Australia's National
Science Agency

Review of Progress to Achieving Targets Under Section 7 of the Climate Change and Greenhouse Emissions Reduction Act 2007

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Executive summary

The Government of South Australia *Climate Change and Greenhouse Emissions Reduction Act 2007* includes as one of its requirements under Section 7 (5) that a report be prepared to assess the extent to which any determination or target made or set under Section 5 of the Act is being achieved and, if it appears relevant, should be revised. The report that follows is Commonwealth Scientific and Industrial Research Organisation's (CSIRO) independent assessment to meet this requirement.

Part 2 of the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act) specifies a principal target to achieve a reduction in greenhouse gas emissions within the State of South Australia, as well as two related targets that promote the generation and use of renewable sources of energy. The Act also instructs the Minister for Climate Change (the Minister) on the operation of these targets. Specifically, the Act states in Part 2:

Part 2 – Targets

5—Targets

(1) The principal target under this Act is to reduce by 31 December 2050 greenhouse gas emissions within this State by at least 60% to an amount that is equal to or less than 40% of 1990 levels.

(2) Two related targets under this Act are—

(a) to increase the proportion of renewable electricity generated so that it comprises at least 20% of electricity generated in the State by 31 December 2014;

(b) to increase the proportion of renewable electricity consumed so that it comprises at least 20% of electricity consumed in the State by 31 December 2014.

(3) The Minister may, in connection with the operation of subsections (1) and (2) for the purposes of any other provision of this Act—

(a) determine the method for calculating greenhouse gas emissions for the purposes of setting relevant 1990 levels (the ***baseline***), and then determine a figure that represents that baseline;

(b) determine the method for calculating any reduction in greenhouse gas emissions;

(c) set sector-based targets and additional interim targets;

(d) set specific baselines for particular areas of activity (as components of the overall baseline);

(e) make other determinations that assist in measuring greenhouse gas emissions within the State.

On 2 June 2009, the Minister for Climate Change announced an additional target under Part 2 of the Act stating "33.3% of South Australia's electricity generation to come from renewable energy by 2020".

The Minister is required, on a two-yearly basis, to prepare a report on the operation of the Act. The first report, and thereafter every alternate report, must incorporate a report from the CSIRO that:

- Summarises CSIRO's assessment of the extent to which any determination or target made or set under Part 2 of the Act is being achieved and, if it appears relevant, should be revised; and
- Provides advice on the method for calculating the 1990 baseline for the greenhouse gas target consistent with Sections 5 (4) (b) and Section 5 (4) (c) of the Act.

This document reports the assessment of CSIRO in relation to the fourth of these four-yearly reports. Overall, South Australia's renewable energy targets have been achieved and the state has achieved an approximate 36% reduction on 1990 levels based on the latest inventory year. It is on track to achieve 60% reduction on 1990 levels by 2050 if the current reduction trajectory is maintained. The key findings are listed below.

As of 2019, greenhouse gas emissions in South Australia have decreased by 36.1% compared to 1990 levels.	• In recent years, energy sector GHG emissions have been declining mainly due to the increased deployment of large-scale renewable generation and rooftop solar photovoltaic (PV) systems, especially residential based systems. • Since 2008, net GHG emissions from Land Use, Land Use Change and Forestry (LULUCF) have been negative (GHG emissions sequestered by LULUCF sinks exceeding GHG emissions from LULUCF sources), contributing to the decline.
As of 2020, the proportion of South Australia electricity generation that was generated using renewables was 56.6%.	• The proportion of renewable electricity generation in South Australia has increased significantly in recent years. • South Australia surpassed its current target for renewable electricity generation (33.3% of South Australia's electricity generation to come from renewable energy by 2020) during 2013/14.
Many jurisdictions have, or are considering, legislating long-term net zero GHG emission targets	• Pledges of net zero GHG reduction targets are becoming more prevalent. • The Australian Capital Territory and Victoria have legislated long-term net zero GHG reduction targets and

	internationally, 10 countries have legislated net zero targets.

