



AIRAH ADVOCACY

Thought leadership

Policy and Advocacy Positions 2017 – 2020

**POSITIONS AND RECOMMENDATIONS ON HVAC&R
ISSUES:**

**RESILIENCE | SUSTAINABILITY | COMPLIANCE | REFRIGERANT
TRANSITION AND PRIME | INNOVATION AND RESEARCH**



Prepared by

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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 and business leaders. This overarching perspective – and reach to more than 25,000 industry participants – positions AIRAH well to develop and promote the most efficient, productive and resilient HVAC&R industry for Australia's future.

The 21st 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 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.

AIRAH has been representing the HVAC&R industry in Australia for almost a century, since 1920. This paper sets out AIRAH advocacy positions on the five key strategic topic areas that the institute is focussed on for 2017 namely:

- Resilience
- Sustainability
- Compliance
- Refrigerant Transition including PRIME
- Innovation and Research

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Principles of AIRAH Advocacy

AIRAH’s positions have been developed with our the following guiding principles:

- A safe, sustainable and professional refrigeration and HVAC industry.
- Technology neutral, outcomes-based, holistic, whole of supply chain view of the HVAC&R industry.
- Recognises of the global, regional and local pressures that the industry operates under.
- Transparent collaboration to develop consensus-based technical standards and advocate for measurable outcomes from any regulatory intervention.
- Recognition that correct information is key to maintaining a professionalised workforce, as are licencing, registration and their relationship to training and skills maintenance.
- Training and competence are significant issues for an industry that is in the grip of intense technological change and increasing demands for performance and productivity improvement.
- Research and innovation is a cornerstone of developing the industry for the future, as well as increasing the awareness and attractiveness of the industry for new entrants and for all of the many and diverse stakeholders involved in HVAC&R.
- Support of the involvement of all industry participants in the creation and implementation of policies and strategies for the future development of the industry. Everyone has something to offer; respect, negotiation and harmonisation is important.

Why AIRAH and Why HVAC&R?

Australia, as a signatory to the Paris Climate Change Agreement COP21, has now committed to the global transition to net-zero emissions, and to reaching net-zero emissions nationally around 2050. Also, Australia and the other parties to the Montreal Protocol have reached an agreement to a global 85 per cent phase-down of hydrofluorocarbons (HFCs) by 2050, in Kigali, Rwanda. Australia has committed to an 85% phase down by 2036. These commitments have wide reaching implications for all Australian, State, Territory and Local governments and all sectors of the Australian economy.

The Australian built environment and refrigeration sectors – 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 will play a huge part in this transformation. 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 enabling health and digital infrastructures, to the design and maintenance of high-performing buildings and the industrial and commercial refrigeration services used in manufacturing, production and agriculture.

AIRAH works with a broad range of government and industry stakeholders. The Institute has been very involved with the development of the Australian Sustainability Built Environment Council (ASBEC) *Low Carbon High Performance* report, and we support its recommendations.

AIRAH is also the driving force behind PRIME, the HVAC&R industry’s blueprint for a successful transition to a low-emissions future through **P**rofessionalism, **R**egulation, **I**nformation, **M**easurement and **E**mission abatement. www.primehvacr.com.au

As Australia moves to meet the challenges associated 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 for emission reductions and efficiency gains.

The four main sustainability impacts of HVAC&R are energy consumption, water consumption indoor environment quality, and refrigerant related atmospheric changes, all of which are inter-related. Before clean energy can be effectively used in the built environment, the systems using the energy have to be optimised and efficient.

The operation of refrigeration and air conditioning systems consumes about 22 per cent of all the electricity generated in Australia, and is responsible for more than 11 per cent of Australian total national emissions (Cold Hard Fact 2, 2013). Indirect emissions of HVAC&R systems typically represent 90 per cent or more of total emissions so it is clear that HVAC&R energy consumption has a significant sustainability impact. To reduce these high levels of emissions AIRAH notes that:

1. Buildings and refrigeration infrastructure have to become more energy efficient and more energy productive, this includes higher standards for fabric thermal performance and building sealing, as well as performance benchmarks for ongoing operation and maintenance.

2. HVAC&R systems have to be designed, installed and maintained for high efficiency and low emission. Measurement, monitoring and ongoing maintenance is the key to improving energy efficiency and productivity of the existing HVAC&R systems. Direct emissions of high global warming potential (GWP) refrigerants must remain a significant focus.
3. The energy used to run high efficiency HVAC&R in highly efficient buildings and the cold chain has to be from a clean low-carbon source.

Through these three key activities; more efficient buildings, more efficient systems combined with cleaner low-carbon energy sources, the emissions associated with HVAC&R, buildings and the cold chain can be dramatically reduced. Education and training of all supply chain participants in these three areas is key to successfully driving significant emission reductions in all of these sectors.

Resilience in HVAC&R

The key issues about resilience in HVAC&R

Resilience in the built environment, and across all HVAC&R applications, is a topic that is attracting an increasing focus in Australia and also around the world. In the current global physical, social and environmental situation, the ability of a building to deal with external and unusual impacts due to; climate change, extreme heat and cold, severe storm events, large bushfire events, earthquakes, social unrest, terrorist attack or criminal misadventure, is becoming more important and more valued.

Resilience in the context of the built environment means the capacity of a building and its associated systems (i.e. ventilation, heating/cooling, fire safety, lighting and sanitary facilities), to operate during and after a severe storm or some other unusual catastrophic event. The ability of a building to adapt, or be easily adapted, to a changing climate or a changing scenario is also an element of its resilience.

