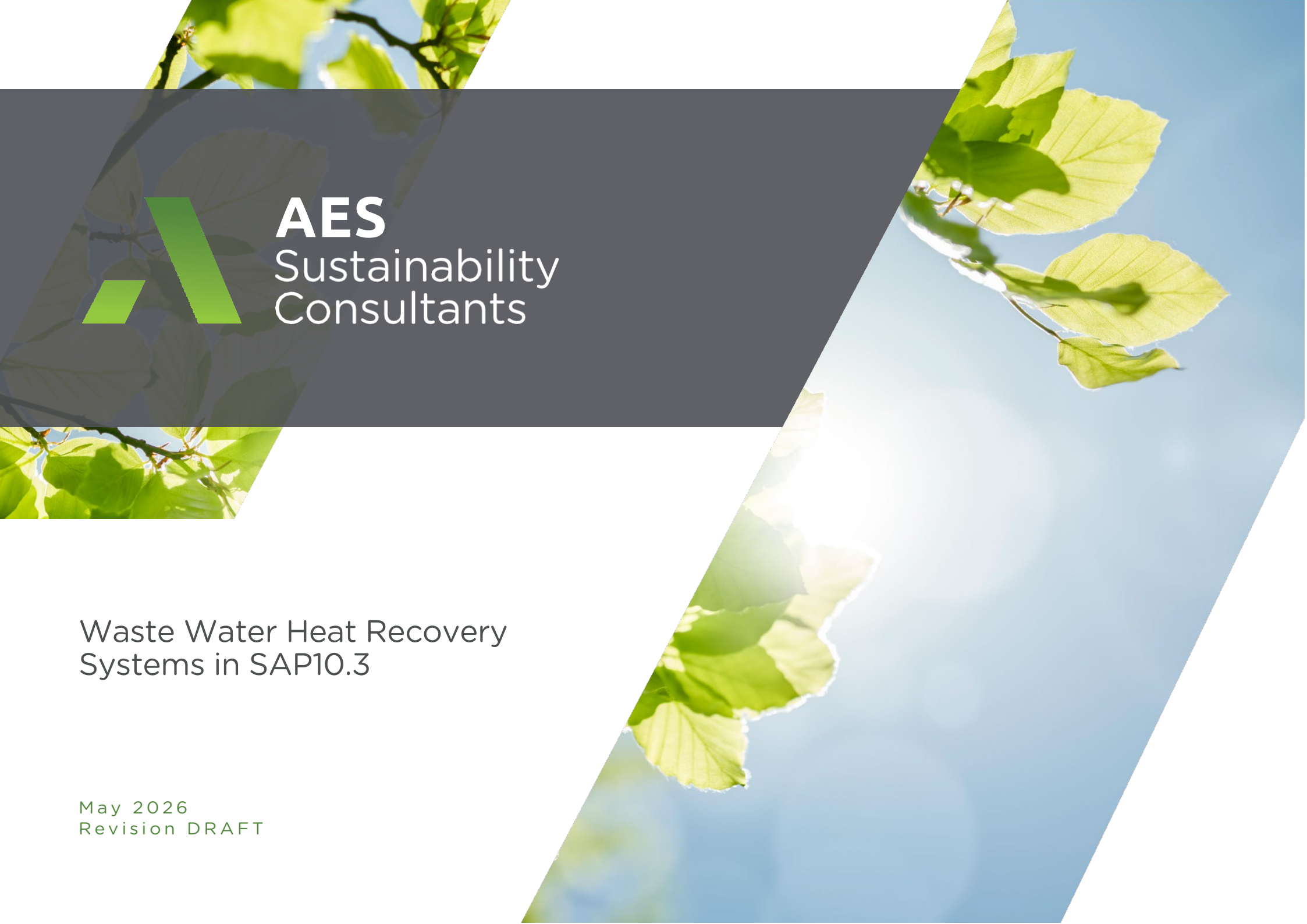

AES
Sustainability
Consultants

Waste Water Heat Recovery Systems in SAP10.3

May 2026
Revision DRAFT

1. Introduction

1.1. The recent publication (March 2026) of the UK Government's final response to the six-year Future Homes Standard project has set the country's construction industry on a new course towards the strictest standards on energy efficiency and fabric performance, the removal of fossil fuel heating systems from new building works, and the introduction of mandatory onsite generation on all new homes.

