BEYOND CCGTS – THE NEXT CARBON REDUCTION STRATEGY

Introduction

In the course of the last ten years Northern Ireland's electricity supply industry has substantially reduced its $C0_2$ emissions. Indeed the energy sector in Northern Ireland is now making a disproportionately large contribution to the UK's campaign to reduce CO_2 emissions.

However, this is not the time to rest on our laurels. The purpose of this consultation paper is to seek views on the measures which energy users might take from 2005 on to ensure the continued reduction of Northern Ireland's $C0_2$ emissions.

Background

$C0_2$ emissions - the principal agent of global warming - in so far as they are the result of human activity, come from two types of activities; namely, transport, and the energy which is used to heat buildings and water and drive all the machines and appliances used in, or in association with them.

This consultation paper is not concerned with transport. This is not because it is not important in this discussion. In fact, quite the contrary is the case. Despite its improving energy efficiency, transport accounts for a growing percentage of greenhouse gas. According to a report completed by the National Environmental Technology Centre (NETCEN) for DEFRA[1], road transport was the second largest source of CO_2 emissions in Northern Ireland in 2004, and accounted for around 31% of the Northern Ireland CO_2 emissions. Transport is only omitted from this paper because, except at the margins, the Authority is in no position to influence CO_2 emissions from the Transport sector.

Historical Context

Northern Ireland's CO_2 emissions have historically been high, relative to the rest of the United Kingdom and the Irish Republic. This is despite the absence of heavy industry and the much lower levels of disposal income in Northern Ireland. As recently as 2001,

[1] "Greenhouse Gas Inventories for England, Scotland, Wales, and Northern Ireland, October 2004."

according to a report by the Office for National Statistics[2], the average household in Northern Ireland was responsible for 30.3 tonnes of CO_2 equivalent per annum compared to a UK average of 24.6 tonnes. This Northern Ireland average is 23% above the UK average. However, as households in NI are larger than in Great Britain this figure exaggerates the level of emissions in Northern Ireland. In contrast, per capita figures for CO_2 emissions in 2001 were 11.28 tonnes for Northern Ireland and 10.72 tonnes for the UK average[3] which indicates that they were 5% above the GB figures.

There are obvious reasons why in 1990 Northern Ireland's CO_2 figure would have been higher than in Great Britain. These would include the absence of natural gas with the consequent reliance on oil and coal for space and water heating, together with an old collection of coal and oil fired power stations, and no nuclear electricity generators.

While the 2001 figures compared unfavourably with those in Great Britain, CO_2 emissions which in 1990 were 923 grams per kWh of electricity generated had been reduced to 723 grams per kWh generated - mainly through the conversion of Ballylumford to gas. The substitution of oil for coal for space and water heating would also have had a beneficial effect in reducing per capita emissions outside the electricity sector.

Since that date however, progress in reducing CO_2 emissions has been accelerated by two main drivers. The first is the re-powering of the Ballylumford and Coolkeeragh power stations with CCGTs. These use natural gas, the cleanest of the fossil fuels, but do so at an average efficiency of 52%. Consequently, they can produce 7500GWhs of electricity at an average of 387 grams of CO_2 per kWh, compared to a Northern Ireland 2001 average of 723 grams per kWh. At a saving of 336 grams per kWh this represents a potential reduction of 2.5m tonnes or 4 tonnes[4] per household.

The simple but not significantly appreciated fact is that no other single energy measure will have quite such a dramatic effect on CO_2 reductions in the first 20 years of this century as the switch from inefficient coal and oil stations to the two CCGTs.

