

Leaving the ARENA

Fossil fuels vs renewables in Australian energy R&D funding

Australia has a long history of prioritising fossil fuels over renewables in research and development (R&D) funding. ARENA turned this around, making Australia a world leader in renewables. Government plans to cut ARENA's funding while providing new funds for fossil fuel R&D risks putting Australia back decades in energy R&D.

Discussion paper

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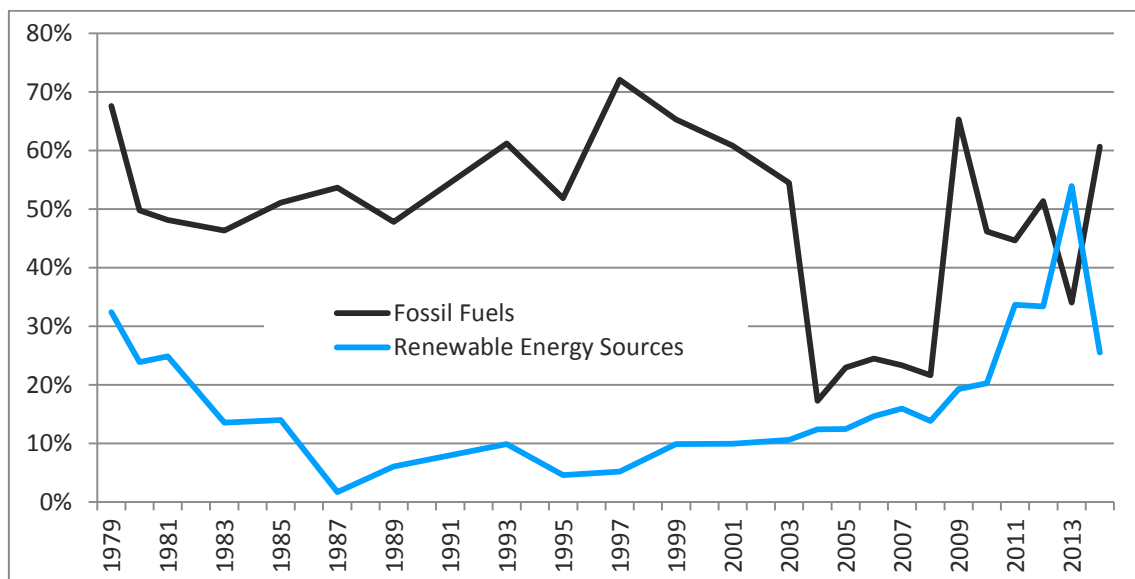
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Summary

The Australian government has overwhelmingly prioritised fossil fuels over renewables since 1979, according to International Energy Agency (IEA) data on research, demonstration and deployment (RD&D). Fossil fuels received most of the funding in most years and were the most funded energy source in every year, except one:

Share of Australian energy RD&D spending – fossil fuels vs renewables



Source: IEA (2015) *Energy Technology RD&D Budgets*

Australia's funding of fossil fuel research has consistently been among the highest in the developed world, both in absolute terms and as a percentage of our gross domestic product (GDP). Among the IEA members, Australia was the first, second or third largest funder of fossil fuel research from 1989 to 2003, and second or third from 2009 onwards as a percentage of GDP.

IEA data shows Australia spent over \$1.1 billion USD on carbon capture and storage (CCS) alone from 2009 to 2014. Despite this, there is no large-scale CCS project operating in Australia and none expected in the foreseeable future.

By contrast, Australia was ranked towards the bottom of IEA members states for renewables RD&D for most years. We were outside the top ten throughout the 1980s, 1990s and 2000s in both absolute and percentage of GDP terms, with one exception.

This history of poor performance in renewable energy RD&D funding changed in 2013-14, with the establishment of the Australian Renewable Energy Agency (ARENA).

When ARENA was established, Australia became a world leader renewable RD&D, ranked third in absolute terms and first as a percentage of GDP.

ARENA mostly gives grants, which are crucial to bringing new technologies to market on a commercial scale, especially in a new industry where there are also considerable public benefits. ARENA has funded research into new solar, wave and bioenergy technology, large scale solar, batteries, community renewables, deployment of solar-powered microgrids – including on mining sites and remote towns – grid management and much else.

Despite ARENA's success the Abbott government tried to abolish it in 2014, an attempt that was blocked by the Senate. Despite the new 'Innovation Agenda', the Turnbull government has retained the Abbott policy in all but name. The new Senate is currently considering an Omnibus savings bill that includes cuts to ARENA's funding.

There is strong public support for ARENA. A nation-wide survey of 10,271 people commissioned by The Australia Institute found:

- 56 percent of respondents said the Senate should not pass the cuts to ARENA. Only 21 percent said they should pass the cuts.
- Amongst all voters for non-Coalition parties, most voters wanted the Senate to block the cuts, including 68 percent of Labor voters.
- More Coalition voters want the Senate to block the cuts than support the Senate passing them.
- There was a clear majority against passing the cuts in every state.

Instead the government seems to be moving in the opposite direction. It has announced further support for fossil fuel research, including:

- \$15 million for a "Oil, Gas and Energy Resources Growth Centre" and more for a "Mining Equipment" Growth Centre.
- \$24 million for CCS projects, including grants to Glencore and Shell;
- \$100 million in the 2016 Budget to Geoscience Australia towards new exploration and mapping, including for fossil fuel reserves;
- \$4 million for gas research at CSIRO.

Still more support for fossil fuel research is provided through the R&D tax breaks.

Current government policy risks sending Australia back to an energy research policy from the 1980s and 90s. This is not what the public wants and it is not in the nation's interest. The Senate should oppose the government's proposal to cut renewable energy funding.

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Introduction

Over 30 years, the Australian government has focused its R&D spending on fossil fuels rather than renewables.