1.2. These policies will be governed by a revision of the Building Regulation volume; Approved Document Part L (2026). This revised document has been published, but will not be enforceable on new building projects until March 2027.

1.3. To accompany the new Part L targets, the approved methodology tool which confirms compliance with the regulations, the Standard Assessment Procedure (SAP) has also been updated.

1.4. This document, produced by AES Sustainability Consultants, and commissioned by Showersave and Recoup, provides evidence showing how results from the new version of SAP (version 10.3) are reacting when Waste Water Heat Recovery Systems is applied to a dwelling model.

1.5. The information provided in this report is taken directly from an approved SAP calculation tool (Elmhurst Design SAP10.3, version 3.1.62), and compares emission rates, energy use, and running costs of a typical dwelling, when different Air Source Heat Pump (ASHP) models are paired with WWHRS units.

1.6. All heat pump and WWHRS efficiency data has been taken from the Product Characteristics DataBase (PCDB) which is approved for use in SAP and maintained by the Building Research Establishment (BRE). Based on database version 593 as published in April 2026.

1.7. The planned roll-out of the new Home Energy Model, which will eventually replace SAP as the approved compliance tool for Part L, has not been considered as part of this review.

2. Methodology

2.1. This Review initially compares SAP results based on a three-bedroom, two-storey detached house with a useful floor area of approximately 97m^2.

2.2. The design has been anonymised for the purposes of this study. It is taken from a standard library of house designs used by a nationally recognised construction company.

2.3. The dwelling specification has been set up to mimic the SAP10.3 Notional Specification. Full details of this specification are provided in Appendix R of the SAP10.3 methodology. The only parts to vary from this Notional specification are:

1. Heating: Instead of using the Notional ASHP efficiency of 2.5, actual heat pump models are used, with efficiency taken from the PCDB.

2. WWHRS: Instead of using the Notional WWHRS efficiency of 50% with a 0.98 utilisation factor, actual WWHRS models are used, with efficiencies taken from the PCDB.

2.4. Following the review of a 'Notional' house, this Report also considers the performance of two actual houses, based on true design and specification details. This exercise portrays a more realistic set of results that will be experienced on building projects today.

2.5. In particular, this document compares three outputs from SAP:

1. The Dwelling Emission Rate (DER). This shows the expected annual emissions created by the dwelling's heating, hot water, ventilation and lighting.

2. The Dwelling Primary Energy Rate (DPER). This reports the expected energy demand of the dwelling's heating, hot water, ventilation and lighting, including a factor to consider the Primary Energy factor. (Energy consumed and lost when the fuel (electricity) is created and transported to the property).

3. Energy Performance Certificates (EPC) ratings and typical running costs.

2.6. Although SAP also reports the Fabric Energy Efficiency (FEE) as a primary metric, it is not relevant for this study. The fabric performance of the SAP model matches the Notional, and making changes to the heating and hot water will have no impact on this calculation.

2.7. Where running costs are listed in this report, these have been based on the latest Fuel Cost Factors as used by the (EPC) Energy Performance Certificate (BEDF version 593).

2.8. These reflect the typical running costs of a dwelling based on average occupancy use and typical weather patterns. Running costs do not consider 'unregulated energy' as defined by SAP and are not included in this Report. The impact of PV panels on running costs has also been excluded.

2.9. By taking this approach with running cost predictions, this Report can display figures as a fair like-for-like comparison without external factors distorting the results.

3. The Notional Dwelling

3.1. This Report uses an existing SAP model: A two-storey, three-bedroom detached house. The specification of the true house design has been changed to match the SAP Notional Specification.

3.2. Throughout this study, the dwelling design and fabric performance will not be changed.

Figure 1: Floor plan of the anonymized house design

3.3. Table 1 provides a brief summary of the specification used. This mimics Appendix R of the SAP10.3 methodology.

Table 1: Summary of the SAP10.3 Notional Specification

Element	Value
External wall U-Value (W/m²K)	0.18
Roof U-Value (W/m²K)	0.11
Floor U-Value (W/m²K)	0.13
Window U-Value (W/m²K)	1.20
Window transmittance (g-value)	Actual
Front door (W/m²K)	1.00
Thermal bridging total (y-value)	Psi-values match Appendix R
Ventilation Specific Fan Power (w/l/s)	dMEV 0.15
Air Leakage Test	4.0
Showers	Heated by ASHP. 8l/min
Lighting efficiency (lum/W)	120
PV	Matches Functional Requirement

4. Results from a Notional house

4.1. The SAP10.3 Notional calculation uses an assumed air source heat pump to meet the dwelling's heating and hot water needs. A Coefficient of Performance (CoP) efficiency of 2.5 is always used.