The resilience of Australian buildings, the cold chain, IT infrastructure, health services, manufacturing facilities and processing sectors all depend on the resilience of the HVAC&R systems that support them. As a critical enabler in the Australian economy, it is clear that the resilience of HVAC&R systems, in terms of their design, installation and operation has to be addressed to safe-guard the built environment and its occupants during extreme events.

Currently the resilience of HVAC&R infrastructure is not being strategically addressed in the property sector or elsewhere in the economy, apart from in specific critical applications. While there is growing awareness in Government and industry about resiliency, most of the focus is on cities and buildings with very little focus on HVAC&R and the related building services issues.

AIRAH's position on HVAC&R resilience

The HVAC&R industry needs to develop a unified strategy for increasing the resilience of HVAC&R, resulting in more resilient buildings and cities, more resilient cold chain and food supplies, and more resilient technical infrastructure in health, processing, education and information technology. AIRAH promote the following activities in relation to HVAC&R resilience:

1. The industry needs to develop and document the types of **actions and solutions** that can improve building and HVAC&R resilience.
2. The industry needs to collaborate and develop a clear and agreed **framework to address resilience** issues across the entire HVAC&R supply chain (including during design, installation, operation and maintenance activities) so that clients, procurement agencies and technical service providers alike can all address resilience in a unified and collaborative manner.
3. More research is needed, particularly into the magnitude of impacts and change in **future climate design data** over the typical 10 to 20 year 'useful life' of an HVAC&R system.

4. **Education and awareness raising** around the challenges in HVAC&R resilience, and what is possible to address these, should be developed for related stakeholders.

Providing the right people with the right information on HVAC&R resilience is a key component of addressing any weak links.

5. **Government policy and support** is also needed to ensure that resilience is considered in all new infrastructure. Industry cannot achieve this alone and a strong federal, state and local governmental policy platform around resilience, which includes strong minimum standards as well as incentives for best practice and support for training and professionalism, are also clearly needed.

Background

The world is now beginning to move toward combined collaborative action to mitigate the worst impacts of climate change. This was evidenced by the Paris COP 21 agreement in December 2015 and subsequent ratifications which signalled a move to global net-zero emissions by mid-century, and the Montreal Protocol agreement in Kigali in October 2016 to phase out HFCs.

The realities of a changing climate and more extreme weather events are already evident in Australia. Higher temperatures for longer periods, increased coastal and river flooding, severe wind- rain- and hail-storms are already happening, and the advice from the Bureau of Meteorology is that more extreme weather is set to become the new normal in Australia. Advice from insurance companies is that claims in relation to climate-related damage is rising in terms of both the number of claims and their economic cost.

There is currently little activity aimed at addressing mainstream HVAC&R resilience in Australia. There are significant knowledge gaps around methods to “harden” HVAC&R services or the techniques for using HVAC&R systems and components to make refrigeration infrastructure, buildings, precincts and cities more resilient. Resilience techniques used for critical refrigeration processes need to be adopted more broadly into mainstream HVAC&R applications. Interest in resilience strategies for buildings and other infrastructure is growing in the all sectors of the economy and the HVAC&R industry must be ready to play its part and even lead the building, property, manufacturing and cold chain sectors in innovative approaches to resilience.

Resilience is a global issue that requires local, national, regional and global solutions. AIRAH believe that HVAC&R professionals have a lot to offer all sectors in terms of better preparing buildings and refrigeration infrastructure to absorb, deflect and rebound from unexpected external impacts.

AIRAH's achievements and credentials in the resilience space

AIRAH has brought together a range of industry professionals and AIRAH members to consider the topic of HVAC&R resilience. This included a Resilience task force meeting in Sydney in 2015 and was followed up by a Resilience Think Tank meeting in 2016. Out of these initiatives AIRAH has formed a HVAC&R Resilience Special Technical Group (STG) to further develop AIRAH strategy in this space.

How AIRAH can contribute to next steps

HVAC&R resilience framework

AIRAH's Resilience STG, a special technical group of building and services experts, will develop an **AIRAH HVAC&R Resilience Framework** to deliver practical solutions across the entire HVAC&R supply chain.

Future climate data

The Resilience STG will also facilitate a "Future TMY" (future typical meteorological year) group to help industry predict future climate design standards and data. This group will research international and local approaches and determine the best way to facilitate the development of Australian Future TMY data for use by Australian industry.

Resilience awareness

Through the STG activities AIRAH will build awareness around the growing importance of HVAC&R resilience. This includes awareness raising amongst the HVAC&R community and the full range of building stakeholders that need to be informed as well as exploring opportunities to collaborate with industry organisations and government to develop and provide appropriate tools to address resiliency in the built environment.

Skills sharing

AIRAH will also examine how to share resilience skills and experiences within the AIRAH network including communicating to broader Australian stakeholders via ASBEC, NCARF etc., as well as leveraging international relationships through kindred organisations like ASHRAE, CIBSE, IIR, IAR and IEA.

Education and training

AIRAH resilience tools and framework can be offered to University and VET training institutions for incorporation into their education and training programs, embedding resilience as a concept into the mind of industry entrants.

