Submission to the

Commonwealth Joint Standing Committee on Treaties

Inquiry into The Kyoto Protocol

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The retraction of the US Administration from the Kyoto Protocol and subsequent affect on negotiations.

The Kyoto Protocol is a process with three underlying and defining elements. One is that it is a global process, two is that there are differential responsibilities among those who produce emissions and can afford to control them, and the third thing is avoiding unnecessary expense – which is what the flexibility mechanisms in Kyoto are about. These mechanisms contribute to developing efficient methods and actions to reduce emissions. Cost-effectiveness is exactly what any business, Government or individual seeks to implement. It makes sense to find those initial options that are lower cost, even if they are, perhaps, in other countries. Ethics is about *who pays for the emissions reductions*, not whether you have cut emissions in your own back yard by prematurely retiring capital stock, and therefore having a higher price to achieve the same emissions reductions goal – this is a concept that is not always well understood.

The three principles will exist regardless of whether we call the process Kyoto, daughter of Kyoto, or the name of the next city where something is signed. The Kyoto process will remain and we will be negotiating the same things we have been negotiating to date – and those three principles will remain.

Kyoto, the process, is clearly not dead regardless of what President Bush said. In my view Bush was paying a campaign contribution debt to the fossil fuel industry for which the Vice-President has been a CEO of a company. There is clearly a strong division within Bush's Cabinet and the advisers who pushed the "Kyoto is dead" line substantially underestimated both world and domestic reaction. They clearly did not do their homework on what is in the interests of the US industry, the clout of the US environmentalists and the negative reactions from the media to the Administration's summary dismissal of Kyoto with nothing to be proposed in its place. It will not be long, I think, before the US will be back negotiating the process—although I don't expect as much serious concern about climate issues from this administration as the Clinton-Gore team. I also think we'll get some tired clichés about scientific uncertainty, despite the increasingly strong messages from the IPCC and, more recently, a ringing endorsement of the IPCC Reports by the US National Academy of Sciences.

The development of the IPCC findings.

The Intergovernmental Panel on Climate Change (IPCC) assesses available scientific and technical information on climate change, the environmental and socioeconomic impacts of climate change, and response options. The Third Assessment Report (TAR) is due for release mid-2001, and the draft report has recently undergone government review.

Three Working Groups assist the IPCC in preparing the TAR:

- Working Group I assesses the science of climate change;
- Working Group II assesses the sensitivity, adaptability and vulnerability of physical, ecological and social systems to climate change; and
- Working Group III assesses options for mitigating climate change.

There are three main classes of IPCC materials:

- IPCC reports (Assessment, Synthesis and Special Reports and their Summary for Policy Makers);
- Technical Papers;
- Supporting Material

The different classes of material are subject to different levels of endorsement or acceptance. Generally, there is expert review of IPCC reports, followed by government/expert review of IPCC Reports and government review of the Summaries and Synthesis Reports. Generally, there are four separate stages of review and for the TAR, this occurred between mid 1999 and early 2001 — except for the Synthesis Report, which is in final government review in the middle of 2001.

All written expert and government comments are made available to reviewers and retained in an open archive for at least five years on completion of the report.

Acceptance of IPCC Reports is conducted at a session of the appropriate Working Group, after expert/government review. During a session of a Working Group, 'acceptance' of a report signifies that the report presents a comprehensive, objective and balanced view. The content of the authored chapters is the responsibility of the Lead Authors, subject to Working Group acceptance. Acceptance of a Report is always clearly stated at the beginning of that report. The Summary for Policy Makers Reports are reviewed in conjunction with the main reports (scientific, technical, socio-economic reports) with a final line by line review at a Plenary session of the Working Group. The review process is extremely comprehensive—even if tedious at times.

For example, the draft Working Group reports were circulated for expert and government review from May to July 2000. Australia's input for Working Group I was coordinated by the Bureau of Meteorology and the Australian Greenhouse Office coordinated input related to Working Groups II and III.

The revised Summary for Policy Makers and Technical Summary were circulated for comment in late October (WG I) and early November (WG II and III). The Australian Greenhouse Office and Bureau of Meteorology coordinated Australia's response on the draft summaries. Similarly in the US, federal agencies like EPA or the National Atmospheric and Oceanic Administration coordinated the US response.