4.2. SAP assumes various in-use factors which worsen the performance of the notional heat pump, (Refer to Appendix N of SAP10.3 methodology) which means the final calculation for the targets is based on a heating CoP of 2.38, and a hot water CoP of 1.50.

4.3. The sample SAP model has been recalculated using current heat pump systems supplied by four well known manufacturers.

4.4. Table 2 shows how the selected models ASHP, the PCDB reference number, the heating and hot water CoP efficiency, and the chosen hot water cylinder size..

Table 2: ASHP Variants

Heat pump manufacturer	Model details and (PCDB) reference	Cylinder volume	SAP In-Use Efficiency
Daikin	Altherma EDLA09DA3V3 (9kW) (107730)	180 litre	287.5 (Heat) 273.5 (DHW)
Ideal	HP290 Monobloc (6kW) (110176)	180 litre	284.6 (Heat) 310.5 (DHW)
Vaillant	aroTherm+ (7kW) (110264)	175 litre	275.8 (Heat) 272.4 (DHW)
Worcester Bosch	CS5800i (7kW) (107949)	255 litre	260.2 (Heat) 288.1 (DHW)

4.5. Table 3 displays SAP results using the selected heat pumps without any WWHRS. Displayed results show emissions (DER), primary energy (DPER), EPC ratings and annual running costs.

4.6. Running costs display the impact of heating, hot water, ventilation and lighting only. The additional cost of unregulated energy use, and any savings from PV panels have been excluded from running cost figures.

Table 3: SAP10.3 Results. ASHP, no WWHRS

Ref	DER vs TER	DPER vs TPER	EPC Rating and running costs
Daikin	-0.92 vs -0.72 Pass (0.2)	0.54 vs 4.90 Pass (4.4)	(A) 98 £596
Ideal	-1.02 vs -0.72 Pass (0.3)	-1.60 vs 4.90 Pass (6.5)	(A) 99 £564
Vaillant	-0.88 vs -0.72 Pass (0.2)	1.38 vs 4.90 Pass (3.5)	(A) 98 £605
Worcester Bosch	-0.90 vs -0.73 Pass (0.2)	1.13 vs 4.77 Pass (3.6)	(A) 98 £592

4.7. The above results show all four tested air source heat pumps fully comply with the required SAP10.3 targets without the inclusion of WWHRS systems.

4.8. As the SAP model has been setup to mimic the Notional design in all other areas, this confirms that the manufacturer heat pump efficiencies, as shown in Table 2, are sufficiently higher than the notional heat pump efficiency to provide more than enough offset to remove WWHRS without risking non-compliance.

4.9. The above exercise has been replicated with the inclusion of WWHRS to all showers (Showersave Blue QB1-21). The updated results are shown in Table 4.

Table 4: SAP10.3 Results. ASHP with WWHRS

Ref	DER vs TER	DPER vs TPER	EPC Rating and running costs
Daikin	-1.1 vs -0.72 Pass (0.4)	-3.37 vs 4.90 Pass (8.3)	(A) 99 £539
Ideal	-1.18 vs -0.72 Pass (0.5)	-5.04 vs 4.90 Pass (9.9)	(A) 100 £514
Vaillant	-1.06 vs -0.72 Pass (0.3)	-2.52 vs 4.90 Pass (7.4)	(A) 99 £548
Worcester Bosch	-1.07 vs -0.73 Pass (0.3)	-2.58 vs 4.77 Pass (7.4)	(A) 99 £539

4.10. The inclusion of WWHRS in the SAP model has improved results further. The Primary Energy Rate is typically performing 8 points better. The EPC result is 1 point higher, (the banding remains at the top A bracket).

4.11. Running costs are lower with the introduction of WWHRS. In this example, the annual fuel saving is £50-£57. This value will change depending on the WWHRS model installed, the size of the property, and the true specification (as opposed to the Notional).

4.12. Although SAP10.3 confirms that inclusion of WWHRS in a dwelling will provide a reasonable reduction in running costs for the occupier, it can be viewed as an optional extra by the housebuilder, as the dwelling fully meets Part L compliance targets without its inclusion.

