Mr Combet's Sun God

Comments on the Clean Energy Legislation

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SUMMARY

This Submission argues *first*, that at the proposed starting level of the carbon tax ($23 per tonne of carbon dioxide), there will be insufficient incentive on its own either for existing power generators to invest in wind and/or solar power, or for largescale production of power by wind and solar generators, unless there is either a higher tax or additional direct subsidies like feed-in tariffs at well above even the retail price of electricity.

Secondly, it shows that Australians have such a strong demand for electrical and electronic goods that the carbon tax and income compensation package is most unlikely to get them to give up on new plasma TVs and computers in favour of more beer or garden furniture

Thirdly, it shows from actual experience in Ireland and Germany that there are limits to the degree to which wind power can replace conventional hydrocarbon power without resulting in increased emissions of CO_2 as more and more generators have to be on standby, emitting but not producing power, in case there is a run of windless days. Texas had brown outs last month because its wind generators failed during the hottest but windless days, and there was insufficient backup.

Fourthly, Australia's "Clean Energy" Bill avoids all mention of the emissions that result when thermal hydrocarbon power stations are in wind power back-up mode without delivering and selling power. Why should they be subject to the carbon tax on their emissions when they are performing an unpaid vital social service?

Finally, my Submission shows that the "Clean Energy" legislation is a solution in search of a problem. My statistical analysis (now under peer review) shows both that the actual trend of global average temperature since 1948 is much lower than claimed, so is unlikely on the current trend to rise by as much as 2 oC even without any emission reduction schemes being implemented, and also that there is no statistically significant evidence for increasing atmospheric CO2 playing any role in the observed very slight increase in global temperature since 1948.

Introduction

Many of us, possibly along with Mr Combet and some MPs, will have enjoyed the SBS programme (21st August 2011) on the Egyptian Pharaoh Akhenaten and his superb wife

Nefertiti, and on how he built a new capital city to embody his vision of a single god, the Sun, that gave special favour to himself and Nefertiti, superseding all other gods. The "Clean Energy Legislative Package" with its carbon tax is a similar obeisance to the Sun and Wind Gods that the Commonwealth Government believes will deliver carbon-free power to Australia, provided the tax is enacted at $23 a tonne of emitted CO_2, even though the actual tax level to achieve that with solar energy would be between $300 and $600, and up to $150 for wind power when all costs are taken into account. That means the Government's dream that the Sun and Wind can displace carbon-based energy will not likely outlast the 25 years Akhenaten's Sun City survived after his death.

1. A meaningless tax based on misleading engineering and economics

The so-called Carbon Tax due to become effective next July is at a level that will have minimal climatic but seriously detrimental economic effects. First, at $23 per tonne of carbon dioxide emitted, the tax is set too low to induce a switch in energy sourcing by any existing power generation plant from coal to "cleaner" gas, or even less plausibly, renewables like wind and solar, given the very large cost advantage of coal-fired electricity.

Secondly, if the respective inelastic price and elastic income elasticities of demand for energy-intensive final demand goods and services are taken into account, as they rarely are, the proposed tax will in any case easily be passed on to final consumers by energy producers, who will thereby have no incentive to switch from coal to other fuels. The compensation payments to 80 per cent of households will also enable them if they so wish to maintain their strong preference for electronic consumer goods above all others apart from food and drink.

Thirdly, as I document below, experience in the Irish Republic and Germany shows that there is a ceiling to the volume of CO_2 emissions that can be avoided by the replacement of hydrocarbon-based generation of power by solar and wind power, because the intermittency of the latter necessitates considerable reliance on coal or gas as backup, a dependence that increases the greater is the proportion of total energy produced by those renewables. That means the indicated minimum level of tax needed to encourage switching to renewables has to be raised significantly.

Moreover, it will be somewhat perverse to tax coal and gas power producers on their CO_2 emissions when they are operating just to be ready to meet gaps in power supply caused by the intermittency of wind and solar. At the least one might expect coal and gas power suppliers to demand compensation for this proportion of their carbon tax liability by exemption of that part of their emissions from the tax. I have seen no consideration of this in the publications of the Department of Climate Change and Energy Efficiency and the Treasury, nor is there any provision in the Clean Energy Bill that provides for compensation to thermal electricity producers when they are in standby mode.

In regard to the first point, it is evident from Table 1 (using data from the 2010 study commissioned from California's Electric Power Research Institute – EPRI - by the Department of Resources, Energy, and Tourism DRET), but ignored by DCCEE) that the proposed tax at $23 per tonne of CO_2 emitted is not nearly high enough to make wind or solar energy remotely competitive with coal-fired electricity. For example, the high cost wind power setup requires a tax of at least $157 per tonne of CO_2 emitted from a high cost black coal fuelled power station to be competitive, while even the low cost wind installation requires a tax of $76 per tonne of CO2 before a high cost coal-fired generator would feel impelled to switch from coal to wind, without it taking into account that it would still be taxed on its emissions while keeping its turbines spinning against windless or sunfree periods.

The tax needs to be as high as $640 for PV solar to be an option for installation by any existing black coal power station. The tax also needs to be much higher than $23 for Integrated Gasification Combined Cycle Gas (IGCC) to become viable, which in any case has the same level of CO_2 emissions per MWh as coal (800 kg of CO_2 per MWh). Combined Cycle Gas Turbines (CCGT) are already competitive with coal, but still have high CO_2 emissions, at around 50 per cent of those from coal-fired power stations. That means a complete switch to CCGT would not achieve the Government's long term 80 per cent emission reduction target.

Table 1

Levelised Cost of Electricity in Australia 2009

	LCOE $/MWh		CO2 kg/MWh net	Tax @ $23/tCO2	LCOE + Tax, $/MWh	
Type of Energy	High Cost	Low Cost			High Cost	Low Cost
SCPC Black	98	75	740	17.02	115.02	92.02
SCPC Brown	102	80	825	18.98	120.98	98.98
Wind	214	154	10	0.23	214.23	154.23
Fixed PV	570	300	20	0.46	570.46	300.46
Gas IGCC	150	100	800	18.40	168.40	118.40
Gas CCGT	125	60	380	8.74	133.74	68.74
Source:	DRET 2010, derived from cost ranges in Fig.10-13, p.10-16; Zero Carbon Australia, Fig.2.26.					

