Association

Climate Change

LP Gas: Part of the Solution

Executive Summary

Irish LP Gas Association

The Irish LP Gas Association was established in 1969 and is the representative body for companies involved in the marketing and distribution of LP Gas in Ireland.

In Ireland, LP Gas is widely used for domestic heating and cooking, industrial, commercial and agricultural applications, and as an alternative gas in areas where Natural Gas is not available. The benefits of using cleaner fuels, such as LP Gas and Natural Gas, include less damage to public health, particularly respiratory health, and a more beneficial impact on the environment. LP Gas is also a more environmentally friendly fuel for industrial, domestic and automotive use, compared to electricity, coal, petrol or diesel, and an increased level of usage, in the place of these more polluting fuels, will assist in meeting Ireland's obligations to limit and reduce carbon dioxide and other Greenhouse Gas emissions under the Kyoto Protocol.

An Overview On The Proposed Carbon Energy Tax

The Irish LP Gas association believe that the industry is very well positioned to make a major contribution to the reduction of CO_2 emissions and assist in meeting Ireland's committments to limit the level of CO_2 production.

Other fuels, such as sod peat, coal, peat briquettes, gas oil and kerosene all produce significantly more CO_2 than LP Gas or Natural Gas.

The Irish LP Gas Association suggests that any proposed financial instruments should be designed to penalise high carbon fuels.

It should be used as an incentive to promote the use of cleaner fuels, such as LP Gas or Natural Gas and should have an inherent stimulus to promote switching to cleaner fuels.

We also consider that any proposed changes in the current structure should be used as an opportunity to eliminate the current anti-competitive situation, where excise duty is charged on LP Gas but not on Natural Gas.

This also puts industrial users who do not have access to the Natural Gas Grid at a competitive disadvantage in terms of energy costs. Many of these users are operating businesses in currently volatile and vulnerable sectors, such as tourism and horticulture. This is a particular issue in more peripheral and rural areas, where the Government has stated its objective, through the National Development Plan and The National Spatial Strategy, of achieving economic development in tandem with regional re-balancing.

With regard to CO_2 emissions, the generation of electricity through combustion of carbon fuels generates more than three times the levels of carbon dioxide than LP Gas or Natural Gas. In spite of this, the 2002 Discussion Document "National Climate Strategy - Proposal for a Carbon Energy Tax" proposes that electricity be rewarded with the lowest Carbon Energy Tax percentage increase, of all the energy forms, despite the fact that it is the worst offender in terms of CO_2 emissions.

Key Proposals On Climate Change:

- In principle, we believe that cleaner fuels such as LP Gas should not be subject to a Carbon Energy Tax.
- If Carbon Energy Taxes are to be introduced for all fuels, we propose that they be on a sliding scale, i.e. the fuel with the greatest production of CO_2 should have the highest rate of tax per TOE, based on the level of carbon dioxide production. This will encourage fuel-switching to cleaner fuels.
- Fuel switching to cleaner fuels will also result in significant reductions of other environmental pollutants and health hazards such as SO_2, NO_x and PM 10.
- We propose that exemption be provided for small packages of environmentally friendly fuels such as cylinder gas (up to 50 kg) as it is primarily used as a substitute for central heating systems with a consequent reduction in CO_2. Usage of such units is high in lower social income groups, particularly those who do not have the resources for the installation and operation of central heating systems.
- Financial incentives, through tax credits or some other revenue recycling initiatives, should be provided to promote the introduction of condensing gas boilers (for both LP Gas and Natural Gas usage) for the residential and industrial sectors. Usage of condensing gas boilers can reduce the CO_2 heating emissions of a typical domestic house by 30 - 40%. The accelerated introduction of gas condensing boilers to both sectors would reduce national CO_2 emissions by 348,000 tonnes per annum by the end of a 10-year implementation period. This emission reduction can be achieved on a self-financing basis due to savings in levies, which would otherwise be paid on an emissions trading basis.
- We believe that LP Gas should be promoted through financial incentives as a cleaner fuel for the transport sector (e.g. buses and taxis) to reduce harmful emissions from both diesel and petrol vehicles. Such measures should include lower taxes on cleaner fuel vehicles, lower rates of tax on cleaner fuels, and subsidies towards conversions.

SECTION 1

LP GAS AND ITS USAGE IN IRELAND

General Usage

In the industrial, commercial and agricultural sectors, LP Gas is particularly used in areas away from a Natural Gas supply. Where new industries set up in similar locations for specific economic, logistical or social reasons, they can depend on having access to a gas supply from the LP Gas industry. In areas not connected to the natural gas grid, LP Gas provides an efficient and environmentally friendly alternative to other fuels.

National Distribution Infrastructure

The LP Gas industry has invested significant funding in marine importation and distribution facilities at Dublin, Cork and Belfast as well as land terminals at Whitegate, Claremorris, Ballyhaunis and Sligo. The costs of rolling out this infrastructure have been covered by the industry and without any direct Government financial support. This efficient and proven infrastructure is already in place and provides gas to those who require it.

LP Gas for Domestic Use

LP Gas also provides an alternative to electricity or other energy forms for home heating, hot water and cooking in over 400,000 homes around the country, particularly in areas not connected to the natural gas grid.

LP Gas as an Automotive Fuel

As an automotive fuel, LP Gas is gaining support and usage throughout the world, particularly in towns and cities where heavy-duty vehicles can cause specific pollution problems.

