

# **STRONG GROWTH, LOW POLLUTION**

**MODELLING A CARBON PRICE**

**UPDATE**

© Commonwealth of Australia 2011

ISBN 978-0-642-74737-2

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The Manager

Communications Unit

Ministerial and Communications Division

Treasury

Langton Crescent

PARKES ACT 2600

Email: [medialiaison@treasury.gov.au](mailto:medialiaison@treasury.gov.au)

## Overview

This update revises the policy parameters of the national and sectoral economic modelling contained in the *Strong growth, low pollution: modelling a carbon price* (SGLP) report. It presents two additional scenarios: one that reflects the *Clean Energy Future* package endorsed by the MPCCC, with a starting carbon price of \$23/t CO<sub>2</sub>-e instead of the \$20/t CO<sub>2</sub>-e modelled in the SGLP report; and one that also includes additional Government policy measures.

The updated modelling confirms the Australian economy will continue to grow strongly while emissions are reduced. Macroeconomic and sectoral projections from the updated policy scenarios are very close to those of the SGLP policy scenario, as the policy scenarios feature the same emission targets, the same carbon prices after the first three years and share a majority of other policy features.

Average incomes measured by gross national income (GNI) per person increase by around \$9,000 from today's level to 2020 and by more than \$30,000 to 2050. GNI per person grows by 1.1 per cent per year to 2050 with carbon pricing, compared to 1.2 per cent per year without carbon pricing. Employment continues to grow strongly, with national employment increasing by 1.6 million jobs by 2020, with or without carbon pricing. All state economies continue to grow strongly.

The impact of a \$23/t CO<sub>2</sub>-e carbon price on aggregate consumer prices (of 0.7 per cent in 2012-13) was reported in the SGLP report; no update is needed.

The main additional results in this modelling update are:

- the higher starting price reduces domestic emissions by an additional 5 Mt CO<sub>2</sub>-e in total over the first three years of the scheme;
- the Government measure to apply an effective carbon price to fuel used by heavy road vehicles from 1 July 2014 reduces Australia's domestic emissions by an additional 4 Mt CO<sub>2</sub>-e in 2020 and 20 Mt CO<sub>2</sub>-e in 2050 and lowers the cost of meeting Australia's emission reduction targets; and
- updated electricity sector modelling confirms the estimated 10 per cent increase in electricity prices in 2012-13 from carbon pricing presented in the SGLP report.

## Introduction

The *Strong growth, low pollution: modelling a carbon price* (SGLP) report provided a comprehensive analysis of the implications of carbon pricing on the economy at global, national, sectoral and household levels. The costs of cutting pollution and transforming the Australian economy to clean energy sources through carbon pricing are modest.

Modelling of household impacts in the SGLP report was based on a starting carbon price of \$23/t CO<sub>2</sub>-e in 2012-13 and other aspects of the final policy design. The modelling showed carbon pricing will increase aggregate consumer prices by 0.7 per cent in 2012-13 and that a second increase of 0.2 per cent by 2015-16 is projected, reflecting the move to a floating carbon price and other policy parameters. These effects are small compared with the increase from the Goods and Services Tax introduced in July 2000, and small in the context of movements in consumer prices from year to year. Nothing in this modelling update affects those conclusions.

The national and sectoral economic modelling contained in the SGLP report did not incorporate some elements of the *Clean Energy Future* policy package agreed by the Multi-Party Committee on Climate Change (MPCCC). The long lead time required to commission detailed modelling of the electricity generation and other sectors meant it was not possible to incorporate some details of the package, including the initial \$23 carbon price. This update revises the policy parameters of the national and sectoral economic modelling and compares results with those in the SGLP report. The modelling covers over 50 industry groups with detailed sectoral analysis of electricity generation, road transport and land sectors.

The four scenarios are:

- medium global action scenario — unchanged from SGLP, assumes the world takes action to stabilise greenhouse gas concentrations at 550 ppm CO<sub>2</sub>-e but Australian carbon emissions are not priced;
- SGLP policy scenario — the ‘core policy scenario’ presented in SGLP;
- Clean Energy Future scenario — where possible incorporates features of the *Clean Energy Future* package endorsed by the MPCCC, and reflected in the legislation currently before the Parliament; and
- Government policy scenario — includes additional Government-only measures for heavy on-road transport and some of the additional assistance for the steel industry.

The three policy scenarios assume Australia introduces a domestic carbon price in a world where other countries also act to mitigate climate change. They assume a fixed price scheme from 1 July 2012, before moving to a flexible world price of around \$29/t CO<sub>2</sub>-e in 2015-16. The SGLP policy scenario assumed an initial starting price of \$20/t CO<sub>2</sub>-e. The two updated policy scenarios are based on the same assumptions as in the SGLP policy scenario, apart from updated policy details. In particular, the Clean Energy Future scenario incorporates:

- an initial \$23/t CO<sub>2</sub>-e price, rising by 2½ per cent per year plus inflation during the fixed price period;
- a requirement that businesses meet at least 50 per cent of their annual liability from domestic permits and credits until 2020;

- no maximum cap on transitional assistance to emission-intensive trade-exposed industries under the Jobs and Competitiveness Program; and
- permanent exclusion of heavy on-road transport combustion emissions from carbon pricing.

