

Programmes and Investment Committee



Date: 13 October 2017

Item: Air Quality and Environment Programme

This paper will be considered in public

1 Summary

AIR QUALITY and ENVIRONMENT				
Existing Financial Authority	EFC	Existing Project Authority	Additional Authority Requested	Total Authority
£ 399m	£ 431m	NIL ¹	£ 202m	£ 202m

Authority Approval: The Committee is asked to approve budgeted Programme and Project Authority of £202m to reduce emissions from vehicles in London. This authority covers financial years 2017/18-2020/21 – the programme will return annually to the Committee to renew and validate a rolling approval.

Outputs and Schedule: The Air Quality and Environment Programme improves transport's impact on air quality and climate change through a programme of measures targeted at vehicles in TfL's contracted and regulated fleets, and at all vehicles driving in London.

- 1.1 This paper presents the strategic case for the Surface Transport Air Quality and Environment Programme (the Programme), summarises the development and delivery practices, sets out the proposed governance arrangements and the options considered for delivery of each aspect of the Programme.
- 1.2 Section 8 sets out a detailed cost and funding breakdown, including third party costs and funding.
- 1.3 A paper is included on Part 2 of the agenda, which includes exempt supplementary information. The information is exempt by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

¹ Project authority has previously been granted by the Committee for a number of the components of this Programme. However, in order to maintain a single clear view of the Programme, this paper requests authority across all elements of the Programme, regardless of previous authority requests.

2 Recommendation

2.1 The Committee is asked to note the paper and the related paper on Part 2 of the agenda and:

(a) approve Programme and Project Authority of £202m for delivery of the Surface Air Quality and Environment Programme, covering: £66m in 2017/18; £105m in 2018/19; and £30m for activities which commence in 2017/18 and extend into subsequent years as described in this paper; and

(b) note that Procurement Authority in respect of the various elements of the Air Quality and Environment Programme will be sought at officer level in accordance with Standing Orders.

3 Background

3.1 The draft Mayor's Transport Strategy (MTS) sets out the Mayor's vision that 'London's transport network needs to contribute to the meeting of legal air quality levels as soon as possible and the achievement of a zero carbon city by 2050, thereby protecting the health of Londoners and demonstrating a commitment to tackling climate change.' This paper sets out the proposed investment approach to deliver this commitment.

3.2 While the Mayor has a duty to help achieve the legal limits (called "limit values") for air pollutants in Greater London as quickly and effectively as possible, an equal driver for tackling air pollution is the benefit to public health. Poor air quality affects the health of every Londoner but it is also a social justice issue as deprived communities are more likely to be located in areas with poor air quality².

3.3 The two key pollutants of concern in London are nitrogen dioxide (NO₂) and particulate matter (PM), both of which are harmful to human health. At high concentrations, NO₂ causes inflammation of the airways and long term exposure is associated with an increase in symptoms of bronchitis in asthmatic children and reduced lung development and function. PM can harm the human respiratory and cardiovascular systems. More evidence on the health impacts of NO₂ and PM exposure is set out in Appendix 2.

3.4 Large areas of the Capital continue to exceed both the annual mean and hourly limit values for NO₂ and this is likely to continue beyond 2020, unless more action is taken. Within the first week of 2017, Putney High Street and Brixton Road breached hourly legal limits in terms of the number of times pollution episodes are allowed.

² <http://www.sciencedirect.com/science/article/pii/S0269749114005144>

- 3.5 The limit values for ambient air pollutants are set by European Union (EU) Directive 2008/ 50/ EC and in domestic law by the Air Quality Standards Regulations 2010. This legislation will remain in force in UK law regardless of the UK leaving the EU, unless and until specifically amended or repealed by Parliament.
- 3.6 Improving air quality in the Capital is a shared responsibility. Under the Greater London Authority (GLA) Act 1999, the Mayor must prepare a London Environment Strategy (LES) looking at, among other things, the Capital's air quality and containing measures to meet legal limits as soon as possible. He is also in the process of preparing a new Transport Strategy which sets out measures to address transport's contribution to air pollution. Drafts of both strategies are currently being consulted on with the public and stakeholders. The Mayor and TfL are under a duty to take such action within their powers as is feasible to bring an end to the current NO₂ limit value exceedance as quickly and effectively as possible. However, additional Government action is required to under-pin the effectiveness of the measures to be taken by the Mayor and TfL. The Mayor has been lobbying Government as to the action it should take. The boroughs also have their own responsibilities under the local air quality management framework of the Environment Act 1995.
- 3.6 Although London is currently compliant with limit values for levels of PM less than 2.5 microns in diameter (PM_{2.5}), it does not meet safe levels as recommended by the World Health Organization. Without further action, this is projected to be the case until well after 2030.
- 3.7 Road traffic is often the greatest contributor to poor air quality in places where people live and work. Diesel vehicles are the most significant source of nitrogen oxides (NO_x) emissions, which contribute to illegal levels of NO₂. The reason for this is partly because of the underperformance of some diesel vehicle emission standards over time, with significant discrepancies between official emission measurements and real-world vehicle performance in urban environments.
- 3.8 Recent catastrophic weather events have highlighted the urgent need to reduce greenhouse gas emissions, in particular carbon dioxide (CO₂). CO₂ emissions from transport are unlikely to decrease quickly enough to support the Mayor's ambition for a zero carbon city by 2050 without significant action. It will only be possible to bring about a zero carbon city by 2050 if all vehicles have zero exhaust emissions by that date.

4 Strategic Case

- 4.1 The overarching strategic case for the Air Quality and Environment Programme investment is set out in Appendix 2. The Appendix presents our analysis and evidence that demonstrates why this Air Quality and Environment Programme is needed in London to improve transport's impact on air quality and climate change.
- 4.2 The draft MTS sets out the Mayor's priorities to reduce emissions and improve air quality. Policy 5 of the draft MTS states that 'the Mayor, through TfL and

working with the boroughs, will take action to reduce emissions – in particular diesel emissions – from vehicles on London’s streets, to improve air quality and support London reaching compliance with UK and EU legal limits as soon as possible. Measures will include retrofitting vehicles with equipment to reduce emissions, promoting electrification, road charging, the imposition of parking charges/levies, responsible procurement, the making of traffic restrictions/regulations and local actions’.

