Appendix 4
Traded Share of DA Emission Inventories

Analysis of the Traded Share of Emissions in England, Scotland, Wales and Northern Ireland in 2007

A4.1 Background

It is becoming increasingly important for the prioritisation and development of GHG mitigation policies and data reporting at UK and DA level, that a better understanding of the emissions from the traded and non-traded sectors is developed.

Whilst the Scottish Government GHG emission reduction targets will include both the traded and non-traded elements, those of the Welsh Assembly Government are focussed on the non-traded sectors only. Despite these different approaches to implementing national targets, a better understanding of the opportunities for GHG emission reductions through DA Government policy levers is sought across all DAs.

The "traded" sector in the context of this work is defined as those emissions from installations operating within the European Union Emissions Trading Scheme (EUETS) only. No consideration of emissions from sites that operate within the UK Emissions Trading Scheme (UKETS) or within Climate Change Agreements (CCAs) has been made, primarily due to the limited access to detailed emissions data for UKETS and CCA sites.

The EUETS has been operational since 2005, and in this work we have considered the available emissions and fuel use data for EUETS sites during 2005, 2006 and 2007. In some cases, the scope of reporting to EUETS has changed over that period (i.e. some sites have joined the scheme, others have left). The analysis is therefore presented for the 2007 year only, as this is the most up to date representation of the traded share of inventory emissions.

In consultation with DECC DUKES energy statisticians and EU ETS regulatory experts from the Environment Agency of England and Wales, the Scottish Environment Protection Agency and the Northern Ireland Environment Agency, the EUETS site data have been analysed to allocate fuels and sites to align with inventory criteria.

This is the first time such analysis has been conducted, and the accuracy of the analysis is variable between different IPCC sectors; the data for major industrial sectors such as power generation, refineries, mineral processing sites and iron & steel installations are well understood (although some reporting inconsistencies are evident), whilst the level of quality checking for smaller-scale EUETS emitters across a wide range of industrial and commercial sectors has been limited by the available research resources. Further research is planned in order to develop this analysis and present a more rigorous, detailed breakdown of sector traded / non-traded emissions.

The comparison between reported EUETS emissions and the DA GHG inventory data are presented below, by IPCC sector and at the DA level.

[Note that the 2008 EUETS data will provide a greater scope of installation reporting, due to the cessation of CCA opt-outs for several industry sectors. Hence it is recommended that the EUETS data analysis be repeated once the 2008 EUETS and GHGI data are available.]

A4.2 Results

A4.2.1 Overall Traded / Non-Traded Emissions Share, 2007

	Units	England	Scotland	Wales	N Ireland
EUETS CO_2 emissions	Mt CO_2	191.6	22.3	22.8	5.6
GHGI total net GHG emissions	Mt CO_2e	493.9	54.5	46.8	21.8
"Non-traded" total net GHG emissions	Mt CO_2e	302.3	32.3	24.0	16.2
Traded share	*%*	*38.8*	*40.8*	*48.7*	*25.6*
GHGI total net CO_2 emissions	Mt CO_2	426.9	43.1	39.0	15.8
"Non-traded" total net CO_2 emissions	Mt CO_2	235.4	20.8	16.2	10.3
Traded share	*%*	*44.9*	*51.7*	*58.4*	*35.2*
GHGI IPCC Energy & Industrial process CO_2 Emissions	Mt CO_2	423.4	47.5	39.2	16.1
"Non-traded" Energy & Industrial process CO_2 emissions	Mt CO_2	231.8	25.2	16.4	10.5
Traded share	*%*	*45.2*	*46.9*	*58.1*	*34.6*

A4.2.2 IPCC Sector Traded / Non-Traded Emissions Share, 2007

IPCC Sector 1A1a: Power Generation

This sector covers major power stations in the UK. Almost all power stations operate within the EUETS. Exceptions arise for some very small power stations generating electricity in remote areas, and MSW incinerators. In the latter case, most of the carbon is from biological sources and therefore excluded from the DA GHGIs.

