

# Towards a National Framework for Energy Efficiency (NFEE)

## Issues and Challenges

### Discussion Paper Submission Proforma

#### Introduction

Thank you for taking the time to provide your feedback and comments on the Discussion Paper, Towards a National Framework for Energy Efficiency – Issues and Challenges. This optional proforma has been developed to assist you in your response, and to help us collate the responses received. If possible, it is preferable for responses to be submitted electronically to the Secretariat email address, [nfee.secretariat@deh.gov.au](mailto:nfee.secretariat@deh.gov.au), however written submissions can be sent to the NFEE Secretariat at GPO Box 621, Canberra, ACT, 2601. Electronic copies of this proforma can be downloaded from the NFEE website [www.seav.vic.gov.au/news/nfee.html](http://www.seav.vic.gov.au/news/nfee.html). The closing date for submissions is cob 12 March 2004.

Please note that, with the exception of contact details and energy use information, the intention is to ultimately place all submissions on the NFEE website unless they have been identified as confidential. This information on energy use is requested to enable the secretariat to broadly categorise the types of organisations from which submissions are received. If you regard your submission to be confidential in nature beyond the energy data, please mark the box below to advise the Secretariat that you do not want this submission made public.

I request that this submission be treated as confidential and not made publicly available

#### Organisation details

Name of Organisation:

Australian Institute of Refrigeration Air conditioning and Heating (AIRAH)
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Sector(s) (ANZSIC Code if relevant):

N/A
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About AIRAH

AIRAH has a long and proud history of representing an industry of professionals, who are of fundamental, and increasing, importance to the comfort, health and safety of the community.

Formed in 1920, AIRAH is recognised by government and industry bodies for our expertise across a wide range of issues in the area of engineering services for the built environment.

AIRAH encourages world best practice within the industry.

Through continuing professional development, Accreditation programs and a wide range of technical handbooks and publications, AIRAH has earned a reputation for developing the competence and skills of industry practitioners so that they can better meet society's evolving demands on health, safety and environmental impacts.

As the leading specialist membership association for air conditioning, refrigeration, heating and ventilation professionals, AIRAH influences over 10,000 professionals across Australia. Now in its 84<sup>th</sup> year, AIRAH's longevity stems from the successful delivery of key member benefits including representation, dissemination of information, networking, member recognition and education and training.

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## Section 5 of Discussion Paper – What are the barriers to further action?

Which of these identified barriers does your organisation / body strongly agree or disagree with and why? Are there any barriers that your organisation / body thinks should be added to those mentioned in the paper?

Relevant information is not always available at the right time to the right people to enable informed energy efficiency choices to be made.	From the perspective of Building services design engineers:  Agree – little time and importance is placed on evaluation of energy efficient solutions by clients on the whole. Owner occupiers tend to place greater value on researching the benefits of energy efficient solutions as they are the ones paying the ongoing energy costs. The majority of medium to small developers however are in the business of maximising profit upon completion/sale of the building and hence look for lowest capital cost / shortest timeframe solutions.
The policies and programs that only provide information do not address or overcome behavioural barriers and inertia.	Agree – the framework needs to address a lot more that just information – incentives or legislation may be the main drivers.  Needs a stick and carrot approach, small stick to get attention and large carrot to provide incentive.
As energy is a small proportion of total expenditure for most consumers, the potential savings aren't perceived as justifying the necessary investment in time and effort to consider and implement energy efficiency improvements.	Agree - Accountants / decision makers need to have the savings put in terms they understand – eg energy savings in a hospital may be equivalent to 3 new registrars salaries  In existing buildings there are different levels of expenditure for returns on energy savings:- <ol style="list-style-type: none"> <li>1. Low cost – eg Simple behavioural changes – eg switching off equipment when not in use etc – involves education</li> <li>2. Medium cost – eg Minor upgrades / recommissioning of systems / updated controls systems / good practice plant maintenance</li> <li>3. High cost – eg Plant replacement / reconfiguration</li> </ol> For potential savings to be evaluated, research must be done to allow energy efficiency spending considerations in future budgets.  Normal economics don't apply to energy as the cost of energy is too low when compared to the available finite limit of prime fossil fuels. We may need a shift in thinking (outside the square) when addressing these issues, such as a special life cycle costing process to reflect the available energy theory for example (exergy and anagy) for the whole system for whole of life for the type of energy to be utilised. May be too technical but fit the problem.
Many organisations do not have easy internal or external access to the necessary expertise or tools to identify or take advantage of the available energy efficiency opportunities.	Disagree – The expertise is close by, AIRAH is just one organisation that has been helping with lots of relevant programs in this area .Programs such as the AIRAH Residential Best Practice Guidelines, Energy Training modules (design, audit, maintenance), conferences (several in the last 2/3 years) the Energy Auditor Register – are some examples of tools readily accessible. The main difficulty is in the communication of tools available and the cost of utilising them.
There are limits and priorities on the capital available to any organisation—and energy efficiency has to compete for this capital with other potential investments.	Agree although the people making the financial decisions don't always have a full understanding of the benefits of energy efficiency savings.
Organisations appear to use a higher hurdle rate for energy efficiency investments than for other investments.	Don't know  Need special life cycle costing consideration as outlined above.

