Victorian Energy Upgrades: Proposed Activity

Cold Room Upgrades: Regulations and Specifications 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.

December 2020

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.

Accessibility

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136186, email energy.upgrades@delwp.vic.gov.au, or via the National Relay Service on 133 677 www.relayservice.com.au. This document is also available on the internet at www.delwp.vic.gov.au.

Overview

About the Victorian Energy Upgrades (VEU) program

The Victorian Energy Upgrades (VEU) program is established under the *Victorian Energy Efficiency Target Act 2007* to help Victoria reduce its greenhouse gas emissions, reduce the use of electricity and gas and invest in industries that provide energy demand management technology and services. The program provides subsidies for residential and business consumers to reduce their energy use by upgrading appliances, processes or buildings.

The VEU program works by creating financial incentives for households and businesses to undertake energy saving activities. When accredited businesses (known as accredited providers) 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 emission savings target each year based on their annual electricity and gas sales.

The VEU program includes energy saving activities for both households and businesses. 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 activity methods (e.g. measurement and verification).

Purpose of the Cold Room Upgrades: Regulations and Specifications Issues Paper

The Department of Environment, Land, Water and Planning (the department) is looking at expanding the range of energy efficiency upgrades (activities) available under the VEU program and is seeking feedback from stakeholders on four potential new activities, including;

- upgrades to the refrigeration equipment of cold rooms
- installation of Energy Management Information Systems (EMIS) in commercial buildings
- upgrades to install lagging (or insulation) on pipework for gas systems
- the installation of smart thermostats for residential heating and cooling systems.

The purpose of this document is to set out the proposed Regulations and Specifications for upgrades to the refrigeration equipment of walk-in cold rooms and to seek the views of interested stakeholders. Feedback has already been received from stakeholders on the potential for cold room upgrades using a public consultation process conducted in August 2019.

Have your say

Stakeholders can submit their feedback on the four potential new activities using the **new activities consultation response template and/or the survey**, both available on the Engage Victoria website https://engage.vic.gov.au/victorian-energy-upgrades-new-activities-consultation Please submit your feedback to the questions in the Cold Room Upgrades Issues Paper by completing the new activities consultation response template and/or the survey and uploading your submission to the Engage Victoria website. Feedback from stakeholder submissions will be used to guide the creation and implementation of the new VEU activities.

Submissions can also be emailed to energy.upgrades@delwp.vic.gov.au or sent as a hard copy submission to: *Victorian Energy Upgrades, Department of Environment, Land, Water and Planning, PO Box 500, East Melbourne, VIC 8002*. If you make a submission by email or post, please ensure to state whether the department can publish your submission.

This consultation will close on 5 February 2021.

Introduction

Why include upgrades to cold room equipment as a VEU activity?

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 generally operate at ('medium') temperatures between 1°C and 3°C.
- Freezer rooms or walk-in freezers keep goods frozen and generally operate at temperatures between of -18°C and -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 10 per cent to 30 per cent energy savings and $400-$1200 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 per cent 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 as not including:

- refrigerated cabinets
  - refrigeration display cases and merchandisers
  - refrigerated storage or service cabinets typically used in commercial kitchens
- 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 performance and energy usage. Features of the cold room, including the lighting, doors and windows also have an effect on total energy use. Cold rooms often form a permanent feature of a building or site, with their working life lasting 20-30 years or more.

The proposed VEU activities for cold rooms involve changes to the refrigeration equipment of a cold room.

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

Previous consultation and feedback

A consultation issues paper was prepared and released on 22 July 2019. The consultation period ran until 16 August 2019 and a number of submissions were received and reviewed. Draft Regulations and Specifications for cold room upgrade activities were prepared, with input from stakeholder submissions being considered in the drafting of these documents.

