

To: Senate Environment and Communications Legislation Committee,  
Parliament House, Canberra

Inquiry Submission: Clean Energy Finance Corporation Amendment (Grid Reliability Fund) Bill 2020

From: David Arthur

22 September 2020

My name is David Arthur, and I would like to thank the Committee for the opportunity to make this submission to its Inquiry into the provisions of the Clean Energy Finance Corporation Amendment (Grid Reliability Fund) Bill 2020.

I am an Australian citizen who has completed degrees in Physical Chemistry and Chemical Engineering in 1983 and 1986.

It is this submission's view that an understanding of the climate task this generation has before it should guide, inform and constrain the design of relevant programmes and legislation.

While atmospheric and earth system physics was not studied in either of those degrees, my general understanding of chemical physics and of mass and energy transfers has afforded me the opportunity through my own reading and research to develop a sound lay understanding of earth's climate and its history.

This program of reading and study pertaining to climate science and earth's climate history was undertaken in response to hearing Don Aitkin's talks on ABC Radio National's "Ockam's Razor" under the title "A Challenge to Global Warming Orthodoxies" in 2008. To the extent that listening to Prof Aitkin encouraged me to inquire more deeply into climate science, I thank him; indeed, my inquiries have confirmed the veracity of the "orthodoxies" against which Aitkin's sophistries were deployed, and I have come to appreciate how even purportedly well-meaning speakers may not always be correct.

In particular, Prof Aitkin's challenges encouraged me to read about how earth's climate had slowly varied long before a clever species of ape started digging up and burning the carbon that had long been naturally geosequestered.

I read of the Cretaceous Era, when dinosaurs were the largest land animals on earth. The Southern continents Australia, South America, Africa and India were still attached to Antarctica. There were no polar icecaps, and Earth was much warmer than now, with atmospheric concentration of carbon dioxide (CO<sub>2</sub>) around 1,000 parts per million (ppm).

The long slow process of post-Cretaceous cooling has proceeded throughout the Cenozoic Era through removal of CO<sub>2</sub> from the atmosphere to ocean and solid earth through various processes such as ocean dissolution and mineralisation followed by deposition and subduction, ongoing terrestrial retention in peat beds and permafrost, and carbonation of silicate rocks.

I read of the Pleistocene Epoch which began with the earth gradually cooling from the relative warmth of the previous Pliocene Epoch about 2.6 million years ago, initiated by the formation of the Greenland ice cap when movements of earth's crust simultaneously brought Greenland was both moved closer to the North Pole and uplifted the island<sup>i ii</sup>, so that snowfall could accumulate year by year, decade by decade, century by century and so on, so that it could cool the earth by providing an elevated sunlight-reflecting ice sheet and cool the waters of the adjacent North Atlantic Ocean. By cooling the North Atlantic end of the 'global ocean conveyor belt'<sup>iii</sup>, earth's entire ocean could gradually cool slightly, sufficient to increase its capacity to dissolve carbon dioxide gas (CO<sub>2</sub>) from the atmosphere – which gradually allowed earth to undergo further cooling.

The Pleistocene Epoch progressed with gradual further cooling until ice sheets spread across the northern continents associated with major lowering of sea level. These glaciated periods were interspersed with quasi-periodical warming and sea level rise to 'interglacial' periods, with the periodicity largely determined by variations in earth's orbit about the sun; when the earth's orbit varied so that there was more summer insolation on the great boreal ice sheets they tended to melt allowing earth to warm slightly which in turn warmed ocean surface waters slightly which decreased CO<sub>2</sub> solubility in ocean surface which allowed atmospheric CO<sub>2</sub> to increase which drove further warming.

In fact the most recent geological epoch, the Holocene Epoch which commenced some 11 millennia ago was simply the most recent of these Interglacials; had the clever ape species not taken to burning fossil fuel as we have it is possible that the earth would already be slowly cooling, reverting once again to that glacial state.

In my reading I read of ice core studies, which showed that interglacial periods such as the Holocene Epoch could be characterised by the

atmospheric concentration of CO<sub>2</sub> being about 280 parts per million (ppm), and sea levels approximately similar to those of the Holocene Epoch, and that Pleistocene glacial periods had concentrations of atmospheric CO<sub>2</sub> somewhat lower than that, generally less than 250 ppm with the most recent and most severe glacial state having atmospheric CO<sub>2</sub> around 180 ppm. Sea levels during glaciated states could be as much as 140 m lower.

But all this process of gradual change has been suddenly and rapidly disturbed by the return to the atmosphere through fossil fuel burning of so much geosequestered carbon; around the start of the Industrial Revolution in 1750 the atmospheric concentration of CO<sub>2</sub> was about 280 parts per million (ppm), and approximately 2 centuries later when Charles Keeling commenced his measurements at Mauna Loa Observatory, Hawaii it had risen to 315 ppm. That was about 1959, but by now the fully human clever apes had really hit their straps and managed to double the divergence from pre-Industrial 280 ppm again in a mere 4 decades, atmospheric concentration of CO<sub>2</sub> reaching 350 ppm in about 1989.

