

## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Unipart Rail Limited	Prototype zero emissions Trac Rail Transposer (TRT-e)	£398,280	£398,280

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Project description - provided by applicants

Project TRT-e seeks to design, develop and manufacture a working prototype, zero-emission, Trac Rail Transposer (TRT™) for use on the World's railway infrastructure, for removing and replacing rails, particularly in confined areas.

Using the base TRT machines that have been designed, developed and successfully used over the last 15 years by McCulloch Rail, Unipart Group and Williams Advanced Engineering in conjunction with McCulloch Rail will work together to remove the current diesel power unit and develop an electric motor, battery power pack and electronic control system with remote condition monitoring to produce a zero-emissions machine that will enable it to be worked more extensively on the rail infrastructure where diesel emissions and noise pollution are a particular problem, for example, underground systems, tunnels and enclosed stations.

As the majority of track maintenance machines used on the World's railway infrastructure are currently diesel-powered, this will be the first zero-emission machine available for this type of work and therefore a significant innovation in the market.

The output of this project will be a full working prototype, performance tested, certified and ready to be worked on the UK rail network by McCulloch Rail and demonstrated to potential customers Worldwide

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Seatfrog Ops Limited	Train Swap - providing user friendly service switching and flexible seat reservation	£390,771	£390,771

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## Project description - provided by applicants

A recent survey of rail passengers found 8 out of 10 respondents wanted rail fares to be overhauled with consideration for filling empty seats, flexibility of travel, or mixing and matching types of tickets. Current approaches available to passengers either involve ticketing exchange (for example for Advance ticket holders), which is available at stations or via a train operators' app if the original was purchased in this way, or post-purchase seat reservation (for example for Anytime ticket holders) – ten-minute reservation - only available with two train operators.

There is no combined solution which offers passengers a single point of contact, accessing multiple train operators, for all ticketing exchange and seat reservation decisions. In addition, ticket exchange often has a high price attached which prevents passengers who may be able to switch from doing so. This contributes to platform busyness, with associated passenger stress, and offers no incentive to move away from high occupancy services.

This project aims to deliver a first of a kind solution to address these issues. Seatfrog Train Swap will allow passengers to quickly and remotely update their seat reservation to a new service. Seatfrog have developed a standalone prototype based on a fixed fee model to test user interest.

Seatfrog are working with LNER to integrate and trial this technology. The project will develop on the proven concept to deliver and integrate components critical to achieve market acceptance from both Operators' and passengers. Original ticket validation must be seamless, accurate, user-friendly and accessible. Pricing must reflect the needs of operators as well as offering more cost-effective options to passengers to encourage switching. Train Swap uptake should be communicated to Operators' to allow for maximum benefit to be achieved. Alongside LNER involvement, ongoing passenger engagement will inform project decision-making to ensure acceptance across the value chain by project close. The project will culminate in a live trial to validate and verify the Train Swap demonstrator.

Seatfrog have implemented their previous Upgrade-Bidding solution with four Operators', covering almost 50% of the available UK market for Train Swap. With this established route to market, Seatfrog anticipate rapid roll-out across multiple rail networks.

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Associated Utility Supplies Limited	Minimising disruption of overhead line renewals via novel headspan assemblies	£321,542	£321,542

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## Project description - provided by applicants

Currently 42% of the UK's routed rail network is electrified, with 4,238km using Overhead Line Electrification (OLE) infrastructure (Office of Road and Rail 2018/19 data). The use of flexible headspans has been a common approach to support the wires supplying power to the train pantograph, with significant economic advantage in most scenarios, particularly for multi-track sections of line.

Span wire clamps are a key component of headspan OLE infrastructure, but with most of the existing infrastructure having been in situ for over 40 years, corrosion-related degradation of existing assemblies is common, with other failure modes arising from outdated designs, materials and manufacturing methods.

Whilst most current headspan infrastructure therefore requires comprehensive renewal over the next 3 control periods, existing span wire clamp assemblies are complex (having 31 components), unwieldy (weighing over 3kg) and challenging to install or adjust, and therefore not fit-for-purpose. As a result, the technologies currently available to Network Rail do not overcome the perceived operational barriers to practical integration, performance, resilience and future availability requirements, despite the vast majority of OLE failures being caused by problems with aspects beyond the span wire assemblies themselves and overall approach of using headspans.

In response, Associated Utility Supplies Ltd. (AUS) has developed a disruptive first-of-a-kind span wire clamping system with multiple unique attributes underpinning a compelling business case for rapid, low-cost OLE headspan renewals with minimum network disruption. Optimised parametric design has yielded an innovative modular mechanical clamping solution with only 14 components, enabling a 4-fold reduction in installation time and simplifying operations to install the span wire clamps at height. The new clamp can be oriented with full directional freedom, negating misalignment loads and other failure modes. Use of new materials in this domain with increased strength, toughness and fatigue life, enables a 66% reduction in mass and part size, with unconditional corrosion-resistance.

To be formally approved for use on national railways, AUS' new system must now be validated through Network Rail's Product Acceptance Process in terms of availability, maintainability, and safety. The funding provided will be used to demonstrate and prove that requirements set within these safety-critical standards are met.

