



Department  
for Transport



# Train Operator Competition 2017 (TOC17)



Guidance Notes



# Competition Information

## 1 Introduction and Background

TOC17 is a competition that seeks to encourage new innovative solutions to improve the operational performance of the railway network and encourage greater collaboration and participation in the innovation process between the rail supply chain and the railway undertakings. By encouraging this broader participation it is anticipated that potential solutions to key railway challenges will be focused towards the needs of the end-user customers and be provided with the best chance of reaching the market.

## 2 Aims and objectives

The aims of the competition are to:

- Encourage and foster appropriate relationships between Railway Undertakings (RU's)<sup>1</sup> and the supply chain to inspire innovative solutions to RU led challenges which are progressive and pushing boundaries.
- Provide appropriate mechanisms for collaboration between RUs and suppliers to develop innovative solutions to challenges and promote suitable collaboration in Research, Development & Innovation.
- Inspire a step-change in the areas in which a challenge/solution is being proposed.

## 3 Competition Scope

TOC17 will focus on challenges that improve the operational performance of the railway system and that bring significant benefits to Railway Undertakings as well as customers. The publication of the Rail Technical Strategy Capability Delivery Plan (RTS CDP)<sup>2</sup> in January 2017 identifies the technical capabilities that need to be developed over the next thirty years to address the challenges facing the rail industry. Following a series of workshops with Railway Undertakings the following key capabilities from the RTS CDP have been identified as ones of potential interest:

- Operations timed to the second;
- Minimal disruption to train services; and
- Optimum energy use (in particular traction energy)

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<sup>1</sup> For the purposes of this competition a wider definition of Railway Undertaking will be used and shall mean Train Operating Company (TOC), Freight Operating Company (FOC), Rolling Stock Operating Company (ROSCO) or Infrastructure Manager (IM).

<sup>2</sup> <https://www.rssb.co.uk/rts/Documents/2017-01-27-rail-technical-strategy-capability-delivery-plan-brochure.pdf>

However, the scope of the competition is not limited to these three key capabilities and other capabilities, can have significant impacts on the operational performance of railway networks, such as:

- Efficient passenger flow through stations and trains; and
- More space on trains

Applicants are encouraged to put forward proposals that may have significant impacts across the wider network and that aren't single point solutions for a specific challenge on a particular route or location.

In addition to this, applicants should also consider the 4C's:

- Carbon (reduction)
- Cost (reduction)
- Capacity (increase)
- Customer satisfaction (increase)

Proposals are likely to have significant potential in addressing one or more of these if the project yields a successful outcome that can be widely implemented.

#### Technology Readiness and Rail Industry Readiness Levels (Annexes B and C)

Technology development funded through this competition should already have achieved proof-of-concept and be at TRL 4 to 7 (See Annex B). At a minimum it is anticipated that projects funded will demonstrate their capability in a test environment relevant to the solution. Projects that take demonstration to testing in live environments are welcome and will be looked on favourably.

In addition to this, applicants may also wish to consider the Rail Industry Readiness Levels (RIRL). It is anticipated that proposals operating within this framework are likely to be at or beyond RIRL 3 and below RIRL 7. Within this context activities described or required within this framework are within the scope of the competition as long as in addition to this they fall within the funding categories Industrial Research and/or Experimental Development (See section 4 below).

## 4 Funding

RSSB has allocated up to £3.25m to fund innovative demonstration projects that meet the scope of the TOC17 competition.

The competition is being run under Article 25 of the General Block Exemption Regulation. It is anticipated that applications received to this competition will be classified as industrial research. Table 1 sets out the **maximum** aid intensities that can be awarded by RSSB to organisations participating in consortia. These percentages represent the maximum allowable that RSSB can contribute to eligible project costs (see Annex C)

Category	Small & Micro enterprise	Medium Enterprise	Large Enterprise
<b>Industrial Research</b>			
Base aid intensity	70%	60%	50%



Additional aid intensity where: <ul style="list-style-type: none"> <li>The project involves effective collaboration, or</li> <li>The results of the project are widely disseminated</li> </ul>	80%	75%	65%
<b>Experimental Development</b>			
Base aid intensity	45%	35%	25%
Additional aid intensity where: <ul style="list-style-type: none"> <li>The project involves effective collaboration, or</li> <li>The results of the project are widely disseminated</li> </ul>	60%	50%	40%

Table 1. Maximum Aid Intensities

The additional percentage points may be applicable depending on the precise nature of the project and collaboration involved. Further details can be found at <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0651&from=EN> under Article 25.

