The Secretary
Senate Economics Legislation Committee
PO BOX 6100
Parliament House
CANBERRA ACT 2600

economics.sen@aph.gov.au

24 July 2009

Dear Sir/Madam,

RE: Senate Economics Committee inquiry into the Renewable (Electricity) Energy Amendment Bill 2009

The Gas Industry Alliance (GIA) represents the downstream gas industry in Australia. Its members include the Energy Networks Association (natural gas distributors), LPG Australia (LPG distributors), Gas Appliance Manufacturers Association of Australia (gas appliance suppliers) and the National Association of Food Equipment Suppliers (catering equipment suppliers).

The GIA is pleased to have the opportunity to raise the serious concerns it has with the current legislation and the proposed amendment Bill, concerns which have been raised consistently over the past few years with this and the previous Government.

The GIA would like to bring to the attention of the Committee that the proposed Amendment Bill will not ensure the Governments commitment that 20% of Australia's electricity generation will come from renewable sources by 2020. In fact the continued inclusion of solar hot water systems in the scheme will ensure that this worthy goal will not be met, and based on current forecasts the likely actual outcome will be 20-25%[1] lower then the much heralded target.

Secondly the inclusion of solar hot water systems in the scheme has created a dangerous loophole where products which are clearly not solar or renewable are included in the scheme, worse still the methodology for calculating RECs for these products is disproportionate to the greenhouse gas

[1] Defects in the target: nRET Dr Hugh Saddler

and electricity demand reductions they deliver. The loopholes in the Act are delivering marginal environmental improvements at a great cost to the Australian economy and in some cases providing incentives for consumers and businesses to install higher emission hot water system, a ludicrous outcome.

The GIA urge the committee to make the following recommendations;

1. **Immediately modify the Renewable Energy (Electricity) Amendment Bill 2009 to close a damaging loophole in the current legislation by including a new eligibility criteria for Solar Hot Water systems that requires the installation of solar collectors or panels for all new systems.**

2. **Government to develop a new amendment Bill to completely remove solar hot water systems from the RET scheme to ensure Australia meets its 20% renewable electricity generation target by 2020.**

3. **Government develop a national approach to encourage energy efficiency and greenhouse gas abatement, including support to transition Australian household and businesses to low emission hot water systems in conjunction with the development of the emission trading framework.**

The Government's stated public policy commitment at the beginning of its current term was to a 2020 vision for a clean renewable energy future:

- By ensuring the equivalent of at least 20 per cent of our electricity supply – or approximately 60,000 GWh – is generated from renewable sources by 2020.
- Increasing the Mandatory Renewable Energy Target (MRET) to 45,000 GWh to ensure that together with the approximately 15,000 GWh of existing renewable capacity, Australia reaches its 20 per cent target by 2020.

In the exposure draft of legislation and regulations for the national Renewable Energy Target (nRET) on 17 December 2008 the Government describe this legislation as critical step towards implementation of one of the most important of its pre-election commitments on climate change policy and renewable energy. It proposes to do this by amending the *Renewable Energy (Electricity) Act 2000* and associated Regulations, the legislation and regulations that establish the current Mandatory Renewable Energy Target (MRET) scheme.

It stated the following:

> "The MRET scheme is designed to increase the deployment of renewable energy in Australia's electricity supply. It guarantees a market for additional renewables-based generation (backed by a legislative obligation), using a mechanism of tradeable renewable energy certificates (RECs). One REC is equivalent to one megawatt-hour (MWh) of renewable energy." (COAG Working Group on Climate Change and Water, 2008, p. 5)

The proposed amendments to the Renewable Energy (Electricity) Act will not deliver 20% renewable electricity generation by 2020 and is inconsistent with the Government's own policy objectives.

There is very little ambiguity in the Government's words, their objective is for 20% of Australia's electricity generation in 2020 to be from renewable sources, and they are telling the Australian public that this legislation will deliver it. Yet the inclusion of solar hot water systems which do not generate a single kilowatt of electricity in the RET scheme will ensure that 20% target can not be met and could be up to 25% lower than the Governments stated aim.

The only way to achieve the Government's 20% renewable electricity generation target is to encourage the investment in the development of new renewable electricity generation projects, whether that be large scale wind farms, geothermal, or solar thermal technologies or small scale photovoltaic and hybrid systems. The proposed tradable energy renewable certificates is an appropriate supply side approach which will create the incentive and the market to ensure the most efficient lowest cost renewable technologies are adopted.

The fundamental flaw in this legislation is the continued inclusion of a demand side alternative in the form of solar hot water systems in the scheme. Demand reduction programs are recognised as a significantly lower cost alternative to incremental investment in electricity generation, and as such they will absorb the majority of the incremental investment generated by the proposed RET scheme. Currently solar hot water systems represent approximately 50% of renewable energy certificates created this year[2] and are forecast to represent at up to 25% of all RECs over the course of the scheme. The GIA and others [3]identified and communicated this concern to the Government in its submission in response to the exposure draft.

Flooding the market with low-cost solar hot water RECs clearly will not only drive down the value of RECs it creates significant uncertainty over the longer term value of REC which is one of the primary incentives for businesses to

[2] Green Energy Markets Report June 2009
[3] CEEM Submission to the CoAG Working group on Climate Change and Water

invest in the construction of renewable electricity generation. The outcome is to reduce the premium value of renewable electricity generation and reduce the incentive to invest, exactly the opposite of the primary policy objective of this legislation.

Another significant problem with the inclusion of demand side initiatives in supply focused scheme is the way RECs are created. Supply side initiatives create RECs when they actually generate electricity, which is totally auditable and transparent. Demand side RECs are created by a deeming process in advance of any actual energy reductions, and are based on an estimated efficiency improvements and usage patterns which are subject to significant variations and errors. There is strong evidence that the deeming methodologies used in MRET scheme to calculate RECs for solar hot water systems significantly overstate amount of electricity consumption reduced by the installation of these systems, increasing the quantity of RECs created and further driving down the value of RECs in the market.

There is little debate over the need and benefit of demand programs to reduce energy consumption to tackle climate change, currently there are multiple Federal and State based programs which provide substantial direct incentives for the replacement of existing hot water systems with more energy efficient and greenhouse friendly products. This was not the case in 2000 when the original MRET scheme was developed, and at that time there was a need to support the solar hot water industry, the previous Government decided to include solar hot water systems into the scheme as it was a simple and effective way at the time to provide a demand side incentives. This is clearly not the case now and Government had the opportunity in its review to focus the new RET scheme on delivering renewable electricity generation and consolidate demand-side programs under a single energy efficiency scheme using the state-based schemes such as VEET or NEET as the model. Yet the Government has failed to take this opportunity fix this fundamental flaw in the existing MRET scheme with these proposed amendments before the Senate.

Having outlined above how demand side measures such as solar water heaters undermine and damage the primary policy objectives of the RET scheme, we would like to draw the Senate committee's attention the perverse outcomes that have eventuated as a result of how solar hot water systems are defined in the Act. The current definition used in the Act and Regulations has created a loophole where hot water systems that do not rely on direct solar energy for the majority of their power can qualify as a "solar" system. The systems in question are air-sourced electric heat pumps. The GIA is very concerned about the impact this loophole is having on the real solar and renewable industry, the environment and the Government's MRET objective. Recent analysis of RECs created indicate that air-sourced electric heat pumps are accounting for approximately 30%[4] of all RECs issued this year.

[4] Green Energy Markets June 2009

Electric air sourced heat pump hot water systems are not solar products and the criteria for calculating RECs is disproportionate to the greenhouse gas and electricity demand reductions they deliver.

One would think that the definition of a solar hot water system is obvious. It should have a solar panel or collector that captures solar energy and transfers it to the water, it has a tank that stores the water and has an electric or gas booster for days when there is insufficient solar energy to meet the required hot water demand (Figure 1). On the other hand air-sourced electric heat pumps are effectively a high efficiency electric storage hot water system. They do not have a solar panel or collector but rather the use electricity to drive a standard vapour compression heat pump (Figure 2). Heat pumps are widely used throughout the home to supply heating and cooling, including reverse cycle air conditioners and the common fridge. The logic that a reverse-cycle air conditioner or fridge should be classified as a 'renewable" product is clearly ludicrous, yet the current definition in Act allows this loophole to exist.

The importance of getting the definition of "solar" correct is further emphasised as the Commonwealth and a number of State and Territory Governments provide substantial rebates directly to consumers to subsidise the replacement of electric resistance hot water systems, and rely upon the definitions used in the Act as the basis for determine the level of rebate. As a result a consumer installing air-sourced electric heat pumps can receive up to $3600 in subsidies and rebates, the same level as for traditional solar system. There is no surprise that suppliers have quickly identified that air-sourced electric heat pumps are an easy sell, as they can be supplied at no cost to the consumer and are easier to install than a traditional solar system as they do not have put a solar collector on the roof. As a result there has been a dramatic shift in the Australian hot water market away from traditional solar systems and high efficiency gas systems to air-sourced electric heat pumps. Air-sourced electric heat pumps now out sell traditional solar systems by a factor of 2 to 1[5].

The GIA supports Government initiatives aimed at reducing Australia's energy consumption through energy efficiency programs. Subsidies and rebates to consumers can play an important role in shifting the Australian market to lower emission technologies. However rebates need to deliver cost effective incremental improvements against current market technologies, otherwise they will become a significant burden on the economy and consumers. The current level of subsidies and rebates provided to air-sourced electric heat pumps are disproportionate with the incremental greenhouse gas and electricity demand reductions they offer over conventional high efficiency gas systems. In most parts of Australia high efficiency gas hot water systems produce 30% less greenhouse gas emissions and 95% less electrical demand than air-sourced electric heat pump hot water systems, and yet air-sourced electric heat pumps receive approximately $2800 in Federal subsidies and rebates when replacing an existing electric storage hot water system. A gas

[5] Industry estimate

system would receive nothing, this inequity is seriously distorting the Australian hot water market and resulting in increased greenhouse emissions and electrical demand as consumers shift away from gas systems to the highly subsidised air-sourced electric heat pumps.