LP Gas fuelled vehicles now have low tailpipe emissions of both regulated and non-regulated pollutants: the main advantage of LP Gas remains its CO2 benefit over petrol and its NOx and particulate benefits over diesel – but the exhaust gases of LP Gas vehicles also show less smog forming potential and contain less carcinogenic components such as 1.3 butadiene, benzene and aldehydes. Using LP Gas in road transport can therefore help reduce total emissions and improve air quality. In addition, the continuous adaptation of the automotive LP Gas equipment to the latest technologies allows LP Gas vehicles to take the benefits of all its fuel characteristics and thus maintain their environmental advantages over conventional vehicles.

The use of LP Gas not only helps reduce toxic emissions (which damage air quality and human health) but also significantly reduces the production of greenhouse gases (CHG) of 12 to 20 percent compared to conventional gasoline vehicles. These are similar to those of diesel vehicles but without their disadvantages in terms of high NOx and particulate emissions.

Calculated average emissions of regulated pollutants of current type-approved EURO IV vehicles

Vehicle type	NOx (g/km) Nitrous Oxides	HC (g/km) Hydrocarbons	CO (g/km) Carbon monoxide	Particulates	CO2 (g/km) Carbon Dioxide
Petrol Euro 4 (593 vehicles)	0.032	0.054	0.427	—	209.8
Diesel Euro 4 (2 vehicles)	0.210	0.010	0.140	0.022	156.5
CNG Euro 4 (18 vehicles)	0.019	0.065	0.464	—	174.5
LPG Euro 4 (42 vehicles)	0.025	0.039	0.531	—	178.7

Source: AEGPL

SECTION 2

NATIONAL CLIMATE CHANGE STRATEGY

Kyoto Protocol

The impetus for the Carbon Energy Tax proposal and the pursuit of cleaner air, arise from the Kyoto Protocol, the purpose of which is to cut greenhouse gas emissions.

Ireland, along with all other EU Member States, ratified the Kyoto Protocol in May 2002.

This means that Ireland will have a legally binding commitment to emit an average of no more than 60.9 million tonnes (Mt) of CO_2 equivalent per annum of greenhouse gases (GHGs) in the period 2008-2012 (+13% over 1990 levels)

Ireland's Greenhouse Gas Emissions

Ireland's emissions in 2000 amounted to 67Mt, which is +23.7% over 1990 levels or almost double the increase that we were legally committed not to exceed.

Some of the overshoot may be covered through international emissions trading. However emissions trading cannot be the only method of controlling emissions, as the Kyoto Protocol requires that "domestic action shall constitute a significant element of the effort made".

It is clear therefore that failure to take immediate action to reverse the growth in Ireland's emissions will have serious negative effects in the long run both from an economic and environmental perspective.

The National Competitiveness Council has also identified the benefits for Ireland of maintaining a "green" image. To date nine EU Member States have introduced carbon taxation in some form. The Department of the Environment and Local Government contend that the next significant step in compliance with Kyoto must be the introduction of carbon taxation.

National Climate Change Strategy

The National Climate Change Strategy (NCCS), published in November 2000, identified a 10-year framework to attempt to achieve the greenhouse gas emissions reductions so that Ireland might comply with the Kyoto Protocol.

The NCCS estimates of "business-as-usual" (BAU) emissions predict that Ireland will overshoot its Kyoto target by 13 Mt CO_2 equivalent per annum (which must now be considered a best-case scenario, with the possibility of a significantly worse outcome - this is primarily due to the consistently high levels of industrial activity, record levels of vehicle ownership and usage and other consequences of the significant economic growth from the mid-1990's). Measures implemented or planned to date will only have the potential to reduce the BAU figure by 3.3 Mt.

The consequence of this is that Ireland would need to purchase emission rights at their market price in the period 2008-2012 or pay a penalty (effectively the market price plus 30%). Current estimates put the market price in the region of EUR 2 to EUR 20 per tonne. Ultimately, the value will be determined by the participation of the US in the Kyoto protocol and subsequent trading activities - if the US participates, the values will be at the higher level of the scale.

Assuming that the agricultural sector meets its target as set out in the NCCS and that electricity generation is covered by the EU emissions trading scheme, this would leave circa. 6 – 12 Mt CO_2 equivalent of an overshoot to be accounted for with an Exchequer bill of between EUR 12m and EUR 240m per annum.

Therefore any attempt to "buy" our way out of non-compliance would cost the Exchequer 12m - 240m per annum in perpetuity. Assuming an interest rate of 5% this would have a net present value of between 240m and 4.8bn just to meet an ongoing Kyoto overshoot. Within the tightening economic conditions, any additional pressure on public funds, which could otherwise be avoided through the pursuit of innovative measures, should be avoided.

Tax Strategy Group

The Government agreed on 3 October 2000 to publish the National Climatic Change Strategy and in this context it was agreed that the Tax Strategy Group (TSG) would examine the implications for tax policy of any specific tax proposals brought forward under the Strategy. The Government Programme states, "We will implement our greenhouse gas taxation policies on a phased incremental basis and in a manner which takes account of national economic, social and environmental objectives".

Green Tax Group

The Green Tax Group, which is a sub-group of the TSG, considered this issue in a preliminary fashion on foot of a separate proposal from the Department of the Environment and Local Government (D/ELG) to implement a system of carbon taxation with effect from 2003.

A D/ELG paper has been discussed at two recent meetings of the Green Tax Group and was amended to reflect some of the comments and suggestions made at these meetings.

