



ICRC

independent competition and regulatory commission

Final Report
**ACT Greenhouse Gas
Inventory Report 2010–11**

Report 7 of 2013

September 2013

The Independent Competition and Regulatory Commission is a Territory Authority established under the Independent Competition and Regulatory Commission Act 1997 (ICRC Act). The Commission is constituted under the ICRC Act by one or more standing commissioners and any associated commissioners appointed for particular purposes. Commissioners are statutory appointments and the current Commissioners are Senior Commissioner Malcolm Gray and Commissioner Mike Buckley. We, the Commissioners who constitute the Commission, take direct responsibility for delivery of the outcomes of the Commission.

We have responsibilities for a broad range of regulatory and utility administrative matters. We have responsibility under the Independent Competition and Regulatory Commission Act 1997 (ICRC Act) for regulating and advising government about pricing and other matters for monopoly, near-monopoly and ministerially declared regulated industries, providing advice on competitive neutrality complaints and government- regulated activities. We also have responsibility for arbitrating infrastructure access disputes under the ICRC Act. In discharging our objectives and functions, we provide independent robust analysis and advice.

Our objectives are set out in section 7 of the ICRC Act and section 3 of the Utilities Act.

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Summary

The Australian Capital Territory Government has adopted greenhouse gas reduction targets, which are established under the *Climate Change and Greenhouse Gas Reduction Act 2010* (the Act).

This report provides estimates of the ACT's greenhouse gas emissions attributable to sectors within the Territory for 2010–11. The estimates are based on a methodology that satisfies the legislative requirements of the Act.

The main outcomes for 2010–11 include:

- Total carbon dioxide equivalent (CO₂-e) emissions were 4,458 kilotonnes when emissions reductions from land use, land-use change, and forestry (LULUCF) are included.
- Total CO₂-e emissions were 4,474 kilotonnes when LULUCF is excluded.
- The ACT Government's greenhouse gas reduction target is a 40 per cent reduction in total CO₂-e emissions from 1990 levels by 2020. This target is 1,911 kilotonnes. The 2010–11 CO₂-e emissions (including LULUCF) were 2,547 kilotonnes above this target.
- CO₂-e emissions attributable to electricity consumption are 61 per cent of total emissions (excluding LULUCF), and remains the main contributor to emissions growth since 1990.
- Per capita emissions peaked in 2005–06 at 12.7 tonnes, and in 2010–11 were 12.2 tonnes.
- Renewable energy use has increased from 12.9 per cent of all electricity consumed in the ACT in 2009–10 to 14.2 per cent in 2010–11.

1 Introduction

The *Climate Change and Greenhouse Gas Reduction Act 2010* (the Act) establishes targets for greenhouse gas emissions and energy use in the ACT and requirements for reporting on those targets. Section 12 of the Act requires an independent entity to prepare a report on greenhouse gas emissions and targets and provide it to the Minister for the Environment and Sustainable Development (the Minister) within three months of the end of the reporting period. The Independent Competition and Regulatory Commission (the Commission) is the independent entity tasked with preparing this report for 2010–11.

This is the third annual greenhouse gas inventory report for the ACT prepared by the Commission. The inventory provided in this report is a more comprehensive account of greenhouse gas emissions in the ACT than that given in the Australian National Greenhouse Accounts: State and Territory Greenhouse Gas Inventories 2011 prepared by the Commonwealth Department of Climate Change and Energy Efficiency (DCCEE, 2013b). The DCCEE inventory for the ACT calculates emissions using a production approach that focuses on the geographic location of emissions sources. It therefore accounts for emissions physically occurring within the ACT, but not necessarily those related to ACT activities.

Following advice from the Commission, the Minister determined a methodology for measuring emissions in the ACT (Climate Change and Greenhouse Gas Reduction (Greenhouse Gas Emissions Measurement Method) Determination 2013). It employs a hybrid production and consumption approach satisfying the information needs of the ACT Government and the legislative requirements of the Act. A hybrid approach accounts for emissions attributable to consumption activities in addition to those arising from production activities within the ACT. The methodology accepts responsibility for emissions occurring outside the ACT's geographic region, if actions within the Territory are indirectly responsible for their creation.

The methodology adopted by the Commission is described in the appendixes to this report. It is, as far as practicable, consistent with both national and international practices and continues the approach taken in previous ACT greenhouse gas inventories prepared for the ACT Government. It should be noted that the time series data for some sectors presented in this report vary from that shown in the 2009–10 inventory. This difference is due to revisions in data provided by the Australian Greenhouse Emissions Information System (AGEIS). These revisions are not significant in terms of total emissions. The Commission may undertake further reviews of data sources and methodology before the preparation of the 2011–12 inventory to ensure the inventory's accuracy and quality. Consequently, the data presented in the 2010–11 inventory may be revised in the future if better estimates of emissions become available.

The ACT's targets for emissions are expressed in terms of total emissions including reductions from land use, land-use change, and forestry (LULUCF). For the purpose of

highlighting the contribution that different activities make to the Territory's total emissions, information on total emissions excluding LULUCF is also presented. The particular approach that is being adopted in each instance is clearly stated throughout the report. It should be noted that there is no difference between the values of total emissions including or excluding LULUCF for years before 2007–08. The method for accounting for emissions relating to LULUCF under the Kyoto Protocol between 1990 and the 2008–12 commitment period has changed; therefore, a comparative time series is not available for the period between 1990 and 2006–07.

2 ACT greenhouse gas emissions

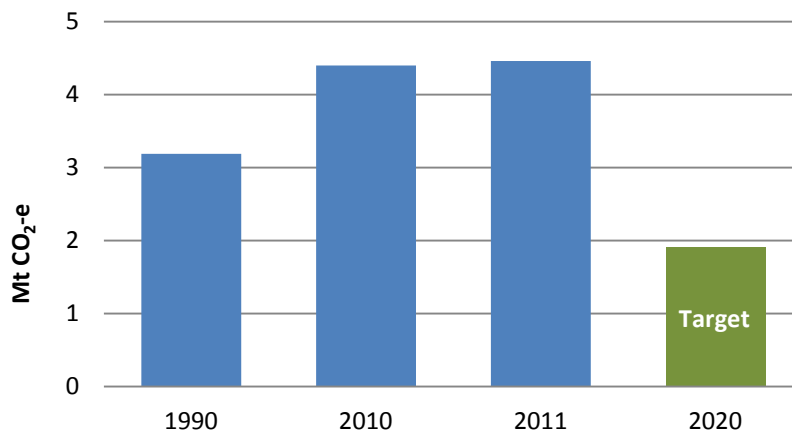
2.1 Total emissions

The ACT's total emissions of greenhouse gases in the 2010–11 financial year were 4,458 kilotonnes (4.458 megatonnes), measured on a carbon dioxide equivalent (CO₂-e) basis and including emissions reductions due to land use, land-use change, and forestry (LULUCF). When emissions reductions due to LULUCF are excluded, the total CO₂-e emissions (total emissions) increase by 17 kilotonnes to 4,475 kilotonnes. These amounts represent an increase of 1.4 per cent and 1.0 per cent over 2009–10 total emissions when reductions from LULUCF are included and excluded, respectively.

