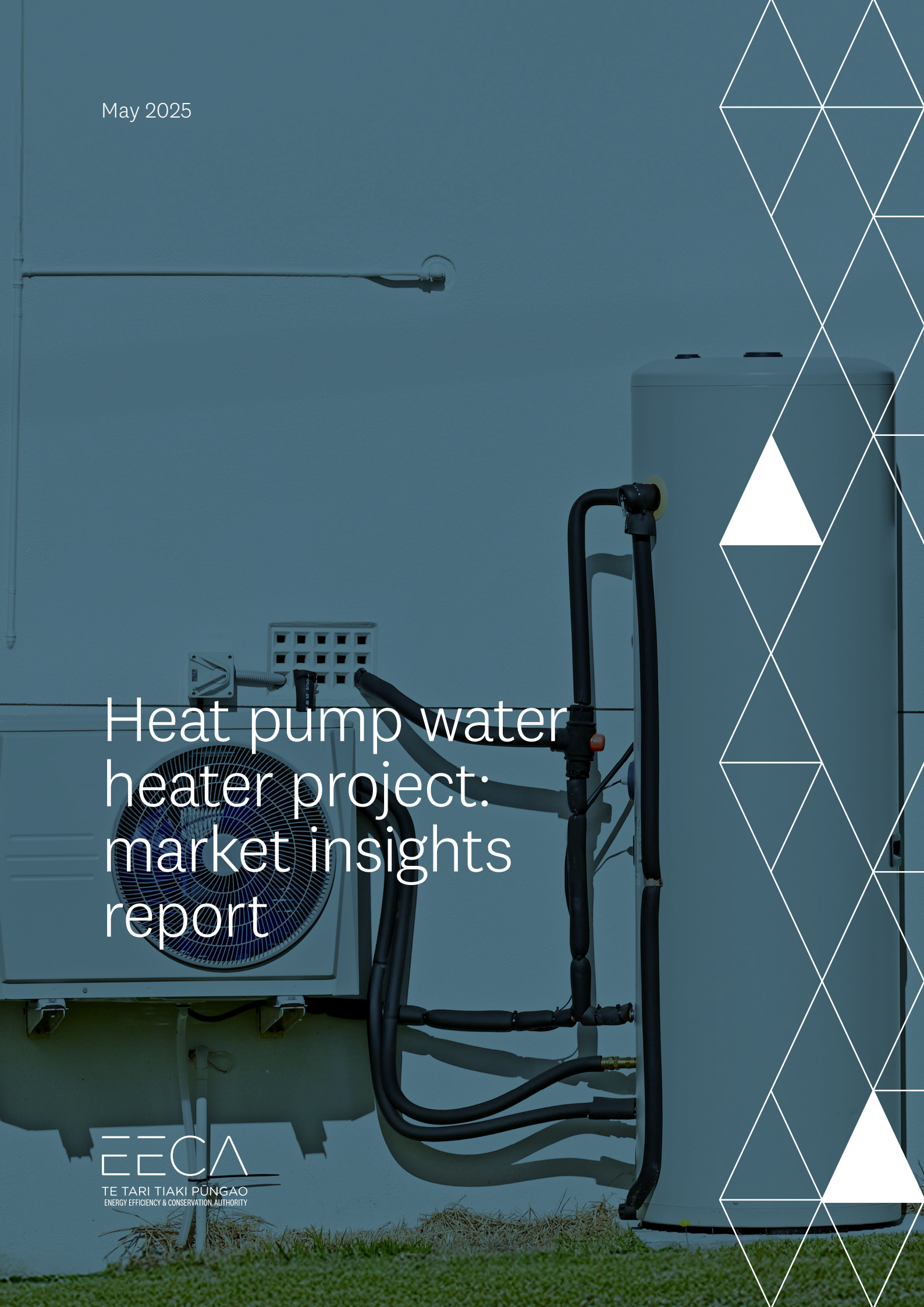
May 2025

Heat pump water heater project: market insights report



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Contents

Summary

This report is the first in a series providing insights into residential potable heat pump water heaters, their real-world performance and the market for them in New Zealand.

The report summarises the findings of a market scan conducted from late-2024 to early-2025. It outlines the current market for heat pump water heaters in New Zealand, including the products available, their claimed performance and their importers/manufacturers.

In the residential sector, hot water makes up a significant proportion of household energy use (estimated at 30%, excluding transport). Adoption of heat pump water heaters offers a significant opportunity to reduce this energy use (by 50% or more).

However, uptake to date in New Zealand has been relatively low, with heat pump water heaters estimated to be less than 1% (12,000) of all hot water systems installed in the nation's homes.

Despite this, there are a large number of heat pump water heater importers/manufacturers (at least 18). There are also more than 40 different models of heat pump water heaters available, claiming to be suitable for a range of climate conditions and household sizes. Models are either split or integral systems, and take various approaches to connectivity, controllability and refrigerants.

At present, there is no mandated energy-efficiency testing or requirements for heat pump water heaters in New Zealand. However, importers/manufacturers make a number of efficiency (in the form of coefficient of performance or COP) and energy savings claims for their products.