Building on technology proven at prototype level, AUS will partner with the University of Huddersfield's Institute of Railway Research (OLE-pantograph team) to analyse impacts on the whole catenary system, to transfer technology, as well as transfer knowledge. Direct support from Network Rail and their supply chain, including rail operations partner VolkerRail, will ensure that the new system is fully integrated and proven at system level, with data and feedback collected from the 2-phase demonstration cutting across off-infrastructure and live trial environments. Actively engaging stakeholders responsible for the installation and ongoing maintenance of the system, outputs therefore underpin AUS' commercialisation strategy, building on over 20years' relationship supplying electrification components to Network Rail, supported by broad dissemination activities alongside the University of Huddersfield.

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rcm2 Limited	Integrated Optical Fibre Sensing (OptRail-PRO) to Optimise Rail S&C Maintenance	£399,500	£399,500

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## Project description - provided by applicants

This SBRI FOAK 2020 “OptRail-PRO” Project will demonstrate the use of Optical Fibre Multi-Sensing for Integrated Condition Monitoring of Rail Infrastructure Switches and Crossings (S&C), through further development, test trial certification and installation of the OptRail prototype solution developed by an rcm2- led consortium funded by Innovate UK and Department for Transport (DfT) under AIR5 during 2018-2019. OptRail achieved Rail Industry Readiness Level Five (RIRL 5) equivalent to Technology Readiness Level Six (TRL 6). Various Intellectual Properties (IP’s) were developed, some of which require further R&D to ensure a robust and cost-effective solution for predictive maintenance of railtrack S&C in particular for void and/or crack growth monitoring, prevention and prediction.

A railway infrastructure Switches and Crossing (S&C) system is a safety-critical and high-value asset with moveable track sections that guide trains from one track to another and allow them to cross paths. They have an especially limited lifespan because trains cause wear and deformation when they travel across them. As such an S&C system is at a multi-disciplinary interface between rolling-stock (train load and wheel-rail dynamics), signalling (point machines aka turnout) and track (crossing panel - designed to enable the train wheel “smooth” travel from the wing rail to the nose rail.). Its long-term performance relies on how these elements interact with each other over time, while it is always required to be highly reliable since its failure or downtime can cause system delay or even fatal accidents, such as the Potters Bar accident in 2002 (seven deaths and 76 injuries).

Network Rail and rcm2 limited identified Bethnal Green Crossing (BGK), Greater Anglia Route as a practicable and critical location for installation and field trial of the OptRail (Optical Fibre Sensing) Solution for Void/Crack Growth Prediction (V&CGP). The Prototype Demonstration project will build upon and advance innovative elements of OptRail. These vary from improving robustness (optimised sensor configuration, magnetic clamp installation kit) to signal processing and V&CGP algorithms (Edge computing, IoT, AI, Cloud) development and validation.

Two field trial sites (BGK in Anglia/Shalford Crossing in Wessex Route) have been identified. Data collected will be validated against S&C Digital Twin model. Further S&C data will be correlated against Train Inertial Monitoring Unit as well as the local Point Machine RCM to develop an integrated pattern for fault pattern classification. The expected outcome is to have demonstrated that OptRail had met and satisfied all the Reliability Readiness Level (RRL6-RRL8) requirements as per NR/L2/RSE/0005 L2 Business Process “Product Design for Reliability”.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Cogitare Limited	Trainserv Software User Trial and Preparation for Commercialisation	£399,942	£399,942

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## Project description - provided by applicants

This project is to help GB rail embrace data and use it to improve services for passengers and cut costs. It is to kick start rail industry adoption of our innovative Trainserv software through user trials to prepare Trainserv for commercialisation and demonstrate the benefits to 8 rail organisations: Network Rail, TfL, HS2 and rail operators including LNER (London North Eastern Railway), MTR Crossrail, GWR (Great Western Railway), GTR (Govia Thameslink Railway) and ARL (Arriva Rail London). Trainserv helps rail organisations put the passenger first, improve timetables, performance, safety and save energy. How? Trainserv democratises data by integrating multiple sources real-time and converting into easy to use information to improve. Data sources include on-train data from the “blackbox” (On-train data recorder/OTDR) and Train Management System, GPS, Timetable Advisory Systems (TAS), signaling, network infrastructure, timetable and we are currently adding passengers. Users include planning, performance, control, station staff, and train crew, in particular drivers and driver managers. Trainserv is a continuous improvement tool to help measure and understand variability on the railway and help rail staff to reduce it. Variability includes train running times and station stop times, and service recovery strategies when there are delays.

The trials will help us prepare and improve Trainserv for for widescale rollout and users and organisations understand how they can use the information provided by Trainserv to improve and demonstrate its value to the industry. These rail organisations want to use Trainserv to “do more for less”. Every rail organization we have approached to partner with us for this trial has said yes. They have seen the potential and want to use the trials to help the industry agree and get the December 21 timetable right, improve driving to improve safety and reduce run-time variability and understand and reduce dwell-time variability.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Perpetuum Limited	Train Axle Crack Monitoring - TAMON	£328,320	£328,320

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## Project description - provided by applicants

### TRAIN AXLE CRACK MONITORING - TAMON

Cracks in axles can lead to complete failure and very dangerous accidents. Train axles are therefore subjected to regular testing to identify incipient crack failure. This process is very costly and involves taking the train out of service. Much work has been done (eg projects Wolaxim and Widem) as well as industrial research and development by many manufacturers of Non Destructive Test (NDT) equipment.

Studies have looked at extending inspection intervals and involve concepts such as statistical determination of "Probability of Detection". There is significant uncertainty and cost involved in the current approach. Major reductions in cost and improvements in the certainty of safe operation are possible by using MONAXLE on-board continuous crack detection.

