Corrigendum

Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 to 2005

05452/2005/CD5069/GT_V3

INTRODUCTION

This document is a corrigendum to *"Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 to 2005"*, published in September 2007, to rectify a data processing error that has been identified in the 2005 power station emissions data for Wales, post-publication of the inventories.

Note to DA GHG Inventory Data Users

The corrected data presented below supersede the data presented within summary tables or elsewhere within the original DA GHG Inventory report. Users of the Devolved Administration GHG inventory data should note that a revised version of the inventory data pivot tables is now available on the NAEI website, replacing the previous version. Due to the substantial changes for the Wales power station estimates for 2005, data users should apply these revised data from now on and, if necessary, re-do any calculations or assessments that were based upon the previous data, particularly regarding power station emissions (IPCC sector 1A1a) and where overall emissions and trends are examined for Wales.

The revised pivot table can be accessed here:

http://www.naei.org.uk/report_link.php?report_id=481

The error only affects emission estimates presented for the power generation sector (IPCC sector 1A1a) in 2005 only, and occurred due to an error in processing EU-ETS site fuel use data. The 1990-2005 inventories used these EU-ETS data for the first time. The nature of the calculation methodology used for the DA inventories means the emissions of the DAs are interdependent, and so this processing error of the Wales power station data also affected the inventories for England, Scotland and Northern Ireland. The sum of DA sector emission estimates are normalised to UK sector emission totals and so all the DA emissions still sum to the UK total.

This document sets out:

1. The source of the error.
2. The impacts of correcting this error, compared to the originally published dataset, including presentation of the revised emission estimates for the power sector and the total GHG inventories in 2005, and the revised GHG emissions trends since 1990.
3. Revisions to QA/QC procedures to address the source of this error, to prevent any re-occurrence of this data processing error, and to further improve the quality control measures applied to data received.

THE SOURCE OF THE DATA PROCESSING ERROR

In the compilation of the 1990-2005 UK and DA inventories, for the first time the AEA inventory team have utilised the site-specific fuel use data available from the annual reports under EU-ETS. These data allow the inventory team to allocate fuel use data across the most energy intensive point sources in the UK, and hence improve the accuracy of the DA emission inventories. The data also provide the inventory team with sector-specific fuel use estimates. These fuel use data can then be compared to those reported within DUKES although an exact match in consumptions is not expected because of differences in the sector coverage of the two data sets.

Using the fuel use data, AEA compiles a point source database of site emission estimates, using literature emission factors for CO_2. This database is then used to provide data inputs to the DA inventories and emission maps.

An error was made in the allocation of power station gas use, due to a misinterpretation of the EU ETS data for one site. The EU-ETS fuel use data for Connah's Quay power station contained both positive and negative gas consumptions. These negative consumptions were the only instance of negative consumptions in the England & Wales EU-ETS dataset and our quality control procedures applied to the data suggested that the negative values were erroneous. We assumed an error with the sign of the data and therefore added the consumption to the positive values. This led to an overestimate of the gas use at this site.

The over-estimate has been traced by AEA through comparison against Wales electricity generation data published by BERR in November 2007[1]. The emissions versus generation trends (from the DA GHGI and BERR statistics respectively) were markedly different and the utilisation of Wales gas-fired power stations would have had to be significantly higher than the generation data suggested, in order that the erroneously high emissions total reported in the DA inventories could be achieved.

[1] Energy Trends December 2007, p16 "*Electricity Generation and supply figures for Scotland, Wales, Northern Ireland and England, 2005 and 2006*"

Further investigation of the Connah's Quay EU-ETS data[2] has revealed that the negative values entered were part of an accounting system that allows imports and exports of gas to the power station to be recorded. The gas terminal, BHP Billiton, provides most of the fuel used by Connah's Quay. Any surplus fuel that is not used for power generation is treated further and exported back out of the Connah's Quay site and into the National Transmission System (NTS) for natural gas. A single meter records the imports and exports of gas to the Connah's Quay site, as positive and negative values respectively.

The incorrect assumption that the negative values were erroneous therefore led to a significant over-allocation of gas use (and consequently CO_2 emissions) to Connah's Quay power station.

In the DA GHG inventory checking routines, the AEA team checks:

(i) Emission estimates against fuel use data (as reported via EU-ETS) for each sector and DA;
(ii) That the sum of DA inventory emissions are consistent with UK estimates by sector across all fuels (to ensure that the database processing is working correctly and that no sources are missing);
(iii) That the DA share of UK emissions for each sector is broadly consistent with previous inventory data.

It is now evident that this approach was insufficient as it assumed that our interpretation of the EU-ETS fuel use data was correct. Therefore, this QAQC routine was not rigorous enough to identify errors at the first data processing step, the compilation of the point source database.

THE EFFECT ON DA GHG EMISSIONS

The overall effects of the recalculation of emissions from Welsh power stations are summarised in the following tables. The corrected emission trend in Wales shows a significantly greater overall reduction in CO_2 and GHG emissions, compared to the trends originally published.

Previously the GHG emission reduction against Kyoto Protocol Base Years (1990 for CO_2, CH_4 and N_2O; 1995 for HFCs, PFCs and SF_6) was estimated at 8.8%, whereas the corrected data shows an 11.9% reduction in total GHG emissions.