- 4.3 In support of Policy 5, proposals in the draft MTS (which are subject to public and stakeholder consultation) include the introduction of the Ultra Low Emission Zone 18 months early in 2019; its expansion London-wide for heavy vehicles by 2020 and to inner London for all other vehicles (except taxis) by 2021; the creation of an alert system to inform Londoners about air pollution episodes; and additional emergency measures to reduce or restrict vehicle use when periods of very high air pollution risk have the potential to cause immediate adverse health effects.
- 4.4 Policy 6 of the draft MTS states that ‘the Mayor, through TfL and the boroughs, and working with other transport providers, will seek to make London’s transport network zero carbon by 2050, which will also deliver further improvements in air quality, by transforming London’s streets and transport infrastructure so as to enable zero emission operation, and by supporting and accelerating the uptake of ultra-low and zero emission technologies.’
- 4.5 In support of Policy 6, proposals in the draft MTS include: encouraging the uptake of Zero Emission Capable (ZEC) taxis and private hire vehicles; the use of ultra low emission vehicles in GLA and borough fleets; and the implementation of zero emission zones.
- 4.6 TfL has assigned funding via its Business Planning processes to address the priorities set out by the Mayor since his election and in his draft MTS. The process to develop the TfL 2017 Business Plan is underway, and will seek to address the most appropriate response to funding the Mayor’s ambitions for air quality and environment within the financial parameters TfL has set the Programme.
- 4.7 The draft MTS sets out the Mayor’s vision to ‘create a future London that is not only home to more people, but is a better place for all of those people to live in’. As such the MTS tasks TfL with taking a ‘Healthy Streets approach’ at the heart of all its decision-making.
- 4.8 The Air Quality and Environment Programme is one of the TfL investment programmes which will deliver the Mayor’s Healthy Streets approach. The Air Quality and Environment Programme focuses on delivering the ‘cleaner air’ element of the Healthy Streets approach. The Healthy Streets Programme focuses on optimising the efficiency of the transport network, improving transport’s impact on the environment, supporting the economy and helping people to live more active, healthier lives. The Assets Programme contributes to the Healthy Streets approach by protecting and maintaining Health Streets benefits and preventing them from being eroded over time, for example, maintaining the condition and ride quality on Cycle Superhighways. These

Programmes were presented to the Committee in March 2017 and June 2017 respectively. The Public Transport Programme contributes to the Healthy Streets outcome by providing more efficient use of road space. This Programme will be presented to the Committee at its meeting on 12 December 2017.

5 Proposal

- 5.1 The preferred option is to deliver the full scope of the Programme as described in Table 5.1 (included in Part 2). The table provides the following information on each discrete project and annualised programme:
- (a) activity – the name of the project or sub-programme that make up the Air Quality and Environment Programme;
 - (b) description – a description of the purpose and the type of works involved;
 - (c) financial authority – the funding that has been allocated for each project in the TfL Business Plan; and
 - (d) authority request – the authority that is being requested from the Committee in this paper – this covers proposed expenditure in 2017/18 to 2020/21.
- 5.2 It should be noted that while the authority request relates to multiple financial years the Programme will return to the Committee every year for authority. The rolling authority reflects the need to continually flex the Programme based on emerging risks, opportunities and constraints.
- 5.3 The Committee will be updated on a quarterly basis on progress with the projects and programmes described in Table 5.1 (included in Part 2). Further details of the authorities sought and the financial implications are set out in Section 8.

Benefits (and Value)

- 5.4 The benefits and value of the Programme will be monitored and reviewed by the Air Quality and Environment Programme Board and sub-boards (programme governance is described in the following section).
- 5.5 We already have a monitoring and project benefits evaluation programme used to measure air quality and emissions in London, including:
- (a) the London Atmospheric Emissions Inventory (LAEI), which contains estimates of key pollutants (NO_x, PM₁₀, PM_{2.5} and CO₂) for the base year 2013 and projected forward to 2020, 2025, and 2030;
 - (b) constant monitoring of London's air quality at around 100 different locations. These sites are operated and funded by London boroughs; and
 - (c) the London Energy and Greenhouse Gas Inventory (LEGGI), which contains estimates of energy consumption and carbon dioxide equivalent (CO₂e) emissions from homes, workplaces and transport within the Greater London area.

- 5.6 We will build on these existing tools to develop a comprehensive benefits evaluation programme for the Air Quality and Environment Programme.
- 5.7 Projects will also be required to provide a plan of benefits expected over time and set indicators to demonstrate success. This will enable the Air Quality and Environment Programme to assess the success of the projects in delivering against expectations, and to assess the action necessary to ensure the achievement of the strategic outcomes.
- 5.8 The Air Quality and Environment Programme Benefits Management approach is based on the learning from the Healthy Streets Programme benefits management and consists of:
- (a) a consistent benefits management process, which includes mandatory post-project benefit reviews;
 - (b) a benefit measures dictionary to ensure consistent use of benefit measures across the Programme, enabling effective benefit aggregation and validation;
 - (c) development of a Programme level benefits map which will show dependencies between benefits and dis-benefits;
 - (d) development of an Air Quality and Environment Benefits Management Strategy;
 - (e) analysis of the relative benefit contribution of the individual projects within the Programme; and
 - (f) regular benefit reporting at project and Programme level, and reviews of benefit delivery against the plan.

Impact of the Air Quality and Environment Programme activities

- 5.9 NO_x emissions reductions have been modelled for the activities in the Air Quality and Environment Programme that result in a quantifiable change in vehicle emission standards. The Programme investment is forecast to lead to a reduction in NO_x emissions from road transport in Greater London of some 5,300 tonnes, or around 38 per cent of forecast total road transport NO_x emissions without any activities. As seen in figure 1, this breaks down into a number of individual activities that can be summarised as central ULEZ and the subsequent expansion of that zone. For central ULEZ, the combined package of measures will deliver up to 50 percent reduction in NO_x emissions from road transport in 2020. By expanding the zone London-wide for heavy vehicles in 2020 and to inner London for light vehicles in 2021, we anticipate reductions in NO_x emissions from road transport of approximately 20 per cent in outer London and approximately 30 percent in inner London³.

³ Central London cover the area up to the Inner Ring Road (the Congestion Charge zone). Inner London covers the area between the Inner Ring Road and the North and South Circular Roads. Outer

5.10 The baseline 2020 modelling has been updated since the original 2014 ULEZ consultation to take account of updated COPERT4 emissions factors for road vehicles, updated traffic growth factors to ensure consistency with the MTS reference case and revised Heathrow Airport layout. Emissions factors for Euro 6 diesel cars and Euro 5 and 6 diesel vans have increased to recognise higher real world driving emissions than original type approval laboratory testing. The impact of these changes means that forecast concentrations for 2020 have increased compared to those presented within the London Atmospheric Emissions Inventory 2013. This explains why NO_x reduction measures will be different for the Air Quality and Environment Programme activities than those presented for consultation in recent years.

AQEP activity		NO _x emissions reduction (tonnes)	Overall NO _x percentage reduction
Central ULEZ	Euro VI bus fleet (Central ULEZ)	1,530	Up to 50% in central
	Central ULEZ 2019*	445	
	Taxi initiatives**	450	
Expanded ULEZ	Heavy vehicle London-wide ULEZ - Euro VI bus fleet (expanded retrofit)	1,830	Up to 20% in outer
	Heavy vehicle London-wide ULEZ 2020*** - HGV and coach	800	
	Inner London ULEZ 2021**	220	Up to 30% in inner
Total		5,270	

* tonnage saving for ULEZ 2019 is whole benefit of the scheme, not just bringing it forward

** ZEC taxi uptake assumes 9000 vehicles or 45% of the vehicle-km are petrol Euro 6

*** expanded ULEZ figures are indicative and are only benefits from within the zone

Figure 1: Quantifiable NO_x emissions reductions for Air Quality and Environment Programme activities, 2020

5.11 The diagram in figure 2 below shows the impact of this investment compared against the baseline.

London covers the area between the North and South Circular Roads and the Greater London Authority boundary.

