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DISCUSSION PAPER: AUSTRALIAN ENERGY MODELLING PROTOCOLS - POTENTIAL FOR HARMONISATION AND ALIGNMENT

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EXECUTIVE SUMMARY

This paper summarises the issues identified when considering the proposed alignment and potential harmonisation of the three energy modelling protocols in current use in the Australian non-residential building industry namely:

- NCC 2011 Volume 1 (Building Code of Australia) –Verification method JV3
- Green Star Greenhouse Gas Emissions Calculator Guide – Public Building PILOT
- NABERS Energy – Guide to Building Energy Estimation (for commitment agreements)

The core issues are:

1. Each modelling protocol has been developed and managed by different organisations and for different purposes and so the three individual protocols have diverged in some areas and duplicated in others.

2. Retaining three separate protocols with different default values and profiles is causing some frustration, confusion and additional expense to industry.

3. Each modelling methodology has slightly different goals and outcomes so default values cannot be automatically standardised.

4. There is potential for alignment of specified defaults, schedules and requirements and also potential for further harmonisation between the three modelling protocols.

5. Harmonisation will only occur after detailed consultation and negotiations with the owners of the three protocols; Australian Building Codes Board (owner of NCC JV3), NSW Office of Environment and Heritage (Administrators of NABERS Energy) and Green Building Council of Australia (Owners of Green Star modelling protocol).

This paper is offered by AIRAH as a starting point in the discussions to consider the proposed alignment and potential harmonisation of the three energy protocols.

1. Introduction

1.1. Purpose

This Discussion Paper has been prepared as a first step in a review of the three main building energy modelling/simulation protocols in use in the Australian industry, namely NCC Volume One (BCA JV3 verification method), NABERS Energy for offices Commitment Agreements and Green Star requirements for energy simulation (GBCA).

Comments on this Discussion Paper are sought from several key stakeholders including:

- Australian Building Codes Board – representatives associated with ABCB protocol for building analysis software and verification method JV3 of the National Construction Code volume 1 (BCA).
- Green Building Council of Australia – representatives associated with the development and management of Green Star and its energy modelling methodology.
- Office of Environment and Heritage (NSW) - representatives associated with the development and management of NABERS Energy and representative of the NABERS National Steering Committee where appropriate
- Department of Climate Change and Energy Efficiency (Commonwealth) - representatives associated with the Commercial Energy Efficiency and the Buildings Framework.
- AIRAH - representatives associated with using and applying energy modelling software.
- CSIRO/ACADS-BSG - representatives associated with developing energy modelling software used for modelling building performance against BCA, NABERS or Green Star protocols.

Ultimately the purpose of this paper is to encourage early resolution of key technical and administrative barriers to the technical alignment of the energy modelling protocols where possible. Many of the conclusions and recommendations outlined in this discussion paper have been informed by discussions with technical staff from ABCB, GBCA, NABERS administrators as well as technical experts drawn from the AIRAH membership base.

1.2. Background

There are several energy modelling protocols currently in use by the Australian building industry to simulate the energy performance of non-residential buildings. These include protocols required to undertake energy modelling for; BCA minimum energy efficiency standards compliance using the JV3 approach, NABERS Energy Commitment Agreements for offices, and Green Star building rating schemes.

While all of these energy modelling protocols have differing applications and goals, there are some opportunities for alignment between the energy simulation requirements, particularly with regards to default input values that are specified for input into the simulation programs. Default values such as climate conditions, building schedules, internal loads, occupancy profiles and the like can have a significant effect on the modelling outcomes. The specification of different

defaults in each protocol can cause confusion and frustration for protocol users leading to error or inaccuracy in modelling results and duplication of modelling work

The alignment of requirements and practices where possible, has the potential to improve the Australian building industry's understanding of the various energy modelling requirements. A more complete understanding of the requirements, including the reasons underlying the remaining differences between protocols has the potential to improve the standard of energy modelling outcomes, as well as reduce compliance and implementation costs to industry.