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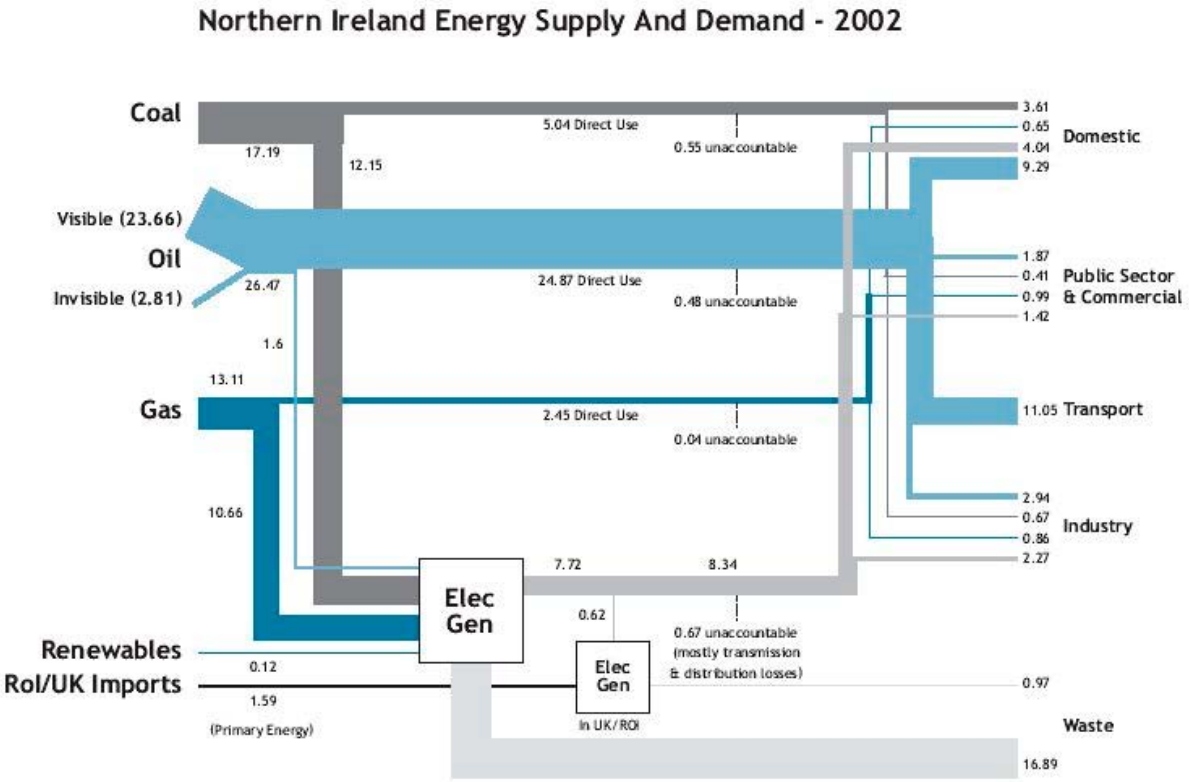
[2] "The impact of UK households on the environment, October 2004."
[3] These figures assume populations of 627, 258 in Northern Ireland and 24, 188, 149 in the UK as a whole, taken from the 2001 Expenditure and Food Survey.
[4] This figure is the total number divided by the number of households in Northern Ireland (assuming 627,258 households in NI).

The second principal driver is downstream natural gas. In 2001 Phoenix Natural Gas had sales of only 67m therms. Since then sales have grown to 100m therms. These 100m therms (the equivalent of approximately 3000 GWh) should avoid ¼ m tonnes of CO_2 per annum. But the gas industry is still far from realising its full potential. When fully rolled out, gas should have 300,000 customers across Northern Ireland.

Energy Supply in Northern Ireland.

Energy supply in Northern Ireland comes from the three main primary fuels; coal, oil and natural gas. It is also supplemented by electricity from mainland UK and the Republic of Ireland (including generation losses), plus a small – but rapidly growing - contribution from renewable sources. This is shown in the Sankey diagram below, which shows energy supply and demand in Northern Ireland in 2002[5]. It should be noted that in 2005/06 with the commissioning of Coolkeeragh, Northern Ireland should move from being a net importer to being a net exporter of electricity.

[5] Source: "Northern Ireland Energy Study 2002" by the Carbon Trust.



The "Northern Ireland Energy Study 2002" by the Carbon Trust reported that in 2002, Northern Ireland was responsible for 40.58 TWh of delivered energy consumption (or 58.45 TWh of primary energy) per year. This difference between delivered and primary energy is largely due to generation inefficiencies in electricity. For each kWh of electricity delivered to a consumer, between 2.5 and 3.5 kWh of fossil fuel is typically required to be consumed at the power plant, depending on the efficiency of the plant. In 2002, according to the Carbon Trust, Northern Ireland was also responsible for 4.05 Mt of energy related emissions of Carbon (C) which equals 14.86 Mt as $C0_2$.

Energy consumption in Northern Ireland in 2002 was split across five main demand sectors, namely; industry, domestic, commercial, public sector and transport. Energy consumption and carbon emissions from each sector in 2002 were as follows:

- Industry: Approximately 6.74 TWh of energy consumption delivered and CO_2 emissions of 2.86 m/tonnes.
- Domestic: For this sector, the Carbon Trust used two main sources of information. These were the NIHE 1996 and 2001 surveys, and the Digest of

