



AIRAH Advocacy

# Response to Australian Government Review

---

**CLIMATE CHANGE POLICIES 2017**

## Prepared by:

**Phil Wilkinson**, F.AIRAH, Executive Manager; and **Vince Aherne**, M.AIRAH, Technical Manager  
Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH)  
3/1 Elizabeth Street, Melbourne, VIC 3000 | Tel: 03 8623 3000 | [www.airah.org.au](http://www.airah.org.au)  
Any questions or comments please email: [phil@airah.org.au](mailto:phil@airah.org.au)

## About AIRAH

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) is an industry-led organisation that represents the entire heating, ventilation, air conditioning and refrigeration (HVAC&R) value chain, from the tradesperson on site through to university-educated engineers, researchers and business leaders. This overarching perspective – and reach to more than 25,000 industry participants – positions AIRAH well to develop and promote a safe, sustainable, healthy and comfortable built environment for Australia's future.

The 21<sup>st</sup> century imperatives of emissions reduction and energy productivity present our nation with significant change, challenges and opportunities. It is important that all stakeholders from the built environment and refrigeration sector come together to meet these challenges, because all of us have a part to play in achieving low emissions and in ensuring that technical challenges are met and risks are mitigated.

AIRAH is keen to work with all levels of government to improve the environmental performance and safety considerations of existing and new HVAC&R systems. We envisage a collaborative effort to get and keep positive action firmly on the agenda. AIRAH appreciates that it is important for all stakeholders to understand not only the vital role the HVAC&R industry has in the wider economy, but also the role the industry can play in helping Australia achieve its environmental aspirations, and international and national commitments.



## COVER SHEET FOR SUBMISSIONS

### 2017 review of climate change policies Discussion Paper

<b>Overview</b>	
<p>The Discussion Paper provides an overview of the Government's current climate change policies and invites input from business and the community on how Australia can build on the success of current policies to achieve our 2030 target.</p> <p>To guide input, questions are posed at the end of each section. Stakeholders are encouraged to include a one-page executive summary.</p>	
<b>Contact details</b>	
<b>Name of organisation (where applicable)</b>	Australian Institute of Refrigeration, Air conditioning and Heating (AIRAH)
<b>Name of author</b>	<b>Phil Wilkinson - Executive manager, government relations and technical services</b>
<b>Contact person (If not the author)</b>	<b>Phil Wilkinson</b>
<b>Phone number</b>	<b>(03) 8623 3003</b>
<b>Email</b>	<b>phil@airah.org.au</b>
<b>Address</b>	<b>Level 3/1 Elizabeth St Melbourne Vic 3000</b>
<b>Website (optional)</b>	<a href="http://www.airah.org.au">www.airah.org.au</a>

<b>Optional: to assist with reviewing feedback please indicate if your submission addresses the following</b>					
<b>Electricity sector policies</b> (including the Renewable Energy Target)	Yes	<b>Emissions Reduction Fund</b>	Yes	<b>Safeguard Mechanism</b>	No
<b>Managing policy impacts</b>	Yes	<b>Energy efficiency and productivity</b>	Yes	<b>Research development and innovation</b>	Yes
<b>Voluntary action</b>	Yes	<b>International units</b>	No	<b>Long-term goals</b>	Yes
<b>Sectors discussed</b> (Please list)	Refrigeration and air conditioning, buildings, cold chain, education		<b>If other</b> (Please describe)		



### Confidentiality and privacy

The Department will treat all submissions as public documents, unless the author requests the submission be treated as confidential.

Public submissions will be published in full on the Department's website. The Department will publish the name of the individual or, name of the organisation (if applicable) and state or territory with your submission.

A request may be made under the *Freedom of Information Act 1982* (Commonwealth) for a submission marked 'confidential' to be made available. Such requests will be determined in accordance with provisions under that Act.

The Department will deal with personal information contained in, or provided in relation to, submissions in accordance with this cover sheet and its Privacy Policy ([www.environment.gov.au/privacy-policy](http://www.environment.gov.au/privacy-policy)). Personal information is collected for the purposes of identifying authors of submissions. It may be used and disclosed within the Department and to other persons for the purposes of carrying out the review, and otherwise as required or permitted by law.

**Do you want this submission to be treated as confidential?**       Yes       No

### Submission instructions

Submissions are due by 5:00pm AEST, Friday, 5 May 2017. Any submissions received after this date will be considered at the Government's discretion.

Where possible, submissions should be sent electronically, preferably in Microsoft Word or other text-based formats, to the email address listed below. Submissions may be sent to the postal address below.

All submissions must include a cover sheet.

Submissions can be forwarded to:

Email address (preferred)

[climatechangereview@environment.gov.au](mailto:climatechangereview@environment.gov.au)

Postal address

Climate Change Policies Review – Discussion Paper submissions

2017 Review Branch

Department of the Environment and Energy

GPO Box 787

CANBERRA ACT 2601

For further information, please call 1800 057 590.



## EXECUTIVE SUMMARY - AIRAH

Please find the following as AIRAH comments on several of the questions raised in the discussion paper prepared by the Department of Environment and Energy to help review its climate change policies and ensure policies remain effective in achieving Australia's 2030 target and Paris Agreement commitments.

AIRAH has consulted with our membership base in the development of these comments. AIRAH's members work across all sectors of the built environment, from residential heating and cooling systems through to complex HVAC design and construction for larger buildings, through to the cold chain and industrial refrigeration.

The work of AIRAH's members not only impacts on construction industry productivity, it also has significant impact on the productive use of assets over their lifetime.

These comments are offered in good faith by AIRAH as a constructive submission in support of the Australian Government's efforts to develop and support a meaningful emissions reduction and climate change adaptation and mitigation strategy.

In this submission AIRAH is recommending the Australian Government:

- Develop a plan to deliver net zero buildings by 2050; including a pathway to highly efficient buildings serviced by highly efficient HVAC&R that is powered by low carbon renewable energy sources.
- Co-ordinate with Commonwealth and other states and territories for a national licencing approach for refrigeration and air conditioning trades, based on harmonised training and skills maintenance standards;
- Implement a national approach to the mandatory disclosure of the energy performance of all buildings at their point of sale or lease;
- Implement a harmonised state-based energy saving certificate scheme/platform to incentivise increased level and depth of energy efficiency interventions in a range of sectors;
- Assist refrigeration stakeholders to develop and apply benchmarking tools for the energy performance of refrigeration systems in a variety of economic sectors; retail, cold chain, health, IT.
- Support HVAC&R innovation and research in academia and industry.

Ultimately the Australian Government needs to undertake a range of policy initiatives to become a leader in sustainability, low carbon energy and low-emission construction. The first step is for Government and its agencies to 'lead by example'.

## AIRAH

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) welcomes the opportunity to work with the Australian Government to make the transition to a low-carbon future in practical and productive ways. AIRAH is an industry-led organisation that represents the entire value chain, from the tradesperson on site to university-educated



engineers and business leaders. This overarching perspective – and reach to more than 25,000 industry participants – positions AIRAH to promote and develop the most efficient, productive and resilient heating, ventilation, air conditioning and refrigeration (HVAC&R) industry for Australia's future.

The 21<sup>st</sup> century imperatives of emissions reductions and energy productivity present our nation with significant change, challenges and opportunities. It is important that all stakeholders from the built environment come together to meet these challenges, because all of us have a part to play in the move towards low emissions and in ensuring specific safety concerns and challenges are mitigated.