1.3. Need

This discussion paper is needed to highlight the specific issues associated with the alignment and potential harmonisation of energy modelling practice where practicable.

This paper is one tool that can help the owners of the individual protocols better understand these issues and agree a way forward so that future revisions or amendments to the protocols can meet the needs of all stakeholders as well as industry practitioners.

This paper and the responses to it will provide guidance for ABCB, GBCA and NABERS administrators on the direction of proposed revisions to the protocols. In particular this paper should help:

- To facilitate a clear understanding, by all parties, of the fundamental objective of each modelling methodology.
- To provide a comparison of the "requirements" of the various modelling protocols for all stakeholders.
- To highlight any apparent inconsistencies between the protocols (and their defaults) that may not be absolutely necessary.
- To investigate areas where these requirements (and associated default values) can be aligned or rationalised between the protocols and provide recommendations on the options for alignment where applicable and appropriate. (This may require a sensitivity analysis to be undertaken on the input variables for each approach to quantify their effect on modelling outcomes.)
- To acknowledge areas where modelling cannot be aligned due to the different goals of the individual modelling protocols.
- To facilitate the consultation process with industry experts and key stakeholder groups, including the owners of the modelling protocols, to build consensus on an agreed set of recommendations for alignment.
- To document these recommendations for consideration in stage two.

1.4. Associated issues

The associated issues that need to be addressed are:

- The future format of the three protocols.

- Whether a single model can be adapted with enough variations built in to meet the varying needs (minimum requirements, good/best practice and actual performance).

Once the issues highlighted in this paper are resolved a clear direction can be provided to the organisations responsible for the individual protocols to ensure consistency, alignment and efficiency in future energy modelling developments.

2. Energy Simulation Objectives

2.1. Objectives of individual protocols

It should be noted that none of the three modelling protocols under consideration claim to provide an accurate model of the building's energy consumption. Safety margins are used in these protocols so that the modelling outcomes will be conservative rather than accurate. The different approaches either set a compliance standard independent of likely operation (in the case of the NCC and Green Star protocols), or attempt to predict likely operation (in the case of the NABERS Guide).

The goals of the three modelling protocols are different and hence the inputs may also need to be different to reflect these goals. However, there are opportunities for alignment of method and defaults and also opportunities to ensure that future developments in individual protocols are convergent rather than divergent.

It is a useful first step in the discussion to clearly state the purpose or objectives of each individual protocol.

2.2. NCC Volume 1 JV3

The National Construction Code Volume 1 (The BCA Volume 1) sets a minimum standard of construction/energy efficiency for new buildings and uses a verification methodology based on a comparison of the proposed building and its services with a reference (deemed to satisfy) building and its services. Hence it is important that the parameters on which the compliance is based upon are fixed.

Verification is by method JV3 which requires that the modelled energy consumption of the proposed building (modelled with both the proposed building services and with the reference building services) is not more than the modelled energy consumption of the reference building. The aim of these two assessments is to test the energy efficiency of both the building services and the building fabric independently. Deficiencies in one cannot be hidden by good performance in the other. Both aspects of the building, its services and its fabric/layout/orientation must meet the minimum standard specified.

The JV3 verification methodology requires that the proposed and reference building are assessed using the same calculation method, physical model, internal heat gains, occupancy and operational profiles, geographic location, climate and with the same HVAC zoning and internal environmental conditions.

The intent of the modelling is to assess the building design for compliance with the minimum energy performance specified within the NCC Volume 1 Section J. Compliance is assessed on a pass/fail basis, i.e. there is no recognition for exceeding the specified minimum requirements.

2.3. Green Star

The Green Star Greenhouse Gas Emissions Calculator Guide was developed for the Green Building Council of Australia Public Building PILOT, Healthcare V1 and Industrial V1 rating tools. This document specifies how to undertake energy simulations for the purpose of these Green Star rating schemes. It is intended that this protocol (revised as appropriate after the pilot stage) will be applied to all green star rating tools in the future.