In some situations the financial incentives are split—the person or organisation that would need to invest in the energy efficiency improvement is separate from those that will gain the benefits of the resulting reduction in energy use.	Agree – from the building services perspective. Usually it is the tenant that will benefit from the developer/investor spending the initial capital on energy efficient options.
There is uncertainty regarding the consistency and adequacy of resources, and continuity of government measures over the long-term.	Agree Governments give the impression of saying one thing and then not supporting their own policies. The continual state by state regulations that National companies have to cope with are a significant burden. Governments create duplication and inconsistency through whilst all are supposedly trying to achieve the same outcomes
Energy efficiency is not broadly integrated into the current curricula of TAFE's and universities, or the professional development programs of both professional and trade organisations.	Agree/Disagree TAFE's and universities are slow and meandering when developing new curricular and they are not close enough to industry to develop suitable programs. Industry associations respond more quickly to the development of educational programs – these programs can then be delivered through the existing educational institutions or the organisations themselves.. AIRAH has worked closely with energy efficiency experts to develop a suite of courses – there simply is not the incentive to encourage people to upskill in this area.
There is a lack of evidence of achievements from energy efficient applications and government measures as a result of a lack of consistent measuring and reporting of energy use and efficiency.	Agree There is a large amount of confusion in the market about measuring and reporting. The multiplicity of rating schemes has created its own barrier. The lack of evidence has created a degree of scepticism about energy efficiency initiatives.
Additional barriers	In the mechanical services sector – HVAC -(heating, ventilating, air conditioning) <ul style="list-style-type: none"> <li>• Designers are not involved in the early decision making stage of projects and have little or no impact on final design</li> <li>• Poor commissioning of systems means they are not operating as designed</li> <li>• Poor maintenance of building services once installed reduces efficiency</li> <li>• Policies and programs need to look at existing buildings as well as new buildings</li> <li>• Accounting techniques – lack of understanding of the benefits of sound life cycle costing / cost benefit analysis by decision makers</li> </ul>

What does your organisation / body see as the major barrier(s) you face in accelerating the uptake of energy efficient practices and technologies? (Prioritise / highlight those barriers that are particularly important to your organisation / body)

<p>Lowest capital cost options taken by developers  Mechanical services designers are left out of the early decision making phase of projects  Lack of time allotted by developers to examine energy efficient options available for buildings  Lack of education and training of all parties  Poor commissioning of mechanical services systems  Poor maintenance of mechanical services systems</p>
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## Section 6 of Discussion Paper – What are the challenges to achieving more?

## General challenges to be addressed

Which of these identified challenges does your organisation / body strongly agree or disagree with and why? Are there any other challenges that need be added to those already listed in the paper?

