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Heat pump water heater project

Interim findings report

ENERGY EFFICIENCY & CONSERVATION AUTHORITY
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Contents

Summary

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

HPWHs have the potential to significantly reduce household energy use, being typically two to three times more efficient at heating water than traditional electric-element storage systems. Despite this, uptake in the New Zealand market remains low, with HPWHs estimated to make up only about 1% of all installed water heating systems.

EECA (the Energy Efficiency and Conservation Authority) is undertaking a research project to collect and better understand real-world evidence about factors affecting HPWHs' installation and performance, and to identify opportunities to accelerate their adoption in New Zealand.

This report presents interim findings from the project, which involved installing HPWH systems across a range of household types within all New Zealand's major climate zones.

The interim findings are encouraging and participant feedback has been largely positive – some of the key findings are summarised here.

- Early monitoring data shows the HPWHs are performing well overall, delivering measurable efficiency improvements over traditional electric-element storage water heaters. Efficiency is highest in warmer climate zones and in households that have higher hot water demand.
- While installers' knowledge of HPWHs varied, most installations were completed successfully, and the installers' capabilities improved as their installation experience increased.
- The project provided valuable insights into optimum sizing and system setup, and the influence that factors such as existing water heating system type and configuration had on performance.
- Product and installation costs varied widely, with systems ranging from $1,900 to $7,800, and installation costs from $1,600 to $9,500. These variations reflect differences in product types, site conditions and market maturity. Integral systems were generally more affordable and straightforward to install than split systems, but split systems provided more flexibility in some situations.
- Most households reported reliable hot water supply and were satisfied with their new systems once the initial configuration was complete. The few issues identified were able to be resolved.

Overall, the project has so far demonstrated that HPWHs are an efficient solution for New Zealand homes when appropriately specified and installed. EECA will continue to monitor all participating sites over the next 12 months, collecting detailed performance and household electricity data to assess energy savings and reliability.

The data from this monitoring will be used to inform future policy, training for installers and consumer information, and support confident uptake of HPWH technology. A comprehensive final report presenting the full analysis from the project will be published in late 2026.

Background

While HPWHs are not a new technology, their uptake in the New Zealand residential market has been slow. At present, HPWHs are estimated to make up about 1%[1] of all installed water heating technologies in New Zealand households, with gas instantaneous and electric-element storage water heaters making up the overwhelming majority. Although consumers have high levels of trust in heat pump technology for space heating, this hasn't yet translated to widespread adoption for water heating.

Despite the slow uptake to date, HPWHs represent a significant opportunity to reduce household energy use (by 17% or more), as they are typically at least twice as energy efficient as traditional electric-element storage water heaters. To understand how uptake could be improved, it is important to consider how HPWH performance can be influenced by factors such as the local climate, the type of heat pump and the quality of the installation.

This EECA report is the second in a series presenting findings from a research project to examine the potential for HPWHs to reduce household energy use. The first report – *Heat Pump Water Heater Project: Market Insights Report* – provided an overview of HPWH technology, suppliers, claimed performance and barriers to uptake.

The first report identified that key barriers to consumer uptake of HPWH technology include high capital cost and lack of consumer and installer awareness. On top of this, despite manufacturers' and importers' claims of high efficiency, there is a lack of local research demonstrating the technology's real-world performance in New Zealand climatic conditions.

EECA's research project aims to address these knowledge gaps. HPWH systems of different types have been installed in a variety of household types within different climate zones across the country. EECA is collecting detailed performance and usage data from these systems over a period of at least 12 months to better understand their actual efficiency and reliability, and user experiences of them in local conditions.

This interim report shares details of how the installations were completed and what monitoring data is being collected. It compiles key lessons from the installation phase, feedback from participants and initial performance insights from data gained from the project to date.

[1] 2021 Residential Baseline Study for Australia and New Zealand for 2000 to 2040 | Energy Rating

Installing and monitoring the systems

Selecting suppliers and products

In order to identify and select suitable suppliers (importers and manufacturers) and products for the project, EECA conducted a competitive request for proposal process through the Government Electronic Tender Service.