However, State and Federal Rebates are subject to a variety of conditions but all include a stipulation that the rebates are only available if solar or heat pump water heaters are replacing an existing electric resistance water heaters. This condition is explicit recognition by these Governments that replacing a gas water heater with an electric boosted solar or air sourced electric heat pump system will result in an adverse environmental outcome. Not only is the definition wrong in the Act, in implementing the MRET scheme the Office of the Renewable Electricity Regulator's requirement is in complete contrast to the above conditions set by other Governments, as it does not restrict qualification for RECs in any way. In the words of the ORER website:

> "Each and every SWH installation that meets the above eligibility requirements is entitled to create RECs. ***This is regardless of whether the SWH is installed in a new building or an existing building, or whether the SWH replaces, or is additional to, any type of existing water heater.*** If a person or organisation owns more than one eligible SWH installation, then they are entitled to create RECs for each of those eligible installations." (ORER, 2009)

As a result of the application of this Act in this way, the Federal Government is subsidising through RECs the replacement of high efficiency gas hot water systems with higher emission and electrical demand air-sourced electric heat pumps, a truly perverse outcome. This outcome is most apparent in the commercial hot water market where the methodology used to calculate RECs grossly distorts the potential benefit of air-sourced electric heat pumps and is resulting in the over-specification of installations many times greater than the required capacity, in order to maximise claimable RECs under the scheme.

While the GIA recommends the complete removal of solar hot water systems from the RET scheme, it recognises this would be problematic, and may take some time to implement. However a pragmatic and intermediary step to limit the damage the current legislation is causing, is to close the definition loophole with regard to solar hot water systems. The GIA urges the Committee to make the necessary recommendations to immediately modify the definition of solar hot water systems to ensure that all eligible systems include solar panels or collectors as a critical first step in improving the integrity of the RET scheme.

As stated previously there is sound reasoning behind Government support for solar and renewable technologies as Australia transitions to low carbon economy. Industries may need initial support to establish the scale necessary

to compete with lower cost high emission technologies. This is the case for traditional solar hot water systems where the installation of solar panels presents a significant barrier to the uptake of the technology.

Redefining solar hot water systems in the Act is no threat to Australian manufacturing.

The proposed requirement for the installation of a solar panel as the key eligibility criteria for the creation of RECs is actually likely to increase the proportion of Australian manufactured product in the Australian hot water market. As set out in this submission the market distortions created by current Government policies have substantially increased the market share of air-sourced electric heat pumps compared to traditional solar and gas technologies. As described previously traditional solar hot water systems and air-sourced electric heat pump both require a storage tanks as an integral part of their design, which are generally manufactured in Australia. Traditional solar systems also require a solar panel or collector of which around 50% are manufactured in Australia. However air-sourced electric heat pumps require an vapour compression heat pump in place of the solar panel, that are fully imported into Australia. Therefore any shift in the market shares of the different hot water technologies as a result of the GIA's recommendations is unlikely to have a negative impact on Australian manufacturing.
Air-sourced electric heat pump hot water systems are clearly an efficient electric storage hot water system and should play significant role in the competitive Australian hot water market, especially as simple option for consumers when Governments phase out of electric resistance water heater commences in 2010. However the GIA believes there is no plausible reason why air-sourced electric heat pump hot water systems without solar panels should be included in the amended RET scheme. The GIA proposed amendments do not prevent the Federal, State and Territory Governments continuing to provide subsidies for air-sourced electric heat pumps when replacing electric resistance systems, but we do recommend that such rebates should recognise incremental environmental benefits.

We urge this committee to consider this submission as the GIA strongly believes the proposed Amendments require immediate changes to close damaging loopholes which are threatening the integrity of the RET scheme. GIA recommends the removal of solar hot water systems from the RET scheme to ensure the scheme delivers on its policy objectives, of 20% renewable electricity generation by 2020, and develop a national approach to energy efficiency and greenhouse gas abatement, of which hot water will be an integral part.

We look forward to presenting our submission before the committee in August.

Yours truly,

Warring Neilsen
Chairman, Gas Industry Alliance

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Attachments

Figure 1: Traditional Solar Hot Water installation

Figure 2: Air-sourced electric heat pump hot water system

Gas Industry Alliance Submission Exposure Draft - 20 February 2009

CEEM Submission to the CoAG Working group on Climate Change and Water – May 2009

Defects in the target: nRET, R&D Update – Dr Hugh Saddler

Report for Elgas on RECs produced by Commercial Heat Pumps - Green Energy Market – June 2009

Figure 1

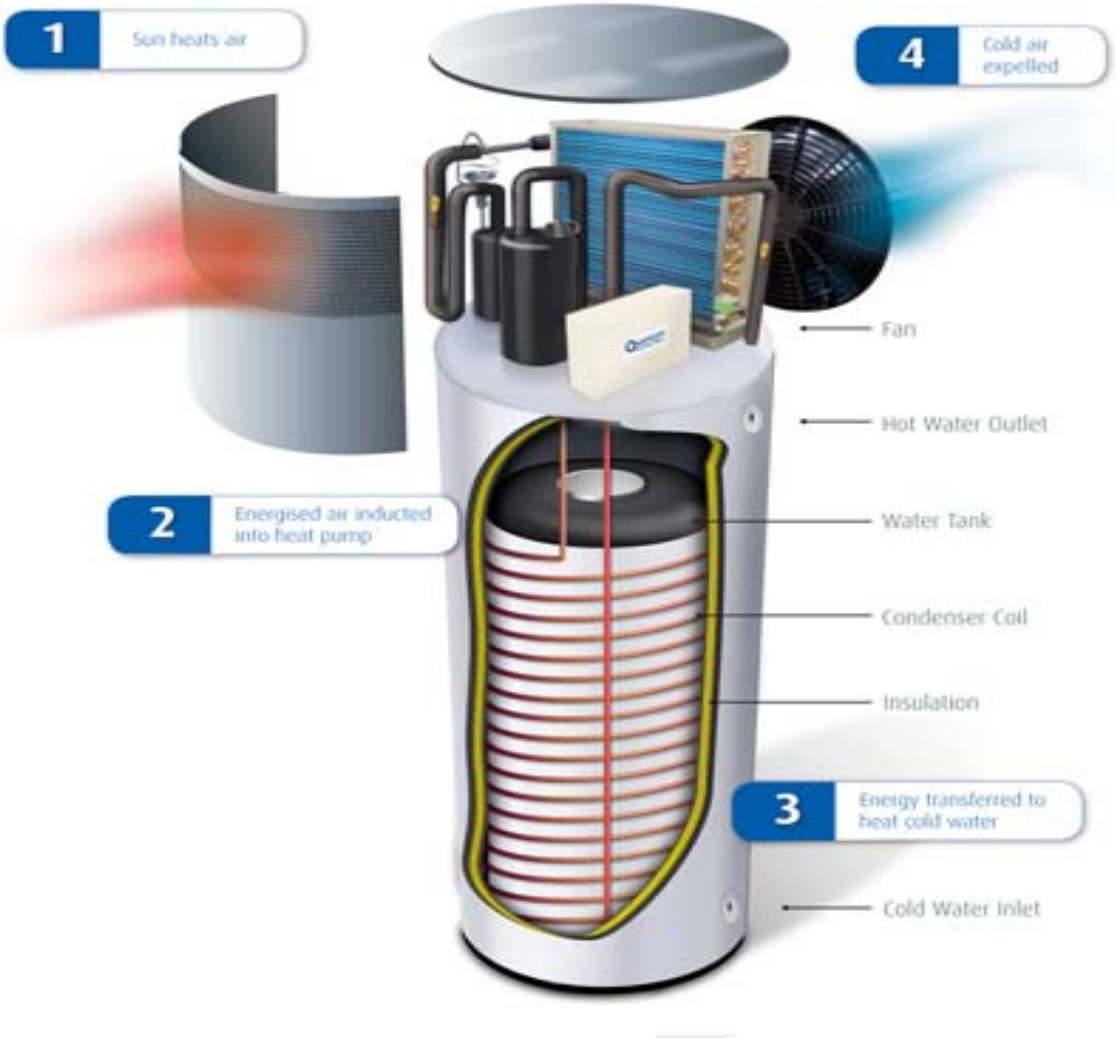
1
Sun heats air
4
Cold air expelled
Fan
Hot Water Outlet
2
Energised air inducted into heat pump
Water Tank
Condenser Coil
Insulation
3
Energy transferred to heat cold water
Cold Water Inlet

Figure 2

February 20th, 2009

Joelle Richardson
The Renewable Energy Sub Group Secretariat
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Department of Climate Change
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CANBERRA ACT 2601

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Dear Sir/Madam,

RE: Comments Exposure Draft (19/12/2008)
Renewable Energy (Electricity) Amendment Bill 2008

The Gas Industry Alliance which represents ENA (Natural Gas),LPG Australia, GAMAA(gas appliance manufacturers) and NAFE (Food Equipment) wishes to express its disappointment in the approach taken by the government in the proposed amendments to the Renewable Energy (Electricity) Amendment Bill 2008.

Inclusion of solar and heat pump water heaters within the nRET is not consistent with it's stated objectives. It does not "increase the deployment of renewable energy in Australia's electricity supply" and neither does it "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". It will result in falling short of the 20% renewable energy target.

The government's release of exposure draft legislation and regulations for the national Renewable Energy Target (nRET) on 17 December last represents is a step towards implementation of one of the most important of its pre-election commitments on climate change policy and renewable energy. It proposes to do this by amending the *Renewable Energy (Electricity) Act 2000* and associated Regulations. The legislation and regulations that establish the current Mandatory Renewable Energy Target (MRET) scheme. Apart from extensive changes relating to the treatment of micro-generation, with which this submission is not concerned, the only material amendments are the change of end date for the scheme, the insertion of an additional target of 45 TWh, to be achieved by 2020, and specification of the lesser year by year targets culminating in the final 45 TWh figure.
Hence all the major design features of the present MRET scheme are retained. This Submission is particularly concerned with the continuing inclusion of solar and heat pump water heaters as eligible sources for the purpose of the scheme and the negative impact their inclusion has on the achievement of Government's greenhouse gas and environmental objectives.

There are three main reasons for our concerns:

- Inclusion of solar and heat pump water heaters is in principle not consistent with the policy objectives of the nRET to promote the investment in renewable electricity generation to ensure 20% of electricity is generated from renewable sources by 2020.

- Inclusion of solar and heat pump water heaters degrades the integrity of the nRET scheme, as there is significant inaccuracy in the deeming approach to calculate RECs and clear evidence that heat pumps included in the scheme are not a renewable or solar product.

- Inclusion of heat pump water heaters in combination with other Government hot water policy is likely to result in greater greenhouse gas emission and significantly greater costs to the Australian economy.

Policy objectives of the nRET

It is almost universally accepted that obtaining a higher proportion of electricity from renewable resources will make an essential contribution to moving Australia towards a low greenhouse emission economy. It is also now recognised that Australia has very large, high quality resources of many sources of renewable energy, including wind, solar radiation, hot rock geothermal heat, and waves.