Irish LP Gas Association

Unless more assertive corrective action is taken, Ireland will fail to meet its obligations under the Kyoto protocol in relation to Greenhouse Gas Emissions.

We believe that LP Gas, as a cleaner fuel, can make a significant contribution to reducing the CO_2 emissions, as detailed in this document.

This document outlines:

1. How the proposal on a Carbon Energy Tax can be structured to encourage fuel switching to cleaner fuels rather than a direct tax on all carbon producing fuels
2. How use of new technology condensing gas boilers will save 5.4 million tonnes of CO_2 production on a self-financing basis
3. How the sector with greatest environmental pollution, transport sector, can benefit from use of LP Gas

SECTION 3

PROPOSAL ON A CARBON ENERGY TAX

In principle, the Irish LP Gas Association's position is that cleaner fuels, such as LP Gas, should not be subject to a Carbon Energy Tax. We strongly reject the inequitable proposed increases, as outlined in "National Climate Strategy - Proposal for a Carbon Energy Tax", which favours the fuel with the highest CO_2 production - electricity - over other more environmentally-friendly fuels such as LP Gas.

At the outset, we wish to point out that the calculations made for LP Gas (in the Document TSG/02/23) in the section "LPG Carbon Tax Analysis" are incorrect. These were out by a factor of two and have been corrected and amended on Appendix 1.

How do various fuels compare in terms of CO_2 production?

The table below indicates the relativity of CO_2 production of other fuels compared to LP Gas.

Fuel Type	**CO_2 Production**
LPG	**100%**
Sod Peat	**163%**
Coal	**134%**
Peat Briquettes	**154%**
Gas Oil	**115%**
Natural Gas	**86%**
Kerosene	**112%**
Electricity	**313%**

Source: Department of the Environment and Local Government

Electricity is the worst offender in terms of CO_2 emissions by a huge margin - three times as much as LP Gas or Natural Gas. In spite of this, it is being rewarded with the lowest Carbon Energy Tax percentage increase of all energy forms, as outlined in the proposal on retail prices for residential customers, as estimated by the Department of the Environment and Local Government.

The reference numbers of the paragraphs (***in Italics***) quoted below are the reference numbers in the corresponding paragraphs of the TSG document.

"The effects of this proposal on retail prices for residential customers as estimated by D/ELG are presented in Table A below, showing the increases in the prices of energy products."

Ref: TSG/02/23

Retail Price increases from the proposal

Fuel	Retail Unit	Current Price	Price increase resulting from 7.50 tax		Price increase resulting from 20 tax	
		EUR	EUR	%	EUR	%
Peat – Briquette	Bale	2.37	0.25	10.55	0.67	28.27
Coal	40kg Bag	9.91	0.79	7.97	2.11	21.29
	Tonne	247.63	19.76	7.98	52.68	21.27
Oil – Heating	Litre	0.4	0.029	7.25	0.077	19.25
Oil – Motor	Litre	0.9	0.028	3.11	0.074	8.22
LPG	**Litre**	**0.38**	**0.028**	**7.37**	**0.075**	**19.74**
Gas	kWh	0.0223	0.0014	6.28	0.0037	16.59
Electricity	**kWh**	**0.11**	**0.0049**	**4.45**	**0.0124**	**11.27**

If Carbon Energy Taxes are to be introduced for all fuels, we propose that they be on a sliding scale, based on the level of carbon dioxide production, where fuel with greater production of $C0_2$ per TOE is taxed at a higher rate.

Although such an initiative would be designed specifically to penalise fuels with carbon dioxide emissions, we are concerned that insufficient emphasis is placed on the reduction of SO_2, NOx and PM 10. We propose that this imbalance can be corrected by taxation weighting, which will encourage fuel switching to cleaner fuels away from fuels with higher levels of pollutants such as carbon monoxide, hydrocarbons, particulate matter and ozone.

9. "It is proposed by the D/ELG to place an excise-type tax on all fossil fuels across all sectors, directly related to the amount of CO_2 emitted from their combustion. This, they believe, will create the most effective incentive for greater sustainability of energy use, fuel switching to less carbon intensive fuels and methods of energy production, and to ensure that Kyoto requirements are met at least cost."

Ref: TSG/02/23

The Irish LP Gas Association's position is that any proposed financial instruments designed to penalise high carbon fuels should be used as an incentive to promote the use of cleaner fuels, such as LP Gas. We also consider that any proposed changes in the current structure should be used as an opportunity to eliminate the current anti-competitive situation, where excise duty is charged on LP Gas but not on Natural Gas. Natural Gas has always received preferential, and completely unfair, treatment in respect of excise duty. From an environmental viewpoint, LP Gas is generally similar to Natural Gas in terms of its impact. This is fundamentally due to both being simple gases as opposed to other higher-carbon content fuels being mixtures. The proposed Carbon Energy Tax, if implemented as an excise duty, should take into account the existing excise duty on LP Gas.

The current system is inequitable and puts industrial users who do not have access to the Natural Gas Grid at a competitive disadvantage in terms of energy costs. Many of

these users are operating businesses in currently volatile and vulnerable sectors, such as tourism and horticulture. This is a particular issue in more peripheral and rural areas, where the Government has stated its objective, through the National Development Plan and The National Spatial Strategy, of achieving economic development in tandem with regional re-balancing.

11. "Comparisons of the revenue raised and the consequent CO_2 reductions do not produce an accurate figure for actual cost of reductions. The amount of revenue raised reflects the cost of not making reductions, which will be recycled back into the economy in an appropriate manner. The total cost of reductions equates to the amount of reductions (2.02Mt) by the tax rate (20) or less and amounts to no more than 40.4m."

