

Coming in from the cold

A report released in late July has set a pathway for achieving huge energy savings in the industry's non-domestic refrigeration sector. From new minimum energy performance standards to voluntary measures undertaken by key stakeholders, evidence of its rollout will soon be seen by many in the industry. Sean McGowan reports.

In From the Cold is a 10-year strategy developed by the Australian and New Zealand governments in collaboration with the non-domestic refrigeration industries of both countries, to take advantage of the enormous energy-saving opportunities available to the sector.

Jointly funded as part of the Equipment Energy Efficiency (E3) program of Australia's National Strategy on Energy Efficiency, it is also now part of New Zealand's Energy Efficiency and Conservation Strategy.

In specifically targeting the non-domestic refrigeration sector, which uses the equivalent energy of all residential lighting and refrigeration in both countries, its aim is to reduce the sector's annual electricity consumption by 14 per cent (3300 GWh) in 2020, while cutting annual greenhouse gas emissions by 2.5 Mt CO₂-e.

"In 2008, non-domestic refrigeration in Australia consumed approximately 13,400 GWh and was responsible for greenhouse gas emissions of 13.7 Mt CO₂-e; equivalent to 4 per cent of GHG emissions from all fuel combustion in Australia's energy sector," explains the report.

With such a considerable amount of energy being consumed by this sector, the report surmises that small inefficiencies in individual components, systems and pieces of equipment can, when multiplied across both countries, produce significant energy waste and associated greenhouse gas emissions.

The report's objective is therefore to stimulate improved energy performance and the uptake of more energy-efficient non-domestic refrigeration products, systems and services.

It provides a coordinated approach that recommends both mandatory and voluntary measures, all of which are expected to transform the market over a 10-year period.

Along with energy and greenhouse gas emission savings, the financial advantages are also significant.

"It is estimated that the program could deliver more than AU \$9.7 billion in savings on the electricity bills of Australian end-users from the date of implementation to 2030, and NZ \$1.8 billion to New Zealand end-users," the report says.

There are a number of key issues, opportunities and benefits highlighted in the *In From the Cold* strategy, with sectoral and horizontal measures designed to make both significant and long-lasting changes to the way the industry operates.

Although these won't all be evidenced immediately, many are well advanced in their planning. The

sectors targeted that will most impact HVAC&R Nation readers over the next 10 years include:

Supermarkets

Supermarkets are perhaps the most important sector to be targeted by *In From the Cold*, as they are the largest single end-user of electricity for non-domestic refrigeration in Australia and New Zealand, using one-third of the total electricity used in refrigeration.

Though some significant improvements are being made by individual companies, the uptake of energy-efficient systems, products and practices in this sector remains relatively slow.

In From the Cold has proposed a number of key measures and challenges for supermarkets, including the establishment of electricity intensity benchmarks by region and/or climate zone, to help propagate the sharing of knowledge and best practice across the sector.

Furthermore, the report recommends transitioning from open display cabinets for refrigerated and frozen foods to cabinets with doors and lids, and those open display cabinets that achieve similar efficiency levels to closed cases. This includes the use of night blinds.

Sub-metering is also an opportunity highlighted, to provide a means for measuring the electricity consumption and performance of refrigeration systems, as is knowledge sharing and best practice initiatives to stimulate wider industry investment in energy efficiency.

Walk-in coolrooms

Over 70,000 walk-in cool rooms used to store refrigerated and frozen food are currently in operation across Australia and New Zealand – the majority of which are under 100 sq m in size, up to 4m in height and built on-site to fit an internal space.

"Many older constructions provide very poor energy performance and while some companies have realised the benefits of efficient practices and modest investment in thermal improvements, a number of market barriers prevent widely spread energy-efficient outcomes across the broad range of micro, small and medium enterprises... that use and rely on walk-in cool rooms," the report says.

The report claims that catering and hospitality applications account for around 60 per cent of coolrooms and 50 per cent of the total electricity consumption in this sub-sector. Poor practices such as oversized refrigeration systems, poorly controlled



Hilton Taylor from the Department of Climate Change and Energy Efficiency officially launched the *In from the Cold* strategy at AIRAH's Refrigeration Engineering Conference: *Preparing for a low carbon future.*

heated surfaces, a lack of maintenance leading to poor seals, poor airflow and poor heat exchanger performance all contribute to this energy waste.

As such, measures to be investigated include regulated minimum thermal insulation ratings for walls, ceilings and floors; specified requirements for doors to minimise infiltration; and seal requirements to ensure air-tightness and moisture resistance.

The merits of introducing a code of practice for walk-in coolrooms will also be considered.

Process refrigeration and cold storage

This sub-sector is responsible for 31 per cent of the total electricity use in Australia for non-domestic refrigeration, and 29 per cent in New Zealand.

It includes large chilling and freezing applications for meat, dairy and ice-making as well as industrial applications such as the manufacture of plastics, rubber, pharmaceuticals, mechanical engineering and mining. The majority of refrigeration systems in these applications use ammonia (R717) as the refrigerant.

While benchmarking and key performance indicators (KPIs) are already used by major facility operators, they are company rather than industry driven and typically confined to larger corporations.

"With over 10 million cu m of cold storage facilities in Australia alone there are significant energy-saving opportunities, greenhouse gas reductions and financial gains available for those who invest in efficiency," says the report.

The report recommends the investigation of an online benchmarking tool for cold storage facilities to measure and compare energy use, and provide best-practice information back to the industry, including smaller facilities and companies.

Appropriate benchmark targets will be set by the beginning of next year, and while process refrigeration has not been targeted by this strategy, it is thought that rising electricity prices and broader policy measures will drive such facilities to seek their own energy-efficiency solutions.

