Victorian Energy Upgrades: Proposed Activity

Cold Room Upgrades Issues Paper

VICTORIA State Government | Environment, Land, Water and Planning

Author
This document has been prepared by the Department of Environment, Land, Water and Planning.

Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

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Introduction

The Victorian Energy Upgrades (VEU) program is a market-based program that encourages households and businesses to reduce their energy consumption. When accredited businesses undertake eligible energy efficiency improvements in homes or businesses they create Victorian Energy Efficiency Certificates (VEECs). Each VEEC represents one tonne of greenhouse gas emissions saved over the lifetime of the activity or product installed. VEECs can then be sold to energy retailers, who must meet an emissions savings target each year.

The VEU program (formerly the Victorian Energy Efficiency Target scheme) includes activities for both households and businesses. Energy efficiency activities currently available for business in the program include lighting upgrades, installation of high efficiency motors, upgrades to gas-fired boilers, and energy efficiency projects whose impacts are measured through project-based assessment methods (e.g. measurement and verification).

To increase the range of benefits for business through the VEU program, the Victorian Government is considering introducing new activities focused on improving the energy efficiency of walk-in cold rooms.

Purpose

The purpose of this document is to set out options to introduce deemed activities into the VEU program for upgrades to the refrigeration equipment of walk-in cold rooms, and to seek the views of interested stakeholders. Feedback from submissions will be used to guide the creation and implementation of new VEU activities.

Stakeholder feedback

The Department of Environment, Land, Water and Planning (the department) is seeking feedback from all stakeholders on proposed activities for refrigerated cold rooms. The feedback you provide will help the department make sure the activity regulations and supporting technical details in the specifications deliver energy efficiency improvements to Victorian businesses and reduce greenhouse gas emissions.

You are encouraged to provide any comments and feedback you may have for the proposed activities.

Your responses should clearly define the topic and question being addressed.

You can submit your feedback by emailing energy.upgrades@delwp.vic.gov.au, or sending a hard copy submission to: *Victorian Energy Upgrades, Department of Environment, Land, Water and Planning, PO Box 500, East Melbourne, VIC 8002*.

If you are interested in learning more about the proposed changes, or if you wish to raise any preliminary queries with the department, please email energy.upgrades@delwp.vic.gov.au

If you wish to participate in an information session on these proposed activities, please include this in your written submission. The department will decide about running an information session based on the number of people wishing to participate in one. The department will provide a response on the status of this session following the close of the consultation period.

The department will consider all feedback received regarding the proposed activities before it makes the activity Regulations and Specifications.

All comments and submissions received in relation to the consultation documents will be treated as public documents unless the organisation or individual lodging the submission specifically requests that it not be made publicly available.

This consultation will close on 16 August 2019.

Why include upgrades to cold room equipment as activities in the VEU?

The proposed activities are focused on improving the efficiency of the refrigeration systems of walk-in cold rooms. Walk-in cold rooms (cold rooms), are refrigerated storage rooms where food and beverages are kept cool or frozen. Cold rooms can be found in almost all food and beverage retailers (e.g. supermarkets, bottle shops, butchers and grocers), cafes and restaurants, food and beverage manufacturers, and retailers selling perishable goods (e.g. florists).

Cold rooms can be divided into cool rooms and freezer rooms. Cool rooms are operated at 'medium temperatures' of 1°C to 3°C. Freezer rooms or walk in freezers keep goods frozen and operate at temperatures of -18°C to -20°C.

There are approximately 65,000 cold rooms in Victoria. An average cold room uses approximately 19 MWh per annum[1] in energy and cost a business around $4,000 per annum in energy bills. The energy costs of larger systems can be as much as $20,000 per annum. New technologies have now made it possible to cost-effectively upgrade the refrigeration equipment, producing 15%-30% energy savings and $500-$1500 in annual energy cost savings for an average sized system.

To date, the market for cold rooms has primarily focused on supplying new installations and replacements at the lowest possible up-front cost, with little to no consideration given to the energy efficiency and ongoing operating costs of the refrigeration equipment. This has resulted in the more efficient refrigeration equipment being used in only around 10% of the market, due to a range of market barriers.

The proposed VEU activities will encourage the upgrading of refrigeration equipment in cold rooms. The relatively large potential energy and emission savings means that VEU program activities could produce significant incentives to encourage the uptake of more efficient equipment.

Characteristics of cold rooms

Cold rooms are refrigerated storage rooms where food and beverages are kept cool or frozen and are found in all businesses where food, beverages or perishable goods are stored or processed.

