

# **Green jobs**

## What are they and do we need them?

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## Executive summary

What are green jobs? What policies can create green jobs? And is the term 'green jobs' meaningful in itself or is it just a politically attractive phrase? This paper seeks to answer these questions.

Despite a great deal of enthusiasm about green jobs, there has been surprisingly little interest in what the concept actually means. Given that the precise definition of a green job will ultimately determine both the environmental effectiveness of the growing body of green-collar workers and the value received in return for significant public investment, the absence of a cogent definition is a cause for concern.

Is a green job one that actively contributes to the long-term transformation of society into a more ecologically sustainable form? A firm that produces wind turbines, for example, is clearly contributing to the transition to a sustainable energy system, but should the jobs of those who manufactured the steel and aluminum from which the turbines are made also be classified as green?

What about those who work in industries with low environmental impacts? Should the small ecological footprint of a job be enough to earn itself the title of a green job? Although these industries tend to rely more heavily on human capital and less heavily on physical capital, is it meaningful to categorise all jobs in the entire service sector as green?

Is it possible to class a job that marginally reduces the impact of a resource-intensive industry such as mining as a green job? For instance, are those who clean up oil spills working in green jobs? If not, it would appear inconsistent to categorise those working in environmental remediation roles as having green jobs when the only difference between such roles is that the initial damage was unintentional in the case of the oil spill and intentional in the case of the mine.

The difficulties of defining green jobs are much greater than mere semantics. If green-job creation is to be considered a legitimate role for government, it is important to define clearly what the outcome is and why governments would seek to pursue it. Protecting the environment is clearly a role for government as is encouraging full employment, but unless the concept of a green job is clearly defined, it is not clear that either objective will be achieved via the pursuit of 'green-job creation'.

### Would the CPRS have created green jobs?

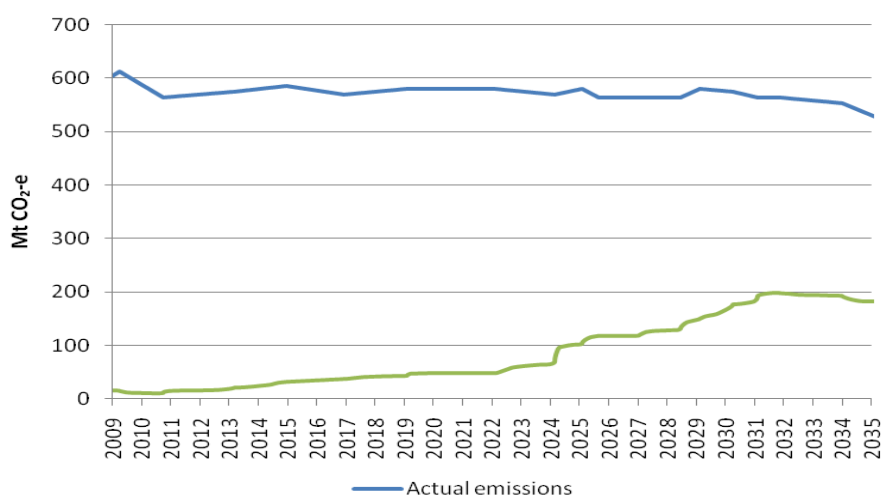
Even if, as is likely, the Rudd Government's Carbon Pollution Reduction Scheme (CPRS) is abandoned, it is important to consider the potential impact of the proposed emissions trading scheme on job creation in Australia. Its two-year deferral provides an opportunity to align climate policy more meaningfully with its stated rationale.

It was an article of faith that the CPRS would underpin a green jobs 'revolution' in Australia. However, the unrestricted international carbon-offsetting provisions contained in the policy would have delivered up to 114,000 fewer jobs in the Australian clean-energy sector by 2020 than would have transpired if emission reductions were planned through domestic investment in renewable energy. In other words, if Australia had invested in sufficient renewable-energy generation to meet its emission-reduction targets rather than simply

planning to import offset permits from other countries, the result would have been up to 114,000 more people employed in the renewable-energy industry.

Emissions trading advocates emphasised the need to transform Australia into a ‘low-carbon economy’, but Treasury modelling showed that the CPRS would not have delivered the absolute emissions reductions that would have delivered this outcome. While the CPRS would have slowed the *growth* in Australian emissions, it would have relied on the importation of international offset permits to achieve its stated *emissions-reduction* goal. As shown in Figure A1, the CPRS would have acted more as a vehicle for offset imports than as a driver of domestic greenhouse abatement. Put simply, every offset permit that is imported exports the potential for green-job creation in Australia.

Figure A1: Actual emissions and projected imports of ‘offset credits’ (CPRS–5 scenario)



### Do green jobs matter?

While much has been made of the importance of green-job creation in the recent debate about the CPRS, it would appear that the primary motivation for such an approach was to counter the argument mounted by those opposed to taking any action at all that emissions reduction would destroy jobs. In fact, the CPRS was designed to allow for the unlimited importation of offset permits from other countries, the implication being that domestic green-job creation was not a priority for the architects of the scheme. But even if it were possible to define what green jobs are, is it important that public policy seeks specifically to create them?

This paper argues that green jobs should be incidental to the desired environmental policy outcomes pursued by governments; green jobs will follow inevitably from effective environmental policy but effective environmental outcomes do not necessarily flow from the creation of green jobs. Consider the following.

Imagine that the government wants to create dedicated road-construction jobs, considering it socially beneficial for the road network to be upgraded and expanded. The most efficient and effective way to achieve this result would be, presumably, to announce and fund an ambitious

10-year road-building plan, which in turn would lead to the employment of a wide range of road-building workers with the appropriate range of skills.

If skills shortages became apparent, rising wages and apparent job security would likely lead potential employees to seek the necessary training required to secure the jobs in question. Government policy might be able to expedite the development of such training programs to the benefit of both the workers, their employers and, ultimately, to those awaiting the construction of the road.

Now imagine that instead of committing to an ambitious 10-year road-building plan, the government committed to a road-building jobs package, which provided incentives for firms to recruit and train road builders and also encouraged the Vocational Education and Training (VET) sector to offer new road-building courses.

While the government is arguably investing in a 'public good' in the form of training, the presence of such an investment is in no way a substitute for the existence of the ambitious road-building program. On the contrary, it could be argued that in the absence of such a program, the investment in training is actually wasted.

The construction of roads, not the training and employment of road workers, should be the goal of government.

Climate policy is desirable in so far as it contributes meaningfully to global efforts to reduce greenhouse-gas emissions, not because it generates green jobs. Differing approaches to climate policy should not be assessed, supported or rejected on the basis of the number of green jobs they create. Nor should green jobs be viewed as a meaningful substitute for effective climate policy.

### What is a low carbon economy?

Much has been made of the potential for green-job creation associated with installing ceiling insulation and building wind turbines. Although important, it is essential to realise that the creation of these 'transformational' green jobs is not, of itself, evidence of the development of a low-carbon economy. Rather, such jobs represent an adjustment in the way energy is created and consumed, not the uses to which that energy is put. They represent a lower-carbon approach to the growth of current economic structures, not the emergence of a *bona fide* low-carbon economy.

A low-carbon economy is not an economy in which large numbers of people are employed installing insulation or building wind turbines. It is an economy in which the dominant production and consumption activities require much less energy overall *as well as* a significant reduction in reliance on energy from traditional sources. When low-impact sectors are defined as those that require low-energy use per job created, an economy experiencing rapid growth in sectors such as health, education and community services will have a much smaller carbon footprint than an economy experiencing rapidly growing manufacturing and mining industries. Further, the re-emergence of the early 20<sup>th</sup>-century trend towards the conversion of productivity growth into increased leisure time rather than into increased material consumption would also signal the emergence of a genuine trend towards a low-carbon economy.