AIRAH is keen to work with the all levels of government to improve the environmental performance of existing and new HVAC&R (heating, ventilation, air conditioning and refrigeration) systems. We envisage a collaborative effort to get and keep action firmly on the agenda. AIRAH feels that it's important for politicians from all parties to understand both the vital role the HVAC&R industry has in the Australian economy, and also the part it can play in helping Australia achieve its environmental aspirations and commitments.

## **THE ROLE OF HVAC&R**

Australia, as a signatory to the Paris Climate Change Agreement, has now committed to the global transition to net-zero emissions, and to reaching net-zero emissions nationally around 2050. Obviously, this has implications for all state and local governments as well as the Australian Government.

The Australian Government should understand that the Australian built environment sector – and within that, the HVAC&R industry – can make a major contribution to meeting this 2050 goal, as well as improving energy productivity, supporting innovation, and creating healthier, more liveable cities. AIRAH members can play a huge part in this transformation. Vapour compression refrigeration systems as used in refrigerators, air conditioning systems, food processing and production, beverage industries and the like throughout the economy consume around 22% of all electricity generated in Australia. Though working in a largely “hidden industry”, our members are part of a sector that includes more than 170,000 Australians. Their work impacts everything from keeping our food fresh, to the design and maintenance of high-performing buildings.

The Institute has been intimately involved with the development of ASBEC's *Low Carbon High Performance* report, and we support its recommendations. And AIRAH is also the driving force behind PRIME, the HVAC&R industry's blueprint for a successful transition to a low-emissions future through Professionalism, Regulation, Information, Measurement and Emission abatement. As Australia comes to grips with its national and international emission reduction commitments, it is becoming clearer that the built environment, including the refrigeration sector, is a critical point of focus, particularly for emission reductions. See PRIME website [www.primehvacr.com.au](http://www.primehvacr.com.au)



## AIRAH RESPONSES TO LISTED QUESTIONS

### **QUESTION: WHAT ARE THE OPPORTUNITIES AND CHALLENGES OF REDUCING EMISSIONS FROM THE ELECTRICITY SECTOR? ARE THERE ANY IMPLICATIONS FOR POLICY?**

#### **ENERGY PRODUCTIVITY, EMISSIONS REDUCTION, AND HVAC&R**

The electricity sector should play a central role in helping Australia meeting agreed greenhouse gas reduction targets.

De-carbonising the grid, supporting large and small-scale renewable energy, and incentivising energy efficiency upgrades for both buildings and cold-chain refrigeration infrastructure are all key roles that should be undertaken, either solely or in partnership, by the electricity sector.

The electricity consumption of HVAC typically accounts for around 40 to 60 per cent of total building energy consumption, and 23 per cent of all the electricity generated in Australia is used by Australian buildings. HVAC&R is responsible for the consumption of about 22 per cent of all the electricity produced in Australia and causes more than 11 per cent of the total Australian national emissions. It is clear from these numbers that the energy consumption of HVAC&R and the resulting direct and indirect emissions have a significant impact on National emissions. HVAC&R must be part of the emission reduction solution. To reduce these levels of emissions AIRAH notes that:

- Buildings (and processes) must become more energy efficient and more energy productive, this includes higher standards for envelope thermal performance and building sealing.
- HVAC&R systems must be designed, installed, commissioned and maintained for high energy efficiency. Measurement, monitoring and ongoing maintenance is the key to improving and maintaining the energy efficiency and energy productivity of existing HVAC&R systems.
- Electrical energy used to run high efficiency HVAC&R in highly efficient buildings (and processes) must be low carbon energy.

These three fundamental steps need to be followed to maximise the energy productivity of HVAC&R in all sectors and applications.

The HVAC&R industry also has a significant role to play in meeting Australia's greenhouse gas reduction targets and the electricity sector needs to engage more effectively with this important end-use industry. For greater uptake of energy efficiency AIRAH advocate for the following type of programs:

- A Nationally harmonised energy saving certificate scheme that incentivises HVAC&R energy efficiency interventions in buildings and refrigeration infrastructure;
- Mandatory disclosure of building energy performance;
- Increase in the stringency of the minimum energy performance standards for new buildings;



- Establishing minimum energy performance standards for existing buildings
- Increasing minimum energy efficiency standards of equipment and appliances;
- Provide better information to the property industry regarding life-cycle costing and life cycle cost/benefit analysis;
- Require a developer/builder to provide an energy performance guarantee for every new building (similar to a NABERS commitment agreement)
- Provide a performance measure similar to vehicle L/100km, such as a base building maximum w/m<sup>2</sup> energy performance for all new buildings. The Australian Government should collaborate with the ABCB to implement this nationally through the NCC.
- Energy performance benchmarking for a wide range of refrigeration applications based on a universally applicable energy performance benchmarking tool.

Before clean energy can be effectively used in the built environment, the systems using the energy must be optimised and efficient. Apart from the energy embodied in their materials of manufacture, HVAC&R systems have three main sustainability impacts; energy consumption, water consumption and refrigerant related environmental damage.

## **INNOVATION TO ADDRESS ELECTRICITY CONSUMPTION**

Innovation, training, skills maintenance and continuing professional development are the key ways to ensure that new low-emission/energy efficient-technologies are adopted and applied effectively and safely.

To address energy consumption, innovative cooling and heating technologies, building integrated renewables, thermal storage and phase change materials will all impact the market in the future. There are many technologies available today that can significantly reduce building cooling and heating energy consumption. Reduced energy consumption and particularly reduced cooling demands on hot days can significantly improve energy supply reliability and security.

Major items include better building facades and better building sealing, the more widespread use of solar cooling, greater use of evaporative cooling technologies, building-integrated photovoltaics, batteries and thermal energy storage, natural and mixed mode ventilation systems, non-vapour compression chillers, phase change materials to stabilise building temperatures, better use of waste heat within and between buildings, seawater cooling, and heat recovery.

Innovation to address electricity consumption has the potential to significantly reduce costs to consumers. Due to the many failures in our imperfect free market in Australia, energy consumers often do not have the knowledge or skills to effectively address consumption issues. Excessive consumption or using more electricity than is needed reduces productivity.

There is no concerted effort in Australia to support innovation in electricity consumption.

Without a concerted effort to provide effective training to all stakeholders, including suppliers, manufacturers and end users, new technologies and innovative approaches will be seen as attracting increased risk in the mainstream of the industry.

Training and familiarity reduces risk or reduces the perception of risk.





The electricity industry can help promote innovation in building heating, cooling and freezing technology and practices by sponsoring programs that evaluate innovative HVAC&R technologies. Innovation in HVAC&R in Australia has led to successful small businesses start-up and niche manufacturing opportunities. Small businesses often need incentives and financial or resource assistance to make the jump to some new technology or process. For optimum effectiveness HVAC&R technology demonstration and evaluation projects should:

1. Include direct approaches to property owners, to determine the level of interest and the window of opportunity for potential innovative technology projects.
2. Work with property owners and HVAC&R consultants to decide which innovative solution(s) would be most suited to particular situations.
3. Ensure that potential projects and their funding requirements are individually assessed by independent HVAC&R consultants.
4. Ensure that the outcomes from the projects are individually verified and evaluated by independent HVAC&R consultants, and the information is shared with the wider industry (warts and all).

