Low Carbon Growth Plan for Australia

www.climateworksaustralia.org
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CEO, ClimateWorks Australia
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Executive Director, ClimateWorks Australia
Introducing ClimateWorks Australia

ClimateWorks Australia is a new non-profit organisation created through a partnership between The Myer Foundation & Monash University. It’s focus is enabling practical projects to deliver emissions reductions in Australia.

Affiliations:
Introducing Low Carbon Growth Plans

- Low Carbon Growth Plans (LCGPs) are an internationally recognised tool for integrating nationwide actions to reduce emissions alongside economic growth
- All national leaders at the Major Economies Forum in Italy, July 2009 agreed to prepare LCGPs
- ClimateWorks Australia’s Low Carbon Growth Plan is the first comprehensive economy-wide LCGP for Australia
- ClimateWorks Foundation has supported LCGPs around the world, including:
  - Indonesia
  - Mexico
  - Korea
The Low Carbon Growth Plan has been built on the following principles:

1. Establish a comprehensive fact base
2. Examine GHG emissions reduction opportunities from both a societal and business perspective
3. Identify the lowest cost means to reduce GHG emissions
4. Understand barriers to GHG emissions reduction and develop measures to overcome them
5. Build momentum for collaborative action
Key Findings

- Australia has the potential to achieve GHG emissions reductions of 249 MtCO$_2$e (25% below 2000 levels) at a low average cost by 2020

- Reducing GHG emissions can be profitable for businesses

- A combination of a carbon price and targeted actions is required to achieve Australia’s full potential of low cost emissions reductions

- A portfolio of prompt action is required
Meg Argyriou
Project Officer, ClimateWorks Australia
Contents

- Methodology
- The Opportunity
- The Challenge
- The Roadmap
Our methodology

Four stages:

1. Updated the Australian cost curve using McKinsey methodology
2. Translated to investor perspective
3. Examined barriers to implementation, in particular in four focus areas
4. Developed a roadmap

Our rationale

- Understand the lowest cost opportunities to reduce emissions
- Take account of private cost of capital and taxes & subsidies
- Recognise that cost is not the only relevant factor affecting the ability to implement the opportunities
- Specify the opportunities in practical detail, and integrate them into a roadmap according to their ease of implementation and risk of emissions lock-in
Business-as-usual emissions are forecast to grow by 20%

Real GDP
A$ Billions, 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>957</td>
<td>1,274</td>
<td>1,701</td>
</tr>
</tbody>
</table>

Direct emissions by sector
Mt CO₂e

<table>
<thead>
<tr>
<th>Sector</th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stationary energy²</td>
<td>251</td>
<td>293</td>
<td>311</td>
</tr>
<tr>
<td>Industrial processes and fugitive³</td>
<td>75</td>
<td>89</td>
<td>117</td>
</tr>
<tr>
<td>Transport</td>
<td>75</td>
<td>82</td>
<td>96</td>
</tr>
<tr>
<td>Agriculture</td>
<td>95</td>
<td>91</td>
<td>98</td>
</tr>
<tr>
<td>Forestry⁴</td>
<td>58</td>
<td>28</td>
<td>42</td>
</tr>
</tbody>
</table>

Volume to meet 25% target
Mt CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume to meet 25% target</td>
<td>553</td>
<td>249</td>
</tr>
</tbody>
</table>

1 Compound Annual Growth Rate per annum, 2000–20
2 Direct emissions from the power sector can also be regarded as indirect emissions from downstream power-consuming activities (e.g. power use in the building and industry sectors)
3 Includes fugitive emissions, industrial process emissions and waste emissions
4 Net emissions after subtracting growth in carbon sinks (e.g. new plantations) from emissions due to land clearing; Kyoto accounting method used

SOURCE: Australian Department of Climate Change (2009); ClimateWorks team analysis
Contents

- Methodology
  - The Opportunity
- The Challenge
- The Roadmap
How to read an emissions reduction cost curve

Each box represents one emissions reduction opportunity.

Estimated cost in 2020 to reduce emissions by 1 tCO₂e with this opportunity.

Annual GHG emissions reduction potential in 2020.

Opportunities are sorted by increasing costs per tCO₂e.

