RSSB

A Better, Safer Railway

Research & Innovation Competitions

Intelligent Power Networks to Decarbonise Rail

30 October 2018

Innovate UK

I would like to see us take all diesel-only trains off the track by 2040 […] Rail may be less carbon intensive than road transport […] But that does not absolve the rail industry from cleaning up its own act […] Rail emissions have actually increased in absolute terms, up 33% since 1990 […]

By decarbonising rail, we'll reduce pollutants and improve air quality. We will tackle this with the urgency it deserves by setting tough new environmental performance goals in each rail franchise which the train operators will have to meet.

Total electrification of our tracks is unlikely to be the only or most cost-effective way to secure these vital environmental benefits. New bi-modes trains are a great bridging technology to other low emission futures. […]

And as technologies improve we expect to see the diesel engines in bi-modes replaced altogether. […]

I am calling on the railway to provide a vision for how it will decarbonise.

Excerpt from the speech delivered on 12 February 2018 by

Jo Johnson MP, Minister of State at the Department for Transport

Follow the conversation on twitter: **#carbfreerail**

Contents

The Rail Safety and Standards Board (RSSB) is making funding available to facilitate research and innovation in support of the industry's decarbonisation challenge, in particularly by developing intelligent, zero-carbon technologies to enable the industry to be world leader in delivering low-carbon transport solutions.

The funding will be made available via two competitions:

- an RSSB-funded collaborative R&D competition, which will make up to £1 million available for feasibility studies and demonstrator projects, and
- a Knowledge Transfer Partnership (KTP) call, funded by Innovate UK and other government co-funders, and delivered by the Knowledge Transfer Network (KTN).

Applications are welcome from all sectors. We are particularly interested in promoting knowledge and technology transfer from other sectors into rail.

This document contains information about the scope of the competitions and it is meant to serve as guidance for the submission of proposals.

RSSB | A Better, Safer Railway

RSSB is an independent body, working with its members to drive improvements in the British rail system.

Innovate UK

Innovate UK drives productivity and economic growth by supporting businesses to develop and realise the potential of new ideas.

1. Context

Continuing to reduce carbon emissions will help meet national and international commitments to tackle climate change, and, at the same time, it could provide the UK with a real national economic boost in the long term[1]. Significant results in hitting carbon targets and expanding the low-carbon economy have been achieved in the power and waste sectors.

This success must now be replicated in other sectors, such as transport, where clean growth can also deliver wider benefits. Cutting transport CO2 emissions should result in cleaner air, which has an important effect on public health, the economy, and the environment; while the innovation and investment required to cut emissions could create more jobs and more export opportunities[2].

Although transport accounted for 24% of total UK greenhouse gas emissions in 2015 (Figure 1) – and became the largest emitting sector according to 2016 data (Figure 2) – road transport is responsible for over 90% (Figure 3), with rail only accounting for 2%. Rail is overall a very low carbon form of transport for both passengers and freight services and it can reduce CO2 emissions by up to 7.7m tons per year (valued at £460m)[3]. However, there is still a lot that can be improved.

The rail industry is one of the biggest single customers of electricity. Traction alone consumes over 700 million litres of diesel and 3,500GWh of electricity a year[4], the annual expenditure for which is over £500 million. The rolling stock market has so far been dominated by electric and diesel trains, with diesel trains currently comprising roughly 30% of the national fleet[5], with the rest being pure electric vehicles. While electric trains are still the optimum solution on areas of the network that are fully electrified, the need for greener transport solutions is catalysing a drive for traditional diesel vehicles to be replaced by 'self-powered' traction sources such as battery, hydrogen, fuel cells and other lower carbon solutions where electrification and use of electrified lines is not an option. Interest in alternative traction modes for vehicles is rising rapidly following two far reaching policy announcements: in July 2017, the government expressed reduced ambition in its network electrification programme and instead encouraged increased use of bi-mode trains; and in February 2018, the Minister for Transport called for all diesel-only trains to be taken off the network by 2040.

According to the RDG Rolling Stock Strategy[6], in the next 30 years, it is expected that the national passenger fleet will increase in size with the electric fleets (including bi-mode) set to increase from 72% up to 86% and the 'self-powered' fleet (excluding bi-mode) falling from 28% to 19% or less. Therefore, it is estimated that between 10,600 (low scenario) and 15,000 (high scenario) new electric and bi-mode vehicles would be required by 2047. Similarly, between 1,350 (low scenario) and 3,500 (high scenario) new self-powered vehicles will be required over the next 30 years.

A large amount of energy is also required to maintain, renew and enhance the railway. Network Rail alone spends £60m each year on utilities used across its non-traction operational estate and a further £3m in order to comply with carbon legislation[7].