Ensuring appropriate incentives and support be provided so that continuous improvement in energy efficiency becomes a mainstream and self-sustaining business activity in Australia.	Strongly Agree Needs a stick and carrot approach, small stick to get attention and large carrot to provide incentive?
Building a self-sustaining energy efficiency industry in Australia.	Agree Needs, government incentive and framework for industry association to work too!
Ensuring that the necessary expertise exists and is available to consumers to identify and implement energy efficiency opportunities.	Agree
Making it easier or cheaper for consumers to exploit the opportunities for energy efficiency savings. For example, assisting to overcome or minimise the transaction costs of implementing energy efficiency measures.	Disagree Think this was tried in the 90's – people received 50% of the cost of an energy audit. All it meant was many audits being done but little action taken
Reducing inertia and increasing the motivation to implement energy efficiency opportunities, for example by increasing the perceived level and range of benefits in implementing energy efficiency opportunities.	agree
Making energy efficiency important enough for decision makers to devote time and resources to addressing the opportunities. For example, in the shortterm, how can the necessary level of senior management awareness of the issues and opportunities be raised?	agree
Connecting the savings produced with those who are required to make the investments, particularly in the industrial and commercial building sector.	Agree Consider an energy bank, set up with a small, very small, and acceptable tax surcharge on fuel.
Encouraging and facilitating internal or external access to the required capital for investment in energy efficiency opportunities—for example, by raising the internal priority for investment in energy efficiency or spreading the costs or risks.	Agree
Assessing the extent of information gaps, and ensuring that relevant, consistent and non-duplicative information (from awareness raising to detailed technical information) gets to the right people at the right time.	Agree One set of rules for all states and territories is essential.
Encouraging increased monitoring of the necessary information and encouraging the provision of this information to consumers and the government to ensure that measures and application are effectively delivering the desired outcomes.	Strongly agree
Developing a long-term nationally consistent approach to energy efficiency while maintaining sufficient flexibility for regional or jurisdictional initiatives.	Strongly agree

What does your organisation / body see as the major challenge(s) you face in accelerating the uptake of energy efficiency practices and technologies? (Prioritise / highlight those challenges that are particularly important to your organisation / body).

Provision of consistent and Australia wide clear and concise messages, with achievable targets and feed back on achievements.

What possible solutions does your organisation / body propose to effectively address these general challenges?

Extending the existing AIRAH Accreditation program to provide structured leading edge training (in accordance with Building Code energy provisions – to be introduced 2005). This will result in a pool of qualified skilled persons who can clearly be identified as being able to achieve best practice standards in all aspects of design and maintenance of energy efficient solutions.



What potential opportunities does your organisation / body foresee as being realised from the resolution of these general challenges?

Through the development of a formal education process, an increase in awareness and information transfer will be improved through formal training and an increase in the development of reference material, seminars, conferences, tutorial and technical evenings.

**Sector specific challenges** (Please indicate which one(s) your response refers to)

<input type="checkbox"/> Industrial	<input checked="" type="checkbox"/> Commercial	<input type="checkbox"/> Residential	<input type="checkbox"/> Conversion	<input type="checkbox"/> Intermediaries
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Which of these identified sectoral challenges does your organisation / body strongly agree or disagree with in your sector(s) and why? Are there any other challenges that need be added to those already listed in the paper?

What does your organisation / body see as the major sectoral challenge(s) you face in accelerating the uptake of energy efficiency practices and technologies? (Prioritise / highlight those challenges that are particularly important to your organisation / body).

Mindset  
Cost of energy

What possible solutions does your organisation / body propose to effectively address the specific challenges?

Accreditation, education / training / dissemination of information in monthly journal and website

What potential opportunities does your organisation / body foresee as being realised from the resolution of the specific challenges?

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**Other comments, recommendations and feedback**

Attached for your information are the results of a member survey undertaken May 2003 which substantiates the views expressed in this proposal.
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*engineering a better built environment*

**Member Survey  
Energy Efficient Design  
in the  
Commercial Building Sector**

**Report prepared by AIRAH**

**May 2003**

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## **Executive Summary**

There is a great deal of interest amongst AIRAH members (who are specialists in a variety of disciplines in the air conditioning, refrigeration, heating and ventilation industry - HVAC), in the field of energy efficient design.

To date, AIRAH members have shown a commitment to minimising energy use in the HVAC industry by implementing a range of best practice principles through voluntary programs.

According to AIRAH members, the most crucial barriers to the adoption of energy efficient design and operation in commercial building projects today are:-

- Developers and financial backers looking for the lowest capital cost design solutions to maximise their returns on today's projects.
- Designers of buildings and their services are left out of the early decision making stages of projects.
- The lack of time allotted by developers to examine the various energy efficient options available for buildings.
- Poor maintenance standards of existing equipment.
- Poor commissioning of well designed systems.
- A general lack of formal industry training and education

## **Introduction**

### **Terms of Reference**

Since the late 1980's, AIRAH has been involved in the development and delivery of education on energy and its efficient use in the commercial building industry. Several energy efficiency focused education courses have been conceived and developed and are currently being delivered. In looking for future directions in energy AIRAH worked with key members to determine what areas must be addressed to minimise energy use.

