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# **Hung out to dry**

**Federal neglect of renewable energy research and development in Australia**

**A report by Greenpeace Australia Pacific  
September 2007**

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## **Federal Neglect of renewable energy research and development in Australia**

### **Executive Summary**

The scientific evidence is in: climate change is under way - and is being caused by human interference, specifically the burning of fossil fuels like oil, coal and gas. In response, Governments across the globe are shifting policy gears, focussing on how they can encourage their renewable energy industries so as to decrease their reliance on dirty energy sources.

But not so in Australia. This report, released on the eve of the APEC Leaders meeting in Sydney, details how the Australian Government has gone in the opposite direction. In addition to failing to support renewable energy industries with an adequate target the Federal Government has systematically cut funding to renewable energy research and development programs over the past decade.

Programs cut over the past decade include the Energy R&D Corporation, the Australian Cooperative Research Centre for Renewable Energy, and the Renewable Energy Commercialisation Program of the Australian Greenhouse Office. University research programs and the CSIRO have been re-oriented towards fossil fuel industry support, despite the unrivalled track record of renewable energy innovation coming out of programs at the University of New South Wales and the Australian National University among others. Researchers who would be hailed as heroes internationally struggle to maintain research programs in Australia.

In Australia, renewable energy research and development (R&D) now receives very little federal funding; in fact, nearly all current federal energy R&D supports fossil fuel industries. A recent report examining energy and transport subsidies estimated that for 2005-06 R&D funding to Cooperative Research Centres and the CSIRO for fossil fuels was \$226 million compared with just \$27 million for renewable energy. (see section 6)

Government policy settings are crucial to effective research, development, demonstration and commercialisation of renewable energy innovation. Given the current shortfall of domestic policy support, promising Australian renewable technologies, pioneering companies and top-notch research groups are leaving Australia for countries with more favourable policies – or are simply going out of business. Recent years have seen a near stampede of industries leaving the country – and achieving remarkable success elsewhere.

What is needed now is substantial funding for renewable energy R&D, demonstration and commercialisation, together with large-scale market support via renewable energy targets and carbon pricing. The R&D funding package for renewable energy should total at least \$2 billion over 10 years, in order to cover the “funding gap” that exists for early-phase research and development.

A vibrant renewable energy industry requires a strong connection between the market and R&D. At the moment Australia has neither a strong market for renewable energy nor a solid R&D foundation. An active renewable energy market that lacks an R&D foundation will see Australia’s balance of payments deteriorate as we are compelled to import new technologies and skills. A comprehensive suite of policies could provide both a strong market and solid renewable energy R&D, foundations that would spur domestic manufacturing and maximise the technologies’ economic and employment benefits.

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## **Renewable Energy Research and Development - the foundations of a successful industry and deep cuts to greenhouse pollution.**

### **1. Introduction- Why is renewable energy research and development (R&D) relevant to APEC?**

Climate change has been put firmly on the APEC agenda, largely as a result of efforts by Australia to undermine the Kyoto negotiations for phase 2 of the Kyoto Protocol. One of the expected outcomes of the Sydney APEC meeting is the establishment of a new research network called APNet - the Asia Pacific Network for Energy Technology. The Australian Government allocated \$5 million for this initiative on September 2 2007, describing the network as an effort to "improve linkages between researchers in the APEC region on emerging low emissions energy and energy efficiency technologies"<sup>1</sup>.

However, Australia's rhetoric on supporting low emissions technology research needs to be weighed against its track record over the past decade. This report highlights how the Howard Government has systematically gutted renewable energy research and development in Australia. Without an effort to reinvigorate Australian renewable energy R&D, Australia's APNet commitment will reinforce business as usual for the big polluters who receive the lion's share of Australian R&D funding.

### **2. Why R&D funding is needed**

Deep cuts in greenhouse gas (GHG) emissions must be made in coming decades to stabilise the Earth's climate. To achieve this, governments must put a price on carbon *and* provide support for low-emissions technologies including renewable energy. The latter measures are essential because low emissions technologies provide the best environmental and economic outcomes. Experience of emissions trading in Europe has demonstrated that a price on carbon alone is insufficient to deliver new renewable energy projects. Renewable energy targets are critical to establishing a market for renewable energy.

