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Prime Ministers Taskforce on Energy Efficiencies Issues Paper: Response from the Tropical Green Building Network.

The Network's charter is to identify, develop and action projects that will have a measurable impact on the uptake of sustainable building practices in Far North Queensland. To achieve this, builders, construction service professionals, building material manufacturers, retailers, government representatives, industry and community associations and other interested stakeholders are invited to work together. Network members have had the opportunity of considering the Prime Ministers Taskforce on Energy Efficiencies Issues Paper. The focus of our response is energy use, in particular energy use in houses and embedding behavioural change. Our main argument is directed towards Australian Building Code regulations that are counterproductive to behavioural change in tropical housing and energy use.

Building Codes Australia has been directed by COAG to deliver 6 Star energy performance compliance in the 2010 codes. The Network in principal supports the move to increase the star rating but does not support the use of the Thermal Performance Simulation Software delivering the star ratings until such time as the software is indiscriminate in the rating that it provides for naturally ventilated tropical design.

Passive building design methods that reduces the reliance of costly energy consuming mechanical ventilation has environmental benefits. Building design that harnesses the benefits of natural ventilation using modern building systems and technologies in the tropics is an exportable expertise and requires the support of the Australian Government.

Good tropical design that relies on large openings, cross ventilation, fans, building membranes that breathe and have low thermal mass does not need air-conditioning to achieve occupant comfort. This design type is not rewarded with higher star ratings and the impact of this may be the demise of vernacular architectural design in regional Australia, in particular the tropics that features naturally ventilated buildings.

It is reported that across Australia where a climate and design allows the successful reliance on natural ventilation and passive design to cool buildings, the star rating produces a bias against, and not in favour of, a building that is designed to consume less energy. Generally it is reported that the software works well in parts of Australia that has mechanical heating loads and also a combination of heating and cooling loads although the downfall is in areas where the software deals primarily with cooling loads (i.e. assumes the use of air-conditioning).

The Thermal Performance Simulation Software also known as BERSPro produces a rating of 1 to 10, the higher the star the more energy efficient. When in regulatory or star rating mode, the software assumes the use of mechanical heating and cooling to produce a star rating. Where a building design has solutions so that mechanical heating and cooling are not required, the software star rating will not take this into account and assumes an energy use. The software can be used in a 'free run' or non-regulatory mode to model no mechanical ventilation although the outcome cannot be used to produce a star rating and meet regulatory requirements.

The deficiencies and limits in the Thermal Performance Simulation Software cause discrimination on a number of levels. The discrimination adversely affects the primary outcome to reduce energy use in buildings in parts of Australia including Tropical North Queensland.

Public perception is distorted where a building that relies on mechanical heating and cooling can achieve a higher star rating than a building that does not. Ramifications include designers and builders seeking a high star rating perpetuating design that relies on mechanical ventilation to maintain occupant comfort. Solutions that include adding further insulation and including 'green' glass may increase the star rating although a house that is not air-conditioned does not need additional bulk insulation that also traps any heat in a tropical building. This solution adds costs of building materials and maintenance as trapped heat causes mould and damp in a highly humid climate.

The 'peer review' process that may be a forced path for compliance will incur costs, time and risk to the building process. The applications of credits through State regulation such as the credit in Queensland (Queensland Development Codes - of half a star and a full star for outdoor living areas that have a ceiling fan does not duly compensate the discrimination.

The Tropical Green Building Network considers that the limits of the software in the regulatory star rating mode produces deficiencies and requires ongoing research and development regarding how the software rates buildings in the tropics.