Proposed VEU cold room upgrade activities

Defining the activities

The proposed activities are focused on improving the efficiency of the refrigeration systems of walk-in cold rooms. There are three types of refrigeration upgrades being considered as potential VEU program activities, which are supported by draft Regulations and Specifications. These activities include:

1) Modifying the cold room refrigeration equipment to use an electronic expansion valve (EEV) (as defined in AHRI Standard 1371 (SI) and installation of appropriate control technology which in combination can automatically control the superheat of the refrigeration system.
2) Installation of an upgraded refrigeration system, which contains at least three components of a high efficiency refrigeration system (further described below).[2]
3) Installation of a high efficiency refrigeration system.

These three activities are explained in more detail below.

1) Install EEV and compressor controllers

This activity will involve improving the efficiency of a new or existing refrigeration system by installing an EEV (instead of a thermostatic expansion valve) and superheat controller which in combination can automatically control the superheat of the refrigeration system. The activity may be undertaken by retrofitting an existing refrigeration system or by installing a new refrigeration system which has had the EEV and controller factory fitted.

2) Install efficient refrigeration systems

Installing an efficient refrigeration system will be relevant when a business is installing a new cold room or replacing their existing refrigeration equipment. An upgraded refrigeration system must include at least three of the following:

- EEV and compatible superheat controller
- technology capable of floating head pressure so it will vary with ambient temperature
- compressors with variable capacity modulation such as variable speed capacity control
- speed controlled condensing fans, that are either electronically commutated (EC) fans or variable speed drive (VSD) driven fans
- high efficiency evaporator fans, such as electronically commutated (EC) fans.

The energy savings from a high efficiency refrigeration system are achieved by using more energy efficient components and by improving the control of components that make up the system, so it more effectively responds to changes in demand (e.g. temperature variations).

3) Install high efficiency refrigeration systems

Installing a high efficiency refrigeration system will be done under similar situations to when installing an efficient system (i.e. when a business is installing a new cold room or replacing their refrigeration equipment). The features of a high efficiency system will include (at a minimum) all of the following components:

- EEV and compatible superheat controller
- technology capable of floating head pressure so it will vary with ambient temperature
- compressors with variable capacity modulation such as variable speed capacity control
- speed controlled condensing fans, that are either electronically commutated (EC) fans or variable speed drive (VSD) driven fans
- high efficiency evaporator fans, such as electronically commutated (EC) fans.

[2] Note: This is a new activity that was developed in response to feedback from the August 2019 consultation in response to some uncertainty that suppliers would be able to provide all five components of a high efficiency refrigeration system.

The energy savings from a high efficiency refrigeration system are achieved by using more energy efficient components and by improving the control of components that make up the system, so it more effectively responds to changes in demand (e.g. temperature variations). High efficiency refrigeration systems and upgraded refrigeration systems will operate more effectively than systems typically installed, because they will be able to more accurately meet temperature set points, react faster to temperature fluctuations and by operate for longer periods at reduced output. This will increase the life of stored produce in the cold room and extend the operating life of the refrigeration system.

Energy savings and VEEC incentives

The three proposed refrigeration equipment upgrade activities will produce predictable energy savings and are considered suitable as deemed VEU activities.

The energy savings from these activities will vary with the size of the cold room and the capacity of the refrigeration equipment. Noting that research has found over 80 per cent of cold rooms are of a similar size (i.e. small). This means that if an average size of a cold room is assumed when calculating emission savings and allocating VEECs, then the resulting estimations of energy saving and VEECs will be appropriate to the vast majority of the cold rooms. Consequently, the average sized cold room will be used to determine deemed energy savings and VEEC allocations.

A variation in energy use in a cold room results if the facility operates as a cool room (at medium temperatures) or freezer. It is proposed that the VEEC incentive for cold rooms vary between cool rooms and freezers. Freezer equipment uses more energy than cool room equipment of the same size. To simplify the processing of cold room activities, 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 per cent of cold rooms are cool rooms.[3] Additional evidence will need to be supplied by VEU accredited providers in order to receive the larger deemed VEEC incentive provided to freezer room activities. Proof could consist of photos of room, temperature gauges and set-points, descriptions of types of goods stored in the room (with photos) or declarations that setpoints are as stated.