The solar photovoltaic (PV) industry illustrates why this support is needed now. The Federal Government has identified Australia's PV research as leading international R&D efforts. Although PV technology is still relatively expensive, it is closely related to the computer chip industry, and could obtain cost reductions and dramatic performance improvements with appropriate R&D support. Without this support, PV's considerable promise will not be realised in time to substantially contribute to cutting GHG emissions. Australian PV research groups are already world leaders, but are struggling to survive with a paucity of government research funding.

Worldwide, governments have a crucial role to play in the very large R&D efforts required to achieve emissions reductions at reasonable cost. Their role will be particularly important in the research, development and demonstration phases. Effective policies will promote and streamline the transition of innovation from universities and research institutes, out to companies and mass production. Renewable energy can be installed more rapidly than any other clean energy supply technology.

Despite its modest size, Australia is a major player in R&D in this area, and would accrue enormous economic benefit from a strong commercial position in these industries. Worldwide, billion-dollar companies are being floated in the renewable energy sector every few months.

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<sup>1</sup> [http://www.pm.gov.au/media/Release/2007/Media\\_Release24523.cfm](http://www.pm.gov.au/media/Release/2007/Media_Release24523.cfm)

Investment capital flowing into renewable energy and energy efficiency exceeded \$US 100 billion in 2006<sup>2</sup> globally, and the annual industry growth rate is 30 to 50 per cent. Renewable energy is clearly a vast and important new industry of the future, and Australia should be part of it.

## **2. Untapped potential: Australia could lead in Renewable R&D**

Australia has a history of solar innovation, largely associated with programs at the University of New South Wales and the Australian National University. Both universities have developed cutting-edge solar technologies that are being developed internationally (see CSG example in section 7) or that may fall out of Australian hands; the 'sliver cell' technology developed by ANU and in pilot manufacture by Origin Energy could be sold to an international player without commercialisation and market support. Other universities, like the University of Sydney, have also punched above their weight in the development of solar water heating and solar thermal technologies, but again manufacturing moved off-shore. Solar researchers like Professor Martin Green and Professor Andrew Blakers are 'solar celebrities' in places like Germany, California and Japan, but receive little support for their research efforts in Australia. Dedicated renewable energy research funding in Australia has been drying up over the past decade and outstanding research programs like those mentioned above, are being run on skeleton staff and with minimal research budgets.

Similarly the CSIRO has increasingly been forced to look for commercial research partners as core government funding to the organisation has been reduced. In a country like Australia that has meant that the incumbent energy players - the coal and gas industries- form the foundation of the CSIRO's energy research priorities. The 2007 Federal Budget saw a slight reversal of this trend within the CSIRO as the government perhaps realised that its cuts had gone too deep. However fossil fuel research remains dominant (see Table 2).

Although Australia cannot be a major player in *all* areas of renewable energy R&D, its track record demonstrates clear potential in key areas. The Federal Government's 2004 Energy White Paper suggested Australia's areas of greatest energy technology promise. As Table 1 demonstrates, three renewable energy technologies (hot dry rocks, photovoltaics, and remote power generation systems) are clearly identified as market leaders.<sup>3</sup>

Based on Australia's clear R&D advantage in these areas, one would expect a corresponding share of Federal Government R&D funding to follow; unfortunately this is not the case. The vast majority of federal R&D funding is being allocated to fossil fuels. Thus, given Australia's renewable energy R&D strengths, the federal funding portfolio remains decidedly unbalanced.

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<sup>2</sup> "Investors flock to renewable energy", [www.unep.org/Documents.Multilingual/Default.asp?DocumentID=512&ArticleID=5616&I=en](http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=512&ArticleID=5616&I=en)

<sup>3</sup> Although there is no reason why Australia could not be technology leaders in other technologies like energy efficiency and solar thermal electricity with concerted policy support and R&D funding.

