Stakeholder Feedback Report for Green Star – Multi Unit Residential

Outcomes of PILOT Process Feedback

The Green Star – Multi Unit Residential PILOT rating tool was developed by the Green Building Council of Australia (GBCA), in conjunction with its Technical Working Group (TWG) to facilitate environmental assessment of multi unit residential buildings. The tool development process includes a PILOT period which allows for public review and comment.

The GBCA ensures that the public review period is transparent through a formal Stakeholder Feedback process; this can be viewed at www.gbca.org.au. The process includes publishing this Stakeholder Feedback Report. This document provides a summary of all feedback received in writing from stakeholders and PILOT projects. The GBCA's response is detailed for each item of feedback. As part of the process, any comments received after the public review period has closed are considered for further improvement of future versions of the Green Star rating tool.

The feedback has been organised according to the Green Star categories. The submitted feedback is provided in *italics*, followed by a number in brackets that identifies each submitter; this code is for the GBCA and submitter's own reference only. This is followed by the GBCA response to the feedback in the following format:
It was suggested that…. (1)
GBCA Response: Agreed, the…

Management

General

It was suggested that a smart user guide should be awarded in the rating tool (13).
GBCA Response: Agreed, this initiative is encouraged in Man-5 'Building Users' Guide'.

It was suggested that a credit for providing individual bills to tenants to encourage energy saving should be included (13).
GBCA Response: It is agreed, that individual billing can lead to reduced energy and water consumption. The installation of the equipment necessary to individually bill tenants is awarded in the Metering credit.

Man-1 'Green Star Accredited Professional'

No feedback was received on this credit.

Man-2 'Commissioning Clauses'

It was suggested that this is an easy 2 points for projects such as this that do not have A/C or complex electrical and hydraulic systems (10).
GBCA Response: The purpose of commissioning is to ensure that systems function according to their intended design. It is agreed that buildings designed with simple systems are easier to commission; it is however important that such buildings function as intended, hence commissioning is still relevant and important. This credit will still be applicable to all buildings.

It was suggested that depending on the size and complexity of the project, the use of Green Star - Office v3 benchmarks as a basis for residential developments which generally do not have central mechanical services and/or BMS services would appear to be onerous and that depending on the size and complexity of the project, the contract documents should indicate that a detailed commissioning report and test results are provided for each system installed, which would be available to the actual unit owner on completion of the sale. This could also be used to indicate regular maintenance schedules and trouble shooting advice (4)

GBCA Response: Commissioning is relevant and important for all buildings, including those with simple design and without much equipment. However when the building design is simple the commissioning process will be less onerous by virtue of not needing to commission as many items. This credit will still be applicable to all buildings. Documenting and providing maintenance schedule and other user guidance is awarded in the credit Man-5 'Building Users' Guide'.

Man-3 'Building Tuning'
No feedback was received on this credit.

Man-4 'Independent Commissioning Agent'
It was suggested that for projects with no A/C or complex electrical and hydraulic systems, applicants would be unlikely to pursue Man-3 and Man-4. However they more than likely would have received the 2 points for Man-2 so for the 4 points available, they get 2 which is a reasonable outcome, given their simpler systems create less risk of poor performance (10).
GBCA Response: Agreed, the allocation of points and the commissioning requirements for less complex building designs will be similar for Green Star – Multi Unit Residential v1 as they were for the pilot version of the tool.

It was suggested that the commissioning agent should not be required at schematic design in order to get this point (11).
GBCA Response: The design advice from an independent commissioning agent is important to ensure that the building design allows for effective commissioning and tuning once the building is constructed. The requirement for the independent commissioning agent's design advice is still included in the credit.

Man-5 'Building Users' Guide'
No feedback was received on this credit.

Man-6 'Environmental Management'
It was suggested that ISO accreditation is not held by many builders in the residential industry. Very high benchmarks are set which may make it hard for smaller projects to comply. This means that you will miss out on rating small developments, and this is the bulk of the market. In the residential field, with smaller scale building, there are lots of builders who don't have the accreditation for ISO, but still have expertise to do an EMP, and there should be an allowance for that (13).
GBCA Response: Agreed, Please refer to the Green Star – Multi Unit Residential v1 Technical Manual for acceptable alternatives to ISO1400 accreditation.

It was suggested that including provisions in the tender documents that the main contractor must have ISO14000 accreditation should suffice as evidence when the main contract has not been awarded (1).
GBCA Response: Agreed, the documentation guidelines allow tender documentation as evidence.

Man-7 'Waste Management'
No feedback was received on this credit.

Man-8 'Waste Management – Operations Plan'
Not applicable to this tool.

Man-9 'Building Management System'
Not applicable to this tool.

Man-10 'Learning Resource'
Not applicable to this tool.

Man-11 'Maintainability'

Not applicable to this tool.

Man-12 'Construction Indoor Air Quality Plan'
Not applicable to this tool.

Man-13 'Medical Equipment Efficiency'
Not applicable to this tool.

Man-14 'Operations Environmental Management'
Not applicable to this tool.

Man-15 'Precinct Environmental Management'
Not applicable to this tool.

Man-16 'Smart Metering'
It was suggested that this credit is impossible to achieve - not commercially available and no suppliers are willing to enter into R&D at this stage (11) (13).
GBCA Response: The benchmarks in Green Star are set to challenge the design teams to create innovative design solutions and to specify environmentally preferable products and materials. The idea is that through this credit a market demand for products and materials with improved environmental performance is created, new products are developed, the cost of these products decreases, and these products become more readily available.

The Green Star rating system has already influenced various product markets. One example is the credit for Volatile Organic Compounds (VOCs) in the Indoor Environmental Quality category that requires any paint to have low-VOC content. Only white low-VOC paint was available when Green Star was first released, but now low-VOC paint is available in a wide range of colours and from a variety of domestic and international suppliers.

It was suggested that anything which is documentation based or web based is not as useful to the tenant as it does not offer the instantaneous relationship to the event which is using the power. Smart metering offers this: when turning on a stove, the tenant can see power use going up (13).
GBCA Response: Agreed, the system must still provide instant feedback for the credit to be achieved.