Under this protocol the assessment of the energy performance of a proposed new (or refurbished) building is based on the comparison of the modelled greenhouse gas emissions of the proposed building during operation with that of a 'standard practice building'. The characteristics of the standard practice building are specified within the calculator guide.

The intent of the green star protocol is to measure the ability of the building to be energy efficient in operation, not to predict or assess the actual energy or environmental performance of the building.

2.4. NABERS Energy

NABERS differ from the two schemes above in that the data used in an Energy rating is extracted from the building in use. NABERS ratings assess actual energy consumption from the building in operation, and therefore, are always based on actual parameters rather than default or specified parameters.

The operational focus of the NABERS program is reflected in the NABERS Energy Commitment Agreements for offices. Under these arrangements developers of new and refurbished office premises can commit their building to achieving a 4, 4.5, 5, 5.5 or 6 Star NABERS Energy performance rating. Energy performance simulations are recommended for 4 star commitments and are mandatory for commitments of 4.5 Stars and above. All simulations used for commitment agreements must be in accordance with the NABERS Energy Guide to Building Energy Estimation and for whole buildings the NABERS Guide to Tenancy Energy estimation must also be used.

Under the Commitment Agreement process the energy use of the building in operation will be verified using a NABERS rating. Consequently, the intent of the Nabers Energy simulation is to accurately predict the energy consumption of the building in operation, within the limitations of theoretical computer simulation. This provides useful and realistic assistance to the design and construction process and specifically helps achieving the target NABERS rating.

The Guide requires modelling the building as it is expected to operate. Default values are only intended to be used when actual data, or realistic estimates, are unknown. These default figures provide a conservative estimate of likely building consumption and were established with reference to the extensive NABERS database of rated office buildings

3. Identification of differences

3.1. Background

This section of the report highlights specific differences between the protocols under consideration and in particular any specified default values that must or can be used.

- NCC JV3 – Means the requirements of NCC 2011 Vol 1 Section J/ Verification method JV3.
- GS - PB - Means Green Star Public Building Pilot - Greenhouse Gas Emissions Calculator Guide.
- NABERS – Means NABERS Energy Guide to Building (or Tenancy) Energy Estimation for NABERS Energy Commitment Agreements.

3.2. Defaults, design and operation

Energy modelling is highly complex and when undertaken without specific design or default parameters can often produce a wide range of results. To this end, the JV3 and GS - PB protocols (and to a lesser extent the NABERS protocol), attempt to standardise some of the design and operational parameters by specifying default values that should be used. NABERS protocol simulations do allow or encourage building specific parameters to be used in the place of defaults but still leave it up to unstated "conservative" assumptions or the use of "safety factors" to ensure that idealised simulation, i.e. the simulation results of NABERS results do not exceed the realities of building operations.

Specific differences between the defaults and operating profiles of the three protocols are outlined in this section. When considering the alignment of defaults or requirements between protocols consideration should be given to the sensitivity of outcomes (or modelling results) to changes in specified default values.

3.3. Major differences in protocols

3.3.1. Calculation methodology

NCC JV3	The JV3 modelling method uses a methodology based on a comparison of the proposed building and its services with a reference (Deemed To Satisfy) building and its services. JV3 a) includes 2 parts; comparing the annual energy consumption of a 'reference building' with the 'proposed building' when: 1. Proposed building is modelled with proposed services. 2 Proposed building is modelled with reference building services. The aim of these comparisons is to test the energy efficiency of both the services AND the fabric independently, i.e. you cannot get away with very efficient services but an inefficient envelope. The aim of the verification method JV3 is to allow designers to verify that their designs meet or exceed the

