Community Greenhouse Gas Reporting: A Guide for Local Government

Prepared by Southern Tasmanian Councils Authority under the Regional Climate Change Initiative May 2019, based on the original pilot methodology by City of Hobart and updated in 2023

Final as of August 2023

Contents

Glossary

GHG	Greenhouse Gas
CO_2-e	Carbon Dioxide Equivalent
CCP	Cities for Climate Protection
NGA	National Greenhouse Accounts
GWP	Global Warming Potential

Executive summary

ESTIMATING COMMUNITY EMISSIONS HELPS WORK OUT WHERE TO TAKE CLIMATE ACTION

The establishment of a baseline community energy and emissions inventory is the first step for councils in determining a zero emissions pathway and identifying effective and relevant local abatement activities. This approach is internationally recognised as the best practice to informed climate action.

TO ADDRESS AN IMPORTANT INFORMATION GAP THE SOUTHERN TASMANIAN COUNCILS AUTHORITY DEVELOPED A METHOD FOR ESTIMATING COMMUNITY ENERGY USE AND GREENHOUSE GAS EMISSIONS

The Climate Collaboration Project 2023 was a project undertaken by the Regional Climate Change Initiative (RCCI), under the auspices of the Southern Tasmanian Councils Authority's (STCA) that utilised earlier work to further develop a free community greenhouse gas emissions footprint reporting template. The 'Southern Tasmanian Regional and Municipal Energy and Emissions Project 2018' was an initiative of the STCA, RCCI. Developed and piloted by the City of Hobart in 2016, the methodology was then further developed by the 12 southern Tasmanian councils through the STCA Regional and municipal energy use and greenhouse gas Project 2018, which delivered municipal and regional community energy and greenhouse footprints in 2019.

Importantly the above projects fill an information gap as there is no mandated method for local government greenhouse reporting in Australia or Tasmania. The RCCI/STCA method estimates emissions by using the Australian Energy Statistics for Tasmania on a per capita basis and applying standard Australian Government National Greenhouse Factors.

THE STCA METHOD FOR ESTIMATING COMMUNITY ENERGY USE AND GREENHOUSE GAS EMISSIONS IS SIMPLE, OPEN SOURCE AND FREE

Cost is major deterrent for most councils to complete and update community emission footprints over time. The Project's open-source method provides councils Australia-wide

free access to a consistent and simple method for calculating community energy use greenhouse footprints.

The method developed by the STCA was designed with councils in mind and considers:

- free availability - as councils have little to no resources to conduct this work, it can be completed in-house by a staff members
- reliance on information and government data that will be available over time, facilitating consistency over decades of reporting
- straightforward steps, as open source material, requiring less decision making and independent calculations so councils can repeat the process and report back to their communities regularly
- reporting simplicity – by grouping data into categories such as 'residential' or 'commercial' instead of 'scope 1' and 'scope 2' or 'stationary' or 'non-stationary'. Though as the data provided is source detail based so it can easily be grouped into scope categories.

WHY DID THE STCA DEVELOP A NEW COMMUNITY ENERGY USE AND GREENHOUSE GAS EMISSIONS METHOD?

There is no standard way for councils in Tasmania and throughout Australia to report community energy use and greenhouse gas emissions. The Cities for Climate Protection (CCP) program through the International Council for Local Environmental Initiatives (ICLEI) program had the support of the Australian Government until 2010 to provide a voluntary reporting standard for several hundred local governments throughout Australia. The STCA filled this gap by building on councils' experience with CCP reporting and creating an open-source free version of community greenhouse reporting.

Since then, some councils have undertaken reporting by engaging various consultants. The drawbacks to this approach are the results are not comparable due to the differing parameters, consultants can regard the base data and model as IP protected and do not provide free and transparent access to results as well as charge an ongoing fee to repeat the process for councils.

THE DETAILED BASE DATA IN THE STCA METHOD MEANS THAT IS ALIGNS WITH OTHER REPORTING METHODS.

The STCA method uses the Australian Energy Statistics where the data is provided by energy source (electricity, gas, coal and other) and grouped according to Australian and New Zealand Standard Industrial Classifications. These can be grouped as Scope-1 (inside the municipality fuel use) and Scope-2 (electricity generation outside the municipal boundary and used inside).

THE STCA METHOD FOCUSES ON EMISSIONS FROM ENERGY USE AS IT IS THE LARGEST AREA OF EMISSIONS (49%) IN TASMANIA.

It provides a first-pass assessment of our communities' emissions and energy use. It does not include emissions from the: agricultural (which represent a third of Tasmania's emissions), industrial (19%) and waste (4%[1]) sectors, however, subsequent reporting can include if required. It is noted that waste is captured in councils' corporate emissions reporting as, for the most part, Tasmanian councils own and manage landfills/waste.

THE PROJECT'S FINDINGS ARE WITHIN RANGE OF THE TASMANIAN CLIMATE CHANGE OFFICE'S (TCCO), TASMANIAN GREENHOUSE GAS ACCOUNTS STATE GREENHOUSE GAS INVENTORY 2015-16, DESPITE THE TWO BEING BASED ON DIFFERENT AUSTRALIAN GOVERNMENT STATISTICS.

The Project identified that the regional energy-use greenhouse gas emissions were 2.6 m e-CO_2t, 68% of the State's energy-use related greenhouse gas emissions results of 3.98 m e-CO_2t.

The TCCO results are based on the National Greenhouse Accounts, which are used for Australia's broad-scale reporting requirements under the United Nations Framework Convention on Climate Change and is not suitable for local purposes as the level of detail is too limited (focussed on greenhouse gas emissions without clear energy/waste sources). The Project's results, however, are based on the Australian Energy Statistics which is based on fine detail energy use, and in addition metered electricity data from TasNetworks.

[1] Tasmanian Climate Change Office, Tasmanian Greenhouse Gas Accounts State Greenhouse Gas inventory 2021: Tasmania's Greenhouse Gas Emissions | Renewables, Climate and Future Industries Tasmania (recfit.tas.gov.au)

Part 1: Introduction

WHAT IS A GREENHOUSE GAS INVENTORY?

A greenhouse gas emissions inventory or profile is a list of greenhouse gas emissions from a set of activities. An inventory process collates information on energy consumption from across the region so that it may be further analysed and utilised by decision makers for policy development.

Inventories are constructed from energy use data such as electricity, natural gas, fuel (diesel and petrol); and non-energy sources, such as emissions from landfills.

A COMMUNITY GREENHOUSE INVENTORY FILLS A GAP IN UNDERSTANDING

Knowing the quantity of emissions currently released each year, estimating future emissions and the quantity of allowable emissions to prevent further climate change helps global, national, state, regional and local communities determine goals and measure the success of abatement projects. The benefits to individual councils from greenhouse gas reporting can include:

- more accurate information to increase community understanding and identify local trends;
- new opportunities to raise awareness of climate change and market the opportunities for abatement in the area/ in the home/ in the workplace;
- data for assessing the costs and benefits of abatement projects to maximise short to long term returns of any council investment;
- assistance with reliable project or program Key Performance Indicators (KPIs);
- useful information for developing new relationships and building on existing networks to optimise private and public sector funding arrangements; and
- access to up-to-date local information for decision maker reporting.

DEVELOPED BY LOCAL GOVERNMENT FOR LOCAL GOVERNMENT

The STCA developed a method for all Australian local governments to use based on the following local government requirements:

- accurate, consistent and accountable information provision, acknowledging that this is a rapidly expanding field and best estimates are sometimes all that is available
- publically available, regularly reported and funded by stable data sources so the inventory can be revised over time
- improve the quality of the inventory over time by acknowledging gaps and the resources/systems/processes required to fill those gaps
- substitute modelled information or estimates over time with more reliable and accurate sources, such as metered information
- provide as detailed insights into local trends as possible, while ensuring individual or company information cannot be identified
- outline straightforward processes for local government community energy and greenhouse accounting, so that other councils, and council staff, have the confidence to conduct inventories on behalf of their respective communities
- align with domestic, national and international reporting frameworks for local government

COMMUNITY VERSUS CORPORATE INVENTORIES

Inventories can be used to audit energy consumption from any activities (in the home, at work or transport options) over a period. By keeping the process simple and documenting the steps in the process, it can then be repeated to assess change and attribute savings to projects.

Typically, the easier areas to complete an inventory are where the organisation has the greatest control; over their own assets. This is known as a corporate inventory.

Community inventories are much more difficult to develop and maintain. This is due to the challenges getting access to accurate and up-to-date information and the diminished control and influence local government has over community behaviour, the local economy and factors of high influence such as energy regulation and pricing policies.

For further information on local government reporting options, including corporate reporting options, please refer to the corporate inventory section on the RCCI/STCA website: www.stcs.tas.gov.au/rcci/our-projects/councils-carbon-and-energy-footprints

Part 2: How to complete a community greenhouse gas inventory

COMPLETING A 'KEEP IT SIMPLE' INVENTORY

The data necessary for inventories is available from energy retailers or can be summarised from publically available government data; the Australian Energy Statistics. To complete a keep-it-simple inventory councils annually compile a summary of community energy use (electricity, fuel petrol/diesel, natural gas or other) in a spreadsheet format. Then it is as simple as adding an emissions column and formula to convert energy to greenhouse gas (GHG) emissions to the spreadsheet to generate the emissions footprint.