IPCC Sector		England	Scotland	Wales	N Ireland
1A1a	GHGI, Mt CO_2	145.6	15.51	11.27	4.64
	Traded, Mt CO_2	145.9	15.58	11.39	4.70
	Traded share, %	*100.2*	*100.5*	*101.1*	*101.3*

The traded share is expected to be lower than, but close to 100%. In fact, the figures are all slightly higher than 100%. This is likely to be due to small differences in the activity data used in the DA GHGIs and the EUETS. Activity data for the DA inventories are based on the UK data given in DUKES, which is derived independently from the EUETS data. The DECC DUKES statistics are based on annual operator returns of fuel use via a separate reporting system, but since 2006 the DUKES data have been closely consistent with the EU ETS fuel use data. The emission factors used in the DA inventories are taken from the UK GHGI and are based on EUETS data analysis. This means that inconsistent activity data will be the primary reason for the traded CO_2 being apparently higher than the recorded total CO_2 for this sector. The two sets of data are very closely consistent, but for the purposes of further research into the power sector emissions, the EUETS data are regarded as the more accurate dataset at DA level.

Detailed examination of the EUETS data suggests that country-specific emission factors deviate most significantly and consistently from UK-wide factors in the case of coal in Wales and natural gas in Northern Ireland.

IPCC Sector 1A1b: Petroleum Refineries

This sector covers petroleum refineries and there are very significant inconsistencies between the EUETS data and the GHGI totals; the traded emissions in England, Scotland and Wales (there are no refineries in Northern Ireland) are nearly 20% higher than the total emissions given in the DA inventories.

From consultation with the DECC DUKES team, it is understood that this inconsistency is probably due to erroneous reporting by refinery operators via the Petroleum Production Reporting System (PPRS) used to compile DUKES by DECC, leading to under-reporting of refinery energy use within the national energy consumption data. For example, consumption of petroleum coke by refineries appears to be underestimated in DUKES. The DUKES data underpin the UK and DA GHG inventories, and hence the emission inventory estimates are lower than those reported via EUETS.

Note also that differences in reporting scope may also contribute to the reporting differences; United Kingdom Petroleum Industry Association (UKPIA) emissions reporting is the primary data source for the DA GHGI estimates and may be wider than the scope of EUETS reporting for some sites. Further analysis is needed to resolve data inconsistencies, and there is ongoing consultation with DECC DUKES and UKPIA to progress this research. However, for the purposes of further research into the refinery sector emissions, the EUETS data are regarded as the more accurate dataset.

IPCC Sector		England	Scotland	Wales	N Ireland
1A1b	GHGI, Mt CO_2	10.01	1.89	3.11	-
	Traded, Mt CO_2	11.89	2.27	3.66	-
	Traded share, %	*118.8*	*119.8*	*117.8*	-

IPCC Sector 1A1c / 1A2a / 2C1: Other Energy Industries and Iron & Steel

Due to the difficulty in separating out the EUETS data into these three IPCC sectors, a combined total is compared with the GHG inventory data for each country. In particular, the iron & steel sector emissions reported via EUETS for one site are allocated across all three of these IPCC sectors within the inventories, including:

- 1A1c: energy industry activities (e.g. coke production);
- 2C1: process emissions (e.g. decarbonisation of limestone and dolomite); and
- 1A2a: fossil fuel combustion sources (e.g. consumption of coke, blast furnace gas, coke oven gas).

The data show a reasonable level of agreement with the traded figures. The differences that do exist are most likely to be within the 1A1c sector, since analysis of UK inventory data against EUETS data has demonstrated good agreement for the major sources within the 1A2a and 2C1 sectors. It is possible that errors in assigning EUETS processes to either the 1A1c or 1A2f sectors are partially responsible for the differences observed, but further investigations are needed to resolve this point.

IPCC Sector		England	Scotland	Wales	N Ireland
1A1c / 1A2a / 2C1	GHGI, Mt CO_2	16.13	1.90	7.82	-
	Traded, Mt CO_2	15.19	2.02	7.26	-
	Traded share, %	*94.2*	*106.2*	*92.8*	-

In England and Wales, the combined sector emissions are dominated by iron and steel sources, with the large integrated steelworks all reporting within the EUETS. The traded share of emissions for this sector in both England and Wales is over 90%. This analysis indicates that the large iron and steel works cover the vast majority of the inventory emissions; it is likely that the remaining emissions arise from smaller-scale sites that do not report to the EUETS (e.g. secondary iron & steel processing plant such as rolling mills etc).

The situation in Scotland is somewhat different. In Scotland, there is no major iron and steel processing plant, and the overall inventory and EUETS emissions are much lower than those reported in England and Wales. In Scotland, these emissions are predominantly from oil and gas sector sites, which are reported within the other energy industries (1A1c) sector. The analysis indicates that the traded share of emissions is over 100%, when compared to the GHGI estimates. There are a number of possible reasons for this data inconsistency. The most likely explanation is that the fuel use allocation (to sector) within EUETS differs from those made within the compilation of the energy consumption statistics for DUKES. There is also some uncertainty with regard to the allocation of fuel use at DA level, with the allocation of sites to sectors 1A1c and 1A2f being somewhat uncertain for several installations.