Compared to the other 28 member countries of the International Energy Agency (IEA), Australia has been one of the bigger funders of fossil fuel research – at times it was the biggest. Conversely, Australia has been a relatively low ranking supporter of renewables research.

This changed in 2013 with the establishment of the Australian Renewable Energy Agency (ARENA). For the first time, Australian energy R&D spending focused on renewables instead of fossil fuels. Australia became a leader on renewable energy R&D funding.

ARENA funds renewable energy innovation and construction in Australia. It provides grants and other support to projects that reduce the cost of renewables and increase supply of renewable energy, and shares knowledge that develops the industry.

The government intends to cut all of ARENA's remaining funding for a saving of \$1.3 billion over 5 years from 2017–18.¹ This would effectively abolish ARENA, a government policy dating back to the Abbott Government's 2014 Budget.

While the Turnbull Government wants to cut funding to renewables research, it has recently provided new grant funding to fossil fuel research. Seen in historical context, this is backsliding to approach from previous decades.

If ARENA's remaining funding is cut, fossil fuels are likely to again dominate Australia's spending on energy research. This is inconsistent with the government's stated goals to support innovation, move beyond the mining agenda and reduce emissions.

¹ Note just \$1 billion over estimates.

Explanatory Memorandum, Budget Savings (Omnibus) Bill 2016, http://www.aph.gov.au/Parliamentary_Business/Bills_LEGislation/Bills_Search_Results/Result?bId=r5707

Australia's history of energy RD&D

Fossil fuels have dominated the Australian government's funding of energy research for the last 40 years.

The International Energy Agency (IEA) publishes data on Research, Development and Deployment (RD&D) expenditure by the governments of its 29 member countries. The IEA's member countries include all OECD nations and five others. The IEA's data provides a good basis for analysing and comparing countries' energy RD&D priorities over time.²

IEA data on Australian RD&D spending dates back to 1979–80 and the most recent is from 2014–15. The 2014–15 IEA data includes funding from:

- a) Department of Industry
- b) Australian Renewable Energy Agency (ARENA)
- c) Commonwealth Science and Industrial Research Organisation (CSIRO)
- d) Australian Research Council (ARC)
- e) Australian Nuclear Science and Technology Organisation (ANSTO)³

Note that this does not include incentives for R&D offered through the tax system, currently through the R&D Tax Incentive. These are discussed below.

² IEA (2015) *Energy Technology RD&D Budgets, Database Documentation*

http://wds.iea.org/wds/pdf/RDD_Documentation.pdf

Some caution is required when using this data. For example, governments do not all report figures every year. There are some differences in coverage between years. Figures do not typically include sub-national government level programs. For most countries, including Australia, they do not include publicly owned companies, while for others they do.

³ IEA (2015) *Energy Technology RD&D Budgets, Database Documentation*

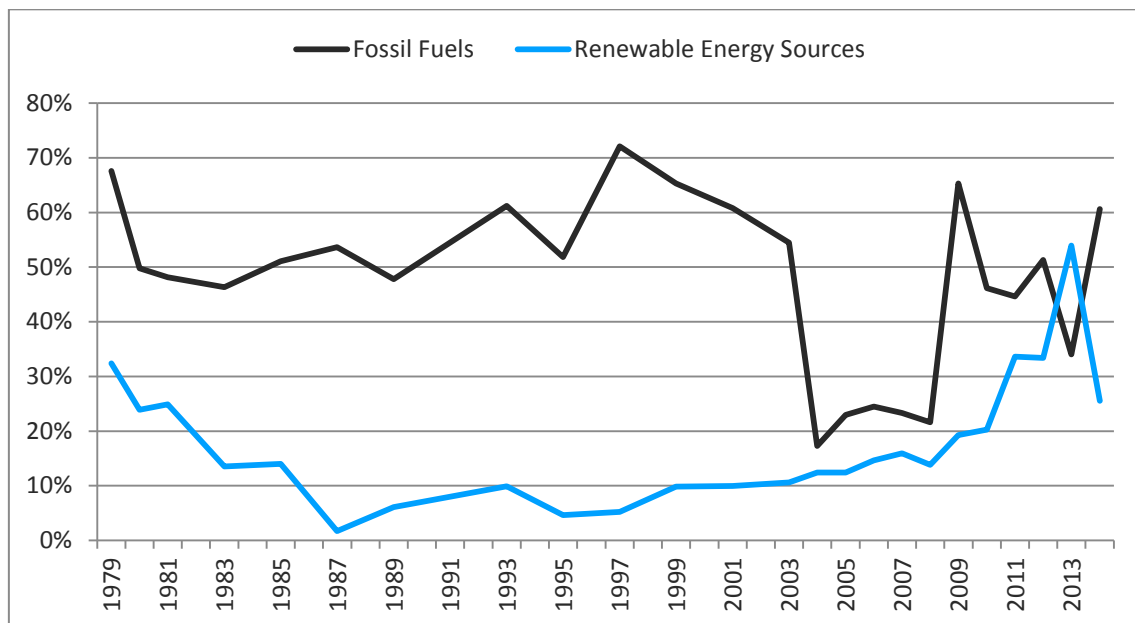
http://wds.iea.org/wds/pdf/RDD_Documentation.pdf

Note that ARENA co-funds projects with the CSIRO and the ARC.

FOSSIL FUELS DOMINATE

Fossil fuel research has dominated Australian government energy RD&D spending over the last 30 years, as shown in Figure 1.

