Submission to the Senate Economics Committee

Inquiry into the Renewable Energy (Electricity) Amendment Bill 2009 and a related bill

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I am making this submission in my personal capacity. It draws in part and includes, with the permission of both parties, the results of analysis I undertook as an employee of pitt&sherry, on behalf of the Gas Industry Alliance. The opinions expressed are my personal views.

The submission principally addresses two questions:

Firstly, whether a major expansion of the Howard Government's MRET scheme, with virtually no change to the design aspects of the scheme, is the most efficient and effective means of building for the long term Australian renewable energy generation capacity, taken as given that Australia has the resources needed to support such a major expansion and that a large increase in renewable electricity generation capacity will be essential if Australia is to achieve significant reductions in greenhouse gas emissions.

Secondly, whether these objectives are best achieved by including solar and heat pump water heaters, which consume rather than generate electricity within the scheme. As a subsidiary issue under this heading, some comments are made about the excessively generous treatment of heat pump water heaters in particular by the Office of the Renewable Energy Regulator (ORER), as administrator of the scheme.

In addition, brief comments are made at the end on two other issues relating to the legislation.

Are the design features embodied in the legislation the best way to build major long term renewable electricity generation capacity?

As a mechanism to increase the share of Australia's electricity produced from renewable sources, the Howard Government's MRET legislation had a number of weaknesses. These include the excessively generous treatment of output from "legacy" hydro-electric plant above an historic baseline, and the inclusion of solar and heat pump water heaters within the scheme. However, as a mechanism to harness the market to the goal of identifying and developing the least cost sources of renewable electricity available in Australia it was highly successful. Prior to the legislation coming into force, it was widely believed that Australia did not have large resources of wind energy. The working of the .market for new renewable electricity, which the legislation created, quickly demonstrated that this was not the case. It is now recognised that, relative to its electricity demand, Australia has one of the largest wind

energy resources of any country, and a number of Australian businesses have developed, designing, building and operating wind farms.

I conclude from this experience that markets, if properly designed, can be a very efficient and effective way of achieving specific policy objectives. But before concluding that carrying forward the MRET design, virtually unchanged is the best approach, it is important to recognise that design features that may work well for a target of 9,500 GWh over ten years, set in 1999 will not necessarily work well for a target of (45,000 – 9,500 =) 35,500 GWh set in 2009.

In exploring this issue, the key starting point is the answer to the question: what are the policy objectives of the expanded nRET?

If the objective is simply to achieve the defined increase in renewable electricity generation at the lowest possible cost, then the proposed legislation may work reasonably well. The most likely outcome is that wind generation will provide the great majority of the additional generation capacity, solar and heat pump water heaters may take up to 20% (see below), and very little will be provided by other highly promising renewable generation technologies, including solar thermal, hot rock geothermal, biomass, and photovoltaics. The reason is that the other technologies, although in some cases quite widely used and relatively commercially mature in other countries, are immature in Australia. Consequently, the first few installations will be more expensive than wind, which is now a commercially mature industry in Australia. In the name of |"not picking winners" the market created by the MRET works, like so many markets, on a winner take all basis. The provision for unlimited banking will exacerbate this effect, by making it commercially feasible for wind generators to invest in capacity in excess of the target requirement in the early years of the expanded scheme, thereby "locking out" potential alternative, less mature technologies in later years.

If the objective of the scheme is considered, at least to some extent, to include development of a diverse renewable electricity generation portfolio, this is potentially a cause for serious concern. Solar thermal, hot rock geothermal, photovoltaics and other renewable energy technologies and sources have different and in important ways complementary technical characteristics, which can allow more efficient operation of the electricity grid as a whole. Moreover, although the Australian wind resource is undoubtedly sufficient to supply most of the proposed expanded target, it is neither technically suitable nor sufficient to supply more than 20-25% of Australia's total electricity requirements. If the objective in the long term is to achieve a much higher fraction of renewable electricity, which it must be if Australia is to achieve emission cuts of 60% or more by 2050, then the possibility that solar thermal, hot rock geothermal and other renewable energy sources may be "locked out" until well after 2020 is a cause for serious concern.

In the early stages of the design of the original MRET, some consideration was given to the possibility of reserving tranches of capacity to the different technologies. It was decided not to proceed on this basis, because insufficient was known about the likely relative costs and

performance characteristics of the different technologies. In retrospect, as stated above, this was a wise decision.