For the purposes of this issues paper, cold rooms are defined to not include:

- refrigeration display cases and merchandisers
- refrigerated storage or service cabinets typically used in commercial kitchens
- cold storage facilities with a chilled storage area greater than or equal to 800 m^3
- equipment and products exclusively for medical, scientific, or research purposes
- portable or mobile cold rooms or refrigerated containers.

The above types of refrigerated equipment are excluded from the definition of cold rooms as they either have the characteristics of refrigerated appliances (e.g. refrigerated display cases, merchandisers and commercial kitchen cabinets), use different refrigeration technologies (i.e. larger cold storage facilities), or serve a completely different market and purpose (e.g. medical and scientific equipment or food transport).

Cold rooms consist of an insulated room, which may be situated inside a building or form its own separate structure, and the refrigeration equipment which cools the room. The location, design, layout and construction of the cold room will affect its effectiveness and its energy usage. Features of the cold room, including the lighting, doors and windows also have an effect the energy use of the cold room. Cold rooms often form a permanent feature of a building or site, with their working life 20-30 years or more.

The proposed VEU activities for cold rooms concern changes to the refrigeration equipment of the cold rooms.

1. AIRAH, 'Walk-in cool room and freezer research – Barriers to energy efficiency: Findings and Recommendations', September 2018

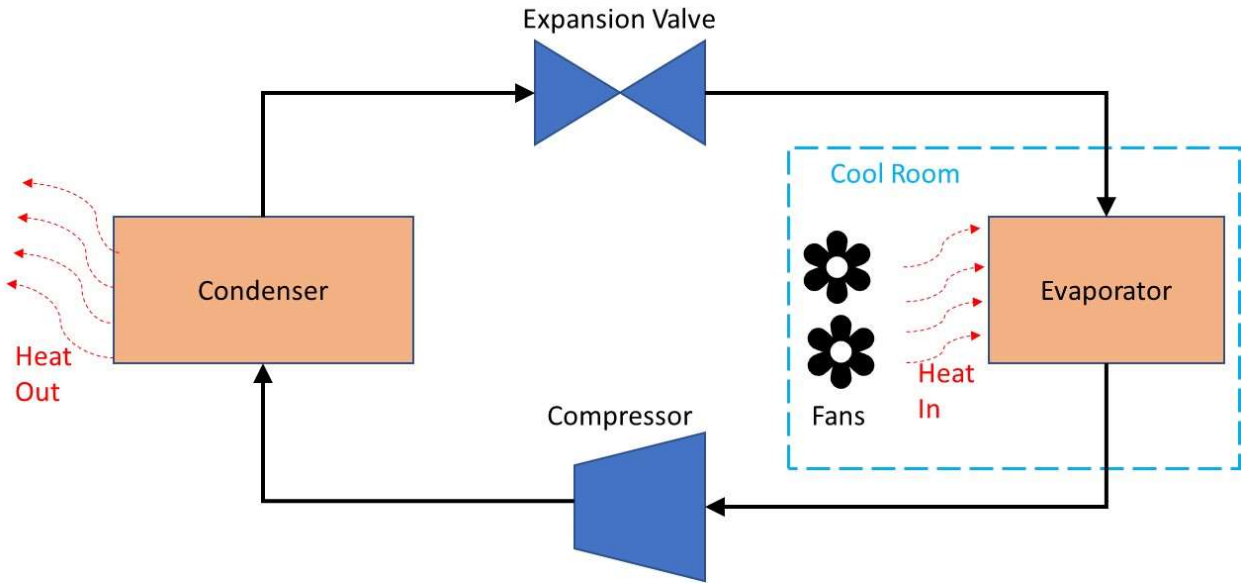
Refrigeration equipment of cold rooms

Cold rooms generally use customised equipment consisting of one or more evaporators situated in the cold room and one or more remote condensing units. These units may be situated some distance from the cold room. Only about 5% of smaller cold rooms use integrated equipment, commonly referred to as “drop-in” or “slide-in” units. Refrigeration equipment is generally very reliable, but the ongoing demand on the equipment means that the operating life of the equipment is only around 12 years for small walk-in cold rooms (noting it may be longer for larger cold rooms).

The main four components of a refrigeration system are:

1. compressor
2. condenser, with associated fans and motors
3. evaporator, with associated fans and motors
4. expansion valve.