**Table 1. 2004 Energy White Paper Technology Assessment**

<b>Market leader</b> <i>Play a leading role in international R&amp;D efforts.</i>	<b>Fast follower</b> <i>Strongly position Australia to follow international developments quickly.</i>	<b>Reserve</b> <i>Monitor international developments and follow as needed.</i>
<b>Energy supply technologies</b>		
<ul style="list-style-type: none"> <li>○ Advanced brown coal</li> <li>○ Geosequestration</li> <li>○ Hot dry rocks</li> <li>○ Photovoltaics</li> <li>○ Remote area power systems</li> <li>○ Coal mining and extraction</li> </ul>	<ul style="list-style-type: none"> <li>○ Advanced black coal</li> <li>○ Natural gas</li> <li>○ Wind</li> <li>○ Biomass</li> <li>○ Wave</li> </ul>	<ul style="list-style-type: none"> <li>○ Hydrogen</li> <li>○ Tidal</li> <li>○ Large-scale hydro</li> <li>○ Nuclear</li> </ul>

### 3. Paucity of Federal Government support

While the past decade has seen the government establish several mechanisms to support the renewable energy industry, R&D has languished. Government support for the renewable energy industry support has been very limited and of a stop-start-stop nature. For example, the federal Mandatory Renewable Energy Target (MRET) required 9,500 gigawatt hours of new renewable electricity to be generated by 2010. A very modest target, it nonetheless led to rapid growth of Australia’s renewable energy industry – growth that halted when the government declined to raise the target.

This policy environment makes it very difficult for Australia’s renewable energy industry to compete with well-supported foreign companies. Likewise, it makes it difficult for Australian companies in this sector to justify substantial R&D expenditure, without a future market looking secure.

### 4. Trend of cutting renewable energy R&D

Over the past decade, the Federal Government has systematically cut funds to Australia’s renewable-energy focussed research and development programs. Programs cut over the past decade include the Energy R&D Corporation, the Australian Cooperative Research Centre for Renewable Energy, and the Renewable Energy Commercialisation Program of the Australian Greenhouse Office.

The current stop-start management of R&D support is destructive to the long-term innovation process that can deliver the needed breakthroughs for major cost reductions. It has left a critical funding gap (see below and Figure 1) between early stage research and support at the point of commercialisation.

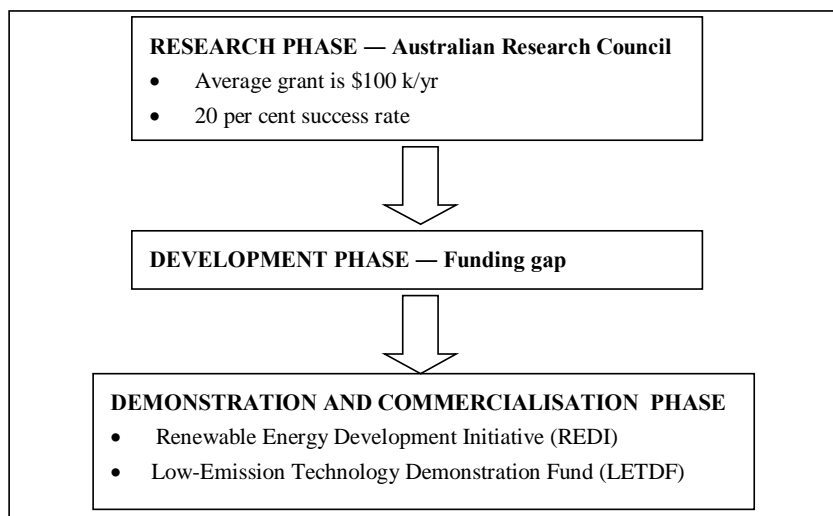
Furthermore, the Low Emissions Technology Development Fund, (the Government’s flagship low emissions technology program) allocation has favoured fossil fuel projects over renewable energy projects by a ratio of more than four to one on a dollar basis (\$335 million so far to fossil fuel projects; \$75 million to renewable energy). Moreover this program is not available to support R&D.

Given both the scale of the problem presented by climate change, and the scale of commercial opportunity presented by renewable energy solutions the level of Government support is completely inadequate.

## 5. The funding gap

During the past decade, a funding gap has emerged between early research, and demonstration- and commercialisation-phase funding for renewable energy. Although the Australian Research Council provides small amounts of funding to universities for early-stage research, this support is not targeted toward renewable energy. Of the remaining renewable energy programs, the Renewable Energy Development Initiative (REDI) and the Low Emissions Technology Development Fund (LETDF) only support commercialisation (see Figure 1).

