

# **A REVIEW OF INTERNATIONAL INITIATIVES TO ACCELERATE THE REDUCTION OF SULPHUR IN DIESEL FUEL**

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## TABLE OF CONTENTS

1.	Executive Summary .....	i
2.	Introduction.....	1
3.	An Overview of Measures in OECD Countries Applied to Reduce Sulphur in Diesel Fuel .....	2
3.1	Regulations .....	2
3.2	Industry Voluntary Initiatives .....	2
3.3	Economic Instruments .....	2
4.	Case Studies ..	4
4.1	The United Kingdom .....	4
4.2	Denmark.....	9
4.3	Finland.....	13
4.4	Germany .....	16
5.	Concluding Observations from the Case Studies.....	19
	References .....	20
	Appendices	
	Appendix A - Summary of Regulations for Sulphur in Diesel Fuel in OECD Countries	
	Appendix B - Summary of Industry Voluntary Initiatives for Diesel in OECD Countries	
	Appendix C - Summary of Economic Instruments Applied to Diesel Fuel in OECD Countries	

## 1. Executive Summary

Environment Canada plans to propose a regulation to reduce the sulphur content in diesel fuel in line with the final rule being developed by the US EPA. (The EPA has proposed a 15 ppm limit effective 2006). Currently, most OECD countries and many other countries regulate sulphur in diesel at the 350 ppm to 500 ppm level. Members of the European Union (EU), Australia and Korea are committed to sulphur levels in diesel fuel of 50 ppm by 2005 and many other countries have announced intentions or launched active discussions to move ahead of regulation to reduce sulphur in diesel through the use of economic instruments.

The European Union's (EU) target for 50 ppm by 2005, has been achieved well in advance by several of its member states who have utilized a tax differential measure to do so. Commitment to cleaner air has been the main driver for these measures although, recently, commitment to the Kyoto Protocol has become an additional driver to reduce emissions from vehicles by reducing sulphur in the fuel. As of March 2000, the EU commenced discussions on a further regulated reduction to 10 ppm sulphur in diesel.

Many countries apply excise taxes on diesel as a form of revenue generation, although fewer countries employ taxes specifically to reduce sulphur levels. In 1992, Sweden was the first country to apply an environmental tax on sulphur in diesel which has resulted in almost 100% market share for urban diesel fuel of 10 ppm. The United Kingdom, Denmark and Finland also have used economic instruments to accelerate the reduction of sulphur in diesel to 50 ppm several years in advance of regulation. The primary driver cited for reducing sulphur in diesel is the improvement of air quality for health and environmental benefits while another benefit is the introduction of improved vehicle and pollution abatement technologies.

Four case studies (the UK, Denmark, Finland, and Germany) on the use of economic instruments in accelerating the reduction of sulphur in diesel are reviewed.

Beginning in 1993, the **United Kingdom** (UK) government was motivated by a dual agenda for air quality and reduction of greenhouse gases to introduce a collection of fuel duty measures which, as of 1997, included a tax differential in support of Ultra Low Sulphur Diesel (ULSD). This measure was introduced at 2.2 cents/litre in favour of ULSD in 1997, was increased to 4.4 cents in 1998 and was again increased to 6.6 cents in 1999. The market shift was modest at 2.2 cents, and the increase to 4.4 cents began to impact on supply and demand. The increase to 6.6 cents resulted in ULSD accounting for nearly 100% of production and marketing for domestic use. At its current rate of 6.6 cents, the cost to the government for ULSD is estimated at over \$887 million per year. This case underscores the importance of "getting the price right" for the measure to succeed. An accompanying factor for the successful market shift was the limited pipeline infrastructure to support a dual diesel supply system on a large scale in the UK.

Because a tax reduction of 1.5 cents for low sulphur diesel was introduced at the same time as a tax increase for 1.5 cents for higher sulphur content, the net differential is 3 cents/litre in **Denmark**. Denmark's commitment to improve air quality prompted the introduction of a tax incentive for diesel fuel with lower than 50 ppm sulphur as of June 1, 1999. The Danish Government incurs a cost for maintaining this measure which will be in place to 2005 when the 50 ppm sulphur level becomes mandatory for the European Union. Immediately upon introduction of the tax differential, literally overnight, the measure achieved 100% market shift to 50 ppm sulphur diesel. This may be, in large part, due to effective consultations with refiners and technical experts in the development phase of the measure.

In 1993, concern for air quality prompted **Finland** to offer a 3.3 cents/litre tax differential in support of diesel with 50 ppm at a time when the Europe-wide limit was 500 ppm. In the first year, the market shifted to 70% low sulphur diesel followed by market penetration of 80-100% in subsequent years. The measure was planned as revenue neutral and to place minimal additional administrative burden on all parties. Finland's Tax Department considers this the most efficient environmental measure they have introduced.

**Germany** is focused on improving air quality for health benefits and reducing greenhouse gas emissions from traffic through its fiscal incentive to introduce low sulphur fuels in advance of the EU schedule. It has specified November 1, 2001 to introduce both diesel and gasoline with 50 ppm sulphur and, subject to EU approval, proposes January 1, 2003 for 10 ppm. Fuel with a higher sulphur level is taxed an extra 2 cents/litre from November 2001 onward. The tax break for cleaner fuel applies to fuels with less than 50 ppm effective November 1, 2001 and to only those with less than 10 ppm effective January 1, 2003. The measure is planned to operate as revenue neutral.

The following are concluding observations from the case studies:

**Measure of Choice-** At least 11 OECD jurisdictions have implemented or announced the use of economic instruments in order to accelerate the introduction of low sulphur diesel fuel. The case studies examined show that these measures have been very successful. In each of the cases the economic instrument is backstopped by a regulated requirement taking effect at a later date.

**Cost to Government-** For two of the four case studies, the measures were designed to be revenue neutral with minimal cost of administration. The UK's measure was not, but needs to be considered in the context of the associated annual fuel price escalator.

**Getting the Price Right** - Pricing for an economic instrument in advance of a regulation seems to be a case of encouraging refiners to advance spending of capital costs that would ultimately be incurred by all refiners to meet the regulation. The UK and Danish example are the most instructive in this respect.

**Projecting and Assessing Benefits** - Communicating the human health and environmental benefits as well as measuring impacts are important components of designing the introduction of a measure. Denmark's air quality testing and the UK's assessment of environmental benefits of budget measures go a long way in showing the public benefit of tax differentials. Such measures to encourage the early introduction of low sulphur diesel might otherwise be construed as an economic benefit to refiners.

#### **Emission Reductions Reported or Projected**

- The UK projected that its fiscal measures to encourage the early introduction of low sulphur diesel fuel would reduce particulates by 21% and by up to 2% of NO<sub>x</sub> emissions.
- Denmark has projected a 13% reduction in fine particulate based on the use of 50 ppm diesel growing to 26% reduction once all city buses use this quality of fuel.
- Finland has reported emission reductions better than those achieved in the use of reformulated gasoline - therefore, the only comparison available is based on those results - carbon monoxide down by 10-20%, hydrocarbons by 5-10% and evaporation emissions by 13-17%.
- Germany projects the benefits of its measure to include reduced emissions of NO<sub>x</sub>, CO, SO<sub>2</sub> and CO<sub>2</sub> emissions reduction of 20-25% from its current fleets along with a projected 4% reduction in fuel consumption.

**Infrastructure** - Distribution of two qualities of fuel may lead to cost and verification issues when attempting to accelerate reduction of sulphur in diesel.

**Timing** - An economic instrument can produce a rapid market shift in particular when the consultative process leading to its introduction is effective.

**Duration** - All jurisdictions plan to keep the economic instrument in place until the regulation kicks in.

**Voluntary Initiatives** - Industry voluntary initiatives may create a market advantage for companies positioning themselves as leaders (BP Amoco). However, the longevity of the measure and verification of its effectiveness may be problematic. Voluntary leadership may not be adequate to motivate refiners to move in advance of regulation.

## **2. Introduction**

Environment Canada plans to propose a regulation to reduce the sulphur content in diesel fuel in line with the final rule being developed by the US EPA. (The EPA has proposed a 15 ppm limit effective 2006). Through their trade association, the Canadian Petroleum Products Institute, many of Canada's refiners have indicated their willingness to match the U.S. EPA final levels and timing.

However, the European Union's (EU) target for 50 ppm by 2005, has already been achieved well in advance by several of its member states who have utilized a tax differential measure to do so. Commitment to cleaner air has been the main driver for these measures although, recently, commitment to the Kyoto Protocol has become an additional driver for reducing sulphur in the fuel. As of March 2000, the EU commenced discussions on a further regulated reduction to 10 ppm sulphur in diesel.

The report examines regulations, voluntary initiatives and economic instruments as they are applied to diesel in OECD countries. The situation in four countries is reviewed to gain insight from their experiences in applying measures to accelerate market shifts to lower sulphur diesel. Based on this work, a set of observations is put forward.

### 3. An Overview of Measures in OECD Countries Applied to Reduce Sulphur in Diesel Fuel

This section provides an overview of three kinds of measures used in OECD countries to reduce sulphur in diesel fuel: regulations, voluntary initiatives and economic instruments. See Appendices for the charts summarizing measures by country.

#### 3.1 Regulations

Currently, in OECD countries and Hong Kong, sulphur in on-road diesel is regulated at the 350 to 500 ppm level. Many jurisdictions, including the members of the **EU, Australia, and Korea** are committed to reductions to 50 ppm by 2005 or 2006. However, discussions have commenced in the EU on the desirability of changing this target to sulphur-free (defined as less than 10 ppm). The **United States** and **Canada** are each engaged in considering reductions to 15 ppm for 2006. (See Appendix A)

#### 3.2 Industry Voluntary Initiatives

Industry voluntary initiatives to reduce sulphur in diesel in advance of requirements may create market advantages for a company. However, there appear to be a small number of these initiatives. (See Appendix B)

**Australia** is negotiating with refiners for the introduction of lower than regulated levels of sulphur in diesel in particular for urban markets. At the beginning of 2000 or roughly six years in advance of regulation, BP Amoco began to progressively introduce diesel with 50 ppm sulphur starting in Western Australia and then moving into the remaining states. This will supply approximately 12% of the overall market.

