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The Greenhouse Problem; The refusal to recognise the situation

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The greenhouse problem has rapidly moved to the centre of official and public attention. Virtually every one accepts that there is a serious problem and that urgent action is required. Two fundamental beliefs underlie the discussion, the first being that the problem can be solved by conservation effort, technical advance and renewable energy, and the second being that the cost will be negligible. Both of these beliefs have been confirmed emphatically by the recent Stern Report[1] and the working Group 3 Reports of the IPCC.[2]

I am not aware of any literature questioning these conclusions (except that asserting that the cost will be less than Stern thinks; Toll[3] and Nordhaus[4].) This aligns with the indubitable convictions that capitalist-consumer society has been established as the "end of history", that technology can solve all problems, and that there is no need to question the commitment to affluent "living standards" and economic growth. Thus the problem is seen in terms of the stupidity of politicians who are not moving us from carbon based fuels to alternative fuels, and the corporate fossil fuel interests blocking change.

This blind faith in the capacity of non-carbon technologies to save consumer-capitalist society is understandable in view of the almost total lack of critical literature examining the limits to renewable energy. Until 2007 when my *Renewable Energy Cannot Save Consumer Society* [5] was published there seems to have been only one book on the theme. [6] Thus Stern and the many studies summarised in the IPCC Working Group 3 Report have understandably not given any attention to the possibility that the alternative technologies they discuss cannot solve the greenhouse problem.

I have analysed the Stern Report and the IPCC Working Group 3 Reports in some detail in the light of my understanding of the limits to geo-sequestration, nuclear energy and renewable technologies.[7] Following is a brief summary of some of the main issues. These are most clearly put in terms of the impossibility of explaining how the anticipated 2050 world energy budget could be provided without exceeding safe carbon emission limits.

Why the greenhouse problem cannot be solved.

First, a responsible, safe greenhouse target is now generally taken to be to keep the atmospheric CO2 concentration under 450 ppm (and probably 400 ppm.) It is increasingly accepted that adverse climatic events are occurring earlier than the IPCC anticipated, meaning that what will be regarded as a safe atmospheric concentration in future will be significantly lower than the levels stated in 2007. The unsafe temperature rise is generally taken to be 2 degrees C. The IPCC associates the 450-490 ppm level with a

2 – 2.4 degree rise. They state that to meet that target we would have to cut emissions by 50 - 80% by 2050, i.e., perhaps to 5.2 GT/y of CO2 equivalent, and to somewhere around zero by 2100.[8]

There are only four options for providing the expected 2050 world energy demand of approximately 1100 EJ, more than twice as great as at present – conservation/efficiency in use, coal burning with sequestration of the CO2, nuclear energy, and renewables.

Let's assume energy conservation etc. cuts 25% off energy required to supply services, so the task is to provide 875 EJ of energy. (This is much more optimistic than Stern.)

Only 80 – 90% of the CO2 generated when coal is burned can be captured and stored (CCS) . If we take the goal for late this century as a 5 GT/y release limit, (although it is likely to be no emissions at all), electrical energy derived from coal use must be around 42 EJ. That means 825 – 42 = 783 EJ must come from nuclear energy and renewals. Let's divide the task between them.

To provide 390 EJ from nuclear reactors we would need around 48 times as much reactor capacity as we have now. Uranium resources (assuming 4 million tonnes) would be totally exhausted in about 2 years.[9] Take the highest estimates and add Thorium and its only 15 years (without going to breeder reactors.)

So we would have to give most of the task to the renewables, and for simplicity let us split 700 EJ between solar and wind. We would need 1750 times the world's present wind capacity. Where are you going to locate that? Not within thousands of km of demand.

Then how will you deal with the variability of renewables. Wind and PV provide no electricity on calm nights. Unless you can store vast quantities of electricity wind and PV cannot save consumer society. Energy can be stored as water pumped up into dams to generate electricity later, but world potential hydro capacity would be a small proportion of demand so it could not carry the load when wind and sun were down. Storing electrical energy as hydrogen wastes three-quarters of the energy generated by the time it drives a vehicle and this is why we are not likely to use it in large quantity.[10]

What about solar thermal systems with their capacity to store heat? Solar thermal will be a valuable contributor to a renewable energy world, but it seems that it will not be sufficiently effective in winter. Even in the best locations such as Central Australia it seems that net output (i.e., after energy embodied in materials and construction, operations and management and long distance transmission energy costs have been subtracted) would be too low in the winter months, or that so much collection area would be needed that the cost would be prohibitive, and much plant would then be idle in summer.

By far the greatest problem for renewable energy is the provision of liquid fuels. Biomass cannot meet more than a tiny fraction of the demand. We will probably get 50 GJ/ha of ethanol net produced from woody biomass. To give the expected 9 billion people the present Australian amount of oil plus gas energy we would need to harvest 23 billion ha of plantations – on a planet with only 13 billion ha of land.

"Well then, we'll have electric vehicles." Let us ignore the fact that air and sea transport

can't be run on electricity. About two units of electrical energy have to be generated to get one to power wheels, because the losses on this path are considerable. Australian transport energy consumption is 70% greater than electricity consumption, so to run our present transport system on electricity we would have to generate 3.4 times as much electricity as we do now. And both transport and electrical energy demand are rising fast.

It must be recognised that the discussion is not about how to sustain the present society. The most fundamental element built into the foundations of this society, and into the mentality that drives politicians, economists, the media, and ordinary people, is the fanatical obsession with constantly getting richer and consuming more and more, that is, with economic growth.

