EPA VICTORIA'S GREENHOUSE INVENTORY MANAGEMENT PLAN: 2010–11 UPDATE

Updated December 2011 for the 2010–11 financial year

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I THE PURPOSE OF THIS DOCUMENT

EPA's Greenhouse Inventory Management Plan outlines the steps undertaken as part of the 2010–11 annual greenhouse gas (GHG) inventory. EPA has made this document public and transparent. While it will serve as an internal guide for future inventories, it is not intended to serve as a manual for other organisations.

This document includes the following topics:

Section	Subject	Content
Section I	Introduction	Summarises EPA's carbon neutral strategy, the protocol followed for GHG inventories and the external assurance of the Strategy and GHG inventory for 2010–11.
Section II	Boundaries	Describes the inventory boundaries, including which parts of the organisation and sources are covered in the inventory.
Section III	Methodology	Outlines the sources of activity data and quantification methods (including equations and emissions factors) for each inventory item, as well as recommended tasks to improve the item in the future.
Section IV	Reduction Measures	Discusses reduction measures, including onsite reductions and offset product purchases to neutralise emissions.
Section V	Process Management	Outlines roles and responsibilities of EPA staff in the inventory process.
Section VI	Assurance and Verification	Summarises EPA's carbon neutral strategy assurance and inventory verification process.
Section VII	Updates	Major updates to inventory boundaries, data management or quantification methods.
	Bibliography	Documents sourced for the development of this document.
	Appendices	Includes: • All EPA Victoria publications relating to the 2010–11 GHG inventory, *2010–11 carbon neutral strategy* and external assurance process. • Details of background calculations for public transport, taxi, reticulated water, office paper and staff commuting emissions. • Documentation regarding offset product purchases.

II GHG INVENTORY – A COMPONENT OF EPA'S CARBON NEUTRAL STRATEGY

EPA Victoria achieved 'carbon neutrality' for the first time for the financial year 2005–06 and pledged to remain carbon neutral every year until 2010, at which time would assess its strategy. This has been upheld.

During this process EPA developed a step-by-step decision-making framework, the Carbon Management Principles (see Figure 1), to guide our carbon neutral strategy. Under these principles, an organisation should measure their impacts, then set an objective, implement avoidance and reduction strategies, and finally look at offsetting residual emissions. This greenhouse inventory management plan provides the technical underpinnings of EPA's GHG emissions measurement, as well as documentation of emission reduction measures, including offset product purchases undertaken in 2010–11. A summary of EPA's carbon neutral strategy is available in Appendix A.

The GHG inventory describes EPA's current approach to achieving carbon neutrality: addressing emissions from direct sources, purchases of electricity and hot water, other accurately measurable, indirect sources that are critical to operations, and a range of indirect life-cycle emission sources.

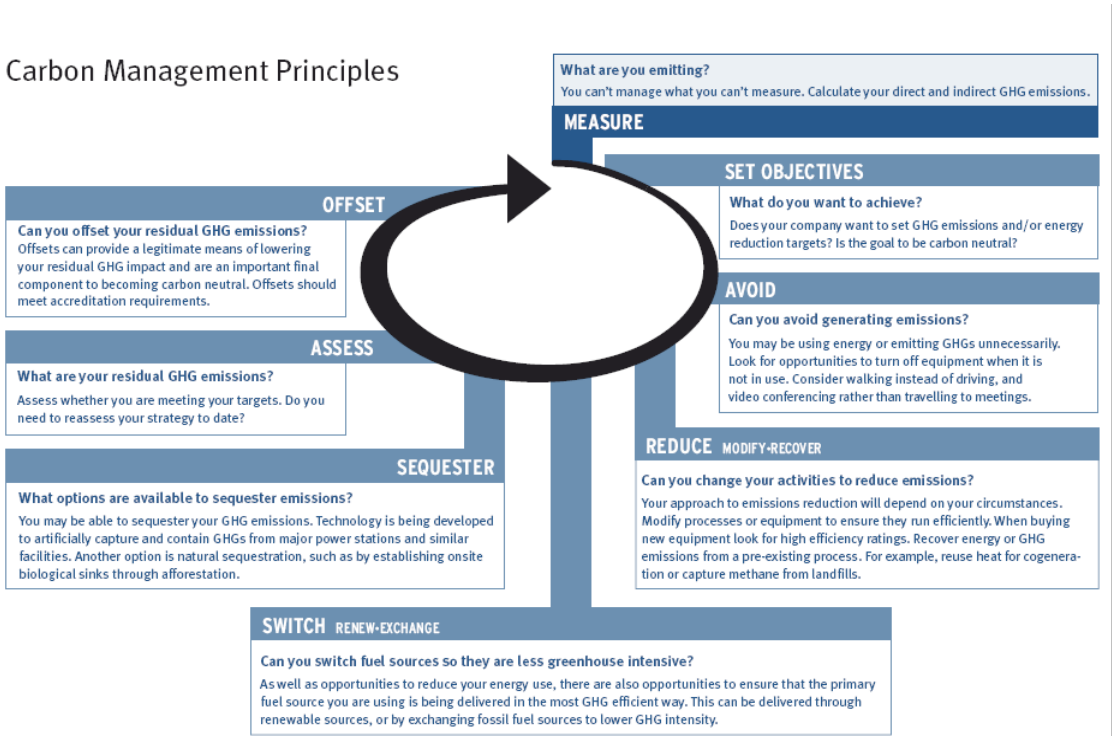

Figure 1: Carbon Management Principles

EPA developed its GHG inventory in accordance with the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol) developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) in 2004. The GHG Protocol is used and endorsed by many organisations, including the Global Reporting Initiative, Carbon Disclosure Project, International Organization for Standardization, EU Emissions Trading Scheme, and Chicago Climate Exchange. The Protocol provides guidance on what emission sources to include, how to ensure transparency and avoid double counting, and how to quantify.

EPA is committed to having its GHG inventory and carbon neutral strategy statement externally assured each year. For the years 2005–06 to 2010–11, EPA engaged Net Balance Management Group to perform this task. Its assurance statement for EPA for 2010–11 is available in Appendix B.
Summary tables of EPA's 2009–10, 2008–09, 2007–08, 2006–07 and 2005–06 GHG inventories are in appendices C, D, E, F and G, respectively.

III MAJOR UPDATES TO INVENTORY BOUNDARIES, DATA MANAGEMENT OR QUANTIFICATION METHODS

This section aims to highlight any major changes to the inventory boundaries, data management and quantification methods from EPA's baseline inventory in 2005–06. This section also demonstrates changes such as the use of different emissions factors and new ways of collecting data.

Backcasting

For all significant changes to our 2010–11 GHG inventory from the methodology used for our 2005–06 baseline year, we have used backcasting. This means we have recalculated our baseline data (2005–06) with our new methodologies and included all new emission sources to allow for a more useful and relative comparison between the six years. All aspects of the inventory for which this was conducted are outlined below.

Reticulated water and office paper

EPA's 2006–07 GHG inventory included two new emission sources. These were emissions associated with the provision of reticulated water and office paper. The steps taken to quantify these emissions have been outlined in sections K and L in part V of this document. Emissions associated with purchased office paper and reticulated water have also been calculated for the 2005–06 year based on our usage for that year, to allow for comparison.

Staff commuting and catering

EPA's 2007–08 GHG inventory included two new emission sources. These were emissions associated with the mode of transport EPA staff members use to travel to and from work each day and the growth, production, preparation and delivery of catering purchased. The steps taken to quantify these emissions have been outlined in sections O and P of part V of this document. Emissions associated with staff commuting and catering has also been calculated for the 2005–06 and 2006–07 years based on our usage for that year, to allow for comparison.

Courier services and colour publications

EPA's 2009–10 GHG inventory included two new emission sources. These were emissions associated with provision of courier services and colour publications. The steps taken to quantify these emissions have been outlined in sections Q and R of Part V of this document. Emissions associated with colour publications have also been calculated for the 2005–06, 2006–07, 2007–08 and 2008–09 years based on our usage for that year, to allow for comparison.

Non-Kyoto refrigerants from building air conditioning and kitchen and laboratory refrigerators

EPA's 2009–10 GHG inventory included two new emission sources. These were emissions associated with non-Kyoto greenhouse gas emissions used as refrigerants in building air conditioning and refrigerators. The steps taken to quantify these emissions have been have been outlined in Section E of this document.

Flights

The methodology we applied to our flight calculation has changed from the baseline calculation in 2005–06. In 2010–11 we have included an uplift factor in addition to the radiative forcing factor. We have also used a new radiative forcing factor, based on published methodologies (outlined in section H). This resulted in our emissions associated with flights appearing much lower for this year than in the past five years. Therefore, we have backcast our 2005–06, 2006–07, 2007–08, 2008–09 and 2009–10 data to allow for comparison.

Public transport

The methodology we applied to our public transport calculation has changed from the baseline calculation in 2005–06. For the 2010–11 GHG inventory we separated public transport into metropolitan and regional use and then applied appropriate emissions factors. This resulted in a more accurate calculation of emissions associated with public transport use. We also backcast this new methodology to 2005–06, 2006–07, 2007–08, 2008–09 and 2009–10 data to allow for comparison. For background on the quantification method used, see Appendix F.

High-temperature hot water

The methodology used to calculate EPA's use of high-temperature hot water (HTHW) at our CES site has changed from the baseline calculation in 2005–06. For the 2010–11 GHG inventory, the proportion of natural gas attributable to losses and auxiliary services associated with HTHW consumed (%) is assumed constant, based on metered data available from 2005–06. This approach was used to ensure that the overall consumption of the cogeneration plant was incorporated into the calculations. This differs from previous calculations, in which EPA assumed that the monthly quantities of natural gas consumed remained constant. We feel that a dynamic approach is more suitable, as changes

in EPA's use of HTHW may reflect overall changes in natural gas consumption by the cogeneration plant. We have backcast the calculations for the updated approach to 2005-06, 2006-07, 2007-08, 2008-09 and 2009-10 data to allow for inter-annual comparisons. It should be noted that both these methods are inaccurate as they are based on consumption data from 2005-06.

IV INVENTORY BOUNDARIES

a Organisational boundary

EPA follows the operational control approach for consolidating GHG emissions throughout the organisation, as defined by the GHG Protocol. EPA includes emissions from all operations where we have the full authority to introduce and implement operating policies. For leased facilities, EPA has determined that we have operational control of all tenant light and power (TL&P) since we can implement operating policies regarding lighting, computer use and other appliance energy demand regardless of whether we are directly billed for TL&P. EPA cannot claim full operational control of base building power, such as power for air conditioning and elevators, central heating or air conditioning refrigeration in leased facilities. As such, these sources are only deemed within our 'operational control' if we are the sole tenant in the building.[1] Those emissions considered outside EPA's full operational control, but for which we do have some responsibility, have been included in the scope 3 section of our inventory.

EPA includes emissions from the following facilities:

Table A: EPA Victoria sites

Site	Address	Is EPA the sole tenant?
Head Office: 200 Victoria St, Carlton (from November 2009)	200 Victoria Street, Carlton, Victoria 3053 Phone: 03 9695 2722 Fax: 03 9695 2610	No
Air monitoring sites	Various	Yes
Centre for Environmental Sciences	Ernest Jones Drive, Macleod, Victoria 3085 Phone: 03 8458 2300 Fax: 03 8458 2301	Yes
EPA Gippsland	7 Church Street, Traralgon, Victoria 3844 Phone: 03 5173 9800 Fax: 03 5174 7851	Yes
EPA North East	27–29 Faithful Street, Wangaratta, Victoria 3677 Phone: 03 5720 1111 Fax: 03 5721 2121	No
EPA North West	43 Williamson Street, Bendigo, Victoria 3550 Phone: 03 5438 1000 Fax: 03 5443 6555	No
EPA South West	State Government Offices, Corner Little Malop and Fenwick Streets, Geelong, Victoria 3220 Phone: 03 5226 4825 Fax: 03 5226 4632	No
EPA Southern Metro	35 Langhorne Street, Dandenong, Victoria 3175 Phone: 03 8710 5555 Fax: 03 9794 5188	Yes
HWT office (until 31 October 2009)	HWT Tower, 40 City Road, Southbank, Victoria 3006 Phone: 03 9695 2722 Fax: 03 9695 2780	No
IBM office (until 31 October 2009)	IBM Centre Level 4, 60 City Road, Southbank, Victoria 3006 Phone: 03 9695 2722 Fax: 03 9695 2753	No

b Operational boundary

We include the six gas sources covered by the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perflourocarbons (PFCs) and sulphur hexafluoride (SF_6). EPA reports emissions of these gases in units of carbon dioxide equivalents (CO_2-e).

From 2009–10 we have also included the non-Kyoto Protocol gases used as refrigerants in our buildings' air conditioning and kitchen and laboratories refrigerators.

1 EPA decided to include base building power, heating and air conditioning refrigeration emissions from leased facilities where EPA is not the sole tenant as scope 3 emission sources in our inventories, as outlined in section IVb, Operational boundary.

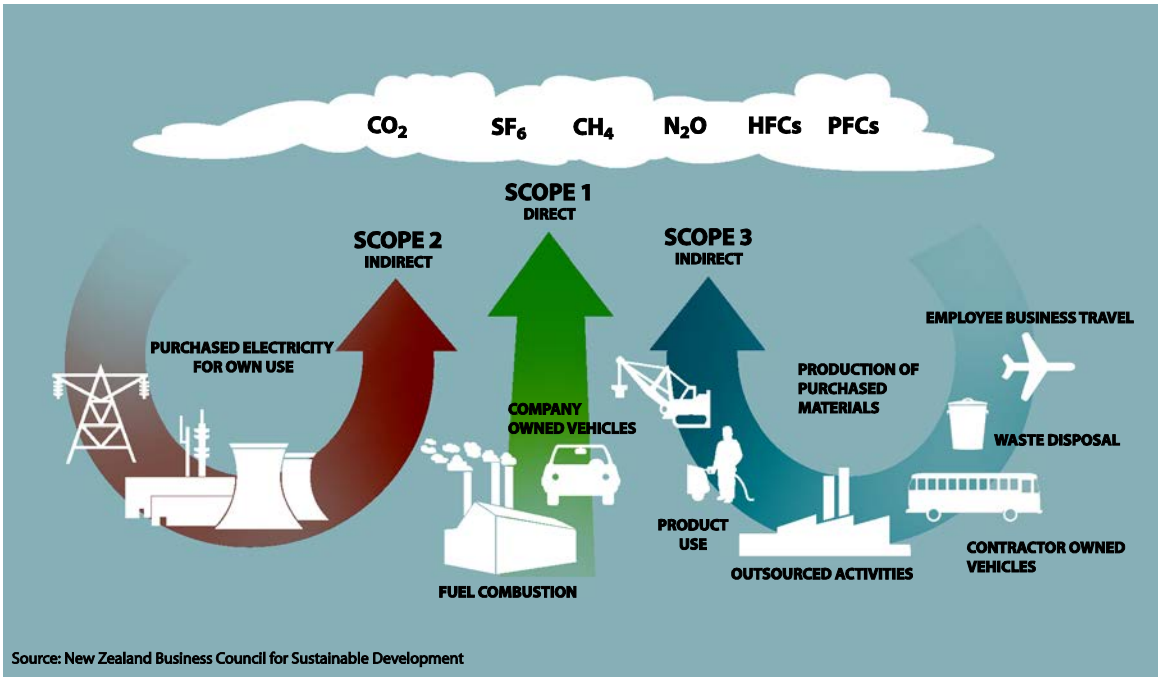

Figure 2: Overview of scopes and emission sources

Figure 2 demonstrates the composition of the three scopes that make up a GHG Protocol greenhouse gas inventory. Scope 1 includes all direct emissions, scope 2 is emissions from purchased electricity and steam and scope 3 includes all other indirect emissions. Scope 3 can include a range of emission sources such as public transport, embedded carbon in paper, catering, business travel, waste disposal and emissions associated with contractors.

EPA's GHG inventory includes direct emission sources (scope 1) and emissions from electricity and hot water purchases (scope 2) from all operations where we have the full authority to introduce and implement operating policies. We also include other accurately measurable indirect sources (scope 3) that are critical to EPA's operations, including shared emission sources at leased facilities where EPA is not the sole tenant. EPA groups emissions according to the GHG Protocol scope categories, which are to be transparent and to identify our inventory items that could be double-counted by other organisations (e.g. scope 2 and 3). Figure 2 illustrates the types of emission sources under each scope category.

A summary list of emission sources contained in EPA's 2010–11 GHG inventory is in Appendix A.

EPA consults members of its Green Stars committee[2], its external assurer and staff from the Service Growth and Risk & Governance units to ensure accurate and relevant scope 1 and 2 emission sources within its organisational boundary have been included each year.

Additional emission sources and/or calculation expansion that are not material but could be included are:

- solvents at EPA laboratories at the Centre for Environmental Studies (CES) in Macleod
- emissions from the installation and disposal of refrigeration and air-conditioning equipment
- life-cycle emissions of materials such as:
  - stationery
  - uniforms
  - personal protective equipment
  - communication equipment
  - electronic and electric hardware
  - audiovisual equipment
  - materials used in construction of buildings occupied/retrofits
- contractor and consultant activities as part of EPA projects (e.g. EPA's auditors)

2 EPA's Green Stars committee is an organisational environmental committee that develops and implements projects to minimise EPA's environmental impacts. Its role also includes implementing behaviour change educational programs.

- other life-cycle emission sources critical to EPA's operations
- expansion of publication type already included in GHG inventory (i.e. annual reports, marketing material, information sheets and other sources)
- provide more detail on glossy publications printed
- other areas of procurement, such as electronic equipment
- external IT and data centres, or separate these emissions to show the significance, if any, of these centres
- external electronic data houses such as search engines, website hosting, and email storage.

V INVENTORY DATA MANAGEMENT AND EMISSIONS QUANTIFICATION

a Overview

The following sections outline:

1. activity data management – how EPA collects and manages 'activity data', e.g. kWh consumed, kilometres travelled on flights etc
2. quantification method – how EPA calculates emissions (including computing final activity data and applying emissions factors to final activity data)
3. future tasks – recommended annual tasks and steps to improve the inventory.

1 Activity data management

EPA does not monitor emissions from any of the inventory items, so we rely on activity data. The primary sources of data are utility bills and records kept by EPA's facility landlords, travel agents, Risk & Governance Unit, Finance Unit and EMS Coordinator. All inventory data, including additional detail to the following sections (such as individual refrigerator charge capacity and refrigerant type), is stored in a limited-access spreadsheet on EPA's network.

2 Quantification method

EPA seeks to follow best practice when calculating GHG emissions. Therefore, the GHG Protocol calculation guidance and tools, based on the Intergovernmental Panel on Climate Change (IPCC) GHG inventory guidelines are used.

For 2010–11 we applied emissions factors from the latest National Greenhouse Accounts (NGA) Factors (Department of Climate Change and Energy Efficiency [DCCEE] 2011) to activity data for all sources except for refrigerants, flights, staff commuting, couriers, catering, public transport, reticulated water and office paper, because NGA factors were not available for these sources. EPA chooses to use the most recently released NGA factors (e.g. 2011 factors for the 2010–11 inventory) for consistency with the rest of the Victorian Government and to align with the Victorian Government Financial Reporting Directive on reporting for environment data. However, EPA recognises that, for reporting under the National Greenhouse and Energy Reporting Act (NGER), previous year's factors are used (e.g. 2010 factors for the 2010–11 inventory).

Refrigerant emissions factors are sourced from the GHG Protocol; the flights emissions factors are sourced from UK's Department of Environment, Food and Rural Affairs (DEFRA); the public transport and staff commuting emissions factors are sourced from the Victorian Department of Transport and V/Line; and the reticulated water, catering and office paper emissions factors are sourced from the Royal Melbourne Institute of Technology's Centre for Design.

A full list of our external sources is available in the bibliography of this publication.

Pro rating methodology

When collecting activity data from utilities, including electricity, natural gas, and water invoices, data can often overlap outside the annual reporting period of 1 July to 30 June. For example, bills received will be from 20 June 2010 to 20 June 2011. Where this occurs, EPA will use preceding and following utility invoices and apply a pro-rata figure in order to calculate for the exact reporting period. Where following utility invoices are not available, an extrapolated figure based on the most recent invoice will be used.

3 Future tasks

EPA will update the essential inventory items annually, with the exception of diesel used in backup generators, building refrigeration and vehicle refrigeration. These inventory items will be updated less frequently, as the resources required to collect this data are intensive while their contribution is relatively small. However, EPA will ensure any significant changes to backup generators and building and vehicle refrigeration are picked up in our annual inventory.

EPA will aim to use the most up-to-date versions of inventory guidelines and individual calculation tools – such as the GHG Protocol – before starting each annual inventory. EPA's EMS Coordinator will also consult the most recent version of the DCCEE's NGA factors for emissions factors and GHG global warming potentials.

b Scope 1 and 2 emissions

Building energy use:

There are four types of fossil fuel energy sources used at EPA facilities:

- electricity
- natural gas (including natural gas-fired tri-generation power)
- high-temperature hot water (HTHW) from a cogeneration facility

- diesel for backup generators.

Data management and emissions quantification for each of these energy types is detailed below. For all energy sources, EPA uses data from billing cycles and direct readings that most closely align with the inventory financial year (e.g. 27/6/10 – 26/6/11).

A Electricity

Checklist for electricity
Key activity data
Electricity consumption from utility bills and/or overall building data from landlords (kWh); amount of EPA-occupied space (m^2).
Key emissions factors
Victorian end-user electricity for scope 2: 1.21 kg CO_2-e/kWh (DCCEE 2011, page 20, Table 5).
Key methodology guidance
GHG Protocol 2007.

1 Activity data management

There are two general categories of electricity use at EPA facilities: tenant light and power (TL&P) and base building power. TL&P consists of electricity used for lighting, computers, unit air conditioners and other appliances. Base building power is electricity used for services such as central air conditioning, elevators and lighting in lobbies and other shared spaces. The way EPA obtains data related to these two categories of electricity consumption varies for each site.

EPA receives the majority of TL&P data directly from electricity providers, either in a flat file or from invoices, while EPA estimates base building power at most facilities based on total building electricity consumption data and EPA's share of the floor space. The source of electricity data for each facility is outlined in Table B.

Table B: Electricity data sources by facility

Site	Is EPA the sole tenant?	Landlord	Electricity provider	TL&P billing source	Base building billing source	GreenPower via utility bill (%)
Head Office: 200 Victoria St, Carlton	No	Drapac	Cogent	Utility	Building manager	0
Air monitoring sites x14	Yes	EPA Victoria	Various	Utility	Utility	0
Centre for Environmental Sciences (CES)	Yes	La Trobe University	Origin	Utility	Utility	0
EPA Gippsland	Yes	Two private companies	TRU	Utility	Utility	100
EPA North East	No	Arandem Pty Ltd Lloyd Pty Ltd	TRU	Utility	Landlord	100
EPA North West	No	Becklegal	Origin	Landlord	Landlord	0
EPA Southern Metro	Yes	KH Implex Pty	TRU	Utility	Utility	0
EPA South West	No	Victorian Government – VGPG/Jones Lang La Salle	TRU	Landlord	Landlord	20

The Risk & governance Unit receives all electricity bills coming directly from the electricity provider and then the EMS Coordinator enters the start and finish dates for the billing period, the number of days in the billing period, the kWh consumption (split between normal grid and GreenPower) and the cost (split between normal grid and GreenPower) for our air monitoring stations and CES into spreadsheets on EPA's shared network space. The Risk & governance Unit then signs and approves individual invoices and forwards them on to the Finance Unit for payment processing.

The EMS Coordinator receives a monthly flat file from TRU energy detailing the electricity use at the EPA Southern Metro, North East and Gippsland sites. The EMS Coordinator then enters the start and finish dates for the billing

period, the number of days in the billing period, the kWh consumption (split between normal grid and GreenPower), and the cost (split between normal grid and GreenPower) into the same spreadsheets on EPA's shared network space.

Brookfield Multiplex, the property manager for the EPA North West and South West facilities, sends quarterly spreadsheets to the EMS Coordinator that indicate the energy usage (in kWh) attributed to EPA TL&P, as well as total base building power. The EMS Coordinator keeps copies of these spreadsheets and inputs the TL&P data into the relevant spreadsheet.

The EMS Coordinator contacts the landlord for Head Office, EPA North East and North West for total base building power at respective sites on an annual basis.

2 Quantification method

For those facilities where EPA is billed directly for kWh use or the landlord provides pro rata data, no further quantification of activity data is needed. For those facilities where EPA is not the sole tenant and only building-wide kWh data is available for base building power (North West, South West and Head Office), the EMS Coordinator calculates the kWh consumption for EPA based on the percentage of the buildings' leasable floor space that EPA occupies (see Figure 3). The Risk & governance Unit maintains information on square metres of EPA's leased space and landlords provide information on total building space.

$$B_e = (F_e/F_t) * B_t$$

Where:

- B_e = EPA's share of base building electricity use (kWh)
- F_e = Floor space of EPA's leased space (m^2)
- F_t = Floor space of building (m^2)
- B_t = Total base building electricity use (kWh)

Figure 3: Equation for estimating EPA's share of base building power

EPA then applies the DCCEE scope 1 emissions factor for consumption of purchased electricity by end-users in Victoria (scope 2) to the final activity data.

3 Future tasks

- Update data annually.
- Seek the most up to date methodology for calculating emissions from electricity used in tri-generation plants.
- Seek more regular updates from landlords on electricity use for TL&P and base building power use.
- Spot-check landlord electricity data spreadsheets for errors.

B Natural gas

Checklist for natural gas
Key activity data
Natural gas consumption from utility bills and/or overall building data from landlords (GJ); amount of EPA-occupied space (m^2).
Key emissions factors
Consumption of natural gas distributed in a pipeline: 51.33 kg CO_2-e/GJ (DCCEE 2011, page 14, Table 2).
Key methodology guidance
GHG Protocol 2005b.

