ENERGY CONSUMPTION IN RESIDENTIAL BUILDINGS

Thank you for the opportunity to comment on this important issue.
This submission briefly covers the following:

1. Strategies to address increasing energy consumption in residential buildings including the approach used in some parts of the United States to address escalating energy consumption.
2. The need for consistent regulation that includes deemed-to-satisfy solutions.
3. Rating Tools.
4. Issues associated with current approaches to cost/environmental benefit analysis.

Strategies to Address Increasing Energy Consumption

- From a broad perspective we agree with regulation of residential construction through the Building Code of Australia, to create homes with low energy requirements.
- The energy used within a typical Australian home over its lifetime (utilisation energy) is by far the most significant portion of the life cycle energy of the home. Therefore, regulation should focus on reducing energy use within the home.
- Space heating and cooling accounts for about 40% of energy use within the home and therefore addressing heating and cooling loads through building design is entirely appropriate.
- Water heating accounts for about 30% of the energy use within the home. Strategies to reduce water heating energy use are therefore equally important to reducing energy use within the home. Solar water heaters have comprised an important part of government strategy through rebate schemes. Consideration of building fabric concessions may be appropriate to further encourage the use of solar hot water heaters. A very simple cost effective method of significantly reducing energy use within the home (up to about 10%) is through the use of low volume showerheads (see Appendix A). This strategy saves more energy than moving from a 4 star to 5 star home, yet the low flow showerhead comes at little or no additional cost compared with the latter, which on average will cost the consumer about $3,000 based on a recent Victorian study. It also saves water.
- Regulation should recognise and encourage the use of clean energy sources. The introduction of new forms of energy conversion and storage is one such technique. As a supplier of steel roofing materials, we are directly involved in a number of promising research activities that utilise the properties of steel roofing to heat air passing over the roofing surface and ultimately store the energy in some way for later use. We believe that research into techniques such as this, which eliminate the need for fossil fuels, should be encouraged as part of a move towards energy efficiency and greenhouse gas reduction.
- Recognition of light coloured roofing in New South Wales is important. The New South Wales population resides in some of the warmer temperate regions of Australia. The benefits of light colours in warm climates are well documented; particularly in the United States where schemes exist that provide rebates and concessions to buildings with light coloured roofing. Light coloured roofing has many benefits. The benefits specifically relating to energy are that light coloured roofing reduces energy use within the home and helps reduce the surrounding environmental temperature, particularly in built up areas (reduces the heat island effect). The reduced environmental temperature further reduces the energy use within neighbouring homes and also reduces the propensity for smog. The following web sites contain information and links that detail the benefits of light colours and there use in reducing spiralling energy consumption.

Lawrence Berkeley National Laboratory	http://eetd.lbl.gov/HeatIsland/
Cool Roof Rating Council	http://www.coolroofs.org/
Oak Ridge National Laboratory	http://www.ornl.gov/roofs+walls
Energy Star Program	http://www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products
Florida Solar Energy Centre	http://fsec.ucf.edu/bldg/nonres/walls-roofs/index.htm

The Need for Consistent Regulation With Deemed-To-Satisfy Solutions

- We believe strongly in the need for a nationally consistent approach on Energy Efficiency within the Building Code of Australia. The current myriad of schemes within NSW local government areas creates unnecessary confusion.
- The regulation should include both a means of compliance through modelling and through deemed-to-satisfy solutions.
    - Industry has had the choice of using either deemed-to-satisfy solutions or modelling in many parts of Australia. Deemed-to-satisfy solutions have been widely used to date. This presumably means that people find this means of compliance cheaper, simpler, or in some way more convenient.
    - Education should be at the forefront of any drive towards energy efficiency and deemed-to-satisfy provisions are a key part of educating the community in good practice. We believe that it is better to give users the option of either a deemed-to-satisfy solution or modelling and let them choose whichever is more suitable for them.
    - There can be many hidden costs if a builder is forced to use a modelling approach. Firstly, a project builder may have standard sets of plans, with ordering systems set up. When a customer comes along and selects a plan, they immediately know how many and what type of windows to order, for example. With only the option of modelling, they would either have to model the same house again and again every time the design was ordered (to allow for orientation etc) and then be confronted with the complexity of ordering different materials for each house, or they would have to model each design for every possible orientation and use a 'worst case' scenario.