Claims vary by importers/manufacturers, but in general are based on test information (typically AS/NZS 5125 and AS/NZS 4234)[1], and are in the order of a COP of 3 to 4, and energy savings of 60% to 80%, when compared to traditional electric and gas water heating systems.

In practice, the real-world energy savings that heat pump water heaters achieve will depend on many factors. EECA (the Energy Efficiency and Conservation Authority) has a project underway to install around 70 heat pump water heaters in homes across New Zealand and monitor their performance to provide better understanding of the real-world energy savings that such systems might offer.

1 AS/NZS 5125.1:2014 Heat pump water heaters - Performance assessment - Part 1: Air source heat pump water heaters; AS/NZS 4232:2011 Heated water systems - Calculation of energy consumption.

Background to the project

How heat pump water heaters work

Heat pump water heaters are innovative water heating systems that use heat pump technology to efficiently heat water.

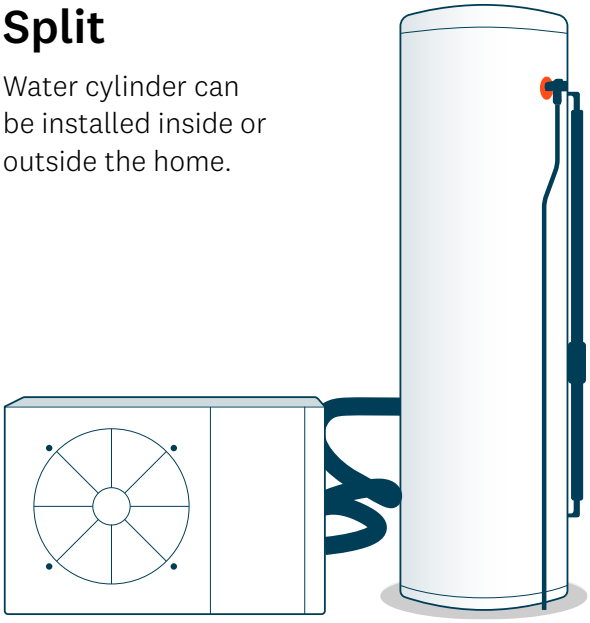
They are similar to the air-to-air heat pumps commonly used to heat homes. They work on the same principle of extracting heat from the surrounding air, but instead of transferring that heat to air inside the house, they transfer it into water stored in a storage tank.

The design of heat pump water heaters varies considerably, although they can generally be divided into two main configurations: split (or stand-alone) and integral (or all-in-one).

Split systems have a storage tank and stand-alone heat pump unit that can be located separately from the tank. Integral systems have the heat pump and storage tank all in one unit. The two configurations are shown in Figure 1.

Split

Water cylinder can be installed inside or outside the home.



Integral

Water cylinder is installed outside the home.

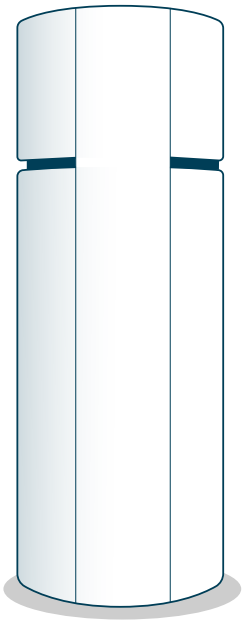


Figure 1: Split and integral heat pump water heaters

Heat pump water heaters use a refrigerant fluid and vapour compression cycle to extract heat from the air and transfer it to the water in the storage tank.

This is done through the following steps.

1. The refrigerant absorbs heat from the outside air and transforms from a liquid to a gas in the evaporator.

2. The refrigerant is then compressed in the compressor, which raises the refrigerant's temperature to above the desired hot water temperature.

3. The hot, pressurised refrigerant then passes through a condenser coil, where it transforms from a gas to a liquid, giving its heat to the water.

4. The liquid refrigerant then flows back to the evaporator coil to repeat the cycle until the desired temperature is reached.

Figure 2 shows the key components of a heat pump water heater.