EPA's natural gas activity data management and quantification method is similar to that for electricity. Only three of EPA's facilities – EPA South West, CES and Head Office – used natural gas in 2010–11. Details on the sources of natural gas data for each facility are available in Table C.

1 Activity data management

Brookfield Multiplex sends quarterly spreadsheets to EPA's EMS Coordinator that indicates the GJ attributed to EPA's share of natural gas consumption at the South West site. The EMS Coordinator keeps copies of these spreadsheets and inputs the gas consumption data into the relevant spreadsheet.

The Risk & governance Unit receives all natural gas bills for CES directly from the natural gas provider and then the EMS Coordinator enters the start and finish dates for the billing period, the number of days in the billing period, the GJ consumption and the cost into spreadsheets on EPA's shared network space. For Head Office, the EMS Coordinator receives natural gas use in spreadsheets directly from the tri-generation plant operator, CoGent. The Risk & governance Unit then signs and approves individual invoices and forwards them on to the Finance Unit for payment processing.

The EMS Coordinator contacts the landlord at HWT and IBM Offices for total natural gas consumption at those sites on an annual basis.

Table C: Natural gas data source by facility

Site	Is EPA the sole tenant?	Landlord	Natural gas provider	Billing source
Head Office: 200 Victoria St, Carlton	No	Drapac	CoGent for the trigeneration plant	Utility
South West	No	Victorian Government – Brookfield Multiplex	N/A	Property manager
Centre for Environmental Sciences (CES)	Yes	La Trobe University	TRU Energy	Utility

2 Quantification method

For all sites no further quantification of activity data was needed, as exact metered data is provided via bills and/or spreadsheets.

$$B_e = (F_e/F_t) * B_t$$

Where:

B_e = EPA's share of base building natural gas use (GJ)

F_e = Floor space of EPA's leased space (m^2)

F_t = Floor space of building (m^2)

B_t = Total base building natural gas use (GJ)

Figure 4: Equation for estimating EPA's share of total building natural gas use

EPA then applies the DCCEE scope 1 emissions factor for consumption of natural gas distributed in a pipeline to the final activity data.

3 Future tasks

- Update data annually.
- Seek the most up-to-date methodology for calculating emissions from natural gas used in tri-generation plants.
- Seek more regular updates from landlords on natural gas use for EPA and total-building gas use.
- Spot-check landlord natural gas data spreadsheets for errors.

C High-temperature hot water (HTHW)

Checklist for HTHW
Key activity data
Natural gas consumption at La Trobe University cogeneration plant (GJ); EPA HTHW natural gas consumption from landlord (GJ); proportion of natural gas energy content dedicated to HTHW generation from landlord-sponsored energy audit (%).
Key emissions factors
Consumption of natural gas distributed in a pipeline: 51.33 kg CO_2-e/GJ (DCCEE 2011, page 14, Table 2).
Key methodology guidance
None for 2010–11. In the future, GHG Protocol 2006.

EPA purchases high-temperature hot water (HTHW) from the cogeneration (cogen) plant at La Trobe University to heat and cool EPA's Centre for Environmental Sciences (CES) facility at Macleod. La Trobe University transports the HTHW through a pipeline roughly two kilometres to the energy centre adjacent to the CES facility.

The GHG Protocol guidance for calculating emissions for energy products derived from cogeneration (GHG Protocol 2006) is EPA's preferred quantification methodology for this emission source. However, there is not enough activity data available to follow any of the GHG Protocol suggested calculation methods. Additionally, EPA has difficulty determining the amount of HTHW that is delivered to the CES facility versus the amount lost along the transmission pipeline, the latter of which is not within EPA's operational control per GHG Protocol guidance. EPA's Risk & governance Unit believe there is a significant amount of energy loss along the line between the plant and the energy centre, but metering at both ends of the pipeline has been malfunctioning for several years so there is no accurate data. The methodology below reflects EPA's best attempt at estimating emissions from the CES facility's HTHW consumption.

1 Activity data management

The data used by La Trobe University to estimate EPA's HTHW consumption is based on 2002–03 and 2003–04 metered output at the cogen plant, which is then delivered via the pipeline to the energy centre. La Trobe believes this is a conservative estimate (since it used some of the smallest readings during the 2002–03 and 2003–04 periods as a baseline) and that the actual output delivered to the pipeline is higher. La Trobe does not, however, account for line losses, since it does not have functioning meters to measure the HTHW received at CES. In the absence of further metering, EPA feels that this data is the best available estimate of the CES facility's actual consumption and is likely to be an overestimate rather than an underestimate.

2 Quantification method

In order to translate EPA's consumption of HTHW into GHG emissions, EPA must determine how much natural gas La Trobe uses to generate the HTHW and, therefore, how much natural gas EPA uses as a proportion of this. La Trobe's Energy Manager provides the total GJ of natural gas used at the cogen plant. La Trobe's cogen plant Facility Manager provides information on the proportion of energy content of natural gas used at the cogen plant dedicated to HTHW, electricity, losses, and auxiliary services[3]. EPA then applies the DCCEE scope 1 emissions factor for consumption of natural gas distributed in a pipeline to the final activity data.

The full calculations for estimating natural gas consumption attributable to CES's HTHW use are detailed in Figure 5.

3 Future tasks

- Update data annually.
- Work with La Trobe University to install better metering of the separate energy products at the cogen plant, HTHW delivered to the pipeline and HTHW delivered to the energy centre.
- Work towards following the preferred method – the 'efficiency' method – for attributing fuel use to cogen products outlined in the GHG Protocol tool (GHG Protocol 2006).
- Update inventory to reflect actual data; separating CES consumption into scope 2 and line losses into scope 3.
- Investigate commissioning a new energy audit to determine EPA's consumption of HTHW.

3For 2010–11, this data was based on an energy audit conducted by Sinclair Knight Merz in 2003.

Step 1

Calculate GJ of HTHW generated at the cogen plant (H_t):

$$\mathbf{H_t = N_t * EC_h} = 129{,}104 \text{ GJ in 2010-11}$$

Where:

Nt	=	Total natural gas used at cogen plant (GJ)	=	368,867 GJ in 2010-11, as supplied by Latrobe University.
EC_h		Proportion of energy content of natural gas used at cogen plant dedicated to HTHW		0.35 in 2010-11

Step 2

Calculate GJ of natural gas attributable to losses and auxiliary services at the cogen plant (A_t), assuming 50% of losses and auxiliary services are attributable to HTHW generation:

$$\mathbf{A_t = 0.5 * N_t * EC_a} = 66{,}396 \text{ GJ in 2010-11}$$

Where:

$\mathbf{N_t}$	=	Total natural gas used at cogen plant (GJ)	=	368,867 GJ in 2010-11
$\mathbf{EC_a}$	=	Proportion of energy content of natural gas used at cogen plant dedicated to losses and auxiliary services	=	0.36 in 2010-11

Step 3

Calculate proportion of natural gas attributable to losses and auxiliary services associated with HTHW consumed at CES (A_e),:

$$\mathbf{A_e = (H_e * 12)/ H_t} = 0.0414\% \text{ in 2010-11}$$

Where:

$\mathbf{H_e}$	=	Monthly HTHW consumption at CES facility (GJ)	=	475GJ in 2005-06, based on latest metered data available.
$\mathbf{H_t}$	=	Total HTHW generated at the cogen plant (GJ)	=	137,550GJ in 2005-06, based on latest metered data available.

Step 4

Calculate total GJ of natural gas associated with CES's HTHW consumption (N_e):

$$\mathbf{N_e = A_e}*(\mathbf{H_t + A_t}) = 8{,}101 \text{ GJ in 2010-11}$$

Where:

$\mathbf{A_e}$	=	Proportion of natural gas attributable to losses and auxiliary services associated with HTHW consumed at CES (%)	=	0.0414% in 2010-11
$\mathbf{H_t}$	=	GJ of HTHW generated at the cogen plant (GJ)	=	129,104 GJ in 2010-11
$\mathbf{A_e}$	=	GJ of natural gas attributable to losses and auxiliary services at the cogen plant (GJ)	=	66,396 GJ in 2010-11

D Diesel for backup generators

Checklist for diesel generators
Key activity data
Automotive diesel oil consumption based on landlord dipstick readings or estimates (kL).
Key emissions factors
Automotive diesel oil: 2,683 kg CO_2-e/kL (DCCEE 2011, page 16, Table 3).
Key methodology guidance
GHG Protocol, 2005b.

In October 2009, EPA's head office relocated from the HWT and IBM office sites to 200 Victoria Street in Carlton. The 200 Victoria St site does not have a backup diesel generator. However EPA does have a backup generator at the CES site.

1 Activity data management

The EMS Coordinator contacts La Trobe University's Facility Manager for an estimate of average annual diesel use in the CES backup generator.

2 Quantification method

For the CES facility, no further quantification of activity data is needed. EPA converts the final activity data from kL to GJ (using the energy content of automotive diesel oil from DCCEE), and then applies DCCEE's scope 1 emissions factor for stationary automotive diesel oil combustion to the final activity data.

CES is reported as a scope 1 emission, as EPA is a sole tenant.

3 Future tasks

- Update data from CES, when EPA changes facilities, or when major blackout events occur.
- Work with La Trobe University to more accurately quantify annual diesel usage in the CES backup generator.

E Building, kitchen and laboratory refrigeration

Checklist for refrigeration
Key activity data
Refrigerant recharge capacity (kg); type of refrigerant from direct readings or equipment manual consultation; number of each type of unit.
Key emissions factors
Default loss rates per annum from: • commercial air conditioning: 0.09 (DCCEE, 2011, page 47, Table 24). • commercial standalone chiller – large (>500L): 0.08 • commercial standalone freezer – small (<300L): 0.08 • commercial standalone freezer – large (>500L): 0.08 • kitchen fridge – large (>300L): 0.03 • kitchen fridge – medium (150-300L): 0.03 • kitchen fridge – small (<150L): 0.03 • water cooler: 0.03 (NZ MfE 2008, pages 16-17). Global warming potentials (GWPs) Kyoto gases – R134a: 1300, R404a: 3260, R407b: 2285, R407c: 1526, R410A: 1725, R507A: 3300 (IPCC, 1995, page 22) Non-Kyoto gases – R12: 10720, R123: 76, R13: 14190, R141b: 713, R22: 1780, R502: 4581 (WMO 2003, pages 1.32-1.33)
Key methodology guidance
GHG Protocol 2005a.

EPA estimates operating HFC emissions[4] from facility refrigerant systems, but does not include emissions from installation or disposal of these systems, since these are deemed outside operational control due to current leasing arrangements. In 2009–10 we expanded these calculations beyond the gases under the Kyoto Protocol gases ('Kyoto gases'), to chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) refrigerants ('non-Kyoto gases'). CFCs and HCFCs are ozone-depleting substances being phased out under the Montreal Protocol, but they have a global warming potential.

Operating emissions include refrigerant leakage during normal operations and as part of servicing. Due to limited data, EPA employs the GHG Protocol screening approach (i.e. the 'emissions factor based approach'), which is based on the IPCC Good Practice Tier 2 Bottom-Up approach (GHG Protocol 2005a).

A complete survey of building, kitchen and laboratory fridges was completed during 2009–10 and the data from this survey was used again in 2010–11 because no major infrastructure changed. Data will be updated when major infrastructure changes occur.

1 Activity data management

There are two main types of refrigeration taking place in buildings:

- air conditioning chillers and modular units
- kitchen and laboratory refrigerators.

4 Several refrigerant systems at EPA use CFC and HCFC refrigerants. These refrigerants are not included in our inventory as they are ozone-depleting substances being phased out under the Montreal Protocol and are not one of the six Kyoto Protocol gases, as per GHG Protocol guidance.

GHG emissions (g CO_2-e) = **C * L * GWP** = 4,477,284 g CO_2-e for Wangaratta air conditioner

Where:

C	=	Refrigerant recharge capacity (grams)	=	32,600g for Wangaratta air conditioner in 2010–11
L	=	Annual loss rate (according to refrigeration technology)	=	0.09 (commercial air conditioning-chillers)
GWP	=	Global warming potential of refrigerant	=	1526 for R407c

Figure 6: Equation for estimating annual GHG emissions from building refrigerant losses

For air conditioning chillers and modular units, the EMS Coordinator seeks data on the refrigerant charge capacity and type of refrigerant through the following collection methods and sources:

- visual readings, equipment manual consultation or estimates based on experience from landlords at Head Office, EPA Southern Metro, Gippsland, North East, South West and North West sites
- visual readings or equipment manual consultation from EPA's Facility Manager at CES
- air monitoring station equipment manual consultation from the Environmental Monitoring Unit.

For kitchen and laboratory refrigerators, the EMS Coordinator takes visual readings of refrigerant charge capacity and type of refrigerant from all sites.

2 Quantification method

EPA then applies the DCCEE default loss rate factors for different types of refrigeration and air conditioning systems and the GHG Protocol global warming potential factors for different types of refrigerants, which are based on the IPCC Second Assessment Report and ASHRAE Standard 34. See Figure 6 for a sample calculation.

3 Future tasks

- Update data, at a minimum, when EPA changes facilities, or when major infrastructure changes occur.
- Estimate and incorporate installation and disposal emissions for refrigerators and air conditioning systems at leased facilities where EPA is the sole tenant (scope 1), and consider doing the same for any air conditioning systems at leased facilities where EPA is not the sole tenant (scope 3).
- Work with landlords and service repairmen to document recharge rates for refrigeration and air conditioning equipment in order to follow the GHG Protocol 'sales-based approach' or 'life-cycle stage approach' for quantifying HFC emissions from refrigerants.

F Vehicle and boat fuel

Checklist for vehicle and boat fuel
Key activity data
Fuel consumption of each type of fuel based on fuel card data and/or non-fuel card expenditures (kL).
Key emissions factors
Consumption of fuel for transport use – Post-2004 vehicles (vehicle fleet) • LPG: 1577 kg CO_2-e/kL • petrol: 2289 kg CO_2-e/kL • automotive diesel oil: 2695 kg CO_2-e/kL (DCCEE 2011, page 18, Table 4). Consumption of fuel for transport use – general transport (boat fleet) • petrol: 2380 kg CO_2-e/kL • automotive diesel oil: 2698 kg CO_2-e/kL (DCCEE 2011, page 18, Table 4).
Key methodology guidance
DCCEE 2011.

1 Activity data management

There are three types of fuel used in EPA's fleet:

- LPG
- petrol
- automotive diesel oil (ADO).

Each motor vehicle is equipped with fuel cards that EPA drivers must use to purchase fuel. As part of monthly billing, fuel suppliers send the Finance Unit consumption data linked to individual fuel cards. The Fleet Manager manipulates the data and produces reports, which are emailed to the EMS Coordinator. The Finance Unit also puts the monthly litre consumption for each vehicle into the Finance system.

The Fleet Manager also collects driver log sheets documenting kilometres travelled on each vehicle and stores this data along with fuel consumption in a spreadsheet; however, this data is not used in inventory development.

In line with current leasing arrangements, EPA replaces vehicles approximately every three years. The inventory captures fuel use from all vehicles that were in service throughout the year, including those that were replaced partway through the year.

The Environmental Monitoring Unit keeps receipts for all Marine Science boat fuel purchases and reports them annually to the EMS Coordinator. This information includes boat fuel use as well as cost data for each boat used. Emission data for the Environmental Assessment Unit's freshwater science boat is based on detailed records of fuel use (by boat) kept by the unit and reported annually to the EMS Coordinator.

2 Quantification method

EPA then applies the DCCEE scope 1 emissions factor (post-2004 vehicles) for LPG, petrol and automotive diesel oil fuel combustion for vehicles to the final activity data – and for boats uses the DCCEE scope 1 emissions factor (general transport) for LPG, petrol and automotive diesel oil fuel combustion.

3 Future tasks

- Update data annually.
- Investigate ability to track vehicle kilometres travelled per driver/unit with new GPS systems that have been installed in operational vehicles for navigation.
- Double-check that no vehicle fuel is purchased by any other method than the fleet fuel card.
- Streamline reporting of boat fuel data to ensure timely provision of data.

G Vehicle refrigeration

Checklist for vehicle refrigeration
Key activity data
Refrigerant recharge capacity (kg); type of refrigerant from direct vehicle bonnet readings; number of each type of unit.
Key emissions factors
Default loss rate per annum: 0.15 (AGO 2006, page 20). Global Warming Potential (GWP): R134a: 1300 (IPCC 1995, page 22).
Key methodology guidance
GHG Protocol 2005a.

EPA estimates operating HFC emissions from vehicle air conditioning systems, but does not include emissions from installation or disposal of these systems, since these operations are deemed outside of our control due to current leasing arrangements. Operating emissions include refrigerant leakage during normal operations and as part of servicing. Due to limited data, EPA employs the GHG Protocol screening approach (i.e. the 'emissions factor-based approach'), which is based on the IPCC Good Practice Tier 2 Bottom-Up Approach.

The data used in the 2010–11 inventory was collected by the EMS Coordinator in July 2011. Data will be updated when major changes in the makeup of the vehicle fleet occur.

1 Activity data management

The EMS Coordinator or Fleet Manager takes visual readings of refrigerant charge capacities and types of refrigerants from a representative sampling of the full EPA vehicle fleet found in the Head Office vehicle pool. Where visual readings of certain types of vehicles were not possible, the EMS Coordinator or Fleet Manager contacted the vehicle manufacturer to obtain the refrigerant change capacity and type of refrigerant. The EMS Coordinator then extrapolates these readings to the entire fleet of vehicles on EPA's official roster as of July each financial year based on the type of vehicle (e.g. hybrid sedan, conventional sedan, 4WD or station wagon).

Table D lists the readings used in the 2010–11 inventory, which were based on readings from 2009–10.

Table D: 2010–11 vehicle refrigerant readings

Vehicle	Refrigerant charge capacity
Hybrid – Toyota Prius	440 g
Sedan – Toyota Camry/Toyota Ateva	600 g
Sedan – Toyota Altise	500 g
Sedan – Ford Falcon	700 g
4WD – Holden Rodeo	700 g
AWD – Subaru Outback	700 g
Station wagon – Holden Commodore	650 g
Station wagon – Ford Falcon	650 g

All vehicles use the refrigerant type HFC–134a.

2 Quantification method

EPA then applies the AGO default loss rate factors for mobile air conditioning systems and the GHG Protocol global warming potential factor for HFC–134a, which is based on the IPCC Second Assessment Report. See Figure 7 for a sample calculation.

GHG emissions (g CO_2-e) = **C * L * GWP** = 136,500 g CO_2-e for Ford Falcon

Where:

C	=	Refrigerant recharge capacity (grams)	=	700 g for Ford Falcon
L	=	Annual loss rate for mobile air conditioners	=	0.15
GWP	=	Global warming potential of HFC–134a	=	1300

Figure 7: Equation for estimating GHG emissions from vehicle refrigerant losses and illustrative example

3 Future tasks

- Update data, at a minimum, when major changes in the make-up of the vehicle fleet occur.
- Investigate ability to document refrigerant type and charge amount in the vehicle tracking system.
- Investigate working with smash repairers and/or mechanics who service EPA's vehicles to document recharge rates for air conditioning equipment in order to follow the GHG Protocol 'sales-based approach' or 'lifecycle stage approach' for quantifying HFC emissions from refrigerants.

c Scope 3 emissions

H Flights

Checklist for flights
Key activity data
Distance travelled on short, medium and long-haul flights from travel agent (km).
Key emissions factors
Direct • Short-haul flights (less than 500 km): 0.000165 t CO_2-e/km/person • Medium-haul flights (between 500 and 3700 km): 0.0000968 t CO_2-e/km/person • Long-haul flights (more than 3700 km): 0.000111 t CO_2-e/km/person (DEFRA 2011, page 24). • IPCC radiative forcing index: 1.9 (DEFRA, 2011, page 24) • Uplift factor: 1.09 (IPCC, 2007) Indirect • Short-haul flights (less than 500 km): 0.00003034 t CO_2-e/km/person • Medium-haul flights (between 500 and 3700 km): 0.00001783 t CO_2-e /km/person • Long-haul flights (more than 3700 km): 0.00002053 t CO_2-e /km/person (DEFRA 2011, page 24).
Key methodology guidance
GHG Protocol 2006; IPCC 2007, DEFRA 2011

1 Activity data management

Hard copy of data outlining the origin, destination, date and cost of all EPA flights is provided by Flight Centre Management (FCM). FCM provides electronic data files monthly, outlining origin, destination, date, cost and distance. The EMS Coordinator inputs this data into a summary spreadsheet on EPA's network. The list of flights is then sorted into short, medium and long-haul flights, based on their distance.

2 Quantification method

EPA applies the United Kingdom's Department of Environment Food and Rural Affairs (2011) direct and indirect emissions factors for short, medium and long-haul flights, based on passenger kilometres travelled (see Figure 8).

EPA then multiplies the resulting total emissions by the IPCC radiative forcing index (RFI) to calculate total GHG emissions from air travel. This factor takes into account the impact of non-CO_2-e aviation emissions – for example, NOx compounds, ozone, methane, water, contrails and particles – on the atmosphere, as these compounds have a greater potential to effect anthropogenic radiative forcing in the stratosphere than CO_2-e alone. In 2009–10, EPA chose to use a conservative RFI of 5.0, based on emerging science. However, because this has not been published, EPA has chosen to revert to DEFRA's radiative forcing factor of 1.9. In 2010–11, EPA has also added an additional multiplier to direct emissions by incorporating an uplift factor of 1.09, which refers to the additional emissions that come from circling, take-off and indirect routes.

EPA then adds the indirect emissions (see Figure 8) from aircraft gasoline by applying the DEFRA (2011) emissions factor.

GHG emissions (t CO_2-e) = [(Direct GHG emissions * RFI * UF) + Indirect GHG emissions]

Where:

RFI =	Radiative forcing index	=	1.9
UF =	Uplift factor	=	1.09

Direct GHG emissions (t CO_2-e) = **$[(D_s * EF_s) + (D_m * EF_m) + (D_L * EF_L)]$**

Where:

D_s =	Kilometres travelled on short-haul flights (<500 km per flight)		
EF_s =	Emissions factor for short-haul flights	=	0.000165 t CO_2-e/person/km
D_M =	Kilometres travelled on medium-haul flights (500–3700 km per flight)		
EF_M =	Emissions factor for medium-haul flights	=	0.0000968 t CO_2-e/person/km
D_L =	Kilometres travelled on long-haul flights (>3700 km per flight)		
EFL_l =	Emissions factor for long-haul flights	=	0.000111 t CO_2-e/person/km

Indirect GHG emissions **(t CO_2-e) = [(Ds * IEFs) + (Dm * IEFm) + (DL * IEFL]**

Where:

D_s =	Kilometres travelled on short-haul flights (<500km per flight)		
IEF_s =	Indirect emissions factor for short-haul flights	=	0.00003034 t CO_2-e/person/km
D_M =	Kilometres travelled on medium-haul flights (between 500–3700km per flight)		
IEF_M =	Indirect emissions factor for medium-haul flights	=	0.00001783 t CO_2-e/person/km
D_L =	Kilometres travelled on long-haul flights (>3700km per flight)		
IEF_L =	Indirect emissions factor for long-haul flights	=	0.00002053 t CO_2-e/person/km

Figure 8: Equation for estimating GHG emissions from air travel

3 Future tasks

- Update data annually.
- Incorporate improved estimates of the greenhouse impact from air travel and associated emissions factors as research improves over time.

I Taxis

Checklist for taxis
Key activity data
Taxi expenditure ($); type of fuel; average fare ($/km); average fuel consumption from local taxi companies (L/km).
Key emissions factors
LPG: 1593 kg CO_2-e/kL (DCCEE 2011, page 18, table 4).
Key methodology guidance
EPA's draft EMS *Standard operating procedure – Public transport and taxi data collection and assessment* (see Appendix H).

1 Activity data management

The Finance Unit accounts for all Cabcharge vouchers and cab receipt reimbursements under a specific cost centre. The EMS Coordinator then queries the financial database for annual taxi expenditure.

2 Quantification method

EPA estimates emissions from business travel in taxis via expenditure data and assumptions regarding type of fuel, average fare charge ($/km), which are based on information from local taxi companies, the Victorian Taxi Association and average fuel consumption (L/km), which is based on information from the Australian Tax Office website.[5] EPA assumes that all taxi trips take place in LPG-fuelled taxis and extrapolates this data for all business travel in taxis.

EPA then applies DCCEE's scope 1 emissions factor for LPG combustion for transport purposes to the final activity data. See Figure 9 for a summary of the calculation.

GHG emissions (t CO_2-e) = **(Exp/F) * LPK * EF_L**

Where:

Exp = EPA expenditure on taxis ($)

F = Average fare per taxi kilometre travelled ($/km)

LPK = Average LPG consumed by taxis per kilometre travelled (kL/km)

EF_L = Emissions factor for LPG (t CO_2-e/kL)

Figure 9: Equation for estimating GHG emissions from taxis

3 Future tasks

- Update data annually, including expenditures and assumptions regarding type of fuel, $/km and litre/km assumptions.
- Revisit data received by taxi companies, Victorian Taxi Association and Australian Tax Office, i.e. average charge per taxi kilometre travelled, fuel mix of the local taxi fleet and average litres of LPG per kilometre travelled.
- Investigate whether number of trips can be calculated, so flagfall figure can be removed to achieve a more accurate estimate of emissions.