When emissions reductions from LULUCF are accounted for, total emissions are 2,547 kilotonnes greater than the level of emissions required to meet the ACT Government's target of a 40 per cent reduction in net emissions from the 1990 level of 3,185 kilotonnes¹ by 2020. To achieve the 2020 target, which is equivalent to total net emissions of 1,911 kilotonnes of CO₂-e, the ACT needs to reduce and/or offset approximately 283 kilotonnes in each of the remaining 9 years. This projection assumes a linear reduction path and emissions reductions beginning in 2011–12.

Figure 2.1 presents total emissions including LULUCF for the 1990, 2010, and 2011 financial years and the 2020 target.

Figure 2.1 ACT total emissions and removals (including LULUCF)



Mt = megatonnes

Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b, unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

¹ 1990 emissions have been revised down from the 3,200 kilotonnes reported in the 2009–10 inventory as a consequence of the AGEIS data revisions.

In 2010–11, total emissions of CO₂-e greenhouse gases were 40.0 per cent greater than the 1990 level of 3,185 kilotonnes and 1.4 per cent greater than the 4,398 kilotonnes of greenhouse gases emitted in 2009–10.

2.2 Sectoral breakdown

Table 2.1 presents a detailed breakdown of the ACT greenhouse gas inventory for 2010–11 by sector.

Table 2.1 Sectoral report for ACT greenhouse gas inventory, 2010–11

Greenhouse gas source and sink categories	Total CO ₂ -e (kt)
Total ACT emissions and removals	4,458.2
1. Energy	4,202.4
A. Fuel combustion activities	4,173.8
Electricity	2,753.4
Natural gas	386.1
Transport fuels	1,022.7
Fuel wood	11.7
B. Fugitive emissions from fuels	28.6
Natural gas leakage	28.6
2. Industrial processes	133.9
Production of halocarbons and SF ₆	
Consumption of halocarbons and SF ₆	128.3
Other	5.0
3. Agriculture	22.4
Enteric fermentation	18.6
Manure management	0.1
Agricultural soils	3.6
4. Land use, land-use change and forestry	-16.5
Afforestation and reforestation	-16.5
5. Waste	116.0
Total CO₂-e emissions including net CO₂-e from LULUCF	4,458.2
Total CO₂-e emissions excluding net CO₂-e from LULUCF	4,474.7

kt = kilotonnes

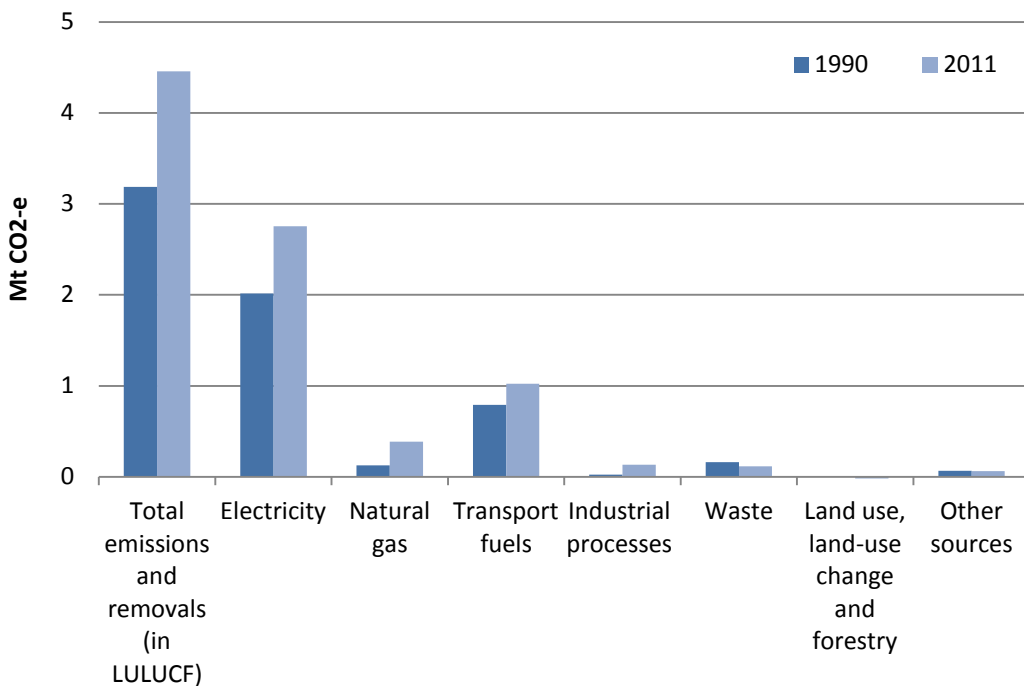
Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

Table 2.1 shows that the consumption of electricity, natural gas, and transport fuels remain the main sources of greenhouse gas emissions. Fuel combustion activities are responsible for approximately 93 per cent of total emissions excluding LULUCF.

Relatively minor sources of emissions include activities relating to industrial processes and waste, which jointly account for approximately 6 percentage points of the remaining 7 per cent of total emissions.

Figure 2.2 compares the level of total and sectoral emissions for 2010–11 with those occurring in 1990. The main sectors responsible for increased emissions over this period include electricity (36.6 per cent), natural gas (202.4 per cent), and transport fuels (29.5 per cent). Emissions from the waste sector have declined by 28.4 per cent.

Figure 2.2 ACT emissions and removals by sector, 1990 and 2010–11 (including LULUCF)



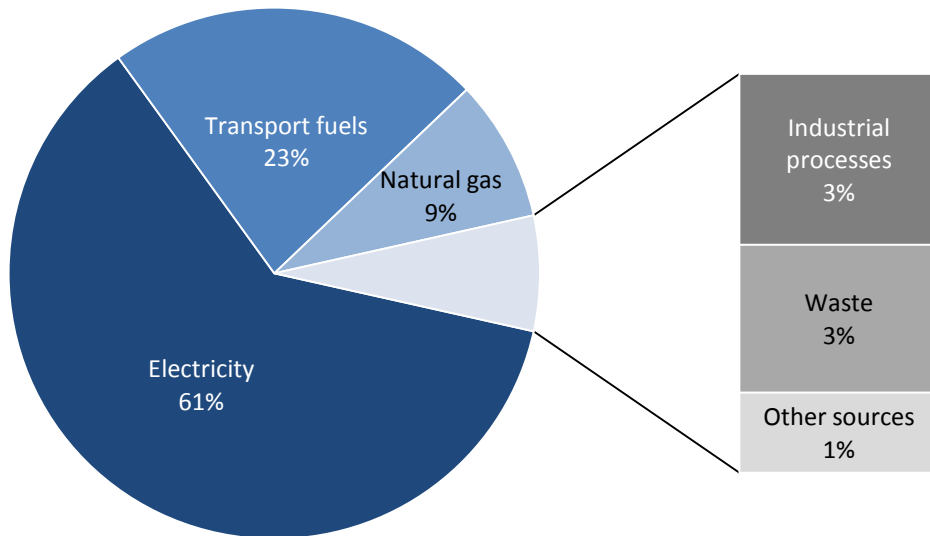
Mt = megatonnes

Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT Greenhouse Gas Inventories.