The aim was to ensure that the project included products that met certain minimum technical requirements, sourced from suppliers that could reliably deliver throughout the project, and that reflected a representative cross-section of the current market for HPWHs in New Zealand, enabling a range of product types to be installed.

Ten suppliers were selected based on:

- product compliance with specified efficiency, performance and warranty criteria
- product availability and supply capacity
- supplier ability to manage installations across multiple regions
- product and installation costs and overall value for money.

From these suppliers, 18 different models of HPWH were sourced for the project, as detailed in Table 1.

Table 1: Models of heat pump water heaters installed in the project

Supplier	Models supplied	Type of system
AHI Carrier NZ	DHW-300N3	Integral
Black Diamond Technologies	Aquacore	Split
Calitec Hot Water Systems	WH-70	Split
Fisher and Paykel Appliances	Haier HP200M1U1	Integral
	Haier HP250M1U1	Integral
	Haier HP330M1U1	Integral
Apricus Eco	Apricus KL15-270	Integral
	Panasonic	Split
Hot Water Heat Pumps	Econergy HP4000LT	Split
	ThermoPlus TH-260D1	Integral
Consolidated Energy NZ	Reclaim CO2 315L	Split
	Enviroheat 250L	Integral
	Envirosun 330L	Integral
Rinnai New Zealand	Hydraheat 275L	Split[2]
Stiebel Eltron NZ	WWK 222H	Integral
	WWK 302H	Integral
Trade Depot	Midea 787190	Integral
	Midea 787300	Integral

Identifying locations and households for system installations

The project required HPWH systems to be installed in varied locations across New Zealand. The locations selected aimed to ensure that:

- a range of household sizes were covered – to understand the benefits of different systems for different levels of water use
- New Zealand's range of climatic conditions were covered – to understand how climate impacts system performance
- the same product was installed in multiple climate zones (where suitable) – to understand a product's relative performance in different zones
- a range of existing hot water technologies were replaced.

Households

In total, 84 households were selected to take part in the project.

[2] While the HydraHeat 275L takes the form of an integral unit, it is in fact a split unit as the compressor is separate from the storage cylinder.

EECA worked with social and community housing providers, and product suppliers and installers to find suitable households where HPWHs could be installed. Taking this approach helped ensure a diverse range of households were taking part in the project, reflecting a range of income and occupancy levels. This in turn will enable the project to capture a more representative picture of HPWH performance in typical New Zealand homes.

The size of the households selected varies from one to ten people, as shown in Table 2.

Table 2: Size of households with heat pump water heaters installed

Size category	Number of occupants	Number of households selected
Small	1	6
	2	12
Medium	3	12
	4	28
Large	5	15
	6	6
Extra large	7	3
	8	1
	9	0
	10	1

It is important to recognise that, while the approach adopted to select households will provide valuable insights into HPWH performance across different household types, a household's income may also influence how it uses hot water. For example, lower income households may be more inclined to limit or control their hot water usage in order to reduce energy costs, and this will have an impact on a system's suitability and efficiency.

Climate zones

For the purposes of the project, New Zealand was broken up into three climate zones: from zone 1 (warmer conditions) to zone 3 (colder conditions).[3]

The 84 households selected to take part in the project ensured coverage of all three climate zones, as set out in Table 3.

[3] Zones were based on the six climate zones used for clause H1—Energy Efficiency of the New Zealand Building Code; zones with similar hours at each temperature range were combined to create the three zones used in the project.

Table 3: Types of heat pump water heater systems installed by climate zone

Climate zone	Split system	Integral system	Total installed for zone
Zone 1	13	28	41
Zone 2	9	13	22
Zone 3	10	11	21

Each climate zone has a representation of small, medium and large households. All extra-large households are located in zones 1 or 2. The locations of the households where the HPWH systems are installed are shown in Figure 1.