Part I Assessment

1 Greenhouse Gas Emissions Target

1.1 Current progress

For the purposes of the Act, the target pertaining to "… *greenhouse gas emissions within this State*" requires the establishment of the SA greenhouse gas (GHG) inventory as a time series from the base year 1990.

Total SA GHG emissions are calculated as total SA GHG emissions, including Land Use, Land Use Change and Forestry (LULUCF) sources, less LULUCF sinks.

The Department of Industry, Science, Energy and Resources (DISER) provides annual GHG emissions data for all states and territories and annually revises the State and Territory Greenhouse Gas Inventories (STGGIs). The DISER updates emission factors and methodologies when new information or more accurate methodologies become available, and revises figures back to 1990 to ensure time series consistency. Re-calculation is an obligation under the United Nations Framework Convention on Climate Change (UNFCCC).

For this reason, historical GHG emissions data may change. The progress to target is assessed using the latest data available. The latest inventory year that is available is for financial year 2019 (1 July 2018 to 30 June 2019).

Table 1-1 presents total GHG emissions in kilotonnes (kt) of carbon-dioxide equivalent (CO_2-e) for South Australia for recent selected years relative to the 1990 baseline. These emissions estimates are reported using the UNFCCC classifications. The South Australian Government monitors progress against the legislated 2050 target consistent with the Australian Government Paris Agreement targets.

Table 1-1: SA greenhouse gas emissions, 1990-2019, selected years

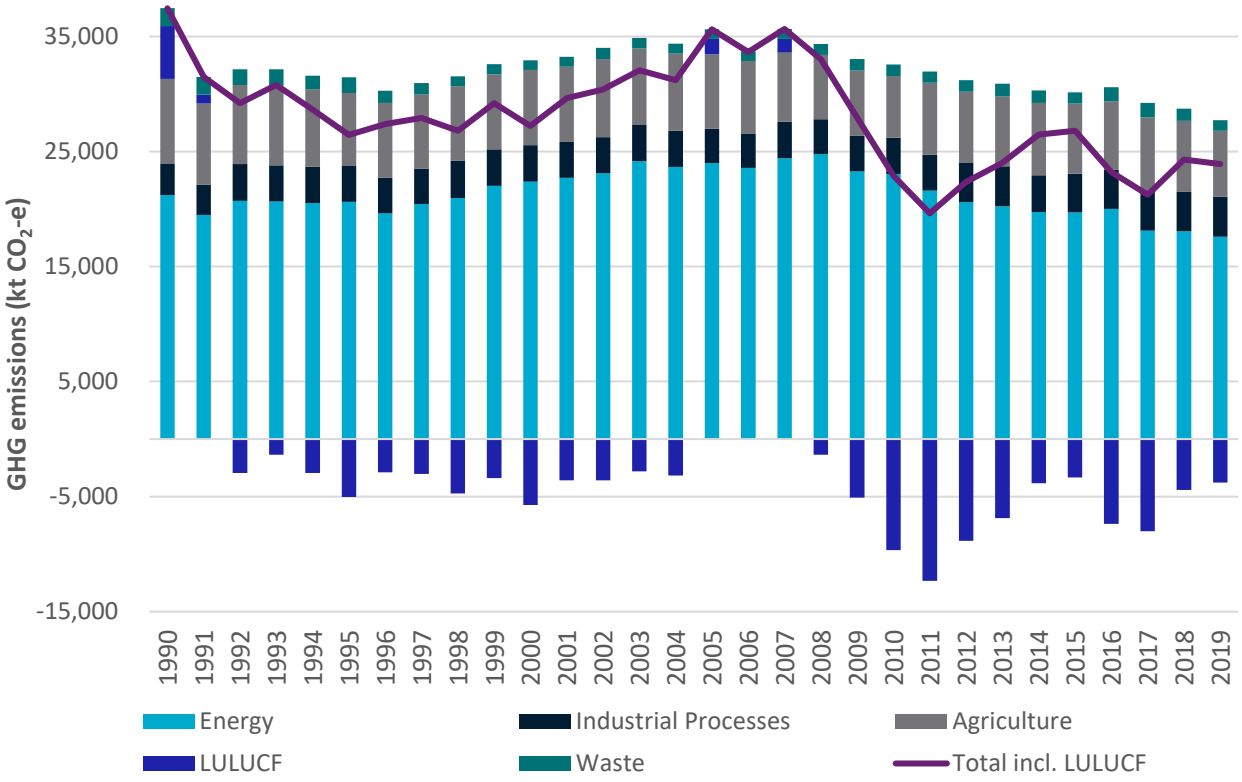
SA GHG Emissions (ktCO2-e)	1990	2015	2016	2017	2018	2019
Total GHG emissions with land use, land-use change and forestry	37,453	26,818	23,204	21,238	24,300	23,919
Change since 1990		-28.4%	-38.0%	-43.3%	-35.1%	-36.1%