2.3 Sources of emissions

The main sources of emissions in 2010–11 presented in the sectoral breakdown in Table 2.1 are shown in Figure 2.3 as a percentage of total emissions excluding reductions from LULUCF.

Figure 2.3 Share of emissions by sector, 2010–11 (excluding LULUCF)

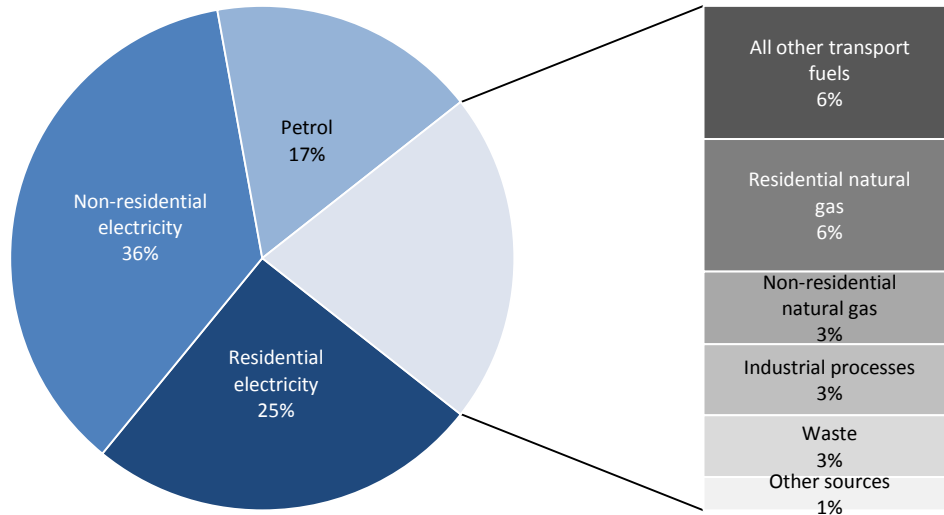


Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

Electricity consumption is responsible for 61 per cent of total emissions. Following electricity, the second and third largest contributions to total emissions are from transport fuels (23 per cent) and natural gas (9 per cent), respectively. Industrial processes and waste activities each contribute approximately 3 per cent of total emissions. The significant contribution of fuel combustion activities to the ACT's sectoral emissions profile arises from the low levels of industrial and agricultural activity, along with the absence of mining.

Figure 2.4 presents a more detailed breakdown of total emissions for 2010–11. At the subsector level, non-residential electricity is the largest contributor, accounting for 36 per cent of total emissions. This is followed in order of contribution by residential electricity (25 per cent), petrol (17 per cent), all other transport fuels (6 per cent) and residential natural gas (6 per cent).

Figure 2.4 Share of emissions by source subsector, 2010–11 (excluding LULUCF)



Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

The major subsector contributing to emissions from each fuel combustion category are non-residential electricity consumption, which is responsible for 59 per cent of emissions attributable to electricity consumption; petrol combustion, which accounts for 74 per cent of emissions attributable to road transport fuels²; and residential natural gas consumption, which accounts for 67 per cent of emissions from natural gas consumption.

2.4 Trend in emissions

Table 2.2 presents a detailed sectoral breakdown of emissions from 1990 to 2010–11.

² Emissions from aviation and water transport activities occurring in the ACT are not reported.

Table 2.2 ACT CO₂ equivalent emissions, 1990 to 2011 financial years, (kilotonnes)

Greenhouse gas source and sink categories	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total CO₂-e emissions	3,185.3	-	-	-	-	-	-	-	-	-	-	-
1 Energy	2,953.7	3,011.9	3,056.4	3,242.1	3,228.1	3,217.6	3,317.5	3,413.0	3,455.0	3,454.7	3,507.6	3,598.6
A. Fuel combustion activities	2,950.2	3,007.8	3,051.5	3,236.7	3,222.0	3,211.0	3,310.9	3,405.9	3,447.8	3,447.0	3,499.7	3,590.1
Electricity	2,015.8	2,049.6	2,050.3	2,129.5	2,098.7	2,034.8	2,130.2	2,167.0	2,203.2	2,207.8	2,279.1	2,374.9
Natural gas	127.7	151.8	179.0	201.6	224.7	244.8	247.1	265.2	265.9	286.6	294.1	317.1
Transport fuels	790.0	789.9	806.2	890.0	883.7	917.0	919.6	959.8	965.4	939.6	913.8	888.0
Fuel wood	16.8	16.5	16.0	15.5	14.9	14.4	14.1	13.7	13.3	13.0	12.7	10.0
B. Fugitive emissions from fuels	3.5	4.1	4.8	5.4	6.1	6.6	6.7	7.2	7.2	7.7	8.0	8.6
Natural gas leakage	3.5	4.1	4.8	5.4	6.1	6.6	6.7	7.2	7.2	7.7	8.0	8.6
2 Industrial processes	24.7	25.2	24.7	31.7	21.2	21.5	13.8	18.0	21.5	25.8	29.3	39.3
Production of halocarbons and SF ₆	18.6	18.7	17.7	24.4	13.7	12.1						
Consumption of halocarbons and SF ₆	3.6	4.0	4.3	4.7	5.0	6.9	11.1	15.0	18.3	22.3	25.6	35.2
Other	2.0	2.0	2.2	2.2	2.0	1.9	2.2	2.5	2.8	3.1	3.3	3.7
3 Agriculture	44.8	44.6	42.8	41.8	40.1	38.4	37.6	36.1	34.6	33.0	36.1	37.3
Enteric fermentation	36.0	35.8	34.3	33.6	32.2	30.8	30.1	28.9	27.7	26.4	28.8	29.7
Manure management	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.3	0.3	0.3	0.4
Agricultural soils	8.4	8.4	8.0	7.8	7.5	7.1	7.0	6.7	6.6	6.3	6.9	7.2
4 Land use, land-use change and forestry	0.0											
Afforestation and reforestation												
5 Waste	162.1	166.3	170.4	174.5	167.9	172.0	148.9	146.2	130.2	133.5	129.2	129.8
Total CO₂-e emissions including net CO₂-e from LULUCF	3,185.3	3,247.9	3,294.3	3,490.1	3,457.3	3,449.5	3,517.8	3,613.3	3,641.3	3,647.0	3,702.2	3,805.0
Total CO₂-e emissions excluding net CO₂-e from LULUCF	3,185.3	3,247.9	3,294.3	3,490.1	3,457.3	3,449.5	3,517.8	3,613.3	3,641.3	3,647.0	3,702.2	3,805.0