Note also that the 2050 target taken above, 1100 EJ, is only one-fifth of the amount we would need to give all 9 billion people expected the per capita energy use Australians are likely to have by then. That's what they are all fiercely striving for whether we like it or not. To give them all the "living standards" Australians are heading for by 2050 world economic output would have to be about 30 times as great as it is now.

So what's the answer? If the question was, as everyone thinks it is, "How can we run our rampant affluence and growth consumer society without causing a greenhouse problem?" then the answer is – we can't! The overshoot, the magnitude of the unsustainability, is far too great. Consumer society has slammed into its limits. There is no possibility of keeping this party going on renewables plus nuclear energy. It can only be kept going, for a few for a while, by continuing to burn carbon based fuels.

They will now plunge into things like carbon taxes, planting trees, researching CCS – while building coal-fired and nuclear power stations and desalinisation plants just as soon as consumers demand more energy and water. They will follow Australian ex-Prime Minister Howard's wisdom – take action to save the environment, but not if it harms the economy... which the elder Bush put more elegantly as, "The American way of life is not negotiable."

They will in fact make big gains, maybe even reducing emissions 20% by 2020. And this will make them think that all they have to do is keep that up and the problem will be solved. But even if they achieve new Prime Minister Rudd's goal of a 50% cut by 2050 this would leave Australians on 13 tonnes of CO2 per capita p.a., and if 9 billion were to live like that world emissions would be 117 billion tonnes p.a. ...which is 4.5 times as high as at present. If we were to cut global emissions by 50%, to 13 billion tonnes p.a., that would be an average of 1.4 tonnes per person...which is 5% of the present Australian per capita amount of CO2 emissions. Let's see you do that without "harming the economy" Mr. Rudd.

The way out?

For fifty years a few have attempted to point to the ecological impossibility of pursuing affluent "living standards" and economic growth on a finite planet. Paul Ehrlich and Herman Daly were among the heroic pioneers. My humble *Abandon Affluence*[11] was an attempt to summarise the case in the early 1980s. It is painfully obvious that these efforts have just about come to nothing. There is almost no critical discussion of the connection between affluence and the environmental crisis or of the absurdity of pursuing economic

growth. Even the peak environmental agencies overwhelmingly fail to question these goals.

There is also a profound failure to recognise that our "development" would not have been possible had we not conquered and looted the Third World, or the fact that our high "living standards" now are only possible for a few while we maintain the empire which delivers to us far more than our fair share of the world's dwindling resources.

What we are up against here is not so much delusion as wilful refusal. The information and analyses are available, but they are steadfastly ignored.

The last chapter of Trainer 2007 argues that a sustainable and just society has to be some kind of "Simpler Way", involving mostly small, highly self-sufficient local economies using local resources to meet local need, without any economic growth at all, run by cooperative and participatory arrangements and not driven by market forces, the profit motive, or by competition or acquisitiveness. (I do not think this vision differs significantly from that of the Inclusive Democracy project.)[12] It is argued that these ways could greatly increase the quality of life of all, while reducing our footprint to miniscule proportions...and enabling materially satisfactory lifestyles on renewable energy sources.[13] Needless to say such a vision could not be realised unless the core institutions of the capitalist-market system had been scrapped.

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[1] Stern, N., 2006, *Review on the Economics of Climate Change*, H. M. Treasury, UK, Oct.

[2] Intergovernmental Panel on Climate Change (IPCC), (1991), *Climate Change; The IPCC Response Strategies*, Washington, Island Press, IPCC, 2007, *Fourth Assessment Report*, Working Group III Report "Mitigation of Climate Change".

[3] Toll, S. J., (2006), "The Stern Review of the economics of climate change; A comment", *Economic and Social Research Institute*, Hamburg.

[4] Nordhaus, W., 2007, "The Stern Review on the economics of climate change", http://nordhaus.econ.yale.edu/SternReviewD2.pdf (June, 2007.)

[5] Trainer, T., 2007, *Renewable Energy Cannot Sustain A Consumer Society*, Dordrect, Springer.

[6] Hayden, H. C., (2001), *The Solar Fraud,* Pueblo West, Co, Vales Lake Publishing.

[7] Trainer, T., 2007, „The Stern Review; A critical assessment of its mitigation optimism," (in press), Trainer, T., 2007, "A critical discussion of the IPCC analyses of carbon emission mitigation possibilities and costs."

[8] IPCC, 2007, op cit., Fig. SPM 7 and Table SPM 5, p. 16.

[9] Zittel, W, et al., (2006), *Uranium resources and nuclear energy*, Energy Watch Group, Dec., Leeuwin, J. W., and Smith, P., (2003), "Can nuclear power provide energy for the future; would it solve the CO2 emission problem?" www.oprit.rug.nl/deenen/, (and in more detail at www.oprit.rug.nl/deenen/Technical.html

[10] Bossel, U., (2004), "The hydrogen illusion; why electrons are a better energy carrier", *Cogeneration and On-Site Power Production*, March – April, pp. 55 – 59.

[11] Trainer, F. E. (T.), (1985), *Abandon Affluence*, London, Zed Books.

[12] See Takis Fotopoulos, "The Ecological Crisis as Part of the Present Multi-dimensional Crisis and Inclusive Democracy", *The International Journal of Inclusive Democracy*, Vol. 3 - No. 3 (July 2007).

[13] For the detail see The Simpler Way website.