SOURCE: ClimateWorks team analysis
What’s included/excluded from the cost curve

**Included**

- Opportunities for which technology is commercially available
- Some opportunities that are outside Australia’s Kyoto obligations
- The realistic potential, rather than the full technical potential for each opportunity
- Only opportunities available in Australia

**Excluded**

- Opportunities expected to occur under current policies
- A carbon price
- Changes in business mix
- Lifestyle changes
- Taxes and subsidies (when estimating costs from a societal perspective).
- Transaction and program costs
- Value of co-benefits, such as improved health or reduced congestion
2020 GHG emissions reduction societal cost curve
Lowest cost opportunities to reduce emissions by 249 Mt CO$_2$e

Cost to society
A$/tCO$_2$e

-250 -200 -150 -100 -50 0 50 100 150 200

Exhibit 4

SOURCE: ClimateWorks team analysis (refer to bibliography)

1 Includes only opportunities required to reach emission reduction target of 249 Mtpa (25% reduction on 2000 emissions); excludes opportunities involving a significant lifestyle element or consumption decision, changes in business/activity mix, and opportunities with a high degree of speculation or technological uncertainty.
Conversion of societal to investor cost curve

Changes made to obtain investor perspective
- Increased discount rates from 4% (societal) to between 8 and 14% depending on sector
- Adjusted energy prices to take into account taxes (e.g. fuel excise, GST), retail margins, and direct or indirect subsides

Additional factors which impact investor profitability vary depending on how opportunity is captured, e.g.
- Project transaction costs
- Policy implementation costs

1 Does not include the impact of a carbon price

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)
Key investor cost curve metrics

Cost to an investor
A$/tCO₂e

<table>
<thead>
<tr>
<th></th>
<th>Profitable¹</th>
<th>Moderate cost</th>
<th>Higher cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG reduction, MtCO₂e</td>
<td>54 Mt</td>
<td>102 Mt</td>
<td>93 Mt</td>
</tr>
<tr>
<td>Percentage of total opportunity</td>
<td>22%</td>
<td>41%</td>
<td>37%</td>
</tr>
<tr>
<td>Average cost, A$/tCO₂e</td>
<td>-$103</td>
<td>$18</td>
<td>$90</td>
</tr>
</tbody>
</table>

¹ In this report, profitable is defined as positive return on incremental invested capital and operating expense (excluding transaction or policy implementation costs)

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)
Australian 2020 emissions reduction potential by sector\(^1\)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Volume (Mt(\text{CO}_2)e)</th>
<th>Average cost per tonne (Real 2010 A$)</th>
<th>Example opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Societal</td>
<td>Investor</td>
</tr>
<tr>
<td>Power</td>
<td>77</td>
<td>54</td>
<td>87</td>
</tr>
<tr>
<td>Forestry</td>
<td>70</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Industry</td>
<td>37</td>
<td>-48</td>
<td>-25</td>
</tr>
<tr>
<td>Agriculture</td>
<td>32</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Buildings</td>
<td>28</td>
<td>-99</td>
<td>-90</td>
</tr>
<tr>
<td>Transport</td>
<td>6</td>
<td>-60</td>
<td>-194</td>
</tr>
<tr>
<td>Total</td>
<td>249</td>
<td>7</td>
<td>19</td>
</tr>
</tbody>
</table>

1 Includes all emission reduction opportunities required to achieve 249Mt\(\text{CO}_2\)pa

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)
2020 Buildings GHG emissions reduction investor cost curve

Cost to an investor
A$/tCO₂e

Residential building envelope advanced
Residential building envelope
Commercial retrofit insulation
Commercial retrofit water heating
Commercial new builds

Residential new builds to 7.2 stars
Residential HVAC

Commercial retrofit cooking and refrigeration
Commercial retrofit lighting
Commercial retrofit energy waste reduction
Residential lighting high efficiency halogen

Commercial retrofit electronics
Commercial retrofit appliances
Commercial retrofit HVAC

Residential appliances and electronics

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)

1 Higher cost opportunities not required to meet target emissions of 25% below 2000 levels
Further breakdown of the emissions reduction opportunity in commercial buildings shows we must focus on more than offices.

Percent of total, 2020 estimates

- **Offices**: 3.8%
- **Non-food retail**: 3.2%
- **Education**: 1.7%
- **Community**: 1.4%
- **Food retail**: 1.3%
- **Accommodation**: 1.2%
- **Health**: 1.1%
- **Other**: 1.0%
- **Wholesale**: 0.9%
- **Food service**: 0.7%

**Total**: 16.3%

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Most of the current policy and business efforts are concentrated on a small share of the opportunity.