Ref: TSG/02/23

This is one aspect of the proposals, which may result in the opposite result to that intended. It relates to the narrow focus on revenue generation, which will merely fund emissions trading.

While this may appear to be a solution, it does nothing to ensure that we comply with the Kyoto Protocol, which states, (as referred to in Section 6) "domestic action shall constitute a significant element *of the effort made"*

To ensure that there is a switch to low-carbon fuels, we would propose that instead of the Carbon Energy Tax being directly in proportion to the amount of CO_2 generated, that it be disproportionate, and penalise the more harmful fuels at a higher rate. This could take the form of just an increase for those fuels (resulting in a higher tax take) or that they all be readjusted to give the same overall tax take.

We recognise that all hydrocarbon fuels and electricity produce CO_2. However we strongly believe that an incentive should be created to encourage consumers to switch to low carbon fuels.

What is also hampering any incentive for a consumer to consider switching fuels will be their perception of the figures in Table A - apart from peat, the percentage increase for the different fuels is broadly similar. It will appear to the consumer that there is no benefit in switching fuels. This has the potential to negate the purpose.

However, were this to be changed to a differentially loaded tax favouring the cleaner fuels, it would be obvious to the consumer that switching to a cleaner fuel would result in paying less Carbon Energy Tax. It would be readily apparent that there is an environmental benefit to be gained by the introduction of the Carbon Energy Tax. While consumer acceptance is going to be difficult anyway, in the absence of a differentially-loaded tax, it could appear to the consumer that there is little benefit in switching fuels and that the Carbon Energy Tax is just another "back-door" revenue mechanism. This could then result in no reduction in real CO_2 emissions.

There is a further problem with implementing the tax on the fuel-input side of the electricity generators: the consumers will never see a Carbon Energy Tax charge on their electricity bills, unlike other fuels.

This will reinforce their incorrect perception of electricity being environmentally friendly. As a minimum, there should be a requirement to show an agreed, separate, amount on their bills to reflect their relative environmental harm.

Ironically there could be a real risk of a switch to electricity, which may be very serious. It is important that there is no unintentional consumer switch in this direction: a higher differential rate for electricity, to encourage a switch to low-carbon fuels such as natural gas or LPG, should be an essential core objective of the Carbon Energy Tax.

There is one area, which the Irish LP Gas Association proposes should be exempt from excise duty. These are specific units with proven negligible emission levels. We propose that exemption be provided for small packages of environmentally friendly fuels such as cylinder gas (up to 50kg), as it is primarily used as a substitute for central heating systems with consequent reduction in CO_2. Usage of such units is high in lower social income groups, particularly those who do not have the resources for the installation and operation of central heating systems. This association with fuel poverty links in with a reference in the 2002 Report and we believe that our proposal could make a positive contribution in meeting this objective.

43. "The Department notes the projected CPI impact (Para 45 and subsequent of D/ELG paper). It welcomes the statement in Para 61 of that paper that "consideration will have to be given to meeting increases for those living in fuel poverty both through, for example, weekly social welfare payments and through assistance with the capital costs of fuel switching". In that regard, programmes to address the causes of fuel poverty, for example by improving home insulation or heating systems, should receive priority over increased payments in winter time to compensate people for the higher cost of inefficient fuel use."

Ref: TSG/02/23

Within this context, the promotion of gas condensing boilers is particularly appropriate in achieving these objectives. This is covered in detail in Section 4 of this document.

22. "This proposal will, recording to D/ELG have ancillary benefits, both environmental and economic, which will not accrue through the use of international emissions trading. The health and environmental benefits arise from reduced SO2, NOx and PM10, combinations of which cause respiratory problems, acid rain, and damage to agricultural productivity. These reductions have been valued by the European Commission and the OECD at 35 per tonne of CO_2 reduced. The ancillary economic benefits of this proposal include new markets for clean technology providers, increased investment in research and development, and potentially lower expenditure on imported energy products."

Ref: TSG/02/23

The ancillary health and environmental benefits that would arise from reduced SO_2, NOx and PM10 will not arise unless fuel switching to low-carbon fuels occurs.

Both Natural Gas and LP Gas are the best solutions to these problems, which at a penalty of 35 per tonne of CO_2, are expensive problems. This reinforces the case for differentially-taxing the high CO_2 generators.

SECTION 4.

CONDENSING BOILERS - PART OF THE SOLUTION

Introduction

The Irish LP Gas Association has identified another action that could help Ireland to satisfy its Kyoto obligations.

The residential sector in Ireland accounts for approximately 30 percent of energy-related CO_2 emissions. The accelerated introduction of gas condensing boilers to both domestic and commercial sectors could reduce national CO_2 emissions by 348,000 tonnes per annum by the end of a 10-year implementation period.

How Can A Gas Fired Condensing Boiler Reduce CO_2 Emissions?

- Firstly, the fuel (natural gas or LP Gas) contains less carbon than oil and consequently produces less CO_2 during combustion.
- Secondly, condensing boilers are designed to extract as much heat as possible from the products of combustion.

The combined effect of these factors means that the CO_2 heating emissions of a typical domestic house can be reduced by 30 – 40 percent when compared to a conventional oil fired boiler.

