1. Introduction

The Australian Wood Panels Association (A.W.P.A.) represents Australian manufacturers of composites wood products such as MDF and Particleboard. These products are routinely used in the construction of residential and commercial buildings. It is from this perspective that we make this submission.

2. Comments on previous submissions

It is noted that the terms of reference relate to the adoption of cost effective energy efficiency measures. However we feel that cost effectiveness is inextricably linked to performance of current programs and policies and therefore we believe that these aspects require comment if cost effectiveness is to be quantified.

There are a number of submissions that add to the richness of the debate. We take particular note and support Dr Terry Williamsons observations and findings on the lack of correlation between building star ratings and energy use. We are also concerned that there has been no corroboration of the effectiveness of past and proposed energy efficiency measure for the residential sector. We therefore draw the conclusion that current actions in the residential sector may be ineffective and by inference not cost effective either.

We also support the comments from the BPIC that a national approach is needed and unnecessary state and local government amendments are counter-productive to efficiencies in our sector. We endorse the announcement by Minister Ian Macfarlane to reform the current building regulation IGA and to pursue more consistent national regulations.

3. Further Comments from the AWPA

In commenting on the draft report the AWPA would like to voice its own concerns about the effectiveness of the current approach to energy efficiency in residential buildings as proposed by the current RD2004-2 from the ABCB. We would like to provide details of the main shortcomings, which can be summarised into the following areas:

- Lack of a holistic approach.
- Modelling.
- Flow on effects.
- Effectiveness of the current policy.

Lack of a Holistic Approach

As noted in your draft report the purpose of new energy efficiency regulations are to reduce greenhouse gas emissions and ultimately we believe the effectiveness of these programs will be judged by cost and efficiency metrics.

We believe that the approach taken to achieve this objective is fundamentally flawed. The current methodology used by policy makers is not holistic, several factors affecting energy use are not considered. We also believe the building fabric factors currently being regulated by the ABCB via the Building Code of Australia operate

with the paradigm that "high thermal mass is equivalent to energy efficiency". This paradigm causes a bias towards concrete slab on ground construction thereby prejudicing lightweight construction methods, which in many situations offers a more efficient approach to energy use, setting aside occupant use factors. We believe that energy use is a complex issue that needs a more comprehensive approach.

Our view is that the energy use in the residential sector is affected by a number of factors including:

- Building fabric performance (operational energy)
- Materials of construction (embodied energy)
- Construction methods (embodied energy)
- Occupant Use (operational energy)
- Location (operational energy)
- Appliance intensity (operational energy)

More specifically the usage factors can be allocated to:

- Operational
- Embodied energy of materials and construction methods related to material life-cycles

The current approach to energy efficiency is flawed because it does not attempt to address all these issues. Even more concerning is the fact that it doesn't address the most important factor which appears to be sociological according to Williamson[1]. We have called this the occupant use factor.

If the current regulations proposed by the ABCB are considered in isolation and the effects that they have on the materials of construction and energy use through embodied energy is considered, some serious concerns are revealed. The AGO report "Australian Residential Building Sector Greenhouse Gas Emissions 1990–2010"[2] in part 8.7 reaches as one of its conclusions:

"Embodied energy and its resultant greenhouse gas emissions form a significant proportion of the life cycle energy of a residential building. Any measures designed to abate greenhouse gas emissions could not be considered to be comprehensive if they did not address this issue".

Further it states[2]:

"In policy terms, embodied energy may be addressed by building in some factor into say a HERS scheme, if implemented. For example, a four star house (operational energy) using low embodied energy materials (for example, timber) may rate as equivalent to a five star house (operational energy) using higher embodied energy materials (for example, concrete and clay brick)."

To further highlight the importance of embodied energy we would like to emphasise the examples from the same report which indicate:
"There have been several studies investigating the life cycle significance of the energy embodied in construction at the individual building level. Pullen[3], and Treloar and

[1] Submission 028 to this inquiry, Terry Williamson, 2005
[2] The AGO report Australian Residential Building Sector Greenhouse Gas Emissions 1990–2010 P 102

Fay[4] found that the energy embodied in house construction was equal to approximately 15–20 years of operational energy. With periodic maintenance and refurbishment, over a typical house life of 100 years, the embodied energy in the building, furniture and equipment could represent up to 50 per cent of the total. For very efficient houses, the embodied energy could be more important than the operational energy, both in energy and greenhouse terms. More significantly, in the short term the initial embodied energy may be the most important component (Treloar and Fay,[4])".

