

**Environment and Communications Legislation Committee**  
**Coal-Fired Power Funding Prohibition Bill 2017 Inquiry**  
**David Arthur Submission**

Summary of Submission

1. The world needs to cease all fossil fuel use, including coal, as rapidly as possible, in order to minimise future losses from changing climate and climate-related events.
2. In order to avoid exposure to ever-increasing climate-related risks, the insurance industry is gradually moving away from doing business with coal producing and coal consuming (burning) projects. The withdrawal of the insurance industry from exposure to projects that either produce or consume coal might serve as a default definition of “as rapidly as possible” in point 1 above.
3. I support the banning of Commonwealth Government funding of coal-fired power projects because such funding exposes the Commonwealth Government to the risk of litigation relating to climate-related disasters.
4. If the Commonwealth Government wants to fund provision of electricity in Australia, then it should look to funding climatically benign technologies. In particular, because renewable technologies may not be able to generate power at the exact time that demand for power occurs, funding could be allocated to power storage, such as pumped hydro-electric schemes.

Submission in Detail

I am a middle-aged Australian citizen and Queensland-enrolled voter who has long been interested in understanding the physical world, both natural and man-made, on which we all depend.

For over two decades I have studied earth’s climate and how human impacts on earth’s natural systems are affecting that climate, learning, for example, that fossil fuel use alone can account for all the increase in atmospheric concentration of principle greenhouse gas carbon dioxide (CO<sub>2</sub>) since the onset of the Industrial Revolution (1750, say), irrespective of all the deforestation and land use changes that have occurred worldwide in that time.

I conclude<sup>1</sup> that unless atmospheric concentration of is restored to approximately 300 parts per million (ppm) – that is, to concentration prevailing approximately 80-100 years ago – then sea level rise due to loss of polar ice sheets of up to 20 metres over the next several centuries will impose unacceptably large losses on coastal infrastructure and cities.

Since technologies now exist at scale and at low enough cost to replace all fossil fuel use, not only is there no economic or technological need to prolong use of any fossil fuel, be it coal, petroleum or mineral gas, there is also a *strong and ever-increasing need to phase out all fossil fuel use as rapidly as can be effected*.

I fully support the intent of the Coal-Fired Power Funding Prohibition Bill 2017 ('the Bill') because it is counter-productive to continue propping up an industry that must be phased out if Australia – and the world – is to continue enjoying a climate even approximately similar to the relatively benign climate of the Holocene Epoch – the ten millennia or so of relatively stable climate within which human civilisation has developed, and to which human civilisation (particular our coastal cities) is adapted.

Elsewhere I read the proposition that Federal Government support for power generation projects should be technology-neutral. On the face of it, this is a reasonable proposition, except that it disregards the fact that all technologies operate in, depend upon and affect the environment around them. The climate-related impacts of fossil fuel burning must necessarily be considered when entering into commercial relations with coal producers and coal consumers.

As far as the insurance industry is concerned, the issues of exposure to climate-related economic losses and litigation are becoming increasingly important.

Queensland-based insurer Suncorp has recently announced that it will no longer insure new thermal coal projects; fellow insurer QBE Insurance made a similar announcement several months ago, bringing Australia into line with Europe, where most major insurers have already "broken with coal", to borrow a phrase from University of Queensland Economics Professor John Quiggin<sup>2</sup>. Prof Quiggin goes on to write that:

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<sup>1</sup> Appendix 1 summarises more information on how I have reached this conclusion.

<sup>2</sup> "Adani beware: coal is on the road to becoming completely uninsurable", John Quiggin, The Conversation, 13 August 2019, <https://theconversation.com/adani-beware-coal-is-on-the-road-to-becoming-completely-uninsurable-121552>).

*Even more than divestment of coal shares by banks and managed funds, the withdrawal of insurance has the potential to make coal mining and coal-fired power generation businesses unsustainable.*

As a default, perhaps both coal production projects (generally coal-mining) and coal consumption projects (generally coal-burning facilities such as power stations) will cease operation as and when insurers are no longer willing to cover them for climate-related risks. In the absence of any other policy to replace fossil fuel use, the withdrawal of insurance cover for climate-related risks would then be the metric that determines how rapidly *all fossil fuel use is phased out*.

