NABERS: Lessons from 12 Years of Performance Based Ratings in Australia

P. Bannister[1]

[1] *Exergy Australia Pty Ltd PO Box 546 Belconnen ACT 2616 Canberra Australia*

Email: paul@xgl.com.au (Email)

Abstract:
The National Australian Built Environment Rating System (NABERS) has been operating for 12 years as a performance based rating system for the energy/greenhouse efficiency of office buildings in Australia. During this period, the scheme has been expanded to include performance based energy and water ratings for offices, hotels and shopping centres, plus performance based rating tools for office indoor environment and waste.

NABERS has achieved significant success in transforming the energy efficiency of the office building stock, particularly with respect to the landlord operated services in the higher-quality end of the market. NABERS ratings have become established as a core valuation in the market for sale or lease of these buildings. The declaration of NABERS ratings has recently become mandatory for commercial sale and lease transactions over 2000m².

In this paper, the history of the NABERS scheme is outlined, with particular emphasis on the key lessons learnt and the underlying factors that have contributed to successes and failures along the way. Directions for future development are also discussed.

Keywords:
Efficiency, Energy, Performance, Rating, Water, Market Transformation.

1. Introduction

Rating systems are a means of communicating a complex technical message in a format readily understood by the non-technical market. Ideally, this enables decision makers (who are typically financially rather than engineering trained) to factor efficiency into commercial decisions.

The development of such rating systems has occurred in a piecemeal manner internationally. Early adopters include Australia (NABERS, 2012a) and USA (Energy Star) (US EPA, 2012), both of which started operation in the late 1990s. In Europe, significant development of rating systems has occurred subsequent to the European Building Performance Directive (EU 2002). In addition, a wide range of design-based sustainability tools incorporating energy as one component has developed over the past 15 years, led by LEED (US GBC 2012), BREEAM (BRE, 2012) and Green Star (GBCA, 2012).

This paper presents the history and associated insights related to the development of the National Australian Built Environment Rating Scheme (NABERS).

2. NABERS Development History

The original development of NABERS dates from 1998 when the Sustainable Energy Development Authority of NSW called for tenders to develop a building energy/greenhouse efficiency rating scheme. The original scope was relatively non-specific as to the nature of the rating, other than that it should provide a means of differentiating buildings of different efficiency levels.

Over 1998-9 a development process was conducted to determine the detail of the rating system. Originally, significant development was put towards the development of both a performance rating system (based on energy bills) and a design based system (based on design potential). However, the latter component was dropped as being too complex and unproven in its ability to generate actual greenhouse reductions, resulting ultimately in the release of the Australian Building Greenhouse Rating (ABGR) for NSW in September 1999.

Although the rating was notionally national in coverage, the other state jurisdictions generally did not accept ABGR to begin with, with the largest concern being whether the rating benchmarks were appropriate for each individual state. This was not an unreasonable concern, as the original dataset was of variable quality and biased towards NSW. The state of Victoria adopted ABGR in 2000 but only after conducting its own benchmarking exercise and negotiating changes to the operation of the scheme – specifically the conversion of the rating from using gross conditioned area to net lettable area and the addition of half stars to the rating; both of these were sensible changes to the scheme that facilitated its wider acceptance in the market.

Other states followed with separate benchmarking exercises (Western Australia, followed by Queensland) albeit with no further operational changes to the scheme. Benchmarks for the Northern Territory were modified in 2006 to reflect issues with the rating in tropical climates (the rating tended to over-rate buildings in the tropics). A further update to the Victorian benchmarks was applied in 2010 to respond to industry criticism that the benchmark was perceived as being set "harder" in that state than in NSW. South Australia, New South Wales and the Australian Capital Territory all use the original benchmarks developed in 1999, adjusted for the change in area assessment from 2000.

