



www.airah.org.au

10 May 2011

Consultation Support Team
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Canberra **ACT 2601**
Australia
CarbonPriceSubmissions@climatechange.gov.au

Dear Sir,

Re: AIRAH'S response to DCCEE invitation to comment on the proposed carbon price mechanism and architecture.

The Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH) thanks you for the opportunity to provide a response to this important matter. Our submission, *Job creation and emissions abatement opportunities in the HVAC& R Industry*, is attached.

Transforming the energy economy of Australia with a carbon price mechanism is necessary; the transformation cannot be left to economics alone. The market for energy efficiency has been shown to fail, for many reasons. Too often the reason is because of a lack of trained engineering professionals and technicians to implement both new technology and the cost-effective strategies of servicing and maintenance, which lead to energy savings.

An expansion of training and education in the heating, ventilation HVAC&R industry is vital to properly maintain the essential services of air conditioning and refrigeration upon which so much of the economy is now reliant.

To capture the larger opportunities briefly outlined in our submission, which could so directly support the decarbonisation of the economy, will require a sharp focus on the resources from the national education vote to this sector. It is a contribution that, we assert, does not fairly represent the scale of the benefit this industry makes to the national economy.

AIRAH offers its support to the work of the Committee and is willing to provide its relevant expertise and assistance in the further design of matters still to be determined in the implementation of the carbon price mechanism.

Yours faithfully,

Phil Wilkinson, Chief Executive Officer, AIRAH

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**May
2011**

**AIRAH'S response to DCCEE invitation to
comment on the proposed carbon price
mechanism and architecture.**

*Job creation and emissions abatement
opportunities in the HVAC&R Industry*



Job creation and emissions abatement opportunities in the HVAC& R Industry

Executive summary

Air conditioning and refrigeration services have to be considered as essential services in the majority of modern-day applications. They are ubiquitous throughout the economy, and are one of the largest single uses of electricity in Australia. These services also rely on refrigerant gases known as hydrofluorocarbons (HFCs), one of the Kyoto Protocol gases, as the “working gases” in the heat transfer systems that are at the heart of the technology.

As a result, the complex issues associated with transforming the energy economy to a sustainable, low carbon future could be said to converge on this sector.

AIRAH is the professional association representing engineering design professionals and skilled tradespeople in the heating, ventilation, air conditioning and refrigeration (HVAC&R) sector. AIRAH supports the implementation of a price on carbon, and broadly supports the proposed carbon price mechanism.

In this sector, AIRAH believes there are real and effective means to achieve the goals of the carbon price mechanism, while delivering employment growth, social engagement, economic development and a more efficient economy. For this to occur, real investment in new training and education in this sector is needed.

However, there is also real potential for perverse outcomes from the introduction of a carbon price radically inflating the costs of HFCs. In the worst cases this could lead to both larger greenhouse gas emissions, and higher energy consumption. The impact of a carbon price on the working gas in every household refrigerator has to be carefully considered. AIRAH believes that the thoughtful implementation of the carbon price mechanism can avoid any perverse outcomes foreshadowed herein.

Introduction

AIRAH is the Australian Institute of Refrigeration, Air Conditioning and Heating. AIRAH is the voice of the skilled trades, technical and engineering professionals that design and service Australia's refrigeration and air conditioning services. AIRAH represents a largely invisible – but essential – industry that maintains the temperature and air quality in our buildings and homes, keeps the Australian perishable food supply chains working from farm to port or kitchen, and keeps cool and operational the essential communications infrastructure that powers our digital economy.

The business of keeping things habitable, comfortable, cool and frozen in Australia was estimated in 2006¹ to:

- Involve direct spending of more than \$15.9 billion or more than 1.7% of GDP;
- Employ machinery that consumed as much as 45,000GWh of electricity, or more than 21% of all “sent out” electricity;

¹“The Refrigeration and Air-conditioning Industry in Australia”, DEWHA May 2008
<http://www.environment.gov.au/atmosphere/ozone/publications/cold-hard-facts.html>

- Resulting in as much as 7% of all Australian greenhouse gas emissions in that year, or around 40MTCO₂e;
- Employ at least 163,000 people.

In the five years since 2006, demand for cooling and refrigeration has grown at least as fast as the overall economy. When considering the multitude of applications of refrigeration and air conditioning in everyday life, one may rightfully wonder about the full extent of the contribution to the national economy and society of these energy services.

It is reasonably safe to say that nearly all of the citizens of Australia directly interact with some form of this technology almost every day of their lives. This could be as simple as reaching into the fridge in the morning for the milk that has been chilled from the moment it was produced at some distant dairy, up to the minute it was poured into the morning cereal or coffee.