J Public transport

Checklist for public transport
Key activity data
Public transport expenditure for each office ($); fares for different types of public transport ($); distance travelled by EPA staff on average journey for each type of public transport (km); distance to and from Melbourne from regional offices (km); percentage breakdown of types of EPA public transport use (%).
Key emissions factors
Full fuel cycle emissions: • bus: 146 g CO_2-e/passenger km • rail: 120 g CO_2-e/passenger km • tram: 148 g CO_2-e/passenger km (Victorian Department of Transport 2009). V/Line emission factor: • 103.3 g CO_2-e/passenger km (V/Line 2010).

5 From the Essential Services Commission 2008, *Taxi Fare Review 2007-08: Final Report*, August 2008, EPA calculated the average charge per taxi kilometre travelled ($2.42 per km) and received confirmation of the figure from the Victorian Taxi Association. In August 2009, EPA contacted the Victorian Taxi Association for the average litres of LPG per kilometre travelled (0.20 litres/km) and for an assessment of the fuel mix of the local taxi fleet; the VTA indicated that 98% of all taxis use LPG and they had also introduced hybrids to the fleet. The Australian Tax Office releases information on average fuel consumption of taxis, which was 18 L per 100km in 2011.

Key methodology guidance
EPA's EMS *Standard operating procedure – Public transport and taxi data collection and assessment* (see Appendix H).

1 Activity data management

The Finance Unit accounts for all public transport ticket purchases – including bus, rail and tram– under a specific cost centre. The EMS Coordinator then queries the financial database for annual expenditure per EPA office and separates it into metropolitan and regional public transport use.

2 Quantification method

Metropolitan public transport use

EPA uses an emission coefficient for metropolitan public transport expenditure (2.4541 x 10^{-4} t CO_2-e/$ public transport expenditure). This was developed by the Green Stars Committee based on bus, rail and tram usage patterns at EPA, emissions associated with these types of transport and fares for these types of transport.

Regional public transport use

EPA uses an emission factor provided by V/Line, based on the greenhouse gas and energy reporting for their NGERS requirements (1.033 x 10^{-4} t CO_2-e/passenger km). Distance travelled by EPA regional staff is calculated based on each regional office's public transport expenditure, distance of their regional town to and from Melbourne on V/Line, and fare.

The full quantification method for both metropolitan and regional public transport use (which includes sources of emissions factors) is outlined in Appendix H, which is sourced from EPA's EMS *Standard operating procedure – Public transport and taxi data collection and assessment*.

3 Future tasks

- Update expenditure data annually.
- Update input data assumptions every two years, including the breakdown of public transport modes for EPA business travel, public transport ticket rates, and public transport emissions factors.
- Investigate availability of new data sources and developments in the Victorian-specific public transport emissions factors.
- Verify that financial data does not include purchases unrelated to public transport.
- Investigate staff trips that are not charged to EPA (e.g. people may already have a daily ticket).

K Reticulated water

Checklist for reticulated water
Key activity data
Reticulated water consumed (l).
Key emissions factors
Reticulated water emissions factor: 2.34 kg CO_2-e/m^3 (RMIT Centre for Design 2007).
Key methodology guidance
EPA's EMS *Standard operating procedure – GHG emissions associated with reticulated water* (Appendix I).

1 Activity data management

The EMS Coordinator obtains water data from either water retailers or landlords. The source of water data for each of EPA's sites is outlined in Table E. Water data is received in litres used, which is multiplied by 1000 to convert to cubic metres. The EMS Coordinator inputs this data into the relevant spreadsheet. Details of EPA's water consumption during 2010–11 are given in Table E below.

Table E: Mains water used at each EPA site

Site	Data source	2010–11 usage (kL)
CES (Macleod)	Water retailer	1180.56
EPA Gippsland	Water retailer	69
EPA North East	Water retailer	116.28
EPA North West	Landlord	36.29
EPA Southern Metro	Water retailer	74
EPA South West	Landlord	72.5
Head office	Landlord	2961.24
Total		4509.87

2 Quantification method

EPA uses an emissions factor for overall water use that Royal Melbourne Institute of Technology's (RMIT's) Centre for Design developed, based on emissions associated with reticulated water provision in Victoria.

The full quantification method (including sources of emissions factors) is outlined in Appendix I which is sourced from EPA's EMS *Standard operating procedure – GHG emissions associated with reticulated water.*

3 Future tasks

- Update data annually.
- Investigate more accurate quantification of water consumption data. For example installation of water meters.

L Office paper

Checklist for office paper
Key activity data
Reams of paper purchased; weight per ream (kg).
Key emissions factors
• 100% recycled: 1.52 kg CO_2-e/kg • Virgin: 1.3 kg CO_2-e/kg (RMIT Centre for Design 2011).
Key methodology guidance
EPA's EMS *Standard operating procedure – GHG emissions associated with office paper* (Appendix J).

1 Activity data management

The EMS Coordinator receives monthly reports on the quantity of office paper purchased by EPA from its stationery provider, OfficeMax. This data is received in 'reams purchased'. The EMS Coordinator inputs this data into the relevant spreadsheet. The OfficeMax reports are also saved on the shared network space.

2 Quantification method

EPA uses two different emissions factors, one for paper produced from virgin material and one for paper produced from recycled material. These factors were developed by Royal Melbourne Institute of Technology's Centre for Design, based on emissions associated with office paper manufacturing and transportation.

The full quantification method (including sources of emissions factors) is outlined in Appendix J, EPA's EMS *Standard operating procedure – GHG emissions associated with office paper.*

EPA has recently reviewed its paper factors and an updated version of emissions factors for office paper has been released as EPA publication 1374.

3 Future tasks

- Update data annually.

M Waste

Checklist for waste
Key activity data
Waste audit and assessment data for all EPA facilities except air monitoring stations.
Key emissions factors
• Commingled: 0.0 t CO_2-e/tonne waste • Paper and cardboard: 2.5 t CO_2-e/tonne waste • Food: 1.6 t CO_2-e/tonne waste • General municipal solid waste: 1.2 t CO_2-e/tonne waste (DCCEE 2011, page 71, table 40).
Key methodology guidance
DCCEE 2011.

EPA estimates the amount of methane released into the atmosphere as a result of the waste sent to landfill.

1 Activity data management

EPA estimates the weight of various types of waste it sends to landfill per year based on the results of quarterly waste audits at Head Office and CES and annual waste audits at all other offices (excluding air monitoring stations). Green Makeover consultancy services undertook all of these audits in 2010–11. The waste audit activity data is then extrapolated to represent one year's worth of waste sent to landfill from EPA's facilities.

GHG emissions (t CO_2-e) = **$(Wt * PP * EFP) + (Wt * Pc * EFc) + (Wt * Pf * EFf) + (Wt * Pm * EFm) = 3.9$ t CO_2-e**

Where:

W_t	=	Total EPA waste send to landfill (tonnes)	=	3.01 tonnes
P_p	=	Proportion of paper and cardboard waste (from audit) sent to landfill	=	8.4%
EF_p	=	Annual methane conversion factor for paper and cardboard waste	=	2.5 t CO_2-e/tonne waste
P_c	=	Proportion of commingled waste (from audit) sent to landfill	=	12.58%
EF_c	=	Annual methane conversion factor for commingled waste	=	0.0 t CO_2-e/tonne waste
P_f	=	Proportion of food waste (from audit) sent to landfill	=	36.30%
EF_f	=	Annual methane conversion factor for food waste	=	1.6 t CO_2-e/tonne waste
P_m	=	Proportion of general municipal solid waste (from audit) sent to landfill	=	42.73%
EF_m	=	Annual methane conversion factor for general municipal solid waste	=	1.2 t CO_2-e/tonne waste

Figure 10: Equation for estimating methane emissions attributable to EPA waste and illustrative example

2 Quantification method

The waste audit waste type categories are translated to DCCEE's NGA Factor Workbook waste type categories. EPA then applies the DCCEE annual methane conversion factors for each waste type.

Calculations for estimating methane attributable to EPA's waste are detailed in Figure 10.

3 Future tasks

- Update data annually to reflect new emissions factors, landfill methane recovery rates and waste audit data.

N Fuel extraction, production, transportation and electricity line losses

Checklist for fuel extraction, production, transportation and electricity line losses
Key activity data
Based on GJ and kWh data collected for fuels and electricity (see inventory items 'Electricity', 'Natural gas', 'High-temperature hot water', 'Diesel for backup generators', 'Vehicle and boat fuel', 'Flights' and 'Taxis' above).
Key emissions factors
• Victorian end-user electricity (full fuel cycle and transmission losses): 0.15 kg CO_2-e/kWh (DCCEE 2011, page 68, table 39). • Victorian small user natural gas (full fuel cycle): 4.0 kg CO_2-e/GJ (DCCEE 2011, page 66, table 37). • Automotive diesel oil (full fuel cycle): 5.3 kg CO_2-e/GJ (DCCEE 2011, page 67, table 38). • Petrol (full fuel cycle): 5.3 kg CO_2-e/GJ (DCCEE 2011, page 67, table 38). • LPG (full fuel cycle): 5.0 kg CO_2-e/GJ (DCCEE 2011, page 67, table 38). • Gasoline for use as fuel in an aircraft: 5.3 kg CO_2-e/GJ (DCCEE 2011, page 66, table 38).
Key methodology guidance
DCCEE 2011.

EPA estimates the scope 3 full fuel cycle emissions associated with all of our energy (electricity, gas and fuel) consumption, including:

- extraction, production, and transportation of fuel burned to generate our electricity
- electricity lost in the delivery of EPA's electricity along the transmission and distribution network
- extraction, production and transportation of natural gas, automotive diesel oil, petrol, LPG and aircraft gasoline.

1 Activity data management

Electricity, gas and fuel data is based on the activity data collected for the following emission sources discussed above:

- building energy use
- vehicle and boat fuel
- flights
- taxis.

2 Quantification method

EPA then applies the DCCEE scope 3 emissions factors for each energy type to the activity data.

3 Future tasks

- Update data annually.

0 Catering

Checklist for catering	
Key activity data	
Catering expenditure ($); percentage spent on catering categories from Elizabeth Andrews catering company (%).	
Key emissions factors	
Source	**kg CO_2-e/$**
Meat and meat products	5.825
Dairy products	1.615
Vegetable and fruit growing, hay, plant nurseries, flowers	0.9244
Oils and fats	1.312
Flour, cereal foods, rice, pasta and other flour mill products	0.9243
Bread, cakes, biscuits and other bakery products	0.6890
Confectionery	0.5019
Other (EPA calculation – average of all EF)	1.6845
(RMIT Centre for Design)	
Key methodology guidance	
As outlined below.	

EPA estimates the amount of GHG emissions associated with the production, preparation and supply of internal catering. Catering at external venues has not been included.

1 Activity data management

EPA obtained a breakdown of the percentage of dollars spent on each catering category in 2007–08 from preferred catering supplier Elizabeth Andrews. EPA then obtains the total dollar spent on internal catering from its Finance Unit. The catering categories and their associated emissions factors have been calculated by RMIT's Centre for Design.

2 Quantification method

The dollar amount spent on each catering category is determined by multiplying the percentage breakdown (provided by Elizabeth Andrews) by the total catering expenditure for the year. EPA then multiplies the dollar spent on each food type by the appropriate emission factor, as outlined in Figure 11.

GHG emissions (kg CO_2-e) = $\mathbf{(C_t * P_m * EF_m) + (C_t * P_d * EF_d) + (C_t * P_v * EF_v) + (C_t * P_o * EF_o) + (C_t * P_f * EF_f) + (C_t * P_b * EF_b) + (C_t * P_c * EF_c) + (C_t * P_{ot} * EF_{ot})}$

Where:

$\mathbf{C_t}$	=	Total EPA expenditure on catering ($)
$\mathbf{P_m}$	=	Proportion of expenditure spent on meat and meat products (%)
$\mathbf{EF_m}$	=	Emissions factor for meat and meat products (kg CO_2-e/$)
$\mathbf{P_d}$	=	Proportion of expenditure spent on dairy products (%)
$\mathbf{EF_d}$	=	Emissions factor for dairy products (kg CO_2-e/$)
$\mathbf{P_v}$	=	Proportion of expenditure spent on vegetable and fruit growing, hay, plant nurseries and flowers (%)
$\mathbf{EF_v}$	=	Emissions factor for vegetable and fruit growing, hay, plant nurseries and flowers (kg CO_2-e/$)
$\mathbf{P_o}$	=	Proportion of expenditure spent on oils and fats (%)
$\mathbf{EF_o}$	=	Emissions factor for oils and fats (kg CO_2-e/$)
$\mathbf{P_f}$	=	Proportion of expenditure spent on flour, cereal foods, rice, pasta and other flour mill products (%)
$\mathbf{EF_f}$	=	Emissions factor for flour, cereal foods, rice, pasta and other flour mill products (kg CO_2-e/$)
$\mathbf{P_b}$	=	Proportion of expenditure spent on bread, cakes, biscuits and other bakery products (%)
$\mathbf{EF_b}$	=	Emissions factor for bread, cakes, biscuits and other bakery products (kg CO_2-e/$)
$\mathbf{P_c}$	=	Proportion of expenditure spent on confectionery (%)
$\mathbf{EF_c}$	=	Emissions factor for confectionery ((kg CO_2-e/$)
$\mathbf{P_{ot}}$	=	Proportion of expenditure spent on other (%)
$\mathbf{EF_{ot}}$	=	Emissions factor for other (kg CO_2-e/$)

Figure 11: Equation for estimating GHG emissions from catering

3 Future tasks

- Update data annually.
- Update proportion of expenditure data with EPA's preferred catering supplier.

P Staff commuting

Checklist for staff commuting	
Key activity data	
Distance travelled; mode of transport; frequency of travel	
Key emissions factors	
Mode	**Emissions factor (g CO_2-e/km)**
Small car (e.g. Toyota Corolla)	172.0
Super-efficient car, i.e. hybrid (e.g. Toyota Prius)	106.0
Medium car (e.g. Toyota Camry)	210.0
Large car (e.g. Holden Commodore Executive)	256.0
Small 4WD (e.g. Land Rover Freelander)	224.0
Medium 4WD (e.g. Jeep Wrangler)	273.0
Large 4WD (e.g. Jeep Grand Cherokee)	352.0
Unspecified car type	213.0
Train – metropolitan	120.0
Train – regional	104.5
Tram	148.0
Bus	146.0
Motorbike, scooter	112.0
Walk	–
Cycle	–
Worked from home	–
Did not go to work	–
Calculated from Green Vehicle Guide 2008; DOT 2009; CES 2008, V/Line 2010.	
Key methodology guidance	
EPA's EMS *Standard operating procedure – Staff commuting data collection and assessment* (Appendix K)	

1 Activity data management

EPA uses the data collected from an annual survey of staff regarding their commuting modes and distances, that is completed in April each year. The survey activity data is extrapolated to all of EPA, based on the total number of full-time employees at EPA at that time.

2 Quantification method

EPA applies the appropriate emissions factors to the distance travelled to each of the modes of transport.

The full quantification method (including sources of emissions factors) is outlined in Appendix K, which is sourced from EPA's EMS *Standard operating procedure – Staff commuting data collection and assessment*.

3 Future tasks

- Update staff commuting data annually.
- Investigate availability of new data sources and developments in the Victorian-specific public transport emissions factors.

Q Courier services

Checklist for courier services
Key activity data
Courier services expenditure ($); percentage of different types of courier modes of transport and distances travelled by TNT (most used courier service provider by EPA).
Key emissions factors
• Emissions factor: 3.7 x 10^{-5} t CO_2-e/$ (Based on EPA courier services data 2008–09).
Key methodology guidance
EPA's EMS *Standard operating procedure – GHG emissions associated with courier services* (Appendix L).

EPA estimates the amount of GHG emissions associated with transporting all couriered items.

1 Activity data management

EPA obtains a breakdown of the dollars spent on courier services each year from the Finance Unit. In order to estimate the emissions per dollar spent on courier services, EPA contacted its most-used courier service provider, TNT, in 2008–09. Each individual transaction undertaken with TNT was analysed to work out the average GHG emissions per dollar spent by EPA when engaging this courier service provider. This factor could not be updated in 2009–10 or 2010–11, as our most-used courier was unable to provide the data needed to estimate the emissions per dollar spent. Despite not being able to update our GHG emissions factor (emissions per dollar spent), we used EPA's 2010–11 courier expenditure to calculate our emissions. We also included emissions associated with fuel extraction, production and transportation of the fuel used in courier services.

2 Quantification method

EPA's total courier services expenditure for 2010–11 was then multiplied by EPA's courier services emissions factor (2008–09).

3 Future tasks

- Update data annually.
- Work with courier companies to update emissions factor.
-

R Colour publications

Checklist for colour publications
Key activity data
Number of sheets of colour publications.
Key emissions factors
Emissions factor (t CO_2-e/sheet used in colour publications): Commercial in confidence.
Key methodology guidance
Finsbury Green 2011.

EPA estimates the amount of GHG emissions associated with printing colour publications.

1 Activity data management

EPA obtains the number of sheets used in its colour publications each year from its colour publications provider, Finsbury Green. The colour publications provider calculates the emissions associated with our colour publications. This is provided to EPA's Publications Manager. EPA's EMS Coordinator obtains the data from the Publications Manager.

Note: a different publications provider is used for black-and-white and scientific publications; however, because they cannot provide us with the emissions associated with our publications, we do not include their data.

2 Quantification method

This emissions factor was multiplied by EPA's total number of sheets used for colour publications for 2010–11.

3 Future tasks

- Update data annually.
- Seek more details from Finsbury Green regarding the methodology it uses to calculate emissions so this could potentially be applied to EPA's other publication providers.

VI REDUCTION MEASURES

a Onsite reductions

Any measures that directly reduce emissions sources in EPA's inventory should automatically be reflected in activity data. This section briefly outlines EPA's onsite reductions to date and our proposed steps for facilitating onsite reductions in the future.

To date, EPA has implemented the following initiatives to reduce GHG emissions:

- upgrading regional offices to incorporate a wide range of environmentally-friendly features
- greening our fleet by purchasing hybrid and LPG-dedicated vehicles and smaller cars
- undergoing fuel-efficient driver training for staff
- promoting car-pooling and public transport for business travel
- improving facilities for cyclists
- hosting lighting and appliance turn-off campaigns
- running paper-use reduction campaigns
- installing energy efficient lighting systems and timers on electrical equipment
- installing insulation
- delamping
- replacing existing computer screens with low-energy intensity flat screens
- replacing existing computers and monitors with small, low-wattage PCs and monitors
- reducing the number of printers
- increasing the virtualisation of servers
- undertaking energy audits and energy behaviour change programs at all sites
- undertaking water audits and water behaviour change programs at all sites
- undertaking waste audits and waste behaviour change programs at all sites
- upgrade of video and teleconferencing facilities across all of EPA sites
- an internal carbon cap and trade scheme across all of EPA's sites
- developing a Sustainable Purchasing Framework that considers greenhouse implications of purchases
- relocating EPA's head office to a 6 green star building and incorporating environmental considerations in operating and maintaining infrastructure.
- Choosing to relocate EPA's head office to a building with a tri-generation plant as the main source of electricity
- a PIN-based printing system to reduce printing volumes
- implementing a comprehensive waste management system including the recycling of organic, commingled, paper and electronic waste across all of EPA sites.

b GreenPower purchases

In 2010–11 EPA purchased 61 per cent GreenPower for its direct electricity use across all sites. This was a significant increase on a figure of 23 per cent in 2008–09, but a decrease on 2009–10, when 100 per cent of purchased electricity was GreenPower. However, being consistent with 2009–10, EPA has not counted this purchase as a direct reduction or offset from its inventory for the purpose of its 2010–11 carbon neutrality claim.

Recent Australian Government policy changes and accounting practices created uncertainties regarding the additionality of GreenPower in achieving total carbon reductions. As a result, EPA chose instead to purchase internationally accredited carbon offsets to neutralise emissions.

EPA will continue to review its carbon neutral strategy, including the place of GreenPower in our carbon neutrality claim. As renewable energy sources are critical to transition to a low carbon economy, EPA will continue to purchase GreenPower to support innovation and growth in this industry.

c Offset product purchases

EPA seeks robust, transparent, externally verified and cost-competitive offset products that deliver positive environmental co-benefits. We go through a rigorous process to investigate offset products, the primary aim of which is to ensure that the offsets we purchase reduce the amount of greenhouse gases entering the atmosphere. Before making a purchase, EPA evaluates the characteristics and the accounting methods of potential products by contacting offset providers and asking to see:

- technical documentation of their accounting methods and monitoring and verification protocols

- evidence of third-party verification and accreditation
- documentation that the carbon credits are retired upon purchase.

EPA acquired 4250 tonnes of carbon offsets to balance its residual emissions. This includes an 11-tonne 'buffer' to cover any potential margin of error in inventory or carbon credit calculations. A portfolio of offsets was purchased from six main sources. The following sources of offsets are discussed in more detail below:

- First Climate Gold Standard-accredited Ugandan cookstove offsets (600 t CO_2-e)
- Climate Friendly VCS-accredited Brazilian biomass offsets (1000 t CO_2-e)
- Climate Friendly VCS-accredited Vietnamese small hydropower offsets (600 t CO_2-e)
- COZero VCS-accredited Thai wastewater offsets (1000 t CO_2-e)
- Climate Positive VCS-accredited Chinese wind farm offsets (1050 t CO_2-e)

First Climate Gold Standard-accredited Ugandan cook-stove offsets (600 t CO_2-e)

Sourced through First Climate (www.firstclimate.com), these offsets are accredited under the Gold Standard Framework (www.cdmgoldstandard.org). The project from which the offsets are sourced is a fuel wood-saving project through the use of improved cooking stoves, located in Kampala, Uganda. The project will decrease the carbon intensity of the cooking activities of participants, thereby displacing greenhouse gas emissions. Additional documentation related to this project is available in Appendix M.

Climate Friendly VCS-accredited Brazilian biomass offsets (1000 t CO_2-e)

Sourced through Climate Friendly (https://climatefriendly.com), these offsets are accredited under the Voluntary Carbon Standard (www.v-c-s.org). The project from which the offsets are sourced is the Irmãos Fredie ceramics factory, which produces red ceramic devices. The project activity involves switching kiln fuel from native firewood to sawdust mixed with wood chips originated from sustainable, managed firewood areas and sugar cane bagasse from sugar and alcohol mills. The project will decrease the carbon intensity of the local grid, thereby displacing greenhouse gas emissions. . Additional documentation related to this project is available in Appendix N.

Climate Friendly VCS-accredited Vietnamese small hydropower offsets (600 t CO_2-e)

Sourced through Climate Friendly (https://climatefriendly.com), these offsets are accredited under the Voluntary Carbon Standard (www.v-c-s.org). The project from which the offsets are sourced is a 7.5 MW three-unit hydropower plant project in Nam Det commune, Bac Ha district in the Lao Cai province of Vietnam. The project will decrease the carbon intensity of the local grid, thereby displacing greenhouse gas emissions. Additional documentation related to this project is available in Appendix O.

CO Zero VCS-accredited Thai wastewater offsets (1000 t CO_2-e)

Sourced through CO Zero (www.cozero.com.au), these offsets are accredited under the Voluntary Carbon Standard (www.v-c-s.org). The project from which the offsets are sourced is the recovery of biogas from an anaerobic wastewater treatment facility at a starch manufacturing plant located at Nongyai, Chonburi, Thailand. The biogas generated is used as fuel in a hot oil boiler and steam boilers to produce electricity and heat. The project will decrease the carbon intensity of the local grid, thereby displacing greenhouse gas emissions. Additional documentation related to this project is available in Appendix P.

Climate Positive VCS-accredited Chinese wind farm offsets (1050 t CO_2-e)

Sourced through Climate Positive (www.climatepositive.org), these offsets are accredited under the Voluntary Carbon Standard (www.v-c-s.org). The project from which the offsets are sourced is the 40.5 MW Bogeda Wind Power Project in Urumqi, Xinjiang, China. The project will decrease the carbon intensity of the local grid, thereby displacing greenhouse gas emissions. For every tonne of carbon offset purchased from Climate Positive, they purchase and surrender a tonne of accredited abatement and plant 4 m^2 of forest of cleared land on Trust for Nature covenanted properties. Additional documentation related to this project is available in Appendix Q.

VII ROLES AND RESPONSIBILITIES

Structure

The Service Growth Unit and, more specifically, the EMS Coordinator are responsible for managing EPA's annual GHG inventory and implementing EPA's carbon neutral strategy. The Service Growth Unit sits within the Business Development Directorate.

EMS Coordinator and Carbon Neutral team

EPA's EMS Coordinator, will gather data from the Risk & Governance and Finance units to develop an annual GHG inventory in line with the GHG Protocol. They will also work cooperatively with an internal and external verification and assurance team to allow smooth implementation of process.

Manager, Service Growth

EPA's Service Growth Manager will oversee, review and approve EPA's annual GHG Inventory and associated communication documents. They will also ensure adequate resources are available to develop and deliver EPA's carbon neutral strategy annually.

Director, Business Development

EPA's Business Development Director will oversee the development of EPA's annual GHG inventory and carbon neutral strategy. They will review the GHG inventory and carbon neutral strategy, and assume ultimate responsibility for the achievement of targets set through the carbon neutral strategy.

Executive Management Team

EPA's Executive Management Team will review and approve EPA's annual GHG inventory and carbon neutral strategy. Members of the Executive Management Team will also be responsible for communicating the strategy at senior conferences, meetings and discussions, where appropriate.

Green Stars committee

EPA's Green Stars will assist with data provision and internal verification wherever applicable.

Finance Unit

EPA's Finance Unit will review and provide all relevant data that sits with this unit.

Risk & Governance Unit

EPA's Risk & governance Unit will review and provide all relevant data that sits with this unit.

