



Department
for Transport

GRANT SPECIFICATION

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1. INTRODUCTION

- 1.1 The focus of this competition is to discover new ideas for mitigating nitrogen oxides (NO_x) including nitrogen dioxide (NO₂). European Union (EU) Directives on Ambient Air Quality stipulate limits for the concentration levels of NO₂ on the road networks in the UK to protect public health. Although the competition focuses on mitigating NO_x post tail pipe, the ultimate purpose is to reduce the roadside concentration levels of NO₂ and ensure that more of the UK Road Network is compliant with the EU Directives on Ambient Air Quality.
- 1.2 The Department for Transport (DfT) works with its agencies and partners to support the transport network that helps UK businesses and gets people and goods travelling around the country. Transport is a contributor to polluting emissions and therefore managing the environmental impacts of road transport is an important part of what we do. For many environmental impacts there are a range of tried and tested measures that can be implemented to either eliminate or reduce their adverse effects. There are limited air quality solutions that are both cost effective and broadly acceptable across a range of stakeholders.
- 1.3 A particular priority is reducing roadside concentrations of nitrogen dioxide (NO₂) through control of emissions of oxides of nitrogen (NO_x). Focusing on NO_x has become imperative as the UK is failing to comply with EU air quality standards and is being infringed by the European Commission. An [updated recent report](#) from the Department for Environment, Food and Rural Affairs (Defra) forecast that by 2020 (EU's target date for all 43 zones to be compliant) the majority of air quality reporting zones in the UK will still be non-compliant for NO₂. The Department has already invested massively in green technology for vehicles. To complement these developments, this competition aims to fill the gap by providing short term solutions of investing in new technologies and innovative ideas to mitigate NO_x emission levels post tail pipe.

2. PURPOSE

- 2.1 The Science and Research Division within the Department is running this competition to identify measures that could be taken to reduce NO_x emissions from road transport on the Strategic Road Network (SRN) and in the urban environment. For the purpose of this project, NO_x refers to nitrogen dioxide (NO₂) and nitric oxide (NO). This call is to encourage new product development and innovation in the area of reducing roadside concentrations of NO₂ by funding through a grant scheme. This competition could offer new and more effective NO_x reduction options to the Highways Agency (HA) and other authorities including Transport for London (TfL), unitary authorities, metropolitan districts and County Councils to improve air quality and enhance the wellbeing of the population. It will identify strategies for reducing the number of km on the road network which do not comply with EU air quality standards (NO₂ roadside concentrations of 40 µg/m³ (20 ppbv) and one hour maximum 200 µg/m³; not to be exceeded more than 18 times a calendar).
- 2.2 This competition is therefore designed to provide proofs of concept. It will look at the following three specific NO_x Air Quality challenges:
 - 2.2.1 Landscape/Infrastructure mitigation measures on the Strategic Road Network;
 - 2.2.2 Landscape/Infrastructure mitigation measures in the urban environment;
 - 2.2.3 Traffic management measures to mitigate NO_x.

3. DEPARTMENT FOR TRANSPORT BACKGROUND

- 3.1 The Department for Transport (DfT) plan and invest in transport infrastructure to keep the UK on the move, focus on growth in the UK economy, adapt to the effects of climate change, work with local government giving local authorities greater power in deciding to spend public money, and identify and address the most pressing risks to national security.
- 3.2 The Science and Research Division's role is to support the Department's Chief Scientific Adviser (CSA) in raising the quality of the DfT use of analysis and research, ensuring that the department has a strategic vision for its use of evidence. The Division is DfT's 'centre of excellence' for research projects and programme management, including on relevant calls, communications and quality assurance issues. Much of the Department's research has an international dimension, either because the policy context is international or because the research objectives are also of interest to other countries and international research organisations.