It is important to realise that when national caps on greenhouse-gas emissions exist, the notion of a low-carbon economy is not terribly meaningful. That is, if Australia commits to a given level of pollution, it does not really matter how that level is distributed between

production and consumption decisions. The pursuit of low-emission activities by some producers or consumers would simply permit the expansion of high-emission activities elsewhere in the economy. However, both in the short term, where such caps may not exist, and in the very long term, when hopefully they will become unnecessary, the idea of transitioning away from economic activities such as recreational shopping that are emissions intensive towards activities such as human services and leisure that are not, will deliver genuine least-cost abatement.

In order to reduce greenhouse-gas emissions significantly much investment in new energy technologies will need to be made and many jobs will in turn be created. However, the ultimate goal of such activity must remain clear—lower levels of global emissions. Green jobs will inevitably flow from the pursuit of such a goal, but lower emissions will not inevitably flow from the pursuit of green jobs.

## 1. Introduction

The past years have witnessed a great deal of excitement about green jobs, simultaneously envisaged as a solution to the global economic downturn and a way of addressing the range of environmental challenges currently facing Australia. During the opening address to the 2009 Australian Labor Party National Conference, Prime Minister Kevin Rudd declared:

The climate change sceptics constantly scare-monger about the possible loss of jobs through the transition to a lower carbon economy. But they constantly fail to talk about the new clean energy jobs of the future which will arise from the introduction of the Carbon Pollution Reduction Scheme, the renewable energy target and energy efficiency measures in the future.<sup>1</sup>

This enthusiasm for green jobs was echoed by the NSW Deputy Premier Carmel Tebbutt who, when announcing the establishment of the Green Skills NSW Taskforce, stated:

The global financial crisis and climate change are the twin threats to our standard of living. New South Wales' transformation to a low carbon economy with an increase in 'green collar' jobs provides a key part of the solution to both issues.<sup>2</sup>

The Coalition recently announced its own rival green-jobs plan. On 14 January 2010, Opposition leader Tony Abbott used an address to the Sydney Institute to outline Coalition plans for a standing 'army' of 15,000 green workers that could be deployed across the country.<sup>3</sup>

Those calling for an ambitious response to climate change have embraced the green-jobs narrative as a way of responding to a long history of exaggerated claims that reducing greenhouse-gas emissions can only come at the expense of large job losses. Many labour unions, seeing the potential for their constituents to gain from a green-jobs policy, have also

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<sup>1</sup> K Rudd. *50,000 new green jobs and green skills training places for a stronger greener Australian economy*, media release, 30 July 2009. Available at: [www.pm.gov.au/node/6078](http://www.pm.gov.au/node/6078)

<sup>2</sup> C Tebbutt and V Firth, *Special Green Skills Taskforce for NSW*, media release, 2 April 2009. Available at: [www.environment.nsw.gov.au/resources/MinMedia/MinMedia09040201.pdf](http://www.environment.nsw.gov.au/resources/MinMedia/MinMedia09040201.pdf)

<sup>3</sup> T Abbott, 'Address to the Sydney Institute'. 14 January 2010. Available at: <http://www.tonyabbott.com.au/Pages/Article.aspx?ID=3900>

become vocal advocates,<sup>4,5,6,7,8</sup> others, fearing that their workers may lose in a green-jobs-inspired labour-market transformation, have been quick to deride the concept, calling for a broader view of the role that all workers can play in a carbon-constrained world.<sup>9,10</sup> Faced with a surge of community support for green jobs and (temporarily) confronted with growing unemployment, governments were quick to embrace the concept, launching green-jobs summits, taskforces, inquiries, and policy initiatives.

Despite this intense level of interest in green jobs, there has been surprisingly little interest in what the term actually means. Far from mere semantics, the definition of a 'green job' is fundamentally important both to the environmental effectiveness of Australia's growing body of green-collar workers and the appropriate use of the policy levers available to government.

An undefined term, which is nevertheless embraced by the public, can be a very dangerous object. Unless the definition of green jobs is clear, and unless the case for government support for such jobs is spelled out, it is likely that:

- money will be spent on inefficient or unnecessary policies
- stakeholder advocates will misdirect their energies
- more effective policies will be overlooked.

Any sound basis for assessing the nature of a green job, and subsequent analysis of the appropriate role for government in green-job creation, should start from first principles. To that end, the aim of this paper is to explore the nature of green jobs and what public policy role this definition implies for governments seeking to promote them.

In so doing, the paper explores whether policymakers and stakeholder advocates in their collective enthusiasm for the green-jobs narrative have overlooked more effective policy options and ignored the fundamental policy weaknesses that stand to impede the evolution of a green-collar labour market in Australia.

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- <sup>4</sup> AMWU (Australian Manufacturing Workers Union), 'Green jobs and renewable industries are the way forward to secure Australia's future', *AMWU News*, 16 December 2008. Available at: <http://www.amwu.org.au/read-article/news-detail/222/Green-jobs-and-renewable-industries-are-the-way-forward-to-secure-Australia%E2%80%99s-future/>.
- <sup>5</sup> ACTU (Australian Council of Trade Unions), *Climate change is an opportunity to create one million green jobs: union report*, media release, ACTU, 19 November 2008. Available at: <http://www.actu.asn.au/Media/Mediareleases/Climatechangeisanopportunitytcreateonemilliongreenjobsunionreport.aspx>.
- <sup>6</sup> Search Foundation, 'Global Crisis Fact Sheet 3: Green Jobs', April 2009. Available at: <http://www.asumembers.org.au/downloads/Fact-sheet-3-Green-jobs.pdf>
- <sup>7</sup> ETU (Electrical Trades Union of Australia, Victorian Branch), *Time to get serious on real green jobs*, media release, 2 September 2009. Available at: [http://www.etu.asn.au/files/pdfs/solar-fit-report/etu\\_solar\\_report\\_media\\_release\\_28Aug09.pdf](http://www.etu.asn.au/files/pdfs/solar-fit-report/etu_solar_report_media_release_28Aug09.pdf).
- <sup>8</sup> LHMU (Liquor, Hospitality and Miscellaneous Union), *Renewing power in a changing climate*, LHMU, 5 July 2009. Available at: <http://www.lhmu.org.au/files/Renewing-Power-LHMU-July09.pdf>.
- <sup>9</sup> B Herbert, "'Dopey'" green jobs tag alienating workers', *ABC News*, 14 September 2009. Available at: <http://www.abc.net.au/news/stories/2009/09/14/2685003.htm>.
- <sup>10</sup> AWU (The Australian Workers' Union), 'Steel is green as the wind', AWU, 25 March 2009. Available at: <http://www.awu.net.au/248.html>.

## 2. What is a green job?

Despite a great deal of enthusiasm about green jobs, there has been surprisingly little interest in what the term actually means and so it is perhaps unsurprising that little consensus has emerged about what jobs should be considered green. Given that the exact definition of a green job will ultimately determine both the environmental effectiveness of the growing body of green-collar workers and the value received in return for significant public investment, the absence of a precise decision should be met with concern.

So what exactly is a green job? Is it a job that actively contributes to the long-term transformation of our society to a more ecologically sustainable form? Almost certainly. But should these *transformational* jobs be defined by the nature of the employer or by the function of the role? A firm that produces wind turbines, for example, is clearly contributing to the transition to a sustainable energy system but wind turbines also use steel as an input to production. Are green jobs only to be found on the employee registry of the wind-turbine company or can the category be expanded to include the workers that provide the steel?