Applicants will need to demonstrate **value for money** as part of their proposals. **Proposals that provide better matched funding percentages than the maximums allowable will be considered favourably.**

### Funding Levels

It is anticipated that requests for funding from RSSB will be in the range of £250,000 to £750,000. However, the **minimum request for funding is £150,000** and the **maximum request for funding is £1,000,000.**

Projects may be a mix of industrial research and experimental development, the relevant research category should be identified for each work package along with the associated costs.

Total projects costs are anticipated to be between £450,000 to £1,500,000, however, these do not represent upper or lower limits. Limits only apply to the funding request from RSSB and ensuring that this request is at below the maximum aid intensity allowed under the relevant research category.

Universities and Research organisations are eligible to apply as part of consortia. As long as the University and/or Research organisations are performing non-economic activity they will be funded as follows:

- Universities will receive 80% of full economic costs
- All other research organisations: 100% of eligible costs

Universities and research organisation costs may only represent a maximum of 30% of total eligible project costs. If more than one research organisation is involved in the project this amount will be shared between them.

### Project Duration



It is anticipated that projects will last between 12-24mths. The maximum allowable project duration will be 24mths.

## 5 Collaboration

A key aim of the competition is to encourage collaboration between suppliers and Railway Undertakings. The reason for this is that:

- Key challenges are often cross-system and may involve more than one Railway Undertaking
- Solutions for one part of the system may be delivered by another part e.g monitoring of infrastructure may be achieved through systems on trains
- Enables better understanding of the challenge facing the end-user and therefore produce more relevant solutions
- Partnering with the end-users provides a potential route to market for the solution.

As such collaborative proposals including Railway Undertakings are strongly encouraged. Large organisations MUST collaborate with SMEs.

Proposals will ideally be collaborations and be business led. Collaborations will ideally include:

- at least one supplier and one Railway Undertaking
- further Railway Undertakings if appropriate to the project (and/or letter(s) of support if not appropriate for them to be part of the project at this stage but may be required at later stages of the development.

If it is not appropriate to enter in to a formal collaboration because, for example, the Railway Undertaking(s) have no financial request from the project then the proposal should demonstrate involvement and support from appropriate Railway Undertakings through:

- letters of support from appropriate Railway Undertakings
- involvement of named people from Railway Undertakings on project advisory/steering groups

## 6 Requirements and Eligibility

To be eligible and within the scope for TOC17, proposals:

- Must demonstrate an impact on operational performance
- should be progressive, pushing the boundaries and innovative.
- Must fall under the 'industrial research' and/or experimental development' classification. (Definitions of 'industrial research', 'experimental development', 'effective collaboration' and enterprise size are provided in Annex A)
- be primarily looking to fund activity that advances the project between TRL 4 to 7 (Annex B) and/or RIRL 3 to 6 (Annex C).
- Collaborations will ideally be business-led (unless otherwise adequately justified) and address the specific requirements of the competition as outlined in the scope section of this document.
- It is expected that projects will last approximately 12 to 24 months.
- RSSB will fund projects up between a minimum contribution of £150,000 and up to a maximum contribution of £1m per project.

- Appropriate collaboration between supply chain and Railway Undertakings is evidenced through the proposal
- Companies from all nations are eligible to apply, however, it is expected that the majority of the work will take place in the UK.
- Large companies must be in collaboration with SMEs
- Universities and research organisations are eligible to apply as part of consortia. For all consortia, including research organisations, the total costs for all research organisations in a project will be capped at 30% of the total project value. Proposals should be exclusive of VAT.

#### Out of scope or ineligible

- Anything resembling, or close to, a ‘business as usual’ activity.
- Technologies that are at TRL 3 or below or TRL 8 or above
- Anything RU’s are already contractually committed to provide under their franchise agreement or other agreement.

All applications will be assessed on individual merit in accordance with the evaluation criteria (see section 7).

