From: Peter Thornton
Sent: Friday, 17 May 2013 7:48 AM
To: 'GALLAGHER'
Cc:
Subject: Re: Wood Heating and Air Quality Issues

Dear Chief Minister,

Introduction

Thank you for your correspondence dated 25 Mar 2013, which was received in response to the various pieces of previous correspondence culminating in my email dated 22 Feb 2013. This previous correspondence is attached for your quick reference and for the benefit of those copied addressees also.

Upon receipt of your 25th of March letter, I must say that I am somewhat bewildered at the logic of the ACT Government's rejection of extending the Wood Heater Replacement Program to that of more efficient and lower emissions wood heaters In the context of improved air quality standards, it is somewhat beguiling to see a policy framework that only tends to favour the commercial interests of natural gas companies. I am also concerned about some of the unsubstantiated claims that are made within your letter about the health implications and air quality implications of wood heaters alone and that these unsubstantiated claims are then used as the basis upon which the Government continues to reject extending the Wood Heater Replacement Program to newer standards based wood heaters.

With these preliminary objections in mind, I now feel compelled to respond with the information below and based upon the research presented, provide the Government with a number of policy prescription in order to truly improve the air quality of the ACT, and by broader implication, Australia more generally.

General

Some Of The Unsubstantiated Claims being Made

As stated, upon reading your letter (or indeed the advice of one or more of your policy advisors), I must say that I found some of the unsubstantiated statements hard to believe. These statements were, and I quote:

> *'Smoke from domestic wood heaters is the largest source of air pollution in Canberra' .... AND .... ' Canberra ... does experience elevated particle pollution during winter because of emissions from domestic wood heaters' .... AND .... 'The reason the ACT Government is targeting the replacement of wood heaters with other forms of heating at present, is because of their emissions and associated health impacts.'*

Some of these statements seem to be reflective of similar unsubstantiated statements made by former MLA Amanda Bresnan in her draft exposure legislation 'Addressing Wood Heater Pollution in the ACT' , where she stated, and I quote:

> *'70% of particulate matter pollution in Canberra comes from wood heaters – which is linked to lung disease, heart disease and other serious health problems.' .... AND ..... 'Particulate matter levels in winter are 3 times higher than the warmer months, and increase to a degree significant enough to cause short and long term health problems for the population.'* (page 3-4 refers).

So What Does Some Of The Research Actually Say?

With the foregoing in mind, I would like to address some of these unsubstantiated claims that have and continue to be made surrounding the supposed health effects caused solely by wood heating.

In their current publically available '*Review of literature on residential firewood use, wood-smoke and air toxics*', the Australian Federal Department of Environment states, and I quote from Section 2.8:

> *'There have been no studies of the direct impact of wood-smoke on human health in Australia. However, there have been epidemiological studies establishing correlations between human health and PM10. There have also been useful reviews by Australian researchers of international literature on the possible impacts of wood-smoke and PM10 on human health (Gras 1996, Robinson and Campbell 1998).'* (Please remember the PM10 comment as I intend to return to this measure a little further on).

Whilst some of the international research alludes to health impacts stemming from wood smoke, most of this research is 20-30 years old, and so the research becomes less relevant as wood heater standards improve; particularly since Australia adopted newer emission and efficiency standards with the introduction of AS/NZS 4012/ 4013 in 1999. However, whilst there might be some inkling from international research, the Australian research cited in Section 2.8 tells a somewhat different story when disease and mortality rates are analysed and particularly at the time of year. Section 2.8 states in part, and I quote:

> *'Morgan* et al. *(1998b) have also examined the link between air pollution and hospital admissions for Sydney. They found a statistically significant link between chronic obstructive pulmonary disease (COPD) in the elderly (over 65 years) and particulates (as measured by nephelometer) with a 3% increase when the one-hour particulate concentration increased from the 10th to the 90th percentile (23 to 142 inverse megametre). Correlations with asthma and heart disease were not found to be significant.'*
>
> *'The Melbourne Mortality Study (EPA Vic 2000d) examined links between air pollution and mortality between1991 and 1996. The study (based on light scattering coefficient determined using nephelometers) suggested a 1.4% increase in mortality for a 10 μ g/m^3 increase in PM2.5. The study found significant correlations in summer*

months but not in winter months. The report noted the difficulty in controlling for confounding factors.'