Notes: 1. The DRET's EPRI Report claims there are zero CO_2 emissions from wind and solar power, which is not quite true, as wind towers require significant recurrent injections of lubricating oil for their turbines' gearboxes, and there are also implicit CO_2 emissions during the manufacturing process. The estimates in this Table are from *Zero Carbon Australia*, Fig.2.26 (2010). In addition wind turbines and towers have a relatively short lifespan of around 15 years before needing to be replaced.

2. The US EIA (Wikipedia, Levelized Energy Cost, 28 August 2011) estimates the cost of solar *thermal* power at US$312.8/MWh by 2016, for which the tax would have to be $305 per tonne of CO_2 ($0.305/kg) emitted by a low cost black coal plant (=75+740*0.305) before such a power station would consider switching from coal to solar thermal power. For Gas IGCC the carbon tax would have to be in the range $45 to $93.6 for it to be competitive with SVCPC Black Coal (because the tax would be applicable to its own CO_2 emissions).

The EPRI study for DRET specifically (page 4.4) excludes the cost of the enormous land requirements of solar PV arrays, at 80 hectares for the 155,000 panels needed for a 10 MW plant, so a 2000 MW PV plant would require 16,000 hectares, a very large amount of costly farmland if the plant is located anywhere near Australia's cities. Right now, a Sydney generator if it moves fast enough could pick up almost 8 hectares within 50 minutes of the CBD (NSW 2178) for just $3.9 million. A 2000 MW solar plant would need 16,000 hectares, at a cost of $8 billion if located at NSW2178. Moving further out from Sydney would reduce the land cost but, except in the Hunter Valley, where it would cost only around $800 million for 16,000 hectares, most greenfield sites require additional transmission and distribution power lines, the costs of which are also not taken into account by the DRET study.

2. Price and Income Elasticities of Electricity Demand

The relative price and income elasticities of demand for electricity by industrial and domestic users are rarely considered, and not at all of course by DCCEE and most of the reports it has financed, such as those of the Australian Academy of Science (Allison *et al.*, 2010), its own chief adviser, Garnaut (2011), Frank Jotzo (2011), and Will Steffen's *The Critical Decade*, 2011. Garnaut's final report (2011) does briefly (pp.78, 162-164) discuss the price elasticity of household demand for electricity in Australia, and implies both that it will be relatively high for low income groups, and that the Government's very large income handouts from the carbon tax proceeds - to apparently 80 per cent of all households - will not offset the price effect, despite the Government's claim (2011) that the 4 million households in the lowest income groups will be over-compensated (by 120%) relative to their contributions to carbon tax proceeds.

The Treasury's modelling (2011, p.160) claims the price elasticity is such that a 10% increase in the price of electricity produces a 3% reduction in demand, without mentioning that a 10% increase in total income arising from the compensation scheme, could raise demand by say 1%, so the net effect is a fall in demand for electricity of only 2%. Garnaut does not provide data on these points, but the ABS does. Its latest Household Expenditure survey (2011) shows that average spending on fuel and power per household increased from $23.59 per week in 2003-04 to $32.52 in 2009-10, an increase of 37.87%, despite considerable increases in electricity prices: in the ACT the charge per kWh was $0.0893 in 2003-04, and $0.1386 in 2009-10, an increase of 55% (to be compared with the only 13.67% increase in the CPI over that period, a reflection of the extent to which renewable energy targets and feed-in tariffs for solar PV had already flowed through to household power prices). However, although there was zero reduction in spending on electricity – in fact it increased by 37.87% - despite the large increase in tariffs across Australia, there was a reduction in household's usage of electricity as such, from 264 kWh per week in 2003-04, to 235 kWh in 2009-10, a fall of 11%, whereas by the Treasury's modelling, consumption should have fallen by 16% (given the 55% increase in the tariff). This is suggestive of income elasticity of demand for electricity offsetting some of the price effect.

But the real issue is why any government would consider reduction in electricity usage by 11% over 6 years to be a Good Thing when it is the basic amenity of a Good Life. Moreover, at $23, the tax works out at just $0.02 per kWh, which is about 12 per cent of the existing ACTEW tariff in the ACT ($0.1418). Given that electricity cost is still a fairly small proportion, at less than 3 per cent of total average household expenditure in 2009-10, the tax clearly needs to be much higher to have much impact on total household demand for electricity, given the promised income compensation to around 80% of all households via tax reductions and higher welfare benefits - but then the higher the tax, the greater the income compensation, in what clearly is a pointless but damaging exercise.

If clearly households have a fairly inelastic demand for electricity, that is even truer of the industrial, commercial, and service sectors, which simply have no realistic alternative to their electricity consumption, and will readily absorb the higher costs thereof post tax before passing them on to their customers. That is why *total* electricity demand increased by 12.5% between 2002-03 and 2007-08 despite rising tariffs and the reduced demand of the household sector (ABS).