## 7 Competition Format

The competition is a one stage competition, following evaluation and based on the moderated application ranking, the highest ranked applicants will be invited to present their proposal before a panel at RSSB, prior to making final award decisions. Whilst it is anticipated that the available funds will be fully utilised from the shortlisted applicants, RSSB reserves the right to hold an additional presentation day in the event that the available funds have not been fully allocated and the next ranked applications are above the funding threshold. This will take place during May 2018.

## 8 Key Dates

Formal Launch	16 November 2017
Submission deadline	1.00pm, 23 March 2018
Invitation to evaluation panel	w/c 30 April 2018
Presentations to the evaluation panel	w/c 14 May 2018
Applicants informed of outcome	w/c 21 May 2018

## 9 Evaluation Criteria and Process

The competition will be evaluated after all proposals are submitted and all applicants will be notified of the outcome of their application once the final funding decisions have been made. The evaluation will be based on a weighted marking system, as follows:

Criterion	Description	Weight
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Business proposition	How does the proposal meet the TOC business challenges; and how innovative and feasible is the proposal to lead to a marketable product?	35%
Project	How effectively will the project be managed, are the skills and capabilities of the consortium appropriate?	45%
Finances	How appropriate is the proposal financially? Is the overall budget realistic and justified in terms of the aims and methods proposed, and complies with state aid funding requirements?	20%

An evaluation panel will apply the weighted marks and any other relevant considerations when determining which applications will be shortlisted to the presentations stage.

### Questions and Enquiries

Any additional questions relating to the Competition Guidelines and Competition brief must be submitted by email to [TOC17@RSSB.co.uk](mailto:TOC17@RSSB.co.uk) before 5pm on 23<sup>rd</sup> February 2018. Amendments and clarifications to the guidance documents may be made based on these questions and all registered organisations will be informed by email of any new editions of documentation.

## 10 Awards

Applicants will be informed of the outcome of their application no later than end of May 2018. All awards will be made as a grant, a copy of the grant terms will be made available by 31<sup>st</sup> January 2018.

## 11 Application Form

If you wish to apply for funding for more than one project, you must use an additional application form for each proposal and submit separate email applications.

The completed application form must be emailed to [TOC17@RSSB.co.uk](mailto:TOC17@RSSB.co.uk) before **1.00pm on 23 March 2018**.

Please ensure that you allow plenty of time to email your completed documents for submission to the competition, as the deadline is final.

Once you have sent in your application, you will receive an email confirming that we have received it successfully. You will be informed of the outcomes of the evaluation in due course, this may include a request to present your proposal to an evaluation panel.

The rest of this section explains the structure of the application form and offers guidance on the information to include in each section.

The application form structure is as follows:

- Section 1 Application details
- Section 2 Contact details of RU and consortium





- Section 3 The Business proposition
- Section 4 Project details
- Section 5 Funding details
- Section 6 Other Public Funding details
- Section 7 Extract for publication

The sections highlighted above address specific questions; these are listed in the following tables with guidance notes. When you submit your application form, it will be assessed according to how well it answers the specific questions.

It is important that you address and respond to each question clearly. To help you, the guidance below provides an explanation of what is required for each question. The guidance notes are not intended to be exhaustive; you should develop your own responses based on your own skills, knowledge and experience.

Notes:

- It is important that you complete each field and present a fully completed form, to enable effective evaluation of your proposal
- The space provided in each field of the form is not fixed and you may extend the space of individual fields. However the total document length **MUST NOT exceed 20 pages (excluding Annexes)**, the Font Calibri 11 point must be used. Any illustrations and graphics should be referenced in the application form and provided as an annex (this Annex should not exceed more than 5 pages). The project Gantt chart (See Question 7) should also be submitted as an annex.

When completing the application form it is important to take into account that the space provided is to enable you to give as fuller response as possible for each question. You are encouraged, therefore, to utilise fully all available space at your disposal within the 20 page total limit.