A working group was convened in November 2002 to look at the major issues hindering the adoption of energy efficient HVAC designs as everyday practice in the Australian building industry. This working group comprised representation from all facets on the HVAC industry including installers, designers and academics.

### **Reasons for Concern about Energy Efficient Design**

The efficient usage of energy is environmentally and economically beneficial and the cost of energy is likely to rise in the foreseeable future, but the building industry still appears to be reluctant to improve energy efficiency through design. Future energy supplies are limited and will have to be used far more efficiently to ensure a reduction in greenhouse gas emissions. We have already seen situations in Australia where states have had to purchase electricity from each other to meet peak demands in the summer months.

In 1999 the Australian Greenhouse Office (AGO) produced a report on the greenhouse gas emission levels from the Australian Commercial Building sector [1]. They reported that, over the next decade, the commercial building industry will need to recognise and address greenhouse concerns. It comes as no surprise that as much as 60% of energy consumed in the commercial building sector is attributed to heating, cooling and ventilation [1]. There are many opportunities for reduction in greenhouse gas emissions in the commercial building sector, including of energy efficient design and installation of heating ventilation and air-conditioning systems.

There is still a very slow uptake of energy efficient technology in the marketplace today. A few high profile financial backers and developers have delivered some excellent examples of what can be achieved with a shift in thinking about the design process and a change in approach for

today's projects, but on the whole there is little change in the way commercial buildings are being designed and built. Currently there is little or no legislation governing energy efficient design and there also appears to be very little incentive for buildings to be built to operate more efficiently.

The relatively low current cost of energy means that there is little financial incentive driving change and there appears to be very little understanding outside the HVAC industry about what can be achieved through energy efficient design.

The situation of commercial buildings being inefficient to operate will ultimately improve. Standards and the Building Code of Australia (BCA) will need to encourage market direction but that will require educating the market, and having resources and materials to design and deliver the buildings. The HVAC industry is in a position to take responsibility and educate its customers and members on the economic, competitive and social advantages that follow on from designing and constructing energy efficient buildings.

## **Approach**

### ***AIRAH Working Group***

The group convened in November 2002 focused on the barriers to energy efficient design of HVAC systems being adopted in today's marketplace. A number of fields were addressed, including consulting issues, education matters both internal and external to our industry, and engineering practice.

The group highlighted a large number of barriers, and further work was required to determine the overall HVAC industry position. A list of the main issues given in Appendix 1.

To derive an overall position from the industry on the barriers to energy efficient design in the commercial building sector, AIRAH conducted a survey of its members.

### ***Survey***

The survey was conducted in April 2003, with a questionnaire being distributed to over five hundred AIRAH members nationwide with a specific interest in energy. Over 100 responses were received. The questionnaire topics are stated in Appendix 1 of this report and an overview of responses is outlined below. Members surveyed were representative of all States and Territories and from the following sectors of the industry:

- Energy Purchasing Managers for multinational corporations
- Energy Auditors
- Designers
- Contractors
- Equipment manufactures and suppliers
- Property owner representatives
- Facility managers
- Government employees responsible for energy
- Controls companies

## **Barriers to Sustainable design and Best Practice**

### **Summary of the survey responses**

Following the analysis of the questionnaire responses received, the results were compiled (see Appendix 1) and a summary is presented below of the industry position on barriers to energy efficient design in the commercial building sector.

### ***Capital Cost Price Driven Options***

Builders and developers are mainly interested in short term payback on building projects as a result of this, the majority of HVAC designs are currently measured on their capital cost value, with full life cost very rarely a consideration at the design stage. Clients are not always aware of energy efficient design options and their benefits, and hence are rarely specifying their inclusion in their briefs to designers.

Innovative design solutions that do get considered are often not adopted due to the initial capital cost forecasts by project managers.