The Government policy scenario includes an effective carbon price on fuel used by heavy on-road transport from 2014-15, as in the SGLP policy scenario, and additional steel industry support compared to the SGLP policy scenario through a 10 per cent increase from 2016-17 in the allocative baseline under the Jobs and Competitiveness Program. The Government proposes to seek Parliamentary approval for additional steel industry support shortly after passing the carbon price legislation, but will not legislate for an effective carbon price on fuel used by heavy on-road transport until after the next election.

The modelling covers the main impacts of the *Clean Energy Future* package on the Australian economy; however, modelling all the detailed elements of the plan is not feasible.

In relation to the roll out of renewable energy, it is important to note that the modelling of the renewable energy sector does not include the Clean Energy Finance Corporation. The Government is yet to finalise consultation with key stakeholders about how the corporation will operate. The inaugural Chair of the Clean Energy Finance Corporation will report to the Government by early 2012, including on a proposed investment mandate and risk management policies. In addition, the modelling does not include policies that provide investment and innovation grants, such as the \$3.2 billion Australian Renewable Energy Agency, the \$1.2 billion Clean Technology Program or the \$300 million Steel Transformation Plan. The Carbon Farming Futures Fund and the Biodiversity Fund also are not modelled. The impact of these programs on investment and behaviour is difficult to predict. Generally, they reduce the cost of investment in energy efficiency, renewable energy, and abatement in the land sector. These policies would likely lead to more investment and lower domestic emissions.

Similarly, the modelling does not include the planned closure of 2,000 MW of electricity generation capacity of the most emission-intensive power plants, as this requires assumptions about which generators close under the tender process and when they close. The outcomes depend on expressions of interest from individual generators, negotiations with selected generators and an assessment of value for money, taking account of power system reliability requirements and other criteria. The contract for closure arrangements aim to provide certainty to new investors in low-pollution generation and begin the electricity sector's transformation to a clean energy future. Should the retirement and replacement of the highest-polluting coal-fired generation capacity occur sooner than under the modelling, emissions would fall below the levels presented in the scenarios.

The modelling does not capture policies that assist targeted facilities in industries with an unusually diverse level of emissions. For example, the effects of the supplementary allocation for liquefied natural gas projects and the Coal Sector Jobs Package for the few mines with high volumes of fugitive emissions are not individually modelled. These policies tend to support innovation and investment, resulting in a more competitive sector with stronger growth than presented in the SGLP policy scenario.

Nevertheless, the modelling provides a robust picture of the effects of the package at an aggregate industry and macroeconomic level.

The updated modelling reinforces results from the core policy scenario in the SGLP report. This paper focuses on key messages from the updated modelling and highlights the main differences between the scenarios. Revised charts and tables from the SGLP report including the updated policy scenarios are available at [www.treasury.gov.au/carbonpricemodelling](http://www.treasury.gov.au/carbonpricemodelling).

**Table 1: Policy scenario assumptions**

		<b>SGLP</b>	<b>Clean Energy Future</b>	<b>Government</b>
Carbon price nominal A\$/t CO <sub>2</sub> -e	2012-13	\$20 (\$23 for household modelling)	\$23	
	Growth rate in fixed price period	5 per cent per year plus inflation	2½ per cent per year plus inflation	
	Flexible price	Projected to be \$29 in 2015-16		
World stabilisation target		550 ppm CO <sub>2</sub> -e		
Australian emission reduction target		5 per cent below 2000 levels by 2020; 80 per cent below 2000 levels by 2050		
Allocation		Set as straight line reductions: from the end of the Kyoto commitment period to achieve the 2020 targets; and from 2020 to achieve an 80 per cent reduction on 2000 levels in 2050		
International linking		Unrestricted from 2015-16	Quantitative restriction ensures liable parties meet at least 50 per cent of their annual liability from domestic permits and credits until 2020	
Fuel		An effective carbon price is applied to: businesses' combustion of liquid fuels from 2012-13 (except light vehicles, agriculture, forestry and fishing) and heavy on-road vehicles from 2014-15, through the fuel tax credit system; and aviation fuel from 2012-13 through the domestic aviation excise system. Private passenger cars are excluded.	As for other policy scenarios, but with permanent exclusion of heavy on-road vehicles from carbon price coverage	As for SGLP scenario
Exclusions		Agriculture, forestry (in terms of mandatory liability for emissions), decommissioned mines, legacy waste and existing emissions of synthetic gases		
Emission-intensive trade-exposed industries	Rate	Assistance starts at 94.5 per cent or 66 per cent, depending on emission intensity, and declines by 1.3 per cent per year		
	Cap	A cap of 100 per cent of scope 1 and scope 2 emissions	No maximum cap on assistance	
	Additional assistance for steel industry			A 10 per cent increase in permit allocation from 2016-17
Household assistance		Remaining scheme revenue is allocated to households as lump sum payments		

