels, bridges, and GNSS-denied areas. The system supports traffic management by improving vehicle speed regulation, leading to better safety, fuel efficiency, and overall system performance. Additionally, ASLAN aids in reducing infrastructure costs, enhancing sustainability, and minimising the need for extensive new construction enabling innovative onboard signalling and communication systems.

We plan to install ASLAN on CVLR (Coventry Very Light Rail) and Tram 16 for trials at BCIMO; an environment for developing rail-based applications. The 870m curved tunnel presents an ideal GNSS-denied environment and will be used to test the IMU and camera-based navigation algorithms. The track's inclines and curves will help collect detailed data on vehicle dynamics, fuel usage, braking and driver performance. The trials aim to gather data to develop vehicle efficiency algorithms and performance models. We plan to collaborate with WMG (Warwick Manufacturing Group), CVLR, West Midlands Passenger Transport, Coventry City Council, and others

www.geospatialventures.co.uk

Grinsty has developed a Passenger Comfort Module and this has been developed as there are lots of individual sensors on the market and fitted to rail vehicles, but this combines many of these sensors into one cost effective module that will also reduce labour costs in terms of maintenance. It can be fitted to all types rail vehicles, DMU's, EMU's, Trams and Locomotives.

Grinsty has developed a true wireless passenger comfort module, which monitors the passenger environment on the train. The device records: CO2 (Carbon Dioxide), Light , Vibration, Humidity and Temperature. This data can then be used to determine the perceived passenger (or driver) experience and therefore improve passenger comfort – a key factor for franchise operators is to improve efficiency management of the environment and predictive asset failure such as a heater or HVAC unit. Reduction in energy use is also possible by only recirculating the air when required, saving thousands of pounds as well as the wider benefit on the environment.

The unit is powered by special industrial grade batteries and WiFi enabled which gives a true wireless and compact solution. This highly configurable device allows users to remotely adjust the sample rate per their application needs, providing flexibility and freedom for future data needs. The unit can be fitted to all types of rail vehicles DMU's, EMU's, Trams and Locomotives.

The solution works by being designed as a one-stop monitoring solution and for the purpose of the rail sector, all electronic components are carefully selected to meet its approvals. The module will also monitor passenger comfort with real time intelligence. The data will further allow analytics to establish baselines, benchmarks, and goals to keep moving forward.

The data is reported in near real-time to a cloud-based server where the data can be used by any system as the solution is software agnostic. With access to data, train operators can build a better understanding of the customer they are serving and identify the needs of their specific audience.

We plan to have a working unit available in early 2025 and have some units fitted and on trial around the same time. We already have parties interested in working with us on the trial of this innovative unit.

www.grinstyrail.co.uk

Integrated Systems Engineering brings together electronics, mechanics, software and telecoms to develop a 5G network for continuous tunnel connectivity, addressing communication gaps in railway tunnels. Its technology will be tested at the BCIMO light rail facility in Dudley.

Integrated Systems Engineering has developed an advanced 5G open-source wireless communication network specifically designed to address the challenges of maintaining robust, high-speed connectivity within railway tunnels. Its solution leverages OpenAirInterface (OAI) for Radio Access Network (RAN) components and Open5GS for core network functions. By deploying Remote Radio Units (RRUs) and Distributed Antenna Systems (DAS) strategically throughout a tunnel, continuous, reliable communication can be ensured, supporting real-time monitoring, autonomous systems and predictive maintenance, which are crucial for enhancing the safety and efficiency of rail operations.

This innovative solution stands out due to its integration of open-source technologies, offering greater customisation and cost-effectiveness compared to previous systems. Additionally, the new system incorporates edge computing for real-time data processing and is powered by energy-efficient technologies and renewable energy sources; significantly reducing environmental impact. An initial deployment and trial at the BCIMO light rail facility in Dudley will validate the system under real-world conditions, demonstrating its scalability and potential for broader implementation in rail networks and other critical infrastructures where reliable communication is essential. The company's focus on sustainability, flexibility, and technological innovation makes its solution a key advancement in modernising transportation infrastructure.

www.ise.bot

MOLE is a British venture and we are automating EV charging. We believe EV charging can be better than filling a combustion engine fuel tank. MOLE does that - it is hands free, safe, efficient, scalable, and saves space, time and money for opertors. The MOLE system can be used for business and consumer vehicles.