Figure 1: Overview of single stage vapour compression refrigeration cycle



Refrigeration systems are typically robust and reliable but there generally has not been an emphasis on designing and installing the most energy efficient equipment available. A range of technical innovations have been developed over the last three decades which can be applied to cold room refrigeration systems to significantly improve their efficiency. Two improvements are of relevance to this issues paper:

- Upgrading the expansion valve and controller: around 90% or more of refrigeration systems use a mechanical expansion valve, called a thermostatic expansion valve (TX valve). However, the TX valve can be upgraded to an electronic expansion valve (EEV), as defined in AHRI Standard 1371 (SI). When coupled with appropriate control technology, this upgrade can enable the compressor head pressure to float. The result is the compressor is better controlled and its operation can be varied in response to demand, which can create significant energy savings.
- Installing High Efficiency equipment: a range of more efficient technology features can be chosen which upgrade the functioning of the four main components of a refrigeration system and result in the total refrigeration system operating as a high efficiency system. High efficiency systems will use much less energy than a traditional system, producing around twice the energy saving as an EEV and controller upgrade.

These two types of refrigeration upgrades will be the basis for the proposed VEU activities discussed in this issues paper.

Proposed VEU cold room upgrade activities

There are two types of refrigeration upgrades being considered as potential VEU program activities. These activities consist of:

1. Upgrading the cool room refrigeration equipment to use an electronic expansion valve (EEV) (as defined in AHRI Standard 1371 (SI), and installation of appropriate control technology which will enable the compressor head pressure to float.
2. Installation of complete high efficiency refrigeration system.

EEV and compressor controllers

This activity can be implemented in the following ways:

- Retrofit upgrade to an existing system: this will involve removing the TX valve from an existing refrigeration system and replacing it with an EEV and installing appropriate controller technology. The cost of retrofitting an existing compressor may approach that of installing a new compressor, so it is possible that this activity will only be undertaken on near-new or larger systems where it is regarded as cost effective.
- Installing a new compressor with EEV and controller upgraded: this activity could be undertaken as part of installing a new cold room, or by replacing the compressor of an existing cold room. The EEV and control technology will be factory/supplier fitted, so the refrigeration technician will be installing an upgraded compressor. It is expected that this will be easier to commission than the traditional compressor with a TX valve. The cost of the activity will be the marginal cost of installing the EEV and compressor controls on a new compressor. These costs do not vary significantly between compressors of different sizes.

The payback period for upgrading to a factory fitted EEV and controller on a new small sized refrigeration system is estimated at approximately 1.5 years and under one year for larger cold rooms. The payback period will be longer for a retrofit of an EEV and controller in an existing refrigeration system but will still often be less than two years for medium and large cold rooms. This activity is expected to be most attractive to businesses installing a new cold room or who have an existing refrigeration system that needs its compressor replaced.

High efficiency refrigeration systems

Installing a complete high efficiency refrigeration system will be relevant when a business is installing a new cold room or replacing their refrigeration equipment. The minimum features of such a high efficiency system will include:

- compressors with variable speed compressor control or variable capacity modulation
- technology capable of floating condensing temperature/pressure which is linked to the ambient temperature
- electronic expansion valve (EEV) as defined in AHRI Standard 1371 (SI)
- speed controlled condensing fans (EC fans or VSD driven)
- EC evaporator fans and other high efficiency fans with similar or higher efficiencies.

The energy saving from high efficiency systems is achieved by the system using more energy efficient components (enabling the operation or capacity of the components to be varied with system demands – e.g. variable speed fans), and by improving the control of all components in the system so the system more effectively responds to changes in demand (e.g. temperature variations).

Upgrading to a high efficiency refrigeration system will add approximately 70% to the cost of the equipment, but the installation time will be less than for traditional systems, which will lower the total installed cost. The costs of the refrigeration system are only a small proportion of the total cost of a cold room, so the marginal cost of the high efficiency upgrade is expected to be only around 10-15% of the total cold room cost.

The payback from this action is around 5-6 years from energy cost saving on a small sized refrigeration system but is expected to be under three years for medium and large systems.

The high efficiency refrigeration systems will also operate more effectively, such as by more accurately meeting temperature set points, reacting faster to temperature fluctuations and by operating for longer periods at reduced output. This increasing the life of stored produce and the operating life of the refrigeration system.

Consultation questions:

1. Do you think there is a market for these cold room activities?
2. Do the activities have merit as potential VEU activities?
3. Do you think there are barriers to implementing these activities?

Deemed energy savings and VEEC incentives

The two proposed refrigeration equipment upgrade activities will produce predictable energy savings and are considered suitable as potential deemed VEU activities, assuming the cold rooms are operated throughout the year. Confirmation may be needed that a cold room is operated on a continuous basis as part of VEEC allocation and activity creation.