Source: DISER (2021), data tables downloaded from https://www.industry.gov.au/sites/default/files/April%202021/document/state-and-territory-greenhouse-gas-inventories-2019-time-series-data-tables.xlsx [accessed 9 August 2021]

The SA GHG Inventory shows that GHG emissions have decreased by 36.1% under the UNFCCC methodology by 2019 compared to 1990 levels.

Figure 1-1 presents total GHG emissions by headline category for South Australia since 1990. There has been significant movement in both the energy component and LULUCF emissions over that period. In recent years, energy sector GHG emissions have been declining mainly due to the increased deployment of large-scale wind and solar generation and distributed rooftop solar photovoltaic (PV) systems, especially residential based systems. At the same time, coal-fired power generation in South Australia ceased in May 2016 with the closure of the 546 MW Northern power station and the 240 MW Playford power station. There was also some reduction in gas-fired

electricity generation with the second turbine at Pelican Point power station taken offline for upgrade in 2015, returning to service in 2017. Fuel combustion in manufacturing industries has also declined, and fugitive emissions have remained flat over the last five years. In contrast, transport sector GHG emissions have showed some moderate growth over the period.



Source: DISER (2021), data tables downloaded from https://www.industry.gov.au/sites/default/files/April%202021/document/state-and-territory-greenhouse-gas-inventories-2019-time-series-data-tables.xlsx [accessed 9 August 2021]

This graph is based on the UNFCCC methodology for net LULUCF emissions.

Figure 1-1: SA greenhouse gas emissions by source and sink category, 1990-2019

In regards to the LULUCF category, net GHG emissions from LULUCF have been negative (GHG emissions sequestered by LULUCF sinks exceeding GHG emissions from LULUCF sources) over the last decade, mainly due to plantations and natural regeneration of forest land, regrowth on deforested land and to a lesser extent cropland remaining as cropland.

1.2 Progress towards the 2050 target

Assessing progress towards South Australia's GHG target for 2050 is difficult and subject to considerable estimation risk given uncertainties regarding technological change, state and national policy decisions, investment behaviour, and the impact of the foregoing on consumer demand. As the state has achieved an approximate 36% reduction on 1990 levels based on the latest inventory year, it is on track to achieve 60% reduction on 1990 levels by 2050 if the current reduction trajectory is maintained.

