Carbon Down

Guidelines for Measuring Carbon Emissions

in Small and Medium Enterprise Programs

CONTENTS

→ INTRODUCTION

Carbon Down is a partnership between the Victorian Government agency Sustainability Victoria and the Victorian Employers' Chamber of Commerce and Industry (VECCI) aimed at reducing the environmental impact of Victorian businesses. The overarching goal of Carbon Down, which ran from 2008 to 2011, was to raise awareness among Victoria's 514,000 small to medium-sized enterprises (SMEs) of the need to reduce carbon emissions for both environmental and economic benefits.

Carbon Down's primary strategy was to partner with large companies and organisations to develop voluntary programs and services to help SMEs to reduce their carbon footprint and reduce operating costs in the process. Carbon Down partnered with Victorian business and industry, providing knowledge, funding and support to significantly reduce carbon emissions through education and behaviour change. These programs are outlined on page 7 and in Section 3 of these guidelines. The Carbon Down objectives were to:

- → Raise awareness among Victorian SMEs of the need to reduce carbon dioxide emissions for environmental and economic benefit
- → Increase the number of SMEs taking direct action to reduce carbon emissions
- → Demonstrate measurable and verifiable carbon equivalent emission reductions by SMEs (see Figure 1 for definitions of measurable and verifiable).

Carbon accounting can rarely be 100% accurate given that there are various scientific and estimation uncertainty factors when measuring greenhouse gas activities. Additionally, when undergoing carbon reduction activities, measuring and verifying these reductions against recognised carbon accounting standards can be limited by a lack of documentation. In acknowledging that verification of carbon emissions reductions is not always possible, Carbon Down recognised that it was still possible to measure some of the outcomes. Therefore, two approaches were undertaken to measure the reduction of carbon emissions through Carbon Down programs: verifiable and unverifiable.

Figure 1: Definition of verified and unverified measurement of carbon emission reductions

[1] A confidence factor of 0 to 1 is applied to all activities undertaken by carbon reduction programs. Confidence factors account for the variables and risk factors involved in a given activity, and allows for a more conservative estimation of program results.

→ OBJECTIVES OF THE GUIDELINES

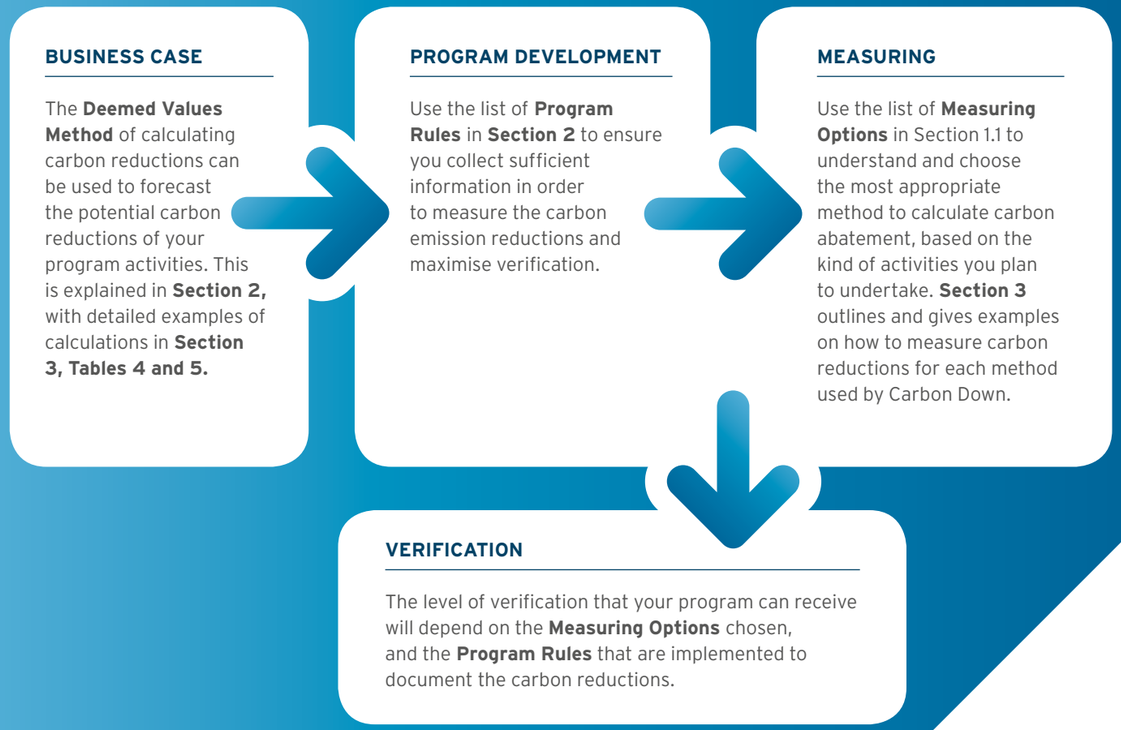
These guidelines have been developed based on Carbon Down's experience in delivering programs and services to help SMEs reduce carbon emissions. Carbon Down utilised existing State-based initiatives, and documented their learning in order to share this experience with other programs, assist program managers with the process of carbon accounting and increase the quality and prevalence of carbon reduction measurements more generally.

Program managers can use these guidelines as a reference tool for developing a functional carbon forecasting and accounting framework specifically designed for the SME environment.

The guidelines consist of three sections:

- **SECTION 1:** The measuring options available to quantify carbon reductions based on program objectives and the types of activities undertaken. Section 1 outlines the three methods used by Carbon Down to deliver various carbon reduction activities for SME participants: Project Impact Assessment, Metered Baseline and Deemed Values.
- **SECTION 2:** Considerations for maximising the verification of carbon reductions. Program rules are created in the development stage of each program to ensure that sufficient information is collected from participants as evidence for verification purposes. Section 2 includes examples of specific program rules within Carbon Down.
- **SECTION 3:** The assumptions required to calculate and forecast carbon emission reductions for a range of program types. Section 3 provides examples of carbon reduction activities undertaken by Carbon Down programs, and the assumptions and variables required to calculate the carbon savings.

