

Report: ACT Greenhouse Gas Inventory for 2014-15: with recalculations for 2012-13 and 2013-14

transport | community | industrial & mining | carbon & energy



Prepared for: Environment and Planning Directorate,
ACT Government

Client representatives: Peta Olesen, Simon French

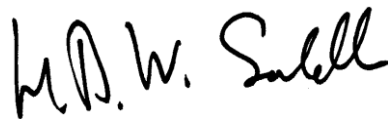
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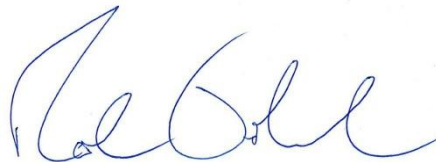
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Prepared by:

Hugh Saddler

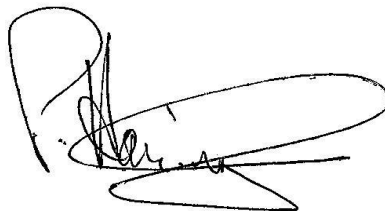
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Reviewed by:

Mark Johnston

Date: 20 October 2015



Authorised by:

Phil Harrington

Date: 20 October 2015

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1. Introduction

This report presents the ACT Greenhouse Gas Inventory for 2014-15. This provisional inventory has been developed on the basis of the latest methodology, published in 2015.

This inventory is provisional, rather than final, due to timing issues with the methodology. The 2015 methodology does not reflect all of the methodology changes recommended in 2015 methodology review. Therefore a further update of the methodology will occur and it is expected that this version of the methodology will be fully complete in 2016. The preparation of the 2015-16 emissions inventory will then use the 2016 methodology. The 2015-16 inventory will accordingly also contain final, non-provisional, results for 2014-15.

The major methodology change that was deployed for the 2014-15 inventory is that for electricity related emissions. Since electricity accounts for over half the total inventory, this is the most important change. The other source category for which a new methodology has been used is waste. The previous interim ACT emissions inventories for 2012-13 and 2014-15 have been recalculated using the new methodologies for electricity and waste.

The source categories for which changes are expected to be made in 2016 are industrial processes, agriculture, and land use, land use change and forestry, all of which are relatively small contributors to total ACT emissions. For these source categories, estimates prepared by the Department of the Environment, as part of the National Greenhouse Gas Inventory, continue to be used, as under the previous methodology. However, a new national Greenhouse Gas Inventory has been published since the previous 2012-13 and 2013-14 inventories were compiled. The resultant modest changes in estimates for the ACT have been incorporated into this inventory.

2. Total ACT Greenhouse Gas Emissions

The provisional estimate of total greenhouse gas emissions for the ACT in 2014-15 is 3,934.1 kt CO₂-e.

These totals include the net impact of both emissions and removals of CO₂-e in the land use, land use changes and forestry (LULUCF) sector, which is estimated to be a net CO₂ sink in the ACT.

Table 1 shows the interim results for 2012-13, 2013-14 and 2014-15, together with the estimates for the two preceding years and for the reference year of 1989-90. The targeted result for 2020 is also shown. This target is 40 per cent below the 1989-90 level of greenhouse gas emissions and is a legislated objective. It can be seen that provisional emissions in 2014-15 were 24 per cent higher than in 1989-90.

Table 1 - Total ACT Greenhouse Gas Emissions Summary (kilo tonnes CO₂-e)

	1989-90	2010-11	2011-12	2012-13	2013-14	2014-15	2020 Target
Provisional	3185.5	4459.7	4352.1	3,869.2	3,759.8	3,934.1	1911
Previous (interim)	3185.5	4459.7	4352.1	4,096.5	3,995.0	NA	

Table 2 shows total emissions when CO₂-e emissions from land use, land use changes and forestry (LULUCF) are excluded. It is important to note that, while inventories for the years 2010-11 and 2011-12 are included for completeness, these were compiled under the previous methodology. They are therefore not directly comparable with inventories for the past three years and the difference between the 2011-12 and 2012-13 inventories should not be interpreted as a true or accurate measure of the change in ACT emissions between those two years. Recalculation of past inventories prior to 2012-13 did not form part of this year's inventory preparation task. It could, however, be undertaken as part of the preparation of the 2015-16 inventory.