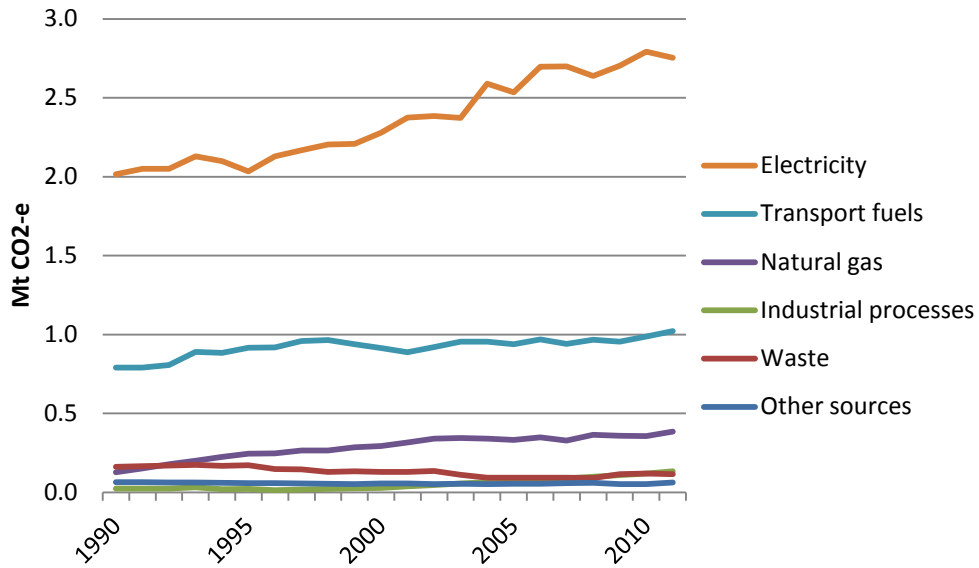
Table 2.2 ACT CO2 equivalent emissions, 1990 to 2011 financial years, (kilotonnes)

Greenhouse gas source and sink categories	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	1990 to 2011	2010 to 2011
Total CO2-e emissions	-	-	-	-	-	-	-	-	4,398.0	4,458.2	40.0%	1.4%
1 Energy	3,659.3	3,693.5	3,903.6	3,828.3	4,036.2	3,998.6	4,004.5	4,047.4	4,168.4	4,202.4	42.3%	0.8%
A. Fuel combustion activities	3,654.1	3,684.2	3,896.7	3,818.1	4,025.5	3,980.2	3,982.7	4,027.9	4,149.2	4,173.8	41.5%	0.6%
Electricity	2,383.9	2,372.7	2,589.5	2,535.1	2,696.7	2,699.2	2,637.4	2,702.2	2,792.9	2,753.4	36.6%	-1.4%
Natural gas	340.2	345.6	340.8	333.2	348.7	329.2	365.4	358.5	356.7	386.1	202.4%	8.2%
Transport fuels	920.9	956.1	956.0	938.9	968.4	940.1	968.2	955.6	987.9	1,022.7	29.5%	3.5%
Fuel wood	9.1	9.7	10.4	11.0	11.7	11.7	11.7	11.7	11.7	11.7	-30.5%	0.0%
B. Fugitive emissions from fuels	5.2	9.3	7.0	10.2	10.7	18.3	21.8	19.5	19.2	28.6	728.9%	48.7%
Natural gas leakage	5.2	9.3	7.0	10.2	10.7	18.3	21.8	19.5	19.2	28.6	728.9%	48.7%
2 Industrial processes	47.3	57.2	65.3	72.6	79.4	88.8	99.7	108.9	120.5	133.9	442.2%	11.1%
Production of halocarbons and SF6												
Consumption of halocarbons and SF6	43.6	52.1	60.4	68.7	74.8	84.5	94.4	103.6	115.1	128.3	3420.2%	11.5%
Other	3.3	4.6	4.5	3.5	4.1	3.9	4.9	4.8	4.9	5.0	156.2%	1.9%
3 Agriculture	38.0	35.5	34.9	34.0	32.9	29.4	26.6	22.1	22.4	22.4	-50.0%	0.1%
Enteric fermentation	29.8	27.6	27.2	26.7	26.0	23.0	20.8	18.0	18.5	18.6	-48.2%	0.7%
Manure management	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.2	0.1	-72.7%	-23.0%
Agricultural soils	7.7	7.4	7.3	6.9	6.5	5.9	5.4	3.9	3.7	3.6	-56.9%	-1.9%
4 Land use, land-use change and forestry							-26.8	-23.6	-32.8	-16.5		-49.8%
Afforestation and reforestation							-26.8	-23.6	-32.9	-16.5		-49.7%
5 Waste	136.2	112.5	93.3	94.1	93.8	92.9	92.0	115.5	119.5	116.0	-28.4%	-2.9%
Total CO2-e emissions including net CO2-e from LULUCF	3,880.8	3,898.6	4,097.2	4,029.0	4,242.3	4,209.6	4,196.0	4,270.4	4,398.0	4,458.2	40.0%	1.4%
Total CO2-e emissions excluding net CO2-e from LULUCF	3,880.8	3,898.6	4,097.2	4,029.0	4,242.3	4,209.6	4,222.8	4,294.0	4,430.8	4,474.7	40.5%	1.0%

Source: ABS, 2011, 2012; DCCCE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b, unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

In 2010–11 the ACT’s total greenhouse gas emissions continued the upward trend that began in 1990. Total emissions including LULUCF have increased by 40.0 per cent over that period, which corresponds to a 40.5 per cent increase in total emissions excluding LULUCF. The trend in total emissions and those of the main emitting sectors from 1990 to 2010–11 are shown in Figure 2.5.