It was suggested that it would be advantageous to have separate points for monitoring water and gas/electricity etc, as the systems that monitor all at the same time are currently unavailable (13).
It was suggested that it is possible to get individual meters, but not integrated. Electricity is definitely available, but the team has not seen one for gas or water. Changing the credit to offer 1 point for each, gas and water, would be helpful (13).
GBCA Response: The credit has been changed to award one point where smart metering is provided for water, electricity or gas and two points where smart metering is provided for water, electricity and gas.

It was suggested that Smart Metering to the level required by the tool is not economically viable for building owners to provide. Instead the level could be reduced to allow the use of units like the Wattbug or a similar simple system which indicates power usage with a smiley or unhappy face! (4)
GBCA Response: A function that reports current consumption and trends in relevant units is important for the usability and the potential reduction of energy and water consumption due to the smart metering system. The credit criteria will not be changed and since the suggested system does not have this function, it does not meet the credit criteria.

It was suggested that sub-metering and smart metering should be combined in one credit. Smart metering could be an additional point to sub metering. Water should be kept separate (13).

GBCA Response: The Water Meter, Energy Sub-metering and the Smart-metering credits have been combined into one credit Man-16 'Metering'. The points available are independent of each other.

It was suggested that there is value in awarding for sub-metering as well as smart metering, as each have separate purpose (13).
GBCA Response: Sub-metering and smart-metering are still awarded separately.

Indoor Environment Quality

IEQ-1 'Ventilation Rates'
Please note that the name of this credit has been changed to IEQ-21 'Dwelling Ventilation'.

It was suggested that 'effectively naturally ventilated' should be defined in the Technical Manual (9).
It was suggested that the Technical Manual will need to define 'natural ventilation' and 'distance from windows'. A kitchen any more than 2m from a window should not comply as a naturally ventilated kitchen (10).
GBCA Response: Kitchens must be exhausted by a separated and dedicated exhaust riser. Naturally ventilatied kitchens are not compliant for purposes of this credit.

It was suggested that the point being awarded for naturally ventilated kitchens is appropriate as natural ventilation provides an improved ventilation rate to the mechanical option. Therefore it should be awarded equally (but not more as natural ventilation gets additional points elsewhere) (11).
GBCA Response: Naturally ventilated kitchens do not remove odour, smoke and pollutants as efficiently as a separate exhaust riser. Naturally ventilatied kitchens are not compliant for purposes of this credit.

It was suggested that the required documentation should be changed from specification clauses to certification from Mechanical Consultant or owner that no air conditioning is to be installed (10).
GBCA Response: The credit has changed so that the same credit criteria applies to naturally ventilated and air-conditioned spaces, hence no need to demonstrate whether a building is naturally ventilated or not.

IEQ-2 'Air Change Effectiveness'
Please note that the name of this credit has been changed to IEQ-22 'Natural Ventilation'.

It was suggested that the front door should not be considered a ventilation opening when determining dual aspect (10).
GBCA Response: Agreed, the credit has been amended accordingly.

It was suggested that cross ventilation/dual aspect needs to be defined very clearly in the Technical Manual (10).
GBCA Response: Agreed, this has been defined in the Technical Manual.

It was suggested that dual aspect should be required to allow for effective natural ventilation (11).
GBCA Response: Agreed, this credit is awarding designs that incorporate dual aspect design as it provides effective natural ventilation.

IEQ-3 'CO_2 Monitoring and Control and VOC Monitoring'
Not Applicable to this tool.

IEQ-4 'Daylight'
It was suggested that Daylight factor is generally not calculated in residential buildings and 2.5% seems very high for residential purposes (12).
GBCA Response: The daylight factor has been reduced to 2% in Kitchen and 1.5% in the other living areas at floor level.
Daylight calculations are beneficial to the building design from a daylight access point of view. Typical dwellings can be used for the calculations.

It was suggested that Bathroom (and maybe laundry too) should be excluded or at least have a different requirement compared to other areas. Bathrooms are not living areas and therefore not much time is spent there so it is not that relevant to achieve good daylight level for bathrooms. Excluding bathrooms from the modelling increased the average by approx.10% in one of the projects we are currently working on (9).
GBCA Response: Agreed, the 90% and 60% criteria in the credit allows for bathrooms and laundries to be excluded.

IEQ-5 'Thermal Comfort'
It was suggested that there is no clear optimum to achieve as physiological effects are different from person to person (12).
GBCA Response: Agreed, a requirement for ceiling fans has been introduced to provide increased individual control of the thermal comfort.

It was suggested that the criteria should be based on the relationship between time it takes to adjust (i.e. no sudden spikes in temperature), if allow thermal lag in building material, how long does it take for a body to adjust in a given environment? No point setting a particular thermal band (12).
GBCA Response: Agreed, the requirements for low cooling and heating loads ensure that no sudden peaks in temperature will occur.

It was suggested that fans are good because allows control over thermal comfort (12).
GBCA Response: Agreed, a requirement for ceiling fans has been included in the credit.

It was suggested that NatHERS criteria are not suitable as those benchmarks are set based on political reasoning rather than thermal comfort (12).
GBCA Response: The NatHERS rating system is a well established, system that most if not all buildings must be assessed against. Using this system in the Green Star rating tool provides a simple and useful route to demonstrate compliance with Green Star. The heating and cooling loads in the credit were established by the Technical Working Group. No other suggestions or alternatives to these values have been presented to the GBCA.

It was suggested that the criteria should incorporate humidity (12).
GBCA Response: Humidity is an important aspect of comfort, however no feasible building attribute based solution for humidity control with multi unit residential application has been presented to the GBCA.

It was suggested that the word "less than" should be added to the credit criteria, i.e. "less than 86MJ/m^2"(10).
GBCA Response: Agreed, this has been amended accordingly.

It was suggested that embedded controls e.g. thermal capacity in the floor/other ways of using the environment as part of the thermal comfort solution should be awarded (13).
GBCA Response: The cooling and heating load requirements that are in the credit criteria can be achieved by designing buildings with good thermal capacity in its building elements.

It was suggested that thermal comfort is dependent on ambient temperatures, radiant heat and air flow, the current credit does not address these appropriately (13).
GBCA Response: Radiant heat and air flow are directly addressed by the credit criteria. Comfortable ambient temperature can be achieved by using these two initiatives in combination.

It was suggested that there could be a mechanism to ask occupants themselves to rate over the previous 12 months (13).
GBCA Response: This could have been a possible solution for a rating tool for occupied existing buildings. This rating tool assesses building designs and newly completed or refurbished buildings. It is unlikely that the buildings are occupied before they are assessed, hence there are most likely no occupants to survey.