5. Results from Actual houses

5.1. Section 4 shows a clean comparison in results where all other elements are set to the SAP Notional. This section follows the same steps, but using two actual house types built in England by national housebuilders.

5.2. House A is a small two-bedroom, mid-terraced dwelling with a total floor area of 80m².

5.3. House B is a large five-bedroom detached dwelling constructed of timber frame and with a total floor area of 180m².

5.4. These house designs do not follow the SAP Notional recipe, but still comply with all Part L targets. This exercise provides a more realistic set of results, as the two examples are based on true building specifications which are currently in-use on construction sites in England.

5.5. Table 5 summarises the specification of both house types.

Table 5: Specification Summary for House Types A & B

Element	House A	House B
External wall U-Value (W/m²K)	0.18 (Masonry)	0.20 (Timber)
Roof U-Value (W/m²K)	0.09	0.11
Floor U-Value (W/m²K)	0.10	0.15
Window U-Value (W/m²K)	1.20	0.86 (Triple glazed)
Window transmittance (g-value)	Actual	Actual
Front door (W/m²K)	1.10	1.20
Thermal bridging total (y-value)	Calculated	Calculated
Ventilation Specific Fan Power (w/l/s)	dMEV 0.12	dMEV 0.11
Air Leakage Test	6.0	4.5
Heating / Hot Water	ASHP: Ideal 150l cylinder	ASHP: Daikin 250l cylinder
Showers	Heated by ASHP. 8l/min	Heated by ASHP. 8l/min
Lighting efficiency (lum/W)	120	105
PV	Matches Functional Requirement	Matches Functional Requirement

5.6. Table 6 shows the SAP results without the use of any WWHRS systems. Both dwellings comply with all Part L targets:

Table 6: SAP10.3 Results. Houses A & B without WWHRS

Ref	DER vs TER	DPER vs TPER	EPC Rating and running costs
House Type A Small, mid	-1.28 vs -0.61 Pass (0.7)	-7.41 vs 3.69 Pass (11.1)	(A) 101 £428
House Type B Larg, detached	-1.21 vs -0.70 Pass (0.5)	-4.04 vs 3.57 Pass (7.6)	(A) 99 £1,040

5.7. Table 7 shows the improved SAP results when WWHRS is included (Based on the Showersave Blue QB1-21 serving all showers). 80183 80185

Table 7: SAP10.3 Results. Houses A & B with WWHRS

Ref	DER vs TER	DPER vs TPER	EPC Rating and running costs
House Type A Small, mid	-1.47 vs -0.61 Pass (0.9)	-11.58 vs 3.69 Pass (15.3)	(A) 102 £378
House Type B Larg, detached	-1.35 vs -0.70 Pass (0.7)	-6.92 vs 3.57 Pass (10.5)	(A) 100 £957

5.8. The analysis of actual dwelling designs follows a similar pattern to the Notional house in the previous chapter. Both dwellings meet all SAP targets based on the developer's preferred specification without the need to incorporate WWHRS.

5.9. By adding WWHRS to the specification, the Primary Energy results are improved by a further 3-4 points and the EPC rating increases by a point.

5.10. The annual running costs improve by £50 for the small dwelling, and £83 for the large dwelling, when WWHRS is included.

6. Energy Split

6.1. In 2020, the Sustainable Energy Association (SEA) completed research into household energy use based on typical new build construction that was compliant with Part L (2013), and what was perceived at the time to be the Part L (2026) / Future Homes Standard specification.

6.2. This research predicts that homes built to the new regulations will use 50% of regulated energy on hot water; a higher energy demand than required for heating (41%).

