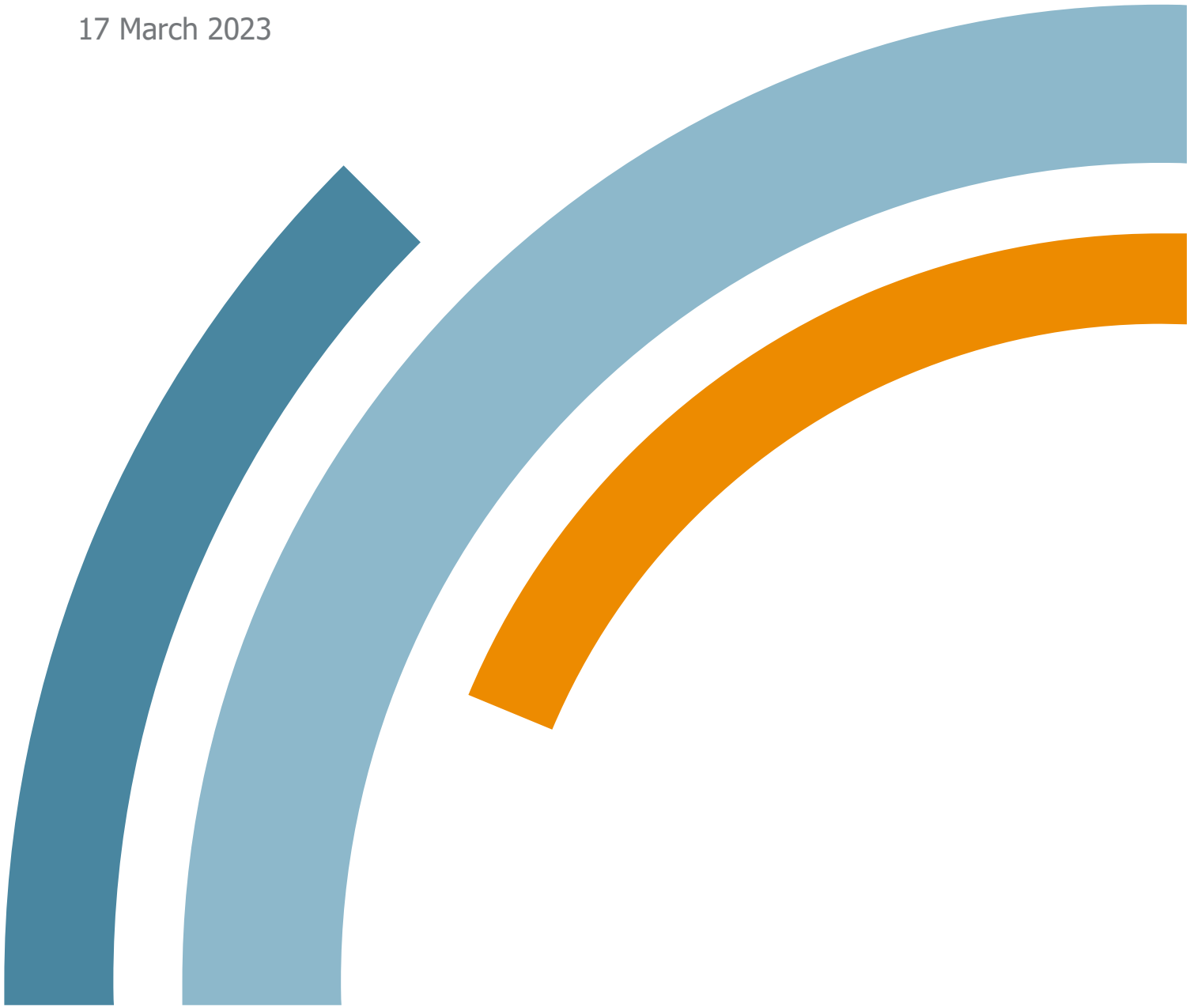
ESSENTIAL SERVICES COMMISSION

Victorian Energy Upgrades

Commercial and Industrial Heat Pump Water Heater Activity Guide

17 March 2023



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Introduction

Accredited persons (APs) and their installers under the Victorian Energy Upgrades (VEU) program must comply with program requirements when undertaking commercial and industrial heat pump water heater activities to create Victorian energy efficiency certificates (VEECs).

About this guide

Use this guide for assistance in meeting the specific requirements (products, installation, decommissioning, recommissioning, training, safety and evidence) for commercial and industrial heat pump water heater activity upgrades. We have split the guide into seven key sections:

- Section 1: Introduction to commercial and industrial heat pump water heater activity
- Section 2: Calculating Victorian energy efficiency certificates (VEECs)
- Section 3: Requirements for personnel undertaking commercial and industrial heat pump water heater activities
- Section 4: Activity requirements for commercial and industrial heat pump water heater activities
- Section 5: Record keeping and evidence requirements
- Section 6: Minimum evidence requirements
- Section 7: Commercial and industrial heat pump water heater activity process.

You should read this guide in conjunction with our Obligations and Program Guide for Accredited Persons for:

- overarching information about the Victorian Energy Upgrades program
- your obligations under the program
- guidance on how to create VEECs under the program.

Access this document at www.esc.vic.gov.au/veu-accredited-persons

Who should use this guide

You should use this guide if you are:

- seeking accreditation to undertake commercial and industrial heat pump water heater activities under the program
- accredited to undertake commercial and industrial heat pump water heater activities under the program
- an installer seeking to undertake installations for this activity under the program.

This guide will help you to understand the activity, your responsibilities, and evidentiary requirements you must meet to create and register VEECs.

To apply for accreditation for this activity, access the required documents at www.esc.vic.gov.au/become-veu-accredited

Seeking assistance

If you are unsure about any aspects of undertaking this activity and cannot find the answer in this guide or the documents listed above, contact VEU support on (03) 9032 1310 or veu@esc.vic.gov.au.

Legal context for this guide

We have prepared this guide as a general summary of relevant parts of:

- Victorian Energy Efficiency Target Act 2007 (the VEET Act)
- Victorian Energy Efficiency Target Regulations 2018 (the regulations)
- Victorian Energy Upgrades Specifications 2018 (the specifications)
- Victorian Energy Efficiency Target Guidelines (the guidelines)

View these documents at www.esc.vic.gov.au/veu-legislation

This guide should not be relied upon as substitute for legal advice and should be read in conjunction with the above source documents. In the event of inconsistency between this guide and the source documents, the content in the source documents apply.