However, circumstances are now very different, much more is known about the characteristics of the different resources and technologies. The Government has implicitly recognised the importance of developing these other technologies, by establishing the Renewable Energy Fund. However, this is an essentially *ad hoc* approach which makes no use at all of market forces. A better approach may be to modify the "purity" of the nRET market by allocating minority tranches of capacity to selected technologies, such as solar thermal and one or two others. The objective should be to ensure that, when the scheme reaches maturity in 2020, Australia will have a diverse portfolio of renewable electricity generation, capable of providing the basis for further expansion driven by an emissions price signal across the energy economy.

Inclusion of solar and heat pump water heaters

Under the current MRET, installation of solar and pump water heaters earns Renewable Energy Certificates (RECs), equal to the additional number of MWh of electricity that, it is deemed, would have been consumed over the lifetime of the water heater, had an electric resistance water heater been installed instead. The current bill proposes to retain this aspect of the scheme.

This raises a number of issues of concern, which can be grouped under three headings:

- Inclusion of solar and heat pump water heaters is in principle not consistent with the policy objectives of the nRET and the need to use a deeming approach to calculate RECs degrades the integrity of the scheme.

- Interaction with other policy commitments relating to residential water heating means that solar and heat pump water heaters could become the largest source of RECs, even in the expanded scheme, thereby, in practice, undermining the objective of the scheme.

- Inclusion of solar and heat pump water heaters distorts the market for water heaters and discriminates against other forms of water heating which have the same or in many cases lower levels of greenhouse gas emissions..

Each of these is discussed in turn.

Policy objectives of the nRET

Last year's discussion paper on the nRET started that "the MRET scheme is designed to increase the deployment of renewable energy in Australia's electricity supply" (COAG Working Group on Climate Change and Water, 2008, p. 5). Inclusion of solar and heat pump water heaters within the nRET is not consistent this objective. Nor does it, in the words of the Australian Labor Party's platform for the 2007 election "ensure the equivalent of at least 20 per cent of our electricity supply – or approximately 60,000 GWh – is generated from

renewable sources by 2020" (Australian Labor Party, 2007). The more solar and heat pump water heaters are included within the notional 60,000 GWh the more will the percentage of electricity from renewable sources supplying the grid fall below 20%.

Solar water heaters, if they replace electric water heaters, reduce demand for electricity, by substituting solar heat at point of use for some of the electricity which would otherwise be used. They are precisely analogous to the addition of thermal mass or north facing windows with properly sized eaves to a residential building, to reduce the demand for purchased energy for space heating. It is far more logical to treat these types of technology as a particular category of energy efficiency, which increases the efficiency for which purchased energy is used by partial substitution of free energy from the sun.

Heat pump water heaters are effectively a pure energy efficiency technology, increasing the efficiency with which electricity is used to heat water by a factor equal to the coefficient of performance of the heat pump. Heat pumps are widely used throughout the economy to supply heat, including residential scale reverse cycle air conditioning, commercial scale HVAC systems and specialised applications in manufacturing. There is no obvious logic for treating air source heat pumps used to heat water as eligible under the MRET, and not all these other heat pump applications. Indeed, if the criterion for eligibility were the effectiveness of heat pumps in reducing electricity consumption, then it would be more logical to make ground source heat pumps, occasionally used for space heating, often under the misleading name of geothermal heat, an eligible technology. Since they have a higher capital cost, but lower electricity consumption than air source heat pumps, they are in more need of assistance, such as eligibility under the MRET provides, than any type of air source heat pump, including air source heat pump water heaters.

Solar and heat pump water heaters displace, rather than generate, electricity, and the amount displaced cannot be measured, but only estimated by use of modelling tools. They are therefore qualitatively different from other sources, which deliver metered quantities of electricity to electricity supply networks. A deeming approach is required, and this relies on a number of assumptions and approximations, which may be summarised in the following series of steps.

- The quantity of electrical energy saved by solar systems is assumed to equal the difference between the total quantity of energy added to the cold water inlet to supply hot water throughout the year, and the quantity of boost energy input over the year.

- The quantity of electrical energy saved by heat pump systems is assumed to equal the difference between the electricity consumption of a conventional electric resistance storage water heater and that of a heat pump system of the same size delivering the same quantity of hot water.

- These quantities are estimated by means of thermal simulation modelling of the performance of the relevant water heater models.

- In addition to the technical characteristics of the water heater models, the simulation modelling makes broad averaging assumptions about the climate of the location where the system is installed, the quantity of hot water consumed by households, how that consumption is distributed over time, both on a daily and an annual (seasonal) basis, and the temperature at which the hot water is supplied.