3. **By how much does wind power reduce CO_2 emissions?** [2]

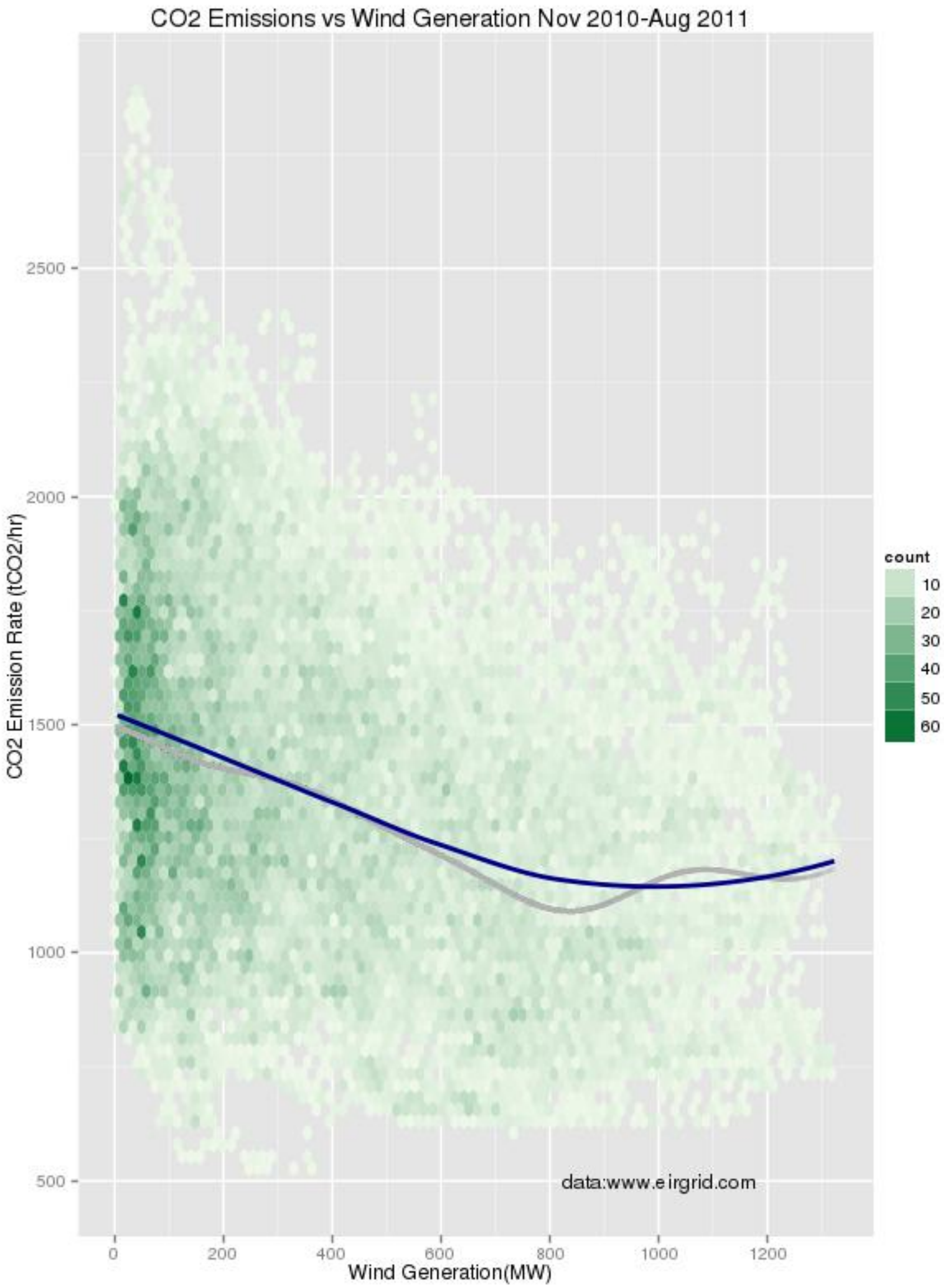
It should be borne in mind that the CO_2 reduction costs estimates in DRET's study (Table 1 above) assume that direct replacements of coal- or gas-fired power stations by wind and solar are feasible, without needing to keep the former on standby for when there is neither wind nor sun. Recent studies of the experience of the Irish Republic show this is not a valid assumption. For example, the Irish economist Colm McCarthy (2011) has noted (see Wheatley 2011) that "Wind generators can be relied on to produce power only about one hour in three over a year, and those productive hours are unpredictable. So conventional capacity has to be kept in reserve for the periods when the wind does not blow. These stations will be utilised less than optimally and this is a hidden cost of wind generation". In addition to inefficient use of capital, critics have argued that wind generation has a potential ***cost*** in terms of CO_2 emissions. "When the wind is blowing, priority is given to wind generation over conventional capacity. However an idling thermal plant is like a car crawling along in traffic – not doing very much but still burning fuel. This may cause thermal plant to burn more fuel per unit energy generated than would otherwise be the case" (Wheatley 2011) – or than is assumed in my Table 1 above.

*C**arbon intensity*** is CO2 emitted per unit energy generated (Udo *et al.* 2011). To see why emissions savings decrease as wind generation increases, we need to look at the carbon intensity of ***thermal generation***. Thermal generation as extracted from the Eirgrid data by Wheatley (2011) and shown here in Fig.1 is the difference between demand (MW) and wind generation(MW) (it assumes no power is dumped).

Fig.1 shows *in real time* the carbon intensity of thermal generation (tCO2/MWh) versus thermal generation (MW) for the period Nov 2010 – Aug 2011. Its scatterplot shows the relationship between total instantaneous CO2 emissions and instantaneous wind generation using data from the Irish grid operator Eirgrid. The data cover the period from 1-Nov-2010 to 30-Aug-2011 at 15 minute intervals (~ 29,000 data points). The blue line is a local regression (lo*ess*) fit (Wheatley 2011). Clearly when wind generation increases as a proportion of total power generation, CO_2 emissions also increase because of the need for larger backup generation capacity from hydrocarbon (fossil fuel) generators. Thus when wind power generation reaches 1000 MW, CO_2 emissions begin to rise, having in any case fallen only from 1500 to 1250 tCO_2 per hour while wind power increased from nil to 800 MW.