It was suggested that the credit doesn't actually address thermal comfort – does the credit belong in the energy category? (13)
GBCA Response: Thermal performance of a building is beneficial from an energy consumption aspect as well as from a thermal comfort aspect.

It was suggested that having a band of temperatures would capture different climate zones (13).
GBCA Response: The credit specifies a limit for heating loads as well as cooling, hence addressing thermal comfort relevant to different climate zones.

It was suggested that the credit could be reworded so that not all need to meet the thermal comfort, e.g. 90% might be more achievable (13).
GBCA Response: The credit criteria has been changed to require 95% of all apartments to comply with the thermal comfort criteria rather than requiring all apartments to comply.

It was suggested that this is a measure of thermal comfort. The heating and cooling loads tell you how much energy is required to make the space thermally comfortable. The lower these values are the more thermally comfortable the dwelling is and the less it relies on artificial heating and cooling (11).
GBCA Response: Agreed, the heating and cooling loads will be used in combination with ceiling fans as a way to provide a thermally comfortable dwelling in Green Star – Multi Unit Residential v1.

IEQ-6 'Hazardous Materials'
No feedback was received on this credit.

IEQ-7 'Internal Noise Levels'
It was suggested that internal noise levels for building services based on recommended satisfactory design noise levels in AS2107-2000 are:
1. too low - if building is close to major road, the majority of noise would be via the facade and therefore an overdesign of the mechanical services system.
2. the standard does not stipulate when (time periods) these should be achieved.
3. the standard is not exhaustive for every room type within an apartment.

BCA requirements - there is only one area of the BCA that the performance should be exceeded, that is, floor impact performance. The performance requirements for walls is adequate and of a high standard and does not require a performance to be greater than 10%.

Building Service Noise

Occupancy / Space	*Satisfactory Recommended Sound LevelLAeq, dB(A)*
Bedroom	*30*
Other habitable rooms including open plan kitchens	*35*
Entry/Foyers of Apartments and Hallways	*40*
Wet areas other than a kitchen with manually operating exhaust fan	*50*
Apartment Common Areas (e.g. Foyer, Lift Lobby)	*45*

BCA Requirements
Airborne Noise - Walls between apartments RW+Ctr 50
Airborne Noise - Floors between apartments RW+Ctr 50
Impact Noise - Floors between apartments Ln,w+CI 50
(6)

It was suggested that there are three major issues that relate to noise in multi unit residential apartments, these are:

Internal noise levels
Internal noise levels are a combination of noise from building services (air conditioning etc) and intrusion from sources such as road and rail traffic. Therefore the acoustic amenity of occupants is a function of services and façade design whereby the combined noise levels should not exceed appropriate noise criteria. Referencing AS2107:2000 leaves the assessment open to interpretation as there are various categories of residential buildings (such as residences near busy roads) which leaves the condition non precise. Further where facades are required to be closed to provide acceptable internal acoustic amenity there is a need to provide mechanical ventilation in accordance with the requirements of the BCA.

Airborne noise Transfer
Noise transfer between apartments is a function of the floor and wall constructions between apartments. In 2004 the BCA was revised to increase the minimum standard of isolation to Rw + Ctr of 50. This standard between apartments has generally proved satisfactory however higher standards have been adopted on quality projects.
It is recommended that Green Star adopt a standard 5 points higher, being Rw + Ctr 55. As acoustics works on a log rather than linear scale the 10% factor in the pilot is unclear and open to interpretation.

Impact Noise
Noise from footfall on hard floor surfaces above adjacent tenancies has become a more common problem with the current trends for timber and other hard floor surfaces in apartments.
Whilst the BCA now specifics a minimum impact isolation standard of LnTw+C1 of 62, this level of impact isolation is average to say the least. In the case of Green Star I would recommended that a minimum standard of at least Lntw+C1 of 55.

Recommendations
In our experience one of the major issues affecting the IEQ of residences in multi residential dwellings is noise, therefore I would recommended that three points be allocated to IEQ 6 as follows. "Up to three points are awarded as follows:
- One point is awarded where the internal noise level (combined building services noise and external noise intrusion) does not exceed LAeq(1 hour) 35 dBA in any bedroom in the building at any time between 10 pm and 7 am and LAeq(1 hour) 40 dBA anywhere else in the building (other than a garage, kitchen, bathroom or hallway) at any time.
- One point is awarded where the bounding apartment construction to habitable areas (walls, ceiling and floor over) equals or exceeds the an airborne noise isolation standard of Rw + Ctr 55;and
- One point is awarded where the floor construction above habitable rooms of adjacent tenancies (i.e floor over) equals or exceeds the an impact isolation standard of L+Cof 55 (8)
GBCA Response: This Green Star credit has been changed slightly from the pilot tool to version 1 of the tool. The changes were made influenced by the above feedback submissions. The main changes were:

- The suggested stricter level suggested for floor noise isolation was adopted;
- The suggestion to include external noise in the requirement was adopted;
- The suggestion to have the same requirements for all dwellings independent of their location (e.g. close to major roads) was adopted; and
- The reference to a10% increase on the BCA requirements has been removed.

Please review the new version of the rating tool for further details on the changes.

In addition, please note that all assumptions must be thoroughly justified in all Green Star submission.

IEQ-8 'Volatile Organic Compounds'
No feedback was received on this credit

IEQ-9 'Formaldehyde Minimisation'
No feedback was received on this credit

IEQ-10 'Mould Prevention'
Not applicable to this tool.

IEQ-11 'Daylight Glare Control'
Not applicable to this tool.

IEQ-12 'High Frequency Ballasts'
Not applicable to this tool.

IEQ-13 'Electric Lighting Levels'
No feedback was received on this credit

IEQ-14 'External Views'
It was suggested that the aim of credit in office is for eye strain, it is unclear what the aim is in this tool (13).

It was suggested that passive surveillance of public open space could be used as aim of credit (13).

It was suggested that it should be clarified what the 75% refers to. Living space? Number of apartments? If it is of apartments then how much of living space need to have the views? (13)

It was suggested that this credit should exclude areas that are not living spaces as other tools do (13).

It was suggested that an active view of 10m is more appropriate than 25m (13).

It was suggested that a quality element should be included to the criteria i.e. a short view of a park is more relevant than a long view of a carpark (13).