[1] The UK low carbon economy could grow by an estimated 11% per year between now and 2030 and could deliver between £60 billion and £170 billion of export sales of goods and services by 2030 (The Clean Growth Strategy – leading the way to a low carbon future, HM Government, 2017)

[2] The Clean Growth Strategy – leading the way to a low carbon future, HM Government, 2017

[3] Fast Track to the Future, Rail Supply Group (RSG), 2016

[4] ORR Data portal - Estimates of passenger and freight energy consumption and carbon dioxide equivalent (CO2e) emissions - Table 2.101

[5] Long Term Rolling Stock Strategy, Rail Delivery Group (RDG), 2018

[6] Long Term Rolling Stock Strategy, Rail Delivery Group (RDG), 2018

[7] Environment and social, Challenge Statements, Network Rail

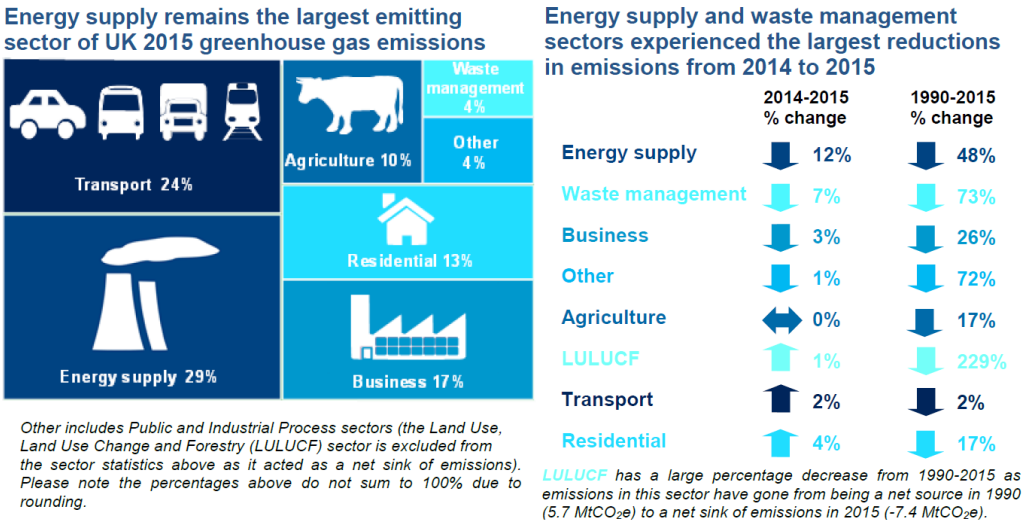


Figure 1 *UK greenhouse gas emissions by sector (2015 data)* [8]

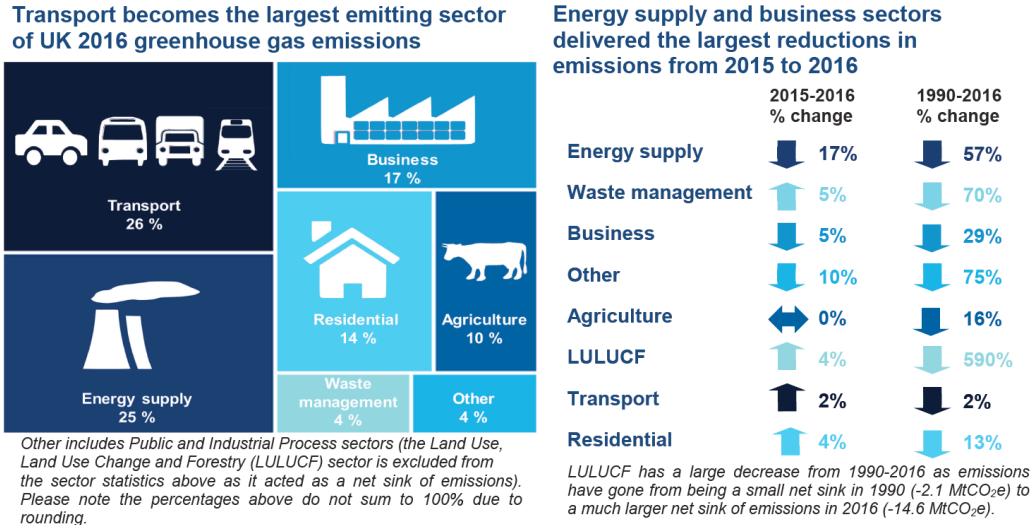


Figure 2 *UK greenhouse gas emissions by sector (2016 data)* [9]

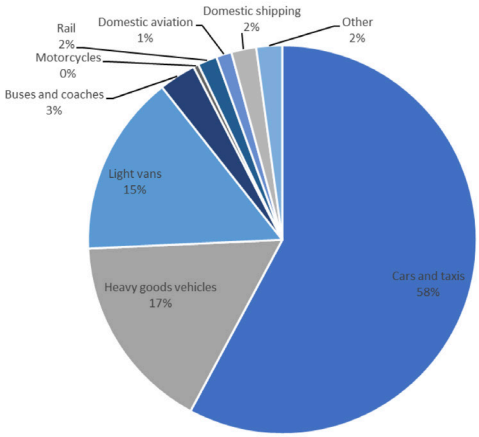


Figure 3 *Greenhouse gas emissions breakdown by transport mode (2015 data)* [10]

[8] BEIS (2017) UK Greenhouse Gas Inventory Statistics (1990-2015)
https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics#2018

[9] BEIS (2018) UK Greenhouse Gas Inventory Statistics (1990-2016)
https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics#2018

[10] Department for Transport (2017), Greenhouse gas emissions (ENV02)
https://www.gov.uk/government/statistical-data-sets/env02-greenhouse-gas-emissions

In this context, the rail industry is keen to ensure that its 'green' credentials are maintained and enhanced, to become world leader in delivering low-carbon transport solutions. The Rail Technical Strategy (RTS) Capability Delivery Plan (CDP) identified potential annual benefits of £228m (Figure 4) from optimizing energy use and sets out the priorities for the next 30 years:

Figure 4 Annual benefits related to key capability 5 identified in the RTS CPD

"Optimised on-board and lineside energy storage technologies allow the railway to move energy around the system according to the supply and demand. A higher proportion of energy is recovered through regenerative braking, and small-scale energy generation and harvesting technologies feed energy-efficient trackside systems […] A more holistic approach, which makes better use of energy generation and storage technologies, drives down operational costs and reduces the railway's carbon footprint. […] Hybrid operation […] dramatically reduces the capital cost of extending electrification to more parts of the network."[11]

Developing novel solutions that will help reduce the amount of carbon emissions by 2040 without relying on full electrification is the main aim of this competition.