And what of those industries that boast systemically low environmental impacts to begin with? Should *low-impact* jobs be considered green jobs? The International Labour Organization (ILO) thinks so, defining green jobs as ‘high eco-efficiency and low emissions ... [jobs that] help to protect the climate’.<sup>11</sup> This seems plausible at first glance. After all, a re-weighting of the economy towards *low-impact* sectors would reduce society’s ecological footprint. Moreover, on what basis can we say that an industry with an ecological footprint that has been reduced but remains substantial is more green than one with a consistently small footprint?

But should the small ecological footprint of a job be enough to earn itself the title of a green job? *Low-impact* jobs are likely to be in industries with low capital intensities like the services sector and while it is easy to conceptualise various green-collar services, is it meaningful to classify any job in the service sector as a green job? Probably not. To do so indiscriminately would be to ignore the impacts of the activities that the service supports, or more generally the activities that these services are supported by.

But consider a scenario where government pursues a policy of influencing the choices made by citizens in an attempt to direct income growth away from the consumption of resource-intensive goods and services into the pursuit of increased leisure time<sup>12</sup> and the consumption of low-impact goods and services. If such a policy were to be implemented to curtail business-as-usual growth in ecological impacts, it could certainly be considered a green policy.

In fact, in international climate negotiations such ‘deviation from baseline’ policies are a mainstay of the proposed developing-nation response to climate change. The remaining question is whether the low-impact jobs that cater for such redirected consumption growth

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<sup>11</sup> ILO (International Labour Organization), ‘Green Jobs: Climate Change in the World of Work’, *World of Work, the magazine of the ILO* No.60. ILO, Geneva, August 2007, p. 9. Available at: [http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms\\_083901.pdf](http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_083901.pdf)

<sup>12</sup> ‘Leisure time’ is used here in the economic sense of reducing the number of days worked.



can be automatically considered green jobs? Stated alternatively, should jobs that arise from green policies automatically qualify as green jobs? Maybe.

Is it possible to class a job that marginally reduces the impact of a resource-intensive industry as green? That is less than certain. All things considered, is it really appropriate to class people who clean up oil spills as green workers? And if not, it is doubtful that mine-remediation workers should be considered green-collar workers either, the only difference between such *remediation* jobs being that the initial damage was unintentional in the case of the oil spill and intentional in the case of the mine. On what basis should amelioration of an intentional impact be more green than amelioration of an unintended impact? Despite this quandary, the Australian Conservation Foundation (ACF) defines mine-remediation workers as 'light green-collar' workers but remains silent on the status of oil-spill workers.<sup>13</sup>

What of jobs that increase accessibility to the natural environment such as laying out signage on a bush-walking trail? Can such *natural appreciation* jobs be classed as green jobs? The South Australian Greens Senator Sarah Hanson-Young thinks so. On 3 September 2009, Senator Hanson-Young announced five projects that would together create '110 local green jobs, 15 traineeships, and 45 work experience places'. One of the five projects entailed installing 'information stations' along the River Torrens Park Trail in South Australia.<sup>14</sup>

Such *natural appreciation* jobs attract people to areas of natural significance and fulfil an important conservation role; increasing the value of these areas to society helps to protect them from alternative industrial, commercial, or residential use. Moreover, visiting these areas may engender 'environmental values' in visitors and thereby contribute to improved environmental outcomes well beyond the confines of the reserve or park. That said, increasing human access to these areas will also increase ecological degradation of the area. Can enabling human use of nature reserves be considered green if it acts to protect the area from more ecologically destructive uses and/or engenders greater environmental values in the community?

If so, people who educate others about the need to reduce their environmental impacts are also green workers. In fact, a report released by the South Australian Conservation Council (CCSA) suggests just this. The CCSA aims to 'help youth access green jobs' by facilitating 'youth involvement with environmental organisations'.<sup>15</sup> If we were to accept this definition, *environmental-education* workers would be classed as green workers, not because of the magnitude of their own direct ecological impacts, but because of their role as an input into

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<sup>13</sup> ACF (Australian Conservation Foundation), 'Green Jobs Fact Sheet', ACF, 24 September 2008, p. 1. Available at: [http://www.acfonline.org.au/uploads/res/Green\\_Jobs\\_Fact\\_Sheet\\_no\\_footnotes\\_080925\\_final.pdf](http://www.acfonline.org.au/uploads/res/Green_Jobs_Fact_Sheet_no_footnotes_080925_final.pdf)

<sup>14</sup> S Hanson-Young, *Greens launch \$3.4m local green jobs boost for SA*, media release, The Greens, 3 September 2009, p. 1. Available at: <http://sarah-hanson-young.greensmps.org.au/content/media-release/greens-launch-34m-local-green-jobs-boost-sa>

<sup>15</sup> CCSA Youth and Business Roundtable, *The green guide: opportunities for young people in the environmental movement*, CCSA and Office for Youth, Adelaide, 2009. Available at: <http://www.conservation.sa.gov.au/files/Green%20Guide%20for%20Web%20low.pdf>

the reduced environmental impacts of others. By this standard, the steel worker supplying steel for wind turbines suddenly looks like a *bona fide* green-collar worker.<sup>16</sup>

Environment Victoria defines a green job as ‘a job that helps us address the environmental challenges (that) we face’.<sup>17</sup> This definition is appealing in its simplicity. While it allows for the full range of activities that can be offered as potential examples of green jobs, our purpose here is to find the appropriate role for government in creating green jobs and to identify policies that impede their growth. This requires a more nuanced definition that specifically accounts for the full range of potential green jobs just explored; *transformational, low-impact, remediation, natural-appreciation* and *environmental-education* jobs. The following section will explore the most effective and appropriate role for governments that intend to promote some or all of these potential categories of green jobs.

It will also examine the direction of causation between green outcomes and green jobs. While it would usually be argued that if governments were to mandate the achievement of a particular green outcome, the requisite number of green jobs would inevitably follow, it appears that many of the arguments advanced in favour of green-job creation implicitly reverse this causation. That is, many green-job advocates seem to be suggesting, or perhaps hoping, that if governments employ enough green workers, this will, in and of itself, deliver the desired green outcome.

### 3. Government’s role in green-job creation

The traditional role of government in a liberal democratic society with a mixed-market economy like that of Australia’s is to:

- provide security of property and person for its citizens
- establish the rules and institutions required for the effective operation of the market
- establish the institutions required to manage fluctuations in the business cycle
- respond to various forms of market failure either through direct provision or market intervention
- redistribute income according to prevailing notions of distributive justice.

Viewed through this lens, environmental problems are the consequence of market failures like negative externalities,<sup>18</sup> imperfect information, imperfect capital markets and irrational decision-making.<sup>19</sup> In response, governments can address such market failures through regulation, information provision or the creation of a price signal such as that associated with an emissions trading scheme or a carbon tax. These measures ensure that firms and customers face the full costs of their individual production and consumption decisions—they internalise their externalities.

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<sup>16</sup> AWU, ‘Steel is green as the wind’.

<sup>17</sup> Environment Victoria, ‘Green jobs: seizing the opportunities’, 2009. Available at: <http://www.environmentvictoria.org.au/green-jobs>.

<sup>18</sup> A negative externality is a cost imposed on a third party who is not party to, and does not directly gain from, another’s consumption or production decision.

<sup>19</sup> Also known as ‘bounded rationality’.

Given that most of the recent discussion about green jobs centres around climate change, this paper will focus on those jobs that deliver on greenhouse-gas reductions. The primary market failure driving anthropogenic climate change consists of negative externalities, greenhouse-gas emissions, generated by individual production and consumption decisions.