The Importance of Air Movement and Ventilation

In 'Factors affecting internal air movement of an Evaluation of AccuRate simulations of various design strategies to improve house thermal performance in Darwin and Alice Springs', prepared by Tony Isaacs Consulting Pty Ltd for the Northern Territory Department of Planning and Infrastructure it is explained that air movement allows people to tolerate higher temperatures and humidity's without discomfort. Houses which promote better air movement through windows and other openings will be able to reduce

the amount of time where air conditioning is needed to provide comfort. In addition, ceiling fan simulation is available in the AccuRate and BERSPro software that can be used to artificially provide air movement and so make conditions comfortable at higher temperatures. The way in which AccuRate and BERSPro models this air movement is based on research undertaken by Dr. Steven Szokolay, one of Australia's leading experts in the thermal performance of tropical housing. This comfort effect due to air movement is allowed for in the calculation of comfort in AccuRate and BERSPro and it affects the way it activates air conditioning. If AccuRate and BERSPro was correctly predicting internal wind speed this comfort effect should substantially reduce cooling loads (the use of airconditioning) in well ventilated houses.

We understand that an area of improvement in the software is the data that may be included on Wind speed and air movement as a factor for increasing comfort. As the software has limits in this area, the simulation of naturally ventilated and passive design is also limited and producing deficiencies and discriminations. Professor Richard Aynsley has also developed data in this area and the uptake of the data in AccuRate and BERSPro may alleviate the limits.

The 2010 Australian Building Codes Energy Efficiency Performance Criteria is counterproductive to behavioural change and embeds the use of airconditioning in tropical buildings

Thermal Performance Simulation Software based compliance

The Cost Benefit Analysis studies presented by The Centre for International Economics as part of the BCA Consultation Regulation Impact Statement reports a survey of HIA members where a Brisbane study of new residential construction found 60 per cent of new residential constructions opting for simulation compliance. The Tropical Green Building Network has many members in North Queensland reporting that they do not use the star rating software for naturally ventilated architecture due to its shortcomings. Using the 'deemed to satisfy' prescriptive method for building certification purposes includes using additional insulation under the roof and above ceilings catering for air-conditioned buildings only.

Distorted Public Perception that embeds bad air-conditioning practices

Star ratings are an indicator that allows a consumer to compare one house against another. Public perception is distorted where a building that relies on mechanical heating and cooling can achieve a higher star rating than a building that does not. The advertising and marketing of new homes is including promotion of the star rating supplied by the thermal performance simulation software and public awareness of the rating is increasing. Building values are potentially supported by the star rating and where the star rating discriminates due to the inherent shortcomings of the software, building values can be also adversely affected. This may represent an area of potential litigation unless the use of star ratings in marketing material is cautioned appropriately.

Designers and builders perpetuating design that relies on mechanical ventilation to maintain occupant comfort in a bid to achieve a high star rating is counterproductive to the behaviour change that the government is seeking.

With the introduction of mandatory disclosure including greater public awareness on the horizon, the inherent deficiencies of thermal performance simulation software will be more critical in parts of Australia where the software discriminates against building design that does not rely on mechanical ventilation.

The deleterious effects of using insulation products that have high 'up' or 'winter' R values in tropical housing

Members of the Tropical Green Building Network have discussed the moisture trapping effects of building materials and systems in highly humid climates and wrapping building envelopes in insulation products potentially causes rotting and mould increasing chances of structural inadequacy, maintenance costs and shortening the life of a building. In regard to the life term of a building, the building industry and insurers may also regard the enforcement of this building regulation in the tropics as litigious particularly in relation to cyclonic winds areas.

The impacts of the Building Code regulations includes embedding a practice of insulation that traps hot humid air and this is counterproductive to energy efficiency measures.

The 2010 Building Codes is to regulate the location of insulation where 50% of insulation is required to be located above a ceiling of a pitched roof to cater for air-leaks in roofs. This has been considered and is not supported by the Tropical Green Building Network.

We refer to a letter attached by Professor Dick Aynsley that addresses the importance of restricting daytime heat gains without restricting night time heat losses and that condensation is a serious issue that is caused by the use of bulk insulation products in warm humid climates. Professor Aynsley recognises the importance of thermal reflective insulation in warm coastal regions of Australia. Where thermal reflective insulation product may be successfully applied to meet 'R' value requirements at roof level, there should be no further requirement to locate insulation above the ceiling. The placement of insulation at a ceiling level is counter productive in buildings that do not rely on mechanical cooling and by enforcing ceiling insulation at this location the proposed regulation is discriminating against naturally ventilated passively designed buildings in tropical Australia.