The very significant consumption of electricity, the ubiquitous nature of the many forms of refrigeration and air conditioning, and the fact that these systems presently rely on the use of very stable synthetic greenhouse gases to transfer heat (classified as industrial gases under the Kyoto Protocol) mean that in some ways, almost all of the issues involved in transforming the energy economy to be less carbon intensive, can be seen to converge on this cross cutting technology².

This brief paper from AIRAH in response to the proposed architecture of a carbon pricing system for Australia voices our specific support for a price on carbon and our general support for the mechanism as so far defined. It is also a review of the opportunities that we see for this industry to play an active role in “de-carbonising” the economy. It is, in effect, a summary of our long-standing strategy to shift our industry to one predicated on sustainability and economic and energy efficiency.

Support for carbon pricing and the mechanism proposed

AIRAH is wholly in support of the introduction of a mechanism to put a price on emissions of carbon dioxide. The industry has been on a 20-year journey, under the guidance of the extremely successful Montreal Protocol, driving the transition to environmentally improved refrigerants.

The mechanism for pricing carbon as currently proposed is broadly supported, while noting that the MPCCC paper states, “Ways to promote the environmental effectiveness of the scheme, to support technological innovation, and ways to manage the impacts of the scheme on households, communities and business,” are yet to be determined and developed.

AIRAH supports the principles of the MPCCC and believes that the carbon price mechanism can be implemented in a manner consistent with these principles.

The effect of a price on carbon on the HVAC&R industry

A carbon-pricing mechanism must increase the cost of carbon-intensive energy, which ultimately should drive improvements in energy efficiency across the economy, and shift consumption to less carbon-intensive energy sources.

However, demand for cooling and refrigeration is very inelastic, certainly in commercial and industrial premises, educational and health facilities and in the cold chain (food supply chain). If the energy costs of those cooling and refrigeration services go up, it is unlikely to produce much less demand for the services.

² Cross-cutting technology is a term that is used to refer to those technological systems that are common across every sector of the economy and society such as electric lighting, water heating, refrigeration and air-conditioning.

Also, as industry and consumers become habituated to increased energy prices and accommodates them within their overall expenditure, it is almost certain that the widely observed multi-decadal trend of increased demand for refrigeration, cooling and air conditioning services will continue to rise. Fact: in the majority of applications, air conditioning and refrigeration services are not optional. Whether it's keeping the server rooms cooled for a bank in Brisbane³, or the fruit fresh in the packing sheds in the Riverina, or managing a hospital's demanding air quality requirements, or merely keeping a glass-walled high-rise office at a comfortable temperature, climate control is in effect an essential service. Energy price rises will have to be absorbed to continue the economic and social activity that is facilitated – indeed, made possible – by air conditioning and refrigeration.

The opportunity for efficiency and emissions abatement in the HVAC&R sector

Despite the inelastic demand and essential nature of the services delivered, there remain long-term improvements in the efficiency of energy use that could be achieved. Unlike a lot of appliances, and even some other types of industrial equipment, the capital equipment in the HVAC&R sector often has a very long life. A household fridge is often still running after 20 years. The same is very often the case for large chiller systems keeping office blocks cool, and for cool rooms and commercial refrigeration in supermarkets and food halls and other common commercial environments.

So while driving higher minimum energy performance standards (MEPS) improves the performance of new equipment, most of the equipment involved in this sector that is going to be using electricity under a carbon price mechanism is already installed, and some of it has been in the field for a very long time.

The key to improving long-term efficiency in this sector is servicing and maintenance. And the key to achieving that is employment and training. And it is here, by increasing training and employment opportunities in this sector, while actively pursuing best practice in energy use, we believe the interests of the community, industry and government align to reduce carbon emissions, reduce the impact of a carbon price on the community and industry, and to support the effectiveness of the carbon pricing scheme.

For instance, a study conducted for the Ministerial Council on Energy during 2006⁴ produced a long-term plan, the HVAC High Efficiency Systems Strategy (HVAC HESS), for improving the energy efficiency of the HVAC systems in commercial buildings. This strategy focused largely on improving the skills of operators and the frequency and effectiveness of equipment maintenance. In this segment of the industry alone, it was estimated that savings of \$350 million per annum could be captured, avoiding more than 4Mt per annum of energy-related CO₂ emissions. Although this is a valuable indicator of the potential of programs in this sector, it is regrettable to note that in the years since the strategy was funded by the MCE, very few of the 23 projects and measures identified have been delivered.