Sustainability in HVAC&R

The key issues for HVAC&R sustainability

The Australian government has committed to reducing national emissions by 5 per cent (below 2000 levels) by 2020 and reducing national emissions by 26-28 per cent (below 2005 levels) by 2030. Australia, as a signatory to the 2015 Paris Climate Change Agreement, has also now committed to the global transition to net-zero emissions, and to reaching net-zero emissions nationally around 2050.

All levels of government in Australia have also committed to improving the sustainability of buildings and cities and improving energy productivity more generally within the Australian economy. The issue of national energy use, national emissions and the sustainability outcomes of Australian buildings, cities, and the entire economy cannot be addressed without also addressing HVAC&R sustainability; the concepts are deeply interlinked.

Apart from embodied energy, the three main sustainability impacts of HVAC&R systems are; energy consumption, water consumption and refrigerant related atmospheric changes. Indoor environment quality issues such as thermal comfort and good indoor air quality (IAQ) are also important sustainability 'considerations' as we deliver the healthy and safe indoor environments essential to the welfare of our future generations.

AIRAH's position on building sector sustainability

AIRAH is of the view that the HVAC&R industry has a significant role to play in addressing and improving the sustainability of the Australian building sector and the productivity of the wider economy.

Buildings

AIRAH have collaborated with the Australian Sustainability Built Environment Council (ASBEC) on the development of the *Low Carbon, High Performance* report, which provides a roadmap for the transition of Australian property to a zero carbon footing.

Australia's commitment to the Paris Climate Change Agreement demands a transition to net zero emissions by 2050. The built environment presents the greatest opportunity to reduce emissions, at the least cost. Even without any new technology breakthroughs the ASBEC report shows that energy efficiency measures and fuel switching can reduce the projected 2050 emissions from buildings by more than half.

AIRAH advocates for all governments and all industry stakeholders to commit to achieving net zero emissions buildings by implementing:

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.

Mid-tier buildings

AIRAH is 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 incentives to encourage existing building upgrades and retrofits.

AIRAH is supporting a number of [National Energy Productivity Plan \(NEPP\) work plan](#) initiatives, in particular action 9b that relates to “*engagement with the HVAC&R industry and its industry-led low emissions future initiative*” (PRIME)

AIRAH is also supporting the National Energy Efficient Buildings Project (NEEBP) series of projects, currently being led by the South Australian Government on behalf of all state and territory governments, 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.

AIRAH’s position on HVAC&R sector sustainability

In addition to these property sector initiatives, AIRAH continue to recommend the following actions to help promote and improve HVAC&R systems sustainability.

1. Continued improvement, promotion and uptake of the “**Calculating Cool**” building HVAC online rating tool, including an expansion of the tool to cover low-emission technologies. <http://www.calculatingcool.com.au/#/home>
2. The development of an emissions or efficiency **benchmarking tool for refrigeration** systems, similar to Calculating Cool but addressing industrial and commercial cold room and cool room refrigeration systems. There are software tools in existence overseas which could be modified or adapted for Australian use.
3. A renewed focus on the **maintenance and performance of existing buildings** (PRIME focus topic). 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 benefits, including increased asset values, improvements in worker productivity, process productivity, occupant health benefits, and importantly, improved building and infrastructure resilience.
4. More **research and training in HVAC&R** energy efficiency. Education and skills are critical if Australia is to have safe, sustainable, healthy and comfortable built environments and resilient efficient refrigeration infrastructure in a low-carbon economy. Research programs need to develop and disseminate information on low-emission HVAC&R strategies such as thermal storage, solar cooling, integrated phase change, integrated PV etc.
5. The development of climate zone specific **energy policies** requiring measurement, benchmarking and disclosure of energy use are essential to drive change. The absence of this data is a barrier to change. In particular, the expansion in scope and coverage of the Commercial Building Disclosure program to cover smaller buildings and all building sizes and types (classifications) would be a significant driver for change as would a similar benchmarking standard for refrigeration applications such as cool rooms and refrigerated warehousing the widespread use of electrical resistance based heating in many applications needs to be addressed.

AIRAH advocates for low-emission HVAC&R systems

Low-emission HVAC&R requires a much bigger focus on those building or process characteristics that drive cooling and heating loads. This means that the envelope of the building or container, its thermal performance and the air sealing characteristics have all been optimised to ensure that the minimum amount of HVAC&R energy is required. Low-emission HVAC&R is accurately sized to meet documented realistic operating requirements and is installed, controlled, commissioned, monitored, operated and fine-tuned to ensure optimised energy and water consumption rates.

Low-emission HVAC&R means systems that are designed to have a reduced environmental impact, measured over the entire life-cycle of the system. Low-energy high-productivity systems that utilise energy recovery where practical, either within the system or within the building or facility. Low-emission HVAC&R means low GWP working fluids and tight system construction standards, minimising leaks and maintaining and optimum refrigerant charge.

Low-emission HVAC&R means real time monitoring of electrical, water and refrigerant inputs and outputs, system self-diagnostics and alarms, free running systems and free running buildings or processes when outdoor conditions allow. In buildings, low-emission HVAC&R means optimising ventilation, thermal comfort and indoor environment quality outcomes with controls that are adaptive to external climate conditions and internal occupant needs. In processes and infrastructure applications low-emission HVAC&R means optimised systems that are designed, installed, monitored, benchmarked and controlled for emission performance.

Low-emission HVAC&R costs more to procure than the current industry standard offering but costs a lot less to run and generates better long-term outcomes for businesses, for owners, and for the environment.