The concept of performance-based assessment had received a significant amount of interest within the Australian (Federal) government and in 2005 this was pursued with the development of a conceptual performance based rating scheme covering wide-based sustainability issues such as indoor air quality, waste, transport, water and energy. This scheme was called the National Australian Built Environment Rating Scheme (NABERS). The scheme was developed to a moderate level of detail and its operation was awarded on tender to the NSW Government team running NABERS (by that stage being the NSW Department of Energy Utilities and Sustainability), who also undertook to develop the rating to a full-release level.

As part of this work, a performance based water benchmark was developed for offices, which was released as NABERS Water for Offices in 2006. This was particularly timely as Australia was in the midst of a ten year drought and urban water consumption was a major issue. NABERS Indoor Environment and Waste ratings for offices were subsequently released, both also following the performance-based ethos of the original ABGR, but with necessarily a very different approach. ABGR and NABERS were integrated in 2009, a move which reflected the fact that ABGR was already operating as the energy/greenhouse

benchmark for NABERS; after the merger, ABGR became known as NABERS Energy for Offices. NABERS Energy and Water ratings for Homes were also developed in this period following a similar methodology.

In the period 2008-2009, further development work was undertaken to create performance based benchmarking systems for business hotels and shopping centres, subsequently released as NABERS Energy/Water for Shopping Centres and NABERS Energy/Water for Hotels.

To this point, NABERS had been an entirely voluntary system, with a voluntary uptake on approximately 60% of Australian office's net lettable area. . However, in November 2010 the declaration of NABERS ratings became mandatory for commercial office sale and lease transactions over 2000m², under the Building Energy Efficiency Disclosure Act 2010.

In 2011, the rating scale was expanded from its original 5 stars to 6 stars, reflecting the growth of a significant sector of the market outperforming what had originally been set as an aspirational limit in 1999; 6 stars was set at 50% of the greenhouse emissions of 5 stars, thereby pointing to a notional 7 star/ zero-emissions rating in the future.

3. NABERS – Key Structural Elements

3.1. Common Elements

The various NABERS Energy and Water ratings, which are the primary focus of this paper, share a common structure including a number of key elements:

- The ratings are based on actual consumption
- Corrections are made for unavoidable operational factors (e.g. hours of occupancy, climate) but not for efficiency related factors (plant, building envelope, age)
- The rating scale is based on a median building achieving a rating of approximately 2.5 stars, and an aspirational building achieving 5 stars. The minimum rating is 1 star; ratings of less than this are not certificated. As of 2011, the scale has been extended for all Energy and Water ratings (other than NABERS Homes) to include 6 stars at 50% of the emissions or water consumption of 5 stars. Half star ratings are awarded from 1.5 stars to 5.5 stars.
- The rating scale is bi-linear, with one slope from 1-5 stars and a different slope from 5 stars and above.
- Energy ratings are based on greenhouse emissions calculated from actual energy consumption. As emissions factors are significantly different from state to state, the positioning of the median is adjusted to compensate for this. As a result, the 2.5-3 star median holds true in each state individually, rather than states with greenhouse-intensive generators uniformly rating badly.

3.2. Offices Energy Ratings

Office energy ratings are divided into three categories:

- Base building ratings: Covering the services generally under the control of the landlord, being primary air-conditioning, lifts, common area lighting, and car parks.

- Tenancy ratings: Covering the services generally under the control of the tenant, being lighting within the tenancy, tenant equipment (i.e. computers etc) and supplementary tenant air-conditioning (i.e. for meeting rooms).
- Whole building ratings: Covering all base building and tenancy services.

These divisions reflect relatively common metering boundaries for building in Australia. The presence of this split in energy data, and the relative consistency of metering boundaries in the field, has played a central role in the success of the offices energy rating. This is because the base building rating provides a rating which is largely independent of tenant energy efficiency performance, and thus enables the advertisement of the building's performance in a manner that is largely independent of the current tenant profile. The metering boundaries are well aligned with control of energy using services, and well aligned with the office leasing market. This has been critical in creating the market transformation drivers discussed in Section 4.2.