Figure 2.5 Trend in sectoral emissions, 1990 to 2011 financial years (excluding LULUCF)

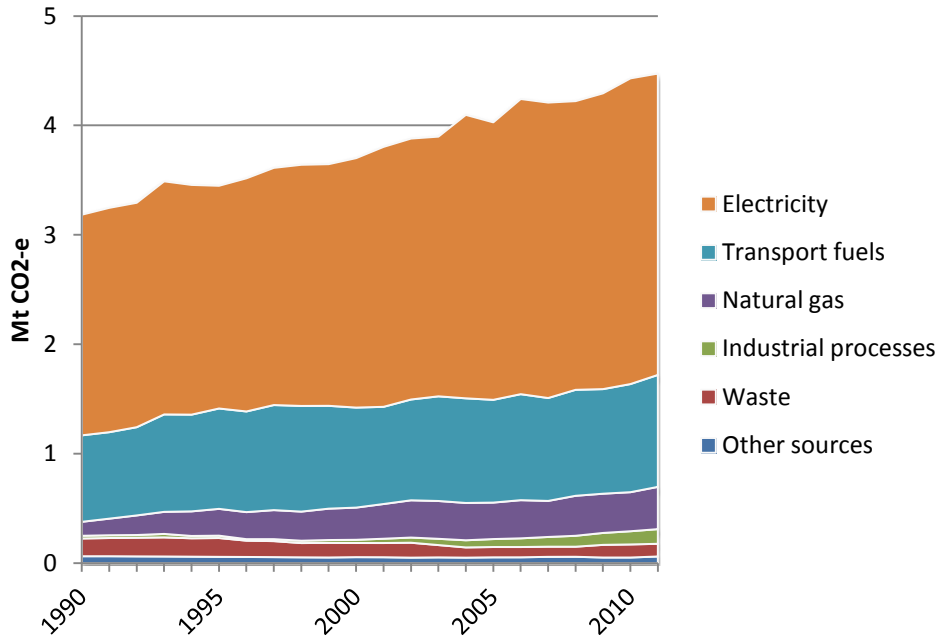


Mt = megatonnes

Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

Figure 2.6 shows the cumulative contribution of each of the main sectors to total emissions, and shows that since 1990 there have only been three financial years in which total emissions (excluding LULUCF) declined from those of the previous year (1994, 2005, and 2007).

Figure 2.6 Trend in composition of total emissions, 1990 to 2011 financial years (excluding LULUCF)



Mt = megatonnes

Source: ABS, 2011, 2012; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

Electricity consumption is responsible for the largest share of annual total emissions, and has also made the greatest contribution to the increase in the ACT's total emissions since 1990. It has increased at an annualised growth rate of 1.5 per cent, almost in line with the annualised growth rate in total emissions of 1.6 per cent. Emissions from the consumption of natural gas have experienced the largest rate of growth of all fuel combustion activities, increasing at an annualised rate of 5.4 per cent. Transport fuel emissions have grown annually at rate of 1.2 per cent.

Other sources of emissions experiencing significant rates of growth from 1990 to 2010–11 are natural gas leakage (10.6 per cent per annum) and the consumption of halocarbons and SF₆ in industrial processes (18.5 per cent per annum).³ Waste is the only activity emitting more than 100 kilotonnes per annum that experienced a negative growth rate in emissions (-1.7 per cent per annum).

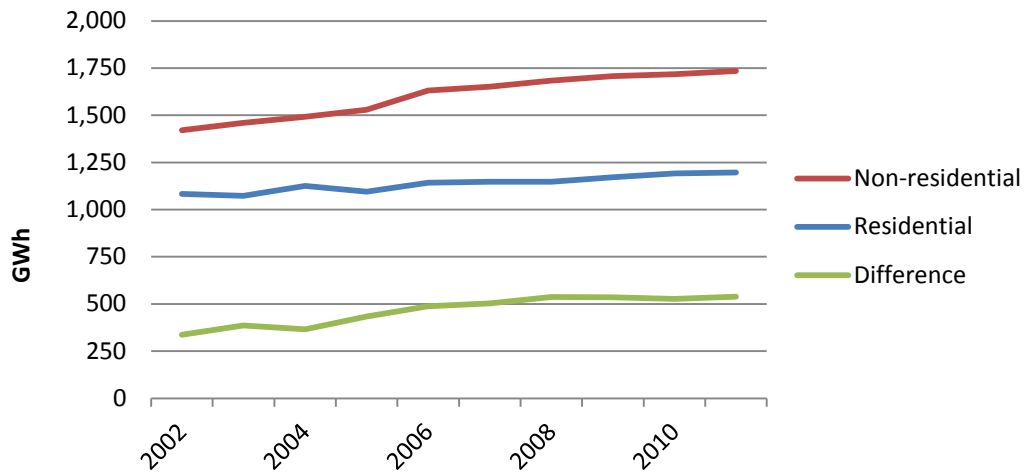
Comparing emissions for each of the major categories excluding LULUCF in 2009–10 with those in 2010–11 shows that energy increased by 0.8 per cent, industrial processes increased by 11.1 per cent, agriculture increased by 0.1 per cent, and waste decreased

³ SF₆ is sulfur hexafluoride.

by 3.2 per cent. The main sectors contributing to total emissions are all within the energy category. Between 2009–10 and 2010–11, emissions from electricity consumption decreased by 1.4 per cent, natural gas increased by 8.2 per cent, and transport fuels increased by 3.5 per cent.

Figure 2.7 and Figure 2.8 show the trend in electricity consumption and natural gas consumption, respectively, for both residential and non-residential consumers. The residential sector represents a smaller share of electricity consumption, but a greater share of gas consumption. Non-residential electricity consumption has been growing as a share of total electricity consumption, while the ratio of residential to non-residential gas consumption has remained fairly stable.

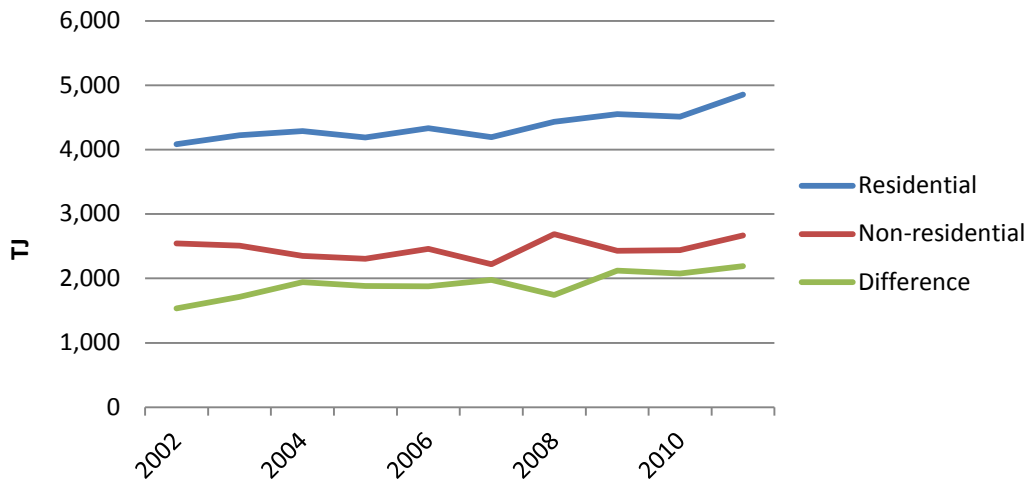
Figure 2.7 Trend in electricity consumption, 2002 to 2011 financial years



GWh = gigawatt hours

Source: ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution; and previous ACT greenhouse gas inventories.