## 12 Application Guidance

1. Application Details	
Field	Guidance
Project Title	Enter the full title of the project.
Brief Description	Enter a brief description of the project.
Project Timescales	Enter the planned duration
2. Contact Details of Lead Applicant/Organisation	
Field	Guidance
Lead RU	The full name of the Lead TOC (or RU) involved as part of the consortium
Applicant Company Name	The full name of the lead applicant (only complete if different from Lead RU). <b>Note: This is the party that RSSB will have the grant agreement with.</b>



Applicant Name and Position	Enter the contact name and job title for the applicant.
Organisation	Enter the full registered name of the organisation sponsoring the project and the company number (as provided by Companies House).
Address details	Enter the full address details of the organisation.
Website/phone/email	Enter the full e-mail, phone and web contact details of the main point of contact.
Consortium arrangements: Organisation and details of each member.	Enter each consortium member including the key contact details and specifically highlight their key role and contribution to the project.
<b>3. The Business Proposition (For completion by the RU)</b>	
<b>Question</b>	<b>Guidance</b>
Q1. What is the business challenge that this project addresses?	<p>Outline the RU business challenge.</p> <p>Describe the nature of the problems or issues facing you and/or your potential customers and how the intended outputs of the project will address these.</p> <p>For projects where there is no railway undertaking as part of a formal collaboration you should demonstrate through letters of support from appropriate railway undertakings the relevance of the business challenge you have identified.</p>



<p>Q2. What is the size of the market opportunity that this project might open?</p>	<p>Describe the size of the market opportunities that this project might open up, including details of:</p> <ul style="list-style-type: none"> <li>• Current nature of the specific market(s) at which the project is targeted (e.g., is it characterised by price competition amongst commoditised suppliers? Is it dominated by a single leading firm?)</li> <li>• The dynamics of the market including quantifying its current size, actual and predicted growth rates.</li> <li>• The projected market share for the project outcome, with justification, in the light of any potential competitors.</li> <li>• The potential to create value-added for the UK and/or the European Economic Area (EEA).</li> </ul> <p>Where possible, provide evidence for your statements about the addressable market for project outcomes and outline your strategy for developing market share.</p>
<p>Q3. What will be the impact of the project for both the RU and its customers?</p>	<p>You should describe and ideally attempt to quantify the potential benefits(if appropriate) to all relevant stakeholders. In particular you should focus on:</p> <ol style="list-style-type: none"> <li>a. Describing the expected external benefits of the solution if it is deployed within the rail network, e.g. benefits to your customers, either direct or indirect assuming the project is successful.</li> <li>b. Describing the potential benefits to the RU of the solution if successful, e.g. impact on revenues, costs, performance etc. assuming the project is successful.</li> </ol> <p>You may also wish to highlight any benefits that may occur if the project only partially succeeds.</p>
<p>Q4. Are there any barriers to implementation on the GB network?</p>	<p>Describe how your proposal will be feasible within the constraints of the GB rail network. You may wish to consider the following questions:</p> <ul style="list-style-type: none"> <li>• Are there any barriers to implementation?</li> <li>• If there are barriers what strategies might be employed to overcome these?</li> <li>• Are there key industry partners that you will need to engage to help in bringing forward implementation?</li> <li>• How might the project be progressed after this phase?</li> </ul>



4. Project details	
Question	Guidance
Q5. What is your proposed solution?	<p>Describe in detail the solution you are developing and how this will address the business challenge.</p> <p>You should highlight why this approach may be better than either existing or alternative approaches. Please also describe the current status of development of the solution.</p>
Q6. What is innovative or novel about your proposed solution?	<p>Identify the extent to which the project is innovative both commercially and technically.</p> <p>Describe any evidence you have to substantiate your belief that the intended work is innovative. This could include the results of patent searches, competitor analyses, literature surveys etc. If applicable, you should also outline your own background intellectual property rights, as related to the project and the technology maturity.</p>
Q7. Describe how your project will be managed, providing a detailed programme of work.	<p>Describe in detail how your project will be managed within the consortia.</p> <p>You should identify and describe the relevant work packages required to deliver the project and key deliverables and milestones during the project. <b>You should identify the research category for each work package.</b> This is particularly important if you project spans two research categories. You should also provide the overall costs for each work package.</p> <p>Consider these questions:</p> <ul style="list-style-type: none"> <li>• is the project plan sufficient in comparison to the complexity of the project? For example, is there sufficient detail to understand the tasks involved and the resources required?</li> <li>• is the timing of key milestones realistic?</li> <li>• is there demonstration of sufficient resource commitment and capability to undertake the project?</li> <li>• are clear management reporting lines identified?</li> </ul>