- It is widely considered that the hot water consumption levels assumed by AS 4234, on which the modelling approach is based, are too large. They derive from a limited set of measurements made in Melbourne in the early 1980s, since when changes in household size, household water consuming habits and characteristics of hot water consuming appliances have all changed in ways that tend to reduce hot water consumption. Using lower consumption levels in the modelling would have the effect of reducing the quantities of electricity saved.

- It is assumed that all solar water heaters are installed at the optimal orientation and elevation, without shading, and are correctly installed in all other respects.

- Modelling of heat pump water heaters assumes that the coefficient of performance (COP) is the same throughout Australia. There is considerable evidence that COP is significantly lower when ambient air temperatures are low, i.e. during winter in southern Australia, but this has so far not been allowed for. All heat pump water heaters include an electric resistance boost element and available data suggest that, during winter, this supplies most of the energy consumed by heat pump water heaters in southern Victoria and Tasmania.

- The broad climate zones (four for the whole of Australia) were originally specified in the Australian Standard for the technical performance of solar water heaters. Zone 3, which covers well over half the Australian population, includes within it cities with climates as different as Brisbane and Canberra. This is considered to be satisfactory for solar systems, because the higher insolation in Canberra offsets the higher standing losses and lower inlet temperatures associated with a much cooler winter climate than Brisbane. This balance does not exist for other types of water heaters, including heat pump systems, which means that the modelled results in many parts of Zone 3 are in serious error.

- It is assumed that all solar and heat pump water heaters are correctly maintained and operated to design specifications for the assumed life, which in most cases is 10 years. All RECs for the full assumed life are earned at the time of installation.

It is obvious that the estimation of displaced electricity depends on a large number of assumptions and approximations. The calculation of RECs earned is in no way comparable to the accuracy of metered output of a renewable electricity generator, which is the basis for calculating the RECs earned by "true" renewable electricity generators.

Finally, there is no process of auditing the installation and operation of solar and heat pump water heaters. It is not known how many are incorrectly or sub-optimally installed, but anecdotal evidence suggest that the number is not negligible.

These many uncertainties clearly degrade the integrity of MRET. Not only is the quantity of renewable electricity generated, and the renewable share of national generation, less than implied by the generally understood public parameters for the program (9,500 MWh), but there is great uncertainty about the accuracy of the estimated electricity savings and a number of reasons to think that they may be too high.

Possible contribution of solar and heat pump water heaters to the nRET, and implications for the success of the nRET in meeting its policy objectives

Data available on the ORER website show that solar and heat pump water heaters account for 24% of all RECs generated to the end of 2008. This means that the quantity of renewable electricity actually generated under the MRET legislation is 24% less than the normal program target. If this trend continues to next year it will mean that additional renewable electricity generated is not 9,500 GWh in that year, but 7,220 GWh. Indeed, the proportion of generated RECs from this source has been steadily increasing over the last few years (which is consistent with limited ABS data on the increasing market share of solar water heaters), suggesting that the overall proportion of solar and heat pump generated RECs in 2010 may be more that 24%.

At its meeting on 2 July last, COAG endorsed the *National Strategy on Energy Efficiency*, which includes a provision to "phase-out conventional electric resistance water heaters". Several States already prohibit the installation of electric water heaters in new houses. The effect of these measures will be to greatly increase the market for all other types of residential water heaters, including gas, but also solar and heat pumps.

According to ABS figures, there were approximately 2.9 million dwellings with off-peak electric water heaters at the beginning of 2008 (ABS, 2008). The new build market for Class 1 dwellings is likely to be at least 100,000 units per year. It is of course impossible to be certain what share of the total market, both for replacement of electric systems and new build, may be taken by solar and heat pump systems. In addition, there will be a smaller, ongoing market for replacements of existing solar and heat pump systems.

If it is assumed that solar and heat pump systems will take 50% of the new build and mandated replacement market, then, notwithstanding the target being four times larger than the current MRET, solar and heat pump water heaters could account for nearly 20% of cumulative RECs generated up to 2020. Because, under the deeming provisions, solar and heat pump water heaters generate their entire complement of RECs, based on a full working life, in their year of installation, the proportion of total RECs sourced from solar and heat pump water heaters will be much higher in the early years of the new scheme, and smaller in later years.

The large share of RECs continuing to be taken by solar and heat pump water heaters will create a significant risk that potential important new renewable electricity generation technologies may be "crowded out" of the nRET. Technologies likely to be particularly affected include concentrating solar thermal and hot rock geothermal. These technologies have played no significant part in the MRET up to the end of 2008 (3,900 RECs from solar, equal to 0.01% of total, zero from geothermal), but are widely seen as of great potential importance in the longer term.