Figure 2.8 Trend in natural gas consumption, 2002 to 2011 financial years

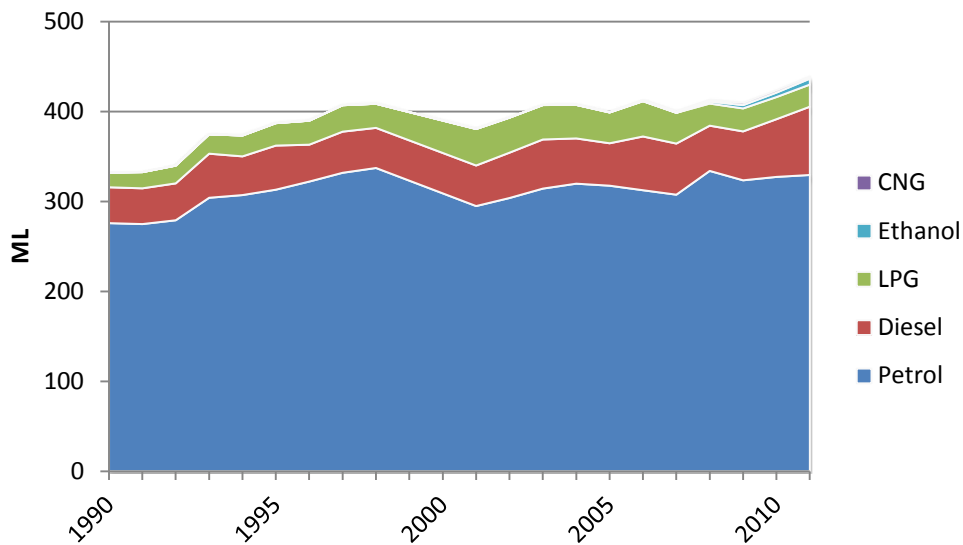


TJ = terajoules

Source: ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; and previous ACT greenhouse gas inventories.

Figure 2.9 illustrates the trend in the consumption of transport fuels and each category’s relative share. Petrol, diesel, and liquefied petroleum gas (LPG) are the three most consumed fuels. Compressed natural gas (CNG) and ethanol are newer forms of transportation fuel; their use continues to be low in the ACT.

Figure 2.9 Trend in transport fuel consumption, 1990 to 2011 financial years



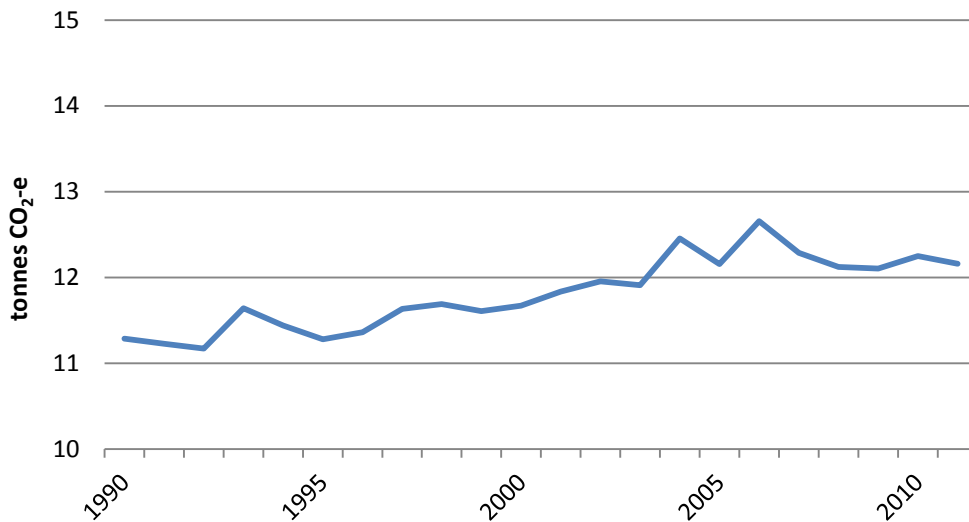
ML = megalitres

Source: ESDD, 2011; unpublished data from ACTION; and previous ACT greenhouse gas inventories.

2.5 Per capita emissions

The Act establishes a greenhouse gas emissions target that requires per capita total emissions including LULUCF to peak by 30 June 2013. Figure 2.10 shows the trend in per capita emissions in the ACT from 1990 to 2010–11. Emissions increased from 11.3 tonnes CO₂-e in 1990 to a high of 12.7 tonnes in 2005–06. In 2010–11, per capita emissions were 12.2 tonnes, which is 0.1 tonnes less than the 12.3 tonnes emitted in 2009–10.

Figure 2.10 Trend in per capita emissions, 1990 to 2011 financial years (excluding LULUCF)



Source: ABS, 2011, 2012, 2013; DCCEE, 2013a, 2013b; ESDD, 2011; GreenPower, 2012; ICRC, 2004a, 2004b, 2005, 2007, 2008, 2009a, 2009b, 2011a, 2011b, 2012b; unpublished data from ActewAGL Distribution, ACTION, ESAA; and previous ACT greenhouse gas inventories.

3 Renewable energy consumption

The ACT Government has set renewable energy targets to complement the greenhouse gas reduction targets established in the Act (*Climate Change and Greenhouse Gas Reduction (Renewable Energy Targets) Determination 2011 (No 1)*). The targets are for 15 per cent of total electricity use in the Territory to be from renewable energy by 2012, increasing to 25 per cent by 2020.

The calculation of renewable energy use in the ACT each financial year consists of four components:

- the ACT's share of the pre-1997 baseline level of electricity generated from renewable energy plants in New South Wales – that is, renewable energy from generation plants ineligible for the creation of renewable energy certificates under the Australian Government's renewable energy target. This share is calculated based on the Territory's electricity consumption as a percentage of total consumption in the NSW region in the National Electricity Market;⁴
- the amount of renewable energy purchased by ACT electricity retailers to comply with the Australian Government's renewable energy target as specified by the annual renewable power percentage (RPP) and the ACT's consumption profile for each half of the financial year;
- the amount of GreenPower purchased by consumers within the ACT; and
- the amount of renewable energy generated under the ACT Government's Feed-in Tariff (FiT) Scheme.