So what will replace coal-fired power? The lowest-cost technologies, photovoltaic electricity and wind-powered generation, essentially harvest energy from natural phenomena; sunlight and wind, respectively.

By themselves, these technologies are not ideal replacements for coal-fired power because the sun only shines during the daylight hours and wind does not blow all the time at any given location; that is, these energy-harvesting techniques are *intermittent*. That's where energy storage technologies, such as pumped hydroelectric power<sup>3</sup> and battery storage are required.

Instead of funding the continuation of coal-fired power, the Commonwealth should start funding large-scale energy storage, for which pumped hydro-electric schemes offer great potential; for example, an ANU team lead by Professor Andrew Blakers has identified some 22,000 suitable sites in Australia<sup>4</sup> for installation of pumped hydro-electric schemes.

Australia should take advantage of lowest-cost power producing and storing technologies; according to the Commonwealth Scientific and Industrial Research Organisation's GenCost report released in December 2018, these lowest-cost technologies do not include the use of coal<sup>5</sup>.

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<sup>3</sup> An explanation of pumped hydroelectric power technology is at "Five gifs that explain how pumped hydro actually works", <https://theconversation.com/five-gifs-that-explain-how-pumped-hydro-actually-works-112610>

<sup>4</sup> "Want energy storage? Here are 22,000 sites for pumped hydro across Australia", <https://theconversation.com/want-energy-storage-here-are-22-000-sites-for-pumped-hydro-across-australia-84275>

<sup>5</sup> "Annual update finds renewables are cheapest new-build power", CSIRO, 21 December 2018, <https://www.csiro.au/en/News/News-releases/2018/Annual-update-finds-renewables-are-cheapest-new-build-power>

Rather than running out of rocks, the Stone Age ended when superior (metal) technologies developed; by the same token, it's time to end the Coal Age.

David Arthur

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Appendix 1: A summary of how I came to understand how climate is affected by anthropogenic fossil fuel consumption, and the likely consequences in the next several centuries.

I first learnt of the so-called Greenhouse Effect while at school in the 1970's, and learnt a little about its cause, the differential passage of solar and terrestrial radiation through the atmosphere, in the course of my undergraduate Science studies in the early 1980's. However, I had little detailed understanding of the mechanisms and evolution of earth's climate until my assumptions were challenged by the so-called "scepticism" of conservative popularists such as political scientist Don Aitkin<sup>6</sup> in the 2000's.

In response I undertook to read about climate science and earth's climate history so as to understand the relevant causative factors; prominent in my reading was paleoclimatologist [William F Ruddiman's](#) 2005 book "[Plows, Plagues and Petroleum – How Humans Took Control of Climate](#)"<sup>7</sup>, and [James E Hansen's](#) "[Storms of My Grandchildren](#)"<sup>8</sup>.

I came to realise that the science is indeed settled – sufficiently settled to unavoidably conclude that all climate change since 1950 has been caused by anthropogenic<sup>9</sup> changes to atmospheric greenhouse gas concentrations – aided and abetted by deforestation, which alters the capacity of the biosphere to rapidly reabsorb anthropogenic carbon emissions.

I explain my concerns by summarising established science with a series of observations, inferences and a root cause analysis, as follows.

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<sup>6</sup> "A challenge to global warming orthodoxies - part one" 27 April 2008, <https://www.abc.net.au/radionational/programs/ockhamsrazor/a-challenge-to-global-warming-orthodoxies---part/3267412#transcript>, and "A challenge to global warming orthodoxies - part two", 4 May 2008, <https://www.abc.net.au/radionational/programs/ockhamsrazor/a-challenge-to-global-warming-orthodoxies---part/3262004#transcript>

<sup>7</sup> [https://en.wikipedia.org/wiki/William\\_Ruddiman](https://en.wikipedia.org/wiki/William_Ruddiman),  
[https://en.wikipedia.org/wiki/Plows,\\_Plagues\\_and\\_Petroleum](https://en.wikipedia.org/wiki/Plows,_Plagues_and_Petroleum)