⁴ COPERT is a worldwide software package use to calculate air pollutant and greenhouse gas emissions from road transport.

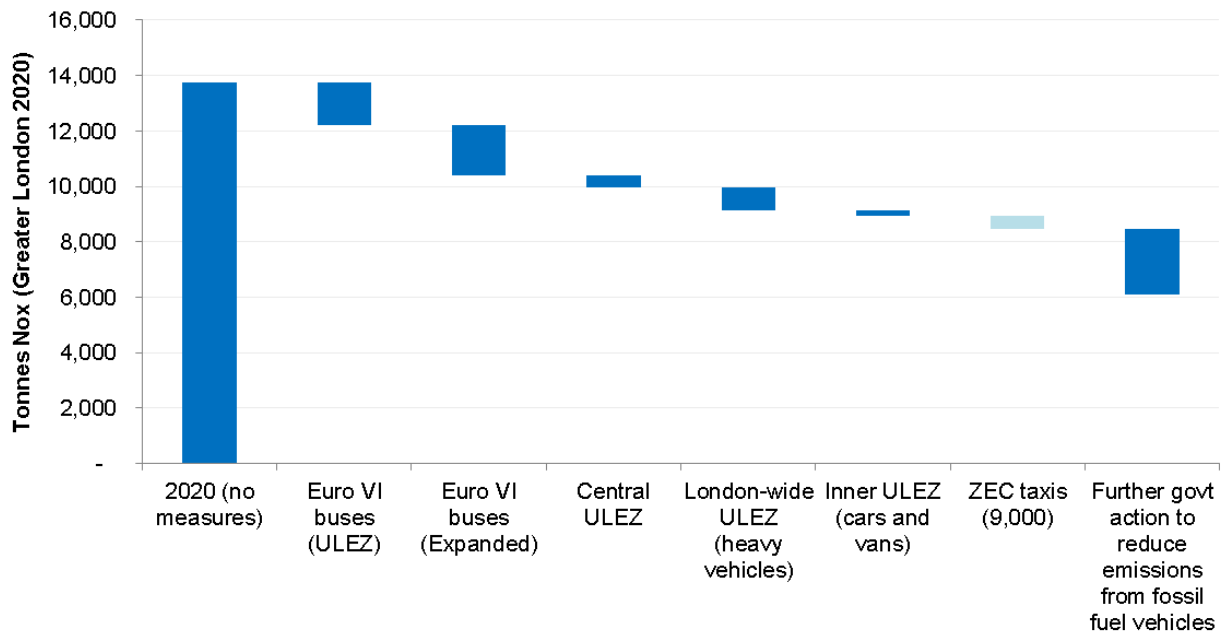


Figure 2: Road transport NOx emissions reduction arising from Air Quality and Environment Programme investment.

5.12 As per figure 2, further government action is required to reduce emissions from fossil fuel vehicles to meet the Mayor’s ambitions. The Mayor has lobbied the Government to include a number of key measures in the national draft Air Quality Plan which would benefit London, including a targeted scrappage fund for diesel cars, vans, minibuses and taxis; amending pro-diesel taxes such as vehicle excise duty, company car tax; and accelerating the uptake of electric vehicles and charging infrastructure⁵.

5.13 TfL has commissioned NO₂ concentrations modelling which will identify the extent of emissions reduction required to achieve compliance with NO₂ legal limits as early as 2020.

Air Quality and Environment Programme Governance

5.14 Programme governance will be managed in line with Standing Orders. The governance structure for the Programme includes a well defined hierarchy of boards (covering projects and sub-programmes) with consistent terms of reference, clear accountabilities and authorities, and coordinated meeting cycles. These boards will monitor and review delivery progress and either take or escalate decisions (for example on costs, risks, milestones, priorities and policies) as defined in their terms of reference.

⁵ Mayor of London’s response to Government’s consultation on draft Air Quality Plan https://www.london.gov.uk/sites/default/files/gla_response_to_defra_aq_plan_final_for_submission_15_june_2017.pdf

6 Equality, Diversity and Inclusion

- 6.1 The Programme will be delivered in accordance with the Equality Act 2010. Equality Impact Assessments are considered on all strategies, policies, business plans, change programmes or projects, having regard to our obligations under the public sector equality duty in section 149 throughout the delivery of the Programme.
- 6.2 As projects progress through feasibility and design, consideration will be given to the need for an Equality Impact Assessment for each one. Possible effects on people with protected characteristics under the Equality Act 2010 (such as age, race, sex, and, often of particular relevance, disability), and mitigations of and countervailing considerations in respect of any adverse effects, will be considered and recorded.

7 Legal Implications

- 7.1 The measures proposed in this report for inclusion in the Air Quality and Environment Programme are consistent with the Mayor's and TfL's duty to bring about compliance with legal limit values for pollutants (NO₂ in particular) as soon as possible and in the manner most likely to achieve that objective. The proposed changes to the ULEZ (commencement in central London in 2019, expansion of emission standards Londonwide for heavy vehicles by 2020 and to Inner London for all vehicles by 2021) are to be brought forward by a series of phased public and stakeholder consultations on the proposals and associated variation orders to implement by making the necessary changes to the relevant road user charging scheme⁶. The outcome of the consultations will be reported to the Mayor in due course and he will be asked whether to confirm the variation orders, with or without modification.
- 7.2 Following further engagement, TfL put forward revised taxi and Private Hire Vehicle (PHV) licensing proposals for public and stakeholder consultation from 1 July 2015 to 25 August 2015. On 30 September 2015, the Mayor endorsed the taxis and PHV licensing proposals put forward in the second consultation and modified in respect of PHVs following the consultation.

8 Authorities Sought

- 8.1 A significant number of projects within the Programme are in flight and as such have existing Project Authority for 2017/18 and in some cases extending beyond. Programme and Project Authority provided by the Committee will extend that Authority to all projects within the Programme set out in Recommendation section 2.1 (a).
- 8.2 The Air Quality and Environment Integrated Assurance Plan 2017/18 sets out a programme of assurance reviews of projects within the

⁶ The Greater London Low Emission Zone Charging Order 2006 as amended.

Programme. Assurance review recommendations will be used to support requests for Programme and Project Authority endorsements by the Air Quality and Environment Programme Board. Funding will be released to projects once the Programme Board endorses the Programme and Project Authorities for individual projects.

- 8.3 The Committee is requested to approve budgeted Project Authority of **£202m** comprising:
- (a) £66m to undertake all Air Quality and Environment Programme activities during the financial year 2017/18;
 - (b) £105m to undertake all Air Quality and Environment Programme activities during the financial year 2018/19; and
 - (c) (a maximum of) £30m to undertake all Air Quality and Environment Programme activities for any project stage that is planned to commence in 2017/18 but which may extend into subsequent years.
- 8.4 The rationale behind the Authorities requested in this paper is to ensure that projects within the Programme have sufficient Authority for the current year and next year and for any stages of the project that commence in the current year but which may extend into the following years.