Table 2 - Total ACT Greenhouse Emissions excluding LULUCF (kilo tonnes CO₂-e)

Year	1989–90	2010–11	2011–12	2012–13	2013–14	2014-15
Provisional	3,185.5	4,471.6	4,364.3	3,939.0	3,829.6	4,004.0
Previous (interim)	3,185.5	4,471.6	4,364.3	4,108.7	4,007.2	NA

Table 3 shows per capita emissions for the same years as reported in the two previous tables. It can be seen that per capita emissions fell between 2012-13 and 2013-14 but increased in 2014-15. Possible reasons for the increase are discussed later in this report. Note that, for the reasons given above, great reliance should not be placed on the values for 2010-11 and 2011-12.

Table 3 – ACT Population, Total Greenhouse Emissions (kt CO₂-e) and Emissions per Capita (t CO₂-e)

Year	1989–90	2010–11	2011–12	2012–13	2013–14	2014-15
Population (at 31 December)	279,219	367,985	374,912	382,024	388,655	394,675
Emissions (kt CO ₂ -e)	3,185.5	4,459.7	4,352.1	3,869.2	3,759.8	3,934.1
Emissions per capita (t CO ₂ -e)	11.41	12.12	11.61	10.13	9.67	9.97

3. Emissions by source

Stationary energy is the dominant source of emissions in the ACT, and produced over two-thirds of the CO₂-e emissions that were attributable to the ACT in 2014-15, as in all previous years.

The transport sector is also very important, with one-quarter of emissions coming from petroleum based fuels used in transport vehicles. Industrial processes, waste, and fugitive emissions related to the energy sector account for the remainder of emissions. The net effect in 2014-15 of land use, land use changes and forestry (LULUCF) was a reduction in emissions of 69.8 kt CO₂-e.

Table provides the broad breakdown of ACT emissions based on the interim results for the year 2014-15.

Emissions relating to some form of energy use accounted for around 93 per cent of emissions in 2014-15. This is the combined emissions of stationary energy, energy for transport, and fugitive emissions (which in the case of the ACT is the leakage of natural gas). Stationary energy emissions are predominantly attributable to the generation of electricity used in the ACT, but also include emissions from use of

natural gas, non-transport use of petroleum fuels, including LPG, heating oil and fuel oil, and use of fuel wood. Emissions attributed to non-transport petroleum fuels and fuel wood are very small.

However, it should be noted that reported emissions from non-transport use of petroleum fuels are almost certainly incomplete. No data are currently available on non-transport use of LPG, by businesses and households. Data on emissions from use of fuel oil includes only the emissions reported by ICON Water, relating to use at the Lower Molonglo Water Quality Control Centre. It is unclear whether the current Fuel Survey completely captures data on diesel fuel used in off-road activities such as earth moving, forestry and agriculture. It is possible also that some on-road diesel use by businesses which operate vehicle fleets refuelled from their own bulk fuel tanks is not captured. Inclusion of additional emissions from these uses of petroleum would result in a small increase in the ACT's reported emissions.

Table 4 - ACT Greenhouse emissions 2013-14 - by source

Emissions Source	Emissions in 2014-15, kilo tonnes CO ₂ -e	% of total emissions ex LULUCF
Stationary energy	2,625.3	66.7%
Transport	1,047.6	26.6%
Fugitive emissions	32.8	0.8%
Industrial processes (synthetic gases)	192.0	4.9%
Agriculture	24.7	0.6%
Waste	81.5	2.1%
Sub Total (ex LULUCF)	4004.0	100%
LULUCF	-69.8	-1.8%
TOTAL including LULUCF	3,934.1	

The detail of all emissions sources for 2014-15, including changes in land use, land use changes and forestry, is shown in Table 5 below.

Table 5 - Detailed ACT Emissions Sources 2014-15

Emissions Source			kt CO ₂ -e
Energy			3,705.8
	A.	<i>Fuel combustion activities</i>	3,672.9
		Electricity	2,246.4
		Natural gas	376.0
		Transport fuels	1,047.6
		Fuel oil	2.6
		Fuel wood	0.3
	B.	<i>Fugitive emissions from fuels</i>	32.8
		Natural gas leakage	32.8
Industrial processes			192.0
		Consumption of halocarbons and SF6	192.0
Agriculture			24.7
		Enteric fermentation	22.0
		Manure management	0.01
		Agricultural soils	2.6
Land use, land-use change and forestry			- 69.8
		Afforestation and reforestation	- 3.6
		Deforestation	3.4
		Forest management	- 6.3
		Cropland management	0.02
		Grazing land management	- 63.4
Waste			81.5
		Solid Waste Disposal on Land	70.6
		Wastewater Handling	10.9
Total emissions including net CO ₂ -e from LULUCF			3,995.0
Total emissions excluding net CO ₂ -e from LULUCF			4,007.2