The Australian Government formerly proposed to respond to this market failure by pricing carbon dioxide equivalent (CO<sub>2</sub>-e) through the Carbon Pollution Reduction Scheme (CPRS). Alternatively, the Australian Greens proposed that carbon be priced through an *interim* carbon tax while outstanding issues with the CPRS were resolved and the federal Opposition has proposed an alternative form of pricing through their own iteration of a 'baseline and credit' carbon-pricing scheme,<sup>20</sup> despite their stated preference for 'direct measures'.

But when government has responded to this underlying market failure either through a carbon price or, alternatively, through direct measures like banning coal-fired power stations, what role would remain for government in relation to green-job creation? If the initial policy intervention is effective in driving investment in renewable energy or energy efficiency, surely the market would deliver all the green jobs required to achieve the environmental task? What secondary-market failures lie in the way of green-job creation?

A significant form of market failure arises when decision-makers lack complete information and/or when individuals do not invest in education or training because the benefits of that training accrue to society as a whole rather than to themselves personally. Under such circumstances, there is a potential role for government to invest in the provision of the information or education necessary to ensure that good decisions can be made. Failure to embrace this legitimate role may well result in situations such as a skills shortage, for example, where a rapid increase in demand for skilled workers like wind-turbine engineers is not able to be met. However, assuming that this secondary market failure is also addressed, what role remains for government?

If the CPRS is sufficiently ambitious in its targets and well-designed in its implementation, its impact on polluters will generate all the green jobs required to deliver on its environmental objectives. That is, if the CPRS resulted in a significant shift away from coal-fired power stations and towards renewable energy, it would be the scheme itself that created green jobs, not any specific green-jobs policy. However, if the targets and underlying design of the CPRS are such that it will not drive significant emissions reductions from Australian coal-fired power stations until 2033, as the Treasury's modelling predicts,<sup>21</sup> and most of the planned absolute emissions abatement is exported to developing nations,<sup>22</sup> there would be little reason to believe, irrespective of government claims, that the CPRS will be a significant driver of green-job creation in Australia.<sup>23</sup>

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<sup>20</sup> T Abbott and G Hunt, *Direct action on the environment and climate change*, joint press release, 2 February 2010. Available at: <http://www.tonyabbott.com.au/Pages/Article.aspx?ID=3929>

<sup>21</sup> R Denniss, *Harder to do than to say? The failure of the CPRS to reduce emissions from coal-fired power stations*, Policy Brief No.5, The Australia Institute, Canberra. 2009. Available at: <https://www.tai.org.au/index.php?q=node%2F19&act=display&type=1&pubid=686>

<sup>22</sup> To be comprehensively explored in Section 4.0 of this paper.

<sup>23</sup> Rudd, *50,000 new green jobs*.

Furthermore, given that the CPRS is designed to deliver on a fixed emissions-reduction target,<sup>24</sup> the recruitment of even an ‘army’ of green workers will not be successful in driving emissions reductions beyond levels mandated by the cap.<sup>25</sup> It is the emissions-reduction target that drives green-job creation, not the other way around. Under such circumstances, a green-jobs policy cannot be seen as a meaningful substitute for an effective greenhouse-abatement mechanism. Indeed, in the Australian context, green-jobs policies are at best likely to confuse the line of causation between green jobs and green outcomes, and at worst represent an attempt to give the impression of meaningful movement when no such movement is in train.

## Jobs vs outcomes

It is useful to consider the same rationale from the perspective of an alternative public-policy initiative.

Imagine that the government wanted to create dedicated road-construction jobs, considering it socially beneficial for the road network to be upgraded and expanded. The most efficient and effective way to achieve this result would be, presumably, to announce and fund an ambitious 10-year road-building plan, which in turn would lead to the employment of a wide range of road-building workers with the appropriate range of skills.

If skills shortages became apparent, rising wages and apparent job security would likely lead potential employees to seek the necessary training required to secure the jobs in question. Government policy might be able to expedite the development of such training programs to the benefit of both the workers, their employers and, ultimately, to those awaiting the construction of the road.

Now imagine that instead of committing to an ambitious 10-year road-building plan, the government committed to a road-building jobs package, which provided incentives for firms to recruit and train road builders and also encouraged the Vocational Education and Training (VET) sector to offer new road-building courses.

While the government is arguably investing in a ‘public good’ in the form of training, the presence of such an investment is in no way a substitute for the existence of the ambitious road-building program. On the contrary, it could be argued that in the absence of such a program, the investment in training is actually wasted.

In the same way that simply training road workers will not lead to the construction of new roads, neither will recruiting even an army of road workers unless of course they are given a road-building task to complete. Similarly, direct market interventions to create or train an

<sup>24</sup> R Denniss, *Fixing the floor in the ETS*, Research Paper No.59, The Australia Institute, Canberra. 2008. Available at: <https://www.tai.org.au/index.php?q=node%2F19&act=display&type=1&pageID=2&pubid=531>

<sup>25</sup> Voluntary GreenPower purchases by businesses and households are the one exception to this rule. All other emissions-reduction activities will simply contribute to the fixed abatement task, the only variable being the prevailing price of emissions permits.

army of green workers, without giving them an environmental task to pursue, is a highly questionable use of resources.

In this regard, the announcement on 30 July 2009 that the government would spend \$97 million to create 50,000 green jobs should have met with more concern than it did. Ironically, only the subsequent admission that it was more a training program than a jobs program caused embarrassment to the government;<sup>26,27</sup> but it was the initial announcement, rather than the latter qualification, that should have raised more questions.

Government does have a legitimate role in direct job creation in those areas for which it retains responsibility, for example wherever market failures and distributive justice concerns preclude socially optimal provision of goods and services by the market. Common examples include infrastructure with natural monopoly properties, and social services that not only exhibit public good and positive externality properties but would also present distributive justice concerns were they to be provided exclusively by the market.

Of the five classes of jobs that may well pass as green jobs, those relevant to direct government job creation could include:

- *Transformational* green jobs in government-owned utilities
- *Low-footprint* jobs in government services (for example health and education)
- *Natural-appreciation* jobs in government-managed national parks and nature reserves
- *Environmental-education* workers in government education and training institutions
- *Remediation* workers on government-managed lands and operations.

Table 1 details private- and public-sector approaches to creating and managing green jobs.

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<sup>26</sup> See for example, D Shanahan and E Hannan, 'Mark Arbib puts PM Kevin Rudd's 50,000 green jobs down to experience', *The Australian*, 31 July 2009.

<sup>27</sup> See also E Rogers, 'Rudd plays down Arbib's job stumble', *ABC News*, 31 July 2009. Available at: <http://www.abc.net.au/news/stories/2009/07/31/2641959.htm>

Table 1: The role for government by green-job type

Green-job type	Private sector	Public sector
Transformational	<ul style="list-style-type: none"> <li>• Correct market failure by restricting pollution, pricing negative externalities, or banning ecologically destructive technologies</li> <li>• Correct secondary market failures</li> <li>• Subsidisation of relevant education and training</li> </ul>	<ul style="list-style-type: none"> <li>• Invest in the transformation of government-owned infrastructure.</li> <li>• Direct job creation: specialists capable of monitoring, investigating, and reducing environmental impacts of government assets</li> </ul>
Low impact	<ul style="list-style-type: none"> <li>• Correct market failure by restricting pollution and pricing negative externalities</li> <li>• Correct secondary market failures</li> <li>• Subsidisation of relevant education and training</li> </ul>	<ul style="list-style-type: none"> <li>• Direct job creation in education, community services, and health</li> </ul>
Remediation	<ul style="list-style-type: none"> <li>• Correct market failure by restricting pollution, pricing negative externalities, or mandating land remediation.</li> <li>• Correct secondary market failures</li> <li>• Subsidisation of relevant education and training</li> </ul>	<ul style="list-style-type: none"> <li>• Invest in the remediation of land and ecosystems held and/or managed by government</li> </ul>
Natural appreciation	<ul style="list-style-type: none"> <li>• Correct market failure by restricting pollution and pricing negative externalities</li> <li>• Correct secondary market failures</li> <li>• Subsidisation of relevant education and training</li> </ul>	<ul style="list-style-type: none"> <li>• Direct job creation in natural parks and wildlife areas owned and/or managed by government</li> </ul>
Educational	<ul style="list-style-type: none"> <li>• Correct market failure by restricting pollution and pricing negative externalities</li> <li>• Correct secondary market failures</li> <li>• Subsidisation of relevant education and training</li> </ul>	<ul style="list-style-type: none"> <li>• Direction job creation and skills provision for education professionals</li> </ul>

