

THE °CLIMATE GROUP

Greenhouse Indicator Annual Report 2009

Victoria, New South Wales, Queensland and South Australia

Overview

The Climate Group is now in its fourth year of tracking greenhouse gas emissions from energy use in Victoria, New South Wales, Queensland and South Australia on a weekly basis through its Greenhouse Indicator.

The Greenhouse Indicator provides accurate and real time information on greenhouse gases produced each week from energy use. It is a unique tool designed to bring greater understanding to the issue of climate change and to help track greenhouse gas emissions in selected Australian states. Each and every week we release greenhouse gas emissions into the atmosphere. Because they can't be seen, it is difficult to understand how much is being produced.

All countries provide a detailed annual report of their greenhouse gas emissions but such reports are normally released long after the emissions have occurred. Thus this information, while comprehensive and critical for policy planning and scientific assessment, arrives much later than the emissions are produced. The Greenhouse Indicator puts a figure on what is happening now, and enables everyone to follow how much we are collectively emitting in their state, each and every week.

This Annual Report covers greenhouse emissions from energy during 2009 and also compares them with emissions from the previous two years.

2009 Results

Across Victoria, NSW, Queensland and South Australia annual emissions were 5.3 million tonnes lower in 2009 than in 2008. This is a fall of 1.8 per cent for the year. The decrease was not uniform across all states. Annual emissions in Victoria and Queensland registered the smallest relative reduction, with falls of 0.5 per cent (543,500 tonnes) and 1.1 per cent (852,210 tonnes) respectively. Emissions in NSW and South Australia declined more substantially, down by 3.1 per cent (3,201,360 tonnes) and 4.2 per cent (730,210 tonnes) respectively.

For Victoria, most of the decrease was due to a reduction in emissions from both gas-fired electricity generation and petroleum-use. Emissions from gas fell by 5.7 per cent or around 772,000 tonnes compared with the previous year, while emissions from petroleum use fell by 2.1 per cent or 540,000 tonnes. Emissions from coal-fired generators rose by 1.24 per cent or 768,000 tonnes in Victoria, the only state to see an increase in emissions from coal.

In NSW and Queensland, the decrease in overall emissions was largely due to a fall in emissions from coal-fired generation. In NSW, emissions from coal fell by 6.3 per cent, a reduction of around 4.2 million tonnes compared with the previous year, the single biggest emissions reduction of any fuel-type across the states. In Queensland, emissions from coal fell by 3.1 per cent or around 1.4 million tonnes. Emissions from gas-fired generation rose in both NSW and Queensland, by 176.6 per cent (or 1.1 million

tonnes) and 21.35 per cent (or 607,000 tonnes) respectively because of the commissioning of new power stations.

In South Australia a reduction in emissions from gas-fired generation was the major factor in the state's overall drop in emissions. Emissions from gas-fired generation dropped 13.7 per cent or around 690,000 tonnes, representing 94 per cent of the State's overall decline in emissions.

Compared with 2000 levels, all states' emissions from energy were higher, except for in SA, which reduced its annual emissions to below 2000 levels. Collectively all states were up 9.6 per cent on equivalent emissions in 2000, in 2009. Victoria was 1.2 per cent higher than its equivalent 2000 emissions level, NSW was 7.1 per cent higher, Queensland was 31.9 per cent higher while South Australia was 3.2 per cent lower.

The gap in emissions above equivalent 1990 levels was more substantial. Victoria was 30.5 per cent higher, NSW 23.7 per cent, Queensland 102.5 per cent and South Australia 1.1 per cent.

Petroleum

Total emissions from petroleum-based fuels were 95.630 million tonnes across all four states.

In contrast to the previous year, 2009 has seen a decrease in sales of petroleum-based fuels across all states, except in SA. Victoria was the state that had the greatest fall in emissions from petroleum, with emissions falling by 2.1 per cent or 540,000 tonnes. NSW and Queensland only recorded slight reductions of 0.2 and 0.3 per cent respectively. South Australia was the only state to register an increase – a marginal rise of 3000 tonnes or 0.3 per cent.

These reductions in petroleum sales come despite positive population growth in each of the states, and growth in Gross State Product in each state.

Across the different types of petroleum-based fuels, results were mixed. Diesel sales were up across all states except for in Victoria where they fell. Petrol sales fell in Victoria and Queensland, remained the same in NSW and increased in South Australia.

Electricity

Across the four states the total electricity generated during 2009 was 1.9 per cent lower than 2008. Coal was responsible for 87.8 per cent of all scheduled electricity generation, down from 88.9 per cent the previous year. The share of gas-fired generation rose from 8.4 to 9.3 per cent and the share of renewable generation increased slightly from 2.7 to 2.8 per cent.

The overall greenhouse intensity of scheduled electricity generation remained virtually identical to 2008. In 2009, greenhouse intensity of electricity generation was 0.9267 tonnes CO₂e per MWh. In 2008, it was 0.9282 tonnes CO₂e per MWh.

In Victoria, electricity demand fell by 2.0 per cent in 2009 compared with the previous year. Generation from brown coal-fired generators increased by 1.1 per cent, while 27 per cent less electricity was produced from gas. A fall in demand combined with a smaller decline in generation meant that Victoria's net export of electricity to other States was 73 per cent higher in 2009 than in 2008. About 4.6 per cent of electricity produced in Victoria was exported in 2009 compared with 2.6 per cent in 2008.

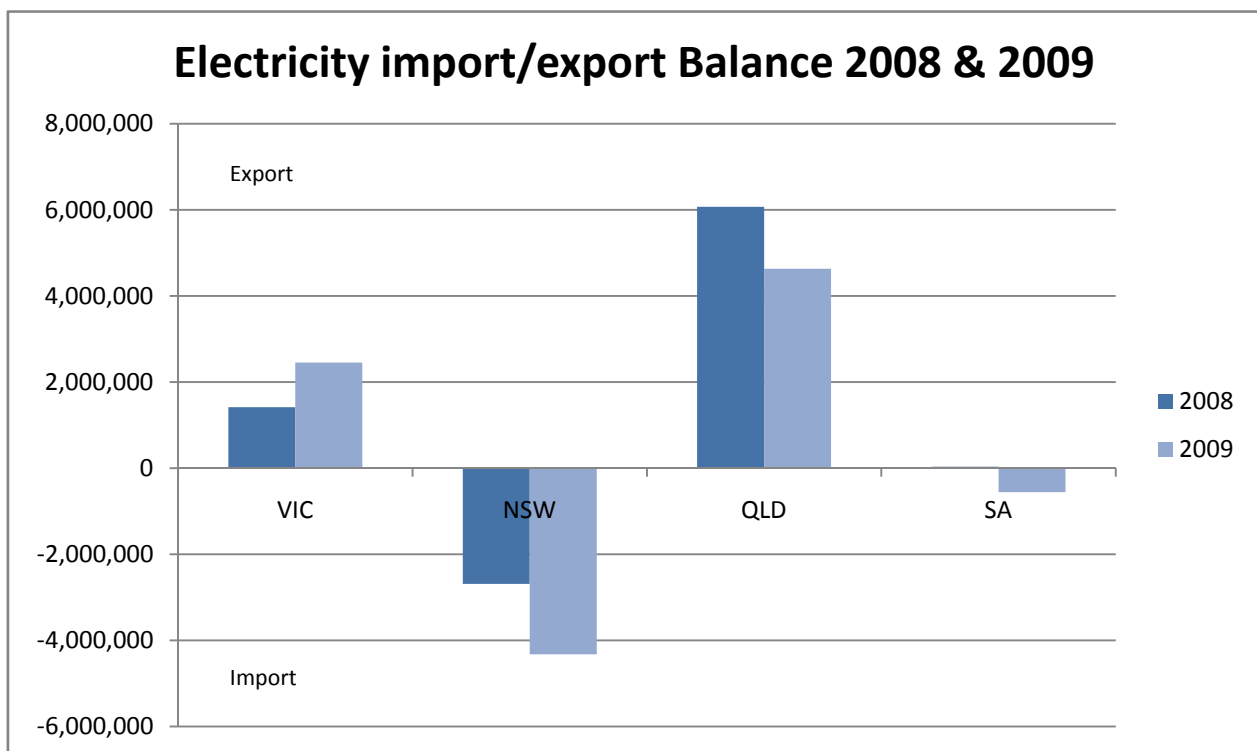
In NSW, electricity demand fell by 1.2 per cent in 2009. Generation from black coal-fired generators in NSW fell by 6.1 per cent with gas-fired generation achieving a 191 per cent growth due to new power

stations being commissioned. However, this was coming off a very low base of 0.6 per cent of total generation in 2008, rising to 1.7 per cent of generation in 2009. Net imports from other states grew by 61 per cent compared with 2008 levels representing 5.6 per cent of overall electricity demand in 2009, up from 3.4 per cent in 2008.