The recent MONAXLE project lead by Perpetuum and in collaboration with TWI and the University of Southampton has proven the concept in the laboratory of detecting cracks by analysing changes in resonance of the axle caused by cracks as it rotates. This FOAK installation will install this concept on passenger trains using a new version of Perpetuum's well established self-powered wireless monitoring system.

This project has been discussed with leading train manufacturers, train owners (ROSCOs) and train operating companies (TOCs). We have agreed to do the first installation on the GWR 802 fleet working with Hitachi, the train builder, Eversholt, the owner, and First Group, the franchisee TOC.

The TAMON project is supported by the RSSB who have said it "would be expected to have a significant positive impact on maintenance programmes and rolling stock availability, while reducing risk and disruption to service."

TAMON will fully meet criteria for the Theme 4 "Optimised and cost effective maintenance" including reducing returns to depot, use of pattern-recognition technologies to automate inspections and improved reporting of failures and/or issues by collecting live data whilst in service and continuous reporting. It will also be possible to monitor and report on loads on axles which could give information helpful to passengers waiting to board on where there is least crowding. By eventually extending the application to freight, this capability would enhance safety of freight wagons by reporting eccentric and over loads and may eliminate the need for weigh stations to monitor loads for revenue determination.

TAMON is expected to bring major benefits:

- Significantly reduced maintenance and inspection costs
- Direct and live information on axle condition to enable confidence in decision making about actions required
- Reduced downtime for rolling stock through less frequent inspections giving better availability
- Fewer unplanned withdrawals from service
- Enhanced safety and reduction in uncertainties on axle cracks

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Esoterix Systems Limited	Dynamic Capacity Management	£368,001	£368,001

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## Project description - provided by applicants

People like to travel by train. The railway network delivers double the number of passenger journeys and passenger kilometres it did 20 years ago, growth which has outperformed external drivers such as population growth. However, the rail network is constrained. Additional rolling stock and infrastructure are both expensive and slow to deliver. To attract and retain new passengers, which is needed if the Government is to reach its net zero 2050 target, the industry needs to find ways to free up space on peak services by increasing use of off-peak ones.

Meanwhile the world is changing. Technology enables people to work remotely, or at multiple jobs, and many people no longer work the traditional working week of 9-5, Monday to Friday. Commuters who travel regularly but intermittently face a stark choice between the convenience of a season ticket, requiring a large up-front payment, and effectively paying for journeys they'll never use, or less convenient and proportionally higher priced alternatives. This pricing structure appears unfair to many and overwhelmingly disadvantages women, who make up the majority of the part-time workforce.

Dynamic Capacity Management brings these factors together. It will help maximise use of existing capacity by introducing utility-style ticketing that for the first time adjusts to travel patterns and rewards particular choices.

Passengers will have access to the value for money of an annual season ticket via a monthly subscription, thereby avoiding the large up-front fee. They will have the assurance of the best value fares and tap-anytime convenience with the option to secure reductions against the next month's subscription for days they don't travel and/or when they use specified services. Train Operators get better utilisation of their existing assets, with increased revenue for little extra cost. And they gain the potential to dynamically manage demand in response to network disruption.

Dynamic Capacity Management will be grounded by the insights of a real-world trial.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
University of Sheffield	High Speed Cryogenic Blasting for Rail Cleaning to Alleviate Low Adhesion	£375,480	£375,480

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## Project description - provided by applicants

### High Speed Cryogenic Blasting for Rail Cleaning to Alleviate Low Adhesion

Low adhesion in the wheel/rail interface causes safety concerns if a train is unable to stop as required. Associated delays result in fines and passenger dissatisfaction. Unpredictable braking and traction is the variation in adhesion conditions in the wheel/rail contact. The fluctuations that occur are largely related to the presence of contaminants on the rail head such as water (as dew or precipitation), leaves, oil, metal oxides or wear debris.

One way to overcome the problem is to clean the rail head to leave a more consistent surface. Previous work has shown that rail head cleaning using dry-ice blasting provides many benefits over the water jetting currently used. As the dry-ice pellets impact a contaminant layer they cool it causing it to crack and debond. Further bombardment, and the blast as the pellets turn into gas, then acts to remove it. This approach leaves no residual material and will not damage wheels or rails.

In Autumn 2019 a road-to-rail mounted system was successfully trialled with Network Rail across five routes. This system can now be rolled out to clean rail where rail head treatment trains (RHTTs) are unable to pass and will be used on the West Highland Line to clean for the whole of Autumn 2020.

In this project, with support of stakeholders such as Network Rail, Northern Trains Ltd., Stagecoach Supertram (Sheffield) and Nexus (Tyne and Wear Metro), work will be carried out develop a high speed cryogenic cleaning system that can operate at at least 60mph to match the operating capability of a current RHTT and asses the viability of having cleaning capability on passenger trains. This will involve adapting the technology for trials on the Nexus Rail Head Treatment Train and a Northern Trains Ltd. passenger train. Development work will be carried out using the University of Huddersfield HAROLD full-scale wheel/rail test-rig (which can operate up to 125mph) to find the optimum application parameters for the higher speeds attained by these vehicles over those used in previous testing.

As the cryogenic pellets can be generated onboard a train, their use allows a high speed rail head treatment platform to be much smaller than a current RHTT and they will be able to clean for longer distances.