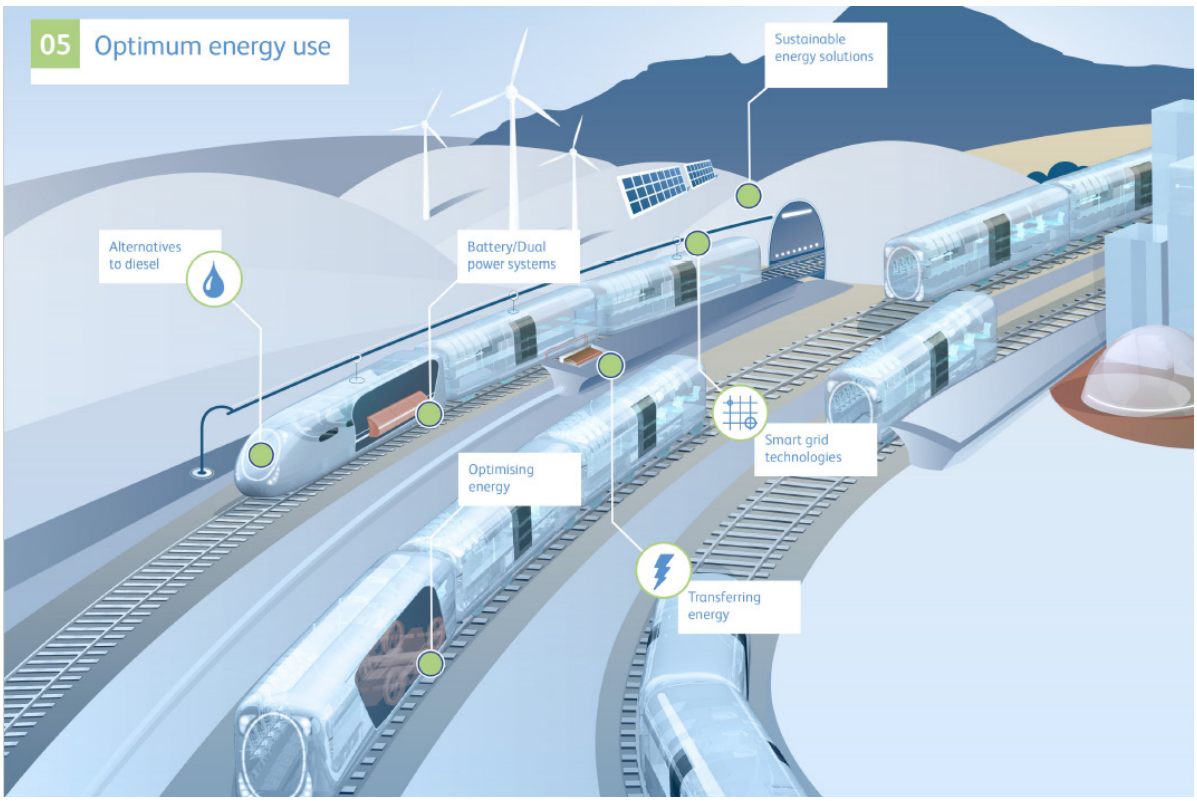


Figure 5 *RTS CDP, Key Capability 5: Optimum Energy Use*

[11] Rail Technical Strategy Capability Delivery Plan, RSSB, 2017

2. RSSB collaborative R&D competition

2.1 Scope

The RSSB research competition will focus on three key challenges:

A. High speed train power

B. Freight traction power

C. Infrastructure to support operations.

We are looking for innovative proposals to develop alternative solutions to pure electrification and diesel-only train operation, both through on-train technology and the infrastructure necessary to support alternative traction options.

A. High speed train power

The greatest challenge is on traction power. Different train types have different power and energy requirements. High speed services (i.e. 125mph+ intercity) – as well as freight – have journey characteristics which demand very high energy and power, requiring any on-board solution to have high density to operate. Weight is a key parameter, as large on-board energy storage takes up space, which would otherwise be available for income generation, and adds extra weight, which itself requires more energy. High power for propulsion is another intrinsic characteristic of these journey types: rapid acceleration and de-acceleration requires a lot of power to push the air away and, at ground level, the air is a lot denser than the height airliners cruise at, hence this causes more resistance. High speed (and freight) trains also normally require great endurance between refuelling. So, what are the alternatives for these journey types beyond electric and diesel traction?

The RSSB research project T1145 proposes a classification of various types of passenger trains and rail freight locomotives which gives an overview of the power and energy requirements of different services ('per vehicle') and of the possible traction power technologies that are likely to be most suitable to reduce the carbon footprint (Figure 6)[12] . What other technologies could become available to meet the need of powering high speed trains?

Hotel loads (i.e. energy generated and used by the vehicle for purposes other than propulsion such as saloon heating, cooling, communications, lighting and other passenger facilities such as plug sockets etc.) can account for up to 25% of energy usage[13]. This may be even more the case for high speed trains, which tend to operate long journeys and experience greater auxiliary energy consumption by passengers, who are more likely to use more of the in-carriage energy. This challenge leads to considerations around future use of mobile devices, future work patterns and future use of rail services for leisure travelling.