2 Renewable Energy Target

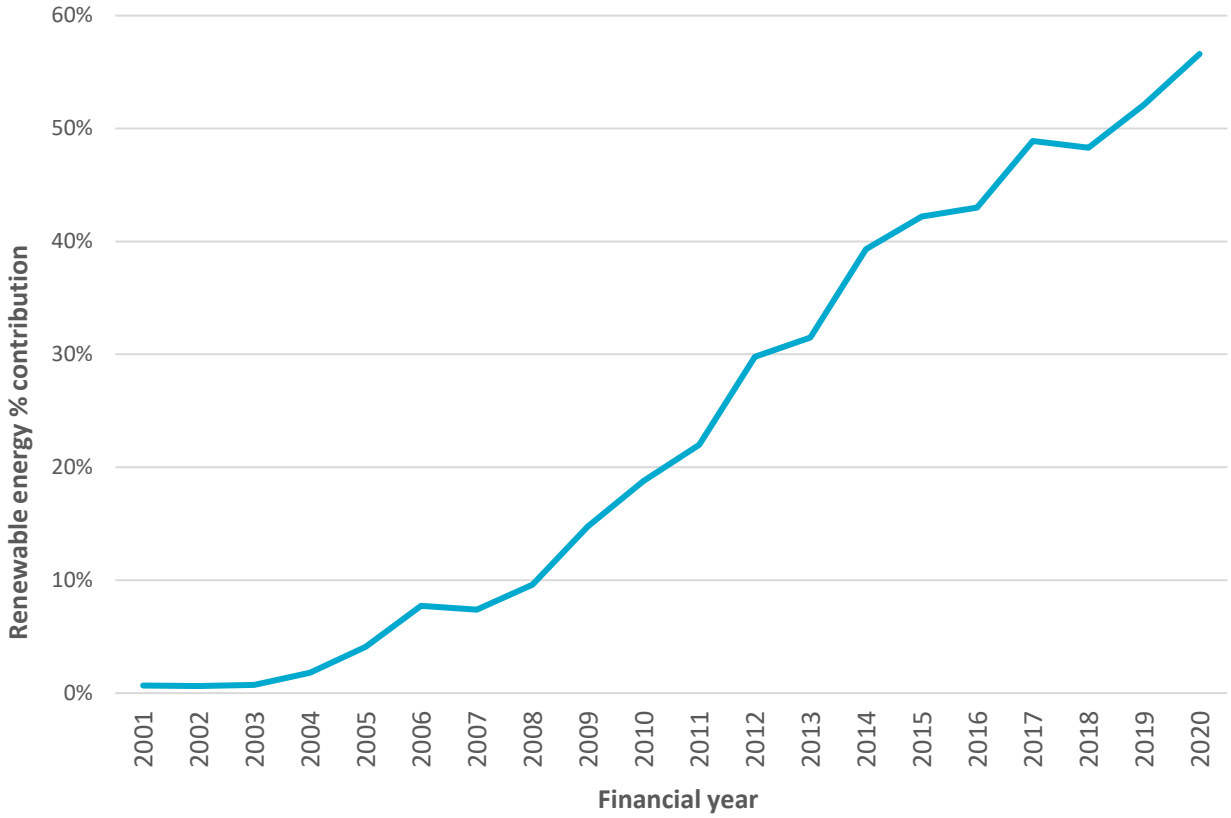
2.1 Current progress

In 2021, the status of renewable energy targets as stated in the Act is as follows:

Table 2-1: Status of renewable energy targets

Target	Status
To increase the proportion of renewable electricity generated so that it comprises at least 20% of electricity generated in the State by 31 December 2014.	This target was achieved in 2010-11 when the result was 22% of electricity generated in the State. In 2013, the CSIRO concluded that this target has been met. Source: 2013 Section 7 report
To increase the proportion of renewable electricity consumed so that it comprises at least 20% of electricity consumed in the State by 31 December 2014.	This target was achieved in 2010-11 when the result was 24.1% of the electricity consumed in the State. In 2013, the CSIRO concluded that this target has been met. Source: 2013 Section 7 report
An additional target of achieving 33% of South Australia's electricity generation to come from renewable energy by 2020 was tabled under Section 5 of Act in 2009.	The electricity generation target was exceeded in 2013-14 when the result was 39%. In 2018, the CSIRO concluded that this target has been met. Source: 2018 Section 7 report

The South Australian government publishes annual statistics for renewable energy generation provided by the Department for Energy and Mining (DEM). Based on data compiled by DEM, the proportion of renewable electricity generation has increased significantly over recent years (Figure 2-1). The amount of renewable energy consumed has not been measured since the target was achieved in 2010/11.



Source: Department for Energy and Mining[1]

Figure 2-1: SA renewable energy % contribution, 2001-2020

The generation data in Figure 2-1 shows that the proportion of SA electricity generation that was generated using renewables in 2019-20 was 56.6%.

DEM now have a policy target of achieving 100% net renewable energy generated in the state by 2030 and measure progress against this target.

[1] DEM uses adjusted data from the Australian Energy Market Operator (AEMO) South Australian Electricity Report (SAER) to calculate renewable energy generation from wind, solar, and small non-scheduled renewable generation. The renewable component of the small non-scheduled generation figure is not published by AEMO in the SAER.

