

**National Greenhouse and Energy  
Reporting System**

**Response**

**to**

**Technical Guidelines for the Estimation of  
Greenhouse Emissions and Energy at  
Facility Level**

**by**

**Malcolm R Lewis MBA, FCPA, GAICD**

**February 2008**

- 1 Overview
  - 2 General methodologies for estimation of greenhouse gases
  - 3 Defining the boundaries of a reporter
  - 4 Uncertainty analysis
  - 5 Emission conversion factors
  - 6 Transport related emissions
  - 7 Waste
  - 8 Management systems
  - 9 National based programs
- Appendix 1 – Energy Balance Sheet

## **1 Overview**

The application of standard methodologies for the measurement of greenhouse gas (GHG) emissions presents an ongoing challenge at both a national and international level. Where possible higher order methodologies, such as site specific sampling, are appropriate to improve the accuracy of emissions data for reporting entities. Notwithstanding the need for continual improvement to domestic reporting, Australian guidelines need to be mindful of international considerations pursuant to the Kyoto protocol.

In the context of international guidelines, reporters are therefore encouraged to continually review and improve their data capture and estimation methodologies to ensure more accurate calculation of emissions.

This submission discusses the estimation of greenhouse gas calculations in the context of a range of uncertainties and the capacity to ensure robust data capture relating to the consumption of energy sources and production of emissions.

## **2 General methodologies for estimation of greenhouse gases**

The tiered approach of the Technical Guidelines enables reporting entities with different quality objectives to consider the extent that data sources for each category require qualification. This is particularly important to ensure compliance obligations can be achieved in a cost effective manner. The guidelines delineate between direct and indirect emissions.

The reporting of direct emissions is well documented and mainly includes the consumption of fossil fuels. The recording of direct emission activity data is often dependent upon the capacity to clearly define the organisational boundaries of a reporting entity. The attributes of indirect emissions, including energy consumption of electricity, steam and/or hot water differ to the direct emission attributes.

Ensuring a clear definition of each reporting entity's organisational boundaries will support the capacity to separately identify and maintain direct form indirect emissions.

This delineation of structures should also support reporting of source three (3) indirect emissions that can also be separately identified - such as third party transport and contracted operations.

It is suggested that, following calculation of emissions by category, reporters create an Energy Balance Sheet that identifies total energy usage from both direct and indirect sources. (Refer Appendix 1). This reporting structure enables the calculation of the sum of primary energy usage, electricity procured and waste energy less any residual that is sold.

Direct emissions can be identified from power station outputs using solid, gaseous and liquid fossil fuels. Indirect emissions generally include the external production of electrical and steam energy as well as other indirect sources including transportation. From an estimation perspective, practical measurements can generally be quantified from amounts of electricity and steam purchased and sold. To ensure a balance between effective measurement and cost efficient operations, reporters need to determine the extent of emission from each component gas from a materiality perspective. For example, if CO<sub>2</sub> comprises in the order of 99 percent of all greenhouse gas emissions as a result of combustion processes, it may be acceptable for reporters to restrict the calculation to CO<sub>2</sub> emissions only. This would eliminate the need for potentially non valued activities that require the commitment of resources to track the remaining 1 percent.

It is prudent for emissions to be determined for each individual production site and aggregated to determine total indirect CO<sub>2</sub> emissions. Energy passed to other users or sold can then be excluded from the energy balance sheet.

Waste heat is a separate balance sheet item and is generated by processes not primary intended for energy generation. Calculation of these indirect emissions can be based on the “Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard, Revised Edition”. (Source: *World Business Council for Sustainable Development*).

The Technical Guidelines primarily focus on emissions derived from energy, industrial processes and wastes. While not included within the scope of the guidelines

it is prudent to conduct high-level estimates of factors from additional categories. This review is suggested to ensure emissions from these categories, such as agriculture, are not significantly to materially impact a reporters total emissions.

By way of example, emissions from volatile organic compounds are organic chemicals with a specific pressure that contribute to the formation of smog and ground-level ozone. Other emissions, such as sulphur dioxide and nitrogen oxides, generally originating from incineration processes, are released during energy generation and production processes. These substances can be categorised according to ozone depletion potential and may materially impact total GHG total emissions.

### **3 Defining the boundaries of a reporter**

A challenge for regulators is the ability to define the reporting entities boundaries for the purposes of accounting for GHG emissions. Reporters typically have different structures that include the ownership and operation of sites as well as equity shares in other operations, the ownership of subsidiaries and the out sourcing of a variety of businesses.