Figure 2: Where the guidelines can be used



→ KEY CONSIDERATIONS

When measuring program outcomes, collecting documentation of carbon reduction activities becomes a challenge when targeting many businesses. This was the experience of Carbon Down, and was compounded by the fact that many SMEs do not have time to allocate resources to effectively report their carbon emission reductions for non-mandatory programs. The voluntary nature of the program made it harder to obtain robust data and verify the carbon reductions.

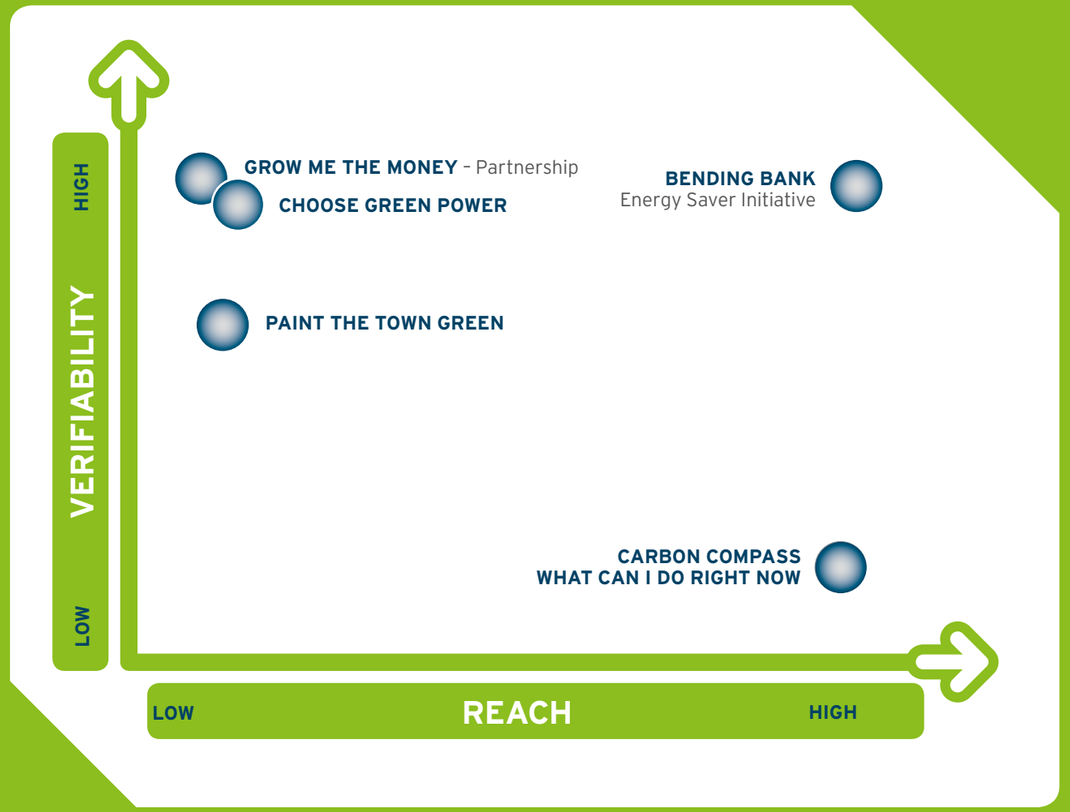
As one of the objectives of the Carbon Down program was to encourage as many SMEs as possible to take direct action, it was important to ensure that Carbon Down's limited resources were allocated wisely and time and money invested in collecting documentation did not exceed the amount invested in action to reduce emissions. Carbon Down carefully navigated the competing demands of maximising reach and verifying carbon reductions.

Adding to the complexity, unlike residential schemes, business owners are not always present at their premises when a carbon reduction activity is undertaken (examples of Carbon Down program activities can be found in Section 3). Obtaining signatures from owners attesting to an activity being performed can often mean return visits are required.

In recognition of these barriers, prospective program managers must therefore strike a balance between verifying their program's carbon emission reductions and reaching a larger proportion of the SME sector. Verifying carbon reductions and reaching a large number of SMEs both require substantial resources and program managers should take this into consideration when designing and implementing programs.

→ PROSPECTIVE PROGRAM MANAGERS MUST THEREFORE STRIKE A BALANCE BETWEEN VERIFYING THEIR PROGRAM'S CARBON EMISSION REDUCTIONS AND REACHING A LARGER PROPORTION OF THE SME SECTOR.

Figure 3: Below illustrates how some of the Carbon Down programs spanned the spectrum across both reach and verification continuums.



- Carbon Compass and What Can I Do Right Now were simple-to-use online resources that provided resource efficiency and carbon reduction advice, and were therefore able to reach large audiences. However, because of the simple interface, the level of evidence of implementation by online users was limited. These programs, therefore, had low verifiability.

- Grow Me the Money and Choose Green Power required greater compliance from participants to support their carbon reduction activities (such as supplying data on energy usage and changing electricity suppliers). They therefore attracted fewer participants, but yielded verifiable results in terms of emissions reductions.

- Paint the Town Green involved direct engagement with participating SMEs and was therefore limited in reach. However, it provided (and in some cases installed) physical items to SMEs in order to reduce energy usage, which was easily documented and verified.

- The Bendigo Bank Energy Saver Initiative involved the physical distribution of items, but leveraged the customer base of the bank to reach a larger audience than Carbon Down could reach alone.

  The activities and measurement of their outcomes are further outlined in Section 3.

→ SECTION 1. MEASURING CARBON EMISSION REDUCTION

There are several methodologies that can be used to measure a reduction in carbon emissions. They differ in the level of accuracy delivered and assumptions used to calculate the reductions and also in the degree of effort required to collect data and maintain records.