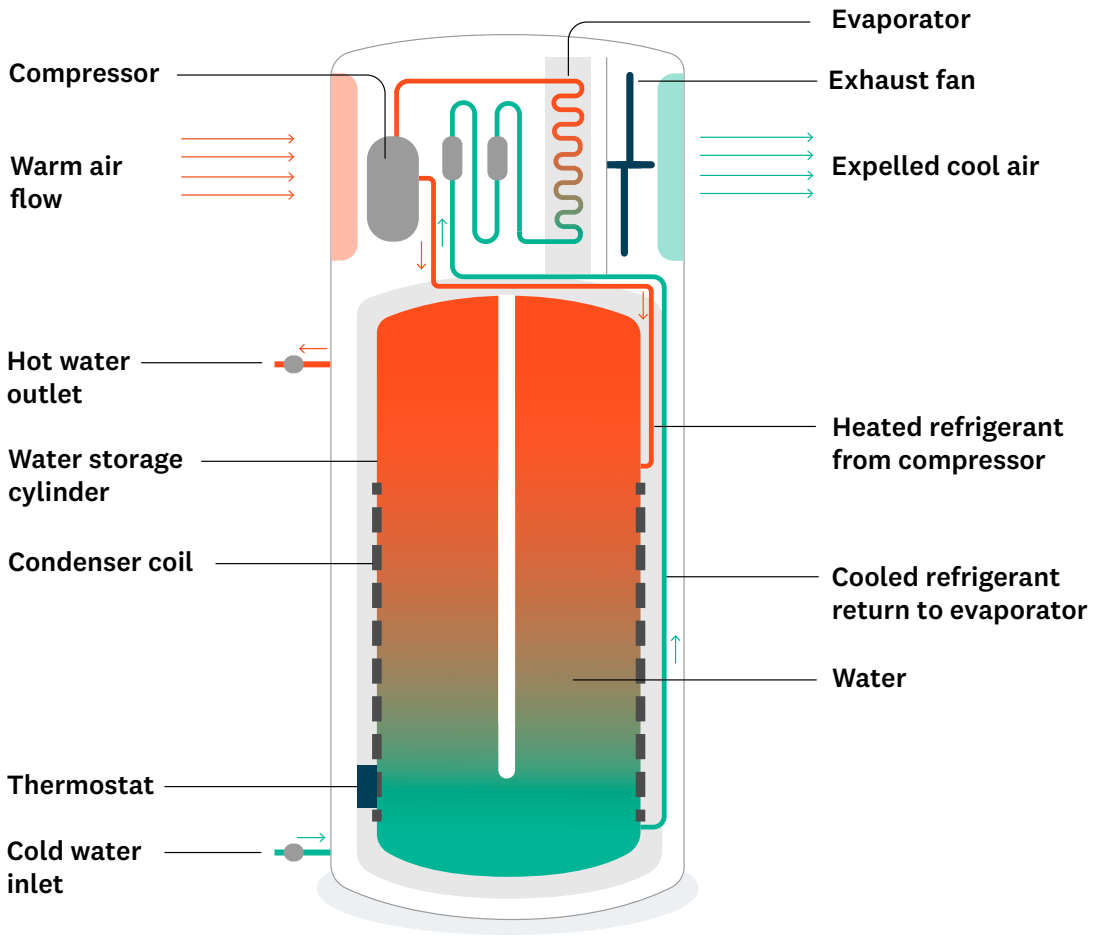


Figure 2: Parts of a heat pump water heater

Why understanding heat pump water heaters is important

Potable hot water heating makes up about 30% of the average New Zealand household's energy use (excluding transport).[2] A number of different technologies are used to heat potable water, although the residential sector is currently dominated by electric-element storage water heaters and gas instantaneous systems.

However, there are more efficient options available, including solar and heat pump water heaters.

Figure 3 shows the residential water heating technologies currently installed in New Zealand.

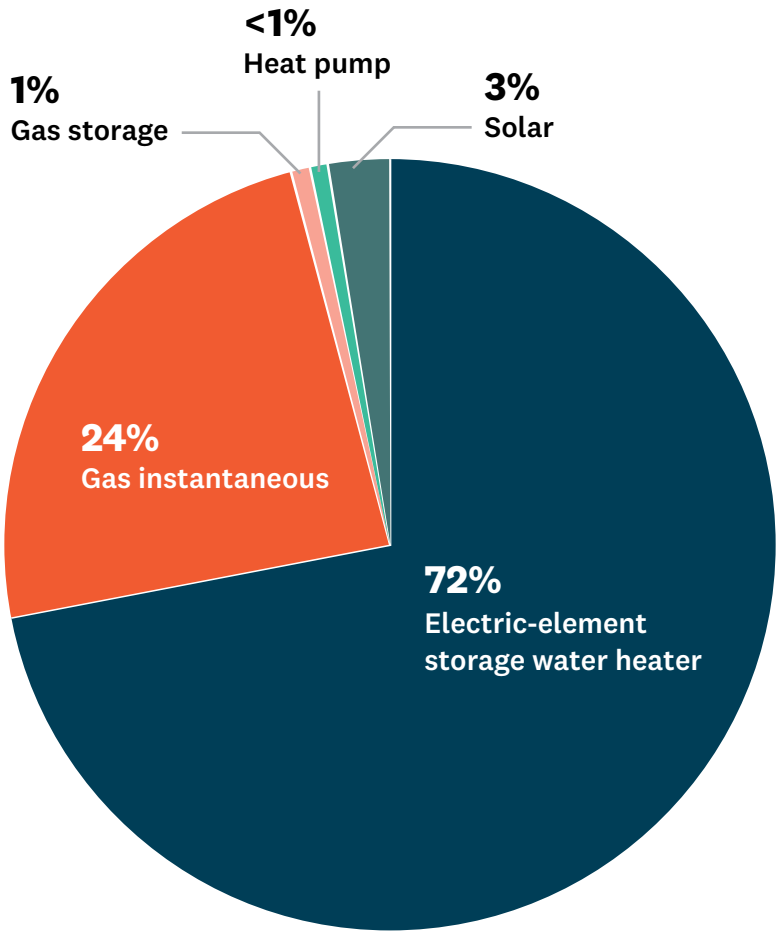


Figure 3: Estimated residential water heating technologies installed in New Zealand

