MCS 007 HP Product Standard – New Energy Performance Benchmark Proposal

Disclaimer: The figures used within this proposal are correct as of December 2022.

What is the difference between the Seasonal Coefficient of Performance (SCOP) and the Seasonal Space Heating Energy Efficiency (SSHEE)?

SCOP is the overall coefficient of performance of a heat pump, representative of the whole designated heating season. It is defined as the reference annual heating demand divided by the annual energy consumption for heating and is expressed in kWh/kWh. It is used as a performance indicator in calculations that predict heat pump system energy efficiency/running costs.

SSHEE is the ratio, expressed as a percentage, between the space heating demand for a designated heating season supplied by a space heater, and the annual primary energy consumption required to meet this demand. The following formula describes the relationship between SCOP and SSHEE:

$$\textbf{SSHEE} = \frac{\text{SCOP}}{\text{PEF}} - \textbf{the sum of corrections for SSHEE} = \frac{\text{SCOP}}{2.5} - \sum \textbf{F1+F2}$$

Where **PEF** (Primary Energy Factor) is currently equal to **2.5**, **F1** is equal to **3%** and **F2** is equal to **5%**.

F1 accounts for the adjusted contributions of temperature controls and F2 accounts for the energy consumption of brine and water pumps. Note that F2 is **only** included for **water(brine)-to-water** heat pumps.

What are the current minimum energy performance standards (MEPS) within MCS 007?

MCS 007 currently uses EU Ecodesign requirements, correct as of 26 September 2017:

- Heat pump space heaters and heat pump combination heaters, except for low-temperature heat pumps, must achieve a SSHEE no less than 110%.
- Low temperature heat pumps must achieve a SSHEE no less than 125%.
- Air-to-air heat pumps less than or equal to 12kW heating capacity must achieve a SSHEE no less than 130%.

Note: all these SSHEE values correspond to a SCOP value of at least 2.8 at a flow temperature of 35 degrees centigrade. This means, on paper, all heat pumps registered on the MCS product directory should be Boiler Upgrade Scheme (BUS) eligible if installed with a 35 degrees centigrade design flow temperature. We check if this holds true later.

Why should we consider raising the minimum energy performance benchmark?

MCS is a voluntary mark of quality and therefore should arguably be seeking to offer heat pump products that are more energy efficient/perform better than those that can only achieve the minimum statutory requirements.

MCS is aware such a change could reduce the revenue MCS receives from product certification, but feels it is appropriate to be driving quality and efficiency for the benefit of both industry and consumers.

Consumers benefit as it directly impacts their running costs, and MCS Contractors benefit with a trusted list of market leading products they can recommend to their customers.

If we're to consider raising the minimum energy performance benchmark, where should we start? BEIS held a 'Heat Pump Energy Efficiency' consultation call in early 2022 to explore raising the minimum statutory requirements in a staged manner, first in 2025 and then in 2028. The following slides are from their presentation:

Note: Minimum Energy Performance Standard (MEPS) is also now used interchangeably with SSHEE but means the same thing.

Background

- Heating buildings accounts for 79% of building emission and 23% of the total UK emissions. Government has committed to deploy 600,000 heat pumps a year by 2028.
- Estimates indicate that a typical heat pump energy consumption is around 3.6 to 4.4 MWh per year. This is significantly less than other heating systems.
- Heat Pumps are subject to MEPS, these are based on a PEF of 2.5
  - Low Temperature Heat Pumps – 125% (SCOP 3.2-3.3)
  - Medium Temperature Heat Pumps – 110% (SCOP 2.8-3.0)
  - Air-to-air Heat Pumps non-reversible unit <12kW - 130% (SCOP 3.3)

Primary Energy Factor (PEF) for Electricity

What is it?

- It indicates how much primary energy is used to generate a unit of electricity. It is a measure of the efficiency of that fuel or energy vector in delivering energy
- When combined with an energy using product it gives an indication of the efficiency of that product in terms of the primary energy use. Allows for a comparison of efficiency between fossil fuel and electric appliances.

Ecodesign

- Existing reg linked to old PEF of 2.5 established through Energy Efficiency Directive which is an average take across the EU
- Revised from 2.5 in 2018 to 2.1 to reflect increased use of renewables in electricity generation.
- Out of step with situation in UK and SAP context. Next version of SAP will use a PEF of 1.5.

Low Temperature Heat Pumps

- Low Temperature Heat Pumps are specifically defined to deliver water with a flow temperature of 35°C
- Based on the market we expect the BAT to be 190% for air to water low temperature heat pump, 270% for water/brine to water low temperature heat pumps and 225% for ground/groundwater to water low temperature heat pumps.
- The proposals set out below are based on a PEF of 2.5.

Option 1 - Set MEPS at 130% from 2025 rising to 150% from 2028	• The 2025 level would be equivalent to a SCOP of 3.5 for GSHP and 3.3 for all other heat pumps whilst the 2028 proposal would be equivalent to a SCOP of 4 for GSHP and 3.8 for all other heat pumps.
Option 2 - Set MEPS at 130% from 2025 rising to 160% from 2028	• The 2025 level would be equivalent to a SCOP of 3.5 for GSHP and 3.3 for all other heat pumps whilst the 2028 proposal would be equivalent to a SCOP of 4.2 for GSHP and 4.1 for all other heat pumps.

Medium Temperature Heat Pumps

- Medium Temperature Heat Pumps are specifically designed to deliver water with a flow temperature of 55 °C.
- Based on the market we expect the BAT to be between 135 and 140% for air to water medium temperature heat pump and 225% for water/brine to water medium temperature heat pumps.
- The proposals set out below are based on a PEF of 2.5.