All methods, however, should follow the Guiding Principles from the Greenhouse Gas (GHG) Project Protocol outlined in Table 1 on the facing page. These principles are intended to underpin all aspects of the accounting, quantification and reporting of program-based GHG reductions. Program managers should use these principles and core concepts to ensure carbon reductions are robust and verifiable.

Table 1: Core concepts and guiding principles of a SME carbon reduction program

CONCEPT	FEATURE	EXPLANATION
CORE CONCEPTS	REAL	Demonstrate that emission reductions have occurred.
	MEASURABLE	The baseline carbon emissions and carbon emissions reduction must be quantified and measurable.
	VERIFIABLE	Data and records must be maintained, and must be available on request.
GUIDING PRINCIPLES*	RELEVANCE	The records must measure the carbon emissions linked to the resource that is the focus of the program.
	COMPLETENESS	The documentation should account for and report on all GHG emission sources and activities. Disclose and justify any exclusions.
	CONSERVATIVENESS	Use conservative assumptions, values and procedures when uncertainty is high, and do not overestimate GHG reductions.
	CONSISTENCY	Consistent methodologies to allow for meaningful comparisons of carbon emissions over time should be used.
	TRANSPARENCY	Information should be documented clearly to enable verification. Any assumptions made must be documented. Calculation methodologies must be clearly documented.
	ACCURACY	The quantification of carbon emissions is accurate.

* The guiding principles are set out in the The GHG Protocol.

1

Once the program objectives and activities have been established, there are two steps required to quantify any reduction in carbon emissions from activities targeting SMEs.

The first step is measuring the reduction in carbon emissions from a specific activity and, typically, there are three key methods from which to choose:

METERED BASELINE METHOD

PROJECT IMPACT ASSESSMENT METHOD

DEEMED VALUES METHOD

The second step is to apply a confidence factor (also called an installation discount factor). This factor is applied to take account of the risk that some carbon-saving items may not be installed. For example, a program manager may choose not to directly install an appliance but to distribute them via mail. The following confidence factors can be applied:

- A confidence factor of 1.0 should be applied if the program manager is satisfied that the items/appliances have been installed, which may be on the basis of a written statement from the owner of the businesses confirming they have been installed, a written statement from an appropriately trained person who performed the installation or contractor invoices; or
- A confidence factor of 0.4 should be applied if a person has taken possession of the item/appliance, but the program manager does not have sufficient evidence that the item/appliance has actually been installed.[2]

Confidence factors are not applied under the Metered Baseline Approach because savings are not calculated on the number of appliances installed, but are instead based on actual consumption before and after the carbon reduction activity has taken place.

Carbon Down also applied confidence factors of 0.5, 0.7 and 0.8 for certain activities (see Section 3, Tables 3-5). These were applied based on sample data collected by Carbon Down and/or based on the number of unknown variables in the abatement calculations.

2

2 The New South Wales Energy Savings Scheme rule of 2009. www.greenhousegas.nsw.gov.au/Documents/ESSRule.pdf

→ 1.1 MEASURING OPTIONS EXPLAINED

The three methods outlined below vary in the number of assumptions used to calculate the reduction in carbon emissions and each one is suited to different program approaches. A comparison of the measuring options is summarised in Table 2 on pages 17-24.

1.1.1 PROJECT IMPACT ASSESSMENT METHOD

The Project Impact Assessment Method can be used to measure the reduction in carbon emissions in programs that aim to modify existing energy consuming equipment, processes or systems. It is most appropriate when emissions reduction is small compared to the total electricity consumed at the site. It may also be appropriate where baseline energy consumption data is unavailable or contains a high level of unexplainable variation. It should also be used where emissions reduction occurs across a number of sites. Carbon Down used this method, outlined in Table 3, to measure the impact on carbon emissions following the Distribution of fridge timers to SMEs in the Paint the Town Green program.

In order to claim carbon emissions reductions, it must be possible to demonstrate that the installations have lower GHG emissions than other comparable installations in Australia. Reduced energy consumption is determined by comparing the original energy consumption before the program was implemented with the consumption after it was implemented. Carbon reduction values are then assigned to the energy saving activities. These values can be based on observations, as in the case of Paint the Town Green. However, this method measures only the energy consumption of the equipment, process or system under consideration, and not overall energy consumption. This method also forms the basis of the Deemed Values Method, where once energy savings have been determined, they can be applied to widespread installations of the equipment. See section 1.1.3 for further details.

1.1.2 METERED BASELINE METHOD

The Metered Baseline Method of measuring reductions in carbon emissions involves comparing overall energy usage before and after the carbon saving actions have been implemented. This method, outlined in Section 3.2 of these guidelines, was used in, Grow Me The Money and required commitment from SMEs to document and report on energy usage.

1.1.3 DEEMED VALUES METHOD

The Deemed Values Method is a generic approach for measuring the lifetime or 'deemed' savings of an activity upfront or before the actual savings occurs. It is generally applied to carbon saving activities involving the installation or replacement of a range of common end user equipment types such as lights and refrigerators. It should be noted that these 'deemed' savings can be based on the Project Impact Assessments carried out by equipment producers and/or existing government departments. Prospective program managers that have access to existing energy saving data for specific equipment types (eg. Australian Energy Ratings, or from various State-based energy saving schemes), can create their own deemed values for program activities. This is a less accurate but cost-effective alternative to undertaking a Project Impact Assessment Method to test the energy savings from individual installations.

For accuracy, Carbon Down relied on the Deemed Values Method to measure the reduction in carbon emissions in a number of initiatives where all the data was not available. While it is not as precise as the Metered Baseline Approach, the Deemed Values Method does provide some level of accuracy without the need for SMEs to record and monitor their energy use that enables verification (in other words it can be independently assessed by a carbon accounting firm).

