FEEDBACK TO THE MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT (MBIE) ON CCUS

By [redacted]

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Prior University positions: Pro Vice Chancellor (Innovation Campus), Dean of Science (13 Departments), Head of Chemistry Department, Chair in Physical Chemistry
Research publications on advanced materials: 300 in international peer reviewed research journals
Since retirement (2000) I have worked pro bono on communication with the NZ community on climate change and renewables, including writing about 16 articles for NZ Herald, Stuff, Listener, The Conversation, Newsroom Pro, UniNews and regular columns in Chemistry in Australia, NZ Institute of Chemistry and Local Matters papers and Radio NZ interviews. I have organised a U3A Science and Climate Group (70 members) which featured about 20 climate talks from leading NZ scientists plus about 20 talks by myself to community groups around Auckland. I intend to continue with these climate education activities during the years ahead.

Carbon capture and its cost

Carbon capture, as mentioned in the MBIE proposals documents, involves removing and capturing CO2 from industrial gas waste streams to prevent this key greenhouse gas from entering the earth's atmosphere and causing further climate warming and damaging the health of NZ citizens. This form of carbon capture is intrinsically very expensive and like any gas stream scrubbing process it becomes increasingly more expensive as the proportion of CO2 removed from the gas stream, increases. Cost is and always has been a major factor in industrial gas stream scrubbing. Avoiding forming CO2 at source by switching from carbon fuels to renewable technologies will always be a much less expensive option.

Examples: Existing alternative renewable solutions for leading NZ companies and products based on international best practice

MBIE Sectors (% of global emissions)	**Lead NZ Firms**	**Existing Fuels**	**Alternative Renewable**	**Low carbon Product**
Electricity	Meridian Energy	Hydro, Solar, Wind	As before	NZ grid 84%
Steel (7%)	NZ Steel	Coal (800kt pa)	Hydrogen: Grey to green (Sweden)	Sweden Zero Carbon Steel (in production)
Cement (3%)	Holcim	Coal and Waste	Hydrogen and Plasma (MPA, UK)	(UK) zero carbon cement (cost is low)

Quotes: The untested nature of carbon capture globally:

Nature Editorial: 13 February 2024

- Both independent and in house advisors to the EU Climate Policy stated, "that the EU Climate Policy is dangerously reliant on untested carbon-capture technology".
- "There is not a single fully operational CCS plant in Europe nor a system for governing and regulating the technology."

Guardian 6 February 2024

- But the promise of carbon capture in the future is also used by governments and oil companies to keep burning fuels that pollute the air with other toxic particles, and to allow them to cut emissions more slowly today.

The two versions of carbon capture and presumed uses for captured CO2

It is important that in analysing the CCUS feedback from climate scientists, that MBIE understands that there are two scales of carbon capture. The smaller scale version, which seems to be the one proposed by MBIE, is described in the text of the feedback above.

The much larger version is a form of geoengineering that seeks to recover historical CO2 from the atmosphere itself. This large version has attracted much controversary among climate scientists mainly because it was intended to be used to offset the carbon emissions caused by major oil companies so they can continue to trade in fossil fuels in the USA . The largest atmospheric carbon capture facility on the planet, which is located at Shute Creek, Wyoming, USA, has been recently abandoned by its big oil and gas owners, Occidental Petroleum. There now appears to be only one similar but much smaller facility operating at present, viz., Climeworks in Iceland/Switzerland which captures only 900 tonnes pa which would need to be replicated at 41 million locations worldwide to compensate for the 37 billion tonnes of CO2 emitted by humans globally each year! Early prototypes of this facility used the trapped CO2 to assist greening of horticultural crops in large greenhouses. Alternatively, if the trapped CO2 is in the form of calcium carbonates (trapped CO2 in alkali) then this end-product would be stable for long periods given that mineral carbonates are very common and stable materials in the earth's crust.
However, in conclusion, this is both an extremely expensive and uncertain method of reducing historic atmospheric CO2 levels that have accumulated since the onset of coal fuel usage around 1850, compared to simply terminating the carbon emissions at source and switching the process to renewables.

2024: The First Decline in Global Carbon Emission since 1870

A final important update: It appears very likely that 2024 will be the first year that carbon emissions have decreased significantly (aside from COVID lockdowns) since 1850. This is the result of USA emissions peaking about 2005 and China's emissions peaking this

year. Chjna's global leadership in renewables has been a key factor in this important development.

2024 References:

Economist Leaders Editorial (last week, July 2024) *The Age of Solar*
Newsroom Pro article, by Ralph Cooney (12/07/2024) *Here comes the Sun.*.
The Sydney Morning Herald, by Nick O'Malley, July 13, 2024. *It's good news*..