### ***Developers Driving Market***

In the majority of cases the developers and financial backers of projects are driving the building market and their prime concern is maximising short-term profit. It would appear that there is very little input from other stakeholders at the design stage of any project. This leads to a short-term view being taken in the design process.

As an example tenants can have some very valuable input to design matters, typically only those that are considered to be “A grade” tenants have a chance to provide input.

### ***Design Time Frame***

The short time frame allowed for the services design stage (conception to tender) restricts the possibility for innovative/energy efficient solutions to be developed. Designs could be improved with more time and increased fees. Currently there is not enough time in the project cycle given to explore innovative solutions for projects. Developers and builders do not want to pay for what they perceive to be expensive, out of the ordinary systems, so they do not allow the time or money for energy efficient options to be considered. It is possible for designers to specify energy efficient system components in the current time frames, but overall improved holistic system approach takes more time.

There is also a strong case that there is more chance of energy efficient solutions being considered if the designer is involved at the building concept stage, so timing in the project is important also.

### ***Inappropriate Fee Structure***

Designers in today’s marketplace are finding themselves working for low fees and competing for jobs on price, not experience. This is precluding innovative and energy efficient solutions being delivered. With falling design fees there has been a move to reduce training of younger engineers, and as a result companies are employing less qualified, less experienced staff, which affects the quality of the resulting designs, including the design of energy efficient solutions. With lower design fees, off the shelf design solutions are repeatedly used to meet the time constraints that are imposed by limited fee budgets.

### ***Non-Uniformity of Regulations***

There are a number of different acts and regulations across Australia requiring different minimum design standards. It is difficult and time consuming for a designer to gain an understanding of the various requirements. The survey results showed that the majority of respondents do not work across state boundaries, but those that do find it a problem keeping up

to date with the myriad of legislation that is continually changing. With a trend towards a more mobile workforce and it is felt that this issue will become more of a problem. At a local level younger engineers are not always well versed in the use of the BCA and the industry related Australian Standards.

### ***Poor Installation***

The poor installation of well designed, energy efficient systems is resulting in inefficient operation of the systems.

There has been a boom in the building industry over recent years and this, coupled with reduced training in the contracting side of the industry, has resulted in a deterioration of skill levels. These skill shortages lead to a lack of understanding of the design intent by the mechanical contractor. Aspects of building construction that affect the operation of the HVAC systems are also not picked up by staff on site (e.g. removal of shading devices, increased window areas, omission of insulation, etc.).

Today's building practices also preclude the involvement of the design consultant at installation and handover stage of a project. This comes from cost cutting strategies employed by many builders. As a result, poor installations and on site problems are not picked up in the construction phase of a project.

### ***Poor Commissioning***

Many well designed and well installed systems are inefficiently operated as a result of poor commissioning and balancing.

Good commissioning and balancing of a project is crucial to maintain user comfort and ensure the plant is operating as effectively as possible. The survey identified that there is a great lack of knowledge between the designer, who doesn't understand or get involved in the commissioning process, and the commissioning personnel that do not fully understand the way in which the design is supposed to operate. There is often very little time/budget at the end of a project for sufficient commissioning to be undertaken involving close attention to detail and spot checks.

### ***Poor Maintenance***

Poor maintenance is one of the major contributing factors to inefficient energy usage in systems. There is a great lack of understanding of the design intent by building owner and maintenance contractors. This may be due to complex designs. One of the other main factors cited a number of times is the unwillingness of owners to spend money on maintenance, resulting in plants falling into disrepair and work only being done when absolutely necessary.

Poor handover of new buildings to users and insufficient guidance on operating and maintenance manuals also has a great impact on poor operation of buildings.

### ***Energy Modelling***

There is currently a lot of skepticism about the reliability of results of energy modeling programs. The BCA will incorporate minimum energy usage targets in the next 2 years and there is currently no formal industry training or accreditation of energy modeling practitioners here in Australia. There are a number of different energy modeling software packages available on the market today but the lack of adequate training and assessment for designers using these packages limits the reliability of the results. These programs are expensive and difficult to use properly. There is also very little verification of whether energy modeling matches real performance. It has been suggested that it can be easy to alter inputs in modeling programs to provide any desired result.

### ***Addressing BCA Design Criteria / Alternative Solutions***

The BCA allows for deemed to satisfy and engineered solutions. There is a low level of uptake of engineered solutions submitted on projects.