Proposals within 'Challenge A' are expected to be around:

- Intelligent, carbon efficient traction energy solutions for high speed trains where electrification isn't a viable option;
- Intelligent solutions that could help reduce energy requirements for auxiliary energy consumption (e.g. hotel loads);
- Solutions to harvest additional energy.

[12] While technically feasible, there are significant technical and design challenges to maintaining high-speed train performance off the wire with diesel electric bi-modes. As such they are marked accordingly in the table.

[13] Decarbonising Rail: Trains, energy and air quality, Dr Jenifer Baxter, IMechE
https://www.imeche.org/news/news-article/decarbonising-rail-trains-energy-and-air-quality

					Electric		Autonomous Power			
Future Rolling Stock Category	Description	Total Self-Powered Range Required (miles)	Total Max Power Per Vehicle (kW)	Approx. Engine Energy Output Per Vehicle Per Day (kWh)	AC Electric (OLE)	DC Electric (third rail)	Diesel	Hydrogen	Battery	Biodiesel
A	Shorter distance self-powered with 75 mph maximum speed	500	275	1,200	✓	✓	✓	✓	×	✓
B	Middle distance self-powered with 100 mph capability	800	400	2,400	✓	✓	✓	×	×	✓
C	Long distance self-powered with 125 mph capability	1100	550	4,620	✓	×	✓	×	×	✓
E-A	Electric to 100mph, self-powered to 75mph	250	300	600	✓	✓	✓	✓	×	✓
E-B	Electric to 100mph, self-powered to 100mph	400	400	1,200	✓	✓	✓	×	×	✓
E-SH	Electric to 100mph with ability to do short hops 'off wire'	50	400	150	✓	✓	✓	✓	✓	✓
F-A	Electric to 125mph, self-powered to 75mph	250	300	600	✓	×	✓	✓	×	✓
F-B	Electric to 125mph, self-powered to 100mph	400	400	1,200	✓	×	✓	×	×	✓
F-C	Electric to 125mph, self-powered to 125mph	550	550	2,310	✓	×	?	×	×	?
F-SH	Electric to 125mph with ability to do short hops 'off wire'	50	550	210	✓	×	✓	✓	✓	✓
Freight	Freight loco capable of hauling 2500 tonne trailing load	750	2400	18,000	✓	✓	✓	×	×	✓

Figure 6 *Assessment of practicality and suitability of traction options to deliver specific types of services*

B. Freight traction power

One of the main challenges of freight locomotives' energy consumption is the heavy weight that they haul and therefore the high energy requirement when accelerating.

There is also the need for freight trains in the UK to be able to run at reasonably high speeds (60mph+), so the overall network operational efficiency may be maintained. This also requires high levels of energy for heavy trains.

Space is another parameter to take into account when considering alternative traction power options for freight. On-board energy supplier must not interfere with the available cargo space, in order to maximise economic gains. Replacing a revenue-earning car with a fuel tank is, in many cases, likely to render the whole freight train unprofitable under the current tight profit margins rail freight is bearing. Therefore, the freight community would look at low carbon traction solutions that can be retrofitted into current locomotives or which offer alternative solutions within a reasonable economic cost.

Rail freight operates in a highly competitive commercial environment with tight margins and without government subsidies. In 2015, rail freight accounted for 9% of the market (Figure 7). Changing patterns of consumption, such as the rise of e-shopping and quick next-day deliveries, where speed is often prioritised over fuel efficiency, have led to a decline of rail freight over the years. This is set against the backdrop of a drop in coal freight moved, reflecting the reduced demand for coal at UK power stations due to use of renewable energy sources[14].

[14] Transport Statistics Great Britain, Department for Transport and National Statistics, 2017

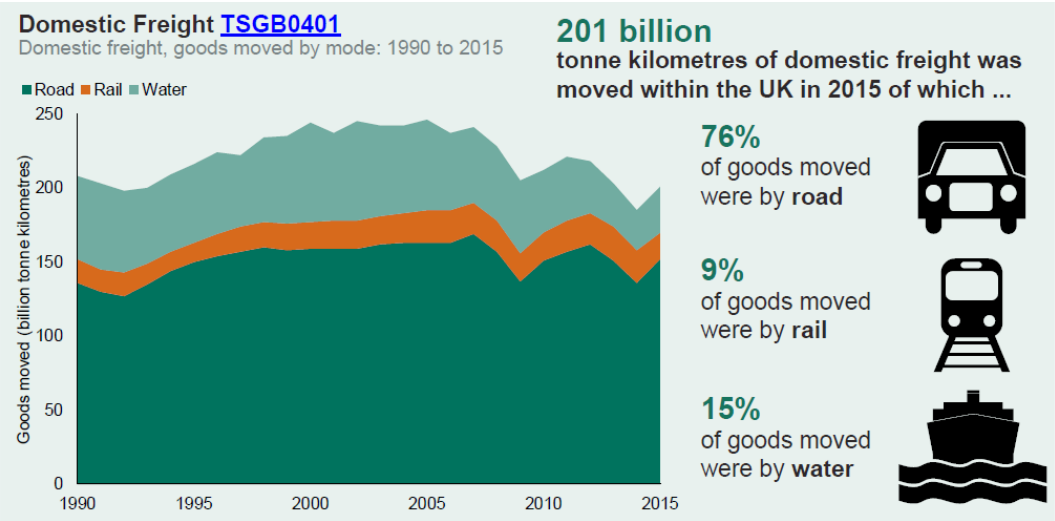


Figure 7 *Breakdown of domestic freight by transport mode*[15]

While road freight has seen significant reductions in emissions, rail freight has not made the same progress, owing to the challenges of the operations of freight and the level of investment required to make a change.