**Focus of current policies: large offices**

Additional opportunities to reduce emissions through lifestyle and behaviour change – some examples

<table>
<thead>
<tr>
<th>Categories</th>
<th>% of personal carbon footprint</th>
<th>Example opportunities</th>
<th>2020 emissions reduction potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger transport</td>
<td>44%</td>
<td>▶ Avoid 25% of business flights on high traffic routes through increased videoconferencing</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Switch 15% of total urban car trips under 3 km to walking or cycling</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Reduce total urban car travel by 5% through increased use of public transport</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Switch key home appliances from standby to off when not in use</td>
<td>2.8</td>
</tr>
<tr>
<td>Building and household energy</td>
<td>36%</td>
<td>▶ Reduce required home temperature by 2 C</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Reduce required commercial temperature change by 2 C</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ Switch 50% of bottled water drunk in Australia to tap water</td>
<td>0.2</td>
</tr>
<tr>
<td>Consumables</td>
<td>20%</td>
<td>▶ Shifting car occupancy rates from 1.4 to 1.6 persons per car</td>
<td>2.8</td>
</tr>
</tbody>
</table>

SOURCE: BITRE/CSIRO (2008); Australian Institute of Petroleum (2009); Ovum (2008); ABS (2009 and 2010); DEWHA (2008); Hackett et al (2009); Australasian Bottled Water Institute (2009); Econometrica (2009); ClimateWorks team analysis
Contents

- Business as usual
- The Opportunity
- The Challenge
- The Roadmap
A range of barriers currently hinder the capture of emission reduction opportunities

**Specific barriers**

**Investor profitability**
- Positive cost
- Non-market pricing (fixed fees, negotiated rates)
- Scientific or technical uncertainty

**Capital availability/priorities**
- Finite access to capital
- Payback periods
- Investment hurdle rate > cost of capital

**Informed decision process**
- Access to information
- Lack of awareness or understanding
- Low business priority
- Lack of statistical experience to prove benefits
- Lack of long term view on carbon/energy price
- Split administrative structures or budget allocation process

**Market structure and supply**
- Split incentives (owner/tenant, current/future)
- Lack of project scale (increased transaction costs, fragmented decision-makers)
- Sufficient availability of or access to equipment, infrastructure and skilled labour
- Reliability/quality of supply (immature markets)

**SOURCE:** Team analysis
Impact of carbon price on investor economics

Investor cost curve without carbon price

Investor cost curve with carbon price (A$69/t)

- Tonnes available at internal rate of return (IRR) above cost of capital
- Change in tonnes available at IRR above cost of capital

54 Mt

3.7X

199 Mt

1 Carbon price in 2020 of A$69 per tonne based on Treasury Garnaut -25% estimate (Australia’s Low Pollution Future) converted to 2010 dollars

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)
Analysis assumes a carbon price large enough to make each opportunity profitable.

Such as reduced consumption (e.g., turning lights off, driving fewer kms) and switching to less carbon-intensive forms of consumption (e.g., using public transport instead of driving).

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)
Capital intensity of opportunities by sector

2020 capital intensity and emissions reduction cost

- Relatively high capital intensity restricts the capture of otherwise profitable opportunities

- Size of bubble represents emissions reduction potential of sector

SOURCE: ClimateWorks team analysis, derived from 2020 GHG emissions reduction cost curve (exhibit 4)
Contents

- Business as usual
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### Roadmap of action