Feedback on this guide

We are committed to implementing a risk-based regulatory framework for this activity. To achieve this objective, we would like to hear from you if you have any feedback on the requirements set out in this guide.

To provide feedback, please contact VEU Support on veu@esc.vic.gov.au or (03) 9032 1310.

1. Introduction to commercial and industrial heat pump water heater activity

The Department of Environment, Land, Water and Planning introduced the commercial and industrial heat pump water heater activity to the VEU program under Part 44 of the Victorian Energy Efficiency Target (VEET) Regulations 2018 (the regulations). The activity has a commencement date of 1 February 2022 under the program.

The regulations provide for three separate upgrade scenarios for installation of new commercial and industrial heat pump water heaters under the VEU program (as listed in Table 1)

Table 1 Summary of eligible commercial and industrial heat pump water heater activity scenarios

Activity scenario	Summary description
44A	Decommissioning one or more gas-fired hot water boilers or gas-fired water heaters and installing an air source heat pump water heater
44B	Decommissioning one or more electric resistance hot water boilers or electric resistance water heaters and installing an air source heat pump water heater
44C	Installing an air source heat pump water heater

This activity is based on a deemed method for calculating VEECs under the program. If your commercial and industrial heat pump water heater upgrade is complex or linked to another upgrade, we recommend you consider the suitability of the measurement and verification method for project-based activities in accessing certificates under the program.

Find out how to participate in project-based activities at www.esc.vic.gov.au/project-based-activities

1.1. Which activities are eligible

For the commercial and industrial heat pump water heater upgrade to be eligible under the VEU program:

- the upgrade must take place in an eligible site
- the product installed must be eligible
- you must be accredited to undertake the commercial and industrial heat pump water heater activity
- the upgrade must be undertaken in accordance with the activity requirements (see Section 4 and Section 5 of this document).

1.1.1. Eligible sites

To be eligible, the upgrade must be undertaken at:

- a business/non-residential premises
- the common areas of a building that is classified under Part A6 of Volume One of the Building Code as a Class 2 building (i.e., common area of a multi-residential building).

1.1.2. Eligible products

Any product installed as part of this activity must be listed as an approved product on our Register of Products at the time of VEEC creation.

Learn more about applying for product approvals, by reading our Commercial and Industrial Air Source Heat Pump Water Heater Product Application Guide available at www.esc.vic.gov.au/veu-product-applicants

An installed product must meet the product criteria listed in Table 2 to be eligible to create VEECs under the program.

Table 2: Product criteria for commercial and industrial heat pump water heater activity scenarios

Activity	Product criteria
44A, 44B, and 44C	One or more air source heat pump water heaters that: • either have an insulated storage volume: – not exceeding 700 litres and are certified to AS/NZS 2712 – exceeding 700 litres • provide a minimum delivery temperature of 45°C, • are installed by a licensed or registered plumber, • achieves the specified minimum annual energy savings, and • is modelled against the specified heat pump modelling requirements. Where an existing storage tank is to be used in the place of a modelled tank component, the storage tank must: • have been manufactured less than 10 years before the existing product is decommissioned • have a volume that is greater than or equal to the volume of the modelled component • be insulated.

1.1.3. Appropriate accreditation and approvals

You must be accredited by us and approved for the commercial and industrial heat pump water heater activity to create VEECs for this activity.

A streamlined accreditation form is available for organisations who have already been accredited for water heating, gas efficiency or cold room activities under the VEU program provided they have either:

- received their accreditation approval for these activities within two years of submitting an application for the commercial and industrial heat pump water heater activity and/or
- created certificates under the program for water heater, gas efficiency or cold rooms upgrades within two years of submitting an application for the commercial and industrial heat pump water heater activity.

Find the relevant application form and how to become accredited at https://www.esc.vic.gov.au/become-veu-accredited.

2. Calculating Victorian energy efficiency certificates

The number of Victorian energy efficiency certificates (VEECs) you receive for a given commercial and industrial heat pump water heater upgrade is based on the deemed abatement associated with the activity.

The deemed abatement is calculated using assumptions about an upgrade situation's key variables, such as the efficiency of a representative baseline product (electric or gas fired water heater or boiler), the expected lifetime of the new heat pump, and the pattern of demand for hot water required of the new heat pump.

Due to these assumptions, the deemed abatement calculated may vary from the actual abatement achieved for a particular upgrade. If you wish to claim VEECs using a more accurate abatement value, the measurement and verification method for project-based activities is an available option.

The key variables used to calculate the number of VEECs for the commercial and industrial heat pump water heater activity are:

- Lifetime
- EEF - electricity emissions factor
- GEF - gas emissions factor
- Capacity factor
- Regional factor
- RFE – refrigerant emissions factor
- GWP - Global warming potential
- RfrgCharge (Kg) - Refrigerant charge
- HPElec (GJ/a) – annual electricity consumption of the new heat pump water heater system as modelled in TRNSYS
- HPGas (GJ/a) – annual gas consumption of the new heat pump water heater system as modelled in TRNSYS
- RefElec (GJ/a) – reference electricity consumption of incumbent product
- RepEff – efficiency of gas boiler being replaced
- NewEff – efficiency of a hypothetical new gas boiler

The VEEC calculation method is detailed further in part 44 of the VEU specifications. Appendix B includes examples of how to calculate VEECs for this activity.

An explanation of the key calculation variables is provided below.

2.1. Calculation variables

2.1.1. Lifetime

The asset lifetime values (measured in years) provided for upgrades across activity scenarios for the commercial and industrial heat pump water heater activity are as follows:

- For upgrades using an existing storage tank with a new system, the lifetime is 10 years.[1]
- For upgrades using a new storage tank with a new system, the lifetime is 15 years.[1]

2.1.2. Electricity emissions factor

The electricity emissions factor (EEF) represents emissions intensity of electricity drawn from the grid and is used to calculate greenhouse gas equivalent emissions reduction. The electricity emissions factor is in units of tonnes of carbon dioxide equivalent emissions per megawatt hour of electricity used and takes the following values:

- From 1 February 2022 to 31 January 2023, the EEF is 0.516
- From 1 February 2023 to 31 January 2024, the EEF is 0.473
- From 1 February 2024 to 31 January 2025, the EEF is 0.433
- From 1 February 2025, the EEF is 0.393

2.1.3. Gas emissions factor

The gas emissions factor (GEF) represents emissions intensity of natural gas drawn from the gas network and is used to calculate greenhouse gas equivalent emissions reduction. The gas emissions factor for this activity is 0.05523 tonnes of carbon dioxide equivalent emissions per gigajoule of energy used.