Step 1 Identify officer responsible for undertaking inventory. This officer should have skills and expertise in data management and the use of spreadsheets.

Step 2 Officer uses the Australian Energy statistics to build a foundation of energy use in the local area. Each category should be considered on merit – is there really coal or town gas burnt in the area? Exclude any categories you know to be irrelevant. Convert this information to local scale by using the per capita method.

Step 3 Officer requests summary from local energy providers(such as TasNetworks and TasGas) in an Excel spreadsheet format.

Step 4 Substitute in any further information that you may have at hand that provides a more accurate picture of energy use in the community, such as the amount of embedded energy generation from solar photovoltaics (PV), solar hot water, micro wind, and micro hydro systems, all publically available from Clean Energy Regulator statistics

Step 5 Determine the GHG emissions footprint by applying the National Greenhouse Account (NGA) Factors (updated annually and available online from Australian Government's webpage) to the energy data sources in the spreadsheet.

Step 6 Proof check - use supporting statistics and local information to identify and analyse trends – why did electricity use decrease that year – was it a particularly warm winter? Check the final results against the Australian Greenhouse Emissions Information System (AEGIS) results and the annual state government greenhouse gas inventories as a final check.

Stage 7 Present and regularly update findings to decision makers and the community. The inventory spreadsheet is retained within existing council data management (filing) systems for comparative and ongoing assessment and review.

KEY DECISIONS – COMPLETING A GREENHOUSE INVENTORY

DECISION 1: WHO WILL UNDERTAKE AN INVENTORY WITHIN COUNCIL

Setting up and completing an inventory for the first time is likely to take an officer a month of fulltime work, depending on the size of the council, however once the hard work is done it will take less time each year to update and complete (anything from a couple of days to a week of full time work). Experience from other councils has shown that allocating one person to this task minimises doubling up on information, improves communications within council regarding the project and ensures consistent information management methodologies. The council officer allocated responsibility to complete this task should have the ability to:

- perform basic multiplying, addition, subtraction calculations;
- sort, compile, store and record data systematically; and
- understand basic energy concepts to be able to present data in different units[2] - these concepts are further explained in the National Greenhouse Accounts

[2] If there are any queries with energy concepts there are explanations of the terminology on the internet at: http://www.eia.doe.gov/basics/conversion_basics.html and simple explanations of key concepts in the Glossary.

DECISION 2: WHAT INFORMATION IS INCLUDED AND EXCLUDED

As with any project, boundaries have to be clearly defined. Establishing what information councils are capable of collecting defines the boundaries of what is in and out of the inventory. The scope of inventories also depends on the degree of responsibility and ability to enact change in that area.

For the purposes of reporting, 'emissions' means the release of greenhouse gases into the atmosphere. Of the six main greenhouse gases (carbon dioxide; methane; nitrous oxide; hydrofluorocarbons; perfluorocarbons and sulphur hexafluoride) it is highly likely councils will report on only carbon dioxide emissions or tonnes of carbon dioxide equivalent, denotes by the sign tCO2-e (represents other emissions as carbon dioxide) . The remaining greenhouse gases are primarily accounted for in other sectors:

- the aluminium industry is primarily responsible for perflurocarbons (PFCs)[3];
- the electricity transmission and distribution networks are mainly responsible for sulphur hexafluoride (SF6) emissions[4],
- Hydroflurocarbon (HFCs) are mostly sourced from the refrigeration and air conditioners industry[5];
- Nitrous oxide is derived mainly from agriculture and land use change[6];
- Agriculture is responsible for most methane production; and
- Methane from waste breakdown at landfills is often owned by corporations or bodies other than councils[7].

Greenhouse accounting protocols[8] group energy and greenhouse gas information into three different scopes (Scope-1, Scope-2 and Scope-3) of data according to energy use and the resulting GHG emissions releases.

[3] http://www.environment.gov.au/settlements/challenge/members/aac.html

[4] http://www.environment.gov.au/settlements/challenge/publications/pubs/sulphurhexafluoride.pdf

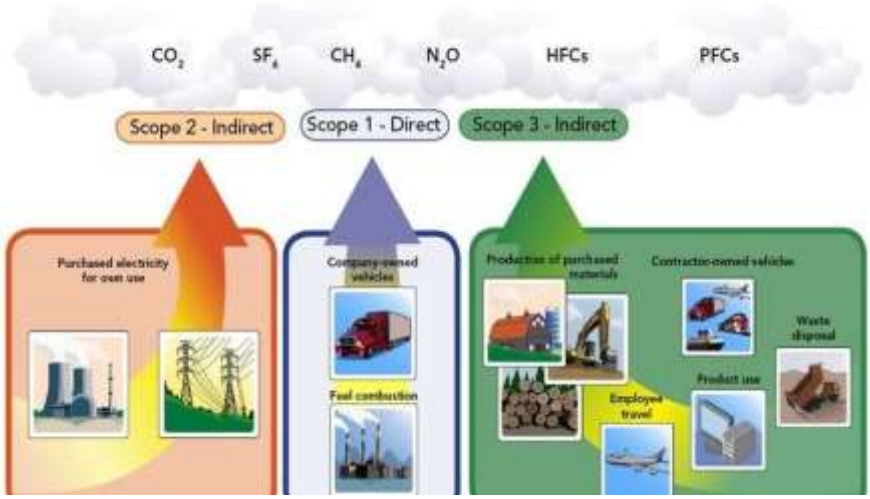
[5] http://www.environment.gov.au/settlements/industry/ggap/nrac.html

[6] http://www.climatechange.gov.au/ncas/reports/tr35final.html

[7] http://www.climatechange.gov.au/agriculture/emissions.html

[8] Australian Reporting requirements are outlined clearly under the NGER guidelines at: http://www.climatechange.gov.au/reporting/report.html . For information on international reporting see The Inter

Figure 1: illustrates 'scope1', 'scope 2' and 'scope 3' greenhouse reporting categories and associated activities



Waste has been and continues to be a challenging area for greenhouse accounting. There is an identified need for greater accuracy in measuring council-specific waste composition and gas quantities emitted from council landfills. Typically, those with operational control should report waste emissions. However, waste management is a key area for achieving emissions savings and local governments typically have access to data such as recycling rates and garbage tonnage to landfill, suggesting that in the least councils have an information reporting responsibility.

Waste was added to the community greenhouse gas emissions footprint in 2023, courtesy of the corporate emissions project undertaken by the RCCI, STCA.

DECISION 3: WHICH TIME PERIOD TO CHOOSE?

Greenhouse gas inventories typically occur over a calendar or financial year time period. Usually a base year is selected where there is the most comprehensive information set available as a starting point for comparisons to future emissions. It should be not too far away that the time period is no longer relevant and included enough years of information between the past and present to be able to identify trends. For the purposes of the STCA method reporting a base year of 2006-07 has been selected, mainly based on the

Governmental Panel on Climate Change (IPCC) website details on the 2006 IPCC Guidelines for National Greenhouse Inventories at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html

availability of more accurate electricity data and the decadal reporting with the current final year of 2020-21 in 2023.

Earlier data from 2004-05 is available to align with the Australian Government reporting obligations under the Paris Agreement.

DECISION 4: DATA COLLECTION SOURCES

Firstly, the selected officer requests summary data from energy providers (such as TasNetworks and Tas Gas Networks) in an Excel spreadsheet format. This may require approval and endorsement from managers or the General Manager.

Broadly, there is only one main source for free and reliable community energy information – the Australian Energy Statistics. This is supported by a range of other sources, such as TasNetworks electricity data, Clean Energy Regulator heat pump and renewables systems data and Australian Bureau of Statistics to provide further context. An example is the increased installation of heat pumps in Tasmania, where using a more efficient heating source uses less energy use overall, which may in part explain electricity efficiency improvements from year to year.

Rooftop solar photovoltaic (PV) systems have reduced the amount of electricity consumption recorded overall as those households with solar PV use more of their own generated power and less electricity from the grid. The Clean Energy Regulator (CER) provides small scale solar PV, wind, micro hydro and solar hot water systems data at a postcode level.

Population figures are used to convert data for different geographical areas in a fair and consistent manner. There are multiple ABS sources for population. The simplest approach of using the last Census 2016 material has been adopted. This reduces the amount of calculations required and the possibility of error.