The Essential Services Commission (ESC) will publish the evidentiary requirements for cold room activities once these activities are introduced into the VEU Regulations and Specifications.

Consultation questions:

1. Do you have any comments on the draft Regulations and Specifications for Part 43 – Cold room upgrades?
2. Do you have any comments on assuming one size of cold room for estimating energy savings and VEECs?
3. Do you have any suggestions concerning what verification information should be used to confirm the equipment type (i.e. cool room or freezer)?

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

Submissions

Summary of consultation questions

1. Do you have you any comments on the draft Regulations and Specifications for Part 43 – Cold room upgrades?
2. Do you have any comments on assuming one size of cold room for estimating energy savings and VEECs?
3. Do you have any suggestions concerning what verification information should be used to confirm the equipment type (i.e. cool room or freezer)?

Have your say

Stakeholders can submit their feedback on the Cold Room Upgrades: Regulations and Specifications Issues Paper using the **new activities consultation response template and/or the survey**, both available on the Engage Victoria website. Please submit your feedback to the questions in the Cold Room Upgrades Issues Paper by completing the new activities consultation response template and/or the survey and uploading your submission to the Engage Victoria website https://engage.vic.gov.au/victorian-energy-upgrades-new-activities-consultation.

Submissions can also be emailed to energy.upgrades@delwp.vic.gov.au or sent as a hard copy submission to: *Victorian Energy Upgrades, Department of Environment, Land, Water and Planning, PO Box 500, East Melbourne, VIC 8002*. If you make a submission by email or post, please ensure to state whether the department can publish your submission.

Next steps

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

• Open stakeholder consultation on the proposed activity	18 December 2020
• **Close stakeholder consultation on the proposed activity**	**5 February 2021**
• Response to stakeholder consultation on the proposed activity	March 2021
• Finalise Regulations and Specifications	June 2021
• Cold room activity introduced into the VEU program	Second half 2021

Appendix: Cold Room Upgrades – Regulations and Specifications

The *Victorian Energy Efficiency Target Regulations 2018* commenced on 10 December 2018 and provide for deemed activities in the program. Details of the technical requirements for these regulations are contained in the publication Victorian Energy Upgrades – Specifications.

The Regulations set out the activities that attract incentives and the methodologies for calculating greenhouse gas (GHG) emissions reductions, while the Specifications document provides further technical details of the GHG emissions calculations. The technical elements in the Specifications can be more responsive to changing circumstances and be updated more frequently, without foregoing appropriate consultation processes.

The three proposed cold room upgrade scenarios have been defined in the draft Regulations and Specifications. Please see the following sections for:

1. Draft Victorian Energy Efficiency Target Regulations 2018 – Cold Room Upgrades
2. Draft Victorian Energy Upgrades – Specifications - Part 43 – Cold Room Upgrades.

The draft Regulations and Specifications are being consulted on as part of this process.

The department welcomes your views and any technical feedback on these documents.

1. Draft Text – Victorian Energy Efficiency Target Regulations 2018 – Cold Rooms

Definitions

In regulation 5 of the Principal Regulations, **insert** the following definitions—

cold room means a refrigerated room or structure where goods are stored at temperatures below 7 degrees Celsius but does not include—

(a) a refrigerated cabinet; or

(b) equipment or a product used exclusively for medical, scientific, or research purposes; or

(c) a portable or mobile cold room or refrigerated container;

electronic expansion valve means an electrically driven device which regulates the flow of volatile refrigerant into an evaporator of a refrigeration system;

evaporator means a heat exchanger over which liquid refrigerant is dripped or sprayed and evaporated;

refrigeration system means an assembly of parts used in the cooling of a space, substance or system to lower and/or maintain its temperature below the ambient one (removed heat is rejected at a higher temperature);

saturation temperature means saturation temperature means the temperature at which a refrigerant changes from a liquid state to a vapour;

superheat means, in relation to a refrigeration system, the difference in temperature between—

(a) the saturation temperature corresponding to the pressure measured at the outlet of an evaporator of the refrigeration system; and

(b) the temperature of the refrigerant vapor when leaving the outlet of an evaporator.

superheat controller means a device responsive to changes of pressure, temperature, or other variables for regulation of superheat in a refrigeration system in normal operation.