De-carbonising rail freight represents a real technical challenge, but opportunities to reduce emissions and improve efficiency could form part of a case to increase its attractiveness to customers.

Proposals within 'Challenge B' are expected to be around:

- Intelligent, non-diesel and non-diesel-only, carbon efficient traction energy solutions able to meet the needs of freight;
- Solutions to improve diesel traction, such as: retrofitting existing engines with new technology; improved design for diesel engine replacement; improvements to diesel fuels to reduce carbon.

C. Infrastructure to support operations

The move to an efficient, low carbon energy supply will require a transformation of existing energy networks and the promotion of long-term policy focused on decarbonisation, either at the local or national level.

The amount of storage to be employed in the energy system is dependent on the route chosen to decarbonisation. To start to address the design of future energy networks, markets in the UK need to be incentivised to adapt and enhance existing networks, to ensure that they are fit for purpose. New network infrastructures must support a system wide response to consumer and decarbonisation demands. To balance energy supply with demand, the Energy Technologies Institute (ETI) believes that an energy system needs to have sufficient operational flexibility. It is here that energy storage can have an important role to play in mobilising the UK's transition to a low carbon future[16].

[15] Transport Statistics Great Britain, Department for Transport and National Statistics, 2017

[16] "Overcoming barriers to the UK's adoption of low carbon energy networks", Rebecca Sweeney, Energy Technologies Institute, 2018

Different energy types have a differing storage requirements. For instance, gas, hydrogen and heat networks have some degree of inherent storage and dedicated storage is low-cost; whereas electricity supply needs to be in real-time balance and storage tends to be comparatively expensive[17].

The Rail Supply Group has identified energy management systems (storage, distribution) as one of the priority areas for technology innovation[18]. The roll out of new traction power technologies must be accompanied by novel solutions around energy storage and distribution applicable to rail infrastructure specific applications.

Rail energy storage and distribution technologies must have a long lifespan, be able to provide high capacity, offer greater energy density, enable fast charging and be resilient to in different seasons and weather conditions. Maintenance costs of the energy storage devices must be kept to a minimum to make them economically feasible. So, what is the future role of energy storage for the rail network and what is the value of various forms of storage to the system?

Proposals within 'Challenge C' are expected to be around:

- Innovative energy storage and distribution technologies able to support alternative traction energy sources, beyond diesel and electric trains.
- Studies which look at the economic, safety and policy implications, as well as the technical compatibility, of scaling up energy storage and distribution technologies on the wider rail network, either locally or nationally, and any possible cross modal integration.
- Complementary benefits of traction energy solutions with storage and distribution networks, for instance, creating a second life for traction power technologies.

Proposals in the following areas are not in scope for the RSSB competition, but we will accept proposals on these areas as part of the Knowledge Transport Partnership (KTP) scheme[19]:

- Solutions for non-high-speed passenger trains;
- Solutions to enable electric trains to be more energy efficient;
- Solutions around lightweight materials (unless this is proven to be particularly relevant to an aspect of the competition);
- Aerodynamics and other design-related solutions (unless this is proven to be particularly relevant for a new fleet and relevant rail stakeholders are supporting the proposals);
- Solutions that look exclusively at air quality / noise reductions (if air quality improvements are a complementary outcome of a proposed technology, clearly it will be within scope);
- Driver behaviour and management related improvements (i.e. C-DAS) as a way to reduce energy usage;
- General, non-traction related solutions to improve energy efficiency and reduce carbon at stations / depots.

Feel free to discuss your idea with us by emailing: **researchcompetitions@rssb.co.uk**

[17] "Understanding the role of energy storage", Alex Buckman, Energy System Catapult, 2018

[18] Fast Track to the Future, Rail Supply Group (RSG), 2016.

[19] Refer to section 3.

2.2 Submission guidance

This competition is encouraging the submission of two types of projects:

- **Feasibility studies:** these are defined as research intended to show the technical feasibility of the proposed concept or design; they are also aimed at the acquisition of new knowledge for developing such concepts and designs. In terms of Rail Industry Readiness Levels (RIRL)[20] , these projects fall within level 3 – 5.
- **Demonstrator projects** (prototypes and trials): these are defined as projects intended to demonstrate and evaluate prototypes via testing. In terms of RIRL, these projects fall within level 5 – 7.

WHOLE-LIFE MANAGEMENT (9)

Continue incremental improvements using business as usual practices are undertaken or directed by asset owners.

EXPLOITATION (7-8)

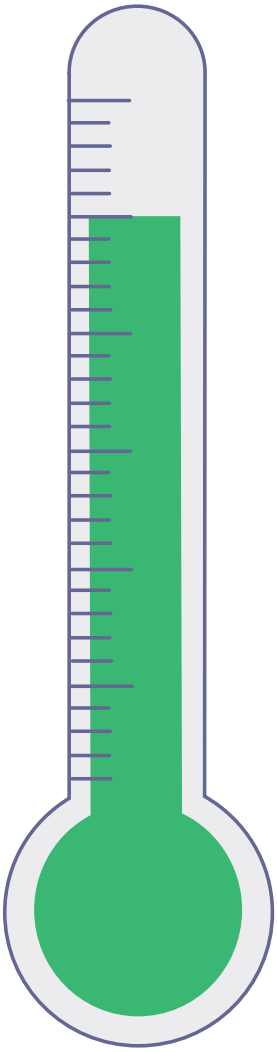
First of class deployment sees the concept earning value with end users acting as agents for delivery. Cost price and risk are all well understood.