Other factors that can also influence results:

- Number of new electricity meters in the area – a growth in connections (such as number of units at a single house) could distort the energy consumption per household data, so to address this the amount of electricity can be divided by the numbers of meters
- Local weather conditions or extreme events

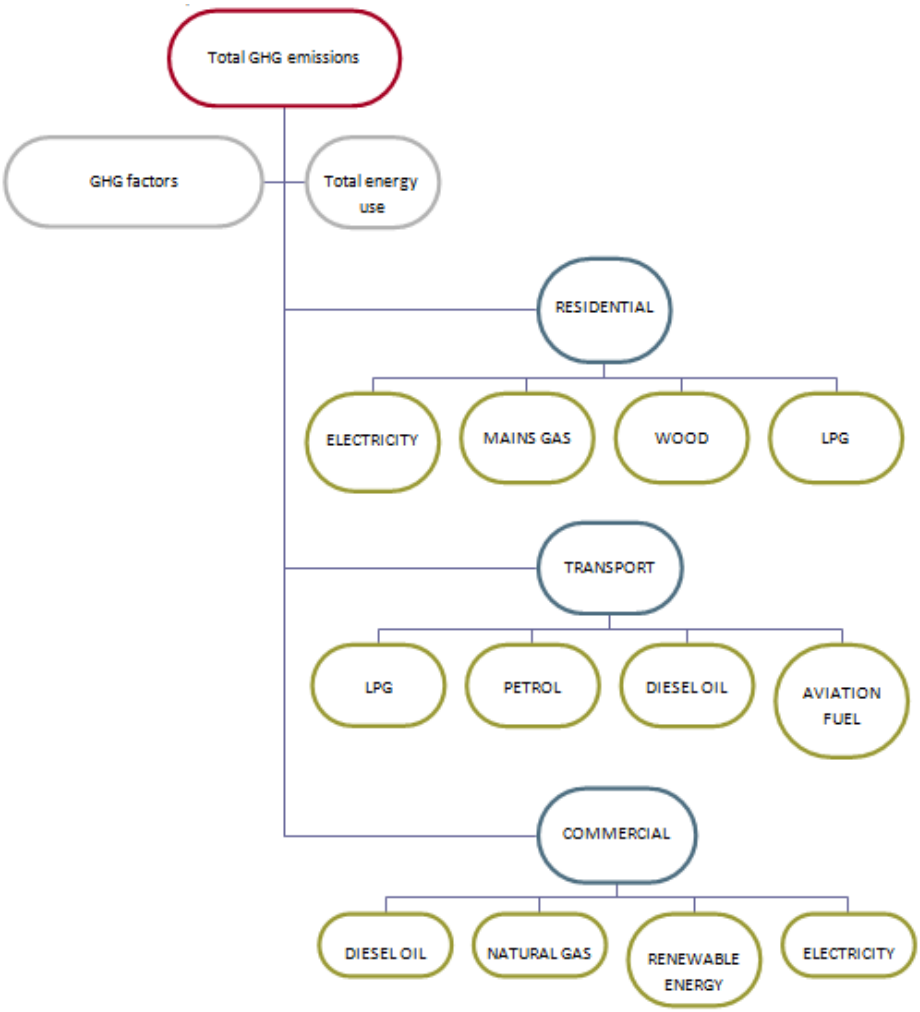
- Dwelling size /type changes – new buildings are generally more efficient resulting in less energy use per person
- Appliance changes – more computers than ever before, larger TV's, more efficient fridges

DECISION 5: STORING, COLLATING AND PRESENTING DATA

As part of greenhouse accounting it is important that councils keep consistent and verifiable records of the energy and emissions related data. It makes sense then to consider the design of a data storage system for energy and emissions related information. The STCA method is compatible with most data management systems as it uses a simple Excell spreadsheet.

The adoption of common reporting categories specific to councils is likely to provide greater transparency and enhance the community's understanding of local government's energy profiles than the use of 'scope 1' and 'scope 2' or 'stationary' and 'non-stationary'. The following categories have been used for easy understanding; residential; commercial; transport; industrial; agriculture and forestry.

Figure 2: Schematic showing how energy use data is grouped under example categories: the residential, commercial and transport sectors, for the STCA method



What are emission factors?

Due to difficulties accurately recording exactly what quantities and types of emissions are emitted, the Australian Government developed emissions factors for all energy uses and waste creation for the general public. To calculate total emissions the emissions factor is simply multiplied by the number of units of fuel, electricity consumed or waste created.

Emissions factors are developed in line with international standards and represent the total amount of emissions created through the unit carbon dioxide equivalent or CO_2-e[9]. This represents all gases converted to the same unit according to their Global Warming Potential (GWP). For instance 1 unit of methane represents 25 units of carbon dioxide equivalent (CO_2-e) as the GWP of methane is 25 times that of carbon dioxide. The Australian Government regularly updates emissions factors and publishes the most updated version of the NGA factors[10].

Calculating emissions

Essentially emissions are calculated by multiplying the NGA emissions factor per unit of fuel. Emissions factors vary according to whether or not the activity occurred on site for electricity use (direct Scope 1 emissions) or off site (indirect Scope 2 emissions).

Solar and renewables (except biomass/biogas/biofuel, which have relatively small emissions footprint) have zero emissions associated with energy generation.

Example: How to Calculate Emissions from Natural Gas

Table 1: Fuel combustion emissions – natural gas

Fuel sources generally release emissions at the point of use, through combustion. The emissions associated with the energy created are represented by kilograms of carbon dioxide (CO_2-e) per gigajoule (GJ). If the energy units available are in different units then the factor has to be converted to reflect the correct unit. An example: if data is in megajoules (MJ)'s, then this needs to be divided by 1000 to ensure the units are in gigajoules (GJ)'s.

Table 1: Example National Greenhouse Gas Accounts emissions factors

Example emissions factors(kg CO_2/GJ)

[9] The notation "-e" stands for equivalent. In this context it is to show that all other greenhouse gases recorded have been converted into this standard unit in line with international greenhouse accounting guidelines. For instance the global warming potential of methane is 21 times that of carbon dioxide, so one tonne of methane is equal to 21tCO2e.

[10] http://www.environment.gov.au/system/files/resources/3ef30d52-d447-4911-b85c-1ad53e55dc39/files/national-greenhouse-accounts-factors-august-2015.pdf

LPG	61.5
Auto gasoline-unleaded	67.42
Diesel	70.5
Fuel oil	73.56
Aviation gasoline	67.75
Aviation turbine fuel	67.04
Petroleum products	67.04
Natural gas	51.53
Electricity*	55.2(0.2kg/kWh)

Source:http://www.environment.gov.au/system/files/resources/3ef30d52-d447-4911-b85c-1ad53e55dc39/files/national-greenhouse-accounts-factors-august-2015.pdf *NB: the latest estimate is 0.22kg/kWh for electricity. The decision to keep the emissions factor constant avoids changes in the emissions factor influencing results from year to year.

Step 1 Establish the total fuel quantity consumed for the period i.e. 100kL per annum

Step 2 Multiply the total fuel quantity by the energy content factor to calculate the Total Energy annually i.e. 39.3GJ/kL x 100kL = 3,930GJ

Step 3 Multiply the Total Energy Content by the Total Emissions Factor (that is the CO_2 equivalent of all three gases released in natural gas combustion combined) to determine the annual Total Emissions i.e. 3,930GJ x 59.9kgCO2-e/GJ = 235,407 kgCO2-e

Step 4 Divide the annual Total Emissions by 1,000 to convert kg emissions to tonnage emissions i.e. 235,407kgCO2-e /1,000 = 235 tonnes of CO2-e

The Tasmanian Electricity Mix

Electricity is typically generated from multiple sources of energy that all feed in to the electricity grid. Each source of power has an emissions factor associated with every unit (kWh) contributed to the electricity main grid. The state electricity emissions factor represents an average for the year depending on what proportion of electricity has come from where. When Tasmania imports Victorian power via the Bass Strait electricity network connection, this significantly increases Tasmania's electricity emissions factor for that year.

To calculate total greenhouse gas emissions from electricity use, councils simply multiply the total amount of units (kWh) consumed throughout the specified year by the Tasmanian emissions factor.

Example: How to calculate emissions from Tasmanian electricity use

Table 2: Scope 2 Emissions – the generation of electricity offsite

Fixed emissions factor estimate for STCA method	0.2 Emissions Factor (Scope 2) (kgCO2-e/kWh unless otherwise indicated)

The following calculations are required to assess total emissions from electricity use:

Step 1 Establish the total electricity quantity consumed for the period e.g.100, 000 kWh per annum.

Step 2 Multiply the total electricity quantity by the emissions factor to calculate Total Emissions i.e. 0.2kgCO_2e/kWh x 100,000kWh = 20,000kgCO_2-e

Step 3 Divide total by 1 000 to convert kg emissions to tonnage emissions i.e. 20,000kgCO_2-e /1,000 = 20 tonnes of CO_2-e

DECISION 6: EXPLAINING INVENTORY RESULTS

The development of more complex analysis through the interpretation of inventory results provides councils with the basis to undertake abatement program design, implementation and evaluation. In this way councils can establish which options provide the most significant short, mid and long term return on investment.

Part 3: Step by step guide

Use the associated Excel worksheet as the tool to help you work out the exact numbers and formula. This spreadsheet is set up to complement this written guide. In the first instance primary data sources such as the original Australian Energy Statistics data are kept on separate tabs to the left of tabs outlining the main calculations. A summary tab right at the front to help check results. The spreadsheet works from left to right with the first sector residential, the last industry calculations. Any meter electricity data has specific data use requirements and these are outlined on a separate Excel spreadsheet.

