Using the Tax System to Encourage Cleaner Fuels:

The Experience of Ultra-Low Sulphur Diesel

HM Customs and Excise

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Foreword by Stephen Timms, MP, Financial Secretary to the Treasury

Many people and businesses rely on road transport as a vital part of their everyday lives and activity, particularly in rural areas. But road transport is also one of the main causes of local air pollution, particularly in urban areas.

Improvements in fuel quality and vehicle emission technology over the last decade have led to a 50 per cent fall in transport-related emissions, but nevertheless road transport remains a major source of the emissions that damage local air quality.

Local air pollution affects all of us. The Government is committed to tackling local air pollution and protecting people and the environment from the damage it can cause. Its health effects are greatest among the most vulnerable in our communities: children, pensioners and people suffering from respiratory and cardiovascular illness.

Since the Chancellor announced his Statement of Intent on Environmental Taxation in Budget 97, we have successfully used the tax system to achieve environmental objectives. Improving local air quality has been at the heart of our policy-making on transport taxation.

Between 1997 and 1999, the rate of fuel duty for Ultra-Low Sulphur Diesel was steadily cut relative to conventional diesel. In the space of two years, these duty differentials succeeded in converting the entire diesel market to the cleaner fuel, cutting emissions of the most damaging local air pollutants and enabling the introduction of new, pollution-reducing technology.

The ULSD experience which this paper discusses is not only a success story in its own right, but has also provided a model of how duty differentials can be used to deliver a cleaner environment.

Executive Summary

- In the Air Quality Strategy published earlier this year, the Government re-stated its commitment to improving local air quality in the UK and set challenging new objectives for reducing the impact of local air pollution.
- It also outlined the damaging health effects of local air pollution, ranging from breathing difficulties to premature death for people suffering from respiratory or cardiovascular disease.
- The Government is committed to tackling local air pollution, particularly emissions of particulates and nitrogen oxides, which are associated with damaging health effects, and of which road transport is the biggest single source.
- Compared to conventional diesel, Ultra-Low Sulphur Diesel (ULSD), which can be used in any standard diesel vehicles, offers significant reductions of particulate and nitrogen oxide emissions, and enables the introduction of new pollution-reducing engine and exhaust technology.
- In line with its 1997 Statement of Intent on Environmental Taxation, this Government has used the tax system to encourage the use of less-polluting fuels, both through duty differentials and through reforms to the Vehicle Excise Duty and company car tax systems.
- Between 1997 and 1999, the increase of the duty differential in favour of ULSD from 1p to 3p per litre persuaded oil companies to produce and supply ULSD and achieved an almost complete conversion of the diesel market in just two years – enabling the UK to meet the EC's proposed 2005 diesel standards six years ahead of schedule.
- This conversion of the market has delivered significant emissions savings, including an 8 per cent reduction in particulate emissions in urban areas, and has stimulated the development of new pollution-reducing technology by diesel vehicle manufacturers.
- The Government has used the ULSD experience as a model for its efforts to incentivise other environmentally-friendly fuels, such as road fuel gases and Ultra-Low Sulphur Petrol, which can be used in any car that currently uses unleaded petrol.

AIR QUALITY

THE GOVERNMENT'S AIR QUALITY STRATEGY

1.1 In March 1997, the first edition of the National Air Quality Strategy was published, fulfilling the requirements of the Environment Act 1995 for the Government to set out its policies for managing local air quality. The new Government endorsed this strategy in July 1997, but promised to review it at the earliest opportunity to ensure that the evidence behind the policies was as up to date as possible. This review took place in 1998, looking at ways of strengthening the 1997 Strategy to speed up improvements in local air quality. The Government consulted on its proposals in January 1999, and the new Air Quality Strategy was published in January 2000.

1.2 In it, the Government and the devolved administrations re-stated their commitment to ensure that people could enjoy a level of air quality in public places which poses no significant risk to their health or quality of life. They set out a framework for improving air quality in the UK to 2003 and beyond, setting standards and objectives for the eight major air pollutants described below. The strategy also identified what needed to be done at international, national and local level to meet these objectives, including the contributions that industry, transport and local government could make to ensure they were met.

Box 1.1: The main local air pollutants

CO – Carbon Monoxide. A gas formed by the incomplete combustion of carbon-containing fuels. The more efficient the combustion process, the lower the emissions. The main outdoor source of CO is currently road transport, particularly petrol-engined cars.

NO_X – All combustion processes in air produce oxides of nitrogen: Nitrogen dioxide (NO_2) and nitric oxide (NO) – collectively known as NO_x. Road transport accounts for about 50 per cent of total emissions, more than the electricity supply industry and the industrial and commercial sectors put together. NO_x is also a precursor of ozone, and therefore an indirect greenhouse gas.