VIII EXTERNAL VERIFICATION AND ASSURANCE OF INVENTORY AND CARBON NEUTRAL STRATEGY

Each year, EPA will seek the services of an external verification/assurance provider to independently assure our inventory and strategy. Net Balance Management Group was used to provide this service for the 2010–11 GHG inventory and carbon neutral strategy (see Appendix B for external assurance statement). Their contact details are given below:

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F: +61 3 9600 1295
Email: terence@netbalancemanagement.com

EPA will consider available independent assurance providers each year before engaging a company. The decision will include consideration of the following:

- familiarity with EPA
- experience in verifying robust GHG Protocol inventories and carbon reduction strategies
- value for money.

BIBLIOGRAPHY

AGO 2006, *AGO Factors and Methods Workbook*, Australian Greenhouse Office, Department of the Environment and Heritage, December 2006.

DEFRA 2011, *Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting*, Department of Environment Fisheries and Rural Affairs, UK, August 2011. http://archive.defra.gov.uk/environment/business/reporting/pdf/110819-guidelines-ghg-conversion-factors.xls

DCCEE 2011, *National Greenhouse Accounts Factors,* Department of Climate Change, July 2011. Available at http://www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-factors.aspx

GHG Protocol 2004, *The GHG Protocol: A Corporate Accounting and Reporting Standard*, WRI/WBCSD GHG Protocol, Revised Edition, March 2004. Available at www.ghgprotocol.org/DocRoot/7e9ttsv1gVKekh7BFhqo/ghg-protocol-revised.pdf

GHG Protocol 2005a, *Calculating HFC and PFC Emissions from the Manufacturing, Installation, Operation and Disposal of Refrigeration and Air-conditioning Equipment, Guide to calculation worksheets*, GHG Protocol, v 1.0, January 2005. Available at www.ghgprotocol.org/DocRoot/lhhec9unFl9CGBKGYLeN/hfc-cfc.pdf

GHG Protocol 2005b, *Calculation Tool for Direct Emissions from Stationary Combustion*, WRI/WBCSD GHG Protocol Stationary Combustion Guidance, v 3.0, July 2005. Available at www.ghgprotocol.org/DocRoot/J9VHPLuxkvLRGp5vqw4w/Stationary%20Combustion%20Guidance%20%28final%29.pdf

GHG Protocol 2006, *Allocation of GHG Emissions from a Combined Heat and Power (CHP) Plant*, Guide to calculation worksheets v 1.0, September 2006. Available at :

www.ghgprotocol.org/DocRoot/5oXDVprhkP96lekkQlUH/CHP%20guidance_v1.0.pdf

GHG Protocol 2007, *Indirect CO2 emissions from the Consumption of Purchased Electricity, Heat, and Steam: Guide to calculation worksheets v 1.2*, a WRI/WBSCD GHG Protocol Initiative calculation tool, January 2007. Available at www.ghgprotocol.org/DocRoot/DHJvSZCSTno5NU5BeA6q/ElectricityHeatSteamPurchase_guidance1.2.pdf

Grant T 2007, *Carbon Emissions Factors Developed for EPA Personal Footprint Calculator*, Royal Melbourne Institute of Technology, Calculator available at www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp

Green Vehicle Guide 2008, Australian Government, www.greenvehicleguide.gov.au/GVGPublicUI/home.aspx

IPCC 1995, Bolin B et al, 1995, *IPCC Second Assessment: Climate Change 1995*, A Report of the Intergovernmental Panel on Climate Change, page 22.

IPCC 2007 Forster PV et al., 'Changes in Atmospheric Constituents and in Radiative Forcing', in *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, USA.

NZ MfE 2008, New Zealand Ministry for the Environment, 2008, *Guidance for Voluntary, Corporate Greenhouse Gas Reporting*, page 16-17

State Government of Victoria 2008, *Guidance for FRD24C Reporting,* Department of Sustainability and Environment, February 2008.

WMO 2003, World Meterological Organisation, 2003. *Scientific Assessment of Ozone Depletion: 2002*, pages 1.32–1.33.

APPENDIX A: SUMMARY OF EPA'S 2010–11 GHG EMISSIONS INVENTORY

EPA Victoria
Carbon neutral update 2010–11

'As Victoria's environmental regulator it is vitally important we demonstrate business leadership when it comes to environmental performance. This is no more evident than with EPA's commitment to being a carbon neutral organisation, now in our 6th year.

By committing to being carbon neutral and following carbon management principles that focus on avoiding and reducing emissions prior to purchasing offsets, EPA has achieved a 23 per cent reduction in greenhouse gas emissions since 2005-06 and we are on well on track to reduce by another 15 per cent by 2015.'

John Merritt, CEO, EPA Victoria

2010-11 is EPA's sixth year of being carbon neutral. As the context for managing carbon continually changes we need to adapt our approach to ensure it remains relevant for EPA. EPA's Carbon Management Principles provide a dynamic process by which we improve and continue to learn.

Measure our impact

EPA has been measuring its carbon footprint since 2005–06. Using the WRI/WBCSD GHG Protocol framework, we develop an annual greenhouse gas (GHG) inventory (see inventory overleaf).

Set an objective

EPA exceeded our goal of reducing emissions by 10 per cent from 2005–06 levels by 2010, by achieving a 17 per cent reduction. In 2010-11 we aimed to reduce this by a further 8 per cent and exceeded this again by achieving a 9.5 percent reduction. EPA is now committing to a further 15 per cent reduction target on 2009-2010 levels emissions by 2015.

Avoid and reduce

2010-11 saw the implementation of a number of initiatives that resulted in emission reductions:

- Transition to tri-generation as the main source of power at EPA's Head Office.
- 6 star Green Star office design in full operation at EPA's Head Office including motion sensor lighting.
- Information technology projects including moving all computers across to low wattage PC's and monitors, further server virtualisation and improved power management and video-conferencing facilities.
- Waste reduction projects, including targeted reduction of waste to landfill and office paper.

Assess and offset remaining emissions

EPA's primary approach to carbon management is to implement cost-effective, direct emission reduction projects in our operations. We then assess the remaining emissions in our inventory and purchase robust offset products.

EPA is committed to purchasing offsets from projects that are verified, transparent and demonstrate additionality. We also look for best value for money and additional social and/or environmental benefits in our purchases. In 2010-11, we purchased offsets from projects accredited under the Clean Development Mechanism (CDM), the Voluntary Carbon Standard (VCS), and the Gold Standard (see inventory overleaf). EPA is committed to purchasing the highest quality products to neutralise our emissions which meet our criteria. As such, although EPA purchased 47 per cent accredited GreenPower for all electricity in 2010-11, we decided against deducting this from our inventory, as part of our carbon neutrality. Information currently available on GreenPower does not satisfy our criteria of additionality.
We will reassess both the cost and the demonstration of additionality of GreenPower each year and will include it when appropriate.

Transparency and financial drivers

In 2010-11, EPA's internal cost of carbon decreased to $16 per tonne. This cost has progressively decreased from $42 per tonne since 2007–08. This is the result of a general drop in the price of offsets as well as a greater range of 'over the counter' offsets available to Australian businesses. The cost of carbon will continue to provide incentive to decrease our onsite carbon emissions and implement best practice. In line with good business practice and the application of the Carbon Management Principles, EPA will continue to review how we achieve carbon neutrality.

Our inventory and emission reduction strategy continues to be externally verified and published each year.

Our current carbon footprint

In 2010-11, EPA's operations before offset purchases resulted in 4,238 tonnes of CO2-e emissions. The nature of EPA's business is primarily office-based, which means the main sources of our emissions is from building energy use (62 per cent) and staff commuting (19 per cent).

When EPA first became carbon neutral in 2005–06, we included a 'base' list of emission sources in our inventory. This included all of our 'direct' emission sources such as natural gas use, vehicle fleet fuel and refrigerants, as well as a wide-range of 'indirect' sources such as purchased electricity, business travel and waste.

Each year, EPA has added new emission sources to our inventory and recalculates our base year (and other previous inventories) to include all emission sources reported in the current year. This recalculation is done so we can accurately understand and demonstrate our progress.

EPA's approach going forward

EPA is committed to improving our carbon management approach each year in line with our Carbon Management Principles. Each year our plan will be externally assured and will incorporate the following components:

Further significant direct reductions in overall GHG emissions by 2011 and beyond

At a minimum, EPA is committed to implementing measures with a four-year payback or less in order to achieve at least a 15 per cent reduction against 2010 emissions by 2015.
We will track our progress against this target and report back.

Robust offsets for residual emissions

EPA will continue to seek high-quality, transparent, and cost-competitive offset products in the marketplace and, as required, adjust our approach in response to changes in national climate change policy.
We will purchase National Carbon Offset Standard compliant offsets where possible.
We will continue to reassess GreenPower each year for its appropriateness to neutralise residual emissions.

Development of internal GHG reduction initiatives

EPA will maintain robust monitoring and reporting systems by investing in improving our measurement and monitoring systems.
We will continue to investigate new carbon reduction projects and maintain annual external assurance.

EPA will continue to review how we achieve Carbon Neutrality

EPA VICTORIA

State Government Victoria

EPA Carbon neutral update 2010–11

Emissions source	Consumption units	Consumption	CO_2-e (tonnes)	Proportion of total inventory (%)	Change from baseline (%) (2005–06)
Direct emissions (Scope 1)					
Petrol for vehicles	kL	63.72	145.8	3.44 %	-41.36 %
LPG for vehicles	kL	65.29	102.9	2.43%	-48.80 %
Petrol for boats	kL	15.08	35.9	0.85 %	25.02 %
Automotive diesel oil for vehicles (ADO)	kg	15.25	41.1	0.97 %	422.09 %
Natural gas where EPA is the sole tenant	GJ	346.36	17.8	0.42 %	0.00 %
Vehicle AC refrigerant leakage	kg	7.13	9.3	0.22 %	-15.32 %
Building AC refrigerants leakage where EPA is the sole tenant - Non-Kyoto gases	kg	4.12	7.3	0.17 %	0.64 %
Building AC refrigerants leakage where EPA is the sole tenant - Kyoto gases	kg	3.65	5.7	0.13 %	23.1 %
Kitchen & lab refrigerants leakage - Non-Kyoto gases	kg	0.35	1.3	0.03 %	-2.69 %
Kitchen & lab refrigerants leakage - Kyoto gases	kg	0.35	0.8	0.02 %	138.48 %
Back-up diesel generators where EPA is the sole tenant	kL	0.20	0.5	0.01 %	0.14 %
Automotive diesel oil for boats (ADO)	kL	0	0	0.00 %	0.00 %
Total Scope 1			**368.5**	**8.69 %**	
Indirect emissions (Scope 2)					
Purchased electricity for tenant power & light at all facilities and base building power where EPA is the sole tenant	kWh	1,276,231.89	1544.22	36.44 %	-29.98 %
Purchased high temperature hot water*	GJ of natural gas	8,101.41	415.8	9.81%	-7.17 %
Total Scope 2			**1960.0**	**46.25 %**	
Optional emissions (Scope 3)					
Staff commuting*	km	6,150,752.63	825.6	19.48 %	39.38 %
Catering	$ expenditure	141,658.10	254.8	6.01 %	30.05 %
Emissions from fuel extraction and T&D line losses for all purchased electricity	kWh	1,450,463.73	217.6	5.13 %	4.13 %
Purchased electricity for base building power where EPA is not the sole tenant	kWh	174,231.84	210.8	4.97 %	-73.81 %
Natural gas where EPA is not the sole tenant	GJ	3521.88	180.8	4.27 %	460.21 %
Flights*	km	345,535.81	87.04	2.05 %	-62.28 %
Emissions from fuel extraction for natural gas	GJ	11,969.65	47.9	1.13 %	55.99 %
Emissions from fuel extraction for petrol	kL	78.80	14.3	0.34 %	-58.81 %
Public transport	$ expenditure	23,697.97	11.3	0.27 %	-19.05 %
Building AC refrigerant leakage where EPA is not the sole tenant - Kyoto gases	kg	8.65	11.3	0.27 %	0.00%
Office paper	reams	2865.2	10.78	0.25%	-27.03 %
Reticulated water supply	kL	4,509.87	10.5	0.25 %	-45.73 %
Emissions from fuel extraction for LPG	kL	68.72	9.0	0.21 %	-66.26 %
Taxi	$ expenditure	45,989.50	5.5	0.13 %	-55.82 %
Emissions from fuel extraction for ADO	kL	15.45	3.2	0.07 %	263.26 %
Building AC refrigerant leakage where EPA is not the sole tenant - Non-Kyoto gases	kg	1.47	2.6	0.06 %	0.00%
Coloured publications	sheets	77,300	1.9	0.04 %	-83.53 %
Food waste (Organics)	tonnes	1.09	1.75	0.04 %	139.73 %
Municipal solid waste (generic)	tonnes	1.29	1.5	0.04 %	13.6 %
Paper & cardboard waste	tonnes	0.25	0.6	0.01 %	-6.95 %
Couriers	$ expenditure	23,441.89	0.9	0.02 %	6.98 %
Back-up diesel generators where EPA is not the sole tenant	kL	0.00	0.0	0.00 %	100.00 %
Inert recyclable waste (comingled)	tonnes	0.38	0.0	0.00 %	0.00 %
Total Scope 3			**1909.7**	**45.06 %**	
Scope 1 + 2			**2328.5**	**54.94 %**	
SCOPE 1 + 2 + 3			**4238.2**		**22.67 %**
Reduction measures					
Offsets					
Gold Standard – Cookstoves, Uganda	tonnes CO_2-e	600.00	-600.0		
VCS – Biomass, Brazil	tonnes CO_2-e	1,000.00	-1,000.0		
VCS – Wastewater, Thailand	tonnes CO_2-e	1,000.00	-1,000.0		
VCS – Small Hydro, Vietnam	tonnes CO_2-e	600.00	-600.0		
VCS – Wind farm, China	tonnes CO_2-e	1050.00	-1050.00		
NET EMISSIONS			**-4250.00**		

** Data back-cast with new methodologies for purpose of comparison with previous years*

For more information email EPA's EMS Coordinator, ems.coordinator@epa.vic.gov.au

EPA VICTORIA

State Government Victoria

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APPENDIX B: EPA'S CARBON NEUTRAL EXTERNAL ASSURANCE STATEMENT

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INDEPENDENT VERIFICATION STATEMENT

To the Chairman, Directors, Management and stakeholders of EPA Victoria:

The Environment Protection Authority, Victoria (EPA Victoria) commissioned Net Balance Management Group Pty Ltd (Net Balance) to undertake a limited verification of the EPA Victoria's greenhouse gas emissions (GHG) Inventory for the period 1 July 2010 to 30 June 2011 (the 'GHG Inventory'). This GHG Inventory forms part of the overall strategy for maintaining the organisation's carbon neutral status. EPA Victoria was responsible for the preparation of the GHG Inventory. Net Balance's responsibility in performing our verification activities is to the Chairman and Directors of EPA Victoria alone and in accordance with the terms of reference agreed with them. Other stakeholders should perform their own due diligence before taking any action as a result of this statement.

Verification Objectives

The objectives of the limited verification were to assess:

- The accuracy, completeness, relevance, consistency and transparency of EPA Victoria's data and assertions.
- Conformance of EPA Victoria's GHG inventory, calculation methodology and emission factors with accepted standards and practice.

Verification Process and Limitations

The verification process was undertaken between August and September 2011, and involved:

- A desktop verification of the accuracy of EPA Victoria's GHG Inventory, including an assessment of calculation methodologies and conversion factors used to calculated the greenhouse gas emissions for scope 1, scope 2 and scope 3 emissions with guidance from *ISO 14064-3:2006 Greenhouse gases - Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions*.
- A sampling based approach to verify source data, where sufficient evidence is obtained to support the statement, such that the risk of Net Balance's conclusions being in error is reduced.
- Reviewing EPA Victoria's carbon neutral status for 2010-11, including a review of the quantity of the offsets purchased on behalf of EPA Victoria. The portfolio consists of a suite of offsets purchased from a combination of retired emission reduction projects and Voluntary Carbon Standard (VSC) carbon offsets.
- Providing a written statement and supporting report on the findings, conclusions and recommendations.

Further information on the verification process is presented in the management report.

The verification process was subject to the following limitations:

- The scope of work included limited desktop testing of source data, transcription and aggregation accuracy.
- Selected interviews were conducted with data owners, with some data provided over e-mail.
- Sample testing (invoice through to final inventory) was only conduced on materiality sources including electricity and natural gas, as well as reticulated water.
- Supplier-provided reports were used to calculate emissions for flights and office paper.
- Reports from the finance system, FinanceOne, were used to quantify fuel usage for automobiles and boats, taxi and public transport expenditure, catering expenditure, and couriers.
- Office waste to landfill and high temperature hot water (HTHW) emissions were derived from best estimate data as no mechanisms have been implemented to monitor and measure consumption.
- The calculations of emissions from refrigerants were based on previously verified values, with the addition of new vehicles and refrigerators based on emails.
- The scope of work did not involve the witnessing and verification of source data extraction from internal and external systems.

- The verification process did not include a review of greenhouse gas calculation methodologies, emissions factors and results provided by external parties.

Our Independence

Net Balance was not responsible for preparing any part of the GHG Inventory. Net Balance confirms that we are not aware of any issue that could impair our objectivity in relation to this verification engagement. Net Balance has provided EPA Victoria with technical advice on air quality issues during the reporting year. This work was determined not to be in conflict with Net Balance's role as an independent verification provider.

Our Findings

Based on the scope of the verification process, the following represents Net Balance's key findings:

- There are a number of manual aggregation and transcription processes, which has the potential for anomalies. In some instances EPA Victoria uses multiple spreadsheets for a given source of emissions which creates the potential for potential for transcription and manual handling errors.
- Net Balance has observed a number of errors in the application of emissions factors and the use of out-dated conversion factors.
- Assumptions were generally transparent and reasonable and conservative, although improvements to methodologies for systematically updating and disclosing emissions and conversion factors used could be made. Data trails selected were identifiable and traceable, and the personnel responsible were able to reliably demonstrate the origin(s) and interpretation of data.
- All suggested data changes were satisfactorily addressed by EPA Victoria prior to finalising the GHG Inventory.
- The declaration of EPA Victoria's carbon neutral status for 2010-11 appropriately reflects the GHG Inventory for the reporting period by the organisation.

Net Balance has provided further information and guidance regarding these key findings in a detailed report presented to EPA Victoria Management.

Our Recommendations

Going forward, it is recommended that EPA Victoria continues to work on obtaining high quality, primary sources of raw data wherever possible. Specifically, it is recommended that EPA Victoria:

- improves data management and internal data validation processes and streamlines internal quarterly and external annual reporting requirements
- develops a consistent pro-rating methodology
- reviews the methodology for estimating quantities of gas consumed for High Temperature Hot Water
- introduces regular monitoring of emerging best practice greenhouse gas calculation methodologies and emissions factors provided by external third parties, particularly in regard to scope 3 emissions.

Conclusions

Based on the process and procedures conducted, there is no evidence that EPA Victoria data assertions:

- are not materially correct and are not a fair representation of data and information
- have not been prepared in accordance with accepted standards and practice.

Net Balance has provided further information and guidance regarding these recommendations in a detailed report presented to EPA Victoria Management.

On behalf of the verification team
14 October 2011
Melbourne, Australia

Neil Salisbury
Director, Net Balance
DCCEE Registered Auditor, RABQSA Lead Auditor (Environment) BSc (App Chem), Bsc (Hons), MBA, FAIM, FAIE

APPENDIX C: SUMMARY OF EPA'S 2009–10 GHG EMISSIONS INVENTORY

EPA's carbon neutral update 2009–10

'As Victoria's environmental regulator it is vitally important we demonstrate business leadership when it comes to environmental performance.

This is no more evident than with EPA's carbon neutral approach.

Since 2005–06, EPA has reduced its emissions by 17 per cent and we are on track to reduce by another 15 per cent by 2015.'

John Merritt
CEO
EPA Victoria

2009–10 is EPA's fifth year of being carbon neutral. As the context for managing carbon continually changes we need to adapt our approach to ensure it remains relevant for EPA. EPA's Carbon Management Principles provide an interactive process by which we improve and continue to learn.

Measure our impact

EPA has been measuring its carbon footprint since 2005–06. Using the World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) GHG Protocol framework, we develop an annual greenhouse gas (GHG) inventory. Each year we have added extra greenhouse gas emission sources. In 2009–10 we have included non-Kyoto greenhouse gas emissions associated with refrigerants from both building air conditioning and kitchen and laboratory refrigerators.

Set an objective

EPA exceeded our goal of reducing emissions by 10 per cent from 2005–06 levels by 2010, by achieving a 17 per cent reduction. EPA is now committing to a 15 per cent reduction target on 2010 emissions by 2015. Our aim is to incorporate carbon management into everyday processes.

Avoid and reduce

2009–10 saw the implementation of a number of projects that resulted in emission reductions:

- EPA's Internal Cap and Trade Scheme, resulting in a 24.5 per cent reduction across emissions sources included in the Scheme
- videoconferencing facilities optimised
- insulation of hot water piping
- power management of information communications technology systems.

Assess and offset remaining emissions

EPA's primary approach to carbon management is to implement cost-effective, direct emission reduction projects in our operations. We then assess the remaining emissions in our inventory and purchase robust offset products.

EPA is committed to purchasing offsets from projects that are verified, transparent and demonstrate additionality. We also look for best value for money and additional social and/or environmental benefits in our purchases. In 2009–10, we purchased offsets from projects accredited under the Clean Development Mechanism (CDM), the Voluntary Carbon Standard (VCS), and the Gold Standard (see inventory overleaf). We purchased an additional 242 tonnes CO_2-e of offsets to cover any potential margin of error from inventory or carbon credit miscalculations.

EPA is committed to purchasing the highest quality products to neutralise our emissions which meet our criteria. As such, although EPA purchased 100 per cent accredited GreenPower for all electricity in 2009–10, we decided against deducting this from our inventory, as part of our carbon neutrality. Information currently available on GreenPower does not satisfy our criteria of additionality. We will reassess both the cost and the demonstration of additionality of GreenPower each year and will include it when appropriate.

Transparency and financial drivers

In 2009–10, EPA's internal cost of carbon decreased to $18 per tonne. This cost has progressively decreased from $42 per tonne price since 2007–08. This is the result of a general drop in the price of offsets as well as a greater range of 'over the counter' offsets available to Australian businesses. The cost of carbon will continue to provide incentive to decrease our onsite carbon emissions and implement best practice. In line with good business practice and the application of the Carbon Management Principles, EPA will continue to review how we achieve carbon neutrality.

Our inventory and emission reduction strategy continues to be externally verified and published each year.

For more information on EPA's carbon neutral strategy please contact **ems.coordinator@epa.vic.gov.au**.

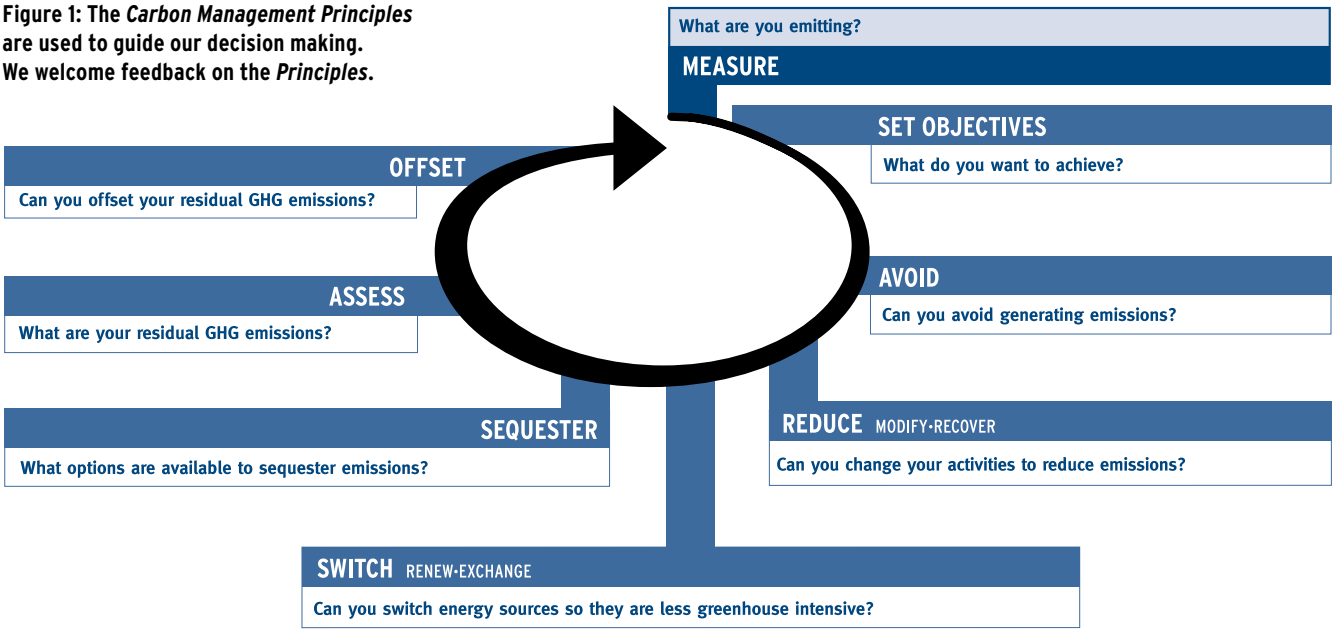
EPA's journey so far

EPA has been implementing energy saving measures for many years. Prior to going carbon neutral, EPA reduced our energy consumption per square metre of our total office space to 59 per cent of 1999–2000 levels. Since then we have continued to reduce the impacts from our buildings, fleet and other parts of our business.

EPA VICTORIA

State Government Victoria

Figure 1: The *Carbon Management Principles* are used to guide our decision making. We welcome feedback on the *Principles*.