With this approach property owners would install the most appropriate new technology, while clearly understanding the risks involved. Over time property owners and technical service providers would become comfortable with the new approaches, and be more open to considering new technologies and practices. Demonstrating changes in attitude is often as important as demonstrating the technologies themselves, particularly in the risk averse construction industry. The measurement of costs and savings by independent consultants would generate the accuracy of information required.

Living laboratories for product testing, development and evaluation are ideal environments to help prove and improve new technologies. Learnings must be consolidated and shared for maximum impact.

In regard to innovation to address energy consumption AIRAH have the following additional recommendations:

1. Support **low-emission demonstration projects** – The electricity industry can support innovation and commercialisation of low emission HVAC&R technologies by supporting technology demonstration projects and facilitating the development and distribution of independently verified Case Studies of actual delivered innovative HVAC&R solutions, providing the industry with detailed benefit and cost analysis of real installations and construction methods. Learnings must be consolidated and shared for maximum impact.
2. Support **low-emission technology learning** - The electricity industry could collaborate with industry associations and training providers and help to facilitate the delivery of demonstration/training technology to all TAFEs/VET colleges and universities that provide training and education in the sector, so that industry entrants are more technology and innovation aware.
3. Provide **incentives to reward innovation** - Government and industry should encourage and support new innovative processes by providing incentives in the form of financial tax breaks or accelerated depreciation and encouragement in the form of awards and showcase materials developed to support and promote new innovative processes and materials.



## ADDRESSING PEAK DEMAND ISSUES

Heating ventilation air conditioning and refrigeration (HVAC&R) systems have a large cumulative impact on the peak demands made of the National electricity grid and the overall energy consumption of the Australian economy.

There are alternatives to building network infrastructure to service peak demand.

Reducing the peak demand is the most cost effective option by electricity suppliers addressing (in an innovative way) the demand side of the equation.

Demand management provides a range of benefits to energy supply companies and their customers. Benefits to the electricity sector include:

- Reduces the need for costly infrastructure upgrades;
- Provides better insight into customer requirements and practices;
- Improves customer satisfaction by decreasing electricity bills.

Benefits to customers and community value include:

- Reduces GHG emissions;
- Improves network utilisation and reliability;
- Reduces energy costs for customers;
- Increases 'value add' for customers through incentives, rebates and in-home consultation;
- Increases community awareness of benefits of energy conservation.

AIRAH have considered the most cost effective interventions that could be made to incentivise and encourage the property sector and cold chain participants to better manage refrigeration and air conditioning infrastructure peak demand and the energy costs and emissions associated with the sector.

The main conclusions are that:

- Lowering peak demand via improving plant and systems is very achievable.
- While building and system tuning is a good and right approach, it is often hard to implement successfully for non-technical reasons.
- The R22 phase out is an opportunity but is limited because of the nature of the existing 'fleet' and the reservoir of refrigerant held in the industry.
- Thermal storage could make a comeback however this too is problematic and typically system inefficiencies and the inevitable losses make this a hard sell.
- The opportunities that temperature complaints or end of lease offers as potential trigger points for improvement are there, however there are always multiple factors involved and these events do not often result in delivered improvements to the HVAC.
- Central plant COP up lift, where you have aged plant, makes the most sense for this sector.



AIRAH recommend the following strategies, in order of preference –

1. Incentivise mid-tier building owners to upgrade central plant (chillers and boilers) based on installing new plant with a high/very high coefficient of performance (COP) and/or integrated part load value (IPLV). This is a simple change-over program where the new plant purchase is incentivised by a grant.
2. Incentivise and facilitate building owners to have an energy audit completed for their building and provide independent support for the owner to help them interpret and use the audit findings to procure either capital upgrades or building tuning programs.
3. Incentivise or subsidise capital plant upgrades for targeted sectors following the building audit. In some cases, the provision of financial incentive grants (% of the costs) for a building owner to upgrade their building to provide demand reduction and/or energy efficiency improvements can produce a very cost effective demand reduction strategy.
4. Encourage the market in the uptake/delivery of building services maintenance practices for the purposes of improving energy efficiency/productivity of the building asset. There is a value proposition here that is not understood at all by building owners.
5. Signal the market on mandatory energy disclosure and start to develop the tools needed to support the expansion of mandatory disclosure of energy performance, i.e. the commercial building disclosure (CBD) program to other, and eventually all, non-office commercial and residential building types.

Note: AIRAH strongly opposes the proposal to remove the requirements to provide access for maintenance from the National Construction Code 2019 edition. The provision of access for maintenance is a design and construction function and should remain within the NCC. Reducing the provisions for access will reduce the energy efficiency and increase emissions from any building.



**Question: How can energy and climate policy be better integrated, including the impact of state-based policies on achieving an effective national approach?**

**BARRIERS TO INVESTMENT IN ENERGY EFFICIENCY**

To help explore the policy opportunities we must first consider the barriers to change.

Language and understanding is often a key barrier. Stakeholders on one side of the energy meter, (e.g. energy generators and technical service providers) don't understand the language, drivers and problems of the HVAC and other energy users on the other side of the meter. Stakeholders in the electricity supply industry all the way through to the electricity end user don't understand (or want to understand) the language and issues, and they don't know how to influence change back up the supply chain and with government.

Uncertainty in Australian Government energy and emissions policy, which includes poor incentives and misalignment of drivers/motivation for building energy efficiency and no or low focus on actual building energy performance are also significant barriers to investment.

The Australia Government Direct Action policy and the associated Emission Reduction Fund (ERF) is not readily open to commercial building or commercial refrigeration participation, largely due to the requirements for aggregation (over time and sites) to meet minimum bid sizes.

Good policy must be made based on evidence. In our world of HVAC&R, the refrigeration mechanic has a massive role to play in emissions reductions, as does everyone in the "system" supply chain. Nobody within government policy departments understands the coal face evidence well, no one understands the behaviours exhibited at the coal face (by technicians and end-users), and no one has worked out how to change the emissions reduction story so that behaviour change is not seen as a challenge.

The key elements of an emissions reduction policy to support investor confidence are

- Transparency – including real cost benefit justification and state clear objectives;
- Strong technical background – Provide the technical justification and don't leave implementation to be worked out;
- Good information – unbiased and honest information is key to investor confidence and government is often reluctant to talk in plain English;
- A focus on measurement helps to ensure program success. Does the project actually reduce emissions and on what basis? Measurement and reporting protocols must be transparent.
- Collection of quality data at all stages is key to developing robust tools that can better estimate future program costs and benefits;
- Publication of program learnings and insights (what works and what doesn't work) is essential if the impact of a particular policy or action is to extend beyond the life of the program.

The incentivising and support of distributed energy generation and storage is an immediate action that can be taken. Buildings can be viewed as energy generators and thermal energy storage devices.



## **BARRIERS TO LOW EMISSION HVAC&R**

Investor confidence in the clean energy sector is low. The Government should switch from incentivising fossil fuel resource development to incentivising renewable energy technologies.

The comparatively low cost of energy is often a prohibitive factor in the acceptance of energy saving HVAC&R equipment. The drive for lowest 'first-cost' construction is also a barrier as good life-cycle solutions are not considered by developers or their designers. There is also a split incentive between the developer or builder and the owner or operator because the entity that pays for the innovate low-emission solution is not the same as the entity that benefits from its installation.