Financial Authority

- 8.5 TfL's Business Plan (approved by the Board on 15 December 2016) sets out our plans for the transport network over the five years 2017/18 to 2021/22 and provides the Financial Authority needed to deliver the scope of work set out in this paper. The 2017 business plan process is in flight and through this process we will be managing the risk to the current plan whilst meeting the Mayor's Transport Strategy requirements.
- 8.6 Further detail on the programmes making up the Air Quality and Environment Programme is included in the supplemental exempt material attached to Part 2 of the agenda (a summary is provided in Table 5.1 of the exempt paper with additional detail in the Part 2 appendix).

Financial Implications

Table 8.1: Summary of the costs and funding

Cost and Funding Breakdown								
Air Quality & Environment Portfolio								
Gross Costs Rounded to £m		2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	TOTAL
Portfolio Total		68	123	74	91	75	2	433
Over- programming and Value Engineering		-2	0	0	0	0	0	-2
Budget or Plan	TfL element	38	93	130	75	40	N/A	375
	Third party funding	7	7	6	4	0	0	24
Surplus / (Shortfall) v BP 2016		21	23	-62	12	35	N/A	30
Project Authority	TfL element	60	58	11	7	-	-	136
	Third party funding	6	10	9	3	-	-	29
	Total Request	66	105	20	10	-	-	202
Future Authority Requests			18	54	81	75	2	229
PIC is requested to approval full Project Authority, noting that PIC have already seen and approved some projects								

8.7 Savings are being sought within the Programme to absorb the shortfall in funding for 2017/18 and onward years.

Cost Estimation and Risk

8.8 The approach to cost estimation and the level of cost certainty varies between projects. Influencing factors include the relative maturity of each project (reflected by the Stage Gate) and the relative risk associated with estimating errors (which is likely to reflect the cost used for planning purposes and also the ownership of risk).

8.9 Each project is required to actively manage risks by identifying and as far as possible mitigating them. Part of active risk management involves ensuring that adequate financial provision is made to either fund mitigating activity, for example to keep delivery on track or to cover any additional costs that may be incurred in the event that mitigation is not achievable.

8.10 For immature projects, risk may simply be calculated as a percentage of base cost. As projects develop, scope is firmed up and designs mature and a

detailed risk register will be developed and a Quantified Risk Assessment produced. Most projects will hold risk at P50. Risk provision can be made at a higher level in exceptional circumstances but the decision will be made and the risk held centrally under the authority of the Chief Financial Officer.

- 8.11 The authority requested contains an appropriate level of risk provision for each project. While there will be a risk register for the Air Quality and Environment Programme, there will not be any strategic risk budget. All risk will be held at the project or sub-programme level and, in accordance with agreed governance arrangements, will be approved for drawdown at Project Board or Programme Board level depending on value.

Over-Programming

- 8.12 The Air Quality and Environment Programme includes £2m of over-programming in 2017/18. This level of over-programming reflects TfL's experience with air quality and environment programmes.
- 8.13 Over-programming will be managed by the Air Quality and Environment Programme Board.

Value Engineering

- 8.14 The objective of value engineering is to optimise how project outcomes and products are delivered and how they deliver benefits. These savings are being actively pursued across the Programme. We intend to set the Programme a target to save 10 per cent through value engineering, and this will form part of the development of the Programme.
- 8.15 In the event that the full value engineering savings do not materialise, then 2017/18 priorities will be reviewed and the Programme Board will agree which are to be deferred to 2018/19.

Commercial

- 8.16 The Programme utilises a combination of existing contracts with suppliers and new contracts specifically procured under the programme, with the key items set out below. There is no all-encompassing procurement which covers the whole of the programme. Full details of the procurement approach for each project is included in Appendix 1.

Operating Costs and Income

- 8.17 Under the Programme there are three projects classed under the vehicle compliance zone that once live will generate a revenue stream. The most prominent for this approval is Ultra Low Emission Zone Central which is due to start in April 2019 subject to consultation. This is forecasted to generate annual net revenues of between £20m to £30m.

9 Assurance

- 9.1 TfL Project Assurance conducted an Integrated Assurance Review (IAR) on the Air Quality and Environment Programme in September 2017.
- 9.2 There were no critical issues identified through the IAR. An agreed Integrated Assurance Plan (IAP) for the Programme has been produced under the Programme Review.

List of appendices to this paper:

Exempt supplemental information is provided in the paper and appendix (Business Plan Composition Detail) on Part 2 of the agenda.

Appendix 1: Procurement Approach

Appendix 2: Strategic Narrative

List of background papers:

IIPAG and PMO Reports

Management response to IIPAG and PMO Reports

Programmes and Investment Committee Healthy Streets Programme, 8 March 2017

Programmes and Investment Committee Surface Assets Programme, 28 June 2017

Contact Officer: Leon Daniels, Managing Director Surface Transport and
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Appendix 1: Procurement Approach

Emissions Surcharge

Emissions Surcharge is being delivered via a variation to the existing Congestion Charging (CC) and Low Emission Zone (LEZ) contracts, which encompasses two contracts: Business Operations Services Agreement (BOPS) and Enforcement Operations Services Agreements (EOPS). This contract runs to September 2021 and allows for variation for new services. A fixed price was agreed with Capita – the existing service provider – in June 2016. This will enable Capita to make the required changes to the ‘back office’ system and ‘front office’ service operation to allow detection of applicable vehicles and payments to be processed.

Rapid Charge Network

The Rapid Charge project has put in place a new 'Rapid Charge Point Concessions' framework which includes numerous suppliers of rapid charge point equipment. The contract was awarded in April 2017. In addition to this Rapid Charging will utilise the existing TfL LOHAC (London Highways Alliance) contracts for minor civils works required in the installation of charge points and also utilise UK Power Networks for the provision of power.

ULEZ

The new ULEZ scheme will also be delivered via a variation to the existing Congestion Charging (CC) and Low Emission Zone (LEZ) contracts, which encompasses two contracts: Business Operations Services Agreement (BOPS) and Enforcement Operations Services Agreements (EOPS). This contract runs to September 2021 and allows for variation for new services. A fixed price will be agreed with Capita in December 2016. This will enable Capita to make the required changes to the ‘back office’ system and ‘front office’ service operation to allow detection of applicable vehicles and payments to be processed.

In addition we will vary our contract with Siemens for the upgrade of the image processing system required due to the increased volumes of image captures that the new ULEZ scheme will bring. We will also utilise the LOHAC contracts for the provision of on street signs and lines, which will inform customers of the scheme.

Extend ULEZ North/South and LEZ 2020

We are still considering options for the delivery of these schemes.

Go Ultra Low City Scheme (GULCS)

TfL are partnering with London Councils and the GLA to deliver GULCS as a consortium. This is funded by the Office of Low Emission Vehicles. The Crown Commercial Services (CCS) framework will be used for the provision of suppliers for boroughs to install the charging infrastructure to be installed in residential areas.

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Appendix 2: Air Quality and Environment Programme – Strategic Need for Air Quality and Environment Investment

Background

The Mayor committed to making London a cleaner and greener city in his election campaign. In May 2016, following his election, he announced a series of new proposals on air quality and emissions reduction that goes further than previously committed measures. This includes the introduction of a £10 T-Charge on the Congestion Charge from October 2017; introducing the Ultra Low Emission Zone earlier in central London and expanding the zone London-wide for heavy vehicles in 2020 and to the North and South Circular Roads for light vehicles in 2021; extending the Euro VI bus retrofit programme; developing a detailed proposal for a national diesel scrappage scheme for implementation by national government; and implementing 12 Low Emission Bus Zones outside central London.