Our current carbon footprint

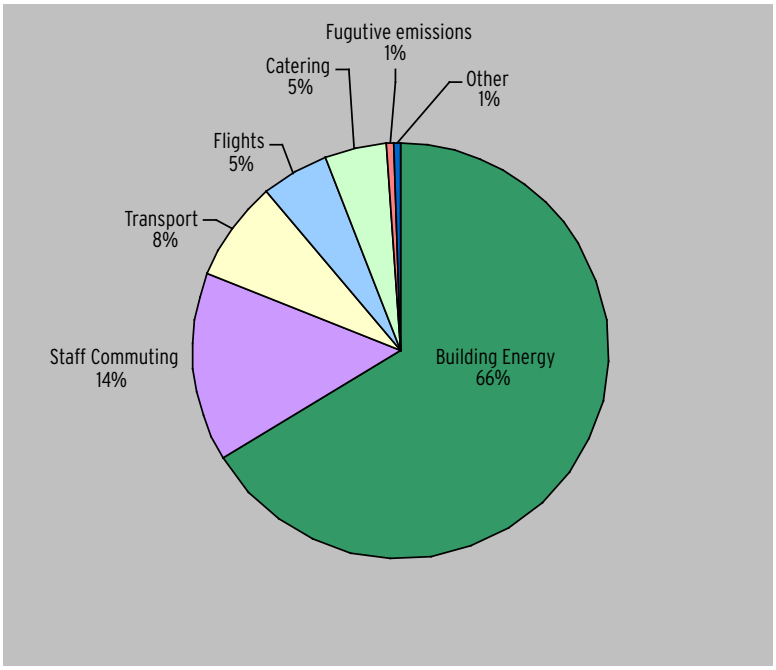
In 2009–10, EPA's operations before offset purchases resulted in 4822 tonnes of CO_2-e emissions. The nature of EPA's business is primarily office-based, which means the main sources of our emissions is from building energy use (66 per cent) and staff commuting (14 per cent).

When EPA first became carbon neutral in 2005–06, we included a 'base' list of emission sources in our inventory. This included all of our 'direct' emission sources such as natural gas use, vehicle fleet fuel and refrigerants, as well as a wide range of 'indirect' sources such as purchased electricity, business travel and waste.

Each year, EPA has added new emission sources to our inventory; we then recalculate our base year (and other previous inventories) to include all emission sources reported in the current year. This recalculation is done so we can accurately understand and demonstrate our progress (see Figure 3).

Our full emission inventory is listed in this document.

Figure 2: EPA's GHG inventory for 2009–10 (total emissions 4822 t CO_2-e)



Emissions source	Consumption units	Consumption	CO_2-e (tonnes)	Proportion of total inventory (%)	Change from baseline (%) (2005–06)
Direct emissions (Scope 1)					
Petrol for vehicles	kL	57.92	132.6	2.75 %	-46.70 %
LPG for vehicles	kL	74.16	117.0	2.43%	-41.85 %
Petrol for boats	kL	13.89	33.1	0.69 %	15.16 %
Automotive diesel oil for vehicles (ADO)	kg	7.30	19.7	0.41 %	149.82 %
Automotive diesel oil for boats (ADO)	kL	4.07	11.0	0.23 %	100.00 %
Vehicle AC refrigerant leakage	kL	7.78	10.1	0.21 %	-7.58 %
Building AC refrigerants leakage where EPA is the sole tenant - Non-Kyoto gases*	kg	4.12	7.3	0.15 %	0.00 %
Building AC refrigerants leakage where EPA is the sole tenant - Kyoto gases	kg	3.65	5.7	0.12 %	23.06 %
Natural gas where EPA is the sole tenant	GJ	320.73	1.6	0.03 %	0.03 %
Kitchen & lab refrigerants leakage - Non-Kyoto gases*	kg	0.35	1.3	0.03 %	0.00 %
Kitchen & lab refrigerants leakage - Kyoto gases	kg	0.36	0.8	0.02 %	127.01 %
Back-up diesel generators where EPA is the sole tenant	kL	0.20	0.5	0.01 %	0.14 %
Total Scope 1			**340.5**	**7.06 %**	
Indirect emissions (Scope 2)					
Purchased electricity for tenant power & light at all facilities and base building power where EPA is the sole tenant	kWh	1,496,728.01	1841.0	38.18 %	-16.53 %
Purchased high temperature hot water	GJ of natural gas	8,631.43	443.1	9.19%	-1.10 %
Total Scope 2			**2284.0**	**47.37 %**	
Optional emissions (Scope 3)					
Staff commuting	km	2,477,647.20	704.3	14.61 %	18.90 %
Purchased electricity for base building power where EPA is not the sole tenant	kWh	515,878.04	634.5	13.16%	-21.17%
Emissions from fuel extraction and T&D line losses for all purchased electricity	kWh	2,012,606.04	281.8	5.84%	34.85 %
Flights*	km	426,269.92	254.1	5.27 %	-52.58 %
Catering	$ expenditure	129,830.81	233.5	4.84 %	19.60 %
Public transport	$ expenditure	37,318.81	14.9	0.31 %	6.76 %
Emissions from fuel extraction for petrol	kL	71.81	13.0	0.27 %	-62.47 %
Reticulated water supply	m^3	4,413.61	10.3	0.21 %	-61.98 %
Emissions from fuel extraction for LPG	kL	78.31	10.3	0.21 %	-61.55 %
Office paper	reams	1912.00	9.1	0.19%	-38.56 %
Building AC refrigerant leakage where EPA is not the sole tenant - Kyoto gases	kg	8.40	8.4	0.17 %	0.00%
Taxi	kL of LPG	4.15	6.6	0.14 %	-46.44 %
Building AC refrigerant leakage where EPA is not the sole tenant - Non-Kyoto gases*	kg	15.65	3.9	0.08 %	0.00%
Emissions from fuel extraction for natural gas	GJ	607.03	2.4	0.05%	-97.77 %
Emissions from fuel extraction for ADO	kL	11.60	2.4	0.05 %	172.67 %
Coloured publications	sheets	44,167	1.7	0.03 %	-85.39 %
Food waste (Organics)	tonnes	1.75	1.6	0.03 %	116.08 %
Natural gas where EPA is not the sole tenant (Geelong, Southbank)	GJ	286.30	1.5	0.03 %	-95.45 %
Municipal solid waste (generic)	tonnes	1.26	1.3	0.03 %	-7.68 %
Paper & cardboard waste	tonnes	0.43	1.1	0.02 %	56.67 %
Couriers	$ expenditure	10,950.14	0.4	0.01 %	-50.03 %
Back-up diesel generators where EPA is not the sole tenant	kL	0.03	0.1	0.00 %	-77.11 %
Inert recyclable waste (comingled)	tonnes	0.39	0.0	0.00 %	0.00 %
Total Scope 3*			**2197.0**	**45.57 %**	
Scope 1 + 2			**2624.6**	**54.43 %**	
SCOPE 1 + 2 + 3 *			**4821.6**		**16.77 %**
Reduction measures					
Offsets					
VCS – geothermal, Turkey	tonnes CO_2-e	1,000.00	-1,000.0		
Gold Standard – landfill gas, China	tonnes CO_2-e	1,000.00	-1,000.0		
Gold Standard – biomass, Thailand	tonnes CO_2-e	1,000.00	-1,000.0		
VCS – cookstoves, Cambodia	tonnes CO_2-e	1,000.00	-1,000.0		
CDM – wind farm, China	tonnes CO_2-e	664.00	-664.00		
VCS 2007 China wind farm	tonnes CO_2-e	400.00	400.0		
NET EMISSIONS			**-242.4**		

* Data back-cast for new methodologies for purpose of comparison with last year's data

EPA's approach going forward

EPA is committed to improving our carbon management approach each year in line with our Carbon Management Principles. Each year our plan will be externally assured and will incorporate the following components:

Further significant direct reductions in overall GHG emissions by 2010 and beyond

- At a minimum, EPA is committed to implementing measures with a four-year payback or less in order to achieve at least a 15 per cent reduction against 2010 emissions by 2015.
- We will track our progress against this target and report back.

Robust offsets for residual emissions

- EPA will continue to seek high-quality, transparent, and cost-competitive offset products in the marketplace and, as required, adjust our approach in response to changes in national climate change policy.
- We will purchase National Carbon Offset Standard compliant offsets where possible.
- We will continue to reassess GreenPower each year for its appropriateness to neutralise residual emissions.

Development of internal GHG reduction initiatives

- EPA will maintain robust monitoring and reporting systems by investing in improving our measurement and monitoring systems.
- We will continue to investigate new carbon reduction projects and maintain annual external assurance.
- We will build the capacity of our own people by engaging in staff training and education.

EPA will continue to review how we achieve carbon neutrality.

Key lessons

Treatment of GreenPower

While EPA purchased 100 per cent accredited GreenPower in 2009-10 for all electricity, we decided against deducting this from our inventory.

EPA is committed to purchasing products that are verified, transparent and demonstrate additionality to neutralise our emissions.

Information currently available on GreenPower does not satisfy our criteria of additionality, with respect to additionality under the Kyoto Protocol and the calculation of electricity emissions factors for Australia.

More information

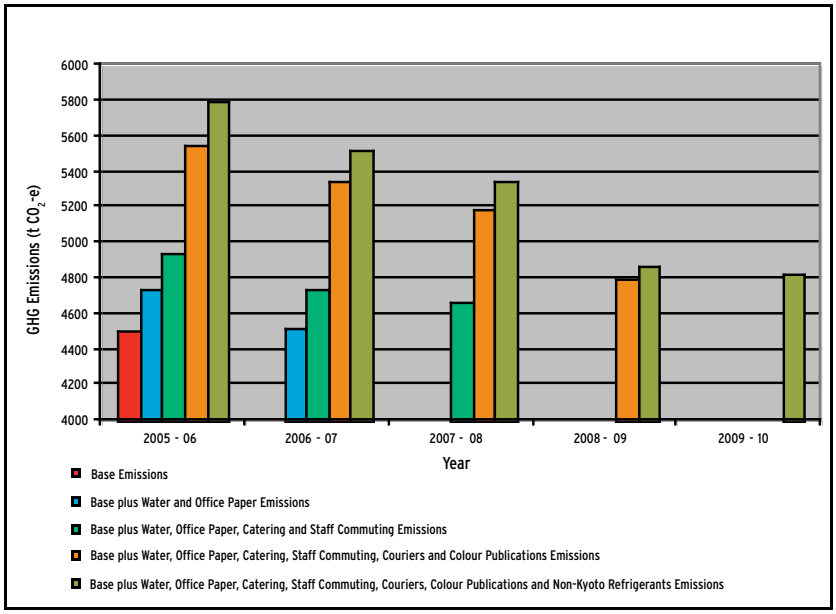
To learn more about EPA's carbon neutral strategy, including the Carbon Management Principles and technical documentation on EPA's GHG inventory, visit

www.epa.vic.gov.au/climate-change

or contact EPA's EMS Coordinator at

ems.coordinator@epa.vic.gov.au.

Figure 3: EPA Victoria's greeenhouse gas emissions 2005–06 to 2009–10



EPA VICTORIA

State Government Victoria

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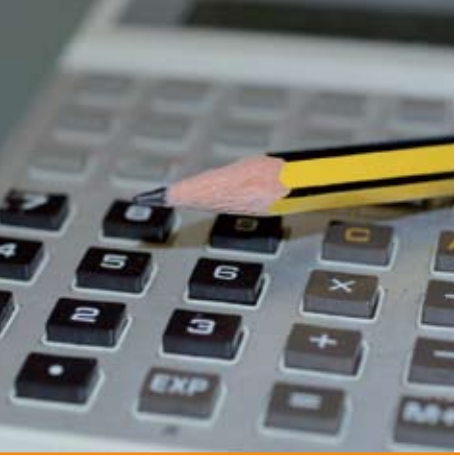
APPENDIX D: SUMMARY OF EPA'S 2008–09 GHG EMISSIONS INVENTORY



EPA's carbon neutral update 2008–09

'Since 2005–06, EPA has received great value from the experience of actively managing our carbon footprint. Being carbon neutral changes every year, and as a result we continue to go back to our stakeholders to redefine best practice in this space.

'Our Carbon Management Principles have allowed us to adapt our processes to effectively manage impacts relevant to our organisation. In a rapidly changing environment, this experience has given us the knowledge and expertise to help Victorian business deal with climate change practically and strategically.'

Terry A'Hearn
Acting CEO and Deputy Chairman, EPA Victoria

2008-09 is EPA's fourth year of being carbon neutral. The context for managing carbon has changed rapidly since we first went carbon neutral in 2005-06, and we continue to update our approach. EPA's Carbon Management Principles provide an interactive process by which we improve and continue to learn. We encourage organisations to use these Principles, assess their value, and work with us to improve them.

Measure our impact

EPA has been measuring its carbon footprint since 2005-06. Using the WRI/WBCSD GHG Protocol framework, we develop an annual inventory. In addition, we have added two extra greenhouse gas (GHG) emission sources each year. This year, 2008-09, we've included emissions associated with colour publications and couriers.

Set an objective

EPA continues to be committed to reducing emissions by 10 per cent from 2005-06 levels by 2010. Our aim is to encourage our clients and stakeholders to incorporate carbon management into 'the everyday', while enhancing their bottom line.

Avoid and reduce

Following annual energy audits of each of EPA's sites, 2008-09 saw the implementation of a number of projects that will result in carbon emission reductions:

- EPA Cap and Trade Scheme was launched.
- Sensor lighting was optimised.
- EPA's buildings were further de-lamped.
- Soft drink vending machine was upgraded.
- Timers were installed on boiling water systems.

Assess and offset remaining emissions

EPA's primary approach to carbon management is to implement cost-effective, direct emission reduction projects in our operations. We then assess the remaining emissions in our inventory and purchase robust offset products.

EPA is committed to purchasing offsets from projects that are verified, demonstrate additionality and are transparent. We also look for best value for money and additional social/environmental benefits in our purchases. In 2008-09, we purchased offsets from projects accredited under the Clean Development Mechanism, the Voluntary Carbon Standard and the Gold Standard (see inventory on page 3). We purchased an additional 213 tonnes CO_2-e of offsets to cover any potential margin of error from inventory or carbon credit miscalculations.

EPA is committed to purchasing the highest quality products to neutralise our emissions which meet our criteria. As such, we decided against the purchase of GreenPower as part of our carbon neutrality in 2008-09. We will reassess both the cost and the demonstration of additionality of GreenPower each year and will include it again when appropriate.

Transparency and financial drivers

In 2008-09, EPA's internal cost of carbon decreased to $24 per tonne, which is significantly lower than the $42 per tonne price in 2007-08. This is the result of a general drop in the price of offsets as well as a greater range of 'over the counter' offsets available to Australian businesses. This $24 cost of carbon will provide ongoing incentive to decrease our on-site carbon emissions and implement best practice. In line with good business practice and the application of the Carbon Management Principles, EPA will continue to review how we achieve carbon neutrality.

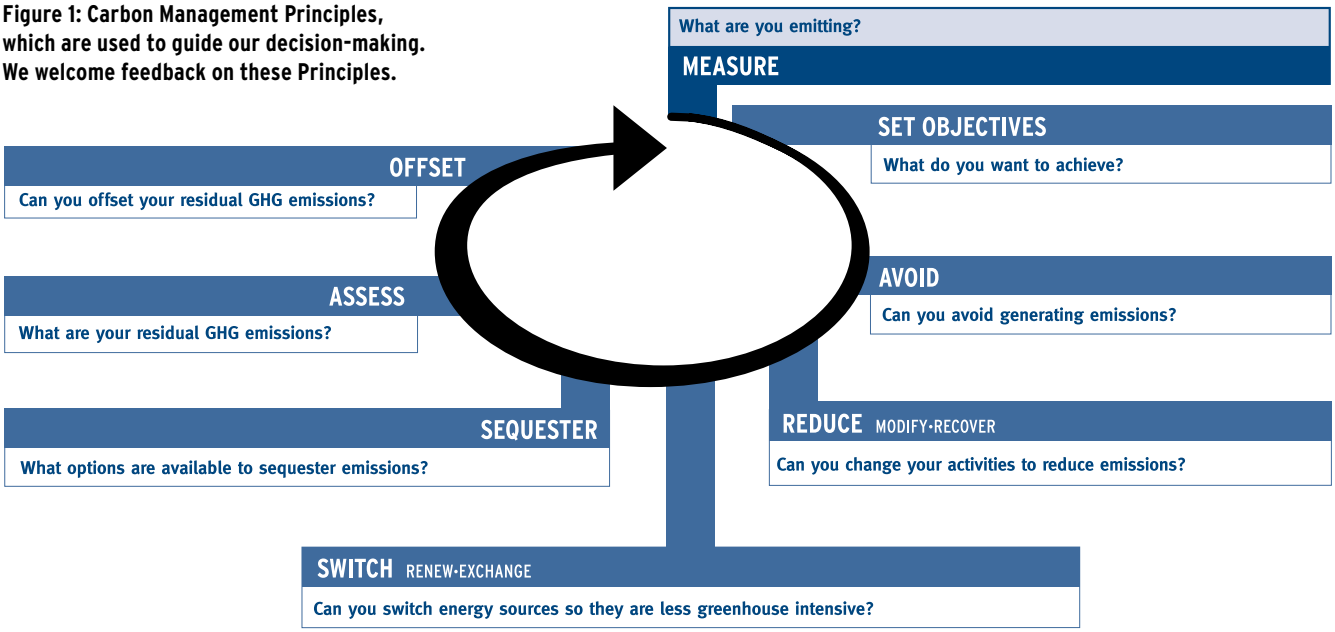
Our GHG inventory and GHG reduction strategy continues to be externally assured and published each year. For more information on how to better manage your organisations GHG emissions visit www.epa.vic.gov.au/climate-change or join EPA Carbon Innovators Network at carbon.innovators@epa.vic.gov.au.

For more information on EPA's carbon neutral strategy please contact ems.coordinator@epa.vic.gov.au.

EPA VICTORIA

Victoria The Place To Be

Figure 1: Carbon Management Principles, which are used to guide our decision-making. We welcome feedback on these Principles.



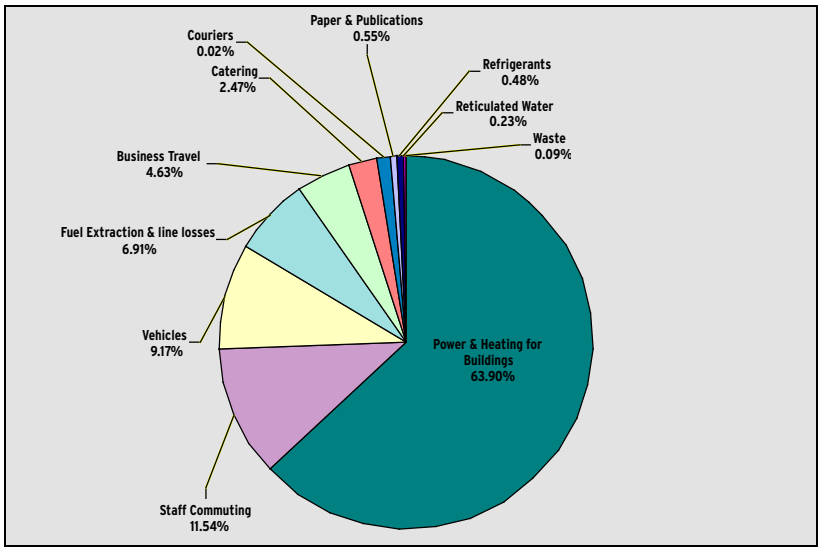
EPA's journey so far

EPA has been implementing energy saving measures for many years. Prior to going carbon neutral, EPA reduced our energy consumption per square metre of our total office space to 59 per cent of 1999-2000 levels. Since then we have continued to reduce the impacts from our buildings, fleet and other parts of our business.

Buildings

EPA has made progress to ensure our office spaces integrate environmentally-friendly design. EPA's head office moved to a six-star GreenStar building design in November 2009, while a number of our regional offices have been fitted out according to the Green Building Council of Australia's GreenStar guidelines.

Figure 2: EPA's GHG inventory for 2008-09 (total emissions 4792.38 t CO_2-e



Fleet

We have made a significant effort to minimise the GHG emissions of our vehicle fleet. In 2003, EPA purchased its first hybrid vehicle. Today, 13 per cent of our fleet is made up of hybrid vehicles, with a range of other fuel-efficient models in our corporate fleet.

Other reduction measures

EPA has also purchased accredited GreenPower since 2000 (although it is currently not deducted from our inventory) and undertaken a range of other measures. However, many opportunities remain to eliminate our contribution to the accumulation of GHG emissions in the atmosphere. Our carbon neutral commitment takes up this challenge.

Our current carbon footprint

In 2008-09, EPA's operations before offset purchases resulted in 4792 tonnes of CO_2-e emissions. The nature of EPA's business is primarily office-based, which means the main sources of our GHG emissions come from building energy use (64 per cent) and staff commuting (12 per cent).

When EPA first became carbon neutral in 2005-06, we included a 'base' list of emission sources in our inventory. This included all of our 'direct' emission sources such as natural gas use, vehicle fleet fuel and refrigerants, as well as a wide-range of 'indirect' sources such as purchased electricity, business travel and waste. Our full emission inventory is listed in this document.

Each year, EPA has added an additional two emission sources to our inventory and recalculated our base year (and other previous inventories) to include all emission sources reported in the current year. This recalculation is done so we can accurately understand and demonstrate our progress (see Figure 3).

Emissions source	Consumption units	Consumption	CO_2-e (tonnes)	Proportion of total inventory (%)	Change from baseline (%) (2005-06)
Direct emissions (Scope 1)					
Petrol for vehicles	kL	71.80	170.9	3.57 %	-31.28 %
LPG for vehicles	kL	93.10	148.3	3.09 %	-26.27 %
Petrol for boats	kL	9.84	23.4	0.49 %	-18.49 %
Vehicle AC refrigerant leakage	kg	11.17	14.5	0.30 %	32.56 %
Automotive diesel oil for vehicles (ADO)	kL	6.42	17.3	0.36 %	120.25 %
Automotive diesel oil for boats (ADO)	kL	29.53	79.7	1.66 %	100.00 %
Building AC refrigerants leakage at leased space where EPA is the sole tenant	kg	7.77	5.7	0.12 %	23.09 %
Back-up diesel generators at leased space where EPA is sole tenant (CES)	Gj	0.31	0.8	0.02 %	55.99 %
Kitchen & lab refrigerator refrigerant leakage	kg	1.80	2.8	0.06 %	734.48 %
Total Scope 1			**463.5**	**9.67 %**	
Indirect emissions (Scope 2)					
Purchased electricity for tenant power & light at all facilities and base building power where EPA is sole tenant	kWh	1,566,439.36	1,911.1	39.88 %	-13.35 %
Purchased high temperature hot water	GJ of natural gas	8,631.43	443.0	9.24 %	-1.10 %
Total Scope 2			**2354.1**	**49.12 %**	
Optional emissions (Scope 3)					
Purchased electricity for base building power at leased space where EPA is not the sole tenant	kWh	553,928.06	675.8	14.10 %	-16.04 %
Emissions from fuel extraction and T&D line losses for all purchased electricity	kWh	2,120,367.42	254.4	5.31 %	21.77 %
Flights*	km	613,745.16	198.5	4.14 %	-24.34 %
Emissions from fuel extraction for natural gas	GJ	9,221.03	41.5	0.87 %	-61.86 %
Natural gas at leased space where EPA is not the sole tenant (Geelong, Southbank)	GJ	589.60	30.3	0.63 %	-6.22 %
Emissions from fuel extraction for petrol	kL	81.64	14.8	0.31 %	-57.33 %
Emissions from fuel extraction for LPG	kL	98.83	12.9	0.27 %	-51.47 %
Reticulated water supply	m^3	4,676.22	10.9	0.23 %	-43.74 %
Office paper	reams	3,132.60	14.9	0.31 %	0.66 %
Taxi	kL of LPG	5.73	9.1	0.19 %	-25.59 %
Couriers*	$ expenditure	23,888.26	0.8	0.02%	0.00%
Coloured publications*	sheets	339,800.00	11.5	0.24 %	0.00%
Catering	$ expenditure	65,939.58	118.6	2.47 %	-39.27 %
Staff commuting*	km	1,849,104.00	553.0	11.54 %	-6.64 %
Public transport*	$ expenditure	31,817.31	14.1	0.20 %	1.01 %
Paper & cardboard waste	tonnes	0.64	1.6	0.03 %	136.86 %
Municipal solid waste (generic)	tonnes	1.14	1.3	0.03 %	-7.03 %
Commingled recyclable waste	tonnes	1.05	0.0	0.00 %	0.00 %
Food waste	tonnes	1.83	1.6	0.03 %	125.03 %
Emissions from fuel extraction for ADO	kL	36.78	7.5	0.16%	764.76%
Back-up diesel generators at leased space where EPA is not the sole tenant	kL	0.51	1.4	0.03%	271.00%
Building AC refrigerant leakage at leased space where EPA is not sole tenant	kg	251.64	0.0	0.00 %	0.00%
Total Scope 3*			**1,974.6**	**41.21 %**	
Scope 1 + 2			**2,817.6**	**58.79 %**	
SCOPE 1 + 2 + 3 *			**4,792.4**		**12.86 %**
Reduction measures					
Offsets					
Gold Standard - Anemone Intepe Wind Farm Turkey	tonnes CO_2-e	1,000.00	-1,000.0		
VicFleet Offset Program	tonnes CO_2-e	see vehicle fuel use above	356		
CDM - Bagasse Energy, Ecuador	tonnes CO_2-e	1,000.00	-1,000.0		
VCS - Biomass Energy, Brazil	tonnes CO_2-e	400.00	-400.0		
VCS - GFL Wind Farm, India	tonnes CO_2-e	1,000.00	-1,000.0		
VCS - Wind Farm China	tonnes CO_2-e	1,250.00	-1,250.0		
NET EMISSIONS			**-213.6**		

* Data back-cast for new methodologies for purpose of comparison with last year's data

Our 2008–09 GHG inventory has been externally assured by Net Balance Management Group, a consultancy with international accreditation by the International Register of Certified Auditors (UK) for sustainability assurance provision.