[2] Personal communication, Ray Cottam (March 2008), Environment Agency of England and Wales EU-ETS site regulator for Connah's Quay

Table 1. Emissions in Wales in 2005 (kt CO_2e):

	Original Inventory	Recalculated Inventory
CO_2 Emission from 1A1a	14,047	12,382
Total GHG from 1A1a	14,106	12,439
Total CO_2 Emission	41,722	40,056
Total GHG emission	50,126	48,459

Table 2. Trend in Wales CO_2 and GHG emissions from 1990 (or 1995 for F-gases) to 2005

	Original Inventory	Recalculated Inventory
CO_2 Emission from 1A1a	+24.8%	+10.0%
Total GHG from 1A1a	+24.3%	+9.6%
Total CO_2 Emission	-3.7%	-7.5%
Total GHG emission	-8.8%	-11.9%

Table 3. Trend in Wales CO_2 and GHG emissions from 2004 to 2005

	Original Inventory	Recalculated Inventory
CO_2 Emission from 1A1a	+7.3%	-5.4%
Total GHG from 1A1a	+7.3	-5.4%
Total CO_2 Emission	-1.6%	-5.5%
Total GHG emission	-1.3%	-4.6%

The overall UK trends are unaffected, and the trends in the England, Scotland and Northern Ireland inventories now show slightly smaller reductions to 2005 than those originally reported in September 2007.

Table 4. Trend in England, Scotland and Northern Ireland CO_2 and GHG emissions from 1990 (or 1995 for F-gases) to 2005

	Original Inventory	Recalculated Inventory
England CO_2 inventory	- 7.1%	- 6.8%
England GHG inventory	**-17.7%**	**-17.4%**
Scotland CO_2 inventory	-12.5%	-12.3%
Scotland GHG inventory	**-15.5%**	**-15.4%**
N Ireland CO_2 inventory	-3.6%	-3.3%
N Ireland GHG inventory	**-5.6%**	**-5.5%**

IMPROVEMENTS TO THE QA SYSTEM

The DA inventories are subject to a series of systematic checks from data compilation from source UK data through to publication. Time series consistency checks are performed on the latest inventory estimates to examine differences between the current and historic inventories. However, several thousand pieces of data are required to generate the DA emissions estimates, and the calculation system is necessarily complex. This means the identification of outliers is not a simple task. For example, for many sectors the trend in emissions is often dominated by the overall UK trend, and hence

it is difficult to separate out the effects of DA-specific trends or recalculations in the UK data from erroneous data that may have been entered at DA level.

The production of the inventory and checking its accuracy are managed within a defined budget. The priority is to ensure that inventories are as comprehensive and accurate as possible within that budget. Discussions are ongoing about how further improvements might be made, given the importance of this data source for measuring emissions of greenhouse gases in each of the devolved administrations.

The “drivers” used to split out the UK data to DA level are checked when they are developed to explain any significant changes in the percentage split from one year to the next. This step is useful to highlight inconsistencies in the data, but in this instance where the Wales share of gas use should have declined this check is not a robust enough measure.

Point source data are available from a number of sources including EU ETS data, and Pollution Inventory data from the EA, SEPA and DOENI. The point source database that AEA compiles feeds emission estimates into the DA inventory calculation system as well as being used in the pollution emissions mapping NAEI outputs.

To manage the integration of the 2005 EU-ETS fuel use dataset, considerable additional time was spent in the processing of the point source database for the 1990-2005 inventory; 30 days more than was budgeted, in fact. Many reporting inconsistencies and discrepancies (e.g. from comparison against other point source datasets such as the Pollution Inventory) were identified and resolved, as the quality and consistency of fuel use reporting in the first annual EUETS data was found to be variable.

Estimates of emissions in the EUETS returns are verified by external auditors. However, within the 2005 EUETS site-specific fuel use data there was extensive mis-reporting of fuel types and over 20 unidentifiable fuel names used. The allocations of these fuels were based on AEA assumptions, mostly using the calorific values and carbon emission factors to estimate the correct fuel type. These findings were reported by AEA and have been fed back to Defra and the EUETS regulatory agencies.

The final check on the DA GHGI data is via a pre-publication review. The report and associated data are sent to stakeholders before publication and any comments or queries are considered and incorporated before the data are published.

This gas consumption error has highlighted the need to adopt further QA checks in future DA inventories. Note that these efforts will be limited to those that can be achieved within the agreed budget for the DA inventory compilation.

Additional checking procedures will include:

1. Automated checks of year-to-year emission trends, to help to identify any outliers in the emission trends, which will then be investigated to find out whether these reflect the real emissions trend, or if there has been an error.

2. Automated cross-checking of different point source data, where data for the same site are available from more than one source (e.g. PI and EUETS), these should be directly comparable. Database queries can be designed to check such cross-comparisons, and also to highlight significant changes in emissions from one year to the next. The inventory team have a good working relationship with the regulators and data suppliers, to facilitate investigation of emissions that look to be anomalous.

3. In addition, for the power generation sector the emission trends will be compared with the DA electricity generation data published in BERR's Energy Trends. This will help to highlight any inconsistencies in this important sector.

SUMMARY

Whilst every effort is made to ensure that errors in the DA Inventories do not occur, unfortunately this year a significant mistake remained in the data when it was published. An error was made in the allocation of power station gas use, as the EU ETS data contained negative gas consumptions for Connah's Quay power station. These were the only negative values in the entire EUETS database, and the AEA inventory team assumed the negative values were anomalous. However, they were part of a gas import / export balance calculation. The effect of this error was a significant over-estimate of emissions for Wales in 2005 which also affected the allocation of emissions to other DAs to a small extent.

AEA has identified this error, corrected it, and new QAQC procedures will be implemented to minimise the chance of such mistakes being repeated.