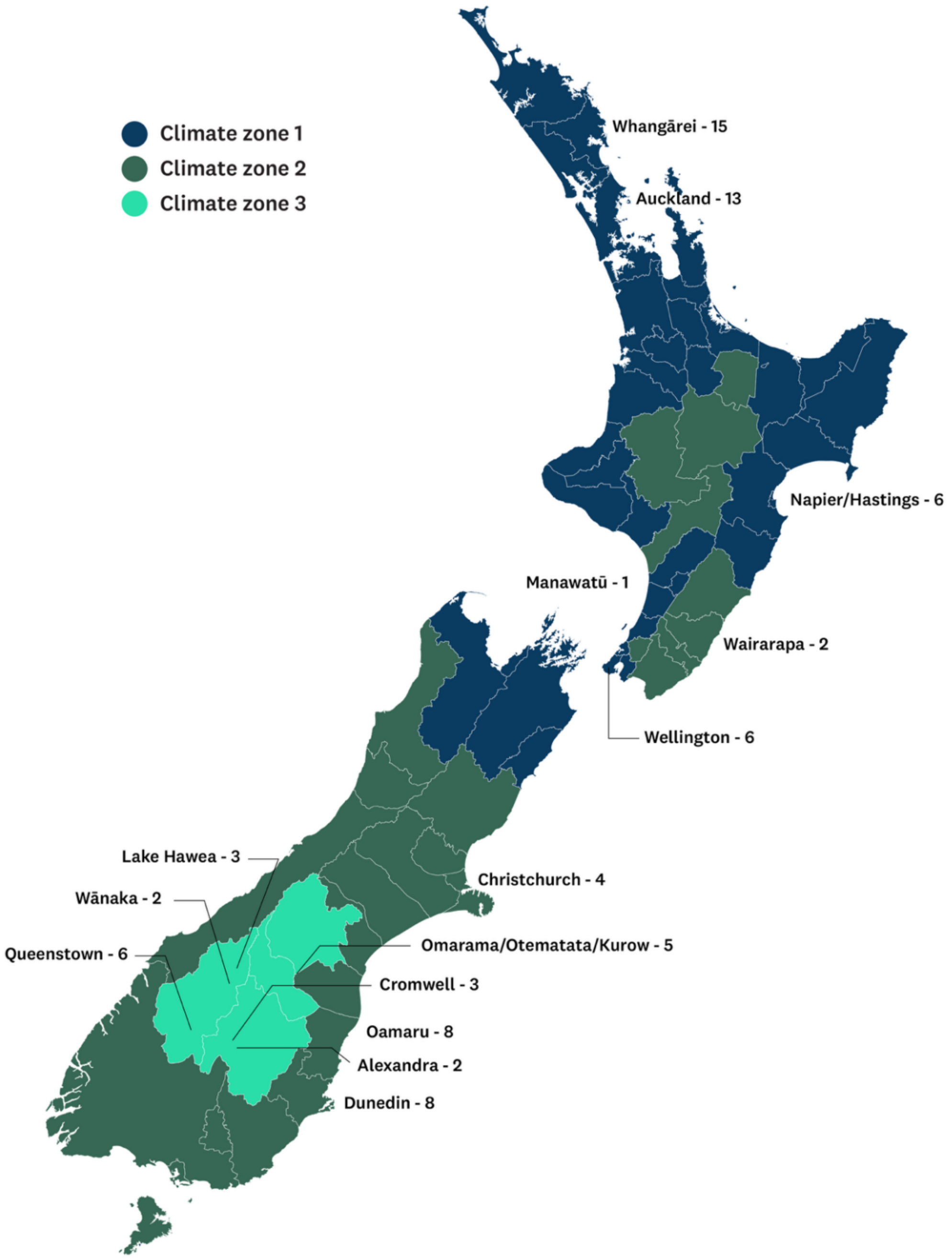

Figure 1: Locations of heat pump water heaters installed

Existing technology types

A variety of existing hot water heating technologies were replaced during the project, as set out in Table 4.