In Queensland, electricity demand grew by 1.5 per cent this year compared with 2008. Generation from black coal-fired generators fell by 3.0 per cent while gas-fired generation increased by 16 per cent. The net export of electricity to other states from Queensland was 24 per cent less than the amount exported in 2008. In 2009, Queensland exported 8.1 per cent of the electricity it generated, down from 10.5 per cent in 2008.

In South Australia, electricity demand increased by 0.1 per cent in 2009. Generation from coal-fired generators fell by 2.8 per cent while electricity produced from gas-fired generation was 11.5 per cent lower, meaning that total generation fell by 4.3 per cent in 2009. Subsequently, South Australia went from being a marginal net exporter of electricity in 2008 to a net importer in 2009.

Figure 1



Temperatures

Annual mean temperatures were consistently above average in 2009, which was the second warmest year on record in Australia. New maximum temperature records were set in numerous cities early in the year, as well as in the unusual heatwaves in August and November. 1999 – 2009 was the warmest decade on record. The Bureau of Meteorology now believes that Australia’s decadal temperature profile has shifted from one influenced solely by natural variations, to the upward trend caused by anthropogenic factors.¹ Globally, 2009 was the 5th warmest year on record.

¹ http://www.bom.gov.au/announcements/media_releases/climate/change/20100105.shtml

Table 1

Temperature Summary 2009									
Average Maximum Temperatures (°C)					Average Minimum Temperatures (°C)				
Region	2008	2009	Change	2009 Comment	Region	2008	2009	Change	2009 Comment
National	22.6	23.3	↑0.7		National	12.7	13.3	↑0.6	
VIC	20.9	21.6	↑0.7		VIC	11.6	12.0	↑0.4	
NSW	22.1	22.9	↑0.8		NSW	14.3	15.1	↑0.8	Second highest on record
QLD	24.6	25.0	↑0.4	Highest on record	QLD	12.3	12.7	↑0.4	
SA	22.8	23.5	↑0.7		SA	12.4	13.2	↑0.8	Highest on record

Source: Bureau of Meteorology

The higher temperatures resulted in less demand for heating over winter and more demand for cooling over summer. Demand across the National Electricity Market (NEM) in the winter of 2009 was 3.4 per cent less than the winter of 2008. The summer of 08/09 saw demand increase by 1.7 per cent over the previous summer.

Population Growth

Emissions have decreased across all states, despite robust growth in the population of each state (see table 2 below). This means per capita emissions from energy decreased in 2009 by 3.75 per cent to 15.4 tonnes from 16.0 tonnes in 2008. ²

Gross State Product

As well as hotter temperatures and population growth, all states also recorded positive Gross State Product (GSP) over the period. Data from the last financial year of June 2008 to June 2009 indicates that all states recorded growth in GSP despite the Global Financial Crisis (GFC). However, growth rates were reasonably low compared with previous years, and this would certainly have relieved upward pressure on emissions levels.

Table 2

Growth Summary from June 08 to June 09		
State	Gross State Product	Population
VIC	↑0.8	↑2.1
NSW	↑0.2	↑1.7
QLD	↑0.3	↑2.6
SA	↑1.4	↑1.2

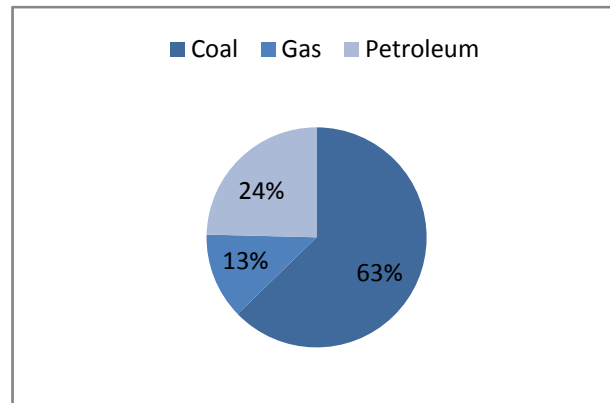
Source: ABS

² <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0/>

Greenhouse Gas Indicator, Victoria

2009: 100.040 million tonnes CO_{2e} down 0.543 million tonnes or 0.54 per cent on 2008

Coal-fired electricity: 62.767 million; 62.7 per cent up 1.1 per cent on 2008
Natural gas: 12.674 million; 12.7 per cent down 5.7 per cent on 2008
Petroleum: 24.599 million; 24.6 per cent down 2.2 per cent on 2008

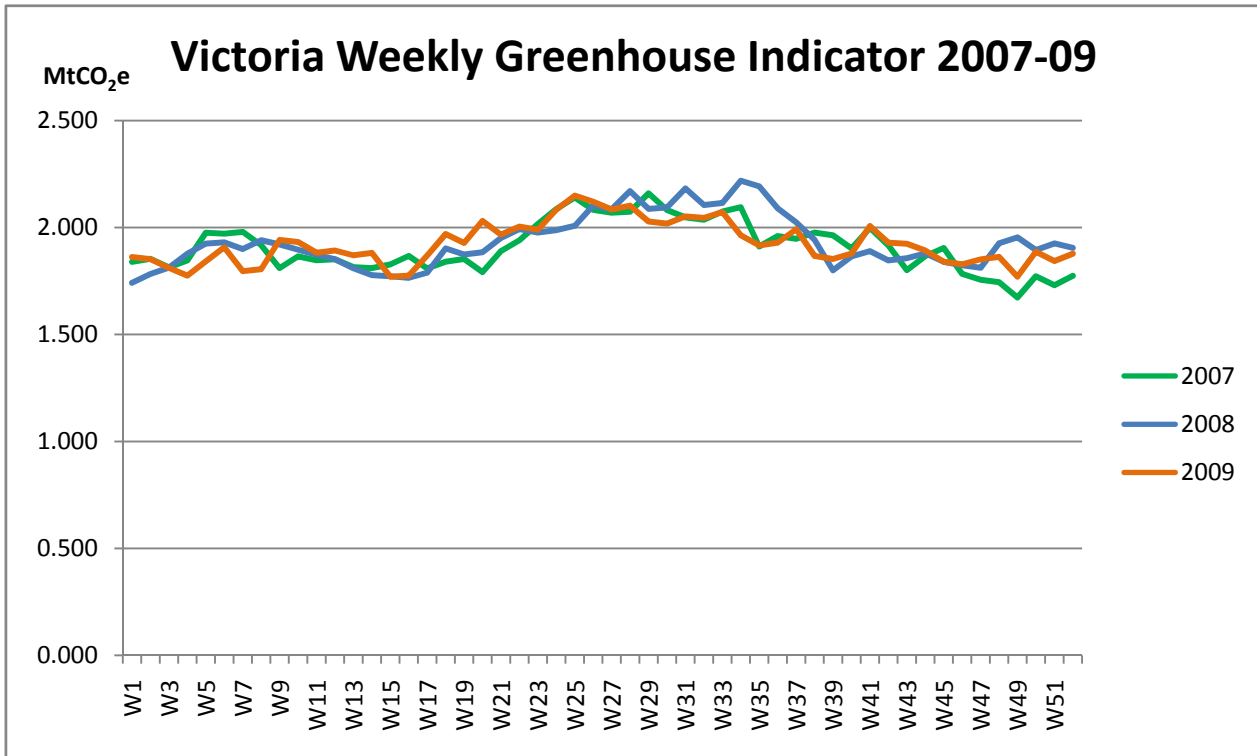


The Greenhouse Indicator accounts for just about all of Victoria's emissions from energy and about 85 per cent of the state's total greenhouse gas emissions. Remaining emissions come from agriculture, waste and industrial processes. Forestry also acts as a sink for about 2 per cent of the total emissions. Greenhouse gas emissions in Victoria not included by the Indicator are estimated to be approximately 380,000 tonnes per week.