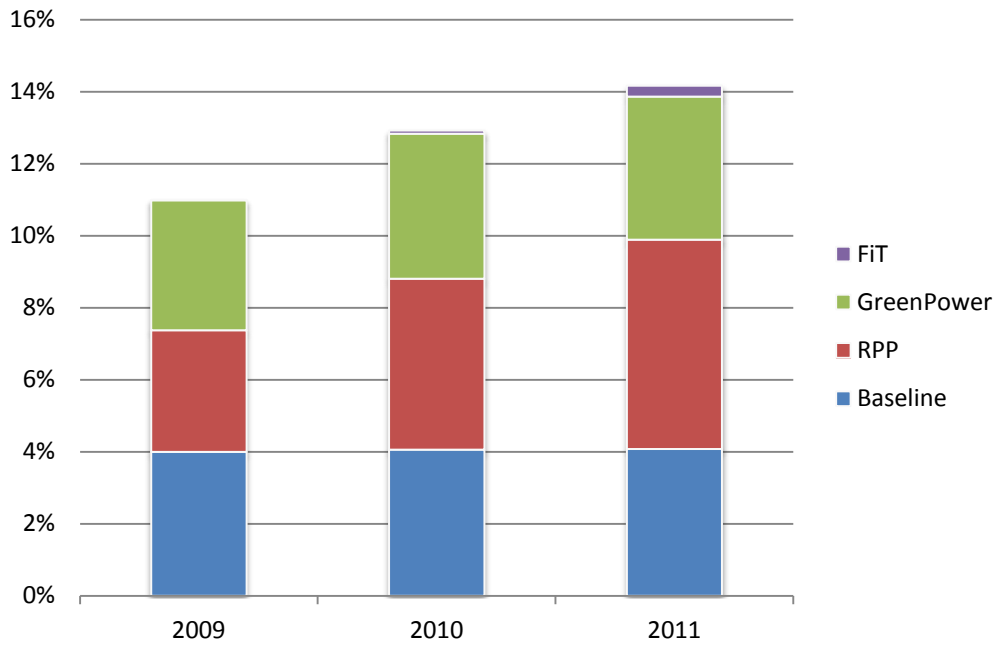
In 2010–11 renewable energy use in the ACT was 14.2 per cent of total electricity consumption. This compares to 12.9 per cent in 2009–10 and 11.0 per cent in 2008–09. Figure 3.1 illustrates the component shares for the three years.

The baseline component in 2010–11 remained relatively constant when compared to 2009–10 at 4.1 per cent of total electricity consumption.

The RPP component for 2010 and 2011 adjusted for the variation in electricity consumption in each half of the financial year is 4.7 and 5.8 per cent, respectively. GreenPower sales were 117 GWh in 2009–10 and 2010–11, which represents 4.0 per cent of electricity consumption in both years. The contribution from the ACT FiT component was small: 0.1 per cent in 2009–10 and 0.3 per cent in 2010–11.

⁴ The NSW pre-1997 renewable energy baseline of 3,280 GWh is taken from estimates provided to the Office of the Renewable Energy Regulator (IES, 2002: 53–59).

Figure 3.1 Percentage of total electricity consumption, 2008-09 to 2010-11



Source: AER, 2010; BREE, 2012; CER, 2012; GreenPower, 2012; ICRC, 2012a; IES, 2002; Snowy Hydro, nd; and unpublished data from ActewAGL Distribution.

Appendix 1 Determination

Australian Capital Territory

Climate Change and Greenhouse Gas Reduction (Greenhouse Gas Emissions Measurement Method) Determination 2013

Disallowable Instrument DI2013-76

made under the

***Climate Change and Greenhouse Gas Reductions Act 2010* (the Act) s 11
(Measuring greenhouse gas emissions – determination)**

1 Name of instrument

This instrument is the *Climate Change and Greenhouse Gas Reduction (Greenhouse Gas Emissions Measurement Method) Determination 2013*.

2 Commencement

This instrument commences on the day after it is notified.

3 Revocation

I revoke the *Climate Change and Greenhouse Gas Reduction (Greenhouse Gas Emissions Measurement Method) Determination 2011*, DI2011-257.

4 Determination of method for measuring greenhouse gas emissions

I determine the method for measuring the amount of greenhouse gas emissions in the ACT for the year (the *annual emissions amount*) as set out in the schedule attached to this instrument.

Simon Corbell MLA
Minister for the Environment and Sustainable Development
21 May 2013

Schedule to *the Climate Change and Greenhouse Gas Reduction (Greenhouse Gas Emissions Measurement Method) Determination 2013*

1. Objects of the determination

This determination sets out the method for the measurement of greenhouse gas emissions arising from sources, or attributable to activities, located within the geographic boundary of the Australian Capital Territory (ACT).

2. Application of the determination

The method determined in this instrument must be used to measure the amount of greenhouse gas emissions in the ACT for the year (the annual emissions amount) in the annual report prepared by an independent entity as required under section 12 of the Act.

3. Greenhouse gas emissions covered

The emissions covered by this determination are:

- Scope 1 emissions from:
 - fuel combustion
 - fugitive emissions from fuels
 - industrial processes
 - agriculture
 - land use, land-use change, and forestry
 - waste.
- Scope 2 emissions from electricity consumption in the ACT, adjusted for scope 3 electricity transmission and distribution losses.

The annual data on these emissions will be obtained from the National Greenhouse Accounts except for the following:

- electricity consumption
- natural gas consumption
- wood fuel combustion
- road transport
- natural gas leakage.

4. Definitions

In this Determination:

carbon dioxide equivalence or **CO₂-e**, means the amount of greenhouse gas multiplied by its specific global warming potential.

dry wood means wood that:

- a) has a moisture content of 20% or less if the moisture content is calculated on a wet basis; and
- b) is combusted to produce heat.

emission factors refer to the kilograms of carbon dioxide equivalent emitted per unit of activity.

energy content factor, for a fuel, means gigajoules of energy per unit of the fuel measured as a gross calorific value.

fugitive emissions means the release of emissions that occur during the extraction, processing and delivery of fossil fuels.

global warming potential refers to an index (on a 100 year time horizon) representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.

greenhouse gas emissions has the meaning given by the *Climate Change and Greenhouse Gas Reduction Act 2010*.

scope 1 emissions refer to the emission of greenhouse gases directly resulting from an activity, or series of activities (including ancillary activities).

scope 2 emissions refer to the emission of greenhouse gases that occurs outside the ACT as a consequence of using grid-supplied electricity, heating and/or cooling within the ACT.

scope 3 emissions refer to the emissions of greenhouse gases not included as a scope 1 or scope 2 emissions that occur outside the ACT as a result of activities within the jurisdiction due to use of goods and services. Scope 3 emissions include electricity transmission and distribution losses.