Whilst the construction industry is evolving, there is still a significant divide between high end premium buildings and low cost developments. The mainstream of the construction industry on the whole does not like change. There is a preference to deliver tried and tested solutions rather than adopt innovative solutions and a general tendency to "do it the same way as we did it for the last project". This can be attributed to economic and time related budget pressures as well as a general tendency for the industry to be risk averse and time poor. Change needs to be incentivised and the Australian Government has a role to play in this.

Note: AIRAH strongly opposes the proposal to remove the requirements to provide access for maintenance from the National Construction Code 2019 edition. The provision of access for maintenance is a design and construction function and should remain within the NCC. Reducing the provisions for access will reduce the energy efficiency and increase emissions from any building. Poor access provisions are just another barrier to low emission HVAC&R.

## **PRIME AND THE HVAC&R INDUSTRY**

PRIME is an initiative developed by a coalition of stakeholders from within the Australian heating, ventilation, air conditioning, and refrigeration (HVAC&R) industry. The industry has been under pressure to help reduce the environmental impact of HVAC&R. Key stakeholders have taken a step back and spent some time evaluating exactly what needs to be done to develop low-emission solutions for the essential HVAC&R services we all depend upon.

PRIME stands for the five pathways to transition: Professionalism, Regulation, Information, Measurement, and Emission abatement. All of the industry-sourced emission-reduction solutions have been allocated into one of these five categories.

Information for PRIME stakeholders is available [here](#).

AIRAH recommend that the electricity sector engage with the PRIME initiative to develop and deliver projects that improve energy efficiency and increase energy productivity.

Informing government regulation, policy, programs and research is an important element of the PRIME approach. Low emission HVAC&R can improve Australian productivity and competitiveness in international markets, as well as reduce emissions and improve sustainability at home and globally.



PRIME is fundamentally about reducing the direct and indirect emissions arising from the HVAC&R sector, it is a conduit for emission reduction proposals and projects from grassroots and throughout all sectors of the industry.

PRIME offers the electricity industry a transparent and open platform from which to address those issues that are best addressed with a whole-of-industry approach. PRIME improves coordination and removes duplication of effort.

Reducing direct and indirect emissions from HVAC&R means optimising life-time system performance and minimising life-time refrigerant leakage rates. This is only achievable through better maintenance and improved system operation which not only improves energy efficiency, but also delivers a range of other co-benefits, including increased asset values, improvements in worker productivity, process productivity gains, occupant health benefits, and importantly, improved building and electricity infrastructure resilience.

## **BUILDING ENERGY POLICY OPPORTUNITIES**

Correct buildings energy policy could see:

- Buildings becoming more energy efficient, more productive and less costly to operate;
- Buildings becoming more resilient and helping local electricity distribution networks to become more resilient;
- Planning regulations that consider buildings at the precinct or community level;

While there has been some progress in improving the energy efficiencies in 'CBD style' office buildings and 'green' buildings to date, most other building sectors and the industrial and commercial refrigeration sector has not been overly successful at improving energy efficiency or reducing peak demand. (data and source ASBEC)

With some notable exceptions, most buildings in Australia are existing and very few were designed to operate energy efficiently, similarly most existing refrigeration infrastructure has not been designed for optimal energy efficiency. In truth, there are considerable energy inefficiencies 'built-in' to many Australian buildings.

There are a range of barriers apparent for improving the operating energy efficiency of existing infrastructure including a low awareness of the issues among the investor/owner group, a lack of technical and management capacity to change, and of course the immediate financial and resource constraints that push back against taking action.

However, as energy costs continue to increase, as businesses start to take account of environmental responsibility and as government moves to regulate operating performance for existing systems these barriers to change may be lowering for many sectors.

So, what are the main strategies for improving energy efficiency and reducing peak demand?

These basically revolve around strategies to increase energy productivity (energy efficiency) and strategies to reduce peak demand.

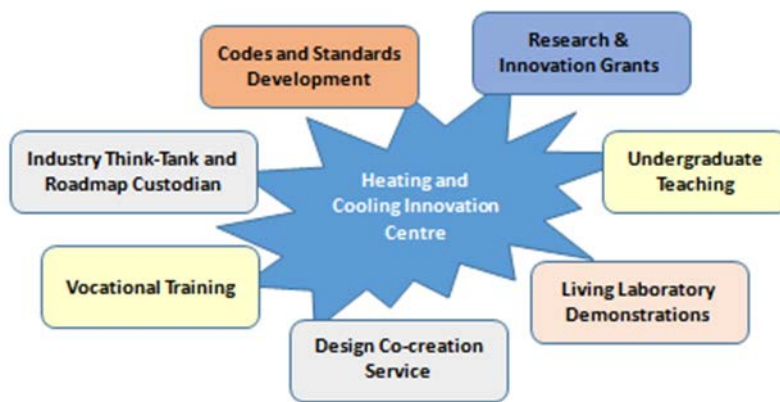


## IHUB – HVACR INNOVATION OPPORTUNITY

In association with the CSIRO and PRIME, AIRAH is proposing to establish the Innovation Hub for Affordable Heating and Cooling, or iHub.

The Innovation Hub for Affordable Heating and Cooling will facilitate the HVAC&R industry’s transition to a low-emissions future, stimulate jobs growth, and showcase HVAC innovations in buildings.

The Innovation Hub will provide virtual and physical spaces where a community of industry innovators, designers, and educators can easily access knowledge and research infrastructure to incubate ideas and reshape industry practice to the needs of the 21st century.



The Innovation Hub will enable Australian SMEs to accelerate product development through access to cutting-edge intellectual property, independent technology validation, and interfaces with venture capital investment.

The iHub provides clear low-emission and emission reduction development pathways for the HVAC&R industry and is consistent with the NEPP and as range of government policies.

The Australian Government should partner with AIRAH, CSIRO and our PRIME partners to help set up, launch and deliver the iHub.

Key iHub activities and their linkage to the PRIME pathways include:

1	Industry road-mapping	<ul style="list-style-type: none"> <li>• <b>P</b>rofessionalism</li> </ul>	PRIME identifies the need to provide the predominantly SME HVAC industry, with more clarity and strategic foresight on the key transition steps to a low emissions future. A participatory process will be maintained over the life of the Hub.
2	Research and seed innovation grants	<ul style="list-style-type: none"> <li>• <b>E</b>missions abatement</li> </ul>	Grant funding and PhD stipends will be provided to research institutions on a competitive basis. Funding priority will be given to projects focusing on the development of commercialisable IP. Seed funding will also be available to SMEs for product prototyping and market testing. Intellectual property will be held in a “Team Australia” entity, with preferential access provided to Australian SME members.



3	Living laboratory accelerators	<ul style="list-style-type: none"> <li>• <b>M</b>easurement</li> </ul>	Exemplar building spaces (e.g. Shopping Centre, Office, Hotel, School etc.) will be established as research infrastructure for accelerated real-world testing of new products and services.
4	Design co-creation labs	<ul style="list-style-type: none"> <li>• <b>E</b>missions abatement</li> </ul>	The building design consulting industry will be supported with additional funding to enable more detailed exploration of innovative HVAC solutions, in partnership with educators. This will extend the scope of innovations that can be explored, and help train the next generation of design engineers.
5	Undergraduate and vocational training centre	<ul style="list-style-type: none"> <li>• <b>P</b>rofessionalism</li> <li>• <b>I</b>nformation</li> </ul>	Australia does not have a dedicated undergraduate Building Services degree. A process will be implemented to recruit a training provider to establish a suite of undergraduate and vocational courses. This will also provide a physical “incubator” location for the Hub.
6	Codes, standards and evidence base	<ul style="list-style-type: none"> <li>• <b>R</b>egulation</li> <li>• <b>I</b>nformation</li> <li>• <b>M</b>easurement</li> </ul>	Part of the industry will always build to the minimum code. So the HVAC industry has an ongoing need to provide high quality evidence to support practical codes and standards development. A structured program of engagement will be established with international knowledge brokers (e.g. ASHRAE, IEA, ISO). Additional adhoc measurement campaigns will be commissioned, where required.