It is recommended that their should be no proposed regulation to locate 50% of insulation above a ceiling for a pitched roof and this recommendation may apply to climate Zones 1 and 2.

The Issue of Credits through State Regulation

The applications of credits through State regulation such as the credit in Queensland of half a star and a full star for outdoor living areas that have a ceiling fan does not duly compensate the discrimination. The credits are a short term fix to help passive design achieve building approval. Poor design causing inefficient energy use can also benefit from the credits. The software's purpose of delivering a means for energy performance ratings is eroded by credit giving.

The Tropical Green Building Network recognises that the Queensland State Government and Building Codes Queensland may adopt credits through the

Queensland Development Code and the Network may support credits while Building Codes Australia and associated government departments are clearly actioning and pursuing improvements addressing the deficiency and limits of the Thermal Performance Simulation Software. The use of credits to offset the deficiencies in the Software should be a short term measure only and ceased as soon as practical.

Peer review

Where buildings do not achieve a star rating that complies with the energy performance regulations in Queensland, an alternative assessment pathway to achieve compliance can be the 'expert judgement' or 'peer review' process. The assessment is conducted by a specialist (the expert) in building design and energy efficiency. It is preferred that applicants have already used the star rating process or deemed to satisfy provisions and failed to achieve compliance. Experts will provide applicants with a completed peer review assessment report used to gain building approval.
Applicants can choose to apply to one of eight experts in Queensland. The application must include a description of the building and its energy efficient design features, the method of assessment used including all qualifying relevant factors eg. Comparative references and a justification of how the building's design features will perform in compliance with the minimum energy efficiency performance requirements under the BCA.

The fee for the assessment is set by the expert and agreed with the applicant. The expert has 20 business days where no variations are required to provide the assessment. Should the expert require design amendments further fees are paid for re-assessment of amendments and there are no known time limits for the review. The applicant must communicate to their clients any amendments to the design that cause cost changes and changes to the appearance of the building.

There appears to be no published criterion or terms of reference other than promise of an explanation when the process is completed; the result could be a pass or fail. Criterion alluded to are not available for consideration in the normal software based assessment, or available for critique or consideration prior to the 'Peer Review' process. The designer is further affected by loss of access to their preferred assessors, including the loss of control regarding intellectual property distribution.

The peer review process may incur costs, time, risk, uncertainty and inconsistency to the process of building to reduce dependence on mechanical temperature control.

The Tropical Green Building Network may only support the 'Peer Review' process after the deficiencies and limitations of the Thermal Performance Simulation Software that cause discrimination and penalties to naturally ventilated and passive design are removed.

Climate Zone Anomalies

Climate Zone anomalies are causing issues with the star rating performance of buildings on the Atherton Tablelands in North Queensland and this requires

rectification. There are other parts of Australia that would also benefit from the software having additional climate files. The AccuRate and BERS Pro software requires a change to the protocol that increases the number of climate files from 69 to 80. Currently the software protocol changes are lagging behind government driven policy changes.

The Tropical Green Building Network recommends that the deficiency in the Thermal Performance Simulation Software caused by the need for additional climate files be rectified.

The dichotomy of the counterproductive building and development codes explored:

The following passage is an extract from a leaflet 'Minimum energy rating for air conditioners. New sustainable housing laws' produced recently by Building Codes Queensland, Department of Infrastructure and Planning.

Queenslanders are increasingly installing air conditioners into their homes, with around 70 per cent of households now having at least one air conditioner. Air conditioning is contributing to increased average household energy consumption and greenhouse gas emissions, particularly when less energy efficient models are installed and used. The increasing use of air conditioners also places additional demands on community-owned electricity infrastructure which contributes to peak demand. Extreme peak demand occurs on very hot days when most households are running air conditioning at the same time.