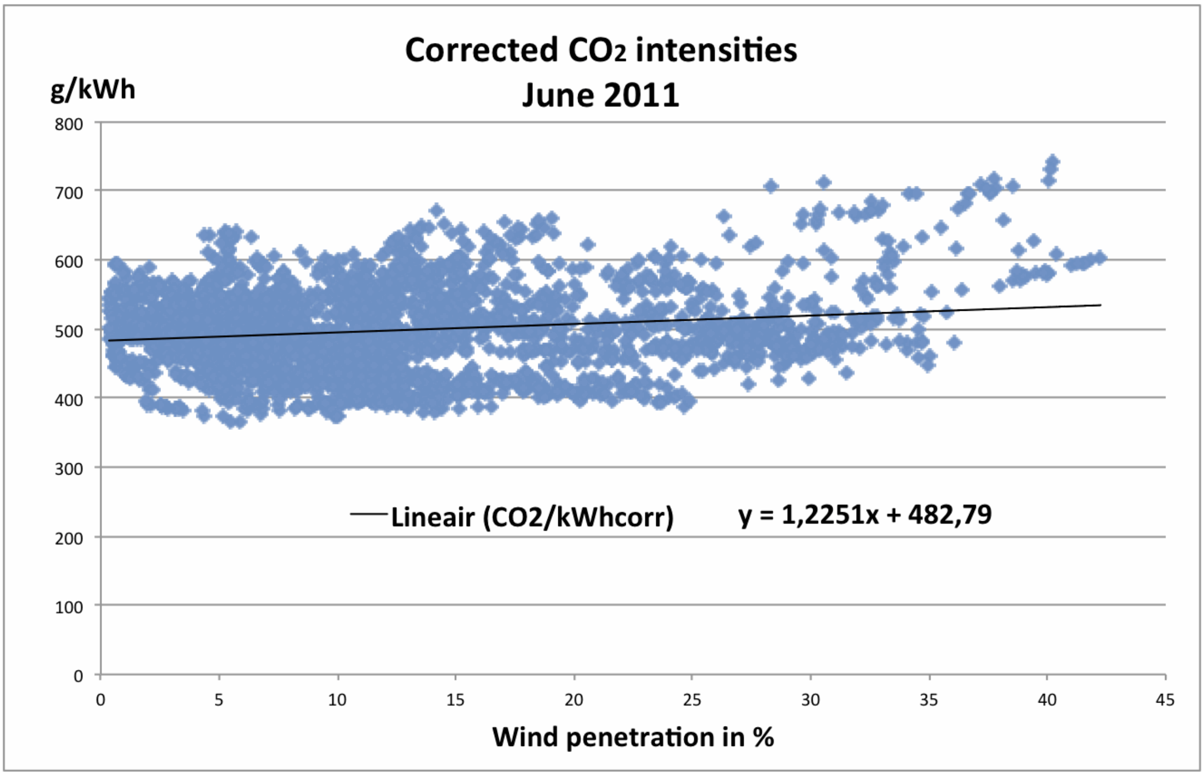
[2] This section draws heavily on Udo (2011).

Fig.1 Wind Generation and CO2 Emissions, Ireland 2010-11 (Wheatley 2011)



Similarly, Fig.2 shows how in June 2011, CO_2 emissions increased with increasing penetration of wind power. Wind penetration as shown in Fig.3 is defined as wind production (the red line) divided by the total demand (the blue line in the same graph). This quantity is calculated for every quarter of an hour. Clearly there is a total mismatch between the uncontrollable wind input (unlike hydrocarbon-fuelled generation) to Ireland's power system and power demand. This can only mean massive inefficiency, and far greater reductions in GDP growth than the Treasury, DCCEE and its Ross Garnaut ever admit.

Fig.2 Wind penetration and CO2 emissions (grams per kWh)in Ireland (Udo 2011) NB: the comma in the trend equation is the EU style for decimal points



The next three Figures also show how when wind generation increases beyond a certain proportion of total supply, the level of CO2 emissions per MWh also start to rise again, because of the emissions from stand-by power stations that are not themselves generating power when in stand-by mode.

Fig.3 Total electricity demand and wind supply, Republic of Ireland April 2011 (Udo 2011).