PM_{10} – Particulates smaller than 10 microns. They consist of primary particles arising from combustion sources (mainly road transport); secondary particles (mainly sulphate and nitrate formed by atmospheric chemical reactions); and coarse particles (suspended soils and dusts, seasalt, biological particles and particles from construction work). Ultra-fine particles (smaller than 2.5 microns) are mainly primary and secondary.

SO_2 – Sulphur dioxide. In the UK, the predominant source is the combustion of sulphur-containing fossil fuels, principally coal and heavy oils. Output from road vehicles is relatively small, but combustion of fuel (especially diesel) makes a significant contribution to emission levels in urban areas.

1,3 Butadiene – A gas at normal temperatures and pressures deriving mainly from the combustion of diesel and petrol engines.

VOCs – Volatile Organic Compounds which, in sunlight, react with NOx to form ozone. Can therefore be considered an indirect greenhouse gas. Ozone measured at a particular location may have arisen from VOCs and NO_x emissions hundreds or thousands of miles away so high concentrations generally occur downwind of the source emissions, most frequently in summer, in the south, and in rural and suburban areas.

Benzene – One of the VOCs, its main atmospheric source has been the combustion and distribution of petrol, to which it has traditionally been added. New fuel standards introduced from January 2000 have set stringent limits on benzene levels in petrol.

Lead – Previously used as an additive to enhance the octane rating of petrol, most of the national airborne emissions of lead have arisen from petrol-engined vehicles, but they have declined since the phasing out of leaded petrol prior to 1 January, 2000.

THE IMPACT OF LOCAL AIR POLLUTION

1.3 The first official attempt to quantify the short-term impact of local air pollution on the health of people living in the UK was published in January 1998 by the independent expert Committee on the Medical Effects of Air Pollutants (COMEAP) for the Department of Health. It suggested that the deaths of between 12,000 and 24,000 vulnerable people may be brought forward each year in the UK as a result of local air pollution and that between 14,000 and 24,000 hospital admissions and readmissions may also result from poor air quality.

1.4 The report attributed these effects to PM_{10} (which is estimated to bring forward 8,100 deaths annually), SO_2 (3,500 deaths) and ozone (up to 12,500 deaths). COMEAP also found that each year some 8,700 of the hospital admissions for respiratory problems were caused by NO_x emissions, while PM_{10} emissions accounted for another 10,500 admissions. COMEAP are currently investigating the impact of longer term exposure to local air pollution, which some studies have found to be potentially more damaging.

Box 1.2: The health effects of the main local air pollutants

CO	**– Causes the formation of carboxyhaemoglobin, which substantially reduces the blood's capacity to carry oxygen and deliver it to key tissues and organs, and blocks important biochemical reactions in cells. People who have an existing disease which affects the delivery of oxygen to the heart or brain (e.g. angina) are at particular risk.**
NO_X	**– NO_x can have both acute (short-term) and chronic (long-term) effects on health, particularly in people with asthma – primarily due to NO_2. At relatively high concentrations, NO_2 causes inflammation of the airways, and long-term exposure may affect lung function. Also enhances the response to allergens in sensitised individuals.**
PM_{10}	**– Associated with a range of effects on the respiratory and cardiovascular systems, ranging from asthma to premature death among those with pre-existing lung and heart disease. The higher the concentration of particles, the greater the effect on health, and there is emerging evidence that the health effects of particles are due principally to ultra-fine particles ($PM_{2.5}$) – emissions of which derive mainly from road transport.**
SO_2	**– Causes constriction of the airways by stimulating nerves in the lining of the nose, throat and airways of the lung, particularly in those suffering from asthma and chronic lung disease.**
VOCs	**– Some kinds of VOCs can be carcinogenic. They also contribute to high concentrations of ozone – exposure to which may cause slight irritation to the eyes and nose and – over several hours – may damage the airway lining, causing inflammatory reactions.**
Benzene	**– A recognised genotoxic human carcinogen. Studies of industrial workers exposed in the past to high levels of benzene have demonstrated an excess risk of leukaemia which increased in relation to their working lifetime exposure.**
1,3 Butadiene	**– A genotoxic carcinogen, inducing lymphomas, leukaemias and cancers of the lymphoid system and blood-forming tissues.**
Lead	**– Exposure to high levels may result in toxic biochemical effects in humans which can affect the kidneys, gastrointestinal tract, joints, reproductive system and the synthesis of haemoglobin, and cause acute or chronic damage to the nervous system. The possible effect on brain development in children is the greatest cause for concern. There is also emerging evidence of a link between lead exposure and blood pressure.**

I.5 Air pollution also affects our natural environment. Forests, lakes, crops, wildlife and buildings can all suffer significant damage from high levels of airborne pollutants. NO_x, for instance, can be transported over hundreds or even thousands of miles before being deposited as acid rain, which can acidify soil and cause changes in species composition and biodiversity. SO_2 plays a role in damage to ecosystems, and accelerates the natural weathering and corrosion of buildings and building materials. Ozone formed by chemical reactions between NO_x and VOCs is also a long range pollutant which can damage sensitive vegetation. It has been associated with reduced yields in crops and forestry, as well as with changes in species composition and biodiversity in natural and semi-natural ecosystems.