Figure 1 – Share of Australian energy RD&D spending – fossil fuels vs renewables



Source: IEA (2015) *Energy Technology RD&D Budgets*

Fossil fuels received most of the total funding in most years and received the most funding of any category of research in nearly every year. The period between 2004 and 2008 where fossil fuel funding is noticeably lower is likely due to a recategorisation of some spending; an undefined ‘Other’ category almost exactly corresponds with this decline.⁴ Fossil fuels remained the largest category in these years, despite growth in other categories during this period.⁵

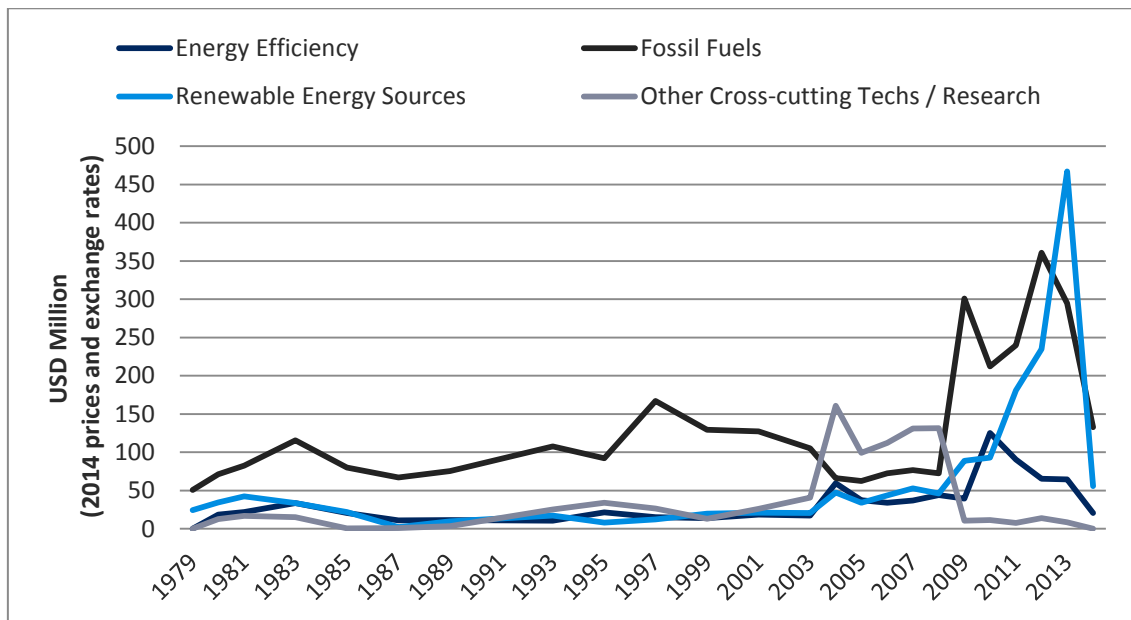
2013 was the only year since 1979 when Australian government spending on renewable RD&D was greater than spending on fossil fuel research, according to the data provided to the IEA. This was the year ARENA began operation.

⁴ In this period, fossil fuel funding declines dramatically while “Other Cross-Cutting Techs / Research” increases. This is almost entirely due to growth in the “Other” subcategory – i.e. no detail is given. It is unclear why. The notes from the Australian government only explain a break in the dataset from 2008 to 2009, not before. From 2009 to 2011 the government provided estimates resulting in breaks in the series. http://wds.iea.org/wds/pdf/RDD_Documentation.pdf page 16

⁵ In particular energy efficiency, with minor growth in excludes hydrogen fuel cells, nuclear, other power and storage tech.

Figure 2 shows Australian public energy RD&D spending in US dollars as presented by the IEA for selected categories.⁶

Figure 2 – Australian government RD&D energy spending by selected type (USD 2014 and exchange rates)



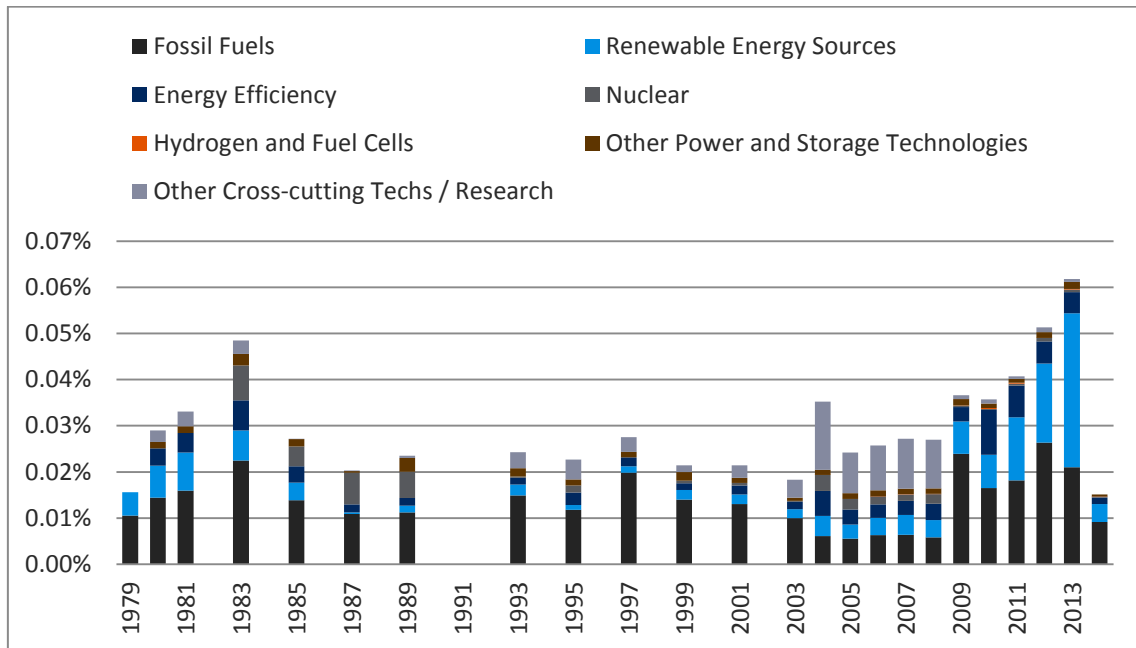
Source: IEA (2015) *Energy Technology RD&D Budgets*. Note: excludes spending on hydrogen fuel cells, nuclear, other power and storage technology.