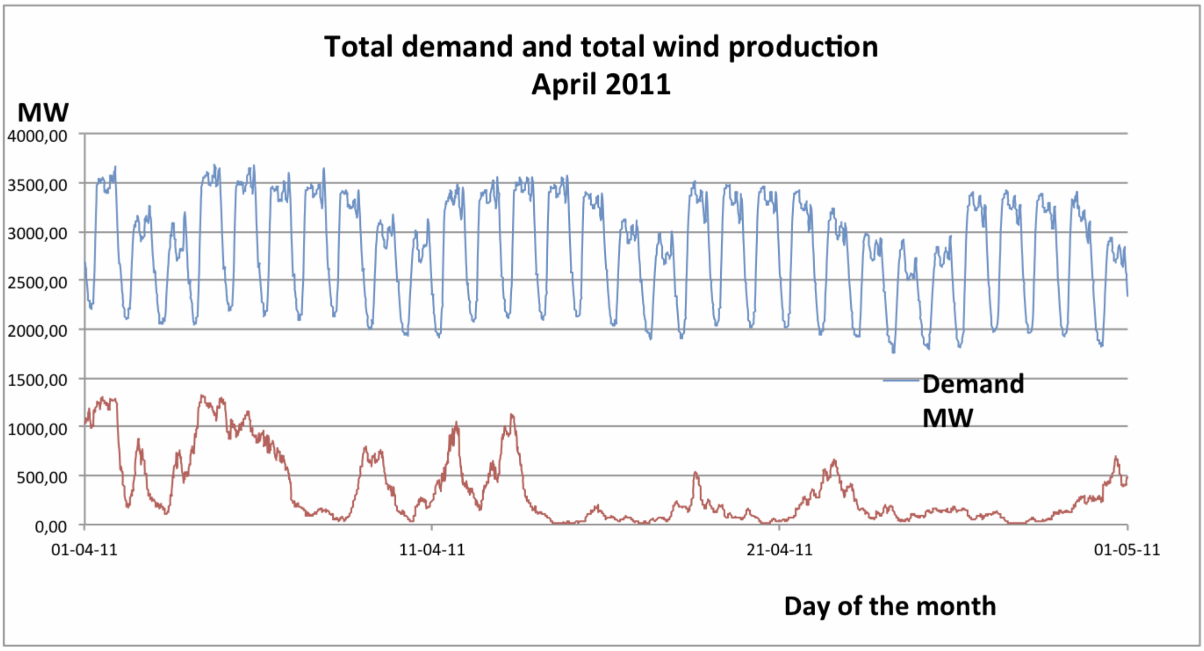
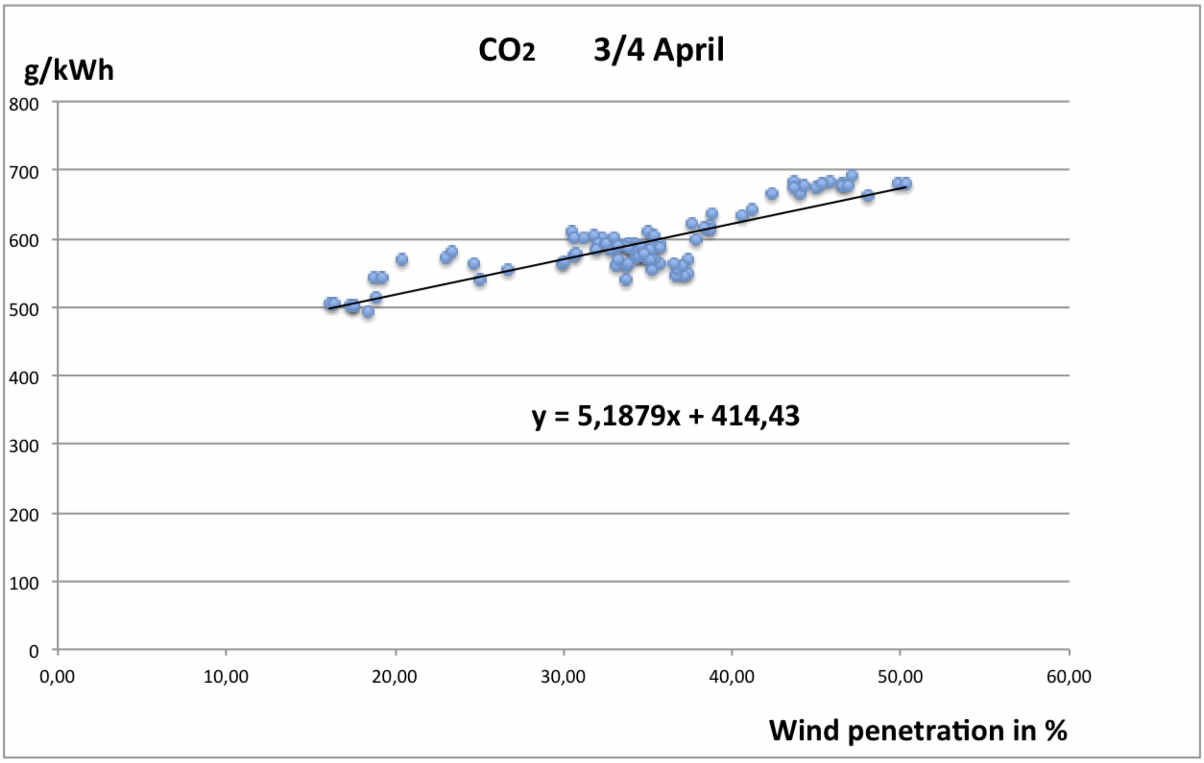


Fig.4 How increasing wind penetration increases CO2 emissions (g/kWh), Ireland April 2011 (Udo, 2011)



NB: In the above Figures, the commas in the trend equations are EU-style decimal points.

The fitted equation to the scatterplot in Fig.4 shows that the CO_2intensity without wind turbines is 414 g/kWh, but that over 50% wind supply, CO_2 emissions per kWh actually increase to over 650 grams per kWh because the backup hydrocarbon power stations are still running and emitting but without delivering their usual volume of kWh (Udo 2011). The emissions factor increased in April 2011 in Eire because of the absence of hydropower backup during that month. The presence of 34% wind power decreased the CO_2 emission from 414 to 390 g/kWh.(-6%), which is a far cry from the 50-80% reduction dreamt of by 2050 by the Australian Government. But that was for a good windy spell over just two days. Things were not so good over the next three days in Ireland (4-6 April 2011): the presence of 30% wind power decreased CO_2emissions only from 398 to 386 g/kWh.(-3,0%), well below the Australian Government's target of at least a 20 per cent reduction from 2011 levels by 2020 (the official target reduction of 5 per cent deceptively refers only to the base level in 2000, not to required reduction *from* the actual current level). [5]

The April 2011 data of the Irish electricity system show clearly that the combination of wind energy with gas turbines does not work, if no storage of energy is present. An investment of billions in wind turbines produces not more than a few per cent reduction in CO_2 output, far below the implicit emission reduction target of the Australian government of around 12-15 per cent from the current (2011) level of emissions.[6]

4. Electricity, wind power, and CO2 emission reduction in USA

Michael Goggin (2011) of the American Wind Energy Association (AWEA) has criticised Fred Udo's Irish data (2011) showing how CO_2 intensity can increase even with high wind penetration of the power generation system, and claims that data from 4 USA generators shows substantial reductions in CO_2 emissions with adoption of wind energy (Table 2), at 562 kg of CO_2/MWh in Texas. However his Table is based on the saved CO_2 emissions when the wind farms are delivering power, and does not take into account the emissions from standby hydrocarbon generators that are running but not delivering power when the wind is operational. Moreover Goggin's data are estimates and are not based on real time power and emissions data like those for Eire cited in Figs. 1-4 above, which are simply not available in the US except for a few instances in Colorado.