Table 4: Existing water heating technologies replaced

Existing technology	Number replaced
Electric-element storage – indoor (mains pressure)	37
Electric-element storage – outdoor (mains pressure)	2
Electric-element storage – low pressure	29
Gas instantaneous	12
Gas storage – outdoor	2
Gas storage – indoor	1
Electric-element storage indoor + solar thermosiphon	1

Monitoring and collecting system performance data

All HPWHs installed under the project have had independent monitoring equipment installed with them and will be monitored for a minimum of 12 months.

Quantities being measured by the monitoring equipment are:

- outdoor temperature in °C
- supply water temperature to the storage tank from the mains in °C
- delivery hot water outlet temperature[4] in °C
- flow rate of water supplied to the storage tank from the mains in L/min – the water meters are installed either before or after the cold water branch to the tempering valve[5]
- electrical power input of the hot water system in kWh (heat pump and element)
- tank core temperatures (for some models only).

In addition to the quantities being measured, electricity consumption data for all households is being collected for the 12 months prior to installation and throughout the ongoing monitoring period. This will enable comparisons between household electricity use before and after the HPWH installation.

Additional information about households being collected includes the number and ages of the occupants, their water use habits, and their perceptions of the previous hot water technology installed and the new HPWHs.

[4] The hot water outlet temperature is measured at the tank outlet (pre-tempering) if the cold water supply meter is located between the cold-water branch to the tempering valve and the hot water tank. The measurement is taken after the tempering valve (post-tempering) if the cold water supply meter is located on the main line before the cold water branch to the tempering valve.
[5] See footnote 4.

Insights from suppliers and installers has also been collected from the installation process.

Initial findings

The majority of HPWHs for the project were installed before August 2025. In this section, we set out the lessons learned from the installation phase, as well as some initial findings from the monitoring data collected to date.

Monitoring of the installed systems will continue throughout 2026, and analysis of the collected data will be ongoing during this time.

Product and installation costs

Product costs varied widely across the project. The minimum, maximum and average product cost of the HPWHs installed are given in Table 5. The figures have been adjusted to reflect recommended retail prices.[6]

Table 5: Product costs (excluding GST)

	Minimum	Maximum	Average
Product cost	$1,900	$7,800	$5,800

Installation costs also varied widely and were impacted by factors such as the region of the country, the type of HPWH, and the impact of additional building, plumbing or electrical work required.

Installation costs in climate zone 3 were approximately $1,500 more than in zones 1 and 2, as shown in Table 6. Installation timeframes were also longest in climate zone 3.

Table 6: Installation costs by climate zone (excluding GST)

Zone	Minimum	Maximum	Average
1	$2,300	$7,700	$4,200
2	$1,600	$7,800	$4,000
3	$2,000	$9,500	$5,600

With split systems, the positioning of the cylinder affected the cost significantly in some cases. In two instances, quotes for installations in homes in zone 3 were nearing $15,000 to $20,000, due to their complexity. EECA did not proceed with those installations (and they are therefore not included in the table above). In these situations, significant pipework, building work or electrical work was required to complete the

[6] Product costs include the price of a complete system (heat pump and cylinder). However, some split models on the market are able to retrofit to an existing tank to reduce the product cost.

installation, meaning another type of HPWH may have been better suited and easier to install.

While there is overlap, both the product cost and installation cost for integral units is significantly less (on average) than the product cost and installation cost for split systems, as shown in Table 7.

Table 7: Costs for integral and split systems (excluding GST)

Integral			
	Product	Install	Product and install
Minimum	$1,900	$1,600	$3,900
Maximum	$6,500	$7,200	$13,000
Average	$5,700	$4,100	$7,500
Split			
Minimum	$5,900	$2,400	$7,900
Maximum	$7,800	$9,500	$16,500
Average	$6,600	$5,200	$10,800

In situations where the HPWH was replacing an existing hot water system, replacing a low-pressure electric-element storage water heater tended to add more complexity to the process. Despite this, the average installation costs in this situation were similar to those for mains-pressure electric-element storage water heater replacements, as shown in Table 8.

