



Hot water cylinder sizing for domestic heat pump systems with showers

Accounting for Waste
Water Heat Recovery and
Instantaneous Electric Showers

2025 Future Homes and Buildings Standard



As the Future Homes Standard 2025 ushers in air source heat pumps (ASHPs) across the UK as part of the transition to net zero, there is an issue with the current guidance around how the accompanying hot water cylinders are sized: it takes no account of Waste Water Heat Recovery Systems (WWHRS) or the use of Instantaneous Electric Showers (IES).

This is a major missed opportunity. New technology such as WWHRS and developments in Instantaneous Electric Showers (IES) can significantly improve domestic hot water

systems' performance, reducing hot water demand, cutting energy bills, freeing up space in homes, and lowering installation costs.

This report demonstrates why the current guidance on hot water cylinder sizing needs to evolve to account for new technologies such as WWHRS and IES.

A home with a WWHRS and two IESs needs just over 100 litres of water and uses around 3 kWh per day.

The hazards of mis-sizing

Current guidance from industry bodies requires that the sizing of ASHPs is based on space heating requirements alone and should not rely on the use of additional direct electric heating. Once the size of the heat pump is determined, hot water demand must be handled by the choice of an adequately sized cylinder and the possible use of back-up from an immersion heater.

The problems caused by mis-sizing the cylinder are many. Oversized cylinders waste energy through standing losses, occupy unnecessary space, and suffer from long recovery times. In many systems if recovery takes more than

20-30 minutes backup immersion heaters are activated by default, undermining the efficiency of the heat pump. Undersized cylinders, on the other hand, may fail to meet peak demand, again triggering electric backup heating.

By reducing the volume of hot water required, WWHRs and IES can hugely reduce both risks, particularly when used together. In new builds, they allow for a smaller tank to be specified, and in retrofits, they reduce the need for backup heating. Either way, the result is improved efficiency, reduced energy use, and greater cost-effectiveness.

The key technologies

Air Source Heat Pumps (ASHPs)

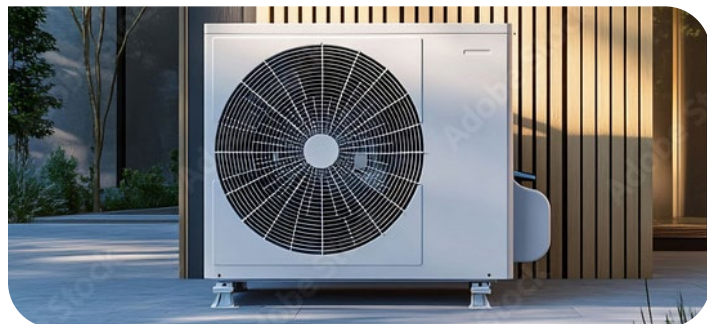
ASHPs extract heat from outside air to provide space heating and hot water. While efficient for space heating, they are less effective at meeting hot water demand, particularly in larger households. There is some evidence that the ASHP may then be oversized to compensate for this, which then reduces the efficiency of the system when it is providing space heating.

Waste Water Heat Recovery Systems (WWHRs)

WWHRs reuse heat from warm shower waste water to preheat incoming cold water. This lowers the energy required to heat water. WWHRs can reduce electricity consumption for domestic hot water by 31-36%, or 41-47% when the immersion is enabled.

Instantaneous Electric Showers (IES)

An IES is a shower that heats cold mains water on demand using an electric heating element. They operate independently of stored hot water and reduce the overall hot water load, especially in homes with multiple showering points.