IPCC Sector 1A2f: Other Industrial Combustion

This sector covers all industrial combustion plant except those in the iron and steel sector. It has been split into cement and non-cement plant in order to show the different features of these two groups.

IPCC Sector		England	Scotland	Wales	N Ireland
1A2f (cement)	GHGI, Mt CO_2	7.72	0.62	0.92	0.72
	Traded, Mt CO_2	6.20	0.40	0.83	0.62
	Traded share, %	*80.3*	*65.1*	*90.1*	*86.7*
1A2f (other)	GHGI, Mt CO_2	46.79	5.19	3.12	1.85
	Traded, Mt CO_2	10.71	1.79	0.31	0.19
	Traded share, %	*22.9*	*34.5*	*10.1*	*10.5*

The GHGI emissions for each country are derived from emissions data (from pollution inventory reporting by operators, under IPPC) and supplementary information provided by the British Cement Association. It is expected that all UK cement kilns will ultimately operate within the EUETS, but during the first phase of the EUETS, covering 2005 to 2007, some sites have opted out of EUETS due to their participation in emissions trading via the sector CCA. This is reflected in the figures, which show that traded emissions are somewhat lower than total sector emissions, indicating that in each country some components of the cement industry emissions are excluded from the EUETS data. As the opted-out sites join the EUETS during Phase 2, then the traded share for this sector is expected to approach 100% for all countries.

The non-cement plant reported in sector 1A2f include both larger combustion plant operating within the EUETS as well as numerous smaller plant, which do not. Plant

covered by CCAs are also absent from the traded figure, but will be represented within the GHGI data. Therefore it should be expected that the traded emissions total should be significantly lower than the DA GHGI sector totals, and this is the case in all countries.

Interestingly, the traded share is notably higher in Scotland compared with Wales and Northern Ireland, while the situation in England is between these two extremes. Possibly the higher traded percentage in Scotland in particular (and England to a lesser extent) is due to the important contributions in these regions of industrial sectors such as oil and gas production, papermaking, chemicals and petrochemicals, all of which are well represented in the EUETS data. Further analysis is needed to investigate the reasons for these regional differences more thoroughly.

IPCC Sector 1A4a: Public Sector and Commercial

This sector covers commercial and public sector combustion plant. These sectors are characterised by a wide range of plant size, with relatively few large plant and numerous smaller plant that do not operate within the EUETS. Only a small percentage of emissions (mainly from large installations such as hospitals, large commercial sites / boilers) are expected to be within the traded sector, and the figures support this.

IPCC Sector		England	Scotland	Wales	N Ireland
1A4a	GHGI, Mt CO_2	17.64	1.73	0.85	0.33
	Traded, Mt CO_2	1.52	0.21	0.02	0.06
	Traded share, %	*8.6*	*12.2*	*2.5*	*19.2*

Surprisingly, the traded percentage varies quite significantly from country to country, being lowest in Wales and highest in Northern Ireland. Initial analysis seems to indicate that this is due to the sector being a relatively small dataset (in terms of inclusion within EUETS) and a small number of traded sites can have a significant impact on the % share. The sites that are within EUETS are mainly hospitals, MOD sites and institutions such as universities. In Northern Ireland, for example, there are 5 sites (4 hospitals and RAF Aldergrove) that together make up 85% of the EUETS emissions in this sector.

IPCC Sector 2: Industrial Processes (excluding cement and iron & steel)

This sector includes industrial processes such as the manufacture of lime, glass and aluminium. Many of these processes are not operating within the EUETS during Phase 1 (2005-2007), either due to their inclusion in CCAs, or because they are not covered by the scheme (although they may join the scheme in later phases). This is reflected in the figures, with few traded emissions in Wales, Scotland and Northern Ireland. All UK lime production takes place in England, and this contributes to the much larger traded percentage. The traded percentage is expected to increase in all countries in future years when processes covered by CCAs start to trade within the EUETS.

IPCC Sector		England	Scotland	Wales	N Ireland
2	GHGI, Mt CO_2	5.22	0.25	0.65	0.06
	Traded, Mt CO_2	0.94	-	0.003	-
	Traded share, %	*18.1*	-	*0.5*	-