<p>Q8. Who will deliver the project, what is their role, responsibilities and experience?</p>	<p>Describe the track record of each of the team members in undertaking the project.</p> <p>Consider whether:</p> <ul style="list-style-type: none"> <li>the project team has the right available mix of skills and experience to deliver the project successfully.</li> <li>how the organisations working together will achieve more than if they were working individually.</li> <li>If there is no formal collaboration between a supplier and a railway undertaking you should demonstrate how you have engaged your end-user customer i.e. TOC, FOC, ROSCO, NR in the project through advisory groups etc.</li> </ul>
<p>Q9. What is the project's risk management strategy? What are the risks (technical, commercial and environmental) to project success?</p>	<p>RSSB recognises that projects are inherently risky, but seeks assurance that the projects it funds have adequate arrangements for managing this risk. Focus, therefore, on the arrangements for managing and mitigating risk as follows:</p> <ul style="list-style-type: none"> <li>Identify the key risks and uncertainties of the project and provide a detailed risk analysis for the project content and approach, including the technical, commercial, managerial and environmental risks as well as other uncertainties (e.g., ethical issues) associated with the project. The main risks should then be rated as High/Medium/Low (H/M/L).</li> <li>State how the project would mitigate these key risks. You should address all significant and relevant risks and their mitigation.</li> </ul> <p>Identify key project management tools and mechanisms that will be implemented to provide confidence that sufficient control will be in place to minimise operational risk and, therefore, promote successful project delivery.</p>
<p><b>5 Financial</b></p>	
<p><b>Field</b></p>	<p><b>Guidance</b></p>
<p>Q10. What funding is required?</p>	
<p><b>Column 1</b> Organisation Name</p>	<p>Please provide the full names of the (lead) organisation and any participants in the project consortium (organisation names as noted in Companies House).</p>
<p><b>2</b> Organisation Registration Number</p>	<p>Companies should provide the Company Registration Number (as noted in Companies House).</p>
<p><b>3</b> Enterprise Category</p>	<p>Please select your Enterprise Category. (SME definition is based on the EU definition (see Annex A). This may also be a research establishment.</p>

<b>4</b> Postcode	Please provide the postcode of each organisation participating in the project.
<b>5</b> Contribution to the project by each organisation (£)	Please list the total contribution to be made to the project by each organisation. This should include the 'contribution in kind' such as equipment, facilities and reduced rates. You should identify the full commercial value of these items (ex VAT).
<b>6</b> Funding sought from RSSB	Please enter the funding sought from RSSB for each participant organisation for this competition. This should be the balance of the project costs (ex VAT) to be incurred by each party to achieve the project milestones.
<b>7</b> Other funding from public sector bodies	Please include any funding for the project from any other public sector bodies which has been applied for separately, and not as part of this competition. Funding from other public sector bodies might include other applications to research councils, other government departments, devolved administrations, other public sector organisations (e.g. Network Rail) and some charities. The purpose of this column is to provide RSSB with information on the total public funding for the project.
<b>8</b> Total (£)	The total cost of the project – this is the sum of columns 5, 6 and 7.
<b>Bottom Row</b> Total (£)	The total of the final column will be entered here.
Q11.How are the costs justified and how do they add value?	<p>Supporting information and explanation for project costs should be provided in this section of the form.</p> <p>Consider the following:</p> <ul style="list-style-type: none"> <li>• Is the budget realistic for the scale and complexity of the project?</li> <li>• Does the financial support required from RSSB fit within the limits set by the competition?</li> <li>• Is a financial commitment from other sources demonstrated for the balance of the project costs?</li> <li>• Has a realistic budget breakdown been provided?</li> <li>• Have any work package breakdowns been described and justified adequately?</li> <li>• Why the funding is required for the project to be able to proceed</li> <li>• RSSB funding would allow you to undertake the project differently (more quickly, on a larger scale, etc.) and why this would be beneficial to the UK?</li> </ul>