DEVELOPMENT (4-6)

Promising ideas and concepts are developed and qualified by development and demonstration agents. Business plans are increasingly robust and end users are engaged with the concept being prepared for deployment.

INVENTION (1-3)

New ideas, emerging technologies are usually created in/by the academic/research/innovation agent domain. business plans are necessarily loose allowing the potential room to evolve and be understood.



[20] Rail Industry Readiness Level (RIRL): **https://www.rssb.co.uk/rail-technical-strategy/rail-industry-readiness-levels**

2.2.1 Proposals requirements

The proposals should address at least one of the three challenges (A – C) described in section 2 (Scope) of this document.

We expect the proposals to:

- propose innovative solutions;
- demonstrate a good understanding of the chosen challenge and an awareness of relevant research that has already been undertaken in that area;
- offer a solution or improvement that should have a measurable impact (the ideas cannot simply gather new knowledge, but are expected to be addressing at least one of the challenges described in the 'Scope' section of this document) and should be supported, if possible, by a relevant business case;
- produce an implementation map, where (if successful) the solution's route to market is broadly mapped;
- demonstrate some cross-sector knowledge transfer, where applicable.

2.2.2 Eligibility and consortia requirements

Organisations of any size can lead a project, this includes academia and supplier organisations.

Applicants are welcome from all sectors. A successful submission is likely to consist of participants with a range of disciplinary perspectives and different expertise.

To lead a project, the lead organisation must be based in the UK; international partners are welcome to join consortia as long as a justification for their involvement is provided in the proposal.

Consortia should include industry experts, either as partner or supporters. All projects are expected to benefit from a high degree of stakeholder 'buy-in' to the delivery and implementation of research outputs.

Each consortium must appoint a Principal Investigator (PI), who will be responsible for receiving and managing the funding. RSSB will contract directly with the PI.

2.2.3 Funding

Project duration is expected to be between 6 and 12 months, although we will consider longer projects on their merit.

This is a single-phase competition with a total allocation of up to £1 million. We expect all projects to be in contract by the end of March 2019.

Type of project	RSSB funding[21]	Match funding[22]
Feasibility studies	80 %	20 %
Demonstrator projects	60 %	40 %

[21] The percentage of funding indicated in the table refers to the percentage that RSSB will contribute towards the total project costs.

[22] The percentage of match funding indicated in the table refers to the percentage that the consortium will contribute towards the total project costs.

Match funding can be either a contribution 'in kind' or 'in cash', or a combination of both. The match funding from the consortium must be made up of at least 20% cash with the remainder being in-kind contributions. Contribution from grants received from other sources cannot be counted toward the consortium contribution.

Upon award of funding, RSSB will issue a grant agreement. The lead organisation will be required to sign and return it within 30 days of receipt, or funding may be withdrawn.

RSSB will fund projects as can be afforded within the available £1m funding. RSSB will aim at funding an equal amount of proposals in the three challenges outlined in section 2 of this document; this will be dependent on the quality and number of proposals received within each challenge area.

RSSB will pay 50% of the total funding contribution upfront and the remaining 50% at completion, upon acceptance of the final deliverable.

A sample agreement is available on the webinar hub for reference **(https://rssb.wavecast.io/carbfreerail)**. Bidders are encouraged to review the grant agreement; however, no changes will be accepted unless under special circumstances. This will enable us to accelerate the procurement process.

What are the types of costs that the Grant contribution could cover?

- Labour costs: these include the costs of personnel from the consortium organisations working directly on the project. The costs of project management as well as report writing are eligible and should be included within the labour totals.
- Travel and subsistence: these are costs incurred exclusively for progressing the project.
- Subcontractor costs: these include any work that is essential to the success of the project and that is outsourced (beyond the partners on the consortium). The reasons for employing each subcontractor, rather than including them in the consortium, must be clearly outlined in the proposal.
- Capital equipment: this includes capital equipment and tools bought or consumed on the project.
- Materials: these are the materials to be consumed on the project and purchased from third parties.

The project should take into consideration time and resources required for regular project meetings (on a quarterly basis or at other periodic recurrence, depending on the project length) and dissemination opportunities. It is expected that the project team will proactively seek these, however RSSB will make relevant dissemination opportunities available throughout the life of the project.

The following are ineligible costs:

- Overhead costs
- Interest, e.g. hire-purchase interest
- Patent costs
- Advertising
- Certifications
- Entertainment
- Training

2.2.4 Proposal format and guidance

We are expecting good quality proposals, clearly written and formatted. You must use the proposal template provided, which is available via the webinar hub.

Your proposal should be between 8-12 pages long and should include the following:

- **Description of the proposed research:** this section should include the project scope and objectives; methodology; breakdown of tasks; description of expected deliverables for each task and associated delivery dates.
- **Workplan**[23]: a Gantt chart or other graphic representation comprehensive of milestones, tasks and deliverable dates. Projects should be planned to commence in March 2019.
- **Pathway to impact:** this section should include a high-level description of the overall implementation journey of the project. It should also highlight the potential wider industry benefits. This section is expected to be kept up to date during the life of the project, if successful.
- **Justification of resources:** clear and transparent breakdown of costs, using the template provided.
- **Track record:** a list of all consortium members and supporters. For the consortium members, it should specify the relevant expertise that each investigator will bring to the project.
- **Short summary** *(half A4 page).*

Please note that the assessment panel may request additional clarifications or ask that a proposal is resubmitted, if it does not meet the required format.