Part II Revisions of Targets

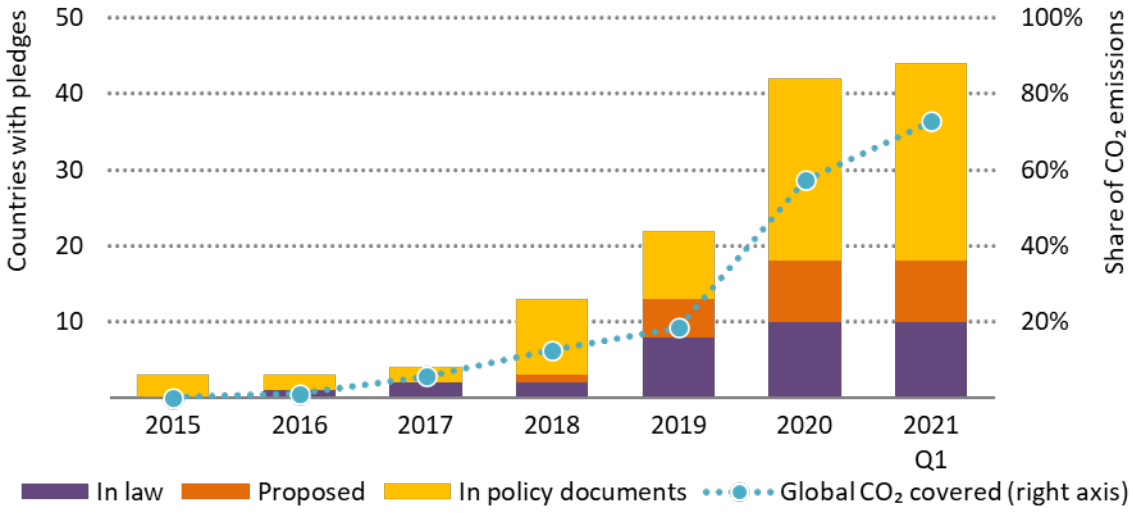
3 Greenhouse Gas Emissions Targets

3.1 SA targets

In October 2016, the Paris Climate Change Agreement was ratified. The main aim of the "Paris Agreement" is to limit global average temperature rise this century to well below 2°C and to pursue efforts to limit the temperature increase even further to 1.5°C above pre-industrial levels. In anticipation of this global agreement, the *South Australian Government Climate Change Action Plan 2021-25* includes a state-wide goal of reducing emissions to more than 50% of 2005 levels by 2030 and net zero emissions by 2050.[2] The information below indicates this target is consistent with global trends in country targets and with other Australian states and territories.

3.2 Country targets

The International Energy Agency (IEA) reports that there has been a rapid increase in the number of governments making pledges to reduce GHG emissions to net zero (Figure 3-1).



Source: IEA (2021)

Figure 3-1: Number of national net zero pledges and share of global CO_2 emissions covered

3.3 State and Territory targets

The States and Territories in Australia have also responded to the challenge of addressing climate change setting aspirational goals or legislating for net zero GHG emissions by 2050 (Table 3-1). Based on these stated policy commitments, the SA Government could consider revising its GHG emissions targets under the *Act*.

[2] Net zero emissions means that any remaining greenhouse gas emissions, after emissions are reduced, are balanced out by removal of an equivalent amount of carbon through additional carbon storage or carbon credits generated from a range of emissions reduction activities.