Table 8: Installation costs for mains-pressure vs low-pressure electric-element storage water heater replacements (excluding GST)

System type	Minimum	Maximum	Average
Mains-pressure electric	$2,000	$9,500	$4,500
Low-pressure electric	$2,800	$7,800	$4,400

Product and installation considerations

Most of the HPWHs were installed seamlessly and have performed well.

The following findings highlight the few instances where there were some challenges, and the learnings that emerged from them. These findings provide valuable real-world information that can be used to strengthen future installations and industry capability as HPWHs become more common in the market.

Overall, feedback about both installer capability and the suitability of HPWHs for particular houses was positive. It has, however, highlighted the need for a standardised approach to be taken to installation, and EECA has published a HPWH installation guide to support the development of this.

Ensuring correct sizing

In a couple of instances, incorrect sizing affected the HPWH's ability to provide enough hot water for the household.

In practice, it became clear choosing a HPWH isn't just about matching the tank size to the number of occupants; the system's heating capacity plays an equally important role.

In one home, the occupants informed us that although the tank size looked suitable on paper, their HPWH struggled to keep up during periods of high demand. This was because the heating capacity was too low and the reheat time too long.

Both of these factors are affected by ambient outdoor air temperature, and our initial findings showed that colder climates can make issues around adequacy of hot water supply worse.

In one case, a model installed in zone 3 was found to be underperforming because its heating capacity dropped in the lower ambient temperatures. The supplier's original recommendation for the system's tank size turned out to be too small for those conditions, and the system had to be replaced with one with a bigger tank.

This experience highlighted how important it is in colder climates to select a model with greater heating capacity or a larger tank in order to maintain sufficient hot water supply.

System configuration can also influence performance. In general, single-pass systems performed well with smaller tanks, while multi-pass split and integral systems typically needed larger tanks to deliver the same amount of hot water.

Another finding came from installations where households switched from low-pressure to mains-pressure systems. The increased water flow in these cases can mean that the existing tank size is no longer adequate. This is an important factor to consider when selecting a system size in these scenarios.

Replacing an existing system

In a few instances, where low-pressure systems were replaced with HPWHs (which are mains-pressure systems), this created some challenges.[7] The higher water flow of mains pressure systems exposed weaknesses in older plumbing and fittings, or saw households run through hot water too quickly. In one home, leaks developed soon after the HPWH was installed, because the existing tapware, shower mixers and pipework weren't designed to handle the increased pressure. In these situations, additional work was required to replace components or install flow restrictors to manage the issue.

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[7] This is not specific to HPWHs. Similar challenges may arise in any situation where a low-pressure system is being upgraded to a modern water heating system.

Although this project didn't include any HPWHs integrated with wetback systems, we noted that some models on the market can be configured to do so. This could be a consideration for households with existing wetback setups.

We also came across situations where the existing electric-element storage water heaters were being controlled by ripple control. Some manufacturers advise against connecting HPWHs to ripple control, as power interruptions can damage the compressor. It is important, therefore, that before any HPWH is connected to ripple control, its compatibility is checked with the manufacturer.

Another common piece of feedback from households was that the hot water from their new HPWH wasn't as hot as from their previous system. This tended to be linked to households with older existing systems, particularly low-pressure systems, that didn't have tempering valves and thermostats, enabling them to be turned up higher to compensate for smaller tank sizes.

In addition, changes to the Building Code from November 2024 mean that hot water delivered from personal hygiene fixtures is limited to no more than 50°C. As a result, users perceived the new systems as producing 'less hot' water, when in fact the systems were operating in compliance with modern safety standards.