In **France** in 1999, BP Amoco introduced diesel with 50 ppm sulphur at 40 inner-Paris service stations and then extended it to all their 240 stations with no additional cost to consumers. The same quality fuel was offered to commercial customers including bus and transport companies.

In **Ireland**, Kelly Fuels introduced Ultra Low Sulphur Diesel (ULSD) with 50 ppm sulphur on a voluntary basis in November 1998. Market share is not known.

The limited number of voluntary initiatives identified suggests that their use does not offer governments the strategic, measurable impact that can be achieved with economic instruments. Nevertheless, there does seem to be a market advantage for companies positioning themselves as leaders as is the case with the BP Amoco initiative in Australia and France. The durability or longevity of the measure and its verification may be problematic since it could be at the discretion of the company to revert to higher levels of sulphur. Possibly, such issues could be managed through some type of formalized agreement between or among the government, companies and other interested parties.

#### 3.3 Economic Instruments

Diesel fuel is a common focus for revenue generation as seen by the range of excise taxes in the accompanying chart. Excise taxes are shown on the chart along side taxes explicitly focused on reducing sulphur. (See Appendix C)

**Sweden** is a leader; it first introduced an environmental tax on sulphur in diesel in 1991 with subsequent adjustments in 1992 and 1996 that resulted in an almost 100% market share for urban diesel fuel of 10 ppm sulphur.

Other countries that have applied an economic instrument to accelerate reduction of sulphur in diesel include:

**Czech Republic** with an air pollution charge on sulphur in diesel;

**Denmark** with its tax differential effective in 1999 (3 cents/litre <sup>1</sup>) and its 1992 incentive for public bus services to use Ultra Light Diesel;

**Finland** with its tax differential to promote low sulphur diesel (50 ppm) in 1993 (3.3 cents/litre);

**Hong Kong** with a current tax incentive of 17.6 cents/litre to encourage early introduction of low sulphur (50 ppm) through 2001;

**Norway** with a sulphur tax on diesel containing a sulphur content higher than 50 ppm; and,

the **United Kingdom** with its tax differential of 6.6 cents/litre to promote Ultra Low Sulphur Diesel (ULSD) (less than 50 ppm)

Other countries that have announced intentions or are engaged in active discussions to move ahead of regulation to reduce sulphur in diesel by using an economic instrument include Germany, with Austria likely to follow their lead, Australia, Japan and especially the Tokyo region, the Netherlands and Switzerland.

The Authors chose the four tax differential approaches for case studies - the United Kingdom, Denmark, Finland, and Germany.

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<sup>1</sup>Local currency converted to Canadian cents.



## 4. Case Studies

### 4.1 The United Kingdom

#### 4.1.1. Status of the Measure

City Diesel (50 ppm sulphur content) was introduced by the British government on August 15, 1997 (renamed in March 1998 as Ultra Low Sulphur Diesel (ULSD)). The average sulphur content in diesel fuel at this time was 200 ppm.<sup>2</sup> As of July 2000, the UK government was assessing potential benefits of air quality improvement and CO<sub>2</sub> reduction from a further shift to lower than 50 ppm gasoline and diesel fuel.<sup>3</sup>

Initially, the UK Government introduced a fuel duty strategy which consists of a fuel duty escalator and several fuel duty differentials:

- 1) In 1993, they introduced an annual increase in the real level of motor fuel duty (fuel duty escalator) by 3% per annum. The escalator was increased to 5% in November 1993. The July 1997 budget included a commitment to annual increases of 6% in real terms in the duty on road fuels, except road fuel gases.
- 2) A rebate for red diesel of 3.13 pence per litre (6.9 CDN cents per litre) used exclusively in off-road vehicles. The sulphur content for off-road diesel fuel is regulated at 2000 ppm and averages between 1000 and 2000 ppm.<sup>4</sup>
- 3) In August 1997 the Government introduced a duty differential between ordinary diesel and Ultra Low Sulphur Diesel (ULSD) of 1p per litre (2.2 CDN cents/litre) and, increased it to 2p per litre (4.4 CDN cents/litre) in 1998. In March 1999, the duty differential was increased to 3p per litre (6.6 CDN cents/litre). In addition, the specification of ULSD was tightened to ensure only the cleanest diesels could qualify for the reduced rate.
- 4) In March 1998, the Government introduced a duty differential between standard diesel relative to unleaded gasoline of 1p per litre (2.2 CDN cents/litre). In March 1999, this differential was widened to 3p per litre (6.6 CDN cents/litre).
- 5) The success of the differential for ULSD, a measure for improved air quality, has led to the UK government to the introduction of a differential of 1 pence/litre (2.2 CDN cents/litre) for Ultra Low Sulphur Petrol (ULSP) over regular unleaded beginning October 1, 2000. Customs currently estimate that 40% of unleaded gasoline sold at the pumps will be ULSP by the end of 2000-2001.<sup>5</sup>

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<sup>2</sup>Correspondence with Tim Ward, UK Department of Environment, Transport and the Regions

<sup>3</sup>Federal Government of the UK, *UK initial information in response to the European Commission's call for evidence on the benefits of reducing sulphur in petrol and diesel to less than 50 parts per million*, July 28, 2000

<sup>4</sup>Correspondence with Neil Semple, UK Department of Trade and Industry

<sup>5</sup>HM Customs and Excise, *Using the tax system to encourage cleaner fuels: The experience of Ultra-Low Sulphur Diesel*, November 2000

**4.1.2. Attributes of the Measure**

The fuel duty strategy aims at reducing emissions of greenhouse gases and encouraging cleaner fuels. It consists of a fuel duty escalator up to 6% a year and several duty differentials of which three pertain to diesel:

- Reduction of the duty on road fuel gases (LPG and CNG) relative to the increase of the duty of diesel and gasoline due to the duty escalator.
- Duty differential between ordinary diesel and ultra low sulphur diesel (ULSD).
- Duty differential between standard diesel relative to unleaded gasoline.

The preferential duty rate for ULSD was introduced on 15 August 1997 at 1 pence less per litre (2.2 CDN cents/litre) than ordinary diesel. This was increased to 2 pence per litre (4.4 CDN cents/litre) in the March 1998 Budget and, as of March 1999, rose to 3 pence per litre (6.6 CDN cents/litre).<sup>6</sup>

Table 1: Duty rates on UK diesel fuel<sup>7</sup>

	Duty rate (pence per litre)
Ordinary diesel	50.21 (\$1.11 CDN/litre)
Ultra Low Sulphur Diesel	47.21 (\$1.05 CDN/litre)

**4.1.2b Delivery Agents of the Measure and Operational Finances**

The Department of Environment, Transport and the Regions (DETR) introduced "City Diesel" in response to concerns about traffic pollution in cities and especially particulate emissions. This Department was responsible for launching the environmental case and researching the technical issues.<sup>8</sup> HM Treasury is responsible for fiscal policy and hence it was their final decision to go ahead with the differential measure after the environmental case was made. Treasury was receptive to the measure since lead-free gasoline duty differentials had been a success.<sup>9</sup> The HM Customs and Excise, under the control of the Treasury, administers the differential. The administrative costs are very low as the fuel duty is collected at the refinery gate (low number of tax points) and the number of refineries manufacturing ULSD is small.<sup>10</sup> In 1996, when the measure was introduced at the 1 pence (2.2 CDN cents) differential from ordinary diesel, the cost to the Crown was calculated

<sup>6</sup>HM Customs and Excise C & E 11, *Chancellor honours commitment on fuel duties to protect environment*, March 9, 1999

<sup>7</sup>HM Customs and Excise C & E 11, *Chancellor honours commitment on fuel duties to protect environment*, March 9, 1999

<sup>8</sup>Before 1997, this was two separate Departments - Environment and Transport

<sup>9</sup>Correspondence with Research Coordinator of the Policy and Research Unit for FOE EWNI, Dr. Tim Jenkins

<sup>10</sup>Correspondence with Research Coordinator of the Policy and Research Unit for FOE EWNI, Dr. Tim Jenkins

at £15 million (\$33 million CDN) per year.<sup>11</sup> As of 1999, because of the increase to a 3 pence (6.6 CDN cents) differential as well as the market shift to ULSD, the revenue cost to the Crown is estimated to be £400 million (\$887 million CDN) a year.<sup>12</sup>

#### 4.1.2c Purpose of the Measure/Rationale for Initiating Measure

While the main purpose of fuel taxation is fiscal, fuel duty differentials have become an increasingly significant way of encouraging cleaner fuels. The fuel escalator and the fuel duty differentials are important policies to reduce emissions of greenhouse gases and to tackle local air pollution. According to the UK Government, the fuel escalator is the key policy instrument for reducing emissions of CO<sub>2</sub> from the transport sector.

The aim of the duty differential favoring ultra low sulphur diesel (ULSD) over conventional diesel is to encourage the manufacture and use of the ULSD which offers substantial benefits to urban air quality by reducing the amount of particulates, nitrogen oxides and black smoke produced during combustion. The use of cleaner diesel is generally needed for the introduction of emission reduction technologies, such as oxidation catalysts and particulate traps. ULSD is an essential element in the strategy to improve air quality, particularly in urban areas. Cleaner air is a further incentive to encourage all users of diesel to switch to this significantly cleaner fuel.

The higher duty increase for diesel relative to gasoline is partially to offset the higher energy and carbon content and also reflects the fact that using diesel is worse than gasoline for urban air quality.<sup>13</sup> This means that the tax on a litre of diesel should be higher than that on gasoline, to reflect the higher levels of pollution.