2 ROAD TRANSPORT AND LOCAL AIR POLLUTION

EMISSIONS FROM ROAD TRANSPORT

2.1 Many people and business rely on road transport as a vital part of their everyday lives and activity, particularly in urban areas. But road transport is also one of the main causes of local air pollution, particularly in urban areas. Improvements in fuel quality and vehicle emission technology over the last decade have led to a 50 per cent fall in transport-related emissions, but nevertheless road transport remains a major source of the emissions that damage local air quality.

2.2 Table 2.1 details the contribution of road transport to emissions of some of the most significant local air pollutants. It also demonstrates that, in urban areas, the contribution of road transport to overall emissions can be considerably higher than the national emission figures suggest, especially for PM_{10} and NO_x, because of the higher concentrations of traffic.

Table 2.1: The impact of road transport on local air pollution

	Per cent of total emissions (1997)	
	National	**Urban**
Benzene	65	82
1,3-Butadiene	77	97
CO	75	97
Lead	61	not available
NO_x	48	75
PM_{10}	26	78
SO_2	2	23
VOCs	30	60

Source: Air Quality Strategy for England, Scotland, Wales and Northern Ireland, *DETR, January 2000.*

2.3 While road transport is responsible for about 26 per cent of particulate emissions of size 10 microns or less, evidence shows that the smaller the particle, the more transport contributes proportionately to its total volume of emissions. In 1996, emissions from road transport made up 31 per cent of particulate emissions 2.5 microns or less, 35 per cent of emissions 1 micron or less, and 60 per cent of emissions 0.1 microns or less. The health effects of these 'ultra-fine' particles are of increasing concern to experts as a form of local air pollution.

2.4 It is also worth noting that those people most heavily exposed to emissions from road transport are motorists themselves. In normal conditions, road users could be exposed to up to three times as much local air pollution when inside a vehicle compared to when walking or cycling by the side of the road, because they are effectively travelling in a tunnel of pollution. Pedestrians generally experience the lowest exposures of any road users but they are still exposed to much higher levels of pollution at the roadside than in normal background air conditions.

USING THE TAX SYSTEM TO ENCOURAGE CLEANER FUELS

2.5 Successive Governments have played an important part in encouraging the cuts in transport-related emissions. Duty differentials set between conventional fuels and new, less-polluting fuels have created the incentives for oil companies to manufacture these cleaner fuels and for motorists to use them. These differentials have been an increasingly significant way of encouraging cleaner fuels, ever since the introduction of a differential in favour of unleaded petrol in 1989. Sections 3 to 5 of this paper focus primarily on the way in which duty differentials were used to convert the UK diesel market from conventional diesel to cleaner, Ultra-Low Sulphur Diesel (ULSD) between 1996 and 2000.

2.6 As well as duty differentials, the Government has introduced a package of other tax measures in recent Budgets designed to reduce the tax on less-polluting vehicles and fuels. This follows the Chancellor's Statement of Intent on Environmental Taxation in Budget 97, which promised to explore using taxes together with other instruments to achieve environmental objectives:

- In January 1999, the Government introduced a Vehicle Excise Duty (VED) concession of up to £500 for buses and lorries meeting stringent particle emission standards. Vehicles can meet these standards by fitting a particulate trap, fitting a new engine to a higher standard or converting to gas. Budget 99 doubled the maximum discount to £1,000, creating a substantial incentive for bus and lorry operators to convert to a cleaner vehicle. So far, over 40,000 vehicles have qualified for this concession;
- Budget 99 announced a reduced VED rate for cars with engines up to 1,100cc, giving a £55 cut to owners of around 1.8 million smaller-engined cars, which tend to be more efficient and therefore less polluting than larger-engined models. Budget 2000 extended the reduced rate threshold to 1,200cc, benefiting the owners of a further 2.2 million cars;
- In Budget 2000, the Government also announced details of the graduated VED system which will apply to all brand new cars from March 2001, and of the new company car tax system which will come into effect from April 2002. While these new systems are primarily linked to CO_2 emission rates, both systems feature discount rates for cars which run on cleaner, alternative fuels. They also include supplements for diesel cars to reflect the fact that, while they generally have lower CO_2 emission rates per kilometre than petrol cars, diesel cars produce higher emissions of local air pollutants;
- The Government has also promised to review the treatment of diesel vehicles under the graduated VED and company car tax systems as their local air pollution emissions performance improves, creating an incentive for motor manufacturers and traders to bring forward and market new pollution-reducing technology.