London's air has improved significantly in recent years and is now considered compliant for all air pollutants for which the European Union (EU) has set legal limits (called 'limit values'), with the exception of nitrogen dioxide (NO₂), where there are widespread exceedances. At high concentrations, NO₂ causes inflammation of the airways. Long-term exposure is associated with reduced lung development in children and with an increase in symptoms of bronchitis in asthmatic children.

The map of modelled NO₂ concentrations below illustrates the geographical extent of the problem where yellow and red highlights areas in excess of the limit value as well as the strong influence of road transport.

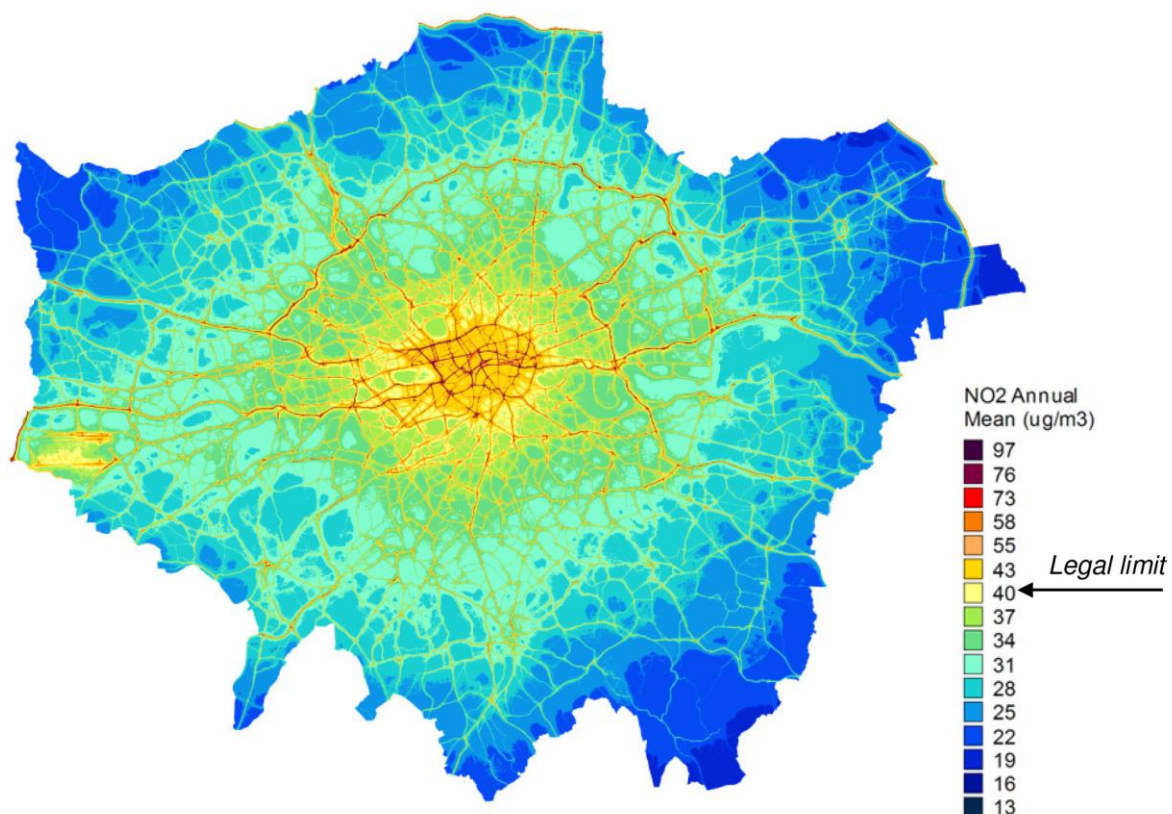


Figure 3: Concentrations of annual average NO₂ in 2013 (London Atmospheric Emissions Inventory 2013)

The other pollutant of concern is particulate matter (PM), which can harm the human respiratory and cardiovascular systems. Long-term exposure to very small particles increases the risk of early death from diseases of the heart and lung. Research shows that particles with a diameter of 10 microns or smaller (PM₁₀) are likely to be inhaled deep into the respiratory tract. The health impacts of particles with a diameter of 2.5 microns or smaller (PM_{2.5}) is even more significant as smaller particles can penetrate even deeper and can cross into the bloodstream. In addition to the long-term impacts, short-term exposure to high levels of air pollution increases the risk of hospital admissions for heart and lung conditions, and worsens the symptoms and severity of asthma.

In 2015, the Greater London Authority (GLA) published an assessment of the combined health impacts of long-term exposure to PM_{2.5} and NO₂¹. This assessment found that, on average, if a baby born in London in 2010 was exposed to that same level of air pollution for its life, they would be expected to die around two years earlier than if they had not been exposed to air pollution. Children are especially sensitive to harm and air pollution can affect their lung development, leading to an increased risk of ill health later in life. A six-year study found that children living in highly polluted parts of London have up to 10 per cent less lung capacity than normal². However, there is also some evidence that damage to children's lungs can be reversed if air quality improves; strengthening the case for urgent action³.

Worldwide, the scientific evidence for other health impacts related to air pollution is growing. A recent study found an association between air pollution and dementia⁴ whilst another reported an association between high levels of exposure to NO₂ in pregnancy and a higher risk of birth defects⁵.

London is now broadly compliant with legal limits for PM₁₀ and annual mean concentrations of PM_{2.5} are also well within the legal limit value of 25ug/m³. Although compliance has officially been achieved, further reductions in PM concentrations will bring about further health benefits, especially for PM_{2.5}, for which there are no safe limits. London does not meet levels for PM_{2.5} recommended by the World Health Organisation (WHO).

Emissions from road transport are a major contributor to poor air quality in London. In 2013, they accounted for 50 per cent of all sources of emissions of oxides of nitrogen (NO_x, which forms NO₂ in the atmosphere) in London. London is projected

¹ <http://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/understandinghealth-impacts-air-pollution-london>

² <http://sro.sussex.ac.uk/56496/>

³ <http://www.nejm.org/doi/full/10.1056/NEJMoa1414123>

⁴ [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(16\)32399-6/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)32399-6/abstract)

⁵ <http://med.stanford.edu/news/all-news/2013/03/air-pollutants-linked-to-higher-risk-of-birth-defectsresearchers-find.html>

to comply with NO₂ legal limits by 2025. However, the Mayor is clear that this is not ambitious enough and wants to go further to improve London's poor air quality, making it vital to take additional action to clean up London's air.