2.1.4. Capacity factor (for activity scenarios 44A and B only)

The capacity factor is a ratio of the thermal capacity of the baseline product to be decommissioned and the thermal capacity of the heat pump installed.

- If the baseline thermal capacity is greater than or equal to the upgrade thermal capacity, the capacity factor is 1.
- If the baseline thermal capacity is lower than the upgrade thermal capacity, the capacity factor is calculated by dividing the baseline by the upgrade, to arrive at a capacity factor that is less than 1.

[1] The lifetime input value is based on assumptions of remaining life and does not amount to a warranty on the product.

- Where multiple baseline units are decommissioned under an upgrade, the baseline thermal capacity is the sum of the thermal capacities of the decommissioned baseline units.

2.1.5. Regional factor

Regional factor is the input value used to account for increasing distribution losses as the distance increases from the generation site to an upgrade's location. The regional factors are as follows:

- For upgrades in metropolitan Victoria, the regional factor is 0.98
- For upgrades in regional Victoria, the regional factor is 1.04.

2.1.6. Refrigerant emissions factor (RFE)

The refrigerant emissions factor (RFE) represents the refrigerant fugitive emissions through the life of the product, including end-of-life. This term is a combination of static factors which acts to

- sum these losses over the lifetime of the product, and
- convert from units of kilograms to tonnes.

The RFE in every instance is 5 x 10-4

2.1.7. Global warming potential (GWP)

The Global Warming Potential (GWP) is based on the refrigerant used in the upgrade product and is a measure of how climate polluting the refrigerant is. It is represented as a ratio of the global warming potential of the refrigerant used to charge the heat pump water heater and the global warming potential of carbon dioxide for a 100-year time horizon.

2.1.8. Refrigerant charge (RfgCharge)

The refrigerant charge (RfrgCharge) is the mass of refrigerant present in the evaporator and condenser of the air source heat pump water heater. This does not include the refrigerant required to charge the pipework which connects these working components of the system to each other. This is measured in kilograms.

2.1.9. Annual electrical energy use (HPElec)

The annual electrical energy use (HPElec) of the heat pump water heater and associated pumps and auxiliary product as modelled in TRNSYS. This variable is a TRNSYS modelling output measured in gigajoules per year (GJ/a).

2.1.10. Annual gas energy use (HPGas)

The annual gas energy use (HPGas) of a heat pump water heating system as modelled in TRNSYS. This value will be zero unless gas fired booster equipment is used in the system. This variable is a TRNSYS modelling output measured in gigajoules per year (GJ/a).

2.1.11. Reference annual electrical energy use (RefElec)

The reference annual electrical energy use (RefElec) represents the energy consumption of a theoretical electric resistance boiler supplying the same hot water load as the heat pump water heater being installed. This is measured in gigajoules per year (GJ/a) and is calculated based on the peak daily winter load output of the TRNSYS simulation.

2.1.12. Replaced Efficiency (for activity scenarios 44A and 44B only)

Replaced efficiency (RepEff) is the assumed efficiency of the gas boiler or water heater being replaced. The value is 0.788 in every instance, representing a combustion efficiency of 78.8 per cent.

2.1.13. New efficiency (NewEff) (for activity scenario 44C only)

New efficiency (NewEff) represents the assumed efficiency of a hypothetical modern gas water heater for activities not involving the decommissioning of an existing product. The value is 0.85 in every instance, representing a combustion efficiency of 85 per cent.

2.2. Determining the thermal capacity for baseline and upgrade products

2.2.1. Baseline (existing system) thermal capacity

For gas-fired water heater baseline products, the thermal capacity is either:

- the thermal capacity or “output capacity” displayed on the nameplate converted to kW
- calculated using the nameplate nominal gas flow (often in MJ/hour, older units may be in BTU/hour) converted to kW using the following equation:

$$〚\text{thermal capacity (kW)}〛\_\text{gas} = \text{nominal gas flow} \times \text{RepEff}$$

For electric resistance baseline products, the thermal capacity is either:

- displayed on the nameplate in kW
- calculated using the nameplate current by multiplying the current by a nominal voltage of 230V for single phase products.

〖thermal capacity (kW)〗_elec = nominal electrical current × 230

2.2.2. Upgrade (new heat pump) thermal capacity

The thermal capacity for the upgrade product is modelled and approved as part of the approval process for the product and can be determined by reviewing the details of the product in the Register of Products.

2.3. Upgrades with multiple baseline and/or upgrade products

This activity allows for upgrades to be claimed involving single or multiple baseline and upgrade products.

Upgrades under this activity may involve the replacement of:

- one baseline product with one heat pump system (one to one replacement).
- two or more baseline products with one heat pump system (multiple to one replacement)
- one baseline product with two or more heat pump systems (one to multiple replacement).
- two or more baseline products with two or more heat pump systems (multiple to multiple replacement).

An upgrade could also involve the carrying out of different activity scenarios (44A, 44B and/or 44C) at the one premises and/or the installation of more than one type of heat pump system. You are able to claim for up to three different activity scenarios and/or upgrade products in the one VEEC creation claim. If you have to claim for more than three activity scenarios and/or upgrade products at the one premises, you will need to split your upgrade into two separate VEEC creation claims.

The examples outlined below provides guidance on how VEEC creation claims for different type of upgrade activities should be made.

2.3.1. Replacing one baseline product with two or more heat pump water heater system(s)

For upgrades replacing one baseline product with multiple heat pumps with **different** thermal capacities, the baseline thermal capacity should be apportioned in the “Baseline Thermal Capacity” fields in the VEEC creation form and allocated in proportion to the thermal capacities of each heat pump water heater system installed.