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Porterbrook Leasing Company Limited	LoCe: Less oil, Cleaner exhaust	£397,669	£397,669

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## Project description - provided by applicants

Our innovation project is called LoCe: Less oil, Cleaner exhaust.

We aim to transfer novel retrofit technology onto one of Porterbrook's Class 170 Turbostar vehicles, enabling mid-life diesel engines to rapidly become more Environmentally Sustainable (addressing Theme 1 of the InnovateUK First-of-a-Kind competition). We will work with Eminox, Bosch Rexroth and DG8: established Porterbrook collaborators who have track records in delivering innovations to the UK railway industry.

A key technical project challenge is the limited space on Turbostar vehicles for retrofitment: which we will resolve by creating an innovative 2-box Exhaust After-Treatment System, and introducing a novel low-volume hydrostatic reservoir. Once the 2-box system is developed and successfully bench-tested, we plan to de-risk these innovations during a demonstrator phase on East Midlands Railway (EMR).

Gareth Race, EMR Fleet Director (interim) said, "As part of our environmental policy, we're keen to enhance and build on our sustainable railway credentials, with a commitment to work with the supply chain to share best practice and continually improve our environmental and energy performance. Porterbrook are a trusted partner with whom we work collaboratively to deliver improvements across our fleets. EMR offer our support to Porterbrook in this innovative project... as it offers the opportunity to provide tangible benefits for both emissions and waste."

We then envisage progressing to commercial roll-out beyond the 9-month Foak demonstrator project, potentially making a significant environmental difference e.g. improving air quality by lowering emissions (by 75-90+%) and reducing waste oil (by 84%) across all 464 Turbostar vehicles.

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Garrandale Limited	Cleartrak on Train Testing (CoTT)	£365,392	£365,392

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## Project description - provided by applicants

### Cleartrak on Train Testing (CoTT) Project

This project will evaluate Cleartrak when installed on a rail vehicle and operated on a test track and then in passenger service on the network. This will involve special adaptation of a rail vehicle and existing Cleartrak prototype systems and the subsequent homologation of the adaptation designs.

Cleartrak processes all toilet waste on board, both liquid and solid. It purifies and recycles waste water and renders solid waste inert, much reduced in volume and weight. It provides the solution to the problems associated with the reliable operation of trains with toilets.

Cleartrak reduces the whole of life costs associated with operating trains with toilets. It reduces the amount of time trains spend in depots out of passenger service. It reduces the transported weight of the train, the energy required per journey and wear on the track. It provides flexibility in service locations, obviating the need for specialist rail depot equipment connected to a mains sewage network and increases the number of passenger journeys on the network.

Cleartrak optimises railway operations through enabling lengthier journeys free from route constraints and servicing disruptions. It keeps trains running longer, greener and more efficiently. It is a first of a kind on-board waste processing system, revolutionising train servicing and increasing the availability of rolling stock assets for passenger revenue generation over a wider network of routes.

#### NOTE:

For the purpose of this application please note that the definition of a CET is a Controlled Emission Tank.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Steamology Motion Limited	Zero Emission Rail Freight Power	£400,000	£400,000

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## Project description - provided by applicants

The UK Minister for Transport has announced the ambition to remove all diesel only trains off the track by 2040. This presents technical challenges to the UK rail network where only ~42% of the 20,000-miles is electrified, particularly for freight trains. There are about 850 freight locomotives in regular service in the UK moving 19 billion tonne kilometers in 2016-17. Rail freight is currently low emission, ~1/4 of the CO2 of road freight. In order to maintain and increase the amount of rail freight carried the industry must develop zero emission traction solutions to avoid transfer to other transport modes such as zero emission HGVs.

Steamology are developing innovative hydrogen-based power generation and storage products that deliver zero emission power solutions when connected to Renewable Energy (RE). The SBR1 rail demonstrations: first of a kind grant will enable the application of this technology to Theme1: environmental sustainability:

The project team will be able to tackle the key competition priorities of:

- Low carbon freight
- Energy generation and storage solutions
- Low emission self-powered vehicles
- Improved air quality in enclosed spaces
- Sustainable and recyclable materials that reduce whole-life carbon footprint
- Reduction of noise from diesel engines and wheels

Steamology is an innovative technology development company with an extreme engineering pedigree and a land speed record breaking heritage. Founded to commercially exploit the technology legacy from a successful world record attempt and to explore the potential of novel clean green renewable hydrogen steam power generation. Steamology has a proven record in delivering complex functioning systems. At the heart of the W2W (Water to Water) system is a compact energy dense steam generator. Steam is generated using energy stored as compressed hydrogen and oxygen gas in tanks. High pressure superheated steam is used to drive a turbine to do useful work. This system will provide an innovative power train for freight locomotive rolling stock.

The zero-emission steam turbine can be manufactured as a diesel engine replacement for existing rail freight locomotives. The turbines are low noise helping the expansion of urban and late night freight operations

Renewable Energy, RE, is used to power electrolysis to generate the hydrogen and oxygen gas and to compress the gas into storage tanks.

The W2W closed cycle is emission free, producing no carbon, NOX SOX emissions in a repeatable cycle without charging losses.