As previously discussed it is important to clarify the definition of organisational boundaries and structures in order to support the identification of emissions for reporting and validation purposes.

Organisational boundary can be defined according to the following three tiers of inter-company investment (*source: United Nations Energy Program*)

- The holding company
- Where a company owns a controlling interest in a subsidiary (greater than 50 percent equity)
- Any joint arrangement or operations that are proportionally consolidated

For consolidated accounts, parent companies should require subsidiaries and associates to follow the same GHG technical reporting procedures.

## **4 Uncertainty analysis**

The Technical Guidelines identify uncertainty analysis criteria for assessing and estimating the level of greenhouse gas (GHG) emissions. Accurate estimation of greenhouse gases includes the capacity to determine and reliably measure uncertainties of the contributing sources. The level of uncertainty often depends upon the quality of the data applied to the estimation and measurement of emissions in the context of the underlying variables.

The challenge is to continually improve and, where appropriate, standardise estimation methodologies. Uncertainty analysis provides a standard measure that can facilitate the process of comparing inventories.

The estimation methodologies are designed to provide regulators with the confidence that methods for monitoring, reporting and verifying emissions have an acceptable degree of certainty to demonstrate compliance. An issue for regulators is how to balance the need for improved accuracy of estimates for sources with sparse data compared to the cost effectiveness of actions necessary to provide improved accuracy.

The use of uncertainty analysis in the estimation of greenhouse gases can include application of the following techniques:

4.1 Measurement methods - the following options can be applied to support higher order information and methodologies:

- Sampling and analysis
- Maintenance and calibration of meters
- Temperature and pressure corrections
- Accuracy of flow measurement devices
- Accuracy of assessing flaring and venting emissions

4.2 Computational methods - effective computation and calculation of emissions can address the following questions:

- What is the relative contribution of individual sources to the overall inventory?
- What is the frequency of sampling and calibration?
- What is the role of monitoring and inventory management plans?

## **5 Emission conversion factors**

The assumptions underlying conversion of the production and consumption to CO<sub>2</sub> equivalents are of paramount importance to ensure acceptance of an emissions trading system. The guidelines identify the importance of higher order methods, such as on-site sampling of facility specific emission factors, in lieu of the application of default emission factors.

From an international perspective, there is acceptance for indicators to include assumptions that apply an average of conversion factors. The issue may therefore invoke a trade off between the enforcement of higher order estimates, such as on site sampling in order to comply with proposed Australian standards, verses a more cost efficient calculation if internationally accepted factors were applied.

The solution may require consideration to the abovementioned trade-off, on a case by case basis, depending on the likely levels of emissions and according to an agreed level of materiality.

This potential dilemma is not dissimilar to issues associated with the adoption of International Accounting Standards wherein the move from Australian Standards to their international equivalents provides ongoing challenges regarding the impacts and perceived accuracy of annual financial reporting.

Emission estimates are driven by the quality of the activity data. In order to determine appropriate activity data, the guidelines identify the inclusion of information from commercial invoices as well as the need to assess stock inventories such as the measurement of fossil fuels (for example the ability to accurately weigh fossil fuels such as coal)

While some source data is more accessible than others, commercial invoice data should be readily obtainable and verifiable. This data should be obtainable from accounts and administration departments including:

- Electricity and gas bills
- Fuel delivery invoices

- Meter readings
- Pipeline measurements
- Records from energy management software

## **6 Transport related emissions**

Technical guidelines identify transport sources using default NGA methods where the separation of emissions from the combustion of mobile fuel sources is supported internationally. It is noted that this information is better included in the calculation of transport emissions. As a guide it is appropriate to consider the inclusion of all official business transport related activities including the transportation of goods and company personnel.

Subject to the specific industry, data from transportation can be obtained from the following sources:

- Fleet records and car rental information
- Travel agency records
- Freight handling invoices and employee claim forms

Some reporters may delineate transport into road and non-road transport. Calculating road vehicle emissions can be complex given a reporter may use a number of transportation modes. The methodology of using total fuel consumption therefore avoids the need for data on different types of vehicles.

This method is consistent with the proposition that emission levels and fuel consumption vary in parallel – that is vehicles, with high emission rates also tend to have high fuel consumption.

Non-road transport requires a different methodology due to the difficulties in attributing an accurate quantity of the fuel consumed. For example, it is not realistic to estimate the amount of fuel consumed when an employee flies interstate on company business. Accordingly methods such as the number of kilometres travelled are to be applied to a relative emission factor to determine the equivalent emission output.