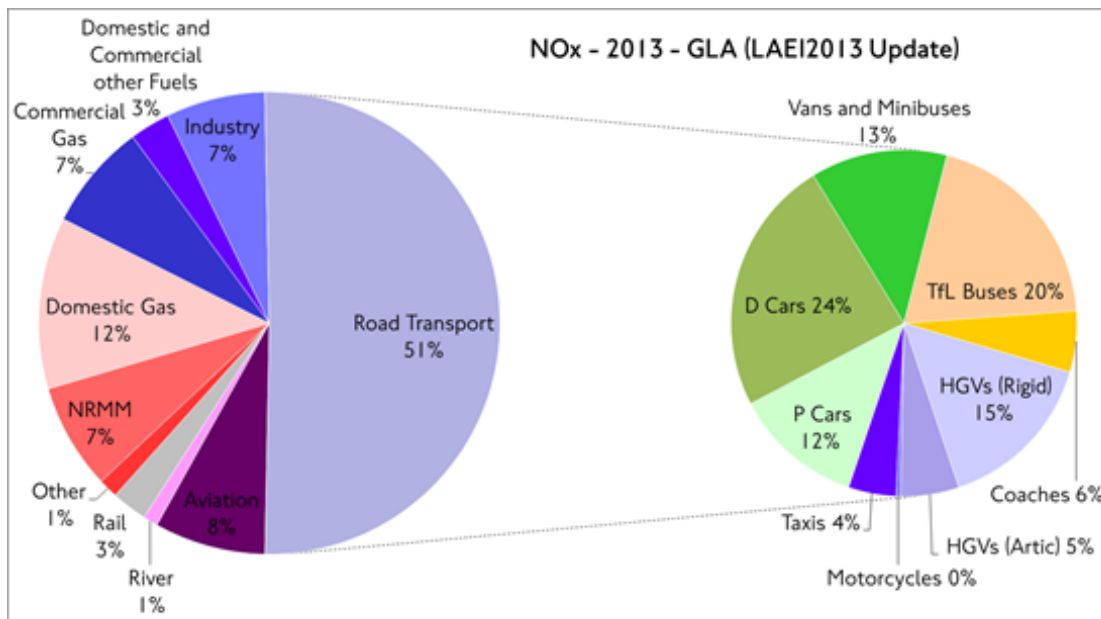


Figure 4: NOx source apportionment in Greater London in 2013 (London Atmospheric Emissions Inventory 2013)

Under the most recent government plans, London will not comply with legal limits for NO₂ until 2025, 15 years after the original deadline and will exceed WHO levels for PM_{2.5} until well after 2030.

The draft Mayor's Transport Strategy (MTS), published in June 2017, sets out the Mayor's vision that *London's transport network needs to contribute to the meeting of legal air quality levels as soon as possible and the achievement of a zero carbon city by 2050, thereby protecting the health of Londoners and demonstrating a commitment to tackling climate change.* The Air Quality and Environment Programme investment is spread across five key activities to support this, as set out in the sections below.

Air Quality and Environment Programme Activities

Mayor's Air Quality Fund

The Mayor's Air Quality Fund is a £20m fund, over ten years, to support new projects by London boroughs to improve air quality. The second round of funding awarded £5m to projects commencing in April 2015. In addition, five boroughs were awarded £1m each to deliver their Low Emission Neighbourhood (LEN) proposals, with further match funding from the boroughs. A LEN is a package of measures in a defined area to create a measurable reduction in emissions and improve communities. The LENs will be in operation by January 2019.

TfL Fleet Compliance

In 2013 TfL buses were responsible for 20 per cent of road transport NOx emissions.

We have taken significant steps to reduce air pollution from our bus fleet with the introduction of the Londonwide Low Emission Zone (LEZ). The LEZ scheme was successful in bringing forward compliance in London with PM legal limits. The most recent tightening of the LEZ standards to Euro IV for NOx was introduced for TfL buses only in 2015 in the absence of a national NOx abatement equipment certification and testing scheme. All buses in Greater London now meet at least Euro IV standards for NOx.

To support the ULEZ, in addition to all buses meeting Euro VI, all double-decker buses operating in the Congestion Charging zone will be hybrid electric vehicles from September 2019 and all single-decker buses in the zone will emit no pollutants from their engine exhaust by September 2020. The Mayor has also committed to purchasing only electric or hybrid double deck buses from 2018.

TfL's costs for achieving ULEZ compliance with its fleets are mostly associated with upgrading new buses with better emission standards sooner than would happen under business as usual.

We are also delivering a number of other air quality initiatives to cut tailpipe emissions from the bus fleet, including implementing up to 12 Low Emission Bus Zones (LEBZ) across London – tackling the worst pollution hotspots by concentrating cleaner buses on the dirtiest routes. All LEBZ will be delivered between now and summer 2019 and only Euro VI buses (or better) will be travelling along these corridors, through fleet renewal or retrofits.

Additionally, to enable the whole fleet to achieve a Euro VI standard by 2020, we have expanded the original ULEZ Euro VI retrofit programme from 800 buses to over 4,000 buses across London.

More recently the Mayor has asked TfL to have a zero-tailpipe emission bus fleet by 2037. To achieve this we would need to only procure electric/hydrogen single deck buses from 2020 and electric/hydrogen double deck buses from 2025. We are currently undertaking feasibility work to understand the cost and delivery impacts of this proposal, as well as engaging with manufacturers on the developing technology.

Vehicle Compliance Zone

Diesel vehicles, other than TfL buses, are responsible for around 70 per cent of Greater London's road transport NOx emissions, with diesel cars responsible for 24 per cent, HGVs 15 per cent, vans and minibuses 13 per cent and coaches six per cent. Petrol cars are also a significant contributor, responsible for around 12 per cent of NOx emissions. Requiring vehicles to meet tighter emission standards to discourage the use of the most polluting vehicles will therefore reduce harmful NOx and PM emissions.

The Ultra Low Emission Zone (ULEZ) was confirmed by the previous Mayor in March 2015, following a statutory consultation which ran from October 2014 to January 2015. Overall, the majority of respondents recognised the importance of improving air quality in London and supported the ULEZ proposals. There was also strong support at this time for expanding the zone and tightening the standards.

ULEZ will require motorcycles, cars, vans, minibuses, buses, coaches and heavy goods vehicles (HGVs) to meet emission standards to travel in the Congestion Charge zone in central London or pay a daily charge. ULEZ will operate 24 hours a day, 365 days a year. The required emission standards are Euro 3 for motorcycles, Euro 4 for petrol vehicles, Euro 6 for diesel cars, vans and minibuses and Euro VI for buses, coaches and HGVs. The daily charge for non-compliant vehicles is £12.50 for motorcycles, cars, vans and minibuses and £100 for buses, coaches and HGVs, in addition to any relevant Congestion Charge and Low Emission Zone charge.

There are limited discounts and exemptions to the scheme to ensure maximum emissions reductions are achieved. Taxis are exempt but emissions reduction will be achieved through new licensing requirements and financial incentives to remove older vehicles from London (see below). Residents of the Congestion Charge zone and drivers of vehicles adapted to transport disabled people (disabled tax class) will be given additional time to meet the emissions standards with a 100 per cent discount.

The objectives for the ULEZ are derived from the previous Mayor's Transport Strategy, Air Quality Strategy and Climate Change Mitigation and Energy Strategy and will be included in the new versions of these strategies currently in development. The benefits are derived from the evidence and consultation used to develop these strategies, as well as the evidence base, impacts assessment, stakeholder engagement and feasibility work used to develop the ULEZ proposals⁶.