GBCA Response: The original aim of this credit is unclear. This credit is not included in Green Star – Multi Unit Residential v1.

IEQ-15 'Individual Thermal Comfort Control'
Not Applicable to this tool.

IEQ-16 'Exhaust Riser'
Not Applicable to this tool.

IEQ-17 'Air Distribution System'
Not applicable to this tool.

IEQ-18 'Outdoor Pollutant Source Control'
Not applicable to this tool.

IEQ-19 'Places of Respite'
Not applicable to this tool.

IEQ-20 'Private External Space'
It was suggested that the 15% size requirement is high and the solar and shading requirements are too stringent (12).

GBCA Response: The shading and solar access requirements have been reduced from 100% of the area to 80% of the area. The size requirement is considered to be adequate and is not changed for Green Star – Multi Unit Residential v1.

Energy

Ene-con Conditional Requirement

It was suggested that It seems unnecessary to provide "evidence that the software complies with the Protocol for House Energy Rating Software (Version 2006.1)" when using CSIRO's AccuRate. The GBCA should compile the short list of acceptable five star second generation software packages that are acceptable (including BERS Professional, FirstRate 5, AccuRate) and save the protocol for less common and newly released software (1).
GBCA Response: Agreed, this information has been included in the Technical Manual.

It was suggested that an average requirement for the NatHERS rating is more appropriate, e.g. generally the end units cannot perform as well as the units in between (9).

It was suggested that 7 stars NatHERS for each unit is unachievable. Should be average or perhaps 90% of units achieve 7 stars (13).

It was suggested that an average requirement works much better than a minimum, or e.g. 90% need to meet the minimum 7 stars (12).

It was suggested that 5 stars would be easily achievable; this is standard practice (13).

It was suggested that a 7 star NatHERS requirement is too high, and perhaps should be an optional set of credits (12).

It was suggested that 7 stars minimum would limit how many projects public housing could go for (13).
GBCA Response: Agreed, the conditional requirement has been reduced to a 10% improvement on the legislated requirement.

It was suggested that it is confusing to use 7 Star 'NatHERS rating' because most people think of NatHERS software straight away and achieving above 5 Star is not possible. Maybe use 'NatHERS Scheme' or '2nd generation NatHERS software' instead (9).
GBCA Response: This has been clarified throughout the rating tool.

It was suggested that the AccuRate software is new so modellers weren't familiar with it (12).
GBCA Response: AccuRate was accredited by the NatHERS scheme in May 2006. Professionals that are familiar with the software should be available.

It was suggested that CO_2 should be the main focus, need to identify what contributes to CO_2 emissions in construction, rather than thermal performance (12).
GBCA Response: Embodied energy is one of the many measurements of environmental impact that the GBCA are considering in the ongoing review of the Green Star tools. There is currently no established and agreed calculation methodology for embodied energy in Australia. The GBCA does not have the resources or the expertise to develop such methodology at present; hence the GBCA cannot yet include embodied energy in the rating tools.

It was suggested that recognition that energy can be from a sustainable source should be given, CO_2 should be the "bad guy", rather than energy use e.g. credit for renewable energy rather than focus on reducing energy use. If you don't reward renewable energy, people will not try to achieve this and might not be the best design outcome. There could be more/less points for different renewable sources. It is not necessarily essential to reward for energy generated on site, but more of an agreement to use (12).
GBCA Response: Reductions in greenhouse gas emissions are rewarded in the Ene-1 'Greenhouse Gas Emissions'. The maximum points are awarded to buildings that achieve zero net operating greenhouse gas emissions. Carbon Credits, off-sets and commitments to purchase renewable or 'green' power from an electricity supplier are an operational matter, rather than an inherent building attribute; as a result 'green' power cannot be recognised in energy modelling.

It was suggested that the Energy conditional requirement should be changing based on the climate? (12)
GBCA Response: The thermal comfort conditional requirement (in terms of MJ/m^2.annum) does vary with climate as it is based on NatHERS. The NatHERS (second generation) scheme star rating band thresholds are climate dependent, based on 69 different climate zones throughout Australia. See http://www.nathers.gov.au//.

It was suggested that there should be guidance on how calculator works – too much reliant on trial and error to find out how to achieve points (12).
GBCA Response: The Energy Calculator Guide explains how to use the energy calculator and how the benchmarks were established. This document is available on the GBCA website.

It was suggested that perhaps 7 stars NatHERS shouldn't be a conditional requirement, and provide bonus points for 7 plus stars (12).
GBCA Response: Reductions in Greenhouse gas emissions above and beyond the conditional requirement is rewarded in the Ene-1 'Greenhouse Gas Emissions'. The maximum points are awarded to buildings that achieve zero net operating greenhouse gas emissions.

It was suggested that the NatHERS requirement should be included in the tool as it is an established scheme (13).
GBCA Response: Agreed, NatHERS is included in Green Star – Multi Unit Residential v1. Additional documentation and modelling is avoided by referring to the NatHERS scheme to determine thermal performance in this Green Star tool.

It was suggested that a weighted average system would be better. Average alone is to simplistic. Perhaps the credit could have a statistical weighting tool depending on the site (area weighted average) (13).
GBCA Response: Details on how the area-weighted average must be calculated is provided in the rating tool.

It was suggested that an objective of the conditional requirement should be defined, not just star ratings eg. kg CO_2 per sqm. energy use, energy use per person. Relate back to a scientific objective (13).
GBCA Response: The objective of this credit is given in the 'Aim of Credit': To encourage and recognise designs that minimise the greenhouse gas emissions associated with operational energy consumption, and maximise potential operational energy efficiency of the base building.

It was suggested that a whole palette of sustainability features rather than just energy should be considered for conditional requirement (13).
GBCA Response: This feedback comment has been included in the GBCA's annual stakeholder feedback review that related to all the Green Star rating tools.

Ene-1 'Greenhouse Gas Emissions'

The table below outlines the feedback received during the Public Review Period, and the GBCA response explains the reasoning behind the position, and any corrective action, taken.