Table 2: Headline indicators

	At 2010	At 2020				At 2050			
		Medium global action reference	SGLP policy	Clean Energy Future	Government policy	Medium global action reference	SGLP policy	Clean Energy Future	Government policy
Emission target, change from 2000 level, per cent	-	-	-5	-5	-5	-	-80	-80	-80
Carbon price, real, \$/t CO <sub>2</sub> -e	-	-	29	29	29	-	131	131	131
Domestic emissions, Mt CO <sub>2</sub> -e	578	679	621	624	621	1008	545	566	546
Change from reference, Mt CO <sub>2</sub> -e	-	-	-58	-54	-58	-	-463	-442	-463
Change from 2000 level, per cent	-	22	12	13	12	82	-2	2	-2
Emission intensity of GDP, kg CO <sub>2</sub> -e/\$	0.45	0.39	0.36	0.36	0.36	0.28	0.15	0.16	0.15
Emissions per person, t CO <sub>2</sub> -e per person	26.1	26.5	24.2	24.3	24.2	27.9	15.1	15.7	15.1
Internationally-sourced abatement, Mt CO <sub>2</sub> -e	-	-	94	97	94	-	434	455	435
GNI per person, \$ '000	55.8	65.1	64.8	64.8	64.8	91.2	86.9	86.9	86.9
Change from reference, per cent	-	-	-0.5	-0.5	-0.5	-	-4.7	-4.8	-4.7
Average annual growth, per cent	-	1.6	1.5	1.5	1.5	1.2	1.1	1.1	1.1
GDP, \$ '000 billion	1.28	1.73	1.72	1.72	1.72	3.66	3.56	3.56	3.56
Change from reference, per cent	-	-	-0.3	-0.3	-0.3	-	-2.8	-2.8	-2.8
Average annual growth, per cent	-	3.0	3.0	3.0	3.0	2.7	2.6	2.6	2.6
Employment, million people	11.4	13.0	13.0	13.0	13.0	17.4	17.4	17.4	17.4
Household consumption per person, average annual growth, per cent	-	1.6	1.6	1.6	1.6	1.2	1.1	1.1	1.1
Real wages, average annual growth, per cent	-	1.9	1.9	1.9	1.9	1.2	1.0	1.0	1.0
Real investment, average annual growth, per cent	-	3.2	3.1	3.1	3.1	2.4	2.3	2.3	2.3
Capital stock, average annual growth, per cent	-	4.1	4.1	4.1	4.1	2.9	2.8	2.8	2.8
GSP, average annual growth, per cent									
New South Wales	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Victoria	-	2.7	2.6	2.6	2.6	2.5	2.4	2.4	2.4
Queensland	-	3.6	3.5	3.5	3.5	3.0	2.9	2.9	2.9
South Australia	-	2.1	2.1	2.1	2.1	1.9	1.8	1.8	1.8
Western Australia	-	4.3	4.2	4.2	4.2	3.0	3.0	3.0	3.0
Tasmania	-	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9

Note: All dollar values are in Australian dollars at 2010 prices. Annual growth rates are from 2010. Initial employment is for 2011. All results in this publication refer to the financial year ending 30 June of the year quoted unless otherwise indicated.

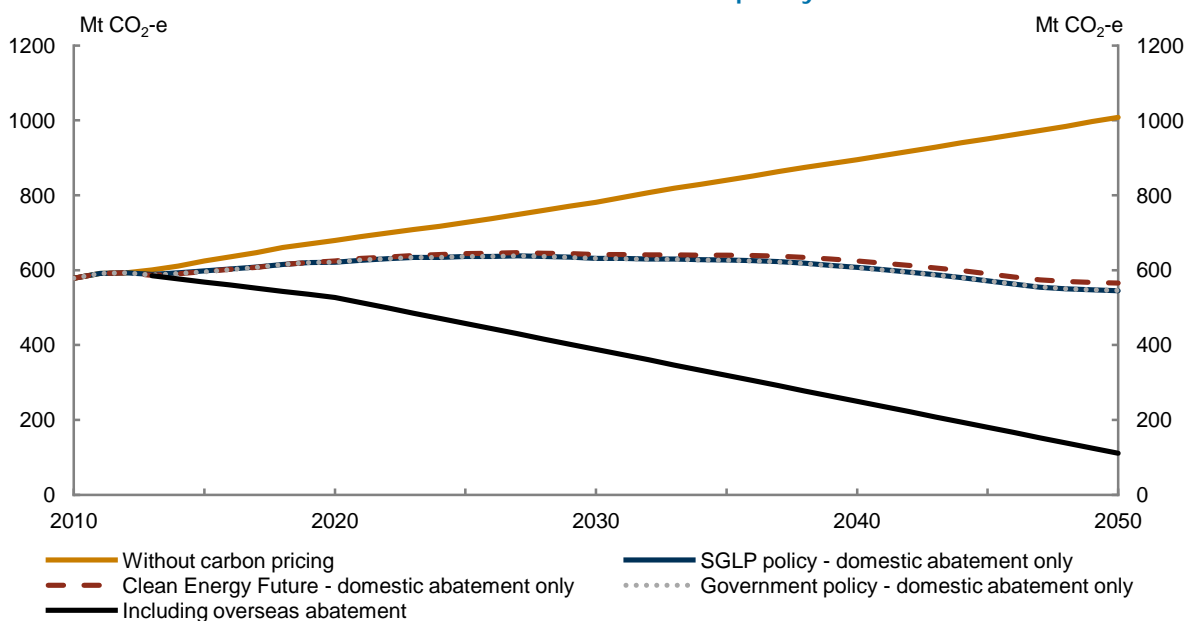
Source: Treasury estimates from MMRF; and ABS.