MOLE is automating EV charging making it better than filling fuel. The MOLE system is hands-free, safe, and saves space, time and money. It works with business and consumer vehicles.

Charging a vehicle with the MOLE system is very simple. All you need is to install our underbody adapter on your vehicle. It is easy to install (and remove) and allows you to continue to use the traditional charge port when needed. The vehicle will now be compatible to just park in any parking bay with a MOLE ground unit. Just park over it and let the MOLE charge.

The trials planned under the Clean Futures programme will see the integration and testing of key subsystems of the MOLE solution. This will prepare our technology for full scale, live trials, and demonstrations. We expect to demonstrate publicly our solution with a highly visible fleet operated by Solihull Council in the second quarter of 2025.

This demonstration at a one of the UK's top venues will allow businesses and consumers to experience the MOLE solution firsthand.

www.mole.energy

LiBatt Recycling has developed a chemical process to recycle lithium thionyl chloride batteries to stop them from being shipped abroad for treatment and keep the valuable lithium within the UK.

As part of this project, LiBatt Recycling will scale up its innovative lithium thionyl chloride (LTC) battery recycling process to tens of kilo scale. LTC batteries are found in every home, in smart meters and fire alarms as well as a multitude of industrial applications. They contain toxic chemicals and are extremely volatile if mistreated. The current route of disposal is to ship them abroad to third world countries where the treatment routes mean the toxic chemicals end up in the environment.

LiBatt Recycling's process will ensure the batteries are treated in the UK at its Wolverhampton facility and the lithium within the batteries is safely recycled to feed the growing demand from the automotive industry. The process itself relies on the physical shredding and neutralisation of the toxic chemicals inside the batteries to produce benign products, which can be recycled back into the supply chain.

The pilot process will be in operation by the end of 2024 and once online, it will be the only process in Europe capable of recycling LTC batteries.

www.libattrecycling.com

Moasure is a motion-based measuring tool, utilising advanced sensors and algorithms to simplify complex area measurements. Moasure is used by industry professionals across numerous sectors, such as landscaping and construction.

Moasure is the world's first motion-based measuring tool which employs motion sensors and algorithms to track the device's movement in real-time, and utilises the x, y and z data to calculate area, perimeter, elevation changes, gradient and more.

Connecting to a companion app via Bluetooth, Moasure measures and draws simultaneously, and instantly visualises 2D and 3D views on-screen. Alongside powerful in-app tools, professionals can measure straight lines, circles, arcs and freeform trace lines, offering an innovative solution which would otherwise be complex using traditional methods.

The invention of Moasure is rooted in a DIY problem faced by electronics engineer Alan Rock in 2002. There was no tool in existence to solve his dilemma, so Alan's background in electronics engineering inspired him to create a solution.

Since it came to market in May 2019, Moasure has proven its ability to reduce measurement time and eliminate guesswork, thereby saving costs and increasing efficiency for industry professionals worldwide. Key markets include construction, landscaping, surveying and mapping.

By participating in the Open Challenge, Moasure aims to promote West Midlands industry by relocating some of their production to the UK, and decrease carbon emissions as a result of fewer air miles in the supply chain.

www.moasure.co.uk

Moonbility

Moonbility helps the transport sector better manage and understand disruptions. Its flagship Impact Visualisation platform cleans data and enables operators to simulate the impact of asset failures and unavailability. These insights allow operators to identify inefficiencies in operational flows.

Leveraging Moonbility's flagship Impact Visualisation platform, the trial will demonstrate the machine-learning-powered software's ability to provide real-time status updates on wheelchair bays for intermodal journeys, starting with a tram and ending with a bus. Partners involved include National Express and Transport for West Midlands.