The Victorian Government's Energy Efficiency Target (VEET)[3] and the New South Wales Energy Saving Scheme[4] both use the Deemed Values Method. Carbon Down was able to use VEET deemed values to calculate the reduction in carbon emissions for a range of activities. Where Carbon Down was not able to use VEET deemed values, Carbon Down formed assumptions and created its own values, based on the best available information. Tables 4 and 5 provide details of how the deemed values were calculated for a variety of activities.

[3] Victorian Energy Efficiency Target scheme: www.veet.vic.gov.au/

[4] New South Wales Energy Saving scheme: www.ess.nsw.gov.au/

Within the Deemed Values Method, results can also be verifiable or unverifiable depending on the type and scope of activities undertaken.

A. **Verifiable –** This method of recording can be used when businesses have been contacted and their businesses attributes are known but is not suitable for the measurement of behaviour change actions.

B. Unverifiable – This method can be used when business attributes are unknown and consumption of the product is variable, particularly to measure the impact of behaviour change actions. Carbon Down developed a top down approach to measure carbon reductions for activities where many variables were taken into account.

With Carbon Down's emphasis on educating SMEs about climate change and the need to reduce carbon emissions, it was also important to record the value of these activities by quantifying the outcome regardless of their ability to be verified. So Carbon Down developed a top down approach to create averages for a range of variables to measure the likely reduction in carbon emissions as a result of behaviour change and education based activities.

In particular the top down approach is a useful way to measure carbon reductions in a non-market based, non-regulatory framework in particular:

- **When specific details of a business are not known or are too difficult to obtain.** For example, it is difficult to obtain all the information necessary to calculate the impact of changing heating and cooling temperature settings to save energy. There are a number of key variables to consider for calculating savings from heating including room size, number of employees, and whether the building is insulated or not. The time and effort required to collect this information would outweigh the benefits of carbon saved, unlike a simple lighting change from 75W to 15W light globe where hours of operation is the only key variable.

- **For mass reach education activities.** It would also be administratively burdensome to collect the information and documentation from every businesses required to measure carbon savings.

A lower confidence factor is introduced to this top down approach to reduce the risk of claiming greater reductions in carbon emissions than those actually achieved. This factor takes into account the action is a behaviour change that might not continue. It also takes into account the high number of assumptions used to calculate the carbon savings.

Table 5 outlines a range of assumptions required to calculate carbon reduction from:

- **Setting heating ventilation air conditioning systems (HVAC) to maximum efficiency (setting heating and cooling levels to energy saving levels)**

- **Turning off standby power**

- **Setting printers to default duplex printing.**

Table 2: Approaches to carbon accounting compared

	DESCRIPTION	SUITABILITY	EXAMPLE	COMMON CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
1. PROJECT IMPACT ASSESSMENT METHOD	Compare energy consumption of specific equipment, process or system under consideration before and after implementation.	→ When the reduction in carbon emissions is small compared to the total electricity consumed at the site → For use with programs where multiple SMEs will be targeted → Where the usage pattern of the equipment is constant e.g. Lighting, digital timers, computers in an office.	**Installation of Fridge Timers** Test the use of digital timers on a range of common refrigerators to arrive at an average mount of energy saved by installing digital timers that switch off fridges overnight. The appliance is then installed in multiple sites and the average energy saved is then applied across all sites. See TABLE 3 for further information and examples of this approach.	Need to test the range of expected appliance variations to ensure the average carbon savings is representative of the appliances that exist in the targeted SME sector. For example; if one or two door fridges exist in the targeted SME sectors then testing is required for both types of fridges.	→ Can be easily applied to many sites so suited to programs that have high reach targets → High confidence factors can be applied to the installation if accompanied with documentation to verify installation.	→ If the appliance or action is not common, expert testing is required → Not suited to behaviour change actions such as manually setting heating thermostats lower where the pattern of usage is dependent on too many variables.

cont' Table 2: Approaches to carbon accounting compared

	DESCRIPTION	SUITABILITY	EXAMPLE	COMMON CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
2. METERED BASELINE METHOD	Compare overall energy usage of a business before and after the carbon saving action(s) have been implemented.	→ For when large reductions in carbon emissions occur at few sites rather than many → For use where a SME is able to invest the time to create baseline data to compare usage against → Not suited to programs where the reduction is small but applied to multiple sites. The time required to report and monitor multiple sites out weights the amount of carbon saved at each site.	**Where a business wants to reach ISO 14006 parts 1 - 3 accreditation.**[5] SMEs collect information on all resource use, energy, waste, water and consumables and create a baseline before actions are implemented. Savings are then calculated against the baseline. See page 31 for further information and examples of this approach.	Need to overlay the comparison of energy use with business output increases/reductions. e.g. Output in hospitality businesses are likely to significantly affect energy output. Conversely an office based business's output is not likely to impact energy output significantly.	→ Accurate measure → Fewer assumptions used → High confidence factor.	Not as accurate if the output of a business before and after is different. Time needed to measure baselines not ideal for the time-poor SME sector.