EPA's approach going forward

EPA is committed to improving our carbon management approach each year in line with our Carbon Management Principles. Each year our plan will be externally assured and will incorporate the following six components:

Further significant direct reductions in overall GHG emissions by 2010 and beyond

- At a minimum, EPA is committed to implementing measures with a four-year payback or less in order to achieve at least a 10 per cent reduction in overall 2005–06 GHG emissions by 2010. We are well on track to exceed this target.
- We will set a challenging but achievable target for beyond 2010 at the end of the current financial year.

Development of methodology for additional life-cycle emission sources as carbon accounting improves

- EPA commits to developing methodology for additional life-cycle sources that are relevant to business and, where appropriate, incorporating into our inventory.

Robust offsets for residual emissions

- EPA will continue to seek high-quality, transparent, and cost-competitive offset products in the marketplace and, as required, adjust our approach in response to changes in national climate change policy.
- We will contribute to the ongoing work to set standards for offset accounting and accreditation.
- We will continue to reassess GreenPower each year for its appropriateness to neutralise residual emissions.

Development of internal GHG reduction incentive schemes

To further learn about and demonstrate the business case for carbon management, EPA aims to:

- internalise the carbon cost of doing business to each EPA business unit
- establish innovative schemes that provide incentives for carbon reduction
- provide findings to business about our experience implementing these schemes.

Building our own carbon management capacity

- EPA will invest in additional resources to improve our measurement and monitoring systems and to manage our carbon reduction projects.
- We will build the capacity of our own people by engaging in staff training and education.
- We will also ensure we maintain a robust monitoring and reporting systems and continued annual external assurance.

Seeking external feedback

- In establishing the Carbon Innovators Network, a network of companies and climate change experts who share ideas and learnings about carbon management, EPA can access high-quality, relevant feedback concerning our carbon neutral plan and other carbon services.

Key lessons

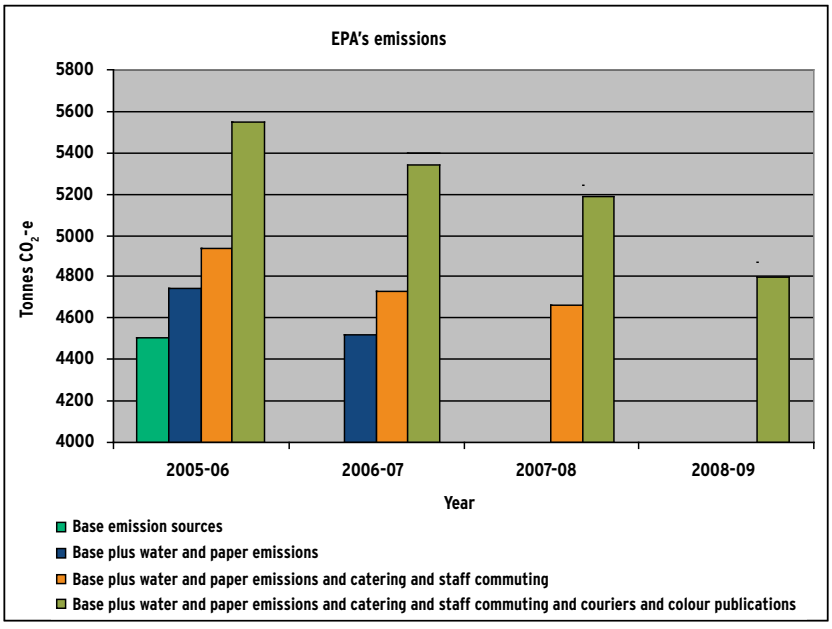
The concept of 'carbon neutrality' is evolving. EPA welcomed the Australian Competition and Consumer Commission's guidance on carbon neutral claims. However, there is no clear agreement on which 'optional' indirect emission sources to include (for example, business travel, waste, transmission and distribution electricity losses). To be as comprehensive as possible, we included all sources we could accurately estimate at present and aim to include additional emission sources going forward.

The market for GreenPower and offset products is evolving. As a consumer, we look for:

- independently verified and additional GreenPower and offset products
- highly transparent vendors who provided background technical documentation and not simply marketing materials
- environmental and social co-benefits.

We will continue to work with clients and stakeholders to ensure we communicate our discoveries about the green power and offset markets.

Figure 3: EPA Victoria's geeenhouse gas emissions



More information

To learn more about EPA's carbon neutral strategy, including the Carbon Management Principles and technical documentation on EPA's GHG inventory, visit **www.epa.vic.gov.au/climate-change** or contact EPA's EMS Coordinator at 03 9695 2738 or **ems.coordinator@epa.vic.gov.au**.

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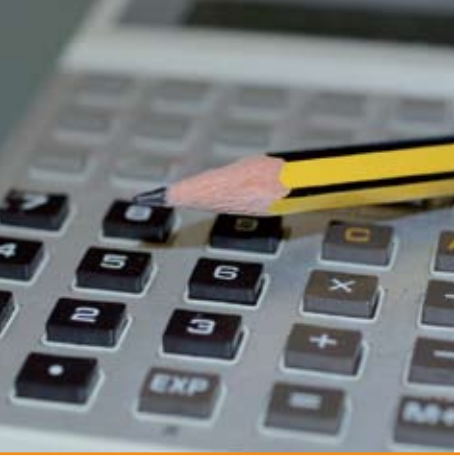
Publication number 1306 December 2009

APPENDIX E: SUMMARY OF EPA'S 2007–08 GHG EMISSIONS INVENTORY



EPA's carbon neutral update 2007–08

'Since we first went carbon neutral in 2005–06, we have further developed our approach, our systems and our understanding of the challenges and practicalities of carbon management. This is consistent with the continuous improvement model discussed in our carbon management principles.

'In a rapidly changing environment, from this experience we are well placed to help Victorian business deal with climate change practically and strategically.'

Mick Bourke
Chairman, EPA Victoria

Measuring our impact

EPA's first step each year is to develop a robust and externally verified greenhouse gas (GHG) emissions inventory. We have been measuring since 2005-06, which serves as a benchmark to measure our progress in reducing our carbon footprint each year.

EPA uses the WRI/WBCSD GHG Protocol framework to develop our GHG inventory (for more information see **www.ghgprotocol.org**). In 2005-06 EPA committed to include two additional GHG emissions sources in our inventory each year. This year we chose to include the emissions associated with catering and staff commuting.

Setting an objective

Our approach to achieving carbon neutrality was to focus first on avoiding and reducing our emissions. We remain committed to achieving our overall target of reducing emissions by 10 per cent from 2005-06 levels by 2010.

We prioritise projects with attractive financial paybacks and other organisational co-benefits. We continuously aim to establish innovative schemes that provide incentives to our employees, vendors and landlords to think strategically about carbon management and to deliver solutions that enhance our organisation's financial bottom line.

Avoid and reduce

Throughout 2007-08, EPA implemented a range of projects to further reduce our GHG emissions. We conducted energy audits and assessments across our metropolitan and regional sites to identify cost-effective reduction opportunities. The results of the audits and assessments informed the design of a pilot EPA cap and trade scheme, which began on 1 January 2009. Reduction projects are being implemented as part of the scheme. Other actions to reduce EPA emissions included the following:

- Upgrade video and teleconferencing facilities across EPA sites.
- Continue to investigate the implementation of a global positioning system (GPS) for EPA's vehicle fleet.
- Consider greenhouse implications of major purchases, such as vehicles, buildings and IT equipment.
- Take steps to address the greenhouse impacts of the energy centre at the CES facility.
- Implement behaviour change programs to further encourage staff to reduce the GHG intensity of their work, including education and incentive programs.

Assess and offset remaining emissions

EPA's primary approach to carbon management is to implement cost-effective, direct emission-reduction projects in our operations. We assess the remaining emissions in our inventory, secure enough green power every year to neutralise emissions from our electricity consumption, and purchase robust offset products for the residual emissions.

EPA has purchased accredited green power products for 100 per cent of our 2007-08 electricity emissions. We purchase a majority of our green power from a Victorian wind farm to ensure that the energy purchased displaced the Victorian, GHG-intensive electricity that would have otherwise been used.

Going forward, EPA will review our green power and offset strategies to adjust to new regulations such as the Australian Carbon Pollution Reduction Scheme (CPRS).

EPA is committed to purchasing offsets from projects that are verified, demonstrate additionality and are transparent. During our investigations for our 2007-08 purchases, we purchased offsets from projects accredited under the Clean Development Mechanism, the Voluntary Carbon Standard, and the Gold Standard (see inventory overleaf). We purchased an additional 200 tonnes of CO_2-e in offsets to cover any potential margin of error from inventory or carbon credit miscalculations.

Transparency and financial drivers

In 2007-08, EPA's internal cost of carbon rose to $42 per tonne, which is significantly higher than the $26 per tonne price of 2005-06. This steep increase is the result of increased offset and green power prices. This rising cost provides further incentive for us to decrease our on-site carbon emissions and implement best practice. In line with good business practice and the application of the carbon management principles, EPA will continue to review the business case for how we achieve carbon neutrality.

Our GHG inventory and GHG reduction strategy will continue to be externally assured and published each year. For more information on how to better manage your organisations GHG emissions please visit **www.epa.vic.gov.au/climate-change** or join EPA's Carbon Innovators Network (enquiries to **carbon.innovators@epa.vic.gov.au**).

For more information on EPA's carbon neutral strategy please contact **ems.coordinator@epa.vic.gov.au**.

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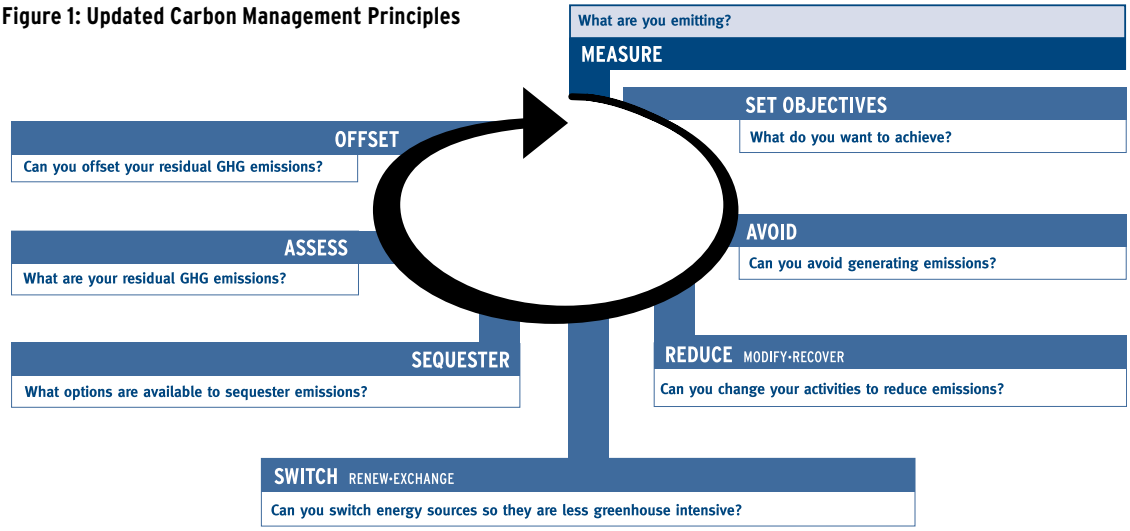
Figure 1: Updated Carbon Management Principles



EPA'S journey so far

EPA has been implementing energy-saving initiatives to reduce our GHG emissions for over five years. Over the past few years we have made significant progress. Prior to going carbon neutral, EPA reduced the energy consumption per square metre of our total office space to 59 per cent of 1999–2000 levels.

More recently, EPA has taken steps to ensure that any new space we occupy integrates environmentally friendly design. For example, EPA's head office will be relocating to a six-star GreenStar building in mid-2009, while a number of our regional offices have been fitted out according to the Green Building Council of Australia's GreenStar guidelines.

EPA has purchased accredited green power since 2000. Prior to going carbon neutral, 28 per cent of our electricity consumption was linked to green power; since going carbon neutral in 2005–06 EPA has purchased 100 per cent GreenPower for all electricity used.

We have also made a significant effort to minimise the GHG emissions of our vehicle fleet. In 2003, EPA purchased its first hybrid vehicle. Today, 18 per cent of our fleet is made up of hybrid vehicles, with a range of other fuel-efficient models in our corporate fleet.

We have made considerable progress in reducing our GHG emissions, but many opportunities remain to eliminate our contribution to the accumulation of GHG emissions in the atmosphere. Our carbon neutral commitment takes up this challenge.

Our current carbon footprint

In 2007–08, EPA's operations before green power and offset purchases resulted in 4569 tonnes of equivalent (CO_2-e) emissions. Despite having previously made significant reductions in energy consumption, the primary source of our GHG emissions remains our building electricity use, which represents 79 per cent of our total emissions. Vehicle and boat fuel use is the next biggest emission source at approximately 10 per cent of our total emissions. Our 2007–08 GHG inventory has been externally assured by Net Balance Management Group, a consultancy with international accreditation by the International Register of Certified Auditors (UK) for sustainability assurance provision.

EPA's GHG inventory was developed in accordance with the WRI/WBCSD GHG Protocol (for more information see **www.ghgprotocol.org**). We included all of our 'direct' emissions sources, such as natural gas use, vehicle fleet fuel, and refrigerants, as well as a wide-range of 'indirect' sources (such as purchased electricity, business travel and waste). A summary of our emissions inventory is available on EPA's website.

In 2005–06, when EPA first became carbon neutral, we included a 'base' list of emissions sources in our inventory. Each subsequent year we have added two additional emission sources to our inventory. To compare our progress on a year-to-year basis, we recalculated our base year (and other previous inventories) to include all emission sources reported in the current year. This way, even though we continue to add emission sources to our inventory, we can accurately understand and demonstrate our progress.

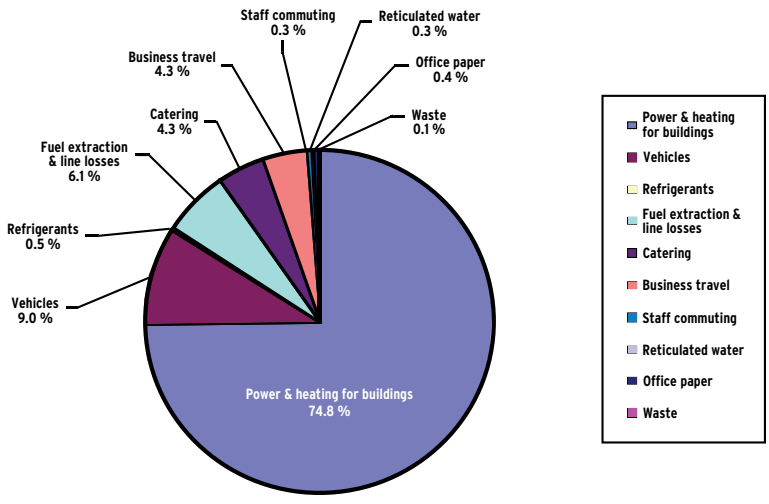


Figure 2: EPA's GHG inventory for 2007–08 (total emissions = 4569 tonnes CO_2-e)

Emissions source	Consumption units	Consumption	CO_2-e (tonnes)	Proportion of total inventory (%)	Change from baseline (%) (2005–06)
Direct emissions (Scope 1)					
Petrol for vehicles	kL	82.35	189.40	4.15 %	-23.84 %
LPG for vehicles	kL	101.80	160.56	3.51 %	-20.18 %
Petrol for boats	kL	20.87	48.00	1.05 %	67.12 %
Vehicle AC refrigerant leakage	kg	10.11	13.15	0.29 %	20.05%
Automotive diesel oil for vehicles (ADO)	kL	2.10	5.66	0.12 %	-28.05 %
Automotive diesel oil for boats (ADO)	kL	3.65	9.86	0.22 %	100 %
Building AC refrigerants leakage at leased space where EPA is the sole tenant	kg	7.77	5.71	0.13 %	23.09 %
Back-up diesel generators at leased space where EPA is sole tenant (CES)	Gj	7.72	0.54	0.01 %	-0.64 %
Kitchen & lab refrigerator refrigerant leakage	kg	1.62	2.61	0.06 %	668.92 %
Total Scope 1			**435.49**	**9.53 %**	
Indirect emissions (Scope 2)					
Purchased electricity for tenant power & light at all facilities and base building power where EPA is the sole tenant	kWh	1,886,473.76	2301.50	50.38 %	4.35 %
Purchased high temperature hot water	GJ of natural gas	8631.43	442.79	9.69 %	-1.16 %
Total Scope 2			**2744.29**	**60.07 %**	
Optional emissions (Scope 3)					
Purchased electricity for base building power at leased space where EPA is not the sole tenant	kWh	524,786.12	640.24	14.01 %	-20.46 %
Emissions from fuel extraction and T&D line losses for all purchased electricity	kWh	2,411,259.88	192.9	4.22 %	-7.68 %
Flights *	km	500,651.75	178.60	3.91 %	-39.46 %
Emissions from fuel extraction for natural gas	GJ	9231.05	54.46	1.19 %	-49.94 %
Natural gas at leased space where EPA is not the sole tenant (Geelong, Southbank)	GJ	599.62	30.76	0.67 %	-4.68%
Emissions from fuel extraction for petrol	kL	103.22	20.64	0.45 %	-40.48 %
Emissions from fuel extraction for LPG	kL	106.22	10.62	0.23 %	-60.19%
Reticulated water supply *	m^3	5899.78	13.81	0.30 %	-29.02 %
Office paper *	reams	3575	16.98	0.37 %	14.87 %
Taxi	kL of LPG	4.42	6.98	0.15 %	-43.08 %
Catering	$ expenditure	108,533.08	195.28	4.27 %	0 %
Staff commuting	km	42,449.50	12.34	0.27 %	0 %
Public transport	$ expenditure	31,804.79	10.14	0.02 %	18.64 %
Paper & cardboard waste	tonnes	0.77	1.92	0.04 %	182.15 %
Municipal solid waste (generic)	tonnes	2.37	2.63	0.06 %	93.13 %
Food waste	tonnes	0.16	0.14	0.00 %	-80.34 %
Emissions from fuel extraction for ADO (stationery)	Gj	9.11	0.05	0.00 %	0 %
Emissions from fuel extraction for ADO (transport)	kL	2.10	0.42	0.01 %	-51.79 %
Back-up diesel generators at leased space where EPA is not the sole tenant	kL	1.39	0.10	0.00 %	-73.96 %
Building AC refrigerant leakage at leased space where EPA is not sole tenant	kg	240.84	0.00	0.00 %	0 %
Total Scope 3*			**1389.01**	**30.40 %**	
SCOPE 1 + 2 + 3 *			**4568.73**		**-7.46%**
Reduction measures					
Green Power					
Ark Climate Green Power Product	kWh	1,877,000.00	-2289.94		
Origin Green Power – HWT	kWh	410,385.64	-500.67		
Origin Green Power Premium – CES	kWh	25,861.00	-31.55		
AGL – Green Power – Wangaratta	kWh	31,288.42	-38.17		
Green Power – Traralgon	KWh	45,936.90	-56.04		
Tru Energy Green Power Premium – Geelong	kWh	6900.88	-8.42		
Offsets					
ANZ CER's Brazil N_2O facility	tonnes CO_2-e	800.00	-800.00		
VicFleet Offset Program	kL	see vehicle fuel use above	-355.62		
VCS credits – Hebei Kangbao Wolongtusham project	tonnes CO_2-e	200.00	-200.00		
Climate Friendly Gold Standard Accredited Offsets – Turkey wind farm	tonnes CO_2-e	100	-100.00		
VCS credits – Indian wind farm	tonnes CO_2-e	200	-200.00		
Fieldforce – Greenhouse Friendly Accredited Offsets	tonnes CO_2-e	200.00	-200.00		
NET EMISSIONS			**-211.68**		

* Data back-cast for new methodologies for purpose of comparison with last year's data

Two key lessons to date

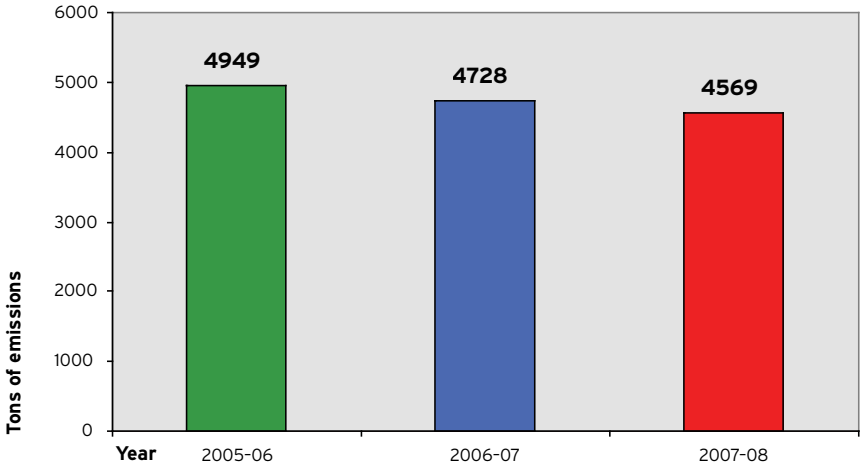
'We aim to neutralise 100 per cent of the carbon generated by our operations each year by directly reducing emissions – and then offsetting emissions that are not yet avoidable, through innovative products and partnerships.'

Mick Bourke
Chairman, EPA Victoria

The concept of 'carbon neutrality' is not yet well defined. A key consideration was selecting which emission sources to include in our inventory. The WRI-WBCSD GHG Protocol requires direct emissions and emissions from purchased electricity to be included, but there is no clear agreement on which 'optional' indirect emissions sources to include (such as business travel, waste, and electricity transmission and distribution losses). To be as comprehensive as possible, we included all sources we could accurately estimate at present and aim to include additional emissions sources going forward.

The market for green power and offset products is evolving. As a consumer, we looked for independently verified products. We sought highly transparent vendors who provided background technical documentation and not simply marketing materials. We also discovered that the marketplace for green power and offsets contains some volatility, providing both risks and rewards for the consumer. We will continue to evaluate the merits of long-term contracts, timing of purchases and the robustness of products, to make sure we are making commercially sensible decisions.

Figure 3: EPA's CO_2 emissions
(incorporating all emission sources included in 2007–08 inventory)



For more information on how to better manage your organisation's GHG emissions please visit **www.epa.vic.gov/climate-change** or join EPA Carbon Innovators Network at **carbon.innovators@epa.vic.gov.au**.
For more information on EPA's carbon neutral strategy contact EPA's EMS Coordinator on (03) 9695 2722 or email **ems.coordinator@epa.vic.gov.au**.

EPA's approach to 2010

EPA is committed to improving our carbon management approach each year in line with our carbon management principles. Each year, our plan will be externally assured and will incorporate the following seven components.

Further significant direct reductions in overall GHG emissions by 2010

- At a minimum, we commit to implementing measures with a four-year payback or less in order to achieve at least a 10 per cent reduction in overall 2005-06 GHG emissions by 2010.

Inclusion of additional life-cycle emissions sources as carbon accounting improves

- EPA commits to estimating and incorporating two new life-cycle sources into our inventory every year.

Robust Green Power and Offsets for Residual Emissions

- We will continue to seek high-quality, transparent, and cost-competitive products in the marketplace to neutralise our residual emissions.
- EPA will work with its partners and clients to indentify best practice approaches to neutralising residual emissions, under the resulting changes to the market created by the Carbon Pollution Reduction Scheme and the proposed National Carbon Offset Standard.
- EPA will also contribute to the ongoing work to set standards for offset accounting and accreditation.

Development of internal GHG reduction incentive scheme

To further learn about and demonstrate the business case for carbon management, EPA aims to:

- internalise the carbon cost of doing business to each EPA business unit
- establish innovative schemes that provide incentives for carbon reduction.

Building our own carbon management capacity

- EPA will invest in additional resources to improve our measurement and monitoring systems and to manage our carbon reduction projects.
- We will build the capacity of our own people by engaging in staff training and education.
- We will also ensure we maintain robust monitoring and reporting systems and continued annual, external assurance.

Seeking external feedback

- In establishing the Carbon Innovators Network, a network of companies and climate change experts who share ideas and learnings about carbon management, EPA can access high-quality, relevant feedback concerning our Carbon Management Plan and other carbon services.

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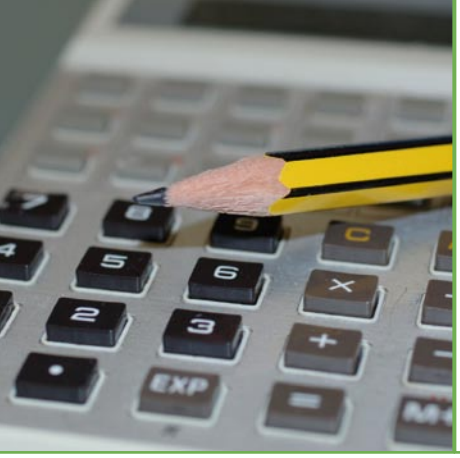
APPENDIX F: SUMMARY OF EPA'S 2006–07 GREENHOUSE GAS EMISSIONS INVENTORY



EPA's Carbon Neutral Update 2006-07

In 2005-06 EPA Victoria became carbon neutral and made a public commitment to maintain this status each year.
In 2006-07 EPA again calculated its GHG footprint and took appropriate steps, following the Carbon Management Principles to ensure all its emissions were neutralized.