Background

Buildings use 24 per cent of all the electricity generated in Australia and HVAC&R uses 40 to 60 per cent of all building energy use ([Low Carbon High Performance Buildings Report](#)). Across the economy HVAC&R is responsible for consuming more than 22 per cent of all generated electricity and generating more than 11 per cent of all Australian emissions ([cold-hard-facts-2](#)). This shows that HVAC&R in buildings consumes roughly about 14 per cent of all electricity in Australia and other refrigeration uses consume a further 8 per cent.

The HVAC&R industry has a significant history in relation to adverse environmental impact, particularly in relation to impacts from refrigerants, energy use, environmental noise, and sick building syndrome due to poor building ventilation standards. These environmental impacts relate, in large part, to the size and diversified nature of the industry, to the fact that HVAC&R technology is fundamental to, and intrinsic in, almost all aspects of modern Australian life.

Addressing the environmental impacts of the sector requires a whole-of industry approach as championed by the PRIME Steering Council.

AIRAH's achievements and credentials in the HVAC&R sustainability space

AIRAH has completed significant work addressing HVAC&R sustainability.

AIRAH have had an Environmentally Sustainable Design Special Technical Group (ESD STG) in operation since June 2011. As well as informing regulation and policy this group have developed and published the [AIRAH Building Simulation Procurement Guide](#).

The AIRAH Refrigeration STG developed and published the [AIRAH Methods of calculating Total Equivalent Warming Impact \(TEWI\) Best Practice Guideline](#).

AIRAH have collaborated with the NSW government to develop the *HVAC Optimisation Guideline* to promote and facilitate HVAC energy savings in existing buildings and open up the industry to wider participation in the NSW Energy Saver scheme (ESS) and other state-based energy certificate schemes. [HVAC Optimisation Guideline](#).

AIRAH worked closely with ASBEC to develop the *Low Carbon, High Performance* report, a roadmap to deliver zero carbon buildings. [Low Carbon, High Performance](#).

AIRAH worked with Government and Industry to develop the *Guide to Best Practice Maintenance & Operation of HVAC Systems for Energy Efficiency* [HVAC HESS Operation and Maintenance guide](#).

AIRAH continues to work with Sustainability Victoria and a range of industry stakeholders to develop the Calculating Cool HVAC rating tool which is PRIME endorsed, evolving and gaining traction within the facilities space. <http://www.calculatingcool.com.au/#/home>

How AIRAH can contribute to the next steps

PRIME

As a founding member of the HVAC&R industry's PRIME initiative, AIRAH will continue to support the development and delivery of initiatives that promote low-emission HVAC&R by providing secretariat and project management services and resources to PRIME. www.primehvacr.com.au

Energy productivity and the NCC 2019

AIRAH is involved in and is a contributing member of the technical working group developing the ASBEC National *Construction Code NCC 2019* Energy Efficiency Upgrade project.

AIRAH will deliver a PRIME project to secure an all-of-industry endorsement to introduce a mandatory commissioning requirement into NCC Vol One 2019 for new buildings.

AIRAH have set up a Building Physics Special Technical Group (STG) that will be addressing requirements and training needs for practitioners designing and constructing air-tight buildings as well as validating construction quality using building pressurisation testing.

Existing building energy productivity

AIRAH is active in the continued development and wider application of the *NABERS Energy rating tool* and continues to advocate for the expansion of the CBD mandatory disclosure of building energy performance scheme to a wider range of building types.

AIRAH is in discussions with several industry stakeholders about collaborating in the development of an *Australian Greener Buildings Standard*, to help promote the incorporation of sustainable design and green construction practices into 'ordinary' Australian buildings and address the gap between minimum NCC building practice and green star design and construction best practice.

Emission reductions and Direct Action

AIRAH is involved in and supports the work of the Emission Reduction Fund team at the Department of the Environment to develop measurement and verification protocols for energy interventions in buildings, facilities and HVAC&R systems and components. AIRAH sees these methods as valuable tools that can be used in current and future state and commonwealth energy certificate schemes in Australia (i.e. NSW ESS, Victorian VEET and Commonwealth ERF).

HVAC&R Compliance

The key issues around HVAC&R regulation

The HVAC&R industry operates under a wide range of legislation and regulatory requirements and regimes from all levels of government. The main areas of regulation encountered by our industry includes:

- Building regulations – National Construction Code (NCC) requirements and various state based variations and differing building administration systems.
- Planning regulations – Including specific local requirements imposed through local government-based planning or development consent conditions.
- Local council regulations – Special local planning conditions, food services regulations, environmental noise enforcement.
- Environmental regulations – Ozone Protection and Synthetic Greenhouse Gas Management Act and associated regulations, environmental noise regulations, and air pollution regulations.
- Energy regulations – Including Commercial Building Disclosure (incorporating NABERS), Greenhouse and Energy Minimum Standards (GEMS) and minimum energy performance standards (MEPS).
- Electrical regulations – AS/NZS 3000 wiring rules, electrical safety for refrigeration and heating appliances, hazardous area standards.
- Plumbing regulations – Including NCC Volume 3, AS 3500 series, backflow prevention trade waste regulations, and sewage.
- Gas regulations – Flammable fuel gas regulations, hydrocarbon refrigerants.
- Licensing regulations – For synthetic refrigerants handling through the Australian Refrigeration Council, for refrigeration and air conditioning contracting businesses through the state regulator, for hydrocarbon refrigerants through the state regulator.
- Occupational safety regulations – Model WHS Act and regulations in most states, or state based OH&S Act and regulations (Victoria and WA), safety in design, national occupational exposure standards, hazardous atmospheres, confined spaces, design registration, plant registration.
- Public Health regulations – State-based Legionnaires disease regulations, microbial control inspection testing and maintenance, indoor air quality.
- Fire Safety regulations – Essential services inspection testing and maintenance.