The operational factors corrected for in office energy ratings are:

- Base buildings: Climate (indexed by postcode across approximately 80 climate zones), requested hours of service and net lettable floor area.
- Tenancies: Hours of occupancy, number of computers (as an index of general equipment density) and net lettable floor area.
- Whole buildings: Climate, hours of occupancy, number of computers (as an index of general equipment density) and net lettable floor area.

An approximate idea of the rating scale stringency within temperate mainland states is as follows, based on a building utilizing 80% electricity and 20% gas:

- For whole buildings: 2.5 stars threshold 996-1251MJ/m^2; 5 stars threshold 544-592MJ/m^2.
- For base buildings: 2.5 stars threshold 545-685MJ/m^2; 5 stars threshold 314-331MJ/m^2.

Across all states the 5 star threshold is typically 43-60% (base building) or 43-52% (whole building) of the 2.5 star threshold.

In terms of calculation, the office energy rating is structured differently from the other energy and water ratings, largely due to the age of the rating methodology itself. For the office rating the benchmarking methodology uses a normalized emissions basis for comparison of building with different operating characteristics. Under this approach, the gross emissions are calculated for the building and then corrected for operational factors which have been theoretically derived to create a normalized emissions figure reflecting the expected performance of the building normalized to Sydney climate, 50 hours a week occupancy and 8W/m^2 (at 200W total equipment per computer) overall equipment density. This normalized emissions figure is then compared to a fixed rating scale reflecting the performance of a standardized building operating under the normalized conditions.

This calculation methodology has served well over 12 years but has limitations for high efficiency buildings, as some of the normalization factors are additive and thus a zero-emissions building outside Sydney, for instance, has non-zero normalized emissions. This issue was known at the time of the original development but was seen as being "off the horizon" as at that stage the best ratings available were at 4 stars, while this issue only arises

for buildings well above 5 stars (as the normalization factors were effectively set based on a 5 star building). The 2011 update to extend the scale to 6 stars addressed this issue by fixing the gross emissions at 5 stars and calculating ratings above this as a fraction of the 5 star gross emissions.

A significant feature of the offices rating is that all of the normalization factors were derived theoretically. This to some extent reflects the limitations of the underlying dataset but also reflects the limited domain and range of such factors. Thus for instance, theoretical studies undertaken at the time of development predicted a change in gross emissions due to climate of less than 10% from Melbourne to Brisbane (a change in latitude of 10°, not allowing for differences in greenhouse emissions factors); this compares to the 200%+range of the rating scale. For hours, the dataset was generally limited to 50-70 hours per week operation. Derivation of a correction factor to extrapolate hours effects to 168 hours on this basis was not practical, so simulation estimates were used.

3.3. Offices Water Ratings

The Office Water rating is available as a whole building rating only and is normalised for climate, hours of operation and net lettable area only.

Unlike offices energy, and in common with all the other energy and water ratings, the water rating is calculated on a variable benchmark basis. Under this methodology, the median water consumption is calculated based on an equation that incorporates climate and occupancy factors, and the performance of the building is calculated based on the percentage deviation from this median. In effect this calculates the expected water consumption for a building in the location and with the hours of the sample building, and compares actual performance to that rather than trying to normalized the building itself to a standard.

Although this approach is functionally interchangeable with the normalized building method, it avoids the issues at high efficiency associated with the normalized building method.

The climate dependence of water consumption was found to be very strong, with the average water consumption in cool temperate regions (Melbourne, Adelaide, Canberra) being approximately 0.7kl/m² while in subtropical Brisbane the average consumption is 1.56kl/m²; extrapolation of these figures to cold climates aligns well with UK water consumption benchmarks (Bannister and Bloomfield 2007). As a result, the climate adjustment for the rating is based on empirical data. However for the same reasons as discussed earlier for the energy rating, a theoretical adjustment factor was derived for the hours correction.

3.4. Other NABERS Ratings

NABERS incorporates a number of additional ratings which follow the same performance based-philosophy as the offices energy and water ratings. In particular:

- Hotels: Energy and water ratings are available for business hotels. These are both based on the variable benchmark methodology but are otherwise very similar to the offices energy and water ratings. To date, 49 Energy and 53 Water ratings have been undertaken; there are 20 sites with current energy and water ratings at the time of writing.