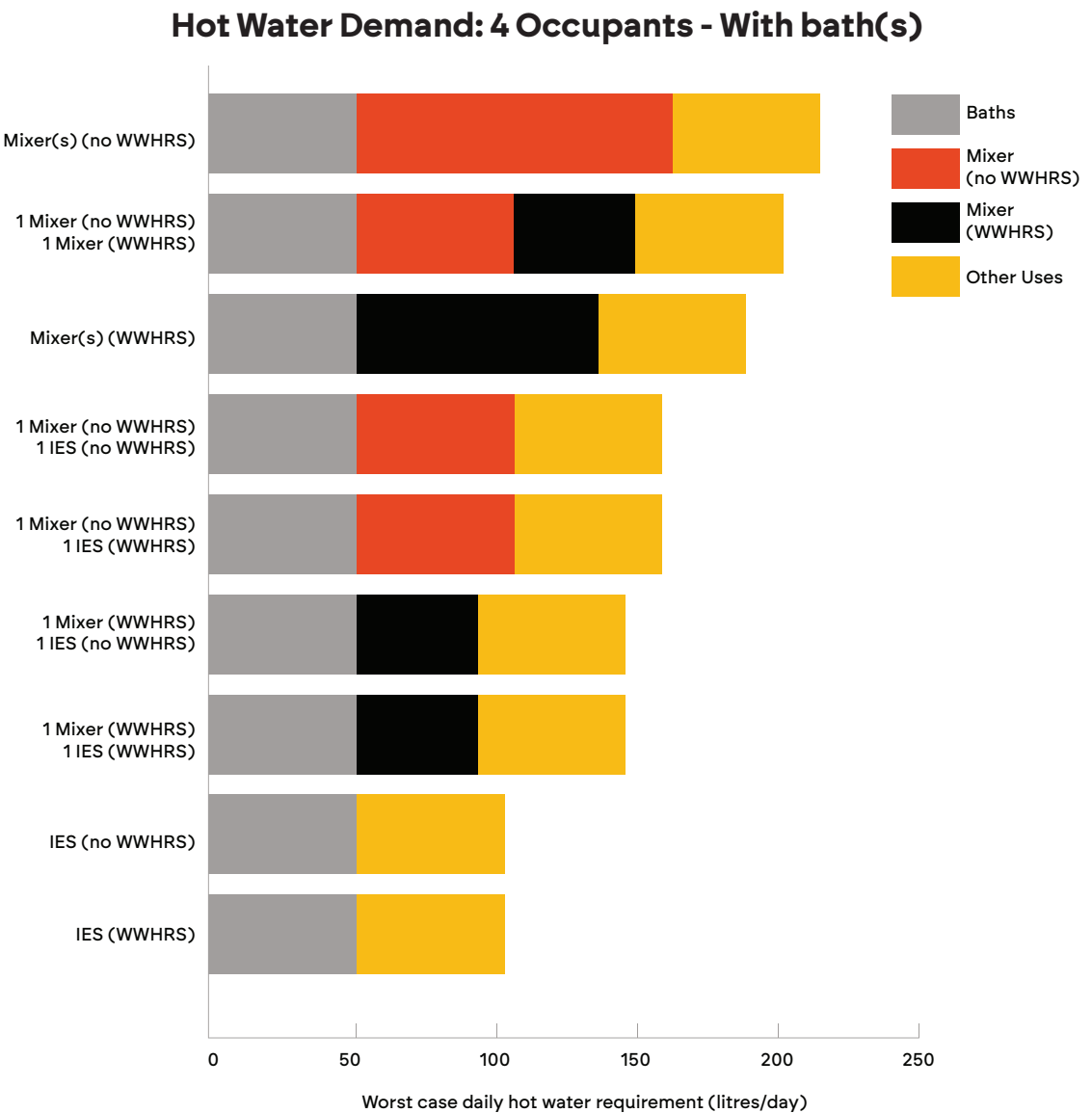
The benefits of WWHRS for heat pump installations

Showersave teamed up with Chris Martin – formerly of the Energy Monitoring Company – and Triton Showers to explore how heat pumps interact with mixer showers, IES, and WWHRS. The findings uncover three main benefits of WWHRS and IES:

1. Reduced hot water demand

Without WWHRS, a home with two mixer showers requires up to 200 litres per day of hot water, while a setup with one mixer and one IES requires over 150 litres. However, a home with a WWHRS

and two IESs needs just over 100 litres. This lower demand allows for smaller tanks, faster reheating, less reliance on backup heating, and reduced energy and carbon emissions.