The detailed calculations of this proposal were submitted in our pre budget submission in 2000 and are attached (updated to reflect the Euro conversion and subsequently updated data) as appendix 3

Carbon Dioxide Saving In Converting The Existing Housing Stock

For every conventional boiler replaced by a condensing boiler there is an estimated average saving of 1.3 tonnes of CO_2 per annum per domestic household (see section "Average Emissions per House for Space Heating" in Appendix 3).

Assuming that the proposal is implemented, 267,400 (see start of Appendix 3) gas fired condensing boilers will replace conventional boilers over the next 10 years leading to a national CO_2 saving of 347,620 tonnes per annum by the end of the l0th year.

The value of 347,620 tonnes of CO_2 is EUR 6,952,400 per annum, at EUR 20 per tonne (see point 10 and others of TSG 02/23, "Implementing Greenhouse Gas Taxation", October 2002, for the Green Tax Group).

The total saving of this proposal over the expected boiler lifetime (20 years), and assuming a tax credit of EUR 300 per boiler, is therefore EUR 107.75 million and 5.4 million tonnes of CO_2.

Year	Investment EUR M	Saving EUR M*	Savings/Tonnes
1	**8.022**	**0.695**	**34,762**
2	**8.022**	**1.390**	**69,524**
3	**8.022**	**2.086**	**104,286**
4	**8.022**	**2.781**	**139,048**
5	**8.022**	**3.476**	**173,810**
6	**8.022**	**4.171**	**208,572**
7	**8.022**	**4.867**	**243,334**
8	**8.022**	**5.562**	**278,096**
9	**8.022**	**6.257**	**312,858**
10	**8.022**	**6.952**	**347,620**
11	**0**	**6.952**	**347,620**
12	**0**	**6.952**	**347,620**
13	**0**	**6.952**	**347,620**
14	**0**	**6.952**	**347,620**
15	**0**	**6.952**	**347,620**
16	**0**	**6.952**	**347,620**
17	**0**	**6.952**	**347,620**
18	**0**	**6.952**	**347,620**
19	**0**	**6.952**	**347,620**
20	**0**	**6.952**	**347,620**
Total	***EUR 80.22 m***	***EUR 107.75m***	***EUR 5,388,110***

* Assumes no change in emissions penalty level during these years

Source: Irish LP Gas Association / TSG

Costs Of Implementation

The additional capital cost of a condensing boiler is estimated to be EUR 400 over the cost of an equivalent conventional boiler.

As the objective of the Carbon Energy Tax is to achieve real CO_2 reduction then part of the tax raised should be directed to encourage a switch to cleaner fuels such as natural gas or LP Gas. As stated in paragraph 23 of National climate strategy – Proposal for a Carbon Energy Tax:

"The NCCS commitment to introduce greenhouse gas taxation incorporated broad fiscal neutrality as a design consideration. In light of the current fiscal position and wider economic context it is not envisaged that if any such a tax was introduced any revenue should be earmarked for specific purposes. The Department of Enterprise Trade and Employment considers however that tax revenues raised through taxation from the enterprise sector should be recycled to that sector to help them achieve their emission reductions."

Ref: TSG/02/23

The issue of Revenue Recycling again comes up in sections 24 and 33. In this context, we would draw attention to previous proposals submitted by the ILPGA, starting with the ILPGA budget submission in October 2000, on the benefits of promoting gas-condensing boilers.

At seasonal efficiencies above 90%, they present significant opportunities to reduce CO_2 emissions for domestic, commercial and industrial users.

If this proposal were implemented (which is both for Natural Gas and LP Gas), it would be a tangible demonstration of the government's commitment to the Kyoto requirement that "domestic action shall constitute a significant element of the effort made". The introduction of a proposal promoting gas condensing boilers at the time of the introduction of the Carbon Energy Tax would also help show to consumers that the whole purpose is the reduction in CO_2 rather than revenue generation.

43. "The Department notes the projected CPI impact (Para 45 and subsequent of D/ELG paper). It welcomes the statement in Para 61 of that paper that "consideration will have to be given to meeting increases for those living in fuel poverty both through, for example, weekly social welfare payments and through assistance with the capital costs of fuel switching". In that regard, programmes to address the causes of fuel poverty, for example by improving home insulation or heating systems, should receive priority over increased payments in winter time to compensate people for the higher cost of inefficient fuel use."