The final Summary for Policy Makers for the three Working Group reports were finalised and involved a number of experts as follows:

- Working Group I – January 2001, Shanghai

The report was compiled between July 1998 and January 2001. The Report was compiled by 122 Lead Authors. In addition, 515 Contributing Authors submitted draft text and information to the Lead Authors. The draft report was circulated for review by experts, with 420 reviewers submitting suggestions for improvement. This was followed by review by governments and experts including several hundred additional reviewers. All comments were analysed and assimilated into a revised document and this was considered at the Shanghai session. In the TAR a new feature was added: Review Editors whose job was to assure the governments and the IPCC Bureau that all significant reviewers comments were fairly dealt with by the Lead Authors in the final revision. Their supervision of the redrafting process helped to insure that the final versions were more reflective of community consensus than previous reports. The Summary for Policy Makers was approved in detail and the underlying report accepted.

A similar process was endorsed for Working Group II and III reports, which were approved in February 2001, Geneva and March 2001, Accra, respectively.

May hundreds of scientific and other experts have been involved in the development of the latest IPCC findings. Overall, this has involved over 60 Australian scientific experts as either lead authors (over 120 lead authors altogether) contributing authors or review editors and about 99 government delegations at any one stage.

Please respond to critics who claim that IPCC assessments of warming are exaggerated.

The 2001 assessment of climate change enhances and updates but also assesses new information and research since 1996. All parts of the climate system have been analysed concluding that the information now gives a collective picture of global warming.

There is now stronger evidence of the degree of human impact on global climate. There is also increased confidence in the description of past changes of climate and in the capability of climate models to project future climate trends for a range of emission scenarios for the twenty first century.

With regard to IPCC assessments of warming, this includes observed warming as well as projected warming.

Key conclusions from the TAR with regard to **observed warming are**:

- The global average surface temperature has increased over the 20th century by about 0.6°C. This value is about 0.15°C larger than that estimated by the

Second Assessment Report (SAR) for the period up to 1994. The increase in value is a result of the relatively high temperatures of the years 1995 to 2000 and improved methods of processing the data since the SAR.
- The historic records show a great deal of variability during the 20th century and this is particularly obvious during 1910-1945 and 1976-2000.
- From the observed record, it is very likely that the 1990s were the warmest decade and 1998 the warmest year since 1861 – and this contributes to the increased estimates from the TAR.

It is important to note that not all areas of the globe have warmed over the past few decades and these include parts of the Southern Hemisphere oceans and parts of Antarctica.

Key conclusions from the TAR with regard to **projected warming are**:
- The globally averaged surface temperature is projected to increase by 1.4°C to 5.8°C over the period 1990 to 2100.
- The higher temperature projections and wider range of values are due primarily to the lower projected sulphur dioxide emissions in the SRES scenarios.
- The results are based on the full range of 35 SRES scenarios that are complemented by climate models. The full range of scenarios explore a variety of assumptions with regard to socio-economic, population, energy sources and development arrangements. However, no probabilities were assigned to either the SRES scenarios or climate model estimates, so the likelihood of any specific climatic warming within the projected range is not yet assessed by IPCC.

Complex physically based climate models are required to provide detailed estimates. However, such models cannot yet simulate with much confidence all aspects of climate such as surface-trophosphere temperature differences since 1979, and interactions of clouds with radiation and aerosols. Regardless of the remaining uncertainties, confidence in the models has significantly improved as a result of their demonstrated performance in simulating features of the 20th century climate, tests that increase our confidence that they can provide useful projections of future climate across a range of space and time scales. This includes the following improvements:

- The understanding of climate processes and incorporation in climate models of such processes has improved;
- Simulated model runs of natural and anthropogenic forcings are able to reproduce observed changes in climate with a high degree of consistency;
- Some recent models are able to satisfactorily simulate the current climate without the need for artificial adjustments or “tuning”;
- Significant aspects of model simulations have improved and include ENSO, monsoons and periods of past climate.