Last year's discussion paper on the nRET described the MRET in the following terms:

> "The MRET scheme is designed to increase the deployment of renewable energy in Australia's electricity supply. It guarantees a market for additional renewables-based generation (backed by a legislative obligation), using a mechanism of tradeable renewable energy certificates (RECs). One REC is equivalent to one megawatt-hour (MWh) of renewable energy." (COAG Working Group on Climate Change and Water, 2008, p. 5)

The Governments pre election platform announced in the 2007 election states its policy objective in expanding the MRET in the following terms:

> "As part of Labor's 2020 vision for a clean renewable energy future, Federal Labor will:
>
> - 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.
> - Increase the Mandatory Renewable Energy Target (MRET) to 45,000 GWh to ensure that together with the approximately 15,000 GWh of existing renewable capacity, Australia reaches Labor's 20 per cent target by 2020. "(Australian Labor Party, 2007)

Inclusion of solar and heat pump water heaters within the nRET is not consistent with either of these stated objectives. It does not "increase the deployment of renewable energy in Australia's electricity supply" and neither does it "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".

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%.

A summary of holdings of Renewable Energy Certificates (RECs) by the Registry of the Office of the Renewable Energy Regulator (ORER), of all RECs generated up to the end of 2008, is shown in Tables 1 and 2. These cover all categories of holdings with the exception of RECs that are "invalid due to audit" (in the words of the ORER website). Some of these may eventually be registered, but their number is quite small, and their inclusion or otherwise would make no difference to the overall picture that emerges from the Tables.

The date shows that solar and heat pump water heaters account for 24% of all RECs generated to the end of 2008. Moreover, the proportion of generated RECs from this source has been increasing over time and in 2008 was 37%. Reflecting this timing effect, water heaters account for a higher proportion of Registered RECs, i.e. RECs available to be purchased for surrender by liable parties (or others), than of RECs already surrendered.

In terms of the issues raised in the previous section, this means that the actual quantity of renewable electricity actually generated under the MRET is 24% less than the normal program target.

Table 1: RECs generated up to end 2008, by year generated

Year generated	Total	Solar &Heat Pump HW	Solar & Heat Pump HW %
2001	1,662,714	215,357	13.0%
2002	2,779,116	525,137	18.9%
2003	4,355,839	705,472	16.2%
2004	3,403,041	812,722	23.9%
2005	4,822,401	997,641	20.7%
2006	5,193,900	1,017,953	19.6%
2007	6,287,111	1,516,877	24.1%

2008	7,953,938	2,944,563	37.0%
Total	36,458,060	8,735,722	24.0%

Table 2: RECs generated up to end 2008, by status

Status	Total	Solar & Heat Pump HW	Solar & Heat Pump HW %
Registered	14,695,704	4,279,818	29.1%
Available Registered	10,315,226	2,834,801	27.5%
Pending Transfer	261,521	17,756	6.8%
Pending Surrender	4,088,266	1,427,261	34.9%
Pending Voluntary Surrender	30,691	-	0.0%
Pending registration	184,338	40,070	21.7%
Invalid	21,578,018	4,415,834	20.5%
Due to surrender	19,176,108	4,373,988	22.8%
Due to voluntary surrender	2,401,910	41,846	1.7%
Overall total	36,458,060	8,735,722	24.0%

The large number of RECs generated from solar and heat pump water heaters is consistent with ABS data on the energy sources used for water heating. ABS conducts triennial surveys of energy use in the residential sector. The most recent survey collected data in March 2008 in Table 3 shows changes in electric resistance, solar and total water heating between 2005 and 2008. It can be seen that there was a very significant increase in the number of solar water heaters reported in this period. The number of heat pump systems is too small to show separately up in the survey, but these numbers are now increasing rapidly.

The number estimated from the ABS survey, as shown in Table 3, is broadly consistent with the number of RECs generated over the three years, as shown in Table 1. In 2008, as shown in Table 1, the number of RECs generated from solar and heat pump water heaters was 2.9 million. If it is assumed that the average quantity of RECs per installation is 25, this generation of RECs corresponds to the installation of about 116 thousand systems.

Table 3: Types of water heaters in Australian housing, 2005 and 2008 (thousands)

Water heater type	2005	2008	Change	Percentage change
Peak electricity	1,306	907.8	-398	-31%
Off-peak electricity	2,675	2,884	209	8%
Total electric	3,982	3,792	-189	-5%
Solar	348	588	240.0	69%
All other types (includes Don't know)	3,517	3,863	346.0	10%
Total dwellings	7,847	8,243	396	5%

The market for all types of residential water heaters other than larger electric resistance systems (typically off-peak electric), is likely to increase significantly, because of a specific commitment in the Governments pre election platform of 2007:

> "Climate-Friendly Hot Water: Labor will phase-out the installation of greenhouse-intensive electric hot water heaters in new and existing homes with access to reticulated natural gas by 2010, and as installations in all existing homes by 2012. Exemptions will be granted for dwellings where the installation of climate-friendly systems is impractical."

In broad terms, this commitment is interpreted to mean that off-peak electric resistance water heaters will cease to be installed in either new or replacement situations. In many jurisdictions these water heaters are already prohibited, either explicitly or implicitly, in new build, including major extensions and renovations. These policies are undoubtedly one factor driving the strong increase in solar water heater installation seen in Table 1, and the overall increase in market share seen in Table 3. The phase-out commitment therefore represents the next logical step towards the accelerated elimination of large electric resistance water heaters, because replacement installations account for between 80% and 90% of the total residential water heater market.

The major alternatives to large electric resistance water heaters are electric boosted solar and heat pump systems on the one hand, and storage and instantaneous gas (both natural gas and LPG) systems including solar gas boosted on the other. On the basis of the data in Table 3 it can be calculated that the total additional market for these types of water heater arising from the phase-out is about 2.9 million units.

In addition, based on the net increase in total dwellings, the new build market is approximately 130 thousand per annum. Some of the new build is apartments (Class 2 dwellings), for which solar systems are not suitable. It is therefore assumed that the annual new build market potential for solar is about 100 thousand per annum. The final component of the market is replacement of existing non-electric systems when they reach the end of their life. It is assumed that there is like for like replacement only, so this component will be relatively small in the early years, reflecting the lower annual sales of solar systems prior to 2005. It will be further discounted by the smaller number of RECs per installation, being based on the increase in solar contribution compared with the replaced system, rather than the entire solar contribution to the new system.

It is very hard to estimate what share of the total market, both for replacement of electric systems and new build, may be taken by solar and heat pump systems. Key factors affecting the choice include home owners, influenced by installer's preference, choosing heat pumps (classified as solar) because they don't require the cost or installation of a solar panel on the roof.

The fact that 5 star gas systems have a lower purchase and installation cost, competitive operating costs and lower greenhouse emissions but only have access to State Rebates not RECs will impact on consumer choice. (Refer Rebate distortion)

The total number of RECs which may be generated by solar and heat pump water heaters, and their resultant contribution to the overall to the nRET target has been estimated for the above estimates of the total size of the market for new solar, heat pump and gas water heaters, and the following additional assumptions.

- The average number of RECs per solar/heat pump water heater is 25.
- The replacement of existing electric water heaters occurs in five equal tranches over the period 2010 to 2014 inclusive.
- The market share for solar/heat pumps systems is either 50% or 70%.

Table 4 shows the results for the 50% case. It can be seen that in the early years of the nRET, coinciding with the electric hot water phase-out, solar and heat pumps supply well over half the total requirement for RECs, in both annual and cumulative terms. The share only begins to fall away once the phase-out is complete. Should solar and heat pump systems achieve a larger market share, their proportion of RECs generated would of course be higher.

Table 4: RECs generated from 2010 to 2020 inclusive, assuming solar and heat pump hot water capture 50% of the new and replacement residential hot water market

	2010	2014	2020
Annual target	12,500	20,100	45,000
Solar and heat pump HW RECs generated	8,710	8,760	1,650

Solar share of annual target	70%	44%	4%
Cumulative solar and heat pump HW RECs **	8,710	43,690	53,210
Solar share of cumulative target	70%	54%	19%

** Indications show that in the past 12 month period heat pump share is around 60%+ of solar.

The results of this analysis show that, despite the significant increase in the size of the target in the nRET, solar and heat pump water heaters will continue to generate a significant proportion of the total target. This 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.

Integrity of the proposed nRET Scheme

The inclusion of solar and heat pump water heaters in the nRET scheme now raises some deep concern over the impact this is now having on the current structure of nRET with the urgent push to increase % of renewable generation and the supporting policies to reduce greenhouse gas emissions.

Firstly there is the issue of classifying heat pump hot water systems as a renewable system under the scheme. 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 with 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.

Inclusion of heat pump water heaters may in part be a legacy of their origin in Australia. They were first developed as a research project at the Melbourne University Department of Mechanical Engineering, under the leadership of Professor Bill Charters.

Throughout their development and early stage commercialisation, through the company that eventually became Quantum, the heat source for the evaporator was a solar collector, and the aim of the heat pump was to increase the overall efficiency with which solar heat was collected and transferred to hot water. When commercialisation got underway, Quantum found that dispensing with the solar collector and using a simple air coil evaporator gave satisfactory performance at lower cost. The great majority of systems now sold by Quantum, and all other companies, are now of this type, meaning that there is no solar energy input (except incidentally, in that solar radiation is the source of heat in the air).

The second serious integrity issue relating to the inclusion of solar and heat pump hot waters in the nRET scheme relates to the inaccuracies of attributing a RECs value to solar and heat pump hot waters, this is because they displace, rather than generate, electricity, and the amount displaced cannot be measured, but only estimated by use of modelling tools, solar water heaters and heat pumps are qualitatively different from other sources, which deliver metered quantities of electricity to electricity supply networks. Instead, a deeming approach is used, 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 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.

- The quantity of electrical energy saved by solar systems is assumed to equal the difference between the electricity consumption of a conventional electric resistance storage water heater and that of a solar 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 limit 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 with 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.

- 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. 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 need of review. **(refer solar zone map and Cold Climate)**

- It is assumed that all solar and heat pump water heaters are correctly maintained and operate 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. Refrigerate components in most cases only have a 2 year warranty.

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.