Feedback	GBCA Response
Doesn't include gas and electric cookers (comes up in BASIX)and should be included in energy calculator (13)	This has now been included.
Benchmarks are calculated using national average emissions, whereas actual are calculated using state specific coefficients. This significantly disadvantages Victoria and is not a correct measure of CO2 reduced (2).	The Green Star Energy Calculator does not provide adjustments in benchmarks for greenhouse gas emissions for different regions or states. The aim of the Energy category in the Green Star tools is to reduce the total greenhouse gas emissions from buildings, regardless of their location. The Green Star Energy Calculator uses greenhouse gas emission coefficients from the Australian Greenhouse Office (AGO). These coefficients for electricity and gas vary between states; the greenhouse gas benchmarks are however the same throughout the states. The electricity benchmark was calculated by finding the weighted average of the emissions for consumption of electricity generation. The weightings came from the percentage of contributions to national emissions. The gas benchmark was calculated using the natural gas combustion emission factors for small users. Small users were chosen to set the benchmark as most buildings will be classified as small gas users (<100,0000GJ per annum). The weighted average was found using percentage of contributions to national emissions. Because of the variations in the states' greenhouse gas coefficients, projects in some states will have to perform better, and engage in more climate-sensitive design, in order to achieve the Conditional Requirement and points within the Ene-1 credit.
HVAC benchmark does not vary with	The thermal performance of the

climate. We understand that the GBCA is making this common throughout all tools and to a certain degree agree with the philosophy of the decision, however I am not convinced that this drives the right environmental design outcome. For example a development in northeast Queensland with no gas supply may not be able to score any points under energy so will eliminate cooling towers to gain points in water. This will substantially increase cooling energy, however no energy points are lost and points are gained under the water category. This is probably the wrong answer for a hot climate with significant rainfall where cooling towers should be encouraged to reduce cooling energy (2).	benchmark dwellings does now vary with climate, based on a percentage improvement on BCA compliance requirements which use NatHERS star ratings. The efficiency of the heating and cooling equipment does however remain the same throughout the country.
We note that a TAS model has been used to derive the HVAC benchmark. The majority of developments will be using Accurate or similar software as required by BCA. I would have thought that one of these approved pieces of software should have been used to develop the HVAC benchmark as it may give a different result. Has a comparison been completed to ensure comparability and avoid the chosen software introducing a bias (2).	The benchmark has been redefined as described in the Green Star Greenhouse Gas Emissions Calculator Guide. The benchmark does not rely on TAS modelling.
HVAC benchmark is based on a high performing dwelling in Darwin. The COP for the DX system assumed is 4.3 which seems extremely high for this climate. There are also no air volume assumptions given (2).	The benchmark HVAC system now has an Energy Efficiency Ratio (EER) of 3.2 and Coefficient of Performance (COP) of 3.5.
Lighting benchmark for dwellings appears very low. The benchmark dwelling is 120m^2 including 60m^2 of living and two 30m^2 bedrooms. The lighting loads given in the operational profiles suggest 5W/m^2 is the benchmark for living areas and 3.3W/m^2 for bedrooms. We believe the most energy efficient design may achieve 6W/m^2 on average throughout a dwelling (2).	The lighting benchmark has been revised to be at the same level as what is required in Section J of the BCA.
Many benchmarks are generated by simply using the motor sizes for equipment. We note that power consumed will be different to the motor size. For larger motors it will be less for small motors it will be more (2).	The lift benchmark methodology has been significantly improved to include stand-by energy, and is now based on Draft ISO standard ISO/DIS 25745-1: Energy performance of lifts and escalators - Part 1: Energy measurement and conformance.

The benchmark for the Domestic Hot Water is based on an instantaneous gas system. The benchmark does not seem to take into account the efficiency of the gas burner. We also note that gas storage is more likely for high-rise multi-unit (2).	The new benchmark is now an 80% efficient gas storage system, with a declared heat loss of 6.8MJ/day and that each dwelling has 4 Star WELS rated taps and 3 Star WELS rated showers installed.
The linear scale of Green Star points to BASIX score is only correct if the calculations within BASIX are replicated by the energy calculator. Have the calculations used by BASIX been compared to the calculations used in the energy calculator (2).	The option of entering a BASIX score to calculate the Green Star points awarded in this credit has been removed as it has not been possible to create a correct ratio between the BASIX and the new Green Star benchmark.
Need to ensure that project teams are aware that if they use BASIX for their energy score, they cannot include appliances in the calculation as these are excluded from the energy calculator (2).	This no longer applies as the Green Star calculator must be completed for all projects, including those in NSW.

Ene-2 'Energy Sub-metering'
It was suggested that one point should be achieved if metering is provided, and another point if a BMS is provided. In small developments and public housing, no one will monitor the system there anyway, as there is no FM (9)
GBCA Response: It is not a mandatory requirement to include a BMS in the building design to achieve this credit, an *effective mechanism for monitoring energy consumption data* will suffice. Although a Facilities Manager may not be designated to the building initially, there is still value in providing equipment to collect consumption data if in the future a facilities manager would be employed or a resident management group is interested in reviewing the data and optimising the energy performance of the building.

It was suggested that the sub metering and smart metering credits should be combined, and offer the smart metering as an extra point to sub metering (13).
GBCA Response: Agreed, The credits for Energy sub-metering, Water Meters and Smart-metering have been combined in one credit named Man-16 'Metering'.

It was suggested that the owner must get sign off for tracking sub-metering of apartment usage. It is a privacy issue (but not unsurmountable), to access the information, a clause could be put it in the lease (13).
GBCA Response: This is noted and will be considered and the suggestion may be considered when answering future queries.

Ene-3 'Peak Energy Demand Reduction'
No feedback was received on this credit

Ene-4 'Lighting Zoning'
Not applicable to this tool.

Ene-5 'Lighting Power Density'
Not applicable to this tool.

Ene-6 'Car Park Ventilation'
Not applicable to this tool.

Ene-7 'Unoccupied Spaces'
It was suggested that this credit is about the control of light and mechanical systems in unoccupied spaces, not about complying with ventilation standards. The submission requirements for naturally ventilated buildings are excessive. For apartments the documents showing the provision of a kill switch will suffice as long as for apartments with A/C, this is also connected to the switch. For naturally ventilated apartments, it is deemed to be taken for granted that the apartment will comply with the BCA requirements for natural ventilation and the calculations asked for are unnecessary (10).
GBCA Response: Agreed, the documentation requirements have been reduced; please refer to the Technical Manual for further details.

Ene-8 'Stairs'
Not applicable to this tool.

Ene-9 'Efficient External Lighting'
Not applicable to this tool.