<sup>8</sup> [https://en.wikipedia.org/wiki/James\\_Hansen](https://en.wikipedia.org/wiki/James_Hansen),  
[https://en.wikipedia.org/wiki/Storms\\_of\\_My\\_Grandchildren](https://en.wikipedia.org/wiki/Storms_of_My_Grandchildren)

<sup>9</sup> "Analysis: Why scientists think 100% of global warming is due to humans" 13 December 2017, <https://www.carbonbrief.org/analysis-why-scientists-think-100-of-global-warming-is-due-to-humans>

Observation 1. Sun irradiates earth with short-wave energy.

Observation 2. Earth re-radiates long-wave energy.

Observation 3. Greenhouse gases (primarily carbon dioxide; CO<sub>2</sub>) retard transmission of long-wave energy, not short-wave energy.

Observation 4. Satellite observations show decreasing emission to space of this long-wave energy, at exactly the same wavelengths as CO<sub>2</sub> absorbs long-wave energy.

Observation 5. Ground-based observations show increasing radiation back to earth's surface of this long-wave energy, at exactly the same wavelengths as CO<sub>2</sub> absorbs long-wave energy (see Observation 4 above). In 2015, researchers at Lawrence Berkeley National (US) Laboratory published directly observed proof of increasing warming due to greenhouse gas CO<sub>2</sub>: "Observational determination of surface radiative forcing by CO<sub>2</sub> from 2000 to 2010" (<https://www.sciencedaily.com/releases/2015/02/150225132103.htm>)

Observation 6. Arctic sea ice is melting, so that summertime sunlight is being absorbed in exposed ocean rather than reflected off ice.

Observation 7. Greenland and Antarctic ice is melting, increasing the rate of sea level rise. The rate of ice melt is accelerating as atmospheric greenhouse gases increase.

Observation 8. In the Arctic, tipping points have been crossed. Permafrost is thawing, releasing stored methane and carbon dioxide, and warming Siberian continental shelf is causing release of methane from submarine methane clathrates.

Observation 9. The last time atmospheric concentration of CO<sub>2</sub> was anywhere near its present 415 parts per million (ppm) was during the Pliocene Epoch, when global average temperatures were about 3°C higher than pre-Industrial Holocene temperatures, and sea levels were about 20 m higher than pre-Industrial Holocene sea levels<sup>10</sup>. As of 2019, global average temperatures have already risen by over 1°C, and sea levels are expected to rise by between 1 and 2 m by 2100.

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<sup>10</sup> James Hansen, Makiko Sato, Gary Russell and Pushker Kharecha, "Climate sensitivity, sea level and atmospheric carbon dioxide", *Philosophical Transactions of the Royal Society A*, v. 371 (2013); <https://royalsocietypublishing.org/doi/10.1098/rsta.2012.0294>

Inference 1, drawn from observations 1, 2, 3, 4 and 5. Greenhouse gases thus regulate earth's temperature. Altering atmospheric greenhouse gas content therefore alters earth's temperature.

Inference 2, drawn from inference 1 and observations 6, 7 and 8. Ocean is thermally coupled with atmosphere, and transfers a lot of heat to both Arctic and Antarctic.

Inference 3, drawn from inferences 1 and 2, and observation 9. Unless atmospheric concentration of CO<sub>2</sub> can be drawn down with sufficient rapidity to about 300 ppm, it is likely that sea level rise will inundate much coastal infrastructure worldwide over the next couple of centuries.

Root cause analysis 1. Historic fossil fuel use and cement production data (Oak Ridge National (US) Laboratory Carbon Dioxide Information Analysis Center) shows sufficient CO<sub>2</sub> emission from 1800 to 2007 to raise atmospheric CO<sub>2</sub> from 280 ppm to 430 ppm. Dissolution of CO<sub>2</sub> in oceans limited atmospheric CO<sub>2</sub> to about 390 ppm in 2007, 400 ppm in 2013 and 410 ppm in 2018, and continues to acidify oceans (decreased ocean pH).

It is thus not possible that fossil fuel combustion ('consumption') is not the primary cause of the presently observed climate change.