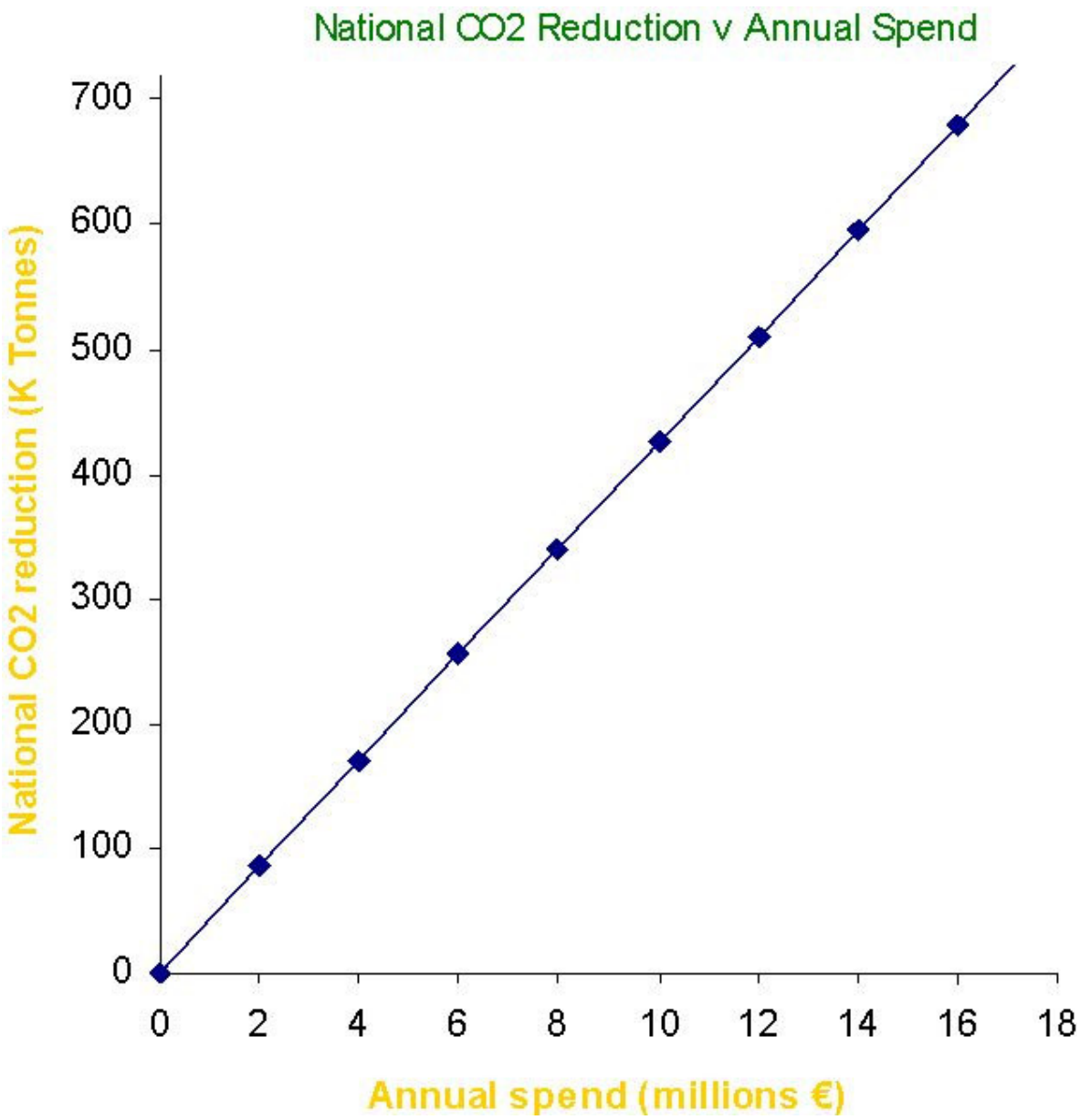
Ref: TSG/02/23

Within this context, the promotion of gas condensing boilers is particularly appropriate in achieving these objectives.

On the assumption that EUR 300 is allocated to subsidise the extra cost of EUR 400 for a condensing boiler the total cost of this proposal is EUR 80.22M.

It is worth noting that the savings in CO_2 emissions are totally proportional to the cost, which is proportional to the take-up rate of the tax credit. Given the various assumptions, the graph "National CO_2 Reduction v Annual Spend" below shows this projection.

This graph shows that savings in national CO_2 emissions are proportional to the annual tax credit spend on condensing boilers for the existing housing stock.



Summary

- Ireland can save 348,000 tonnes of carbon dioxide per annum.
- Ireland is required to reduce the total greenhouse gas emissions by the equivalent of 13 MT of CO_2 by 2012. This single proposal could provide 2.5% of the required national saving within the next 10 years.
- The proposal is self-financing given the value of potential saving.

SECTION 5

THE CASE FOR USING LP GAS AS AN AUTOMOTIVE FUEL

Ireland has a nationwide automotive LP Gas forecourt-refuelling infrastructure that in the short to medium term can provide an outlet for cleaner automotive fuels.

Ireland should follow the example of many other European countries (see table2) that have encouraged the use of cleaner automotive fuels, such as LP Gas, as an alternative to diesel and petrol.

Ireland should adopt the "polluter pays" principle by increasing excise tax on diesel and remove excise tax from Automotive LP Gas.

The current status of LP Gas is outlined in the attached paper prepared by the European LP Gas Association. (Appendix 4)

The table below outlines some of the Government-led incentives, which have been pursued in Europe. The objective of such incentives is to reduce the level of harmful automotive emissions in urban areas, generated primarily by petrol and diesel.

Government Incentives for Automotive LPG across Europe
Netherlands
The Dutch road traffic Strategy plan 1997 – 2010 aims to have over 60% of city buses, 40-50% of taxis, and up to 10% of passenger cars/light commercial vehicles on LP Gas/CNG by the year 2010.
UK
In the late nineties a POWERSHIFT programme under the control of the Energy Saving Trust was introduced to encourage cleaner and more energy efficient fuels. Depending on the cleanliness of the emissions, tax credits of up to 75% of the cost of converting a petrol engine to LP Gas were established. This has resulted in up to 100,000 conversions of motorcars in the UK to date
France
France has implemented a favourable tax, including low excise duty and tax rebates for new vehicles driving on LP Gas. The incentives will last over a period of at least 7 years.
Italy
Ongoing tax incentives have resulted in 1.3 million vehicles using LP Gas. These cars are exempt from certain restrictions, which apply to petrol and diesel cars in some heavily polluted cities.
Austria
For more than 30 years, it has been the policy of the Vienna bus company to fuel all the buses on LP Gas – at the current time up to 600 buses are fuelled on LP Gas.
Denmark
Over the last five years, Copenhagen has introduced over 250 buses on LP Gas.