- Shopping Centres: Energy and water ratings are available for the owners of shopping centres of greater than 15,000m². These are structured very similarly to the hotel energy and water ratings. However the energy rating is effectively a "base building" rating only as it rates the energy consumption of the owner which excludes tenancy lighting and power and also excludes a significant amount of tenant-provided air-conditioning. (Bloomfield and Bannister 2010). This results in a somewhat more complex rating, but one which is gaining recognition and use in the market place. To date, there have been 89 Energy and 85 Water ratings; there are approximately 45 sites with current energy and water ratings.
- Offices Indoor Environment. The offices indoor environment rating is based on measurement of key variables such as indoor air quality, noise and light levels. A base building rating is provided based entirely on measurements, while tenancy and whole building ratings incorporate post-occupancy evaluation surveys. Thirty one sites have undertaken Indoor Environment ratings; there are 12 current ratings at the time of writing.
- Office Waste. The offices waste measurement is based on measurement of normal office waste across a 10 working day period and provides ratings based on total waste quantity and percentage recycling. Thirty one sites have undertaken office waste ratings.

4. Market Impacts

4.1. Roll-out and Adoption

The program has grown immensely since 1999, as can be seen in Figure 1. The vast majority of ratings undertaken are office ratings, where the market penetration by floor area in 2011 has been estimated at approximately 66% for energy and 41% for water ratings (NABERS, 2012b).

In the early days of the scheme, there were relatively few ratings and these were generally conducted in a one-off manner. The level of interest increased markedly when the NSW Government nominated (appx 2002) that all NSW government leases should be in properties with a minimum rating of 3.5 stars for existing buildings and 4.5 stars for new buildings. As government is a major office tenant in Australia, this certainly engaged the attention of the upper property sector and led to much of the first phase of rating activity in the period 2002-2006.

The impact of this requirement on the market can be appreciated when it is understood that at the time the policy was released there were no 4.5 star buildings in NSW and thus no knowledge as to what would be required to build such a building. The rate of change in the market, however, was such that the requirement for *existing* buildings was reset to 4.5 stars after a period of only a few years

Rating activity was supplemented by the gradual adoption of a 4.5 star target for new and existing government leases by all states (except Tasmania) and the Australian federal government over the period 2002-2009. Mandatory disclosure of NABERS Ratings commenced in 2010.

4.2. Factors Driving Voluntary Adoption

The high level of voluntary adoption, which in turn led to the successful roll-out of mandatory adoption with remarkably little objection from industry, is a key factor in the success of NABERS. It is useful therefore to assess the factors contributing to this:

- Base Building/Tenancy Split. The ability to separately rate the base building in a manner that is largely independent of the tenants is a critical success factor for NABERS and also differentiates it from schemes such as Energy Star. In particular, the separate assessment of base buildings means that the base building rating can be used as a generic measure of efficiency in procurement i.e. it is possible to seek a base building rating without consideration of current tenant behavior and efficiency, and to expect that this rating will be able to be maintained through the duration of a new lease.