Rating Tools

- The use of rating tools as an option for compliance is necessary. Currently there exist three major rating tools, NatHERS, BERS and FirstRATE. In their current form we believe that the use of NatHERS and BERS are more appropriate than FirstRATE due to their ability to model free-running homes and their allowance for the influence of light colours, which is particularly important for the warmer regions of New South Wales.

Issues Associated with Current Approach to Cost/Environmental Benefit Analysis

- The approach that has been used to date for justifying stringent measures for improving building design has been flawed and it is unclear whether actual benefits would be derived. A moderate approach is more likely to achieve positive benefits.
    - Analysis should be on incremental improvements.
    - Energy associated with the extra material required to obtain stringent levels should be considered.
    - Benefits should not be overestimated.
    - An ideal home designed for air conditioning is unlikely to have the ideal attributes for a free running home (one that relies on passive design principles for maintaining its internal environment).

- <u>Incremental Improvements</u> – The current approach has been to look at the financial justification in moving from a poorly insulated home to a home at a particular star rating. This will not result in the best outcome for consumers and possibly the environment. The laws of diminishing return are applicable for energy efficiency improvements. The first improvements you make take little effort (or cost) but result in large improvements (or savings). Subsequent improvements take much more effort (cost) and result in much

smaller improvements (savings). To put this in some sort of perspective an example is shown in the following table. The incremental improvement from 4 to 5 stars is probably not justified. Similar energy reductions can be achieved through significantly cheaper items – eg low flow showerhead.

Star Rating Change	Cost	Benefit	Justified
0.5 to 4.0 stars	$3000	60% energy reduction $400 off annual bill	YES
0.5 to 5.0 stars	$6000	66% energy reduction $440 off annual bill	YES
4.0 to 5.0 stars	$3000	6% energy reduction $40 off annual bill	?

- Extra Energy from Materials – The current approach has ignored the extra energy required to make and maintain the materials to improve the buildings energy performance. This is justified to an extent. However, as the measures become more stringent the amount of material that must be used to improve the home increases with only small increases in saved energy. There is a point where the added energy from the increased materials is more than any perceived saving.
- Benefits Overestimated – Analysis that ignores the two previous points will overestimate any benefit. In addition to this the cost benefits are based on unrealistic conditioning regimes and the savings are clearly not relevant to those whom already choose to heat and cool minimally or can only afford minimal heating and cooling.
- Ideal Air Conditioned Home ≠ Ideal Free Running Home – Most energy efficiency regulations in Australia have been developed based on improvements to a home to improve its ability to utilise air conditioning and cooling. It is not obvious that a home that has been improved ideally to cater for air conditioning would also be ideal for use as a free running home (one that relies on passive design principles for maintaining its internal environment).

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REFERENCES

[1] Comparative Cost Benefit Study of Energy Efficiency Measures for Class 1 Buildings and High Rise Apartments, Project for the Sustainable Energy Authority of Victoria by Energy Efficient Strategies, Draft Final Report, March 2002.

[2] Chris Reardon, "Your Home: Design for Lifestyle and the Future: Technical Manual", Institute for Sustainable Futures, UTS, 2001.

APPENDIX A – LOW VOLUME SHOWER HEADS

Information published by South Australian Government:

Cost of device – from $20.
Savings (Water & Energy) - $50 to $110 per year.
Energy Saving - $35 to $85 per year.

Note that this energy saving is of the same order as achieved in going from 4 stars to 5 stars in NatHERS, which is reported to cost around $3,000 [1]. The only cost required to achieve this benefits is an up-front cost of about $20, yet the benefits are ongoing.

An alternative form of analysis on this subject is included below:

About 30% of household energy is for hot water.
About half of the hot water is for showering. AAA shower heads can reduce flow by about 2/3.
Therefore a household energy reduction of about up to 10 % (30% x 50% x 67%) is possible.
40% of household energy use is for heating and cooling (ref: Your Home [2]). Therefore 10% household reduction is equivalent to about a 25% heating and cooling energy reduction, which is much greater than going from 4 stars to 5 stars.