2 Energy End Use Database

Heat pump water heaters are being adopted at a rapid pace in Australia. This is largely due to financial incentive schemes in Victoria, New South Wales and South Australia. These incentives led to over 100,000 heat pump water heaters being sold across Australia in both 2021 and 2022. In total, between 850,000 and 1,000,000 hot water systems are sold every year in Australia (with an annual growth rate of 1.8%). It is estimated that heat pump water heaters could achieve around 40% of this market by 2036.[3]

In comparison, heat pump water heaters are only an emerging technology in New Zealand's residential water heating market. Only around 12,000[4] are currently installed in New Zealand homes (of around 2 million hot water systems installed in total), and only a few thousand are sold each year.

Yet, greater adoption of heat pump water heaters could deliver significant opportunities to reduce energy use.

Heat pump water heaters are typically at least twice as energy efficient as traditional electric-element storage water heaters. They're cheaper to run and can be particularly cost effective for households that use a lot of hot water.

It is important to note, though, that how heat pump water heaters perform can vary based on factors such as the local climate, the type of heat pump and the quality of the installation.

While there are voluntary energy performance test standards (for example, AS/NZS 5125) and test data that importers/manufacturers and potential purchasers can refer to, there is currently limited real-world information about performance available. This is particularly true for heat pump water heaters installed in low-temperature conditions, and for understanding how such conditions are likely to affect the energy savings and product performance of the heat pump units.

3 Heat pumps - Emerging trends in the Australian market

4 2021 Residential Baseline Study for Australia and New Zealand for 2000 to 2040

Our project to understand real-world performance

EECA is undertaking a project to understand how heat pump water heaters perform in real New Zealand settings. This market insights report is the first of a series of reports that the project will generate.

The project's findings will help us understand how to maximise the benefits of heat pump water heaters and support their uptake in New Zealand.

The findings will also help determine how suitable heat pump water heaters are for supporting electricity demand flexibility — it is anticipated they may be a useful tool, given they use a water storage tank and don't necessarily have to consume power at the same time that the hot water is drawn, but this needs to be confirmed.

To this end, EECA is installing approximately 70 heat pump water heaters (both integral and split systems) in households across New Zealand. We are installing a range of products to suit different households and climate zones.

For the purposes of the project, New Zealand has been split into three climate zones, as shown in Figure 4 on the next page.