Figure 2 shows that in dollar terms, funding of fossil fuel research has dominated Australia’s RD&D funding since 1979. Total Australian government energy RD&D spending remained relatively stable in real terms for most of the last 30 years. There was a large increase from 2009, caused by increased spending on carbon capture and storage, further discussed below. This was followed by a large increase in renewables funding as ARENA and other programs were established, before all energy research funding was reduced.

Figure 3 below presents the IEA data on Australian energy RD&D as a percentage of GDP.

⁶ Absolute figures are provided as USD “2014 prices and exchange rates”.

Figure 3 - Australian government RD&D energy spending by type (share of GDP)



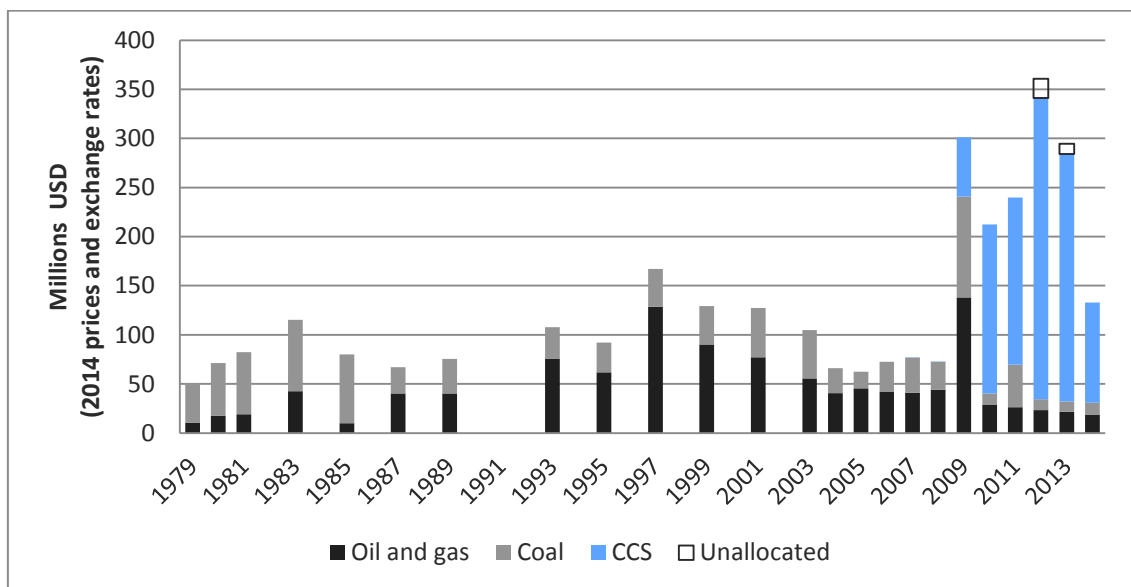
Source: IEA (2015) *Energy Technology RD&D Budgets*

This data only includes direct expenditure from the government. If R&D tax incentives to private companies were also included, Australia’s fossil fuel R&D support would be even higher, as explained below.

CARBON CAPTURE AND STORAGE

Coal was the focus of energy R&D in the early 1980s, later overtaken by oil and gas. In 2009 there was a temporary boost to both coal and oil and gas research. However the overwhelming bulk of Australia’s recent fossil fuel RD&D spending has been on Carbon Capture and Storage, as shown in Figure 4.

Figure 4 – Australian government fossil fuel RD&D spending by category



Source: IEA (2015) *Energy Technology RD&D Budgets*

CCS funding increased to over 85 percent of fossil fuel R&D funding in 2012 and 44 percent of all R&D funding in total.

A total of \$1.1 billion (2014 USD) was spent on CCS in this period. By another account, the total spending was \$2 billion (AUD).⁷ Following the 2014 Budget, fossil fuel RD&D funding fell dramatically including cuts to CCS funding under the Abbott Government.

One example of CCS funding in this period was Kevin Rudd’s Global CCS Institute. While it was intended to attract international support, in the end it was 99 percent funded by Australian taxpayers.⁸

In 2009 the head of the Australian Coal Association said CCS would be operating at commercial demonstration scale by the end of 2015, thanks to a \$1 billion industry fund.⁹ Despite billions of dollars and seven years, the Global CCS Institute currently lists only 15 operating plants worldwide. Only one captures emissions from power generation, Canada’s Boundary Dam project, heavily subsidised by the Canadian

⁷ Toohey (2014) *Clean coal dream little more than dust*, <http://www.afr.com/business/energy/electricity/clean-coal-dream-little-more-than-dust-20141107-11iz1d>

⁸ Atkin (2014) Cloud hangs over Rudd’s clean coal vision, <http://www.abc.net.au/news/2012-02-14/rudd-carbon-capture-storage-institute/3769936>

⁹ ABC (2009) *Ralph Hillman and Richard Denniss join Lateline*, <http://www.abc.net.au/lateline/content/2008/s2575402.htm>

Government.¹⁰ Most CCS projects – of any stage of development – are associated with processing gas or extracting more oil, and so are not zero emissions. While CCS has not lived up to early expectations, renewables now account for the majority of global new energy installation.¹¹