[5] "It has to be stressed that the minuscule decreases in CO_2emission from fuel usage shown in the above graphs are calculated for the entire system of Ireland's grid in April 2011. During the first days of the month large variations in wind energy occurred and the operators counteracted this by using mainly gas as a backup. This can be inferred from the fits, which point to about 400 grams CO_2/kWh for zero wind, which is normal for generators using gas turbines" (Udo *et al.* 2011). That is the most efficient backup source of energy, where available, but not yet everywhere in Australia, with its 80% current dependence on coal-fired electricity, so that the CO_2 emissions when wind power fails to materialise will be double those for gas, as evident in Table 1 above.

[6] Australia's Treasury (2011) estimates that without a carbon price, Australia's emissions would reach 679 Mt CO2-e in 2020 (22 per cent above the 2000 level of 557 Mt CO2-e); the Government's target's 5% reduction on 2000 implies getting the "BAU" 679 Mt CO2-e in 2020 down to 529 Mt CO2-e by means of its carbon tax.

Table 2. Grid Operators' Calculations of Wind's Emissions Savings

Grid Operator	Texas[12] (ERCOT)	Midwest[13] (MISO)	Mid-Atlantic[14] (PJM)	New England[15]
Pounds of CO2 saved per MWh of wind energy	1,241	1,277	1,628	1,036

Australia's "Clean Energy" Bill similarly avoids all mention of the emissions that result when thermal hydrocarbon power stations are in back-up mode without delivering power. Why should they be subject to the carbon tax when they are performing a vital social service?

5. Electricity and Wind Power in Germany[7]

The wind turbine duty factor in Germany (defined as the ratio of what was delivered to the grid and the amount that would have been delivered with design capacity of the wind turbines) was on average 17%.

Table 3. The installed wind power in Germany and the actual yearly electricity production in TWh (tera Watt hour) and the derived wind turbine duty factor (= ratio effective power / installed power) (de Groot and Le Pair 2009).

Year	Power [MW]	Yield [TWh]	Wind turbine duty factor[4]
2000	6050	8,8	17%
2001	8680	10,9	14%
2002	11850	17	16%
2003	14500	19,2	15%
2004	16480	26,8	19%
2005	18290	27,1	17%
2006	20470	31,2	17%
2007	22090	40	21%

"When considering these figures one has to keep in mind that in Germany by law, wind-generated electricity has absolute priority over all conventionally generated electricity. When

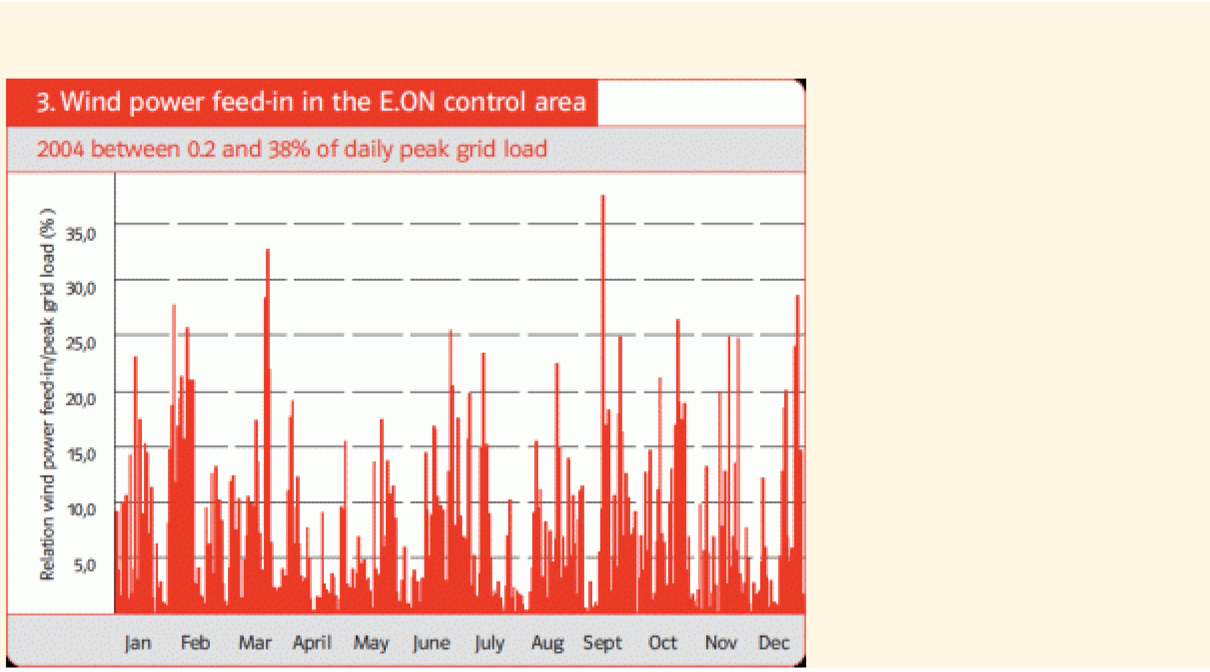
[7] This section is based on the findings of de Groot and le Pair (2009).

wind generated electricity is available, it must be used. The output of other power stations has to be reduced commensurately" (de Groot and le Pair, 2011).

The data in Table 2 cover wind turbines all over the country, so the effect of wind variability over the country is taken into account. Firstly, the contribution of this large "name plate" (design) capacity is rather modest. Secondly, the effect of spreading the turbines over a large geographical area did not solve this problem.

E.ON is the largest German wind-generated electricity provider. They show in Fig. 5 the significant engineering challenge they had to cope with over the time span of a year, as the fraction of "wind" in the electricity they delivered varied from 0,2% of the total to as much as 38%. The strong variation in yield over time is partly the result of the given unfavourable physics of wind energy: the energy yield varies with the 3rd power of the wind velocity. In practice, when the wind blows at half the wind turbine design speed, the electricity yield is only one eighth of the design output, or some 12% of the design capacity. Furthermore, there are days when there is no wind at all over almost the whole geographical area. In both cases, a very significant amount of energy must come from the conventional sources (de Groot and le Pair 2009).

Fig. 5 Wind power penetration, Germany 2004. Fraction of delivered wind of total delivered power. Wind delivery varied from 0,2% to 38% of total power delivered to the grid.