'Simpson et al. *(1997) report similar links between mortality and particulate material (measured using nephelometer-derived scattering coefficient data) for Brisbane. Their results suggest an increase in mortality of 0.9 to 1.8% for each μ g/m^3 increase in PM10 (the range is a function of the conversion factor used to convert from scattering coefficient to PM10). The effect was greatest in summer months and for people over 65 years.'*

'The stronger association between particulates in summer months compared to winter months suggests that sources other than woodheaters are significant, although it does not eliminate woodheaters as a potential problem.'

'A study of preschool children in South Australia found a significant reduction in the prevalence of dry cough and wheeze in households with woodheaters compared to other forms of heating (Volkmer et al. *1995). The study identified increased dry cough and wheeze in households with unflued gas heaters.'* (Underlined emphasis' added)

Furthermore, in their summary on '*Wood heater particle emissions and operating efficiency standards*' the department once again states, and I quote:

'We consulted many relevant studies that make assessments of the impact of PM10 both on air quality and human health and found that often they, as we did, had difficulties in matching population, health statistics and data years to PM10 airshed emissions.' (last para Exec Summary, page 3 refers)

So What Could be the Major Culprit To Poor Air Quality Within The ACT .... And By Extension Other Precincts?

Whilst I will not for a minute discount that wood heaters themselves will not have an impact on air quality, it must be clearly stated that wood heaters alone are not the sole source of particulate matter or indeed the sole source of adverse health effects as cited by your advisors or others. To substantiate this, in their 30 June 2012 report 'State of the Environment 2011', the Federal Environment Department again stated, and I quote:

Among diffuse sources of air pollution, motor vehicles are the most pervasive and have the largest impact on urban air quality and human health. In our capital cities, they are the dominant source of NO_x (a generic term for nitric oxide and nitrogen dioxide) and VOCs—the precursors of photochemical smog. Although the combined emissions from industry, electricity generation and wood heating are a larger source of PM_{10} than motor vehicles, because of their ubiquitous presence in our cities, motor vehicles tend to be a more important source of human exposure. (underline emphasis added)

.... AND THAT .....

' In addition, very fine particles (<1 micrometre) form a major part of vehicle particulate emissions. It is these, together with particles in the range 1 micrometre

> *to less than 2.5 micrometres, that are the focus of increasing concern in relation to cardiovascular and respiratory disease, with which they are strongly correlated.*[158] *The Australian Bureau of Transport and Regional Economics estimates that, in 2000, motor vehicle pollution was responsible for 900–4500 cases of respiratory and cardiovascular disease and bronchitis, and as many as 2000 premature deaths.* (underline emphasis added)

With the foregoing in mind, and according to the ABS, the ACT had 267,164 registered motor vehicles as at 31 Jan 2012, which is the total number of vehicles arising out of an average annual increase of 3.2% over the last 10 years (Page 4 of this reference refers). This compares with further ABS statistical figures that state that as at 2011 the ACT had approximately 82,000 natural gas fired heater systems as opposed to just 3,100 wood heaters (Table 12 of the data cube refers). Also, Table 13 of this last reference suggests that the total number of wood heaters has remained relatively stable over the period of March 2005 – March 2011.

With the number of vehicles cited as a backdrop, most of the research reviewed by myself clearly suggests that the cold start and running of a motor vehicle during winter months could add substantially to the particulate matter generated in the first 15-20 min of running before the vehicle reaches its optimal operating temperature. The research suggests that even modern vehicles fitted with catalysts or diesel particulate filters require maximum operating temperatures before the filters burn off excess particulates efficiently and effectively. "Poisoned Catalysts" and real world driving habits together with the re-suspension of dust and other particles that naturally occur from the movement of vehicular traffic operating within and around the ACT, could be more of a major contributing factor to increased air quality problems during cold temperature inversion layer events than wood heaters alone.