6. Other Public Funding Details	
Field	Guidance
Table of funding from other public bodies	Fill in the sheet for all funding that has been received from other public funding bodies, giving details of the amount and the date received.
7. Extract for Publication	
Field	Guidance
Please provide a brief, public-facing description of the project. Should your project be successful, this information will be made public once the award is confirmed. We reserve the right to amend the description before publication if necessary, but will consult you about any changes. This should be up to 300 words to describe the context and key principles behind your proposal.	<p>To comply with Government practice on openness and transparency of public-funded activities, RSSB has to publish information relating to funded projects. Please provide a short description of your proposal in a way that will be comprehensible to the general public. Do not include any commercially confidential information, for example intellectual property or patent details, in this summary.</p> <p><b>Whilst this section is not assessed, provision of this public description is mandatory. Funding will not be provided to successful projects without this.</b></p>



## ANNEX A – Definitions

**‘experimental development’** means acquiring, combining, shaping and using existing scientific, technological, business and other relevant knowledge and skills with the aim of developing new or improved products, processes or services. This may also include, for example, activities aiming at the conceptual definition, planning and documentation of new products, processes or services;

Experimental development may comprise prototyping, demonstrating, piloting, testing and validation of new or improved products, processes or services in environments representative of real life operating conditions where the primary objective is to make further technical improvements on products, processes or services that are not substantially set. This may include the development of a commercially usable prototype or pilot which is necessarily the final commercial product and which is too expensive to produce for it to be used only for demonstration and validation purposes.

Experimental development does not include routine or periodic changes made to existing products, production lines, manufacturing processes, services and other operations in progress, even if those changes may represent improvements;

**‘industrial research’** means the planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of components parts of complex systems, and may include the construction of prototypes in a laboratory environment or in an environment with simulated interfaces to existing systems as well as of pilot lines, when necessary for the industrial research and notably for generic technology validation;

**‘effective collaboration’** means collaboration between at least two independent parties to exchange knowledge or technology, or to achieve a common objective based on the division of labour where the parties jointly define the scope of the collaborative project, contribute to its implementation and share its risks, as well as its results. One or several parties may bear the full costs of the project and thus relieve other parties of its financial risks. Contract research and provision of research services are not considered forms of collaboration.



### Enterprise size

The main factors determining whether an enterprise is an SME are:

- Staff headcount and
- Either turnover or balance sheet total

Company category	Staff headcount	Turnover	or Balance sheet total
Medium-sized	<250	≤ € 50m	≤ € 43m
Small	<50	≤ € 10m	≤ € 10m
Micro	<10	≤ € 2m	≤ € 2m

These ceilings apply to the figures for individual firms only. A firm that is part of a larger group may need to include staff headcount/turnover/balance sheet data from that group too.

Further information can be found in:

European Commission. (2014, May 21). *Framework for state aid for research and development and innovation*. Retrieved from [http://ec.europa.eu/competition/state\\_aid/modernisation/rdi\\_framework\\_en.pdf](http://ec.europa.eu/competition/state_aid/modernisation/rdi_framework_en.pdf)

## ANNEX B

### Technology Readiness Levels

TRL	Description	Stage Summary	In scope of competition
1	Basic principles observed and reported	Research	No
2	Technology concept and/ or application formulated		No
3	Analytical and experimental critical function and/ or characteristic proof-of-concept		No
4	Technology basic validation in a laboratory environment	Demonstrate	Yes
5	Technology basic validation in a relevant environment		Yes
6	Technology model or prototype demonstration in a relevant environment		Yes
7	Technology prototype demonstration in an operational environment	Commercialise	Yes
8	Actual Technology completed and qualified through test and demonstration		No
9	Actual Technology qualified through successful mission operations		No