Option 1 - Set MEPS at 120% from 2025 rising to 130% from 2028	• The 2025 level would be equivalent to a SCOP of 3.2 for GSHP and 3.1 for all other heat pumps whilst the 2028 proposal would be equivalent to a SCOP of 3.5 for GSHP and 3.3 for all other heat pumps.
Option 2 - Set MEPS at 125% from 2025 rising to 130% from 2028.	• The 2025 level would be equivalent to a SCOP of 3.3 for GSHP and 3.2 for all other heat pumps whilst the 2028 proposal would be equivalent to a SCOP of 3.5 for GSHP and 3.3 for all other heat pumps.
Option 3 - Set MEPS at 130% from 2025 rising to 160% from 2028.	• The 2025 level would be equivalent to a SCOP of 3.5 for GSHP and 3.3 for all other heat pumps whilst the 2028 proposal would be equivalent to a SCOP of 4.2 for GSHP and 4.1 for all other heat pumps.

Air-to-Air Heat Pumps

- The proposals set out below are based on a PEF of 2.5 and are applicable to non-reversible, heating only, air-to-air heat pumps <12kW.
- Reversible air-to-air up to 1000kW heat pumps and air conditioning units are covered by by ecodesign regulation 2016/2281 and therefore beyond the scope of this work.

Option 1 - Set MEPS at 150% from 2025 rising to 160% from 2028	• The 2025 level would be equivalent to a SCOP of 3.8 whilst the 2028 proposal would be equivalent to a SCOP of 4.1.
Option 2 - Set MEPS at 150% from 2025 rising to 170% from 2028.	• The 2025 level would be equivalent to a SCOP of 3.8 whilst the 2028 proposal would be equivalent to a SCOP of 4.3.

For the purposes of this paper, air-to-air heat pumps have not been considered since they represent a negligible number of products registered on the product directory.

Should MCS seek to meet or exceed these suggested MEPS or SSHEE values?

Proposed options:

1) Keep the energy efficiency requirements the same as they are now and only raise them in line with these statutory requirements floated by BEIS, assuming these come into force.

2) Take what BEIS are proposing become statutory in 2025 and make them applicable in MCS 007 now.

3) Take what BEIS are proposing become statutory in 2028 and make them applicable in MCS 007 now.

4) Consider a 'middle ground' SCOP value which doesn't remove too many products from the MCS product directory and is therefore less controversial/easier to implement.

This paper explores pursuing proposal number 4.

What are the impacts of pursuing these options?

	SCOP Value									
	2.8 @35°C (Current MCS Requirement)		3.0 @55°C (Original MCS Proposal)		3.2 @55°C (Option 12025 BEIS Proposal)		3.5 @55°C (Option 12028 BEIS Proposal)		3.5 @35°C (Alternative MCS Proposal)	
	ASHP	G/WSHP	ASHP	G/WSHP	ASHP	G/WSHP	ASHP	G/WSHP	ASHP	G/WSHP
Number of currently certified HP models that DO NOT meet SCOP requirement	17	0	307	75	724	148	1,275	321	77	5
Percentage of the total 1,405 ASHP and 512 G/WSHP products currently certified	1%	0%	22%	15%	52%	29%	91%	63%	5%	1%
Number of said HP models that have been installed since March 2008	446	0	12,548	8,557	81,330	10,661	132,493	19,287	2,200	2,797
Percentage of the 145,710 ASHP and 28,554 G/WSHP installations since March 2008	0.3%	0%	9%	30%	56%	37%	91%	68%	2%	10%
Number of said HP models that have been installed since the start of 2021	12	0	6,052	2,795	21,319	3,252	49,924	5,077	608	1,066
Percentage of the 51,879 ASHP and 6,965 G/WSHP installations since the start of 2021	0.02%	0%	12%	40%	41%	47%	96%	73%	1%	15%

What is being proposed?

To implement either of the BEIS options within MCS 007 ahead of their proposed dates would be counterproductive to achieving the mass rollout of heat pumps in the UK, as it would involve removing a significant proportion of the heat pump products from the product directory, potentially causing significant supply chain issues. It also does not address those heat pumps that are 'low temperature' only, which can't achieve 55°C flow temperatures.

It was agreed that the original MCS Proposal (presented to the MCS Heat Pump Working Group in the summer of 2022) would be an improvement as it would remove a much smaller proportion of heat pumps, but still suffered from not addressing 'low temperature' only heat pumps.

Therefore, **MCS now proposes an alternative SCOP value of 3.5 at a 35°C flow temperature,** which removes only a small number of certified products and is applicable to all heat pump types, regardless of maximum flow temperature. Although the impact is modest, it sets a direction of travel (towards the BEIS proposals) and establishes an important principal.

This can be seen in the two right hand most columns in the table above.

Other considerations…

- Should MCS classify heat pumps, e.g., low, medium, and high flow temperatures, on the MCS Product Directory with different SCOP requirements for different classes? Or add a SCOP filter?

  This is certainly possible but may have implications for BUS. Open to comment.

- Will MCS be cleansing the product directory of any heat pump products that don't achieve a SCOP of 2.8 at any flow temperatures equal to or above 35?

  These products will be removed from the MCS Product Directory imminently.

- A change to the minimum SCOP/SSHEE requirements will necessitate a cleansing of the product directory. Could there be any unintended consequences of this?

  Open to comment.

- Do we have a SCOP value for CH and one for DHW?

  Could be done but may add unnecessary complexity.

- Could MCS keep the existing minimum performance benchmarks and categorise heat pumps by SCOP once they are published in the product directory?

  For example, bronze tier for those that achieve a SCOP of 2.8, silver for those that achieve 3.0, and gold for those that achieve 3.5.

  Open to comment.