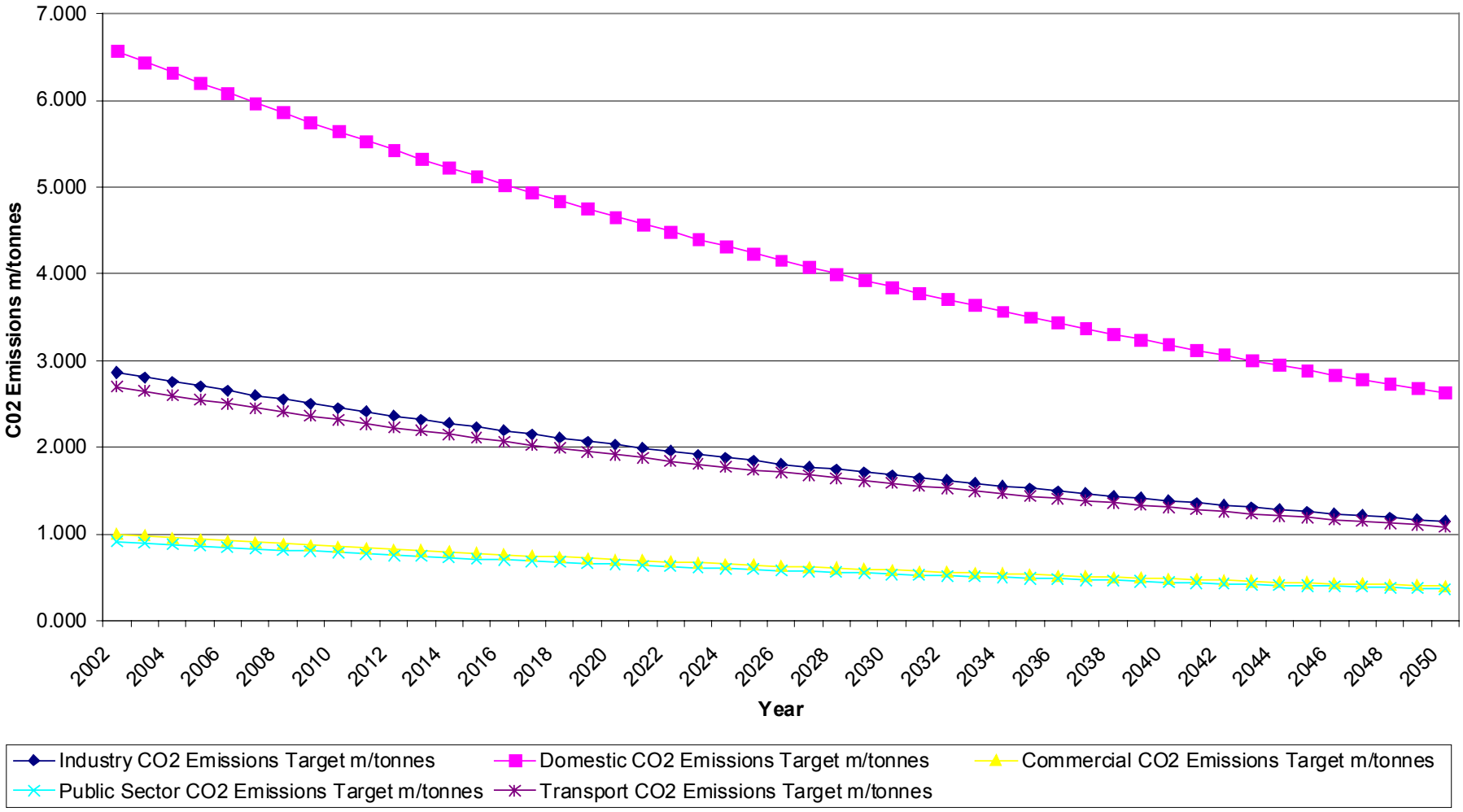
UK Energy Statistics (DUKES). These however produced results which differed by 20%. Based on the NIHE surveys, domestic fuel consumption was 19.46 TWh delivered whereas, based on the DUKES information domestic fuel consumption was 15.72 TWh delivered. As the Carbon Trust could not be sure which of these data sources provided the better data, the average of the two figures was used. This resulted in 17.59 TWh of delivered energy consumption and 6.571 m/tonnes of CO_2 emissions.

- Commercial: 2.58 TWh of energy consumption delivered and 0.994 m/tonnes of CO_2 emissions.
- Public Sector: Approximately 2.11 TWh of energy consumption delivered and 0.913 m/tonnes of CO_2 emissions.
- Transport: Approximately 11.05 TWh of energy consumption delivered and carbon emissions of 2.699 m/tonnes of CO_2 emissions.

There is 0.823 Mt of carbon not accounted for here. This may be due to losses in electricity distribution, fuel storage etc.

As set out in the Energy White paper, the UK's target is to reduce emissions by 60% by the year 2050. In order for CO_2 emissions to be reduced by 60% by the year 2050, emissions will need to reduce from these figures in 2002 as shown in the graph below.