Example 1: Replacing a 60kW gas -fired water heater with a 40kW and 20kW heat pump water heater system

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry)	Upgrade system thermal capacity (from Register of products)	Quantity (VEEC creation form entry)
44A - Replacing gas-fired boiler/ heater	40	40	1
44A - Replacing gas-fired boiler/ heater	20	20	1

Example 2: Replacing a 50kW gas -fired water boiler with a 40kW and 20kW heat pump water heater system

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry	Upgrade system thermal capacity (from Register of products)	Quantity (VEEC creation form entry)
44A - Replacing gas-fired boiler/ heater	33 (i.e. 40/60*50)	40	1
44A - Replacing gas-fired boiler/ heater	17 (i.e. 20/60*50)	20	1

Example 3: Replacing a 60kW electric resistance water boiler with a 60kW and 20kW heat pump system

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry	Upgrade system thermal capacity (from Register of products)	Quantity (VEEC creation form entry)
44B - Replacing electric resistance boiler/heater	60	60	1
44C - Installing an air source heat pump water heater	0	20	1

Example 4: Replacing a 60kW gas -fired water heater with six 10kW heat pump systems (i.e. six of the same product)

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry)	Upgrade system thermal capacity (from Register of products)	Quantity (VEEC creation form entry)	Total installed thermal capacity (Registry calculated value)
44A - Replacing gas-fired boiler/ heater	60	10	6	60

2.3.2. Replacing two or more baseline products with the one upgrade product

For upgrades involving the replacement of two or more baseline products with the one heat pump system, you must include the sum of the thermal capacities of all the products being replaced in the 'Baseline thermal capacity' field in the VEEC creation form for the upgrade.

Example 5: Replacing two 25kW gas -fired water boilers with a 40kW heat pump water heater system

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry	Upgrade system thermal capacity (from Register of products)	Quantity (VEEC creation form entry)
44A - Replacing gas-fired boiler/ heater	50 (i.e. 2 * 25)	40	1

2.3.3. Replacing two or more baseline products with two or more upgrade products

The sum of the baseline thermal capacities should be entered into the VEEC creation form for upgrades replacing multiple baseline products.

If multiples of the same heat pump products are installed, the number of products installed should be reflected in the Quantity field in the VEECs creation form.

Example 5: Replacing two 40kW gas-fired water heaters with four 20kW heat pumps (i.e. four of the same product)

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry)	Upgrade system thermal capacity (from product register)	Quantity (VEEC creation form entry)	Total installed thermal capacity (Registry calculated value)

44A - Replacing gas-fired boiler/ heater	80	20	4	80

If multiple heat pumps with **different** thermal capacities are being installed, the sum of all baseline thermal capacities should be allocated in proportion to the thermal capacities of each heat pump installed.

Example 6: Replacing two 40kW baseline gas water heaters with a 60kW and 30kW heat pump system

Activity scenario (VEEC creation form entry)	Baseline thermal capacity (VEEC creation form entry)	Upgrade system thermal capacity (from product register)	Quantity (VEEC creation form entry)
44A - Replacing gas-fired boiler/ heater	53.4 (i.e. 60/90 * 80)	60	1
44A - Replacing gas-fired boiler/ heater	26.7 (i.e. 30/90 * 80)	30	1

3. Requirements for personnel undertaking commercial and industrial heat pump water heater upgrades

3.1. Product safety, OHS and compliance with standards

You must comply with all relevant laws and regulations, including occupational health and safety (OHS), even if you subcontract the installation to a third party. To minimise risk and ensure a safe work environment, you and your installers should be aware of the risks applicable to commercial and industrial building environments including:

- risks relating to installers working in constricted places and the use of specialist equipment
- risks associated with the handling of equipment with water at high temperatures and refrigerant gasses.

3.2. Required training and qualifications

3.2.1. Installation

All commercial and industrial heat pump water heater upgrades must comply with legal requirements and be undertaken by personnel holding the following licenses as required by legislation:

- a plumber licence registered with the Victorian Building Authority for gas fitting and water supply classes
- an electrician licence registered with Energy Safe Victoria or a Restricted Electrical Worker registered by Energy Safe Victoria with suitable training in water heating appliances (where wiring work is undertaken)
- an RAC01 refrigerant handling licence (where handling of refrigerants is required).

3.2.2. Decommissioning

Decommissioning of an electric resistance hot water heater or boiler or gas hot water heater or boiler must comply with legal requirements and be undertaken by personnel holding the following qualifications as required by legislation:

- a plumber licence registered with the Victorian Building Authority for gas fitting and water supply classes

- an electrician licence registered with Energy Safe Victoria with suitable training in water heating appliances (where wiring work is undertaken)
- a gas fitter licenced and registered with the Victorian Building Authority to work on Type B gas appliances.

3.2.3. Training and qualification record keeping requirements

Accredited persons must maintain a register of personnel qualifications (plumbing licence, electrical licence, refrigerant handling licence, and/or gas fitting licence as required) to confirm all personnel involved have the relevant qualifications needed to decommission the baseline product and/or install the upgrade product.

3.3. Role of the upgrade manager

For each upgrade, you must nominate a single person (referred to as the upgrade manager) to legally represent your business to verify the documentation for the upgrade, including but not limited to the VEEC assignment form and documentation outlined in the evidence requirements.

This should be the person who is responsible for overseeing the installation and commissioning of the commercial and industrial heat pump water heater upgrade.

4. Activity requirements for commercial and industrial heat pump water heater activities

You should be aware of, and adhere to, below activity requirements to ensure that you comply with legislation

4.1. Assignment of rights to create VEECs

A consumer may assign their right to create VEECs to an AP. A VEEC assignment form must be completed for you to create VEECs and demonstrate compliance with the legislation.

Download the VEEC assignment form template for this activity at www.esc.vic.gov.au/commercial-and-industrial-heat-pump-water-heater

You must give the energy consumer a copy of the VEEC assignment form at the time of signing (for written forms) or within 10 business days (for electronic forms). You must also ensure that all personal information collected in the VEEC assignment form is held in accordance with the Information Privacy Principles under the Privacy and Data Protection Act 2014 (Vic).

Details of how to comply can be found at https://ovic.vic.gov.au/privacy.

4.2. Commercial and industrial heat pump water heater modelling requirements

All products to be installed under this activity of the VEU program must be modelled in TRNSYS in accordance with the Commercial and Industrial Air Source Heat Pump Water Heater Product Application Guide so that minimum annual energy savings are determined for both HP4-Au and HP5-Au climate zones. The TRNSYS files must be provided to the commission for approval.