STEP 1: DOWNLOAD THE LATEST AUSTRALIAN ENERGY STATISTICS

Go to the Australian Energy Statistics website and select the latest data download of *Table F1 Australian energy consumption, by industry and fuel type, energy units*.

Table E7 provides a general overview, however, does not have the same level of detail as Table F1. If you want to check the significance of each sector overall use Table E7.

Table 3: categories of reporting broadly reflect the groupings used by the Australian Energy Statistics Table E7

Regional Energy Project categories	Agriculture and forestry	Industry					Transport	Commercial	Residential
AES table E7 categories	Agriculture	Mining	Manufacturing	Electricity generation	Construction	Other c	Transport	Commercial b	Residential
2014-15 (PJ)	4.3	3.0	46.6	3.8	1.5	0.8	24.8	8.7	13.8

NB: b Includes ANZSIC Divisions F, G, H, J, K, L, M, N, O, P, Q, R, S and the water supply, sewerage and drainage service industries, and c includes consumption of lubricants and greases, bitumen and solvents, as well as energy consumption in the gas production and distribution industries; and energy that is unable to be classified.

STEP 2: USE THE AUSTRALIAN ENERGY STATISTICS AS A BASE FOR EACH SECTOR; RESIDENTIAL

2.1 Cut and paste the Australian Energy Statistic for your state under the residential heading into a new tab

2.2 Convert the results to gigajoules from petajoules for each energy use category
2.3 Divide the results by the population of the state or territory for each energy use category. If there is a shared boundary with another council/s split the results between boundaries by dividing by the number of councils involved.
2.4 Multiply the per capita results from step 2.3 by the population of your municipality for each energy use category
2.5 In the electricity use category replace any electricity estimates with metered data if this has been provided by your local energy retailer/supplier
2.6 Multiply the summary energy use results in each energy category by the specific emissions factor (National Greenhouse Accounts, Australian Government factors) for that energy use
2.7 Cut and paste the summary energy and greenhouse gas results into the summary tab

STEP 3: REPEAT THE SAME STEPS FOR THE REMAINING SECTORS; COMMERCIAL, TRANSPORT, AGRICULTURE AND FORESTRY AND INDUSTRY

3.1 Ensure care is taken for the most complex sector, industry, as it covers a number of subsectors such as mining, manufacturing, electricity generation, construction and 'other' (includes consumption of lubricants and greases, bitumen and solvents, as well as energy consumption in the gas production and distribution industries; and energy that is unable to be classified)
3.2 Substitute all estimates for electricity use if this has been provided for the industry sector. Otherwise, if total electricity use has been provided with commercial electricity data remove industry electricity data to avoid double counting

STEP 4: REVIEW THE RESULTS IN CONJUNCTION WITH OTHER SUPPPORTING INFORMATION

4.1 In sectors such as transport, where there is limited detail on the type of fuel end use review Australian Bureau of Statistics (ABS) data to establish the number and type of motor vehicle registrations for the municipality.
4.2 Additional sources of energy end use information include:

Tasmanian Energy Regulator annual reports – Energy Performance in Tasmania 2014-15 - mainly references material from the Australian Government departments
http://www.economicregulator.tas.gov.au/domino/otter.nsf/LookupFiles/Energy_in_Tasmania_-_Performance_Report_2014-15.pdf/$file/Energy_in_Tasmania_-_Performance_Report_2014-15.pdf

Tasmanian Energy Sector – An Overview – general trend descriptions http://www.dpac.tas.gov.au/__data/assets/pdf_file/0017/141803/Tasmania_s_Energy_Sector_-_an_Overview.PDF

Household Energy Use 2010-2012 – Australian Bureau of Statistics - The contribution of generating households is captured and the change in household electricity consumption over time, as SA2 level maps: Business Survey of Residential Electricity Distribution, Experimental Estimates from Household Energy Consumption Survey (cat. no. 4670.0). Also there are energy-related behaviours and perceptions and energy spend on transport and a detailed breakdown of types of energy efficiency measures implemented across Australia http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4670.0~2012~Main%20Features~Summary%20of%20Findings~13

NICTA – Australian Renewable Energy Mapping Infrastructure – 2014 - Depends on the use of resource availability. Can be used to present information on a map: http://newui.aremi.nicta.com.au/prototype/

Australian Energy Market Operator (AEMO) has detailed daily load profiles, based on meter substations (servicing multiple postcodes) The data is either too detailed or too high level to gain useful insights, but should be kept in mind to validate results for Tasmania: http://www.aemo.com.au/Reports-and-Documents

Australian Bureau of Statistics, wood heater use- The ABS publishes data for capital cities in relation the main source of energy for heating. This can be used as an indicator of wood heater use. The last report on data of this type is 4602.0.55.001 - Environmental Issues: Energy Use and Conservation, Mar 2014:http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4602.0.55.001Main+Features1Mar%202014?OpenDocument

Australian PV Institute – solar PV uptake by postcode, daily generation, based on CER data and their own calculations: http://pv-map.apvi.org.au/historical#10/-42.9051/147.2539

Part 4: STCA method overview

The Project estimates emissions by using the Australian Energy Statistics for Tasmania on a per capita basis and applying standard Australian Government National Greenhouse Gas Factors. The method provides councils Australia-wide free access to a consistent and simple method for calculating community energy use greenhouse footprints.

DEVELOPED WITH GREENHOUSE GAS INVENTORY PRINCIPLES IN MIND

The following principles are a guide to developing and assessing inventory reports:

- usefulness –maximising the usefulness, practicality and relevance of information provided;
- accuracy – ensuring that reported figures are correct and current;
- transparency – stating assumptions to provide clear and factual details;
- consistency over time – adherence to the same methodologies to improve the reliability of successive results; and
- completeness – reporting all emissions within the chosen inventory boundary and justifying the exclusion of other data.

In 2023 the RCCI, STCA addressed some of the areas for improvement identified in the points below, in the following ways:

- Most up-to-date information – the Australian Energy Statistics for Tasmania, National Greenhouse Gas Accounts factors and Australian Bureau of Energy statistics (electric vehicles census data) have been updated yearly since 2019, so this round of reporting includes several more years of data.
- Increasing scope of emissions included – estimates for waste and sewerage have been included for the first time. Both areas do not cover all emissions from each sector, rather a portion. For example, waste emissions are taken from the corporate inventories reported across the region and include only the measured waste to landfill, not commercial waste delivered outside of this. In the sewerage sector an estimate per capita has been used and does not account for the differing sewerage arrangements in regional areas, such as septic tanks, that have a differing emissions.

- Population growth now included – the last iteration of reporting used standard population figures and now these population figures are updated yearly, better reflecting growth and per capita energy use.
- Tasmania's emissions factors fluctuate due to variations in our energy mix (for example an increase in natural gas due to the Basslink failure saw an increase in the emissions factor for Tasmania) so emissions factors are revised yearly and have been revised historically sometimes changing the total emissions reported in hindsight.
- The range of data on transport is represented in the detailed data rather than summary reports. The Australian Bureau of Statistics has a range of information on local transport trends such as the southern Tasmanian region age of vehicle stock, fuel choices and commuter choices such as public transport, walking or cycling.

The scope/ boundaries of municipal inventories for the STCA projects previously, and form the basis of the method going forward:

1. The Australian Energy Statistics is the primary source of information, and is substituted with more accurate meter based electricity records

2. National Greenhouse Accounts factors are applied to determine the carbon footprint of energy use

3. A site based geographical approach to accounting, utilising the internationally accepted hierarchy (Carbon Development Program- CDP and ICLEI based) of scope 1 onsite use and scope 2 for electricity generation. Scope 3 is generally regarded as those emissions occurring across geographical boundaries, which cannot easily be attributed to one area. An example is transport emissions, which are emissions from transboundary journeys occurring outside the city boundary (state-wide statistics) reallocated to the municipal area boundary due to the use of the per capita method. For the purposes of the STCA method these are regarded as scope-1.

4. Scope categories are not reported in the STCA method, though the existing categories can be grouped into scope categories for scope based methods i.e. all electricity is scope 2.

5. A fixed emissions factor of 0.2kg/kWh or 55.2kg/GJ was selected for the STCA method based on the average of the last decade (2006-07 to 2016-17). This is expected to be reviewed every 5 years and the average updated. The graph below demonstrates that the fixed value of 0.2kg/kWh provides a reasonable representation of a very variable emissions factor from year to year.