Industry contributions supplemented with government funding will be used to fund the activities. The Innovation Hub aims to build its membership base and IP returns, to a point where it is self-sustaining.

### RAISING ENERGY STANDARDS

Raise minimum energy performance standards for buildings and appliances, under a harmonised national approach. Increasing minimum energy performance standards for new and refurbished buildings, for all facets of the cold chain, and for new appliances and systems is a very low-cost high-benefit option.

While the process to increase the stringency of energy standards for new buildings is in progress there is little to no attention being given to the existing building stock which comprises the vast majority of Australian building assets.

The minimum energy efficiency performance of HVAC Equipment and appliances has increased significantly over the last decade, which has resulted in considerable reduction in carbon footprint. The Australian Government plays an important role under the current national E3 framework and need to maintain momentum with this process.

### MANDATORY DISCLOSURE OF ENERGY PERFORMANCE – BUILDING INFRASTRUCTURE

Instigate mandatory disclosure of energy performance for all buildings being rented or sold.

Incentivising or mandating the energy performance of existing buildings and refrigeration systems is a bigger challenge but with huge benefits. It is almost universally agreed that





energy efficiency interventions in the existing building stock is one of the lowest cost forms of emissions reduction. The existing stock of vapour compression systems comprises around 53 million systems nationwide and many of these systems are not optimised.

### **Expand CBD program**

Introducing the mandatory disclosure of the energy performance of all residential, commercial and public/institutional/industrial buildings at the point of sale or lease would go some way to removing the barriers for change in the property sector. Implementing similar measurable/reportable efficiency standards for refrigeration systems would help to drive commercial and industrial refrigeration efficiency.

### **Calculating cool**

Promoting the use of the “Calculating Cool” tool and the “HVAC Optimisation” guidelines and training generally, and mandate their use for all Australian government owned or controlled property assets.

## **MANDATORY DISCLOSURE OF ENERGY PERFORMANCE – REFRIGERATION INFRASTRUCTURE**

Implement national measurable/reportable efficiency standards for refrigeration systems, with efficiency not based on individual components that make up the system but on the overall system energy usage, with maximum usage based on application i.e. kW/m<sup>3</sup> for cold storage facilities, kW/m<sup>2</sup> for supermarkets. Adopting achievable energy efficiency standards for (non-air conditioning) refrigeration systems would remove a lot of poor energy performance in the sector. Commercial and residential buildings efficiency are regulated through the CBD/NABERS program and NCC regulations, however there are no national efficiency standards for refrigeration systems.

## **ENERGY INCENTIVES**

The Australian government should create a National Australian market for the white certificate/energy efficiency certificates generated by state/territory based energy efficiency schemes such as; NSW ESS and Victorian VEET scheme, ACT scheme, and SA scheme. These schemes are being opened up to energy savings derived from refrigeration system replacement, refrigeration system upgrades, building tuning, retrocommissioning and in particular HVAC&R optimisation, providing an incentive to owners to save energy.

The Australian government should collaborate with all states and territories to share these tools and experiences to create a single harmonised white certificate/energy efficiency certificate scheme that can be applied to energy savings in HVAC&R and buildings/facilities anywhere in Australia.

## **RESILIENCE**

The resiliency of systems, buildings and communities to climactic impacts also needs to be addressed.



**Australian Government**

**Department of the Environment and Energy**

The costs of measures need to be assessed correctly within a Life Cycle Assessment framework, and not the simple capital cost evaluations as often used by government agencies. Impact assessments of changes away from high GWP refrigerants should be assessed using holistic product lifetime metrics.



**Question: What are the opportunities and challenges of reducing emissions for households, SMEs and the built environment? Are there any implications for policy?**

## **HOUSEHOLDS, SMES AND THE BUILT ENVIRONMENT**

### **Building energy efficiency**

Commercial and residential buildings are a major source of greenhouse gas emissions, creating around 23 per cent of Australia's national emissions through electricity consumption. This is split approximately 50:50 between residential and non-residential buildings. The Australian Bureau of Statistics estimates that around 60% of Class 1 residential buildings in Australia are air conditioned to some extent. For commercial buildings the number is more likely to be close to 95%. Refrigeration, space heating and cooling, mechanical ventilation and hot water delivery are all significant energy demands generated in buildings, typically 40 to 60 per cent of a building's total energy use, which has a direct and marked effect on Australia's energy performance and emissions targets.

Improving building energy efficiency is a way for households, occupants, commercial building owners, and small businesses to reduce energy bills.

AIRAH have collaborated with other members of the Australian Sustainable Built Environment Council (ASBEC) to deliver the Low Carbon High Performance report which shows that cost-effective action across the property sector could deliver a 23 per cent reduction in emissions by 2030 and 55 per cent by 2050 in Australian buildings. AIRAH encourages the Australian Government to support the delivery of the recommendations of this report. AIRAH advocates for the following policies in regard to energy efficient buildings

1. A **'Towards net zero' buildings plan** with supporting policy frameworks, governance arrangements, clear targets and ministerial responsibilities.
2. **Strong mandatory minimum standards** for new buildings, equipment and appliances with the long-term goal of net zero emissions. This includes better design integration through commissioning and validation testing but also strong minimum standards for the operation and maintenance of existing buildings and infrastructure.
3. **Targeted incentives and programs** to accelerate action, motivate and support higher performance, including incentives and the use of government market power.
4. **Energy market reforms** to ensure that the energy market supports roll-out of cost-effective energy efficiency and distributed energy improvements, including thermal energy storage and distribution
5. A range of **supporting data, information, training and education** measures to enable informed consumer choice, innovation, commercialisation and deployment of new technologies and business models.

AIRAH are also working with a range of stakeholders to establish a plan of action for energy efficiency improvements in existing mid-tier buildings. The plan intends to accelerate improvements to mid-tier buildings and harness their emissions-reduction potential through the following activities:



1. **Supporting further research** to better understand the number, location, size and performance of mid-tier buildings.
2. Develop a **Building Retrofit Toolkit**, to bring together existing resources and tools and create new ones based on confirmed gaps and needs, together with an informed communications plan for building owners and their trusted advisers and service providers.
3. Advocate for the **expansion of** initiatives such as the **Commercial Building Disclosure** program to apply to smaller buildings and other non-office building types.
4. Promote **innovative financing mechanisms** and Government/industry incentives to encourage existing building upgrades and retrofits.

AIRAH are also supporting the National Energy Efficient Buildings Project (NEEBP) series of projects and support the proposed NEEBP strategies for change. This includes the development of requirements and training for designing and constructing air-tight buildings and for validating construction quality using building pressurisation testing.

### **Building tuning**

From an energy efficiency perspective, the first best investment is always in tuning - making the best of what you already have. Getting existing plant and systems to work together properly can also have a positive effect on reducing peak electrical demand on degree cooling days and in the southern climate zones gas demand on degree heating days. Simple pay back, from electricity usage reduction only, is typically 0.5 - 1.5 years. The process takes a couple of seasonal cycles to fully make the changes and bed them in. Whilst there are always quick wins the challenge is always building-in the changes, i.e. perpetuating the savings into the long term.