The economic costs in terms of energy consumption of air-conditioning in tropical Australia may be measured against the benefit of committing resources to providing Thermal Performance Simulation Software that supports passive design that reduces reliance on air-conditioning in the tropics.

Building Codes that regulate the energy performance of buildings in Northern Australia are of paramount importance. As the population of the region continues to grow, the built environment will support communities that are living in part of Australia's most environmentally diverse and ecologically important regions. New technology in building materials, building systems and passive design that limits the use of energy consuming mechanical ventilation and other impediments to sustainable building that also preserves and enhances vernacular architecture in this region requires the support of Building Codes Australia to meet the COAG principles of reducing energy use.

The Tropical Green Building Network supports initiatives to develop sustainable building practises that also provide economic advantages. Effort has been put into developing tropical expertise with the view of exporting expertise to other tropical developing countries that are embracing sustainable building practices. Developing the software to provide more sensitive ratings for tropical building styles may contribute towards Australian industry earnings from this area.

The 'Star Rating' industry monopoly in Queensland

Recently, the Tropical Green Building Network members recently took part in a forum held by the Queensland State Department of Infrastructure and Planning. It was

confirmed that the industry is dis-satisfied with the BERSPro performance shortcomings as recorded in the 'key outcomes' document provided by the department after the event. The BERSPro software developer and supplier in Queensland 'Solarlogic' was present at the Forum. We understand that they hold a monopoly on the software supply and use in Queensland and there is no alternative. In addition, it was cited that the CSIRO NatHERS software that BERSPro is 'driven by' is the limiting factor and changes to NatHERS is essential to improve the simulation of the thermal energy performance of buildings. We understand that lack of investment into the software development by the CSIRO is the barrier.

Recommendations

- The Tropical Green Building Network considers that the limits of the software in the BERSPro regulatory star rating mode produces deficiencies and BERSPro and NatHers software requires immediate and ongoing research and development regarding how the software rates buildings in the tropics.

- It is considered imperative that the software is indiscriminate before it is the sole 'deemed to satisfy' provision for building code compliance.

- In relation to distorted public perception, The Tropical Green Building Network requests that the shortcomings of the BERSPro software are clearly disclosed to the public at large and that the responsibility of the disclosure lies with the government as they enforce the regulation.

- It is recommended that the requirement under the 'deemed to satisfy' provisions in the Australian Building Codes to locate 50% of insulation above a ceiling for a pitched roof be abandoned in climate Zones 1 and 2. Furthermore, the building codes should recognise the insulation products that are radiant heat barriers in climate zones 1 and 2 and the work they perform. Where thermal reflective insulation that is a radiant heat barrier is installed under roof sheeting the need to provide additional 'up' or 'winter' R values for buildings in these climate zones should be abandoned if the design documentation of the house also records that the house achieves passive design principles that rely on natural ventilation.

- The Tropical Green Building Network recommends that the deficiency in the Thermal Performance Simulation Software caused by the need for additional climate files be rectified.

- The Tropical Green Building Network recognises that the Queensland State Government and Building Codes Queensland may adopt credits and the use of credits to offset the deficiencies in the Software should be a short term measure only and ceased as soon as practical.

- The 'Peer Review' process in Queensland should not be supported until after the deficiencies and limitations of the Thermal Performance Simulation

Software that cause discrimination and penalties to naturally ventilated and passive design are removed.

Conclusion

In a drive to bring about a nationally consistent minimum standard for the energy performance of buildings to allow comparative star rating indicators, thermal performance simulation software that is destined to provide the consistency has limits in the regulation mode. The inherent deficiencies are discriminating against passive design, the very design type that it should be supporting. Resource allocation and action to improve the Thermal Performance Simulation Software is an imperative.

Regulation that enforces the ‘wrapping’ of buildings in membranes and materials that restricts natural air-flow in tropical Australia should be abandoned. Where a building has been designed for natural air-flow, regulation should support this design and not erode the intent of the design.

Enforced practices that erode the intent of passive design reducing energy use are counterproductive and do not bring about the positive behavioural change in tropical housing energy use.