2.2.5 Evaluation criteria

All proposals will be reviewed by a panel of experts and assessed according to the following nine criteria:

Novelty of the idea

1. Relevance to the scope of the call.
2. Originality of the proposed work and novel methodology.
3. Potential scientific merit and contribution to knowledge.

Demonstrated delivery capability

4. Ability of bidding team to deliver the research.
5. Probability of technical success, acknowledgment of risks and relevant mitigation actions.
6. Evidence of adequate plans for industry engagement during the life span of the research, including evidence of support from relevant industry stakeholders.

[23] It is expected that, if successful, the workplan is updated regularly by the project team and is discussed during the project update meetings.

Resources and management:

7. Clear and transparent breakdown of resources. Your proposal should include a clear narrative description that demonstrates:

- 'value for money' of the proposed idea;
- all costs associated with the project have been identified;
- the level of commitment of match funding.

Potential impact:

8. Quantified potential benefits for the industry.
9. Evidence of sound rationale of next steps and possible 'routes to market'.

Criteria will be weighted evenly and scored out of 3:

0 = Does not meet the criterion

1 = Significant concerns about ability to meet criterion

2 = Minor concerns about ability to meet criterion

3 = Confident that response fully meets criterion

2.2.6 How to apply

Download the project proposal template, the master pricing sheet and the grant agreement from the online hub: **https://rssb.wavecast.io/carbfreerail**

All the proposals must be submitted by 17:00 on **9 January 2019.** Please use "COF-IPS Proposal Submission" in the email subject and send it to **researchcompetitions@rssb.co.uk**

The submission should include the following attachments:

- Project proposal using the feasibility study template provided (Word doc version preferred)
- Master pricing sheet (PDF version preferred)

For any queries, please contact: **researchcompetitions@rssb.co.uk**

3. Knowledge Transfer Partnerships (KTPs) call

RSSB is one of the co-funders for Innovate UK's Knowledge Transfer Partnership scheme and will be funding KTPs in the area of rail decarbonisation and energy efficiency.

We are looking to support a number of projects across the UK, to raise the profile of KTP in the rail industry and to help the UK gain a greater share of the expanding global rail market, by translating the UK's academic strengths in this area into commercial success.

We will support businesses that are looking to apply intelligent, low-carbon solutions and technologies to reduce the industry's overall carbon footprint and make it more energy efficient. The rail industry is keen to ensure that its 'green' credentials are maintained and enhanced, to become world leader in delivering low carbon transport solutions.

3.1 Background

KTPs are is a dynamic three-way collaboration – between a business or not for profit organisation of any size, a UK university or research organisation, and a suitably qualified graduate – to help realise a strategic innovation project, bring about transformative change and embed new capability. For over 40 years KTPs have been helping businesses innovate for growth by accessing the UK's world-leading knowledge base.

3.2 Approach

This targeted call will establish a group of KTPs that will operate together as a cohort, supported by a programme of networking between the partners and rail industry organisations. The cohort approach will encourage knowledge-sharing across projects, and across supply chains and sectors, and will help to engage wider industry support for innovation and knowledge exchange.

Introducing new technologies, products, services or operational concepts and processes in the rail industry can be challenging and innovation is often expensive and commercially risky. This high barrier to innovation hampers the rail industry in meeting customer needs. By supporting high-quality KTPs, we aim to help reduce the cost and risk involved in developing innovative products and services. As a result, we aim to help the rail industry and UK businesses realise tangible benefits, both in the UK and globally.

There are a number of UK Universities with unique expertise in the rail sector and in energy management. The wealth of capabilities represents a significant resource for the UK rail industry, and the aim of this targeted KTP call is to help businesses to make use of it.

This targeted KTP call is being run in parallel with the RSSB collaborative R&D competition described in Section 2 of this document.

There is an opportunity for KTP applicants to link their proposals to collaborative R&D projects in this parallel competition where appropriate, although it is not a requirement to do so.

We welcome complementary applications, but organisations applying for funding through both mechanisms should ensure that their proposals can stand alone and are not dependent on both applications being successful.

We will support knowledge-sharing between the KTPs that result from this targeted call, by:

- Organising knowledge-sharing and dissemination opportunities with industry stakeholders;
- Setting up a dedicated page on the competition hub (https://rssb.wavecast.io/carbfreerail);
- Working to promote the success of the individual KTPs and of the whole cohort.

3.3 Scope

Within this call we are looking for specific project proposals able to accelerate the 'route to market' for innovative intelligent power solutions to decarbonise rail.

This targeted KTP call shares the same challenge areas as the RSSB collaborative R&D competition (listed below), but its scope extends also to other areas:

A. High speed train power

Proposals within 'Challenge A' are expected to be around:

- Intelligent, carbon efficient traction energy solutions for high speed trains where electrification isn't a viable option;
- Intelligent solutions that could help reduce energy requirements for auxiliary energy consumption (e.g. hotel loads);
- Solutions to harvest additional energy.

B. Freight traction power

Proposals within 'Challenge B' are expected to be around:

- Intelligent, non-diesel and non-diesel-only, carbon efficient traction energy solutions able to meet the needs of freight;
- Solutions to improve diesel traction, such as: retrofitting existing engines with new technology; improved design for diesel engine replacement; improvements to diesel fuels to reduce carbon.