It is important to note, however, that in the context of a cap on emissions such as that proposed by the CPRS, these distinctions would be largely redundant. Given that even a large number of green jobs would fail to achieve any emissions reductions beyond that dictated by the cap, the active pursuit of such jobs would do little more than change the level of demand for emissions permits. Under a cap-and-trade system, green-jobs policies change the cost, not the quantum, of emissions reductions. This problem would not arise if, instead of an inadequate emissions target such as that suggested as part of the CPRS, the government were to impose a carbon tax.

#### 4. Exporting green jobs: international offsetting in the CPRS

Despite the apparent enthusiasm for green jobs among sections of the environment and labour movements, there was virtually no concern expressed about the way in which the design features of the CPRS would have worked to drive green-job creation. Indeed, many of the environment and labour groups that seem most enthusiastic about green-job creation were also been the most enthusiastic supporters of the proposed CPRS.<sup>28,29,30,31,32,33</sup>

One explanation for this disparity is, perhaps, that the implications of the linking provisions in the CPRS appeared to be so poorly understood. Put simply, under the proposed CPRS companies were going to be permitted to purchase an unlimited number of Kyoto-compliant offsets<sup>34</sup> from other countries, which would have allowed their domestic emissions to continue to rise indefinitely.

Indeed, as Figure 1 shows, the Treasury's own modelling predicted that under a five-per-cent reduction in Australia's emissions by 2020,<sup>35</sup> the CPRS would have had to rely on international offset imports to achieve absolute cuts in emissions. Domestic emissions would have remained largely constant in the period out to 2020. Put simply, if the CPRS had been passed there would have been virtually no reduction in Australia's domestic emissions and the green jobs associated with emissions abatement would have been created overseas.

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<sup>28</sup> Australian Council of Trade Unions, *CPRS must now be passed to create jobs and a stronger economy*, media release, 25 November 2009.

<sup>29</sup> Southern Cross Climate Coalition, *Climate change action means thousands of new jobs*, media release, 4 November 2009. Available at: [http://www.climateinstitute.org.au/index.php?option=com\\_content&view=article&id=554:climate-change-action-means-thousands-of-new-jobs&catid=39:media-releases&Itemid=36](http://www.climateinstitute.org.au/index.php?option=com_content&view=article&id=554:climate-change-action-means-thousands-of-new-jobs&catid=39:media-releases&Itemid=36).

<sup>30</sup> The Climate Institute, *Parliament stumbles as world moves on climate change*, media release, 2 December 2009. Available at: [http://www.climateinstitute.org.au/index.php?option=com\\_content&view=category&layout=blog&id=39&Itemid=36&limitstart=10](http://www.climateinstitute.org.au/index.php?option=com_content&view=category&layout=blog&id=39&Itemid=36&limitstart=10).

<sup>31</sup> The Climate Institute, *How to make the CPRS a springboard not a gangplank*, media release, 25 November 2009. Available at: [http://www.climateinstitute.org.au/index.php?option=com\\_content&view=article&id=573:now-to-make-the-cprs-a-springboard-not-a-gangplank&catid=39:media-releases&Itemid=36](http://www.climateinstitute.org.au/index.php?option=com_content&view=article&id=573:now-to-make-the-cprs-a-springboard-not-a-gangplank&catid=39:media-releases&Itemid=36).

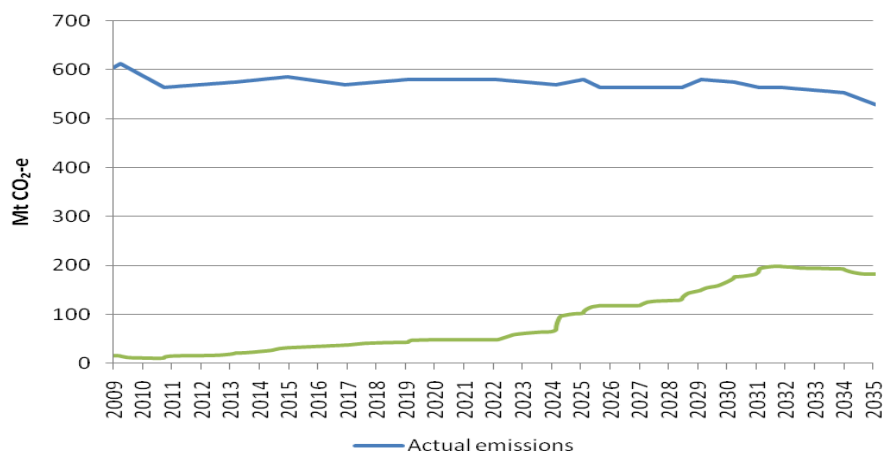
<sup>32</sup> WWF, *Australia missing out on clean energy boom*, media release, 11 December 2009. Available at: <http://www.wwf.org.au/news/australia-missing-out-on-clean-energy-boom/>.

<sup>33</sup> WWF, *Double dissolution only option after CPRS failure*, media release, 3 December 2009. Available at: <http://www.wwf.org.au/news/double-dissolution-only-option-after-cprs-failure/>.

<sup>34</sup> Kyoto-compliant offsets include those generated as part of the Clean Development Mechanism (CDM) and Joint Implementation (JI) projects by signatory nations.

<sup>35</sup> From emissions levels in 2000.

Figure 1: Actual emissions and projected imports of offset credits (CPRS-5 scenario)



Source: Commonwealth Treasury estimates from MMRF<sup>36</sup>

The '100-per-cent linking provision' of the proposed CPRS, the ability to import an unlimited number of offset credits, constituted a uniquely liberal approach to international offsetting and contrasted with the more cautious line taken in the European Union<sup>37</sup> and proposed in the US. The cautious approach found overseas is informed by the myriad of governance challenges that invariably arise when dealing with relatively intangible<sup>38</sup> commodities from distant countries with under-developed institutions.

The relative wisdom of such caution was affirmed by a 2008 review of all Clean Development Mechanism (CDM) projects in which Victor and Wara concluded that 'between one and two-thirds of all ... CDM offsets do not represent actual emission cuts'.<sup>39</sup> Claiming that linking will export green jobs may therefore be a mischaracterisation. The term 'export' suggests that the linking provisions will, in fact, lead to genuine mitigation activity in host nations; thus it may be more accurate to speak of *forgone* green jobs.

Table 2 below reflects the Treasury data from Figure 1, which confirm that Australia's domestic emissions would have remained largely static over the coming decade with the majority of emissions cuts achieved by the purchase of abatement from developing nations. In doing so, the data reveal that the now-deferred CPRS would have acted more as a mechanism for the importation of international offsets than as a driver of domestic abatement.

<sup>36</sup> Australian Treasury, *Australia's Low Pollution Future*.

<sup>37</sup> The more cautious approach of the Europeans places quantitative limits on the number of offsets that can be imported.

<sup>38</sup> The underlying product in a carbon offset is a unit of forgone emissions. In order to estimate the level of emissions abatement generated by an underlying carbon-offset project, a largely hypothetical baseline is established. Any reduction in emissions below this hypothetical baseline is then sold as a carbon offset.