Impacts and interactions with greenhouse gas abatement strategies

Water heating systems differ in terms of the energy source they use, the quantity of energy they require, their greenhouse emissions both direct and indirect (from electricity use), their purchase and installation costs, and their operating cost. Over the past ten years Government policy has been targeted at reducing the greenhouse impact of the generation of residential hot water in Australia, by providing subsidies or by introducing regulatory requirements for low emission hot water systems. Currently, the Commonwealth and a number of State and Territory governments provide rebates to subsidise the purchase of solar, heat pump and to a lesser extent gas water heaters. While these are subject to a variety of conditions, including in some cases a means test, they all include a stipulation that the rebate is only available if the solar or heat pump unit is replacing an electric resistance water heater. This condition is explicit recognition that replacing a gas water heater with an electric boosted solar or heat pump system will result in little or no reduction in emissions, or even, particularly in Victoria, an increase. www.hotwaterrebate.com.au

The MRET is unique in not restricting assistance to situations where electric resistance is being replaced. In the words of the ORER website:

> "Each and every SWH installation that meets the above eligibility requirements is entitled to create RECs. This is regardless of whether the SWH is installed in a new building or an existing building, or whether the SWH replaces, or is additional to, any type of existing water heater. If a person or organisation owns more than one eligible SWH installation, then they are entitled to create RECs for each of those eligible installations." (ORER, 2009)

In addition to this plethora of hot water programs the Government in late 2008 announced its policy object of phasing out electric resistance storage hot water systems, with the goal of reducing the greenhouse gas emissions resulting from hot water generation in Australia. The interactions of the policy, the proposed nRET and other programs will produce a dramatic distortion of the hot water market in Australia, and under the current framework is likely to result in a worse greenhouse gas emissions outcome in relation to the large cost to the Australian economy, and other options available.

The draft of a study comparing the performance of different type of water heaters throughout Australia, prepared for DEWHA by Energy Strategies and subsequently circulated for industry comment, found that in most parts of Australia the greenhouse performance of electric boosted solar and heat pump water heaters does not differ greatly form that of high efficiency gas water heaters. The solar and heat pumps were superior in Darwin, Alice Springs and Townsville, where the high insolation and high average ambient temperatures allow improved performance from both types of system. Conversely, in Melbourne the greenhouse performance of electric boosted solar and heat pump systems is inferior to gas water heaters, as it is in Tasmania if the greenhouse gas emissions intensity of marginal electricity supply (currently sourced from Victoria) is used in the analysis.

In the case of heat pumps, the relative performance in Victoria and Tasmania (plus inland areas of NSW and cooler areas of SA) is worse than the modelling results indicate. This comment applies equally to the modelling used to calculate the number of RECs attributable to heat pump systems. In both cases, the default methodology uses a single, invariant value for the coefficient of performance (COP), although it is known that in practice the COP falls with decreasing ambient air temperature and that the fall becomes quite precipitous when ambient temperatures fall to freezing point or below.

The lack of conditionality on the availability of RECs for solar and heat pump water heaters means that the MRET is forcing electricity consumers as an entire group to subsidise the purchase and installation of solar and heat pump water heaters, not only as replacements for electric systems, where a reduction in emissions will result, but also as replacements for gas systems, which on balance will cause emissions to increase. **(ref case study)**

Implementation of the Governments electric off-peak phase out policy will provide the opportunity to coordinate and rationalise the current incoherent mixture of assistance measures for solar, heat pump and gas water heaters. Off-peak electric water heaters have a relatively low purchase and installation cost and low operating cost, because of the low cost of off-peak electricity. The price of off-peak electricity varies widely across Australia and is particularly low in NSW and Queensland. As a result, this is the cheapest form of water heating, on a lifetime costs basis, in those two States, which in turn is a major reason why these two States account for nearly three quarters of all off-peak systems.

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. If the program requires premature scrapping of some off peak systems, and this is implicit in the notion of accelerated phase out, then additional costs will be imposed. This will affect all households forced to make such a change, everywhere in Australia, even if the alternative to which they shift is no more expensive on a lifetime cost basis. The amount of any such additional cost will depend on what alternatives are available.

Where reticulated natural gas is available, particularly if it is already connected to the house, gas water heating is generally the lowest cost option although in cases of reduced energy consumption LPG offers similar operating costs. Where natural gas is not available, options include solar (electric or LPG boosted), heat pumps and LPG 5 star.

By implication, accelerated phase out of off-peak electric water heaters will be achieved by means of regulation. It will then not be necessary to use rebates and access to RECs as an incentive to stimulate take-up of these water heating technologies. However, given the complex array of options, depending on the particular circumstances of each household, as described above, combined with the wide variation in economic circumstances of households, social equity will require the use of subsidies. It may also be thought appropriate to calibrate subsidies according to the greenhouse emissions of the alternatives.

The proposed nRET, 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.

The removal of all hot water systems from the proposed nRET scheme is the first step towards a more comprehensive national approach to phasing out of conventional electric resistance water heating altogether. It would leave untouched the present chaotic mix of national and State/Territory programs, which are in urgent need of rationalisation and coordination. It would also leave unexamined the logic of subsidising one class of alternatives to electric resistance water heaters – those which also use electricity, though in smaller quantities – while another class – those which use gas – receive no subsidy. All these issues should be dealt with in the context of developing a coherent and comprehensive program for the accelerated phase-out of electric resistance water heaters. The Victorian VEET and NSW NEET schemes appear to provide robust framework to develop a effective and equitable approach to meeting the objectives of the Government in this regard.

In Summary

Urgent attention is required to correct the unintended outcomes of the current nRET scheme:

- Diluting the policy goal of 20% target 2020 for renewable generation.
- Divergence of emphasis in developing our solar market through the erosion of solar electric/gas boosted with heat pumps.
- Increase in greenhouse emissions through caused through financial bias in the combination of RECs and State Rebates

If we are to accept that it is the governments position to strongly support the inclusion of Solar Hot Water under the nRET scheme as part of its commitment to develop a strong solar industry then there is an urgent requirement to take action to remove the current anomalies and distortions.

1. Some immediate correction could be achieved by imposing similar conditionality on entitlement to RECs as applies to other government financial assistance for the purchase of solar and heat pump water heaters, including the Commonwealth's own rebate program (Department of the Environment, Water, Heritage and the Arts, 2009).

2. A further correction could be to require all heat pump installations to be installed as a solar booster in accordance with the original conception for the Australian solar developed systems.

If and when either or both of these changes are made, subsidies will be available for electricity using water heater systems that are alternatives to conventional electric resistance water heaters. This could be seen as the first step towards a more comprehensive approach to phasing out this type of water heating altogether. It would leave untouched the present chaotic mix of national and State/Territory programs, which are in urgent need of rationalisation and coordination. It would also leave unexamined the logic of subsidising one class of alternatives to electric resistance water heaters – those which also use electricity, though in smaller quantities – while another class – those which use gas – receive no subsidy. All these issues should be dealt with in the context of developing a coherent and comprehensive program for the accelerated phase-out of electric resistance water heaters.

Yours sincerely,

Warring Neilsen
Chairman Gas Industry Alliance

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Centre for Energy and Environmental Markets

CEEM Submission to the CoAG Working Group on Climate Change and Water

Revised Renewable Energy Target (RET) Scheme Design

May 2009

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UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY • AUSTRALIA

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Preamble

The UNSW Centre for Energy and Environmental Markets (CEEM) undertakes interdisciplinary research in the design, analysis and performance monitoring of energy and environmental markets and their associated policy frameworks. CEEM brings together UNSW researchers from the Faculties of Business, Engineering, Science, Arts and Social Sciences and Law, working alongside a growing number of Australian and International partners. Its research areas include the design of spot, ancillary and forward electricity markets, market-based environmental regulation and the broader policy context in which all these markets operate.

The Government recently released its exposure draft legislation and regulations to implement an expanded national Renewable Energy Target (RET) reflecting the design being considered by the CoAG Working Group on Climate Change and Water. Most recently, a number of revisions to this scheme design were agreed at the COAG meeting held in Hobart on 30 April 2009. CEEM welcomes the opportunity to contribute to this policy process.

This discussion paper includes some minor updates to our original submission on the exposure draft legislation that incorporate the outcomes of the COAG meeting in April. It starts with some general comments on the importance of this policy initiative and key challenges for its development process. It then discusses the specific design options proposed in the exposure draft and recent COAG meeting.

Our submission draws on a range of work by researchers associated with the Centre, including submissions to the original MRET development and review processes, an analysis of options for State-based renewables obligations in Australia, a submission to the Victorian Government's Issues paper for development of their scheme and, very significantly, our submission to the original expanded national RET discussion paper. It also draws upon more general work exploring the role of renewable energy deployment mechanisms in a coherent policy response to climate change, and the particular challenges of market-based environmental instruments. These papers and more details of the Centre can be found at the CEEM website – www.ceem.unsw.edu.au.

This is an area of ongoing work for CEEM and we are actively seeking feedback and comments on this submission, and on related work. The corresponding author for this paper is:

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Executive Summary

The Federal Government is to be congratulated on its intention to greatly expand the existing Mandatory Renewable Energy Target (MRET) to drive renewable energy deployment in Australia. The former Government's decision not to expand the scheme (except as a late election commitment) left a major policy gap in driving the uptake of technically proven renewables including wind, biomass, solar and hydro power.

Furthermore, the proposed CPRS legislation does not provide great confidence in the ability of the Federal Government to deliver an effective emissions trading scheme, in the short to medium term at least. In this context, policy 'insurance' such as that provided by an expanded national RET, has a critical role to play. This failure on CPRS governance also highlights the critical task of getting the RET scheme design right, and extending its targets beyond a 20% renewable electricity contribution in 2020.

The proposed expanded national RET for Australia now includes a far more significant target to be implemented within an increasingly stressed electricity industry infrastructure, including transmission, and a rapidly evolving industry structure with less government ownership and growingly powerful vertically integrated 'gentailers'. The risks of poor outcomes with the proposed RET do not appear to have been fully appreciated in the draft legislation and associated policy discussions.

The failure of the draft exposure legislation to correct evident failings in the existing MRET such as the continued inclusion of solar hot water and 'old hydro' is particular problematic. And the CoAG decision that select large electricity intensive and trade exposed industries will not be required to contribute to the RET is alarming. As noted in the Tambling review of MRET, "any (such) exclusion would also undermine the basic principle of the scheme, that MRET liabilities accrue to electricity users, in proportion to the quantity of their usage."

The draft legislation has, indeed, not included some of the best design features of the Victorian renewable energy target which eRET will subsume including that scheme's exclusion of solar hot water and pre-existing projects from participation, and the use of a sunset period to restrict the time period over which projects can earn RECs. It has, however, adopted that scheme's most glaring design failure – the exclusion of some favoured large energy users from contributing their fair share to the scheme's costs. Governance appears to be going backwards and this suggests that the current design process is inadequate for the task. More generally, the evident governance failures in the CPRS design regarding so-called compensation appear to have established a dangerous precedent for future policy efforts.