4. BACKGROUND TO REQUIREMENT/OVERVIEW OF REQUIREMENT

- 4.1 The UK road network provides significant benefits to the UK economy but also gives rise to negative environmental impacts. Many environmental impacts can either be avoided or mitigated through the application of good environmental design. Environmental design can include the consideration of landscaping to screen sensitive receptors from the impact, compensation activities to replace lost habitat or the installation of engineering solutions to improve water quality or mitigate noise.
- 4.2 The EU Directive on Ambient Air Quality (2008/50/EC) provides the strategic framework for tackling air quality across the Europe by setting legally binding limit values for a range of air pollutants. The purpose of the Directive is to help protect human health. In the UK, this European framework is implemented through the Air Quality Regulations 2010. Section 27 of the legislation specifies the Secretary of State's commitment to '*draw up and implement a short-term action plan*' to mitigate NO_x where thresholds are exceeded and thus comply with [The Air Quality Standards Regulations 2010; Section 27](#).
- 4.3 Grants will be offered to fund between four to six projects, with each receiving in the order of £25K-£50K depending on the proposal. The grant will be awarded under section 5(1) of the Science and Technology Act 1965.
- 4.4 High levels of NO₂ concentrations along significant stretches of the SRN and urban environments have been measured. NO₂ concentrations of 40-50 µg/m³ at the road side are not uncommon and, in some extreme cases, high of 70-80 µg/m³ have been measured (see [140708 NO₂ Projection Tables](#)).
- 4.5 The recent Defra report, has updated forecasts based on recent trends which presents a more pessimistic outlook on achieving NO₂ concentration limits than in previous reports. The emission factors for NO_x from road traffic have been updated to reflect more accurate expectations on the performance of modern diesel vehicles and older petrol cars. However, these projections do not take into account any additional measures to tackle roadside concentrations of NO₂ beyond those included in the plans published in 2011 and therefore predictions could be considered an over estimate (see [140708 NO₂ Projection Tables](#)). This implies that in 2020, the majority (65%), 28 out of 43 UK zones are likely to fail in meeting the annual EU limit of 40-50 µg/m³. Further information on vehicle emissions can be found in the HA's '[The Design Manual for Roads and Bridges \(DMRB\) volume 11, Section 3 Part 1, Annex A](#)'

- 4.6 Previously, research has been undertaken to explore the use of noise barriers impregnated with titanium dioxide to see if this could be an effective means to reduce NO_x experienced at receptors. The outcome of the trials was unfortunately unsuccessful.
- 4.7 Active management of traffic flows such as the scheme on the M42 have helped manage congestion but have not delivered air quality improvements on a scale necessary to tackle the problem of achieving compliance with the EU limits.
- 4.8 The Department is therefore looking for proposals which give solutions that mitigate the impact of (NO_x) from post tail pipe by devices/ equipment/ technology/ systems or processes installed or applied within the highway or urban boundary across the UK Road Network by reducing those concentrations and help more of the UK Road Network meet EU legislation. The proposed mitigation should be implemented at a locality between the tail pipe and sensitive receptors.
- 4.9 The DfT wants to use this opportunity to encourage new innovations or applications of existing technologies from other areas to provide a mitigation solution for NO_x emitted post tail pipe. Examples of solutions could include to treat or adapt existing road barriers or build new infrastructure to disperse NO₂ concentration levels.
- 4.10 There is a recognised relationship between traffic characteristics (total vehicles numbers, % HGVs and buses and speed) and overall total emissions. This information is used to assess air quality impacts. However, although improvements in engine technology have reduced total emissions per vehicle and traffic management technologies can help to manage traffic flows more efficiently, air quality remains a growing problem. In July 2011, Defra published a report examining the long term air quality trends in NO_x concentrations. In summary, the report showed that there has been a clear decrease in NO_x concentrations between 1996 and 2002. Thereafter NO_x concentrations have stabilised with little to no reduction between 2004 and 2010 (see [110718 AQ0724 Final Report](#)). The consequence of the long term trends is that there is now a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality. It's clear that air quality will continue to be a major constraint on DfT's road programme.
- 4.11 Mitigating the impacts of NO_x is a particular challenge for the Highways Agency due to high volumes of traffic that will increase further as additional capacity is introduced.
- 4.12 It is also a common issue for all highways operators across the developed world and, with growing car ownership in the developing world and increased awareness of the impacts of air pollutants, it is likely to become a global issue. The development of a successful mitigation solution therefore is expected to have global applications.

5. SCOPE OF COMPETITION

- 5.1 The Department is running a competition to provide a grant for feasibility studies (between four and six) which addresses one of the following three different aspects of the NO_x air quality challenges:
- 5.1.1 Landscape/Infrastructure mitigation measures on the SRN;
 - 5.1.2 Landscape/Infrastructure mitigation measures in the urban environment;
 - 5.1.3 Traffic management mitigation measures.
- 5.2 Organisations with innovative solutions for mitigating NO_x are invited to submit separate applications for one or more (up to three applications, one per challenge) of these three air quality challenges. The scope for this specific competition is to focus on the landscape/infrastructure mitigation measures post tail pipe on the SRN/urban
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environment or traffic management mitigation measures. Therefore, solutions that deliver small or large reductions may all have applications (although the Magnitude of Impact must be in the range of small to large) (see Table 1).