<sup>39</sup> M W Wara and D G Victor, *A realistic policy on international carbon offsets*, Working Paper #74, Program on Energy and Sustainable Development. Stanford University, 2008. Available at: [http://iis-db.stanford.edu/pubs/22157/WP74\\_final\\_final.pdf](http://iis-db.stanford.edu/pubs/22157/WP74_final_final.pdf)



The failure of the CPRS to drive the transformation of Australia into a low-carbon economy, and its subsequent inability to create green jobs, is perhaps most starkly illustrated by the fact that it would not have led to the closure of a single coal-fired power station until 2033.<sup>40</sup> Further, it would have permanently exempted agricultural and deforestation emissions, and in the early years of the scheme at least, effectively excluded transport by providing cent-for-cent fuel-excite cuts for carbon-price impacts on fuel. These sectors collectively account for over 80 per cent of Australian emissions.<sup>41</sup>

Table 2: Permit imports (Mt CO<sub>2</sub>-e) under CPRS5

Year	Actual emissions	Permit imports
2010	589.1	3.9
2011	574.8	7.8
2012	578.1	12.0
2013	587.7	15.9
2014	593.5	20.1
2015	584.2	13.5
2016	574.4	24.0
2017	574.4	31.5
2018	573.2	39.0
2019	582.0	48.8
2020	585.1	46.0

Source: Australian Treasury estimates from MMRF

Confronted with these design features, it is understandable that some have asked aloud, 'What will (the) CPRS actually do?'<sup>42</sup> To this question, Figure 1 offers a relatively straightforward response: the proposed CPRS would have operated principally as a vehicle for purchasing international offset imports rather than as a driver of domestic greenhouse-gas abatement. This fact contrasts starkly with the green-jobs narrative that the most vocal proponents of the CPRS attempted to build in the public mind. It should be clear that the green-jobs benefit of the CPRS would have accrued largely to foreign nations.

The question is how many green jobs would have been exported as a result of the CPRS? Given that almost 70 per cent of Australian greenhouse-gas emissions are associated with energy use,<sup>43</sup> the most obvious area in which to seek this answer is the clean-energy sector. The following section quantifies how many clean-energy jobs would have been precluded as a result of the heavy reliance of the CPRS on permit imports.

<sup>40</sup> Denniss, *Harder to do than to say*.

<sup>41</sup> Stationary Energy, Transport, and Fugitive Emissions, 'Australian Greenhouse Emissions Information System (AGEIS)', Department of Climate Change, Commonwealth of Australia.

<sup>42</sup> R Denniss, 'What will Wong's CPRS actually do?', opinion piece, *Crikey*, 21 October 2009. Available at <http://www.crikey.com.au/2009/10/21/excuse-me-minister-but-what-will-your-cprs-actually-do/>.

<sup>43</sup> Denniss, 'What will Wong's CPRS actually do?'

#### 4.1 How to estimate the number of green jobs lost to international offsets

By equating the likely level of imported emission offsets to the level of domestic renewable-energy generation required to deliver the same amount of abatement, it is possible to calculate the number of clean-energy jobs that Australia would have forgone as a result of its proposed reliance on international offsets. This analysis only considers the period from which the CPRS was initially proposed to begin, 2011, through to the year 2020.

The first step towards estimating the number of clean-energy jobs that would have been lost to international offsets is first to determine the emissions intensity of the Australian electricity supply,<sup>44</sup> and second to adjust it to reflect the level of renewable-energy generation currently in the electricity mix.<sup>45</sup> It is then possible to calculate the number of emissions-intensive megawatt hours (MWh) that would need to be displaced to generate the same level of emission abatement that the CPRS proposed to achieve through the purchase of offset credits from developing nations.

After determining the number of clean-energy MWhs required to match the offset-abatement task, it is then possible to calculate the number of renewable-energy installations that would be required to generate the equivalent amount of renewable energy. A significant determinant of this figure will be the capacity factors of the renewable-energy technologies available to deliver on the required abatement task within Australia.

Capacity factors measure how much of the theoretical maximum capacity of a given installation is actually delivered over any given year. For example, if a wind farm has a 25-per-cent capacity factor it would, in any given year, generate 25 per cent of the total capacity that would be available if the turbines were turning at maximum capacity 24 hours a day, seven days a week, and 365 days a year.

The larger the assumed capacity factor, the smaller the level of installed renewable capacity required to deliver on Australia's emissions-reduction goals. Conversely, the lower the capacity factor, the greater will be the level of clean-energy capacity required to deliver on emissions reductions through domestic abatement.

The sensitivity of the amount of installed renewable-energy capacity to chosen capacity factor, and the variation in capacity factors that a diverse range of renewable-energy resources entails, led to consideration of three scenarios: high-capacity factors, medium-capacity factors, and low-capacity factors. These capacity factors relate to five clean-energy technologies: onshore wind, wave, geothermal, solar thermal and biomass.

The capacity-factor scenarios shown in Table 3 below are based on commonly quoted capacity-factor ranges for each of the technologies.

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<sup>44</sup> CEC (Clean Energy Council), *Clean Energy Australia 2009*, Clean Energy Council, 2009.

<sup>45</sup> Department of Climate Change, *National Greenhouse Accounts (NGA) Factors*, Commonwealth of Australia, 2009.

Table 3: Capacity-factor scenarios

Technology	High-capacity factor scenario	Medium-capacity factor scenario	Low-capacity factor scenario
<b>Onshore wind</b>	40%	30%	20%
<b>Wave</b>	90%	60%	30%
<b>Geothermal</b>	90%	80%	70%
<b>Solar thermal</b>	35%	30%	25%
<b>Biomass</b>	90%	85%	80%

By taking the predicted offset-abatement task and converting it to the number of MWhs of domestic clean-energy generation required to achieve Australia's emissions-reduction target, and assuming the above set of capacity factors, it is possible to calculate the level of renewable-energy capacity that would need to be installed to achieve Australia's emissions reduction target of five per cent below 2000 levels by 2020. When this figure has been reached, the number of clean-energy jobs lost to international linking can be calculated by multiplying the required clean-energy capacity figure by the respective labour-intensity figures of the various clean-energy technologies.

#### 4.2 The number of clean-energy jobs lost to international offset imports

Table 4 below gives the labour intensities of the five clean-energy technologies considered in this paper: onshore wind, wave, geothermal, solar thermal and biomass. The figures are divided between construction, manufacturing and installation jobs, operation and maintenance jobs, and jobs associated with fuel provision.

The table shows that in the case of wind power, every megawatt (MW) of installed generation capacity will generate 15.4 construction, manufacturing and installation jobs, 0.4 operation and maintenance jobs and zero fuel-provision jobs. The latter figure should be unsurprising given that the fuel for wind power is wind, a freely available and localised natural resource.<sup>46</sup> This is true for all but one of the five clean-energy technologies considered. Biomass power requires that organic material (biomass) be harvested, gathered, and transported to the power generation site.

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<sup>46</sup> Given the 'free' nature of wind, an interesting future exercise would be to calculate the economic rents that are derived from utilisation of resources like wind. At this stage, discussion of resource rents remains almost exclusively focused on mineral resources.