5. Method

The method for calculating the emissions for which annual data will not be obtained from the National Greenhouse Accounts will be made using the following equations:

Equation 1: Stationary energy combustion emissions – electricity consumption

$$EIE = \frac{\left(\frac{QE}{1-NL} - GP\right) \times EFE}{1000}$$

Where:

EIE is emissions from electricity consumption expressed in tonnes of CO₂-e

NL is the network loss (that is, transmission and distribution losses) expressed as a ratio of combined NSW and ACT electricity generation and consumption

QE is the consumption of purchased electricity expressed in kilowatt hours

GP is purchases of GreenPower expressed in kilowatt hours

EFE is the emissions factor for scope 2 electricity consumption for NSW/ACT in kilograms of CO₂-e emissions per kilowatt hour.

Equation 2: Stationary energy combustion emissions – natural gas

$$ENG = \frac{QNG \times \sum_j EFNG_j}{1000}$$

Where:

ENG is emissions from natural gas consumption expressed in tonnes of CO₂-e

QNG is the consumption of purchased natural gas less consumption by ACTION Buses expressed in gigajoules

EFNG_j is the emissions factor for natural gas combustion for greenhouse gas type *j* = CO₂, CH₄ and N₂O in kilograms of CO₂-e per gigajoule

Equation 3: Stationary energy combustion emissions – wood fuel

$$EWF = \sum_i \frac{QWF \times ECWF \times UWF_i \times \sum_j EFWF_{ij}}{1000}$$

Where:

EWF is emissions from wood fuel consumption expressed in tonnes of CO₂-e

QWF is the consumption of dry wood expressed in tonnes

ECWF is the energy content factor for dry wood expressed in gigajoules per tonne

UWF_i is the share of wood fuel consumption used in activity type *i* = heating and stoves

EFWF_{ij} is the emissions factor for activity type *i* for greenhouse gas type *j* = CH₄ and N₂O in kilograms of CO₂-e per gigajoule

Equation 4: Transport fuel emissions – road transport

$$ERT = \sum_i \sum_k \frac{QRT_{ik} \times ECRT_i \times \sum_j EFRT_{ijk}}{1000}$$

Where:

ERT is emissions from road transport vehicles expressed in tonnes of CO₂-e

QRT_{ik} is the quantity of transport fuel type *i* = auto gasoline, ethanol, diesel, and liquefied petroleum gas (LPG) sold measured in kilolitres and CNG consumed by ACTION Buses expressed in cubic metres, consumed by vehicle year of manufacture *k* = pre-2005 or post-2004

ECRT_i is the energy content factor for transport fuel type *i* expressed in gigajoules per kilolitre or gigajoules per cubic metre

EFRT_{ijk} is the emissions factor for transport fuel type *i* for greenhouse gas type *j* = CO₂, CH₄ and N₂O in kilograms of CO₂-e emissions per gigajoule, consumed by vehicle year of manufacture *k* = pre-2005 and post-2004

Equation 5: Fugitive emissions – natural gas leakage

$$ENGL = S \times \%UAG \times L \times \sum_j C_j$$

Where:

ENGL is emissions from natural gas leakage expressed in tonnes of CO₂-e

S is the total gas utility sales from the pipeline system expressed in terajoules

%UAG is the percentage of unaccounted for gas in the Territory's pipeline system, relative to the amount issued annually by gas utilities

L is the portion of unaccounted for gas allocated as leakage, which is equal to 0.55¹

C_j is the natural gas composition factor for greenhouse gas type *j* = CO₂ and CH₄ supplied from the Territory's pipeline system expressed in tonnes of CO₂-e per terajoule²

¹ Variable is consistent with 'Method 1 – natural gas distribution' defined in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Cwth)*.

² ACT and NSW share the same coefficient.

6. Annual report about greenhouse gas emissions and targets

The annual report prepared by an independent entity as required under section 12 of the Act must include the information as calculated in the following table:

Greenhouse gas source and sink categories		Total (CO ₂ -e) Gg (kilo tonnes)
Total ACT emissions and removals		1+2+3+4+5
1	Energy	A+B
	<i>A Fuel combustion activities</i>	a+b+c+d
	Electricity	a ¹
	Natural gas	b ²
	Transport fuels	c ³
	Wood fuel	d ⁴
	<i>B Fugitive emissions from fuels</i>	e
	Natural gas leakage	e ⁵
2	Industrial processes	f+g
	Consumption of Halocarbons and SF ₆	f ⁶
	Other	g ⁶
3	Agriculture	h+i+j
	Enteric fermentation	h ⁶
	Manure management	i ⁶
	Agricultural soils	j ⁶
4	Land use, land-use change, and forestry	k
	Afforestation and deforestation	k ⁶
5	Waste	l+m
	Solid waste disposal on land	l ⁶
	Wastewater handling	m ⁶
Total emissions including net CO ₂ from LULUCF		1+2+3+4+5
Total emissions excluding net CO ₂ from LULUCF		1+2+3+5

¹ EIE given by equation 1

² ENG given by equation 2

³ ERT given by equation 4

⁴ EWF given by equation 3

⁵ ENGL given by equation 5

⁶ Data from the Australian Greenhouse Emissions Information System (DCCEE 2013c)

Abbreviations and acronyms

ABS	Australian Bureau of Statistics
Act	<i>Climate Change and Greenhouse Gas Reduction Act 2010 (ACT)</i>
AER	Australian Energy Regulator
AGEIS	Australian Greenhouse Emissions Information System
BREE	Bureau of Resources and Energy Economics
CER	Clean Energy Regulator
CH ₄	methane
CNG	compressed natural gas
CO ₂	carbon dioxide
CO ₂ -e	carbon dioxide equivalent
Commission	Independent Competition and Regulatory Commission (ACT)
DCCEE	Department of Climate Change and Energy Efficiency
ESAA	Energy Supply Association of Australia
ESDD	Environment and Sustainable Development Directorate (ACT)
GWh	gigawatt hours
ICRC	Independent Competition and Regulatory Commission (ACT)
ICRC Act	<i>Independent Competition and Regulatory Commission Act 1997 (ACT)</i>
IES	Intelligent Energy Systems
kt	kilotonnes
LPG	liquefied petroleum gas

Abbreviations and acronyms

LULUCF	land use, land-use change, and forestry
Minister	Minister for the Environment and Sustainable Development (ACT)
ML	megalitres
Mt	megatonnes
N ₂ O	nitrous oxide
REC	Renewable Energy Certificate
SF ₆	sulphur hexafluoride
TJ	Terajoules
total emissions	total CO ₂ -e emissions
Utilities Act	<i>Utilities Act 2000</i> (ACT)

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ABS, see Australian Bureau of Statistics.

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