[5] ISO 14006:2011 provides guidelines to assist organisations in establishing, documenting, implementing, maintaining and continually improving their management of ecodesign as part of an environmental management system (EMS).

cont' Table 2: Approaches to carbon accounting compared

	DESCRIPTION	SUITABILITY	EXAMPLE	COMMON CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
3A. DEEMED VALUES METHOD - VERIFIABLE	Generic approach for measuring the lifetime or 'deemed' savings of an activity upfront or before actual savings occur.	Is most appropriate when the reduction in carbon emissions is small compared to the total electricity consumed at the site. Suited for use in common appliances that meet Australian standards for appliances such as lighting, space heaters, air conditioners and hot water systems. Suited to where patterns of usage in appliances are constant e.g. Lighting, printers.	**Directly Changing 50W Halogens With 15W Compact Fluorescent Globes.** Lighting use can be averaged out across businesses and so it is easy to calculate reductions in carbon emissions per light globe replacement and then apply it to multiple sites. No testing is required unlike the project impact assessment method. Light globes also must meet rigorous testing to claim lifetime hours. Lifetime savings are therefore applied without the need to be tested. See Table 4 for further information and examples of this approach.	Confidence factors are generally applied as this approach is rolled out to multiple sites and there are more variables to take into account when calculating carbon reductions.	→ More suited to mass roll out → Minimal record keeping → Can claim savings upfront.	Some assumptions and averages are used. Lower confidence factors are generally applied as this method is less accurate than the metered baseline and project impact assessment methodologies.

cont' Table 2: Approaches to carbon accounting compared

	DESCRIPTION	SUITABILITY	EXAMPLE	COMMON CONSIDERATIONS	ADVANTAGES	DISADVANTAGES
3B. DEEMED VALUES METHOD - UNVERIFIABLE	Generic approach for measuring the lifetime or 'deemed' savings of an activity upfront or before actual savings occur.	Suited to programs where: → Multiple SMEs will be targeted → Activity being implemented is not bound by regulation or market rules → Consumption of a product is variable but the product is common enough to generalise the variables e.g. Behaviour change activities – such as turning heating down to save energy, printing duplex paper unlike lighting which is not highly variable → SMEs have self-reported action undertaken so most businesses attributes are unknown.	**SMEs set printers to default duplex printing to reduce paper use – self reported online.** Instead of using the baseline method above a range of assumptions can be applied to get a likely carbon reduction figure. The assumptions used are: → An average paper use per employee the amount of duplex occurring. e.g. 50% of paper printing will be duplexed if default setting is applied. See Table 5 for further information and examples of this approach.	Need to generalise consumption patterns of products.	→ Less resources required to measure savings → No data and record management requirements → No record keeping unless a sample is taken to verify self-reported action → Can measure likely outcomes where little information is known about the SME → Can measure and forecast likely outcomes of behaviour change activities.	→ Many assumptions used → Lowest confidence factor used compared to other methods due to least accuracy → Unverifiable.

→ SECTION 2. PROGRAM DEVELOPMENT
- VERIFICATION CONSIDERATIONS

While verification of carbon savings happens after program delivery, it is important to consider what information needs to be collected for verification at the program development stage. This section will provide you with an outline of what you need to consider to maximise verification of carbon savings. These considerations can be thought of as 'program rules'.

→ 2.1 PROGRAM RULES

Program rules are created to ensure information from participants is collected to maximise the amount of carbon savings and obtain evidence for verification purposes. For example:

- If you devise a program using the Metered Baseline Method to measure carbon savings, the rule created for this program could be:

  To be eligible for the free installation of lights you must supply one year's worth of electricity bills before and one year after the installation date.

- If you devise a program using the Deemed Values Method to measure carbon savings as a result of the replacement of an appliance such as lighting, the rule created for this program could be:

  To be eligible to claim a reduction in carbon emissions you must supply a form with the business owner's signature to confirm the appliance has been removed and replaced by a more efficient appliance.

It is essential to establish program rules to define the boundaries within which the program will operate. Rules will also determine the method of delivery for the program. The extent to which rules are implemented will impact on the robustness of the verification of the program's results. The documentation to support carbon reductions should generally include the following:

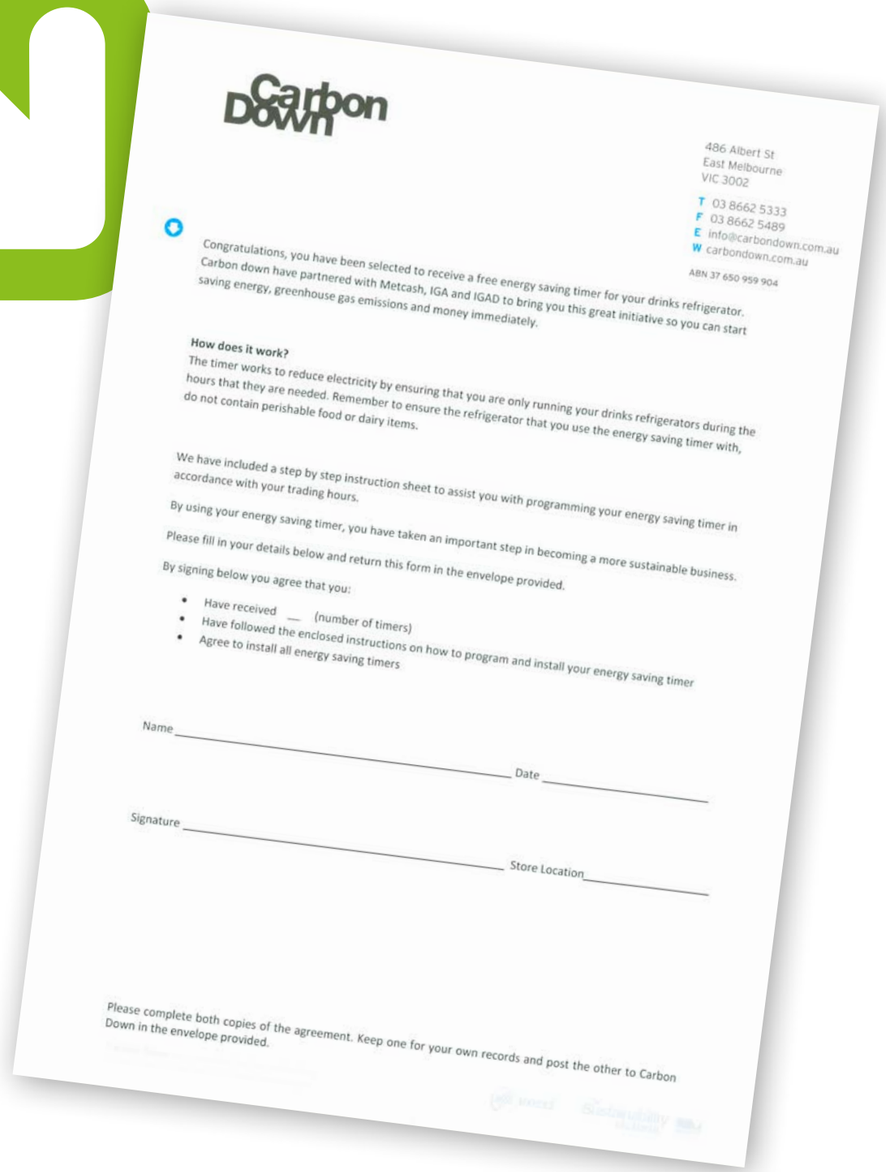
- The date the activity/installation has taken place
- Specific details about what activity was carried out
- The participating SME's business name and owner's signature
- Any other details which inform the activity/installation that is undertaken.