**Ease of implementation (cost and barriers)**

<table>
<thead>
<tr>
<th>Risk of lock-in</th>
<th>Relatively simple</th>
<th>More challenging</th>
<th>Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td>Residential new builds</td>
<td>Coal to gas shift (gas new build)</td>
<td>Biomass/biogas</td>
</tr>
<tr>
<td></td>
<td>Other industry energy efficiency</td>
<td>Coal to gas shift (gas new build)</td>
<td>Geothermal</td>
</tr>
<tr>
<td></td>
<td>Commercial elevators &amp; appliances</td>
<td>Commercial retrofit HVAC</td>
<td>Wind offshore</td>
</tr>
<tr>
<td></td>
<td>Cogeneration</td>
<td>Commercial retrofit HVAC</td>
<td>Coal CCS new build</td>
</tr>
<tr>
<td></td>
<td>Mining energy efficiency</td>
<td>Commercial retrofit HVAC</td>
<td>Coal CCS new build with EOR</td>
</tr>
<tr>
<td></td>
<td>Reduced T&amp;D losses</td>
<td>Commercial retrofit HVAC</td>
<td>Diesel car hybrids</td>
</tr>
<tr>
<td></td>
<td>Residential appliances &amp; electronics</td>
<td>Commercial retrofit HVAC</td>
<td>Petrol car hybrids</td>
</tr>
<tr>
<td></td>
<td>Commercial retrofit lighting</td>
<td>Commercial retrofit HVAC</td>
<td>Gas CCS new build</td>
</tr>
<tr>
<td></td>
<td>Residential lighting</td>
<td>Commercial retrofit HVAC</td>
<td>Residential building envelope</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of response</th>
<th>1 Implement now</th>
<th>2 Act now to remove barriers and motivate action</th>
<th>3 Invest now in information and innovation to reduce long-run cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relatively simple</strong></td>
<td>4 Residential new builds</td>
<td>41 Commercial retrofit HVAC</td>
<td>11 Reduced deforestation and regrowth clearing</td>
</tr>
<tr>
<td><strong>More challenging</strong></td>
<td>31 Other industry energy efficiency</td>
<td>18 Commercial retrofit HVAC</td>
<td>28 Coal CCS new build with EOR</td>
</tr>
<tr>
<td><strong>Difficult</strong></td>
<td>25 Coal to gas shift (gas utilisation)</td>
<td>62 Reforestation of marginal land with environmental forest</td>
<td>29 Pasture and grassland management</td>
</tr>
<tr>
<td></td>
<td>Commercial retrofit energy waste reduction</td>
<td>Strategic reforestation of non-marginal land with enviro. forest</td>
<td>Degraded farmland restoration</td>
</tr>
<tr>
<td></td>
<td>Improved forest management</td>
<td>Mining VAM oxidation</td>
<td>Anti-methanogenic treatments</td>
</tr>
<tr>
<td></td>
<td>Improve existing coal plant efficiency</td>
<td>Chemical processes &amp; fuel shift</td>
<td>Cropland carbon sequestration</td>
</tr>
<tr>
<td></td>
<td>Cement clinker substitution by slag</td>
<td>Reforestation of marginal land with timber plantation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Petroleum and gas maintenance</td>
<td>Active livestock feeding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduced cropland soil emissions</td>
<td>Iron and steel processes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improve existing gas plant efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large articulated truck efficiency improvement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOURCE:** ClimateWorks team analysis

Exhibit 45
## Implement now (extract from Roadmap)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Opportunity</th>
<th>Action required to achieve</th>
<th>Societal cost A$/tCO$_2$e</th>
<th>Size of opportunity Mtpa</th>
<th>Responsiveness to carbon price</th>
<th>Market structure and supply</th>
<th>Information and decision process</th>
<th>Capital constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Cogeneration</td>
<td>Implement 100% in two steel plants; 9% of thermal energy replaced in refineries; 7.5% energy savings in chemicals; 3% energy savings for other industries</td>
<td>-48</td>
<td>4.5</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Commercial retrofit energy waste reduction</td>
<td>Reduce energy consumption by a 10% average in existing buildings by 2020</td>
<td>-138</td>
<td>4.4</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Industry</td>
<td>Residential new builds</td>
<td>Build 100% of new builds to a 7.2 star rating between 2013 and 2020</td>
<td>-98</td>
<td>3.9</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Forestry</td>
<td>Improved forest management</td>
<td>Improve management of 375,000 ha forest annually to increase woody growth</td>
<td>54</td>
<td>3.8</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Transport</td>
<td>Mining energy efficiency</td>
<td>Save 5.2% energy through operational improvements and equipment upgrades</td>
<td>-106</td>
<td>2.9</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Reduced T&amp;D losses</td>
<td>Reduce T&amp;D losses from 8% to 6.5% across the national network</td>
<td>-37</td>
<td>2.8</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
Key Findings

- Australia has the potential to achieve GHG emissions reductions of 249 MtCO$_2$e (25% below 2000 levels) at a low average cost in the next ten years
  - The average cost in 2020 is the equivalent of $185 per household

- Reducing GHG emissions can be profitable for businesses
  - 22% of the opportunities are profitable to investors today

- A combination of a carbon price and targeted actions are required to achieve Australia’s full potential of low cost emissions reductions

- A portfolio of prompt action is required
  - There are 54 practical actions – no silver bullet!
  - Some are ready to be implemented now, while others will need attention from government and businesses to make sure they are implemented by 2020
Next steps
What will ClimateWorks Australia do now?

- Implementing these 54 opportunities can be done ... but we need you!
- The actions are in the hands of all the businesses and individuals across all sectors of our economy

**ClimateWorks Australia will:**

- Work with businesses and governments on specific projects that will achieve the emissions reductions in the next ten years
- Track progress toward achieving 249 Mtpa
Questions?
Low Carbon Growth Plan for Australia

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