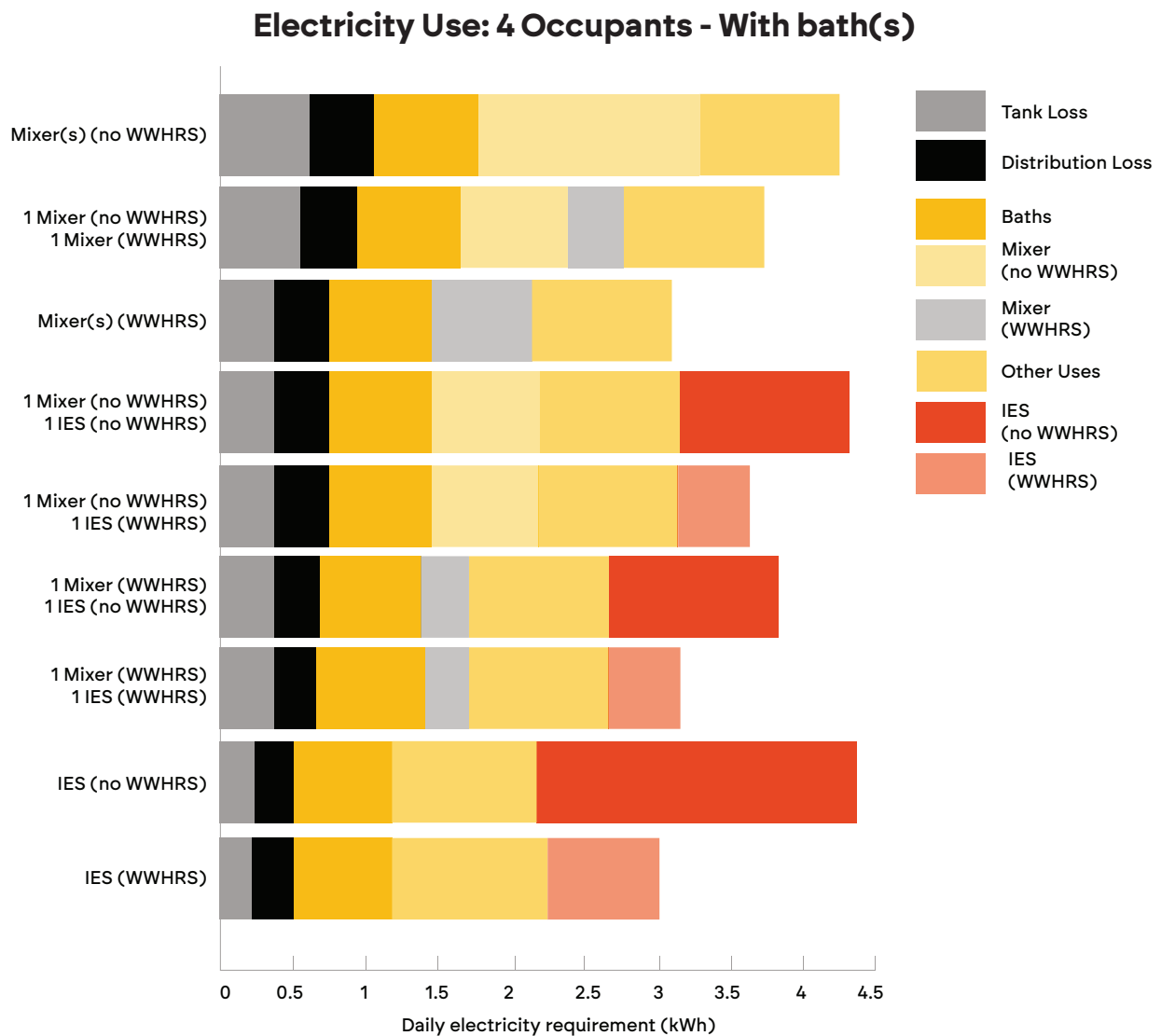




2. Reduced electricity usage

Households without WWHRS use over 4 kWh per day for hot water. With WWHRS, meanwhile, usage falls to around 3 kWh per day

– a significant efficiency-gain that reduces bills and carbon footprint.