Program Rules vary according to program objectives, but three examples of program rules from Carbon Down include:

2.1.1 PROGRAM RULES EXAMPLE 1 - PAINT THE TOWN GREEN

Paint the Town Green was a Carbon Down initiative that entailed cold calling with an offer to send out free fridge timers to eligible businesses. Because Carbon Down was not installing the digital timers, program rules were created to collect proof that installation had occurred. Agreements were sent out with the timers and business owners were asked to fill in the agreements and post them back. The agreement gave instructions on how to install the timers and a space for the business owner to sign the agreement (see page 27).

A reduction in carbon emissions could be claimed with 100% confidence when the agreements were signed and sent back to Carbon Down, otherwise a 0.4 confidence factor was applied. Emissions reduction calculations are outlined in Section 3.



Carbon Down

486 Albert St
East Melbourne
VIC 3002

T 03 8662 5333
F 03 8662 5489
E info@carbondown.com.au
W carbondown.com.au

ABN 37 650 959 904

Congratulations, you have been selected to receive a free energy saving timer for your drinks refrigerator. Carbon down have partnered with Metcash, IGA and IGAD to bring you this great initiative so you can start saving energy, greenhouse gas emissions and money immediately.

How does it work?
The timer works to reduce electricity by ensuring that you are only running your drinks refrigerators during the hours that they are needed. Remember to ensure the refrigerator that you use the energy saving timer with, do not contain perishable food or dairy items.

We have included a step by step instruction sheet to assist you with programming your energy saving timer in accordance with your trading hours.

By using your energy saving timer, you have taken an important step in becoming a more sustainable business.

Please fill in your details below and return this form in the envelope provided.

By signing below you agree that you:

- Have received ___ (number of timers)
- Have followed the enclosed instructions on how to program and install your energy saving timer
- Agree to install all energy saving timers

Name _____ Date _____

Signature _____ Store Location _____

Please complete both copies of the agreement. Keep one for your own records and post the other to Carbon Down in the envelope provided.

2.1.2 PROGRAM RULES EXAMPLE 2 - BENDIGO BANK ENERGY SAVING INITIATIVE

Carbon Down's Bendigo Bank Energy Saving Initiative entailed distributing kill switches (power saving boards) to businesses that entered a competition that required them to write about their sustainable initiatives. Because Carbon Down was not installing the kill switches, program rules were created to collect proof that installation had occurred.

The program rules created were:

- → Businesses must go to their local Bendigo branch to pick up a kill switch and sign a form to provide proof of pick up
- → The forms were then sent to Carbon Down to provide an auditable trail for verification.

2.1.3 PROGRAM RULES EXAMPLE 3 - BENDIGO BANK BAN THE BULB

The Carbon Down Bendigo Bank - Ban the Bulb initiative involved replacing incandescent lights with energy efficient ones. Because Carbon Down was not installing the energy efficient lights, program rules were created to collect proof that installation had occurred.

The program rules created were:

- → SME businesses owner must sign a form attesting to the installation of the energy efficient light globes
- → Old incandescent lights must be counted at recycling point to crosscheck the number of energy efficient lights installed.

→ SECTION 3. EXAMPLES OF MEASURING CARBON ABATEMENT ACTIVITIES

→ 3.1 PROJECT IMPACT ASSESSMENT METHOD

Table 3 shows an example of a Carbon Down program that used the Project Impact Assessment Method to calculate and verify reductions in carbon emissions. In accordance with the criteria of this method outlined in Section 1.1.1, the installation of energy saving timers on beverage fridges reduced the electricity inputs of the fridges without affecting the beverages, thereby improving their energy efficiency. Moreland Energy Foundation Limited carried out independent testing on electricity usage of the fridges before and after the installation of the timers. This allowed Carbon Down to calculate carbon reductions from distributing the timers to participating SMEs based on the assumptions outlined below.

PROJECT IMPACT ASSESSMENT METHOD EXAMPLE

Table 3: Paint the Town Green's beverage fridge timer carbon savings calculations

PROGRAM ACTIVITY	EXPLANATION	ASSUMPTIONS	SAVINGS CALCULATIONS
Energy saving timers installed on beverage refrigerators.	Install 24-hour timers on beverage fridges with non-perishable items only, allowing them to automatically switch off outside of business operating hours and reduce electricity consumption.	Timer installed on a 2-door sealed fridge	Yearly energy saving = 1707 kWh
		Average daily use is reduced from 24 to 14.5 hours[6]	Annual carbon reduction = 1.37 emissions factor x 1707 kWh = 2339 kg CO_2 - e
		NGA emissions factor = 1.37 kg CO_2 - e/kWh[7]	Total abatement over years claimed with 100% confidence = (2339 x 5 years) x 1 = 11692.3 kg CO_2 - e
		Years claimed = 5 years	Total abatement over years claimed with 40% confidence = (2339 x 5 years) x 0.4 = 4667.18 kg CO_2 - e[8]

6 An observation from Moreland Energy Foundation's testing of timers on fridges.

7 Scope 2 and 3 emissions, Victorian NGA GHG Conversion Factor at the time activity was undertaken. www.climatechange.gov.au/~/media/publications/greenhouse-gas/national-greenhouse-factors-june-2009-pdf.ashx

8 Participating SMEs were in charge of installing the fridge timers. Upon receiving written confirmation that the timers had been installed, the reductions were assigned a confidence factor of 1. However, if the timers were distributed but written confirmation of installation wasn't received, the reductions were assigned a confidence factor of 0.4.