All of these regulations require a level of compliance. Issues in relation to non-compliance can arise at various points in the HVAC&R supply chain including:

- Product compliance – Products that do not comply with the regulated requirements, e.g. flexible duct R value, electrical cable rating, fire rating system FRL, MEPS efficiency.

- Specification compliance – Products or entire systems that are not designed or specified correctly and in accordance with the regulation, e.g. fire sprinklers in kitchen exhaust systems.
- Installation compliance – Products and systems that are not installed correctly and so fail to achieve the required compliance, e.g. fire damper installation.
- Operation and maintenance compliance – Products and systems that are not operated and maintained correctly to achieve the required compliance, e.g. cooling tower management.

Not all of these regulated requirements are well understood by the various stakeholders in the HVAC&R sector or in the client and procurement chain, particularly where regulations vary significantly from state to state, e.g. refrigeration and air conditioning contractor licencing, Legionnaires disease regulations. In many situations actual responsibilities are not clear to many duty holders.

Many regulations impose a self-certification scheme that is backed by a dispute driven reactive audit/investigation program. Compliance issues are often only inspected and examined after an incident has occurred and has been reported, or a dispute has arisen, leaving a lot of undiscovered non-compliance.

AIRAH's focus on compliance is on the extent, causes, impacts and solutions for regulatory non-compliance within the HVAC&R sector.

AIRAH's recommendations on HVAC&R compliance

AIRAH want to inform and work with all regulators to help bring a HVAC&R voice to the development of the environmental, energy, building, WHS, plumbing, electrical and health regulations that impact the HVAC&R industry. AIRAH have the following recommendations:

1. The inclusion of an explicit requirement and mandatory high-level process for whole-building **commissioning within the NCC**. Improving the commissioning ethos and practices within the building and property sectors (and within the commercial and industrial refrigeration industry), in particular the documentation and recording of the process should go a long way to providing an improved compliance framework for building administrators. Commissioning also generates the baseline data against which ongoing operational performance can be benchmarked.
2. Regulations should include **clear technical standards and compliance pathways** that industry can work with. Regulations should be written in plain English in a manner and format that can be readily understood by industry participants. Where regulations cannot be written in plain English they should be accompanied by explanatory guidance materials that is.
3. Governments need to focus on **harmonisation of regulation** rather than solely deregulation. AIRAH would like to see a lot more effort from the State and Commonwealth Governments through COAG or minister's forums to harmonise state-based regulations in the following areas:

- National licence schemes for refrigerant occupational licence to cover all refrigerants, with different grades to reflect achieved skill levels, and a separate contractor/business licence if required;
- Minimum standards of competency for building services designers and associated practitioners, under a national register for building services and refrigeration engineering professionals;
- Standardised regulatory requirements for maintenance and inspections of both essential services maintenance (fire dampers, smoke control systems) and Legionnaires disease/microbial control of water and air handling systems (cooling towers);
- Standardised energy certificate incentive scheme requirements for HVAC&R related energy efficiency interventions. Harmonise the technical requirements for Commonwealth ERF, NSW ESS, Victorian VEET, ACT and SA energy certificate incentive schemes and provide a model for new Tas, Qld, NT and WA schemes;
- National building (NCC) and WHS regulations should move to reference the new updated refrigeration safety standards AS/NZS 5149 as a minimum safety requirement or benchmark;
- Government and industry need to work together to develop and deliver more training to all industry participants. Training and continuing education is a significant part of the compliance solution where a competent professional workforce can provide a safe and efficient HVAC&R infrastructure. Digitising training and delivering skills maintenance updates across multiple platforms all need to be adopted.

Background

There are several aspects to non-compliance including the type of issue, the sector in which it occurs, the nature of the issue, where it occurs in the supply chain and the frequency with which it is encountered.

- Compliance for buildings – Poor compliance with requirements of the NCC includes issues like system control sequences, errors with fire and smoke damper installation and smoke control systems not operating correctly.
- Compliance for refrigeration systems – Poor compliance with safety standards includes lack of pressure vessel registration, inadequate safety valves and pressure relief, no refrigerant detection, and poor quality of installation (poor pipe support, risks of trapped liquid, corrosion, liquid hammer, plantroom ventilation etc.), poor compliance with environmental standards includes excessive charge of refrigerant, insufficient leak testing and poor refrigerant management.
- Compliance with maintenance regulations – Poor compliance with state based maintenance regulations for essential services and cooling towers, including neglecting to inspect and maintain fire dampers and smoke control systems in accordance with the required industry standards.

There is anecdotal and documentary evidence of a high level of “undiscovered” non-compliance issues within some sectors of the HVAC&R industry. In the property sector compliance issues often come to light many years after the initial construction, during a fire safety audit or a due diligence pre-purchase inspection of a building.

Due to the multiplicity of state administrations involved, the self-certification approach and low levels of audit carried out, actual levels of regulatory non-compliance are difficult to quantify. There is significant work being undertaken by industry and regulators through the COAG Building Ministers Forum on building product compliance.