Steamology adopt a 'Cradle to Cradle' approach to design. This means not using rare earth or toxic materials or exotic manufacturing processes allowing products with simplified service, maintenance and long service life.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Fugro	InnoTamp	£393,608	£393,608

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## Project description - provided by applicants

### InnoTamp

Currently, accurate geodetic information for track maintenance is only used for high speed lines to ensure optimal ride and safety; the former is not only passenger comfort but low dynamic forces on track and rolling stock, which also reduce their wear and tear. For non-high speed lines it is deemed too expensive and cumbersome (due to safety precautions) to geodetically survey and analyse tracks at regular intervals (monthly/bimonthly).

Fugro, in collaboration with Network Rail, proposes InnoTamp: an innovative, cost-effective and safe survey methodology for maintaining positional track geometry (adjusting both rails to the required optimum alignment) even for non-high speed rail lines. Studies have shown that track maintenance cost savings of up to 30% are achievable when accurate geodetic data are regularly utilised. The use of InnoTamp will therefore lead to improved environmental sustainability and customer experience, optimised railway operations as well as optimised and cost-effective track maintenance for Network Rail and other track owners in future.

InnoTamp extends the capabilities of Fugro's RILA technology, which has been used by Network Rail since 2013 to generate geodetic data for projects such as electrification and track renewals. This survey system neither requires personnel on track, nor a dedicated measurement train. It makes use of regular timetabled revenue earning trains and has proven to be very cost effective. InnoTamp focuses on applying the collected geodetic track data such that track maintenance can be executed efficiently for all lines. It includes e.g. identifying where maintenance is required; for those areas, computing the best alignment and corresponding required track adjustments; checking and proving whether the computed adjustments are practically feasible; uploading the approved adjustments in the computers of on-track maintenance equipment; and finally checking and proving the track changes are implemented correctly.

Fugro seeks funding to transition InnoTamp from an R&D concept through to prototype and proving in the areas of cloud computing, algorithm development, machine learning, process automation and application interfaces. In addition, the funding will be used to undertake pilots in (complex) mainline track layouts together with Network Rail, which would be the first in the world.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Riding Sunbeams Ltd	Daybreak	£399,996	£399,996

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

Riding Sunbeams Limited is a highly-innovative start-up focused on decarbonisation of the railway industry through connecting renewable energy directly into the railway power supply network. We were the first to achieve this globally through our pioneering FOAK 2019 project, which connected solar energy directly into Direct-Current, third rail powered railways, in conjunction with Network Rail at their Aldershot site. The project was a huge success with George Freeman, Minister for State at Department for Transport visiting the site in Jan 2020. This project will build on our success to date and develop a first of a kind direct connection between renewable generation and Alternating Current overhead line powered rail traction systems (which form two thirds of the railway system).

We are passionate about decarbonisation of the railway, whereby ensuring that the UK has a truly green transport solutions is a key tenet of meeting our net zero carbon obligations. Furthermore, our innovation has deep social benefits as it leverages community energy projects to generate the energy required to meeting the substantial demand of the railway system.

This 9-month project will serve to develop a demonstrator site, with the aim of developing a market-ready solution that can be widely deployed through rapid scale-up post project, ensuring a greener, cheaper and socially beneficial transport solution.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Hive Composites Limited	Next generation composite poles for a 5G enabled railway (NG-5G)	£344,001	£344,001

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

Despite 85% of train carriages being fitted with Wi-Fi, mobile and Wi-Fi connectivity on the rail network is a well-known issue; customers struggle to connect to the Internet, maintain a 4G signal, calls drop out and sending text messages is difficult. This affects large parts of the network. The implementation of 5G technology will enable the processing of data 100 times greater than is possible on current mobile deployments, vastly increasing the consistency and quality of the Wi-Fi that passengers will enjoy on their journeys throughout the rail network. Although 5G antennas can handle more users and data, they have a limited range. The fact that they only beam out over short distances requires new infrastructure to ensure coverage. In a railway context, antennae need to be deployed either using existing infrastructure (i.e. mounted on existing stanchions) or in stand-alone installations. A major safety concern during installation of traditional steel poles in a track environment is their weight and electrical conductivity; several people are needed trackside to carry the poles, the track must be closed, and the power be turned off in the electrified sections. Non-conductive, lightweight composite poles will enable installations to be performed without closing the track, with less labour and at higher speed meaning that the rollout of a 5G system can be performed with minimal installation cost and disruption.

The goal of this SBRI First of a Kind project is to develop and field trial advanced composite poles for 5G installations with the following features:

- non-conductive – safe installation in electrified rail areas
- low maintenance – reduced maintenance requirements over steel poles delivering reduced total cost of ownership
- lightweight – reduced parasitic weight, easier transport to site, reduced foundations, faster and safer installation
- state of the art fire protection coatings

The main deliverables of this project will be bespoke composite poles for:

- mounting 5G antenna on existing infrastructure (e.g. stanchions, including developing the brackets)
- ground mounted 5G masts

The composite poles will be tested at several sites with First Group; the poles will be integrated with appropriate foundations (fast deployment, low cost etc). The foundation design will enable the poles to be lowered for ease of maintenance of the 5G antenna. Each pole will only be able to be lowered into a predefined position due to infrastructure, foliage and other space restrictions at each specific installation. These next generation composite poles are an essential part of the hardware for the 5G system being developed by First Group and provide the platform for 5G antennae across the UK rail network.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Liverpool John Moores University	IRIS: Information system for railway station staff	£330,388	£330,388

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

We propose a new kind of information system for frontline station staff called ""IRIS: Information system for railway station staff"" to enhance communication and their experience in stations. Particularly, IRIS digital display equips staff with a 2-way communication mechanism, as well as integrate richer, faster, and more accurate information from different sources into one single view. Also for the first time real-time passenger count at platform will be reported in the system. These new features will allow staff to quickly understand the situation in the station in a quick glance, and to report new development back to control offices. As a result, staff can focus more on speaking to the customer rather than spending time reporting and reconciling information from different sources via different means such as telephone, walky-talky, colleague, internet, and several mobile app.