3 ULSD: THE ENVIRONMENTAL BENEFITS

THE IMPACT OF CONVENTIONAL DIESEL EMISSIONS

3.1 While conventional diesel accounted for only 36.7 per cent of the total amount of fuel used in 1997, diesel vehicles had a disproportionately high impact on the emissions that affect local air quality, particularly PM_{10} and NO_x. As Table 3.1 shows, it was the single biggest source of PM_{10} emissions in 1997 and the second biggest source of NO_x after petrol.

Table 3.1: Emissions from conventional diesel

	Per cent of 1997 emissions	
	Total	**From road transport**
NO_x	22	45
PM_{10}	18	78
CO	3	4
SO_2	1	44
Benzene	4	7

Source: Air Quality Strategy for England, Scotland, Wales and Northern Ireland, *DETR, January 2000.*

THE ADVANTAGES OF ULSD

3.2 ULSD (also known as 'cleaner diesel' or 'green diesel') is designed to have lower sulphur, lower heavy hydrocarbons and lower density than conventional diesel. As a result of these changes to its composition, it produces fewer emissions of PM_{10}, NO_x, VOCs and CO during combustion. While ULSD could be used in all vehicles formerly using conventional diesel, its low sulphur content also allows the introduction of pollution-reducing equipment such as particulate traps and tail pipe catalyst technology, which would be damaged by high levels of sulphur. This equipment can reduce emissions of PM_{10}, NO_x, VOCs and CO to levels well below those offered by the use of ULSD alone. Table 3.2 shows the forecast emissions savings from 2000–2005 which will result from the introduction of particulate traps on diesel vehicles.

Table 3.2: Emissions savings from introduction of particulate traps on diesel vehicles

	Per cent saving of national annual emissions					
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
PM_{10}	0.2	0.4	0.7	0.9	1.0	1.3
NO_x	0.1	0.1	0.3	0.4	0.5	0.6

Source: NETCEN emissions model, UK Road Transport Projections, *January 2000.*

Box 3.1: The EU Auto-Oil programme

In 1993, the European Commission set up the 'Auto-Oil programme' to work with the EU oil and motor industries to identify the most cost-effective means of improving air quality across Europe. Based on their recommendations, two important Directives were adopted by the Council of Ministers in June 1998 designed to achieve improvements to vehicle technology and fuel specifications.

The first set tighter limits for emissions from cars and light vans to apply from 1 January, 2000, with even more stringent limits to come into force from 2005. The second required all petrol and diesel fuels to be manufactured to new, cleaner specifications also from 1 January 2000, and mandated the use of ultra-low sulphur petrol and diesel from 2005.

The UK has made rapid progress to meet these proposed 2005 diesel standards, with the conversion of the UK market to ULSD achieved way ahead of most other EU Member States and 6 years ahead of the EU schedule. The introduction of a duty incentive for ULSP offers a similar opportunity to be among the first Member States to meet the proposed 2005 petrol standards.

4 INCENTIVES FOR ULSD

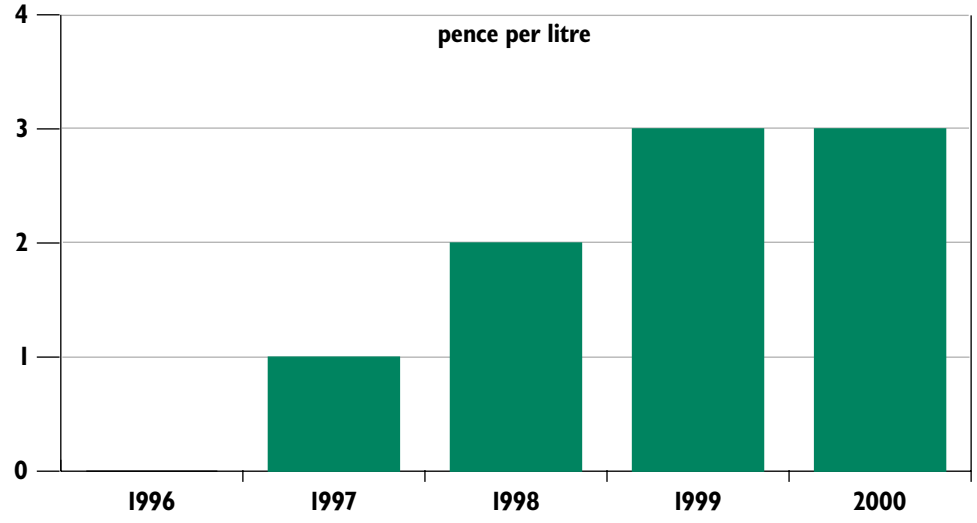
THE USE OF DUTY DIFFERENTIALS, 1996-2000

4.1 In the November 1996 Budget, the previous Government made a commitment to introduce a one pence per litre differential for ULSD over conventional diesel once agreement had been reached on the necessary EC derogation. This derogation was still pending by the time of the July 1997 Budget, but once obtained, to offset the additional production and development costs of ULSD and to encourage diesel retailers to convert the diesel sold at their pumps, the one pence differential was brought into effect on 15 August, 1997.