**Figure 1. The funding gap for renewable energy R&D<sup>4</sup>**



Other countries, like Germany, effectively plug this gap for renewables funding, through integrated programs of support which cover every aspect of the renewable energy industry — research, development, demonstration, commercialisation and market support. As a result of strong research efforts and a substantial renewable energy target Germany has created 250,000 jobs in renewable energy industries<sup>5</sup> - indeed some of the leaders of the clean energy revolution in Germany are expatriate Australians like Dr David Hogg, who moved to Germany to develop new solar technologies that had been pioneered at the University of New South Wales.

Critical mass is built via the availability of large-scale and stable R&D funding in, for example, the Fraunhofer Institute for Solar Energy Systems, which has a budget of \$47 million per year. The Fraunhofer Institute is just one of many such large European solar research institutes. This type of integrated support for energy is available in Australia — for fossil fuels, but not for renewable energy.

<sup>4</sup> Reproduced from submission 11 to Federal Government's Inquiry into non-fossil fuel energy by, "Funding for Renewable Energy R & D". Available at: [www.aph.gov.au/house/committee/isr/renewables/submissions/sub11.pdf](http://www.aph.gov.au/house/committee/isr/renewables/submissions/sub11.pdf)

<sup>5</sup> <http://business.guardian.co.uk/greenbusiness/story/0,,2132728,00.html>

## 6. Support for fossil fuel R&D

In contrast to renewable energy, Australian fossil fuels receive large-scale Federal Government support, including funding through several CSIRO Divisions (Energy Transformed Flagship, Energy Technology, Exploration & Mining, Petroleum Resources), three Cooperative Research Centres (Greenhouse Gas Technologies, Mining, Coal in Sustainable Development), Geoscience Australia, the Rio Tinto Foundation and the National Collaborative Research Infrastructure Strategy. This level of support should be available to renewable energy, but is not.

A recent report examining energy and transport subsidies estimated that for 2005-06 R&D funding to Cooperative Research Centre and the CSIRO for fossil fuels was \$226 million compared with just \$27 million for renewable energy.<sup>6</sup>

**Table 2. Examples of Australian research funding for energy**

Name	Type	Amount	Comments
Australian Research Council <a href="http://www.arc.gov.au/default.htm">http://www.arc.gov.au/default.htm</a> -	Generic R&D. Not just energy	Average grant of \$100k per year	Only available for very early phase research.
AP6 <a href="http://www.ap6.gov.au/">http://www.ap6.gov.au/</a>	Renewable energy and fossil fuels	\$100m	As yet unspent. Was supposed to be spent in 2007. Unclear whether it will carry over to 2008 if unspent.
Renewable Energy Development Initiative	Renewable energy	\$100m over 7 years	Universities not eligible to apply for REDI. Supports commercialisation and hence is generally underspent as the paucity of research funding has seen few renewable energy technologies mature to commercialisation in Australia.
CRC for Greenhouse Gas Technologies <a href="http://www.co2crc.com.au">www.co2crc.com.au</a> (2003-2009)	Fossil fuels	\$21.8m	Received an additional \$6m in 2006.
CRC for Coal in Sustainable Development <a href="http://www.ccsd.biz/">http://www.ccsd.biz/</a> (2001-2008)	Fossil fuels	\$14.5m	Funded till 2008.
CRC for Mining <a href="http://www.crcmining.com.au/int.html">http://www.crcmining.com.au/int.html</a> (2003-2010)	Fossil fuels and minerals	\$27m	In addition to the CRC for Mining there are also CRCs for "Landscapes Environments and Mineral Exploration", "Predictive Mineral Discovery" and "Sustainable Resource Processing"
Rio Tinto Foundation	Fossil fuels and minerals	\$35m no interest loan	No interest loan from Federal Government
CSIRO Energy Transformed <a href="http://www.csiro.au/index.asp?type=blank&amp;id=EnergyTransformed">http://www.csiro.au/index.asp?type=blank&amp;id=EnergyTransformed</a>	Flagship works mostly on fossil fuels, with a small renewables component	\$15m per year for 4 years	
National Collaborative Research Infrastructure <a href="http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/ncris/">http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/ncris/</a>		Will deliver around \$50m in infrastructure to fossil fuels.	

**Note: Other research and development programs include several CSIRO programs (Energy Technology, Explorations and Mining, and Minerals, Petroleum Resources) and Geoscience Australia which are heavily focussed on fossil fuel development.**

<sup>6</sup> Institute for Sustainable Futures, "Energy and Transport subsidies in Australia" April 2007, pp32-33.