Total weekly emissions fluctuated over the year between 1.8 and 2.1 million tonnes (see figure 1). Emissions from coal increased across the year as a whole, while emissions from both gas and petroleum decreased. The Weekly Indicator peaked in the third week of winter (mid June) with 2.149 million tonnes, 3.1 per cent lower than the peak in 2008 (2.219 million tonnes). Emissions from all sources were at high levels in that week, with emissions from gas at particularly high levels to meet the high demand for heating during a cold snap. The lowest Weekly Indicator (1.770 million tonnes) was recorded during the first week of December and was due primarily to low levels of emissions from coal-fired generators (with a number of generation units going offline). This was 1.6 per cent higher than the lowest week in 2008.

Victoria registered modest growth in Gross State Product of nearly 1 per cent and population growth of 2.1 per cent (see table 2). Despite this, electricity demand decreased and generation remained at the same level as in 2008.

Figure 2



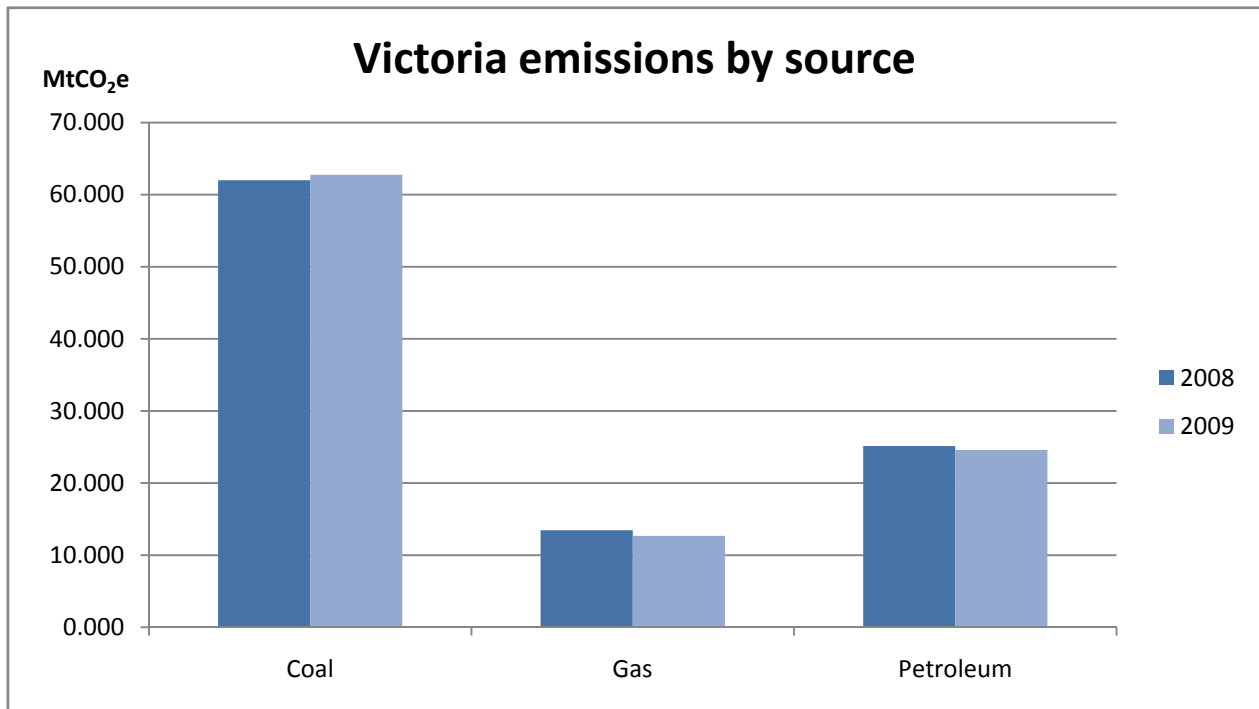
Electricity from coal causes most of the emissions in Victoria and accounted for 96 per cent of electricity generated in the state. The average weekly emissions from coal-fired power stations were 1.207 million tonnes, up 1.2 per cent on 2008. Victoria was the only state to see emissions from coal-fired generators rise in 2009. Peak emissions from coal were recorded during late June, with 1.314 million tonnes emitted that week from a large number of generation units operating at high capacity. However, this was 0.8 per cent lower than the highest week in 2008. The lowest weekly level recorded was in early April and was 1.099 million tonnes, 4.8 per cent higher than the lowest level during 2008.

Natural gas causes the lowest level of emissions of the three energy sources. Natural gas is used in industrial and commercial applications as well as for domestic use (largely heating) and to fuel electricity generation. During 2009 the average weekly emissions from gas use was 244,000 tonnes, down 5.7 per cent on 2008. This was due both to reduced direct gas combustion for heating and industrial applications, as well as 27 per cent less gas-fired electricity generation.

Petroleum emissions in 2009 were on average 473,000 tonnes per week – 2.1 per cent less than in 2008. These emissions include sales of LPG, automotive transport fuels, aviation fuel, industrial diesel and fuel oil. Sales of aviation fuel, fuel oil and LPG rose while sales of diesel and petrol both fell.

Figure 3 below charts the comparison between 2009 and 2008 emissions levels for all fuels.