4.2 Budget 98 affirmed the Government's commitment to encourage all users of diesel to switch to ULSD. It also announced that the specification of ULSD would be tightened to maximise the environmental and health benefits of the differential. In order to accelerate the market conversion, and in recognition of the greater environmental benefits and production costs associated with the tightening of the specification, the Government announced that it would increase the differential between ULSD and conventional diesel to two pence per litre in 1998 and expected to widen the differential to three pence in the following Budget.

4.3 The 2 pence differential and, importantly, the Government's stated intention to increase the differential to 3 pence in 1999 began to have a dramatic impact on the supply and demand for ULSD between May 1998 and March 1999. By the time it announced the three pence differential in the March 99 Budget, the Government was confident that this further increase would convert almost the entire diesel market to ULSD by the end of the year.

Chart 4.1: Duty differential between ULSD and conventional diesel



Source: HM Customs and Excise.

THE OIL COMPANIES' RESPONSE

4.4 UK crude oil is naturally low in sulphur which allowed refining of ULSD to take place without prohibitively expensive conversion of the refining plant. Nevertheless, ULSD does still require some additional refining to reduce levels of sulphur and some benzene-based chemicals, which meant increased production costs for those oil companies converting from conventional diesel.

4.5 Almost immediately after the introduction of the one pence per litre differential in 1997, some companies, including Shell, Total, ELF, Futura and Greenergy, began supplying ULSD. However, some other oil companies felt that the one pence differential was not sufficient to offset the increase in their production costs, especially so far in advance of 2005 – when ULSD production would become mandatory. As a result, many continued to manufacture conventional diesel alone and only a relatively small number of mostly urban road-users had access to supplies of ULSD.

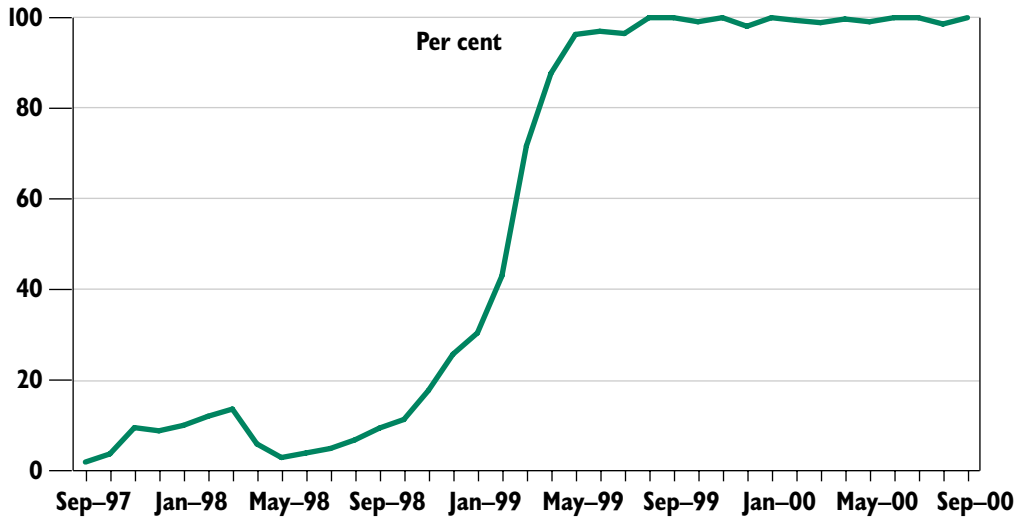
4.6 As well as wanting the environmental benefits of ULSD to be brought forward more quickly, the Government was concerned that oil companies should make uniform progress towards its production to avoid any market distortion, and that diesel-users in all parts of the country should be given the opportunity to use the cleaner fuel. These were additional factors behind the 1998 announcement of a further increase in the ULSD differential.

4.7 By the start of 1999, the number of oil companies producing ULSD had risen and most were supplying it in bulk to their urban fleet operators, but still the overall number of service stations carrying ULSD remained relatively small. However, the final increase in the differential in Budget 99 produced a dramatic effect both on the production and marketing of ULSD. By August 1999, all oil companies had begun to supply and market the fuel.

HOW THE MARKET CHANGED

4.8 Chart 4.2 demonstrates how the diesel market responded to the changes in differentials between 1997 and 1999. This shows an initially slow take-up, followed by a small dip in the first half of 1998 as oil companies adapted to the new tighter specification, and then a rapid rise from May 1999 onwards as the two pence differential began to impact on supply and demand, sustained by the three pence differential announced in Budget 99. By August 1999 – just two years after its introduction and six years before it was due to become the mandatory EU standard – ULSD had achieved almost a 100 per cent share of the UK diesel market.