## Impact on emissions

Carbon pricing in Australia reduces emissions domestically and overseas. Without carbon pricing, Australia’s emissions would continue to rise steadily. Carbon pricing reduces Australia’s emissions by 159 Mt CO<sub>2</sub>-e in 2020 compared to what would happen without carbon pricing, achieving Australia’s emission reduction target of 5 per cent below 2000 levels.<sup>1</sup> Australia’s emissions in 2050 fall by 897 Mt CO<sub>2</sub>-e, so emissions are 80 per cent less than 2000 levels. In all policy scenarios, domestic emissions are significantly lower throughout the period than the emission path without carbon pricing and decline after 2030.

Differences across scenarios in the starting prices and transport coverage affect how these environmental objectives are met, including the shares of abatement sourced domestically and overseas. The higher fixed carbon price path to 2014-15 in the updated scenarios reduces cumulative domestic emissions by an additional 5 Mt CO<sub>2</sub>-e over that period compared with the SGLP policy scenario. The permanent exclusion of heavy on-road transport from carbon pricing in the Clean Energy Future scenario results in less domestic abatement than other policy scenarios, with more abatement sourced overseas.

Chart 1: Australian emissions in the policy scenarios



Note: Emissions without carbon pricing include Carbon Farming Initiative (CFI) abatement. CFI abatement is driven by the global carbon price, at which CFI permits are assumed to be sold, which is the same across all policy scenarios.

Source: Treasury estimates from MMRF.

Australian businesses covered by the scheme will be required to meet at least 50 per cent of their emission liabilities from domestic permits and credits until 2020. They can buy international permits to meet the balance, which will ensure their emissions are offset by abatement overseas. The modelling projects businesses will meet significantly more than 50 per cent of their emission liabilities from domestic permits and credits, and significantly less than 50 per cent through international permits in all policy scenarios, so the cap does not bind. For example, in the Clean

1 The reduction of 159 Mt CO<sub>2</sub>-e in 2020 includes 7 Mt CO<sub>2</sub>-e of abatement through the Carbon Farming Initiative. All results in this publication refer to the financial year ending 30 June of the year quoted unless otherwise indicated.



Energy Future scenario, the modelling projects that Australian businesses source 97 Mt CO<sub>2</sub>-e of abatement overseas in 2020, or 28 per cent of their annual liability under the scheme in that year. Of course, many factors influence the eventual share of emissions met by abatement sourced overseas. For example, the cap may be important if world prices are much lower than expected.

## Macroeconomy

The Australian economy will continue to prosper as we reduce emissions. The two updated policy scenarios have very similar aggregate economic outcomes to the SGLP policy scenario because differences in the carbon price for the first three years and other policy features are small.

Real average incomes continue to grow at rates only slightly below those without carbon pricing. In both updated policy scenarios, gross national income (GNI) per person in today's dollars will rise by \$9,000 to 2020 and by more than \$30,000 to 2050. From 2010 to 2050, GNI per person grows at an average annual rate of 1.1 per cent with carbon pricing compared with 1.2 per cent without carbon pricing.

Gross domestic product (GDP) in today's dollar grows from \$1.3 trillion now to over \$1.7 trillion in 2020 and to around \$3.6 trillion in 2050. Similarly, employment continues to grow strongly, with 1.6 million jobs created by 2020 and 6 million jobs by 2050, with or without carbon pricing. These results are consistent across all policy scenarios.

Carbon pricing affects the composition of the Australia economy. Structural changes due to carbon pricing in the updated policy scenarios are similar to the SGLP policy scenario. Over time, resources shift from emission-intensive to low or less emission-intensive industries and processes, although this shift is smaller than the structural change from other factors such as the high terms of trade, ageing population, changes in tastes and the ongoing expansion of Asian economies.

Under all policy scenarios, all state economies grow strongly with carbon pricing and emissions are reduced significantly from where they otherwise would be. Effects on individual states vary reflecting the carbon intensity of their economies. Carbon pricing slows growth by no more than 0.1 of a percentage point per year to 2050, and in some states — South Australia, Tasmania and Victoria — the effect is even smaller. Data at a sufficient level of detail and quality is not available to reliably quantify the impact of carbon pricing at a sub-state regional level, which would require detailed projections of movements of resources between regions, and between industries within regions.

Australia's GNI is higher in the Government scenario than in the Clean Energy Future scenario. This is because the additional domestic abatement sourced from heavy on-road transport is cheaper than sourcing abatement overseas. The effective carbon price on fuel used by heavy on-road transport also has a small impact on the growth of the road freight industry to 2050.

Different policy settings to the SGLP scenario also directly affect two industries. The steel industry benefits from additional assistance in the Government scenario, so it grows slightly more strongly over the period to 2020. The alumina industry also grows slightly more strongly to 2020 in both updated policy scenarios because the cap on transitional assistance to emission-intensive trade-exposed industries assumed in the SGLP scenario no longer affects it.

