SUBMISSION

NSW Standing Committee on Public Works
Energy Consumption in Residential Building

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Sustainability. An energy crisis in the residential sector is a sub-set of a greater crisis in sustainability that is placing unanswerable demand upon resources and the environment.

Land. There is a new dwelling completed every 1 working minute across Australia. (120,000 dwellings per year. 50 weeks X 5 days X 8 hours X 60 minutes = 120,000). Population growth projections predict a demand for 2.5 – 4.5 million houses and 1.5 – 3.0 million flats or townhouses by 2050 requiring expansion of our urban footprints from 10,000 sq.km today to 12,000 – 15,000 sq.km.

Density. This demand for additional land cannot be satisfied without large environmental negatives and huge infrastructure costs. Low density development and sprawling suburbs impact on the natural environment and create irreconcilable conflicts, such as that posed by new bushfire protection regulations. Infrastructure to support low density sprawl is expensive – roads, rail, water, sewers, electricity, community services, schools, shopping, etc..

Transport. Low density sprawl is predicated on the use of private cars for transportation. Projections suggest an increase in Australia's car population from 10 million at present to 14 – 17 million by 2050 requiring 3,000 – 10,000 km of new roads. One traffic study assesses that the cost to the national economy of traffic congestion will be $30 billion per year by 2015. Vehicle emissions contribute substantially to air pollution problems and greenhouse gas emissions. Incentives need to be introduced to discourage private vehicle use and promote the use of low energy low emissions vehicles.

Urban Renewal. Strategies of urban renewal, related to existing transport networks and infrastructure, need to be accelerated using higher densities and new housing paradigms including apartments, cluster housings, terraces and duplex development.

Dwelling Size. Pressures on land, infrastructure and resources demand that dwelling sizes should be curtailed. Since 1940 the average metropolitan dwelling size has grown from 100 sq.m to 150 sq.m paralleled by declining family size.

Strategies need to be initiated to promote compact dwellings with direct benefits in energy conservation and land and resource efficiency. Energy efficiency and emissions assessment criteria (such as NatHERS) based upon projected energy use per sq.m should be replaced by strategies to limit “whole of lifestyle” resource efficiency.

Housing Designs. The vast majority of contemporary sub-urban house designs are fundamentally unsuited to the climatic environment of Australia. Cellular internalised European housing models ignore potentials for inside-outside living and natural cross-ventilation. Building envelope designs largely ignore optimisation of orientation and solar control to admit welcome winter sun and exclude unwanted summer sun. Traditional features of early Australian houses have been abandoned, such as verandas, eaves overhangs, canopies, pergolas and lattice shading screens. Designs, therefore, fail to be “bioclimatic” – naturally responsive to local climate - and depend on energy and resource consumption to make them habitable – warm in winter and cool in summer. Strategies need to be introduced to promote and reward “bioclimatic” house design.

Housing Construction. Masonry veneer construction, with thermal mass exposed to unwanted solar heat gain, and dark roofs, with no or inadequate natural ventilation, ignore key design strategies for thermal comfort and resource efficiency. The few environmental benefits of current popular housing construction practices are the use of concrete slab on ground construction, which delivers useful internal thermal mass, and adoption of improved wall and roof insulation standards. The latter is possibly due to the potential of achieving an acceptable “star rating” (under the NatHERS criteria) for otherwise unsuitable houses by introducing higher levels of insulation. Again, energy dependent solutions are required to achieve comfortable living conditions. Strategies need to be introduced to promote appropriate construction modes related to local climatic conditions.

Heating and Cooling. Good dwelling designs and appropriate construction techniques can achieve higher user comfort with reduced energy demand. The energy consumption attributable to building envelope design – or the inadequacies thereof – is frequently quoted as only a small proportion of total energy use in the home. Studies based on old data indicate that approximately 14 - 18% of domestic greenhouse emissions can be attributed to space heating and cooling (depending on fuel). An unquantified upward trend is predicted by large-scale introduction of domestic air-conditioning over the last decade. The latter may also exacerbate energy demand through users adoption of artificial heating and cooling, even at times when external conditions would otherwise make natural systems acceptable. Some predictions suggest that energy consumption associated with space heating and cooling could rise to 40% of residential demand. The effort and expense being devoted to regulating housing envelope design (NatHERS etc.), with a view to achieving reductions in energy consumption, needs to be viewed in a total context and balanced against other

priorities and strategies. There is a need for technical examination of low energy alternatives for air conditioning heating and cooling.

Hot Water. The single biggest energy demand from a residence is for water heating, associated greenhouse emissions accounting for between 24 - 39% (depending on fuel). This is an area for priority attention. Every house should be availing of “free” solar water heating, given the abundance of sunshine available. Excessive hot water consumption exacerbates the energy demand for water heating – particularly “long shower abandon”. Strategies should be introduced to promote the use of solar water heaters, and to integrate these into the building design, and to limit hot water consumption through water efficient equipment and – a simple device – on/off shower-head cocks to switch off shower water when “soaping up”. Use of ‘green power’, off-peak and gas back-up options should be promoted for water heating systems.