GRAPH 1: C02 EMISSIONS TARGETS ACROSS ENERGY SUPPLY SECTORS



As can be seen from the graph, each sector would be required to reduce its emissions as follows:

- Industry – a reduction in emissions from 2.86 m/tonnes in 2002 to 1.144 m/tonnes in 2050;
- Domestic – a reduction in emissions from 6.571 m/tonnes in 2002 to 2.628 m/tonnes in 2050;
- Commercial – a reduction in emissions from 0.994 m/tonnes in 2002 to 0.397 m/tonnes in 2050;
- Public Sector – a reduction in emissions from 0.913 m/tonnes in 2002 to 0.366 m/tonnes in 2050;
- Transport - a reduction in emissions from 2.699 m/tonnes in 2002 to 1.080 m/tonnes in 2050.

Note: The graph would suggest that by 2004, emissions from Transport should have been 2.633 m/tonnes. This would have been 19.25% of the total emissions in that year. This figure does not correspond to the 31% figure quoted by NETCEN for 2004. The target figures from 2002 onwards are indicative of what target emissions each sector should have expected to have reached by 2004. As the only actual information on these emissions is the 31% figure from NETCEN, it may have been the case that emissions were not at the target figure for transport for 2004.

Reducing CO_2 emissions.

Apart from the re-powering of Ballylumford and Coolkeeragh with CCGTs, and the introduction of downstream natural gas, two other factors which should also have reduced the per household and per capita emissions levels are, the increasing emphasis on energy efficiency, and the increase in the use of renewables for electricity generation. Both have become more significant since 2001. The Energy Efficiency Levy in the year 2000/01 produced lifetime savings of 187 GWh or an annual figure in that year of about 58 GWhs[6]. The Northern Ireland electricity production from renewables in 2001 was 116 GWhs. Between both energy efficiency measures and the increase in renewables, 174 GWh of fossil fuel electricity might have been avoided - that is the equivalent of about 2% of electricity production. At the Northern Ireland average in 2001 of 723 grams of

[6] This is the cumulative effect of the per annum savings from the levy in the years from 1997/98 as it impacted on consumption in 2001/02.

$C0_2$ per kWh this equates to a saving of about 125,802 tonnes of $C0_2$ per annum. By 2004 the renewables figure had risen to 271 GWhs and the energy efficiency avoided consumption in this year from the Energy Efficiency Levy to about 145 GWhs, which makes their combined contribution the equivalent of about 5% of total electricity consumption. Using the 2001 figure of 723 grams of CO_2 per kWh, the carbon savings would appear to be 300,768 tonnes per annum. However, we need to remember that the declining carbon content of CCGT generated electricity could reduce this annual saving by 2005 to much lower levels.

The CCGT paradox

The paradox of the move to CCGTs is that it can substantially reduce the value of renewables and energy efficiency as ways of reducing CO_2 emissions. The high efficiency of the CCGT may, consequently, substantially reduce the cost effectiveness of renewables and energy efficiency. A CO_2 reduction strategy needs to take this substantial shift into account. The most cost effective policy measures for CO_2 reductions in a world where electricity production is dominated by CCGTs may be different to the measures which were applicable to an inefficient coal and oil based generation park. The most cost effective carbon reduction strategies may still require targeting electricity but not necessarily so. Policy making should be informed by the economic efficiency of the various carbon reduction strategies.

Reducing CO_2 emissions after 2005

The CO_2 reductions attributable to the CCGTs are by far the largest contribution to carbon saving that Northern Ireland will make in the first decade of the present century. As noted above they also have the somewhat paradoxical effect of devaluing the carbon reducing cost effectiveness of measures which henceforth displace electricity generation, whether these measures are the promotion of renewables or energy efficiency. Moreover, they may have devalued the carbon reducing cost effectiveness of the energy efficiency and renewables measures which have taken place in recent years. This consequence remains true unless the CCGTs are run as base load so that the displacement applies to other more polluting generation sources. In other words, to ensure that other carbon reducing measures remain cost effective it will be necessary to have a market structure that allows the CCGTs to run as base load. It remains to be seen if this is either practicable or economically viable. The higher the price of carbon the more likely it is to

be desirable to match energy efficiency and renewable measures against peak demand periods, since with high priced carbon, the cost differential between inefficient peaking plant load and base load increases.