Table 3: Gross output, by industry, 2020

Industry	Change from global action scenario			Change from 2010		
	SGLP policy	CEF	Government	SGLP policy	CEF	Government
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
<b>Agriculture</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>12</b>	<b>12</b>	<b>12</b>
Sheep and cattle	0.3	0.3	0.3	10	10	10
Dairy cattle	0.2	0.2	0.2	1	1	1
Other animals	0.4	0.5	0.4	14	14	14
Grains	0.5	0.6	0.5	15	15	15
Other agriculture	0.2	0.2	0.2	19	19	19
Agricultural services and fisheries	0.6	0.6	0.6	7	7	7
Forestry	0.3	0.3	0.3	5	5	5
<b>Mining</b>	<b>-0.8</b>	<b>-0.9</b>	<b>-0.9</b>	<b>77</b>	<b>77</b>	<b>77</b>
Coal	-2.3	-2.4	-2.4	45	45	45
Oil	0.0	0.0	0.0	1	1	1
Gas	-1.5	-1.5	-1.5	100	100	100
Iron ore	0.8	0.8	0.8	104	104	104
Non-ferrous ore	-0.9	-0.9	-0.9	92	92	92
Other	0.6	0.6	0.6	87	87	87
<b>Manufacturing</b>	<b>0.2</b>	<b>0.3</b>	<b>0.3</b>	<b>5</b>	<b>5</b>	<b>5</b>
Meat products	0.2	0.2	0.2	12	12	12
Other food	0.1	0.1	0.1	3	3	3
Textiles, clothing and footwear	0.7	0.7	0.7	-34	-34	-34
Wood products	-0.1	-0.1	-0.1	3	3	3
Paper products	0.3	0.3	0.3	-7	-7	-7
Printing	0.0	0.0	0.0	14	14	14
Refinery	0.0	-0.2	0.0	-8	-8	-8
Chemicals	1.8	1.8	1.7	9	9	9
Rubber and plastic products	0.6	0.5	0.5	5	5	5
Non-metal construction products	-0.7	-0.7	-0.7	6	6	6
Cement	-0.8	-0.8	-0.8	34	34	34
Iron and steel	0.4	0.5	0.9	9	9	10
Alumina	-0.2	2.1	2.3	49	53	53
Aluminium	0.3	0.8	0.8	0	1	1
Other metals	-0.3	-0.3	-0.3	70	70	70
Metal products	-0.2	-0.1	-0.1	3	3	3
Motor vehicles and parts	0.6	0.8	0.6	-39	-39	-39
Other	0.1	0.2	0.2	-20	-20	-20
<b>Construction</b>	<b>-0.9</b>	<b>-0.9</b>	<b>-0.9</b>	<b>51</b>	<b>51</b>	<b>51</b>
<b>Services</b>	<b>-0.3</b>	<b>-0.3</b>	<b>-0.3</b>	<b>38</b>	<b>38</b>	<b>38</b>
Electricity: coal-fired	-9.6	-9.6	-9.4	-9	-9	-9
Electricity: gas-fired	0.8	0.0	0.2	26	25	25
Electricity: hydro	-1.5	-1.5	-1.4	-1	-1	-1
Electricity: other	20.4	22.9	21.6	521	534	527
Electricity supply	-3.3	-3.2	-3.2	12	12	12
Gas supply	-1.2	-1.3	-1.2	27	27	27
Water supply	-0.3	-0.3	-0.3	20	20	20
Trade	-0.2	-0.2	-0.2	30	30	30
Accommodation and hotels	-0.4	-0.4	-0.4	21	21	21
Road transport: passenger	-0.1	-0.1	-0.1	23	23	23
Road transport: freight	-0.2	-0.1	-0.2	38	38	38
Rail transport: passenger	0.2	0.2	0.2	10	10	10
Rail transport: freight	-0.1	-0.2	-0.1	61	61	61
Water transport	-0.1	-0.1	-0.1	31	31	31
Air transport	-0.2	-0.2	-0.2	9	9	9
Communication	-0.3	-0.3	-0.3	56	56	56
Financial	-0.2	-0.2	-0.2	40	40	40
Business	-0.2	-0.2	-0.2	53	53	53
Public	0.0	0.0	0.0	32	32	32
Other	-0.4	-0.4	-0.4	33	33	33
Ownership of dwellings	-0.1	-0.1	-0.1	33	33	33

Source: Treasury estimates from MMRF.

Note: CEF is an abbreviation for Clean Energy Future.