The UK has a duty differential in favour of unleaded gasoline which was initiated in 1989 and made unleaded gasoline 12p per gallon (26.6 CDN cents per gallon) cheaper than leaded gasoline. The market share for unleaded gasoline rose from 3% in 1989 to 30% in 1990 and has now stabilized at 70% and is gradually increasing as the old vehicle stock is replaced.<sup>14</sup> In October 1999, the duty on higher octane (premium grade) unleaded gasoline was cut to 2p per litre (4.4 CDN cents per litre) above unleaded gasoline.

The introduction of the 2 pence (4.4 CDN cents) duty differential in 1998 was accompanied by the announcement of a £500 (\$1109 CDN) vehicle excise duty (VED) reduced pollution concession for trucks and buses meeting certified emission standards. This was introduced in January 1999 and increased to £1000 (\$2218 CDN) in Budget 1999, providing a substantial incentive for vehicle manufacturers and bus and truck operators to invest in particulate traps and other pollution abatement technology. By October 2000, nearly 43 000 vehicles have been awarded a Reduced Pollution Certificate allowing them to qualify for reduced VED rates.<sup>15</sup>

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<sup>11</sup>Correspondence with Research Coordinator of the Policy and Research Unit for FOE EWNI, Dr. Tim Jenkins

<sup>12</sup>Guardian Unlimited, *Environment: 'we must resolve to lead in respecting the environment'*, March 9, 1999

<sup>13</sup>INFRAS for the ECMT, Group on Transport and the Environment, *Variabilisation and Differentiation Strategies in Road Taxation*, June 2, 2000, pp 227

<sup>14</sup>INFRAS for the ECMT, Group on Transport and the Environment, *Variabilisation and Differentiation Strategies in Road Taxation*, June 2, 2000, pp 229

<sup>15</sup>HM Customs and Excise, *Using the tax system to encourage cleaner fuels: The experience of Ultra-Low Sulphur Diesel*, November 2000

The UK Government does not have a long tradition of using taxes and charges for environmental purposes. However, the reduction of emissions of greenhouse gases and the improvement of local air quality have become more and more important:

- UK policy on climate change is driven by two targets: a legally-binding greenhouse gas emission reduction target of 12.5% on 1990 levels by 2008-12 arising from the Kyoto Protocol; and a domestic goal of reducing CO<sub>2</sub> emissions to 20% below 1990 levels by 2010. Transport has been the fastest growing major source of emissions of CO<sub>2</sub>, the most important of the gases associated with climate change.<sup>16</sup>
- In response to the growing scientific evidence and increasing public concern about the adverse effects of air pollution, in July 1997 the UK Government began to implement the National Air Quality Strategy, published by the last administration following the 1995 Environment Act. It set standards and objectives for eight major air pollutants, which represented levels below which no significant health effects should occur. One of the major tools to achieve the Strategy's aims was management of local air quality. However, environmental tax measures are long-term policies and, since they have been in force only for a few years (fuel tax escalator, fuel duty differentials), it is too early to know what the impacts have been.

#### 4.1.3 Environmental Benefits

ULSD 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<sub>10</sub>, NO<sub>x</sub>, VOCs and CO during combustion. The use of Ultra-Low Sulphur Diesel allows the introduction of the latest diesel after-treatment devices such as particulate traps. Use of ULSD especially effective for cutting emissions from buses and trucks.

Table 2 shows the estimated environmental impact of select 1999 UK Budget measures. The key instrument for reducing emissions of greenhouse gases emissions is the fuel duty escalator. The key instrument for improving air quality (emissions of particulates and NO<sub>x</sub>) is the duty differential for ultra low sulphur diesel (ULSD) compared to conventional diesel:

Table 2: Environmental impact of select 1999 UK budget measures

Budget measures March 1999	Estimated environmental impact
Fuel duty escalator	The escalator over the period 1996 to 2002 estimated to produce CO <sub>2</sub> emission savings of 2–5 million tons by 2010; approximately 5–12% of CO <sub>2</sub> emissions from transport in 2010; and a reduction of 1% in NO <sub>x</sub> emissions and 1.2% in particulate emissions
Increase duty on standard diesel relative to unleaded gasoline	Reduction of 1 to 3% of particulates and NO <sub>x</sub> ; very small increase in emissions of CO <sub>2</sub>
Increase duty differential for ultra low sulphur diesel (ULSD)	Reduction of 21% of particulates; reduction of up to 2% of NO <sub>x</sub> emissions

Source: Estimates of the environmental impact of budget measures 1999 (HM Treasury: Financial Statement and Budget Report March 1999)

<sup>16</sup>In 1997, road transport produced around 32 million tonnes of carbon - a fifth of the total emissions from all sources.

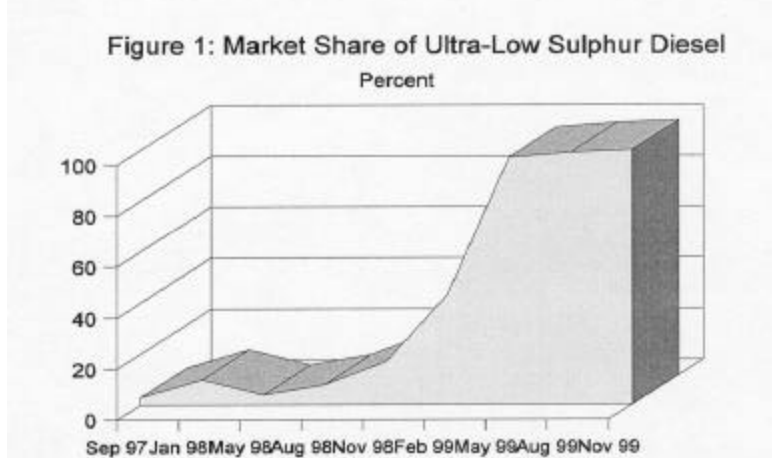
#### 4.1.4. Success/Experience of the Measure

##### 4.1.4a Degree of Market Penetration

The UK has nine major and three smaller domestic refining units. Most UK crude oil originates from the North Sea and is naturally low in sulphur which allowed refining of ULSD to take place without prohibitively expensive conversion of the refining plants.<sup>17</sup> However, ULSD still requires some additional refining to reduce levels of sulphur and some benzene-based chemicals. This did lead to increased production costs for those oil companies converting from conventional diesel.

In 1997, some companies, including Total, Shell, Elf, Futura and Greenergy, began supplying ULSD.<sup>18</sup> However, many continued to manufacture only conventional diesel and only a small number of road-users had access to ULSD. Most of the ULSD supply was available in cities. Since early 1999, BP Mobil, Texaco, Total, Shell, Elf and Esso have supplied ULSD across the UK.<sup>19</sup> By August 1999, with the increase in the differential to 3 pence/litre (0.066 CDN/litre), all oil companies had begun to supply and market the fuel.<sup>20</sup>

Figure 1 demonstrates how the diesel market responded to the changes in differentials between 1997 and 1999. Initially there was slow take-up, followed by a small dip in the first half of 1998 as oil companies adapted to the tighter specification, and then a rapid rise from May 1999 onwards as the two pence differential began to impact on supply and demand. By August 1999, just two years after its introduction, ULSD had achieved almost a 100% share of the UK diesel market.



Source: HM Customs and Excise, *Using the tax system to encourage cleaner fuels: The experience of Ultra-Low Sulphur Diesel*, November 2000

##### 4.1.4b Level of Public Awareness

<sup>17</sup>HM Customs and Excise, *Using the tax system to encourage cleaner fuels: The experience of Ultra-Low Sulphur Diesel*, November 2000

<sup>18</sup>HM Customs and Excise, *Using the tax system to encourage cleaner fuels: The experience of Ultra-Low Sulphur Diesel*, November 2000

<sup>19</sup>Wright, T.L., *UK switch to 50 ppm sulfur may pressure world refiners*, Diesel Fuel News, February 26, 1999, p3-4

<sup>20</sup>HM Customs and Excise, *Using the tax system to encourage cleaner fuels: The experience of Ultra-Low Sulphur Diesel*, November 2000

Overall, the level of public awareness on sulphur in fuels appears to be much higher in the UK than the in other countries studied. This may be attributed to broader stakeholder involvement in raising issues and the length of time the measure has been in force (three years).

Friends of the Earth England, Wales, Northern Ireland (FOE EWNl) campaigned from 1996 to 1998 for two objectives: 1) tighter limits on the sulphur content of fuels in EU fuel standards and 2) duty differentials on low sulphur diesel in the UK budget.<sup>21</sup> Both campaign objectives were successful.

Bus companies publicized that they were using the ULSD when it came into the marketplace in 1997.<sup>22</sup>

As well, there are multistakeholder efforts such as the Cleaner Vehicles Task Force (CVTF) which is a partnership between senior representatives of the motor and oil industries, environmentalists and other organizations. It aims to accelerate the pace of change in vehicle and fuel technology.

The 'Are you doing your bit?' campaign, focuses on the role of individuals to play a part in reducing pollution through small changes in their behavior. This campaign is headed by the DETR and is partnered with Stop Fuming, an environmental non-profit organization. The campaign portrays simple messages which are delivered through TV, press and radio advertising, high profile and media promotions and a mobile exhibition, showing the public how they can take action.<sup>23</sup>

#### **4.1.5 Lessons Learned**

- 1) The Department of Environment, Transport and the Regions noted that the main lessons that they learned were:
  - pitching the tax incentive at the right level (i.e. 3 pence per litre (6.6 CDN cents/litre)) moves the market
  - specifying all fuel quality parameters along with the introduction of low sulphur levels would have been more effective than a piecemeal approach. For example, they should have incorporated density parameters in the initial measure.<sup>24</sup>
- 2) Refiners have noted that the infrastructure for a dual diesel supply system does not exist on a large scale in the UK. At the 1 pence (2.2 CDN cents) level differential, this appeared to be an obstacle. As the differential grew to 3 pence (6.6 CDN cents), the infrastructure limitation seemed to be a driver for a faster shift. This may be an additional consideration for getting the price right.