Creation of certificates

After regulation 16(4)(f) of the Principal Regulations **substitute**—

(f) a category 42A product; or
(g) a category 43A product; or
(h) a category 43B product; or
(i) a category 43C product; or
(j) a category 43D product.

Part 43 – Cold rooms

The prescribed activity is installing for a cold room an unlisted product that complies with the criteria specified in column 2 of an item in Table 43.1.

Table 43.1 – Product categories

Column 1 Category number	Column 2 Criteria applying to product category
43A	An electronic expansion valve and superheat controller, that when installed together into a refrigeration system, will meet the requirements of the Secretary's specifications for this item.
43B	A refrigeration system that includes components that meet the requirements of the Secretary's specifications for this item.
43C	A refrigeration system that includes components that meets the requirements of the Secretary's specifications for this item.
43D	A product that meets the requirements of the Secretary's specifications for this item.

43 Cold rooms – Schedule 2, Part 43

The time specified for the purposes of regulation 11(1) and (2) for a prescribed activity set out in Part 43 of Schedule 2 is the day on which the cold room is first commissioned to refrigerate goods, after the installation of the product or products is completed.

3. Draft Victorian Energy Upgrades – Specifications – Part 43 – Cold Rooms

Definitions

floating head pressure in relation to a refrigeration system, means a type of control that allows the pressure at which the refrigerant is condensed to decrease when ambient air temperatures are lower, to lower the temperature at which the refrigerant is condensed at and improve the efficiency of the compressor.

43: Part 43 Activity– Cold Room Upgrades

Activity Description

Part 43 of Schedule 2 of the Regulations prescribes the upgrade of parts of refrigeration systems for cold rooms or the installation of refrigeration systems for cold rooms as an eligible activity for the purposes of the Victorian Energy Upgrades program.

Table 43.1 lists the types of upgrade installations that may occur. Each type of upgrade is known as a scenario. Each scenario has its own method for determining GHG equivalent reduction.

Over time, the department may determine that there are other equipment changes that reduce GHG equivalent emissions when implemented. In such a case, product requirements and installation requirements for these changes will be listed by the department as scenario number 43D once specified.

Table 43.1 – Eligible Cold Room Upgrade scenarios

Product category number	Scenario number	Decommissioning requirements	Product to be installed	Historical schedule number
43A	43A	None	An electronic expansion valve and superheat controller that: (a) are designed to be installed together in the refrigeration system of a cold room; and (b) when installed together into a refrigeration system can and will automatically control the superheat of the refrigeration system.	N/A
43B	43B	None	A refrigeration system that includes at least three of the components set out in this Table for Activity 43C.	N/A
43C	43C	None	A refrigeration system that includes all of the following components: (a) electronic expansion valve and compatible superheat controller that meet the requirements of Activity 43A (b) technology capable of floating head pressure to	N/A

Product category number	Scenario number	Decommissioning requirements	Product to be installed	Historical schedule number
			vary with ambient temperature without exceeding the ambient temperature by more than the design temperature difference of the condenser (c) compressors with variable capacity modulation such as variable speed capacity control, other than (i) on/off capacity control (ii) hot gas bypass (iii) cylinder unloading (iv) digital scroll (d) speed controlled condensing fans, that (i) are electronically commutated (EC) fans, or (ii) are variable speed drive (VSD) driven fans (e) evaporator fans, that are electronically commutated (EC) fans.	

Specified Minimum Energy Efficiency

There are no further requirements that must be specified for the installed product.

Other specified matters

None.

