Notes for oral submission on
Climate Change (Emissions Trading and Renewable Preference) Bill

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Dangerous manmade global warming—sometimes referred to euphemistically as "climate change"—is in practice an assortment of forecasts. The principal of these is a conditional forecast that temperatures will increase substantially over coming decades if human emissions of the odorless and life-promoting gas carbon dioxide are not dramatically curtailed.

Other forecasts are that dramatic weather and diseases will increase, sea levels will rise, and food production will suffer as a consequence of increased temperatures. Still further forecasts are that proposed policies will be effective in reducing human emissions of CO_2 and that the cost of that reduction will be much less than the benefit of having done so.

These are heroic forecasts. They are also important because they imply a very costly course of action is needed.

Should we believe them?

One way to decide whether to believe them is how believable they seem. Research on persuasion shows that repetition, vivid imagery, and detailed scenarios are very effective. We have all seen these methods used to sell forecasts of dangerous global warming, I'm sure.

Another way to decide would be to submit to authority, and the United Nations' Intergovernmental Panel on Climate Change and the senior people associated with it certainly convey a sense of authority.

A third way would be to assess whether the procedures used to derive this dramatic assortment of forecasts were scientific. In other words, whether there is any empirical evidence that the procedures could be expected to produce valid forecasts. It is this third way that I chose to pursue.

In doing this—assessing whether the forecasting procedures were scientific—I was in a very fortunate position, firstly because scientific research on forecasting has been conveniently summarized in the form of principles or guidelines. Here is an example of a principle…

> *Be conservative in situations of high uncertainty or instability (Principle 7.3)*
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> Forecasts should be conservative when a situation is unstable, complex or uncertain. Being conservative means moving forecasts towards "no change" or, in cases that exhibit a well established long-term trend and where there is no reason to expect the trend to change, being conservative means moving forecasts toward the trend line. A long-term trend is one that has been evident over a period that is *much longer* than the period being forecast. Conservatism is a fundamental principle in forecasting.

These principles are the distillation of more than half-a-century of scientific research on forecasting in many fields including demography, economics, engineering, finance, management, medicine, psychology, politics, and weather in order to ensure that all relevant evidence was taken into account and so that the principles would apply to all types of forecasting problem. The work of summarizing the research was done by 39 authors and 123 reviewers for Professor Scott Armstrong's 2001 handbook, *Principles of Forecasting*. The principles are also available on the internet at forecastingprinciples.com.

Some important principles are counter-intuitive. As a consequence, it is reasonable that decision makers and the public should expect people who make forecasts to be familiar with the principles of forecasting just as a patient expects his physician to be familiar with the procedures dictated by medical science.

Secondly, I was very fortunate in being able to collaborate with Scott Armstrong on this project. Scott Armstrong is the most cited author on the topic of forecasting, full-stop.

You've heard submissions from scientists who have described the current understanding about climate change. Perhaps the major problem is that in such a complex and uncertain situation the forecasts are based on unaided expert judgment. By unaided, I mean unaided by evidence-based forecasting procedures.

Experts' forecasts of climate changes have long been newsworthy… and a cause of worry for people. Here are some headlines from the New York Times:

Sept. 18, **1924:** MacMillan Reports Signs of New Ice Age

March 27, **1933:** America in Longest Warm Spell Since 1776

May 21, **1974:** Scientists Ponder Why World's Climate is Changing: A Major Cooling Widely Considered to be Inevitable

Dec. 27, **2005:** Past Hot Times Hold Few Reasons to Relax About New Warming

Phil Tetlock conducted an excellent study of expert predictions about matters of economics and global politics over a 20 year period. His book about the research is titled "Expert Political Judgment". He found that his top experts were no better than chance in picking what would happen.

Well, what about the computer models? They are *not* scientific forecasting methods; they only reflect what the modelers think might happen, much like a Hollywood disaster movie. Here is what one of the IPCC lead authors, Kevin Trenberth, wrote:

> '…there are no predictions by IPCC at all. And there never have been. The IPCC instead proffers "what if" projections of future climate…'
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> (Written by Kevin Trenberth of the Climate Analysis Section, National Center for Atmospheric Research, and posted on ClimateFeedback at nature.com on June 4, 2007.)

While I agree with this comment by Professor Trenberth, other IPCC authors and the general public appear to believe that the IPCC *does* provide forecasts. What we did, then, was to independently assess the procedures used to derive the IPCC's long-term global temperature "forecasts"—the linchpin forecasts for dangerous manmade global warming—against the scientific evidence on what methods were appropriate for the task.

The first thing we found was that the IPCC authors seemed to be completely unaware of scientific research on the subject of forecasting. Among the many articles that were cited by the authors, none had any relevance to the scientific testing of forecasting methods.

When we conducted our audit, we found that the IPCC's Fourth Assessment Report provided sufficient information for us to make judgments on whether their procedures followed forecasting principles for just 89 out of 140 principles. Of the 89 principles, the IPCC procedures violated 81% or 72 principles.

Some individual principles that were violated are so important that violation of any one of them alone invalidates the IPCC's forecasts.

One of the key principles that was violated was:

> *Keep forecasting methods simple (Principle 7.1)*
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> The IPCC climate forecasters appear to believe that complex models are necessary for forecasting climate and that forecast accuracy will increase with model complexity. That isn't the case. Complex methods involve large numbers of variables, complex interactions, and relationships that employ nonlinear parameters. Complex forecasting methods are only accurate when there is great certainty about relationships now and in the future, where the data are subject to little error, and where the causal variables can be accurately forecast. These conditions do not apply to climate forecasting, and thus simple methods are recommended.

In conclusion, forecasts of dangerous manmade global warming are *not* valid and there is currently no more reason to believe that temperatures will increase over the coming century than there is to believe they will decrease.

Our paper on climate change forecasting is available on http://publicpolicyforecasting.com.

The cost of taking action on the basis of invalid forecasts is so high in this situation, that there is no good reason why efforts to forecast climate should not follow *all* relevant principles.

That is the standard that I believe policy makers and voters should expect.