For a range of reasons (good and bad) getting a building and its energy consuming systems tuned is challenging.

It's hard to sell. Building tuning is somewhat ephemeral – you can't touch it and feel it like a new piece of kit, it's a promise, and it is iterative and whilst based on very empirical activities it's not a precise science. The industry isn't exactly over stocked with people who can do it, let alone sell the concept to owners.

It's not always straightforward to deliver, in practice:

- There ends up being several stakeholders to line up before a successful program can be undertaken.
- It is not something your normal HVAC maintenance provider does.
- There are often several players, including the BMCS provider, that must be engaged in a 'collegiate' fashion, for a successful program.

Rarely is a building 'ready' to be tuned, there is almost always some degree of (relatively minor) investment needed in setting up the BMCS so it can be tuned (access to information/diagnostics and access to control/code etc. to make changes). BMCS are usually installed and commissioned to 'run' the systems not as tuning tools.



## **Analysis and diagnostics**

Buildings and associated HVAC&R will often continue to operate and provide the service even when operating very inefficiently. What is needed is an assessment (energy audit or building tuning assessment) by a technically competent person to show where energy is currently being used, where energy is being wasted and why and what are the potential solutions including the costs and benefits of particular selected interventions (tailored to the owner's objectives).

The results of the assessment can be used by owners but could also be used by government to identify the worst performing buildings/sectors for further targeting of incentives and policy.

## **System plant replacement**

In many existing buildings and refrigeration systems the central plant at the core of the systems are old and outdated. Upgrading and Replacing outdated equipment with new high-efficiency equipment can provide significant energy productivity improvements with limited disruption. Any plant replacement should be considered in association with potential cooling/heating load reduction strategies.

## **Maintenance for energy efficiency**

In many sectors, the application of maintenance strategies to target building services and refrigeration operation and performance is not well adopted. Applying maintenance strategies - cleaning out the filters, cleaning coils, tubes and heat exchangers, monitoring key performance indicators and assessing energy use - all with the purpose of addressing annual and peak energy use is a very beneficial activity and can help reduce demand.

This is potentially the quickest way to reduce peak demand, to make sure the HVAC&R plant is clean and actually working optimally so that the required indoor climate conditions can be achieved with lower and minimal energy input.

Reducing direct emissions from HVAC&R through better maintenance and improved system design and operation also improves energy efficiency, delivering a range of other benefits, including increases in asset values, improvements in worker productivity, process productivity, occupant health benefits, and importantly, improved building resilience, as buildings and industrial facilities become less reliant on energy and HVAC&R.

Without further targeted action, however, emissions from the HVAC&R sector are expected to increase, as this industry grows and the focus on efficiency is sacrificed in return for reductions in initial capital costs.

AIRAH and the HVAC&R industry have ideas and expertise that can generate tangible solutions for the future. We have already been an effective participant in this space.

Smart buildings have great energy productivity potential, however if any innovation or technology initiative is going to gain acceptance in the mainstream industry, it needs to make commercial sense to main-stream development. There needs to be trusted information made available to end-users with regards to the potential costs and benefits. Presently there is a



tendency for sporadic but notable energy efficiency achievements in the refrigeration sector to remain hidden from mainstream industry.

Proper scientific assessment combined with realistic economic analysis are necessary to provide the input data for any study/recommendation/measure. The Australian government could provide funds to support these studies which have to be undertaken by independent specialists/organisations.

Identifying and maintaining appropriate levels of expertise and professionalism in the construction industry to ensure targeted performance of buildings is achieved is a significant challenge. The key aspect of a building performance measure is “is it measurable”. The building regulations must enforce a measurable set of performance criteria that can be used whether the building is 12 months or 30 years old.

### **LOW GWP REFRIGERANTS**

Following the Australian governments mandated HFC phase down schedule, the existing barriers to the uptake of low global warming potential (low GWP) refrigerants need to be addressed. Examples are the legislative limitations to the more widespread use of hydrocarbon refrigerant and the restrictions imposed by local councils to the more widespread application of ammonia refrigerant – particularly in CBD areas. The emphasis here needs to be on the risk management associated with the employment of such working fluids.

With only two exceptions all future refrigerants whether natural or synthetic will be either flammable, toxic or operate under high pressures. The information and education requirements to ensure continued compliance with the current WHS Act are very challenging as the HVACR industry transitions towards the use of low GWP refrigerants. This challenge requires Government commitment and a dedication to the continued management of change.

- Awareness – to inform stakeholders of the change
- Training – to ensure that technical service providers have access to the skills and knowledge required
- Information – TO ensure that all stakeholders understand their responsibilities and how to fulfil them

There are significant regulatory and attitudinal barriers to the uptake of several low GWP Natural Refrigerants. More technical information, application materials and training programs need to be developed and delivered to assist industry meet the needs of the State’s construction industry and the needs of the end-users of refrigeration systems.

Local government and state government planning rules need to be revisited with regard to mixed commercial/residential developments in high density areas.



## **POLICY OPPORTUNITIES**

### **Government to lead by example**

Government needs to step up and undertake a fair share of the work in helping Australia meet its international and national climate change and emission reduction commitments. By leading the way on emissions reduction and energy productivity Government also stands to gain from reduced costs.

Government has obligations under the Paris CoP21 agreement, the Montreal protocol and future regional and international agreements under development.

### **Buildings energy policy**

Designers and builders and more importantly building codes and building procurement entities need to consider the full life-cycle costs of the decisions that they take.

Buildings, precincts and communities need to be developed and delivered with a holistic and integrated approach to sustainability. There needs to be more emphasis on the whole of life costs of building, rather than the build cost, as this would shift the focus to green initiatives and technologies that reduce the energy consumption of buildings. Again, the Australian Government could encourage and support firms that promote efficient buildings and processes by providing recognition, focus, vision, and support to the sector.

### **Product regulatory approvals**

There is a significant issue in the industry with non-compliant products and with copies and fakes of compliant products. This has occurred in many product lines in the construction industry including electrical wiring, so called 'green' HVAC&R retail products, flexible ductwork, thermal insulation and air filters. These low quality copies and fake products undermine the economic viability of Australia's manufacturing sector as compliant products are undermined. Refer to the work by the Australian Industry Group on this topic.

### **Planning regulatory approvals**

New planning frameworks are needed to help planners to consider buildings as energy generators, and energy storage devices, and to help match loads and demands with available supplies. Planning laws could for instance incentivise the co-location of heating demand, cooling demand and thermal storage capacity to provide rounded, flexible and sustainable energy solutions.

There is a need to move away from the idea of buildings as stand-alone assets, with town planning playing a significant role in ensuring for instance that waste heat can be used. A practical example would be planning a swimming pool next to a data centre. Multi-use developments can provide greater ability to utilise waste heat due to simultaneous heating and cooling requirements. Solar access to sunlight, which is particularly important for increased levels of on-site renewable solar electricity generation, is also a town planning issue, as is building orientation and configuration.



AIRAH have noticed the increasing development of apartment buildings that have a retail space allocated to them on the ground floor. The developers make no allowance for the installation of refrigeration systems into these very noise sensitive sites.