Perhaps the best research in this regards is from Dr. Mark Deluchii, who is an environmental scientist from the Institute of Transport Studies at the University of California. In a co-authored Research Paper, Dr. Deluchii provides considerable detail about the extent to which vehicle emission tests and their underlying standards typically underestimate actual observed emissions (with regard to USA EPA tests). Deluchii cites a number of more recent researchers who have provided varying examples of recorded emissions from motor vehicles, but I found his comments about the research undertaken by Williams (who is an Australian) to be the most compelling in the Australian context. Deluchii states on page 29,with respect to Light Duty Gasoline Vehicles (LDGV) and Light Duty Diesel Vehicles (LDDV) that:

> *'Williams et al. (1989a, 1989b) measured PM emissions from "in-use" gasoline and diesel vehicles in Australia. The light-duty gasoline and diesel vehicles were tested over an urban cycle equivalent to the U. S. FTP. (The tests on HDDVs are discussed below.) Most of the vehicles were model years from the late 1970s to the mid 1980s. PM emissions from LDGVs ranged from 50 to 290 mg/mi (average 113 mg/mi), and PM emissions from LDDVs ranged from 290 mg/mi to 1,400 mg/mi (average of 595 mg/mi). PM emissions from LDGVs were correlated with NMHC emissions, and PM emissions from diesel vehicles were correlated with NMHC and CO emissions. Emissions were higher in the cold-start portion of the drive cycle.'*

-

... he continues on page 33 with respect to Heavy Duty Diesel Vehicles (HDDV) ....

> *'Williams et al. (1989b) tested 12 HDDVs, model years 1974-1985, over a multi-model steady-state drive cycle on chassis dynamometer, in Australia. PM emissions ranged from 1.3 g/mi to 11.5 g/mi, with an average of 3.4 mg/mi, or 2.6 g/mi without the highest emitter.'*

That's right, vehicles emissions that could be contributing anywhere up to 11.5 grams per mile travelled (or 1.6Km travelled)!! According to the wood heater certification list of the US EPA, new standards based wood heaters can have emissions as low as 0.45 grams / hr with an efficiency of 80.1% as measured against the US EPA Standard. This wood burning stove (the Cape Cod by Travis Industries) is seconded by the Large Hybrid Fyre fireplace insert, which is rated at 0.58 grams / hr with an efficiency of 80.3% as measured against the US EPA standard. Both of these appliances are available in Australia as distributed by Lopi Australia Pty Ltd. Such improvements in emissions and efficiency of wood heaters contrast starkly to the possible "super emitter" motor vehicles that are possibly present within our environment as cited by Deluchii.

Dr. Deluchii provides some insights into why the current emission test falls short because it typically does not *'include accelerations hard enough to induce "command enrichment," it underestimates the number of cold starts, and it generally is performed with the air conditioning off.'*

In addition, perhaps the most critical observation by Dr. Deluchii in my mind, was the fact that older less well maintained vehicles and/or particularly smoking vehicles were "super emitters" that raised the average emissions of the vehicle fleet significantly. He estimated that "super emitters" could represent anywhere up to 10% of the entire fleet in general.

So What Does the ACT Environment Protection Authority Have To Say?

In their June 2012 report *(i.e. the 'ACT Air Quality Report 2011')*, the ACT Environment Protection Authority states, and I quote:

> *'PM10 levels are below the AAQ NEPM standard. The highest PM10 level recorded during 2011 was 40.0µg/m3 on 14 November 2011. This is 80% of the AAQ NEPM standard.'* (page 17 refers)
>
> ... THEY THEN GO ON TO SAY (and interestingly, with only the Monash Testing Station test results tabulated and cited) ...
>
> *'The 24-hour advisory reporting standard for PM2.5 was exceeded four times at Monash. The exceedences happened during late May to early July 2011 because of particle emissions from wood heaters during winter.'* (Underlined emphasis added, page 17 refers)

With this last statement clearly in mind, I would draw your attention back to the statements made by the Federal Environment Department where they imply that wood smoke is predominately concentrated within the PM10 emissions range. Given all the evidence that is available (or not available as it may be), it is unclear why the ACT EPA would make such an unsubstantiated claim about the contributing factors of PM2.5 and that wood smoke alone would have been the major contributing factor affecting air quality in the ACT at that time. The

reason? Because in discussions with the Director of the Air Quality at the Federal Environment Department (dated 8 May 2013), she confirmed with me that current collection methodologies within Australia are unable to specifically differentiate the sources of particulate emissions from the volumes of air collected. As such, it would appear that the statement pertaining to PM2.5 emissions made by the ACT Environment Protection Authority is unfounded. Hopefully the statement was not progressed on the basis of departmental bias.