With regard to specific design choices within the draft legislation or agreed at the COAG meeting on 30 April 2009:

The change to the scheme trajectory so that it is maintained from 2020 to 2030 is a significant improvement on that originally proposed. Nevertheless, other design choices including the end date of 2030 and no time limit for projects still risk a boom and bust investment cycle, and potentially highly volatile REC prices. Neither is conducive to effective and efficient investment and industry development.

Solar Hot Water heaters do not generate electricity and their inclusion will greatly add to scheme complexity while reducing its impact on driving renewable electricity generation. Solar hot water is an extremely valuable renewable energy option for Australia. However, it and other renewable thermal energy sources would be better served by separate policy support.

The proposed scheme design will permit projects that were undertaken in the context of only the original MRET (that is, pre 2007) to continue to earn RECs beyond that scheme's 2020 end date. This will reduce the new investment driven by the expanded RET and creates the potential for significant windfall profits to such projects.

The problems that have arisen from the decision to include old hydro in the original MRET include reduced investment in new renewable generation and windfall profits to some favoured scheme participants. The proposed scheme design fails to correct these flaws and will reduce scheme effectiveness, efficiency and equity. More generally, this design choice suggests a potential inability of governments to make even the most self-evident and straightforward corrections to the design of market-based environmental mechanisms.

The considerable flaws in the current CPRS design are particularly concerning in this regard. It can not be assumed that future governments will be capable of correcting what are already self-evident problems in the proposed scheme over time, let alone design flaws that only emerge after the CPRS is in operation.

The proposed multiplier for small PV systems in the first years of the scheme is no substitute for a well thought out, coherent and comprehensive policy framework for supporting this important renewable energy technology. Feed-in tariffs would appear to provide a far better basis for promoting industry development and facilitating PV's role in addressing our energy and climate challenges.

The critical role of renewable deployment policies

The Federal Government is to be congratulated on its intention to greatly expand the existing Mandatory Renewable Energy Target (MRET) to drive renewable energy deployment in Australia. The former Government's decision not to expand the scheme (except as a late election commitment) left a major policy gap in driving the uptake of technically proven renewables including wind, biomass, solar and hydro power.

Such deployment measures play a critical role in renewable energy technology innovation between R&D and demonstration of promising but still emerging technologies, through to potential widespread commercial uptake. Elsewhere in the world, market 'pull' measures to drive renewables uptake are now being widely deployed as a key element of climate and energy policy frameworks.

Appropriate policies can achieve short-term emissions reductions, build a renewable energy industry and expand the institutional capacity of the wider energy industry in managing the transition to more sustainable energy systems. All three outcomes will be essential in achieving the longer-term major emissions reductions seemingly required to avoid dangerous climate change.

The role of renewable energy deployment policies here in Australia is currently being questioned by some[1] given the Government's commitment to introduce national emissions trading through the Carbon Pollution Reduction Scheme. It may be argued that an ETS will theoretically find and implement the lowest cost abatement options across the economy. Hence, other policies favouring particular options within covered sectors can only increase the costs of meeting the target while not delivering any additional emissions reductions.

Others including The Garnaut Review and the Federal Government in its Green and White Papers on the CPRS would appear to classify such renewable energy policies as having a complementary, likely transitional, role due to market failures in emissions trading in delivering technical innovation in longer-term abatement options.

While the latter view captures some key challenges of technical innovation, both perspectives miss the key role that renewable deployment policies can play in the present policy context – relatively affordable, rapid and assured emissions reductions that also support the longer-term transition to decarbonised energy systems.

Emissions trading is, at present, best described as an experimental policy approach. It has received enormous attention, offers considerable promise but has achieved little success to date. Existing greenhouse emissions trading schemes are limited both in number – the NSW GGAS, the Kyoto Clean Development Mechanism (CDM) and the EU ETS – and in experience in terms of years in operation. All have had questionable effectiveness, efficiency and equity outcomes to date.[2] The most significant scheme in scale by far, the EU ETS, has been a near debacle in its first three year phase delivering few if any emissions reductions while generating extremely large windfall profits for major emitters – a truly perverse climate policy outcome.

It is still unclear whether this failure resulted from a lack of understanding by policy makers due to the novel nature and inherent complexity of this mechanism or, instead, represents a

[1] See, for example Productivity Commission (2008).

[2] For a review of the NSW GGAS see, for example, Passey et al (2008). The performance of the EU ETS is discussed in a number of papers available on the CEEM website – www.ceem.unsw.edu.au. See, for example, Betz et al (2006); Neuhoff et al. (2006); Betz and Sato (2006); Schleich et al (2007); MacGill et al (2008) and MacGill (2007).

failure of governance in ensuring an appropriate scheme design. If a governance failure, does it reflect a particular set of unfortunate circumstances specific to the nature of the European Union's policy development processes. Or is it, instead, an inherent weakness of such mechanisms because of their high levels of complexity and the ease with which a scheme's underlying integrity can be traded away in favour of particular key stakeholders.

Until this question is resolved, renewable deployment policies should be seen as a means to implement robust and proven emission reduction technologies in a way that also provides policy insurance against the possible shortcomings of an ETS or equivalent economy-wide pricing measure such as a carbon tax. In the case of the EU, the renewable energy deployment policies of some member states have been remarkably effective in reducing emissions and driving renewable industry development and energy sector transformation – a result in stark contrast to the performance of their ETS to date.[3]

This policy 'insurance' perspective is relevant to all of the design questions raised in the discussion paper, as well as in other areas of energy and climate policy development including those intended to drive improved energy efficiency. Support for such policies should be based on more than evident market failures in energy-related decision-making as argued by the Garnaut Review amongst others. Many of these measures also represent proven and robust insurance and should be supported for the same reasons.

The current CPRS legislation does not provide great confidence in the ability of the Federal Government to deliver an effective emissions trading scheme, in the short to medium term at least.[4] In this context, policy 'insurance' such as that provided by an expanded national RET, has a critical role to play. It also highlights the critical task of getting the RET scheme design right, and extending its targets beyond a 20% renewable electricity contribution in 2020.

The risks and opportunities of the RET tradeable certificate approach

The Australian Mandatory Renewable Energy Target (MRET) was one of the world's first national Tradeable Green Certificate (TGC) schemes, and therefore a highly innovative policy measure. Such schemes have been adopted by a number of other countries and have considerable theoretical advantages over other approaches including feed-in tariffs and capital subsidies. They offer technology-neutral support to a wide range of potential renewable energy sources, create competitive pressures to reduce costs, are compatible with restructured electricity industries and may support high levels of renewable energy integration by ensuring project developers and operators are exposed to energy market price signals.[5]

MRET appears to have performed reasonably well to date in effectively achieving its target at low policy support costs by international standards. However, it has only had to achieve a very modest target, operated within an energy market context that is now changing rapidly and did demonstrate some significant failings, as discussed below.[6]

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[3] See, for example, European Commission (2008)

[4] See, for example, MacGill and Betz (2008).

[5] The scheme creates a separate cash flow for renewable energy generation through the certificate market. Project developers and operators derive revenue from both these certificates yet also the value of their energy generation. In the Australian context, electricity market prices facilitate the location and technical design of renewable energy projects in order to maximise their energy market value. By comparison, feed-in tariffs generally shield project developers from the impacts of their particular project on overall energy market operation through a fixed price

[6] See, for example, Passey and MacGill (2006)

Note that such Quota or Tradeable Green Certificate (TGC) Schemes are widely considered to have been a failure in Europe in comparison with feed-in tariffs. There, TGC schemes have demonstrated low effectiveness in achieving significant deployment of key technologies such as wind power, while simultaneously achieving low efficiency because the publicly funded policy support costs are considerably higher than estimated project costs.

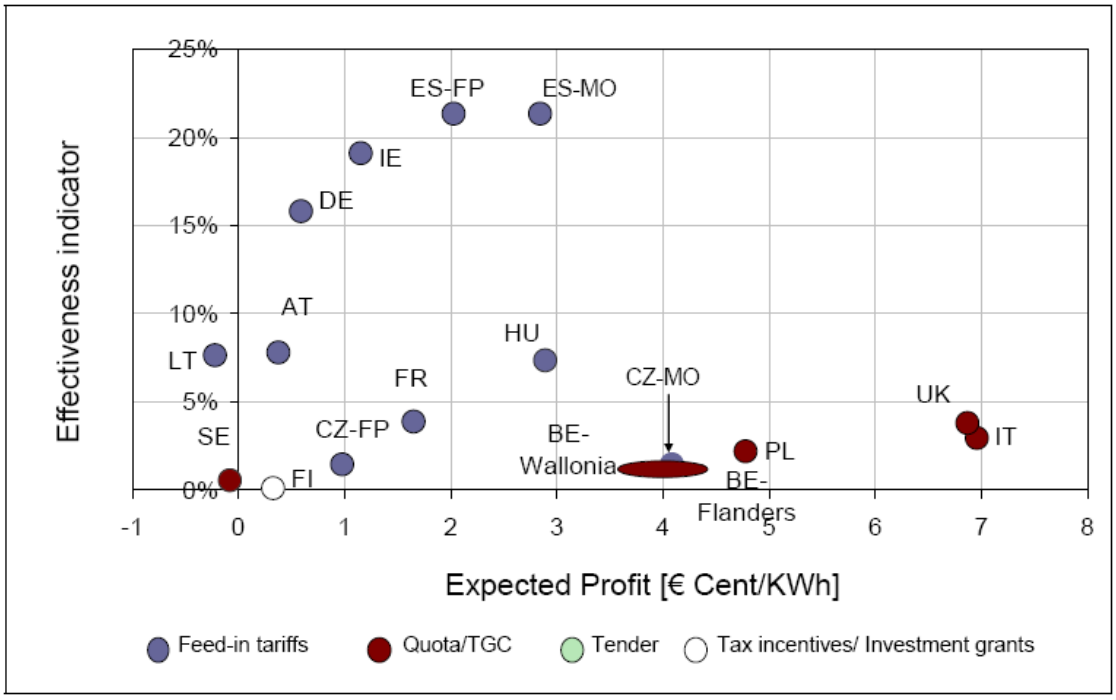

Figure 1. Historically observed effectiveness (in driving deployment) against expected project profits (costs of policy support minus expected costs of generation) for different policies supporting on-shore wind in Europe.[7]

Suggested reasons for this poor performance include the novelty of the schemes, but also developer demands for a higher internal rate of return (IRR) given the greater investor insecurity than seen with other approaches, a 'single' price for different situations and technologies that leads to windfall profits and the susceptibility of the scheme design process to be captured by incumbents who lobby for regulations that they know they can satisfy but that small non-incumbent competitors will not be able to manage.[8]

The poor performance to date of TGC schemes in Europe may reflect the specific design choices of the UK, Italian and Swedish Schemes. Regardless, it highlights the potential risks of such approaches.

