

**2010 INTERNATIONAL CONFERENCE ON CLIMATE CHANGE
(May 16–18)**

CLIMATE CHANGE, ENERGY, AND NATIONAL SECURITY

Gerald E. Marsh

In trying to decide on the subject of this talk, I thought about giving a technical paper, but decided against it since most of you probably know much of what I would say and in any case my papers are available on the preprint arXiv or on my website gemarsh.com. So instead I decided to talk about a more puzzling aspect of the global warming debate: given the very large uncertainties in climate science, how is it that perfectly intelligent people, even those with the relevant background, could support the idea of a climate Armageddon?

What I would like to do in this talk is convince you that the issue of climate change is not simply one of proving who is right in what has become a very heated debate. Nor is it just about the IPCC being alarmist in its summaries. To understand the positions taken by many individuals and governments it is necessary to look at the issue in a broader context.

Here is what we agree on: most of us know that the greater part of carbon dioxide put into the atmosphere by human activities, something like 80%, was added after 1940. Since that time we might agree that global temperature decreased slightly from 1950 to about 1970 despite increasing carbon dioxide concentrations, and increased somewhat from 1970 to 1998. Since then the rise in global temperature has stalled.

While we might also believe, to use the IPCC phrase, that this temperature history “is likely”, we would be hard pressed to prove it by the quality of the data available. Not only is there no consistent temperature data over the last century or so, there is also a real question as to whether there even exists a physically meaningful concept of the earth’s

global temperature in the context of global warming. The earth is not in thermodynamic equilibrium, and an average of temperature data sampled from different parts of a non-equilibrium system cannot be said to be the temperature of the system as a whole. Nonetheless, I will use this questionable concept for the purpose of discussion.

To compound this uncertainty, it was already known in 1996 that almost all the cooling in the northwest Atlantic and the warming across Europe and Eurasia since the mid-1970s resulted from changes in the North Atlantic Oscillation not carbon dioxide.¹ But in terms of current and future policy decisions perhaps the most important uncertainty is that which is inherent in the climate models used by the IPCC. Inter-model variability of future climate predictions can exceed 10 °C at high latitudes.² Moreover, the predicted change in both mid- and high-latitudes is less than the modeling errors!

There is no disagreement that carbon dioxide is a greenhouse gas, albeit a minor one. But there *is* a disagreement over the value of the parameter used to determine forcing at the tropopause due to an increase in carbon dioxide concentration. Many believe the value used by the IPCC is too large. And if this is the case, there is no reason to think that the small warming since the mid-1970s is anthropogenic in origin.

This is reinforced by the fact that we really don't understand interglacial climates. Maximum interglacial temperatures in Antarctica over the past 340 thousand years are now believed to have been some 6-to-10 °C above present values.³ Atmospheric carbon dioxide concentrations during past inter-glacials were comparable to today and in any case could not have been responsible for this difference since the concentrations needed would be far too high.

¹ James W. Hurrell, "Influence of variations in extratropical wintertime teleconnections on Northern Hemisphere temperature", *Geophys. Res. Lett.* **23**, 665-668 (1996).

² P. J. Valdes, "Warm climate forcing mechanisms": B. T. Huber, K. G. Macleod, and S. L. Wing, *Warm Climates in Earth History* (Cambridge Univ. Press, Cambridge 2000), Ch. 1.

³ L. C. Sime, et al., "Evidence for warmer interglacials in East Antarctic ice cores", *Nature* **462**, 342-345 (2009).

All this tells us two things: first, that much, if not all of the warming during the late 20th century was most likely a result of natural rather than anthropogenic causes; and second, model projections are not a sound basis for formulating public policy.

What then is driving the Global Warming Juggernaut? There are many reasons one may point to that motivate environmentalists, other special interests, and the population as a whole, but none provide a satisfactory answer for the complicity of governments. The US government in particular includes many people who are aware of the uncertainties involved in climate science and its predictive powers.

If the US government were primarily concerned with carbon dioxide emissions, it would not be pursuing technologies like solar and wind. They are fully aware of the prediction by the International Energy Agency that says that all alternative sources of energy will contribute no more than 2% to the world's energy-supply by 2030 or 2040. They also know that over 40% of US emissions of carbon dioxide come from the burning of fossil fuels for electricity generation. Rationally, one would formulate policy to eliminate the largest single source of carbon dioxide emissions before going after the smaller sources. If the government were serious about lowering carbon dioxide emissions they would create significant incentives to replace power plants that burn fossil fuels with nuclear. After all, nuclear plants emit no carbon dioxide and the technology is mature. Moreover, they do not emit the real pollutants that cause tens of thousands of premature deaths each year.

For decades France has obtained almost all of its electricity from nuclear plants. In the US, the principle impediment to constructing such plants is an irrational regulatory process that greatly increases cost. The so-called "waste" problem is a political problem not a technical one. The waste can be "burned" in fast-spectrum reactors—also a mature technology—thereby using about 99% of the energy in the original uranium, rather than the roughly 5% gotten today. Following this path means that nuclear power would become an inexhaustible source of electricity. The radioactivity of the less than 1% of real waste composed of fission products would fall below that of the original ore in less

than 500 years. Yucca Mountain could accommodate the quantity of real waste for the indefinite future.