## 7. Brain and Technology drain: Recent consequences of insufficient renewable support

There are numerous on-the-ground examples of jobs and investment lost in recent years due to the lack of policy support for renewable energy. Below is a list<sup>7</sup> of companies and innovation that have departed for greener pastures offshore, or scaled back or terminated Australian operations. But it's by no means a complete list.

### ⇒ Solar

**Solar Heat and Power Pty** was set up in 2002 to commercialise solar thermal concentrator technology developed at the University of Sydney in 1995. A successful 25-MW pilot project is now operating at Liddell coal-fired power plant in NSW. In January 2007, the company relocated to the United States after failing to acquire support for large-scale, stand-alone generation in Australia. Overseas, the company has secured \$41 million in US investment.

*"Some of the largest investors and power companies in the USA have realised that solar thermal power is a probable replacement for coal, nuclear and oil. They believe this will be very big business and power companies are willing to provide the large amount of initial equity to get the industry moving."*

**David Mills, CEO, Solar Heat and Power Pty<sup>8</sup>**

**Pacific Solar** was set up in 1995 as a joint venture between the University of New South Wales (UNSW) and the state electricity company, Pacific Power. Its aim was to commercialise a cost-effective solar PV technology developed in Sydney, now known as "crystalline silicon on glass". In June 2004, Pacific Solar sold its assets and worldwide rights to the technology to a German company, CSG Solar AG, which is now undertaking commercialisation in Germany with significant government investment support.

**SunTech** was set up in 2001 by Chinese-Australian Dr Zhengrong Shi. Dr Shi worked in Australia's solar industry for fifteen years, at UNSW and Pacific Solar, but ultimately opted to found a Chinese company due to Australia's lack of market opportunity. He is now one of the world's richest men, and Suntech looks set to dominate the global solar market. Again, Australia has missed out.

**Others:** Additional examples of overseas commercialisation of Australian solar technology include the **evacuated-tube solar water heaters** which now dominate the rapidly growing Chinese market and were developed at Sydney University; and the **high-efficiency PV panels**, sold under the name "Saturn" by BP Solar, which are manufactured in Spain although the technology was developed at UNSW.

### ⇒ Bioenergy

**Novera Energy** was founded in 1998 in Australia with the intention of developing a renewable portfolio in Australia and Europe. Their main business focus is bioenergy. Over the ensuing years the market in Australia stagnated, while Europe's renewable energy market blossomed; Novera's 2004 UK revenue exceeded \$24 million, compared to just \$0.4 million in Australia. In 2005, the company relocated to the UK, and was de-listed from the Australian stock exchange in 2006.

*"Momentum in the UK renewable energy market accelerated during the year... By contrast, the Australian renewable energy market lost momentum, following unfavourable signals from the*

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<sup>7</sup> From "A Bright Future", [www.greenpeace.org/australia/resources/reports/climate-change/a-bright-future-25-renewable](http://www.greenpeace.org/australia/resources/reports/climate-change/a-bright-future-25-renewable)

<sup>8</sup> Sheehan P (29 January 2007), Cloudy future for solar innovators, Sydney Morning Herald

*Federal Government ... Given the uncertainty, several renewable energy developers, including Novera Energy, are re-evaluating their strategy in Australia."*

**Novera 2003 Annual Report, page 7**

## ⇒Wind

**Vestas:** The Vestas turbine nacelle factory at Wynyard, Tasmania, opened in November 2003 and employed 73 people. Yet it closed less than three years later, in August 2006, due to lack of a domestic market following the Federal Government's decision not to raise the MRET. A further 40 jobs were lost at Aus-Tech Composites, which supplied components to the factory. Then in August 2007, Vestas announced it would also close its Victoria wind turbine blade manufacturing factory at the year's end, citing Australia's market outlook as the reason. The closure of the Portland plant will mean the loss of 136 jobs from this regional area.

**Roaring 40s,** formed by Hydro Tasmania and China Light and Power Group, aims to be a leading renewable energy developer in Asia and Oceania. Although receiving strong support in international markets, in May 2006 the company announced it would halt work on several Australian wind energy projects to due lack of market incentive. Specifically, Roaring 40s highlighted the Federal Government's failure to increase the MRET.