AIRAH achievements and credentials on HVAC&R compliance

AIRAH has constantly tried to put this topic on the national agenda however non-compliances are so widespread and varied across all sectors that it is difficult to find government and industry stakeholders that can inform and enforce meaningful change. The move to self-regulation and self-certification in many sectors needs to be re-evaluated in terms of performance and gaps, and better supported.

AIRAH facilitated a review of NCC Section J compliance issues in 2011 through an industry survey. Following the survey AIRAH worked with the ABCB and other industry organisations to review and reformat the Section J requirements pertaining to HVAC. This improved the practicality and industry understanding of the Section J requirements, removed regulatory contradictions and would be expected to improve compliance levels.

AIRAH conducts seminars and training on NCC referenced standards such as AS/NZS 1668 series and AS/NZS 3666 series, as well as important maintenance standards such as AS 1851. These important Australian Standards underpin many HVAC&R regulations including mechanical and natural ventilation, HVAC hygiene and fire and smoke control.

AIRAH have facilitated the development of several safety-based codes of practice documents including the Victorian Ammonia Code of Practice, The Refrigerant Handling Code of Practice (parts 1 and 2) and the Flammable Refrigerants Safety Guide.

AIRAH have developed and published a free Technical Bulletin on Kitchen Exhaust Fire safety, a topic that is regularly the subject of non-compliance and one that has serious safety implications.

AIRAH have Collaborated with Safework NSW to develop of a safety alert in relation to servicing refrigerant systems.

AIRAH have conducted research into WHS issues identified by the HVAC&R trade and produced a summary report to inform priority areas of action and collaboration with WHS stakeholders.

How AIRAH can contribute to next steps

More technical information for industry

AIRAH is in the process of developing a series of **AIRAH Technical Bulletins** explaining the pertinent requirements of the relevant technical standards, the requirements of regulations,

common areas of non-compliance, and ways to mitigate these, as well as best practices and ways to exceed minimum standards.

A one-stop-shop approach providing technical overviews of specific industry compliance issues.

Training and education

AIRAH will continue to provide leading-edge training and continuing education programs to support all of our compliance efforts.

Commissioning in the NCC

AIRAH is working to facilitate a PRIME project to propose that whole-building commissioning be explicitly included in the NCC.

Refrigerant transition

There are a range of regulations and associated documents that need to be revised to support a refrigerant transition towards low global warming potential refrigerants. AIRAH will work with PRIME to advance those activities that require an all-of-industry approach.

AIRAH wants to work with government to communicate the new HFC Phase-down requirements, commencing in January 2018, and provide appropriate management tools for industry. [HFC phase-down faqs](#)

Industry collaboration

AIRAH will continue to work with Standards Australia to ensure that any updates to important industry standards are communicated to industry.

AIRAH will work with ABCB and State building administrations to explore how AIRAH can contribute to improving compliance systems.

Refrigerant Transition and PRIME

The key issues moving industry towards low global warming potential (GWP) refrigerants

Australia and the other parties to the Montreal Protocol reached an agreement to a global 85 per cent phase-down of hydrofluorocarbons (HFCs) by 2050, during a series of talks in Kigali, Rwanda in October 2016. Australia has committed to an 85% phase down of HFCs 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 low GWP refrigerants and associated technologies. Refrigeration and air conditioning provide many benefits to society, but these benefits carry environmental and societal consequences. In order to mitigate these consequences, the industry is moving towards greater use of low GWP refrigerants.

Many low GWP refrigerants are flammable, some are toxic and some operate at very high pressures. These characteristics, combined with a lack of industry familiarity and training, present a series of safety challenges for the industry, and society as a whole. Most of the refrigerants that licensed technicians have been trained on will be replaced in the near future, resulting in a significant technical re-training requirement for all practitioners in the field.

Choosing a refrigerant has also become more complex. Contemporary low GWP refrigerants include natural refrigerants, synthetic refrigerants and blends of refrigerants.

Synthetic low GWP refrigerants include single species and blends of HFCs and HFOs. Natural low GWP refrigerants include ammonia, carbon dioxide, hydrocarbons, water, and air. Some low GWP natural refrigerants have been used in the Australian market in specific applications for many decades. Although more environmentally favourable, low GWP refrigerants are not free of the traditional refrigerant safety concerns which include flammability, toxicity, high pressures, or simple asphyxiation.

AIRAH position on refrigerant transition

AIRAH supports a move to low-emission (direct and indirect emissions) high efficiency HVAC&R, which includes an industry transition to low GWP refrigerants.

AIRAH's position is that the selection of refrigerants and the type of technology for any particular application should be based on a holistic analysis of multiple criteria. 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 in its support of all low GWP refrigerant technologies.

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

- Low GWP refrigerants bringing new training challenges for the industry technical service providers.

- High GWP refrigerant based systems, that are still being designed and installed will have a defined limited lifetime. Clients and procurement departments need to be aware of the implications of procurement decisions and available alternatives.
- Increased demands for energy efficiency within HVAC&R means that refrigerant system efficiency and refrigeration 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 do operator awareness and behaviours.