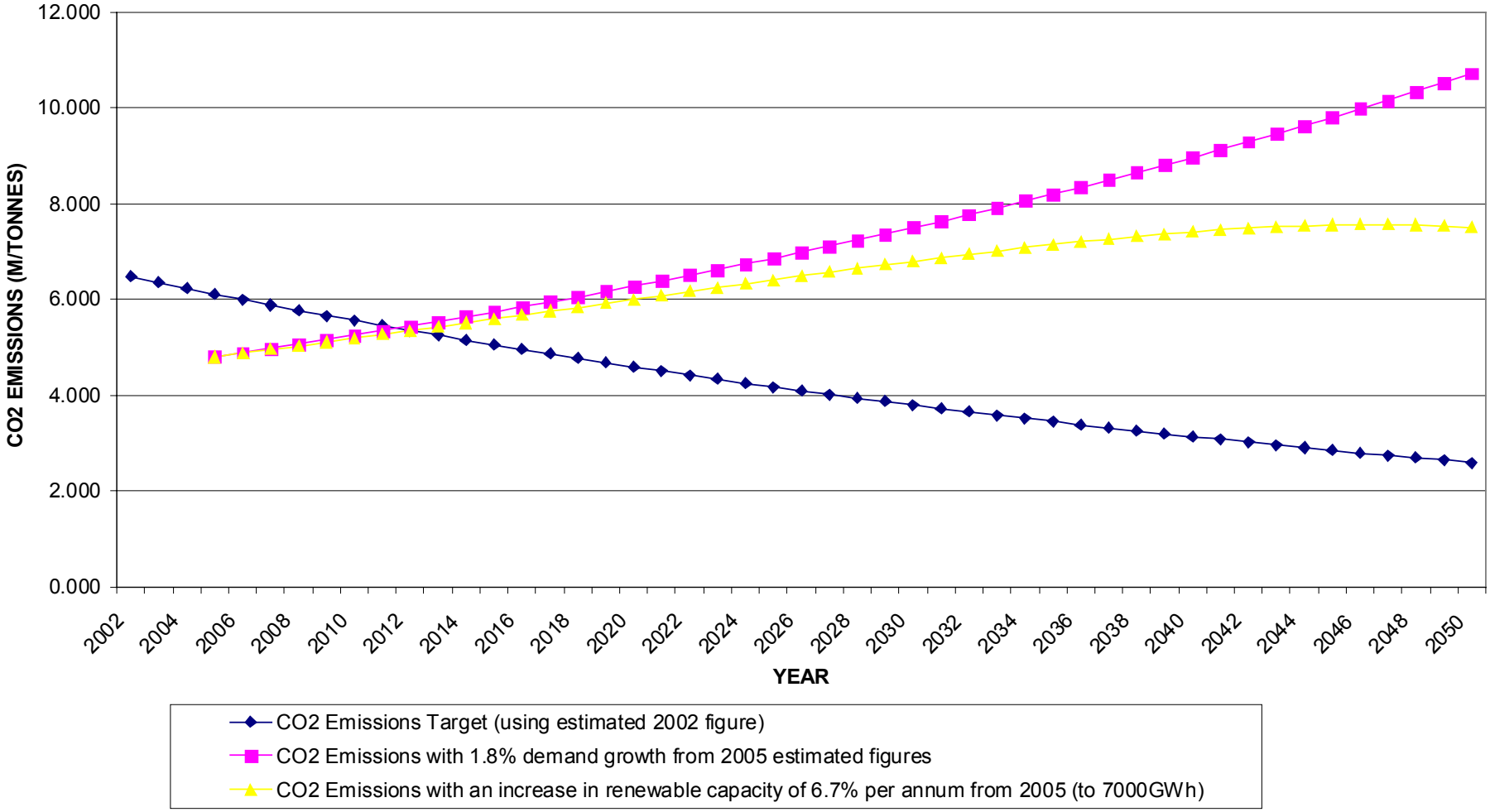
As mentioned previously, the second biggest contributor to CO_2 reduction in the first decade of the 21st century will be the roll out of natural gas. The use of gas to displace coal and oil is a major source of CO_2 saving. If, for example, the roll out of natural gas results in 100,000 additional dwellings moving to natural gas, of which 30,000 were on coal and 70,000 were on oil, the annual saving would be 157,140 tonnes[7] of CO_2. This is probably an understatement as it assumes no efficiency gain.

In the fullness of time, probably in the late 2020s, the CCGTs will be replaced. This may be by more efficient CCGTs but ideally it should be by renewables.

CO_2 emissions caused by electricity generation in Northern Ireland in 2000 were 6.26 million tonnes. The Energy White Paper published in 2003 stressed the UK's commitment to reducing CO_2 emissions by 60% by the year 2050. The emissions figure of 6.26 m/tonnes for 2000 was grossed up for 2002 by using an estimated demand growth in 2000 and 2001 of 1.8% in order to achieve an estimated 2002 figure. Using this estimated emissions figure, the 60% reduction suggests that by 2050, electricity generation's total $C0_2$ output should be 2.595 m tonnes per annum. This admittedly makes the possibly heroic assumption that all other sectors could reduce their output by a similar percentage and that the burden would be shared equitably. In very crude terms this electricity target could be met by reducing emissions by 81,088 tonnes per annum. This is shown on the graph below.