Only a minority of those surveyed did not have strong feelings about this issue.

This low uptake of engineered solutions is a result of inadequate training of engineers in Australia, which also hinders the implementation of energy efficient solutions. There is no well-recognized building services design course available at tertiary level and staff new to the industry have to rely on the job experience.

With today's low design fees there is very little opportunity to learn about design solutions that fall outside of BCA deemed-to-satisfy type. Innovation for energy efficient performance based solutions is not rewarded, therefore there is little incentive for companies to pursue them.

### ***Lack of Understanding by Principal Certifying Authorities (Building Surveyors)***

Principal certifying authorities (PCAs) have a great lack of understanding of how energy efficient designed systems operate.

They often do not have the relevant mechanical/electrical engineering expertise that is required to satisfactorily evaluate energy efficient designs and often the certifiers generally accept the design engineer's own certification.

### ***Problems Inherent in Systems Engineering***

Poor system integration of individual plant components is leading to higher than necessary energy consumption in buildings.

There have been improvements in the efficiency of individual pieces of equipment (chillers, cooling towers, pumps etc.), but there is a great knowledge deficiency in the understanding of systems integration by many in the industry. System integration has to be considered very early in the design of any project to achieve maximum energy efficiency potential, but due to lack of education and competence of design engineers this rarely happens.

### ***Inadequate Part Load Information for Equipment***

The ability of engineers and building designers to do true and effective comparative performance and life cycle cost assessments is severely hindered by the lack of part load performance data from equipment suppliers.

In most cases equipment manufacturers are supplying the demand of the market place, which is currently focused on low cost solutions. Technical information is costly to produce and equipment manufacturers have no incentive to outlay research money in the development of it.

### ***Inadequate Rating of Equipment***

There is a lot of equipment out in the marketplace that is not correctly rated in manufacturers technical guides. Good design is undermined by equipment that does not perform as specified by the manufacturer. This is a chronic problem throughout the industry, particularly with items that involve heat and mass transfer such as cooling towers. Rating of equipment is expensive and difficult due to the wide variety of design conditions throughout Australia and on site performance measurements are difficult.

### ***Life Cycle Costing / Cost Benefit Analysis***

There is an industry wide lack of understanding of the benefits of sound life cycle costing (LCC) and cost benefit analysis. This is precluding broader understanding, and adoption of energy efficient options. Developers and builders rarely have an ongoing role in the running of a building once construction is complete so they are only interested in first cost figures of a project. They are reluctant to pay for this type of analysis; nor do they want to pay for the alternative type systems that LCC show to be beneficial.

### ***Accounting Techniques***

Today's accounting practices do not take into account the triple bottom line of economic, societal and environmental needs.

In today's marketplace, energy prices are relatively cheap and the majority of accounting practices are based on immediate maximum returns for shareholders. There is very limited knowledge in the industry about the cost of environmental degradation, and a great reluctance in looking at longer payback periods.

### ***Rapid Technology Changes***

There is a lot of new energy efficient technology available, but industry is struggling to keep up to speed with what works and what doesn't. Lack of time to research the technologies is one major factor but there is a great lack of basic knowledge and understanding of how existing technology works as well, so the understanding of how new technology works proves increasingly difficult for many in the industry. A lot of overseas technology is simply shunned on the pretext that it is not suitable for the Australian climate without it being tried and tested. People often lack the understanding of how to apply it to our situation.

### ***Lack of Research and Development (Funding Issues)***

The lack of research and development in Australia prevents the development of new and innovative energy efficient options. There is little or no funding to support research and development and there is a lack of awareness and embracement in Australia by engineers and designers of existing and tried/tested technology which is being used overseas. This is highlighted by a number of good energy efficient designs that start off in Australia but get no funding and can often end up overseas.

### ***Energy Efficiency in Existing Buildings***

Existing building stock is a huge source of wasted energy. Current energy costs are relatively low and there is little incentive for building owners to minimize energy usage. There are no requirements for existing building stock to be energy audited and have energy saving measurers put in place. The BCA has introduced energy standards for residential dwellings this year and is due to introduce energy standards for new commercial buildings. These standards are at least 2 years away and will have little impact because of the low volume of construction activity. Most of the building stock for the next 20 years already exists.