Table 4: Gross output, by industry, 2050

Industry	Change from global action scenario			Change from 2010		
	SGLP policy	CEF	Government	SGLP policy	CEF	Government
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
<b>Agriculture</b>	<b>1.7</b>	<b>1.8</b>	<b>1.7</b>	<b>130</b>	<b>131</b>	<b>131</b>
Sheep and cattle	0.5	0.5	0.5	93	93	93
Dairy cattle	2.2	2.3	2.2	88	88	88
Other animals	2.2	2.5	2.2	140	140	140
Grains	1.1	1.2	1.1	126	126	126
Other agriculture	1.3	1.4	1.3	179	179	179
Agricultural services and fisheries	3.9	4.2	3.9	167	168	167
Forestry	2.0	2.4	2.0	130	131	130
<b>Mining</b>	<b>-4.3</b>	<b>-4.1</b>	<b>-4.4</b>	<b>201</b>	<b>202</b>	<b>201</b>
Coal	-17.1	-16.9	-17.1	109	110	109
Oil	-0.1	-0.1	-0.1	-73	-73	-73
Gas	-7.2	-7.1	-7.2	155	155	155
Iron ore	8.8	9.0	8.8	408	409	408
Non-ferrous ore	-6.5	-6.2	-6.7	261	262	260
Other	5.3	5.4	5.3	255	256	255
<b>Manufacturing</b>	<b>-2.8</b>	<b>-2.6</b>	<b>-2.8</b>	<b>69</b>	<b>69</b>	<b>69</b>
Meat products	1.1	1.3	1.2	137	137	137
Other food	2.2	2.4	2.2	108	108	108
Textiles, clothing and footwear	7.1	7.2	7.2	30	30	30
Wood products	0.5	0.9	0.5	116	117	116
Paper products	-1.4	-1.2	-1.4	60	61	60
Printing	1.6	1.7	1.6	147	147	147
Refinery	-6.7	-5.7	-6.8	30	32	30
Chemicals	-1.5	-1.3	-1.5	3	3	3
Rubber and plastic products	-0.2	-0.1	-0.2	42	42	42
Non-metal construction products	0.6	0.8	0.6	100	100	100
Cement	-6.8	-6.8	-6.8	130	131	130
Iron and steel	-21.3	-20.8	-21.2	79	80	79
Alumina	-44.1	-44.7	-44.8	72	70	70
Aluminium	-61.7	-61.5	-61.6	-49	-48	-49
Other metals	-8.9	-8.5	-9.0	44	45	44
Metal products	-4.7	-4.6	-4.7	58	58	58
Motor vehicles and parts	4.1	4.7	4.2	25	26	25
Other	5.2	5.4	5.3	54	54	54
<b>Construction</b>	<b>-5.6</b>	<b>-5.7</b>	<b>-5.6</b>	<b>195</b>	<b>194</b>	<b>195</b>
<b>Services</b>	<b>-1.2</b>	<b>-1.2</b>	<b>-1.2</b>	<b>242</b>	<b>242</b>	<b>242</b>
Electricity: coal-fired	-71.4	-73.8	-71.2	-47	-52	-47
Electricity: gas-fired	97.6	88.8	93.9	238	223	231
Electricity: hydro	-2.6	-2.2	-2.6	3	3	3
Electricity: other	289.7	292.7	293.3	2458	2478	2481
Electricity supply	-13.6	-16.2	-13.7	67	62	67
Gas supply	1.8	1.4	1.5	167	166	166
Water supply	-2.5	-2.6	-2.6	107	107	107
Trade	-1.6	-1.5	-1.6	176	176	176
Accommodation and hotels	-2.6	-2.7	-2.6	151	151	151
Road transport: passenger	0.2	0.2	0.2	205	205	205
Road transport: freight	0.2	0.8	0.2	225	227	225
Rail transport: passenger	13.9	14.5	13.9	415	418	415
Rail transport: freight	4.3	4.4	4.4	330	331	330
Water transport	-1.2	-1.1	-1.2	194	194	194
Air transport	2.6	2.6	2.6	373	373	373
Communication	-3.0	-3.0	-3.0	319	319	319
Financial	-0.8	-0.8	-0.8	257	257	257
Business	-0.3	-0.2	-0.3	353	354	353
Public	-0.5	-0.5	-0.5	243	243	243
Other	-4.6	-4.8	-4.6	164	163	164
Ownership of dwellings	-4.0	-4.1	-4.0	167	166	167

Source: Treasury estimates from MMRF.

Note: CEF is an abbreviation for Clean Energy Future.

### Box 1: Recent developments in the steel industry

The SGLP report projects that Australia's manufacturing sector continues to grow over the next decade, but at a slow rate. Resources continue to be drawn from the manufacturing sector to support growth in services, construction and mining. This structural adjustment continues the long-term shift of resources in the Australian economy seen over recent years. The historically high exchange rate, associated with high commodity prices and strong growth in mining exports as investment comes on line, accelerates this trend over the next decade.

Since the SGLP report, participants in the steel industry have announced plans to restructure their operations, including deactivating one Port Kembla blast furnace. They have made it very clear that their proposed restructure is in no way attributable to the introduction of a carbon price, and is instead driven by factors such as the exchange rate, high input prices, excess supply capacity on global markets and slowing global demand for steel products. The restructure is being conducted in a way that ensures facilities can be reactivated in the event of a sustained improvement in steel markets that enables profitable sales to resume.

The medium global action reference scenario has not been updated to incorporate these recent announcements. To the extent the restructuring would have a similar impact on both the reference case and the policy scenarios — given it is unrelated to the introduction of carbon pricing — updating the modelling to include the restructuring would not affect findings about the effects of carbon pricing on the economy.