## **4.2 Denmark**

### **4.2.1. Status of the Measure**

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<sup>21</sup>Correspondence with Senior Climate and Transport Campaigner for FOE EWNl, Roger Higman

<sup>22</sup>Correspondence with Research Coordinator of the Policy and Research Unit for FOE EWNl, Dr. Tim Jenkins

<sup>23</sup>The DETR' s campaign can be found at [www.doingyourbit.org.uk](http://www.doingyourbit.org.uk)

<sup>24</sup>Personal communication with Tony Baker, UK Department of Environment, Transport and the Regions

A tax incentive for low sulphur diesel fuel (sulphur content below 50 ppm) was introduced for 0.09 DKK per litre (1.5 CDN cents per litre) on June 30, 1999.<sup>25</sup>

#### **4.2.2. Attributes of the Measure**

##### *4.2.2a Type and Description of the Measure*

Tax is reduced by 0.09 DKK/litre (1.5 CDN cents/litre) for low sulphur diesel and increased by 0.09 DKK/litre (1.5 CDN cents/litre) for diesel fuel with higher sulphur content.<sup>26</sup> The net result is a tax differential of 0.18 DKK/litre (3 CDN cents/litre).

Denmark has a history of using tax differentiations as an explicit means of attaining an environmental improvement. In 1995, Denmark introduced a tax differential of 0.03 DKK/litre (0.5 CDN cents/litre) of gasoline if the station installed vapor recovery systems (an increase of 0.01 DKK/litre (0.18 CDN cents/litre) and decrease of 0.02 DKK/litre (0.36 CDN cents/litre) with the recovery system).<sup>27</sup> Vapor recovery became obligatory from January 1, 2000 for stations with throughput above 500 cubic meters per year (approximately 90% of the sales). The incentive is still in force as a motivator for the last 10%.

Denmark has a tax differentiation for gasoline which is made on three different levels: between leaded and unleaded gasoline; between stations with or without vapor-recovering equipment; and since July 1998, according to benzene content.<sup>28</sup> There is also a rebate of 0.02 DKK/litre (0.36 CDN cents/litre) for gasoline with a benzene content of less than 1%.<sup>29</sup>

Denmark also gives a rebate of 10 000 DKK (\$1782 CDN) per truck on new EURO 3 trucks purchased between January 1, 1999 and September 30, 2001, before the EURO 3 standard becomes obligatory on October 1, 2001.<sup>30</sup>

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<sup>25</sup>Danish EPA, *Economic Instruments in Environmental Protection in Denmark*, 2000

<sup>26</sup>Danish EPA, *Fuel Quality in Denmark*, February 11, 1999

<sup>27</sup>Correspondence with Erik Iversen, Danish Environmental Protection Agency

<sup>28</sup>Less than 50% of the gasoline used has a low benzene content. The differentiation is adjusted as gasoline performance improves every summer; INFRAS for the ECMT, Group on Transport and the Environment, *Variabilisation and Differentiation Strategies in Road Taxation*, June 2, 2000, pp129

<sup>29</sup>INFRAS for the ECMT, Group on Transport and the Environment, *Variabilisation and Differentiation Strategies in Road Taxation*, June 2, 2000, pp130

<sup>30</sup>Correspondence with Erik Iversen, Danish Environmental Protection Agency

#### 4.2.2b delivery Agents of the Measure and Operational Finances

The Danish Environmental Protection Agency and the Ministry of Taxation deliver this measure. There is a revenue cost to maintaining this measure. The measure is in place until 2005 when the limit becomes mandatory under Directive 98/70/EC of the European Parliament and of the Council.

The price to the consumer remained the same because the differential appears as a reduced tax in the refiners remittance to the government (if any of the diesel remained at 500 ppm, there would have been an increased tax that would have flowed through to the consumer price - see *Table 3* below).

*Table 3. Danish diesel fuel price parameters*

	Differential for 50 ppm Sulphur Content	Benchmark Established at 500 ppm Sulphur Content	Differential if Remaining at 500 ppm Sulphur Content
	June 1999	May 1999	June 1999
	DKK/litre (CDN\$/litre)		
Production Cost	3.77 (0.669)	3.68 (0.653)	3.68 (0.653)
Tax + VAT	4.16 (0.738)	4.25 (0.754)	4.34 (0.770)
Consumer Price	7.93 (1.406)	7.93 (1.406)	8.02 (1.422)

Source: Correspondence with the Danish Environmental Protection Agency

According to a report commissioned by the Danish EPA, prior to the introduction of the measure, the Danish oil industry was expected to be able to produce the low-sulphur diesel without investing in new equipment. However, extra refining costs of DKK60-90/kl (1.5-3.1 CDN cents per litre) were identified by the refiners.<sup>31</sup> The Danish EPA said that the average diesel sulphur level prior to the introduction of the incentive was close to 500 ppm.

Prior to introducing the measure, the government had consultations with the two Danish-owned refineries and the Danish Technological Institute to assess the size of the incentive needed to accelerate the introduction of low sulphur diesel into the marketplace. The estimated cost was 0.06 DKK (1.1 CDN cents) to 0.09 DKK/litre (1.5 CDN cents/litre) for the refineries to be able to offer the fuel.<sup>32</sup> The Danish Petroleum Industry Association stated that a tax incentive of 0.09 DKK/litre (1.5 CDN cents/litre) would result in a 100% replacement of the existing diesel qualities with new low sulphur diesel.<sup>33</sup>

#### 4.2.2c Purpose of the Measure/Rationale for Initiating Measure

The primary purpose for initiating the current measure was to improve air quality. The Danish parliament's environment planning committee prompted the consideration of the measure through their response to calls for lower sulphur diesel use by Copenhagen buses.<sup>34</sup>

<sup>31</sup>ENDS Environment Daily, *Denmark to switch to low-sulphur diesel*, May 29, 1998

<sup>32</sup>Personal communication with Erik Iversen, Danish Environmental Protection Agency

<sup>33</sup>Danish EPA, *Fuel Quality in Denmark*, February 11, 1999

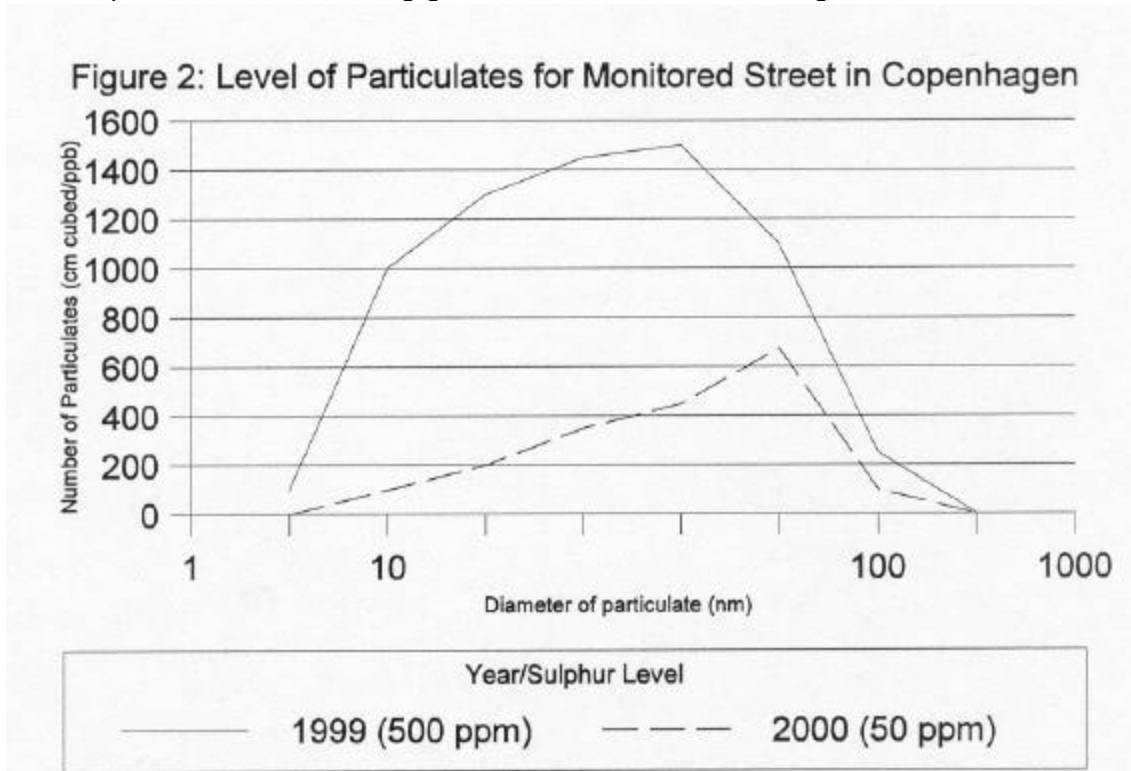
<sup>34</sup>ENDS Environment Daily, *Denmark to switch to low-sulphur diesel*, May 29, 1998



### 4.2.3. Environmental Benefits

According to a report commissioned by the Danish EPA, the introduction of 50 ppm sulphur diesel would cut emissions of fine particulates by 13%. If all city buses used low-sulphur fuel, the reduction would be 26%.<sup>35</sup> 50 ppm sulphur diesel would also enable vehicles to use "continuous regenerating trap" filters, which could reduce particulate emissions by up to 90%.<sup>36</sup>

At the beginning of 1999, before low sulphur diesel was introduced, scientists took measurements of particulate matter in Copenhagen. The following year at the same time (January to March 2000) the scientists took the same set of measurements and found that levels of PM<sub>10</sub> were reduced and ultra fine particulate matter was negligible.<sup>37</sup> This is evident from the figure below.



Source: Correspondence with the Danish EPA

### 4.2.4. Success/Experience of the Measure

#### 4.2.4a Degree of Market Penetration

The tax incentive was introduced on June 30, 1999 and the market penetration reached 100% by July 1, 1999.<sup>38</sup> Hence, only one diesel quality is available on the Danish market today.