Ene-10 'Precinct Energy Systems'
Not applicable to this tool.

Ene-11 'Energy Efficient Appliances'
It was suggested that the credit should award points when dryers and dishwashers are not installed (12).
GBCA Response: Agreed. This credit has been significantly revised and points are now available where neither dishwashers nor clothes dryers are included in dwellings.

It was suggested that it should be possible to get points if some efficient appliances are provided, all four types of appliances must be provided to get any points at the moment (12).

It was suggested that the credit should be split to allow for points being awarded when some of the four appliances are provided. Currently, if a project doesn't have clothes dryers and dishwashers in units no points are awarded. The credit could be split into two points, 1 point for fridges and clothes washers and 1 point for clothes dryers and dishwashers (13).
GBCA Response: Agreed. The credit now makes one point available where energy efficient dishwashers and clothes dryers are provided. Two points are available for additionally providing energy efficient refrigerators and clothes washers.

It was suggested that it is currently not clear whether the credit can be gained where energy efficient dishwashers are not provided, but where there is no space or fittings allowed within the dwelling for occupants to install their own. This is particularly the case within social housing for rent where residents will not be allowed to make changes to the property to enable a dishwasher to be installed. Allow the credit to be gained where no dishwashers are supplied but there is also no opportunity for them to be installed at a later date, thus remaining in accordance with the aim of the credit (5).
GBCA Response: Agreed. This credit has been significantly revised and now makes points available where dishwashers are designed out of dwellings.

It was suggested that the specification for external clothes drying facilities provided in lieu of a clothes dryer is currently unclear. While a permanent external facility might initially seem the best solution, allowing provision of either internal clothes lines (e.g. above the bath) and/or portable clothes airers would achieve the aim of the credit while allowing more flexibility for residents to dry their clothes in wet weather (5).
GBCA Response: Agreed. This credit has been significantly revised and now allows clothes lines to be either private or communal, and internal or external.

Transport

Tra-1 'Provision of Car Parking'
It was suggested that it should be clarified whether car parking provided for Class 5 uses on the ground floor of the residential building must comply with Tra-1 and Tra-2 when no car parking is provided for the residential component.
A proposed suggestion was that if the only new car parking is provided for a separate use class of the building, then Tra-1 and Tra-2 should still be able to be ruled Not Applicable (5).
GBCA Response: Agreed the car parking provided to other uses can be excluded provided that it can be demonstrated that the car parking is designated to the other use.

Tra-2 'Fuel-Efficient Transport'
It was suggested that it should be clarified whether car parking provided for Class 5 uses on the ground floor of the residential building must comply with Tra-1 and Tra-2 when no car parking is provided for the residential component.
A proposed suggestion was that if the only new car parking is provided for a separate use class of the building, then Tra-1 and Tra-2 should still be able to be ruled Not Applicable (5).
GBCA Response: Agreed the car parking provided to other uses can be excluded provided that it can be demonstrated that the car parking is designated to the other use.

Tra-3 'Cyclist Facilities'
It was suggested that cyclist facilities are not necessary for senior living (12).
GBCA Response: The cyclist facilities requirement for housing for seniors or people with a disability has been reduced to require facilities for 50% of the dwellings.

It was suggested that the requirement to be enclosed should be removed. A secure bike rack should be all that is required for Green Star. Security is a separate issue (11).
GBCA Response: The security of the bike rack is an important factor to the usage of the cyclist facilities. The purpose of providing bike racks is to encourage high bicycle usage and secure bike racks are a vital part of the success of this initiative.

Tra-4 'Commuting Mass-Transport'
It was suggested that more postcodes should be included in the list which automatically achieve five points (9).
GBCA Response: Agreed, the list of postcodes will be updated when it is demonstrated that all addresses within a certain postcode achieves the maximum points. Such postcode has not been suggested as part of this feedback submission. The GBCA is continuously reviewing and assessing this matter and suggestions that comply for all addresses will be added to the list.

Tra-5 'Trip Reduction – Mixed Use'
It was suggested that a list of amenities should be included in the Technical Manual (9).
GBCA Response: Agreed, this has been added to the Additional Guidance section of this credit in the Technical Manual.

It was suggested that many shops are small and do not have yellow pages listings and that white pages listing should be acceptable as documentation for this credit (13).
GBCA Response: Agreed, other listings equivalent to the yellow pages will be accepted as evidence.

Tra-6 'Transport Design and Planning'
Not applicable to this tool.

Tra-7 'Proximity to Major Cargo Transport Service'
Not applicable to this tool.

Water

Wat-1 'Occupant Amenity Water'

It was suggested that monthly water balance modelling gives a much better indication of water saved - especially highly seasonal climates such as Perth and Brisbane (1).
GBCA Response: Agreed, this has been incorporated to the potable water calculator

It was suggested that rainwater calculator should be upgraded to be consistent with the Office V3 rainwater calculator, e.g. rainwater collection yield being calculated on a monthly basis rather than a yearly average (1).
GBCA Response: Agreed, this has been incorporated to the potable water calculator

It was suggested that laundry use should be included as it is an important use for rainwater and, even though washing machines are usually not supplied by builders - the rainwater plumbing to the laundry must be in place (1).
GBCA Response: Agreed, this has been incorporated to the potable water calculator

It was suggested that more than one point should be awarded to projects that are using 4 star WELS fittings and are harvesting rainwater to flush all toilets and treating greywater for irrigation (12).
GBCA Response: Agreed, the potable water calculator has been reviewed and amended. A building with similar features as what is described above will achieve more than one point in this credit in Green Star – Multi Unit Residential v1.

It was suggested that there could be a difference when using the calculator compared to BASIX score. In this project the same result was achieved with BASIX score. (9).
GBCA Response: This is true, many input parameters are different in the BASIX modelling and the Green Star modelling, a perfect alignment is not possible.

Wat-2 'Water Meters'

It was suggested that the requirements for a 'practical mechanism for data monitoring', where a BMS is not present should be defined.
A proposed solution was that a management process should be permissible as a 'practical mechanism for data monitoring' in lower-tech buildings with no BMS. This might include a requirement for building managers to log water consumption against expected levels and an action plan to investigate higher levels than usual…. (5).
GBCA Response: The performance requirements of the monitoring system have been specified. Systems other than a BMS will comply as long as they meet these requirements. The proposed solution is based on an ongoing management routine that is not part of the inherent base building features. The Green Star rating system assesses building features that facilitate effective management routines rather than the management routines.