ULEZ will require changes to TfL services and operations, including upgrades to TfL buses and changes to bus contracts in order to comply with the ULEZ standards. All TfL and the wider GLA family support fleets must comply with the ULEZ standards (see section above).

The costs for TfL associated with ULEZ relate to one off costs of developing the scheme and setting up the required infrastructure and systems design to operate and enforce it. Following scheme implementation, there are annual costs of operating the scheme as well as effects it has on TfL's revenue income. There is also an associated cost of compliance for individuals and businesses upgrading vehicles or paying the daily charge.

⁶ See *Supplementary Information, Integrated Impact Assessment (IIA) Summary Report* and individual impact assessment reports prepared for consultation in October 2014 at <https://consultations.tfl.gov.uk/environment/ultra-low-emission-zone/>.

The primary benefit of the ULEZ scheme will be a reduction in emissions of NO_x, and consequently a reduction in concentrations of NO₂ with less associated damage to human health. The NO_x emission reduction, and other associated emissions reductions, particularly PM₁₀ and greenhouse gases, can be monetised. As a consequence of the way the scheme will be implemented, with a charge for non-compliant vehicles, there will be further benefits (and disbenefits) arising from changes in journey times, the payment of charges, and inconvenience due to having to change behaviour.

The introduction of the ULEZ in 2020 was estimated to reduce NO_x emissions in 2020 by 49 per cent in central London, equating to 324 tonnes of NO_x. There would be some wider benefits due to cleaner vehicles also travelling in inner and outer London with an estimated reduction of 18 per cent and 10 per cent respectively. The introduction of the ULEZ in 2020 in central London was estimated to have a total monetised benefit of £75m in the 2020/21 financial year, taking into account both monetised benefits arising from reductions in NO_x and CO₂ emissions and disbenefits arising from the cost of paying the charge or inconvenience/ reduced levels of activity.

ULEZ will also have qualitative benefits. People living in deprived areas are disproportionately affected by air pollution as these areas tend to be located nearer to sources of air pollution, with the poorest areas tending to have poorer than average air quality⁷. In addition to this, people from socio-economically deprived backgrounds tend to live more commonly along main roads than those who are financially better off. An improvement in air quality will provide benefits for deprived areas and for those living alongside main roads with high exposure to pollutants.

An equalities impact assessment was prepared for the 2014 ULEZ consultation as part of the IIA where it identified long term positive impacts of the ULEZ on young and elderly populations, and to pregnant women, who are all the most vulnerable to the negative impacts of poor air quality. However at the same time, it also identified disproportionate impacts on BAME owned small and medium sized enterprises (SMEs) in the retail sector in central and inner London and potential increased costs of school trips to central London.

Overall, the introduction of the ULEZ in 2020 was estimated to deliver significant air quality improvements for central London as well as inner and outer London with associated health benefits and improved quality of life of everyone visiting, working in or living in London but in particular for those exposed to higher levels of pollution such as those living alongside main roads. This must be taken into account when considering the overall EFC of the scheme and whether the ULEZ is the best use of limited funds available. The BCR of the scheme at 1.40:1 represents a good investment for TfL.

⁷ www.sasi.group.shef.ac.uk/publications/2003/mitchell_and_dorling_air_quality.pdf

The current Mayor announced his plans to introduce ULEZ earlier in central London and expand the zone Londonwide for heavy vehicles and to the North and South Circular Roads for light vehicles. The Mayor engaged the public on his plans in July 2016 with a consultation hosted on the Talk London website. The Mayor's proposals are to be brought forward by a series of phased public and stakeholder consultations on the proposals and associated variation orders to implement by making the necessary changes to the relevant road user charging scheme⁸. The outcome of the consultations will be reported to the Mayor in due course and he will be asked whether to confirm the variation orders, with or without modification.

The three schemes are considered below.

Central ULEZ in 2019

A statutory consultation on the early introduction of ULEZ in central London in April 2019 was held from April to June 2017. At the time of writing TfL is preparing a report for the Mayor on the outcome of the consultation.

The analysis of vehicle impacts found that an earlier introduction of the ULEZ would mean Londoners experience its emissions and health benefits sooner. As a result of implementing the ULEZ in central London sooner, road transport emissions in the area are expected to reduce by an additional 20 per cent in 2019 (this is in addition to reduction in emissions already forecast in the baseline for 2019 as a result of people pre-complying with the original ULEZ starting in 2020). Overall, the NOx emissions savings in central London would be 30 per cent in 2019.

NOx emissions from HGVs are expected to reduce by nearly 50 per cent, whilst coach and non-TfL bus emissions will reduce by over a third. Emissions from cars and vans are expected to reduce by eight and 12 per cent respectively, and, whilst the reduction in emissions is smaller than for larger vehicles, their savings make up nearly one third of the emissions reductions of chargeable vehicles in central London.

By bringing forward the commitments for cleaner buses (to 2019 from 2020) across central London as part of the ULEZ, a further 50 per cent reduction in their emissions is expected. Areas outside of the ULEZ will also benefit from its earlier introduction, especially due to the large reductions in emissions from buses, coaches and heavy goods vehicles as a result of the much more stringent requirements needed to meet the ULEZ Euro standard of Euro VI.

The IIA for the proposal, an update on the 2014 ULEZ IIA, found there would be moderate air quality benefits Londonwide due to reduced NO₂ concentrations in 2019, with health benefits associated with an additional year of air quality benefits. It also found a minor adverse impact on some operators and businesses due to costs associated with either complying earlier with ULEZ or paying the charge. There

⁸ The Greater London Low Emission Zone Charging Order 2006 as amended.

would also be minor beneficial impacts associated with earlier reduction in average exposure to NO₂ in deprived areas and moderate beneficial impacts with an earlier reduction in the number of vulnerable people exposed to exceedances of NO₂ legal limits.

Londonwide ULEZ in 2020 for heavy vehicles

TfL is developing proposals to expand the ULEZ Londonwide for buses, coaches and HGVs in 2020. These vehicles are already subject to the Londonwide LEZ and the expanded ULEZ would use the LEZ boundary. Expanding ULEZ Londonwide would have the effect of tightening the LEZ standard for these vehicles from Euro IV for PM to Euro VI.

Inner London ULEZ in 2021 for light vehicles

TfL is also developing proposals to expand the ULEZ to the North and South Circular Roads in 2021 for motorcycles, cars, vans and minibuses. This includes defining the boundary for the expanded zone and developing strategies for sign and camera placement.

Detailed impacts assessment of the two proposals to expand ULEZ will be required, including assessment of the impacts on equalities and businesses. This work will inform the statutory consultation on the ULEZ expansion proposals which is expected to take place in autumn 2017.

Rapids and taxis

Taxis are estimated to be responsible for around 4 per cent of Greater London's NO_x emissions in 2013 and 16 per cent of NO_x and 26 per cent of PM emissions in central London. The higher contribution to emissions in central London reflects the greater mileage operated by taxis in this area.