And further to this the report states:

"The pilot study reveals that, for the generic house, the use of a concrete floor as a means of reducing operational energy consumption as compared to a timber floor is effective in the very long term and would result in a total operational primary energy saving of approximately 208 GJ over a 100 year building life span in the Western Sydney climate type. At this rate, the added embodied energy in the concrete floor as compared to the timber floor would be paid back in approximately 47 years…. In terms of greenhouse gas emissions, this return period is higher at 62 years… making this strategy marginal in terms of improving the buildings life cycle greenhouse gas emissions. If constructed now, by 2010 the additional embodied energy for the concrete floor relative to the timber floor would not have been paid back (i.e., resulting in a significant net increase in greenhouse gas emissions over the 11 year period)."

Current proposed BCA regulations do not take into account the very important factor of embodied energy. As a result of employing either deem-to-satisfy or computer modeling the resulting preferred method of construction consists of high mass materials with high embodied energy. These methods of construction can result in an overall increase in Greenhouse Gas Emissions (GHGE) and a have a significant impact on energy use as noted in the AGO report detailed above. We would argue that this approach is not always in the best interest of energy efficiency.

The proposed BCA regulations also do not take into account the issues that are encountered with topography or wet or saline areas. In these cases the use of high mass construction is not always suitable resulting in "cut and fill" and other high energy inputs in the construction phase further increasing the use of energy and negatively impacting on the environment. There is also a significant cost increase using these methods due to the cost of retaining walls and increased drainage. This will have a marked effect on cost/benefits analysis. The use of a HERS system (apart from BASIX in NSW) makes no allowance for this situation resulting in sub-optimum energy use evaluations.

Modelling

We also have concerns about the modelling of building performance. There appears to be very few studies that support the accuracy of model performance. One study[5]

---

[3] Pullen, S. 1995, Embodied Energy of Building Materials in Houses, Master of Building Science Thesis, University of Adelaide, Adelaide, p. 184.

[4] Treloar, G.J. and Fay, M.R. 1998, Embodied Energy of Living, Environment Design Guide Practice Note GEN 20, Royal Australian Institute of Architects.

[5] Comparison of the measured and predicted sensible heating and cooling loads of six test buildings, Burch DM. US Dept Commerce, NBS 1986.

indicates that models gave energy load results ± 10-15% of actual results. This is perhaps considered acceptable but Williamsons comments need to be heeded, these evaluations are not determinations of the accuracy of the model to reality but purely the accuracy of the model to the reality of keeping a building at a certain temperature under certain situations. As this report is being prepared there are a number of changes occurring in the modelling software to try and improve its performance and we also believe that such models have a place but we are greatly concerned when such models decide the selection and use of materials when reality cannot be predicted with any certainty. The timber industry is trying to improve this situation by establishing a research program in Tasmania to evaluate the real energy performance of different construction methods both in terms of energy load, comparing theoretical load versus actual load and energy use when the building is occupied. The results of this work will ultimately answer some if not all of these questions but they are at least two years away.

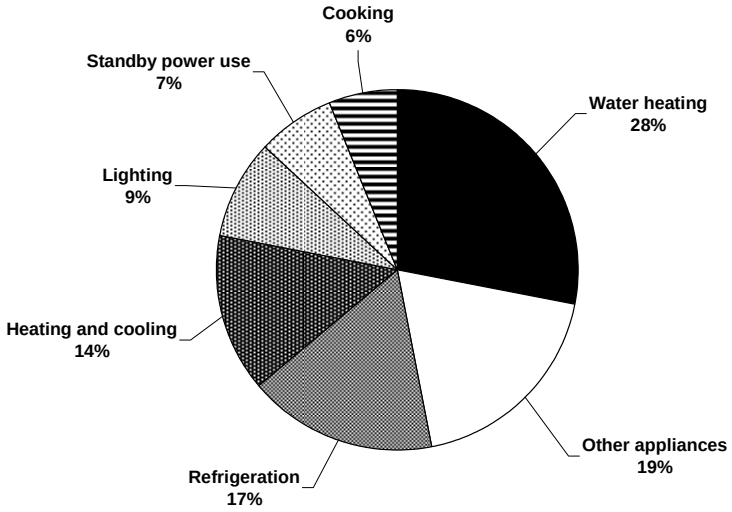
Flow on effects

We also note that in some software models the building envelope is changed to improve energy efficiency but this may be a fallacy. The reason for this is that these changes may have other flow on effects on the energy use in the building. For example some designs have used decreased window opening to improve the thermal performance of the building but it appears that no account has been taken of the effect on energy use for lighting nor for that matter on reduced ventilation and its effect on the use of passive methods to cool the house. In effect we may be "robbing Peter to pay Paul".