- 5.3 The competition is designed to provide proof of concept or the development of a prototype, a feasible desk exercise that demonstrates the potential to mitigate NO_x concentrations on the SRN. In terms of Technology Readiness Levels (TRL), this funding route will support those projects between TRL 2 and 4. Funding at this early stage enables researchers to carry out basic exploratory studies which could lead to pioneering ideas being developed into new products, processes, models or services for transport applications.

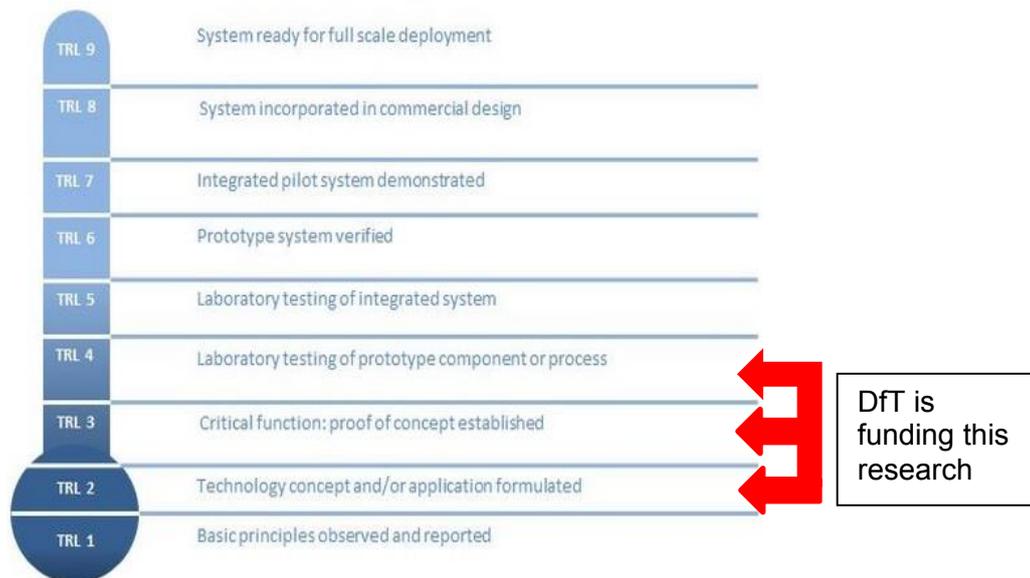


Figure 1: Technology Readiness Level (TRL) scale

- 5.4 In exploring and developing proposals, interested parties may find it helpful to examine how the source, pathway, receptor model used in environmental impact assessment, could help identify possible solutions. Proposals could consider means to prevent or reduce the concentrations of NO_x that arise within or outside the highway boundary (or urban road boundary), though solutions that can be accommodated within the existing highway boundary (or urban road boundary) are more desirable.
- 5.5 Whilst a proposed solution may mitigate the impact of NO_x concentrations at a receptor, it may have other undesirable impacts which would need to be assessed before being implemented. As part of this application the potential undesirable impacts such as visual, noise, engineering constraints, unaffordability and increases in other pollutants must be clearly set out and identified. Also if other pollutants are also reduced as a side benefit of the proposed scheme, this should be also recorded.
- 5.6 To help the Department understand the level of impact expected, i.e. by how much the NO₂ concentration is likely to decrease on an annual basis, the solution needs to specify the impact expected on the concentration levels of NO₂. A Magnitude of Impact Band is defined below in Table 1 and references to this scale should be used when communicating about the expected outcome (see Table 1 below for the categories). The annual expected level of change should be supported with sound justifications.

Table 1: Desired Level of Change in NO₂ Concentrations

Magnitude of Impact Band	Annual Decrease in NO ₂ Concentration (µg/m ³)
Large	>4
Medium	>2 to 4
Small	>0.4 to 2
Imperceptible*	<=0.4
<i>EU Annual Limits</i>	40 µg/m ³ (annual daily average) One hour 200 µg/m ³ ; not to be exceeded more than 18 times a calendar year
*A change of 0.4 µg/m ³ or less for annual average of NO ₂ is considered to be imperceptible.	

5.7 Our priority is for solutions that can mitigate the issues affecting the existing network. Proposals that may be more suitable on new schemes are however also still welcome.