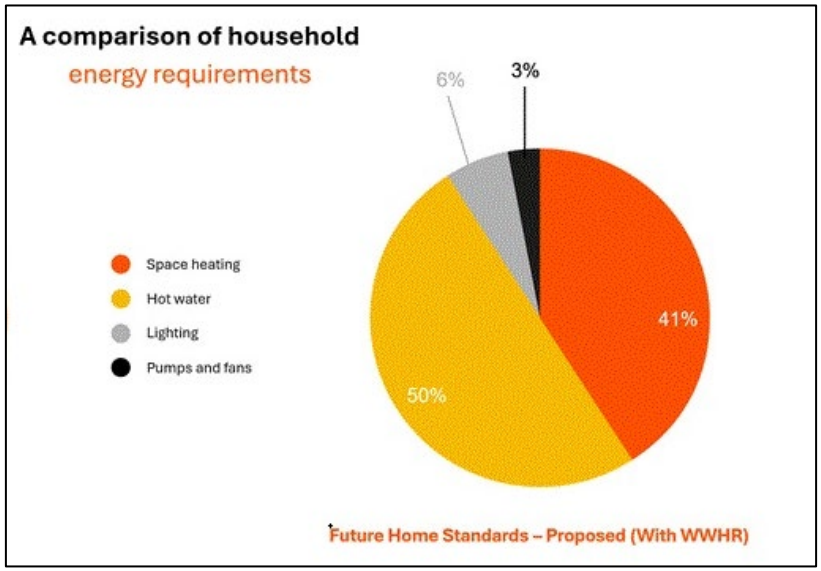

Figure 2: Regulated energy split (SEA 2020)

6.3. This conclusion indicates that focusing on ways to reduce energy demand for hot water, such as the adoption of devices like WWHRS, would be more beneficial than targeting ways of reducing heating demand (such as better fabric performance).

6.4. The three house types used in the above exercise (Notional, House A and House B), have been reviewed using the same breakdown of information; both with and without WWHRS, displaying total annual kWh energy demand, and the percentage split.

6.5. Although PV is included in all SAP models, its impact on energy performance has been excluded for the purpose of this exercise.

Table 8: Energy split without WWHRS

Usage	Notional Dwelling with Daikin ASHP	House Type A (Small Mid-terrace)	House Type B (Large detached)
Heating	1,094 46%	573 35%	1,957 49%
Hot water	1,040 43%	857 52%	1,696 42%
Lighting	202 8%	183 11%	291 7%
Pumps and fans	60 2%	42 3%	78 2%
Total	2,396	1,655	4,022

Table 9: Energy split with WWHRS

Usage	Notional Dwelling with Daikin ASHP	House Type A (Small Mid-terrace)	House Type B (Large detached)
Heating	1,094 50%	573 39%	1,957 53%
Hot water	835 38%	678 46%	1,397 38%
Lighting	202 9%	183 12%	291 8%
Pumps and fans	60 3%	42 3%	78 2%
Total	2,191	1,476	3,723
WWHRS Impact	205 8.5%	179 10.8%	299 7.4%

6.6. The small, mid-terraced dwelling most closely matches the 2020 research, with 52% of energy demand for hot water and 35% for heating.

6.7. The detached dwellings show heating is the largest user of regulated energy. This is to be expected as the total area of heat loss elements (mainly the external wall) is larger for a detached property.

6.8. When WWHRS is added to the dwellings, the energy demand for hot water reduces, leading to an overall reduction in regulated energy use for all dwellings.

6.9. This reduction is most prominent on the small, mid-terrace unit (a 10.8% reduction in energy demand), but the large dwelling also shows a reasonable reduction due to the introduction of WWHRS (at 7.4%).

7. Conclusions

7.1. This Review explores how the use of WWHRS on construction sites may be impacted due to recently announced changes to the compliance targets for Approved Document Part L (2026) using SAP10.3 methodology.

7.2. A detached dwelling has been assessed using SAP10.3 and setup to follow the Notional Specification, with the exception of air source heat pumps (which are based on manufacturer PCDB entry data), and the use of WWHRS (results are tested both with and without this device).

7.3. Four manufacturers of current heat pump ranges were tested, all with similar conclusions. The dwellings show compliance without the need to consider including WWHRS. This is because the efficiency of the actual heat pumps is higher than the notional, and this improvement offsets any benefit provided by WWHRS in the Notional calculation.

7.4. Housing developers are free to install WWHRS if they wish. This report shows the inclusion of these devices will further improve the Primary Energy Rate of the dwellings, and reduce running costs for the homeowner.

7.5. Further analysis has been completed on two actual house designs, currently being used on construction sites across England. This analysis, again, shows the overall design of the dwellings meets compliance without the need to also include WWHRS.

7.6. Based on the findings of these three SAP models, the use of WWHRS is expected to reduce energy bills by £50-£80 annually, and can cut the regulated energy demand of dwellings by 7-10%.

AES
Sustainability Consultants

t: 01884 242050

e: info@aessc.co.uk

www.aessc.co.uk