Utilising advanced CCTV analysis, this first-of-its-kind solution enables passengers with reduced mobility to check the availability of dedicated spaces. By boosting the confidence of these passengers, the solution has the potential to increase public transport usage by 4.8%, contributing to Great Britain's sustainability goals, particularly in reducing carbon emissions and promoting inclusive transportation.

www.moonbility.com

At OX Delivers we're providing clean, affordable, reliable transport using our purpose designed electric OX Truck, delivered-as-a-service to businesses of all shapes and sizes in Africa and beyond. The truck is 10X cheaper to run than existing alternatives, which cuts the cost of transport from $1000s to buy, or $100s to rent, to as little as $1 for a trip.

OX Delivers is on a mission to transform logistics in emerging markets by providing affordable, reliable, and zero-emissions transport solutions. Our flagship OX electric truck, designed to meet the unique challenges of these regions, significantly reduces inefficiencies, high costs, and environmental impact. By empowering local businesses with sustainable and cost-effective transport, we drive economic growth, foster equitable trade, and create lasting social impact.

We are proud to announce the development of a bespoke OX Manufacturing Management System (OX MMS), an innovative digital solution designed to enhance electric vehicle manufacturing and further our mission. Led by the OX Digital Systems team, OX MMS automates Build Steps—traditionally burdened by inefficiencies—greatly improving the accuracy, speed, and sustainability of our production processes.

Supported by the Clean Futures Accelerator, OX MMS will be trialled at our Leamington Spa facilities in Q4 2024. This trial will demonstrate how automated Build Steps, seamlessly integrated into the production workflow, can reduce operational costs, minimise waste, and accelerate our ability to deliver reliable and sustainable transport solutions where they are needed most.

By optimising manufacturing efficiency through automation, OX MMS not only enhances production but also strengthens our commitment to creating positive social and environmental impacts.

www.oxdelivers.com

RAEON
custom batteries. any shape. any size

Raeon has developed an innovative method of building battery packs which dramatically improves affordability and reduces lead times for custom prototypes. Custom batteries are often too expensive for small to medium sized volume vehicle manufacturers. The company aims to make custom batteries affordable to accelerate the transition to net zero emissions. Its solution fits a wide range of applications, including; motorcycles, robotics, drones, marine and niche automotive uses.

Raeon has created an innovative method of building batteries which dramatically reduces the development cost and lead time for custom battery packs. Off-the-shelf batteries frequently fall short of performance requirements and can be too large. Commissioning a custom battery can incur significant financial expenditures, often not justifiable for small to medium sized vehicle manufacturers. The company want to provide affordable custom batteries to accelerate clean energy adoption for applications including motorcycles, robotics, marine, motorsport, drones and trams. Most batteries use injection moulded plastic 'carriers'. Instead, Raeon uses 'reactive fluids' which flow around whatever size or chemistry of cell chosen and sets solid to form an incredibly strong composite 'brick'.

Light rail applications used to test the batteries, will help to create a digital twin, helping customers understand the performance and cost benefits of the batteries. Customer prototypes were delivered in early 2024 and semi-automated production is planned for early 2026. Clients will be able to choose any cell in a battery of any shape, perfectly optimised for their vehicle with prototypes delivered in less than three months.

www.raeon.com

Taraz Metrology

Taraz Metrology Ltd specialises in the development, assembly, supply and maintenance of high-precision digital metrology solutions. We develop a range of cutting-edge technologies to provide accurate measurements and precise data analyses across various fields covering metal, composite and plastic materials.

Our project aims to advance measurement and analysis methods for chassis and EV battery manufacturing. We are developing an innovative solution that can capture precise measurements in seconds using our cutting-edge Areal Surface Measurement (ASM) system. This system is optimised for wide-area measurement, employing fringe projection technology combined with advanced photogrammetry. This combination significantly enhances our ability to accurately measure challenging features and surfaces, such as highly reflective metal components, datums, and sharp edges and corners.