While taxis were exempted from the ULEZ scheme, new licensing requirements were agreed for taxis to reduce emissions from the fleet and increase the number of vehicles capable of operating with zero emissions. From 1 January 2018, new diesel taxis will no longer be licensed and taxis new to licensing will need to be zero emission capable (ZEC). While private hire vehicles (PHVs) are subject to ULEZ, new licensing requirements will also be introduced for PHVs to reduce emissions from the fleet. From January 2018 newly licensed PHVs will be required to meet the Euro 6 standard (Euro 4 for petrol hybrid), with ZEC requirements being introduced for new vehicles licensed for the first time as a PHV from January 2020 and for all vehicles licensed as a PHV for the first time in January 2023.

The taxi age limit of 15 years remains but drivers will be encouraged to remove their 10 to 15 year old diesel taxis from London licensing with the introduction of a taxi delicensing scheme in July 2017. This provides payments of up to £5,000, depending on the age of the vehicle, to drivers who choose to surrender their London taxi vehicle licence and plate. Once surrendered, the taxi cannot be licensed in London again. TfL has funding of £42m which will enable up to 10,000 older taxis to be removed from London.

To help taxi and PHV drivers purchase a new ZEC vehicle, grants will be available from the Office for Low Emission Vehicles. Up to £7,500 will be available for ZEC taxis and up to £4,500 available for other ultra low emission vehicles, depending on the zero emission range of the vehicle. TfL and OLEV have committed to making the national plug-in taxi grant available for the first 9,000 ZEC taxis purchased by London drivers to 2020.

The ZEC licensing requirement for taxis is forecast to deliver 9,000 ZEC taxis by 2020 out of a fleet of around 21,000 vehicles. However, this is dependent on the financial support set out above and assumes sufficient charging infrastructure is in place. Achieving this target (or the equivalent kilometres driven) would reduce NOx emissions from the taxi fleet in 2020 by 45 per cent⁹. This target was set in agreement with the taxi trade during further consultation on the ULEZ scheme in 2015.

If rapid charge points are not available, drivers have indicated they would be less likely to invest in new ZEC taxis. In the worst case scenario, we can expect the licensing requirement alone to deliver 4,000 ZEC taxis by 2020 through the natural fleet replacement cycle, with a significantly smaller reduction in NOx emissions from the fleet.

There are already private hire operators in London using battery electric vehicles. These operators have told TfL that a lack of rapid charging infrastructure, including a lack of rapid charge points in convenient sites, is one barrier to the expansion of their fleets.

There are around 30 rapid charge points currently operational in and around Greater London. However, only a small number are located near to central or inner London and many of these rapid charge points are often out of service.

TfL undertook market engagement on the means by which a rapid charge point network could be delivered in London. This indicated there was private sector interest in financing the development and operation of rapid charge points. However it identified two key barriers the expansion of private provision, namely securing suitable sites for hosting the installation of charge points and the costs of upgrades to the electricity supply infrastructure. TfL's rapid charge point delivery model facilitates private sector delivery by securing sites across London on TfL, borough and private land and covering the costs of power upgrades. Rapid charge point operators, selected from our Rapid Charging Concession Framework, will finance, install, operate and maintain rapid charge points on upgraded sites. Operators on the framework have demonstrated financial security and a high level of customer service, including charge point reliability.

⁹ This figure uses the revised emissions factors for Euro 6 diesel cars and is higher than previously published estimates.

To enable taxi and PHV drivers to maximise their fuel cost savings and operate mostly in zero emission mode, TfL is working with suppliers to deliver rapid charge points across London. The first rapid charge points will be operational from late 2017 when the first ZEC taxis enter the London market. TfL has £17.8m funding¹⁰ from Government to deliver 300 rapid charge points by 2020 and aims to deliver 75 rapid charge points before the introduction of the new ZEC licensing requirements for taxis.

Our research indicates that 9,000 ZEC taxis and additional fully electric PHVs will require some 700 rapid charge points to meet demand by 2020. TfL will monitor vehicle uptake and charge point usage and will work with suppliers and seek additional sources of funding to deliver sufficient rapid charging infrastructure.

Go Ultra Low City Scheme

London was successful in winning £13m from OLEV's GULCS competition in January 2016 to provide the infrastructure and behavioural change required to deliver some 70,000 electric vehicles in the Capital by 2025. The joint bid from TfL, GLA and London Councils sought to overcome the key barriers to electric vehicle uptake in London, namely the lack of off-street residential parking and the complexity involved for boroughs in providing on-street charging infrastructure. It will also enable London's car clubs to convert their fleets to ULEVs, providing visibility and access to these vehicles and helping to normalise their use for Londoners.

The GULCS programme aims to deliver at least 2,000 on-street residential and car club charge points by 2020 through the establishment of a London-wide delivery partnership, which will provide, manage and maintain the charge points. It will also provide support for rapid charging for commercial vehicles by contributing funding to TfL's Rapid Charging Infrastructure project. Finally, six borough-led local Neighbourhoods of the Future schemes will be implemented, to encourage a switch to electric vehicles by residents and businesses by providing charging infrastructure and showcasing the benefits of the vehicles.

Emissions Surcharge

The Emissions Surcharge (T-Charge) is a £10 daily charge, in addition to the Congestion Charge, for cars, vans, minibuses, buses, coaches and HGVs that do not meet the Euro 4 emission standard and travel in the zone during charging hours. The T-Charge will be introduced on 27 October 2017 and will operate until ULEZ is introduced.

Vehicles that are exempt from the Congestion Charge, including taxis and PHVs, will not be subject to the T-Charge. Minibuses, buses and coaches with 9 or more seats

¹⁰ This funding is comprised of £10m from the National Infrastructure Plan, £5.2m from OLEV's Ultra Low Emission Taxi Scheme, and £2.6m from the Go Ultra Low City Scheme programme.

that are not subject to the Congestion Charge will be required to meet the T-Charge standard to travel in the zone in charging hours.

Residents of the Congestion Charge zone registered for the Congestion Charge residents' discount will be eligible for a 90 per cent discount on the T-Charge. This will continue to operate following the introduction of ULEZ during the period these residents are eligible for a 100 per cent discount on ULEZ.

The statutory consultation on the T-Charge was held between October and December 2016. The results showed strong support for implementing the scheme, with 64 per cent of respondents in favour of its introduction.

It is estimated that seven per cent of vehicles travelling in the Congestion Charge zone would be affected by the T-Charge, with around 40 per cent of these vehicles upgrading and seven per cent no longer travelling in the zone. This would result in emissions savings from total road transport of 1.2 per cent for NO_x and 0.2 per cent for PM₁₀ in the first year of operation. If these emissions savings from the T-Charge are delivered, they would have a cumulative monetised health benefit of £1.8m over 2017 and 2018. This is based on the damage costs per tonne of NO_x that the scheme could save.

The business case for the T-Charge is largely strategic, as it acts as a stepping stone ahead of the full introduction of the ULEZ, when tighter vehicle emissions standards will come into force. An Integrated Impact Assessment (IIA) examined the likely significant impacts of the T-Charge proposals on the environment, health, equalities and the economy. This was complementary to the full IIA carried out for the ULEZ in 2014. Overall, the assessment concluded that the T-Charge will have a minor positive impact London-wide in the short term. There were a few 'negligible negative' impacts identified, as well as one 'minor negative' impact that relates to small and medium sized enterprises (SMEs), owing to the cost of upgrading vehicles or paying the charge.

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