With regard to the oil and gas industry transportation can also include third party transport of crude oil and related products as well as contracted operations such as drilling or well maintenance.

## **7 Waste**

The generation of waste by reporters can lead to the production of high levels of CO<sub>2</sub> as well as higher impact greenhouse gases such as methane (CH<sub>4</sub>). The disposal and treatment of waste is identifiable through landfill, recycling and the incineration of solid waste. Liquid waste is generally disposed through wastewater treatment processes.

Calculation of appropriate factors is a complex issue with potential for error in the attempt to determine waste related emissions. Further research into the global warming contribution from waste would support the development of more accurate indicators particularly for industries with high levels of organic waste (food production) as well as within the manufacturing industry including pulp, paper, starch and textile sectors.

Waste disposal can typically include

- Waste removed form landfill sites
- Incineration
- Recycling

Reporters need to actively quantify their waste in preparation for more detailed and reliable data on emissions. For example, the guidelines identify emissions from industrial wastewater processes. Some industry processes result in waste water being returned to the reporting entity. In such cases identification of this activity data can result in an adjustment or reduction to the total emissions.

Other industries may use cooling water that is fed into the production process. Since this water is merely heated, and assuming it is not affected in any other way when used by the reporter, it can be subsequently discharged back to the water supply

without further treatment. Again appropriate adjustments are to be made to the energy balance sheet to account for the resultant reduction in waste water usage.

Corporations with international affiliates need to be mindful that the definition of hazardous waste may differ from one country to another. Accordingly the data capture, and inclusion to the energy balance sheet, may be calculated according to country specific definitions.

For example, hazardous water can includes items such as sludge from wastewater treatment processes as well as distillation and solvent residues. Without clarity and consistency of definitions, annual energy movements may be incorrectly attributable to changes in the product mix of treatment processes.

## **8 Management systems**

Effective management systems are imperative to ensure appropriate record keeping in order to identify the highest possible rating for the quality of emissions estimates. The capacity for a reporting entity to undertake the high order rating includes the application of continuous emissions monitoring systems or facility specific emissions based on direct sampling and analysis.

Ideally systems would be based on international standards and subject to regular audits including the capacity of the reporter to undertake internal review and audit of activity data.

To support facility level compliance at specific reporter locations, internal audits may be performed on existing management systems and supplemented by external certification.

Effective management systems include the application of default emission factors particularly where there is capacity to interface systems to existing accounting and financial reporting software applications. This could potentially streamline recording

of activity data as significant source data, including procurement and invoice transactions, are already held within the reporting entities current systems.

The abovementioned activity data capture could then be supplemented by higher level estimates, such as the estimation of facility specific emission factors and on-site sampling, according to recognised standards.

Industry specific considerations are important when considering the ability to apply common standards for emissions calculations. The following comparison is relevant with regard to direct emissions from fossil fuels within the mining industry. Due to the homogenous nature of petroleum products, they are better assessed according to facility specific factors based on fuel type. By comparison energy from coal is better estimated on a mine by mine basis since the energy content of coals can differ when extracted from different mines.

## **9 National based programs**

It is preferable for the emerging national program to complement existing state or territory based programs. This will support overall consistency and minimise the potential of added accounting issues when existing reporters are required to comply with the national reporting accounting requirements.

Clearly a national perspective will enable the a more complete picture of the reporting entities emissions as well as assist with the preparation for future national climate change regulatory program. Consolidation of national and state based guidelines would support consistency with on-going regulatory programs including the ability to comply with current state based legislation.

<b>Appendix 1 - Energy Balance Sheet</b>		
<b>Fuel Type / Primary Source</b>	<b>Energy usage in Terajoules (E)</b>	<b>Greenhouse Gas Emissions CO2 equivalent (G)</b>
Solid fuels	E1	G1
Gaseous fuels	E2	G2
Liquid Fuels	E3	G3
Other primary energy source	E4	G4
<b>Total Direct</b>	$E1 + E2 + E3 + E4$	$G1 + G2 + G3 + G4$
Electricity Procured	E5	G5
Waste heat (eg steam)	E6	G6
Other indirect (source 3)	E7	G7
<b>Total Indirect</b>	$E5 + E6 + E7$	$G5 + G6 + G7$
Less		
Energy sold	E8	G8
- Steam		
- Refrigeration		
<b>Net Usage</b>	Total Direct + Total Indirect – E8	Total Direct + Total Indirect – G8