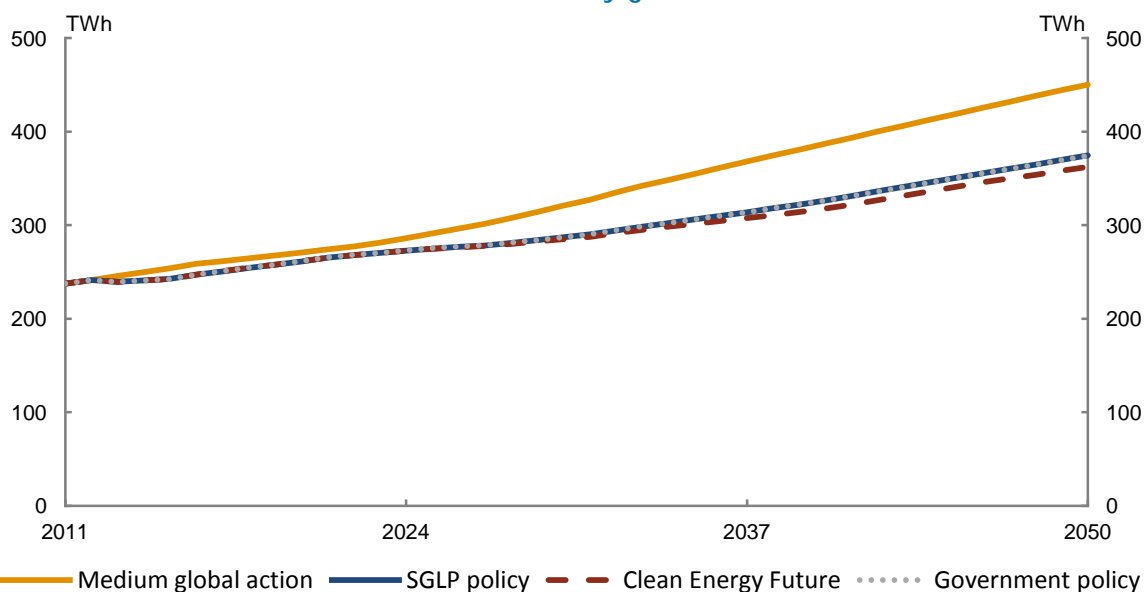
Given the unique set of challenges facing the Australian steel industry, in July the Government announced the Steel Transformation Plan to provide \$300 million of assistance over five years from 2012-13. The Steel Transformation Plan encourages investment and innovation in steel manufacturing and helps the sector become more efficient and sustainable in a low carbon economy. More recently, in August this year, the Government announced the introduction of a new advance facility as part of the Steel Transformation Plan to further support Australian jobs and to help ensure the future of the Australian steel industry.

## Electricity sector

Carbon pricing reduces emissions from electricity generation by shifting the generation mix towards cleaner technologies and moderating growth in electricity demand. As in the SGLP scenario, the updated policy scenarios show a transformation in the electricity generation sector towards renewable generation, with gas generation increasing and traditional coal-fired generation declining. Renewable energy grows from 10 per cent of the generation mix today to 40 per cent by 2050, with around \$100 billion in investment in the renewable sector.

The slight differences in electricity generation, emissions and prices between the updated policy scenarios and the SGLP report are due to different starting carbon prices and differences in demand.

Chart 2: Electricity generation



Note: Data are TWh of electricity sent out.

Source: Treasury estimates from MMRF, SKM MMA and ROAM.

In the near term, electricity sector emissions in the updated policy scenarios are slightly lower than in the SGLP policy scenario (cumulatively, around 3 Mt CO<sub>2</sub>-e lower to 2014-15), reflecting the higher starting carbon price.

The SGLP household sector modelling used to calculate the Government's assistance to households in the *Clean Energy Future* package showed that, with a carbon price starting at \$23/t CO<sub>2</sub>-e, overall consumer prices increase by 0.7 per cent in 2012-13, including an increase in household electricity prices of 10 per cent. There is no need to update that modelling. However, the new electricity sector modelling reaffirms the effect on electricity prices presented in the SGLP report.

In the medium term, after the fixed price period ends, the carbon price moves to the same world price as in the SGLP policy scenario and electricity demand in the updated scenarios is very similar to the SGLP policy scenario. However, from the late 2020s, electricity demand grows slightly more slowly in the Clean Energy Future scenario, compared with the other policy scenarios, due to less electric vehicle take-up. This slightly lowers electricity sector emissions in the Clean Energy Future scenario compared with the Government policy scenario, although higher fuel combustion emissions in transport more than offset this.

This difference in electricity demand also slows growth marginally in electricity prices in the Clean Energy Future scenario compared with the other policy scenarios. This divergence is small and long-term electricity prices converge again across the scenarios to reflect the cost of new generation capacity.