4. Changes in Greenhouse Gas Emissions between 2012-13 and 2014-15

Total ACT emissions decreased by 109 kt CO₂-e from 2012-13 to 2013-14 and then increased by 174 kt CO₂-e from 2013-14 to 2014-15. As explained above, emissions from the Industrial Processes, Agriculture and Land Use, Land Use Change and Forestry source categories as reported in this provisional inventory for all three years 2012-13, 2013-14 and 2014-15 are those reported for the ACT in the 2013, i.e. for year 2012-13, National Inventory. Consequently, the changes in ACT emissions over the period are caused by changes in emissions from the other sources. These are discussed in turn.

4.1 Electricity

Emissions from electricity increased from 2,194 kt CO₂-e in 2013-14 to 2,246 kt CO₂-e in 2014-15, an increase of 2.4 per cent. In absolute terms, electricity contributed 52 kt CO₂-e of the total 174 kt CO₂-e increase between the two years. Two main factors caused this increase.

Firstly, the total quantity of electricity supplied to ACT customers increased by 0.9 per cent, after having fallen in each of the three previous years. In this respect, the ACT trend is similar to what appears to be a trend observed in most of the other NEM states. If the effect of one-off changes in large industrial demand (aluminium smelters etc.) in those states is removed, consumption of electricity by general business and residential consumers fell steadily for several years. Consumption now appears to be levelling out, or even increasing slightly. It is possible that differences in average weather between the two years 2013-14 and 2014-15 may have contributed to the change in demand; colder winters and, to a lesser extent, hotter summers tend to increase total electricity consumption, all else being equal. Further analysis would be required to be able to move towards a firmer view on this point.

Secondly, the total share of renewable electricity in the ACT's electricity supply fell slightly, from 19.8 per cent in 2013-14 to 18.5 per cent in 2014-15, and the overall emissions intensity of electricity supplied increased slightly. The reason for this change is very clear and completely outside the control of the ACT. Snowy Hydro, which is the largest supplier of renewable electricity into the NSW/ACT NEM region, greatly increased its generation during 2012-13 and 2013-14, as it could gain substantial economic benefit from the price on carbon being imposed on competing coal and gas fuelled generators. In doing so, it generated above its long term average output, represented by its LRET baselines generation levels. From February 2014, a few months before the carbon price came to an end, Snowy Hydro drastically cut back its generation, to allow its storages to replenish. The supply shortfall was made up by increased coal fired generation, mainly sourced through the interconnectors from Victoria and Queensland. As a result, the emissions intensity of NEM electricity supplied to consumers in the ACT and NSW increased and the total share of renewable electricity in supply to the ACT decreased. Since the annual volatility in Snowy Hydro generation masks an underlying generating capacity that is largely static, in future inventories it is appropriate to smooth its output using a rolling 5 year average. Had this methodology been applied to this inventory, the share of renewable energy in the ACT's electricity supply would have been 19.8% in 2014-15 and 18.9% in 2013-14.

A secondary factor contributing to the decline in the renewable share was a sharp drop in GreenPower purchases by ACT electricity consumers. This was, however, a relatively small effect, and was more than offset by increases in supply from rooftop solar installations and a slightly higher quantity of electricity supplied under the LRET.

4.2 Natural gas

Emissions from natural gas increased by nearly 7 per cent between 2013-14 and 2014-15 as a direct result of an identical increase in total consumption of gas. The absolute increase was 24 kt CO₂-e. As with

electricity, this is a trend which data compiled by **pitt&sherry** for its CEDEX® reports suggests may be occurring elsewhere, notably in Victoria. Detailed data on natural gas consumption is very limited; it is unclear whether the increased demand is from residential or from business consumers, or from both. Nor is it possible to determine what role, if any, differences in weather may have played.

4.3 Transport

Transport emissions increased by 72 kt CO₂-e, equivalent to 7.4 per cent, between 2013-14 and 2014-15. Transport was the largest contributor to the total increase in emissions. All of this emissions increase was caused by a very large (32 per cent) increase in reported consumption of diesel. Consumption of, and hence emissions from petrol, E10 and auto LPG all fell. While recent years have undoubtedly seen a shift to diesel engines in smaller motor vehicles, it is most unlikely that this shift alone could explain such a large apparent increase in consumption. It seems likely that some of the apparent increase is the result of improved coverage of the Fuel Use Survey, that is, that the 2015 Survey collected data on diesel sales from some sources which had been missed in previous Surveys. If this hypothesis is correct it would mean that inventories prior to 2014-15 under-estimate total ACT emissions, and that the true increase from 2013-14 to 2014-15 is less than the increase reported here.