→ 3.2 METERED BASELINE METHOD

As discussed in Section 1.1.2, Carbon Down used the Metered Baseline Method in its partnership with Grow Me the Money, to measure reductions in carbon emissions from the program. This method involves comparing energy usage before and after the carbon saving actions have been implemented. All resource and GHG emissions savings reported by the Grow Me The Money program were based on comparisons of consumption data taken from participants' utility bills and followed the process outlined below.

1. A baseline period was chosen in order to compare energy consumption after implementation. For Grow Me the Money it was 12 months prior to the date the participant submitted their action plan, and utility bills largely provided the usage data.

2. Action plans for reducing carbon emissions were developed for participating SMEs.

3. After the action plan was submitted by the participant, the changes were implemented.

4. Carbon reductions were calculated individually for each participant by comparing all available consumption data from the year after implementation to the baseline period. This was measured by the reduction in kWh from the baseline to comparison period, as published in utility bills, multiplied by the current GHG conversion factor (the conversion factor used by Carbon Down is shown in Table 3).

5. Months were compared like for like to avoid inaccuracies caused by seasonal variations.

Please note: Consideration must be given to variations in output and whether the activity will be affected by businesses outputs. Energy savings measured after baseline comparisons assume output remains unchanged, which does not hold for all types of activities.

For example, it is reasonable to assume a lighting retrofit in a tenanted office will yield the same savings regardless of how busy the business is. Yet for hospitality equipment, energy savings may be underestimated if the business is experiencing a busy period and using more electricity in comparison with the base year. Conversely, energy savings could be overestimated if the year after implementation is particularly quiet and the business consumes less energy regardless of the new equipment installed.

Therefore, when calculating energy and carbon savings, SME carbon program managers should decide whether to collect data on participants' fixed and variable output to account for any output fluctuations, or assume uniform output and apply an appropriate confidence factor which accounts for this uncertainty.

→ 3.3 DEEMED VALUE METHOD

As discussed in Section 1.1.3, Carbon Down used the Deemed Values Method to calculate reductions in carbon emissions from several programs. This method was used when the carbon saving activity involved installing or replacing a range of common end user equipment types, and for certain behaviour change activities. Under this method, the carbon savings for the lifetime of the product or years claimed can be calculated upfront. Table 4 shows the activities undertaken with this method as well as the explanations of each activity and the assumptions used in the calculations.

As the table shows, each activity's deemed value can have varying degrees of accuracy. Where the saving is based on average emissions and characteristics of SMEs, then the carbon reductions will be less accurate. This is because reductions from behaviour change activities such as efficient HVAC usage can be administratively complex to measure for individual participants, so average usage and savings are used. That is why the Deemed Values Method is perhaps more useful when SME program managers are looking for a broad snapshot of the potential impact of a carbon saving program. Conversely, where the activity involves simple installations of energy efficient products that have been independently tested and verified, such as lighting replacements, the measurement of reductions in carbon emissions is more accurate.

Confidence factors are also applied to account for the variation in carbon savings across products and/or any doubts that the actions aren't fully undertaken. This provides for a more conservative estimation of emissions reduction figures, in accordance with the aforementioned guiding principles of carbon accounting outlined in Table 1.

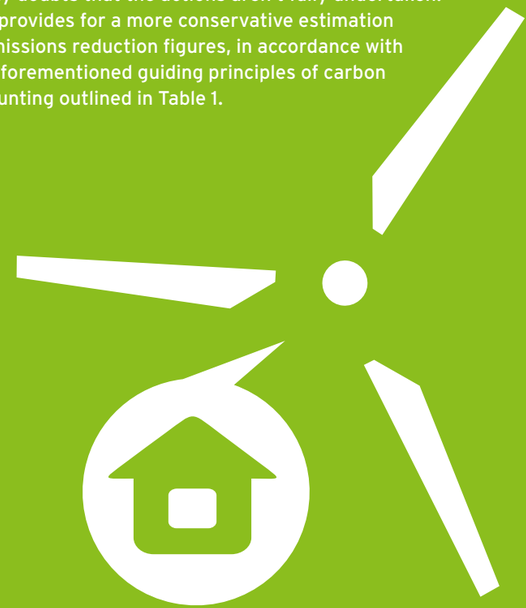


Table 4: Carbon Down activities that used the deemed values method when direct contact with participants occurred.