The energy savings from these activities will vary with the capacity of the refrigeration equipment, as well as whether the facility operates as a cool room (at medium temperatures) or freezer. To simplify the calculation of deemed saving and allocation of VEECs, it is proposed that VEEC allocations be based on three size categories of cold room/equipment, small, medium and large. These size classifications could be based on the size of cold rooms compressors, probably using name plate registration data. It is proposed that the classification of a cold room would default to a small cold room, as over 80% of cold rooms would be classified as small sized[2]. Only activities undertaken for larger cold rooms would then need to provide evidence of the compressor size, allowing them to be classified as medium or large.

An alternative approach of calculating the energy saving and VEEC allocation for all cold rooms based on their exact size was considered but rejected due to the increased complexity and administration this would place on all parties. This approach would also produce a significant increase in VEEC allocation in only a small proportion of cold rooms. It is possible that a small number of very large cold rooms could achieve energy savings that significantly exceed the deemed savings for cold rooms classified as large. For these facilities it is suggested that the VEU program Measurement and Verification approach be used.

It is proposed that the VEEC incentive for cool rooms varies compared to freezers. Freezer equipment uses more energy than cool room equipment of the same size. The default deemed saving and VEEC allocation for cold room actions will assume that the room is a cool room (i.e. non-freezer), as it is estimated 80% of cold rooms are cool rooms[3]. VEU Accredited Providers will need to provide proof that a cold room is operated as a freezer in order to receive a larger deemed VEEC incentive provided to freezer room activities. Possibly proof could consist of photos of room and temperature gauges and set-points, descriptions of types of goods stored in the room (with photos), declarations that setpoints are as stated, or SCADA logs.

[2] Expert Group, 'Cold Hard Facts 3', September 2018. http://www.environment.gov.au/protection/ozone/publications/cold-hard-facts-3

[3] AIRAH, 'Walk-in cool room and freezer research – Barriers to energy efficiency: Findings and Recommendations', Sep 2018

Six quantities of deemed energy savings and VEEC incentives will result from this proposed approach for each of the two proposed cold room activities (i.e. the TX valve upgrade and the installation of high efficiency refrigeration systems). The final VEEC incentive will depend on the size of the cold room compressor (e.g. small, medium or large) and whether the facility is defined as a cool room or freezer. VEEC incentives will default to those for small-sized cool rooms, which are expected to be applicable to two thirds of cold rooms.

Consultation questions:

4. Do you support the use of three levels of deemed energy savings being assigned to each proposed cold room upgrade activity, based on the three size classifications for refrigeration equipment?
5. Do you have any suggestions concerning what verification information should be used to confirm the equipment size and type (i.e. cool room or freezer)?

Implementing the new activities

Identification of approved cold room activities

There are two broad approaches to identifying whether an energy efficiency upgrade meets VEU deemed activity requirements, these being:

- a register of approved products can be developed, with any relevant installation of these products treated as meeting the activity specifications
- the details of each upgrade can be supplied to the Essential Services Commission (ESC), who can make the decision at the activity creation stage on whether that specific installation meets the activity specifications.

The advantage of the approved register of products is that all parties have certainty about whether an installation meets activity requirements. The disadvantage is that product suppliers/Approved Providers will need to register products, which can become a barrier to the adoption of the activity. A further complication of using a register of products for the proposed cold room activities is that a combination of a variety of components/products could be used in upgrade activities.

Assuming a register of products was not developed for cold room activities, it will be important that the VEU program technical specifications for the two proposed activities clearly define what the activities involve and communicate this in a manner which is meaningful to the industry.

For the TX valve replacement activity, the proposed description of this activity is 'Upgrading the cool room refrigeration equipment to use an electronic expansion valve (EEV), as defined in AHRI Standard 1371 (SI), and installation of appropriate control technology which will enable the compressor head pressure to float'. It is also proposed to require Approval Providers to supply evidence that the EEV and controllers they have installed will enable compressor head pressure to float.

For the high efficiency refrigeration equipment activity, the proposed description of this activity is that an installation of a high efficiency system must as a minimum include:

- compressors with variable speed compressor control or variable capacity modulation
- technology capable of floating condensing temperature/pressure which is linked to the ambient temperature
- electronic expansion valve (EEV) as defined in AHRI Standard 1371 (SI)
- speed controlled condensing fans (EC fans or VSD driven)
- EC evaporator fans and other high efficiency fans with similar or higher efficiencies.

Consultation questions:

6. Do you think developing a register of approved products is an appropriate approach for the cold room activities? If yes, what components of the activities should be on the register?
7. How should the upgrade of a TX valve to an EEV and controller activity be defined?
8. Are there publicly available equipment standards or definitions which be referred to in the definition of the EEV and controller activity?
9. How should the upgrade to high efficiency refrigeration system be defined?
10. Are there publicly available equipment standards, specifications or definitions which can referred to in the definition of the high efficiency refrigeration system?