C. Infrastructure to support operations

Proposals within 'Challenge C' are expected to be around:

- Innovative energy storage and distribution technologies able to support alternative traction energy sources, beyond diesel and electric trains.
- Studies which look at the economic, safety and policy implications, as well as the technical compatibility, of scaling up energy storage and distribution technologies on the wider rail network, either locally or nationally, and any possible cross modal integration.
- Complimentary benefits of traction energy solutions with storage and distribution networks, for instance, creating a second life for traction power technologies.

Other areas of interest:

- Solutions for non-high-speed trains;
- Solutions to enable electric trains to be more energy efficient;
- Solutions around lightweight materials
- Aerodynamic and other design-related solutions
- Solutions that look exclusively at air quality / noise reductions
- Driver behaviour and management related improvements (i.e. C-DAS) as a way to reduce energy usage;
- General, non-traction related solutions to improve energy efficiency and reduce carbon at stations / depots.

Feel free to discuss your idea with us by emailing: **researchcompetitions@rssb.co.uk**

NOTE: *If you have a proposal that is not within the scope of this targeted call, you may still be eligible for a KTP grant. The scheme runs throughout the year and supports projects in many fields. You should contact your local Knowledge Transfer Adviser in the first instance to find out more. Visit:* ***https://ktn-uk.co.uk/programmes/knowledge-transfer-partnerships***

3.4 Application process

3.4.1 Eligibility

Business and not for profit organisations who wish to apply should:

- Be UK based and of sufficient size to support the project
- Have the financial capacity to make the required contribution to the cost of running a KTP
- Be aware that KTPs can have a long-term legacy that can be measured over five years as well as shorter term impact

3.4.2 Funding

Project duration is between 12 and 36 months; the knowledge gained during this time is embedded in the business, providing a valuable base to build on long after the project has finished.

The cost of a KTP project is shared by the business and by Innovate UK along with RSSB. The level of grant that the KTPs can receive depends upon the size of the companies involved. Innovate UK and RSSB together will contribute up to 50-67% of the total project cost via a grant to the academic or research organisation. The business makes a cash contribution for the remaining project cost with a small-to-medium business contributing 33% and a large business 50% per annum.

Applications for KTPs enjoy a high chance of being successful, with around 90% of applications being accepted. KTN, as the network partner of Innovate UK, connects people to accelerate innovation and provides specialist support via Knowledge Transfer Advisers to facilitate partnership development and succeed in a KTP.

3.4.3 Knowledge Transfer Advisers

Knowledge Transfer Advisers (KTAs) are regionally based and are responsible for helping you every step of the way: they'll work with you to shape the project brief in preparation for a grant application; and, once the project is up and running, will make regular visits to your business to provide input to the project's progress, coaching and mentoring the Associate, ensuring that the academics understand your needs, and helping optimise ROI.

To contact your regional Knowledge Transfer Adviser, visit: **https://ktn-uk.co.uk/knowledge-transfer-advisers**

3.4.4 How to apply

This targeted call is launched on 30 October and opens on 1 November 2018. The final opportunity to apply for this targeted call is 20th March 2019.

Competition dates for 2018-2019 are:

- 1 November 2018 - 12 December 2018
- 13 December 2018 - 6 February 2019
- 7 February 2019 - 20 March 2019

To apply through this targeted KTP call, businesses should contact one of the KTP Advisers in the first instance. The application process involves:

- **Stage 1:** The Knowledge Transfer Adviser will check the feasibility of your idea and its suitability for funding.
- **Stage 2:** If you meet the criteria for a KTP, the Advisers will help you find an academic partner and draw up a grant application with you.
- **Stage 3:** Proposals are reviewed by the Knowledge Transfer Advisers.
- **Stage 4:** Innovate UK and RSSB make a funding recommendation.

High-quality KTP proposals that are not selected as part of the cohort may be funded as part of the wider KTP programme.

Under this targeted call, applications will be assessed for funding on an ongoing basis i.e. as they are submitted.

4. Key dates

An information day relevant for both funding mechanisms will be held on 30 October 2018 at the University of Warwick and broadcast live. The recording of the event, proceedings and background material are available on the webinar hub, which can be accessed via the following link:

https://rssb.wavecast.io/carbfreerail

RSSB collaborative R&D competition		KTP targeted call	
Launch event: 30 October 2018			
Competition open	30 October 2018	Competition open	1 November 2018
Deadline for applications	17:00 on 9 January 2019	Deadline for applications	• 1 Nov – 12 Dec '18 • 13 Dec '18 – 6 Feb '19 • 7 Feb – 20 Mar '19
Winning bids announced	February 2019	Final deadline	20 March 2019
Grant agreements signed	By March 2019	Final cohort announced	May 2019
Projects due to start	March 2019		
Projects cohort dissemination event: March 2020			

For any queries about the RSSB R&D competition and the scope of KTP proposals, contact: **researchcompetitions@rssb.co.uk**

For more detail on KTPs, visit: **https://www.gov.uk/guidance/knowledge-transfer-partnerships-what-they-are-and-how-to-apply**

NOTES

NOTES

RSSB | A Better, Safer Railway

Email: enquirydesk@rssb.co.uk
Tel: +44 (0) 20 3142 5300
Twitter: @RSSB_rail
Web: www.rssb.co.uk

RSSB,
The Helicon
One South Place
London EC2M 2RB