Ensuring appropriate installation and set up

We found that installation type and configuration had a significant impact on both the ease of installation and the overall system performance.

Integral systems were generally quicker to installer, requiring less pipework and less space. In some homes, replacing an indoor cylinder with an integral unit even freed up extra room inside the house. Split systems, on the other hand, worked well in homes where an existing indoor cylinder could be reused.

Noise was another consistent theme in household feedback. Since most of a HPWH system's moving parts, such as the evaporator fan and compressor, are located in its outdoor unit, the noise was noticeable across several brands. Installers had to take extra care when choosing a location for the outdoor unit not to place it too close to bedrooms or in a location where it might disturb the neighbours.

We also discovered that system set-up played a significant role in how well the HPWH met household needs. Many models allow their run times and heating schedules to be adjusted, but in several cases, crucial setup steps were missed. This led to households running out of hot water or experiencing inconsistent supply. Installers often had to return to fine tune these settings or complete all stages of the installation, and in some cases, to adjust independent monitoring equipment that had been added for the project.

These experiences highlighted how crucial it is not only to configure the systems properly during installation but also to ensure that households understand how to adjust the settings if their usage patterns change over time.

Installer capability

Overall, sentiment from household participants on the installers' professionalism and communication was positive.

From the supplier and installer feedback provided, it was clear that a number of installers involved in the project had little experience in installing HPWHs, while others had dealt with them often. Suppliers found varied installation quality, and in one known case a supplier requested that an installation be rectified due to its poor quality.

However, we also received feedback that in general installation quality improved as time went on. This was partially due to the project providing an opportunity for installers to complete multiple installations in a short period, allowing them to refine their processes. The monitoring equipment installation required for the project did add some additional complexity for installers.

Some suppliers felt that some installers were overcompensating for 'unknowns' in their quotes. Similarly, some feedback from installers was that installations took longer than anticipated due to complexity. Plumbers had to engage other trades (e.g. electricians) to finalise quotes and complete the work, which created some delays. This shows that the relative 'newness' of HPWHs in the market is creating variability in pricing and scoping for installations.

In relation to the plumbing required, some installations had unnecessary pipework due to the orientation of the unit. Some had inadequately secured pipe insulation. Both the excess piping and insulation have implications for system performance, as they can increase heat loss or fail to prevent water freezing in the pipes on cold evenings. In another instance, the condensate drain was left dripping onto a lawn, which is generally considered an unacceptable long-term solution.

Building suitability

The installations were valuable for identifying what attributes of a building make it easy or hard to install a HPWH. The main factors identified are summarised in Table 9.

The most common feedback received was that installers found it especially easy to replace instantaneous gas systems with HPWHs, as the power and plumbing were already in place on the outside of the house, although it can sometimes be necessary to upgrade the electrical wiring in this situation.

When replacing an indoor hot water cylinder, it was sometimes more challenging to site the new unit to ensure good hot water delivery to the entire house. Some household feedback indicated that hot water was now taking longer to get to the taps.

Table 9: Building factors that make it easier or harder to install HPWHs

Easier	Harder
Good external access	Difficult external access
Existing hot water outdoor connection	Internal cylinder

House on piles	Double storey or vaulted roof when rerouting plumbing
Flat ground for siting outdoor unit	Uneven ground for siting outdoor unit
Drain near to installation location for condensate	No drain available for condensate
Space to install away from bedroom windows	No space away from bedroom windows
Room and appropriate clearances for installation outside	Low-pressure system with low-pressure fixtures
Split systems can use an existing cylinder if it's in good condition	Issues routing electricity to installation location

Early product performance findings

Initial monitoring data collected between July and September 2025 shows that, while there is a range of performance between the installed systems, the HPWHs are performing well overall.

These initial results are encouraging and suggest that HPWHs can deliver strong efficiency benefits across a range of household types and climates when correctly specified and installed.

A detailed technical report with a full analysis of the systems' performance will be published at the end of the monitoring period in 2026.