By now, scientists were becoming concerned with the changes to our only life support system that had been set in motion, even though they did not fully understand what those changes might entail.

Three decades further on from 1989, we have not quite managed to double the divergence from pre-Industrial atmospheric concentration of CO<sub>2</sub> once more, but at 410 ppm we are starting to see the changes that we have set in motion – changes that will proceed over forthcoming centuries if we do not rapidly cease all further emissions of CO<sub>2</sub> and instead start rapid reforestation and other processes to try to draw down the excess of carbon that is presently in the atmosphere.

It is this drawing down of the excess of CO<sub>2</sub> that is already in the atmosphere that would be the genuinely useful duty to which reforestation and other processes of carbon capture and storage could be applied, not to the disingenuous subsidisation of further fossil fuel profiteering by corporate donors of this or that persuasion to the Australian political process.

Crucially, I beg the Committee to bear in mind that at the height of the Pliocene Epoch 4 million years ago<sup>iv</sup>, before ice began accumulating on northward-moving Greenland, sea levels were up to 25 metres higher than those of the Holocene Epoch, global average temperature was about 3°C higher than pre-Industrial Holocene, and atmospheric CO<sub>2</sub> concentration was about 390 to 400 ppm; concentrations which have recurred for the first time since the Pliocene Epoch since the election of the Abbott government.

Were atmospheric CO<sub>2</sub> to remain at or above its present concentration, then ice will inevitably respond by melting, with the attendant rise in sea levels will inevitably inundate the orchestra pit of the Sydney Opera House's Joan Sutherland Theatre.

We should not be surprised that we are only now starting to see worrying signs of increasing cracking of polar ice sheets, even though it's been 4 decades since atmospheric CO<sub>2</sub> passed the 'safe' upper limit of 350 ppm about 4 decades ago<sup>v</sup>; it takes that long for something as big as the earth's ice-sheets to respond to our perturbation.

It is the argument of this submission that this Parliament would be both imprudent and would be acting against the best interests of Australia were it to permit facilitation of any new fossil fuel-consuming developments.

Unlike gas-fired generation, it is noted that the prices of the energy sources for solar panels and wind turbines are not subject to the vagaries of international markets. From the perspective of maximising value obtained for taxpayers' funds, this may be a beneficial attribute.

Accordingly, it is my strong recommendation that the Grid Reliability Fund Bill 2020 be amended to exclude all facilitation of any and all use of fossil fuels.

Of course, there is also the Good News that while political leaders have been adopting this pose and that, in the real world technology has already advanced so that lowest cost power can be achieved by intermittent renewables 'firmed' with various storage technologies, and I am pleased to see that our leaders are starting to understand this. Whereas our Prime Minister declared last week that the government would fund a 1,000 MW gas-fired generator to replace Liddell Power Station when it closes in 2023, by Sunday he was sufficiently apprised of plans by AGL and others to ensure that Liddell's capacity would be replaced with firmed renewables to be able to inform ABC's Insiders program that the government may not need to take such action.

I am also pleased to see that half of the shortlisted projects under the Government's Underwriting New Generation Investment programme are pumped hydro-electric power projects, and that Genex Power's K2-Hydro 250 MW pumped hydro project is well advanced with the enabling support of the CEFC.

Again I thank the Committee for providing this opportunity to illuminate the somewhat arduous climate task this generation has bequeathed its heirs, successors and children, and how an understanding of that task informs and constrains what we can and should do about it .

Yours sincerely,

David Arthur,

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<sup>i</sup> <https://www.sciencedaily.com/releases/2015/01/150105112506.htm>, accessed 22 September 2020

<sup>ii</sup> For comparison, the first great cooling even of the Cenozoic Era occurred with the formation of the Antarctic ice cap some 34 million years ago with the opening up of the Drake Channel between the Antarctic Peninsula and Patagonia; this allowed the thermal isolation and cooling of Antarctica with the establishment of the Antarctic Circumpolar Current.

<sup>iii</sup> <https://oceanservice.noaa.gov/facts/conveyor.html>, accessed 22 September 2020

<sup>iv</sup> Dwyer & Chandler (2008), "Mid-Pliocene sea level and continental ice volume based on coupled benthic Mg/Ca palaeotemperatures and oxygen isotopes", Phil Trans Royal Soc A, <https://royalsocietypublishing.org/doi/abs/10.1098/rsta.2008.0222>

<sup>v</sup> Hansen et al, "Target Atmospheric CO<sub>2</sub>: Where Should Humanity Aim?", The Open Atmospheric Science Journal, 2008, 2, 217-231 ,

<https://benthamopen.com/contents/pdf/TOASCJ/TOASCJ-2-217.pdf>, accessed 22 September 2020