Refrigerated display cabinets

While refrigerated display cabinets (RDCs) manufactured or imported into Australia since 2004 have been regulated by MEPS and are defined by AS 1731.14:2003 *Refrigerated display cabinets – Minimum energy performance standard (MEPS) requirements*, a number of related types remain outside current standards. The report therefore makes a number of wide-reaching recommendations about RDCs.

It recommends investigating the replacement of AS 1731 Part 1 to Part 13 with a locally adapted version of the international standard EN ISO 23953. This standard has received both Australian and New Zealand input and incorporates a classification system for refrigerated display cabinets that have both self-contained and remote condenser units.

In From the Cold also recommends extending the scope of MEPS (Minimum Energy Performance Standards) to cover all types of non-domestic refrigeration cabinets used to display and store food and beverages. For those cabinets built on-site and/or in very low volume, a “deemed to comply” allowance should be introduced comprising minimum efficiency specifications for key components.

It also recommends increasing the stringency of MEPS and HEPS (High Efficiency Performance Standards) levels for refrigerated display cabinets to reflect the improving performance of products in the current market and in line with overseas programs, something well overdue.

Finally, a requirement that all new open display cabinets have night blinds is recommended.

Mobile refrigeration

According to the report, energy reductions of more than 35 per cent are available from improved thermal insulation of refrigerated rolling stock, together with more efficient refrigeration equipment.

Among key measures proposed for this sub-sector include the design and use of materials that will increase insulation capacity of refrigerated transport, with flow-on effects of reduced fuel use, greater quality control of products and the reduction of product spoilage.

The introduction of minimum standards for such materials would be considered.

In order to remove obstacles to the use of these materials, the report also recommends investigating the feasibility of increasing the maximum permitted

width of trucks to 2.6m to allow space for adequate insulation when standard pallets are used.

Investigating the feasibility of introducing emission standards for refrigeration transport systems similar to the US EPA Tier 4 non-road engine standards is another recommendation for this sub-sector.

Other sub-sectors targeted by *In From the Cold* include milk vats, beverage cooling systems, refrigerated beverage vending machines, commercial ice-makers and ice storage bins.

In From the Cold also presents a number of horizontal measures designed to have a far-reaching impact across all non-domestic refrigeration. These include refrigerant compressors, fan motors and best practice.

Refrigerant compressors

Compressors account for more than 40 per cent of the total energy used in the non-domestic refrigeration sector, and performance improvements offer an effective way of maximising savings across the whole sector.

“The primary objective of the compressor strategy is to migrate from less efficient technology to more efficient technology and enhance the efficiency levels of all types of compressors,” explains the report.

Among its proposed recommendations are that MEPS and HEPS be introduced for refrigerant compressors used in non-domestic refrigeration applications with displacements between 1.4 and 863 cu m.

“MEPS and HEPS levels should be established on the calculated coefficient of performance (COP) based on input power and the refrigerating capacity of the compressor at specific rating points utilising selected, commonly used refrigerants,” the report says.

The report says these levels should also be in accordance with accepted compressor rating standards such as the International Standard EN12900.

Fan motors

Fan motors consume an estimated 30 per cent of electricity used in non-domestic refrigerated equipment. The use of more efficient fan motors as replacements in existing equipment, and when installed in new equipment, offers the potential to greatly reduce energy consumption and lifecycle costs.

According to the report, policy measures encouraging more efficient fan motors will not only grow this technology but also bring about cost reductions in high-efficiency fan motors. MEPS can be an effective tool in driving such change.

Therefore the report recommends adopting efficiency performance policy measures for all single-phase and three-phase electric motors supplied into Australia and New Zealand that drive air-moving fan blades or impellers intended for the incorporation into, and incorporated into, non-domestic refrigeration equipment. This includes combined fan and motor assemblies.

It also recommends including electric motors supplied as separate components with output

ratings of 5W and greater; and combined fan/impeller motor assemblies supplied as complete units with output ratings of 15W and greater for MEPS and HEPS inclusion.

It is considered that such an introduction is likely by the end of next year to allow suppliers, customers and manufacturers time to adjust.

Best practice – good system design, installation and maintenance

“The correct design, installation and maintenance of refrigeration systems can significantly improve energy performance, and this has a major impact on the quantity of energy consumed throughout the life of that system,” explains the report.

“However, even a refrigeration system built with efficient components, but which is poorly designed or not regularly maintained can lose up to 15 per cent of its efficiency or more, in certain applications.”

The report cites a lack of awareness and information as barriers to the uptake of energy-efficient behaviours, equipment and components. It says demand exists for a range of information including examples of best-practice system design and maintenance, financial benefits of energy-efficiency investment and specification guidelines.

It therefore recommends a working group drawing on members from industry, education and government to identify priority projects for stimulating good design, system selection, installation, commissioning and maintenance in the non-domestic refrigeration sector.

“This group, provisionally called the Best Practice in Refrigeration (BPR) Working Group, will explore synergies with the Australian HVAC High Efficiency System Strategy and the Australian Cool Efficiency Program, and existing professional and training/professional development organisations and initiatives in Australia and New Zealand.”

Coming soon

The rollout of the measures outlined by *In From the Cold* has been prioritised according to the potential for, and certainty of, energy reduction outcomes. Therefore those that will deliver immediate energy reductions will be rolled out first.

The *In From the Cold* project workplan has been split into two three-year periods, the first of which begins this year. The second triennium begins in 2014.

The bulk of the work, particularly in relation to standards development and MEPS projects, is scheduled to be completed by 2013. The performance of the 10-year strategy will be measured and reviewed every three years from 2013.

The strategy’s progress will be communicated across industry forums, through public consultation, government websites and in industry publications such as HVAC&R Nation. ■