ARENA BOOSTS RENEWABLES

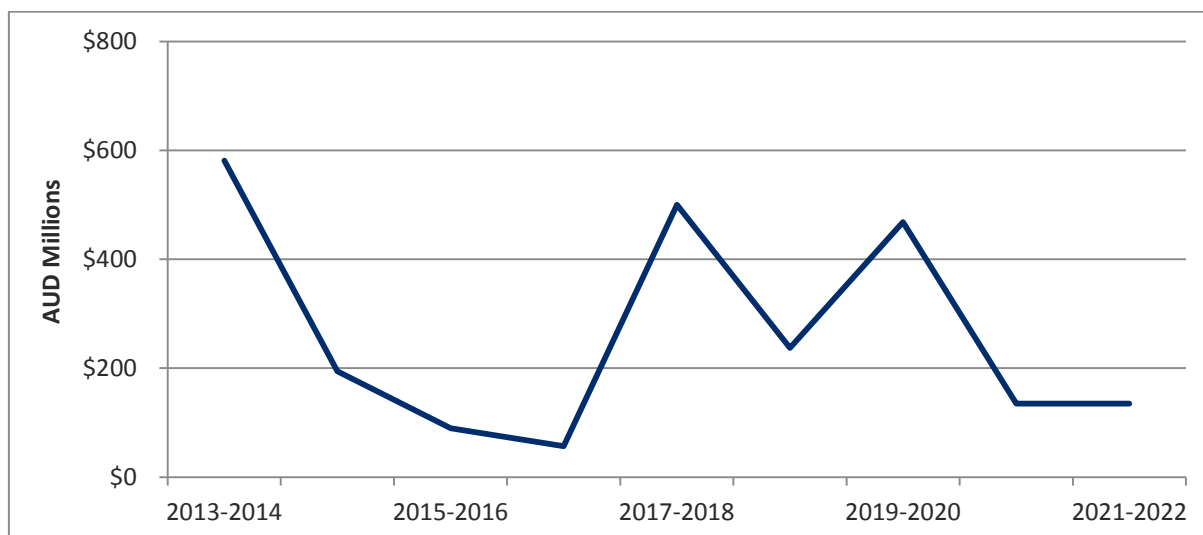
The dominance of fossil fuels in Australia’s energy research spending changed in 2013–14, the first year of ARENA’s operation. For the first time in Australian history, renewables were received most government RD&D support.

ARENA started with \$581 million (AUD) of legislated funding in its first year and continued to operate in 2014–15 with \$194 million (AUD).¹²

However this second year it is not shown in the IEA data. Instead, the IEA shows renewables funding fell dramatically in 2014. It appears that when reporting to the IEA the government assumed ARENA would be abolished, which the Senate refused.

ARENA’s current schedule of funding would see funding levels approach the founding levels again in coming years, as shown in Figure 5.

Figure 5 - ARENA’s legislated funding



Source: ARENA (2016) *Governance and Funding Profile*

¹⁰ Global CCS Institute (2015) *Large Scale CCS Projects*, <https://www.globalccsinstitute.com/projects/large-scale-ccs-projects#overview>

¹¹ Ren21 (2016) *Renewables 2016, Global Status Report* http://www.ren21.net/wp-content/uploads/2016/06/GSR_2016_KeyFindings1.pdf Page 6

¹² ARENA (2016) *Governance and Funding Profile* <http://arena.gov.au/about-arena/governance-and-funding-profile/>

International comparisons

Australia is one of the world's biggest funders of fossil fuel research. By contrast, Australia has performed poorly on renewables research funding in comparison with other IEA member countries. Table 1 (page over) shows Australia's rank amongst IEA countries for RD&D spending in fossil fuels and in renewables.

FOSSIL FUELS

The first column in Table 1 (page over) shows that from 1979 to 1990 Australia was fifth, sixth or seventh in terms of fossil fuel RD&D funding.¹³ During the 1990s, while fossil fuel funding decreased in nearly every other country, Australian funding increased. As a result, from 1995 to 1999 Australia was the third biggest fossil fuel funder and second in 2001. Australia remained in the top five during most of the 2000s.¹⁴ In 2012 the CCS boost put Australia back into second place.

The second column in Table 1 (page over) ranks Australia against other countries by level of fossil fuel research funding as a share of gross domestic product (GDP). Australia's economy is much smaller than some members of the IEA, so this gives a more balanced view of how committed member countries are to energy research.

Australia ranks even higher as a funder of fossil fuel research when considered as a share of GDP. Australia was first, second or third from 1989 to 2003, and second or third from 2009 onwards, during the CCS boost of the 2010s. This was despite competing with other countries that include RD&D expenditure at publicly owned companies, which Australia does not.¹⁵

¹³ Out of the 15-17 reporting countries in this period.

¹⁴ Accounting for the drop in fossil fuel funding and increase in "other" would likely place Australia at fourth or fifth in this period.

¹⁵ There were very large increases in Norway's fossil fuel RD&D in recent years, which may be due to including spending at two publicly owned oil companies; similarly for Canada, which has included R&D at public companies from 2013.

RENEWABLES

The third and fourth columns in Table 1 show that Australia was ranked towards the bottom of IEA members states for renewables RD&D. We were outside the top ten for all of the 1980s, 1990s and 2000s in both absolute and percentage of GDP terms, aside from 2004.

We performed better in 2011 and 2012 before our finest year of renewable research funding in 2013 when we lead the world as a portion of GDP, thanks to ARENA funding. The final year of IEA data has seen us return to our past levels of poor performance.

Table 1 - Australia's ranking among IEA countries for fossil fuel & renewables RD&D

| | Fossil fuel RD&D funding (IEA ranking) | | Renewable energy RD&D funding (IEA ranking) | |
|---------------|---|-------------|---|-------------|
| | Dollar terms | As % of GDP | Dollar terms | As % of GDP |
| 1979 | 7 | 6 | 12 | 10 |
| 1980 | 6 | 6 | 10 | 13 |
| 1981 | 7 | 6 | 10 | 8 |
| 1983 | 6 | 2 | 10 | 11 |
| 1985 | 6 | 6 | 13 | 11 |
| 1987 | 7 | 4 | 17 | 17 |
| 1989 | 5 | 3 | 13 | 14 |
| 1993 | 4 | 1 | 13 | 12 |
| 1995 | 3 | 2 | 15 | 18 |
| 1997 | 3 | 1 | 13 | 15 |
| 1999 | 3 | 2 | 10 | 12 |
| 2001 | 2 | 1 | 12 | 15 |
| 2003 | 4 | 3 | 13 | 14 |
| 2004 | 6 | 5 | 6 | 7 |
| 2005 | 6 | 5 | 13 | 13 |
| 2006 | 6 | 5 | 13 | 12 |
| 2007 | 6 | 7 | 11 | 12 |
| 2008 | 6 | 5 | 15 | 18 |
| 2009 | 3 | 2 | 10 | 16 |
| 2010 | 5 | 3 | 13 | 16 |
| 2011 | 5 | 3 | 6 | 8 |
| 2012 | 2 | 3 | 4 | 5 |
| 2013 | 4 | 3 | 3 | 1 |
| 2014 | 5 | 3 | 9 | 13 |
| Career | | | | |
| Gold | 0 | 3 | 0 | 1 |
| Silver | 2 | 4 | 0 | 0 |
| Bronze | 4 | 7 | 1 | 0 |
| Total | 6 | 14 | 1 | 1 |