Skills and training requirements

Refrigeration sub-contractors will be undertaking the installation of refrigeration systems or upgrades to refrigeration systems. These sub-contractors will need to be qualified and licenced as a refrigeration mechanic. This requires that they:

- have completed a Certificate III in Air-conditioning and Refrigeration
- have completed a relevant apprenticeship or traineeship
- hold a Refrigerant Handling Licence (RAC01) from the Australian Refrigeration Council (ARC)
- hold a Restricted Electrical Worker's Licence from Energy Safe Victoria.

All refrigeration sub-contractors are required to meet this these requirements, so it is expected there will be no additional licencing requirements for those undertaking the proposed VEU cold room activities.

Discussions with industry has suggested a potential market barrier to the uptake of the proposed activities could be that only a minority of refrigeration contractors will be familiar with upgrading refrigeration systems by installing EEV and associated controls. A similar minority is expected to be familiar with installing and commissioning high efficiency refrigeration systems.

Some organisations have focused on promoting energy efficient refrigeration and they would be in the position to install the more efficient cold room refrigeration equipment. This would support any initial uptake of the cold room activities and presumably more sub-contractors would learn the skills to do these high efficiency installations if there was market demand. Increased market demand should also drive refrigeration equipment suppliers to provide training in the installation and commissioning skills for installing and upgrading high efficiency refrigeration equipment in cold rooms.

Consultation questions:

11. Are there any capacity issues associated with refrigeration sub-contractors undertaking the proposed EEV/controller upgrade and high efficiency system installation activities?
12. Are equipment suppliers and the refrigeration industry likely to provide additional training on high efficiency equipment installation if demand for such installations and upgrades increase?
13. Are there any other skills or training issues that might affect the proposed VEU activities?

Roles and responsibilities

VEU Accredited Providers (APs)

To create a VEEC in the VEU program, a person or business must become an Accredited Provider or AP. While Accredited Providers do not necessarily carry out all facets of a VEU activity (for example, they may subcontract installation or act as an aggregator of activities), they are responsible for the correct creation of VEECs in compliance with the VEU program Act, Regulations and Specifications, and the requirements of the ESC.

It is expected that Accredited Providers will need to use appropriately qualified and trained refrigeration sub-contractors to complete VEU cold room activities. As they are responsible for making sure all their sub-contractors are appropriately licensed and trained, Accredited Providers may need to develop and implement training programs or have these delivered to their sub-contractors by refrigeration equipment suppliers or other training organisations.

As with any other VEU activity, Accredited Providers will need to demonstrate competency to support their role in delivering the cold room activities.

Submissions

Summary of consultation questions

1. Do you think there is a market for these cold room activities?
2. Do the activities have merit as potential VEU activities?
3. Do you think there are barriers to implementing these activities?
4. Do you support the use of three levels of deemed energy savings being assigned to each proposed cold room upgrade activity, based on the three size classifications for refrigeration equipment?
5. Do you have any suggestions concerning what verification information should be used to confirm the equipment size and type (i.e. cool room or freezer)?
6. Do you think developing a register of approved products is an appropriate approach for the cold room activities? If yes, what components of the activities should be on the register?
7. How should the upgrade of a TX valve to an EEV and controller activity be defined?
8. Are there publicly available equipment standards or definitions which be referred to in the definition of the EEV and controller activity?
9. How should the upgrade to high efficiency refrigeration system be defined?
10. Are there publicly available equipment standards, specifications or definitions which can referred to in the definition of the high efficiency refrigeration system?
11. Are there any capacity issues with refrigeration sub-contractors undertaking the proposed EEV/controller upgrade and high efficiency system installation activities?
12. Are equipment suppliers and the refrigeration industry likely to provide additional training on high efficiency equipment installation if demand for such installations and upgrades increase?
13. Are there any other skills or training issues that might affect the proposed VEU activities?

Stakeholder feedback

You are encouraged to provide any comments and feedback you may have for the proposed activities.

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If you wish to participate in an information session on these proposed activities, please include this in your written submission. The department will make a decision on running an information session based on the number of people wishing to participate in one. The department will provide a response on the status of this session following the close of the consultation period.

Next steps

Key milestones in the introduction of cold room activities into the VEU program are:

- Open stakeholder consultation on the proposed activity — 22 July 2019
- Cold room stakeholder information session (pending numbers) — 5 August 2019
- **Close stakeholder consultation on the proposed activity** — **16 August 2019**
- Consultation on Regulations and Specifications for proposed activity — October 2019
- Finalise Regulations and Specifications — November 2019
- Cold room activity introduced into the VEU program — December 2016