Table 4: Labour-intensity factors by clean-energy technology (2010)<sup>47</sup>

Technology	Construction, manufacturing and installation jobs (person years/MW)	Operation and maintenance jobs (jobs/MW)	Fuel jobs (jobs/GWh)
<b>Onshore wind</b>	15.4	0.4	-
<b>Biomass</b>	4.3	3.1	0.22
<b>Geothermal</b>	6.4	0.74	-
<b>Ocean</b>	10	0.32	-
<b>Solar thermal</b>	10	0.3	-

Source: Greenpeace International and ERTEC<sup>48</sup>

Providing the capacity factors of the renewable-energy technologies were consistent with the low-capacity factor scenario, and the chosen abatement task was evenly split between the five technologies, the results in tables 5, 6, and 7 show that relying on international offsets to deliver the five per cent reduction in 2000 CO<sub>2</sub>-e emissions by 2020 would mean the loss of:

- 152,945 person years of construction, manufacturing and installation employment between 2010 and 2020
- 7,480 ongoing jobs in operation and maintenance
- 234 ongoing jobs in fuel provision by 2020.

Under the medium-capacity factor scenario, the number of forgone jobs in the clean-energy sector falls to:

- 108,142 person years of construction, manufacturing and installation employment between 2010 and 2020
- 6,137 ongoing operation and maintenance jobs
- 220 ongoing jobs in fuel provision.

Finally, under the high-capacity factor scenario, jobs forgone as a result of the linking provisions of the CPRS would be:

- 86,037 person years of construction, manufacturing and installation employment
- 5,382 ongoing operation and maintenance jobs
- 208 ongoing fuel-provision jobs.

<sup>47</sup> Annual diminishing labour-intensity rates were applied to these 2010 intensity factors for job calculations in the years out to 2020. The chosen annual diminishing labour-intensity rates were taken from Greenpeace International and ERTEC (European Renewable Energy Council), *Working for the Climate. Renewable Energy & the Green Job [R]evolution*, by J Rutovitz, A Atherton, R Short and S Teske, Greenpeace International, Amsterdam, 2009. These included 1.4 per cent for onshore wind, one per cent for biomass, 2.3 per cent for geothermal, 7.8 per cent for wave, and none for solar thermal.

<sup>48</sup> Greenpeace International and ERTEC, *Working for the Climate*, p. 15.

It is interesting to note that the largest number of clean-energy jobs forgone as a result of unlimited offsetting is in construction, manufacturing and installation and that practically half of these jobs are in wind energy. Given that wind is the most employment-intensive form of clean energy, and that it is likely to account for the largest proportion of the market, our assumption that each of the five technologies will make an equal contribution to the required increase in renewable-energy capacity suggests that these estimates are conservative.

Table 5: Aggregate construction, manufacturing and installation jobs, 2010–20 (person years)

	Low-capacity factors	Medium-capacity factors	High-capacity factors
<b>Onshore wind</b>	74,506	49,671	37,253
<b>Biomass</b>	5,318	5,005	4,727
<b>Geothermal</b>	8,418	7,365	6,547
<b>Ocean</b>	22,856	11,428	7,619
<b>Solar thermal</b>	41,847	34,672	29,891
<b>Total</b>	152,945	108,142	86,037

Source: TAI calculations based on Greenpeace International and ERTEC;<sup>49</sup> Department of Climate Change;<sup>50</sup> CEC.<sup>51</sup>

Table 6: Operation and maintenance jobs, 2010–2020

	Low-capacity factors	Medium-capacity factors	High-capacity factors
<b>Onshore wind</b>	1661	1107	830
<b>Biomass</b>	3294	3100	2928
<b>Geothermal</b>	833	729	648
<b>Ocean</b>	611	306	204
<b>Solar thermal</b>	1082	896	773
<b>Total</b>	7480	6137	5382

Source: TAI Calculations based on Greenpeace International and ERTEC; Department of Climate Change and CEC.

Table 7: Renewable fuel supply jobs, 2010–2020 (biomass)

<b>Low Capacity Factors</b>	234
<b>Medium Capacity Factors</b>	220
<b>High Capacity Factors</b>	208

Source: TAI Calculations based on Greenpeace International and ERTEC; Department of Climate Change and CEC.<sup>52</sup>

<sup>49</sup> Greenpeace International and ERTEC, *Working for the Climate*.

<sup>50</sup> Department of Climate Change, *National Greenhouse Accounts (NGA) Factors*.

<sup>51</sup> CEC, *Clean Energy Australia 2009*.

The implications of unlimited offsetting for employment numbers in Australia's clean-energy sector are inevitably premised on assumptions that can be plausibly altered. However, where assumptions have been made, they have been made both transparently and conservatively. Principal amongst conservative assumptions is that wind energy will not provide a greater amount of clean energy than will each of the other four technologies.

It should also be noted that the calculations were made on the basis of a relatively modest five-per-cent cut in 2000 emissions by 2020; the number of forgone clean-energy jobs will be much higher in the case of a 25-per-cent cut in emissions. Moreover, it is only the period out to 2020 that has been considered. Given that permit imports are predicted to rise after 2020, the number of domestic clean-energy jobs forgone as a result of unlimited offsetting will continue to rise in the post-2020 period.

Irrespective of the exact numbers, what should be clear is that the CPRS relied principally on permit imports to achieve its emissions-reduction goals and would therefore have exported the clean-energy jobs required to deliver this abatement domestically. This straightforward conclusion sits awkwardly with the public positioning of government and elements of the environment and labour movements, all of which urged public support for the CPRS, and later commiserated its deferral, on the basis of the green jobs it would have generated.

## 5. Where are the low-impact jobs?

Section 2 of this paper considered the case for categorising low-impact jobs as green jobs and found that the strongest case for inclusion existed where baseline income growth was directed into lower-impact goods and services than would otherwise have been the case. Conceptually, this could be achieved through preference-formation strategies by government or by direct government expenditure itself. This section explains where such low-impact jobs can be found in Australia and does so with a sole focus on greenhouse-gas emissions; other environmental impacts have not been considered.

The constituent sectors of the Australian economy vary widely in terms of their emissions intensity and labour intensity. Table 8 compares both the energy and labour intensity of major sectors within the Australian economy by showing how much energy is used and how many jobs are created for every million dollars spent on the final product of the respective sectors. The emissions intensity of the Australian energy supply allows energy intensity to be used as a proxy for the carbon intensity of the sectors.

Table 8 covers both the private and public sectors. Within the private sector, the analysis considers the agricultural, mining, manufacturing, utilities, construction, wholesale, retail and other service sectors. Public-sector categories include government administration, education, health and community services. The figures are averages of the range of

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<sup>52</sup> It is important to note that these results consider only the employment impacts of 100-per-cent linking for a subset of the clean-energy sector. A broader analysis of the economy-wide employment implications of 100-per-cent linking would need to be calculated using multi-sector Computable General Equilibrium (CGE) models. It should also be apparent that the exact capacity factors of the portfolio of renewable assets deployed in Australia will not strictly accord with the finite sets of capacity factors presented in the three scenarios of this paper. These capacity factors are indicative and results based on them should also be considered indicative.

activities that fall within each of the 12 sectors, and the data are drawn from the input-output tables provided by the Australian Bureau of Statistics (ABS) for the financial year 2004–05.

The table differentiates between direct impacts and indirect impacts. In the case of labour intensity, direct employment impact refers to the number of jobs created within a particular sector for every million dollars of expenditure on the final product of that sector. Indirect impacts include the employment generated throughout the sector's supply chain as a result of each million dollars spent on the final product of the sector.

Consider, for example, the case of mining. The first column shows that 1.4 mining jobs are created for every million dollars spent on mining output—these are jobs created in the industry itself. The second column gives the total employment impact of 4.7 jobs for every million dollars of expenditure and includes the 1.4 direct jobs plus the 3.3 jobs that are created in industries that supply the mining industry. This would include, for example, jobs generated in the business services, electricity, manufacturing, and wholesale trade sectors.