3. Improved sizing method

The current BS 6700 sizing method is overly conservative and does not reflect the real-world behaviour of hot water cylinders.

Actual cylinder tank sizes (litres)

	2 Occupants No bath	2 Occupants With bath(s)	3 Occupants With bath(s)	4 Occupants With bath(s)
Mixer(s) (no WWHRs)	240	300	400	400
1 mixer (no WWHRs) 1 mixer (WWHRs)	210	270	400	400
Mixer(s) (WWHRs)	180	240	270	300
1 mixer (no WWHRs) 1 IES (no WWHRs)	150	210	270	300
1 mixer (no WWHRs) 1 IES (WWHRs)	150	210	270	300
1 mixer (WWHRs) 1 IES (no WWHRs)	120	180	210	240
1 mixer (WWHRs) 1 IES (WWHRs)	120	180	210	240
IES (no WWHRs)	60	120	150	150
IES (WWHRs)	60	120	150	150

Our study has introduced an alternative approach using the more detailed BS EN 15316 model. This method leads to tank size predictions that fit with actual measured cylinder behaviour and reduces oversizing.

Installed tank sizes using BS EN 15316 prediction method (litres)

	2 Occupants No bath	2 Occupants With bath(s)	3 Occupants With bath(s)	4 Occupants With bath(s)
Mixer(s) (no WWHRs)	90	120	150	210
1 mixer (no WWHRs) 1 mixer (WWHRs)	90	90	150	180
Mixer(s) (WWHRs)	60	60	120	120
1 mixer (no WWHRs) 1 IES (no WWHRs)	60	60	90	120
1 mixer (no WWHRs) 1 IES (WWHRs)	60	60	90	120
1 mixer (WWHRs) 1 IES (no WWHRs)	60	60	90	120
1 mixer (WWHRs) 1 IES (WWHRs)	60	60	90	120
IES (no WWHRs)	60	60	60	60
IES (WWHRs)	60	60	60	60

What needs to change

To unlock the benefits of smarter cylinder sizing, we recommend that the industry updates its standards and assumptions in the following ways:

- **Industry bodies such as NHBC, MCS, and CIBSE should update guidance to reflect WWHRS and IES**
- **Housebuilders could benefit from considering WWHRS and IES as standard in energy-conscious developments**
- **System designers should consider using more accurate sizing models, such as those based on BS EN 15316**

If these changes are implemented, along with the SAP calculations that incorporate IES compatibility with WWHRS, this will lead to smaller hot water cylinders.

This will free up valuable space in homes; lower energy bills for homeowners, as less hot water will be stored and reheated; and reduced installation costs, as smaller cylinders and systems are cheaper to buy, transport, and install.



Introducing Showersave

First introduced into the UK market in 2008, Showersave is a leading WWHRS solution installed in more than 200,000 homes across the UK and Europe – all of which benefit from the recovery of the heat energy contained in their waste water.

Recognised in SAP by BRE and certified as a Passive House Component, the Showersave system is one of the most simple and sustainable means of achieving Part L of the Building Regulations. This is

because it is proven to cut running costs of domestic heat pumps and increase the overall efficiency of space heating and hot water production, as well as being easy to incorporate into current building designs.

Additionally, Showersave is extremely easy to install using standard plumbing skills and requires no maintenance. With a fantastic record of post-installation reliability, it comes with comprehensive customer support and is fully recyclable.

WWHRS offer housebuilders a cost-effective, compliant and customer-friendly way to meet the new regulations whilst reducing complaints about hot water availability. Act today by using them in your new build and retrofit projects to stay ahead, as ASHPs are now mandatory.

Learn more at showersave.com





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