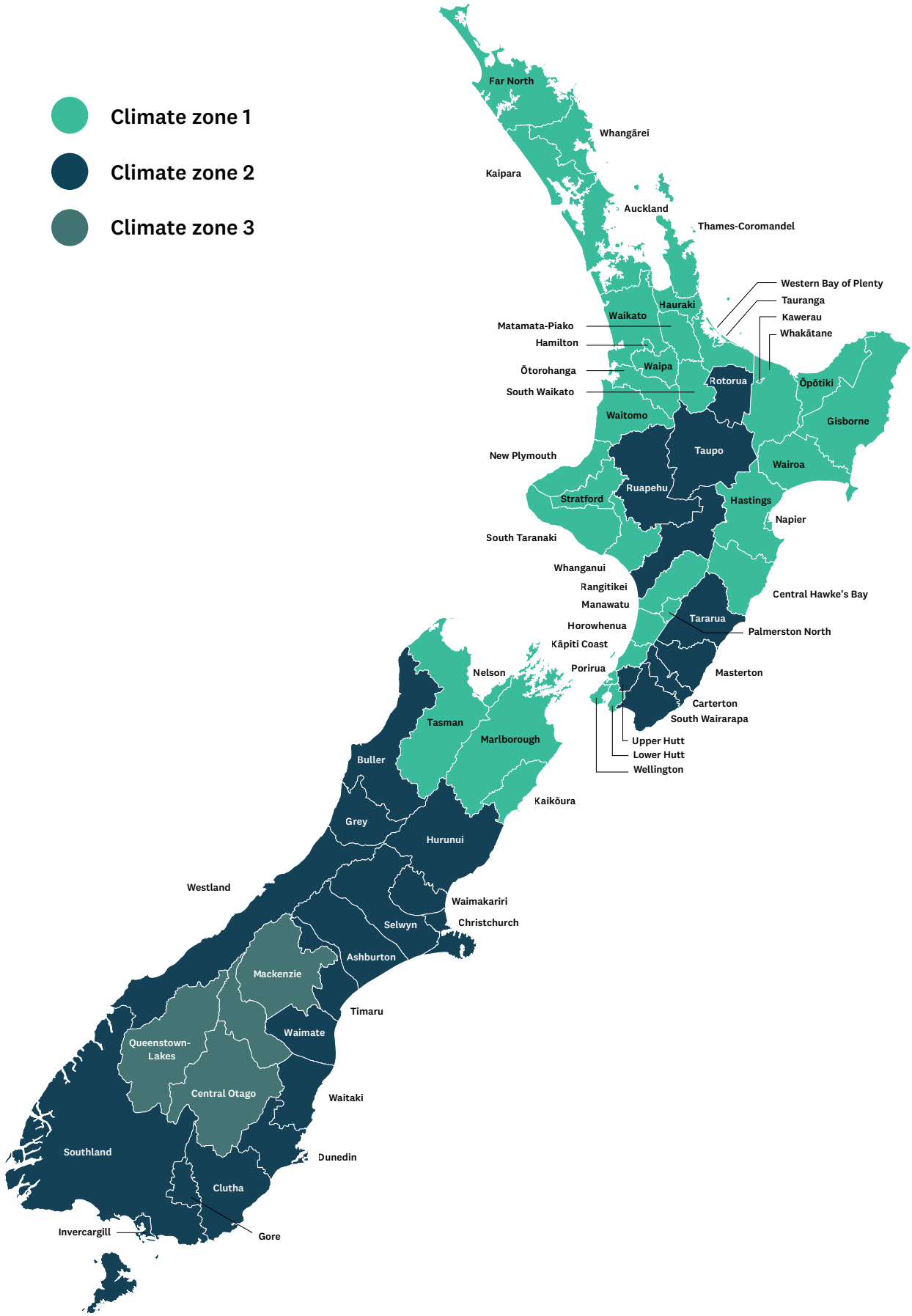


Figure 4: Project climate zones

EECA will monitor the units for at least 12 months. We will then share our findings on the energy use and efficiency of heat pump water heaters. This will include:

- the real-world performance of the products studied (efficiency, reheat time, etc.)
- a comparison of the performance of the different products and system types
- any limitations detected for using heat pump water heaters in different climate zones or household types
- an assessment of how suitable heat pump water heaters are for creating demand flexibility opportunities.

The findings of the market research presented in this initial report will be compared to our real-world findings.

EECA is also working with industry stakeholders to develop a heat pump water heater installation guide, with the guide to be informed by the findings of this research project.

The current New Zealand heat pump water heater market

This section sets out the findings of EECA's initial scan of the residential heat pump water heater market and the types of products available in New Zealand.[5] The findings draw on a combination of discussions with importers/manufacturers and independent internet-based market research.

The New Zealand heat pump water heater market is rapidly changing, as new technologies are adopted. As such, this report may not contain every importer/manufacturer and product, but covers most of those operating and available at the time the research was undertaken.

Composition of the market — importers/ manufacturers

Despite the relatively small number of heat pump water heaters sold in New Zealand each year (estimated at a few thousand), there are many importers/manufacturers (18 or more).

Importers/manufacturers comprise both small and large businesses, including traditional water heater suppliers, air-to-air heat pump importers/manufacturers, and dedicated heat pump water heater importers/manufacturers, as shown in Table 1 on the next page.

5 The findings have been aggregated to protect sensitive information. Publicly available information has been used, where possible. Our study of the market took place in mid-late 2024.

Table 1: Heat pump water heater suppliers in New Zealand, late-2024 to early-2025

Supplier	Type of supplier	Supplies integral units	Supplies split units
Black Diamond Technologies (Mitsubishi Electric)	Air-to-air heat pump product importers/ manufacturers	No	Yes
Daikin		No	Yes
Panasonic New Zealand		No	Yes
Fisher & Paykel Appliances (Haier)		Yes	Yes
Realcold		Yes	No
AHI Carrier		Yes	No
Trade Depot (Midea)		Yes	Yes
Rinnai	Electric-element and/or gas water heater importers/ manufacturers	Yes	Yes
Rheem		Yes	Yes
Stiebel-Eltron		Yes	No
Waterware		No	Yes
Apricus Eco (various brands)	Dedicated heat pump water heater importers/ manufacturers	Yes	Yes
Calitec		No	Yes
Ecobulb		Yes	No
Ecospring		Yes	No
Hot Water Heat Pumps (various brands)		Yes	Yes
Hot Water Solutions (various brands)		Yes	Yes
Living Wise		Yes	No

Composition of the market — products

Most importers/manufacturers offer more than one product, or products that can be configured to suit small and large households.

In total, the market scan recorded 40 different heat pump water heater models on offer from the 18 importers/manufacturers, with two-thirds of these being integral and one-third being split systems (26 and 14 models, respectively). For the split systems, there were two types available – one type pumps water between the storage tank and heat pump, the other circulates refrigerant between the outdoor unit and tank (or an indoor unit).

We compared these numbers to the Australian market and found that, while the Australian market appears to be skewed towards integral systems in terms of volume, there is a similar proportion of split models available. This is to be expected, as for a number of importers/manufacturers, Australia and New Zealand are considered one global market.

Some of the products are manufactured in New Zealand, or have components made here, while others are sourced from overseas.