The proposed expanded national RET for Australia now includes a far more significant target to be implemented within an increasingly stressed electricity industry infrastructure, including transmission, and a rapidly evolving industry structure with less government ownership and growingly powerful vertically integrated 'gentailers'. The risks of poor outcomes with the proposed RET do not appear to have been fully appreciated in the proposed design.

[7] European Commission (2008), p. 10.
[8] See, for example, Lauber V. (2008).

The governance challenge for an expanded RET

Market-based approaches such as Tradeable Green Certificates are sometimes argued to be simpler than regulatory or direct fiscal approaches because governments just have to set the target, and then let the markets work out how best to achieve these objectives. The reality is very different. Markets for tradeable certificates are 'designer' markets – they arise from policy, and design choices can markedly affect their effectiveness, efficiency and equity impacts.

Complexity: Important issues can be lost in all the potential complexities of scheme design. For example, the original MRET design process appears to have given too little attention to some questions of market information – participants such as large hydro were initially able to conceal their amount of renewable generation eligible to earn Renewable Energy Certificates (RECs), thus providing a source of potential market power.

Policy interactions: Tradeable certificate instruments have some useful characteristics for managing policy interactions as the market for certificates can automatically adjust as other policies are put in place. For example, the introduction of a national ETS will increase electricity prices and new renewable projects receiving such electricity prices will require lower prices for their RECs in order to achieve adequate returns on investment. This impact will likely ripple through the REC market over time if it is sufficiently competitive.

Still, interactions can have unexpected impacts that adversely impact on schemes' meeting their stated policy objectives, and MRET design therefore needs to be undertaken in the context of a coherent policy framework. For example, there are obvious problems with including Solar Hot Water in the scheme given that it doesn't generate electricity directly and calculations of its 'effective' demand reduction are highly abstract. Solar Hot Water is certainly deserving of policy support – the question is what form of support is most appropriate.

Risk management: Climate and energy policy is inescapably a risk management exercise. Some of these risks can be reduced or transferred between parties; others will always fall on society, and hence their governments.

Tradeable certificate schemes certainly transfer some risks onto the market participants – both those who are liable parties as well as those who voluntarily participate as project developers. For example, unlike feed-in tariffs, governments do not guarantee fixed publicly funded support for some number of years.

Certificate schemes therefore increase the demands of market participants for some other measures of investment certainty. Governments need to take care here – most private sector decision-making occurs in an environment of risk, and government policies are only partly responsible for this. Furthermore, there is often some asymmetry in such demands for investment certainty - policy changes that create windfall profits for existing renewable projects are unlikely to see project developers offering to hand these profits back to government. Finally, markets need some risk and uncertainty in order to function properly – it drives innovation and careful decision making.

Commitments to creating investor certainty can limit a government's freedom to change a measure's design or introduce other policies at a later date. This is a freedom that governments will require in order to effectively respond to climate change over time.

The original MRET policy process has highlighted potential problems in trying to correct design errors. MRET's baseline problems with old hydro did not take long to emerge once MRET had commenced, yet the Tambling MRET review was unwilling or unable to act on the problem except by recommending a sunset clause that would make pre-2005 generation ineligible to earn RECs after 2020.

The policy design process: Of perhaps greatest concern with Tradeable Green Certificate schemes is the potential for influential stakeholders to manipulate initial design choices to their own advantage. Market participants are always seeking competitive advantage and this can drive innovation that reduces the costs of achieving policy objectives. However, they will also seek advantage during the scheme design process.

For example, the decision to allow pre-1997 generators to earn RECs has had the consequence that such plants are projected to contribute a significant proportion of required RECs to 2020. Some of these plants will not have had to make any additional investment beyond Business-As-Usual to create their RECs. The outcome is reduced investment in genuinely new renewable energy and hence reduced industry development, as well as windfall profits to some participants.

The issue of baselines for old hydro was raised in the original 1998 MRET Issues Paper prepared by the Renewables Target Working Group. They noted that the stated intent of the measure was to encourage new renewables additional to existing renewable generation but that it was important not to discriminate against increased output from existing renewables. In the final report of the working group, they were unable to form consensus on this issue.[9] Instead, they offered three possible approaches that might be adopted – i) do not include any renewable energy projects in commercial operation prior to 1997, ii) provide a regulator with the discretion to decide the proportion of an existing renewable generator's output which would be eligible to earn RECs or iii) make existing generators eligible for RECs for part of their production above a specific target equal to x per cent of their baseline energy output averaged over an appropriate time frame with 'x' determined through the political process. The Commonwealth and Western Australia supported option i, Queensland option ii, and Tasmania option iii. Somehow, the policy process ended up choosing option iii, with the consequences for the scheme noted above.

As seen above, the policy process for introducing tradeable certificate measures is a fraught one. A transparent process that explains why particular design choices were made and assigns accountability for these decisions will be valuable. The process will need to be robust against unreasonable demands from powerful stakeholders, and retain the freedom to change as circumstances demand.

In this regard, the failure of proposed scheme design to correct evident failings in the existing MRET such as the continued inclusion of solar hot water and 'old hydro' is concerning. And the active policy discussion of whether large electricity intensive and trade exposed industries might not be required to contribute to the RET is alarming. As noted in the Tambling review of MRET, "any (such) exclusion would also undermine the basic principle of the scheme, that MRET liabilities accrue to electricity users, in proportion to the quantity of their usage."

The proposed scheme has not included some of the best design features of the Victorian scheme including it's exclusion of solar hot water and pre-existing projects from participation, and the use of a sunset period to restrict the time period over which projects can earn RECs. It has, however, adopted that scheme's most glaring design failure – the exclusion of some favoured large energy users from contributing their fair share to the scheme's costs. Governance appears to be going backwards and this suggests that the current design process is inadequate for the task. More generally, the evident governance failures in the CPRS design regarding so-called compensation appear to have established a dangerous precedent for future policy efforts.

[9] See RTWG (1998) and RTWG (1999).

Design Choices in the exposure draft legislation

Proposed target trajectory.

The new proposed trajectory of annual REC liabilities that maintains a 45,000GWh target from 2020 through to 2030 is a significant improvement on the earlier proposed trajectory but still appears to risk an early boom and bust investment cycle, and potentially highly volatile REC prices. Neither is conducive to effective and efficient investment and industry development. More generally, effective action on climate change will almost certainly require that renewable energy continues to play an increasing role in electricity supply beyond 20% in 2020.

If it is believed that the CPRS will be sufficient to drive such renewable energy deployment in the longer term, then larger longer-term targets for RET should not cause any additional burden – the price of RECs will fall as the costs of fossil-fuel generation options increase and renewable energy becomes increasingly competitive in it's own right. If, however, the Government is unable to deliver an effective CPRS then such enhanced longer-term RET targets would provide valuable policy 'insurance.

Treatment of solar water heaters.

Solar Hot Water heaters do not generate electricity and their inclusion in the current MRET was the outcome of poor governance in the original design process. The presence of these systems in the scheme has greatly added to its complexity while reducing its impact on driving renewable electricity generation. Its inclusion is in conflict with the stated goals of the legislation which are to increase renewable energy's contribution to electricity generation.

This is not to say that solar hot water should not receive policy support - it is an extremely valuable renewable energy option for Australia. However, it and other renewable thermal energy sources would be better served by separate policy support. Regulations and capital grants appear to be well suited to supporting these options and already exist, in a limited way, for solar hot water. Such policies can and should be strengthened and expanded to other non-electricity renewable energy equipment.

Unrestricted eligibility within RET for existing projects

The proposed scheme design will permit projects that were undertaken in the context of only the original MRET (that is, pre 2007) to continue to earn RECs beyond that scheme's 2020 end date. This will reduce the new investment driven by the expanded RET and creates the potential for significant windfall profits to such projects.

A set eligibility period appears to be the best way to manage these issues and help drive a desirable investment profile over the scheme's life. The fifteen year period of the Victorian scheme seems appropriate, and should be implemented.

Unrestricted eligibility of pre-1997 projects accredited within MRET

The problems that have arisen from the decision to include old hydro in the original MRET include reduced investment in new renewable generation and windfall profits to some favoured scheme participants. The exposure draft legislation does not propose to exclude such projects from the scheme post 2020 hence ensuring a further loss of scheme effectiveness, efficiency and equity. More generally, this design choice suggests a potential

inability of governments to make even the most self-evident and straightforward corrections to the design of market-based environmental mechanisms.

The considerable flaws in the current CPRS design are particularly concerning in this regard. It can not be assumed that future governments will be capable of correcting what are already self-evident problems in the proposed scheme over time, let alone design flaws that only emerge after the CPRS is in operation.

Transitional deeming arrangements for small solar PV installations

The proposed multiplier for small PV systems in the first years of the scheme is no substitute for a well thought out, coherent and comprehensive policy framework for supporting this important renewable energy technology. Feed-in tariffs would appear to provide a far better basis for promoting industry development and facilitating PV's role in addressing our energy and climate challenges.

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Defects in the target: nRET

Prior to the 2007 election the Labor Party's commitment to increase the share of Australia's electricity generated from renewable sources to 20% by 2020 was a key component of its strategy to reduce Australia's greenhouse gas emissions second only to the introduction of an emissions trading scheme Now in power, Labor announced details of how it proposes to meet this commitment - at a low key press conference in Brisbane two days after the highly publicised launch in Canberra of the emissions trading scheme (called the Carbon Pollution Reduction Scheme CPRS), and just eight days before Christmas.