One of the many proposals in this industry development strategy was, for instance, to fund hospital engineering sections sufficiently well to dramatically increase apprenticeship numbers working at hospitals and healthcare facilities. These facilities are very intensive users of air conditioning and refrigeration services, and most have full-time in-house engineering teams to maintain and operate the facilities. These teams are always resource constrained, at the same time as working in the most demanding environments for air quality and climate control. The diverse requirements of hospitals and healthcare facilities makes them a perfect place to train a new generation of engineers, so long as the engineering services, essential to support the health and medical outcomes, are well funded.

³ **Wesptac banking back to normal**, <http://www.heraldsun.com.au/news/more-news/air-conditioning-glitch-shuts-down-westpac-online/story-fn7x8me2-1226050245961>

⁴ <http://www.ret.gov.au/documents/mce/energy-eff/nfee/committees/hvac/default.html>

This is not the most appropriate forum in which to expand on these opportunities for economy wide energy efficiency, employment growth and emissions abatement. However, AIRAH would be happy to present its views to the MPCCC at any time might the Committee desire.

Skills Australia has recently released the report *Energy Efficiency in Commercial and Residential Buildings: Jobs and Skills Implications*⁵. It finds the following:

While a few new occupations have resulted from energy efficiency initiatives for the built environment, the demand for new skills within existing occupations is more significant. Electricians and instrumentation electricians, plumbers, facilities managers, building scientists, and several occupations in energy assessment all require new skills. Skills implications for retrofitting are likely to be more extensive than for new build, which represents a small proportion of all construction.

Energy efficiency initiatives call for jobs and skills in:

- *auditing and reporting*
- *installation and maintenance of energy-efficient appliances to meet revised building standards*
- *assessment of new and existing buildings against rating systems*
- *monitoring data output from energy management systems and 'tuning' buildings for peak performance*
- *marketing new and existing buildings in both the commercial and residential sectors*
- *drawing up 'green leases'.*

The potential for perverse outcomes with refrigerant gas

A number of synthetic greenhouse gases are covered by the Kyoto Protocol, under the heading of "industrial gases", including HFCs, perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). In effect we believe that it is a long-standing misconception to include HFCs with "industrial gases", as HFCs are present and working in every home in Australia, keeping groceries cool in the refrigerator. Many houses also have refrigerated air conditioners, which use HFCs as the working gas.

Although it's true that all of the large commercial, agricultural and industrial applications mentioned herein also use HFCs, the role of HFCs as a ubiquitous refrigerant gas in the economy is entirely different to that of PFCs and SF6. Both PFCs and SF6 are gases employed by very limited numbers of very large enterprises in the production of aluminium and the transmission of electricity. HFCs, at the other end of the industrial spectrum, work all day in small systems keeping fish fresh and beer cold.

This is not an entirely rhetorical point. The global warming potential (GWP) of HFCs range from 1300 to 2000, and in the vast majority of applications use less than a kilogram of gas, and often only a few hundred grams. The GWP of PFCs is around 6500, and SF6 is 23,900. These substances are used in large quantities at relatively few sites. The economic and regulatory issues of controlling their use and emission to air are very different to the situation of HFCs.

Total HFC emissions in Australia are estimated to be less than 1% of total annual direct emissions. Yet the compressors in which they're employed as a heat-transfer medium consume possibly more than 20% of all electricity transmitted. Thus, indirect emissions from energy consumed in refrigeration and air conditioning systems are likely to be more than ten times emissions attributed to losses of refrigerant gas.

It is essential to avoid HFC emissions to the atmosphere – a practice enshrined in the Australian refrigerant handling licence, which bans technicians from releasing HFCs to air. Yet it's also important to

⁵ May 2011 http://www.skillsaustralia.gov.au/PDFs_RTf/energyEfficiencyReport.pdf

understand the impact of carbon pricing on the market for HFCs, and what that could mean for energy consumption.

A carbon price of \$20 per tonne would mean that a kilogram of a common HFC, with a GWP of 1300, would have an additional \$26 added to the price. For instance in a suburban butcher shop this might equate to an additional cost of between \$260 to \$500 on the price of gas provided when servicing cool rooms, display cabinets, air conditioners and freezers at the time of a routine maintenance or when fixing leaks.

Is this a significant disincentive to regular maintenance? In many cases – in small operations involving retail, restaurants, bars and hospitality, agriculture or wholesale/transport – we believe it could be.

At the same time the biggest single consumer of electricity in all of these types of establishments is almost always the air conditioning and refrigeration systems.