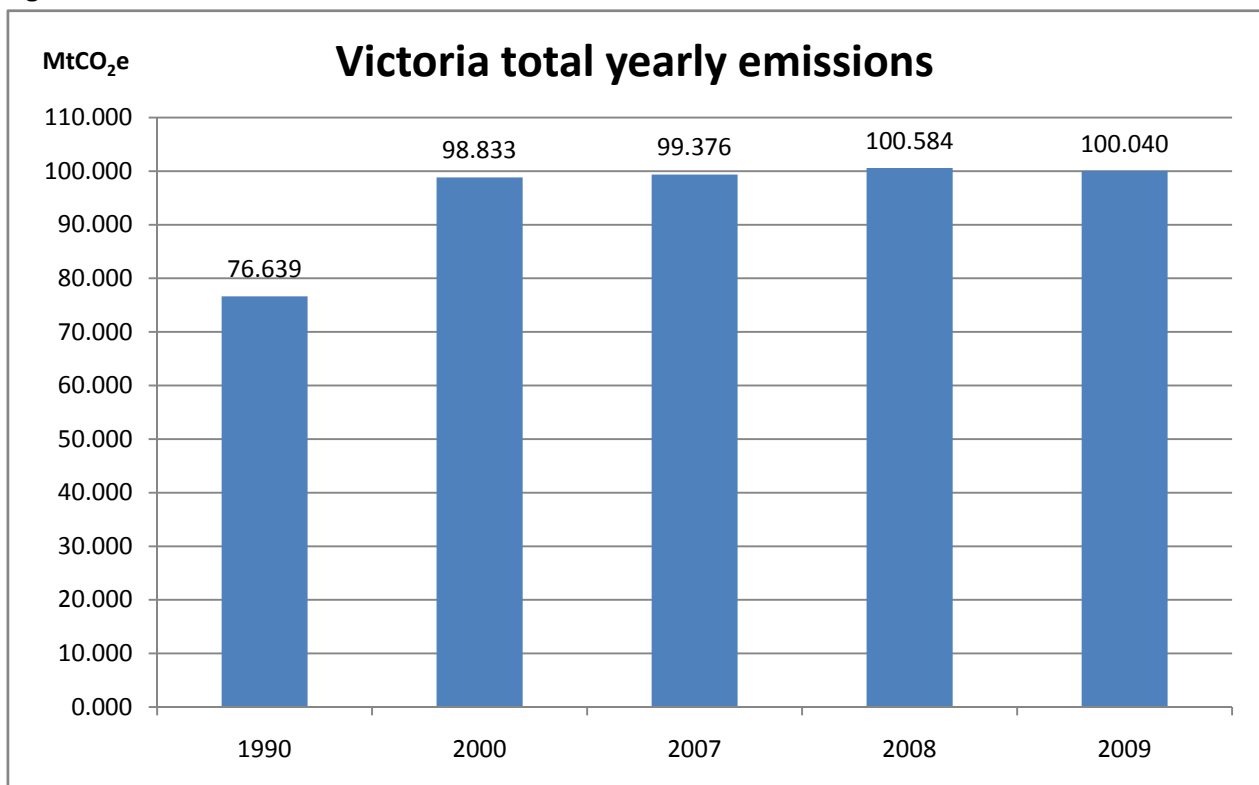
Figure 3



1990/2000 year comparisons

Though Victoria's emissions remain well above 1990 levels (31 per cent higher), emissions growth has started to level out, with the state only 1.2 per cent above 2000 levels.

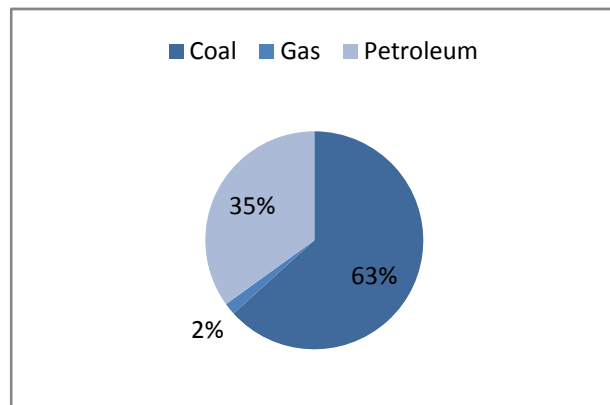
Figure 4



Greenhouse Gas Indicator, New South Wales

2009: 98.683 million tonnes CO_{2e} down 3.201 million tonnes or 3.1 per cent on 2008

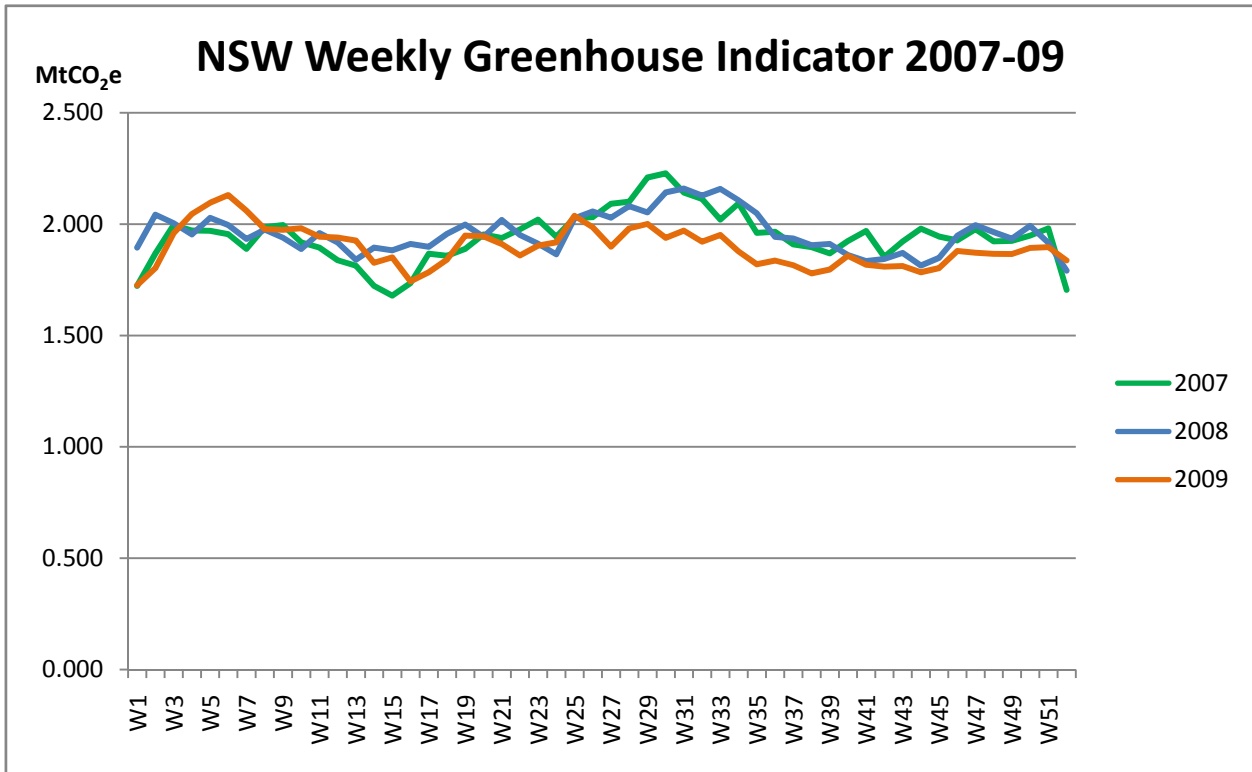
Coal-fired electricity: 62.472 million; 63.3 per cent down 6.3 per cent on 2008
Gas-fired electricity: 1.712 million; 1.7 per cent up 177 per cent on 2008
Petroleum: 34.499 million; 35.0 per cent down 0.2 per cent on 2008



The Greenhouse Indicator accounts for more than 80 per cent of NSW's emissions from energy and 60 per cent of the State's total greenhouse gas emissions. Remaining emissions come from agriculture, land use, waste, industrial processes and fugitive emissions from coal mining. Unlike Victoria, no regular accurate data has historically been available for gas consumption other than gas used for electricity generation in NSW. The availability of new data means that we are updating this for the 2010 Greenhouse Indicator. Greenhouse gas emissions in NSW not included by the Indicator for 2009 are estimated to be approximately 1.2 million tonnes per week.

Total weekly emissions fluctuated over the year between 1.8 and 2 million tonnes (see figure 4). Total emissions for NSW in 2009 fell compared with the previous year, due primarily to a decline in emissions from coal-fired generation. The overall decline occurred despite positive population growth and marginal growth in Gross State Product (0.2 per cent) (see table 2). The Weekly Indicator peaked at 2.130 million tonnes in the first week of February due to a high temperatures causing greater demand for electricity. This peak was 1.3 per cent lower than the highest Indicator in 2008. The lowest Weekly Indicator recorded was 1.725 million tonnes, 3.7 per cent lower than the lowest week in 2008. This was in the first week of the year and was due primarily to the seasonal decline in demand around that time.