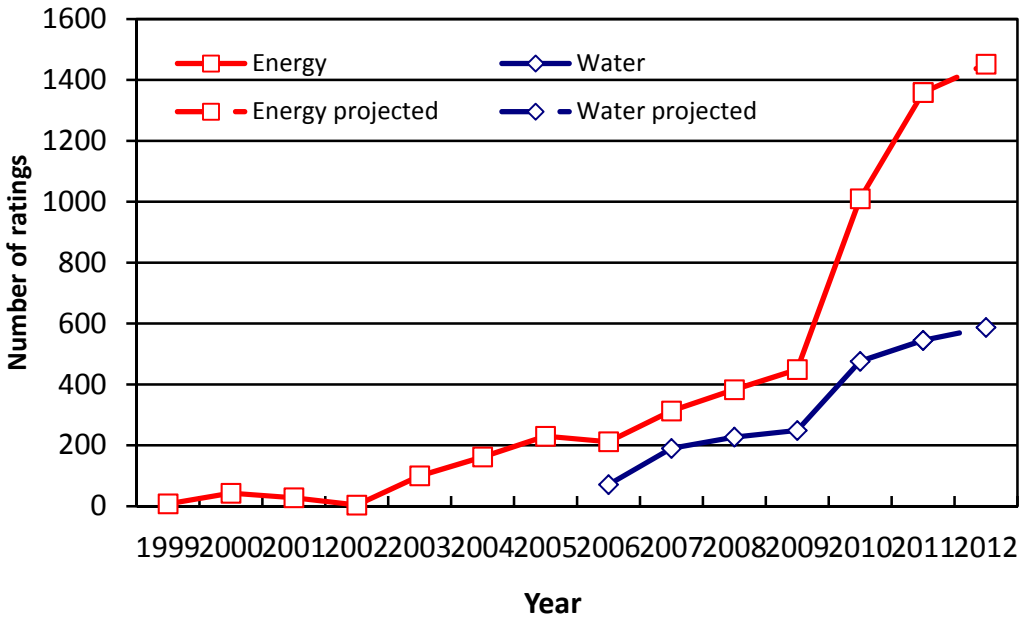

Figure 1. Number of ratings conducted. Figures from 2010 onwards include hotel and shopping centre ratings. Source: NSW Office of Environment and Heritage

- Government procurement. The incorporation of the base building rating into government procurement played an essential role in turning the rating from an object of technical interest to an object of commercial interest. This is because over a period of 5 years, the ability of higher star-rated buildings to obtain government leases (which are large, long, and low risk) has become recognized as a factor in building valuation. As a result, high NABERS ratings have increasingly become correlated with higher rents and higher capital valuations.
- Corporate sustainability. As the investor market has become more environmentally conscious, the ability of property to differentiate itself as an environmentally responsible investment option has played an increasing role in determining the NABERS aspirations of corporate and property trust portfolios. By setting and achieving strong environmental targets, Australian property funds have been able to

gain international recognition for sustainability performance, leading to increased investment.
- Core business vs efficiency. The factors above combine to move efficiency from being a technical issue to being a core business value. This changes the parameters of efficiency investment from a narrow energy-payback model to a model that considers efficiency as part of the general tenant service provision, and thus investment is driven by the prospect of improved lettability and improved rental rather than energy costs. This also has the effect of bypassing the traditional split incentives (most leases in Australia pass base building energy costs to tenants).

4.3. Industry Efficiency Improvements

All of the major property portfolios have embarked on a program of NABERS upgrades over the past 6 years. The results from these have been significant:

- Investa: Increase in average NABERS Energy Rating from 2.6 to 3.99 stars from 2003-2011; 43% reduction in portfolio emissions. Increase in average NABERS Water rating from 2.87-3.54 stars from 2005-2011; 43% reduction in portfolio water consumption intensity (Investa, 2011)
- Colonial First State (Commonwealth Property Fund): Increase in average NABERS Energy rating from 2.6 to 4.1 stars from 2005-2011. Portfolio average target of 4.5 stars by 2012. (Exergy, 2012)
- General Property Trust: Portfolio average NABERS Energy rating in 2011 4.6 stars, compared to average rating in 2006 of 2.7 stars (GPT, 2012)

Other portfolios are known to have policies in place and have achieved upgrades, but adequate public data is not available.

Further evidence of the impact of the rating is that in 2000, there was essentially no floor space rated at 4.5 stars or above, and the benchmarks were specifically constructed to make 5 stars aspirational. At the time of writing, of the 856 current NABERS Office Energy Base Building Ratings, approximately 10% were 5 stars and 2.5% were 5.5 stars, excluding those buildings for which the purchase of externally supplied zero-emissions energy had contributed to the achievement of these ratings.