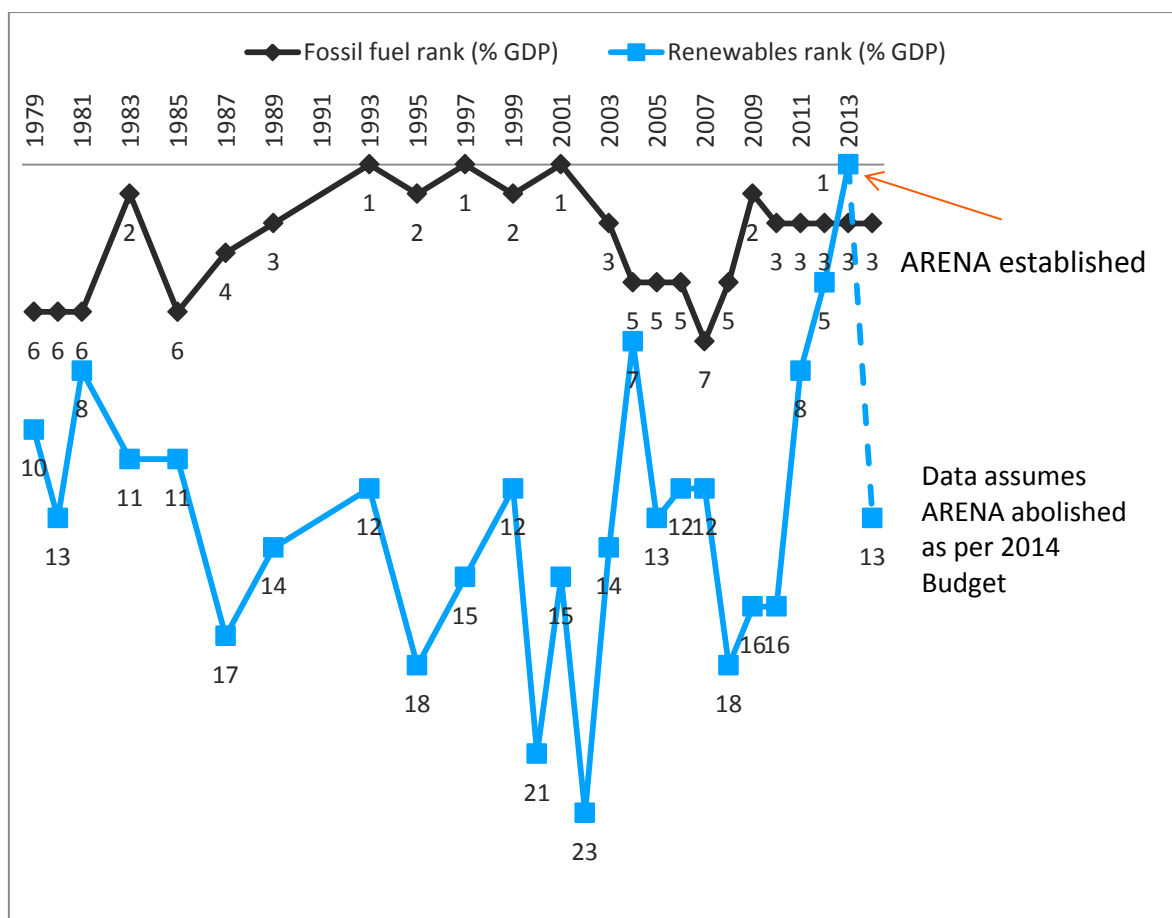
Notes: Not every country reports every year, with lower reporting for 2014, which for most countries is an estimate. For Australia 2014–15 figures are 'finalised', possibly from the Budget.

Source: IEA (2015) *Energy Technology RD&D Budgets*

FOSSIL FUEL VS RENEWABLES

Figure 6 shows Australia’s rank among IEA countries for fossil fuel and renewables research together, when ranked as a share of GDP. These figures make the point clearly: the Australian government has been one of the developed world’s biggest public funders of fossil fuel research in most of the last 30 years. By contrast, on renewables Australia has been towards the bottom of the pack. ARENA briefly sent Australia straight to the top.

Figure 6 – Australia’s rank in IEA on public RD&D funding (as share of GDP)



Source: IEA (2015) *Energy Technology RD&D Budgets*

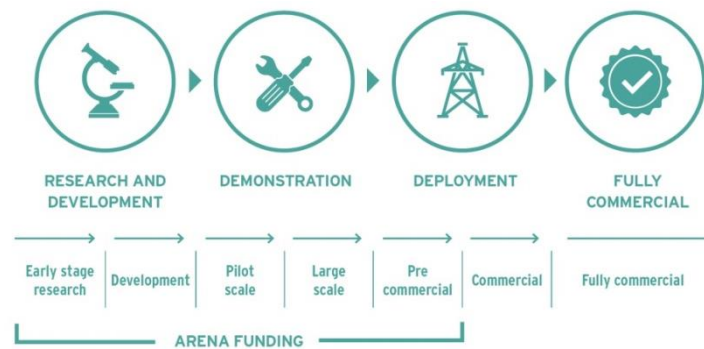
To retain this position and the benefits it brings to Australia, ARENA’s funding must be sustained. The future funding of ARENA is currently being considered by Australia’s parliament.