AIRAH recommendations on refrigerant transition

The transition in refrigerant technologies towards a low-emission refrigeration and air conditioning industry is the biggest single challenge facing the HVAC&R industry. AIRAH make the following recommendations to help facilitate a smoother and accelerated refrigerant transition:

1. **Information initiatives to support the HFC phase-down** – There are a range of stakeholders that will require significant awareness raising around the HFC phase down and what that means for long term procurement of new systems and for the ongoing maintenance of existing systems. Governments should actively engage with representatives of the HVAC&R industry at local, state and commonwealth level, to work together to develop constructive ideas for ensuring the transition to low GWP systems is made as smoothly as the industry transitioned from CFC to HFC refrigerants.
2. **Training and education** – 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 alternatives, through the HFC phase-down, demands new knowledge and skills to operate safely. The development and delivery of TAFE/VET training units that cover the safe and efficient application of low-GWP refrigerants including HFCs, HFOs, hydrocarbons, Ammonia and CO₂ is essential. Workforce development planning should include a scheme to make individual units available to existing licence holders at a significant discount. Digitise training for skills maintenance purposes and provide face to face and alternative delivery platforms for those that need it.

The HVAC&R industry is facing an upcoming skills crisis due to the low level of enrolments in vocational education training and apprenticeships and a lack of targeted university degree courses for building services or refrigeration engineers. The industry needs to lift its profile and attract high quality passionate students. A skills based licensing system is a key enabler to creating a demand for more education and pride in qualifications achieved. The industry needs a more dynamic TAFE/VET system with industry at its centre, government apprenticeship incentives and the development and introduction of graduate courses specifically for HVAC&R.

3. **National licencing and registration** – Australia needs a single skills based national licencing system for refrigeration technicians that covers the application of all refrigerants in all sectors and every jurisdiction. Skills maintenance and continued development is essential. Business and trade practice licencing is a separate issue. A nationally harmonised state-based registration system for building services and refrigeration engineers is also highly desirable to professionalise the building services and refrigeration industry.
4. **Updates of industry Codes of Practice and guides** – The industry will require new information and design tools to help inform their technical decisions. Important industry documents such as the AIRAH Refrigerant Selection Guide need to be updated in content and modernised in format to support the industry transition. Following the *Ozone Protection and Synthetic Greenhouse Gas Management Act* review and the widespread introduction of flammable synthetic refrigerants into the Australian market, the existing [Refrigerant Handling Code of Practice](#) documents (parts 1 and 2) should be updated to reflect all changes and examine the potential for additional leakage stringency increases.
5. **A focus on flammable refrigerants** – As the industry transitions to low-GWP refrigerants, all stakeholders will encounter flammable refrigerants more frequently. There are a whole range of stakeholders, all along the refrigeration and air conditioning supply chain, that will need to adopt new practices and procedures to accommodate the flammability risk, and who are not currently aware of these changes. This topic is identified as a PRIME focus area.
6. **More HVAC&R research** – Is needed into low GWP refrigerants, new safety procedures, and new next generation low-emission cooling and heating technologies. The development of a HVAC&R Research Roadmap should be the first step. In addition, options to link the performance of systems to operational outcomes should be explored including real time energy management and automated fault detection and diagnostics.

Background

In June 2016, the Australian Government announced that it would implement a statutory phase-down of HFC imports which will reduce HFC emissions by 85 per cent by 2036. ([HFC phase-down FAQs](#)). In October 2016 Australia and the other parties to the Montreal Protocol reached an agreement to a global 85 per cent phase-down of hydrofluorocarbons (HFCs) by 2050 in Kigali, Rwanda.

The transition away from high GWP HFC refrigerants is now a reality and is already happening ahead of the regulations which will commence in Australia on January 1 2018. Many low GWP refrigerants are flammable, some are toxic 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 achievements and credentials in the refrigerant transition space

AIRAH has tackled this issue in a number of ways. In an effort to identify the technical barriers and skills gaps in the industry AIRAH started to develop a roadmap to help the industry transition to a low emissions future. This initiative led to the formation of the PRIME Steering Council, a cross-industry council formed to coordinate action and guide the industry through these immense changes.

AIRAH has produced a range of free resources for the industry to help support the transition to low-GWP refrigerant technologies and low-emission HVAC&R including; the AIRAH TEWI Guide, the Flammable Refrigerant Safety Guide, the R22 Management Guideline, the HVAC Optimisation Guide, the Cool Room Hero fact sheets, and the Natural Refrigerant case studies (all available for free from the AIRAH website):

- [Flammable Refrigerants Safety Guide](#) – A comprehensive practical guide on how to manage the health and safety risks associated with the full life-cycle of refrigeration and air conditioning systems that use flammable refrigerants.
- [Method of Calculating Total Equivalent Warming Impact \(TEWI\) Guide](#) – A method to estimate the complete economic and environmental life cycle costs of a refrigeration or air conditioning system. The method allows competing systems to be compared on a common basis and the most efficient and least life-time cost system chosen.
- [Management Guideline for the Phase-out of Refrigerant R22](#) – Information for building owners, facility managers and technical service providers on the four options for the management of existing refrigeration and air conditioning systems that contain the refrigerant R22.
- [HVAC Optimisation Guide](#) – Information for building owners, facility managers and technical service providers on twenty common intervention options for the optimisation of a buildings HVAC systems.
- The [Cool Room Hero](#) fact sheets – Information sheet for cool room owners and managers on potential energy efficiency interventions and system upgrades for typical cool room and cold store operations and a complimentary information sheet for technical service providers.
- [Natural Refrigerant case studies](#) – Six real life case studies of the successful and safe application of natural refrigerants to a range of installations.