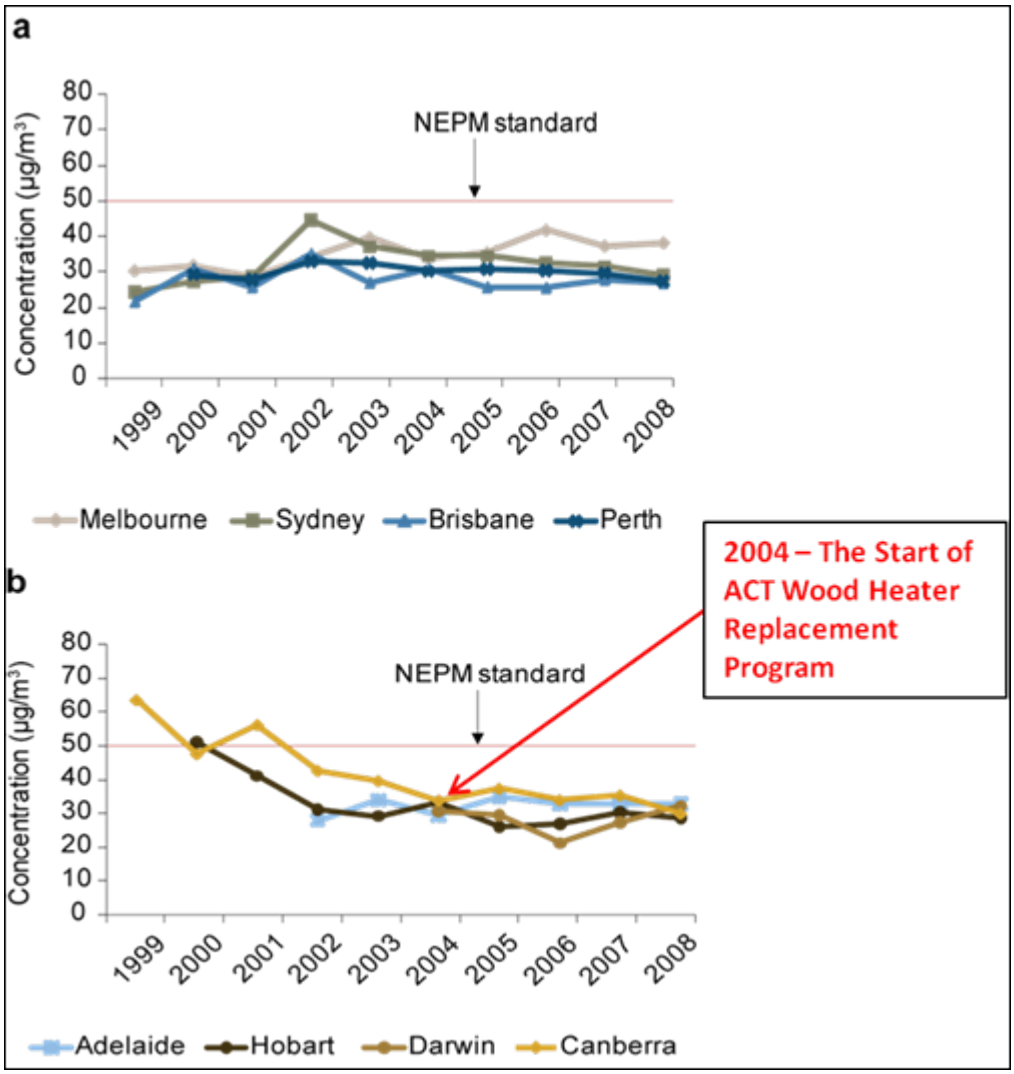
Irrespective of this, Dr. Deluchii provides further insights into this issue where his research (Table 16.19 (pages 170-179)) provides an inkling of the relative contribution rates from various emission sources within a given volume of collected air. Whilst these reference points with respect to the American experience might deviate somewhat from the Australian context, his research nevertheless illustrates that it is indeed Light Duty Gasoline and/or Diesel Vehicles which appears to be the highest contributing factor to air quality problems. This research validates the assertions made by our own Federal Environment Department.