ARENA

WHAT ARENA DOES

ARENA is an independent agency that funds “Research, Demonstration and Deployment” (RD&D) in the renewable energy industry. This is illustrated in Figure 7.

Figure 7 – ARENA’s focus on renewables RD&D



Source: ARENA (2016) *Funding* <http://arena.gov.au/funding/>

ARENA has funded research into new solar technology, large scale solar, solar thermal, batteries, community renewables, deployment of solar, storage and microgrids – including on mining sites and remote towns – grid management and much else.

Funding goes to a wide range of organisations, including private companies, universities and the CSIRO. Over \$800 million has been committed already, most of it in NSW, with some large projects elsewhere, including solar farms in Queensland.¹⁶

ARENA mostly gives grants. Grant funding is crucial to RD&D of new technologies that are not yet available at a commercial cost or scale, especially in a new industry where there are also considerable public benefits. ARENA sometimes offers grants on a ‘recoupable’ basis, analogous to the income-contingent loans used to fund university study.

ARENA’s funding is legislated, scheduling funding for each year. This means changes can only be made through legislation.¹⁷

¹⁶ ARENA (2016) *Projects* <http://arena.gov.au/projects/>

¹⁷ While appropriations are scheduled for each year, ARENA is not required to spend all of its funding allocated each year, and is able to roll-over funding to later years. ARENA affects the government’s budget only when it spends its funds.

ABBOTT / TURNBULL GOVERNMENT CUTS

When the Abbott government tried to abolish ARENA in the 2014 Budget, the Senate rejected the legislation, agreeing in 2014 only to reduce ARENA's funding. Despite the government's policy to abolish the agency, and Budgets which continued to assume its demise, ARENA continues to fund renewable energy RD&D.

Although promoting an 'Innovation Agenda', the Turnbull government has retained the Abbott policy in all but name. Before the 2016 Budget, the government announced it would be retaining both ARENA and the Clean Energy Finance Corporation (CEFC). ARENA would administer a 'Clean Energy Innovation Fund' through loans and equity financing, however it will use funds already provided to the CEFC.

The current ARENA is already an effective Clean Energy Innovation Fund, one which the government's changes would effectively abolish.

Minister for Energy Josh Frydenberg says ARENA's role has simply changed – “transitioning from a grant program to a loan program”.¹⁸ This is not correct. Clearly, the government can book savings only because it is cutting funding. Moreover, the difference between grant and loan funding is very significant. Without grant funding many innovations could be left undeveloped and stranded in the pre-commercial 'valley of death'.¹⁹

The new Senate is currently considering an Omnibus savings bill that includes cuts to ARENA's funding. The government says it is seeking support from the Labor opposition.

¹⁸ ABC RN (2016) *Interview with Josh Frydenberg*

http://mpegmedia.abc.net.au/rn/podcast/2016/09/bst_20160901_0747.mp3

¹⁹ Towell N, (2016) *Australian clean energy heading for 'valley of death'*

<http://www.canberratimes.com.au/act-news/australian-renewable-energy-agency-funding-cuts-will-lead-to-anu-job-losses-andrew-blakers-20160830-gr49i9.html>

THE PUBLIC WANT THE SENATE TO SAVE ARENA

Most Australians want the Senate to block the cuts to ARENA.

A nationwide survey of 10,271 people commissioned by The Australia Institute demonstrates public support for ARENA.²⁰ Respondents were asked about cutting \$1 billion in funding from ARENA and whether the Senate should block or oppose that legislation:

- 56 percent of respondents said the Senate should not pass the cuts to ARENA. Only 21 percent said they should pass the cuts.
- Support was highest amongst voters for non-Coalition parties, , including 68 percent of Labor voters.
- More Coalition voters want the Senate to block the cuts than support the Senate passing them.
- There was a clear majority against passing the cuts in every state.

²⁰ The Australia Institute (2016) *Poll: Electorate reject ARENA cuts, backs new mechanism to retire coal* , Press Release, 1 September, <http://www.tai.org.au/content/poll-electorate-reject-arena-cuts-backs-new-mechanism-retire-coal>

2016: new government funding to fossil fuel research

While the Turnbull government proposes to cut grant funding for renewable energy research, it appears eager to provide new grant funding to fossil fuel research.

In February 2016, then Energy Minister Josh Frydenberg and Minister for Innovation and Industry Christopher Pyne announced \$15.4 million for a new “Oil, Gas and Energy Resources Growth Centre” to support the sector during a “challenging time”.²¹ The government did not explain how growth of fossil fuels is consistent with moving to net zero emissions.

There was also a Growth Centre for “Mining Equipment”. In total, the government announced six Industry Growth Centres with \$248 million in funding. There was no funding for renewables.²²

In the 2016 Budget the government announced \$100 million over four years to Geosciences Australia to explore for and map “mineral, petroleum and groundwater resources in targeted areas across northern Australia and South Australia.”²³

During the federal election campaign, the Coalition promised \$4 million over four years to the CSIRO for “increasing research and community engagement in gas policy”.²⁴ This was the only new Coalition funding to CSIRO promised during the campaign. At the time there was controversy about the CSIRO cutting its leading climate change research programs, both due to government funding cuts and the changed priorities of the new leadership team.