4.4 Fugitive energy

Data provided by ActewAGL Distribution show that from 2013-14 to 2014-15 total gas sales and throughput increased, but the proportion of gas lost in distribution fell and, as a result, the quantity of Unaccounted-for-Gas was the same in both years. Estimated fugitive emissions were therefore also the same.

4.5 Waste

Emissions from waste increased by 16 kt CO₂-e from 2013-14 to 2014-15, equivalent to 24 per cent. Virtually all of the increase was caused by an rise in estimated emissions from solid waste disposal. The great majority of emissions from solid waste disposed at landfill sites, the predominant mode of disposal in the ACT, are contributed by so-called legacy emissions. These are emissions arising from the anaerobic breakdown of putrescible waste sent to landfill in past years.

To compile the 2014-14 ACT emissions inventory, **pitt&sherry** constructed a completely new model of ACT waste emissions, using data on quantities of putrescible waste sent to both the Mugga Lane and the now closed Belconnen landfill sites since 1990 (with some gaps in intermediate years). The data were obtained from several different sources. The volumes of landfill gas captured by the two landfill gas generators were provided by the plant operators, Energy Developments Limited, and subtracted from the modelled total emissions, to give estimates of total net emissions to the atmosphere.

Modelled total emissions show a generally steady increase year by year. The total quantity of putrescible waste accumulates year by year, while waste disposed of several decades previously eventually decays completely. Year to year changes are mostly caused by changes in the volumes of gas captured by the landfill gas plants. These volumes fell from 2012-13 to 2013-14 and again from 2013-14 to 2014-15. Consequently, emissions to the atmosphere increased.

4.6 Industrial processes

ACT industrial process emissions arise entirely from loss to the atmosphere of synthetic fluorinated hydrocarbon gases, most of which are used as refrigerant gases in refrigerators, freezers and air conditioners. As explained previously, the present provisional emissions inventory uses 2013 National Inventory data, the most recent available, for the ACT as the basis for the estimates included in the 2013-

14 and 2014-15. The National Inventory shows a steady year by year increase in emissions from this source, driven by the progressive replacement of Montreal Protocol refrigerant gases by hydrofluorocarbon gases covered by the UNFCCC. We have been advised by relevant staff in the Department of the Environment that they expect this trend to continue for several more years.

Consequently **pitt&sherry** has extrapolated the 2012-13 figure to 2013-14 and 2014-15, in order to provide a more realistic estimate of likely emissions from this source in the two most recent inventory years. As a result, the 2014-15 inventory shows an increase in emissions of 10 kt CO₂-e from this source.

4.7 Summary

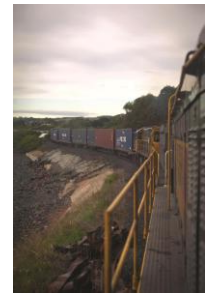
The contributions to the total 174 kt CO₂-e increase in emissions from 2013-14 to 2014-15 of the various emissions source categories discussed in this chapter are as follows:

Electricity	30%
Natural gas	14%
Transport	41%
Industrial Processes	6%
Waste	9%

Contact

Phil Harrington – Principal Consultant, Carbon & Energy
03 6210 1489
pharrington@pittsh.com.au

transport | community | industrial & mining | carbon & energy



Brisbane

Level 2
276 Edward Street
Brisbane QLD 4000
T: (07) 3221 0080
F: (07) 3221 0083

Devonport

Level 1
35 Oldaker Street
PO Box 836
Devonport TAS 7310
T: (03) 6424 1641
F: (03) 6424 9215

Launceston

Level 4
113 Cimitiere Street
PO Box 1409
Launceston TAS 7250
T: (03) 6323 1900
F: (03) 6334 4651

E: info@pittsh.com.au
W: www.pittsh.com.au

incorporated as
Pitt & Sherry (Operations) Pty Ltd
ABN 67 140 184 309

Canberra

LGF, Ethos House
28-36 Ainslie Place
Canberra City ACT 2601
PO Box 122
Civic Square ACT 2608
T: (02) 6274 0100

Hobart

199 Macquarie Street
GPO Box 94
Hobart TAS 7001
T: (03) 6210 1400
F: (03) 6223 1299

Melbourne

Level 1, HWT Tower
40 City Road
Southbank VIC 3006
PO Box 259
South Melbourne VIC 3205
T: (03) 9682 5290
F: (03) 9682 5292