IRIS customer-centric display will also help staff to speak in passengers' language, and thus improve ease of understanding for passengers. The simplified way of automatically reconciling all additional information such as number of passengers, real-time position of trains, list of all stops, expected arrival time etc. of all relevant journeys will allow staff to help passengers in making travel decisions/planning more effectively. The presence of IRIS portable device or digital display will create an impression of ownership and authority to passengers, allowing them to trust staff's ability to be helpful. Staff can also share the view on IRIS display with passengers to improve understanding further

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Vortex IoT Limited	Railway Optical Detection and Obstructions-Tunnel & Station Monitoring	£391,756	£391,756

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

Vortex IoT is an award-winning Wales based SME heading up a consortium that also includes Network Rail and Transport for Wales, Kelos Amey, Balfour Beatty. The company has a proven record in product development and has assembled a highly qualified team of Engineers who are specialist Internet of Things (IoT), wireless mesh networks and Artificial Intelligence (AI). Whilst its partners are a prime rail contractor and integrator and Network Rail Infrastructure respectively (Railway asset owner/ customer).

There is an increasing demand for high availability of rail infrastructure and rolling stock assets for rail passenger journeys and freight customers. Remote Condition Monitoring (RCM) of rail infrastructure is essential to maximise the reliability and maintainability of the rail network and is a key enabler for achieving the goal of 'Minimal Disruption and Delay' set by Network Rail's Capability Delivery Plan.

This funding bid is focussed on securing additional funds to accelerate a 'first mover' RCM solution to market. The proposed project - RODIO®-TSM (Railway Optical Detection of Obstructions and Intrusions-Tunnel and Station Monitoring) - will deploy and integrate 18 devices in two live rail locations: a live 1.2km rail tunnel and 200m of its either entrance at Melton offered by NRI and a live train station in South Wales (Bargoed) with 200m station area and 100m urban tunnel. The project will user test the intrusion/obstruction detection capability of the LiDAR sensor network, that are wirelessly connected to RODIO edge gateway where the sensor fusion and AI engine resides to process the data and then results (e.g. Notifications, Threat level, ...) are pushed to Network Rail Telecom (NRT) cloud server and ubiquitous IP Network.

The system uses data fusion and Deep Learning classifiers to identify intrusion and obstruction types and severities aiming for high recall (sensitivity) and high precision against false alarms. This system can accurately detect, differentiate and classify (a) Intrusions – Human and Animal movements (b) Obstructions – Rock fall, tree fall, brick fall, debris fall, (c) Geotechnical asset failures – localised rapid earthworks, flooding, landslides and then sends real time situational alerts to the rail control centre to prompt further investigation as an advisory system.

The NRI Product Acceptance Framework defined by Rail Industry Readiness Level (RIRL) is a vital indicator of our product maturity. The RODIO-TSM project will advance the current position of the RODIO® product to RIRL8.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Jeremy Benn Associates Limited (T/A JBA Consulting)	Improving resilience through a surface water flooding decision support system	£346,153	£346,153

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

### Improving resilience through a surface water flooding decision support system

Abstract: This project seeks to develop a first of a kind surface water flood forecasting and early warning system for Network Rail to support optimised railway operations (Theme 3) through a real-time decision-making assistance system, and optimised and cost-effective maintenance (Theme 4). The proposed system is designed to be used by operational teams across Network Rail Regions as well as a management tool for the Infrastructure Control Centre (ICC) (operational management) and Safety, Technical & Engineering (ST&E) team (Asset Management). Users will benefit from asset-specific surface water flood information, alerts and warnings, in addition to visualising surface water flood information in map format. This information is provided ahead of the events occurring, across the network, indicating which assets may be partially or fully compromised, identifying if failure may be expected or if inspection/maintenance is required. Asset-specific information is generated by integrating the forecast or real-time mapped flood extent and depths with existing asset metadata (location, elevation, characteristics, etc). This information can also be used to prioritise early action to mitigate flood/heavy rainfall impact and minimise disruption. This will enable proactive flood management to reduce the overall impacts experienced by operators, maintainers, including planning by third party suppliers, and users of the national network. The resulting mapping process and techniques will also be available to inform where rail infrastructure might need priority attention ahead of flood events.

This approach has distinct advantages over other systems because:

- It uses the best available rainfall forecast product that can resolve the type of rain that creates very intense, often short duration, rainfall events (convective rainfall cells)
- It has a method of managing the uncertainty in the rainfall forecasts (multiple forecasts, referred to as a forecast ensemble, are used to create a probability of flooding map)
- It uses existing, mature technology and data to:
  - map the surface water flood likelihood in real time, ahead of the event and
  - link the mapped surface water flood information to Network Rail's assets to assess flood risk (impact and likelihood) in real time.