	minimum standards or energy efficiency levels of the deemed to satisfy (DTS) Section J requirements. Note – there is an allowance for on-site renewable energy generation (allows 100% offsetting);
GS - PB	Green Star Health Care, Industrial and Public buildings uses a Benchmark Building (a hypothetical building that is responsible for 10% less GHG emission than the Standard Practice Building). The Standard Practice building is a hypothetical building with Deemed to Satisfy provisions the same as the BCA Reference Building (i.e., based predominantly on BCA Section J provisions) but with a number of differences. A major difference is that the air conditioning system types are not the same for the proposed and standard practice building. ***The Standard Practice Building*** HVAC system types and configuration must be in accordance with Table 5, 6 and 7 (Modified from G3.1.1 ASHRAE 90.1- 2007) However, the HVAC plant performance parameters must be in accordance with BCA. Where relevant, the energy consumption from external lighting and lifts are to be included, in accordance with the specified efficiencies. Note: Having to use these ASHRAE systems can often necessitate a redesign of the building services. ***The Proposed Building*** must be in accordance with the BCA Section JV3 Verification Method with the following variations: • The climate file. • The HVAC heat loads, and the occupancy and operational profiles. • The energy consumption from lifts is included. • ~~The percentage of electricity generated on-site from sources that do not emit greenhouse gases (such as solar and wind) can be included fully.~~ • The energy consumption from external lighting is included. It is the intention of the GBCA that other building types and rating tools will reference this energy simulation protocol in the future.
NABERS	Nabers Energy uses a Star Rating system based on the energy consumption for Base building, Whole building and Tenancy. There is no comparison with a Reference Building although the results are normalised by building use/type and location. This protocol uses actual building data, as opposed to defaults, wherever possible. The intent of the modelling methodology for NABERS is to predict the energy consumption of the building to determine the potential NABERS rating that could be targeted as part of a commitment agreement. As such, the protocol is concerned with modelling a realistic version of the building with as few assumptions and default values/profiles as possible. However, the modelling protocol also advises that a conservative approach be used, with appropriate margins applied to the simulation results (and inputs), so as not to underestimate the consumption of the building.

	The intent of the NABERS Modelling protocol therefore is not to attempt to predict the exact operating energy of the building but more to assist builders/developers meet their nominated targets under their Commitment Agreement.

3.3.2. Building Class/Type, space type and building boundaries

NCC JV3	The NCC BCA Volume 1 only considers building classes. Building boundaries are differentiated due to building class. The BCA does have defined space types for lighting (Table J2.6a) and, in a way, for people occupancy by reference to Table D1.13 (which is actually for fire egress calculations) but not for the default operating profiles, metabolic rates, etc.
GS - PB	Green Star has building types and, for each building type, defined space types to which profiles for occupancy, lighting and equipment have been designated, and to which specific heat gains have been designated.
NABERS	NABERS Energy Commitment Agreements only considers offices.

Notes:
1. Aligning building class, building types and space types as much as possible should be considered.
2. Space types in Table D1.13, AS1668.2, Table J2.6a and Green Star are similar but different.
3. The BCA references the 1991 edition of AS 1668.2 while Green Star and NABERS reference the 2002 edition.

3.3.3. Treatment of area

NCC JV3	Simulation based on Gross Floor Area (GFA)
GS - PB	Simulation based on Gross Floor Area (GFA) with consideration of Nett Leased Area (NLA)
NABERS	Simulation based on Nett Leased Area (NLA) typically 80%-90% of Gross Floor Area (GFA)

Note: There is potential that simulations could be assessed on same area definition.

After initial discussion with tool owners it was determined the treatment of area is already aligned. No changes are required.

3.3.4. Exclusions/Inclusions from modelling

Some protocols include or exclude particular aspects of the building energy use.

NCC JV3	Car parks excluded. External lighting excluded.
GS - PB	Car parks included. External lighting included.
NABERS	Car parks included. External lighting included

Note: There is potential that these inclusions/exclusions could be aligned between all protocols.

3.4. Differences in default values and profiles

3.4.1. Maximum occupancy

NCC JV3	From NCC Volume 1 Table D1.13.
GS - PB	Per design or from NCC Volume 1 Table D1.13.
NABERS	Default = 15 m^2/person; actual occupancy used where known.