The product must be installed using components as modelled. The only exception is that an existing storage tank may be used in place of a modelled tank if the tank:

- was manufactured less than 10 years before the existing product is decommissioned
- has a volume that is greater than or equal to the volume of the modelled tank component
- is insulated.

4.3. Decommissioning requirements

Activity scenarios 44A and 44B need to meet relevant baseline and decommissioning requirements.

The baseline product – i.e. hot water boiler or heater to be decommissioned - must be in working order and at least 10 years old at the date it is decommissioned based on its manufacturing year. If the product's storage tank is less than 10 years old, the boiler or heater is still an eligible baseline product.

If your upgrade involves decommissioning a baseline product, you must decommission that product prior to certificate creation. Details of your decommissioning practices must be supplied to us as part of your accreditation application for this activity.

Evidence requirements for the decommissioning of the baseline product is set out in section 6 below.

4.3.1. Meeting your decommissioning declaration requirements

Accredited persons, their associates, or an entity under their instructions, must not alter the baseline environment for a given installation for the purposes of inflating a VEEC claim.

For commercial and industrial heat pump water heater activities involving decommissioning (activity 44A and 44B), accredited persons, their installer, and the consumer will need to provide a declaration to us stating that the decommissioned product was not installed for the purposes of decommissioning it as part of this activity under the program.

This declaration must be made:

- by the installer and the energy consumer as part of the activity's VEEC assignment form
- as part of an accredited person accepting the terms and conditions of their VEEC creation claim

3.2.2. Meeting EPA's waste management requirements

From 1 July 2021, every person must comply with the Environment Protection Authority's framework. Chapter 6 of the EPA Act establishes a new waste framework including duties in relation to industrial and priority waste. A producer of industrial or priority waste must take all reasonable steps to ensure that their waste goes to a place that is authorised to receive it (a "lawful place"). Reasonable steps include identifying and classifying your waste in accordance with the Act and the EPA Regulations.

5. Record keeping and evidence requirements for accredited persons

You must collect evidence to demonstrate that each upgrade has been undertaken in accordance with the Victorian Energy Efficiency Target Regulations and Victorian Energy Upgrade Specifications. You are also required to maintain documentation for each commercial and industrial heat pump water heater upgrade and provide it to us upon request.

5.1. Record keeping obligations

You must keep appropriate records to verify all details of the upgrade which relate to the calculation of greenhouse gas abatement and the creation of VEECs.

We may ask to review these records prior to VEECs being registered, or up to six years after they are registered, as evidence that your upgrade complies with the legislation.

Your records must be an auditable record of the work undertaken. If your documentation fails to provide an auditable record of the work undertaken, you may be required to surrender VEECs equivalent to those which we cannot verify or be subject to other compliance and enforcement actions.

5.2. Geo-tagged photograph obligations

You are required to take geo-tagged photographs to verify that the installation of all parts has been performed in accordance with the Victorian Energy Efficiency Target Regulations. Geo-tagged photographs must:

- be clear and in focus.
- include any relevant markings.
- include a date stamp showing the date the photographs were taken.
- include the GPS derived latitude and longitude coordinates. This should be stored in the metadata and generated automatically by the device used to take the geo-tagged photographs.

6. Minimum evidence requirements

6.1. Decommissioning a gas product and installing an air source heat pump water heater (activity 44A)

Table 3: Evidence requirements for decommissioning a gas water heater or boiler and installing an air source heat pump water heater (activity 44A)

Requirements	Documentation	Description
Eligibility	VEEC assignment form	A declaration, signed by the AP or the installer, declaring that: • the building where the activity takes place is a Class 2 building (as per the Building Code of Australia) or a non-residential premises, and • the product was installed as modelled except where an existing storage tank is used as storage in place of a modelled component for activity 44A and 44B
Proof of commercial transaction and energy consumer	Tax invoice	A valid tax invoice for the work carried out must include: • the name, address, and Australian Business Number (ABN)/Australian Company Number (ACN) of the energy consumer • the date of issue of the invoice • the installation address • the name, address, and ABN of the upgrade manager business • the itemised list of installed components including brand(s) and model(s) names.
Baseline product(s)	Geo-tagged photographs of the baseline heater/boiler and tank name plates and/or Manufacturer document(s)	The photographs must clearly show: • the model number • the serial number • the thermal capacity or gas consumption • the year of manufacture of the heater or boiler showing that the heater or boiler is at least 10 years old • the year of manufacture of the tank • the volume of the tank. Where the above information is not legible or available in the nameplates, you must provide:

		• manufacturer document(s) or data sheet(s) that contains this information.
Upgrade Product(s)	Geo-tagged photographs of the upgrade heat pump nameplate(s)	The photographs must clearly show: • the brand(s) • the model number(s) • the serial number(s) • the insulated storage volume of the tank(s).
	Geotagged photographs	The photograph must clearly show the heat pump, booster, and tank after installation.
Decommissioning	Geo-tagged photographs of the baseline product or Recycling invoice	The photographs must clearly show the baseline product(s) having been decommissioned or the recycling invoice for the decommissioned product.
Compliance	Victorian Building Authority (VBA) compliance certificate	VBA compliance certificate must be provided if required by law and must include: • the address details of the heat pump upgrade(s) • the type and quantity of products installed. If the plumber undertakes wholly or any part of decommissioning, the certificate must also include: • the type, brand, and model baseline product(s) decommissioned • the method of decommissioning.
	Certificate of electrical safety (CoES)	A CoES must be provided if one is required by law and must include: • the address details of the heat pump upgrade(s) • the type and quantity of products installed. If the electrician undertakes wholly or any part of decommissioning, the CoES must also include: • The type, brand, and model of each baseline product decommissioned • The method of decommissioning.