It was suggested that 'A practical mechanism for data monitoring' is required, and that options to a BMS should be provided (9).
GBCA Response: The requirements of the monitoring system have been specified. Systems other than a BMS will comply as long as they meet these requirements.

It was suggested that 'Line diagrams sufficient to verify compliance. Do not need to provide hydraulic plans for every floor (10).
GBCA Response: Agreed, this has been included in the Technical Manual. Schematic hydraulic drawings are accepted as evidence.

It was suggested that the owner must get sign off for tracking sub-metering of apartment usage. It is a privacy issue (but not unsurmountable), to access the information, a clause could put it in the lease (13).

GBCA Response: Noted, a smart metering system will suffice as an effective monitoring system for the residents' consumption. This part of the credit can be achieved without the building owner having access to this information.

Wat-3 'Landscape Irrigation'
No feedback was received on this credit.

Wat-4 'Heat Rejection Water'
No feedback was received on this credit.

Wat-5 'Fire System Water Consumption'
It was suggested that fire systems also include hydrants and hose reels, which also require testing, and thus should be included in this credit, not just sprinklers (10).
GBCA Response: Agreed. The credit does include hydrants and hose reels.

Wat-6 'Potable Water Use for Equipment'
Not applicable to this tool.

Wat-7 'Water Efficient Appliances'
It was suggested that there are situations where less water will be used by not installing some of these appliances. In the case of Dept of housing, dishwashers will not be installed by the owner or the tenant. This credit is orientated towards premium apartments. Maybe 1 point can be awarded if dishwashers are not installed, nor is space provided (11).
GBCA Response: Agreed. The credit has been amended to reward projects which provide neither space nor plumbing for dishwashers.

It was suggested that the credit should award points when dryers and dishwashers are not installed (12). GBCA Response: Agreed. The credit has been amended to reward projects which provide neither space nor plumbing for dishwashers.

Wat-8 'Swimming Pool/Spa Water Efficiency'
No feedback was received on this credit.

Materials

Mat-1 'Recycling Waste Storage'
It was suggested that the oversized household goods area should be separated from the general waste area (10).
GBCA Response: Agreed, this has been added to the requirements for this credit.

It was suggested that two points are only obtained if the project does ALL three options (for one point), AND the oversized household recycling (for two points). Therefore, if the project can get two of the first three initiatives, and the household recycling, it cannot even get one point.
A solution was suggested to rather than requiring the first three initiatives to be met, and using household recycling as an additional point, a choice could be made by the project teams as to which initiatives are viable/appropriate and reward this way i.e. if the project has ANY three of the four options, they get 1 point, if the project has ALL of the four options they get two points (3).
GBCA Response: Agreed, the credit has been changed to award one point for any three of the four initiatives and two points for all four initiatives.

It was suggested that the provision of facilities for onsite disposal and re-use of compost and green waste, particularly in developments with balconies and very limited communal garden space and landscaping should be proportional to the scope for on site re-use, e.g. for projects as described above, a communal compost and green waste facility would be sufficient (5).
GBCA Response: Waste that can be composted includes food scrap as well as waste from gardening. The compliance requirement has been changed so that sizes should be based on a Waste auditor's calculations of waste generation. A definition of 'waste auditor' has been provided.

Mat-2 'Building Reuse'
No feedback was received on this credit.

Mat-3 'Recycled Content & Re-used Products & Materials'
No feedback was received on this credit.

Mat-4 'Shell and Core or Integrated Fitout'
It was suggested that this is irrelevant for multi unit residential projects (9).

It was suggested that integrated fitout should be accepted (9).

It was suggested that this credit does not offer the opportunity to gain points for Integrated FitOut, as is the case with GS Office Design v3. This is a disadvantage to projects developed for social rent, where an integrated fit out will be delivered and residents will not be permitted to make changes to the fit out of each dwelling, thus complying with the aim of the credit. Amend the credit to enable points to be gained for an integrated fit out (5).

GBCA Response: The conventional way to deliver a residential development is an integrated fitout; points are awarded in this credit for common construction practice. The Green Star rating tools are aimed at awarding leading best environmental practice in construction; hence this credit has been removed from the Green Star – Multi Unit Residential rating tool. The credit is however still applicable to other Green Star rating tools as the common practice is different in those sectors.
Note: The PILOT version of the rating tool awarded points for Shell and Core only, a CIR for integrated fitout was accepted during the PILOT process.

Mat-5 'Concrete'
No feedback was received on this credit.

Mat-6 'Steel'
No feedback was received on this credit.

Mat-7 'PVC Minimisation'
No feedback was received on this credit.

Mat-8 'Sustainable Timber'
No feedback was received on this credit.

Mat-9 'Design for Disassembly'
Not applicable to this tool.

Mat-10 'Dematerialisation'
It was suggested that it should be clarified as to whether the 'Ductwork' component of this credit can be claimed for apartments that are naturally ventilated according to IEQ-2, but have mechanically ventilated kitchens in accordance with IEQ-1.
A solution was proposed to allow the situation described above as the reduction in ductwork given by not having air conditioning to the apartment complies with the intent of the credit (5).
GBCA Response: Agreed, a naturally ventilated building without ductwork will comply.

It was suggested that the unit size requirements are too low as the affordable housing project cannot achieve the requirement; only one apartment out of our 106 affordable housing units achieved the requirement (9). A proposed solution was to increase the size requirement to 50m^2 for 1 bedroom; 70m^2 for 2 bedrooms; and 95m^2 for 3 bedrooms (13).
GBCA Response: Agreed, the unit size requirement has been updated in accordance with this stakeholder feedback.

It was suggested that it will be difficult to achieve the 95% of no floor covering as the BCA requires strict waterproofing requirements that would rule out all bathrooms and laundries. Maybe the 95% has to exclude bathrooms and laundries (10).
GBCA Response: Agreed, the credit has been changed to 90% of the floor area having no floor covering.

Apartment buildings do not have urinals. They would only be provided in commercial or retail components of a mixed use development so therefore the majority of applicants do not have this option and makes it harder to comply (10).
GBCA Response: Agreed, this has been removed from the credit.

Mat-11 'Flooring'
It was suggested that it should be clarified if PVC flooring products can be claimed as part of this credit (1).
GBCA Response: Any flooring product can be documented under the flooring calculator and potentially achieve up to the maximum score.