Table 3-1: State/Territory net zero GHG emission targets

Jurisdiction	Net Zero Target Year	Interim Targets	Legislative status	Review Process	Limits on offsets
Australian Capital Territory	2045	Reduction on 1990 levels: 2020: 40% 2025: 50-60% 2030: 65-75% 2040: 90-95% 2045: 100% (net zero emissions)	*Climate Change and Greenhouse Gas Reduction Act 2010*	Independent report about GHG emissions and progress to target every year Review of Act after 5th and 10th years of operation	No limits specified in Act
New South Wales	2050	To be informed by periodic Strategic Plans (e.g., Strategic Plan for 2022-27)	Not legislated (NSW Climate Change Policy Framework)[1]	Net Zero Plan Stage 1: 2020-2030[2] released in early 2020	N/A
Northern Territory	2050	N/A	Not legislated (NT Climate Change Response: Towards 2050)[3]	The Response will be reviewed in 2025	N/A
Queensland	2050	2030 Target: 30% reduction on 2005 levels	Not legislated (Queensland Climate Transition Strategy)[4]	Progress review to identify a broader policy framework for Queensland's post-2020 action.	N/A
South Australia	2050	2030 Target: 50% reduction on 2005 levels[5]	Not legislated[5] (*Climate Change and Greenhouse Emissions Reduction Act 2007* legislates 60% below 1990 levels by 2050)	Minister is required, on a two-yearly basis, to prepare a report on the operation of the Act	No
Tasmania	2050	N/A	Not legislated[6] (the *Climate Change (State Action) Act 2008* legislates 60% below 1990 levels by 2050)	Independent review on a four-yearly basis	No limits specified in Act

Jurisdiction	Net Zero Target Year	Interim Targets	Legislative status	Review Process	Limits on offsets
Victoria	2050	Reduction on 2005 levels: 2020: 15-20% 2025: 28-33% 2030: 45-50% 5-yearly interim targets 2035 onwards to be set	*Climate Change Act 2017*	Report on achievement of each interim target within two years after the end of the interim target period	No (any forestry, carbon sequestration or soil carbon rights in Victoria or outside Victoria can be eligible offsets)
Western Australia	2050	N/A	Not legislated (WA Climate Policy)[7]	N/A	N/A

Notes:

1. NSW Climate Change Policy Framework [accessed 9 August 2021]
2. Net Zero Plan Stage 1: 2020-2030 [accessed 9 August 2021]
3. NT Climate Change Response: Towards 2050 [accessed 9 August 2021]
4. Queensland Climate Transition Strategy [accessed 9 August 2021]
5. Directions for a Climate Smart South Australia [accessed 9 August 2021]
6. Tasmania's Climate Change Action Plan 2017-2021 [accessed 9 August 2021]
7. WA Climate Policy [accessed 9 August 2021]

4 Renewable Energy Targets

4.1 State and Territory Targets

State and Territories have also introduced legislated or non-legislated renewable energy targets (Table 4-1).

Table 4-1: State/Territory renewable energy targets

Jurisdiction	Targets	Legislative status	Generation target	Consumption target	DER in target
Australian Capital Territory	100% by 2020	*Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011 (ACT)*	No[1]	Yes[1]	Yes
New South Wales	No % target	*Electricity Infrastructure Investment Act 2020 (NSW)*	Additional 12 GW by 2030	N/A	N/A
Northern Territory	50% by 2030	Not legislated (NT Climate Change Response: Towards 2050)	No	Yes	Yes
Queensland	50% by 2030	Not legislated	No	Yes	Yes
South Australia	2020: 33.3% 2030: 100% net	*Climate Change and Greenhouse Emissions Reduction Act 2007 (SA)*	Yes 2020 target under s2 of Act 2030 target not legislated	No	Yes
Tasmania	100% by 2022 150% by 2030 200% by 2040	*Energy Co-ordination and Planning Amendment (Tasmanian Renewable Energy Target) Act 2020 (TAS)*	Yes	No	Yes
Victoria	40% by 2025 50% by 2030	*Renewable Energy (Jobs and Investment) Act 2017 (VIC)*	Yes	No	Yes
Western Australia	N/A	N/A	N/A	N/A	N/A

Note:

DER: Distributed Energy Resources

1. Renewable generation secured by reverse auction under the *Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011 (ACT)* does not have to be located within the ACT so is effectively a consumption target.

As noted in Section 2.1, South Australia has already exceeded its renewable generation target: 33.3% of South Australia's electricity generation to come from renewable energy by 2020. Subsequently the *South Australian Government Climate Change Action Plan 2021-2025* (released 2020) includes a commitment of 100% net renewables by 2030.

The SA Government could consider revising its renewable energy targets under the *Act*.