Given that most vehicles within the ACT would not typically travel for more than about 15-20 mins on a single commute, and given that they would typically have the air-conditioning running in order to help defog windows in cold weather, then one could reasonably argue and conclude that it is indeed vehicular derived PM2.5 that is the largest single contributing factor to poor air quality in the ACT as compared to that of wood heaters alone (this assertion garners considerable plausibility when you consider the thousands of vehicles that navigate up the grade of hill of Yamba / Erindale drive. The proximity of the Monash testing station to the fall out of these emissions adds considerable weight to my argument I feel).

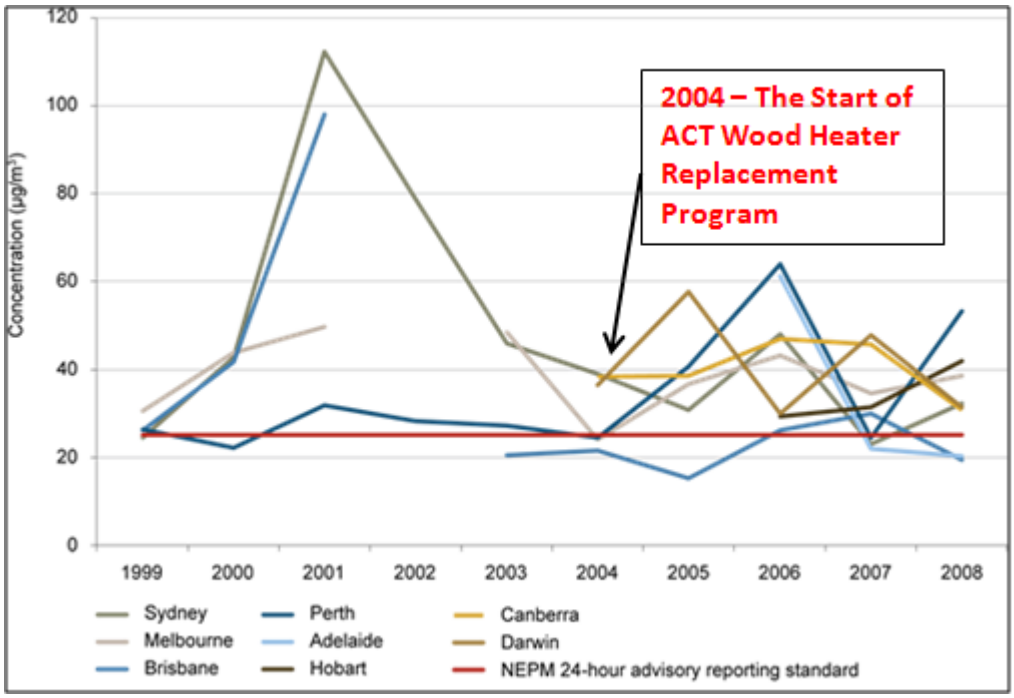
Incidentally, proponents for the outright abolition of wood heaters and/or other commentators who have had a propensity to voice adverse opinion about wood heaters in general, may find that they are in fact bigger contributors to poor air quality than wood heater owners alone, if they indeed drive and operate older and/or poorly maintained motor vehicles.

What Other Hard Evidence Is There That Shows The Air Quality Experience In The ACT?

With the information above about wood heating and PM10 particulates as a backdrop, the following annotated graphs below have been extracted from Figures 3.26 and 3.27 of the Federal Environment Departments 'State of the Environment 2011' report, which has mapped the level of PM10 & PM2.5 particulates over the period analysed.