5.8 This competition is seeking to discover a new proof of concept for the challenge of mitigating NO_x and therefore funding product development on the TRL scale 5-9 (see Figure 1) e.g. testing prototype equipment/technology are out of scope. Other solutions that are out of scope of this competition include the following:

- 5.8.1 Solutions that involve changes in engine or vehicle technologies.
- 5.8.2 Proposals that merely seek to refine and or improve the way we model air quality impacts.
- 5.8.3 Proposals that attempt to reduce NO_x concentrations from areas outside of the Road Network.
- 5.8.4 Proposals that merely highlight or copy current or previous NO_x reduction roadside solutions in the UK or outside UK.
- 5.8.5 Solutions that focus on other pollutants and ignore NO_x.
- 5.8.6 Barriers impregnated with titanium dioxide (have already been tested).

5.9 Expected Outputs of the Project

The output of the project should be a written report containing the following:

5.9.1 The grant recipient will provide a new proof of concept to the challenge of mitigating NO_x on the SRN and/or urban environment. They will develop a feasible new concept that could be implemented on the roadside infrastructure or on landscape at a locality between the source and the receptor on the SRN or urban environment to help mitigate NO_x post tail pipe. It may also include an application or model that was developed or a prototype device. Alternately the proposal could focus on traffic management solutions to mitigate NO_x.

The report should contain the following:

- 5.9.1.1 Objectives of the study
- 5.9.1.2 Outline of the concept (including scientific basis) and how this will help to mitigate NO_x;
- 5.9.1.3 How the idea was generated (i.e. is it an application from another industry) and any intellectual property rights;
- 5.9.1.4 Assumptions made;
- 5.9.1.5 Technologies/equipment used;
- 5.9.1.6 Expected outcome (i.e. reduction in NO₂ see Table 1);
- 5.9.1.7 Limitations (i.e. only look at the higher NO₂ concentrations)

- 5.9.1.8 Practical applications of the concept to the SRN (or urban environment) including indicative cost of application;
- 5.9.1.9 Next steps for testing and implementation;
- 5.9.1.10 Conclusions;
- 5.9.1.11 Executive summary of findings.

5.10 Audience

- 5.10.1 The report will be disseminated to key stakeholders including: Government policy officials at the DfT; HA; BIS; Innovate UK; TfL; Defra; local authorities and key industry partners. It could be made publicly available.
- 5.10.2 The report should be written in plain English suitable for non-specialists.

5.11 Expectations of the project

- 5.11.1 The grant recipient will commence the call with a project initiation meeting to discuss the details of the scheme with the DfT in December 2014. There will be regular liaisons with the Department and the manner of communication will be confirmed in the initiation meeting.
- 5.11.2 The grant recipient will provide a concise report written in plain English suitable for a lay person. The report should include methodology, technologies and equipment that would be used to address NO_x as detailed in section 5.9.1 above.
- 5.11.3 The grant recipient's proposed solution should deliver a meaningful reduction in NO_x (see Table 1) and at appropriate technology/concept level on the TRL scale (see Figure 1). Any associated negative effects of implementation of the proposed scheme such as noise or increased emission of other pollutant should be specified, as should any benefits. Applicants should provide indicative cost estimates of implementing their systems without going into too much detail.
- 5.11.4 Information on Air Quality is available at the following Defra links:
 - 5.11.4.1 [The main page](#)
 - 5.11.4.2 [The local authority section](#) (including the section on the emissions factor toolkit to work out the impact of developments etc.)
 - 5.11.4.3 [Projections for compliance for the zones in the UK](#)
- 5.11.5 The grant recipient's solution will be practical and take into account any requirements for implementing the solution to the SRN and/or urban environment.
- 5.11.6 Key findings from this project are to be presented to the DfT as well a first draft of the report delivered by the end of March 2015, with the final report delivered by end of May 2015.
- 5.11.7 Appropriate NO_x trends and expected emissions will be discussed between the grant recipient and DfT. The grant recipient has been provided links to relevant Air Quality data from Defra in section 5.11.4 above.

5.12 Quality assurance

- 5.12.1 Please explain the practices and procedures that will be developed and implemented to assure quality in all aspects of the project, including appropriate stages for reviewing the programme of work with DfT.
- 5.12.2 Applicants should make sure that all reports are written and presented to a professional standard and are suitable for non-specialists, with all acronyms and unavoidable technical language clearly explained.
- 5.12.3 Applicants will demonstrate that progress is in line with the expected milestones and research will still deliver the expected solution. If at an earlier point the applicant feels that the solution is no longer viable or external factors make it unviable, the applicant will inform the DfT to allow the DfT to terminate the rest of the grant and part pay the grant according to the work completed.