6.2. Decommissioning an electric product and installing an air source heat pump water heater (activity 44B)

Table 4: Evidence requirements decommissioning an electric product and installing an air source heat pump (activity 44B)

Requirements	Documentation	Description
Eligibility	VEEC assignment form	A declaration, signed by the AP or the installer, declaring that: • the building where the activity takes place is a Class 2 building (as per the Building Code of Australia) or a non-residential premises, and • the product was installed as modelled except where an existing storage tank is used as storage in place of a modelled component for activity 44A and 44B
Proof of commercial transaction and energy consumer	Tax invoice	A valid tax invoice for the work carried out must include: • the name, address, and Australian Business Number (ABN)/Australian Company Number (ACN) of the energy consumer • the date of issue of the invoice • the installation address • the name, address, and ABN of the upgrade manager business • the itemised list of installed components including brand(s) and model(s) names.
Baseline product(s)	Geo-tagged photographs of the baseline heater/boiler and tank name plates and/or Manufacturer document(s)	The photographs must clearly show: • the model number • the serial number • the thermal capacity or input power • the year of manufacture of the heater or boiler showing that the heater or boiler is at least 10 years old • the year of manufacture of the tank • the volume of the tank. Where the above information is not legible or available in the nameplates, you must provide: • manufacturer document(s) or data sheet(s) that contains this information.

Upgrade Product(s)	Geo-tagged photographs of the upgrade heat pump nameplate(s)	The photographs must clearly show: • the brand(s) • the model number(s) • the serial number(s) • the insulated storage volume of the tank(s).
	Geotagged photographs	The photograph must clearly show the heat pump, booster, and tank after installation.
Decommissioning	Geo-tagged photographs of the baseline product or Recycling invoice	The photographs must clearly show the baseline product(s) having been decommissioned or the recycling invoice for the decommissioned product.
Compliance	Victorian Building Authority (VBA) compliance certificate	VBA compliance certificate must be provided if required by law and must include: • the address details of the heat pump upgrade(s) • the type and quantity of products installed. If the plumber undertakes wholly or any part of decommissioning, the certificate must also include: • the type, brand, and model baseline product(s) decommissioned • the method of decommissioning.
	Certificate of electrical safety (CoES)	A CoES must be provided if one is required by law and must include: • the address details of the heat pump upgrade(s) • the type and quantity of products installed. If the electrician undertakes wholly or any part of decommissioning, the CoES must also include: • The type, brand, and model of each baseline product decommissioned • The method of decommissioning.

6.3. Installing an air source heat pump water heater (activity 44C)

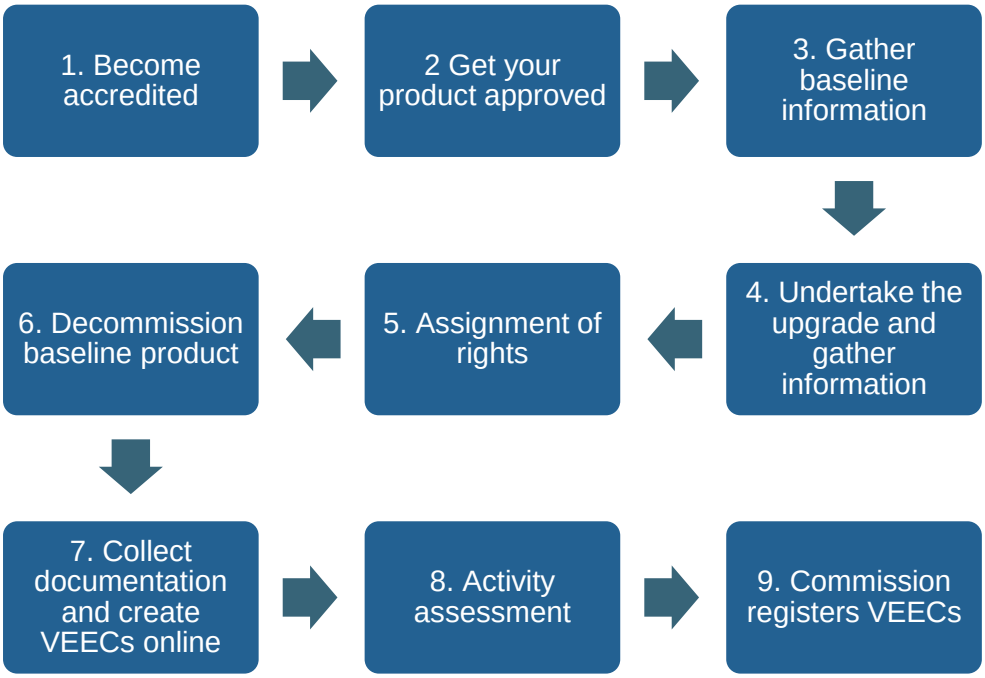
Table 5: Evidence requirements Installing an air source heat pump water heater (activity 44C)

Requirements	Documentation	Description
Eligibility	VEEC assignment form	A declaration, signed by the AP or the installer, declaring that: • the building where the activity takes place is a Class 2 building (as per the Building Code of Australia) or a non-residential premises, and • the product was installed as modelled
Proof of commercial transaction and energy consumer	Tax invoice	A valid tax invoice for the work carried out must include: • the name, address, and Australian Business Number (ABN)/Australian Company Number (ACN) of the energy consumer • the date of issue of the invoice • the installation address • the name, address, and ABN of the upgrade manager business • the itemised list of installed components including brand(s) and model(s) names.
Baseline product(s)	Geo-tagged photographs of the baseline heater/boiler and tank name plates and/or Manufacturer document(s)	The photographs must clearly show: • the model number • the serial number • the thermal capacity or gas consumption • the year of manufacture of the heater or boiler • the year of manufacture of the tank • the volume of the tank. Where the above information is not legible or available in the nameplates, you must provide: • manufacturer document(s) or data sheet(s) that contains this information.
Upgrade Product(s)	Geo-tagged photographs of the upgrade heat pump nameplate(s)	The photographs must clearly show: • the brand(s) • the model number(s) • the serial number(s) • the insulated storage volume of the tank(s).

	Geotagged photographs	The photograph must clearly show the heat pump, booster, and tank after installation.
Compliance	Victorian Building Authority (VBA) compliance certificate	VBA compliance certificate must be provided if required by law and must include: • the address details of the heat pump upgrade(s) • the type and quantity of products installed. If the plumber undertakes wholly or any part of decommissioning, the certificate must also include: • the type, brand, and model baseline product(s) decommissioned • the method of decommissioning.
	Certificate of electrical safety (CoES)	A CoES must be provided if one is required by law and must include: • the address details of the heat pump upgrade(s) • the type and quantity of products installed. If the electrician undertakes wholly or any part of decommissioning, the CoES must also include: • The type, brand, and model of each baseline product decommissioned • The method of decommissioning.

7. Commercial and industrial heat pump water heater activity process

This section provides you with the process for undertaking a commercial and industrial heat pump water heater activity under the program.