Refrigeration. Accounting for between 13 - 20% of greenhouse emissions and associated energy demand in the residential sector, this is another high priority for attention. This is more difficult to resolve as there is no obvious solution such as access to solar energy. Strategies need to be put in place to get low efficiency refrigerators out of use and off the market and to promote the replacement and use of high efficiency products. The ‘star’ system is already in place to facilitate change. There may be opportunity to innovate in the location of refrigerators in homes to minimise cooling loads.

Lighting. Although lighting accounts for a small proportion of energy use in dwellings at around 10%, significant savings can readily be achieved by introduction of compact florescent globes using one-tenth of the energy of conventional globes. These are now readily available in ‘warm white’ colour renderings. Strategies need to be considered to achieve widespread adoption of energy efficient lighting. Most energy efficient globes appear to be imported with negative embodied energy and balance of payments implications – can these be made in Australia?

Other Appliances. Seen as difficult to influence, the use of other equipment and appliances in dwellings accounts for around 25% of residential energy demand. Incentives need to be put in place to encourage users to choose energy efficient equipment and to reduce energy consumption in their application.

Swimming Pools. It appears that the increased population of domestic swimming pools is resulting in significant energy use. Incentives need to be introduced to reduce this.

On-site Water. Indirect energy demand associated with delivery of reticulated water is possibly less important than issues to do with water shortage in general. Efficient use of water, encouragement of on-site water harvesting and storage, water recycling and minimisation of waste water and run-off are all strategies

associated with integrated sustainable living that need to be promoted as a total concept.

Fuel Choices. It appears that natural gas has a lesser environmental impact than electricity sourced from fossil fuels. Thus, if this is correct in environmental accounting terms, strategies should be put in place to encourage the use of gas as a preference over fossil fuel electricity.

On-site Energy. Photovoltaic panels and wind turbines are the most likely options, but current costs and urban or suburban physical conditions appear to limit the potential application of these. Incentives to promote their use should be explored including getting their capital cost down, installation grants and negative premium buy back from the grid. The 'Green Power' option making grid access to energy produced from renewable sources appears a more effective immediate option.

The Market. Only 1.5% of housing in Australia is publicly funded leaving 98.5% to 'the market' that is driven by private property developers whose objectives are primarily short-term financial profit without immediate regard to long-term energy use or social and environmental sustainability. This characteristic fundamentally impedes innovation and discourages necessary risk taking associated with change. If the public and the market do not demand energy efficiency and positive environmental features, then a necessary recourse is to introduce legislation to influence the market – negative and positive incentives.

Negative Incentives. Sticks - basically "regulation" of the free market to eliminate worst practice. Apart from areas of the industry that have been regulated for many years such as structural, fire safety and health aspects, recent initiatives to address energy efficiency appear to have little or no impact on the soaring energy demands of the residential sector. A doubtful 'industry' has been created around the application of energy rating regulation through systems such as NatHERS that appears to have (a) failed to deliver noticeable improvement in residential design for energy efficiency and (b) is addressing only one part of a much larger problem.

Positive Incentives. Carrots - basically financial incentives to improve practice by developers and consumers, these are difficult to conceive and apply and expensive to administrate. Examples are grants for installation of improved insulation, solar water heaters, etc. and the innovative 'green power' option introduced by SEDA.

Retrofitting. As what exists, exists – the vast majority of the housing stock will be what has already been built and larger gains are to be achieved by improving the energy performance of existing dwellings, than by improving the design and performance of new dwellings. In this regard the owners or occupants of the

existing housing stock have to be targeted to effect change and this cannot be achieved through regulation.

True Cost. Many environmental commentators from around the world have called for consumers to 'pay the true cost' for the use of resources – roll out a carbon tax! This means paying for the full environmental cost of energy –

> "….. most of the development in Australia over the 20th century took place in an era when energy - like oxygen, water and soil organic matter – was treated as a virtually free resource from the biosphere where only the costs of exploration and extraction were paid."
> (Foran and Foldy, CSIRO, 2002)

Obvious or Impossible? If only one could triple the $ price of electricity sourced from fossil fuels, calculate municipal $ rates on the greenhouse gas emissions per capita of a dwelling, link car $ registration to annual fuel consumption. If only one could give out free solar water heaters and free compact florescent globes (made in Australia). Political expediency appears to be the impossible obstacle to such necessary innovation – and that is understandable. No government could ever get re-elected by introduction of such draconian measures. The challenge is to find a palatable sugar to go on this essential bitter pill.

AND

Architects. If only every home were designed by a qualified architect! Less than 10% of dwellings constructed each year in Australia are designed by properly qualified architects. The vast majority of dwellings are designed by para-professionals or drafters employed by builders. The professional training of architects, over at least 7 years of university education and associated practical experience, imbues professional architects with a comprehensive understanding of "bioclimatic" design. A deeper involvement of design professionals in the housing sector will deliver positive results in every aspect of this multi-faceted challenge. Such a strategy is already showing positive results in the Sydney multiple dwelling apartment sector, demonstrated by the very high standard of apartment entries in the 2003 RAIA NSW State Architecture Awards, where entries combined aesthetic innovation and environmental responsiveness.

References

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Bio Note

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