²¹ Parkinson, G (2016) *Coalition digs deeper into fossil fuels with new growth centre* <http://reneweconomy.com.au/2016/coalition-digs-deeper-into-fossil-fuels-with-new-growth-centre-82395>

²² Department of Industry (2016) *Industry Growth Centres*, <http://www.industry.gov.au/industry/Industry-Growth-Centres/Pages/default.aspx>

²³ Treasury (2016) *Budget 2016-17 - Budget Paper 2* <http://www.ga.gov.au/news-events/news/latest-news/the-budget-2016-17>

²⁴ PBO (2016) *Post-election report of election commitments* http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Budget_Office/2016_post-election_report page 15

In early August 2016 the federal government gave \$23.7 million for RD&D on Carbon Capture and Storage (CCS).²⁵ Seven projects were funded in total:

- The largest grant of \$8.8 million went to Glencore, a large multinational coal company. The project is also receiving an undisclosed level of industry support.
- Shell, a large multinational oil company, received \$0.6 million.
- CSIRO received 2 grants totalling \$3.5 million.
- The University of Queensland received \$6.1 million and the University of Melbourne received \$1.3 million.

²⁵ Canavan (2016) *\$23.7 million for carbon capture and storage*, Press Release, 12 August, <http://www.minister.industry.gov.au/ministers/canavan/media-releases/237-million-carbon-capture-and-storage>

Further mining industry support through the R&D Tax Incentive

The above discussion focused only on direct government expenditure on energy R&D. However the Australian government gives substantial incentives to R&D activity through the tax system.

The R&D Tax Incentive (previously the 'R&D tax concession') allows companies to receive a tax offset for their spending on eligible research and development activities.²⁶ While the incentive is offered through the tax system, the policy operates as an undirected matched grants program – government expenditure matching company expenditure, wherever it meets the basic eligibility criteria.²⁷

In 2015-16 the R&D Tax Incentive constituted “Almost 92 per cent of Australian Government Budget assistance for private sector science, research and innovation”²⁸ and “is estimated to amount to \$2,929m, or 30 per cent of expenditure” on R&D.²⁹

Available data breaks down total industry R&D expenditure registered for the incentive, and the total cost of the incentive to the government budget. These figures are not included in the IEA data or in RD&D datasets from the Australian Bureau of Statistics.

In 2013–14, the mining industry spent \$3.4 billion supported by the R&D Tax Incentive. This is 18 percent of all registered expenditure, despite mining making up only 6 percent of the project registrations.³⁰

²⁶ Large companies receive a non-refundable offset, while smaller companies receive a refundable offset at a lower rate, with caps on the total that can be claimed.

²⁷ See discussion in Sadiq, K (2014) *Powering Innovation through Tax Concessions: the Changing Research and Development Tax Incentives*
http://www.jausttax.com/Articles_Free/JAT%20Volume%2016,%20Issue%201%20-%20Sadiq.pdf

²⁸ Green, R (2015) *Australia's Innovation Future - A Report on the Structure and Performance of Australia's National Innovation System*, page 25, attached to
http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Innovation_System/Report

²⁹ Green, R (2015) *Australia's Innovation Future* page 18.

³⁰ Innovation Australia (2015) *Annual Report 2014-15*
http://www.industry.gov.au/innovation/Innovation-Australia/Annual-reports/Documents/Innovation-Australia/InnovationAustralia-AnnualReport_2014-15.pdf page 88

By comparison, the entire “Electricity, Gas, Water and Waste” sector – which includes both fossil fuel and renewable power generation – spent only \$560 million in registered R&D expenditure. This was 3 percent of the total spending, and 2 percent of the registrations. The share for power generation specifically would be less, and renewables less still.³¹

The total cost of the R&D Tax Incentive to Australian taxpayers in 2013–14 was \$2.7 billion. In other words, the cost to the government was 15 percent of registered expenditure. This can be allocated pro-rata across industries to their share of total expenditure to produce a rough estimate of industry support from the incentive.³²

On this basis, the mining industry received support of \$504 million in 2013–14, while the entire utilities sector – including all forms of generation as well as water and waste – received only \$83 million.

While mining receives a substantial share of R&D support through the tax incentive, it previously was even higher. In 2008–09, the mining industry registered \$5.2 billion of R&D tax concession expenditure, 30 percent of the total.³³

Despite the fall in support to the mining industry through the R&D Tax Incentive in recent years, this decline brings the concession to the mining industry down to the higher level of ARENA’s annual funding.

The estimated mining support in 2013–14 is a similar size to ARENA’s total funding in that year (\$580 million) but double the average funding level for remaining years (\$255 million).³⁴ This is in addition to direct grant and other funding to fossil fuel RD&D.

³¹ Note both fossil fuel and renewable forms of generation may be supported through tax incentives to other sectors -- for example manufacturing, which makes up over a third of registered expenditure.

³² Allocating to the industry share of supported expenditure

³³ Innovation Australia (2018) *Annual Report 2009-10*

<http://www.industry.gov.au/innovation/Innovation-Australia/Annual-reports/Documents/Innovation-Australia/IA-AnnualReport0910Section04.pdf> page 146

This reduction is probably due to the end of the mining boom, as well changes in the rules tightening eligibility and limiting the total amount that can be claimed.

³⁴ ARENA (2016) *Funding*

Conclusion

Australian government support for energy RD&D has overwhelmingly favoured fossil fuels over the last 30 years. This only includes direct government expenditure. Including support through the tax system, support for fossil fuels is even higher.

By contrast, Australian support for renewables has been low in absolute terms and by comparison with comparable countries.

The establishment of ARENA made Australia a world leader on renewable energy RD&D. It put Australia in the top tier of governments among the IEA even on absolute terms, and in terms of GDP it put us at the top.

There are many benefits to maintaining support for renewables RD&D in Australia, including lower cost renewable power, competitive advantages in a new industry – including jobs and investment -- and long-lasting contribution to reducing emissions here and worldwide. It is surprising that a government that has talked so much about innovation and the post-mining boom economy would seek to cut innovation in the renewable energy and increase funding for fossil fuels research.

These trends risk sending Australia back towards an energy research policy from the 1980s and 90s. This is not what the public wants and it is not in the national interest. The Senate should oppose the government's proposal to cut renewable energy funding.