AIRAH would like to see some regulation introduced that a suitable space must be allocated if there is to be a food retailer installed in that building, it is no use having noise complaints after the store opens, despite installing plant with all of the noise reductions available.

### **Building tuning and re-commissioning**

Existing building tuning and recommissioning programs are becoming more common, and some jurisdictions in the USA have mandated existing building tuning of large commercial buildings through government regulation, (E.G City of Seattle, Office of Sustainability and Environment, Director's Rule 2016-01, Implementation of Building Tune-Up Requirement).

Seattle's Building Tune-Ups policy phases in a periodic tune-up requirement for non-residential buildings 50,000 square feet or larger (excluding parking), beginning in 2018, with buildings 200,000 square feet or greater due first. Tune-ups aim to optimize energy and water performance by identifying no- or low-cost actions related to building operations and maintenance, focusing on actions that typically pay back within 3 years and generate 10-15% in energy savings, on average.

In Australia, Sustainability Victoria's Energy Efficient Office Buildings (EEOB) program demonstrated that the savings potential in mid-tier office buildings is significant, real and feasible. The report *Energy Efficient Office Buildings: Transforming the Mid-tier Sector* by Sustainability Victoria (2016) showed that across the program's 20 participating Victorian buildings, average benefits included:

- 29% reduction in energy use;
- A 1 star NABERS Energy rating improvement;
- Less than 3-year payback on efficiency investment.

Overall, the program is estimated to deliver the following:

- Over 4,000 tonnes CO2 emissions reduction over a 12-month period;
- Over \$1.1m in savings in energy bills per annum;
- Over \$10m in co-investment from building owners;
- Over 90 jobs.

Broadening these types of programs to more buildings and different types of buildings can generate significant energy savings and economic activity.

### **Demand Reduction Utilising Air conditioning and refrigeration**

As significant energy demands air conditioning and refrigeration systems (particularly when combined with thermal energy storage) can also be used to manage peak loads impact on the electricity grid.





## Central Plant Replacement Incentives

All plant gets replaced at end of technical life and sometimes at end of economic life. What an incentive program can do is move the economic life forward to get accelerated change. The Green Building Fund was a very effective example of that approach, and the 'new chiller' was often the favoured project of that program. That program materially and measurably improved the COP of many Australian commercial office buildings in a very effective and efficient way.

In terms of potential market interventions for the mid-tier and refrigerated warehouse sector to bring economic end of life forward, get an uplift in energy efficiency and a reduction in connected load it is this type of scheme that would be most successful. Something canted towards chiller replacement. The intervention needs to be simple and not tied to post installation bona fides, i.e. complicated measurement, verification and normalisation protocols. Post installation M&V is more complicated than it appears and a real barrier to uptake. Verification could be linked to NABER's ratings, most buildings have one and if they don't it's not an expensive exercise to get one. The program could also be linked to demand reduction or management capabilities, as modern plant often comes with these capabilities (either standard or as an option). Previous experience with this type of intervention, where the chiller replacement is the first thing done, is that it seems to encourage further investment in improvements not less. It is in effect a positive learning exercise for those involved and almost always a success.

The challenge with this intervention/incentive is Government requirements for probity and proof of additionality and the lack of sophistication in the mid-tier space with respect to identifying and then successfully applying for grants and delivering the project outcomes. There would need to be an element of 'Goodwill' about the program and protocols to 'means test' it applied to ensure it wasn't soaked up by the top end of town as the Green Building Fund was (by design). Potential applicants may need to be coached or assisted in the application process (which should not be seen by owners as a barrier).

the capacity of companies already doing replacements or retrofits is an important issue to consider in any program, as are the technical credentials of those eligible to do the work.

### Energy audit and decision making support

For mid-tier buildings less than 10,000 sqm metres or more than XXX kWh/annum energy use, government could provide a subsidised energy audit (50% or 100%) program for a building owner and then provide a building performance coach to assist the owner in making decisions based on the results of the audit. Subsidies could be capped at \$10,000 (to subsidise the audit plus provide the coaching).

For highly effective strategic projects Government could follow up by providing financial implementation support for the upgrade in the form of tax incentives, grants, or no-interest loans. Grants would need to be matched by owners.

Subsidies and grants could be weighted for buildings with R22 systems, large chillers, and excessive energy use.



**Question: What is the role of research, development, innovation and technology in reducing Australia's emissions? Are there any implications for policy?**

**INNOVATION**

The construction and refrigeration industries are risk averse, and awareness of how innovation has been successfully undertaken can reduce this perceived risk and encourage uptake. Innovation and technology uptake means changes to practices and procedures. These changes and innovations need to be supported in the traditionally conservative construction and cold chain industries.

There is increasing demand for improved energy performance in buildings and industrial processes and HVAC&R technologies and industry practices will have to continue to drive improvement in energy efficiency and energy productivity outcomes to meet this demand.

HVACR innovation and business development opportunities are significant and the Australian government should lead the way in HVAC&R development utilising the advantages we have of developing specific solutions that will suit the rapidly growing Asian economy. In addition, the development of resilience within those industries will help support Australian economic growth.

The Australian Government can play an essential role in innovation and commercialisation of low emissions and clean technologies by supporting technology demonstration projects and facilitating the development and distribution of independently verified Case Studies of actual innovative HVAC&R solutions being delivered in Australia, providing the industry with detailed benefit and cost analysis of real installations and construction methods.

The Australian Government could partner with Australian research institutions and industry associations to provide the market with trusted and comprehensive information on these new technologies, and new design or construction tools, that will help the sector and the buildings it delivers, operate more efficiently.

The Australian Government should be more active in procuring systems and solutions that are innovative and low emission for their own buildings and projects. Government can lead by example here and these projects can then be used to support demonstration of the technologies and processes to the wider construction industry. Technology examples include passive building, solar cooling, district cooling, low charge ammonia refrigeration systems, trans critical CO<sub>2</sub> based refrigeration systems for tropical climates, PV assisted air conditioning, thermal mass, phase change materials, ammonia based air conditioning systems for high rise air conditioning and many more.

All participants and actors in the construction sector need better information about what is possible in today's construction industry including information about those innovative approaches that are currently being applied and working in real life applications. There are some great success stories about innovative approaches to the construction and installation of heating, ventilation, air conditioning and refrigeration (HVAC&R) services in buildings and the design and installation of refrigeration systems associated with the Cold Chain. The construction and refrigeration industries are risk averse, and awareness of how innovation



has been successfully undertaken locally can reduce this perceived risk and encourage uptake.

These stories are being told by AIRAH and other industry associations but they need to be promulgated to a much wider audience of investors, developers, owners, operators and end users in Australia. HVAC&R is a hidden and technical supply chain industry and investment decisions in it are often controlled by non-technical people. The Australian Government can help by assisting the HVAC&R industry reach a much wider audience to promote increased awareness of the benefits of improved practices, innovative technologies and integrated approaches to HVAC&R.

## **GOVERNMENT SUPPORTING INNOVATION**

The HVAC&R industry's innovative start-ups want more recognition, engagement, promotion and support from the government. This could take the form of:

- Grants to support and promote the uptake of innovative technologies;
- Alleviation of Government costs for building/HVAC&R energy related technology start-up firms;
- Government support through the use of technologies within the supply chains that the government controls;
- Facilitation and support of applied research in the HVAC&R field that can generate commercial and other benefits for the state;
- Facilitate the development of educational tools to support new technologies.