So if carbon dioxide emissions are not the real concern, what is? The answer lies in the national security area and in particular with the necessity for guaranteeing the supply of cheap oil. The use of oil is widespread in industry and will be irreplaceable in the transportation sector for decades. In 2007 the IEA predicted the oil fields that the U.S. and Europe depend upon will peak in the next five to seven years—and this includes those of Russia, the U.S., Mexico and Norway. It is also estimated that world energy demand will increase by fifty percent by 2030. To meet this demand, the Organization of the Petroleum Exporting Countries, where most of the world's remaining readily accessible oil is found, will have to almost double its production. Most of that increase will have to come from Saudi Arabia, Iran and Iraq. Saudi Arabia alone is expected to account for a third. And that is at the root of the problem.

There is plenty of oil, perhaps as much as the 7200 billion barrels estimated by ExxonMobil. But international economic realities, not under the control of any one government, mandate that cheaper oil will be used before investments are made to bring more expensive reserves to market. Nor can alternative sources of oil begin production immediately if they are needed—there is a ramp up period of years. And if the phasing in of such reserves doesn't match the decline of current oilfields, rising prices and conflict over resources are inevitable.

In thinking about oil, it would also help if the real price of oil were used rather than the subsidized one. The real price includes the vast sums being poured into the Gulf region both directly and in the form of military deployments needed to guarantee the free flow of oil from this unstable and politically difficult region. The necessity of maintaining this supply is not only extremely costly, it also puts enormous constraints on the diplomacy of not only the US, but also Europe and Japan. When one talks about the national security interests of these and many other countries in the Gulf area, one is talking about oil.

Because it does not take a great deal of oil to impact prices on the margin, introducing hybrids and other efficiency measures can buy some time by decreasing demand. Increasing the supply of domestic oil would also help, and this is undoubtedly the reason for the recent Obama administration's proposal to open large expanses along the Atlantic coastline, the eastern Gulf of Mexico and the north coast of Alaska to oil and natural gas drilling. Opening up these areas would extend the lifetime of US reserves of conventional oil and that could affect the price on the margin, buying some additional time. Pursuing climate change legislation designed to curb carbon dioxide emissions is probably a political tradeoff, one that the administration may believe would also increase efficiency. Unfortunately, the recent drilling problems in the Gulf of Mexico probably preclude opening up additional offshore areas to drilling for some time.

Energy policy in the US has been an oxymoron for quite some time, and its lack has had a serious impact on US international and economic relations. We, as well as much of the rest of the world, are literally being held over the barrel! During the last decade or so this situation has become an increasingly difficult problem, but even so, one might ask if it justifies misleading the public by exaggerating the threat of possible global warming: I say exaggerating because at our current level of understanding, if there has been warming, it would seem to be well within natural variations since the last ice age.

Of course, the question is unfair. There has never been an explicit policy decision to mislead the public on this issue, and certainly not by any recent US administrations. The problem is a very deep one that has to do with the way science is presented to the increasingly poorly educated public, particularly by the media. Al Gore's exceptionally well-done film *An Inconvenient Truth*, with all of its factual deficiencies, has had an enormous impact throughout the world, and especially on those with environmental concerns. While the film induces fear in the viewer—and this is fundamental to its effectiveness—in the end it gives the public a positive message of hope by convincing them that they are in control of their future. The only other example of a film that comes to mind that had such a wide effect on public perceptions is Jane Fonda's *The China Syndrome*. But she, unlike Gore, failed to get the message across: the film was intended

to trash large corporations and their amoral behavior, not nuclear power, although the nuclear issue was used as a scare tactic. The key point is that these films were intended to raise public opposition and give the positive message that the future is in the hands of the body politic.

Telling the public that the claims of the IPCC and its supporters are wrong may be correct and necessary, but it is also ineffective unless coupled with a positive message and a vision for the future. After all, the public as a whole does not have the background or confidence needed to decide which side of the debate is correct.

What would be far more effective is to continue the process of informing the public about the large uncertainties in climate science, but also to offer insurance in the form of an energy policy that would substantially reduce carbon dioxide emissions by phasing in nuclear power for electricity generation. This would allay public fears of a climate catastrophe and have the added benefit of eliminating the real pollution emitted by burning coal. The public must also come to realize that despite the hype, not only would wind-turbines and solar cells be unable to substitute for fossil fuels in producing base-load electricity, they do not even address the problem of the transportation sector. In time, fuels produced by biologically engineered organisms, as opposed to crop-based fuels that compete with food production, may be able to produce significant amounts of liquid fuels, but that remains to be shown.

So while many in the general public may believe there *is* a danger from global warming due to alarmist IPCC reports and the media's presentation of the issue, others buy into the idea of a global warming crisis for reasons having little to do with a fear of a climate catastrophe. I have often heard the comment that whatever the truth may be, the world is being driven in the right direction. We must increase efficiency and reduce dependence on oil imports. Those who believe carbon dioxide is responsible for whatever recent warming has occurred see climate policy and energy policy as inextricably linked. And since getting a coherent energy policy in much of the world is unachievable, climate policy is used to drive energy policy. Thank you.