Effectiveness of the current policy.

In the draft report we take note of figure 7.3 reproduced below.

Figure 7.3 Household greenhouse gas emissions by purpose, 1998



From this graph we can identify that the contribution to greenhouse gas emissions from heating is disproportionately low compared to energy use. We understand that this is due to the use of fuels other than electricity in heating. The importance of other factors in energy efficiency is put into perspective when reviewing this diagram as it can be seen that factors outside of the building fabric account for 86% of the

operational greenhouse emissions in the residential building sector. Of particular note and concern is the contribution from standby power usage of 7%. This is an obvious target for energy use and subsequent greenhouse gas emissions that has very little impact on users.

We would also like to comment on the projected impact of the current 5 star energy ratings for building envelopes. The AGO in their report[2] comment on the projected energy and greenhouse gas emission savings in 2010 if the currently proposed 5 star regulations were introduced in 1990.

The savings can be summarised as follows:

Scenario	**Energy Use (PJ)**	**GHGE (MT CO_2-e)**
Business as usual + (Note 1)	379.3	56.7
5 star	364.6	55.4
Savings, residential use in Australia	3.8%	1.23%
Saving in total to Australia	1.6%	0.17%

Note 1. BAU+ (business-as-usual *with* measures) — this assumes that dwellings continue to be constructed to the standards prevailing today, including existing or agreed minimum standards where applicable: eg minimum building insulation standards in Victoria and 4 star ACTHERS energy rating in ACT. MEPS for refrigerators, freezers and electric storage water heaters are also included in this scenario.

As can be seen the projected savings are very minor and it of concern that the current measures being implemented as policy do not include a logical approach that targets large energy use factors where significant savings can be made This must have an obvious impact on the cost effectiveness of the measures.

A further concern is also highlighted in the AGO report[2]. If we assume that the target for emission reduction is 108% of 1990 emissions and that the building sector *"equitable"* contribution to these savings is associated with the building envelope and these can be characterized by the heating and cooling energy use then the report states:

"*The projected greenhouse gas emissions in 2010 attributable to space heating and cooling from electricity, natural gas, wood and LPG under this scenario is 8.0 MT CO_2-e in 2010, which is +25.5 percent of the 1990 levels. The emission gap in 2010 for this scenario is therefore some 1.1 MT CO 2 -e in 2010, or 13.9 per cent of heating and cooling emissions in that year*."

So it can be seen even if these measures are introduced it is highly unlikely for reasons identified in this inquiry by Williamson and by the AGO's own estimation that notional greenhouse gas emission targets for the building sectors will be reached using proposed energy efficiency measured under the current ABCB changes to the Building Code of Australia. This is not a reason not to try and achieve these targets but a statement of fact that these proposed measures miss their target even if they were to be totally successful. We have to increase our understanding and find better ways. It is also important to note that these predictions were based on implementation dates of 1990 and therefore the effects are likely to be reduced in 2010.

4. Comments on Findings

Comments on Draft finding 11.2 and Draft recommendation 11.1.

As noted above we support the submission by the BPIC and therefore support finding 11.2 and draft recommendation 11.1. We find the different energy efficiency standards in different states cumbersome and cause extra cost to our industry.

Comments on Draft findings 7.2 and 7.3 and draft recommendation 7.3

We concur with the comments of the inquiry regarding the current energy rating software and energy usage in draft findings 7.2 and 7.3. Current approaches to energy use estimation fail to recognise significant energy use factors in the residential sector. Therefore it is unlikely that star rating systems will portray an accurate picture of energy use or efficiency. We also support the draft recommendation 7.3 that current energy efficiency measures should be fully evaluated before further changes are made to the BCA and further recommend that the ACBC investigations include a more comprehensive review of energy use and savings including embodied energy and other life-cycle costs.

5. Recommendations

We believe that there is no easy solution however we make the following recommendations:

- Any building regulations should not simply consider potential energy load as a means to reduce energy usage. Any modification of existing regulations should be delayed until these considerations are made.
- Factors such as site topography, material embodied energy and appliance use should also be considered in residential building energy efficiency programs.
- A study of actual energy performance of buildings needs to be carried out.
- Cost effectiveness of energy efficiency measures need to incorporate a more holistic view of energy use including effects for the whole energy cycle.
- Education of home owners/purchasers is required to influence their buying and use behaviour.
- New building products and house designs need to be incorporated into the options for energy efficiency. In some cases these are being stifled by restrictive building regulations.

Finally we thank the Productivity Commission for the opportunity to comment on the draft report.