5.13 Management and contract administration

- 5.13.1 Proposals will be assessed to ensure the chosen grant recipients have all the appropriate skills and expertise to successfully carry out the project. Proposals should:
 - 5.13.1.1 Demonstrate they understand the NO_x challenges that face the UK, EU and the global community.
 - 5.13.1.2 Demonstrate a track record in development of new technological solutions.
 - 5.13.1.3 Demonstrate an understanding of the science behind the solution (such as physics, chemistry, modelling, engineering etc.).
 - 5.13.1.4 Demonstrate they have considered the practicality of implementation (including limitations i.e. legislative) to the UK Strategic Road Network and urban environment.
 - 5.13.1.5 Name the key members of the proposed team for delivering the programme of work.
 - 5.13.1.6 Outline the respective roles of all key members of the proposed team and their relevant experience.
- 5.13.2 Proposals will be evaluated using the transparent Evaluation Criteria (available with this document). A panel of experts with possible representation from the DfT, HA and Defra will convene to review the proposals to ensure each one receives a fair assessment.
- 5.13.3 Please set out how your proposed programme of work is designed to meet the project requirements and timetable. It would be helpful if this also showed when development, testing and finalised outputs are timetabled to be delivered. A GANTT chart is advisable (see Evaluation Criteria and Grant Application Form) inserted into the appropriate sections of the Grant Application Form.
- 5.13.4 The proposal should also highlight when and what input you will expect from Science and Research Division and when active contributions will be required by us (e.g. signing off a milestone).
- 5.13.5 DfT would be happy to consider proposals from consortia for this project.

5.13.6 Any sub-contractors or associates who may be employed to undertake any sections of the research should be separately identified, along with their respective roles and how they will be managed. The grant recipient will be responsible for the delivery of any sub-contractors.

5.13.7 Proposals will incorporate the risk assessments conducted including risk assessment of the project failing to meet its objectives. The risk analysis should be shown as high, medium and low and there should also be a discussion of the risk mitigation steps that have been identified.

6. SERVICE LEVELS AND PERFORMANCE

6.1 Project Plan and Milestones (including dates for completion)

The Project Plan is set out below:

Table 2: Plan and Milestones

Milestone	Deliverables	Duration	Milestone Date	DfT Responsibilities (if applicable)
Initiation Meeting between DfT and grant recipient to define input data and discuss project management method and oversight.			Project Start Date	
Key findings/First Draft of Report.	Presentation of key findings & First Draft of Report		3-4 Months from Start Date	
Results compiled and report finished.	Finished Report Delivered to DfT		4-6 Months from Start Date	

6.1.1 If so required by the DfT, the grant recipient shall produce a further version of the Plan (based on the above plan) in such further detail as the DfT may reasonably require.

6.1.2 The grant recipient shall ensure that each version of the Project Plan is subject to approval. The grant recipient shall ensure that the Project Plan is maintained and updated on a regular basis as may be necessary to reflect the then current state of progress.

6.1.3 The DfT shall have the right to require the grant recipient to include any reasonable changes or provisions in each version of the Project Plan.

6.1.4 The grant recipient shall perform its obligations so as to achieve each Milestone by the Milestone Date.

6.1.5 Changes to the Milestones shall only be made in the event of a DfT default which affects the grant recipient's ability to achieve a Milestone by the relevant Milestone Date.

- 6.1.6 Science and Research Division's senior management team will review project progress at each milestone set out above.
- 6.1.7 The grant recipient will liaise with the DfT project manager for the duration of the project with meetings to be arranged as necessary.
- 6.1.8 Single payment of the total grant will be made at the end of the financial year following delivery of the draft report. If the grant recipient fails to comply with any of the conditions of grant set out in the Grant Award Letter, DfT may reduce, suspend, or withhold grant payments, or require all or any part of the grant to be repaid.

7. LOCATION

- 7.1 The Services will be carried out at a suitable location of the grant recipient's choosing.

8. SECURITY REQUIREMENTS

- 8.1 There are no specific security requirements.

9. BUDGET

- 9.1 The indicative budget for this competition is between £25K and £50K per project (£300K in total) and is flexible depending on the idea/solution being suggested. Applications will be considered for higher budget if excellent value for money can be demonstrated.
- 9.2 Prices should be inclusive of expenses and exclusive of VAT.