Source: E.ON Wind Report 2005 (from Inhaber, 2011).

"The effect of giving priority to sustainably generated electricity in Germany has the following obvious consequences: when the wind turbines operate at design capacity, up to 23 GW is produced. When there is no wind, up to 23 GW of electricity must be largely or fully provided from non-sustainable sources. In Germany in practice this means that up to 23 GW must be in stand-by mode. It is obvious that there are extra capital charges involved in maintaining this backup power, making the additional investments in the high tension network and coping with the wind fluctuations” (de Groot and le Pair 2009).

Table 4 Coal Savings with wind power in Germany

Efficiency conv.station	Consumption [g coal]	Extra consumption	Ultimate saving [g coal]	Visible efficiency
55%	22275	0	4725	55%
53%	23116	841	3884	54%
51%	24022	1747	2978	53%
49%	25003	2728	1997	52%
47%	26066	3791	934	51%
45%	27225	4950	−225	50%
43%	28491	6216	−1491	49%
41%	29881	7606	−2881	48%
39%	31413	9138	−4413	48%
37%	33111	10836	−6111	47%
35%	35004	12729	−8004	46%
33%	37125	14850	−10125	45%
31%	39520	17245	−12520	44%
29%	42246	19971	−15246	43%
27%	45375	23100	−18375	42%
25%	49005	26730	−22005	41%

Note. The primary fuel saving (column 4) at assumed reduced efficiencies due to wind variation (column 1) and overall decrease in efficiency of all conventional power stations taken together (column 5). (100 kWh).

Source: de Groot and le Pair, 2009.

Table 4 shows how the decreasing efficiency influences the saving of conventional fuel. “At an overall efficiency rate for the back-up system of 45% the fuel saving already becomes negative and there is an extra fossil fuel demand. Wind electricity generation in this case produces extra CO_2, which is a truly counter intuitive result. If this level of inefficiency is truly the result of wind energy use, a cynic could observe that Putin and OPEC might want to promote wind energy in countries like Germany in order to increase its dependence on fossil fuel" (de Groot and le Pair 2009). Note that the reduced efficiency only applies to the back-up power stations. The other conventional stations operate at their regular efficiency.

6. Concluding comments on power supply and the CO_2 Tax.

It seems very doubtful from the experience of the Irish Republic and Germany whether the "carbon" tax will have any appreciable effect on either investment decisions by power utilities or on the carbon-intensity of energy consumption in Australia. However, the passing on of the tax to final consumers will have an impact on the general price level, and thereby will have knock-on and on-going effects for the CPI and the general wage-level.

In Section 7 below I show that the carbon tax is a solution in search of a problem that does not exist, as there is NO statistically significant relationship between the undoubted rising level of the atmospheric concentration of CO_2 and the very slight observed rises in global or regional temperatures, including those in Australia. Meantime, I have shown there is no basis for the Government's claim (in *Securing a Clean Energy Future*, July 2011) that its carbon tax will "cut pollution (sic) by at least 5 per cent compared with 2000 levels by 2020", dependent as that is on its unproven estimates of (1) supply side substitution effects from coal to renewable sources of energy when the tax is only $23 per tonne of CO_2, and (2) demand side substitution from electrical and electronic goods to say garden furniture and flower pots, as implied by Ross Garnaut.