7.1. Become accredited

You must be accredited/approved to undertake this activity to create VEECs for this activity. Visit www.esc.vic.gov.au/become-veu-accredited for information on how to become accredited.

7.2. Get your product approved

To create VEECs for this activity, the product installed must be listed as an approved product on our Register of Products. You should check our register to see if the product you wish to install has already been approved as another organisation may have submitted the product for approval (e.g. product manufacturer/supplier).

Learn more about getting your products approved in our Commercial and Industrial Air Source Heat Pump Water Heater Product Application Guide at www.esc.vic.gov.au/veu-product-applicants.

7.3. Gather baseline information

Verify the baseline environment by collecting any necessary information you need for certificate creation prior to performing the upgrade. Evidence requirements are outlined in sections 5 and 6.

7.4. Undertake the upgrade and gather information

Ensure you comply with other relevant legislations, such as Occupational Health and Safety, whilst performing the upgrade, and that you collect all evidence requirements. Evidence requirements are outlined in section 5 and 6.

7.5. Assignment of rights

An important part of the certificate creation process is the valid assignment of the right to create VEECs from the consumer to you. Ensure the signatory has the legal authority to sign on behalf of the consumer entity.

7.6. Decommission baseline appliance

For activities 44A and 44B, the baseline appliance that is replaced or removed must be decommissioned in accordance with the VEET Regulations (see section 4.3). See section 6 for evidence requirements.

7.7. Collect documentation and create VEECs online

Prior to creating VEECs for an activity, ensure you have collected the required documents for the upgrade as specified in section 6. You may be asked to submit further information in addition to all those required documents as part of our assessment process.

To create VEECs, you can upload the activity using either an upload form or the online user interface on the VEU Registry. Different activity types have different data input requirements, so it is important that you input the correct data in the relevant field.

7.8. Activity assessment

Given the complex nature of these upgrades and the potential VEEC volumes involved for a single installation, we intend to conduct a detailed assessment of each activity submitted for VEEC creation. All installations may be assessed as first creations prior to the registration of certificates.

After you press the ‘create’ button for your validated activities, the VEECs associated with your upgrade are created and assigned a unique identifier. We then assess your created VEECs and decide whether to register them.

You must always retain complete and accurate documentation for each upgrade you have undertaken.

7.9. Commission registers VEECs

Once your VEEC creation claims have been validated by us, we will provide you with an invoice for the certificate registration fee of $1 per certificate. Once payment is received, we will register your VEECs and notify you that they are available to be traded and/or surrendered to us.

Appendix A: VEEC calculation and worked examples for creating VEECs[2]

The upgrade product to be used in the following three examples is a heat pump water heater product with the following product characteristics: has a thermal capacity of 60kW, uses refrigerant type R410A, has a refrigerant charge of 20 kg, has a zone 5 HPElec of 128.35GJ/year, has a zone 5HPGas of 0, and a zone 5 peak load of 1100MJ/day.

This appendix is intended to provide guidance to stakeholders on potential value for an upgrade under activity 44. We recommend stakeholders refer to the VEU Specifications 2018 as the source document for calculating VEECs for this activity.

Activity 44A - Decommissioning a gas water heater/boiler and installing an electric boosted air source heat pump water heater

GHG Eq. Reduction = ∑systems [GEF x (RefElec/RepEff) – GEF x HPGas - EEF x RegionalFactor x (HPELec/3.6)] x CapacityFactor x Lifetime + ∑systems [(1430 – GWP) x RFE x RfrgCharge]

Example: Replacing a 30kW gas boiler with 60kW heat pump with new tank in postcode metropolitan, climate zone 5.

Input values from upgrade product:

- RefElec is 381.525 GJ/a (i.e. 1100*365*0.905*1.05)/1000)
- Zone 5 HPElec is 128.35 GJ/a
- Zone 5 HPGas is 0
- GWP is 2088 (given refrigerant type is R410A)
- RfrgCharge is 20 kg

Input values from table 44.4 of the VEU specifications:

- GEF is 0.05523
- RepEff is 0.788

[2] Examples in this appendix are for demonstrating calculations only and may not reflect actual baseline and upgrade products.

- EEF is 0.516
- RegionalFactor is 0.98 (for metropolitan Victoria)
- Capacity Factor is 0.5 (a calculated value - i.e. 30/60)
- Lifetime is 15 years (for new tank)
- RFE is 0.0005

Table 6: VEECs generated for activity scenario 44A worked example

Activity	Greenhouse Gas Equivalent Reduction Equation	VEECs
44A	[GEF x (RefElec/RepEff) – GEF x HPGas – EEF x RegionalFactor x (HPELec/3.6)] x CapacityFactor x Lifetime + [(1430 – GWP) x RFE x RfrgCharge] [0.0552 x (381.525/0.788) – 0.05523 x 0 – 0.516 x 0.98 x (128.35/3.6)] x 0.5 x 15 + [(1430 – 2088) x 0.0005 x 20]	59

Activity 44B – Decommissioning an electric water heater/boiler and installing an electric boosted air source heat pump water heater

GHG Eq. Reduction = ∑systems [EEF x (RefElec/3.6) x RegionalFactor – GEF x HPGas – EEF x RegionalFactor x (HPELec/3.6)] x CapacityFactor x Lifetime + ∑systems [(1430 – GWP) x RFE x RfrgCharge]

Example: Replacing a 60kW electric resistant water heater with a 60kW heat pump with a new tank in postcode regional, climate zone 5.