Method for Determining GHG Equivalent Reduction

Scenario 43A: Installing an electronic expansion valve and superheat controller into a refrigeration system

The GHG equivalent emissions reduction for each scenario is given by Equation 43.1, using the variables listed in Table 43.2.

Equation 43.1 – GHG equivalent emissions reduction calculation for Scenario 43A

$$GHG\ \boldsymbol{Eq.Reduction} = \boldsymbol{Energy\ Savings} \times \boldsymbol{Lifetime} \times \boldsymbol{GHG\ Emissions\ Factor} \times \boldsymbol{Temperature\ Factor} \times \boldsymbol{Regional\ Factor}$$

Table 43.2 – GHG equivalent emissions reduction variables for Scenario 43A

Input Type	Condition	Input Value
Energy Savings	In every instance	1.7
Lifetime	In every instance	12
GHG Emissions Factor	In every instance	1.095[4]
Temperature Factor	For upgrades Cold Rooms operating at or above 0°C	1.0
	For upgrades Cold Rooms operating below 0°C (freezers)	1.4
Regional Factor	For upgrades in Metropolitan Victoria	0.98
	For upgrades in Regional Victoria	1.04

[4] The electricity emissions factors will be updated to reflect increasing renewable penetration through gradual decreases in each year to 2025. For more information please visit: https://www.energy.vic.gov.au/energy-efficiency/victorian-energy-upgrades

Scenario 43B: A refrigeration system that includes at a minimum three of the specified components

The GHG equivalent emissions reduction for each scenario is given by Equation 43.2, using the variables listed in Table 43.3.

Equation 43.2 – GHG equivalent emissions reduction calculation for Scenario 43B

$$GHG\ \boldsymbol{Eq.Reduction} = \boldsymbol{Energy\ Savings} \times \boldsymbol{Lifetime} \times \boldsymbol{GHG\ Emissions\ Factor} \times \boldsymbol{Temperature\ Factor} \times \boldsymbol{Regional\ Factor}$$

Table 43.3 – GHG equivalent emissions reduction variables for Scenario 43B

Input Type	Condition	Input Value
Energy Savings	In every instance	3.4
Lifetime	In every instance	12
GHG Emissions Factor	In every instance	1.095[5]
Temperature Factor	For upgrades Cold Rooms operating at or above 0ºC	1.0
	For upgrades Cold Rooms operating below 0ºC (freezers)	1.4
Regional Factor	For upgrades in Metropolitan Victoria	0.98
	For upgrades in Regional Victoria	1.04

[5] The electricity emissions factors will be updated to reflect increasing renewable penetration through gradual decreases in each year to 2025. For more information please visit: https://www.energy.vic.gov.au/energy-efficiency/victorian-energy-upgrades

Scenario 43C: A refrigeration system that includes at a minimum all of the specified components

The GHG equivalent emissions reduction for each scenario is given by Equation 43.3, using the variables listed in Table 43.4.

Equation 43.3 – GHG equivalent emissions reduction calculation for Scenario 43C

$$GHG\ \boldsymbol{Eq.Reduction} = \boldsymbol{Energy\ Savings} \times \boldsymbol{Lifetime} \times \boldsymbol{GHG\ Emissions\ Factor} \times \boldsymbol{Temperature\ Factor} \times \boldsymbol{Regional\ Factor}$$

Table 43.4 – GHG equivalent emissions reduction variables for Scenario 43C

Input Type	Condition	Input Value
Energy Savings	In every instance	5.1
Lifetime	In every instance	12
GHG Emissions Factor	In every instance	1.095[6]
Temperature Factor	For upgrades Cold Rooms operating at or above 0ºC	1.0
	For upgrades Cold Rooms operating below 0ºC (freezers)	1.4
Regional Factor	For upgrades in Metropolitan Victoria	0.98
	For upgrades in Regional Victoria	1.04

[6] The electricity emissions factors will be updated to reflect increasing renewable penetration through gradual decreases in each year to 2025. For more information please visit: https://www.energy.vic.gov.au/energy-efficiency/victorian-energy-upgrades