PROGRAM ACTIVITY	EXPLANATION	KNOWN VARIABLES	ASSUMPTIONS (ASSUMED VARIABLES)	CONFIDENCE FACTOR	SAVINGS CALCULATIONS
KILL SWITCH INSTALLATIONS (SELF-REPORTED INSTALLATION)	A four-plug Switch Power Board is installed to reduce standby power consumption	NA	kWh saved per plug = 0.015[9] Annual hours switched off = 16hrs per weekday + 24hrs for weekends and public holidays = 6760 hours	Confidence factor = 0.7[10]	Annual kWh saved = 4 plugs x 0.015 kWh saved x 6760 hours = 393.3 Annual GHG reduction = 393.3 kWh x 1.37 emissions factor = 538.8 kg CO_2 - e
		NA	Product life = 10 years[11] NGA Emissions factor = 1.37 kg CO_2 - e/kWh		Total abatement over product life with 70% confidence = 538.8 kg CO_2 - e x 10 years x 0.7 = 3771.7 kg CO_2 - e
REPLACE T8 FLUORESCENT TUBES WITH MORE EFFICIENT T5 MODELS (DIRECT INSTALLATION)	Standard fluorescent tubes known as T8 tubes can be replaced with more efficient tubes that save up to 25% of the energy required, or produce more light and/or allow the de-lamping of unrequired tubes	T8 kWh = 0.044 T5 kWh = 0.028 Lamp life = 35,000 hours	NGA Emissions factor = 1.37 kg CO_2-e/kWh	Confidence factor = 0.8[12]	Energy Saving = 0.044 - 0.028 = 0.016 kWh Energy saving over lamp life = 0.016 kWh x 35,000 = 560kWh Total abatement over lamp lifetime with 80% confidence = (560 kWh x 1.37 emissions factor) x 0.8 = 613.76 kg

9 Based on average office equipment usage survey in 2005: www.energyrating.gov.au/library/details200522-standby-local-gov.html

10 A confidence factor of 0.7 was applied based on the fact that there were several unknown variables in the abatement calculations.

11 Kill Switch life was extended to 10 years by the Department of Primary Industries: http://new.dpi.vic.gov.au/__data/assets/pdf_file/0019/100639/VEET-Draft-Regs-Ductwork-and-SPC.pdf

12 Despite the fact that PTTG had 100% confidence of installations, a confidence factor of 0.8 was used to control for possible future changes to the emissions factor of T8 tubes, due to renewable energy targets changes.

Table 5: Carbon activities that used the deemed values top-down approach for behaviour change activities and/or when the business attributes are unknown.

PROGRAM ACTIVITY	EXPLANATION	KNOWN VARIABLES	ASSUMPTIONS (ASSUMED VARIABLES)	SAVINGS CALCULATIONS
SET HVAC SYSTEMS TO MAXIMUM EFFICIENCY (BEHAVIOUR	Ensure temperature settings are adjusted to levels which produce optimal heating, ventilation, and air conditioning (HVAC) efficiency whilst still delivering on comfort	Victorian SME average annual natural gas and electricity emissions = 69.9 tCO_2 - e[13] Average SME HVAC energy load = 36%[14] 10% energy saving from setting HVAC systems to maximum efficiency[15] Years claimed = 2 years	Confidence factor = 0.5[16]	Total emissions from HVAC = 69.9 tCO_2 - e x 36% = 25.16 tCO_2 - e Total annual carbon saved = 25.16 tCO_2 - e x 10% = 2.51 tCO_2 - e Total deemed abatement over years claimed with 50% confidence = (2.51 tCO_2 - e x 2) x 0.5 = 2.51 tCO_2 - e
TURN OFF STANDBY POWER	Ensure all appliances are switched off at the power point overnight or when not in use. Standby power from office appliances can comprise up to 5% of office energy use.	Victorian SME average annual electricity emissions = 68.3 tCO_2 - e[17] 6% energy saving from switching off standby power[18] Years claimed = 2 years	Confidence factor = 0.5	Total annual carbon saved = 68.3 tCO_2 - e x 6% = 4.098 tCO_2 - e Total abatement over years claimed with 50% confidence = (4.098 tCO_2-e x 2 years) x 0.5 = 4.098 tCO_2 - e

13 Estimated based on national SME (excluding micro non employing businesses) average natural gas and electricity consumption and Victoria's scope 1 & 2 emissions factors.

14 Sustainability Victoria Energy Use by Sector: www.sustainability.vic.gov.au/www/html/1820-energy-use-by-sector-.asp

15 www.carboncompass.com.au/hint-and-tip/set-heating-ventilation-and-air-conditioning-hvac-systems-maximum-efficiency

16 Behaviour change confidence factors were more conservative to reflect the uncertainty of activity uptake, and in some cases were based on sampling.

17 Estimated based on national SME average electricity consumption (excluding micro non employing businesses) and Victoria's scope 2 emissions factor.

18 AGO & ICLEI, Australia's Standby Power Strategy (2006).

PROGRAM ACTIVITY	EXPLANATION	KNOWN VARIABLES	ASSUMPTIONS (ASSUMED VARIABLES)	SAVINGS CALCULATIONS
SET PRINTERS TO DEFAULT DUPLEX PRINTING	Set printers to default duplex printing to reduce paper costs and associated biodiversity loss from paper consumption.	Average annual reams used by a SME = 201[19] Assume 50% of paper is duplexed, and therefore a 25% reduction in paper usage.	Confidence factor = 0.7	Paper reduction = 25% x 201 reams = 50.25 reams Annual carbon saved = 4.66 emissions factor x 50.25 = 234.165 kgCO_2 - e
		Emissions per ream = 4.66 kgCO_2 - e[20]		Total carbon saved over years claimed with 70% confidence = (234.165 x 2) x 0.7 = 327.82 kgCO_2 - e
		Years claimed = 2 years		Total deemed abatement over years claimed = 163.91 x 2 = 327.83 kg

19 This is calculated by annual reams used by VECCI employees and multiplied by average number of SME staff (10).

20 This is based on Virgin fibre content paper, which emits 1.867 CO_2 - e per kg of paper used. Each ream weighs 2.5kg, thus each ream emits 2.5 x 1.867 = 4.66 kg CO_2 - e. Source: www.epa.vic.gov.au/climate-change/carbon-management/Worksheet_4-Paper.pdf

Carbon Down

486 Albert Street,
East Melbourne
Victoria 3002

p. 03 8662 5490
f. 03 8662 5489
e. info@carbondown.com.au

www.carbondown.com.au

vecci

Sustainability victoria

State Government Victoria

Carbon Down is a climate change partnership between VECCI and the Victorian Government.