# Annex C – Rail Industry Readiness Levels



Systems and Equipment Readiness Levels: Titles & Short Descriptions									Version 2: 23 <sup>rd</sup> May 2016
<b>Rail Industry</b>	<b>RIRL 1</b> <b>Conception</b> Early awareness of a need and potential outcomes thought worthy of developing	<b>RIRL 2</b> <b>Opportunity Development</b> Thinking, supported by research, to develop understanding of need and possible approaches to obtain qualitative benefits	<b>RIRL 3</b> <b>Proof of Concept</b> Conceptual design supported by experimentation proves viability and feasibility of the concept	<b>RIRL 4</b> <b>Industry Specification</b> Qualitative plans to deliver the concept are supported by positive market and business analyses	<b>RIRL 5</b> <b>Prototype</b> Prototype assets and/or services, developed under quality controlled methodology are available	<b>RIRL 6</b> <b>Operational Transition</b> Supply of goods and/or services of appropriate and repeatable quality meets market needs	<b>RIRL 7</b> <b>Initial Deployment</b> Operational credibility builds as goods and services are employed, feedback used to confirm user expectations	<b>RIRL 8</b> <b>Roll Out</b> Supply meets demand in a timely manner, product / service deemed mature and deployable with ease	<b>RIRL 9</b> <b>Whole Life Management</b> Continued product / service improvement; business as usual; actual whole life cost measured
<b>Technology</b>	<b>TRL 1</b> <b>Idea</b> Technology idea is conceived and developed using desktop and laboratory research	<b>TRL 2</b> <b>Invention</b> Experimentation and desktop modelling used to verify veracity of technology in line with anticipated usage	<b>TRL 3</b> <b>Proof of Concept</b> Proof of concept is ascertained using robust and repeatable processes	<b>TRL 4</b> <b>Development</b> Technology is validated against high level requirements in a laboratory and/or experimental environment	<b>TRL 5</b> <b>Validation</b> Technology is validated against user requirements in a representative environment	<b>TRL 6</b> <b>Demonstration</b> Performance of pre-production assets / system is demonstrated in an operationally representative environment	<b>TRL 7</b> <b>Qualification</b> Production standard assets are qualified for use in an operational environment	<b>TRL 8</b> <b>1st of Class</b> First of Class asset deployed for operational usage under commercial conditions	<b>TRL 9</b> <b>Production</b> Repeated and repeatable technology deployment in conjunction with managed asset development / evolution
<b>Manufacturing</b>	<b>MRL 1</b> <b>Basic Principles</b> Basic Manufacturing Implications have been identified	<b>MRL 2</b> <b>Concepts and Feasibility</b> Manufacturing concepts and feasibility have been determined and processes have been identified	<b>MRL 3</b> <b>Proof of Manufacturability</b> A manufacturing proof-of-concept has been developed	<b>MRL 4</b> <b>Pre-Production</b> Capability exists to produce the technology in a laboratory or prototype production environment	<b>MRL 5</b> <b>Component Production</b> Capability exists to produce prototype components in a production relevant environment	<b>MRL 6</b> <b>Production Integration</b> Capability exists to produce integrated system or subsystem in a production relevant environment	<b>MRL 7</b> <b>Production Facility</b> Capability exists to produce systems, subsystems or components in a production representative environment	<b>MRL 8</b> <b>Low Rate Production</b> Low rate initial production is underway	<b>MRL 9</b> <b>Full Rate Production</b> Full volume rate production capability has been demonstrated
<b>Integration</b>	<b>IRL 1</b> <b>Interface</b> Interface requirements between component / system elements have been established	<b>IRL 2</b> <b>Interaction</b> Required mode and context of interaction between component / system elements has been established	<b>IRL 3</b> <b>Compatibility</b> Quantitative interaction between component / system elements is demonstrable and repeatable	<b>IRL 4</b> <b>Quality and Assurance</b> Successful and repeatable interaction between component / system elements meets quality and assurance requirements	<b>IRL 5</b> <b>Control</b> Action / reaction through the control chain is demonstrated and manageable within required operational parameters	<b>IRL 6</b> <b>Communicate</b> Performance and associated communication / simulation within / by the operational environment delivers required functionality	<b>IRL 7</b> <b>Verification and Validation</b> Performance in a representative operational environment is repeatable, verifiable and validated to the required standards	<b>IRL 8</b> <b>1<sup>st</sup> Of Class</b> Whole system deployed under commercial arrangements for operational usage	<b>IRL 9</b> <b>Proven</b> Repeated and successful low-risk deployment of integrated system for operational usage