Mat-12 'Joinery'
This credit has been introduced to the Green Star – Multi Unit Residential v1rating tool. The 'Joinery calculator' used in the Green Star – Office Interiors and Green Star – Education tools is used. The credit applies to all joinery delivered as part of the base building, for example kitchen and bathroom cabinets and built-in wardrobes.

Mat-13 'Loose Furniture'
Not applicable to this tool.

Mat-14 'Internal Walls'
This credit has been introduced to the Green Star – Multi Unit Residential v1rating tool. The walls section of the 'Ceilings, walls and partitions calculator' used in the Green Star – Office Interiors and Green Star – Education tools is used. The credit applies to all internal walls delivered as part of the base building.

Mat-15 'Universal Design'
It was suggested that an access review report from an Accessibility consultant should suffice as documentation (12).
GBCA Response: Agreed, an Access Review Report suffices as evidence.

Land Use & Ecology

Eco-conditional Requirement
No feedback was received on this credit.

Eco-1 'Topsoil'
No feedback was received on this credit.

Eco-2 'Reuse of Land'
It was suggested that Backyards should be included in the land that is already built on (12). There is a need to amend the definition of "previously built on" or "curtilage"(13)
GBCA Response: The definition of previously built on land has been improved. Curtilage is included in this definition and yards are included in cartilage. See the Green Star – Multi Unit Residential v1 Technical Manual for the full definition.

It was suggested that building on 75% of the land is a problem, as planning legislation often prevents it (13).
GBCA Response: The requirement in this credit is that 75% of the site must be previously developed in accordance with the definition of 'previously developed land' in the Technical Manual rather than that 75% of the structural building must occupy 75% of the land.

Eco-3 'Reclaimed Contaminated Land'
No feedback was received on this credit.

Eco-4 'Change of Ecological Value'
It was suggested that the Ecology Calculator should be reviewed as very rarely any development achieves more than 1 point for this credit (12).
GBCA Response: This is a calculator that is used in all the Green Star rating tools except Green Star – Office Interiors. This item of feedback has been incorporated to the GBCA annual stakeholder feedback, and will be responded to through that process.

Eco-5 'Communal Garden Facilities'
No feedback was received on this credit.

Emissions

Emi-1 'Refrigerant ODP'
It was suggested that documentation requirements should be revisited when the project is naturally ventilated, i.e. a letter from the mechanical engineer/building owner should be enough to confirm compliance (9).
GBCA Response: Agreed, this has been addressed in the Technical Manual. A letter confirming that no air-conditioning is installed in combination with the documentation provided for the Energy – conditional requirement will suffice as evidence in Green Star – Multi Unit Residential v1.

Emi-2 'Refrigerant GWP'
It was suggested that documentation requirements should be revisited when the project is naturally ventilated, i.e. a letter from the mechanical engineer/building owner should be enough to confirm compliance (9).
GBCA Response: Agreed, this has been addressed in the Technical Manual. A letter confirming that no air-conditioning is installed in combination with the documentation provided for the Energy – conditional requirement will suffice as evidence in Green Star – Multi Unit Residential v1.

Emi-3 'Refrigerant Leaks'
It was suggested that documentation requirements should be revisited when the project is naturally ventilated, i.e. a letter from the mechanical engineer/building owner should be enough to confirm compliance (9).
GBCA Response: Agreed, this has been addressed in the Technical Manual. A letter confirming that no air-conditioning is installed in combination with the documentation provided for the Energy – conditional requirement will suffice as evidence in Green Star – Multi Unit Residential v1.

Emi-4 'Insulant ODP'
No feedback was received on this credit.

Emi-5 'Watercourse Pollution'
It was suggested that a few civil engineers who I have talked to about the requirements referred to don't seem to be aware of them. i.e. haven't used those before. I was told the guidelines are very thick and quite complex (9).
GBCA Response: Green Star aims to encourage transformation towards improved practices in environmental design; these guideline documents are examples of good practice in environmental management of stormwater. The guidelines were published in 1999 and are readily available to order online. The reference to these documents will remain in Green Star – Multi Unit Residential v1.

It was suggested that the 1 in 20 year treatment necessity makes this credit almost impossible to achieve. This should be one in 2 years. Flow rates in a 1 in 20 year storm are 4 times as high as standard storm flow rates, but treating for 2 year events captures 98-99 % of the total water over the 20 year time period. We would need to put in $200K worth of concrete to achieve this, which is obviously opposed to the idea of Green Star. Trying to install filtration to filter the water from a 1 in 20 year storm would require the whole site to be covered in manhole covers to access all the necessary filters. The credit is in contrast to the EPA document which recommends just 1 in 2 yr storm treatment (13).
GBCA Response: There are several different methods to capture and filter stormwater some more suitable than others depending on location. Previous Green Star projects have achieved the points in this credit. There are also examples of local government regulations that require the same or more stringent levels of stormwater treatment as this credit. The Credit criteria will not change from Green Star - Multi Unit Residential PILOT to Green Star – Multi Unit Residential v1.

Emi-6 'Discharge to Sewer'
No feedback was received on this credit.

Emi-7 'Light Pollution'
It was suggested that the requirements need to be clarified, i.e. a range provided (9).
GBCA Response: Agreed. This credit has been revised, and no longer contains reference to the minimum requirements of AS1158.

It was suggested that the last sentence should be reviewed - you cannot 'not exceed the minimum requirements' there must be some range (11).
GBCA Response: Agreed. This credit has been revised, and no longer references the minimum requirements of AS1158.

It was suggested that the term "Outdoor Spaces" needs to be defined. Sports ovals and other sports areas for example are outdoor spaces, but require high lighting levels and should be excluded from the definition (7).
GBCA Response: Agreed. This credit has been revised and no longer refers to "outdoor spaces". Instead the credit achieves its aim by limiting the upward light output ratio of external luminaires.

Emi-8 'Legionella'
No feedback was received on this credit.

Emi-9 'Trade Waste Pollution'
Not applicable to this tool.

Innovation

Inn-1 'Innovative Strategies and Technologies'
No feedback was received on this credit.

Inn-2 'Exceeding Green Star Benchmarks'
No feedback was received on this credit.

Inn-3 'Environmental Design Initiatives'
No feedback was received on this credit.