For more information on how to better manage your organisations GHG emissions please visit www.epa.vic.gov/greenhouse or join EPA Carbon Innovators Network at carbon.innovators@epa.vic.gov.au.
For more information on EPA's carbon neutral strategy contact EPA's EMS Coordinator on (03) 9695 2722 or email ems.coordinator@epa.vic.gov.au.

Throughout 2006-07 public awareness about climate change has continued to increase, with a substantial movement in the corporate and industrial sectors to reduce carbon footprints and to combat climate change. The concept of carbon neutrality remains a hotly debated topic therefore EPA will continue to achieve carbon neutrality so we understand the challenges involved. This will allow EPA to help raise the quality of this debate and assist Victorian businesses in tackling them.

Measure

EPA again used the WRI/WBCSD GHG Protocol framework to develop our GHG inventory (for more information see www.ghgprotocol.org). EPA has committed to including two additional GHG emissions sources in our inventory each year. This year we chose to include the emissions associated with office paper usage and reticulated (ie. mains) water usage.

Avoid and reduce

Despite having only implemented our carbon neutral strategy in February 2007, leaving only 4 months to implement avoidance and reduction strategies, EPA still managed to reduce our overall GHG emissions by 4.66%, with a 3% reduction in total electricity use. This was achieved through the implementation of a number of initiatives, for example, the rollout of LCD screens on EPA computers and the installation of low flow shower-heads (which reduced hot-water consumption, therefore reducing electricity needed to heat the water).

EPA remains committed to achieving our 2010 target of a 10% direct reduction in overall GHG emissions. Throughout 2007-08, EPA will implement a range of projects to further reduce our GHG emissions. This will include conducting energy audits across all EPA sites and, as a minimum, implementing any projects that have a 4 year pay back or less.

Offsets and Green Power

EPA is committed to purchasing cost-competitive, accredited green power products for 100% of our electricity GHG emissions. In 2006-07, this green power was sourced from a range of electricity providers. EPA purchased a majority of our GreenPower from a Victorian wind farm to ensure the energy purchased displaces the Victorian GHG intensive electricity that would have been otherwise used.

In 2006-07, EPA has attempted to source a portfolio of robust, accredited carbon offset products to neutralise our residual GHG emissions. EPA is committed to purchasing high quality carbon offsets from a portfolio of projects that are verified, demonstrate additionality and are transparent to neutralise our residual emissions. During our investigations for our 2006/07 purchases, we found that many international projects met these high standards, including projects accredited under the Clean Development Mechanism of the Kyoto Protocol and under the Gold Standard. As a consequence we purchased a combination of robust Australian and international products (see inventory overleaf).

Financial Driver

In 2006-07 EPA's internal cost of carbon rose to $26.63 per tonne, which is significantly higher than the $22 per tonne price of 2005-06. This increase is the result of increased offset and Green Power prices. This financial driver has encouraged EPA to internalise the cost of carbon into EPA operations, for example EPA aims to implement an internal carbon cap and trade scheme.

EPA does not view carbon neutrality as an expense, but rather as a necessary responsibility as an organisation. Implementation of this process allows EPA to better provide guidance and assistance to Victorian businesses on how to better manage their own GHG emissions.

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EPA'S Carbon Neutral Update 2006–07

Emissions source	Consumption units	Consumption	CO_2-e (tonnes)	Proportion of total inventory (%)	Change from 2005-06 (%)
Direct emissions (Scope 1)					
Petrol for vehicles	kL	105.21	252.50	5.59	1.53
LPG for vehicles	kL	120.46	192.74	4.26	-4.18
Petrol for boats	kL	5.97	14.33	0.32	-50.09
Vehicle airconditioner (A/C) refrigerant leakage	kg	72.34	14.11	0.31	28.80
Automotive diesel oil (ADO) for vehicles	kL	1.91	5.17	0.11	-34.37
Building A/C refrigerant leakage at leased space where EPA is the sole tenant	kg	4.38	4.64	0.10	0.00
Back-up diesel generators at leased space where EPA is sole tenant (CES)	kL	0.20	0.54	0.01	0.00
Kitchen and laboratory refrigerator refrigerant leakage	kg	0.21	0.34	0.01	0.00
Total Scope 1			**484.36**	**10.71**	**-4.14**
Indirect emissions (Scope 2)					
Purchased electricity for tenant power and light at all facilities and base building power where EPA is the sole tenant	kWh	1805816.00	2237.41	49.49	1.45
Purchased high-temperature hot water	GJ of natural gas fuel input	8631.43	447.97	9.91	0.00
Total Scope 2			**2685.38**	**59.40**	**1.20**
Optional emissions included (Scope 3)					
Purchased electricity for base building power at leased space where EPA is not the sole tenant	kWh	552339.38	684.35	15.14	-14.98
Emissions from fuel extraction and transmission & distribution line losses for all purchased electricity	kWh	2358155.38	202.80	4.49	-2.94
Flights*	km	632465.20	197.59	4.37	-33.02
Emissions from fuel extraction for natural gas	GJ	9349.40	109.39	2.42	0.54
Natural gas at leased space where EPA is not the sole tenant (Geelong, Southbank)	GJ	717.97	37.26	0.82	15.46
Emissions from fuel extraction for petrol	kL	111.18	33.35	0.74	-3.81
Emissions from fuel extraction for LPG	kL	129.01	25.80	0.57	-3.28
Reticulated water supply*	Meters cubed	8310.20	19.45	0.43	-28.41
Office paper*	Reams	3101.00	14.78	0.33	-23.76
Taxi	kL of LPG	8.55	13.68	0.30	11.54
Public transport (expenditure)	$	25654.10	7.78	0.17	-9.07
Paper and cardboard waste	tonnes	1.07	2.09	0.05	204.91
Municipal solid waste (generic)	tonnes	1.00	0.89	0.02	-34.81
Food waste	tonnes	1.00	0.70	0.02	-3.63
Emissions from fuel extraction for ADO	kL	1.91	0.57	0.01	-34.38
Back-up diesel generators at leased space where EPA is not the sole tenant	kL	0.14	0.38	0.01	3.78
Commingled waste	tonnes	0.13	0.09	0.00	-46.75
Building A/C refrigerant leakage at leased space where EPA is not the sole tenant	kg	227.46	0.00	0.00	0.00
Total Scope 3*			**1350.94**	**29.88**	**-14.65**
SCOPE 1 + 2 + 3*			**4520.68**	**100.00**	**-4.66**
Reduction measures					
Green power					
Australian CO_2 Exchange Green Power Product	kWh	1772000.00	-2195.51	-48.57	n/a
Origin Green Power - HWT	kWh	389493.00	-482.58	-10.67	n/a
Country Green Power Premium - CES	kWh	130582.00	-161.79	-3.58	n/a
AGL Green Power - Wangaratta	kWh	29936.00	-37.09	-0.82	n/a
Green Power - Traralgon	kWh	28777.00	-35.65	-0.79	n/a
TRU Energy Green Power Premium - Geelong	kWh	8093.76	-10.03	-0.22	n/a
Offsets					
Climate Friendly CDM accredited China wind farm offsets	tonnes CO_2-e	900.00	-900.00	-19.91	n/a
VicFleet Offset program	kL	see vehicle fuel use above	-450.41	-9.96	n/a
Carbon Reduction Institute NSW GGAS accredited demand side abatement offsets	tonnes CO_2-e	200.00	-200.00	-4.42	n/a
Climate Friendly Gold Standard accredited Turkey wind farm offsets	tonnes CO_2-e	150.00	-150.00	-3.32	n/a
CO_2 Logic CDM accredited India biomass energy offsets	tonnes CO_2-e	100.00	-100.00	-2.21	n/a
NET EMISSIONS			**-202.38**	**-4.48**	

* Data back-cast for new methodologies for purpose of comparison with 2005-06 data

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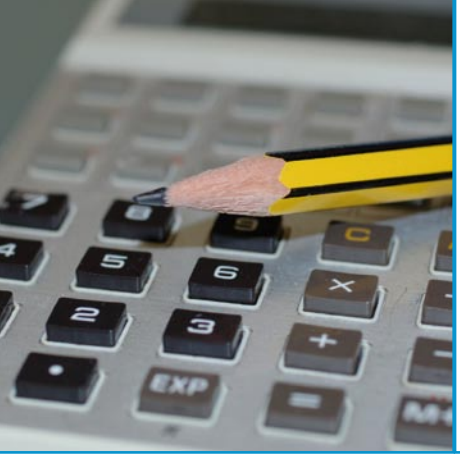
APPENDIX G: SUMMARY OF EPA'S 2005–06 GREENHOUSE GAS EMISSIONS INVENTORY



Summary of EPA's 2005–06 Greenhouse Gas Emissions Inventory

EPA Victoria's GHG inventory was developed in accordance with the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard* (GHG Protocol) developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

* See www.ghgprotocol.org for more information.

About the GHG Protocol

The GHG Protocol is endorsed and used by organisations such as the Global Reporting Initiative, Carbon Disclosure Project, International Organization for Standardization, EU Emissions Trading Scheme, and Chicago Climate Exchange. It provides guidance on which emissions sources to include in a corporate inventory and how to quantify these emissions.

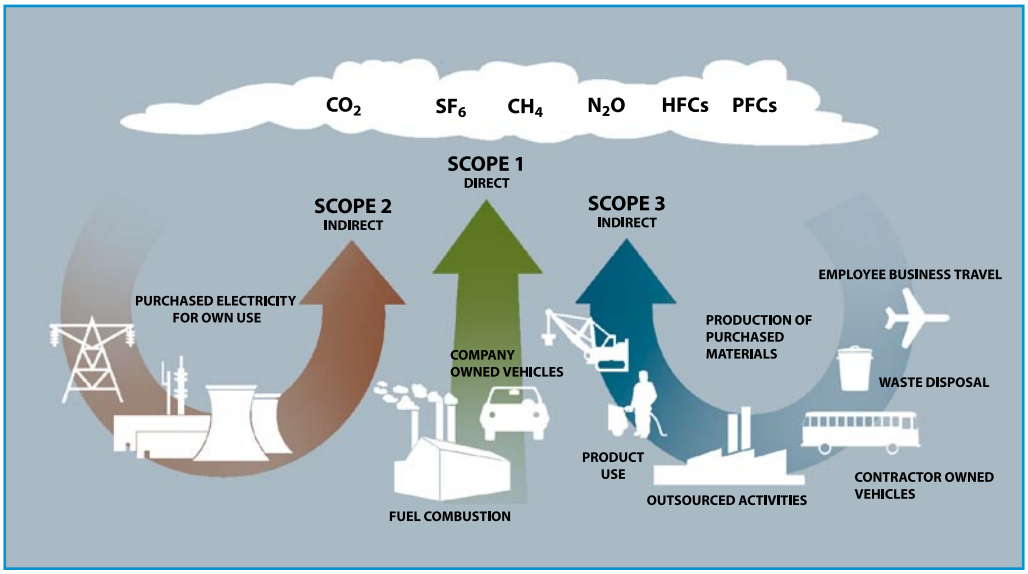
Emission types are categorised into three 'scopes' for reporting purposes. To compile a robust inventory, organisations must include all direct emissions (scope 1) and emissions from purchased electricity and steam (scope 2). Organisations are also encouraged to include appropriate emissions from other indirect sources, but these are optional (scope 3). This system improves transparency in an organisation's inventory and allows for recognition of those sources that could be double-counted by other organisations (e.g. scope 2 and 3).

How EPA Applied the GHG Protocol

Taking the 'operational control approach', EPA has chosen to include scope 1 and scope 2 sources from all operations where we have the full authority to introduce and implement operating policies. We also included accurately measurable scope 3 sources that are critical to EPA's operations. See Table 1 for a full list of EPA's scope 1, 2, and 3 inventory items. In quantifying GHG emissions from these sources, we primarily used factors from the December 2006 *Australian Greenhouse Office Factors and Methods Workbook*.

EPA cannot claim full operational control of base building power (such as air conditioning and elevators) in leased office space. To address this, we developed a policy on which scope to place base building power. Where EPA is the sole tenant, these emissions are included in scope 1 and 2. Where EPA is not the sole tenant, they are included in scope 3 based on the percentage of the building we occupy.

For future publications on our inventory methodology, please visit www.epa.vic.gov/greenhouse or contact EPA's EMS Coordinator on (03) 9695 2722.



Source: New Zealand Business Council for Sustainable Development.

EPA VICTORIA

Victoria The Place To Be

Table 1: EPA'S 2005–06 GHG inventory*†

Emissions source	Consumption	Consumption units	CO_2-e (tonnes)[1]	Proportion of total inventory (%)
Direct emissions (Scope 1)			**500.6**	**11.1**
Petrol for vehicles	103.6	kL	248.7	5.5
LPG for vehicles	125.7	kL	201.2	4.5
Petrol for boats	12.0	kL	28.7	0.6
Vehicle airconditioner (A/C) refrigerant leakage	56.2	kg	11.0	0.2
Automotive diesel oil (ADO) for vehicles	2.9	kL	7.9	0.2
Building A/C refrigerant leakage at leased space where EPA is the sole tenant	4.4	kg	4.6	0.1
Natural gas at leased space where EPA is the sole tenant	45.6	GJ	2.4	0.1
ADO for back-up diesel generators at leased space where EPA is sole tenant	0.2	kL	0.5	0.0
Kitchen and laboratory refrigerator refrigerant leakage	0.2	kg	0.3	0.0
Indirect emissions (Scope 2)			**2653.4**	**58.8**
Purchased electricity for tenant power and light at all facilities and base building power at leased space where EPA is the sole tenant	1780043.6	kWh	2205.5	48.9
Purchased high-temperature hot water from offsite co-gen plant	8631.4	GJ of natural gas fuel input	448.0	9.9
Optional emissions included (Scope 3)			**1355.4**	**30.1**
Purchased electricity for base building power at leased space where EPA is not the sole tenant	649654.6	kWh	804.9	17.9
Emissions from fuel extraction, production and transport, and transmission & distribution line losses for all purchased electricity	2429698.3	kWh	209.0	4.6
Flights	766425.9	km	109.4	2.4
Emissions from natural gas extraction, production and transport	9298.9	GJ	108.8	2.4
Emissions from petrol extraction, production and transport	115.6	kL	34.7	0.8
Natural gas at leased space where EPA is not the sole tenant	621.8	GJ	32.3	0.7
Emissions from LPG extraction, production and transport	133.4	kL	26.7	0.6
Taxi rides (distance converted to LPG consumption)	7.7	LPG	12.3	0.3
Public transport (expenditure)	28212.1	$	8.6	0.2
Municipal solid waste (generic)	1.5	tonnes	1.4	0.0
Emissions from ADO extraction, production and transport	2.9	kL	0.9	0.0
Food waste	1.0	tonnes	0.7	0.0
Paper and cardboard waste	0.4	tonnes	0.7	0.0
ADO for back-up diesel generators at leased space where EPA is not the sole tenant	0.1	kL	0.4	0.0
Commingled recyclable waste	0.2	tonnes	0.2	0.0
Building A/C refrigerant leakage at leased space where EPA is not the sole tenant (no HFCs in 05–06)	227.5	kg	0.0	0.0
Total Scope 1 + 2 + 3			**4509.4**	**100.0**
Reduction measures			**–4710.9**	**–104.5**
Green power				
GreenSwitch	1924000.0	kWh	–2383.8	–52.9
Origin Energy	351383.0	kWh	–435.4	–9.7
Country Energy	146552.0	kWh	–181.6	–4.0
TRUenergy	8300.0	kWh	–10.3	–0.2
Offsets				
Natural Recovery Systems	1050.0	tonnes CO_2-e	–1050.0	–23.3
DSE VicFleet program (All vehicle LPG + petrol)	229.3	kL	–449.8	–10.0
Climate Friendly Gold Standard	100.0	tonnes CO_2-e	–100.0	–2.2
Easy Being Green	100.0	tonnes CO_2-e	–100.0	–2.2
NET EMISSIONS			**–201.5**	**–4.5**

* This inventory has been externally assured by Net Balance Management Group Pty Ltd, a consultancy with international accreditation by the International Register of Certified Auditors (UK) for sustainability assurance provision.

† Figures may not sum due to rounding.

1 Including the six gases covered by the Kyoto Protocol, which are measured in carbon dioxide equivalents (CO_2-e): carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). Note: EPA did not emit any PFCs or SF_6 in this reporting period.

EPA VICTORIA

Victoria The Place To Be

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APPENDIX H: BACKGROUND FOR PUBLIC TRANSPORT AND TAXI QUANTIFICATION METHOD

1. PURPOSE

This standard operating procedure (SOP) sets out the methodology for public transport and taxi data collection and assessment. It ensures that EPA assesses the greenhouse gas (GHG) emissions associated with EPA's public transport and taxi use are in a consistent manner so that results can be compared over time.

2. BACKGROUND

For a true account to be given of EPA's environmental performance, the effects of public transport and taxi use must be assessed. This is particularly important when studying the effects of transport mode choice (e.g. car or train), and also in accounting for the effects of increased mobility via means other than via the EPA vehicle fleet.

3. REQUIREMENTS

This SOP is divided into two sections:
(i) public transport
(ii) taxis

3.1 Public Transport

Public Transport trips have been separated into metropolitan and regional trips.

The total greenhouse gas emissions associated with public transport can be found by adding the sum of the regional offices emissions and the metropolitan emissions:

Total Public Transport GHG Emissions (t CO_2-e) = $\sum$ Regional Office Public Transport GHG Emissions (t CO_2-e) + Metropolitan Public Transport GHG Emissions (t CO_2-e)

3.1.1 Metropolitan Public Transport Trips

INPUT	UNITS OF MEASUREMENT	SOURCE
EPA's city-based offices' public transport expenditure	$ (public transport expenditure)	Finance
Metropolitan public transport emissions factor	t CO_2-e / $ (public transport expenditure)	Refer to Appendix A

The method for calculating the greenhouse gas emissions associated with EPA's metropolitan public transport use is:

Metropolitan Public Transport GHG Emissions (t CO_2-e) : Total Melbourne offices' expenditure ($) **Metropolitan public transport emissions factor (t CO_2-e/$)**

3.1.2 Regional Public Transport Trips

INPUT	UNITS OF MEASUREMENT	SOURCE
EPA's regional offices' public transport expenditure	$ (public transport expenditure)	Finance
V/Line emissions factor	t CO_2-e / passenger km	V/Line Website*
Single Fare	$ (one-way)	V/Line Website*
Distance (Melbourne to each regional office)	km (one-way)	V/Line Website*

*Refer to Appendix B

The method for calculating the greenhouse gas emissions associated with EPA's regional public transport use is:

$$\textbf{Number of trips} = \frac{\text{Regional office public transport expenditure (\$)}}{\text{Single fare (\$)}}$$

$$\textbf{Regional Office Passenger Kilometres (pass. km)} = \text{Number of trips} \times \text{Distance (km)}$$

$$\textbf{Regional Office Public Transport GHG Emissions (t } \mathbf{CO_2}\textbf{-e)} = \text{Regional office passenger kilometres (pass. km)} \times \text{V/Line emissions factor (t } CO_2\text{-e/pass. Km)}$$

The calculation is completed for each regional office, using the corresponding office expenditure amount, fare and distance between regional office and Melbourne. It is assumed that expenditure on public transport by the regions is on V/Line services to and from Melbourne.

The total greenhouse gas emissions from regional public transport is found by adding the emissions calculated from each regional office.

3.2 Taxis

The inputs required for calculation of the taxi use environmental impact are as follows:

INPUT	UNITS OF MEASUREMENT	SOURCE
EPA's total taxi expenditure	$ (taxi expenditure)	Finance
Average taxi earnings per vehicle kilometre	$/km	Refer to Appendix C
Fuel consumption of LPG taxi	L/100km	Refer to Appendix C
Emissions factor for LPG	t CO_2-e/kL	Refer to Appendix C

The method for calculating the greenhouse gas emissions associated with EPA's taxi use is:

$$\textbf{Total Distance Travelled (km)} = \frac{\text{Total taxi expenditure (\$)}}{\text{Average taxi earnings (\$/km)}}$$

Total Fuel Consumption (L)	=	Total distance travelled (km)	X	Fuel consumption (L/km)
Taxi GHG Emissions (t CO_2-e)	=	Total fuel consumption (kL)	X	Emissions factor (t CO_2-e/kL)

4. RESPONSIBILITIES

Individual/Group of Individuals	Responsibilities
EMS Coordinator	Facilitate communication of data inputs/outputs
EMS Coordinator	Maintain SOP
Carbon Neutral team	Perform calculation

5. REVIEW OF PROCEDURE

The Environmental Management System Coordinator will review this procedure every two years.

In addition, this procedure is required to be reviewed and changed to reflect current and best EPA practice. The Environmental Management System Coordinator is required to ensure that this procedure is current at all times.

6. APPROVAL OF PROCEDURE

Date	***Content Authorisation***	
	Name	*Signature*
9 Dec 2011	CLAIRE BLEWITT MANAGER SERVICE GROWTH	

7. DOCUMENT REVISION HISTORY

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1.0			Signed by Director Sustainable Development
2.0	24/11/09	Kim le Cerf	Signed by Director Business Development
3.0	30 Nov 2011	O Tattam	Reviewed and updated, signed by Manager Service Growth

Appendix A – Metropolitan Public Transport Emissions Factor

= 2.442 x 10^{-4} t CO_2-e / $ (Metropolitan Public Transport Expenditure)

This factor is designed to take into account such issues as train, tram and bus greenhouse gas emissions, and EPA's pattern of public transport usage.

The methodology, references and reasoning behind this calculation are shown below. If new input data is obtained that would affect this calculation, the supporting spreadsheet "8.11.11 SOP Public Transport & Taxis.xls" will also be updated to calculate the total emissions.

(i) Metropolitan Public Transport Greenhouse Gas Emissions

The following data has been sourced regarding greenhouse gas emissions of various transport modes:

Mode of Transport	Greenhouse Gas Emissions (g CO_2/passenger km)
Bus	146
Rail	120
Tram	148

Source: McCarthy, A., Department of Transport, August 2009

EPA's metropolitan public transport usage patterns are assumed as follows:

Mode of Transport	Average Distance Travelled (km)	Reasoning	Share of EPA's Metropolitan Public Transport Use (%)
Bus	4	1 x intermodal/ inner city return	10
Rail	30	1 x return trip 200 Vic-Macleod	50
Tram	2	1 x CBD return	40

On this basis a composite metropolitan public transport greenhouse gas emissions factor may be calculated as follows:

Metropolitan Public Transport Emissions (t CO_2-e / fare) =

$\sum$ Transport Mode Emissions (g CO_2-e/pass. km) X Average Distance Travelled (km) X Share EPA's Public Transport Use

= (146 x 4 x 0.1) + (120 x 30 x 0.5) + (148 x 2 x 0.4) g CO_2-e / fare

= 1968 g CO_2-e / fare

= 1.968 x 10^{-3} t CO_2-e / fare

(ii) EPA's Metropolitan Public Transport Expenditure

EPA Finance accounts for the expenditure on public transport tickets for each EPA office. This expenditure takes into account both all-day and 2-hour tickets, and on this basis a composite figure must be calculated, based on this and EPA's estimated of ticket use.

Fare Type	Zone	Cost ($)*	Ticket Use by EPA (%)	Reasoning
2-hour	1	3.80	20	CBD trips represent majority for 200 Vic
	2	2.90	5	Small fraction of tickets used by Macleod
All-day	1	7.00	20	CBD trips represent majority for 200 Vic
	2	5.00	5	Small fraction of tickets used by Macleod
	1+2	11.00	50	200 Vic/Macleod trips represent majority of tickets

**Source: Metlink ticket prices July 2011 (www.metlinkmelbourne.com.au/fares_tickets/metropolitan_fares_and_tickets/)*

Metropolitan Public Transport Expenditure Composite Ticket Price = $\sum$ Fare Cost X Ticket Use by EPA

= (3.80 x 0.2) + (2.90 x 0.05) + (7.00 x 0.2) + (5.00 x 0.05) + (11.00 x 0.5)
$ (Metropolitan Public Transport Expenditure) / fare

= $8.06 / fare

(iii) Metropolitan Public Transport Emissions Factor Calculation

The figures above may then be used to calculate the emissions factor to apply to EPA's Public Transport Use GHG Emissions:

Metropolitan Public Transport Emissions Factor (t CO_2-e / $)

$$= \frac{\text{Metropolitan public transport emissions (t } CO_2\text{-e/fare)}}{\text{Metropolitan public transport expenditure composite ticket price (\$/fare)}}$$

$$= \frac{1.968 \times 10^{-3} \text{ t } CO_2\text{-e/fare}}{\$8.06/\text{fare}}$$

$$= 2.442 \times 10^{-4} \text{ t } CO_2\text{-e/\$}$$

Appendix B – Regional Public Transport Input data

Regional Office	Single Fare ($)*	Distance (km)
Bendigo	23.20	162
Geelong	9.50	73
Traralgon	21.70	158
Wangaratta	22.90	234

**Source: V/Line ticket price, July 2011 (http://www.vline.com.au/fares-and-tickets/)*

APPENDIX I: BACKGROUND FOR RETICULATED WATER QUANTIFICATION METHOD

Standard Operating Procedure – GHG emissions associated with reticulated water

Responsible Manager: EMS Coordinator
Subject: Environmental Management System
Reference number: 8.11.18

1. PURPOSE

This procedure sets out the methodology for calculating total usage and GHG emissions from reticulated water used. This procedure ensures that calculation of reticulated water and associated GHG emissions are undertaken in a consistent manner so that results can be compared over time.

2. BACKGROUND

For a comprehensive account to be given of EPA's Greenhouse impact, the emissions associated with reticulated water provided must be accounted.