APPENDICES

APPENDIX 1: AMENDED LPG CARBON TAX ANALYSIS

LPG Carbon Tax Analysis		
1. Constants		
CO_2 in exhaust per Kg Carbon	**3.67**	
One tonne of oil equivalent (TOE), MJ	**41,868**	
Density of air, kg/m3	**1.225**	
Density of water, kg/m3	**1000**	
MJ per kWh	**3.6**	
Tonnes of CO_2 per TOE		
	Propane	**Butane**
Chemical formula	**C_3H_8**	**C_4H_{10}**
Carbon content, % mass, theoretical	**81.82%**	**82.76%**
Hydrogen content, % mass, theoretical	**18.18%**	**17.24%**
Gross calorific value, MJ/kg	**50.22**	**49.41**
Gas relative density, air = 1	**1.523**	**1.941**
Liquid relative density, water = 1	**0.505**	**0.575**
Density, kg/l (note 1)	**0.505**	**0.575**
Kg CO_2 produced per kg of fuel	**3.00**	**3.03**
Kg CO_2 produced per MJ of fuel	**0.0597**	**0.0614**
Kg CO_2 produced per TOE	**2501**	**2571**
Tonnes CO_2 produced per TOE	**2.50**	**2.57**
Units of fuel per tonne of CO_2		
Tonnes CO_2 per TOE	**2.50**	**2.57**
Tonnes of CO_2 per MJ of fuel	**0.00005974**	**0.00006141**
Tonnes of CO_2 per kg of fuel	**0.00300**	**0.00303**
Tonnes of CO_2 per litre of fuel	**0.00151500**	**0.00174483**
Tonnes of CO_2 per kWh of fuel		
Units for fuel type	**Litres**	**Litres**
Units per tonne of CO_2	**660**	**573**
MJ per unit	**25.36**	**28.41**
TOE per unit	**0.00060574**	**0.00067858**
Taxation rates		

Taxation rate per tonne of CO_2 EUR	**7.50**	**7.50**
Taxation rate per unit of fuel, EUR	**0.011363**	**0.013086**
Taxation rate per tonne of CO_2, EUR	**20**	**20**
Taxation rate per unit of fuel, EUR	**0.030300**	**0.034897**

APPENDIX 2:

DERIVATION OF THE QUOTED EMISSIONS REDUCTIONS

REFERENCE DATA

	Propane	Natural Gas (Mean North Sea)	Gas Oil
Gross calorific value MJ/Kg [1]	50.22	52.41	45.6
Carbon in fuel % mass	82.02	72.16	86.1

	Seasonal Efficiencies [1]
Old boiler (heavyweight)	55%
Old boiler (lightweight))	65%
New boiler (non-condensing)	75%
New boiler (condensing)	88%

ASSUMPTIONS

Assumed efficiency of existing conventional boiler (Assumes an even mix of both 55%-efficiency heavyweight and 65%-efficiency lightweight old boilers)	60%

ASSUMED BREAKDOWN OF PURCHASERS OF CONDENSING BOILERS

Oil users (conventional boilers) to Natural Gas condensing boilers	45%
Oil users (conventional boilers) to LP GAS condensing boilers	5%
Natural Gas users (conventional boilers) to Natural	45%

Gas condensing boilers	
LP GAS users (conventional boilers) to LP GAS condensing boilers	5%

DERIVED DATA

CO_2 reduction due purely to efficiency improvement of condensing versus conventional boilers:

Efficiency of new condensing boilers	88% (from above)
Efficiency of existing conventional boilers	60% (from above)
Consequent reduction in CO2 emissions due to efficiency only	31.8%

CO_2 reduction due purely to changing from oil to gas for a single user:

	Propane	Natural Gas	Gas Oil
Kgs to produce 1 GJ **(from above calorific values)**	**19.91**	**19.08**	**21.93**
Carbon in exhaust Kg/GJ **(using above carbon in fuel % mass)**	**16.33**	**13.77**	**18.88**
Kgs of CO_2 in exhaust per Kg carbon	**3.67**	**3.67**	**3.67**
CO_2 in exhaust Kg per GJ	**59.88**	**50.5**	**69.23**
Percentage CO_2 compared to gas oil	**86.50%**	**72.93%**	**100.00%**
Tonnes CO_2 saved per 1000 tonnes oil burned	**135**	**271**	**0**
CO_2 reduction versus oil	***13.5%***	***27.1%***	

CO_2 reduction due purely to changing fuel, averaged across user profile:

From above assumptions, the weighted average CO_2 reduction across the different fuel-switching possibilities can be calculated.