Input values from upgrade product:

- RefElec is 381.525 GJ/a (i.e. 1100*365*0.905*1.05)/1000)
- Zone 5 HPElec is 128.35GJ/a
- Zone 5 HPGas is 0
- GWP is 2088 (given refrigerant type is R410A)
- RfrgCharge is 20 kg

Input values from table 44.5 of the VEU specifications:

- EEF is 0.516
- GEF is 0.0552
- RegionalFactor is 1.04 (for regional Victoria)
- Capacity Factor is 1 (i.e. baseline thermal capacity = upgrade thermal capacity)
- Lifetime is 15 years (for new tank)

- RFE is 0.0005

Table 7: VEECs generated for activity scenario 44B worked example

Activity	Greenhouse Gas Equivalent Reduction Equation	VEECs
44B	[EEF x (RefElec/3.6) x RegionalFactor – GEF x HPGas – EEF x RegionalFactor x (HPELec/3.6)] x CapacityFactor x Lifetime + [(1430 – GWP) x RFE x RfrgCharge] [0.516 x (381.525 /3.6) x 1.04 – 0.0552 x 0 – 0.516 x 1.04 x (128.35 /3.6)] x 1 x 15 + [(1430 – 2088) x 0.0005 x 20]	560

Activity 44C – Installing an electric boosted air source heat pump water heater in climate zone 5

GHG Eq. Reduction = ∑systems [GEF x (RefElec/NewEff) – GEF x HPGas - EEF x RegionalFactor x (HPELec/3.6)] x Lifetime + ∑systems [(1430 – GWP) x RFE x RfrgCharge]

Example: Installing a 60kW heat pump with a new tank in postcode regional, climate zone 5.

Input values from upgrade product:

- RefElec is 381.525 GJ/a (i.e. 1100*365*0.905*1.05)/1000)
- Zone 5 HPElec is 128.35GJ/a
- Zone 5 HPGas is 0
- GWP is 2088 (given refrigerant type is R410A)
- RfrgCharge is 20 kg

Input values from table 44.6 of the VEU specifications:

- GEF is 0.0552
- NewEff is 0.85
- EEF is 0.516
- RegionalFactor is 1.04 (for regional Victoria)
- Lifetime is 15 years (for new tank)
- RFE is 0.0005

Table 8: VEECs generated for activity scenario 44C worked example

Activity	Greenhouse Gas Equivalent Reduction Equation	VEECs
44C	[GEF x (RefElec/NewEff) – GEF x HPGas - EEF x RegionalFactor x (HPELec/3.6)] x Lifetime + [(1430 – GWP) x RFE x RfrgCharge] [0.0552 x (381.525/0.85) – 0.0552 x 0 – 0.516 x 1.04 x (128.35/3.6)] x 15 + [(1430 – 2088) x 0.0005 x 20]	78

Appendix B: List of Refrigerant GWPs

Table 9: List of refrigerant types with global warming potentials (GWP) values[3]

Refrigerant type	Substance name	GWP
R-1234yf	HFO-1234yf	5
R-1234ze(E)	HFO-1234ze	5
R-125	HFC-125	3500
R-1270	HC-1270	5
R-12A	HC-12A	5
R-134A	HFC-134A	1430
R-143A	HFC-143a	4470
R-152A	HFC-152a	124
R-170	HC-170	5
R-227EA	HFC-227EA	3220
R-22A	HC-22A	5
R-23	HFC-23	14800
R-236CB	HFC-236CB	1340
R-236EA	HFC-236EA	1370
R-236FA	HFC-236FA	9810
R-245CA	HFC-245CA	693
R-245FA	HFC-245FA	1030
R-290	HC-290	3
R-32	HFC-32	675
R-365MFC	HFC-365MFC	794
R-404A	HFC-404A	3922
R-407A	HFC-407A	2107
R-407B	HFC-407B	2804
R-407C	HFC-407C	1774
R-407D	HFC-407D	1627
R-407E	HFC-407E	1552
R-407F	HFC-407F	1825
R-407G	HFC-407G	1463
R-41	HFC-41	92
R-410A	HFC-410A	2088
R-410B	HFC-410B	2229
R-413A	HFC-413A	2053
R-417A	HFC-417A	2346
R-417B	HFC-417B	3027
R-417C	HFC-417C	1809
R-419A	HFC-419A	2967
R-419B	HFC-419B	2384
R-421A	HFC-421A	2631
R-421B	HFC-421B	3190
R-422A	HFC-422A	3143
R-422B	HFC-422B	2526
R-422C	HFC-422C	3085
R-422D	HFC-422D	2729

[3] Sources: Intergovernmental Panel on Climate Change (IPCC) fourth assessment report, 2007 and the Department of Agriculture, Water and the Environment website.

Refrigerant type	Substance name	GWP
R-422E	HFC-422E	2592
R-423A	HFC-423A	2280
R-424A	HFC-424A	2440
R-425A	HFC-425A	1505
R-426A	HFC-426A	1508
R-427A	HFC-427A	2138
R-428A	HFC-428A	3607
R-429A	HFC-429A	13
R-430A	HFC-430A	94
R-43-10MEE	HFC-43-10MEE	1640
R-431A	HFC-431A	36
R-434A	HFC-434A	3245
R-435A	HFC-435A	26
R-437A	HFC-437A	1805
R-438A	HFC-438A	2264
R-439A	HFC-439A	1983
R-440A	HFC-440A	144
R-442A	HFC-442A	1888
R-444A	HFC-444A	87
R-444B	HFC-444B	293
R-445A	HFC-445A	129
R-446A	HFC-446A	459
R-447A	HFC-447A	582
R-447B	HFC-447B	739
R-448A	HFC-448A	1386
R-449A	HFC-449A	1396
R-449B	HFC-449B	1411
R-449C	HFC-449C	1250

Refrigerant type	Substance name	GWP
R-450A	HFC-450A	601
R-451A	HFC-451A	146
R-451B	HFC-451B	160
R-452A	HFC-452A	2139
R-452B	HFC-452B	697
R-452C	HFC-452C	2219
R-453A	HFC-453A	1765
R-454A	HFC-454A	236
R-454B	HFC-454B	465
R-454C	HFC-454C	145
R-455A	HFC-455A	145
R-456A	HFC-456A	684
R-457A	HFC-457A	136
R-458A	HFC-458A	1650
R-500	HFC-500	8077
R-502A	HC-502A	5
R-503	HFC-503	14560
R-507A	HFC-507A	3985
R-508A	HFC-508A	13214
R-508B	HFC-508B	13396
R-512A	HFC-512A	189
R-513A	HFC-513A	629
R-513B	HFC-513B	593
R-515A	HFC-515A	386
R-600	HC-600	5
R-600A	HC-600A	3
R-601A	HC-601a	5
R-717	HC-717	0

Refrigerant type	Substance name	GWP
R-744	HC-744	1

Document version control

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Version	Amendments made	Date published
1.0	First release	1 February 2022
1.1	Updated for error in calculation equation for activity 44A in Appendix A	23 February 2022
1.2	Update to clarify requirement for hot water boiler or heater to be in working order and 10 years old	17 March 2023