Barriers to uptake

Importers/manufacturers were asked what they thought the barriers to greater uptake of heat pump water heaters in New Zealand are. The top barriers identified were:

- capital costs
- consumer awareness
- installer awareness and training.

Other themes included building code requirements, lack of government support and lack of market development.

Storage tank size

The most common storage tank (for the heated water) size among the products on offer in New Zealand is 200 litres to 300 litres.

For integral heat pump water heaters, the tank sizes range from 170 litres to 300 litres. For split heat pump water heaters, the heat pump can connect to different tank sizes, ranging from 125 litres to 600 litres, with some models able to be retrofitted to existing tanks.

The number of products available in various ranges of tank size are as shown in Table 2 on the next page.

Table 2: Number of products available by tank size.[6]

Tank volume	Number of products
Less than 200 L	11
200 L to 249 L	8
250 L to 299 L	20
300 L or more	14

In general, 200 litres is typically considered sufficient for small households, 200 litres to 300 litres for medium households, and more than 300 litres for larger households.

However, because the performance of heat pump water heaters can vary with climate conditions, it is important to ensure a product is the right size for a particular household's needs and an expert should be consulted.

Refrigerant used

A range of refrigerants are used in the heat pump water heaters available in New Zealand, with the most common being R290 and R134a.

It appears that heat pump water heater manufacturers are moving towards using low global warming potential (GWP) refrigerants,[7] as shown in Table 3. Further changes to the refrigerants used may occur as the market matures.

Table 3: Refrigerants used, by product and global warming potential.

Refrigerant	Number of products	Global warming potential
CO_2	3	1
R290	21	3
R513A	1	573
R32	3	675
R134a	11	1,430
R410A	1	2,088

6 The findings have been aggregated to protect sensitive information. Publicly available information has been used, where possible. Our study of the market took place in mid-late 2024.

7 Global warming potential is measure of how much a substance (if released) traps heat in the atmosphere compared to CO_2. So, 1 kg of refrigerant with a GWP of 1, is equivalent to 1 kg of CO_2. If the 1 kg of refrigerant had a GWP of 675, then it is equivalent to 675 kg of CO_2.

Low-GWP refrigerants, such as CO2 and R290, are often as energy efficient or more energy efficient than traditional high-GWP refrigerants. They also operate at lower ambient temperatures and provide higher output water temperatures using the heat pump alone.

Apart from CO_2, all of the low-GWP refrigerants mentioned in Table 3 (those with a GWP <150) are flammable. This limits their use to systems with a low charge, unless expensive safety precautions are undertaken.

EECA considered imposing a maximum refrigerant GWP of 675 for the heat pump water heaters to be used in this project. This would align with the GWP requirement for space heating heat pumps used in EECA's Warmer Kiwi Homes programme. However, many heat pump water heaters currently available on the New Zealand market use R134a as a refrigerant, which has a GWP of 1,430. To ensure the project reflected this, the GWP limit was lifted to 1,430.[8]

Energy efficiency and savings

The energy efficiency of heat pump water heaters is currently unregulated in New Zealand and there is no mandated energy-efficiency testing.

EECA's market scan found a number of energy-efficiency (in the form of coefficient of performance, or COP)[9] and potential energy-savings claims being made by importers/manufacturers, when heat pump water heaters are compared to traditional hot water systems, such as electric-element storage water heaters.

Many of the products we looked at are tested to AS/NZS 5125 and simulated to AS/NZS 4234. These test results are often used to support the performance claims made on importers'/manufacturers' websites, and in their brochures and product manuals.

8 By way of comparison, most residential space heating heat pumps now use R32 refrigerant, which has a GWP of 675.

9 COP is a measure of electrical energy consumed to transfer heat. The higher the COP number the more heat is transferred for the same electrical energy consumed. For example, a COP of 3 (for a heat pump water heater) is three times as efficient as a COP of 1 (for an electric-element water heater)

Claims made by importers/manufacturers about heat pump water heaters include:[10]

- uses about one-third the electricity of a traditional electric resistance heater to heat the same volume of water
- reduces the electricity used to heat the same volume of water by 64% to 79% compared to an electric-resistance water heater
- reduces energy use by 64% to 68% compared to an electric-resistance water heater, by the heat pump technology drawing in heat from the surrounding ambient air
- will heat a household's water while saving up to 75% on water heating costs
- has a good COP (with COPs cited ranging from 3.6 to 5.41).

The range of energy efficiency and savings claims made by importers/manufacturers varies, as can be seen from the above examples. In general, though, importers/manufacturers claim a COP of at least 3 and energy savings of between 60% and 80%.

However, these claims are based on test conditions, and real-world efficiency may differ in New Zealand conditions.

Typically, energy savings claims are based on tests from AS/NZS 5125 and simulations from AS/NZS 4234. These tests are carried out for specific climate zones. Similarly, COP claims are based on tests from AS/NZS 5125, carried out at a range of ambient temperatures, most popularly 19°C.