It is also noted that most of the office-exposed retail portfolios are now rating their retail properties and are engaging in improvement works.

5. Lessons Learnt

Twelve years of NABERS operation in Australia has led to a number of valuable insights into market transformation.

Positive lessons include:

- Performance based benchmarks are feasible and valuable in the market place where they enable benchmarking of energy/water use within the control of the stakeholder.
- Achievement of reductions in excess of 40% from average performance to market leading is quite feasible even for buildings with conventional technology. There are

many standard design older buildings achieving 4.5 and 5 star base building NABERS Energy for Offices ratings.

- Achievement of 5.5 stars is possible with modulations of standard technology such as chilled beams, low temperature VAV and cogeneration/trigeneration.
- Government is an important stakeholder as a market participant and can significantly influence market behavior through its procurement policies.
- Base building office ratings are particularly valuable in the market transformation process due to their ability to be used in procurement. Where such procurement mechanisms have less impact – such as lower grade offices with smaller, less powerful tenants, the impact of the rating is significantly lower.
- Key to the success of the NABERS rating system has been an underlying set of benchmarks which are essentially fair, reasonably accurate and stable. Absolute accuracy is neither possible nor necessary for a successful rating system.
- Retail shopping centre ratings are more complex but feasible. The exposure of the retail portfolio owners to an active and transforming office market has assisted adoption of NABERS in the retail sector. Corporate social responsibility policy appears to be driving this activity rather than the more direct market actions visible n the office sector.
- Hotel ratings are of interest to the industry but in the absence of market drivers for this, adoption has been slow, but positive.
- Voluntary operation can, and has been, highly successful in the presence of adequate market drivers for adoption. Mandatory operation has become possible because of the credibility of the scheme in voluntary operation,; the value of mandatory operation comes in application to market sectors that do not have an adequate voluntary uptake; for base building ratings this has been the mid-grade market which is not greatly exposed to tenants with sufficient market power to demand high NABERS ratings as a procurement requirement for new leases.

Challenges include:

- Where there is no market driver, it is difficult to engage the same level of interest and market transformation as achieved with the base building ratings. Thus for instance, tenancy ratings – which have fewer market drivers - have not achieved the same level of success in market transformation as the base building ratings. Indeed, it is notable that the gap in efficiency culture and practice between building owners and tenants in the high end of the market is increasingly stark, even in buildings where tenants have sought high base building ratings.
- While the base building/tenancy split is fundamental to the success of the rating system, it is also a major challenge in that it forces the prescription of firm boundaries in a situation where boundaries are not necessarily conducive to optimum efficiency outcomes. NABERS manages this issue well through the use of boundaries that are appropriate and efficiency-optimising for the vast majority of the market, but inevitably there are some situations where the definition of strict boundaries does not lead to optimum whole-building outcomes. Furthermore, the prescription of boundaries inevitably leads to attempts to “game” these boundaries which impose an ongoing quality assurance burden on the scheme; indeed much of the content of the rules that govern the performance of ratings is associated with the correct identification and treatment of these boundaries.
- There are differences between the operation of buildings in temperature climates and tropical climates due to the far greater potential for control issues in the former. In

Australia, the tropical sector of the market is much smaller than the temperate sector and as a result has created a number of challenges for benchmarking over the life of the scheme.

- Management of a nationally consistent rating in the rather fragmented state structure of Australia has not always been conducive to the best long term outcomes due to the sheer number, diversity, resource levels and differences in interests and aspirations across the multiple administrations. This has had particular ramifications for the office rating, which has significant state-to-state benchmarking difference due to the progressive nature of the roll-out of the scheme. However, other benchmarks have been able to establish a more nationally uniform approach due to the credibility established by the energy rating.
- Regulation for mandatory ratings is a mixed blessing. Since the Building Energy Efficiency Disclosure Act has come into force, the politics surrounding the operation of the scheme have increased massively and it has become far harder to change the system, even where such change is known to be necessary.

Overall, the lesson learnt is that a well structured and targeted market-based mechanism can deliver significant efficiency gains by turning efficiency from a technical issue into core business.