The Government proposes to amend legislation of the current scheme to boost renewable electricity generation the Mandatory /Renewable Energy Target (MRET), and to change its name to national Renewable Energy Target (nRET) Implemented by the Howard Government, the MRET aimed for an increase of 9.5 TWh equal to about 4% of total electricity generated in 2007, in the annual quantity of renewable electricity generated between 2001 and 2010

In fact, almost no legislative changes will be made in moving from MRET to nRET other than to insert an additional target of 45 TWh, to be achieved by 2020, and to specify the lesser year by year targets culminating in the final 45 TWh The major legislative changes concern the treatment of small scale (rooftop) photovoltaics, which are likely to contribute less than 1% of the nRET target, yet received almost all the media coverage However the much larger issues are the potential for failure of the scheme to meet its main objectives, because it is keeping all the bad features of the old scheme as well as the good ones

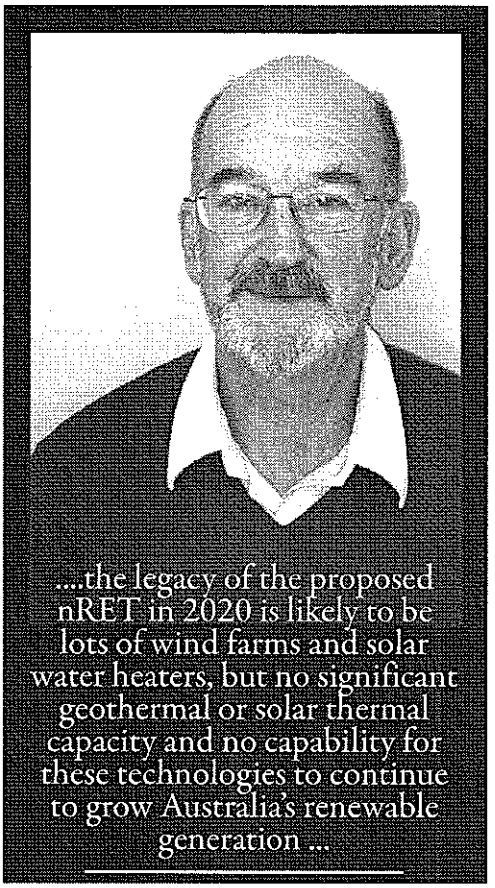
To understand why this is so it is helpful to look at the achievements and failures, of the MRET

The MRET creates a separate higher priced wholesale market for renewable electricity, which operates alongside the much larger and lower priced wholesale electricity market, dominated by coal fired generation. This mechanism allows the market to bring emerging technologies to full commercial status with the discipline of competition to prevent excess profits While criticized by many for picking winners, the MRET instead chooses the very broad and indubitably important category of renewable energy, and then allows the play of market forces to determine which of many possible renewable generation technologies will be successful

Far from being the result of considered policy making, inclusion of solar water heaters is the outcome of a messy last minute compromise made when the original MRET was legislated.

The winner picked by the MRET market was wind The great success of the scheme was to allow the market to discover that Australia had a much larger wind energy resource than had previously been thought The result was a boom in wind farm construction as Australia benefitted from rapid technical advances in the world wide wind generation industry, and improvements in designing and building wind farms flowing from the experience of doing so Learning by doing is here an important consideration in longer term cost benefits

Unfortunately, a fundamental design defect in the scheme meant that the boom was followed by a bust with factories shutting down and investors moving to other countries The defect is so-called unlimited banking which allows generation in excess of the low target requirement in early years of the scheme to be held and used in later years when the target is higher As a result, over-building in early years is encouraged, increasing the likelihood of a later bust



...the legacy of the proposed nRET in 2020 is likely to be lots of wind farms and solar water heaters, but no significant geothermal or solar thermal capacity and no capability for these technologies to continue to grow Australia's renewable generation ...

Had the target been larger, the bust would have been less severe, but in fact the target is more than 20% smaller than it appears This is the share taken by a technology which does not even generate electricity – solar water heaters Far from being the result of considered policy making, inclusion of solar water heaters is the outcome of a messy last minute compromise made when the original MRET was legislated It is the second major defect being carried over into the new scheme What is worse its damaging effect will be greatly amplified because the number of solar water heaters installed each year may increase by as much as five- or tenfold, because of a completely separate policy commitment to phase out residential off-peak electric water heaters

With unlimited banking and the retention of solar water heating, the long queue of neat ready to build wind farm projects and a regulation driven boom in solar water heaters means that these two technologies are likely to swamp the scheme This could be disastrous for other highly promising, but slightly less mature technologies, notably hot rock geothermal and concentrating solar thermal generation because when they are ready to scale up, in perhaps four or five years from now, there may be no space for them within the target This possibility was clearly spelled out in the discussion paper on nRET design, which the Government released last year

The press release accompanying the scheme launch says it will "[help] us build the low-pollution economy and jobs of the future" and "[drive] investment in renewable technologies like wind, solar and geothermal energy" In fact, because of its design defects, the legacy of the proposed nRET in 2020 is likely to be lots of wind farms and solar water heaters but no significant geothermal or solar thermal capacity and no capability for these technologies to continue to grow Australia's renewable generation as the support provided by the nRET falls away This would be bad energy policy bad economic policy and bad for our prospects of reaching the Government's long term target for greenhouse gas emissions reduction

Green Energy Markets Pty Ltd

Report for Elgas on RECs produced by Commercial Heat Pump Systems

Project Scope

Prepare a report that analyses the REC creation for solar water heater (SWH) systems and assesses the level of RECs that heat pumps (particularly commercial heat pumps) are currently creating. This report is to be prepared within a very short timeframe.

Contents

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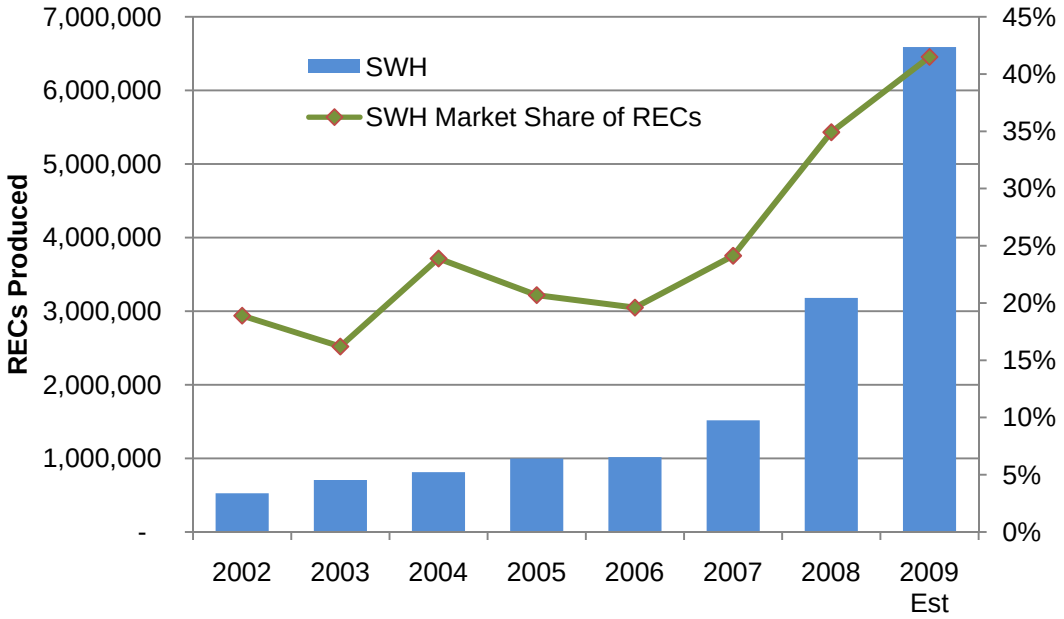
1. Overview of Solar Water Heater (SWH) Market

The solar hot water market has grown strongly over the last five years with Renewable Energy Certificates (RECs) from SWH more than doubling on an annual basis over the last two years. The ability to create and on-sell RECs has been an important market driver that has dramatically reduced the cost of purchasing and installing SWH systems (including heat pump systems).

While RECs have been the key policy driver over this period they have by no means been the only one with building regulations and government rebates also providing strong support to the SWH market. More recently the $1600 Commonwealth government rebate for the installation of a SWH that displaces an electric storage system has become the primary driver for uptake of SWH systems in the residential water heater replacement market. This rebate was increased from $1000 and had its means test removed. On top of the REC benefit (approx $1200 for a typical heat pump system) this means that the installed cost of a SWH can be reduced by more than $2800.

SWH are now the largest creators of RECs having clearly overtaken wind generation. For the five month period of REC creation to May 2009, SWH accounted for 2.3 million RECs which was 46% of all RECs generated over that period.

Figure 1. RECs produced by Solar Hot Water



Growth in SWH RECs, by generation year, over the last seven years is set out in Figure 1. RECs created for 2009 are our estimate of REC creation for SWH based on the current level of monthly activity (approx 550,000 RECs per month). SWH RECs in 2007 were nearly 50% greater than 2006 and we expect will grow by a further by 110% in 2008. We estimate a similar growth rate in 2009 to reach 6.6 million RECs for the 2009 generation year.

A breakdown of SWH RECs created to date by state and generation year (year of installation) is set out below in Figure 2.

Figure 2. Solar Water Heater (Deemed) RECs by Generation Year and State

As at 31 May 2009 (includes RECs Pending Registration)

	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
2001	1,616	43,237	12,183	89,159	15,421	568	14,669	38,504	215,357
2002	6,505	116,862	21,848	197,323	50,187	2,420	38,032	91,960	525,137
2003	11,192	190,162	21,792	230,784	87,075	3,970	38,520	121,977	705,472
2004	13,700	212,246	25,734	249,446	89,724	4,775	51,645	165,452	812,722
2005	12,416	255,523	27,842	274,746	97,681	11,996	100,235	217,202	997,641
2006	5,254	221,570	31,123	299,512	73,678	3,753	126,534	256,529	1,017,953
2007	13,252	270,939	43,615	522,937	88,741	9,954	231,970	335,469	1,516,877
2008	30,960	831,029	37,499	743,674	165,671	65,809	874,443	400,530	3,149,615
2009 YTD	20,289	670,181	12,799	272,527	63,439	33,831	607,990	131,803	1,812,859
Total	**115,184**	**2,811,749**	**234,435**	**2,880,108**	**731,617**	**137,076**	**2,084,038**	**1,759,426**	**10,753,633**

Note: RECs for 2009 YTD generation are as at 31 May 2009 and we expect that more than 6.6 million RECs will be eventually created for systems installed in 2009.

2. Solar Heat Pump Systems

Solar heat pump systems (SHPS) are classified as solar water heaters under the Mandatory Renewable Energy Target (MRET) Scheme and for residential applications typically create between 26 and 30 RECs per system, similar to a typical electric boosted conventional solar hot water system.

SHPS have proved to be extremely popular in recent times, due to ease of installation (plumbers do not need to gain access to roofs) and generally lower cost. They are also an attractive low emissions technology for areas without reticulated natural gas. We currently estimate that SHPS account for more than 50% of total SWH RECs created.

Historically Quantum have been the largest supplier of SHPS into the Australian market however a number of the leading SWH manufacturers now offer a SHPS as part of their product range. Quantum systems currently produce more than 30% of all SWH RECs – of which a significant proportion are commercial SHPS.

3. Commercial SHPS

SWH systems sold for commercial applications are able to produce RECs, provided the system has been accredited by the Office of the Renewable Energy Regulator (ORER) and appears on its list of eligible solar water heaters (which is updated several times a year). The vast majority of commercial systems sold are SHPS supplied by Quantum. Refer to Figure 3 for a listing of Quantum systems accredited for RECs.