Chart 4.2: ULSD share of the diesel market



Source: HM Customs and Excise.

EMISSIONS SAVINGS FROM THE INTRODUCTION OF ULSD

4.9 It has been estimated that the conversion of the diesel market from conventional diesel to ULSD over the period 1997–1999 will produce significant emissions savings in advance of 2005, when ULSD would have become mandatory under the EU Auto-Oil Directive. Tables 4.1a and 4.1b demonstrate the reductions in emissions which have resulted directly from this conversion of the diesel market, including an annual reduction of between 1.3 and 1.6 kilotonnes of PM_{10} and between 1.2 and 2.2 kilotonnes of NO_x.

Table 4.1a: Estimated direct emissions savings from the switch to ULSD

	Per cent of emissions saved from road transport, 2000 to 2004	
	National emissions	**Urban emissions**
PM_{10}	5	8
NO_x	0.5	1

Source: NETCEN emissions model, UK Road Transport Projections, *January 2000.*

Table 4.1b: Estimated direct emissions savings from the switch to ULSD

	Per cent of annual emissions from road transport saved				
	2000	**2001**	**2002**	**2003**	**2004**
PM_{10}	2.8	5.5	5.5	5.4	5.3
NO_x	0.2	0.4	0.4	0.4	0.4

Source: NETCEN emissions model, UK Road Transport Projections, *January 2000.*

4.10 Paragraph 3.2 outlines the crucial role which the switch to ULSD has also played in enabling the introduction of pollution-reducing technology, such as particulate traps. These can reduce PM_{10} emissions from individual diesel vehicles by up to 90 per cent, and their early introduction is already producing substantial emissions savings (see Table 3.2).

4.11 As described in Paragraph 2.6, the introduction of the 2 pence duty differential for ULSD was accompanied in 1998 by the announcement of a £500 VED reduced pollution concession for lorries and buses meeting certified emissions standards. This was introduced in January 1999 and increased to £1,000 in Budget 99, providing a substantial incentive for vehicle manufacturers and bus and lorry operators to invest in particulate traps and other pollution-reducing technology. By October 2000, almost 43,000 vehicles had been awarded a Reduced Pollution Certificate allowing them to qualify for reduced VED rates.

4.12 Diesel vehicle manufacturers have now begun to bring forward this new pollution-reducing engine and exhaust technology, which many of them believe will be necessary in order to meet the future Euro IV and Euro V standards for diesel vehicle emissions. Peugeot Citroen have already put into mass production a car equipped with a diesel particulate filter, and some manufacturers have begun to market light-duty production vehicles fitted with diesel after-treatment systems.

4.13 The market potential for after-treatment systems is expected to grow significantly over the next few years. Manufacturers estimate that over 4,000 vehicles on the road are already fitted with particulate traps, and it is estimated that at least 4,000 more vehicles will be fitted with traps each year until 2004.

5 ENCOURAGING OTHER CLEANER FUELS

ROAD FUEL GASES

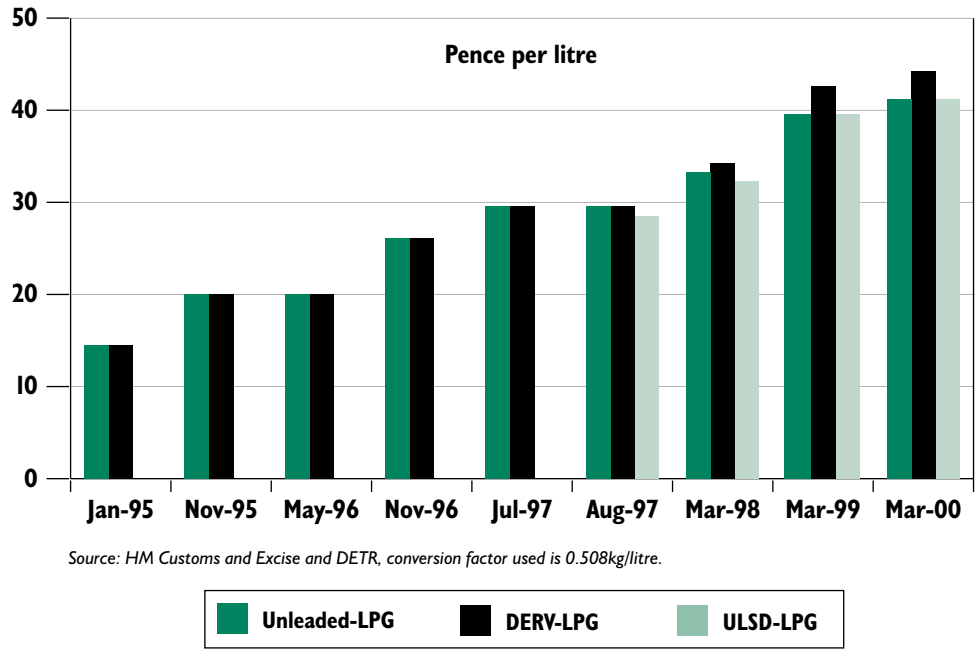
5.1 The ULSD experience has shown how duty differentials can deliver real results that can be magnified if combined with support for innovative technology. The precise measures will depend on the fuel and market in question. Box 5.1 sets out the range of steps the Government has taken to encourage road fuel gases, including duty differentials.