Source: Adapted from Fig 3.26 'State of the Environment 2011' – PM 10 Emissions

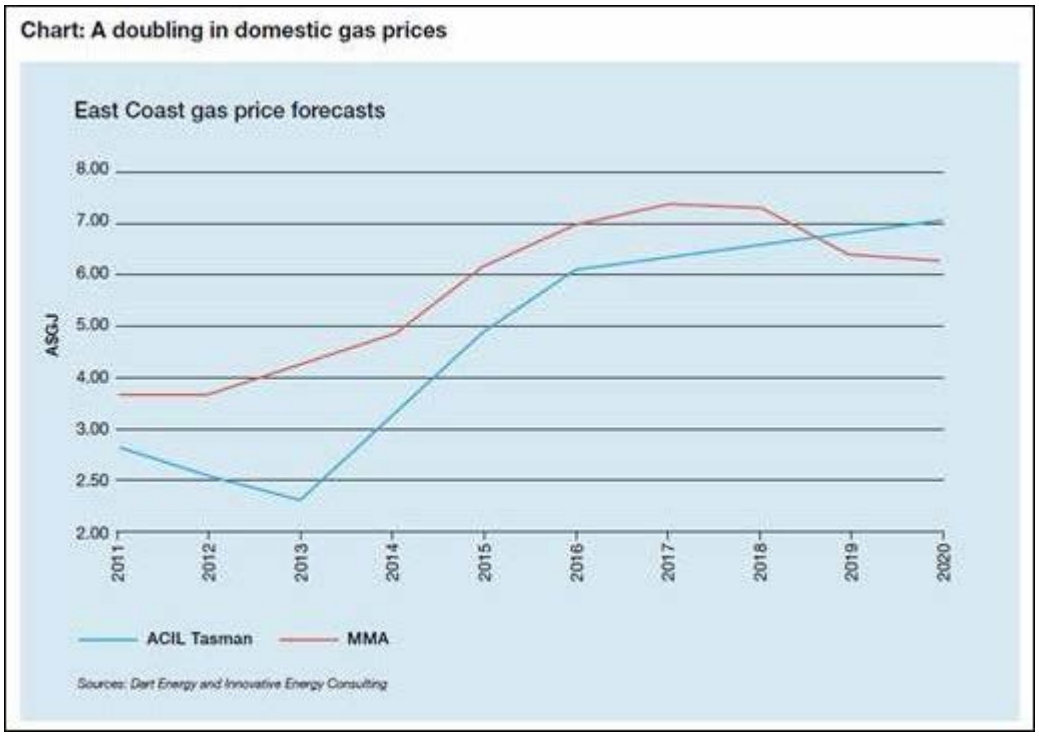


Source: Adapted from Fig 3.27 'State of the Environment 2011' – PM 2.5 Emissions

As can be seen in Figure 3.26, there has been an ever decreasing trend in PM10 emissions since 1999, with a particular emphasis from 1999 to 2004. Arguably, the trend reduction for the ACT could be attributable to many things including, but not limited to: the completion of substantial green field building sites within and around the Territory; significantly improved emission standards and controls applied to the uptake of newer vehicles; the introduction of mains gas supply in the early 1980s, substantially replacing old oil fired heaters, and last but not least, the introduction of the 1999 AS/NZS 4012/4013 standard that mandated improved and stricter emissions and efficiency standards for wood heating appliances.

As I have annotated on both graphs above, the start of the ACT's Wood Heater Replacement Program was initiated in 2004, and according to the Program Manager in a phone conversation on the 16 April 2013, the program has only been responsible for the replacement of 1,008 wood heaters as at 31 December 2012. As can be seen in these graphs, the supposed air quality benefits from the uptake of this replacement program does not seem to have translated noticeably in the results tabulated and graphically represented.

Is Natural Gas Really A Panacea For The ACT Or Australia's Air Quality?