5.1. Forward Actions

The rating scheme has achieved a high level of maturity and success but as always there are opportunities for improvement. In particular:

- After 12 years, it is time to review and update the NABERS office Energy benchmarks and rating systems using recent data, and potentially shift the rating from a normalized emissions system to a variable benchmark system. This also needs to include nationalization of the benchmark, which is currently discontinuous from state to state.
- There are actions in hand to introduce a “multi-tool” which will enable buildings of a mix of types for which ratings currently exist to be rated as a single, mixed use object.
- NABERS for Data Centres is due to be released in late 2012
- NABERS is currently being adapted for extension to New Zealand.

It is noted that the NABERS model has strong potential for extension into other countries, especially where there is appropriate separation of base building and tenancy consumption.

6. Conclusions

Across 12 years of operation, NABERS has become a major influencing factor on the energy efficiency of the Australian office market, and has directly driven a number of major portfolios to reduce emissions by in excess of 40%.

The success of the scheme has been driven by the use of different ratings for base buildings and tenants, enabling tenants, in particular, to use the base building rating as a procurement criterion for new buildings and leases. This has created a significant market driver that has linked efficiency to lettability and thus decoupled efficiency expenditure from energy pay-back. Major portfolios have achieved savings in excess of 40% across base building

performance, reflecting the strength of this driver. Governments at state and federal levels have played a crucial role in this by setting minimum NABERS requirements for base building performance for new government buildings and leases.

An important lesson from the development of the scheme is that the rating tool is only one small but important part of the overall machinery of the scheme. By creating a rating, one is setting a standard in which a very wide range of stakeholders have interest, and a great deal of conscious effort is required to manage the interests and expectations of these stakeholders while maintaining the technical integrity of the scheme. The long period of voluntary operation of the scheme was definitely helpful in this respect, as mandatory operation tends to discourage change, even where such change is desirable.

6.1. Acknowledgements

NABERS is owned and developed by the NSW government. The NSW Government administers NABERS on behalf of the Australian, State and Territory government nationally. For more information on NABERS see www.nabers.gov.au. The author has participated in the program as a developer of the rating system and as an auditor of NABERS assessments on behalf of the NABERS administrator.

The author wishes to thank all of the many people involved in the development and operation of NABERS over the past 12 years, and in particular: Nigel Isaacs, Sue Salmon, Chris Bloomfield, Matthew Clark and Yma ten Hoedt.

7. References

Bannister, P and Bloomfield, C. 2007. Water Consumption in Office Buildings in Australia, Sustainable Buildings Conference Hong Kong 4-5 December 2007.

Bannister, P. 2008. Business Hotel Consumption and Saving Opportunities. Sustainable Building Conference, Melbourne 2008. Note: this paper published some of the preparatory work for the NABERS Hotels rating.

Bloomfield, C and Bannister P. 2010. Energy and Water Performance benchmarking in the Retail Sector – NABERS for Shopping Centres. American Council for an Energy Efficient Economy Buildings Summer Study, Monterey California 2010

BRE 2012 Building Research Establishment www.breeam.org. Accessed October 2012.

Exergy 2012. Data gathered by Exergy Australia in 2012; this data will be released in the Colonial First State 2012 Sustainability report later in 2012.

GBCA 2012 Green Building Council of Australia www.gbca.org.au. Accessed October 2012.

GPT, 2012: www.gpt.com.au. Accessed October 2012.

Investa 2011. Investa Sustainability Report 2011, available at www.investa.com.au. Accessed October 2012.

NABERS 2012a. www.nabers.gov.au. Accessed October 2012.

NABERS 2012b. Data on the number of ratings and the % coverage of office floor area has been provided by the NABERS Administrator (Office of Environment and Heritage, NSW)

EU 2002. Directive EU 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

US GBC 2012 US Green Building Council www.usgbc.org. Accessed October 2012.

US EPA 2012. www.energystar.gov. Accessed October 2012.