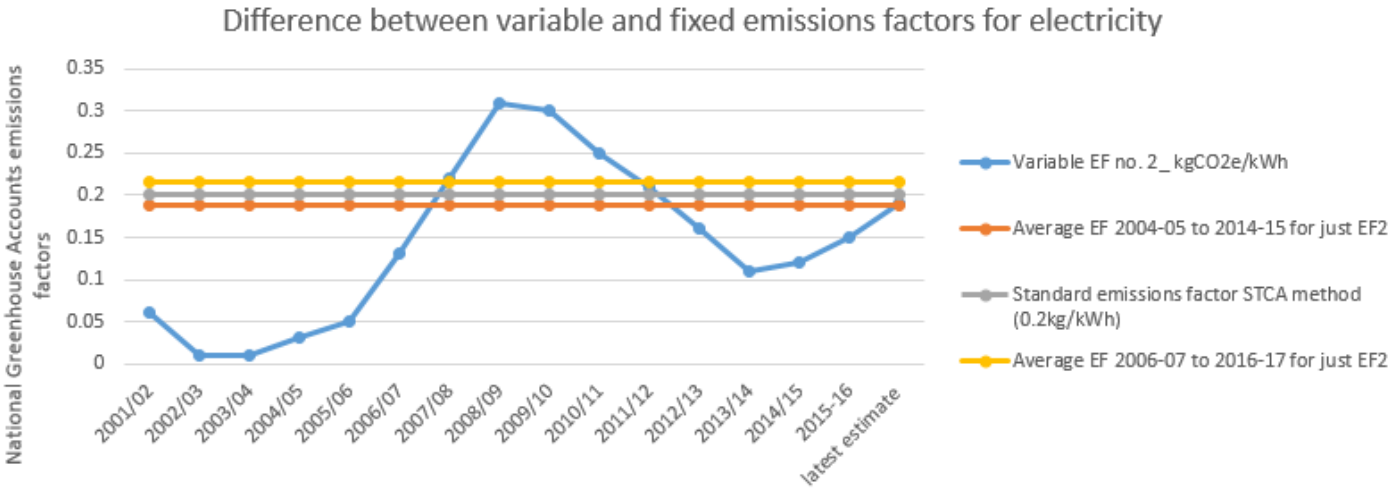


Figure 3: variable and fixed emissions factors for electricity

As the graph below demonstrates using an average emissions factor reduces the variability from year to year of emissions results from electricity use. By using a variable emissions factor, as outlined in the National Greenhouse Accounts, the impact is an estimated 3% of the total greenhouse results, however, the difference in a single year between the two approaches can be less than 1% (as occurs in 2016-17).

Figure 4: variable and fixed emissions factors for southern Tasmanian electricity impact on total emissions

Scope 2 emissions factors were used, excluding scope 3 – transmission from grid-supplied energy consumption. This was to avoid the possibility of double counting in the industry (electricity generation subsector) where it is less clear how the emissions from generation have been allocated.

The later method uses individual year to year emissions factors instead.

6. Street lighting, parks, community centres and other council operations are out of scope, as this information is accounted for in corporate inventories.

7. Agriculture, forestry and industrial processes, such as manufacturing energy use greenhouse gas emissions are in scope, however, consideration as to whether this is applicable to all municipal areas should be undertaken.

8. Out of scope are direct (non energy) emissions from the: agricultural (which represent 26% of Tasmania's emissions) and industrial (20%) sectors, however, subsequent reporting can include if required.

9. Septic tanks are out of scope; this is currently too challenging to gather accurate information for most councils and is likely to be a very small part of the GHG inventory.

10. Water and wastewater treatment plants are excluded. There are out of date council records available from when this infrastructure was managed by councils, however, these are now out of date and there are various sources of greenhouse data from AEGIS and the water management authorities.

11. National Pollution Inventory information is out of scope; it is assumed that refrigerants and other synthetic greenhouse gases and any relevant GHG reporting is gathered through government datasets such as the Clean Energy Regulator reporting and reflected in the Australian Energy Statistics, if applicable.

12. The midpoint method was used to calculate growth.

13. Postal services will be in scope in the transport area, which is in line with the ANZIC classification system, and covers; postal and courier pickup and delivery services, transport support services (port terminal operations, airports, customs and freight forwarding services), warehousing and storage services.

14. Electricity, gas, water supply, sewerage, drainage services and waste services are allocated to the industry sector. The Australian Energy Statistics energy use estimates are used for this sector, however, all electricity data is substituted by the use of measured meter based electricity data from TasNetworks. Division D: electricity generation has been included on the basis that the sector uses LPG, diesel and natural gas to produce electricity and represents 3.5% of the total Table E7 Australian Energy Statistics summary. Industrial electricity use has been moved into the commercial electricity use category, as a condition of data provision by TasNetworks (as to protect the privacy of individual companies that

may be able to be identified as the sole industrial facility in the area). Residential sector electricity use is presented separately in the residential sector.

15. An ANZSIC category classification system has been adopted[11], where possible, using the same categories such as agriculture and forestry (and fishing), residential, commercial (and services) and transport (postal and warehousing) and regrouped the following sectors under one banner as 'industry'; mining, manufacturing, electricity, gas, water and waste services and construction, as outlined in the Australian Energy Statistics categories below:

[11] http://www.abs.gov.au/ausstats/abs@.nsf/0/ACB7CD8AEEA9249ECA25711F00146D71?opendocument

Figure 5: ANZSIC category classification system

Table 2.1: Industries covered in the AES

Industry	Division	Subdivision	Group	Class
Agriculture, forestry and fishing	A			
Mining	B			
Oil and gas extraction		07		
Coal mining		06		
Other mining		08–10		
Manufacturing	C			
Food, beverages and tobacco		11–12		
Textile, clothing, footwear and leather		13		
Wood and wood products		14		
Pulp, paper and printing		15–16		
Petroleum refining				1701
Other petroleum and coal product manufacturing				1709
Basic chemical and chemical, polymer and rubber product manufacturing		18–19		
Non-metallic mineral products		20		
Glass and glass products			201	
Ceramics			202	
Cement, lime, plaster and concrete			203	
Other non-metallic mineral products			209	
Iron and steel			211–212	
Basic non-ferrous metals			213–214	
Fabricated metal products		22		
Machinery and equipment		24		
Furniture and other manufacturing		25		
Electricity, gas, water and waste services	D			
Electricity supply		26		
Gas supply		27		
Water supply, sewerage and drainage services		28–29		
Construction	E			
Commercial and services a	F–H, J–S			
Transport, postal and warehousing	I			
Road transport		61		
Rail transport		62		
Water transport		63		
International bunkers				6301
Coastal bunkers				6302
Air transport		64		
Domestic air transport				
International air transport				
Other transport, services and storage		65–67		
Residential				
Solvents, lubricants, greases and bitumen				

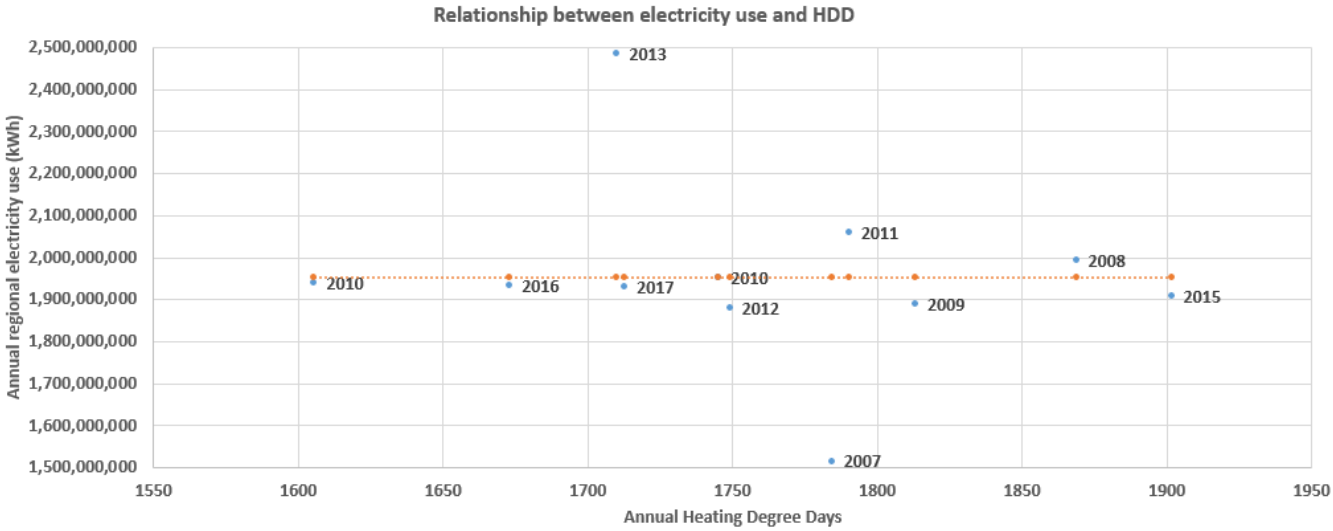
Notes: a Includes divisions F, G, H, J, K, L, M, N, O, P, Q, R, S.

Source: Modified from ABS (2013), *Australian and New Zealand Standard Industrial Classification (2006 edition)*, cat. no. 1292.

16. The impact of weather was not isolated through the STCA method. As one of the most important factors influencing heating energy use in Tasmania the number of Heating Degree Days was analysed against electricity use, providing some insights into the influence of weather on local results. Heating degree days (HDD), provided by the Bureau of Meteorology are more commonly known as the number of days or hours where heating is required to provide an optimum temperature for building users. The graph below shows no clear relationship between less HDD's (and therefore a year with less cold conditions) and lower electricity use as well as no clear relationship between years with higher HDD's

(inferring colder conditions were experienced at some point during that year) and higher electricity use.