In summary, because there is a greater range of projections for global surface temperatures, communicating the reasons for the range is critical. As already mentioned, there have been significant advances in knowledge since the 1996 SAR including advances in scenario construction (the reduction in sulphate emissions, for example) and in many aspects of the complex climate system as well as advances in the modelling techniques applied. The wider range of temperature increase provides a more realistic view of the uncertainties surrounding estimates of 'globally averaged' surface temperature increase, which is subject to the varying regional differences between regions of the globe as well as those areas where gaps in information and understanding remain. However, as noted, the likelihood of any particular warming level within the 1.4 to 5.8 degree C 2100 estimated warming range is not yet assessed by IPCC.

As part of a strategic communication of greenhouse science, the Australian Greenhouse Office, in conjunction with CSIRO sponsored my visit earlier this year to Australia. My key task was a great honour for me: to present the Priestly Lecture for CSIRO. In addition, I presented several seminars to both staff and other key stakeholders for both the AGO and CSIRO, as well as meetings with offices and Ministers in State governments interested in climate change issues (in particular, in New South Wales and Western Australia and Victoria).

Communicating the science of the enhanced greenhouse effect is critical and too often it is in response to attacks on greenhouse science, queries on the value of reducing greenhouse gas emissions and assertions regarding the operation and role of the Intergovernmental Panel on Climate Change. Communicating the science for 2000 and 2001 is timely in the lead up to release of the IPCC's Third Assessment Report.

The 'Subjective Probability Assessment' table.

Decision analysts from Carnegie Mellon University asked 16 climate experts in the US to assess their subjective confidence in the all important "climate sensitivity" factor: that is, the amount of warming that would eventually be experienced after transient adjustments if CO_2 were to double and be held fixed at that level. This is a benchmark against which all climate models must be tested. 15 of the 16 scientists who participated in the survey offered a wide range of subjective probabilities for climate sensitivity, typically bracketing the 1.5 to 4.5 degrees C warming assessed by IPCC in the FAR, SAR and TAR for this climate sensitivity factor. However, one scientist was radically different: scientist 5 on Figure 1, who estimated about a factor of ten lower sensitivity than the other 16. What I found surprising in this estimate, which was the response of Richard Lindzen of MIT, was not that he assigned some probability for negligible change—around a few tenths of a degree warming. After all, most of the rest of us did that as well, including myself—I am scientist 9 on Figure 1. What is surprising—even shocking—is that Lindzen assigned *no chance* for warming beyond 1 degree C, a clear radical departure from the normal uncertainty range expressed by the vast bulk of knowledgeable climate scientists. Although his peers were sufficiently concerned about uncertainties to include some chance for both mild and catastrophic outcomes, only Dick Lindzen assigned no chance for serious warming. Ironically, despite the many uncertainties that Lindzen himself likes to point out, he still assigned only a narrow range of possibilities (a few tenths of a degree warming from a doubling of CO_2)—in my view a clear absurdity given the many remaining uncertainties that led all other interviewed climate scientists to offer a broad range of possibilities as a recognition of the still many remaining uncertainties.

