Inconvenient Truths and Answers: Nuclear Energy and Climate Change

Romney B Duffey, September, 2006

Inconvenient Facts

"We are witnessing an unprecedented collision between our civilization and the Earth".

This is just one of the bleak attention grabbing statements in Al Gore's book "An Inconvenient Truth". A masterful compendium of the negative impacts, trends and predictions due to climate change that could change the world, I bought a copy following a number of recommendations and admonitions that I had not read it, nor seen the companion movie. The spectacular photos and the latest data from the world's leading technical experts illustrate the adverse trends we are seeing in greenhouse gases, ice melting, species extinction, temperatures, sea levels, hurricanes and deforestation.

Mr. Gore then straightforwardly spins into a story that at least might have swung a few voters in Florida. It is an excellent, already well-known and simple story line: clearly climate change is here; man is responsible; and we must reduce global emissions and energy use. The evidence and the data are now becoming pretty clear: something is amiss with the atmosphere, and we humans are the likely suspects. With its glossy pictures and trendy graphs, his audience is the US public's coffee time; and with the Grade 8 grammar and style, takes aim at the US media and classrooms. He and others (often self-styled "environmentalists ") encourage North Americans, like you and me, to follow the usual mantra: to conserve energy, insulate homes, go green and change our driving habits. Clearly they have little time for the nay Sayers, climate change skeptics, Big Oil, current lifestyles and opposing political views.

I like this unabashed and in-your-face approach, and you can actually read it all in about ten minutes. But on the rapid rush to conclusion, Gore and the others spinning the same ideas address the Inconvenient Truth then omit key technical, and perhaps politically Inconvenient Facts. He is not alone in being carefully selective, not only in how to present the causes but also in how to solve the problem. There are technological solutions that exist now, today, to reduce emissions, relieve the pressure on oil and gas, and provide sustainable supplies of unlimited energy. There are also big problems with the proposed solutions. It is apparently just plain inconvenient to even mention them.

Now I am also unabashed as a technologist. Over the last two hundred years we have changed the world already, largely for the good of civilization, so maybe we scientists and experts should also address and solve the bad things too. Surely, carbon dioxide emissions have been and are huge, but this Global Bonfire that we dance around has fueled the Industrial Revolution, turning us from farmers into factory and office workers, sent men to the Moon, made computers, given us MRIs , X rays and cancer treatments, plus provided the fuel for cars, planes and ships that glue it all together. Some Nations have got rich as a result, some people have made fortunes, and now the rest of the world really wants to do the same. Who can blame them? Why stop them? It is OK for us, the

"haves", to pontificate about what the fortunate must abandon: the real question is how do we help the billions of people, the "have-nots" and "wannabees", who really need a more prosperous lifestyle without destroying the Planet as a result . Or at least stop another book being written like this one.

Inconvenient Worlds, Wedges and Wizardry

Today, energy is ninety percent carbon based , so emissions are mainly carbon oil and gas energy driven (roughly one third each industry, domestic and transportation uses). Nuclear energy and hydrolectric waterpower make up the other tenth part. Since energy use will grow several times as the World economy develops, the present demand will grow several times over, despite the high price of carbon (about $400/tonne today in the World and at your local gas pump). More importantly, electricity use is highly coupled to economic and industrial growth, increasing because it is so efficient and convenient.

The predictions of what future Worlds might be like, and what reductions in emissions might be possible are described by the cognoscenti like Mr. Gore as "wedges", and are assumed to be the potential linear reductions that an individual technology group *might* be able achieve between now and 2050. We literally try to Wedge the World. The original study, by Socolow and Pacala, postulated a total of some 16 possible technological options and measures that possibly could make a difference. Mr. Gore for some reason selects just six related to energy use, while largely omitting energy production:

-Energy use efficiency increase
-Energy use reduction
-Increased motor vehicle efficiency, hybrids and fuel cells.
-More efficient cities
-More use of renewable power, namely wind and biofuels
-Carbon emissions capture and storage

This list is pure Wizardry; a belief in magic wand waving that is also available in other popular books. The inconvenient and missing Truth is the *data*, which are available, and hence the worldly reality, purely driven by worldly economics. Large increases in energy efficiency have already happened in the USA, but this just means more energy is available for other uses, so there is reduced rate of increase but no decrease. The case of California is often sighted as using less "negawatts" but here manufacturing has been exported elsewhere, and energy supply shifted to come from outside the state , including Mexico and Canada . Perversely, Mexico has now to import gas in order to supply the USA under NAFTA; and Canada pays Californian energy prices. Any energy use reduction by the "haves" simply makes it available on the world market to the "have nots": China and India do and will eagerly use all the energy that North America and Europe do not, or make available to lower the demand and price. More hybrid vehicles that use electricity still use more energy, even if each uses less gasoline. Our cities are ever more inefficient and over crowded, and would take centuries to re-plan or replace.

As to renewable power, notably windmills, the data are now in. In Germany, the giant power company E-On reports the inconvenient fact that it now takes installing 50,000 MW of wind to replace 2000 MW of conventional power, a factor of 25 more , at a price of about ten times alternate prices. Not surprisingly, they are looking to invest in power plants outside Germany. In Ireland, careful study showed emissions were predicted to actually grow larger as more wind power was added: the wind is so variable that more back up power was needed from other sources, just as it is imported from the neighbors of wind powered Denmark.

As to capturing carbon, this is important to achieve, and is a real possibility for sources close to mines, caverns, or existing shafts, oil wells, gas fields and stable geology. But the amounts needed per year are huge (billions of tones) and the costs so large that a magically created world carbon market is needed with uniform rules, otherwise no one company, country or economy can afford to take the penalty alone.

What this worldly reality means is there is an inconvenient but unmentionable "wedge shortfall". Even the best efforts will not keep energy use increasing by about three times by 2050, and emissions causing atmospheric carbon dioxide rising to beyond the possible threshold (of 550 ppm), despite deploying as many wedge portfolios of windmills, efficient automobiles, carbon taxes, insulated houses, and solar water heaters as we can.

Inconvenient Collisions, Collusions and even more Inconvenient Answers

The answer to the shortfall lies in the unprecedented collision between those who would deploy nuclear technology and hydrogen power on a large scale; and those who cannot accept that adopting nuclear energy is not collusion with some Evil Power.

The data show that nuclear energy is a cheaper low-emissions power producer than the alternatives, is readily deployable around the world (as already in all the world's major economies), and enables a benign and sustainable energy future. This desirable future arises in three strategic and already available ways:

-Building advanced and safe nuclear designs that use sustainable fuel cycles
-Employing nuclear energy to enable introduction of hydrogen as an emissions free fuel
-Joining nuclear and wind power as synergistic producers of co-generated power

As a technologist I have studied these technical aspects very carefully, costed them, and determined the scale of introduction needed (some 3000 or more reactors over the next 50 years). We have shown that this "wedge" would stabilize global emissions by 2100, and that economic hydrogen production results. This new energy can even be used to unlock the oil we still need from the abundant oil sands without additional mining and refining emissions.

These Facts and Answers are inconvenient, since even the word "nuclear" does not appear anywhere in Gore's Truth, which focuses on looking good.
But then, what do I know about truth?