[7] This figure uses the example of a 3 bedroom semi-detached house, using 15,000 kWh per annum for space and water heating.

GRAPH 2: ELECTRICITY GENERATION CO2 EMISSIONS: TARGET VS ESTIMATED 2002-2050



This graph shows projected emissions from 2005 until 2050 based on meeting NI demand in a least carbon way and meeting actual demand assuming a net export of 1370 GWhs[8] in 2003/04 and each year thereafter. Actual emissions in 2003 preceded the commissioning of the CCGTs but included a high level of imports from Scotland. The emissions from these imports are not included in the Northern Ireland total which makes the total for that year atypical.

It will be seen that Northern Ireland's electricity industry is below the steady reduction line for the next few years.

However, if demand grows by 1.8% per annum (using estimated 2005 demand, with 1.8% steady growth per annum) as shown in the graph, the position is less comfortable. Graph 2 shows the growth lines extrapolated from the actual (or likely actual) emissions in 2005/06 following the commissioning of both CCGTs. This figure assumes that Northern Ireland is a net exporter of electricity and that indigenous production is 2150 GWhs of coal based electricity from Kilroot, 400 GWh of local renewables, and around 7,000 GWhs of electricity generated from gas, resulting in emissions of about 4.8m tonnes of CO_2. If, however, at the same time, renewables could grow at a rate of 6.7% per annum, (assuming a zero CO_2 emission factor from these), then the situation would be a little better. An allowance of 2.595m tonnes of $C0_2$ for the electricity supply industry in 2050 would in theory allow us to produce about 6700 GWhs per annum on gas CCGTs or 2,500 GWh on coal if everything else came from renewables. There are just two problems with this. The first is that by 2050 gas may be too expensive to be used for electricity generation. The second is that given that the electricity sector seems more able to make cost effective $C0_2$ reductions it is probable that either by market mechanisms or by Government fiat the electricity supply industry will be required to produce above average savings.

The earlier CO_2 emissions are avoided the more effectively the action will contribute to combating climate change. It would therefore be sensible for Northern Ireland to push forward with other measures to combat CO_2 emissions as rapidly and as cost effectively as we can. The question is: What measures should we go for?

The rest of this paper looks at some possible options and invites consultees to put forward

[8] This figure is based on the actual export figures April 2003 – March 2004.

other ideas.

Identifying the Targets

Before identifying the measures it would be sensible to identify the points in the energy consumption pattern which are most carbon intensive.

The use of oil and coal for space and water heating has already been noted. For existing urban dwellings the gas industry is critical. There remain two building categories where other approaches are more appropriate:

- Rural dwellings which cannot be economically connected to the gas network; and
- New dwellings which could have a much lower requirement for energy than existing buildings.

In addition, the peaks in electricity demand are the periods when less environmentally friendly generating sources are called upon. If the pattern of electricity usage could be flattened or if peaks could be economically met by environmentally benign forms of generation this would result in a disproportionately large reduction in CO_2 emissions.

Reducing CO_2 in Non Gas Areas

Renewables and energy efficiency offer a way of delivering substantial CO_2 reductions to rural areas. The Authority and NIE have collaborated in creating a framework which could help to stimulate a wood fuel based rural economy. The application could take many forms, such as wood burning stoves, wood pellet based central heating boilers and wood based district heating schemes. These could have electricity production included in the package. NIE has offered to support embedded generation in appropriate locations. The NIE Supply Price Control includes an agreement by which NIE will allow a local electricity producing venture to "piggy back" on its systems and this could enable a community supply scheme to emerge.

Other forms of renewables are being pioneered by NIE for rural areas. These include solar water heating, PV, small wind turbines, ground heat schemes and micro hydro. In all these cases, from a carbon reduction perspective, there are two critical aspects: that the technology provides heating in preference to electricity and secondly, if it does provide

electricity it would contribute most savings if it could do so at peak.

Measures which mitigate the demand peak's emissions

If the most environmentally friendly fossil fuel plants are coping with base load, it follows that the shoulder and peaks will be covered by plant which is less efficient and - even if using the same fuel as base load plant - which will be emitting more CO_2 per kWh sent out. These plants will include the coal fired Kilroot plant, the older gas fired units at Ballylumford and in extremis the Gas Turbines that run on distillate.