ORER separates accredited SWH systems according to whether they have more or less than 700 litres of storage capacity. There are currently 4288 systems accredited with less than 700 litres of storage capacity. These are typically for residential applications and range in REC values (Zone 3, eg for Sydney, Brisbane, Adelaide and Perth) from a low of 4 to as high as 52 RECs per system.

There are 6655 accredited systems with a capacity in excess of 700 litres. These range in REC values from a low of 17 to as high as 9914 RECs per system. Systems with more than 700 litres of storage can be generally categorized as "commercial systems" although there will be some larger systems that will be used in a domestic applications – such as for very large homes or where "in slab" hydronic heating may be used.

For the purpose of our analysis we have treated any system that creates 60 or more RECs as a "commercial" system. In addition as just about all commercial systems are SHPS (predominantly Quantum) we can safely assume that systems greater than 60 RECs are SHPS.

Figure 3. ORER Register of Quantum solar water heaters *ORER Version 5 - 19 June 2010*

Item	Brand	Model	Eligible from:	Eligible to:	Number of certificates for an installation in Zone:			
					1	2	3	4
SWH Models with capacity of up to and including 700 litres								
3051	Quantum	150-08ACW-134	03 Sep 2007	31 Dec 2020	17	15	17	16
3052	Quantum	270 11AC3-134	09 Feb 2005	31 Dec 2020	26	22	26	26
3053	Quantum	340 11AC3-134	09 Feb 2005	31 Dec 2020	26	23	26	26
3054	Quantum	340-17ACW-134	07 Feb 2007	31 Dec 2020	27	24	27	27
3055	Quantum	340-TIH-134	07 Feb 2007	31 Dec 2020	25	22	25	24
SWH Models with capacity of more than 700 litres								
5397	Quantum	1020-17ACW-134	07 Feb 2007	31 Dec 2020	99	91	99	101
5398	Quantum	340-17ACW3-134	07 Feb 2007	31 Dec 2020	329	286	329	326
5399	Quantum	340-17ACW4-134	07 Feb 2007	31 Dec 2020	439	381	439	434
5400	Quantum	340-17ACW5-134	07 Feb 2007	31 Dec 2020	549	476	549	543
5401	Quantum	340TI3-134	09 Feb 2005	31 Dec 2020	245	220	245	237
5402	Quantum	340TI4-134	09 Feb 2005	31 Dec 2020	327	293	327	317
5403	Quantum	340TI5-134	09 Feb 2005	31 Dec 2020	409	396	409	396

4. REC creation and analysis

We have analysed the number of systems that have created RECs according to those systems with greater than 60 RECs and designated these as commercial systems with those systems that are less than 60 RECs designated as residential systems.

More than one system may be installed at a particular site. As an example it is not uncommon for several Quantum “3 tank systems” to be installed at a site. As such we are reporting the number of systems rather than the number of sites or installations.

The analysis that follows is based on an analysis of data downloaded from the REC-Registry on 22nd June 2009 and is analysed by ‘generation year’ (ie. the year of installation). Note we have included RECs created so far for 2009 generation year to incorporate the significant market growth witnessed this year. RECs can be created up to 12 months after the system has been installed so there will continue to be RECs created for systems installed in 2008 however we believe that these will be only modest amounts. With regard to 2009 generation year the RECs created so far amount to around 40% of total RECs for the year, with 60% still to be created.

Systems Installed

The number of systems installed since 2002 are summarised in Figure 4 below.

Figure 4. SWH systems installed
(as at 22 June 2009)

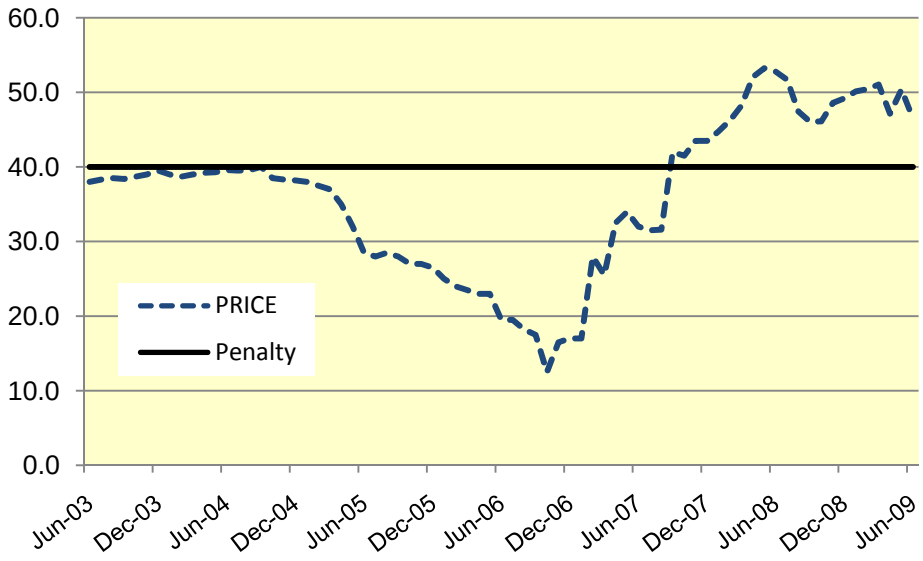
Generation Year	Residential	Commercial	Total
2002	21,827	3	21,830
2003	28,640	10	28,650
2004	30,834	117	30,951
2005	32,721	1,219	33,940
2006	35,842	82	35,924
2007	50,835	146	50,981
2008	81,609	1,966	83,575
2009 YTD	56,791	2,078	58,869

The strong growth in commercial system installation has been driven by rising REC prices (refer to Figure 6) which has seen the effective cost of a commercial heat pump system to the end consumer become negligible if anything. Commercial systems installed in 2009 that have created RECs to date have already exceeded the number of systems in 2008. Victoria in particular has experienced strong growth accounting for 55% of total commercial SHPS installed in 2009 thus far.

Figure 5. Commercial SWH systems installed by state

	2008	2009 YTD
ACT	5	7
NSW	567	466
NT	19	26
QLD	148	226
SA	47	83
TAS	117	88
VIC	932	1133
WA	131	49
Total	**1966**	**2078**

Figure 6. Spot REC Prices



The average amount of RECs created by system since 2002 is summarised in Figure 7 below. RECs per residential system have progressively increased and currently amount to 30 RECs per system. Average RECs per commercial system have also increased over the last five years although in 2009 the level dropped slightly reflecting the increased popularity of the Quantum “three tank manifolded” system.

Figure 7. Average level of RECs per system installed

Generation Year	Residential	Commercial	Total
2002	24.0	170.0	24.1
2003	24.5	248.0	24.6
2004	25.9	128.0	26.3
2005	26.3	113.3	29.4
2006	27.8	265.0	28.3
2007	29.1	262.3	29.8
2008	29.6	387.0	38.0
2009 YTD	30.7	365.0	42.5

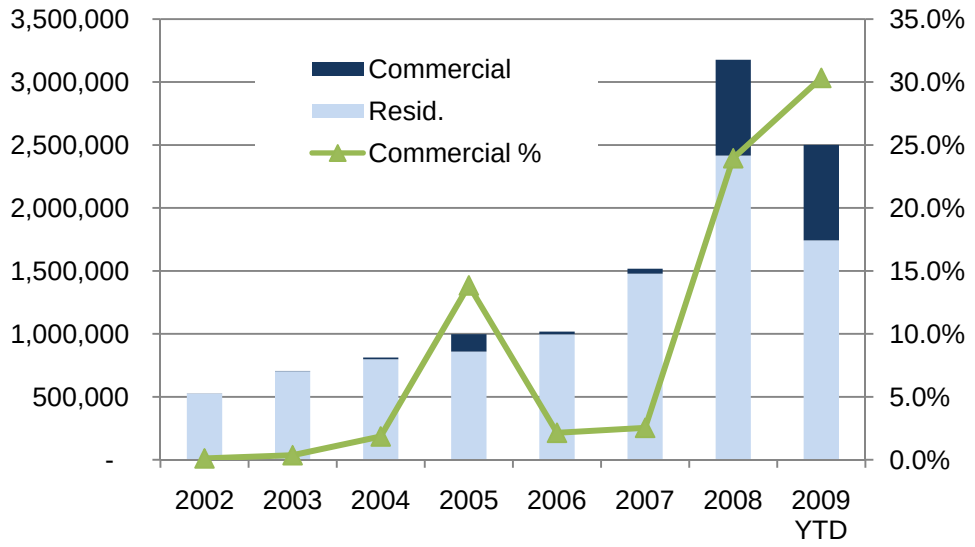
RECs Created

The level of RECs created from commercial systems installed so far in 2009 have nearly exceeded the level in 2008 on a whole year basis. Commercial systems now account for more than 30% of SWH RECs created (refer to Figure 8).

Figure 8. SWH RECs created by Generation Year
(as at 22 June 2009)

Generation Year	Residential	Commercial	Total
2002	524,627	510	525,137
2003	702,992	2,480	705,472
2004	797,745	14,977	812,722
2005	859,534	138,107	997,641
2006	996,226	21,727	1,017,953
2007	1,478,579	38,298	1,516,877
2008	2,416,416	760,842	3,177,258
2009 YTD	1,742,141	758,470	2,500,611

Figure 9. SWH RECs by system type



Attachment 1 Review of SWH RECs by Generation Year

Source: REC-Registry **As at 22 June 2009 (includes Pending Registration)**

Generation Year	RECs Created			Systems Installed			RECs per System			Commercial % of SWH RECs
	Residential	Commercial	Total	Residential	Commercial	Total	Residential	Commercial	Total	
2002	524,627	510	525,137	21,827	3	21,830	24.0	170.0	24.1	0.1%
2003	702,992	2,480	705,472	28,640	10	28,650	24.5	248.0	24.6	0.4%
2004	797,745	14,977	812,722	30,834	117	30,951	25.9	128.0	26.3	1.8%
2005	859,534	138,107	997,641	32,721	1,219	33,940	26.3	113.3	29.4	13.8%
2006	996,226	21,727	1,017,953	35,842	82	35,924	27.8	265.0	28.3	2.1%
2007	1,478,579	38,298	1,516,877	50,835	146	50,981	29.1	262.3	29.8	2.5%
2008	2,416,416	760,842	3,177,258	81,609	1,966	83,575	29.6	387.0	38.0	23.9%
2009 YTD	1,742,141	758,470	2,500,611	56,791	2,078	58,869	30.7	365.0	42.5	30.3%

Note: 2009 YTD figures relate to RECs created for systems installed in 2009 to 22 June 2009.
We expect that more than 6.6 million SWH RECs eventually be created for systems installed in 2009.