Figure 6: relationship between electricity use and Heating Degree Days

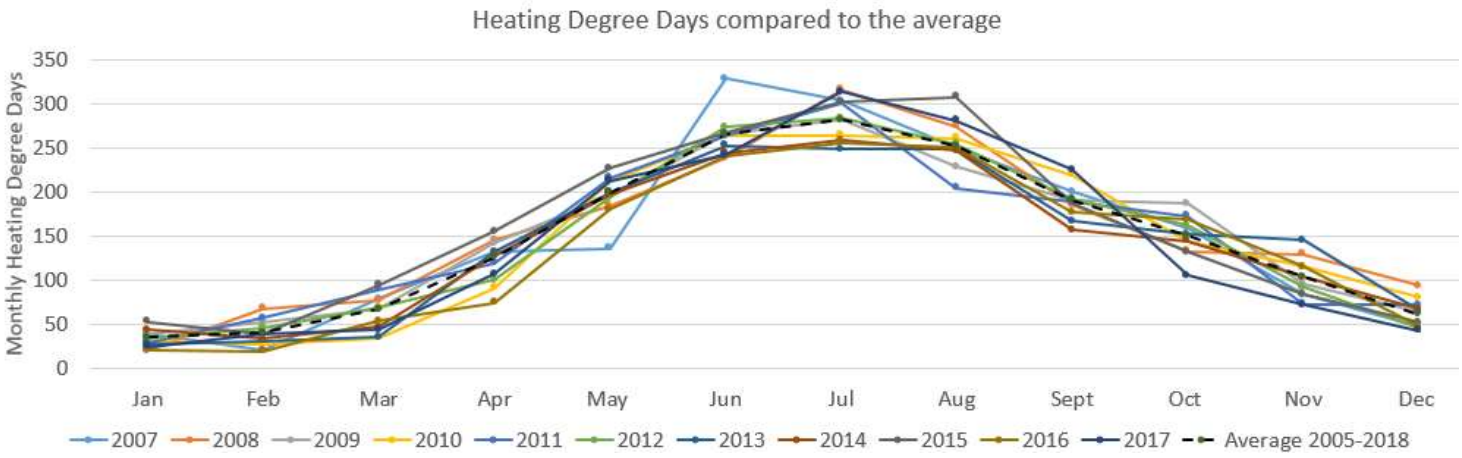


NB: The orange line is the average annual electricity use from 2007 to 2017

The relationship between electricity use in recent times (2016 and 2017) shows lower than average electricity use (than the average over 2007 to 2017) and lower HDD's.

When the individual HDD's for each month and year are analysed it is not clear that there are any exceptional years (although there is for example the high HDD results for June 2013), and high variability between years for monthly results.

Figure 7: Monthly Heating Degree Days for Hobart 2007 to 2017



17. Many other factors influence energy use and greenhouse gas emissions results including: changing consumer preferences, price changes and government programs and incentives were unable to be analysed as separate factors on the overall STCA method results.

GAPS AND OPPORTUNITIES

There are several areas where further detailed analysis is required:

- Seasonal analysis – currently data is only provided on an annual basis.
- Heating Degree Days – if seasonal data compared with local heating and cooling load data the relationship between weather events and electricity use can be further explored.
- The STCA method for estimating energy and greenhouse gas relies on the Australian Energy Statistics method for allocating energy use to different sectors. The Australian Energy statistics uses a method where “Total net energy consumption is equal to the consumption of all fuels minus the production of derived fuels” to describe electricity use. The STCA method removes all estimates for electricity use and substitutes local metered data instead, as industry energy generation is included in the scope of the inventory Australian Energy Statistics. Greater access to how the Australian Energy Statistics data is formulated is required to reduce future double counting.

- Under transport there are some activities such as cruise ships, where there is little current information available, which could form a part of the inventory in the future, if information were made available.

RESULTS VALIDATION

The final results were checked against the original Australian Energy Statistics for Tasmania for energy use and against the Tasmanian Climate Change Office (TCCO) greenhouse gas emission summaries.

Table 4: Regional community energy use results by sector

Preliminary results energy petajoule (PJ)				
Sector	**Local government developed methodology 2016-17**	**Australian Energy Statistics (AES)2016-17 by per capita (52% population)**	**Initial results (inc metered data) compared to AES growth rate (%)**	**AES for TAS**
Residential	6.6	7.2	-52	13.8
Commercial	3.9	4.5	-55	8.6
Transport	12.7	12.7	-48	24.3
Agriculture and Forestry	2.4	2.5	-50	4.8
Industrial	17.7	33.6	-72	64.2
TOTAL	**43.3**	**60.6**	**-63**	**115.7**

NB: the AES results are based on Table F rather than Table E7, as there is a difference there within AES accounting.

The results showed the regional results to be less than the estimates from the Australian Energy Statistics for Tasmania, primarily due to the use of more detailed metered electricity data in the residential, commercial and industrial sectors. Despite this, the regional results were 24% higher than the TCCO State-wide energy use emissions results (using a per capita method to compare results).

Table 5: Regional community greenhouse gas results by sector

Preliminary results GHG emissions tCO2e

Sector	**Local government developed methodology 2016-17 (inc metered data)**	**TCCO results per capita (just region - 52% of population)**	**TCCO Greenhouse Gas Accounts 2016 (just ENERGY and for whole of TAS)**	**Initial results (inc metered data) compared to TCCO growth rate (%)**
Transport	782,705	893,901	1,714,000	-12
Industrial	1,170,310	653,998	1,254,000	79

Residential	239,234	250,334	480,000	19
Commercial	224,705			
Agriculture and Forestry	167,809			
Unaccounted for	0	281,626	540,000	0
TOTAL Regional level results	**2,584,763**	**2,079,830**	**State level: 3,988,000**	**24**

NB: this analysis was undertaken on the primary results using the original method. In 2023 the accuracy of the method has improved with population growth and yearly emissions factors taken into account.

The southern Tasmanian results were also compared against Clean Energy Regulator data, which provided postcode level company reporting summaries from the National Greenhouse and Energy Reporting Scheme (NGERS). The STCA member councils were the first group of councils throughout Australia to access this data in 2018. The results were useful in identifying the presence of companies by ANZSIC division, which align with the Australian Energy Statistic divisions, however, for the industrial and transport sectors they represent the larger energy users and greenhouse gas emitters but not the full picture of the local market. In addition, the CER data is provided by postcode and in many cases this is linked to where the head office of companies were, rather than where the energy was used or emissions released. This means the CER data could not be used to fully validate the regional results.

APPENDIX A: CALCULATIONS FOR ESTIMATING GROWTH

Mid point growth method preferred for consistently estimating growth. The Midpoint method was used for growth rates for the regional project as this provides greater accuracy for growth rates that are both negative and positive[12]. If comparisons are required, the midpoint formula is often a better choice, because it gives uniform results regardless of the direction of change and avoids the "end-point problem" (of unusual results when negative growth is experienced) found with the straight-line method.

1. Write the midpoint percent change formula in which "V0" represents the initial value and "V1" is the later value. The triangle means "change." The only difference between this formula and the straight-line formula is that the denominator is the average of the starting and ending values rather than simply the starting value.

[12] https://sciencing.com/calculate-growth-rate-percent-change-4532706.html

2. Insert the values in place of the variables. Using the straight-line method's population example, the initial and subsequent values are 100 and 150, respectively.
3. Subtract the initial value from the subsequent value to calculate the absolute change. In the example, subtracting 100 from 150 leaves a difference of 50.
4. Add the initial and subsequent values in the denominator and divide by 2 to calculate the average value. In the example, adding 150 plus 100 and dividing by 2 produces an average value of 125.

5. Divide the absolute change by the average value to compute the midpoint rate of change. In the example, dividing 50 by 125 produces a rate of change of 0.4.

6. Multiply the rate of change by 100 to convert it to a percentage. In the example, 0.4 times 100 calculates a midpoint percent change of 40 percent. Unlike the straight-line method, if you reversed the values such that the population decreased from 150 to 100, you get a percent change of -40 percent, which only differs by the sign.