### ***Sales Practices***

Incentive / sales practices of suppliers may compromise energy efficient design integrity. It is unreasonable to think that this is a major contributing factor to poor energy efficient design. The MEPS program is reducing the opportunity for poorly rated equipment to be allowed in the marketplace and designers understand that it is their responsibility to understand products that are offered and verify supplier's claims.

### **Additional issues identified by survey respondents**

Where requested to identify further issues that are affecting the adoption of energy efficient design in commercial buildings it was reiterated by respondents that there is a great knowledge gap in the marketplace. There is a lack of knowledge by the end user (tenant) that there are continuous and substantial savings to be made by using energy efficient designs.

There is a lack of education of developers and financial backers who currently only focus on a very short time frame for payback for their projects.

There is also a huge deficiency of training and education for today's graduates coming into the industry. Australia has no specialised building services degrees and once graduates enter the industry there is very little if any continued training amongst the consultants.

## **Ranking of issues**

Questionnaire respondents were asked to indicate which of the topics they felt were the 5 main barriers from those discussed.

The six most significant issues were:

- Developers and financial backers looking for the lowest capital cost design solutions to maximise their returns on today's projects.
- Designers of buildings and its services are left out of the early decision making stages of projects.
- The lack of time allotted by developers to examine the various energy efficient options available for buildings.
- Poor maintenance standards of existing equipment.
- Poor commissioning of well designed systems.
- A general lack of formal industry training and education

## **Conclusions and Future Work by AIRAH**

The initial results of the working group and survey have indicated that there are a number of issues that need to be addressed by industry to encourage the uptake of energy efficient design. Some of these problems are internal to the HVAC industry and relate to the level of education and training. Through the knowledge and expertise within its membership, AIRAH finds itself in a strong position of being able to develop and provide the training and education for this sector of the industry.

A number of the issues highlighted in this study relate to parties outside the HVAC sector and AIRAH must effectively position itself to provide understandable expert technical guidance and support to these parties. Further work is required to progress a whole of industry approach to counter barriers to energy efficient design being adopted.

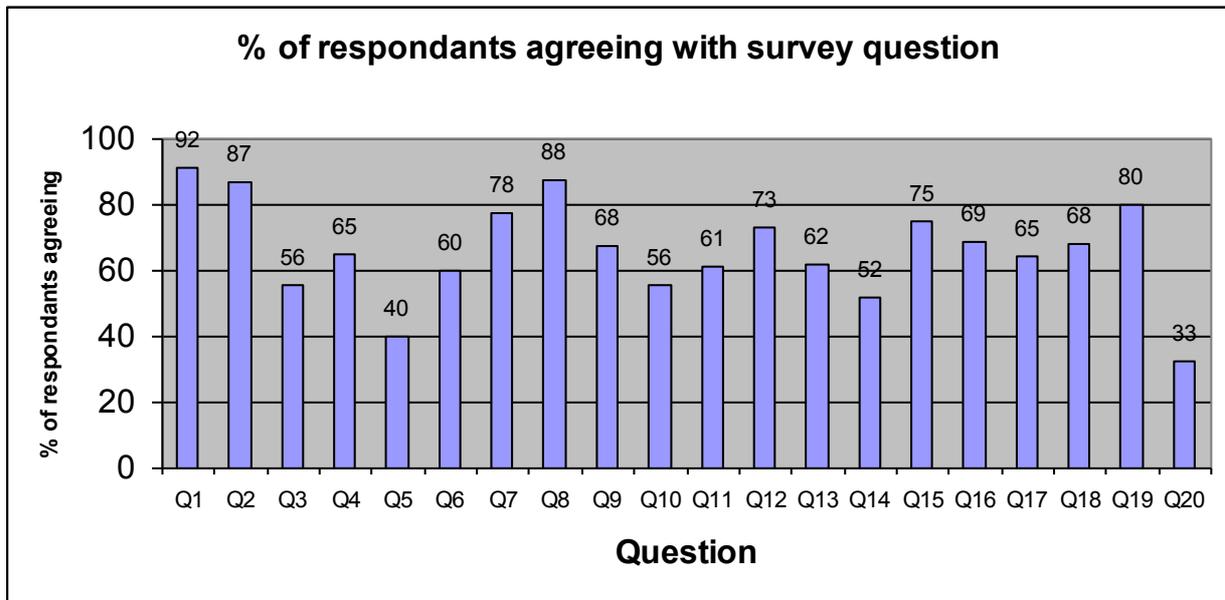
AIRAH must work closely with the Federal and State governments providing effective advice to enable sound decision making.