<b>Systems</b>	<b>SRL 1</b> <b>Thinking</b> Mind picture supported by notes and discussions developed to share thinking	<b>SRL 2</b> <b>Rich Picture</b> Rich picture depicting system elements and interaction of those elements	<b>SRL 3</b> <b>Framework Architecture</b> Structured depiction and robust definition of the system and its associated components	<b>SRL 4</b> <b>Interfaces</b> Qualitative and evidential definition of intra and inter system interface requirements	<b>SRL 5</b> <b>Detailed Architecture</b> Robust system architecture and associated models able to explore evolving system properties	<b>SRL 6</b> <b>Integration</b> Integration of system elements in an appropriate environment producing a functioning system for evaluation	<b>SRL 7</b> <b>Pre-Production</b> Qualified production standard system elements available for systems integration, test, verification and validation	<b>SRL 8</b> <b>1<sup>st</sup> of Class</b> First commercial deployment of whole system in an operational environment	<b>SRL 9</b> <b>Series Production</b> Repeated and repeatable quality whole system deployment in expanding operational usage
<b>Software</b>	<b>SwRL 1</b> <b>Basic Principles</b> Basic principles described, software concepts researched and documented, appropriate languages reviewed	<b>SwRL 2</b> <b>Conception</b> Approaches to deliver software derived functionality outlined and algorithm testing commenced	<b>SwRL 3</b> <b>Proof of Concept</b> Quantitative and/or Qualitative analysis of software approach confirms proof of concept for critical functionality	<b>SwRL 4</b> <b>Laboratory Validation</b> Software code and functionality validated in a laboratory environment	<b>SwRL 5</b> <b>Relevant Environment Validation</b> Software code and functionality validated in a simulated / safe but realistic operational environment	<b>SwRL 6</b> <b>Relevant Environment Demonstration</b> Software code and functionality demonstrated in a simulated / safe but realistic operational environment	<b>SwRL 7</b> <b>Operational Environment Demonstration</b> Software code and functionality demonstrated in a real operational environment (beta standard)	<b>SwRL 8</b> <b>Software Qualification</b> Software code and functionality qualified and certified to appropriate operational standards (final release)	<b>SwRL 9</b> <b>Operational Software</b> Software in operational service and under formal change management control
<b>Reliability</b>	<b>RRL 1 &amp; 2</b> <b>Requirement Definition</b> RAM targets established, Customer requirements defined, translated & confirmed.  <b>Preliminary Design</b> Designed using reliability & maintainability best practices	<b>RRL 3</b> <b>Design assessment</b> Risks to function due to design assessed and addressed. Maintenance regime identified.	<b>RRL 4</b> <b>Installation &amp; commission</b> Installation process defined, risks assessed and improvement actions taken.	<b>RRL 5</b> <b>Manufacturing process assessment</b> Manufacturing risks assessed & addressed. Test plan established. DRACAS established. Training material drafted.	<b>RRL 6</b> <b>Component (or subsystem) testing</b> Reliability and maintainability proven during component or subsystem level testing. DRACAS process commences.	<b>RRL 7</b> <b>System testing</b> Reliability and maintainability proven during system level testing. Feasibility to conduct maintenance regime tested.	<b>RRL 8</b> <b>Manufacture process testing</b> Capability of the manufacturing process proven	<b>RRL 9 - 10</b> <b>Installation commissioning validation</b> Installation process proven during validation  <b>Trial performance validation</b> Successful operational trials	<b>RRL 11</b> <b>In-service performance validation</b> Continued RAM data collection meets predicted performance. DRACAS replaced by normal ongoing data collection systems.



### Rail Industry Readiness Levels (RIRL) : High Level Descriptors





Department  
for Transport



## Annex D – Eligible Project Costs

The eligible costs of research and development projects shall be allocated to a specific category of research and development and shall be the following:

- (a) personnel costs: researchers, technicians and other supporting staff to the extent employed on the project;
- (b) costs of instruments and equipment to the extent and for the period used for the project. Where such instruments and equipment are not used for their full life for the project, only the depreciation costs corresponding to the life of the project, as calculated on the basis of generally accepted accounting principles are considered as eligible.
- (c) costs for buildings and land, to the extent and for the duration period used for the project. With regard to buildings, only the depreciation costs corresponding to the life of the project, as calculated on the basis of generally accepted accounting principles are considered as eligible. For land, costs of commercial transfer or actually incurred capital costs are eligible;
- (d) costs of contractual research, knowledge and patents bought or licensed from outside sources at arm's length conditions, as well as costs of consultancy and equivalent services used exclusively for the project;
- (e) additional overheads and other operating expenses, including costs of materials, supplies and similar products, incurred directly as a result of the project;