Box 5.1: The incentivisation of road fuel gases

Use of Liquid Petroleum Gas (LPG) or Compressed Natural Gas (CNG) can offer considerable emissions savings of PM_{10}, CO and NO_x compared with conventional fuels, particularly when CNG is used as a substitute for heavy duty diesel vehicles in urban environments. While exact emissions savings are difficult to calculate, it is estimated that good quality conversions of most older heavy goods vehicles to run on CNG can cut their emissions of PM_{10} by up to 90 per cent and NO_x by up to 75 per cent.

Duty on road fuel gases has been cut in real terms since 1995 to encourage people to convert from conventional fuels to using CNG or LPG. The biggest step was the Budget 99 cut of 29 per cent in the duty on road fuel gases, creating a significant differential between gas and conventional fuels.

Duty rate differentials between LPG and other fuels



Source: HM Customs and Excise and DETR, conversion factor used is 0.508kg/litre.

As of 1999, CNG was retailing at the forecourt at around 61p/kg (of which only 15p/kg was duty) – equivalent to around 41p/litre for petrol or 45p/litre of diesel in terms of comparative mileage. For bulk purchase, the price for CNG could be as low as 57p/kg. Forecourt prices for LPG are around 71p/kg – equivalent to around 36p/litre of petrol – with bulk prices as low as 28p/litre.

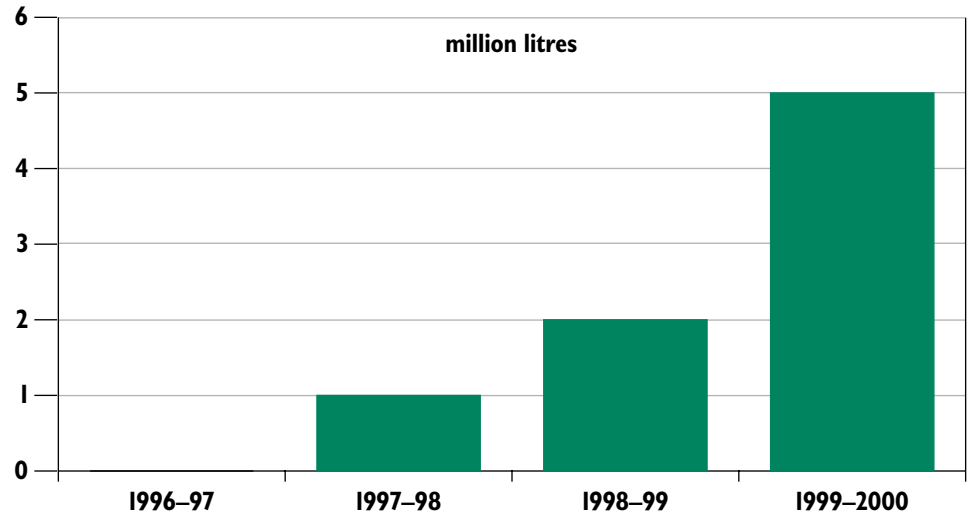
As described in Paragraph 2.6, the new graduated VED and company car tax systems will contain discount rates for gas-powered, bi-fuel and dual-fuel cars. For example, an individual buying a brand new car from next March could save up to £70 on their annual VED bill if they choose a fuel-efficient car which runs on gas. In April 1998, the cost of converting company cars to gas was also removed from the tax calculation of employee benefits.

Since 1996, the Government has been funding the Energy Saving Trust's Powershift programme, which contributes towards the extra cost of buying gas or electric vehicles. Between 1996 and March 2000 the Powershift programme received around £8 million which it used to help convert over 2,700 vehicles to run on gas: over 1,000 cars, almost 1,500 vans and nearly 200 trucks and buses. For 2000–01, the Powershift programme's annual funding has almost trebled to around £10 million.

As a result of this wide range of measures, the size of the UK gas fleet and the accompanying demand for increased refuelling facilities have increased rapidly over the past 3 years. Between Budgets 99 and 2000, the number of bi-fuel (petrol and LPG) cars and vans on UK roads increased by 10,000. There are currently over 750 CNG vehicles on British roads in both private and public sector fleets, and around 20,000 LPG vehicles, the majority of them bi-fuel cars and vans.