We suggest that, if HFCs were to be subject to the full price of carbon, that there is potential for relatively large price rises that could lead to several perverse effects including:

- An increase in a black market for recycled (second-hand) HFCs that, if contaminated with oil from compressors, are far less efficient in performing their essential heat transfer function, leading to more electricity use;
- A disincentive to routinely service equipment, to avoid the high gas costs for recharging compressors, as a result of which systems will be run much longer, working harder to maintain temperatures, and trade increased electricity use for falling efficiency;
- As a result of delaying maintenance in older compressors seals are more likely to dry out, or increase leak rates as they age and wear from vibration and heat, resulting in more losses of refrigerant gas to air.

In these very same businesses where an increase in maintenance costs might lead to reduced maintenance, the potential for electricity costs savings is high. Several studies have shown that very significant efficiency improvements are achievable in all classes of commercial and industrial air conditioning and refrigeration that have more frequent and better informed maintenance.

We believe that a nation-wide program actively supporting improved maintenance of air conditioning and refrigeration equipment in commercial and retail environments would deliver substantial electricity savings. Such a program would also deliver major reductions in HFC leak rates.

Economic gains in small business almost always convert to more employment.

There are other areas of this sector where careful analysis of incentives and costs should be undertaken. For instance in some large chiller systems major reductions in energy use can be achieved at the expense of a very large increase in water consumption (via cooling towers). These things do bear proper consideration, however once again, not in this short communication.

In summary, in regard to the treatment of HFCs under the proposed carbon price mechanism, AIRAH commends the approach of Refrigerants Australia to the Committee, in which it is being suggested that HFCs continue to be controlled under the Australian legislation for implementing the Montreal Protocol.

We also believe that the continued support for the Montreal Protocol should be regarded as vital to the next phase of refrigerant gas replacement that is expected to take place during the next decade. In this

time the sector will migrate equipment to new, very-low-GWP refrigerant gases that are already being manufactured, including an expansion of the use of “natural’ refrigerants.

The need for employment and training in this sector

In conclusion AIRAH reiterates that transforming the energy economy of Australia with a carbon price mechanism is necessary. But to be effective the transformation cannot be left to economics alone. The market for energy efficiency has been shown to fail often, for many reasons, often due to demand inelasticity, but too often because of a lack of trained technicians to implement the cost effective strategies and technological changes that capture available energy savings.

An expansion of training and education in the HVAC&R industry is vital to properly maintain the essential services upon which so much of the economy is now reliant.

To capture the larger opportunities briefly outlined here, which could so directly support the decarbonisation of the economy, will require a sharp focus on the resources from the national education vote to this sector. This is a contribution that, we assert, does not fairly represent the scale of the benefit this industry makes to the national economy.

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Ends

ABOUT AIRAH (www.airah.org.au)

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) is the only institution of its kind in Australia, recognised for its engineering expertise for the built environment sector.

AIRAH reaches over 25,000 air conditioning, refrigeration, ventilation and heating professionals and technical experts across Australia from research and development roles through to innovation, engineering, trade, equipment sales, contracting installers and consultant roles.

AIRAH encourages best practice in the industry and actively develops the skills and competencies of industry practitioners by leading professional development and accreditation programs. The Institute is committed to providing leadership, promotion, representation and support and membership to the HVAC industry at all levels.

We are the key professional organisation representing HVAC at all levels around Australia. AIRAH collaborates with government at both state and federal levels to actively inform decisions that affect the industry, its professionals and society.

AIRAH's strategic aims

Claim the sustainability space

Through its conferences, publications, manuals and training, AIRAH will educate and motivate the HVAC&R industry and related fields about achieving sustainability. Many organisations talk about sustainability as a concept. Our aim is to be the HVAC&R organisation whose values are aligned with sustainability in a practical sense.



Close the skills gap

At a time of rapid change of new technology and standards and a shifting regulatory landscape, AIRAH will provide appropriate and relevant professional development for HVAC&R industry personnel, and work alongside government and other providers to ensure the voids, where they exist in formal training, are filled.

Inform regulation and policy decisions

As the key industry organisation representing HVAC&R in Australia, it is essential AIRAH collaborate with government at both the state and federal levels. In this way the collective skills and specialist knowledge contained within the Institute can better inform the decisions that affect society in general and the HVAC&R industry in particular.

Build and engage membership

AIRAH will become the institute of choice for HVAC&R professionals in Australia. This means ensuring that formal connection with AIRAH provides benefits – actual and intangible – that are valuable, worthwhile and attractive to our members throughout their professional lives