Figure 5



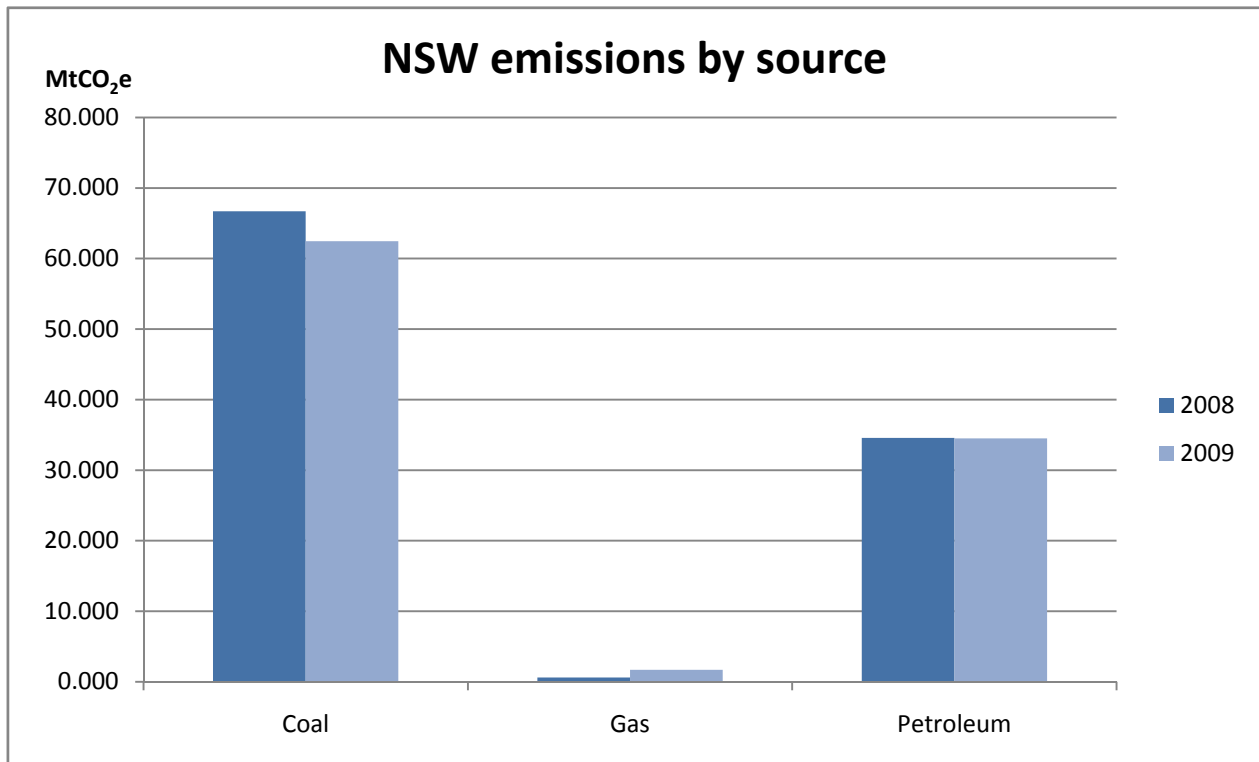
Electricity from coal causes the most emissions from energy in NSW and accounted for 91 per cent of electricity generated in 2009. The average weekly emissions from coal-fired power stations were 1.201 million tonnes, down 6.3 per cent on the previous year. This was the result of a 6.1 per cent fall in coal-fired generation over the entire year with the more polluting Mummorah, Liddell, Vales Point B, Eraring and Mt. Piper power stations operating less. Emissions from coal peaked in the first week of February, with 1.417 million tonnes emitted; this was 4.1 per cent lower than the peak for 2008. The week with the lowest emissions was the first week of the year, recorded 1.043 million tonnes; 4.7 per cent lower than the lowest recording in 2008.

Electricity from natural gas causes the lowest level of emissions of the three energy sources. During 2009 the average weekly emissions from gas-fired generation was 33,000 tonnes. This is a 177 per cent rise from the 2008 average due to the commissioning of three new gas-fired generators at Colongra, Uranquity and Tallawarra.

Petroleum emissions during 2009 were on average 663,000 tonnes per week – 0.2 per cent lower than 2008. Petroleum emissions include sales of LPG, automotive fuels, aviation fuel, industrial diesel and fuel oil. Sales of LPG and diesel grew while average petrol sales stayed much the same.

Figure 6 below charts the comparison between 2009 and 2008 emissions levels for all fuels.

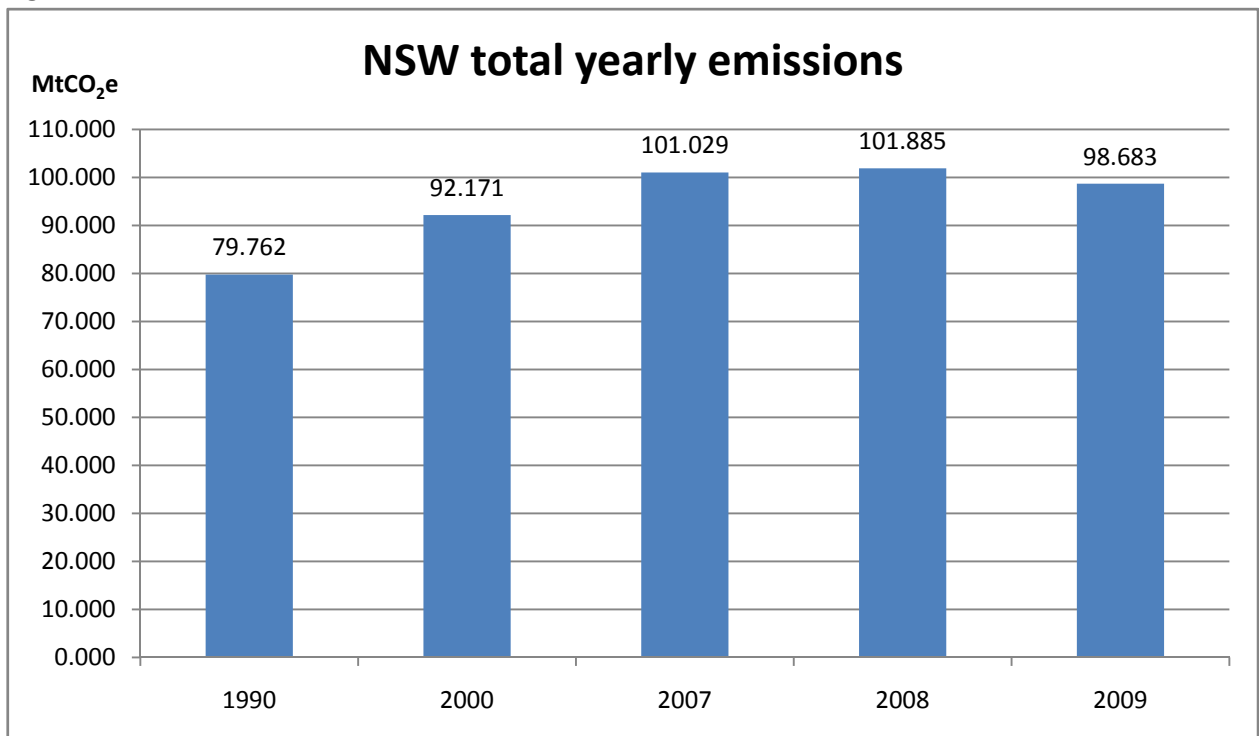
Figure 6



1990/2000 year comparisons

While NSW's emissions remain well above 1990 levels (24 per cent higher), emissions growth has started to come down. Emissions in 2009 were 7.1 per cent above equivalent 2000 levels, compared with 11 per cent the previous year.