From the end of 1998 to 1 November 2000, the number of refuelling facilities offering road fuel gas increased from 150 to around 550. While there are currently only a few dozen CNG filling stations, mostly concentrated in the Midlands and the South East, their number and geographic spread is expected to grow substantially. The number of LPG filling locations is forecast to increase to around 1,000 by the end of the year 2001.

Increase in UK production of road fuel gases



Source: HM Customs and Excise.

THE ENVIRONMENTAL BENEFITS OF ULSP

5.2 Like ULSD, the composition of Ultra-low Sulphur Petrol (ULSP) is designed to reduce regulated emissions and – through its lower sulphur content – to increase the efficiency of exhaust after-treatment systems. ULSP can be used in all vehicles that use unleaded petrol. Because unleaded petrol is already much lower in emissions of harmful local air pollutants than conventional diesel, switching to ULSP does not produce the same emissions savings as switching to ULSD. Nevertheless, it is estimated that the introduction of ULSP in advance of 2005 could save up to 8 kilotonnes of NO_x, 120 kilotonnes of CO and 5.8 kilotonnes of VOCs each year between 2001–2004.

Table 5.1: Potential emission savings from different levels of ULSP take up

	Per cent of annual average emissions from road transport saved, 2001–2004							
	With 25 per cent take up		With 50 per cent take up		With 75 per cent take up		With 100 per cent take up	
	Total	Urban	Total	Urban	Total	Urban	Total	Urban
NO_x	0.3	0.3	0.7	0.6	1.0	0.9	1.4	1.1
CO	1.2	0.7	2.3	1.5	3.5	1.8	4.5	2.9
VOCs	0.4	0.3	0.8	0.5	1.3	0.7	1.5	1.0

Source: DETR.

5.3 Crucially, ULSP also enables the introduction of new petrol engine technologies such as gasoline direct injection (GDI), which should be available for cars from 2002-03. This will offer significant improvements in fuel efficiency compared to conventional petrol engine technologies, and will be one of the key factors in the successful implementation of the voluntary agreement among EU car manufacturers to reduce the average CO_2 emissions from new cars. In other words, ULSP could help reduce emissions causing global climate change as well as improving local air quality. GDI technology will require the use of exhaust after-treatment systems to control regulated emissions and ULSP will be an essential pre-requisite for this, as some 'Lean NO_x' and 'NO_x absorber' catalyst systems used with GDI engines are intolerant of sulphur.

5.4 Similarly, the low sulphur content of ULSP helps to prolong the life and efficiency of catalytic converters in vehicle exhaust systems, which are also damaged by sulphur. A three-way catalytic converter typically reduces emissions of CO, hydrocarbons and NO_x from an individual petrol car by 75 per cent. There are now more than 9 million cars on the road fitted with catalytic converters, and the use of ULSP will help them to function better for longer.

5.5 The current EU specification for 2005 petrol requires that the sulphur content is less than 50 parts per million (ppm) compared to a current mandatory limit – introduced in January this year – of 150ppm. As with ULSD, the incentives for ULSP will help the UK to meet the EU's 2005 standards well ahead of schedule.

5.6 The Cleaner Vehicles Task Force, a partnership between Government, representatives of the motor and oil industries and environmental experts, was set up in November 1997 to look at ways of accelerating the pace of change in vehicle and fuel technology. Their 2000 report, *Alternative Fuels – An Assessment of the Emissions Performance of Alternative and Conventional Fuels* looked at the case for introducing a duty differential in favour of ULSP.

5.7 The CVTF reflected the views of petrol suppliers and retailers that, for a ULSP market to be established, the pump price of ULSP could not be higher than that for conventional unleaded petrol. Because cleaner types of petrol require further refining than ordinary grades, oil companies need either to adopt a more stringent refinery operation or invest in additional refinery facilities. Both strategies make ULSP more expensive to produce than ordinary unleaded petrol.

5.8 The CVTF also suggested that, for a major conversion to cleaner petrol, the distribution system would require all the oil companies with a terminal to switch. Hence, they argued, a duty incentive for ULSP would have to be pitched at ensuring that all companies moved together. In addition, this would enable motorists in all parts of the country to gain access to the new, cleaner fuel and benefit equally from the benefits it would bring for their local air quality.

5.9 In light of the environmental evidence, and following the model provided by the successful incentives for ULSD, the Government announced in Budget 2000 that a one pence per litre differential would be introduced later in the year between ULSP and unleaded petrol. This differential rate came into effect from 1 October to encourage petrol retailers to begin to convert the petrol sold at their pumps. Customs currently estimate that 40% of unleaded petrol sold at the pumps will, in fact, be Ultra-Low Sulphur Petrol by the end of 2000–01.

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