The proposed approach will utilise Met Office rainfall forecasts, when run in real time, and draw on products and knowledge from the suite of other projects that Network Rail has been developing throughout Control Period (CP) 5 (2014 – 2019) and into CP6 (2019 – 2024). This provides a unique and exciting opportunity to combine the wide range of previous and current investment and maximise their use to deliver an application that the rail network currently lacks and would benefit from significantly. The continuing CP6 (2019 – 2024) provides an opportunity to drive the use of these projects and processes forwards to help develop a more sustainable and reliable rail network.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Sheffield Hallam University	Development of Illumin-heated concrete platform coper slabs	£394,504	£394,504

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

The aim of the project is to develop illuminated and heated ('Illumin-heated') concrete slabs for railway platform copers enabling automated de-icing during winter periods and dynamic wayfinding for alighting or boarding passengers. The project is unique in that it will incorporate a low energy heating element embedded into the concrete coper on external platforms and with the use of thermostats will automatically switch-on at freezing temperatures. During wet conditions, the heating can also be applied leading to a quicker drying of the coper. The illumination will be integrated into the top of the slab and will direct alighting passengers to the exit and guide boarding passengers to the correct part of the platform.

Not only can the illumin-heated coper be used where slip hazards are prevalent e.g. on a platform edge, it can also be adapted for use on concourses with high foot traffic such as the entrance to a station. This will help station managers to keep their stations open and safe and avoid disruption or potential injury to passengers and staff during times of freezing weather. It will also serve to direct passengers through the station more efficiently.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Rail Innovations Ltd	Thermal Radiometry for the Remote Condition Monitoring of Railway Vehicles	£293,976	£293,976

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

Project description - provided by applicants

Innovative Applications of Thermal Radiometry for the Remote Condition Monitoring of Railway Vehicles :

This project, led by Rail Innovations, will be a novel application of thermal radiometry camera technology, using it to measure temperatures of mechanical systems on moving trains which will enable automatic alarms to be sent over the Internet in the event of an over-temperature occurrence. These alarms will enable the maintenance teams to plan preventative maintenance in order to avoid failures in service.

No use of constant thermal imagery has been found in UK rail that can offer the benefits of monitoring many parts of a piece of equipment using a single sensor. Rail Innovations lead a consortium that defines requirements (form factor, performance requirements, interface etc) for 2 applications - the On-board system will be mounted in an HST Power Car and the Lineside system will be mounted on either side of an active railway to thermally scan passing trains.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
iProov Limited	LAMINAR – Freeflow Admission to rail services using face verification	£388,440	£388,440

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

Project description - provided by applicants

This project will demonstrate the world's first application of walk-through access to high-speed railway services, enabled by biometric verification. Integrating proven secure identity verification technology with the systems of an international rail operator, the project will demonstrate how opt-in, consent-based biometrics can dramatically enhance the passenger experience, reduce congestion, improve safety and enhance security.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Far-UK Ltd	Resi-Glaze: Resilient glazing for safer passenger vehicle operation	£386,866	£386,866

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

In the UK rail sector, vehicles have relied on glass windows, either toughened or laminated. The efficacy of these glazing solutions has been called into question, for instance, issues linking safety and glazing have been brought into focus by the November 2016 tram accident in Croydon (Sandilands). A recommendation of the accident report is that ""UK tram operators and owners should review existing research and, if necessary, undertake further research to identify means of improving the passenger containment provided by tram windows and doors"".

Thus, the project aims to develop an innovative resilient glazing solution applicable to rail vehicle driver and body-side areas. The project consortium includes innovation expertise, rail industry vehicle developers and integrators, vehicle owners and operators, and, importantly, aligns to two vehicle delivery programmes providing target vehicles and thus future exploitation potential for the concept. Investigating the potential for alternative resilient glazing solutions for rail passenger vehicles is not a new concept, but some of the early work in this area raised concerns such as scratch resistance and reduction in optical clarity over time. These concerns have been addressed previously by the project consortium and have been demonstrated in a full-scale trial with a major bus manufacturer.

This project will utilise the knowledge gained from the previous work and undertake further R&D to develop the polymeric glazing for rail applications, including standards approval. Development activities will centre on:

- The development of design solutions with specific consideration of the rail environment to achieve enhanced passenger and rail staff safety;
- Development of analytical tools to improve the manufacturing process, ultimately reducing production costs and allowing for an increase in production volumes; and
- Development of environmental audit models to understand the potential CO2 emissions saving.

The outcomes will impact the future rail requirements (the 4 C's) by lowering the mass of the glazing by 60%, impacting Carbon emissions, and decreasing operational Costs; improving safety advancing the Customer experience, and finally reducing headways, thus increasing Capacity on the network. Far-UK the project leaders have experience in the development of novel solutions and bringing them to market. WMG and TDI are currently leading projects to deliver full-scale vehicle demonstrators for a light rail vehicles (Coventry VLR vehicle) and regional vehicle (Revolution VLR).

Furthermore, this project is supported by Coventry City Council and Eversholt Rail Group, representing customers for the Coventry and Revolution VLR projects respectively.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Birmingham Centre for Railway Research and Education	HydroFLEX Raft Production Design	£400,000	£400,000

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

Hydrogen offers the UK rail industry a clean and sustainable power solution for routes where electrification would not be commercially viable or not likely to be adopted in the medium to long term. Removing diesel power from the rail network will be essential for the industry to demonstrate its low carbon credentials to the public and Government at a time of increasing environmental awareness and action.