**Table 5: Average household electricity price increases**  
Change from medium global action scenario (per cent)

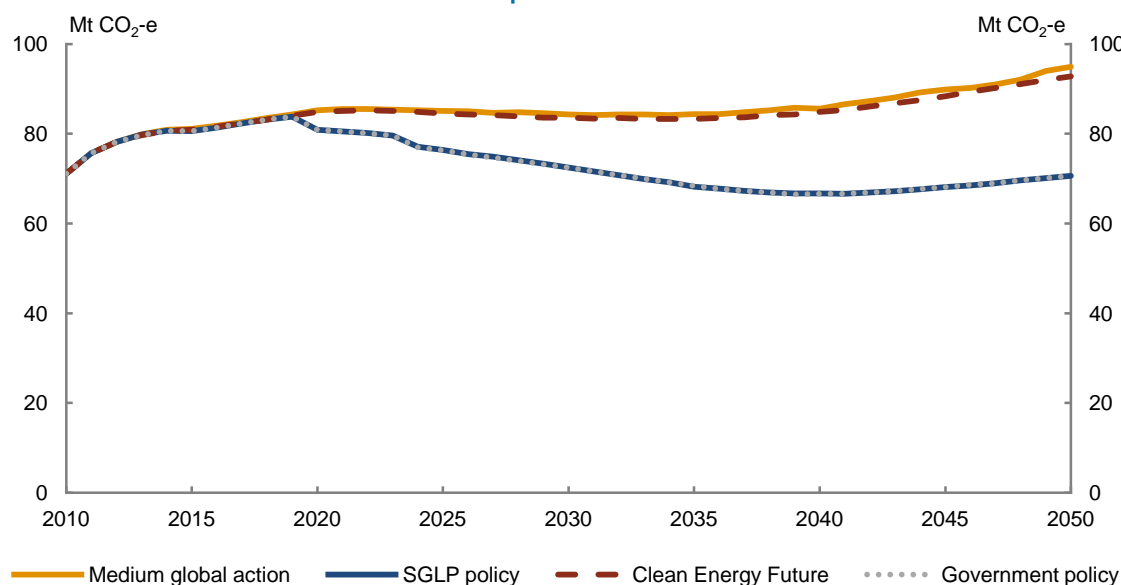
	Clean Energy Future			Government policy		
	2013-2017	2018-2022	2046-2050	2013-2017	2018-2022	2046-2050
	Per cent			Per cent		
New South Wales	10	8	35	10	8	35
Victoria	11	8	30	11	8	31
Queensland	11	8	34	11	8	34
Western Australia	10	10	39	10	10	38
South Australia	9	7	21	9	7	23
Tasmania	9	9	27	9	9	28
Northern Territory	9	6	23	9	6	23
Average	10	8	32	10	8	32

Source: Average of SKM MMA and ROAM.

## Transport

The updated policy scenarios cover road transport differently. This results in higher fuel combustion emissions in transport in the Clean Energy Future scenario than in the other policy scenarios. By 2050, road transport combustion emissions in the Government policy scenario are slightly below their 2010 levels, but remain 31 per cent higher in the Clean Energy Future scenario.

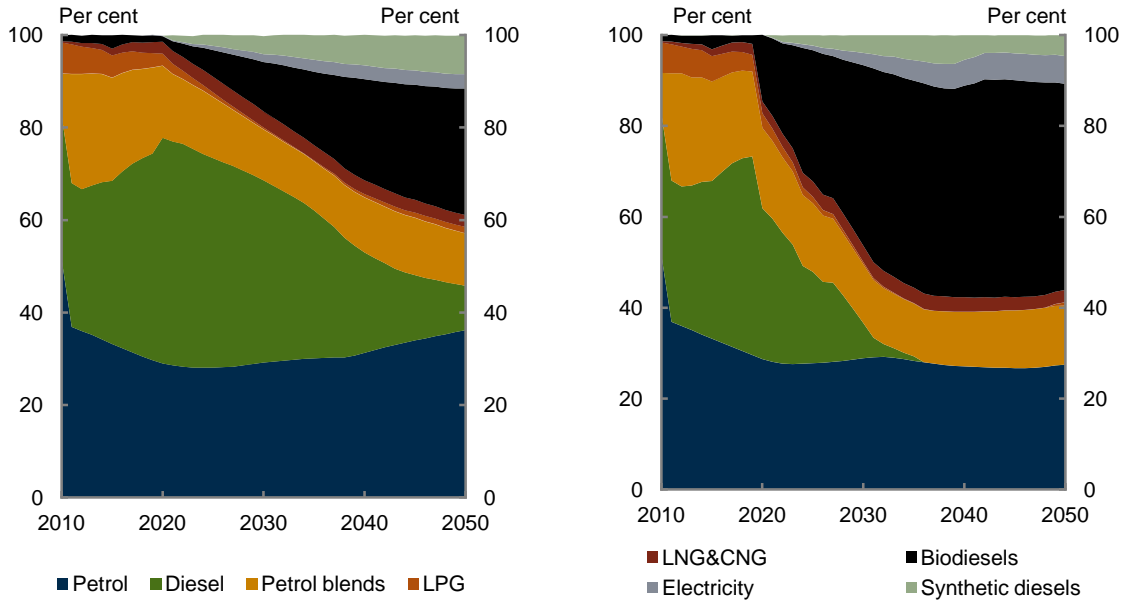
**Chart 3: Road transport combustion emissions**



Source: Treasury estimates from MMRF and CSIRO.

Demand for biofuels and electric vehicles is substantially stronger in the Government policy scenario. By 2050, over 40 petajoules more electricity is used in road transport in the Government policy scenario than the Clean Energy Future policy scenario.

**Chart 4: Road transport fuel mix by policy scenario**  
 Clean Energy Future      Government policy



Note: Biodiesels are B20, pure biodiesel and biomass-to-liquid. Synthetic diesels are coal-to-liquid and gas-to-liquid.  
 Source: CSIRO.