Source: http://www.domgas.com.au/pdf/Alliance_reports/DomGas%20Report%202012.pdf

As per my previous correspondence, I believe the ACT Government could be instrumental in forging new initiatives in the wood heating area, but the Government needs to first recognise and accept that wood heating is a cost effective source of heating for many ACT homes and that constituent attidues to wood heating are not likely to change given the previous information I have tended (i.e. as illustrated in the graph above, the continued and projected increase in natural gas prices over the next 3-4 years will surely be a barrier to entry for many ACT constituents from here on in). In addition, the Natural Gas industry itself claims and threatens that gas prices will increase if Government intervention occurs regarding any reduction in coal seam gas extraction.

But why is Natural Gas so expensive in Australia when we are one of the world's largest producers? The reason I ask this burning question is because the US Energy Information Agency (EIA) provides US citizens with data pertaining to the projected energy prices that consumers are likely to pay over the forthcoming period. Here's a snapshot of that advice:

What is the outlook for home heating fuel prices this winter?

According to EIA's Short Term Energy Outlook released on May 7, 2013, the projections for U.S. residential heating fuel prices[1] for the winter of 2013-2014 (October 2013 to March 2014) are:

Natural Gas: $11.53 per 1,000 cubic feet, about $1.13 per therm[2]

Heating Oil: $3.70 per gallon

Electricity: 11.98 cents per kilowatthour

[1]Retail prices includes taxes.

[2]There are 1,022 Btu per cubic foot, and a them = 100,000 Btu.

Source: http://www.eia.gov/tools/faqs/faq.cfm?id=5&t=8

As can be seen, the information contained within the orange highlighted area, clearly shows that the EIA expects that the retail price of natural gas to cost approximately $1.13 per Therm inclusive of taxes. If you are not aware, one Thermal unit of gas is equivalent to 105.5056MJ (you can check this out here). Therefore, according to the EIA, US residents in general are expected to pay approximately 7.5cents per MJ including tax. Looking at my current bill from ACTEW/AGL, the price quoted charged per MJ is 22.94cents excluding tax .... a 300% differential from the American price!!?? And it is projected that the price we are expected to pay will double again over the next 4 years. There is also a significant but lesser differential regarding electricity. WHY ARE AUSTRALIANS BEING SLUGGED WITH HIGH ENERGY COSTS??

The foregoing information and question poses some fertile ground upon which policy makers and regulators should take particular interest. There is no doubt in my mind that some of the campaigning and the considerable swing against the ACT Government at the last state election was a key indicator of the a real concerns that constituents have about cost of living pressures. If I am any reflection of this general concern, then there is no doubt that gas and electricity prices are central to a desire to seek cost effective energy independence. Contrary to the assertions in your letter about the cost of fire wood, efficient wood heating will provide a cost effective pathway and assurance of this desire.

In addition to the foregoing, there is now added and wide spread concern about the true nature of how clean natural gas really is (i.e. the extraction process of coal seam gas, which has been shown to release significant amounts of methane into the environment). Community awareness about the environmental impacts of CSG extraction methods are centre stage and I believe that the information delivered in a recent ABC 4 Corners Program on this issue is rather compelling. I am sure Mr. Rattenbury and others will have some firm views on this issue also.

Finally, and to refocus my commentary back to specific air quality concerns as it pertains to

individuals, then you might find a recent study undertaken by the University of Sheffield where they found that pollutants and indoor air quality was significantly degraded by the outputs of gas cook tops. Given the research presented, the exposure of building occupants to poorly vented gas cooktops presents a real risk, but perhaps as equally important, gas cook tops that are properly vented will only tend to transfer those emissions into the outside airshed environment. Given the installed base of gas heaters as cited above (i.e. 87,000 gas heaters), one can only assume that a directly proportional number of installed gas cooktops are equally contributing to and affecting our air quality?

Suggested Policy Prescriptions That Could Be Introduced To Improve The ACT's Air Quality, And By Implication If Adopted, Australia More Broadly

With the foregoing research in mind, I tender the following recommended policy prescriptions for your consideration.

1. Extend the current Wood Heater Replacement Program subsidy to include new standards based wood heaters. As I have previously requested, I believe the ACT Government and the ACT Assembly more generally should accept the relevance of wood heating as a via and cost effective means of heating by extending the Wood Heater Replacement Program Subsidy (WHRPS) to those constituents who would genuinely like to contribute to better air quality whilst protecting their rights in making their own informed decisions about the standard of living / cost of living choices that are generally available to them. Such a measure is consistent with many international jurisdictions who have implemented generous financial assistance replacement schemes; thereby acknowledging the benefits of wood heating for constituents whilst actively putting in place the policy frameworks to improve air quality.