APPENDIX B: STEP BY STEP GUIDE USING THE SPREADSHEET

The following steps were undertaken to complete the 2023 community emission footprints:

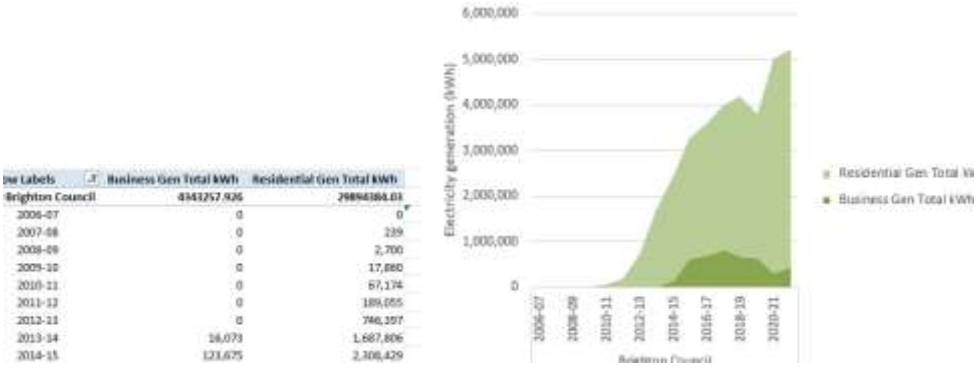
1. *Requested TasNetworks provide data by postcode in the following format:*

			BUSINESS						RESIDENTIAL					
			CONSUMPTION			GENERATION			CONSUMPTION			GENERATION		
LOCAL GOVERNMENT AUTHORITY	POST CODE	FINANCIAL YEAR	Total kWh	NMIs	Average kWh	Total kWh	NMIs	Average kWh	Total kWh	NMIs	Average kWh	Total kWh	NMIs	Average kWh
Brighton Council	7017	2017/2018	11,388,548.33	141	80,769.65	11,383.34	7	3,054.78	21,599,352.58	2,278	9,481.72	1,521,548.20	458	3,338.73
		2018/2019	11,426,646.55	139	82,206.00	31,920.59	6	5,320.10	21,731,791.62	2,428	8,950.49	1,716,221.40	513	3,345.48
		2019/2020	11,836,177.48	143	82,784.46	27,559.06	5	5,511.81	21,606,453.38	2,550	8,084.88	1,519,791.96	562	2,704.26
	7030	2017/2018	30,310,542.98	1,018	29,774.60	1,134,214.40	36	31,505.96	67,224,299.06	7,963	8,442.06	2,634,918.54	845	3,118.25
		2018/2019	31,548,808.10	1,018	30,990.97	919,719.58	39	23,569.73	69,084,292.15	[illegible]	7,430.60	2,863,706.00	904	3,167.82

2. *Split postcode data between shared boundary councils based on population*

	shared with	Split %	Splt com
		8,402	
7054	Kingborough	7,054	0.
	Hobart	1,348	0.
7017		**4851**	
Brighton Council		4192	86.4% remains
Clarence City Cour		659	13.6%
7030		**17044**	
Brighton Council		12046	70.7% remains
Central Highlands		649	3.8%
Glenorchy City Cou		1736	10.2%
Southern Midland		2613	15.3% 100.0
7120		**1845**	remains
Central Highlands		24	1.3%
Southern Midland		1750	94.9%
Glamorgan Spring Bay		71	2.9583333 18
7140		**13758**	
Central Highlands		1254	9.1% remains
Derwent Valley (a		12504	90.9%
7150		**2976**	
Huon Valley Counc		277	9.3% remains
Kingborough Coun		2699	90.7%
7304 Central highlar		37	0.6%
Meander Valley Cou		5856	96.0%
Kentish Council		207	3.4%
		6100	

3. *A pivot table with key stats in each excel sheet is made to provide this information in a graph format for the summary report*



4. *The main spreadsheet is updated with the Australian Energy Statistics from Table F& for each of the agricultural, transport, industry, residential and commercial sectors:*

Table F7
Energy consumption in Tasmania, by industry and fuel type, energy units a

Go back to Index

	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
Div. A Agriculture, forestry and fishing									
Fuels consumed									
Black coal									
Brown coal									
Coke									
Coal byproducts									
Brown coal briquettes									
Wood, woodwaste									
Bagasse									
Crude Oil and Other Refinery feedstock									
LPG									
Auto gasoline-leaded									
Auto gasoline-unleaded									
Aviation gasoline									
Aviation turbine fuel									
Kerosene and Heating oil									
Diesel	0.5	0.5	0.8	1.0	1.0	1.1	1.2	1.2	1.2
Fuel oil									
Petroleum products nec									
Solvents									
Lubricants and greases									
Bitumen									
Natural gas									
Town gas									
Solar energy									
Electricity	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Liquid/gas Biofuels									

An example in the residential sector is as follows:

The spreadsheet highlights the steps at every stage:

Delete all the irrelevant no entry categories and convert from PJ to GJ (x1000, x 1000), clarifying any categories that are confusing:

clarifying any categories that are confusing

	Tasmania Residential Energy Use - Gigajoule (GJ)						
GJ	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2
Wood, woodwaste	6,670,000	6,452,000	6,222,000	5,982,000	5,731,000	5,468,000	5,1
Liquid Petroluem Gas	305,000	400,000	300,000	500,000	500,000	500,000	5
Automotive Diesel Oil	21,000	22,000	22,000	22,000	21,000	22,000	
Natural gas	0	0	11,000	50,000	100,000	100,000	1
Town gas	51,000	51,000	51,000	33,000	0	0	
Solar energy	19,000	18,000	45,000	65,000	96,000	168,000	1
Electricity	7,902,000	7,920,000	8,038,000	8,134,000	8,263,000	8,610,000	8,5
Total energy consumption	14,969,000	14,862,000	14,689,000	14,786,000	14,711,000	14,868,000	14,5

Convert the Statewide results based on the per capita method - this delivers per capita results

Total population figures	in 2011 - 454841	476481	476481	485917.5	485917.5	485917.5	495354	495354	504487.5	513621	515117
	Tasmania Per Capita Residential Energy Use										
GJ	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Wood, woodwaste	15	14	13	12	12	11	10	10	10	10	9
Liquid Petroluem Gas	1	1	1	1	1	1	1	1	1	1	1
Automotive Diesel Oil	0	0	0	0	0	0	0	0	0	0	0
Natural gas	0	0	0	0	0	0	0	0	0	0	0
Town gas	0	0	0	0	0	0	0	0	0	0	0
Solar energy	0	0	0	0	0	0	0	0	0	0	0
Electricity	17	17	17	17	17	18	17	17	17	16	16
Total energy consumption	33	31	31	30	30	31	29	29	29	27	27

The following standard population figures have been used for various geographical areas(these were revised Feb 2022):

Multiply the per capita results by each Local Government Area population figure

		Local Government Area Residential Energy Use									
Local Government Area	Energy use	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Brighton Council	Wood, woodwaste	198,791	188,842	185,897	178,606	174,931	170,955	163,206	164,498	163,752	153,891	147,184
Brighton Council	Liquid Petroluem G	9,090	11,707	8,963	14,928	15,262	15,632	15,708	15,832	15,761	15,335	14,769
Brighton Council	Automotive Diesel	626	644	657	657	641	688	691	697	693	687	681
Brighton Council	Natural gas	0	0	329	1,493	3,052	3,126	3,142	3,166	3,184	3,124	3,243
Brighton Council	Town gas	1,520	1,493	1,524	985	0	0	0	0	0	0	0
Brighton Council	Onsite renewable e	566	527	1,344	1,941	2,930	5,252	5,812	6,143	6,748	6,748	7,998
Brighton Council	Electricity	235,510	231,808	240,154	242,856	252,217	269,188	268,323	267,214	265,808	258,769	259,635
Central Highlands	Wood, woodwaste	34,038	31,754	30,387	28,782	27,691	26,523	24,677	24,729	23,901	21,848	20,316
Central Highlands	Liquid Petroluem G	1,556	1,969	1,465	2,406	2,416	2,425	2,375	2,379	2,300	2,178	2,039
Central Highlands	Automotive Diesel	107	108	107	106	101	107	105	105	101	98	91
Central Highlands	Natural gas	0	0	54	241	483	485	475	476	465	444	448
Central Highlands	Town gas	260	251	249	159	0	0	0	0	0	0	0
Central Highlands	Onsite renewable e	97	89	220	313	484	815	879	923	985	958	1,104
Central Highlands	Electricity	40,323	38,978	39,255	39,137	39,928	41,764	40,571	40,155	38,738	36,737	33,838
City of Hobart	Wood, woodwaste	711,740	662,016	639,710	605,725	583,706	561,713	527,424	529,427	520,985	487,583	464,862
City of Hobart	Liquid Petroluem G	32,546	41,043	30,844	50,629	50,925	51,164	50,783	50,955	50,143	48,600	46,645
City of Hobart	Automotive Diesel	2,241	2,257	2,262	2,228	2,139	2,260	2,234	2,242	2,206	2,178	2,089
City of Hobart	Natural gas	0	0	1,131	5,063	10,185	10,273	10,153	10,191	10,129	9,898	10,244
City of Hobart	Town gas	5,442	5,233	5,244	3,342	0	0	0	0	0	0	0

Insert electricity data figures from Tas Networks

Residential Total Use kWh	Column Labels					
Row Labels	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Brighton Council	52,690,736	54,394,685	41,959,248	48,290,677	58,763,563	50,473,362
Central Highlands	26,427,547	35,253,997	31,217,308	31,908,143	36,015,423	31,578,221

Convert kWh to GJ residential Total Use GJ

Residential Total Use GJ	Column Labels				
Row Labels	2006-07	2007-08	2008-09	2009-10	2010-11
Brighton Council	189,687	195,821	151,053	173,846	211,54
Central Highlands	95,139	126,914	112,382	114,869	129,65