AIRAH must also work closely with the Australian Building Code Board (ABCB) to ensure that energy measures that are to be mandated for commercial building in the BCA are realistic and achievable.

## **References**

1 Australian Greenhouse Office "Australian Commercial Building Sector Greenhouse Gas Emissions 1990-2010" 1999

## **Appendix 1 – Survey data**



**Fig 1 Summary of responses to Questionnaire issued in April 2003 (questions summarised below)**

Respondents were asked to indicate, on a scale of 1 to 5, the degree to which they agreed with the following statements:

**1. Capital Cost Price Driven Options**

In today's market there is a tendency to adopt the lowest capital cost design solution – not the most energy efficient solution

**2. Developers Driving Market**

Developers and financial backers of projects are driving the market and not those involved directly with the design and operation of the buildings.

**3. Design Time Frame Issues**

It has been suggested that the typically short time frame allowed for the design stage (conception to tender) restricts the possibility for innovative/energy efficient solutions to be developed.

**4. Inappropriate Fee Structure**

Low design fees in today's market preclude innovative and energy efficient solutions.

**5. Non-Uniformity of Regulations**

There are a number of different acts and regulations requiring different minimum design standards. For a designer to gain an understanding of the various requirements adds an unreasonable time and cost penalty.

**6. Poor Installation**

It has been suggested that the poor installation of well designed energy efficient systems results in inefficient operation of the systems and negates the intention of the original design.

**7. Poor Commissioning**

Many well designed and well installed system are inefficiently operated as a result of poor commissioning and balancing.

**8. Poor Maintenance**

You can have the best designed system in the market but if it is not maintained to a high standard it is not going to operate efficiently.

**9. Energy Modelling**

There are a number of different energy modelling software packages available. It has been suggested that a lack of adequate training and assessment for designers for these packages limits the reliability of the results.

#### **10. Addressing BCA Design Criteria / Alternative Solutions**

The BCA allows for deemed to satisfy and engineered solutions. The low level of uptake of engineered solutions is a result of inadequate training of engineers, which hinders the implementation of energy efficient solutions.

#### **11. Lack of Understanding by Principal Certifying Authorities (Building Surveyors)**

It has been suggested that there is a lack of understanding by certifying authorities of how energy efficient designed systems operate.

#### **12. Problems Inherent in Systems Engineering**

There have been improvements in the efficiency of individual pieces of equipment (chillers, cooling towers, pumps etc.). Poor system integration of these components does not in the current market, achieve maximum potential energy efficiency.

#### **13. Inadequate Part Load Information for Equipment**

Lack of availability of part load information from equipment suppliers makes it difficult to accurately model energy usage for different systems within buildings

#### **14. Inadequate Rating of Equipment**

Good design may be undermined by equipment that does not perform as specified by the equipment manufacturer.

#### **15. Life Cycle Costing / Cost Benefit Analysis**

It has been suggested that there is an industry lack of understanding of the benefits of sound life cycle costing / cost benefit analysis prevents energy efficient options being considered.

#### **16. Accounting Techniques**

Today's accounting practices do not take into account the triple bottom line of economic, societal and environmental needs. Until there is a paradigm shift in this mentality, uptake of energy efficient designs will be compromised.

#### **17. Rapid Technology Changes**

Current industry practices do not encourage the effective knowledge management of new technological advances.

#### **18. Lack of Research and Development (Funding Issues)**

It has been suggested that the lack of funding for research and development in Australia prevents the development of new and innovative energy efficient options.

#### **19. Energy Efficiency in Existing Buildings**

The current lack of requirements for existing building stock to be energy audited and comply with new BCA standards is resulting in large-scale energy waste.

#### **20. Sales Practices**

It has been suggested that the incentive / sales practices of suppliers compromise energy efficient design integrity.

#### **21. Other Issues**

If you believe there are any other issues that are creating barriers to sustainable / energy efficient design in today's market please outline them below.