## **RESEARCH**

AIRAH has significant oversight and engagement with the industry's research activities. Government can help firstly with engagement and recognition, then with facilitation and forums, and finally with encouragement and funding. By and large research in the HVAC&R, building physics, thermal comfort and indoor air quality fields is 'applied research' that can be turned into commercial and other benefits for the state. Government does not need to make a great 'leap of faith' investing in applied research as may be required with investment into pure or fundamental research.

There needs to be much stronger links between academic institutions and a bridge between academia and industry. Some of the activities proposed to help facilitate better collaboration include:

- A research roadmap for the HVAC&R/construction industry should be developed.
- The key HVAC&R/construction industry research needs should be identified and matched to institution research capacity.
- Findings from existing research projects should be disseminated more widely (beyond academia) while encouraging discussion and debate.
- Government/Industry could provide a platform for collaboration either through a research seminar/conference or through an Australian HVAC&R multi-institute research centre or foundation.
- Australian Government should advocate for funding to be delivered for applied research and not just fundamental research.



Resources in small businesses are stretched, so it would be beneficial if the Australian government advertised the R&D opportunities to businesses.

Continuous improvement in this highly technical field requires innovation and a strong research impetus in a range of areas such as:

- New refrigerants and associated technology;
- New applications for existing well known low global warming potential (GWP) refrigerants;
- New building design and delivery methods;
- Emerging technologies for HVAC;
- Higher performance standards for buildings and appliances;
- New controls and building monitoring and metering, incorporating fault and energy diagnosis;
- Thermal energy storage and distribution systems;
- Reliable energy estimating software that can be used across a range of skill levels;
- New energy sources to drive HVAC&R systems.

### **INCENTIVISING THE APPLICATION OF INNOVATIVE APPROACHES**

The Australian Government could encourage and support new innovative processes by providing incentives in the form of financial tax breaks (including accelerated depreciation) and encouragement in the form of awards and showcase materials that are developed to support and promote new processes, materials, and innovations.

Small businesses often need incentives and government assistance to make the jump to some new technology or process. Firms can be encouraged and supported by government and industry sponsored programs to evaluate innovative HVAC&R technologies. For optimum effectiveness HVAC&R technology demonstration and evaluation projects should ensure that the outcomes from the projects are individually verified and evaluated by independent HVAC&R consultants, and the information is shared with the wider industry (warts and all).

Under this approach, property owners would install the most appropriate technology, while clearly understanding the risks involved. Over time property owners and technical service providers would become comfortable with the new approaches, and be more open to considering new technologies and practices. Demonstrating changes in attitude is often as important as demonstrating the technologies themselves, particularly in the risk averse construction industry. The measurement of costs and savings by independent consultants would generate the accuracy of information required.

In this context, it is important to ensure the qualifications of assessors/verifiers fall within the same envelope as the assessment task(s). In view of the long history of educational neglect within the refrigeration sector and particularly within the industrial refrigeration sector, identification of appropriately qualified assessors/verifiers may pose a challenge.

### **REGULATIONS AND INNOVATION FOR HFC PHASE-DOWN**

The Australian Government will implement a statutory phase-down of HFC imports, commencing January 2018 and will reduce HFC emissions by 85 per cent by 2036.



One of the biggest changes and challenges facing the refrigeration and air conditioning industry is the move from high global warming potential (GWP) refrigerant technology to next generation low GWP refrigerants and associated technologies. Many low GWP refrigerants are flammable, some are toxic, some produce toxic combustion by-products and some operate at very high pressures. AIRAH promotes the safe and responsible use of refrigerants and supports the efforts to advance technologies that minimise impact on the environment while enhancing performance, cost effectiveness, and safety.

AIRAH is technology neutral and is supportive of all low GWP refrigerant technologies.

The transition towards low GWP refrigerant technology is a reality and this means:

- Low GWP refrigerants bringing new training and risk management challenges for the industry technical service providers;
- High GWP refrigerant based systems, which are still being designed and installed, will have a defined limited lifetime. Clients and procurement departments need to be made aware, as well as technical services providers.
- Increased demands for energy efficiency within HVAC&R means that refrigerant cycle efficiency, refrigeration system efficiency and refrigeration technology or component efficiency (compressors, coils, fans) will need to continue to improve.
- Increased demands for greater energy productivity from HVAC&R infrastructure, means that controls, technology, and energy efficiency maintenance all need to be addressed as does operator awareness and behaviours.

The Australian Government should actively engage with representatives of the refrigeration and air conditioning industry, to work together with some constructive ideas for ensuring the transition to low GWP-refrigerant based systems is made as smoothly as the industry transitioned from CFC to HFC refrigerants. Governments should recognise that the transition towards low GWP systems brings a totally new and different set of technical challenges with it as a result of the flammability and toxicity properties that are a feature of most low GWP refrigerants.

Government can also help by ensuring that retailers are aware of the refrigeration industry solutions, and by offering incentives to conserve energy, thereby making the changeover process more of a carrot than a stick. By providing refrigeration dependant industries trusted cost benefit explanations that highlight the monetary and business benefits of refrigerant conversions, the traditional capital cost focus of retailers and other investors in refrigeration may be transformed into a holistic investment approach.

## **LICENSING AND TRAINING**

### **Occupational licensing for refrigeration and air conditioning trade**

The Australian Government should help to create a national, uniform, skills based licensing and licensing retention system for refrigeration technicians and refrigeration system designers. The system must be subject to continuing professional development and rigorous skills testing. The system must be underpinned by strong minimum standards for Education and Training.



## Education and skills

Education and skills are critical if Australia is to have safe, sustainable, healthy and comfortable built environments in a low-carbon economy.

A significant focus for AIRAH is the 20,000 VET-trained technicians who design, install, maintain, repair, and decommission refrigeration and air conditioning plant and components every day. The switch in refrigerant technology to low-GWP gasses, through the HFC phase-down, demands new knowledge and skills to operate safely.

Australia's success in limiting ozone-depleting substances can be replicated with carbon. These technicians are the key to realising targets as we move to a low carbon economy.

These targets can only be achieved if technical services workers are equipped with the appropriate knowledge and tools to implement new technologies. AIRAH is keen to collaborate with the Australian government and the VET sector to enable this outcome.

We will continue to advocate for and collaborate on initiatives that support the resilience of our industry and its valuable contributions.

## Training

Government could facilitate the delivery of demonstration/training technology to TAFEs/VET and universities that provide training and education in the sector, so that incoming industry entrants are more technology and innovation aware. For example, every university that provides training in building engineering, architecture, building physics or construction management should have a state of the art building management and energy diagnostic system operating on their premises so that their students can become familiar with these technologies.

At present, it is not possible to obtain tertiary qualifications in refrigeration technology anywhere in Australia. There should be an opportunity to offer this at a M.Eng level.

There are significant skills gaps in the industry in regard to energy efficiency and low emission tools and processes including:

- Designers and contractors with experience in the application of clean energy technology and low emission HVAC&R.
- Technicians with installation and diagnostic capabilities for building controls and management systems.
- Professionals with experience in building energy optimisation.
- Technicians and designers with experience in the application of natural refrigerant technologies (e.g. NH<sub>3</sub>, hydrocarbons, air, water or CO<sub>2</sub>).
- Technicians and designers with experience in the application of low life cycle climate performance (LCCP) technologies such as energy recovery systems, high efficiency equipment and systems, or equipment/systems using low GWP refrigerant technologies.

**End of submission**