Senate Standing Committee on Economics
ANSWERS TO QUESTIONS ON NOTICE
Innovation, Industry, Science and Research Portfolio
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AGENCY/DEPARTMENT: CHIEF SCIENTIST FOR AUSTRALIA

TOPIC: Carbon Emissions

REFERENCE: Question on Notice (Hansard 21 October 2009, E34 -35)

QUESTION No.: SI-26

Senator JOYCE—As Chief Scientist for Australia and at the top of your role I am going to ask you a clear question because it is at the front of the economic debate at the moment and at the front of the scientific debate. Will a five per cent reduction in Australia's carbon emissions by itself affect the temperature of the globe or change the temperature of the globe?
Prof. Sackett—To reiterate your question, you are asking whether a five per cent reduction in Australia's emissions will affect the temperature of the globe. It certainly will; the question is by how much.
Senator JOYCE—By how much?
Prof. Sackett—I do not have that answer in front of me now, but we know—
Senator JOYCE—Will it be noticeable?
Prof. Sackett—I would have to take on notice the degree to which the temperature could be measured. It is important to note, though, that whatever the change is, it would be the change that is recorded over a long period of time. I just make clear that we are not talking about year-to-year fluctuations; we are not talking about the effects of El Nino and so forth. So it is a matter of degree.
Senator JOYCE—Is the degree we are talking about so infinitesimally small that it is verging on totally irrelevant?
Prof. Sackett—I think irrelevant—or what society thinks is relevant—is actually a question that falls outside science. We know that recommendations have been made, for example, by the IPCC about the total amount of global emissions, the reductions that are required to reach an equilibrium increase in temperature of a certain amount.
Senator JOYCE- I keep on hearing about global emissions. **…….**
Prof. Sackett – Again, I would want to take that on notice to give you a better estimate on anything numeric. I would like to do that. But what I think you would hear scientists say is that in fact this is a global problem, and that means that it needs players across the globe. Australia would not be an exception.

ANSWER
In a hypothetical situation in which Australia reduced its emissions by five per cent of, say, current emissions while the rest of global emissions trajectories continued, the degree to which this hypothetical action would affect global temperatures would depend on a number of factors, including climate inertia, the length of time the reductions were undertaken, and the timeframe (decades, centuries, etc) and area (e.g. a particular part of Australia, ocean temperatures, global air temperatures, etc) over which one seeks to quantify the impact. Furthermore, because feedback in the Earth's system means that the relationship between emissions and temperature change depends

on the state of the Earth (including the temperature of its various constituents)[1], it would be necessary to know, or assume, the progression of the rest of global emissions.

Reductions in emissions may take decades to be felt as temperature differences, due to climate inertia from historic emissions. Temperature will continue to rise until late in the century or perhaps to early next century due to the large thermal inertia in the ocean and the continuing rise in atmospheric greenhouse gas concentrations by the bulk of the world's nations.

It is also important to note that the impact of a hypothetical five per cent reduction in Australia's emissions would be subject to the same sort of regional and temporal variability to which the impact of all emissions are subject[2]. In sum, the specific question posed is complex and provision of a definitive numerical response is not a simple matter. Considerable resources are required in the form of expertise and modelling capability to address this precise question, which are not within the capacity of the Office of the Chief Scientist.

Based on previous work[3], and the fraction (1-2 per cent[4]) of total emissions attributable to Australia, it is likely that a hypothetical five per cent decrease in Australian emissions *alone* would result in a quite small global temperature difference over the next several decades. At the same time, it is important to note that a five per cent *global* emissions mitigation scenario for the near term would help to avoid dangerous climate change by beginning the path required to have a fair chance of limiting average global air temperatures to a change of 2 degrees. This path requires global emissions to begin to decrease in less than about five years[5].

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[1] Randall, D.A., R.A. Wood, S. Bony, R. Colman, T. Fichefet, J. Fyfe, V. Kattsov, A. Pitman, J. Shukla, J. Srinivasan, R.J. Stouffer, A. Sumi and K.E. Taylor, 2007: Climate Models and Their Evaluation. In*: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[2] *Climate Change in Australia, Technical Report 2007,* CSIRO, and references therein.

[3] *Climate Change 2007,* Fourth Assessment Report of the Intergovernmental Panel on Climate Change

[4] Climate Analysis Indicators Tool (CAIT) Version 6.0, World Resources Institute, 2009, http://cait.wri.org

[5] Climate Change: Global Risks, Challenges and Decisions, Synthesis Report, International Alliance of Research Universities, 2009, Table 1.