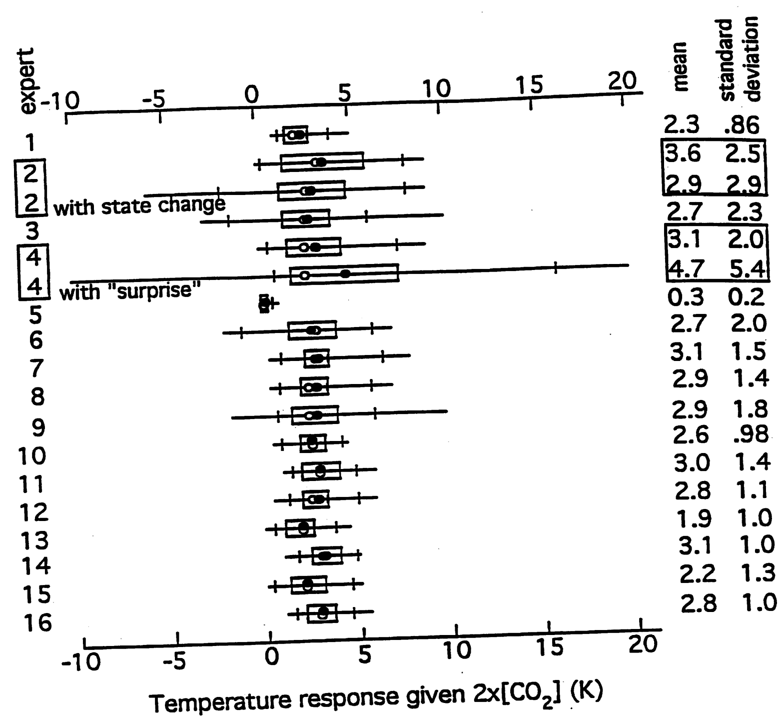

Figure 1. Climate Sensitivity under $2xCO_2$ forcing, °K. Box plots of probability distributions (elicited from 16 climate scientists) of the change in global average surface temperature resulting from a doubling of CO_2. The horizontal lines denote the range from minimum (1st percentile) to maximum (99^{th} percentile) assessed possible values. Vertical marks indicate the locations of the lower 5th and upper 95th percentiles. The boxes indicate the interval spanned by the 50% confidence interval. The solid dots indicate the mean and open dots, the median. Source: Morgan and Keith, 1995.

An adaptive infrared iris cools the Earth: Theory of Prof. Richard Lindzen.

The 'adaptive infared iris' theory that has been promoted by Professor Lindzen and a few others, is apparently linked to the idea that the heat generated from the warming of one small region in the Pacific ocean is released into Space through a high cloud related 'iris effect'. Lindzen then extrapolates this data from a short period in a very small region to the entire globe – therefore reducing the projected climate change warming to a low number consistent with his very low estimate seen in Figure 1 (which he estimated several years before the "iris effect" was offered).

This theory is based on a year or two of data and a study of one tropical region. A comprehensive coverage of all tropical oceans has not yet been considered and the results of the study to date have not yet been confirmed. Even if the mechanism were to prove to be valid locally, the extent to which it would influence planetary scale climate sensitivity is completely speculative. I think any such effect would very likely be considerably reduced by such an averaging process.

Summary

The agreed findings from the IPCC, and in particular Working Group I, indicate that temperatures have risen during the past four decades in the lowest 8 kilometres of the atmosphere. Observed information includes:

- Since the late 1950s (the period of substantial observations from weather balloons) the overall global temperature increases in the lower 8 kilometres of the atmosphere and in surface temperature have been similar at 0.1°C per decade; and the temperature trend of the lower atmosphere and at the surface are in good agreement over this 4 decade period;
- Since the start of the satellite record in 1979, satellite and weather balloon measurements show a warming in the lower atmosphere at a rate of approximately 0.05 ±0.10°C per decade, less than the surface warming;
- During the period 1958 to 1978 surface temperature trends were near zero while trends for the lower atmosphere were near 0.2°C per decade;
- The difference occurs primarily over the tropical and sub-tropical regions;
- In the upper trophosphere no significant global temperature trends have been detected since the early 1960s;
- The lower atmosphere and Earth's surface is directly affected by volcanic eruptions, ozone depletion, aerosols, and El Nino – it is therefore plausible to expect differences in temperature trends over a short period of time (e.g 20 years). Nevertheless, considerable effort is being expended to determine if this is a problem in atmospheric or surface measurements or rather a reflection of a lack of understanding of the connections between surface and overlying atmospheric temperature trends.

Further to this, the IPCC has concluded that the stratosphere (the region above the trophoshere, and approximately 10-50km in altitude) has cooled—precisely as expected from both ozone depletion and greenhouse gas increases.

The IPCC acknowledges that complex physically-based climate models are required to provide detailed estimates, and that many uncertainties remain in these model estimates. Despite the success the models exhibit in simulating the observed cooling after volcanic eruptions or the changes to the hydrological cycle in strong El Nino events, such models cannot yet simulate confidently all aspects of climate such as surface-trophosphere temperature differences since 1979, and interactions of clouds with radiation and aerosols. Regardless, confidence in the models has significantly improved as a result of their demonstrated performance on a variety of observations, and thus they continue to provide useful projections of future climate across a range of space and time scales.