Since the cost of meeting peaks is higher than average costs and the CO_2 emissions are also high, then measures to flatten the peak are particularly likely to be cost effective methods of reducing CO_2 emissions.

The following types of measures might be effective in helping either to flatten the peak or meet it in less polluting ways:

- The widespread application of dCHP. (domestic combined heat and power plants)

  A dCHP plant is one which provides electricity as well as heat and hot water to an individual house. It therefore takes over the role of the individual gas or oil central heating boiler and adds electricity production to its repertoire. In general dCHP is expected to produce about 1500[9] kWhs of electricity per annum. Some of this will coincide with peak and shoulder periods. Around 50 of these appliances are being installed by Phoenix and NIE and the Housing Executive over the next few months. They could be run on oil, natural gas or LPG. If, for example, there were 90,000 of these installed across Northern Ireland they would take 90MWs off the winter peak demand - i.e., about a quarter of the peak**.** While these appliances use more gas than a gas condensing boiler data from Northern Ireland trials suggest that the incremental gas demand is very low in relation to the electricity units produced. This low input cost to output value ratio could be used to justify a support framework to stimulate the more rapid roll out of dCHP as it suggests that the electricity produced has a very low carbon content.

[9] This figure assumes that the dCHP is running for approximately 17% of the time.

– Time of Day Charging

Another factor which would contribute to smoothing the peak would be time of day pricing for those domestic customers who want it. NIE is currently trialling time of day charging and the results will be evaluated shortly. The trial to date would suggest that there is potential for reducing peak demand by about 8%.

– Low Energy Lighting

The penetration of low energy light bulbs in Northern Ireland is relatively good but is still surprisingly low. According to one recent survey[10] energy efficient light bulbs are present in 32% of homes in Northern Ireland. A larger penetration would again have the effect of reducing peak demand. A carbon reduction strategy should therefore include a policy of improving the take up and usage of low energy light bulbs, and, if necessary, a study of the obstacles to their take up and the measures needed to overcome any lack of enthusiasm about them.

– Combined Heat and Power CHP

CHP has a much wider potential application than has hitherto been achieved in Northern Ireland. In a market where fuel prices over time are unpredictable the return on a CHP investment is uncertain. The CO_2 reduction benefits of CHP, however, are not in doubt. A major cause of the uncertainty about the value of CHP is the ratio of the cost of gas to the cost of electricity - the so called "spark spread". If gas prices rise but electricity prices do not, a CHP investment can be stranded. Since Northern Ireland's electricity price is in future going to be more gas price sensitive than most other regions of Europe this may be less of a problem for CHP in NI than in other regions. What is needed is a longer term framework for CHP which would smooth out some of the risks from the uncertainty about "spark spread". A separate consultation paper will be published shortly on CHP.

– Micro Renewables

An increasing number of people are generating electricity on their own premises. They are encouraged by NIE's SMART programme and other specific schemes aimed at rural communities. The technologies encouraged are small scale wind, biomass, hydro and PV. NIE will pay 4.5 pence for each kWh spilled on to the network by small producers. This micro energy sector has considerable growth

[10] "Northern Ireland Housing Executive HECA Report 2004"

potential if a secure long term framework for it is put in place.

- Energy Efficient Housing

It will take some time for society's approach to energy in buildings to change. People need to see that something new works before they will risk their own money on it. This is especially true for the majority of people's most significant economic decision - buying a house. A carbon reduction strategy could accelerate this change by funding across Northern Ireland exemplar building projects by financing, either by grant or loan, the cost of the measures needed to make buildings reach a challengingly high standard.

New buildings pay a connection charge to cover the cost of linking the new building to the electricity network. One option would be to offer the builders/owners of new buildings a "renewables" connection charge. This could, for example, be the option of a charge of say £5000 for a connection which would include a subsidised PV system incorporated into the roof. The cost to the purchaser would be rolled up into the capital cost of the building and paid off with the mortgage. The result would be lower annual electricity bills with the saving growing each year as the household avoids the effects of inflation and rising fuel costs.

– New buildings with minimal energy requirements

New buildings will in future be required to be more energy efficient than in the past. New Building Regulations are proposed to come into effect in 2006 as a result of an EU Directive. "The Energy Performance of Buildings" requires Member States to take major steps to make buildings more energy efficient. The Directive, when fully effective, is expected to deliver savings of 45 million tonnes of CO_2 per annum. However this will not go as far as is desirable. There needs to be an emphasis on capitalising the lifetime energy requirements of new buildings, by building into the fabric both the high levels of efficiency that minimise demand, and also the technologies that produce electrical power. This almost certainly requires spending money on demonstration and exemplar projects.