Notes:
1. There is potential that the maximum occupancy rates could be common between all protocols.
2. HVAC Designers generally use AS1668.2 for determining people occupancy rather than Table D1.13.
3. The BCA references the 1991 edition of AS 1668.2 while Green Star and NABERS reference the 2002 edition.

3.4.2. Occupancy profiles

JV3, Green Star and NABERS all use occupancy profiles that are specified percentages of maximum occupancy. All three protocols use different occupancy profiles for the different building classes/space types. In addition with NCC JV3 defaults must be used if operating hours per year are less than 2500

NCC JV3	Specified percentages of maximum occupancy.
GS - PB	Specified percentages of maximum occupancy.
NABERS	Specified percentages of maximum occupancy unless actual occupancy profile is known.

Note: There is a strong argument that the default percentage occupancy profiles should be common between/across all protocols.

3.4.3. Metabolic rates and heat from people

NCC JV3	Specifies 75W/person sensible heat and 55 W/person latent heat, regardless of building class.
GS - PB	Metabolic rates can be taken from AIRAH, ASHRAE or CIBSE.
NABERS	Metabolic rates not specified and can be taken from reputable sources.

Notes:
1. There is potential that the default metabolic rates could be common between all protocols.
2. AS 1668.2, AIRAH, ASHRAE and CIBSE use slightly different metabolic rate figures.

3.4.4. Climate data

Test Reference Year = TRY; Typical Meteorological Year = TMY

NCC JV3	TRY year for the nearest location with similar climatic conditions. ~~TRY year for the nearest location with similar climatic conditions in the same climate zone.~~
GS - PB	TRY or TMY year. TRY formats are preferred where available. Additional analysis is recommended to quantify the potential effect of 'non average' weather conditions and climate change on future ratings. It is understood that a limited number of TRY files are available- particularly in regional areas without well-established nearby weather stations. GS-PB requires the use of TRY files when they are available, but recognises that alternatives must be provided.
NABERS	Weather data must use actual recorded solar radiation, temperature and humidity data from the local weather station and either be the ACADS-BSG/CSIRO Nominated TRY for the nearest available climatic weather station, a TMY for the location or other standard weather year.

Notes:

1. Currently (hourly) TRY data, based on records in the 1970-80s, is available from ACADS-BSG. More recent data spanning the years from 1964 to 2007 is to be made available by the DCCEE but the validation of this data is ongoing and data has not been made available to the Industry to date.
2. There is a strong argument that the default climate data should be common between/across all protocols.

3.4.5. Temperature bands and hours

NCC JV3	Default temperature bands are 18 to 26 °C for 98% of plant operating hours.
GS - PB	Modelled as per system design in proposed building and as per NCC JV3 for standard practice building. ~~Special provisions included if temperature bands different from NCC JV3.~~
NABERS	Modelled as per system design. In Building Operation Summary must report how well temperature control targets are met.

Note: There is potential that the default temperature bands and hours could be common between all protocols.

3.4.6. Infiltration

AC = Air change

NCC JV3	Perimeter zones 1 AC, Interior zones no infiltration when plant operating. Whole building infiltration is 1.5 AC when plant not operating.
GS - PB	Standard practice building to use values as per BCA Section J, JV3 (d) (i) (F) and proposed building as documented in the design, or if unknown, as per standard practice building.
NABERS	Not specified.

Note: Default values (from NCC) could be specified for perimeter and central zone infiltration for NABERS modelling. However, where actual infiltration values are known or where infiltration testing has been carried out – these values should be used in the energy model.

3.4.7. Outdoor air

NCC JV3	NCC Volume 1 part F4 requirements, natural ventilation or AS 1668.2 (1991) minimum requirements.
GS - PB	Proposed building as designed; Reference building as per BCA. Can be modulated if demand controlled ventilation is installed.
NABERS	No Default specified. Building should be modelled as per system design.

Note: There is potential that the treatment of outdoor airflow rates could be harmonised between all protocols.