Yet, these test conditions may not represent the real-world locations where heat pump water heaters will be used. For example, the average air temperature in Auckland over a typical year is 15.2°C, which is relatively close to 19°C. But in Central Otago it is 9.6°C, and the gap between this and a test temperature of 19°C grows wider if solely the winter months are considered, where the average temperature in Central Otago is 3°C.

In addition, the efficiency of heat pump water heaters depends on a number of other factors, such as ambient air temperature, and start and end water temperatures. This makes the real-world COP and energy savings that heat pump water heaters can achieve highly variable.[11]

10 Based on internet research of the products available in New Zealand in March 2025.

11 Additional information on real-world COP and energy savings, compared to traditional hot water systems, will be provided in following project reports, along with a comparison of this information to importers/manufacturers claims.

Low-temperature performance

In general, the warmer the climate, the higher the COP and energy savings that a heat pump water heater will provide. However, some products are specifically designed for colder climates.

The lower the ambient temperature a heat pump water heater can operate at without having to use its electric element (if it has one), the more energy savings it can achieve in cold climate conditions.

Figure 5 shows the claimed lowest operating temperatures, without using an electric element, for heat pump water heater models currently on the market. As can be seen, most models can operate down to -7°C.

There are 12 models (mostly using R290 or CO2 as a refrigerant) that claim to operate at lower temperatures, ranging from -10°C to -15°C.

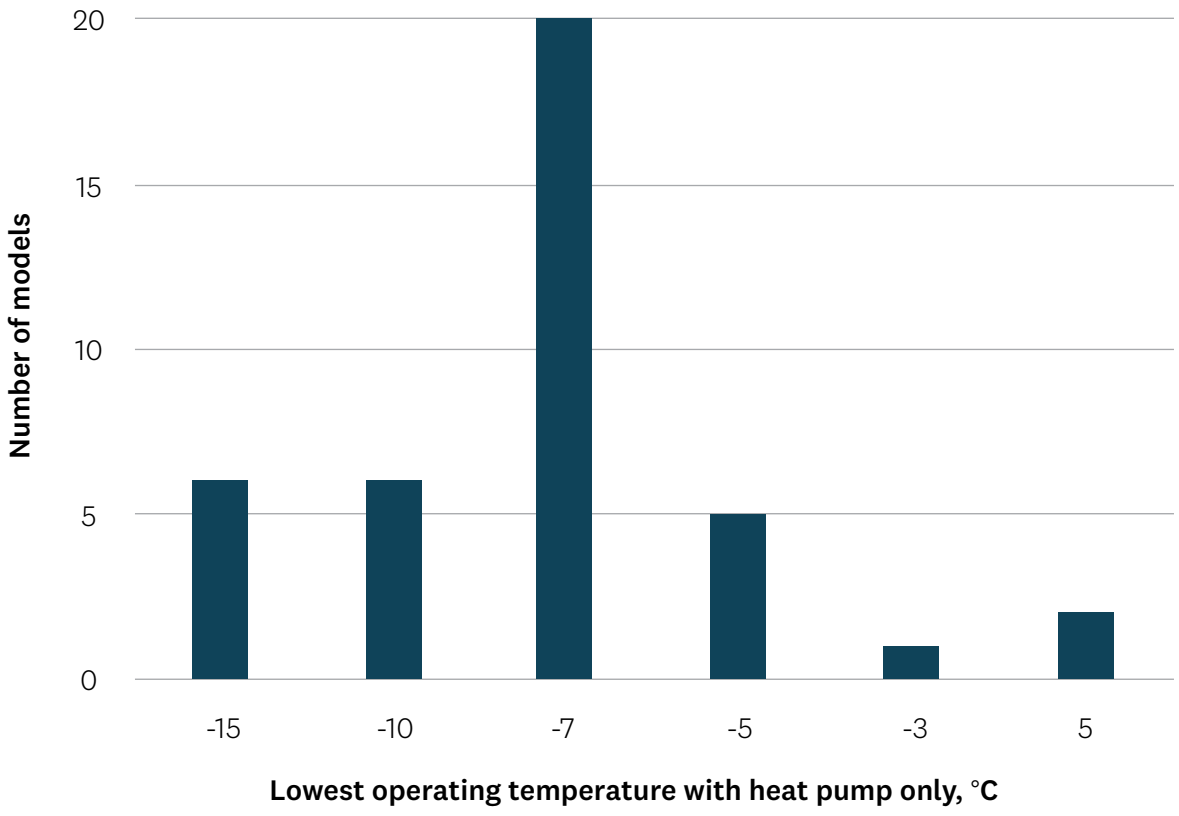


Figure 5: Lowest operating temperature, using the heat pump only, of heat pump water heater models on the market

The suitability of a heat pump water heater for a cold climate is also based on its recovery rate at low temperatures.[12]

The recovery rate (how fast water can be reheated after some hot water has been used) of a heat pump water heater depends on two main factors: the starting and desired end water temperature, and the ambient air temperature. In general, the larger the difference between the start and end water temperatures, and the lower the ambient air temperature, the longer the recovery time.