Distortions and discrimination in the water heater market

I strongly support COAG's decision to phase out electric resistance water heaters. The annual emissions savings, on completion, will be between 5 and 10 Mt CO_2-e and cost per tonne abated very low.

However, the obstacle to implementation is that all alternatives to electric resistance water heaters have a higher capital cost. Moreover, in NSW and Queensland, which at present have particularly low off-peak electricity prices, the operating costs of off-peak electric water heaters are at least as low as the best of the alternatives. For a great many households in these two States, therefore, as well as smaller numbers in other States, phasing out off-peak electric water heating will impose an additional cost, even if the replacement only occurs when an existing off-peak system reaches the end of its useful life. Equitable and effective implementation of the phase-out will therefore require the availability of some form of financial assistance.

At present, such assistance is available through an incoherent mixture of Commonwealth, State and Territory rebates, RECs and planning regulations, which not only discriminate in arbitrary ways between jurisdictions but also, more damagingly for the environment, favour some types of water heaters, notably solar and heat pumps, but not other types, notably high efficiency gas, which in almost all circumstances will have lower lifetime greenhouse gas emissions. Implementation of the electric off-peak phase out will provide the opportunity to coordinate and rationalise these assistance measures.

Clearly, determining what subsidies will be offered in what circumstances and under what conditions will be a complex task, and it is not directly relevant to consideration of the nRET legislation. However, it is certain that to continue to use the nRET for this purpose, by offering RECs to a selected sub-set of alternative water heating options, would be an economically inefficient and socially inequitable approach. It would subsidise some options and not others on a basis quite unrelated to the incremental cost of the options, and it would totally ignore the differing economic circumstances of households. Furthermore, solar and heat pump water systems have been and will continue to be price takers in the market for RECs, having little or no influence on the price, which will be determined by the dynamics of investments in wind and other sources of renewable electricity. Consequently, the amount of subsidy available through the nRET to solar and heat pump water heaters will vary, possibly quite erratically, depending on the dynamics of the MRET market being driven by factors entirely unrelated to the costs of alternative water heating options.

In conclusion, therefore, taking solar and heat pump water heaters out of the nRET will be an essential first step in designing and implementing an equitable and efficient program for achieving the phase out of large electric water heaters throughout Australia.

Other issues

I wish to comment briefly on two other issues: the use of the RET as a mechanism to provide a financial incentive for small scale photovoltaic installations, and the importance of collecting data about scheme operation which show actual electricity sent out by accredited generators as well as certificates created.

Treatment of photovoltaic systems

There has been much comment, and the Committee will undoubtedly receive many submissions addressing the proposed treatment of photovoltaic systems. I simply wish to observe that the use of the multiplier, and consequent "phantom" or "imaginary" RECs is damaging to the integrity of the scheme, for three reasons.

1. It reduces the target to some level less than 35,000 GWh and therefore, it could be argued, breaches the undertaking given by the Government in the lead up to the last election.

2. The very concept of "phantom" RECs is inconsistent with a scheme which is supposed to be based on actual quantities of electricity supplied.

3. The necessity of using a deeming approach to estimate, ex ante, the quantity of electricity a photovoltaic system may be expected to produce over its lifetime (assuming it is correctly installed, at an appropriate orientation and operates to the supplier's specifications) means that RECs generated by such installations are less certain or accurate than RECs generated by other categories of accredited generated, which are based on metered electricity sent out. (They will, however, be rather more certain that RECs generated by water heater installations, for the reasons discussed above.)

Collection of data on renewable electricity generation

It is not known how much renewable electricity is produced in Australia each year. While it is known, through ORER, that all liable electricity retailers meet their obligations to purchase RECs, it is impossible to tell from the data which ORER places n the public domain how much electricity is actually being generated. It seems as if ORER has interpreted its role as the narrow one of ensuring compliance with the law, and sees collecting an publishing data in a form which would allow the effectiveness of the policy which is being delivered by the MRET legislation, that is to increase the share of renewable generation in Australia's total electricity supply. Neither NEMMCO, nor the ESAA nor any other government or industry body collects data on renewable electricity generation which is even vaguely comprehensive, and could substitute for the lack of data from ORER. Given the significant, though in my opinion justifiable, cost of the MRET to electricity consumers, not to mention the centrality

of the MRET to Australia's efforts to mitigate greenhouse gas emissions, this is a reprehensible failure of policy accountability. Of course NEMMCO does report electricity sent out from hydro generators (except in WA and the NT), but it reports only a handful of the non-hydro renewable generators, almost all of which are MRET accredited. In other words, comprehensive reporting of electrical output from MRET accredited generators would cover the great majority of Australia's non-hydro renewable generations.

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