*"The MRET measure introduced by the Federal Government in 2001 successfully kick-started the renewable energy industry in Australia. However, without an increase in the initial target level, electricity retailers are reluctant to commit to long-term REC deals which are crucial in financing renewable energy projects. Consequently, further substantial investment in the renewable energy industry is unlikely without an increase in the target."*<sup>9</sup>

**Roaring 40s Managing Director, Mark Kelleher**

## **8. Reinvigoration of renewable energy R&D: The policy components needed**

Given Australia's R&D strengths, and that a strong renewable energy industry is a vital component of any plan to substantially reduce GHG emissions, the following renewable energy industry support is needed:

- a) A target to reduce greenhouse pollution** of at least 30% by 2020 on 1990 levels.
- b) A carbon price** that forces polluters to pay the full cost of their emissions. These costs, which include the economic, health and environmental impacts of climate change, are currently "externalised" and are instead absorbed by the Australian public and wider global community. Although a carbon price would help level the playing field between fossil fuels and renewable energy, alone it is not enough to guarantee renewable energy deployment.
- c) Removal of fossil fuel subsidies:** Fossil fuel industries receive between \$9.3 billion and \$10.1 billion in state and federal government subsidies each year in Australia (or 97 per cent of total energy and transport subsidies), according to a recent report<sup>1</sup> by the Institute for Sustainable Futures at the University of Technology Sydney. By comparison, the report found that the renewable energy industry receives between \$317 million and \$334 million each year (just three per cent of energy and transport subsidies). Australia would do well to emulate overseas jurisdictions carrying out "green tax shifts" – the deliberate shift of incentives away from polluting power, and toward clean technologies including renewable energy.

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<sup>9</sup> Roaring 40s media release, "Roaring 40s halts Australian developments", 11 May 2006.

**d) A 25 per cent renewable energy target:** Until renewable energy projects are cost-competitive with their fossil fuel counterparts, market mechanisms will be needed to provide incentives to invest in them.

Though starting from a distinct cost disadvantage, the global renewable energy market is catching up fast, thanks in part to legislated renewable energy targets in more than 40 countries. The Federal Government's own MRET successfully delivered new renewable energy projects ahead of schedule and below estimated cost. However, the MRET's minimal target (amounting to less than one per cent of total generation) means it has ceased to act as a driver. Some states have stepped into this policy breach by setting their own renewable energy targets. These are positive developments; however, state-based targets cannot substitute for an effective national support scheme, which is evident from the industry's exodus from the country.

A target of 25 per cent renewable energy by 2020 is feasible, and in line with the level adopted by many governments overseas. A recent report<sup>10</sup> found that such a 25 per cent target would deliver to Australia:

- 16,600 new jobs
- \$33 billion in new investment
- 15,000 MW in new, renewable capacity
- A 69-million-tonne reduction in electricity sector GHG emissions (almost equal to total road transport emissions), and
- Enough renewable electricity to power every home in Australia

**e) \$2 billion in R&D support:** It is important to ensure that greater uptake of renewable energy also delivers manufacturing and export markets for Australia, maximising the economic and employment benefits of this industry. This will require both market support, and support for R&D and its transfer. To invigorate Australia's renewable R&D sector, \$2 billion worth of federal funding should be allocated over the next 10 years. (These funds should be in addition to commercialisation and deployment support.)

## 9. Conclusion

This report illustrates that in the past decade the Federal Government has consistently and determinedly undermined and cut renewable energy R&D in Australia. Its motivations seem clear: eliminating any competitor to fossil fuel based technologies like coal and oil. Yet as climate change begins to bite, this agenda must be reversed. Climate change will necessitate a massive uptake of renewable energy, both globally and in Australia. To further develop existing renewable energy technologies and develop new innovations the research sector needs consistent and on-going support for renewable energy research.

The Federal Government has demonstrated it understands the need to provide integrated energy industry support; however, this integrated approach has so far been limited to the fossil fuel industry. Given the urgent need to reduce greenhouse pollution, and in light of Australia's world-calibre renewable energy R&D, it is essential that meaningful and integrated support for the renewable energy industry be implemented without further delay, to secure its wide economic, social and environmental benefits.

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<sup>10</sup> A Bright Future: 25% renewable energy for Australia by 2020. Available at: [www.greenpeace.org/australia/resources/reports/climate-change/a-bright-future-25-renewable](http://www.greenpeace.org/australia/resources/reports/climate-change/a-bright-future-25-renewable)



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