3. REQUIREMENTS

INPUT	UNITS OF MEASUREMENT	SOURCE
Reticulated water	Meters cubed used	EPA's EMS
Reticulated Water GHG Emission Factor	Kilograms (CO2e)/ meters cubed of reticulated water used	Refer Appendix A

The calculation of the Greenhouse Gas Emissions of EPA's reticulated water is then completed as follows:

Reticulated Water GHG Emissions (kg CO_2-e)	=	Metres cubed (reticulated water)	X	Kilograms (CO2e)/ meters cubed of reticulated water

3.1 Monitoring and Reporting Plan

The EMS Coordinator will monitor water use data quarterly. Results will be used to assess options to reduce water use further.

4. RESPONSIBILITIES

Individual/Group of Individuals	Responsibilities
EMS Coordinator	Facilitate communication of data inputs/outputs
EMS Coordinator	Maintain SOP
Carbon Neutral team	Perform calculation

Suppliers and landlords	Provide water usage data

5. REVIEW OF PROCEDURE

The Environmental Management System Coordinator will review this procedure every two years.

In addition, this procedure is required to be reviewed and changed to reflect current and best EPA practice. The Environmental Management System Coordinator is required to ensure that this procedure is current at all times.

6. APPROVAL OF PROCEDURE

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2.0	Dec 2009	Beth McLachlan	Reviewed and updated
3.0	30 Nov 2011	O Tattam	Reviewed and updated

Appendix A – Reticulated Water GHG EmissionS Factor

= 2.34 kg CO_2-e/m^3

Source: RMIT, Centre for Design, 2007

The emissions factor was sourced from a project undertaken on Simapro (a life cycle software program) using the Global Warming Impacts Method and was based on a study undertaken by Yarra Valley Water in the Box Hill Region of Victoria, Australia. It is designed to take into account emissions associated with:

- Energy used in pumping water (including from (and between) reservoirs, to wholesaler, retailer, customer and then to treatment and disposal)
- Energy used in treating water both prior to use and treatment of wastewater (excluding emissions due to the breakdown of waste, as a significant amount of these emissions are recaptured and turned into energy)
- Only marginal changes (upgrades) to infrastructure

This emissions factor is based on Victorian data (Box Hill Region) and is considered to be highly accurate. It is considered conservative as the South East Region of Melbourne's treatment of wastewater is the most energy intensive in the region.

The methodology, references and reasoning behind the calculation is shown below. If new or updated emissions factors are obtained that would affect this calculation, this document will be updated to reflect the changes.

(i) EPA's Total Reticulated Water Usage

EPA obtains water data from either water retailers or landlords, depending on the site. Water is received in litres used. Total water purchased by EPA for 2010-11 was 4,509,865 litres.

Site	Data Source	Water purchased 2010-11 (L)
Head Office	Property Manager	2,961,239.88
CES	Water retailer	1,180,561.81
EPA Gippsland	Water retailer	69,000.00
EPA North East	Water retailer	116,280.00
EPA North West	Landlord	36,288.69
EPA South West	Landlord	72,495.00
EPA Southern Metro	Landlord	74,000.00
	Total	**4,509,865.39**

(ii) EPA's Reticulated Water GHG Emissions Calculation

The total water purchased (as above) may then be used to calculate the GHG emissions associated with reticulated water used.

Step 1 Convert litres consumed to meters cubed.

$$\text{Water used } (m^3) = \frac{\text{Water used (L)}}{1000}$$

Step 2 Apply the reticulated water emissions factor

$$\textbf{Reticulated Water Use GHG Emissions (kg } CO_2\textbf{-e)} = \text{Reticulated water consumed } (m^3) \times \text{Emissions factor } (\text{kg } CO_2\text{-e}/m^3)$$

Step 3 Convert GHG emissions from kilograms (kg) to tonnes (t)

$$\textbf{Reticulated Water Use GHG Emissions (t } CO_2\textbf{-e)} = \frac{\text{Reticulated Water Use GHG Emissions (kg } CO_2\text{-e)}}{1000}$$

APPENDIX J: BACKGROUND FOR OFFICE PAPER QUANTIFICATION METHOD

Standard Operating Procedure – GHG emissions associated with office paper purchased

Responsible Manager: EMS Coordinator
Subject: Environmental Management System
Reference number: 8.11.19

1. PURPOSE

This standard operating procedure (SOP) sets out the methodology for calculating the greenhouse gas (GHG) emissions associated with office paper purchased. This procedure ensures that calculation is undertaken in a consistent manner so that results can be compared over time.

2. BACKGROUND

For a true account to be given of EPA's environmental performance, the emissions embedded in the office paper purchased must be accounted.

3. REQUIREMENTS

INPUT	UNITS OF MEASUREMENT	SOURCE
Reams of paper purchased	Number of reams	Officemax
Office paper emissions factor	kg CO_2-e/kg	Refer Appendix A

The method for calculating the greenhouse gas emissions associated with the office paper purchased by EPA is:

Office Paper GHG Emissions (kg CO_2-e)	=	Reams of paper purchased (kg)	X	Emissions factor (kg CO_2-e/kg)

3.1 Monitoring and Reporting Plan

The EMS Coordinator will monitor office paper data quarterly. Results will be used to assess options to reduce paper use further.

4. RESPONSIBILITIES

Individual/Group of Individuals	Responsibilities
EMS Coordinator	Facilitate communication of data inputs/outputs
EMS Coordinator	Maintain SOP
Carbon Neutral team	Perform calculation
Contractors and suppliers	Provide paper purchase data

5. REVIEW OF PROCEDURE

The Environmental Management System Coordinator will review this procedure every two years.

In addition, this procedure is required to be reviewed and changed to reflect current and best EPA practice. The Environmental Management System Coordinator is required to ensure that this procedure is current at all times.

6. APPROVAL OF PROCEDURE

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3.0	30 Nov 2011	O Tattam	Revision and update

Appendix A – Office Paper GHG Emissions Factor

Domestic		Imported	
Virgin paper	**Recycled paper**	**Virgin paper**	**Recycled paper**
1.3	1.52	1.08	1.28

Source: RMIT, Centre for Design, 2011

Details of these emissions factors can be found in the EPA Publication 1364, *Greenhouse Gas Emissions Factors for Office Paper*.

(i) EPA's Total Office Paper Usage

EPA's contract with OfficeMax (Corporate Express from July 2011 onwards) requires regular reporting on stationery and office paper purchases including recycled content of paper. The average weight of a ream of office paper has been calculated at 2.5 kg.

Paper Type	Reams purchased 2010-11
100% Recycled	2,673
Virgin	193

(ii) Office Paper GHG Emissions Calculation

The figures given above may then be used to calculate the GHG emissions associated with office paper.

Step 1 Determine the number of reams of virgin and recycled paper purchased.

Count the total number of reams of 100% recycled and virgin office paper. When a ream of office paper has more than 0%, but less than 100% recycled content, then the proportion of recycled content is added to the 100% recycled reams counted and the proportion of virgin content is added to the virgin reams counted.
E.g. 80% recycled ream:

- 0.8 ream is added to the 100% recycled reams counted
- 0.2 ream is added to the virgin reams counted.

Step 2 Determine GHG emissions per ream of office paper (kg $C0_2$-e/ream), for both 100% Recycled and Virgin.

GHG emissions per Ream of 100% Recycled Office Paper (kg $C0_2$-e/ream)	=	Ream (kg/ream)	X	Emissions factor (kg CO_2-e/kg)
	=	2.5	X	1.52
	=	3.8 kg $C0_2$-e/ream		

GHG emissions per Ream of Virgin Office Paper (kg $C0_2$-e/ream)	=	Ream (kg/ream)	X	Emissions factor (kg CO_2-e/kg)
	=	2.5	X	1.3
	=	3.25 kg $C0_2$-e/ream		

Step 3 Calculate the GHG emissions for both 100% Recycled and Virgin, for EPA's office paper use.

100% Recycled Office Paper GHG Emissions (kg CO_2-e)	=	Reams of paper purchased (ream)	X	GHG emissions per ream of 100% recycled office paper (kg CO_2-e/ream)
Virgin Office Paper GHG Emissions (kg CO_2-e)	=	Reams of paper purchased (ream)	X	GHG emissions per ream of virgin office paper (kg CO_2-e/ream)

Step 4 Convert GHG emissions from kilograms (kg) to tonnes, for both 100% Recycled and Virgin.

$$\textbf{100\% Recycled Office Paper GHG Emissions (t } \mathbf{CO_2}\textbf{-e)} = \frac{\text{100\% recycled office paper GHG emissions (kg } CO_2\text{-e)}}{1000}$$

$$\textbf{Virgin Office Paper GHG Emissions (t } \mathbf{CO_2}\textbf{-e)} = \frac{\text{Virgin office paper GHG emissions (kg } CO_2\text{-e)}}{1000}$$

Step 5 Add together the 100% Recycled and Virgin Office Paper GHG Emissions.

Total Office Paper GHG Emissions (t CO_2-e)	=	100% Recycled GHG Emissions (t CO_2-e)	+	Virgin GHG Emissions (t CO_2-e)

APPENDIX K: BACKGROUND FOR STAFF COMMUTING QUANTIFICATION METHOD

Standard Operating Procedure – Staff Commuting Data Collection and Recording

Responsible Manager: EMS Coordinator
Subject: Environmental Management System
Reference number: 8.11.11

1. PURPOSE

This procedure sets out the methodology for collecting staff commuting data for monitoring, measurement and reporting purposes. The procedure also covers the recording of this data in a consistent manner.

2. BACKGROUND

EPA is required to report commuting data via the annual report under *FRD 24C – Reporting of Office-Based Environmental Impacts by Government Departments*. A guidance manual for FRD24C reporting details the required indicators to be reported, data sources, collection methods and analysis recommendations. This information is included in appendix A.

TravelSmart used to conduct an annual survey of commuting behaviour across participating Victorian Government departments. In 2009, EPA was encouraged to conduct an internal travel survey.

3. REQUIREMENTS

3.1 Collecting Data

The EMS Coordinator submits a travel survey to staff using SurveyMonkey. Information asked in this survey can be found in appendix A.

3.2 Recording Data

An excel survey summary from SurveyMonkey can be analysed to determine the following:

- Percentage of employees regularly (>75% of work attendance days) using public transport, cycling, walking, or car pooling to and from work or working from home by locality type. This is an FRD24C requirement.
- Total annual kilometres for:
  - Walking
  - Cycling
  - Motorbike / scooter
  - Tram
  - Train - metropolitan
  - Train – long distance (VLine)
  - Bus
  - Taxi
  - Hybrid Car (e.g. Toyota Prius)
  - Small Car (4-cylinder, e.g. small hatchback)
  - Medium Car (6-cylinder, e.g. small to medium sedan)
  - Large Car (6-cylinder, e.g. 4-wheel drive, V8 or people mover)

3.3 Monitoring and Reporting Plan

The EMS Coordinator will monitor staff commuting data. Results will be used to assess options to promote and encourage sustainable commuting. Any unusual trends or barriers preventing the use of sustainable options will be investigated.

The commuting data will be available for annual FRD24 reporting and greenhouse gas reporting. Survey results will also be disseminated on an annual basis to staff and will be used to re-assess against EPA's annual Sustainable Transport Plan.

4. RESPONSIBILITIES

Individual/Group of Individuals	Responsibilities
EMS Coordinator	• Prepare survey and coordinate collection of survey data.
EMS Coordinator	• Preparation of FRD24 annual reports.
EPA Staff	• Provide transport data by responding to the annual survey in a timely manner.

5. REVIEW OF PROCEDURE

The Environmental Management System Coordinator will review this procedure every two years.

In addition, this procedure is required to be reviewed and changed to reflect current and best EPA practice. The Environmental Management System Coordinator is required to ensure that this procedure is current at all times.

6. APPROVAL OF PROCEDURE

Date	***Content Authorisation***	
	Name	*Signature*
9/12/2011	CLAIRE BLEWITT MANAGER SERVICE GROWTH	

7. DOCUMENT REVISION HISTORY

Version	***Revision Date***	***Revised by***	***Section and change/s***
1.0	8 June 06	Energy Subcommittee	Signed by Director Sustainable Development
2.0	2 Sep 09	N Reid	Periodic review
3.0	14 Nov 11	O Tattam	Signed by Manager, Service Growth

Attachment 1 – Typical *SurveyMonkey* Travel Survey

EPA Travel Survey for 2011

Thank you for taking 3 minutes to complete EPA's Annual Travel Survey. The EPA Travel Survey is vital so that we can record the distance and mode of transport staff use for commuting to and from work. Not only does it help us understand our staff commuting behaviour but it's also a mandatory requirement for Victorian Government annual reporting and for our Greenhouse Gas Inventory.

In 2009-10, staff commuting was EPA's second largest category of emissions (14.6%) after power & heating for our buildings (66%), and ahead of our use of EPA vehicles (8%). So thank you again for helping EPA reduce it emissions impact by filling in this survey.

***1. Which EPA office do you mainly work at?**

- 200 Victoria St
- Bendigo
- Wangaratta
- Macleod
- Dandenong
- Traralgon
- Geelong

***2. Do you work full time?**

- Yes
- No

If no, how many days a week do you work (on average)? e.g. 2.5

***3. On an average working week, how many days do you work from home?**
Please enter 0 if you don't work from home at all

***4. On an average working week, how many days would you use the mode(s) of transport listed below to get to and from work?**

Please note:
- If you use more than one mode of transport, just list your main mode.
- A single one way journey should be recorded as 0.5
- The sum of all boxes below should add up to the number of days you work per week (in Q2)less the number of days you work from home.

Example 1: If you work 5 days per week, walk to work every morning and catch the tram home every evening you would put Walk=2.5, Tram=2.5.
Example 2: If you work 3 days per week including 1 day from home and ride your bike on the other 2 days, you would put Bike=2.

Walk	
Bike	
Motorbike / Scooter	
Tram	
Train	
Train – long distance (VLine)	
Bus	
Taxi	
Car pooling	
Hybrid Car (e.g. Toyota Prius)	
Small Car (4-cylinder, e.g. small hatchback)	
Medium Car (<6-cylinder, e.g. small to medium sedan)	
Large Car (>6-cylinder, e.g. 4-wheel drive, V8 or people mover)	

***5. What is the average estimated journey distance (in kilometres) for a single one way journey for each transport mode(s) that you use?**

Please note:
- You should only provide a figure for the mode(s) you nominated in Q4.
- Only estimate the distance for your main mode of transport.

To help estimate distance visit Google Maps. If you catch public transport there is no precise way of calculating distance however using the maps within the Metlink Journey planner will help.

Just enter the number below

Walk	
Bike	
Motorbike / Scooter	
Tram	
Train	
Train – long distance (VLine)	
Bus	
Taxi	
Car pooling	
Hybrid Car (e.g. Toyota Prius)	
Small Car (4-cylinder, e.g. small hatchback)	
Medium Car (<6-cylinder, e.g. small to medium sedan)	
Large Car (>6-cylinder, e.g. 4-wheel drive, V8 or people mover)	

APPENDIX L: BACKGROUND FOR COURIER SERVICES QUANTIFICATION METHOD

Standard Operating Procedure – GHG emissions associated with Courier services

Responsible Manager: EMS Coordinator
Subject: Environmental Management System
Reference number: 8.11.22

1. PURPOSE

This procedure sets out the methodology for calculating the total greenhouse gas (GHG) emissions associated with EPA's courier services. This procedure ensures that calculation of our courier services and associated GHG emissions are undertaken in a consistent manner so that results can be compared over time.

2. BACKGROUND

For a comprehensive account to be given of EPA's greenhouse impact, the emissions embedded in the courier services we use must be accounted.

3. REQUIREMENTS

INPUT	UNITS OF MEASUREMENT	SOURCE
Courier expenditure	$ (Dollars spent)	FinanceOne
Conversion Factor	t CO_2-e/$ (GHG emissions per dollar spent)	See Appendix A

The method for calculating the greenhouse gas emissions associated with EPA's courier services is:

Courier Services Emissions (t CO_2-e)	=	Courier expenditure ($)	X	GHG emissions per dollar spent (t CO2-e/$)

3.1 Monitoring and Reporting Plan

The EMS Coordinator will monitor water use data quarterly. Results will be used to assess options to reduce water use further.

4. RESPONSIBILITIES

Individual/Group of Individuals	Responsibilities
EMS Coordinator	Facilitate communication of data inputs/outputs
EMS Coordinator	Maintain SOP
Carbon Neutral team	Perform calculation
Contractors and suppliers	Provide courier service data

5. REVIEW OF PROCEDURE

The Environmental Management System Coordinator will review this procedure every two years.

In addition, this procedure is required to be reviewed and changed to reflect current and best EPA practice. The Environmental Management System Coordinator is required to ensure that this procedure is current at all times.

6. APPROVAL OF PROCEDURE

Date	***Content Authorisation***	
	Name	*Signature*
30 Nov 2011	CLAIRE BLEWITT MANAGER SERVICE GROWTH	

7. DOCUMENT REVISION HISTORY

Version	***Revision Date***	***Revised by***	***Section and change/s***
1.0	Dec 2009	B McLachlan	Signed by Director Business Development
2.0	Jan 2011	B McLachlan	To include emissions associated with fuel extraction, production and transportation of the fuel used in courier services
3.0	30 Nov 2011	O Tattam	Reviewed and updated, signed by Manager Service Growth

Appendix A – EPA's Courier Services GHG Emission Factor

GHG Emissions per Dollar Spent on Courier Services (t CO_2-e/$)
= 3.7 x 10^{-5}*

** This figure is based specifically on the type and frequency of EPA's usage of courier services and therefore may not be an accurate representation of general emissions associated with courier services.*

EPA uses a number of courier service providers each year. Six different courier service providers were engaged to provide services to EPA during 2008-09. In order to estimate emissions from all our courier services, an average emissions factor per dollar spent on courier services was developed.

Each individual transaction undertaken with TNT, EPA's most used courier service provider, was analysed to work out the average emissions per dollar spent for the services EPA engaged the courier to undertake. This emission factor was then multiplied by EPA's total courier expenditure for 2010-11 to estimate its total annual GHG emissions from courier services. Unfortunately EPA was unable to allocate time to getting updated information from its courier providers in 2009-10 to calculate a revised emissions factor for 2010-11, therefore the 2008-09 emissions factor was used instead.

This factor takes into account emissions associated with the combustion of transport fuel to courier EPA packages from origin to destination.

The methodology and reasoning behind this calculation is shown below. Should new or updated emissions factors be obtained that would affect this calculation, this document will be updated to reflect the changes.

(i) EPA's Courier Services GHG Emission Factor

In order to calculate an average factor for emissions per dollar spent on courier services, the most commonly engaged courier provider data has been used. This data relates specifically to services provided to EPA.

It was assumed that kerosene was used for Air Freight and diesel was used for Road Freight. A fuel efficiency of 8 MJ/tonne.km* was estimated for Air Freight and 1.2 tonne.km/MJ# for Road Freight (both considered to be conservative estimates).

**Source: Alan Pears, 2009*
#Source: Engineers Australia

Using the following calculation EPA was able to establish the total GHG emissions from its annual TNT courier services:

Step 1: Calculation of energy in fuel used per trip

$$\text{Energy in fuel used for individual trip (MJ)} = \text{Fuel efficiency (MJ/tonne.km)} \times \frac{\text{Weight (kg)}}{1000} \times \text{Distance (km)}$$

Step 2: Calculation of direct GHG emissions per trip

Direct GHG Emissions per trip (t CO_2-e)	=	Energy in fuel used for individual trip (MJ)	**X**	**Emission factor (GJ/t CO_2-e)** / **1000**

Step 3: Calculation of GHG emissions per trip associated with fuel extraction, production and transportation of the fuel

Indirect GHG Emissions per trip (t CO_2-e)	=	Energy in fuel used for individual trip (MJ)	**X**	**Emission factor (GJ/t CO_2-e)** / **1000**

Step 4: Calculation of total GHG emissions per trip

Total GHG Emissions per trip (t CO_2-e)	=	Direct emissions	**+**	**Emissions associated with fuel extraction, production and transportation of fuel**

This calculation was undertaken for each individual courier service (air freight and road fright) and the results were added together. EPA then divided the total GHG emissions by the total dollars spent to get an emissions factor of 3.7×10^{-5} t CO_2-e/$.

(ii) Courier Services GHG Emissions

The figure given above was then used to calculate the total GHG emissions associated with our courier services by multiplying it by the total dollar spent on couriers for the 2010-11 year.

APPENDIX M: FIRST CLIMATE GOLD STANDARD ACCREDITED UGANDAN COOKSTOVE OFFSET PURCHASE DOCUMENTATION

Certificate

EPA VICTORIA

Climate neutral with First Climate

This certificate guarantees that First Climate Markets AG retired greenhouse gas (GHG) emission reductions, in total

600 tonnes of greenhouse gases

from the high quality emission reduction project

Reducing deforestation with improved cook stoves, Uganda

on behalf of EPA Victoria.

Bad Vilbel, 19 August 2011

Dr. Sascha Lafeld, First Climate Markets AG

FC-Reg-Cert-No.: 70388

www.firstclimate.com

firstclimate

APPENDIX N: CLIMATE FRIENDLY VCS ACCREDITED BRAZILIAN BIOMASS OFFSET PURCHASE DOCUMENTATION

climate® friendly

EPA Victoria

This certificate is in recognition that 1,600 tonnes of greenhouse gas emissions have been offset for the period of:

01/07/2010 to 30/06/2011

Climate Friendly commits to retiring the following:

The equivalent of 1,000 tCO2-e in VCS carbon credits from the Ceramica Irmaos Fredi Fuel Switch project in Brazil and 600 tCO2-e in VCS credits from the Coc Dam Hydropower project in Vietnam to offset towards operational emissions.

EPA Victoria
01/07/2010 to 30/06/2011

Thank you for taking meaningful action on climate change and supporting clean energy.

Total Greenhouse Gas Savings

171.53 tonnes

Joel Fleming Founding Chairman

CERT#00011878

climate® friendly
www.climatefriendly.com

APPENDIX O: CLIMATE FRIENDLY VCS ACCREDITED VIETNAMESE SMALL HYDROPOWER OFFSET PURCHASE DOCUMENTATION

climate® friendly

EPA Victoria

This certificate is in recognition that 1,600 tonnes of greenhouse gas emissions have been offset for the period of:

01/07/2010 to 30/06/2011

Climate Friendly commits to retiring the following:

The equivalent of 1,000 tCO2-e in VCS carbon credits from the Ceramica Irmaos Fredi Fuel Switch project in Brazil and 600 tCO2-e in VCS credits from the Coc Dam Hydropower project in Vietnam to offset towards operational emissions.

EPA Victoria
01/07/2010 to 30/06/2011

Thank you for taking meaningful action on climate change and supporting clean energy.

Total Greenhouse Gas Savings

171.53 tonnes

Joel Fleming Founding Chairman

CERT#00011878

climate® friendly
www.climatefriendly.com

APPENDIX P: CO ZERO VCS ACCREDITED THAI WASTEWATER OFFSET PURCHASE DOCUMENTATION

Fwd: Markit Environmental Registry - Unit Retirement
Jemima Hastings
to:
Olivia.Tattam
07/10/2011 11:46 AM
Hide Details
From: Jemima Hastings <jhastings@cozero.com.au>

To: Olivia.Tattam@epa.vic.gov.au

2 Attachments

cozerosig.jpg

Hi Olivia,

Please find retirement notification below.
I will let you know as soon as the official certificate of retirement arrives in the mail and will forward on via Express Post.

All the best with finalizing EPA carbon neutral assurance statement - Please let me know if there is anything else I can do for you.

Kind Regards,

Jemima Hastings
Account Manager COzero

COzero™
change tomorrow, today

P. 1300 BE NEUTRAL
D. +612 9011 7804
F. +612 9012 0385
W. http://www.cozero.com.au

PO Box R775
Royal Exchange
NSW 1225

Level 2
71 Macquarie Street
Sydney 2000
Australia

-------- Original Message --------
Subject: Markit Environmental Registry - Unit Retirement
Date: Thu, 6 Oct 2011 20:37:08 -0400
From: environmental@markit.com
To: jhastings@cozero.com.au

markit Financial Information Services

Retirement Notification

Dear Jemima Hastings,

The following retirement has been completed in the Registry:

Organization Details:

Account Name: COzero Pty Ltd
Account ID: 100000000000075
Contact Name:
Contact Email:

Retirement Details:

Project Name: SD Biosupply Wastewater Treatment and Biogas Utilization Project
Vintage Year: 2008
Quantity: 1000.00000
Credit Type: VCU (tCO2e)

Retirement Date: 6 October 2011

Remarks:
Surrendered on behalf of EPA Victoria

Retirement Certificate: Required

Regards,

Markit Environmental Registry Operations Team

Markit Environmental Registry
620 8th Ave., 35th Floor
New York, NY 10018
Phone: +1 (212) 205-1200
environmental@markit.com
www.markitenvironmental.com

About Markit

Markit is a leading, global financial information services company with over 1,900 employees. The company provides independent data, valuations and trade processing across all asset classes in order to enhance transparency, reduce risk and improve operational efficiency. Its client base includes the most significant institutional participants in the financial marketplace.

APPENDIX Q: CLIMATE POSITIVE CDM-ACCREDITED CHINESE WIND FARM OFFSET PURCHASE DOCUMENTATION

This is to certify that

EPA Victoria

OFFSET 1000 TONNES OF GREENHOUSE GAS EMISSIONS IN SEPTEMBER 2011
WITH OFFSETS FROM THE BOGEDA 40.5MW WIND FARM PROJECT IN CHINA

Climate Positive offsets greenhouse gas emissions through independently verified emission reduction projects which have a renewable energy component. Climate Positive goes further to address carbon debt. For every tonne offset, an additional 4m^2 of biodiverse forests are restored on permanently protected land.

Visit projects and plantings at www.climatepositive.org