Some products contain electric-resistive elements to overcome this issue. Thirty-seven of the 40 models reviewed in the market scan have an electric-resistive element. These elements range from 1.5 kW to 3 kW in size, with 1.5 kW being the most common.[13]

How the element is used varies depending on the model's configuration. Options include turning the element on:

- to heat the water to a set point, if that point has not been achieved by the heat pump water heater within a defined period of time (e.g. 10 hours)
- at low temperatures (e.g. below 5°C), with this function able to be used instead of the heat pump water heater unit or in conjunction with it
- for legionella control
- if the heat pump water heater unit fails
- if the user turns on boost mode to increase the recovery rate.

Using the element to decrease reheat time can ensure households don't run out of hot water. However, this reduces the efficiency (and energy savings) of the heat pump water heater. How much the efficiency is reduced by (and the factors that impact it) will be determined as part of this research project.

12 Information on the relationship between recovery rates and temperature is currently limited, although the research project will provide further insights into this.

13 By comparison, the most common size of the electric-resistive element in an electric-element storage water heater is 2 to 3 kW.

Controllability

New Zealand's electricity system is changing, and with the uptake of intermittent renewable energy (solar and wind) the need for demand-flexible end-use products is becoming more important for maintaining energy security and reducing energy costs.[14]

Hot water systems that use a storage tank represent a good opportunity for building demand flexibility, as they do not need to be consuming power at the same time that hot water is being drawn.

Traditionally, electric storage water heaters have been controlled in response to demand using ripple control. Ripple control is a signal passed down the electricity line to a relay, which turns the electric storage water heater on or off. In the past, this been used by electricity distribution businesses to manage peak demand, and in return the hot water system can run on a lower electricity tariff.

The reported controllability of heat pump water heaters varies.

- Some can respond to a ripple control signal in the same way as an electric storage water heater.
- Some can respond to a ripple control signal but use a special terminal on the product to control it directly.
- Some cannot respond to ripple control signals and are advised not to be controlled in this way.

Building more electricity infrastructure to meet peak demand is expensive and ultimately increases the cost of power for all consumers. Demand flexibility helps manage demand peaks and therefore reduce infrastructure needs. It has the potential to help avoid overinvestment in New Zealand's electricity supply system, and to change how and when we use electricity for the benefit of New Zealand.

Demand flexibility product development for heat pump water heaters needs to:

- use standardised communication protocols
- offer a range of product responses, for example turn up, turn down, turn off, turn on, enter mode x
- send back detailed operation information to ensure the control of the product does not impact on its end use, resulting in a negative experience for the consumer.

14 Demand flexibility — a smarter grid

Product installation and warranty

There are a number of heat pump water heater installers located across New Zealand, with more installers in major centers.

EECA is currently creating a good practice guide for installing heat pump water heaters, which will be similar to the guide used for heat pump installation.[15] Some importers and manufacturers also provide dedicated training for installers.

Installation costs can vary based on the model of heat pump water heater, where in the country it is being installed, the type of technology it is replacing (e.g. instantaneous gas water or indoor electric storage water heater), and the specific circumstances of the installation (including the electrical wiring, and whether the hot water system requires relocating or the pipes and taps replacing). In general costs will range from $1,500 to $10,000 (not including the cost of the product).

Heat pump water heaters are more complex than traditional gas and electric hot water systems, and a range of product warranties are offered for them. Warranty periods vary from as low as 2 years to up to 20 years for a cylinder. Typically, warranty periods for heat pump components are 5, 6 and 7 years.

These warranty periods are similar to those offered for electric-element storage water heaters and gas water heaters (which both range from 3 to 10 years).

Given the variations, consumers should check the coverage and length of the warranties offered carefully before purchasing a heat pump water heater. It is also important to consult an expert to determine the best solution for consumers' needs.

15 Good practice guide to heat pump installation

Conclusion

Despite New Zealand being a small market, it has numerous heat pump water heater importers/ manufacturers (at least 18) offering 40 different models.

This initial scan of the market made the following key findings.

- Heat pump water heaters have relatively low uptake in New Zealand (with an estimated 12,000 installed). This is quite different to the Australian market, where sales are estimated to be 100,000 units each year.
- The top barriers to uptake of heat pump water heaters include the high capital cost, lack of consumer awareness, and limited installer awareness and training. Other challenges include building code requirements, lack of government support and insufficient market development.
- Many products make performance claims based on AS/NZS 5125 and AS/NZS 4234. The claimed COPs and energy savings vary, but generally fall within a COP of at least 3 and energy savings between 60% and 80%.
- The lower the ambient temperature at which a heat pump water heater can operate without using its electric element, the greater potential energy saving it offers in cold climate conditions. Heat pump water heaters that use R290 and CO2 refrigerants have the lowest operating temperatures, ranging from -10°C to -15°C.
- The controllability of heat pump water heaters also varies. Some units can respond to a ripple control signal (like traditional electric storage water heaters), while others require a dedicated terminal. Some models do not support ripple control signals at all.