3.4.8. Carpark ventilation

NCC JV3	NCC Volume 1 part F4.11 requirements, natural ventilation or AS 1668.2 (1991) minimum requirements.
GS - PB	Refers AS 1668.2-2002.
NABERS	No default specified. Car park energy use should be estimated as per system design.

Note: There is potential that the treatment of carpark ventilation could be harmonised between all protocols.

3.4.9. Lighting loads

NCC JV3	BCA Table J6.2~~2.6~~a by space type.
GS - PB	Maximum lighting power density is as per BCA Table J6.2a for the standard practice building. The proposed building may take into account the effect of lighting controls

	by applying adjustment factors.
NABERS	Default load: Lighting 12W/m^2. Default may only be used for shell and core type building construction. Installed lighting power should be assessed from reverse ceiling plans for the tenancy (in a base building rating). Note also that toilet, lift lobby, plant room and foyer lighting should be represented with different lighting power densities where this is the case. For whole building and tenancy ratings the Guide states that the lighting power density must be modelled as per the tenant fitout. Lighting power density is to include power used or lost to control gear and ballasts.

Note: There is potential that the default lighting loads could be common between all protocols.

3.4.10. Equipment loads

NCC JV3	Class 3 sole occupancy, Class 9a Ward, 9c Aged Care - *5 W/m^2 averaged 24hrs/day 7 days/week* Class 5 building, Class 8 laboratory, Class 9a clinic, day surgery and a procedure unit. - *15 W/m^2* Class 6 shop and shopping centre, Class 6 cafe and restaurant and Class 9b school - *5 W/m^2* All others (including schools) - no load.
GS - PB	A range of equipment loads (gains) based on space type. Max Equipment loads originally based on BCA Table 2h Specification JV, but GBCA felt that the table provided in the BCA is very limited.
NABERS	Default load: Equip 11W/m^2. Where the tenant fitout is known, the equipment loads should be modelled to represent the actual equipment loads in the space. The protocol specifies that these loads should be modelled on a zonal basis to ensure that variability of loads passed through to the air-conditioning are captured in the model. Where the default loads are used in the absence of further information, the modelling protocol states that these loads must be randomised as outlined in the Guide so that the area-weighted average equipment load used in the model is within 10% of 11W/m².

Note: There is potential that the default equipment loads could be common between all protocols.

3.4.11. External lighting

NCC JV3	Not required to be included.

GS - PB	Must be included, no defaults but operating profiles specified.
NABERS	Requires external lighting be included. There are no default values provided for external lighting –Should be determined based on actual design where known.

Note: ~~Could potentially look at specifying a W/m² value for this end use and applying a standard operating profile.~~Initial discussion of tool owners determined alignment is not required.

3.4.12. External shading

NCC JV3	Requires this be included in the JV3 analysis as per BCA Section J, JV3 (d) (ii) (C), i.e. adjacent structures and features.
GS - PB	References BCA Section J, JV3 (d) (ii) (C), i.e. adjacent structures and features.
NABERS	Account to be taken of external shade from buildings and trees. Deciduous trees to be modelled as having time-varying transmissivity. External shading including overhangs and window offsets to be accurately represented.

Note: There is potential that the treatment of external shading could be common between all protocols.

3.4.13. Domestic hot water (DHW)

NCC JV3	No specific requirements except that if DHW the same in both the proposed and reference building they can be ignored. If the DHW is more efficient than the Reference building it can be included in the model BUT although the consumption (L/day or L/meal) is specified, the method of calculating the energy consumption for the Reference building is not specified.
GS - PB	Detailed calculation procedure stipulated for DHW for the Proposed and Standard Practice building.
NABERS	Default value; 2kWhrs/m^2/annum, plus any system losses. This default value to be used where accurate building information is not available. Typically these values would be calculated based on design documentation and equipment selection as part of NABERS Modelling. Note that the default value does not specify system losses and these must be estimated separately.