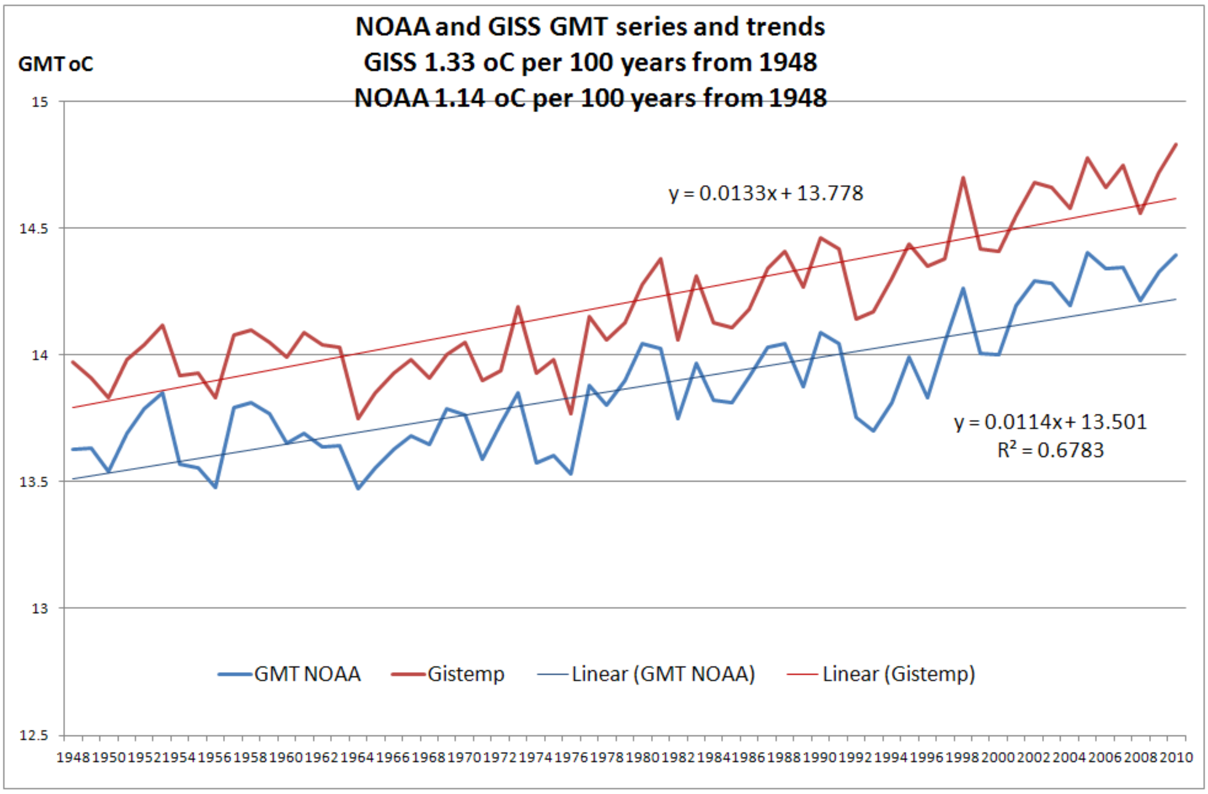
7. A Solution in Search of a Problem

Time and space preclude against me documenting again here the complete failure of climate scientists anywhere to undertake the econometric analysis, using least squares regressions, that is needed to validate their belief (IPCC 2007) that the rising atmospheric concentration of CO_2 (denoted [CO2]), and now at 390 parts per million (ppm) compared with 315 ppm in 1958 and perhaps 280 ppm in 1900 attributable to anthropogenic emissions of CO_2, is with 95% certainty responsible for "most" of the observed rise in global temperatures since the 1950s. I have reported my own regressions, showing that in reality increases in [CO_2] play no statistically significant role in explaining temperature change, in my paper *Econometrics and the Science of Climate Change*, presented to the 2011 Conference of the Australian Economic Society at ANU, and now undergoing peer review. I attach it to my email, and it is available at www.ace2011.org.au. The paper shows that the IPCC's Fourth Assessment Report (Solomon et al., 2007) avoids any econometric validation of its central claim, most notably in its Chapter 9, of which David Karoly was the lead Review Editor, and which is the source of that claim.

My paper shows that in truth the main explanation for observed temperature changes since 1958 is changes in the atmospheric concentration of water vapour, i.e. [H_2O], which really does explain "most" of temperature variability since 1958. This should not, *a priori*, be surprising, as there is indeed a strong upward trend in [CO_2], of more than 1.5 ppm p.a., whereas the rising trend in global mean temperature is very small, at just 0.0114 ^{o}C p.a. from

1948 to 2010, or 0.114 ^{o}C per decade, and 1.114 ^{o}C per hundred years, well below the 3-6 ^{o}C claimed by the IPCC. Moreover, the rate of increase in the growth rate, which is said by the IPCC to be rising dangerously, is actually only 0.0008 ^{o}C p.a. (0.008 ^{o}C per decade, and 0.08 ^{o}C per century). Thus extrapolating this *observed* trend from the last 63 years, it will take until 2110 for Global Mean temperature to rise from the ESRL-NOAA figure of 14.34 ^{o}C in 2010 to 15.54 ^{o}C, well below the claimed 2^{o}C rise that is allegedly unavoidable without the swingeing cuts in current CO_2 emissions that the carbon tax and ETS are supposed to deliver in Australia (see my Fig.6 below). This extrapolation is against the background of the business as usual (BAU) GHG emissions from the 1950s to 2010, so takes no account of all the planned future deep cuts in emissions in Australia, the EU, and supposedly the rest of the world.

Fig.6 Actual Global Average Temperature trends 1948 to 2010



Note: The "GISS" data are produced by James Hansen of NASA-GISS, the "NOAA" series is produced by the US Government's Earth Systems Research Laboratory of its National Oceanic and Atmospheric Administration (ESRL-NOAA).

To conclude, what this brief account of my ACE2011 paper shows is the high degree of chimera in climate science and its practitioners, a self-selected breed, outside the mainstream sciences like physics, geo-physical chemistry, and geology, that has all too conspicuously failed to deploy advanced statistics and econometrics to the observed data, because of their preference for self-fulfilling models. Thus the recommendation of this Submission to Ministers and Members of Parliament as they deliberate on the "clean energy" legislation, is to seek independent advice from mainstream scientists in the teaching and research faculties of our universities rather than members of the self-selected climate change institutes and the like. Thus ideally Parliament should establish a broad based Inquiry into the Climate Science that would not rely exclusively on those with involvement with the IPCC , unlike the Australian Academy of Science (AAS), whose 2010 Report for DCCEE had nine authors of whom 7 had been lead contributors or editors of the IPCC's 2007 Report (Solomon *et al*.).

For example, unlike climate scientists, mainstream biochemists and physicists are well aware of these two equations, systematically swept under the carpet by the IPCC, DCCEE, its Climate Change Institute and the AAS:

$$C_3H_8 + 5O_2 \rightarrow Energy + 3CO_2 + 4H_2O \quad ...(1)$$

In words, burning a typical hydrocarbon fuel like C_3H_8 (aka fossil fuel) needs oxygen and produces the energy needed to create the steam needed by thermal power stations, with as by-products both CO_2 and H_2O (water vapour), which Mr Combet and his DCCEE consider to be pollutants, even though they both figure in equation (2):

$$2CO_2 + 2\,H_2O + photons \rightarrow 2CH_2O + 2O_2 \quad ...(2)$$

In words, carbon dioxide + water + light energy → carbohydrate + oxygen. The typical carbohydrate like $2CH_2O$ is the basis of ALL food produced and consumed by the whole of the animal kingdom, whether directly as the carbohydrate in cereals and sugars, or indirectly in the form of the proteins created by livestock and poultry etc. from their own consumption of cereals and grasses containing carbohydrates and sugars.

Equation (2) explains why although global emissions of CO2 went up by 5.8% in 2010 over 2009, to 33 billion tonnes (33 GtCO2), the increase in the atmospheric concentration of CO2 in 2010 over 2009 was only 18.9 GtCO2. Thus equation (2) accounted for up to 14 GtCO2 (43%) of the emissions that did not remain in the atmosphere, which makes it all the more puzzling why equation (2) is absent from each and every publication of the IPCC and the DCCEE (such as AAS 2010 and Steffen 2011).

Members of Parliament, you will NEVER hear about these equations from the present Green-Labor Government, but if you enact the Clean Energy Bills, you will not be forgiven by posterity for their malign effect on world food production and consumption.

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