The same logic applies to the estimate of energy intensity for the various sectors. The direct energy figure indicates the share of expenditure associated with electricity, gas, petroleum and coal. Considering again the case of mining, the figure of 6.3 in Column 3 indicates that the direct energy inputs of mining operations are equal to 6.3 per cent of total sales; that is, for every million dollars of sales, \$63,000 is spent on energy use. Column 4 shows that this figure increases to 15.7 per cent per cent (\$157,000) when the energy use in the supply chain of mining is considered.

Table 8: Energy and labour intensity for the Australian economy, by sector

	Direct employment per \$million in spending (direct labour input)	Total employment per \$million in spending (total labour input)	Electricity, gas, petroleum and coal. Direct inputs as a share of output by value, %	Electricity, gas, petroleum and coal. Direct and indirect inputs as a share of output by value, %
<b>Agriculture</b>	6.7	11.1	3.6	5.8
<b>Mining (excl. coal, oil and gas)</b>	1.4	4.7	6.3	15.7
<b>Manufacturing</b>	3.2	9.8	2.7	10.8
<b>Electricity, gas and water</b>	1.8	5.1	N/A	N/A
<b>Construction</b>	4.1	11.2	1.4	8.8
<b>Wholesale</b>	4.0	9.3	7.1	13.8
<b>Retail</b>	10.2	18.6	1.6	6.8
<b>Other services</b>	4.5	9.4	2.2	7.4
<b>Government administration</b>	7.5	11.9	0.9	4.7
<b>Education</b>	11.2	13.4	1.5	3.9
<b>Health services</b>	10.1	12.0	0.9	3.3
<b>Community services</b>	18.8	21.2	0.4	0.7
<b>Total Australian industry</b>	<b>4.9</b>	<b>9.2</b>	<b>3.8</b>	<b>12.0</b>

Source: TAI calculations based on data from ABS.<sup>53,54</sup>

The table shows that for the Australian economy as a whole, every additional million dollars spent for either consumption or investment purposes creates 9.2 jobs and leads to a \$120,000 increase in spending on energy. Of the sectors for which data are readily available, the most energy-intensive industry is mining. It is no coincidence that the mining industry also exhibits the lowest labour intensity. The high energy intensity and low labour intensity of mining results from a single factor: high capital intensity. Conversely, the highest labour intensities and lowest energy intensities are to be found in areas for which government holds direct responsibility—health, education and community services.

It is interesting to reflect on the implications of this data for the green-jobs debate in Australia. Considering that government's most legitimate role in direct job creation is in those areas over which it retains responsibility and that these sectors offer the lowest available

<sup>53</sup> ABS (Australian Bureau of Statistics), *Australian National Accounts: Input-Output Tables—Electronic Publication 2004–05*, Cat No 5209.0.55.001, Canberra, 18 November 2008. Available at: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/2CAAA988DEF27248CA2576470014EBF9?opendocument>.

<sup>54</sup> Note that community services could not be estimated precisely for technical reasons. Community services are not an input into any industry. In the input-output tables a row of zeros appears. To obtain the direct and indirect input coefficients, a matrix with a row of zeros (or column) will not give an answer. The equivalent in non-matrix algebra is dividing by zero.



energy intensities, it becomes relevant to ask whether the green-jobs focus of government has been at least partially misplaced.

If low-impact jobs are classed as a legitimate category of green jobs, the conclusion is, at least in part, inescapable. However, it should be immediately apparent that such a strategy would not be capable of reducing society's ecological impacts in absolute terms; everyone cannot be employed in health, education, and community services. However, in the context of year-on-year increases in national income, such a strategy would curtail business-as-usual growth in aggregate impacts.

In the context of a cap on emissions however, these demand-side reductions in energy use would not result in any additional greenhouse abatement other than that dictated by the cap. The active promotion of low-impact jobs would simply reduce the market price for emissions permits. Whether this would generate reductions in the aggregate cost of climate policy would depend on the value of other activities forgone due to the promotion of low-impact sectors.

However, this would not be the case where the emissions-reduction task was not established and fixed by the chosen climate-policy mechanism. Active promotion of low-impact sectors would generate additional contributions to Australia's emission reductions in the presence of a carbon tax or a policy of direct regulation of emissions sources. Whether such a low-impact approach is indeed desirable depends on whether it would represent the most effective use of Australian resources.

## 6. Conclusion

Despite the considerable enthusiasm in recent years for green jobs, there has been surprisingly little interest in what the concept actually means or how governments could best undertake the generation of such jobs. This paper has sought to fill this gap by exploring how the term 'green job' might be defined and the implications of the definition for public policy. Those advocating for green jobs need to be aware of the kinds of green jobs they would like to see and equally conscious of the most effective role that government can play in their creation. The paper has also sought to identify those policies that stand in the way of green-job creation in Australia.

Within the private sector, the government's role in green-job creation should be limited to addressing market failures through effective environmental policy and subsidising green-skills education and training. Direct intervention to create green jobs in the private sector is likely to be of doubtful environmental value and may represent little more than recognition by the government of its own failure to implement meaningful environmental policy. Green jobs are the result of, not substitutes for, effective environmental policy.

Where governments implement policy ostensibly to address market failures, the precise details of these policies should be considered carefully. Those supporting the proposed CPRS on the basis of the green jobs it was supposedly to have generated would have been disappointed to discover that it planned to export the majority of its abatement task to international competitors. Offset imports into Australia will ensure that any green-jobs benefit resulting from the CPRS would have accrued to foreign countries.

A middle-of-the-road estimate places the number of clean-energy jobs lost to offset imports between 2010 and 2020 at 108,142 person years of employment in construction,

manufacture, and installation, 6,137 ongoing jobs in operation and maintenance and 220 ongoing jobs in fuel provision by 2020. It should be noted that these figures relate to the low emissions cut of five per cent of 2000 emissions by 2020 to which the Rudd Labor Government committed itself. Moving to a 25-per-cent cut would have carried an even greater cost for Australian clean-energy jobs.

The government's only legitimate role in direct job creation is in those areas where market failure and distributive justice concerns prevent the transfer of services to the private sector. Interestingly, it is public-sector roles like education, health and community services that exhibit the lowest energy intensities of the 12 sectors considered in this paper, a function of the low capital intensities that also underpin the labour intensity of the sectors.

While increasing public-sector employment will not reduce society's ecological impacts in absolute terms, a strategy of directing year-on-year income growth into increased health, education and social services could curtail business-as-usual growth in aggregate impacts. When considered alongside the social and economic benefits of properly administered and efficiently operated health, education and community services, the redirection of greater resources into these sectors may well be justified on their own terms, irrespective of what fashionable term is chosen to apply to them.

While much has been made of the potential green-job creation associated with installing ceiling insulation and building wind turbines, it is necessary to consider that, although important, the creation of these 'transformational' green jobs are not evidence of the development of a low-carbon economy. Rather, such jobs represent the transformation of the way energy is created and used, not the uses to which that energy is applied.

A low-carbon economy is not an economy in which large numbers of people are employed installing insulation or building wind turbines; it is an economy in which the dominant production and consumption activities require much less energy. 'Low-impact' sectors are defined as those that require low-energy use per job created. An economy that experiences rapid growth in low-impact sectors such as health, education and community services will have a much smaller carbon footprint than an economy that experiences rapidly growing manufacturing and mining industries. The re-emergence of the early 20<sup>th</sup>-century trend towards consuming productivity growth in the form of leisure rather than in the form of material consumption alone would signal the emergence of a genuine trend towards a low-carbon economy.

Significant investment in new energy technologies needs to be made, and many jobs will in turn be created, in the quest to reduce the carbon intensity of Australia's energy system. However, the ultimate goal of such activity must remain clear—the achievement of lower levels of global emissions. Green jobs will inevitably flow from the pursuit of such a goal, but lower emissions will not inevitably flow from the pursuit of green jobs.

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