With this in mind, as recently as last month as I understand, the Australian Standards Committee convened a meeting with industry representatives to consider adopting new emissions and efficiency proposals as suggested by the Wood Heating Industry. It was proposed to have emissions for all newly installed wood heaters to comply with a new initial emissions standard of 2.5g/Kg (down from 4g/Kg), with a minimum starting efficiency of 55%. This is a proposed first step in a suggested 5 year rolling program to incrementally reduce these initial standards further to a subsequent and resultant measure of 1.5g/Kg emissions with a minimum efficiency of 60% by 2018. This initiative is aimed at trying to provide further air quality improvements whilst allowing a research and development pathway for Australian industry to improve appliances on a schedule that would not put them out of business.

In addition to this policy proposal, I would also recommend that a person seeking a WHRPS subsidy needs to be able to demonstrate to the approving authority that they have a dry air wood seasoning and/or undercover storage facility for the storage of seasoned fire wood. It should also be mandated that owners of wood heating appliances also be required to own a functioning moisture meter to ensure that they test and burn only dry seasoned fire wood (i.e. with a moisture content of less than 20%). Such measures would assist the approving authority in the engagement and education process and allow for the any subsequent enforcement of regulations where, in the unlikely event, excessive smoke from a residence is continually observed. I firmly believe that this proposal would help to significantly reduce the perceived impact of wood smoke generally within the community and it would perceivably help to also put

in place measures to reign in any recalcitrant individuals who do not burn wood responsibly.

2. Introduce mandatory annual vehicle emissions tests for all vehicles over a prescribed age limit as pre-determined by an expert panel. This type of regulatory requirement is not new as other international jurisdictions such as California have had annual vehicle emissions testing regimes in place for well over 20 years now. As cited in Dr. Deluchii's research, vehicle emissions appear to increase significantly with the age of vehicles and/or with poor maintenance regimes. Given the research of Dr. Deluchii's and that of others he has cited, it is recommended that such tests should be undertaken so as to invoke "command enrichment" and with the air conditioning turned on to ensure that the emissions tests reflect real world conditions as much as possible.

The impost of similar vehicle testing is not necessarily new in the Australian context because annual testing is a mandated requirement nationally for all LPG aspirated vehicles.

Conclusion

In the interests of better air quality for the ACT, I once again ask that you seriously review and consider extending the current Wood Heater Replacement Program Subsidy to include new standards based wood heaters that comply with the new prospective standards that have just been tabled recently with the Standards Committee. To not include new compliant wood heaters as part of the air quality solution for the ACT would only be an affront to many affected constituents who may have a genuine concern about air quality but do not have the means to effectively replace older wood heaters. Such a policy setting does little to improve air quality and diminishes the viable options available to ACT constituents.

If the ACT Government continues to reject this proposal then one could only conclude that there is some form of collusion occurring between the Government and commercial gas companies or their commercial affiliates that only tends to further the financial interests of those commercial operators; a policy position that would continue to be at the direct expense of ACT constituents and non-aligned but affected businesses, both in financial and environmental terms.

Finally, and based upon some of the evidence presented and cited above, it is recommended that the Government adopt and implement emissions testing for all motor vehicles over a prescribed age limit as pre-determined by an expert panel.

I hope my detailed response will give you pause to reflect and consider this important matter further. I would once again welcome your considered response.

Yours sincerely

Peter Thornton
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PS I have only just learnt in the last couple of days that there is a Senate Enquiry investigating air quality issues. As such, and with your indulgence on such an important matter, it is my

intention to transmit this submission under separate cover forthwith to that Senate Committee for their respective information and consideration. I will also provide a copy to the Home Heating Association to assist them in their respective representations also.

PSS Please note, and if it is not clear, apart from being a concerned and affected constituent, I have no affiliation or financial interest with the wood heating industry.