	%	CO2 usage vis-a-vis oil	Weighted average
Oil users to Natural Gas condensing boilers	45%	72.92%	32.81%
Oil users to LP GAS condensing	5%	86.50%	4.32%

boilers			
Natural Gas users to condensing boilers	45%	100%	45.00%
LP GAS users to condensing boilers	5%	100%	5.00%
Weighted average			87.14%

Total CO_2 reduction due to both efficiency improvement and changing fuel, averaged across user profile:

CO2 generation factor due to efficiency (100% - 31.8%)	68.18%
CO2 generation factor due to fuel switching, weighted average	87.14%
Combined effect	59.41%
Total CO2 reduction	40.59%

APPENDIX 3:

DATA FOR COST OF IMPLEMENTATION

EXISTING HOUSING STOCK

The total annual tax credit involved for the ***existing*** housing stock can be calculated as follows:

Existing housing stock 2002 [3]	1,337,000
Assumed tax credit per unit	€300
Assumed take-up rate	20% (267,400 units)
Cost of implementation	€80,220,000
Implementation period (years)	10
Cost per annum	€8,022,000 (26,740 units)

The assumed take-up rate of 20% can easily be achieved through advising and promoting condensing boilers, because condensing boiler sales in the Netherlands [5] were 60% in 1998, and Dutch boiler manufacturers now estimate this to be 80%. The fact that there are many extremely inefficient boilers in use (lower seasonal efficiencies than the 60% estimated) is borne out by the fact that the percentage of boilers over 20 years old [5] is estimated as being 20%.

Note that the additional (incremental) cost of condensing boilers [4] is estimated as 400 - many have a higher differential than this, but that is due to the fact that those incorporate additional features such as external temperature compensation systems and integrated water pumps, which the manufacturers would justify separately. Some manufacturers claim, with good justification, that those boilers with advanced controls such as external temperature compensation, can deliver seasonal efficiencies above the 88% quoted, up to maybe 94%, which can justify the additional costs.

It was previously shown that there is a 31.8% efficiency improvement in switching from older, conventional gas boilers to modern, similarly fuelled, condensing boilers.

A number of other factors are involved, however, in estimating the CO_2 reduction. One discussed elsewhere [4] is the concern that efficiency improvements will be offset by higher comfort levels: this is discounted in this analysis since in general, existing oil and gas boiler users will already have established patterns of usage and would be offset by the reduction in CO_2 due to a percentage of users switching from other fuels that generate even higher levels of CO_2, which has not been taken into account in this analysis.

The following table indicates the additional CO_2 penalty of other fuels, relative to LP Gas [4]:

Fuel Type	**CO_2 Production**
LPG	**100%**
Sod Peat	**163%**
Coal	**134%**
Peat Briquettes	**154%**
Gas Oil	**115%**
Natural Gas	**86%**
Kerosene	**112%**
Electricity	**313%**

By structuring this as a once-off tax credit, there will inevitably be an efficiency gain in each case, and wasting a tax credit on the replacement of existing condensing boilers can be avoided.

From all the above factors, a pessimistic viewpoint would set an absolute minimum net decrease of 25% per boiler.

From this viewpoint, to obtain the national CO_2 reduction, the various factors are multiplied:

National CO2 emissions for 1998 (million tonnes) [4]	40
Proportion of national CO2 generated by domestic users [4]	30%
Tax credit take-up (assumed)	20%
Proportion of domestic CO2 generated from space heating [5]	53%

CO2 reduction (see preceding notes)	25%
National CO2 reduction	0.80%
Potential saving per annum (tonnes/annum)	320,000

This ignores the additional potential CO_2 reduction that would be achieved on domestic hot water heating, which is responsible for 20% of the domestic CO_2 generation [5].

This alternative approach gives a result that is reasonably consistent with the data presented in Section 4.

NEW HOUSING

Houses built in 2002 [6]	57,695
Estimated number of new houses built per annum (average from 1998 - 2002)	49,800
Assumed Tax credit level per unit	€300
Assumed take-up rate	20%
Cost of implementation per annum	€2,988,000

The CO_2 reduction in this case would not be as great. This is fundamentally because the consumer has a choice between two *modern* boilers. Modern boilers, both condensing and non-condensing, are more efficient than their older equivalents. Modern gas condensing boilers have a seasonal efficiency of 88% (or better), as against 75% for non-condensing boilers. This gives a net CO_2 advantage of 17.3%. Again, the consumer has a choice of using other fuels, and there is a bigger advantage were the user to choose one of these other options. There are other issues involved, but a net advantage of 17% would seem reasonable.

AVERAGE EMISSIONS PER HOUSE FOR SPACE HEATING

Emissions and housing data is available from 1998. On a per-house basis, the CO_2 emissions will not have changed significantly since then.

National CO2 emissions for 1998 (million tonnes) [4]	40
Proportion of national CO2 generated by domestic users [4]	30%
Proportion of domestic CO2 generated from space heating [5]	53%
CO2 generated from domestic space heating (millions tonnes)	6.36
Housing stock 1998 [4]	1,184,000
CO2 space heating emissions per house (tonnes)	5.37

Potential CO2 reduction from condensing boilers (see above)	25%
CO2 space heating reduction/house from condensing boilers	1.34 tonnes

References:

[1] "Combustion Engineering and Gas Utilisation" by British Gas

[2] UK Department of Environment, Transport and the Regions' SEDBUK data

(Seasonal Efficiency of Domestic Boilers in the UK)

[3] Source: Department of the Environment and Local Government, May 21 2003

[4] Environmental Resources Management report, "Limitation and Reduction of CO_2 and Other Greenhouse Gas Emissions in Ireland", 1998

[5] "Boilers for Domestic Space Heating and Hot Water in the United Kingdom, UK DETR (Department of the Environment, Transport and the Regions)

[6] Department of the Environment & Local Government Housing Statistics Bulletin, December Quarter 2002

APPENDIX 4

AUTOMOTIVE LP GAS

Appendix 4

This is a .pdf document which can be viewed using Adobe Acrobat Reader, once you click the link. Adobe Acrobat Reader is freely available from http://www.adobe.com/products/acrobat/readstep2.html