Figure 7

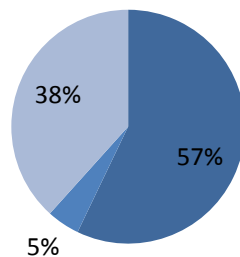


Greenhouse Gas Indicator, Queensland

2009: 75.437 million tonnes CO_{2e}, down 0.852 million tonnes or 1.1 per cent on 2008

Coal-fired electricity: 43.082 million; 57.1 per cent down 3.1 per cent on 2008
Gas-fired electricity: 3.452 million; 4.6 per cent up 21.4 per cent on 2008
Petroleum: 28.903 million; 38.3 per cent down 0.3 per cent on 2008

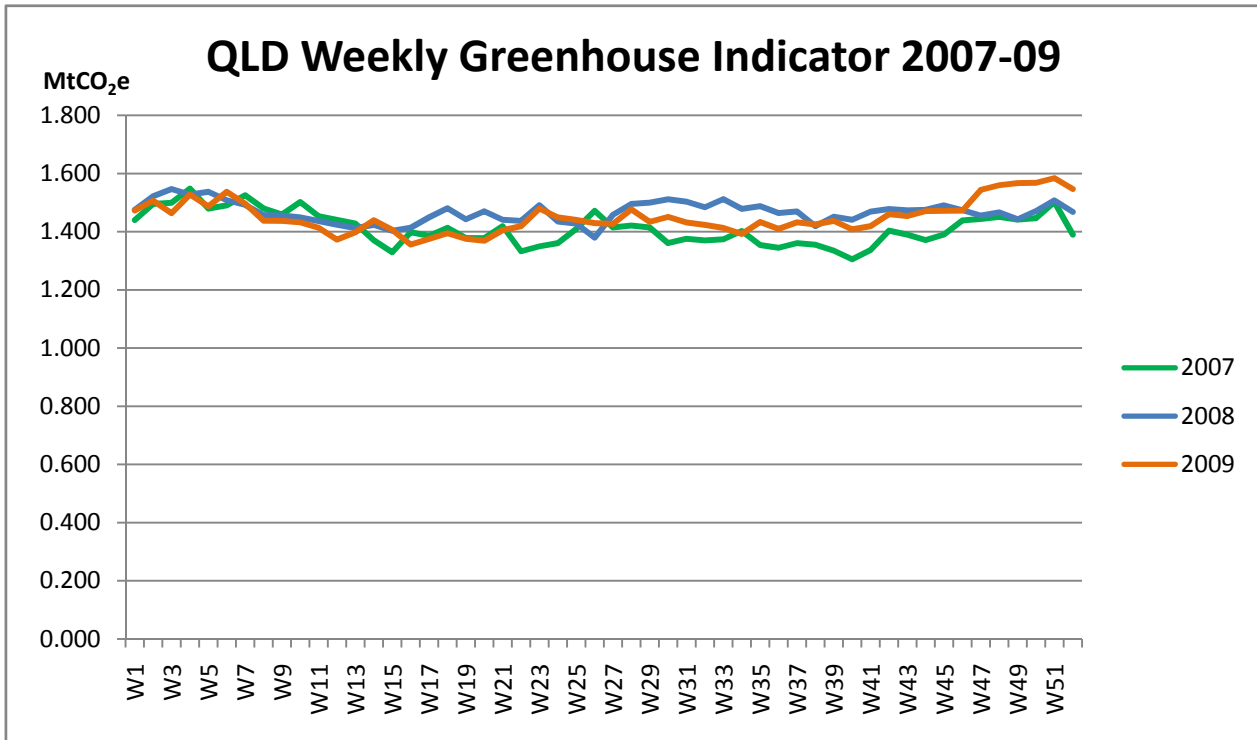
■ Coal ■ Gas ■ Petroleum



The Weekly Indicator accounts for about 75 per cent of Queensland's total energy emissions and 40 per cent of the state's total greenhouse gas emissions. Remaining emissions come from agriculture, land use, waste, industrial processes, electricity generated on-site by industry and fugitive emissions from coal mining. Unlike Victoria, no regular accurate data has historically been available for gas consumption other than gas used for electricity generation in Queensland. The availability of new data means that we are updating this for the 2010 Weekly indicator. Greenhouse gas emissions in Queensland not included by the Indicator are estimated to be approximately 2.1 million tonnes per week.

Total weekly emissions in Queensland fluctuated between 1.3 and 1.5 million tonnes over 2009, with the majority between 1.4 and 1.5 million tonnes per week (see figure 8). Total emissions for Queensland in 2009 fell compared with the previous year, with declining emissions from both coal and petroleum. The decline in emissions from coal-fired generation was the biggest contributor to the fall. As with the other states, the fall in emissions came despite positive population and economic growth in the state. The Weekly Indicator peaked at 1.584 million tonnes in the second last week of the year; this was 2.4 per cent greater than the highest Indicator during 2008. This was due to high emissions from all fuels in that week due to hot weather and higher demand. The lowest Weekly Indicator (1.356 million tonnes) was during mid-April and was 1.7 per cent lower than the lowest Indicator in 2008 and was due to lower demand and mild temperatures.

Figure 8

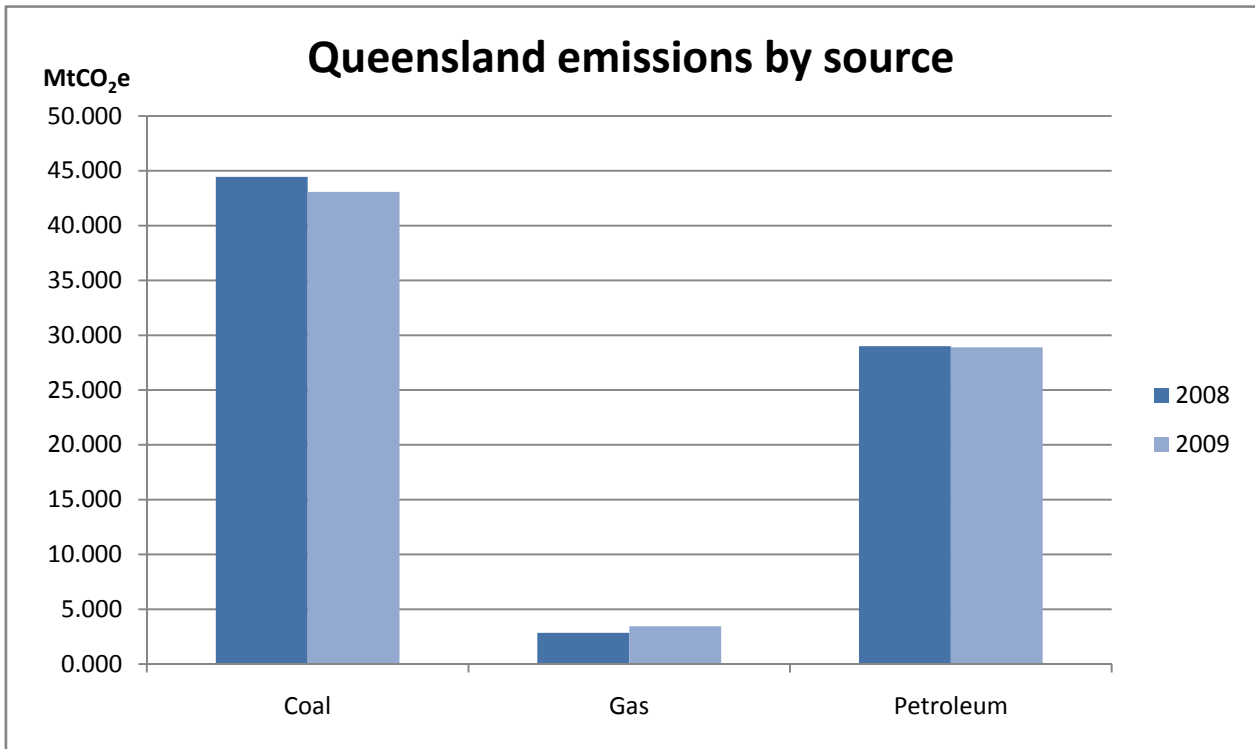


Electricity from coal causes the most emissions in Queensland and accounted for 87 per cent of electricity generated during 2009. The average weekly emissions from coal-fired electricity were 828,000 tonnes, down 3.1 per cent on 2008's average. Peak emissions from coal occurred in the first/second week of February with 918,000 tonnes emitted. This was because more coal-fired generation units were online over a period of high electricity demand on the National Electricity Market due to higher temperatures around the country. This peak was 1.4 per cent greater than the peak for 2008. The lowest Weekly Indicator was in late September and was 2.1 per cent lower than the lowest Indicator in 2008. This was because a generation unit was offline.