<sup>35</sup>ENDS Environment Daily, *Denmark to switch to low-sulphur diesel*, May 29, 1998

<sup>36</sup>ENDS Environment Daily, *Denmark to switch to low-sulphur diesel*, May 29, 1998

<sup>37</sup>Personal communication with Erik Iversen, Danish Environmental Protection Agency

<sup>38</sup>Personal communication with Erik Iversen, Danish Environmental Protection Agency

#### 4.2.4b Level of Public Awareness

The Danish Government and the tax administration provides a website which carries information on the use of economic instruments as tools for environmental protection in Denmark. At this time, no other information is available on public awareness activities around this low sulphur diesel tax measure.

#### 4.2.5. Lessons Learned

- Government commitment to accelerate the introduction of low sulphur diesel for environmental benefits is the first step.
- The Danish EPA's experience shows that proactive consultations with refiners and technical experts in the development of the fuel tax measure paid off with results. Denmark met the EU 2005 target for diesel with low sulphur six years ahead of time.
- The Danish experience indicates that the refiners would not have moved in advance of the regulation without tax incentives.

### 4.3 Finland

#### 4.3.1. Status of the Measure

Reformulated diesel (50 ppm sulphur content) was introduced in July 1993. At this time, the average sulphur content in diesel was thought to be approximately 500 ppm.<sup>39</sup> The use of low sulphur diesel (50 ppm) was encouraged by a tax incentive of 0.15 FIM/litre (3.3 CDN cents per litre) for this fuel relative to the tax on diesel fuel containing 500 ppm sulphur.<sup>40</sup>

#### 4.3.2. Attributes of the Measure

##### 4.3.2a Type and Description of the Measure

The strategy of the measure was to promote the use of low-sulphur diesel through tax differentiation. This was done by levying a lower excise duty rate on the low sulphur diesel compared to the "old" diesel.

Table 4: Excise duty rates for 2000 (Finnish pennies per litre)

Diesel Grade	Basic duty	Additional duty	Strategic stockpile fee
normal grade	166.6 (37 CDN cents)	26.9 (5.9 CDN cents)	2.1 (0.5 CDN cents)
low sulphur content (50 ppm)	151.6 (33 CDN cents)	26.9 (5.9 CDN cents)	2.1 (0.5 CDN cents)

Source: Correspondence with the Finnish Ministry of Environment

##### 4.3.2b Delivery Agents of the Measure and Operational Finances

The project was driven by the Ministry of Finance's Tax Department with input from the Ministry of Transport and the Ministry of the Environment. Although the intention was that the measure would be revenue neutral, when it was first introduced in 1993, there was a small but insignificant decrease in revenue.<sup>41</sup>

<sup>39</sup>Correspondence with Tarja Lahtinen, Finnish Ministry of Environment

<sup>40</sup>Personal communication with Teir Gustav, Ministry of Finance, Tax Department

<sup>41</sup>Personal communication with Teir Gustav, Ministry of Finance, Tax Department

Importers and producers of vehicle fuels register with the Department of Customs. The Department collects the taxes from the importers and producers of vehicle fuels, based on reports of fuel sales. Collection at this level simplifies the administrative burden of collection and control. There were minimal additional administrative costs for the implementation of this measure since reporting was confined to an additional column on the form that importers and producers already filled out.

#### *4.3.2c Purpose of the Measure/Rationale for Initiating Measure*

The primary objective of this measure was to improve local air quality by reducing vehicle emissions that have an adverse effect on human health. The government also wanted to introduce low sulphur diesel to advance the introduction of better quality diesel vehicles into the marketplace. In Finland, high quality fuels are particularly important because of the cold weather starting conditions.

To create market incentives, taxes were differentiated to:

- eliminate the cost advantage of lower quality fuels in consumer pricing since improved fuels in general cost more to produce
- encourage refinery investments in order that the fuels could be produced on a large scale
- off-set increased refinery costs associated with improved fuel grades.

#### **4.3.3. Environmental Benefits**

The benefits for the environment are high, especially in metropolitan areas. An Arthur D. Little study suggests that the largest emission reductions are for sulphur, particulate matter, polyaromatic hydrocarbons (3 rings or more) and nitrogen oxides. While there is no specific data on the environmental benefits from the switch to low sulphur diesel, the Ministry of Environment suggests the benefits are higher than those achieved in the use of reformulated gasoline. That measure reduced harmful exhaust emissions of carbon monoxide by 10-20%, hydrocarbons by 5-10 % and evaporation emissions by 13-17 %.<sup>42</sup> Benefits of low sulphur diesel should be even higher in metropolitan areas.

#### **4.3.4. Success/Experience of the Measure**

The Tax Department assesses this as the most efficient environmental measure they have introduced.

The tax differentials in Finland were large enough to motivate the industry to invest without increasing the price to the consumer for the improved fuels.<sup>43</sup> Higher sales volumes of improved fuels covered the extra costs and investments with increased price per liter for the refiner.<sup>44</sup>

There are two domestic refiners in Finland (Sköldvik and Naantali) operated by Fortum (previously Neste Oy) as well as American-owned refiners.

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<sup>42</sup>Correspondence with Tarja Lahtinen, Finnish Ministry of Environment

<sup>43</sup>Arthur D. Little, *Case Study - The introduction of improved transport fuel qualities in Finland and Sweden*, September 22, 1998

<sup>44</sup>Arthur D. Little, *Case Study - The introduction of improved transport fuel qualities in Finland and Sweden*, September 22, 1998

The industry responded to Finnish diesel tax differentials by investing approximately 365 million ECU (\$487 million CDN) for low sulphur diesel.<sup>45</sup> The Arthur D. Little study estimates that the total incremental annual operating expenditures to meet the new specifications were of the order of 64 million ECU (\$85 million CDN) in 1996 (the largest costs were associated with the use of extra fuel which was approximately 20 million ECU (\$27 million CDN)). Due to the large scale investment programs the refiners became more effective. Approximately 10 million ECU (\$13 million CDN) of total operating expenditures that were offset by upgrade recoveries.<sup>46</sup>

The Arthur D. Little study noted that the total revenue from tax differentials to introduce improved fuel grades in Finland for the years 1993 to 1996 were approximately 0.25 billion ECU (\$300 million CDN), representing about 5% of the total revenues from transport fuels.<sup>45</sup> The use of more polluting fuels provided tax revenues of 0.10 billion ECU (\$134 million CDN) (3% of total).<sup>46</sup> Improved fuel qualities provided market incentives of 0.15 billion ECU (\$200 million CDN).<sup>47</sup>

#### *4.3.4a Degree of Market Penetration*

These tax differentials have ensured that refiners would invest pro-actively to introduce the improved fuels into the market. The result has been a complete transformation of the markets - improved fuel qualities now dominate. In the first year, low sulphur diesel had penetrated the market by 70%.<sup>48</sup> Currently, the market penetration is 80-100%.<sup>49</sup> The low sulphur diesel is mostly in densely populated areas i.e. cities, while the lower quality diesel is mainly found in rural areas.

#### *4.3.4b Level of Public Awareness*

When the measure was first initiated, the government held a public seminar for public input. Most of the Finnish newspaper coverage was around the battle between the refineries and the government.

#### **4.3.5. Lessons Learned**

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<sup>45</sup>Arthur D. Little, *Case Study - The introduction of improved transport fuel qualities in Finland and Sweden*, September 22, 1998; 1 ECU is equal to 6 Finnish marks and 1.34 CDN\$.

<sup>46</sup>Includes associated yield benefits that result directly from investments with for improved fuel qualities. Excludes any capacity creep benefits associated with incremental ongoing investments.

<sup>45</sup>Arthur D. Little, *Case Study - The introduction of improved transport fuel qualities in Finland and Sweden*, September 22, 1998

<sup>46</sup>Arthur D. Little, *Case Study - The introduction of improved transport fuel qualities in Finland and Sweden*, September 22, 1998

<sup>47</sup>Arthur D. Little, *Case Study - The introduction of improved transport fuel qualities in Finland and Sweden*, September 22, 1998

<sup>48</sup>Personal communication with Teir Gustav, Finnish Ministry of Finance, Tax Department

<sup>49</sup>Personal communication with Teir Gustav at the Ministry of Finance stated that currently the market penetration is 80% for low sulphur diesel. Correspondence with the Ministry of Environment reports that in a short period of two years almost 100% of all diesel sold is low-sulphur diesel.

- 1) The Tax Department noted that the following factors contributed to the success of this measure:
  - revenue neutral basis
  - low administrative burden and
  - minimal extra paper burden for participating companies
- 2) Tax differentials were the main market driver for introducing improved fuel qualities and provided added impetus to those inclined to be industry leaders.

#### **4.4 Germany**

##### **4.4.1. Status of the Measure**

The German Federal Government decided to provide fiscal incentives for the early introduction of diesel and gasoline with a low sulphur content (50 ppm) in August 1999. Currently, the average sulphur content in diesel fuel is between 200 and 250 ppm.<sup>50</sup> To allow the petroleum industry a period to convert refineries, they specified November 1, 2001 for the introduction of diesel and gasoline with a sulphur content of 50 ppm and January 1, 2003 for 10 ppm.<sup>51</sup> EU approval of the latter measure is still pending (The German government is hoping a decision will be reached by December 2000).

##### **4.4.2 Attributes of the Measure**

###### *4.4.2a Type and Description of the Measure*

Diesel fuel which has a high sulphur content will be taxed an extra DM 0.03 per litre (2 CDN cents/litre) from November 2001 onward.<sup>52</sup> The tax break (no extra 0.03 DM (2 CDN cents/litre) applies) will apply to diesel fuel with less than 50 ppm sulphur on November 1, 2001 and to only diesel fuel with less than 10 ppm on January 1, 2003.

These measures for lowering sulphur in fuel are part of a package of measures including.<sup>53</sup>

- a fuel price escalator with increases of 6 Pf/litre (4.1 CDN cents/litre) each January;
- tax breaks for power stations achieving conversion efficiencies above 55% for use of natural gas or oil in generating electricity
- a proposed levy on heavy heating oil used in industrial processes. This is an extension of an existing tax on light heating oil used for space heating.