Appendix A

Table A-1: SA greenhouse gas emissions by source and sink category (levels in kt and change), UNFCCC since 1990

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Energy	21,205	19,499	20,710	20,643	20,529	20,617	19,639	20,442	20,952	22,014	22,390	22,702
Industrial Processes	2,755	2,639	3,200	3,157	3,156	3,141	3,066	3,091	3,227	3,164	3,169	3,127
Agriculture	7,353	7,039	6,886	6,978	6,742	6,325	6,510	6,406	6,503	6,529	6,539	6,541
LULUCF	4,596	776	- 2,956	- 1,367	- 2,945	- 5,024	- 2,896	- 3,017	- 4,729	- 3,381	- 5,717	- 3,586
Waste	1,544	1,541	1,353	1,374	1,169	1,381	1,071	1,012	853	884	844	865
Total incl. LULUCF	37,453	31,494	29,193	30,786	28,650	26,440	27,389	27,933	26,806	29,211	27,224	29,649
Change since 1990		-15.9%	-22.1%	-17.8%	-23.5%	-29.4%	-26.9%	-25.4%	-28.4%	-22.0%	-27.3%	-20.8%

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Energy	23,109	24,151	23,663	23,981	23,567	24,411	24,772	23,285	23,044	21,613	20,612	20,228
Industrial Processes	3,129	3,160	3,146	2,981	2,957	3,163	3,035	3,080	3,139	3,119	3,437	3,478
Agriculture	6,814	6,641	6,700	6,492	6,338	6,021	5,586	5,686	5,381	6,238	6,164	6,075
LULUCF	- 3,601	- 2,811	- 3,178	1,346	- 53	1,200	- 1,361	- 5,084	- 9,667	- 12,332	- 8,860	- 6,867
Waste	953	917	878	832	858	875	970	989	997	991	991	1,104
Total incl. LULUCF	30,405	32,057	31,210	35,632	33,667	35,670	33,001	27,955	22,893	19,629	22,345	24,018
Change since 1990	-18.8%	-14.4%	-16.7%	-4.9%	-10.1%	-4.8%	-11.9%	-25.4%	-38.9%	-47.6%	-40.3%	-35.9%

	2014	2015	2016	2017	2018	2019
Energy	19,726	19,712	20,008	18,123	18,070	17,603
Industrial Processes	3,214	3,351	3,396	3,417	3,411	3,471
Agriculture	6,295	6,095	5,951	6,443	6,194	5,725
LULUCF	- 3,850	- 3,337	- 7,380	- 8,001	- 4,430	- 3,795
Waste	1,092	997	1,229	1,255	1,054	914
Total incl. LULUCF	26,477	26,818	23,204	21,238	24,300	23,919
Change since 1990	-29.3%	-28.4%	-38.0%	-43.3%	-35.1%	-36.1%

Source: DISER (2021), data tables downloaded from https://www.industry.gov.au/sites/default/files/April%202021/document/state-and-territory-greenhouse-gas-inventories-2019-time-series-data-tables.xlsx [accessed 9 August 2021]

Shortened forms

Abbreviation	Meaning
AGEIS	Australian Greenhouse Emissions Inventory System
CO_2-e	Carbon-dioxide equivalent
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	SA Department for Energy and Mining
DEW	SA Department for Environment and Water
DISER	Department of Industry, Science, Energy and Resources
GHG	Greenhouse gas
GW	Gigawatt
GWh	Gigawatt-hour
IEA	International Energy Agency
kt	Kilotonnes
LULUCF	Land use, land use change, and forestry
MW	Megawatt
NDC	Nationally Determined Contribution
PV	Photovoltaic
SA	South Australia
SAER	South Australian Electricity Report
STGGI	State and Territory Greenhouse Gas Inventory
UNFCCC	United Nations Framework Convention on Climate Change

References

DISER 2021. National Inventory Report Volume 1, Australian Government Department of Industry, Science, Energy and Resources. www.industry.gov.au/sites/default/files/April%202021/document/national-inventory-report-2019-volume-1.pdf [accessed 9 August 2021]

IEA 2021. *Net Zero by 2050: A Roadmap for the Global Energy Sector*, International Energy Agency, Paris.

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