Electricity from natural gas causes the lowest level of emissions at only 66,000 tonnes on average per week. However, this is up by 121 per cent from 2008 and is due to an increase in gas-fired generators now operating. Two new power stations (Condamine and Braemar) came online in 2009. Gas generates electricity with up to a third of the greenhouse gas emissions of coal.

Petroleum emissions during 2009 averaged 556,000 tonnes per week, 0.3 per cent less than in 2008. Petroleum includes sales of LPG, automotive fuels, aviation fuel, industrial diesel and fuel oil. Aviation and diesel fuel sales grew compared with the previous year, while LPG and petrol sales declined. Figure 9 below charts the comparison between 2009 and 2008 emissions levels for all fuels.

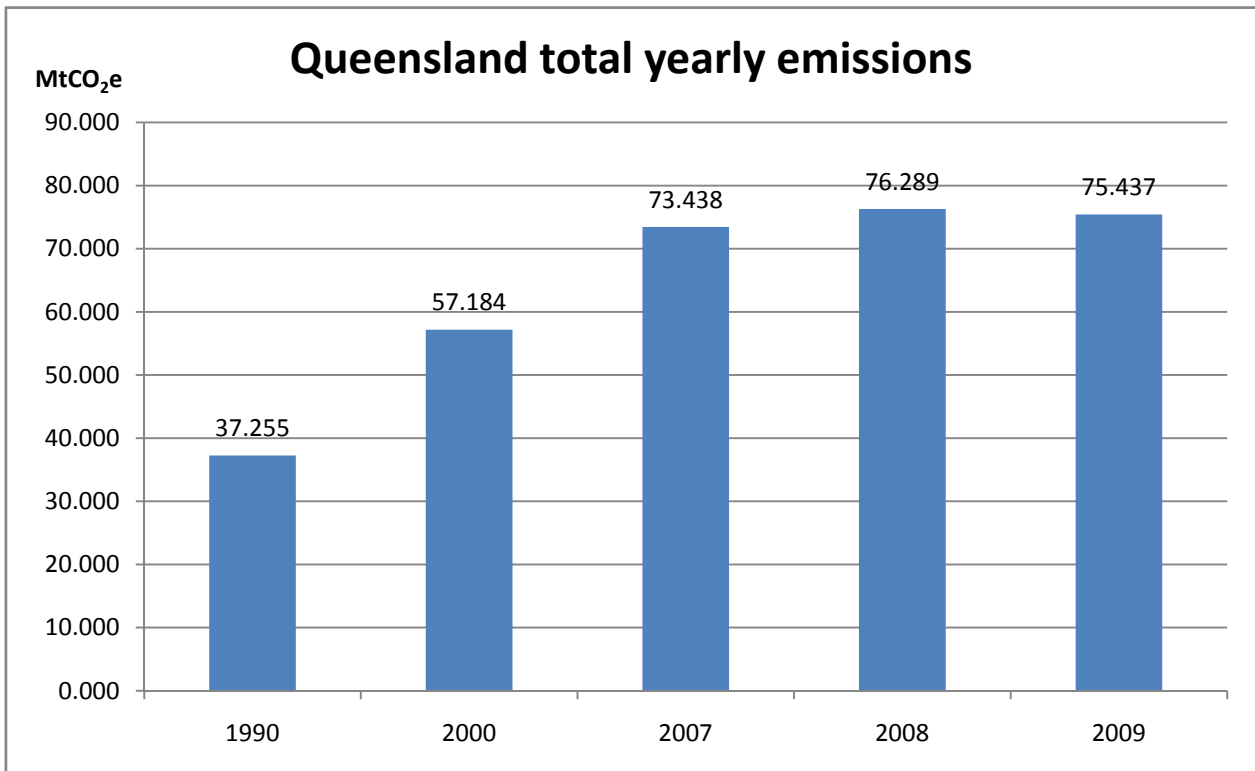
Figure 9



1990/2000 year comparisons

Queensland, unlike Victoria and NSW, has experienced both a population explosion and sustained high rates of economic growth since 1990 and its comparative emissions levels indicate this difference. While emissions have reduced from last year, 2009 still remains 103 per cent above equivalent 1990 levels and 32 per cent above equivalent 2000 levels.

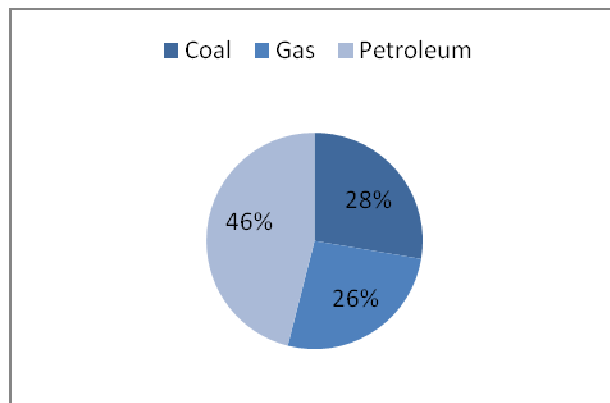
Figure 10



Greenhouse Gas Indicator, South Australia

2009: 16.580 million tonnes CO_{2e} down 0.730 million tonnes or 4.2 per cent on 2008

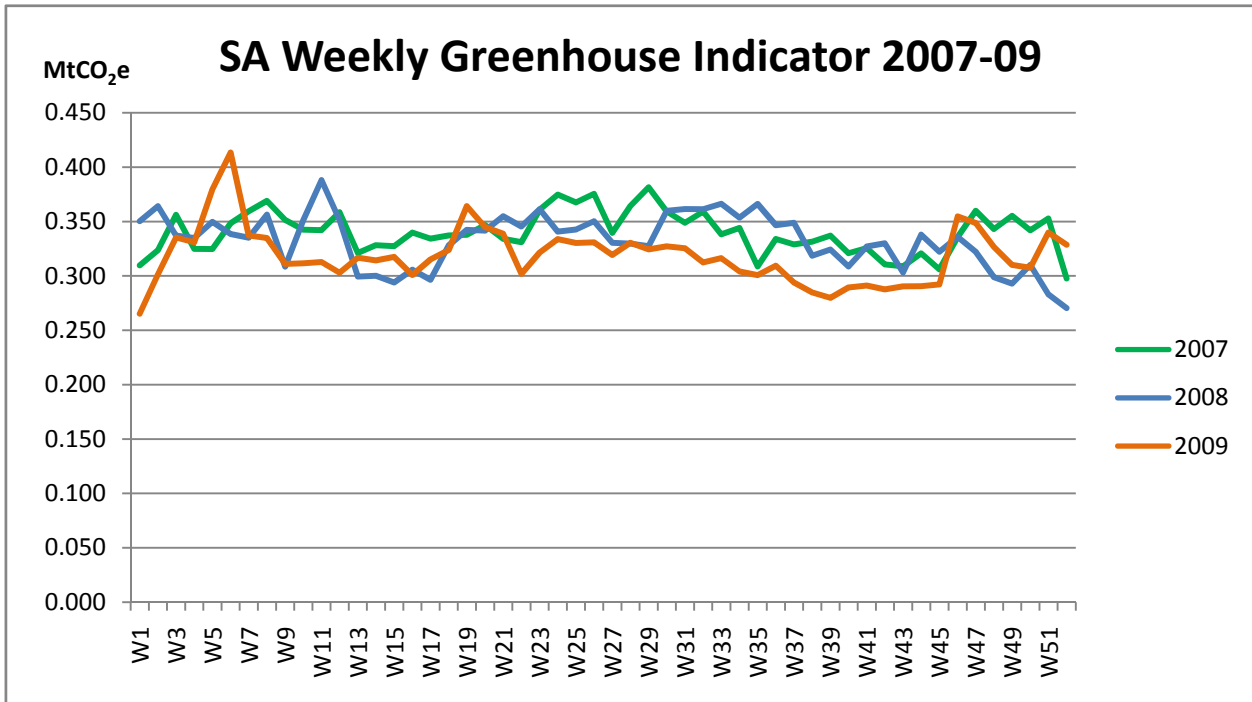
Coal-fired electricity: 4.588 million; 27.7 per cent down 0.9 per cent on 2008
Gas-fired electricity: 4.363 million; 26.3 per cent down 13.7 per cent on 2008
Petroleum: 7.628 million; 46.0 per cent up 0.3 per cent on 2008



The Weekly Indicator accounts for just over three quarters of South Australia's emissions from energy and about 60 per cent of the State's total greenhouse gas emissions. Remaining emissions come from agriculture, waste and industrial processes. Unlike Victoria, no regular accurate data has historically been available for gas consumption other than gas used for electricity generation in South Australia. The availability of new data means that we are updating this for the 2010 Weekly Indicator. Greenhouse gas emissions in South Australia not included by the Indicator are estimated to be approximately 230,000 per week.

Total weekly emissions in South Australia fluctuated over 2009 between 300,000 and 400,000 tonnes per week (see figure 11). Total emissions for South Australia in 2009 fell compared with the previous year, due to a decline in emissions from both coal and gas, but predominately from gas-fired generation. This was despite growth in Gross State Product of 1.4 per cent and positive population growth of 1.2 per cent. The Weekly Indicator peaked at 413,000 tonnes in the first week of February and this was 6.5 per cent greater than the Indicator's peak in 2008. This was due to the heatwave that swept across much of Australia at that time. This high level of emissions was contributed to by high levels of emissions from all fuels, but particularly by gas which registered its highest week. The lowest Weekly Indicator (265,000 tonnes) was in the first week of 2009 and was 1.9 per cent lower than the lowest Indicator in 2008. The low of that week was primarily due to low emissions from both coal and gas-fired generation, with gas registering its lowest week for the year.

Figure 11



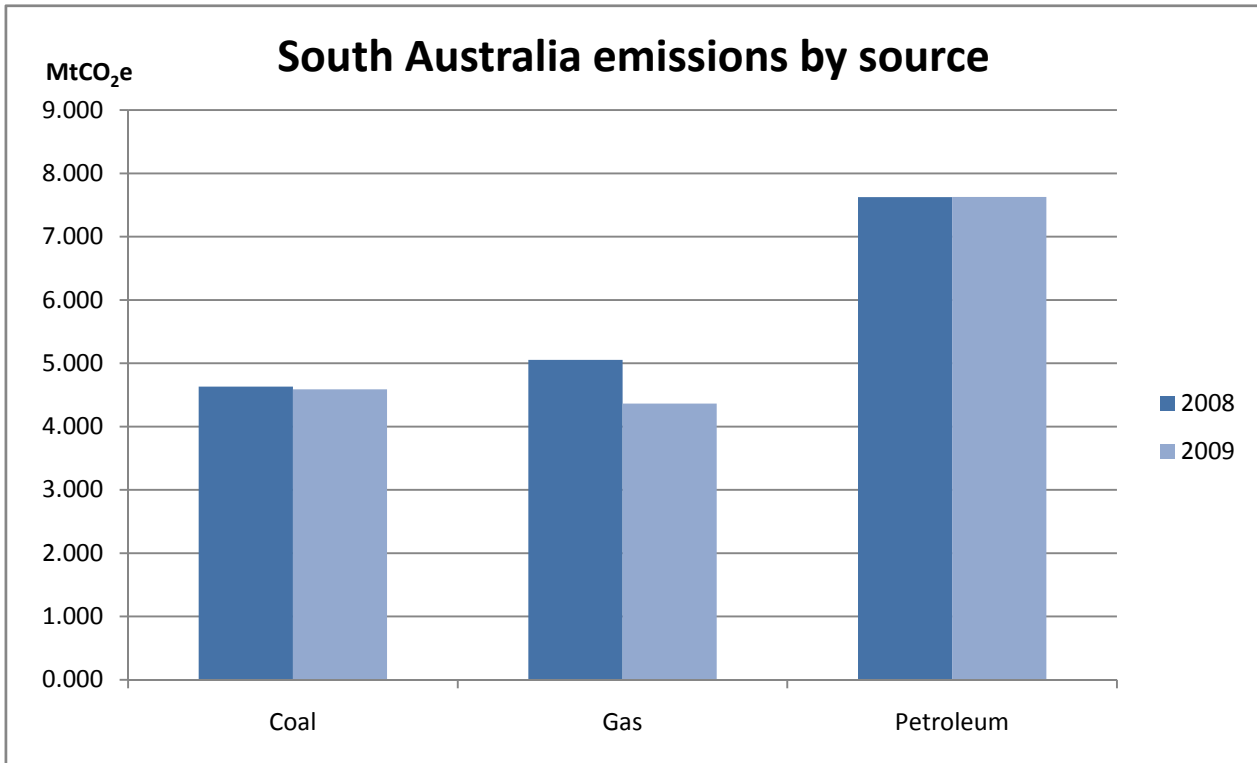
Electricity from coal, in contrast to other states, does not account for the most emissions in South Australia. Coal accounted for 36 per cent of electricity generated during 2009 and 27.7 per cent of emissions. The average weekly emissions from coal-fired electricity was 88,000 tonnes, down 0.9 per cent on 2008. Peak emissions from coal occurred in the first/second week of May with 109,000 tonnes emitted that week. This peak was 2.4 per cent greater than peak for the previous year. The lowest Weekly Indicator was in the first week of October and was 2.7 per cent lower than the lowest Indicator in 2008.

Electricity from natural gas causes the lowest level of emissions at only 84,000 tonnes on average per week. This is down by 14 per cent from 2008, with the 12 per cent decline in gas-fired generation primarily responsible for this. However, gas still accounts for nearly 54 per cent of the state’s generation. Peak emissions from gas occurred during the first week of February with 160,000 tonnes emitted, 13 per cent higher than 2008’s peak. The lowest Weekly Indicator was in the first week of 2009 and was four per cent higher than the lowest Indicator in 2008.

Petroleum emissions account for the highest proportion of South Australia’s emissions. During 2009 petroleum emissions averaged 147,000 tonnes per week. This was virtually the same as in 2008. Petroleum includes sales of LPG, automotive fuels, aviation fuel, industrial diesel and fuel oil. Diesel, LPG and petrol sales all increased, while aviation sales fell.

Figure 12 below charts the comparison between 2009 and 2008 emissions levels for all fuels.

Figure 12



1990/2000 year comparisons

Unlike all other the states, South Australia has begun to approach its 1990 levels of emissions. This is due to a low reliance on coal and a relatively high deployment of renewable technology and gas-fired generators in recent years. South Australia's emissions are now only one per cent above the equivalent 1990 levels.

Figure 13