In partnership with the technical team at Coventry University, our hybrid system will be tested at the AME's chassis and EV battery testbed, with a targeted launch in March 2025. This automated, non-contact measurement system uses advanced optical technology to detect defects in chassis and EV battery components. It not only provides rapid measurements of reflective parts but also helps reduce emissions throughout the manufacturing process. The system is designed to meet relevant ISO standards and NPL guidelines, ensuring accuracy and reliability in characterisation, measurement, and analysis.

www.taraz-metrology.com

Treeva provides reliable and efficient power for transport infrastructure to reduce associated emissions and costs. Using readily available land, we generate renewable energy on roads and railways.

Treeva provides power for rail infrastructure using reliable renewable energy generated along railway tracks. For this pilot, we are working with the BCIMO within the West Midlands Combined Authority (WMCA) region. Treeva turbines are installed along the railway tracks, designed to capture the renewable energy from the airflow of passing trains. As trains move along the tracks, they create airflow that drives the turbines, to provide power for railway infrastructure, such as signals and station facilities. This reduces the reliance on grid electricity and decreases carbon emissions associated with traditional power sources.

The turbines are twice as efficient as alternative sources of renewable energy for railway tracks, as well as being robust and durable for the intense turbulent airflow on the side of the railways. Treeva prioritises safety without compromising on performance, sustainability and cost savings. Overall, our solution represents a scalable and replicable approach to addressing the challenges of designing cost-effective and sustainable transport infrastructure within the WMCA region. By harnessing the power of wind energy from passing trains, we demonstrate the potential to transform traditional transport systems into more efficient, environmentally friendly, and economically viable solutions for the future.

www.treeva.uk

Unipart Powertrain Applications is a leading tier 1 supplier of exhaust systems, fuel systems and engine components. We are at the forefront of no-fault forward production, traceability and digital innovation.

The aim is to develop a methodology to identify feasible emission reduction intervention opportunities for the existing manufacturing lines at Unipart Powertrain Applications (UPA) in Coventry and transfer this learning to other SMEs. This includes optimising high energy use of legacy furnace equipment.

Life cycle assessment and life cycle impact assessment processes and standards are well established to identify opportunities for emissions reduction. The output methodology from this project will guide an SME to the most effective implementation solution, considering the drivers and constraints faced by the business.

Delivering improvement interventions in existing manufacturing value chains is very challenging for SMEs. Change presents risks to customer supplies. Small businesses prioritise near term revenue, sales and resources over process improvements and efficiency gains. This leaves the business exposed to economic viability risks in the long term.

Gaps include methodology to robustly audit an existing facility to identify realistic emission reduction opportunities and an understanding of suitable reliable technology and UK integrators, including energy capture, storage and utilisation.

Creating a business case for internal and or external investment is risky and complicated because of the variables and unknowns. The methodology will use a structured multi criteria decision making approach to help Unipart and other SMEs identify solutions that present minimal risk and maximise returns.

www.unipartmanufacturing.co.uk

THE COHORT

Vanguard
Sustainable Transport Solutions

Vanguard is a fast growing start up with a focus on developing hydrogen and battery solutions to facilitate the decarbonisation of railways across the world.

Vanguard's HydroShunter project will be the UK's first hydrogen powered freight locomotive. Initially destined to be a demonstrator of Vanguard's capabilities, commercial interest in the drivetrain has led it to become the smallest of a suite of locomotive drivetrain offerings, NEO1.

NEO1 is a modular and scalable hydrogen/battery hybrid drivetrain that can be fitted to new build or retrofit applications, affording a cost and time effective decarbonisation solution for freight operators and locomotives owners.

The Clean Futures trial is the perfect opportunity for Vanguard to test and validate our NEO1 drivetrain in a controlled and safe environment, whilst also being able to use it as a tool for educating others about the use of hydrogen in a rail environment.

The initial NEO1 drivetrain is currently in build and, once validated at BCIMO, will be offered as a commercial product in Q2 2025.

www.vanguardsts.com

CATAPULT Connected Places

BCIMO™ BLACK COUNTRY INNOVATIVE MANUFACTURING ORGANISATION

Coventry University | Coventry University and Coventry University Services Ltd

Locally-led Innovation Accelerators delivered in partnership with DSIT, Innovate UK and City Regions

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