Note: There is potential that the treatment of domestic hot water systems could be common between all protocols.

3.4.14. Lifts and building transportation

NCC JV3	No specific requirements except that if the lifts are the same in both the proposed and reference building they can be ignored. If the proposed lifts are more efficient than the Reference building they can be included in the model. The method of calculating the energy consumption for the Reference building is not specified.
GS - PB	Detailed calculation procedure stipulated for Lifts for the Proposed and Standard Practice building.
NABERS	Default value 8kWhrs/m^2/annum. These are default values to be used where Lift information is not available. Typically these values would be calculated based on lift design documentation and equipment selection as part of NABERS Modelling.

Note: A report is being finalised for DCCEE on lift energy consumption which provides an empirical model of lift consumption based on building characteristics and lift technology. When this is published, its inclusion in the modelling protocols is strongly recommended.

3.4.15. Maximum fan power

NCC JV3	Only considers fans over 1000 L/s and then based on *coil design cooling load.*
GS - PB	Standard practice as per minimum requirements of BCA. Where VAV systems are installed, part-loads are given to be used in both standard practice and proposed buildings. Adjustment factors can be used in the proposed building where CO2 sensors and VSDs are used in car parks to provide demand controlled ventilation.
NABERS	No Default specified. Building should be modelled as per system design.

4. Type of revision project

4.1. The way forward

As can be seen there are many major and minor differences between the three protocols under review. Many projects have to be modelled under two or three of these protocols which can cause frustration and unnecessary expense to industry.

The alignment of these requirements and practices where possible, has the potential to improve the Australian building industry's understanding of the various energy modelling requirements. A more complete understanding of the requirements, including the reasons underlying the differences between protocols has the potential to improve the standard of energy modelling outcomes, as well as reduce compliance and implementation costs to industry.

As a first step to progress this project AIRAH have prepared this report identifying areas of differences, and areas of potential alignment, between the three energy modelling methodology protocols.

4.2. The next steps

The next steps in the project should be as follows:

- This report should be circulated to key stakeholders and comments and feedback received back.
- A meeting of key stakeholders should be convened to form a project steering group to map a way forward for phase two of this project including:
    - Terms of reference
    - Project governance and finance model
    - Project objectives
    - Project management
- The discussion paper and the associated feedback should then be reviewed and discussed by the project steering group.
- The project steering group also need to consider whether to retain three separate modelling protocols or whether some attempt should be made to create a combined modelling protocol i.e. a standard single energy modelling protocol that has enough options built into it that it can be used for the three purposes (JV3, GBCA and Nabers).
- Following the review and associated discussions a document should be produced to reflect all stakeholder agreements, including all recommendations for change to better align the three modelling protocols. This should occur as phase two of the project.
- Stakeholders should sign off alignment recommendations agreed in phase two.

- Once the stakeholder recommendations have been signed off Phase three of the project could include a coordinated revision of the requirements of the three modelling methodology protocols reflecting the agreed changes and an industry awareness building program to communicate the detail and benefits of the agreed changes. This could be achieved using a collaborative approach led by AIRAH with input from the communication resources of the individual stakeholders.

4.3. Managing the harmonisation project

The responsibility for managing and delivering the next steps of this project has been undertaken by the Building Framework Section of the Commonwealth Department of Climate Change and Energy Efficiency (DCCEE).

Officers from DCCEE will be organising and coordinating the project steering group and future meetings and work on the subject. AIRAH will be engaging and collaborating with DCCEE and other stakeholders, ABCB, OEH and GBCA throughout the process.

4.4. Other issues

There are other issues when considering the alignment of default values and the harmonisation of protocols. The sensitivity of the analysis to changes in the various default value categories, i.e. the issues and items that make the most difference to modelling results and outcomes, should be considered and used to inform discussions. In addition, the potential for perverse outcomes, such as an over complication of protocol use when combining all common requirements and remaining differences into a harmonised model, particularly for individual or infrequent users, should be avoided.

End of paper