The project partners have already delivered a full size demonstrator, HydroFlex, that was launched at Rail Live 2019. This demonstrator vehicle subsequently won Innovate UK FOAK3 funding to become the UK's first mainline hydrogen powered train.

The HydroFlex demonstrator is not suitable in its current form to become an in-service solution. We need to develop the concept with regards to packaging, range and performance to suit mainline applications, benefiting from the experience gained from the original demonstrator. The HydroFLEX Raft Production Design project will develop the HydroFLEX power pack that will be the intended final commercial design for the hydrogen fuel cell and battery hybrid traction power system. The system will be designed, developed and tested to be installed inside the production raft that would be fitted underneath a train to minimise the loss of passenger saloon space.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Associated Utility Supplies Limited	A Novel, Low Environmental Impact, Composite Railway Footbridge	£399,466	£399,466

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

A Novel, Low Environmental Impact, Composite Railway Footbridge.

In 2014, the House of Commons Transport Committee (House of Commons, 2014) investigated safety at level crossings, noting that in 2012-13 nine people had died on level crossings. The committee set Network Rail the target of reducing these fatalities to zero by 2020. The 2018/19 railway safety report (RSSB, 2019) noted that whilst pedestrian fatalities had reduced to two, there were still more than 1500 incidents of pedestrians crossing when it unsafe. In the UK there are approximately 3,400 pedestrian level crossings where members of the public are currently put at risk. To mitigate against this risk, Network Rail propose to install footbridges wherever this is practicable.

Traditional steel footbridges with substantial concrete foundations have a high environmental impact due to the materials used and therefore clash with Network Rails target to become carbon neutral by 2030. In addition, using this traditional structure can cause disruption to the network during installation and significant, short term, local environmental damage, particularly in difficult to access locations. In the past, bridges formed from fibre reinforced polymers have been installed and these have reduced the environmental impact and disruption to a degree, as their light weight makes them easier to install. However, these bridges have not been price competitive with traditional bridges and due to the inclusion of some traditional materials, have still had long installation times and a significant environmental impact.

In this project Associated Utility Supplies (AUS) Ltd will demonstrate a low environmental impact footbridge which will be the first railway footbridge made entirely from fibre reinforced polymer sections without the use of adhesives onsite or steel bolts. The bridge structure will be light enough to be supported on polymer cement piles rather than traditional cement foundations. The environmental impact of the bridge will be at least 50% lower than the equivalent steel bridge. The bridge will be significantly easier to install than the equivalent steel bridge, greatly reducing network disruption and local environmental damage. The bridge structure makes use of an innovative method of joining standard pultruded fibre reinforced sections. This selection of materials and joining methods will make the bridge price competitive with its steel equivalent and significantly cheaper than composite bridges formed from large moulded sections. The project is a collaboration between AUS Ltd as the lead partner and The University of Huddersfield, Network Rail, HS2, Fiberline A/S and the National Composites Centre.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
Ingram Networks Ltd	Demonstrating 10Gbps+ Track to Train communications to Transport for Wales	£390,000	£390,000

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

The early feasibility studies for this project were performed under an InnovateUK Round 1 Infrastructure Systems Feasibility Study, which completed in March 2018. This was intended to be a purely lab-based study into new very high speed communications technology for railways. The study exceeded its original aims, and concluded by demonstrating the technology on a heritage railway. Further 'Strand 2 Infrastructure Systems' funding was then secured from InnovateUK in 2018 to develop the technology into a full demonstrator, with the same heritage railway as a collaborative grant partner. This work is demonstrating very cost effective trackside to train communications infrastructure over the whole 8km length of the heritage railway in Leicestershire, at speeds of 10Gbps+

These projects have enabled the technology to be matured to a stage where it meets the criteria for a First of a Kind project, focussed on trials and demonstrations in a live rail environment

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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## Results of Competition: SBRI Rail Demonstrations: First of a Kind 2020

Competition Code: 2001\_SBRI\_FOAK\_JAN

Total available funding is £9.4 million

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
CoCatalyst Limited	Improved railway operations through train-mounted water addition	£330,412	£330,412

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

## Project description - provided by applicants

### Improved railway operations through train-mounted water addition

For many years the UK rail industry has struggled to manage the effects of low adhesion. The problem is most severe in Autumn when track-side leaf fall contributes to very slippery conditions on the railway. Each year, the so called problem of "leaves on the line" leads to massive disruption across large parts of the UK rail network. The problem forces the industry to undertake complex and expensive countermeasures; special trains jet the rails with millions of litres of water, Autumn timetables frustrate and confuse rail users and line-side tree felling challenges the green credentials of the rail industry. If all else fails, the trains rely on the steam age technology of sand to stop and start safely. Even if a minor problem occurs on a small part of the network, it can easily escalate into significant operational chaos. Overall, low adhesion costs the UK rail industry up to £350 million each year. We discovered that the issue doesn't occur at all on days with heavy rain, even during Autumn. Our solution simply creates "rainy day" conditions on the track by spraying a small amount of water from the train when a slippery rail is detected. Our idea has been shown to improve train traction and braking on a test track. We have also demonstrated a cleaning effect - i.e. adding water to the track progressively reduces the chance of later trains having braking problems. There is now a need to understand the impact of water addition in an operational environment by testing the system on the mainline. This project aims to demonstrate that a train-mounted water addition solution can deliver a more robust railway, minimising the need for the mitigations described earlier and optimising railway operations.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results