



This question and answer factsheet provides assistance to applicants who **applied before 24 September 2013** for the Non Domestic Renewable Heat Incentive (RHI). For further guidance, please refer to our **RHI guidance documents, volumes one and two**. Chapter seven of volume one deals with metering requirements, and is supported by example scenarios in appendix one.

Some of the answers in this document are necessarily technical in nature; if you are unclear on any information provided here, you are advised to review the RHI Guidance (in particular Chapter Seven of Volume One) which provides a comprehensive treatment of metering issues, including an overview of the requirements and examples of where meters would be required in particular example scenarios.

This document comprises part of a general RHI Frequently Asked Questions document available on the Ofgem RHI website (www.ofgem.gov.uk/rhi).

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A. Metering overview and background

1. What is the purpose of metering?

The RHI only supports renewable heat where the heat generated is usable and useful (heating a room, heating water or heat used for a process). Meters are required to provide the data necessary to calculate the correct payments.

2. What types of meters are required for the RHI?

In the RHI, two types of meters are permissible: heat meters (used for measuring the heat contained in a liquid) or steam meters.

Heat meters:

Heat meters are devices used to measure the thermal energy provided by a source, or delivered to a use by a liquid. In order for this to be achieved a heat meter requires components that are able to measure two quantities:

- Flow rate of the liquid, this is measured by a “flow sensor” or “flow meter”
- The temperature difference between the relevant pipes (the “flow” and “return”). This is measured by a pair of temperature sensors or thermocouples.

In addition to the temperature and flow sensors, a heat meter also needs a “calculator” or “integrator”. This uses the quantities provided by the other components to calculate amount of heat generated or used, this is typically given in kWhth.

Heat meters may be purchased and installed as a single “packaged” heat meter, or as separate components.

Steam meters:

For larger or industrial uses, heat is often delivered in the form of steam, rather than a liquid. In order to measure the thermal energy provided or used, a steam meter requires:

- flow sensor,
- temperature sensor,
- integrator/calculator,
- a pressure sensor.

A steam meter will use only one temperature sensor, with a second reference temperature (typically 0 °C). This is because the integrator will use empirical steam table to calculate the energy of the steam, and these tables typically use 0 °C.

3. Are the rules complicated?

As scheme administrator, Ofgem is required to follow the requirements as set out in the Regulations when deciding the approach to metering under the scheme. The Regulations clearly set out a rigorous set of conditions concerning metering that need to be met by applicants.

Incentive payments under the scheme are based on metered heat – as such accurate metering is essential to ensure that participants are being paid the correct amount. This necessitates the metering requirements to be strict.

Given the importance of correct metering arrangements under the scheme, some applicants are required to provide an Independent Report on Metering Arrangements as part of their application. Only installations that have a capacity of 1MWth or above, or classed as complex for RHI metering purposes (see below) are required to provide a Report.

4. Why are so many meters required?

In order to calculate a participant's payments, Ofgem require accurate information regarding the heat generated and used. For simple systems, typically only one meter will be required to measure the heat generated by the eligible installation and as such, the payment calculation is straightforward:

[Note that in some cases, where an eligible installation is made up of multiple plant and the pipework configuration does not permit a single meter, additional meters would be required to provide a figure for Heat Generated by RHI Installation.]

However, for installations classed as complex systems, the payment calculation involves more terms – this is to take into account any ineligible plants which are connected to the heating system of which the accredited installation forms part of and any ineligible heat uses served by the system. Extra meters are required to ensure that only eligible heat attributable to the eligible installation is supported.

Payment = Tariff Level × Eligible Heat Used on System × Heat Generated by RHI Installation

Total Heat Generated on the System

Ofgem need to be satisfied that accurate data can be submitted for each of these terms. Given the variety and complexity of heating systems, in order to provide this data, multiple meters may need to be installed to provide a single figure for each term. For example, in cases where there are numerous back up fossil fuel boilers on a system, due to the pipework configuration, back up boilers may need to be metered individually. Alternative approaches may apply in this case, as described in Question C.2 below.

5. Why do we have to install meters that don't affect payments?

The Regulations have to address a wide range of scenarios – as the current phase of the RHI applies to a wide range of industries, operating on many different scales and with different heating systems. There are some situations where, as a result of the generality of the Regulations, it may appear that some

meters will be specified that may not impact directly on payments under the RHI. However, these meters may in many cases be beneficial, for example:

- In order to identify problems with heating equipment or heat distribution systems (e.g. leaks);
- In order to assist with maximising the efficiency of installed systems, to maximise the energy cost and carbon savings associated with the installation of renewable technologies;
- In order to future-proof systems to accommodate modifications to heat generation or heat use on the heating system during the 20 years over which tariff payments will be due;
- In order to assist DECC in evaluating the most effective renewable technologies, in order to leverage the benefits of the scheme to deliver best value from public funds and to maximise the positive impacts of incentivising heat use provided from renewable sources.

B. “Simple” and “Complex” metering arrangements

1. When is a system “simple” for metering purposes?

A plant is only defined as “simple” for metering purposes where:

- All heat on the heating system is generated and supplied within the same building, such that there is no external pipework (whether in the air, buried, or in any location other than inside a fully enclosed building); and
- It is not a Combined Heat and Power (CHP) plant; and
- It does not deliver heat by steam; and
- It does not deliver heat for any ineligible purpose.

2. When is a system “complex” for metering purposes?

Whenever it’s not simple (see previous question).

3. There is external pipework; does that make the installation complex?

Yes. This is because external pipework is an “ineligible heat use” in terms of the RHI scheme. As stated in Volume 1: RHI Guidance Document, if there are any ineligible heat uses served by the eligible installation, the system will be “complex” for metering purposes.

4. There are multiple buildings, but all external pipework is **buried or insulated**; does that make the installation complex?

Yes, even if the pipework is buried or insulated, there will still be heat losses associated with this pipework. The RHI Regulations define as complex any situation where all heat generation and heat use do not fall entirely within a single building.

5. What metering do I need if my installation is supplying more than one building?

We will consider you to be a ‘complex’ installation if you are supplying heat to more than one building. In this instance you will need to comply with the meter placement requirements for complex installations.

In exceptional circumstances where metering would be unduly burdensome, for example where it is likely to be highly impractical or disproportionately expensive, as for instance with some legacy heat distribution systems, as a concession we would consider the following alternative arrangement.

Where an applicant does not wish to meter buildings separately, we may be able to accept instead an approach where an agreed quarterly amount is deducted from the eligible heat use figure to represent heat lost between buildings. We are hopeful that it will be possible to point to industry-supported approaches to the calculation of heat losses. In the meantime, we will consider proposals for alternatives to metering individual buildings on a case-by-case basis. Should you be considering applying for a heat loss case, please contact the Ofgem enquiry team for details on how to submit this as part of an application.

For the avoidance of doubt, the scenario of providing heat loss estimates will only apply as a concession. It is Ofgem's strong preference that applicants meter both the heat at the point of generation and the heat used for eligible purposes. Our approach to metering and heat losses is explained further in Chapter Seven, Volume One of the Guidance document.

C. "Complex" metering considerations

1. There is external pipework; does that make the installation complex? [Yes]

Yes. There is no scope in the RHI Regulations for such an installation to be regarded as a "simple" system. Therefore, the installation is "complex" for metering purposes. This will in general impact on the number of meters required, and may also trigger additional requirements such as necessitating an Independent Report on Metering Arrangements.

2. What is the situation regarding "decentralised plant"?

- