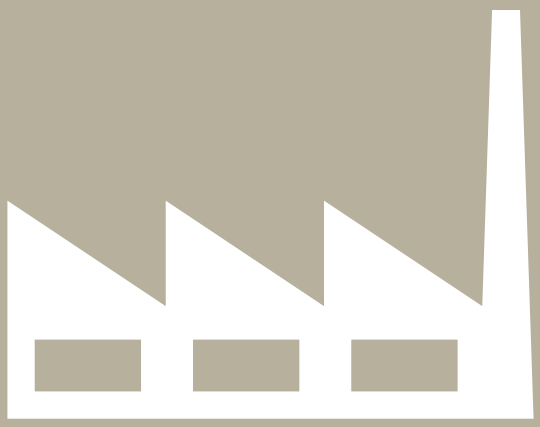
TRACKING PROGRESS TOWARDS A LOW CARBON ECONOMY

ClimateWorks AUSTRALIA



3. INDUSTRY

Summary Report

July 2013

Full report available at www.climateworksaustralia.org/tracking-progress

Executive summary

Recent progress

Industrial emissions intensity[1] has been improving in recent years, driven in part by a large increase in energy efficiency activity, more self-generation of electricity using gas, and improvement in the emissions intensity of processes in the aluminium and cement industries.

Energy efficiency: Energy use accounts for the largest share of industrial emissions. Between 2007-08 and 2009-10, the annual rate of improvement in energy efficiency across the sector as a whole has been 1.3 per cent of energy use per year. This compares with the most rapid energy efficiency improvement rates internationally, although Australia started from a low base compared to other OECD countries due to historically low energy prices and is now catching up. These improvements have helped reduce the growth in industrial energy consumption, but were offset by strong production growth amounting to a 25 per cent increase in industrial value added[2] between 2002-03 and 2011-12[3].

How companies are improving energy efficiency

Companies interviewed for the Special Report on factors influencing large industrial energy efficiency listed numerous energy efficiency projects delivered in recent years, including:

- Improving cooling tower operational control
- Upgrading boilers (including changing fuel sources)
- Waste heat and steam capture and re-use projects
- Upgrading lighting
- Installing co-generation plants
- Improving crushing and grinding on mining sites
- Improving compressed air processes
- Installing variable speed drives on conveyors.

Changes in energy mix: The emissions intensity of industrial energy consumption[4] improved by almost 5 per cent between 2002-03 and 2011-12. Industrial use of grid-supplied electricity has decreased by 8 per cent since 2008-09 and 2011-12 while self-generated electricity and other off-grid electricity use increased by 58 per cent from 2008-09 to 2011-12. Most self-generated electricity uses gas as its fuel input and is less emissions-intensive than grid-supplied electricity. It is mostly associated with growth in the resources sector, often in remote areas. The emissions-intensity of grid-supplied electricity has also declined[5], which has helped to reduce overall emissions intensity of industrial energy consumption.

Industrial processes: Greenhouse gases released as a result of industrial processes (also referred to as process emissions in this report) accounted for 15 per cent of all industrial emissions in 2010-11. The aluminium, iron and steel and cement industries have driven a 10 per cent reduction in their average emissions intensity between 2002-03 and 2011-12 through strong decreases in perfluocarbon (PFC) emissions in the aluminium industry and the use of supplementary materials to replace clinker in cement making.

Reducing aluminium process emissions

Significant effort has been made by aluminium producers to improve the operation of smelters since 1990, resulting in a 95 per cent reduction in perfluorocarbons (PFCs) produced. PFCs are powerful greenhouse gases with over 7,000 times the 100-year global warming potential of carbon dioxide.

The emissions intensity of ammonium nitrate production (used in fertilisers and explosives) has started to decrease in the last few years through the piloting of technologies which transform the nitrous oxide produced in the process into nitrogen gas. Nitrous oxide is responsible for nearly half of all industrial process emissions in the chemical industry.

Transforming nitrous oxide into thin air

Nitrous oxide (N_2O) has a global warming effect around 300 times greater than carbon dioxide, attracting a high carbon liability.

Chemicals producers are using catalysts to convert nitrous oxide into nitrogen and oxygen, the main components of the atmosphere. This technology can reduce N_2O from chemicals production by up to 85 per cent.

Fugitive emissions: Fugitive emissions released during the extraction, transportation and handling of coal, oil and gas accounted for 19 per cent of total industrial emissions in 2010-11. Improved flaring and venting practices in oil and gas production has reduced the growth in fugitive emissions resulting from substantial production increases in the sector.

1 Emissions intensity has been defined as the amount of emissions produced for each unit of output or other metric, eg tonnes of CO_2e per $m value added

2 'Value added' refers to the total value of goods and services produced by an industry, after deducting the cost of goods and services used in the process of production (ABS 2013)

3 2011-12 data in this report has been estimated based on recent trends in industrial output and available public data.

4 The amount of emissions produced for each unit of energy consumed, e.g. tCO_2e / GJ.

5 See Report 2: Power of the *Tracking Progress* report series for further details.

Several projects have been implemented to capture waste coal mine gas for electricity generation, driven by government incentives for carbon abatement. However carbon price uncertainty has restricted the pipeline to only a few projects. The reduction in emissions achieved through improvements in waste gas capture appear to have been offset by an increase in the average emissions intensity of coal production due to increased coal mining in regions with particularly 'gassy' geology.

Combined, the activities described above have helped to decrease the overall emissions intensity of Australia's industrial output by an estimated 10 per cent between 2002-03 and 2011-12. In other words, despite strong growth over this period (in particular in mining and resources) which saw industrial value added grow by 25 per cent, emissions from the sector are estimated to have grown by only 13 per cent.

Outlook to 2020

If recent trends in the improvement of industrial emissions intensity continue, this would offset a portion of the strong expected growth in emissions that could result from increasing industrial production[6].

Australia's Industry sector is expected to continue to grow strongly between 2010-11 and 2019-20, despite no growth assumed in manufacturing. Growth is expected to be particularly strong in LNG production (256 per cent), coal mining (44 per cent), metal ore mining (98 per cent) and alumina production (50 per cent).

How will Australia's industrial mix evolve?

Future industrial emissions are highly dependent on future industrial activity and production. In order to estimate future activity, ClimateWorks has adjusted the Australian Treasury's *Strong Growth, Low Pollution* forecast based on the most recent Australian Government emissions projections, and consultation with experts.

Our best estimate indicates a reduction in manufacturing activity (except alumina production), especially in the most energy-intensive sub-sectors, in contrast with growth in the resources sector particularly in gas production (driven by LNG exports), metal ore and coal mining.

There is a high level of uncertainty around the future direction of some sub-sectors, in particular LNG production and some mining sub-sectors. Future production levels in these sub-sectors will be strongly driven by commodity and resource prices.

Without any further emissions reduction activity, this growth would drive an increase in total emissions from the Industry sector of 37 per cent by 2019-20, making Industry the largest contributor to Australia's emissions growth between now and 2019-20. If recent trends in abatement activity are sustained, this growth in emissions would be reduced from 37 per cent to 20 per cent.

Energy efficiency: Continuation of the recent high levels of industrial energy efficiency improvement is possible, and would lead to a 9 per cent improvement in energy intensity from 2010-11 to 2019-20. Recent trends have been driven by a combination of factors including electricity price rises and government policies which have also led to improvements in energy management skills. Future trends in these areas, as well as future technological improvements and other macroeconomic factors, will determine whether these rates of energy efficiency improvement can be sustained.

Changes in energy mix: Overall, the shift towards self-generated electricity and lower emissions fuel sources (mainly gas) is expected to continue, driven by developments in remote areas and increased production of LNG which is primarily powered by gas. However, if gas prices increase significantly, this may trigger a return to more emissions intensive coal in some sub-sectors that are highly sensitive to energy costs.

Industrial processes: The emissions intensity of process emissions is on track to improve markedly, with cement and chemicals process improvements likely to drive a 12 per cent improvement in industrial process emissions intensity overall between 2010-11 and 2019-20. The cement industry is on track to reach best practice in terms of use of supplementary materials by 2019-20, and nitrous oxide abatement technology is likely to be used in all ammonium nitrate production sites by 2019-20. Reductions in emissions as a result of reduced production of iron and steel and aluminium are also expected. These are expected to be counterbalanced by emissions from refrigerant gases, as a greater proportion of refrigerants are captured in Australia's emissions inventory.

Fugitive emissions: If current trends are sustained, continued reductions in fugitive emissions from conventional oil and gas production are expected, while carbon capture and storage is planned at the new Gorgon gas project which will further reduce growth in vented carbon dioxide. Policy and economic uncertainty are expected to limit uptake of future waste coal mine gas abatement projects. Fugitive emissions from coal seam gas production are particularly uncertain and the methodologies to estimate fugitive emissions from coal seam gas are currently under review.

If recent trends in these emissions reduction activities are sustained, around 57 per cent of the abatement potential identified in the *Low Carbon Growth Plan for Australia* for this sector would be captured by 2019-20.

6 This differs from emissions projections undertaken by the Australian Government. A detailed description of the differences is contained in Report 1: National Progress Report in the *Tracking Progress* report series.

Background

About the *Tracking Progress* project

Tracking Progress is the first national index of Australia's progress towards a low carbon economy. With increasing business and community focus on how best to transition to a low carbon future, it is critical to have a robust measurement and evaluation framework for low carbon activity. In order to understand how Australia is progressing towards our national emissions reduction targets, a good understanding of this activity – and the factors that are supporting or impeding it – is required. Building this evidence is critical for achieving an efficient, least-cost transition while maintaining our economic growth, competitiveness and prosperity.

The reports that make up this project provide an assessment of activity occurring across the Australian economy that reduces or avoids greenhouse gas emissions, pulling together all the available information and data across key sectors. We have tracked and reported progress through our national progress report series covering Power, Industry, Buildings and Land-Use & Waste[7]. In addition we have produced a Special Report of factors influencing large industrial energy efficiency

No other research provides a national aggregation of data on the underlying investments and activity that lead to future abatement. National measurements currently focus on actual emissions and energy use each year. This only reveals 'the tip of the iceberg' of abatement activity.

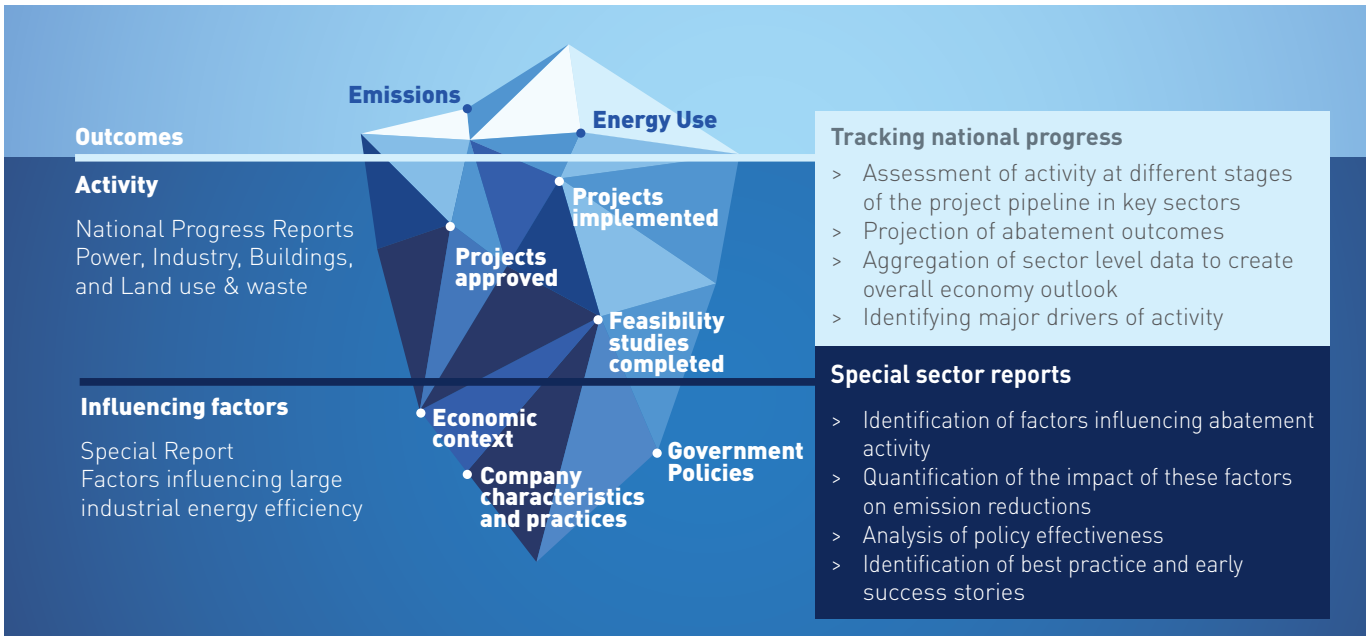
This series of reports reveals the hidden part of the story including:

LEVEL OF CURRENT ACTIVITY across key sectors of the economy. This includes activities that will deliver emissions savings in the future, some of which do not yet appear in national energy and emissions metrics but which are sufficiently advanced to make a known contribution to reducing future emissions.

FUTURE ABATEMENT that can be achieved if recent trends in abatement activity are sustained to 2019-20.

FACTORS INFLUENCING EMISSIONS REDUCTION ACTIVITY for large industrial energy efficiency – from broad economic influences to company specific factors – including an understanding of the common qualities of companies that achieve the most emissions reductions.

7 The Transport sector has not been assessed in the 2013 *Tracking Progress* report series but will be addressed in a future report series.



Description of the Industry sector

This report investigates changes to industrial energy use, fugitive emissions and process emissions. The report also investigates efficiencies in industrial energy use that will reduce the demand for grid-supplied electricity and emissions associated with its generation. Reductions in emissions from energy use can be achieved by reducing energy inputs or reducing the emissions intensity of energy used. Both of these methods will be investigated in this report. Industrial sectors covered by this report include mining, manufacturing and construction.

A full report on progress in the Industry sector — along with a National Progress report, reports on progress in Industry, Building, Land-use and Waste, and a Special Report on factors influencing large industrial energy efficiency — is available at www.climateworksaustralia.org/tracking-progress

Emissions profile

Industrial activities contribute the greatest share of Australia's emissions – nearly 40 per cent according to Australia's National Greenhouse Gas Inventory.

As these emissions are forecast to increase relative to other sources, this sector will become increasingly important in Australia's transition to a low carbon economy.

Breakdown of the sector's emissions

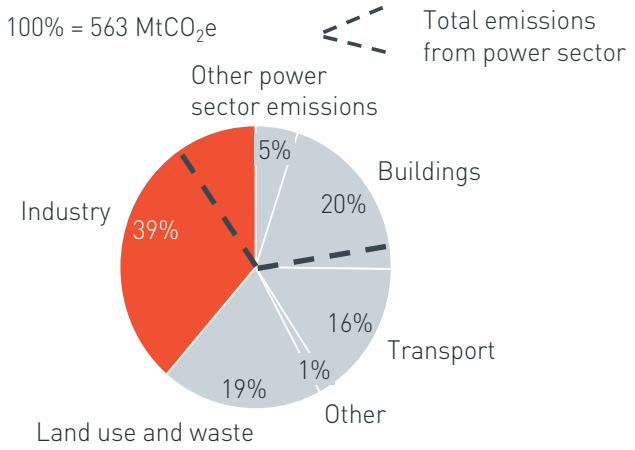
Direct emissions refer to those emissions generated by industrial companies' on-site activities; indirect emissions refer to those associated with grid-supplied electricity that is generated elsewhere by large power stations and consumed on-site.

Indirect emissions represent about 27 per cent of all industrial emissions, with Industry consuming nearly a third of all grid-supplied electricity in Australia[8].

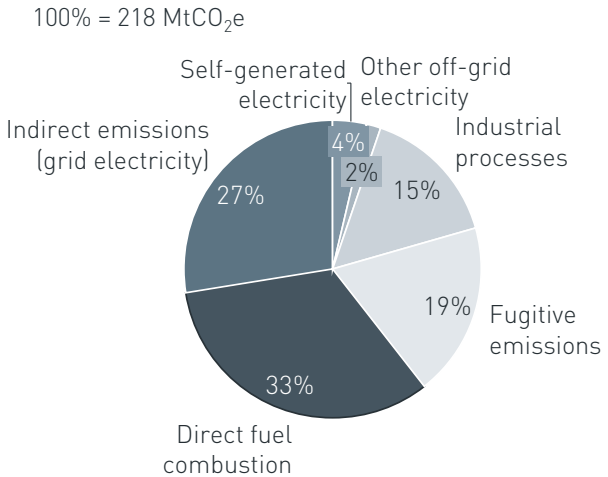
The direct emissions from this sector come from four main sources:

- **Direct fuel combustion** to provide on-site energy.
- **Off-grid electricity consumption**, which can either be generated by companies themselves (self-generated electricity) or purchased from a provider (other off-grid electricity).
- Greenhouse gases produced as a by-product of **industrial processes.**
- **Fugitive emissions** of greenhouse gases associated with the extraction and transport of fossil fuels such as coal, oil and natural gas.

Breakdown of Australian emissions and sector coverage in 2010-11, % (DIICCSRTE 2013a)[9]



Breakdown of industrial emissions in 2010-11, % (DIICCSRTE 2013a, BREE 2012, ClimateWorks team analysis)



8 Grid-supplied electricity emissions are also discussed in Report 2: Power of the *Tracking Progress* report series. Abatement coming from reductions in industrial electricity use is discussed in Report 3: Industry, whereas abatement coming from improvements in the generation mix is discussed in the Power report.

9 A detailed bibliography is available in the full report for the Industry sector at www.climateworksaustralia.org/tracking-progress.

Index of Progress

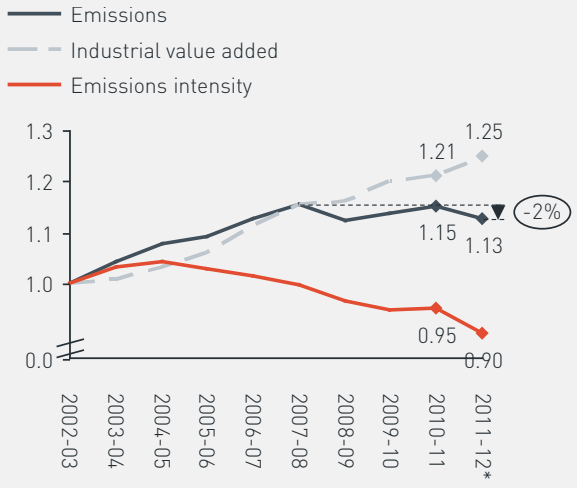
1. Overall sector

Recent progress

Improved emissions intensity of industrial production

Strong improvements in energy efficiency and process emissions offset by large increases in production

Change in emissions and emissions intensity, indices (DIICCSRTE 2013a, ABS 2013, ClimateWorks team analysis)



What factors influenced the abatement activity?

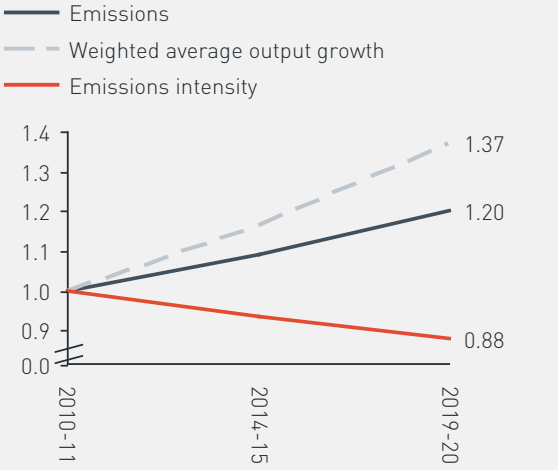
- Rising energy prices
- Government programs (carbon price, EEO)
- Increased production, particularly coal and metal ore mining, and natural gas

Outlook to 2020

Current trends could deliver 57% of the LCGP potential

Across-the-board improvements expected, partially offsetting strong growth in emissions from higher future production

Change in emissions and emissions intensity, indices (DIICCSRTE 2013a, ABS 2013, ClimateWorks team analysis)



What factors will influence abatement activity?

- Electricity and gas price rises
- Carbon price, CTIP grants and EEO
- Increased company capability
- Forecast rapid expansion of gas production, and continued growth in mining

Change relative to historical levels & expectations

- No improvement or backwards
- Patchy or limited improvement
- Some improvement
- Moderate improvement
- Strong improvement

Legend

- Upside factors
- Downside factors

Share of potential identified in the Low Carbon Growth Plan (LCGP) that current trend would deliver

- No abatement captured
- Little abatement captured (1–25%)
- Some abatement captured (26–50%)
- Moderate abatement captured (51–75%)
- Significant abatement captured (>75%)

Legend

- Upside factors
- Downside factors

* Emissions from industrial energy use in 2011-12 were estimated based on 2010-11 data, accounting for differences seen in NGERS data between 2010-11 and 2011-12, and assuming 2010-11 emissions intensities (with the exception of grid-supplied electricity).

Between 2002-03 and 2010-11, industrial emissions grew by 15 per cent despite recent efforts in energy efficiency, and continued improvements in industrial processes emissions intensity. If there was no further abatement activity after 2009-10[10], emissions would grow by 37 per cent between 2010-11 and 2019-20, driven in particular by strong growth in the resources sector – namely natural gas production, coal and metal ore mining. On the other hand, manufacturing production is expected to remain stable, with decreases in metal production, counterbalanced in part by increases in alumina production.

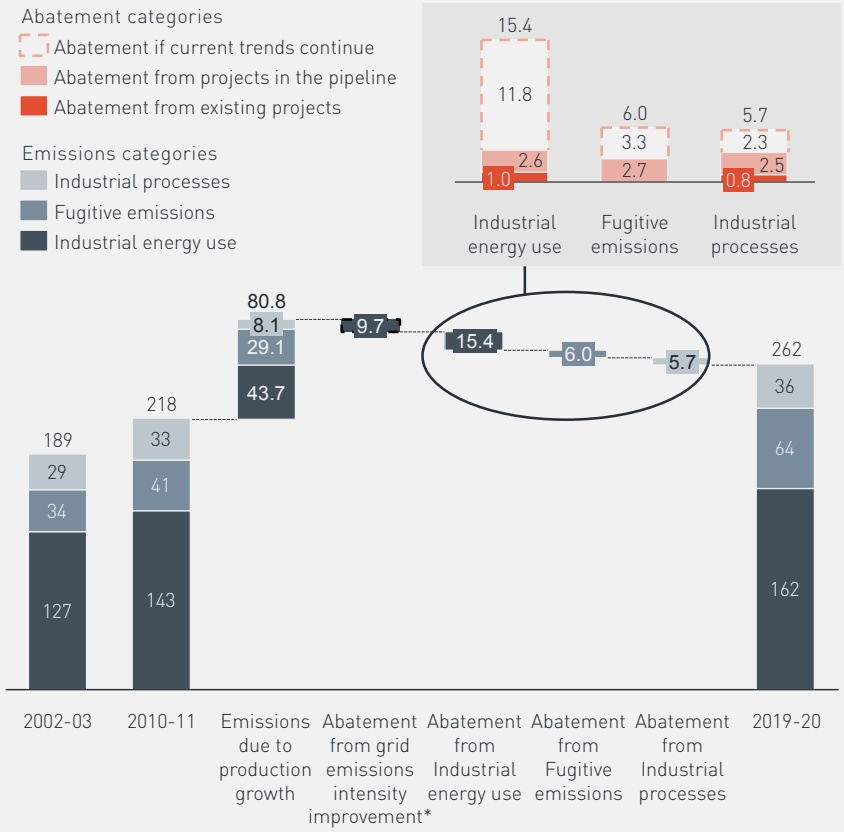
If recent trends are sustained, abatement activity would deliver 27 $MtCO_2e$ of emissions reductions, offseting the sector's growth in emissions by nearly half, reducing the overall increase in emissions to 20 per cent.

An improvement in emissions intensity of grid-supplied electricity would contribute 9.7 $MtCO_2e$ of abatement, and is discussed in the Report 2: Power. Energy efficiency would make the largest contribution to reducing emissions in Industry, with a 15.4 $MtCO_2e$ reduction in industrial energy use emissions delivered by 2019-20 if current trends in uptake of energy efficiency and fuel mix changes are sustained.

Fugitive emissions would deliver the second highest contribution (6 $MtCO_2e$), driven by continued abatement of methane emissions from oil and gas production. Finally improvements in industrial processes could deliver an additional 5.7 $MtCO_2e$.

While there is limited potential to further decrease emissions in metals production, continued improvements in cement emissions intensity, and a step change in nitrous oxide emissions intensity in the chemicals sector are expected to counterbalance increases in production in those sectors.

Emissions in the Industry sector, $MtCO_2e$ (DIICCSRTE 2013a, ClimateWorks team analysis)

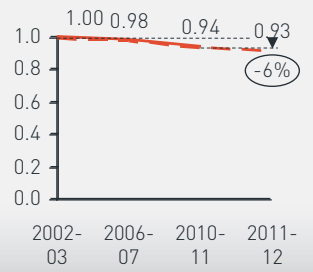
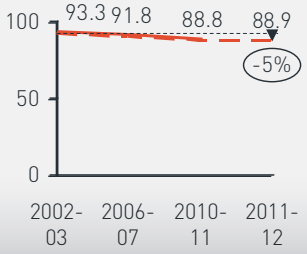
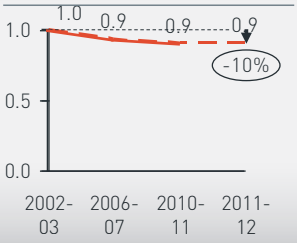
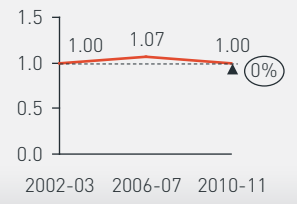


* Abatement allocated to the Power sector (see Report 2: Power)

10 Abatement from 2009-10 to 2010-11 has been captured as 'Abatement from existing projects'.

2. Index of progress for each abatement category

Recent progress

	How much activity is happening?	What are some key achievements?	What factors influenced the activity?	Key metric
ENERGY EFFICIENCY	**Energy efficiency improvements of around 1.3% per annum between 2007-08 and 2009-10, in line with international leaders** **Strong increase in energy efficiency retrofits**	★ It is estimated that, since 2007-08, EEO companies have implemented savings reducing their energy use by 5% ★ Large energy users have nearly all acquired good energy data systems and energy management staff	◀▶ Rising energy prices ◀▶ Energy reporting programs ◀▶ Carbon price ◀ Limited capital availability	Change in energy intensity from energy efficiency activity, index 
CHANGES IN ENERGY MIX	**Moderate improvements in emissions intensity of industrial energy use** **5% improvement in emissions intensity from 2002-03 to 2011-12**	★ Self-generated electricity and other off-grid electricity has increased by 58% from 2008–09 to 2011–12, mostly using gas ★ The wood, paper and printing sector replaced 11% of its fossil fuel use with biomass	◀▶ Growth of gas production which uses gas as its main fuel ◀▶ Improvement in emissions intensity of grid-supplied electricity ◀▶ Increasing share of self-generated electricity in past 4 years driven by remote developments	Average emissions intensity of industrial energy use, tCO_2e/TJ 
INDUSTRIAL PROCESSES	**Strong improvements in aluminium, cement and chemicals** **10% improvement in minerals & metals emissions intensity from '03 to '11**	★ Highly potent PFC emissions from aluminium were reduced by 95% since 1989-90 ★ 31% of supplementary materials used in cement. Approaching best practice identified in ClimateWorks' research	◀▶ Financial savings delivered (energy costs or input costs decrease) ◀▶ Carbon and environmental considerations ◀▶ Improved technology (e.g. controls and catalysts)	Composite emissions intensity for aluminium, iron & steel and cement, index 
FUGITIVE EMISSIONS	**Increase in coal field intensity has countered improvements from oil and gas production** **Overall emissions intensity has remained steady**	★ Over 3 $MtCO_2e$ per year abated from coal mine waste gas during the NSW GGAS scheme ★ Emissions from venting and flaring in oil and gas production decreased by 7% while production increased	◀ Increased production of coal and natural gas ◀ Proportionally greater production from more gassy coal fields ◀▶ Improved technology, in particular in process controls	Composite emissions intensity, index 

Recent Progress

Change relative to historical levels & expectations

- No improvement
- Limited improvement
- Some improvement
- Moderate improvement
- Strong improvement
- Data unavailable

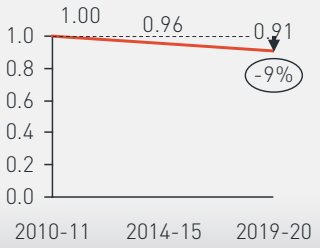
Outlook to 2020

Share of available potential that current trend would deliver

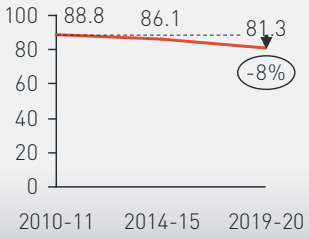
- No abatement captured
- 1–25%
- 26%–50%
- 51%–75%
- 76%+
- Data unavailable

Outlook to 2020

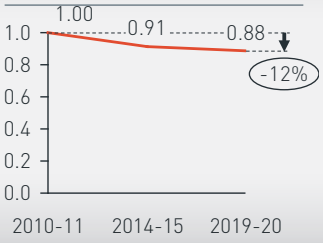
ENERGY EFFICIENCY

How much activity could happen?	What's in the pipeline?	What factors will influence the activity?	Key metric
Continuation of current high levels of energy efficiency is possible **If recent trends are maintained, 53% of the LCGP potential would be captured**	> Projects that have been awarded CTIP grants will be able to save up to 75 PJ of energy, equivalent to 8 $MtCO_2e$ of abatement > Projects already in the pipeline are expected to deliver an additional 33 PJ of savings by 2019-20	◀▶ Further energy price rises ◀▶ Technology improvements / innovation ◀▶ Further skill improvements ◀▶ Higher carbon price ◀ Limited capital availability	Change in energy intensity from energy efficiency activity, index 

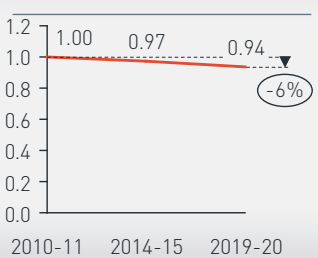
CHANGES IN ENERGY MIX

Continued shift to lower emissions fuel sources, particularly gas **Change in industry mix would to decrease energy emissions intensity by 8%**	> Continued growth of LNG production will drive increased gas use > Self-generated electricity could represent 22% of total electricity use in Industry by 2019-20 if current trends are sustained	◀▶ Further electricity price rises ◀▶ Higher carbon price ◀▶ Continued increase in share of self-generated electricity ◀ Gas price rises and supply concerns could incentivise shift to coal in most exposed sectors	Average emissions intensity of industrial energy use, tCO_2e/TJ 

INDUSTRIAL PROCESSES

Step change expected in chemicals, and continued improvements in cement **On track to capture nearly all LCGP opportunities**	> Nitrous oxide abatement technology likely to be installed in all ammonium nitrate plants > Use of supplementary materials in cement would reach best practice in 2019-20 if current trends continue, reducing emissions from clinker production	◀▶ Development of new technologies ◀ Improved skills in refrigerant gas handling could increase adoption of abatement	Composite emissions intensity for all sub-sectors, index 

FUGITIVE EMISSIONS

Improved efficiency of oil and gas production but limited improvements in coal mining are expected **Continued trend in efficiency would capture 43% of potential**	> Continued reduction of emissions from flaring and venting from conventional oil and gas > Capture and storage of carbon dioxide is planned at the Gorgon gas development, reducing growth in vented CO_2	◀▶ Carbon price certainty could help drive activity in coal mining abatement ◀ Growth in coal and gas production ◀ Coal seam gas emissions intensity may increase with improved measurement	Composite emissions intensity, index 

3. What more could be done?

There is still significant potential to reduce industrial energy use emissions and fugitive emissions, especially in the mining sector

Each sector has the potential to contribute additional emissions reductions by 2019-20. This potential was outlined in ClimateWorks' *Low Carbon Growth Plan for Australia*.

That research, published in 2010 and updated in 2011, provides an indication of the scale of emissions reduction potential available in Australia without changes to the business mix of our economy or to our lifestyles. It also provides details of the activities that can deliver these emissions reductions.

The *Low Carbon Growth Plan for Australia* found that there is enough abatement potential to achieve a 25 per cent emissions reduction target in Australia, using technologies and practices already available. However further policy or economic incentives would be required to drive the uptake of those activities.

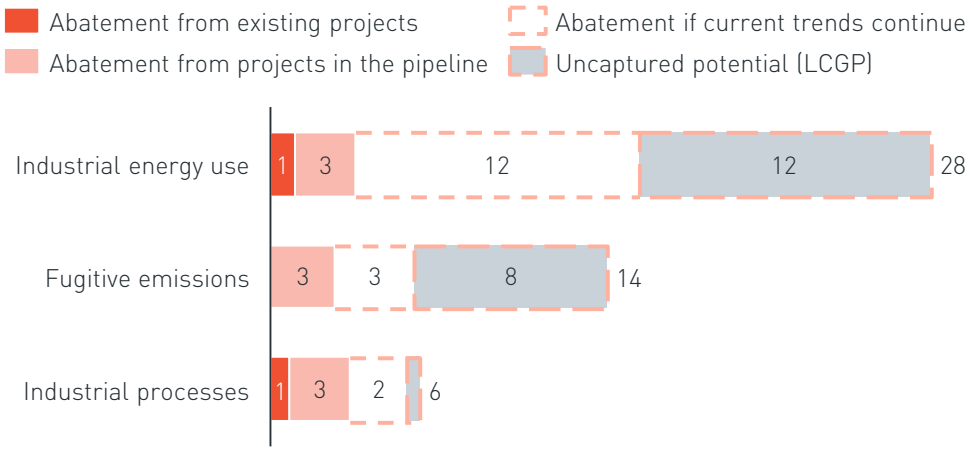
The graph below compares the abatement observed in the Industry sector to date as shown in this *Tracking Progress* report series with the potential described in the *Low Carbon Growth Plan for Australia*, noting that total abatement figures per sector do not align exactly due to the different methodologies used for the two reports and changes in the economic context between 2011 and today[11].

An additional 21 $MtCO_2e$ of emissions reductions would be required in 2020 to meet the 25% emissions reduction potential identified in ClimateWorks' *Low Carbon Growth Plan for Australia*, in addition to the 27 $MtCO_2e$ reduction expected based on current activity levels. Most of the additional potential resides in further improvements in industrial energy efficiency and fuel mix (12 $MtCO_2e$)[12].

Potential also exists to further reduce fugitive emissions, in particular in coal mining through further drainage of coal seam gas, and capture of ventilation air methane.

If recent trends are sustained, abatement activity in industrial processes would capture nearly all of the potential identified in the *Low Carbon Growth Plan for Australia* (LCGP) for this sector.

Relative share of emissions reduction potential by sector in 2019-20, $MtCO_2e$ (ClimateWorks 2011, ClimateWorks team analysis)



11 The *Low Carbon Growth Plan for Australia* (LCGP) is used only as a benchmark indication of how much potential remains available. The numbers presented in this report differ from the numbers presented in the LCGP given that those two analyses have slightly different scopes: the LCGP assessed abatement potential above the Australian Government's business-as-usual emissions projection, whereas this *Tracking Progress* study reports on all abatement activity undertaken, including abatement that would have been regarded as part of business-as-usual by government projections. For example, installation of new renewable capacity to meet the Renewable Energy Target was included in the Government's business-as-usual projection, but has been included in our abatement calculation in this report. This means that the 'total potential' referenced in this report appears larger than what was reported in the LCGP.

12 Please note that the impact of further electricity demand reductions on the electricity generation mix is explored in Report 2: Power of the *Tracking Progress* report series, with any further reduction in demand for grid-supplied electricity expected to reduce fossil fuel generation.

Case studies

Reducing cement process emissions

Boral is one of Australia's largest manufacturers of concrete, cement bricks and other construction products.

Clinker is the main ingredient used to make cement. It is produced by heating limestone to extremely high temperatures, triggering a chemical process which turns the limestone into clinker. This is then ground into fine powder Portland cement. In addition to the energy consumed, the process of turning limestone into clinker (calcination) releases carbon dioxide and other greenhouse gases.

Approximately half of Boral Cement's emissions in any year are from calcination. However, Boral has recently developed a technology which can reduce the overall embedded carbon of its ENVISIA™ cement product by well over 40 per cent by replacing a portion of the clinker with a less emissions-intensive material. This reduces production costs and emissions, without affecting the strength of the concrete product.

The importance of policy certainty for waste coal mine gas capture

The release of Waste Coal Mine Gas (WCMG) is a potentially hazardous and particularly greenhouse intensive part of the coal mining process. The gas, which is composed mostly of methane can be collected and burned to produce electricity, turning it into much less potent CO_2 and reducing emissions from consumption of grid-supplied electricity.

Clean energy company Energy Developments Ltd (EDL) developed the first large scale WCMG facility in 1996, and its latest project at Anglo American's Moranbah North mine displaces around 1.3 million tCO_2e per year and produces enough energy to power around 48,000 homes.

Waste coal mine gas generation is not generally feasible without carbon revenue. Investment in this technology is therefore dependent on policy certainty ensuring that this revenue is available for the life of the project. Relative policy certainty under the NSW Greenhouse Gas Reduction Scheme (GGAS) facilitated the progress of 5 major WCMG power projects leading to the delivery of about 110 MW of new low emissions energy capacity.

Full case studies are available in Report 3: Industry of the *Tracking Progress* report series.

CONTACT US

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and to view all reports in the Tracking Progress series, visit

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