In addition to the publication of the Flammable Refrigerants Safety Guide, AIRAH also developed a series of complimentary fact sheets ([Fact Sheets](#)) and delivered seminars on the topic throughout 2014 and 2015 ([Presentation](#)).

How AIRAH can contribute to the next steps

PRIME

AIRAH will continue to lead industry change by ensuring the implementation of the **PRIME** whole-of-industry strategy for the transition to low-emission HVAC&R. Putting the correct information into the correct people's hands at the right time is a fundamental tenet of [PRIME](#).

In particular, AIRAH will facilitate PRIME to make progress on projects for:

- Building Commissioning in the NCC;
- Energy Efficiency Maintenance and energy benchmarking for existing buildings;
- Investigating low emission HVAC solutions for future buildings;
- Discussions around a preferred National Licencing model; and
- Development of an industry position around VET training and apprenticeships.

Training

AIRAH is strongly advocating for the development of new technical resources and training for all low GWP refrigerants and their associated technologies. AIRAH has advocated for publicly available transparent design, installation and refrigerant handling guidelines to be developed for all types of low GWP refrigerants, including CO₂, NH₃, HC, HFO and new refrigerant blends and an update for existing HFC refrigerant resources.

Information

AIRAH is currently looking for ways to resource the revision and update of the *AIRAH Refrigerant Selection Guide* which would be an ideal vehicle to get information out to AIRAH members and the industry in general about the correct applications and design data for low GWP refrigerants.

Industry standards

AIRAH is currently looking for ways to resource the revision and update of the *Refrigerant Handling Code of Practice 2007* Parts 1 and 2.

AIRAH is working with industry to support the adoption of AS/NZS 5149:2016 to replace AS/NZS 1677:1998 and will work to communicate the requirements of the new standards to industry participants in collaboration with Standards Australia and other industry partners.

AIRAH will look for ways to increase the visibility and application of these standards as minimum industry safety standards.

HVAC&R Innovation and Research

The key issues related to HVAC&R innovation and research

There is increasing demand for improved energy performance in buildings and industrial processes and HVAC&R must continue to improve in energy efficiency and energy productivity outcomes to meet this demand.

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 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
- Behaviour change.

One of the main issues that has been discovered by AIRAH in the HVAC&R research space is the disconnect that is evident between academia and industry. In many cases industry is not aware of ongoing HVAC&R research projects and the results of academic research are not well disseminated within the industry. Researchers and industry appear to be largely working in silos, with some notable exceptions.

AIRAH recommendations on HVAC&R innovation and research

AIRAH believes that an industry forum is needed to facilitate three key aspects that are central to generating value and supporting innovation for the Australian HVAC&R and wider building industry.

These are:

1. Establishing key HVAC&R research needs and developing a **HVAC&R Research Roadmap** for Australia
2. **Engaging industry** in HVAC&R research nationally and internationally; and
3. Effectively **communicating findings** from national and international research that are relevant to Australian HVAC&R issues.

AIRAH would like to facilitate greater coordination in HVAC&R research and would like to see industry preferences for research topics established as well as greater investment by government and industry into local HVAC&R related research.

In regards to innovation AIRAH have the following additional recommendations:

1. Support **low-emission demonstration projects** - Government 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.
2. Support **low-emission technology learning** - Government could 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.

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.

Background

There is currently no effective and lasting coordination in place in Australia to allow identification of HVAC&R research gaps, dissemination of innovative findings and engagement of industry with academia. The result is significant missed opportunities to accelerate HVAC&R innovation.

Innovation in HVAC&R in Australia has led to successful small businesses start-up and niche manufacturing opportunities. 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:

- Include direct approaches to property owners, to determine the level of interest and the window of opportunity for potential innovative technology projects.
- Work with property owners and HVAC&R consultants to decide which innovative solution(s) would be most suited to particular situations.
- Ensure that potential projects and their funding requirements are individually assessed by independent HVAC&R consultants.

- 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 (the good news and bad news).

With this approach, property owners would install the most appropriate technology, while clearly understanding the risks involved. Over time property owners, clients 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.

AIRAH achievements and credentials in HVAC&R innovation and research

AIRAH is supporting the HVAC&R industry research agenda through the delivery of national surveys and workshops. AIRAH conducted surveys on HVAC&R research activity in Australia in 2013 and 2014. AIRAH asked academia and industry what research is being undertaken in the HVAC&R and related fields, by whom, what are the perceived research gaps, and where the unused capacity within research institutions might be.

AIRAH followed up the survey with a 2014 HVAC&R Research summit in partnership with the Institute for Sustainable Futures.

AIRAH has strong working relationships with a number of universities. AIRAH is represented on the University of Wollongong advisory board and partners with RMIT and University of Melbourne to deliver the Melbourne Forum.

AIRAH is supporting the ASBEC proposal to set up a high-level research coordination group to look at research outcomes and opportunities for the building/property sector.

AIRAH supports and rewards project innovations in HVAC&R through the annual AIRAH Industry Awards and the biannual ARBS awards.

How AIRAH can contribute to next steps

ASBEC

AIRAH strongly supports the formation of a high-level research group within ASBEC. AIRAH will be the voice of HVAC&R on the ASBEC research group.

HVAC&R research roadmap

AIRAH would like to collaborate with Australian Universities and centres of learning to develop a HVAC&R research roadmap.

Maintenance for energy efficiency research

AIRAH have proposed some research to examine and quantify the efficacy or cost benefits of energy efficiency for maintenance for small scale refrigeration and air conditioning systems.



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