System energy efficiency

Across most installations, HPWHs are delivering measurable efficiency improvements when compared with traditional electric-element storage water heaters. These early results indicate that the technology is performing broadly as anticipated in real-world New Zealand conditions.

Where systems were not operating correctly when they are installed and set up, lower than expected performance was observed. In most cases, simple configuration adjustments or follow-up visits resolved the issues, emphasising how important correct commissioning is for ensuring the systems perform as intended.

Early findings show that households with higher hot water usage experience the greatest energy savings. While lower usage households will still benefit from a HPWH, the relative gains are smaller because both the hot water and power usage are low. For smaller households that use less than 100 litres of hot water a day, many of the HPWHs currently available in the New Zealand market may be considered oversized, with few that are suitable.

This means that while a number of small households had HPWHs installed as part of EECA's research, most of the systems installed in these homes are considered too large. This results in increased storage tank heat loss from unused stored water, creating significantly lower overall performance in terms of the system's efficiency. Conversely, systems that are undersized can operate efficiently but may not meet household demand. This highlights the importance of correct system sizing for any new hot water system.

HPWHs' performance in terms of efficiency varies by climate zone, with systems achieving the highest system performance in climate zone 1 (warmer conditions) and the lowest in climate zone 3 (colder conditions). As expected, across all climate zones, HPWH performance has improved month-on-month from July to September so far, as average air temperatures have risen.

No significant difference in system performance has been noted between integral and split HPWH configurations so far.

In the New Zealand market, four types of refrigerants are used in HPWHs. Among them, results so far show that R134a delivers the lowest performance, while CO_2 and R32 offer the best. R290 is the most commonly used refrigerant, providing moderate performance overall.

Reliability

Most HPWH systems installed immediately provided reliable hot water for the household. However, several households experienced issues shortly after installation, such as unusual electric element operation, incomplete installation, and running times that did not align with the occupants' usage patterns. These issues were worked through with installers for resolution.

Household energy and cost savings

Some households provided feedback that any benefits from energy savings have not yet been realised. We expect this is due to the time of year when the systems were installed (with energy bills increasing in winter months), and a rise in energy costs from retailers.

However, many households have noticed some energy savings and associated reductions in energy bills compared to last year. We will continue to monitor these trends as the data collection progresses.

Households that have switched from gas hot water systems to HPWHs will see increased electricity usage, due to their water heating now running on electricity. However, they will also have a reduced or no gas bill.

Conclusions

The installation phase of the research project has highlighted that HPWH systems require more careful consideration than installations of traditional hot water systems. Factors such as the type of existing system, correct sizing, appropriate configuration and installer familiarity all play a critical role in achieving optimal performance for systems. Installations also revealed how household characteristics, such as low- pressure or mains-pressure systems, can significantly influence both the ease and success of an installation.

Across the project, installer capability and knowledge varied. While most installations were completed to a high standard, differences in experience levels contributed to inconsistencies in installation quality and system set-up. Encouragingly, feedback suggests that installer competence improved over time as exposure to the technology increased. This highlights the importance of ongoing training and clear installation guidance, such as that provided through EECA's HPWH installation guide.

Costs for both the products and their installation were found to vary widely, driven by product type and installation complexity.

Initial performance results are broadly in line with expectations, showing clear links between performance, climate zone and household water use. HPWHs continue to demonstrate strong potential to deliver meaningful energy savings compared to traditional electric-element storage systems when appropriately specified and installed.

Overall, the findings to date indicate that HPWHs are a reliable, efficient and viable solution for reducing household energy use in New Zealand homes. EECA will continue to monitor system performance and household electricity use across all installation sites over the next 12 months. This will include comparing pre- and post-installation electricity consumption data to quantify any realised energy savings for households. The findings from this monitoring period will be used to gain detailed insights on the performance of HPWH systems and better understand user experiences of them.

A detailed technical report presenting a comprehensive analysis of the project's results will be published in late 2026.