– Dispatchable Renewables

Renewables that could be utilised at peak times would be particularly beneficial in that they would avoid the need for Gas Turbines (GTs). A support framework for biomass and energy from waste plants might therefore include payments for

generating at peak which were equivalent to the avoided fuel cost of Gas Turbines (GTs).

– Renewables for space and water heating in rural areas

As coal and oil are the most carbon emissive of the fossil fuels, where they cannot be replaced economically by gas they might be replaced by renewables such as wood based fuels for space and water heating and by solar for water heating.

– The accelerated roll out of the gas network

Each dwelling moving from oil to gas reduces $C0_2$ emissions by 1.296 tonnes and from coal to gas by 2.214 tonnes (this figure makes the same assumptions as stated previously). The gas roll out is therefore important.

Moving from support measures to targeting sources of emissions

Until now, policy has tended to support measures without being particularly concerned with whether they were tackling a greater or a lesser source of $C0_2$ emissions. As we move into a world where the value or cost of carbon is crystallised into an increasingly firm monetary value it could be argued that where the same measures achieve significantly greater carbon benefits in different circumstances it would be efficient to target resources to those areas where the effect would be greatest. For example, insulating a gas heated home might save less $C0_2$ than insulating a coal heated home; a zero energy building in a rural area would save more $C0_2$ than a zero energy building in an urban area. Grant regimes and energy efficiency programs might recognise this and be allocated on the basis of carbon reduction effectiveness.

Transport

The Authority does not have any role in regulating the fuels used in Northern Ireland's transport system. Electricity could be used in the rail system and the electricity used could be taken from renewable sources. The NIE Supply Price control does provide an incentive to support electric vehicles which can be re-charged at night using renewable electricity. So far, it has been the limited range of the vehicles between recharges that has prevented this mechanism from having a greater effect. However, new cars are coming into the market with a range of 200km without re-charging. A case could possibly be made for increasing the incentive to NIE for encouraging electric vehicles.

There seems to be little interest in Northern Ireland in gas fuelled vehicles. Bio diesel which could be produced locally in significant quantities seems to lack a framework within which to emerge.

Price controls for gas and electricity companies could require them to run their vehicle fleets on renewable fuels or natural gas.

While the Authority has no formal role in transport it would be willing to co-operate where practical in assisting others to reduce the Northern Ireland transport sector's near total dependency on imported fossil fuel.

Promoting Carbon Free Counties

Some areas of Northern Ireland have the potential to produce from renewable sources the equivalent of their total energy consumption. Doing so would not make them independent of the need to import petrol and oil but this external dependency would be offset by "exporting" renewable electricity - and the potential of locally produced biodiesel should not be overlooked. Fermanagh and Tyrone, and possibly district council areas in other counties have this potential. Should it be stimulated and encouraged by special support mechanisms, for example grants for development purposes based on the value of avoided carbon?

Summary, conclusions and consultation.

Following the introduction of CCGTs as the mainstay of our electricity generating sector, Northern Ireland's electricity sector should seek to reduce its CO_2 emissions by about 80,000 tonnes per annum for the next 45 years. There should also be a reduction of about 60,000 tonnes per annum in CO_2 emissions from space and water heating in buildings. This can be achieved by a mix of gas, energy efficiency, CHP, renewables and zero energy and low energy new buildings.

Interested parties are invited to express their views on the following matters:

1. To what extent should the approach to carbon saving change following the introduction of CCGT for electricity production?

2. Is the target of reducing electricity emissions by about 80,000 tonnes per annum on average either reasonable or attainable? Should we have published CO_2 target caps for the Electricity Supply industry in Northern Ireland for each year from now to 2050?

3. The target reduction of 60% for emissions, excluding electricity generation and transport, would imply a target reduction in CO_2 emissions from 4.851 m/tonnes in 2002 to 1.94 m/tonnes in 2050. This has to be achieved while at the same time meeting the energy needs of a growing population and economy. How should this reduction be disaggregated across sectors, planned and delivered?

4. Should resources be allocated on the basis of the carbon saving impact of the measures in order to maximise the cost effectiveness of programs?

5. Should we seek the most cost effective way of reducing CO_2 emissions overall or should there be firm arbitrary targets for - for example - CHP, energy efficiency and renewables without any analysis of the costs and benefits?

6. At what point should reliance on gas as the principal way of achieving CO_2 reductions over the next 10 years give way to other measures? How should this be achieved?

Views of respondents on this and any related matters should be sent to Lisa Mullan at Brookmount Buildings, 42 Fountain Street, Belfast BT1 5EE by 30th May 2005. Unless specifically requested otherwise, responses may be published on our website.

The results of this consultation will inform the Authority's policy on energy efficiency.