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<sup>50</sup>Correspondence with Bernd Ulrich Hildebrandt, Umwelt Bundes Amt (Federal Environmental Agency)

<sup>51</sup>German Federal Government, *Memorandum from the Federal Republic of Germany on Updating the EU Fuel Directive 98/70*, September 1999

<sup>52</sup>ENDS Environment Daily, *Second round of German ecotaxes proposed*, August 26, 1999

<sup>53</sup>ENDS Environment Daily, *Second round of German ecotaxes proposed*, August 26, 1999

#### *4.2.2b Delivery Agents of the Measure and Operational Finances*

While the Ministry of Environment initiated this measure, the Ministry of Finance, Tax Department is also involved through the collection of the tax at the gas station. The measure itself is implemented through Customs and Enforcement. The measure is meant to have a revenue neutral introduction.

There will be a cost increase of 1 or 2 pfennings per litre (0.68 or 1.35 CDN cents per litre) for these low sulphur fuels (diesel and gasoline) at the filling station.<sup>54</sup> This increase reflects the cost of production. The rise in consumer price and the avoidance of the increased duty for higher sulphur constitutes the incentive to refiners to accelerate the introduction of low sulphur diesel and gasoline. Should the market shift as quickly as predicted, i.e. a few weeks, to essentially all low sulphur diesel and gasoline, the price difference to consumers would only be apparent for that short period.

#### *4.2.2c Purpose of the Measure/Rationale for Initiating Measure*

The driver to introduce low-sulphur containing diesel is twofold: 1) air quality - to reduce emissions of NO<sub>x</sub>, CO and SO<sub>2</sub>, and 2) climate change - the introduction of new modern engines could reduce current CO<sub>2</sub> emissions by 20-25% from current fleets.<sup>55</sup> As a result pollutant emissions due to traffic will decrease significantly.

#### **4.4.3 Environmental Benefits**

Emission reductions to benefit human health is the key driver behind this measure. Sulphur-free (10 ppm sulphur) fuel will support the introduction of more fuel efficient engines that meet strict emission restrictions. In addition, various projections suggest that fuel consumption is expected to be reduced starting from a 4% to a 20-25% projection with sulphur-free fuel.

The German Federal Government has noted that a sulphur content of 10 ppm compared to 50 ppm increases the performance and durability of oxidizing catalytic converters, DeNO<sub>x</sub> catalytic converters and particulate filters and hence reduces fuel consumption.<sup>56</sup> According to a FEV (a European scientific institute) study, particulate emissions from diesel passenger cars using sulphur-free rather than low sulphur fuels were immediately reduced by 5% in cities.<sup>57</sup>

#### **4.4.4. Success/Experience of the Measure**

Approximately 80% of German fuel consumption is supplied by domestic production at fourteen refineries.

During the negotiations, the Ministry of Environment noted that some refiners were not capable of meeting the proposed target and would have to import fuel to meet it. This was considered an

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<sup>54</sup>Correspondence with Bernd Ulrich Hildebrandt, Umwelt Bundes Amt (Federal Environmental Agency)

<sup>55</sup>Personal communication with Kai Schlegelmilch, Umwelt Bundes Amt (Federal Environmental Agency)

<sup>56</sup>German Federal Government, *Comments of the Federal Republic of Germany on the updating of the EU Fuels Directive 98/70 regarding the sulphur content of fuels*, May 31, 2000

<sup>57</sup>German Federal Government, *Comments of the Federal Republic of Germany on the updating of the EU Fuels Directive 98/70 regarding the sulphur content of fuels*, May 31, 2000

undesirable situation by the Ministry.<sup>58</sup> Therefore, they accommodated the refiner with a longer phase-in schedule. During the ongoing negotiations, some oil companies have changed their refusal into an offer to produce sulphur-free gasoline.<sup>59</sup>

In August of 1999, a German oil industry association (MWW) spokesperson said the industry had undertaken to make all grades of 50 ppm sulphur diesel available country-wide by January 2001, approximately ten months before required.<sup>60</sup>

#### *4.4.4a Degree of Market Penetration*

The Ministry of Environment notes that they expect the market to fully shift within a few weeks of the introduction of the measure.<sup>61</sup>

#### *4.4.4b Level of Public Awareness*

In August of 1999, an alliance of the German car industry, motoring organizations and NGOs called for the introduction of fuels with a lower sulphur content than required by European legislation. They recommended fiscal incentives greater than those that were envisaged by the German government.<sup>62</sup> The group includes Friends of the Earth Germany (BUND), the German League for Nature and the Environment (DNR), the German automobile club (ADAC), the association of car manufacturers (VDA). The Verkehrsclub Deutschland (VCD), although not part of the alliance, supports the demands.<sup>63</sup> The VDC wanted the mineral tax reduced so that low sulphur fuels would be 0.049-0.059 DM (3.3-4 CDN cents) cheaper than the current fuels.

#### **4.4.5 Lessons Learned**

- 1) Market response shows that these tax differentiations motivate market shift.
- 2) Introduction of the measure was negotiated as one of several measures for air quality and may have had an even earlier introduction if debated as a single measure.

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<sup>58</sup>Personal communication with Kai Schlegelmilch, Umwelt Bundes Amt (Federal Environmental Agency)

<sup>59</sup>Correspondence with Bernd Ulrich Hildebrandt, Umwelt Bundes Amt (Federal Environmental Agency)

<sup>60</sup>ENDS Environment Daily, *Low sulphur fuel in prospect for Germany*, August 12, 1999

<sup>61</sup>Personal communication with Kai Schlegelmilch, Umwelt Bundes Amt (Federal Environmental Agency)

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<sup>63</sup>ENDS Environment Daily, *Low sulphur fuel in prospect for Germany*, August 12, 1999

## 5. Concluding Observations from the Case Studies

**Measure of Choice** - At least 11 OECD jurisdictions have implemented or announced the use of economic instruments in order to accelerate the introduction of low sulphur diesel fuel. The case studies examined show that these measures have been very successful. In each of the cases the economic instrument is backstopped by a regulated requirement taking effect at a later date.

**Cost to Government**- For two of the four case studies, the measures were designed to be revenue neutral with minimal cost of administration. The UK's measure was not, but needs to be considered in the context of the associated annual fuel price escalator.

**Getting the Price Right** - Pricing for an economic instrument in advance of a regulation seems to be a case of encouraging refiners to advance spending of capital costs that would ultimately be incurred by all refiners to meet the regulation. The UK and Danish example are the most instructive in this respect.

**Projecting and Assessing Benefits** - Communicating the human health and environmental benefits as well as measuring impacts are important components of designing the introduction of a measure. Denmark's air quality testing and the UK's assessment of environmental benefits of budget measures go a long way in showing the public benefit of tax differentials. Such measures to encourage the early introduction of low sulphur diesel might otherwise be construed as an economic benefit to refiners.

### **Emission Reductions Reported or Projected**

- The UK projected that its fiscal measures to encourage the early introduction of low sulphur diesel fuel would reduce particulates by 21% and by up to 2% of NO<sub>x</sub> emissions.
- Denmark has projected a 13% reduction in fine particulates based on the use of 50 ppm diesel growing to 26% reduction once all city buses use this quality of fuel.
- Finland has reported emission reductions better than those achieved in the use of reformulated gasoline - therefore, the only comparison available is based on those results - carbon monoxide down by 10-20%, hydrocarbons by 5-10% and evaporation emissions by 13-17%.
- Germany projects the benefits of its measure to include reduced emissions of NO<sub>x</sub>, CO, SO<sub>2</sub> and CO<sub>2</sub> emissions reduction of 20-25% from its current fleets along with a projected 4% reduction in fuel consumption.

**Infrastructure** - Distribution of two qualities of fuel may lead to cost and verification issues when attempting to accelerate reduction of sulphur in diesel.

**Timing** - An economic instrument can produce a rapid market shift in particular when the consultative process leading to its introduction is effective.

**Duration** – All jurisdictions plan to keep the economic instrument in place until the regulation kicks in.

**Voluntary Initiatives** - Industry voluntary initiatives may create a market advantage for companies positioning themselves as leaders (BP Amoco). However, the longevity of the measure and verification of its effectiveness may be problematic. Voluntary leadership may not be adequate to motivate refiners to move in advance of regulation.



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## Appendix A

### Summary of Regulations for Sulphur in Diesel Fuel in OECD Countries

## Summary of Regulations for Sulphur in Diesel Fuel in OECD Countries

Country	Current fuel limit (average content) [measure and when came into effect]	Additional Planned Measures		
		Instrument	Sulphur Limit	Effective Date
<b>Australia</b>	5000 ppm (1300 ppm)	New Tax System Act 1999 - part of the Measures for a Better Environment	road transport diesel to 500 ppm	end of 2002
	will be 500 ppm at this time	National Legislation (mandatory standard: National Environment Protection Measure)	50 ppm	Jan. 1, 2006
<b>Australia - Western Australia Government</b>	500 ppm [Environmental (Diesel and Petrol) Regulations 1999, Jan 1, 2000]			
<b>Australia - Queensland Government</b>	500 ppm [Environmental Protection Act, Jan. 1, 2000]			
<b>Canada</b>	500 ppm (320 ppm ) [Diesel Fuel Regulations, January 1, 1998]	Consulting	15 ppm	proposed 2006