Insert into GJ summary

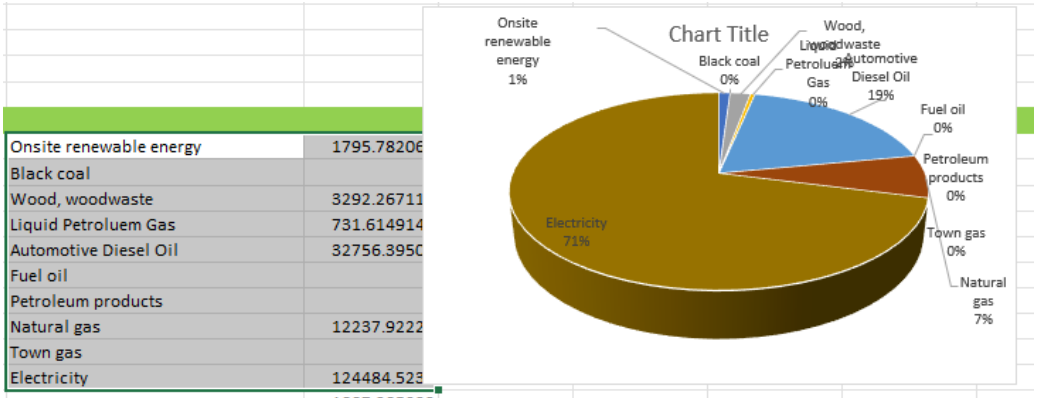
GJ		Local Government Area Residential Energy Use							
Local Government Area	Energy use	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	20
Brighton Council	Wood, woodwaste	198,791	188,842	185,897	178,604	174,931	170,955	163,206	16
Brighton Council	Liquid Petroluem G	9,090	11,707	8,963	14,928	15,262	15,632	15,708	1
Brighton Council	Automotive Diesel	626	644	657	657	641	688	691	
Brighton Council	Natural gas	0	0	329	1,493	3,052	3,126	3,142	
Brighton Council	Town gas	1,520	1,493	1,524	985	0	0	0	
Brighton Council	Onsite renewable	566	527	1,344	1,941	2,930	5,252	5,812	
Brighton Council	Electricity	255,856	256,439	189,687	189,687	195,821	151,053	173,846	21
Central Highlands	Wood, woodwaste	34,036	31,754	30,387	28,782	27,693	26,523	24,677	2
Central Highlands	Liquid Petroluem G	1,556	1,969	1,465	2,406	2,416	2,425	2,375	
Central Highlands	Automotive Diesel	107	108	107	106	101	107	105	
Central Highlands	Natural gas	0	0	54	241	483	485	475	
Central Highlands	Town gas	260	251	249	159	0	0	0	
Central Highlands	Onsite renewable	97	89	220	313	464	815	879	
Central Highlands	Electricity	33,175	33,251	95,139	126,914	112,382	114,869	129,656	11
City of Hobart	Wood, woodwaste	711,740	662,016	639,710	605,725	583,706	561,713	527,424	52
City of Hobart	Liquid Petroluem G	32,546	41,043	30,844	50,629	50,925	51,364	50,763	5

Apply emissions factors taken from the National Greenhouse Accounts Factors available here (updated 2016) :http://www.environment.gov.au/system/files/resources/e30b1895-4870-4a1f-9b32-3a590de3dddf/files/national-greenhouse-accounts-factors-august-2016.pdf

Fuel type	kgCO2e/GJ	tCO2-e/GJ	
Wood, woodwaste	1.3	0.0	Emission
Liquid Petroluem Gas	60.6	0.1	stationary purposes or
Automotive Diesel Oil	70.2	0.1	
Natural gas	51.5	0.1	distributed in a pipeline
Town gas	60.2	0.1	aka natural gas
Onsite renewable energy	0.0	0.0	assuming not biomass
Electricity	55.2	0.0	0.2kg/kWh NB chang
Landfill biogas	3.0		

Summary GHG emissions by LGA						
					Local Government Area Residentia	
Local Government Area	Emissions source	2004-05	2005-06	2006-07	2007-08	2008-09
Brighton Council	Wood, woodwaste	258	245	242	232	227
Brighton Council	Liquid Petroluem G	551	709	543	905	925
Brighton Council	Automotive Diesel	44	45	46	46	45
Brighton Council	Natural gas	0	0	17	77	157
Brighton Council	Town gas	92	90	92	59	0
Brighton Council	Onsite renewable e	0	0	0	0	0
Brighton Council	Electricity	4,605	5,642	8,346	13,468	18,799
Central Highlands	Wood, woodwaste	44	41	40	37	36
Central Highlands	Liquid Petroluem G	94	119	89	146	146
Central Highlands	Automotive Diesel	8	8	8	7	7
Central Highlands	Natural gas	0	0	3	12	25
Central Highlands	Town gas	16	15	15	10	0
Central Highlands	Onsite renewable e	0	0	0	0	0
Central Highlands	Electricity	597	732	4,186	9,011	10,789
City of Hobart	Wood, woodwaste	925	861	832	787	759
City of Hobart	Liquid Petroluem G	1,972	2,487	1,869	3,068	3,086
City of Hobart	Automotive Diesel	157	158	159	156	150
City of Hobart	Natural gas	0	0	58	261	525
City of Hobart	Town gas	328	315	316	201	0
City of Hobart	Onsite renewable e	0	0	0	0	0
City of Hobart	Electricity	15,178	17,878	36,362	58,478	80,793
Clarence City Council	Wood, woodwaste	949	880	855	810	784
Clarence City Council	Liquid Petroluem G	2,022	2,544	1,921	3,157	3,187
Clarence City Council	Automotive Diesel	161	162	163	161	155
Clarence City Council	Natural gas	0	0	60	268	542

Each energy and greenhouse summary table has an associated pivot table to the right of the table to compile summary results:



Onsite renewable energy	1795.78206
Black coal	
Wood, woodwaste	3292.26711
Liquid Petroluem Gas	731.614914
Automotive Diesel Oil	32756.3950
Fuel oil	
Petroleum products	
Natural gas	12237.9222
Town gas	
Electricity	124484.523
	1087.385933

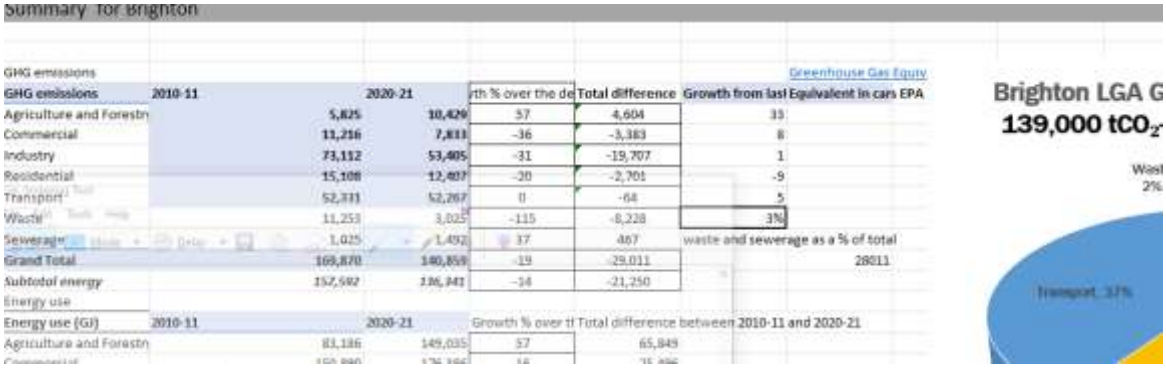
Row Labels	Sum of 2008-09	Sum of 2009-10	Sum of 2010-11	Sum of 2011-12	Sum of 2012-13	Sum of
Brighton Council	143,009	147,868	150,890	148,652	148,830	
Onsite renewable energy	1,192	1,341	1,373	1,384	1,403	
Black coal	4,537	3,962	3,052	1,753	592	
Wood, woodwaste	2,967	2,949	2,960	2,860	2,900	
Liquid Petroluem Gas	4,159	4,320	4,486	4,429	4,677	

Complete the same steps for each sector

Cut and paste the summary info from each sector into the front summary table:

Summary for Brighton			
	ENERGY		
	Row Labels	**2008-09**	**2009-10**
	Agriculture and Forestry	90,249	93,12
	Commercial	143,009	147,86
	Industry	910,747	949,08
	Residential	392,647	346,77
	Transport	862,787	888,88
	Grand Total	**2,399,440**	**2,425,73**
	GHG		
	Row Labels	**2008-09**	**2009-10**
	Agriculture and Forestry	6,321	6,52
	Commercial	12,455	12,56

This populates the summary table and pie graph:



The waste and sewerage figures are manually entered. The waste figures are cut and paste from Corporate inventories to a corresponding year.

The sewerage figures are calculated to the right of the pie graph using a summary table based on TasWater per capita figures (sourced from annual reports):

Taswater				18995 ppl
	tCO2e emissions	Population	tCO2/per person	Brighton
2019-20	33900	431513	0.078560785	1492.26211
2018-19	28936	426514	0.067843025	1288.67826