Country	Current fuel limit (average content) [measure and when came into effect]	Additional Planned Measures		
		Instrument	Sulphur Limit	Effective date
<i>Canada - British Columbia</i>	500 ppm in SW BC [Diesel Fuel Regulations (BC Reg 259/94), 1994] 500 ppm in the rest of BC [1995]			
<i>Canada - Montreal Urban Community</i>	500 ppm for both on- and off-road [By-Law # 90-3, October 1, 1997]			
<i>Czech Republic</i>	350 ppm [National Legislation, Jan. 1, 2000]			
<i>EU Wide</i>	500 ppm (450 ppm) [Euro 2 regulation - 94/12/EC, Oct. 1996 ]			
	500 ppm (450 ppm)	98/70/EC regulation	350 ppm (300 ppm)  50 ppm	2000 (Portugal has exemption to January, 2001)  January 2005
	2000 ppm	98/70/EC regulation for off-road	1000 ppm	2008
	350 (300 ppm)	Proposal for Sulphur-free fuels	less than 10 ppm	TBD
<i>EU Wide - Germany</i>	will be 50 ppm at that time (2005)	EU Wide Proposal for Diesel and Gasoline	sulphur free (less than 10 ppm)	2007
<i>EU Wide - Netherlands</i>	2000 ppm for off-road diesel (National Legislation for Diesel)			
<i>EU Wide - Poland</i>	2000 ppm [National Legislation for Diesel, Jan. 1, 2000]			
<i>Hungary</i>	350 ppm [National Legislation for Diesel, Jan. 1, 2000]			

Country	Current fuel limit (average content) [measure and when came into effect]	Additional Planned Measures		
		Instrument	Sulphur Limit	Effective date
<i>Japan</i>	500 ppm (350 ppm)	National Initiative for Diesel - developing regulations	50 ppm	2007
<i>Korea</i>	500 ppm	Air Quality Conservation Law - Draft Standard	430 ppm	2002
	500 ppm	Air Quality Conservation Law - Target Standard	50 ppm	2006
<i>Mexico</i>	500 ppm [National Legislation for Diesel, 1994]			
<i>Switzerland</i>	500 ppm [National Legislation for Diesel, 1993]			
<i>USA</i>	500 ppm	EPA Regulatory Proposal	15 ppm	proposed June 1, 2006
<i>USA - California</i>	500 ppm for on- and off-road (100 ppm) [State Legislation (209.3 CCR Title B: Sect. 2281), Oct. 1, 1993]	State Legislation - Urban Transit Bus Fleet Rule Requirements and Emission Standards	15 ppm for urban buses	July 1, 2002
<i>USA - Texas</i>	500 ppm	Texas Natural Resource Conservation Commission Proposal for East/Central Texas	500 ppm for on- and off-road diesel	May 1, 2002
	500 ppm	Texas Natural Resource Conservation Commission Proposal for East/Central Texas	30 ppm cap	May 1, 2004
	500 ppm	Texas Natural Resource Conservation Commission Proposal for the City of Houston fleet and contractors serving the City	30 ppm	July 1, 2001

## Appendix B

### Summary of Industry Voluntary Initiatives for Diesel in OECD Countries

## Summary of Industry Voluntary Initiatives for Diesel in OECD Countries

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Comment
<b>Australia</b>	5000 ppm (1300 ppm)	National Initiative for Diesel	500 ppm	Unknown	negotiating with the oil companies for the accelerated, voluntary introduction of lower sulphur diesel into urban areas before 2002 requirement; a pool average of 1000 ppm applies for other refiners supplying to urban areas from January 2000 onward
	5000 ppm (1300 ppm)	BP Amoco Voluntary initiative for low sulphur diesel and a lead replacement alternative "superGreen" gasoline	50 ppm	2000	will supply approximately 75% of the Western Australia network in the beginning of 2000 with low sulphur diesel and in late 2000, the remaining states starting with Queensland will be supplied; capacity to supply only one eighth of the market; unlikely that other significant domestic capacity to produce 50 ppm diesel could be available before 2003; superGreen gasoline will remain the same price at the pump while low sulphur diesel will increase to 0.7 cents per litre (0.006 CDN/litre) to cover the costs of investment, ongoing production costs and raw material cost increases
<b>France - Paris</b>	500 ppm	BP Amoco France's Voluntary "Clean Fuels Program"	50 ppm	Sept. 1, 1999	BP Amoco Diesel Ecology was introduced in all 40 BP Amoco inner-Paris service stations and was progressively marketed at all of BP's 240 Paris region retail network; offered at no extra cost; also marketed to BP Amoco's commercial customers like bus and transport companies running fleets
<b>Ireland</b>	500 ppm	Kelly Fuels Voluntary initiative for Ultra Low Sulphur Diesel (ULSD)	50 ppm	November 1998	making ultra low sulphur diesel (ULSD) widely available to filling stations in Northern Ireland

## Appendix C

# Summary of Economic Instruments Applied to Diesel Fuel in OECD Countries

# Summary of Economic Instruments Applied to Diesel Fuel in OECD Countries

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Australia</b>	5000 ppm (1300 ppm)	Diesel and Alternative Fuels (Grant) Scheme Act 1999	50 ppm or less	after 2006		only diesel fuel with a sulphur content of 50 ppm or less will be eligible for a fuel grant after 2006; grant amount will be calculated by multiplying the amount of fuel used for eligible purposes in a grant period by the relevant rate of grant (rate of grant is an amount per litre)
	5000 ppm (1300 ppm)	Proposed National Incentive for Diesel	diesel with a sulphur level less than 50 ppm	Jan. 1, 2003 Jan. 1, 2004	increase in the diesel excise for high sulphur fuel (fuel with a sulphur level greater than 50 ppm) so that the relevant effective diesel excise payable increases by 1 cent per litre (\$0.008 CDN/litre) in 2003 and by 2 cents per litre (\$0.016 CDN/litre) in 2004	intended to promote the rapid and widespread conversion to the use of low sulphur diesel; the differential excise treatment of low and high sulphur diesel is intended to provide an incentive to switch demand and speed the introduction of new refinery capital investment over the period 2000 to 2005; decision on its implementation has not yet been taken (at the Department of the Prime Minister and Cabinet level)
		Diesel Fuel Rebate Scheme for Off-road diesel		July 1, 2000	rebate per litre varies according to the amount of excise paid and is also adjusted by the Taxation Office which carries out averaging calculations on the rate	provides a rebate for customs or excise duty paid on diesel for use in certain off-road business activities (rail and marine transport, mining, agriculture, forestry, fishing, etc.)
<b>Austria</b>	350 ppm	Excise Tax on Diesel		currently in effect	tax rate of 3890 OS/kl (\$0.372 CDN/l)	

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Austria</b>	350 ppm	National Incentive		No date as of yet		according to the International Fuel Quality Centre, will most likely follow Germany
<b>Belgium</b>	350 ppm	Excise Duty on Diesel		currently in effect	tax rate of 11.70 BEF per litre (\$0.38 CDN/litre)	
<b>Canada</b>	500 ppm	Federal Excise Duty on Motor Fuels (Diesel)		currently in effect	tax rate of 4 cents per litre	
<b>Czech Republic</b>	350 ppm	Air pollution charge on sulphur content of fossil fuels (Diesel)		currently in effect	tax rate of 1000 CZK per tonne (\$0.038 CDN per litre)	
	350 ppm	Excise on hydrocarbon fuels (Diesel)		currently in effect	tax rate of 8150 CZK per 1000 litres (\$0.310 CDN/litre)	
<b>Denmark</b>	350 ppm (50 ppm)	Duty on diesel oil used as motor fuel		tax rate as of Jan. 1, 2000	tax rate of 2.58 DKK per litre of normal diesel (\$0.457 CDN/litre)	
	350 ppm (50 ppm)	Duty on diesel oil with low sulphur content	for diesel with a sulphur content greater than 500 ppm	currently in effect	tax rate of 2.02 DKK per litre of light diesel (\$0.358 CDN/litre) minus 0.1 DKK per litre (\$0.017 CDN/litre) for a total of \$0.341 CDN/litre)	
	350 ppm (50 ppm)	CO <sub>2</sub> Tax for Diesel		1992	tax rate of 0.27 DKK per litre (\$0.047 CDN/litre) for normal and light diesel	levied according to energy content in fuel in 1998

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Denmark</b>	350 ppm (50 ppm)	National incentive for Diesel	50 ppm	June 30 1999 until 2005	reduced tax on low sulphur diesel of 0.9 DKK (\$0.015 CDN) and increased tax on high sulphur diesel of 0.9 DKK (\$0.015 CDN) and net result is a tax differential of 0.18 DKK per litre (\$0.03 CDN/litre)	100% penetration by July 1, 1999
	350 ppm (50 ppm)	National Incentive for Diesel	Public Bus Service Ultra Light Diesel (ULD) 500 ppm	1992	tax incentive of 0.3 DKK per litre (\$0.053 CDN/litre)	In 1992, the regulated limit was 2000 ppm, but in October 1996, the EU sulphur limit was reduced to 500 ppm and as a consequence the tax incentive for ULD was reduced to 0.10 DKK/l (0.017 CDN/litre)
<b>Finland</b>	350 ppm	Environmental Policy graduation of excise duty on low-sulphur diesel	50 ppm	introduced the beginning of 1993 until 2005	a tax subsidy of 0.15 FIM/l (\$0.033 CDN/litre) was administered	purpose was to promote the use of low-sulphur diesel through tax differentiation by levying lower excise duty rate on this product compared to Current diesel
	350 ppm	Excise Duty for low sulphur content diesel oil		currently in effect	Basic Duty is 151.6 pennies per litre (\$0.337 CDN/litre) Additional Duty is 26.9 pennies per litre (\$0.059 CDN/litre) Strategic Stockpile fee is 2.1 pennies per litre (\$0.005 CDN/litre)	
<b>France</b>	350 ppm	Diesel Tax		1998	tax rate of 2.35 FF (\$0.47 CDN/litre) the diesel tax will be increased yearly (1999: growth of 0.07 FF equal to \$0.014 CDN/litre)	decided in 1998 to reduce the difference in the level of taxation of diesel to the European mean difference with the next 5 to 7 years



Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Germany</b>	350 ppm (200-250 ppm)	Excise Tax on Diesel		currently in effect	tax rate of 740 DM/kl (\$0.501 CDN/litre)	German government is proposing a 0.059 DM/l (0.039 CDN/litre) in petrol and diesel taxes in each of the next four years (2000-2004)
	350 ppm (200-250 ppm)	National incentive for Diesel and Gasoline	less than 50 ppm less than 10 ppm	by Nov. 1, 2001 2003	additional tax of 3 Pf (\$0.02 CDN/litre) on each litre of ordinary fuel in 2001 and only fuel without sulphur will be financially supported in 2003 at the same tax rate	German government will subsidize to get the fuel introduced before the EU guideline of 2005 with the second phase subject to permission from the EC
<b>Greece</b>	350 ppm	Excise Tax for Diesel		currently in effect	tax rate of 77 000 DRA/kl (\$0.298 CDN/litre)	
<b>Hong Kong<sup>1</sup></b>	500 ppm	"Ultra low sulphur" national incentive	50 ppm	July 2000	tax incentive of 0.89 HKD (\$0.176 CDN/litre) through 2001	to encourage the quick introduction of ULSD; low sulphur diesel is currently imported to meet this requirement and regional production is not expected until 2001
	500 ppm	Duty on Diesel		currently in effect	tax rate of 2.00 HKD/l (\$0.395 CDN/litre)	
<b>Hungary</b>	350 ppm	Environmental petrol tax (Diesel)		currently in effect	tax rate of 2.00 HUF per litre (\$0.01 CDN/litre)	
	350 ppm	Excise tax on diesel		currently in effect	tax rate of 67.60 HUF per litre (\$0.34 CDN/litre)	

<sup>1</sup>Hong Kong is not an OECD country

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Ireland</b>	350 ppm	Duty on Auto-Diesel		currently in effect	tax rate of 256.44 pounds per 1000 litres (\$0.428 CDN per litre)	
<b>Italy</b>	350 ppm	Excise Tax for Diesel		currently in effect	tax rate of 747 470 LIT/kl (\$0.508 CDN/litre)	
<b>Japan</b>	500 ppm (350 ppm)	Light Oil Delivery Tax for diesel		currently in effect	tax rate of 32.1 yen per litre (\$0.45 CDN/litre)	
<b>Luxembourg</b>	350 ppm	Excise Tax for Diesel		currently in effect	tax rate of 10 200 LFR/kl (\$0.333 CDN/litre)	
<b>Mexico</b>	500 ppm	Special excise on diesel		currently in effect	tax rate is a complex formula which includes reference prices, management costs of the Pemex oil company, net transportation costs, and sales prices to the public	
<b>Netherlands</b>	350 ppm	Excise Duty on Diesel used as a motor fuel		1992; these rates entered into force Jan. 1, 2000	tax rate of 0.7355 NLG per litre (\$0.44 CDN/litre)	to compensate for the price differential between diesel and gasoline, the purchase taxes on diesel vehicles are higher
	350 ppm	Environmental Tax on Diesel		1992; rate at the start of 1999	tax rate of 28.76 NLG per 1000 litres (\$0.0172 CDN per litre)	

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Netherlands</b>	350 ppm	National incentive for Diesel	considering 10, 30 and 50 ppm targets	No date as of yet		considering incentives aimed at an earlier introduction of ultra low sulphur diesel for on-road while looking at the (dis) advantages and cost of future further reductions
<b>Norway</b>	Not known	Sulphur tax on Diesel		currently in effect	tax rate of 0.07 NOK per litre (\$0.01 CDN/litre) and per 0.25% sulphur content	for diesel with a sulphur content of greater than 50 ppm
	Not known	CO <sub>2</sub> Tax on Diesel		currently in effect	tax rate of 174 NOK (\$0.0289 CDN/litre) per tonne of CO <sub>2</sub>	
	Not known	Excise Tax on Diesel		currently in effect	tax rate of 3740 NOK/kl (\$0.620 CDN/l)	
<b>Portugal</b>	Not known	Excise Tax on Diesel		currently in effect	tax rate of 70 000 ESC/kl (\$0.459 CDN/l)	
<b>Spain</b>	350 ppm	Excise tax on Diesel		currently in effect	tax rate of 41 107 PTA per 1000 litres (\$0.325 CDN per litre)	
<b>Sweden</b>	350 ppm	Energy and CO <sub>2</sub> tax on fuels - Diesel Environmental Class 1 (EC1)	10 ppm	introduced January 1991 revised to urban diesel 1 (EC1) in Jan. 1992	tax rate of Energy: 1864 (\$0.288 CDN); CO <sub>2</sub> : 1058 (\$0.164 CDN); Total: 2922 SEK per m <sup>3</sup> (total of \$0.452 CDN per litre)	In 1991, the regulated limit was 2000 ppm and came down to 500 ppm in 1996; after 1996 EC1 became the single standard grade of diesel across Sweden with the market share approaching 100%; the results of the tax differentiation for diesel was a 75% reduction of sulphur emissions by diesel cars and 95% in the city

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Sweden</b>	350 ppm	Energy and CO2 tax on fuels - Diesel Environmental Class 2 (EC2 )	200 ppm (in 1991)  50 ppm (revised to in 1992)	introduced January 1991  revised to urban diesel 2 (EC2) in Jan. 1992	tax rate of Energy: 2092 (\$0.324 CDN);CO2: 1058 (\$0.164 CDN);Total: 3148 SEK per m <sup>3</sup> (total of \$0.487 CDN per litre)	In 1991, the regulated limit was 2000 ppm; In 1996, EC2 was abolished which coincided with the 1996 adoption of 500 ppm sulphur content in EN 590 diesel Europe wide
	350 ppm	Energy and CO2 tax on fuels - Diesel Environmental Class 3		introduced January 1991 and set just as a standard in 1992	tax rate of Energy: 2388 (\$0.369 CDN);CO2: 1058 (\$0.164 CDN);Total: 3446 SEK per m <sup>3</sup> (total of \$0.533 CDN per litre)	In 1991, the regulated limit was 2000 ppm and came down to 500 ppm in 1996
	350 ppm	Tax on sulphur in Diesel		Jan. 1991	tax rate of 27 SEK per m <sup>3</sup> per 0.1% sulphur content by weight (\$0.004 CDN per litre per 0.1% sulphur content by weight)	sulphur tax promotes the use of cleaner diesel

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Sweden</b>	350 ppm	Km Tax on Diesel-Driven Vehicles		introduced in 1974 and abolished in Oct. 1993	abolished and replaced by an extra energy tax on diesel of 1.3 SEK per litre (\$0.20 CDN per litre)	with the abolition of the km-related tax on diesel-driven vehicles, both the energy tax on diesel and the rebate for EC1 were increased
	350 ppm	Tax Rebate for EC1 (Diesel)	10 ppm	1991 increased in 1992 back to original in 1994	tax rebate of -350 SEK per m <sup>3</sup> (-\$0.0541 CDN per litre) tax rebate increased by 100 SEK per m <sup>3</sup> (\$0.0155 CDN per litre) and in 1994 reduced back to the original rebate due to revenue loss and questionable environmental benefits	the level of the tax rebate was determined such that it would cover the additional refinery costs for production of classes 1 and 2 diesel; it appeared that the costs of production of classes 1 and 2 were lower than the production cost of standard fuel (rebates included); the main objective of differentiating diesel according to environmental classes with the introduction of a tax rebate was to stimulate the introduction of diesel with supreme environmental properties; since July 1994, due to revenue loss and questionable environmental benefits, the tax rebate has only been eligible for diesel used in motor vehicles but has disappeared for heating oil
	350 ppm	Tax Rebate for EC2 (Diesel)	200 ppm 50 ppm	1991 increased in 1992 back to original in 1994	tax rebate of -250 SEK per m <sup>3</sup> (-\$0.0387 CDN per litre) tax rebate increased by 100 SEK per m <sup>3</sup> (\$0.0155 CDN per litre) and in 1994 reduced back to the original rebate due to revenue loss and questionable environmental benefits	In 1991, the regulated limit was 2000 ppm and came down to 500 ppm in 1996

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<b>Sweden</b>	350 ppm	Energy Tax on Diesel		October 1995	expansion of the special diesel tax for transport purposes on off-road vehicles	
<b>Switzerland</b>	500 ppm	Tax on diesel		currently in effect	tax rate of 458.70 (\$0.395 CDN) + 300 CHF (\$0.258 CDN) per 1000 litres at 15 <sup>0</sup> C (total of \$0.654 CDN per litre)	approximately 70% of the revenue is earmarked for road construction and other road-related expenditures
	500 ppm	National Incentive Proposal for Diesel		No date proposed		discussing the variation of tax rates according to diesel quality but no decision has been made yet
<b>UK</b>	350 ppm (<50 ppm)	Duty on diesel		rates as of March 1999	tax rate of 50.21 pence per litre (\$1.113 CDN/l)	
	350 ppm (<50 ppm)	Duty on ultra low sulphur diesel	maximum 50 ppm (30-40 ppm)	introduced in 1997 and increased in March 1999	a tax rate of 47.21 pence per litre (\$1.047 CDN/l)	the specification for ULSD has tightened (reduced sulphur, lower heavy hydrocarbons, and lower density than Current diesel) to ensure that only the cleanest diesels qualify for the reduced rates
	350 ppm (<50 ppm)	National Incentive	50 ppm (30-40 ppm)	March 1999 (introduced in Aug. 1997) until 2005	tax incentive of a 3 pence per litre (\$0.066 CDN per litre) duty differential in favour of ULSD over conventional diesel	ULSD has almost 100% of the market share

Country	Current fuel limit (average content)	Instrument	Sulphur limit	Effective Date	Tax	Comment
<i>UK</i>	350 ppm (<50 ppm)	National Incentive		introduced in March 1998 and increased in March 1999	increased to a 3 pence per litre (\$0.066 CDN per litre) duty differential between standard diesel relative to unleaded gasoline	
	2000 ppm (1000-2000ppm)	Rebated red diesel exclusively for off-road vehicles		currently in effect	rate for rebated diesel is 3.13 pence/litre (\$0.069 CDN/litre)	for vehicles used for agricultural, horticultural, forestry, construction and other off-road uses (i.e. not for use on roads repairable at the public expense)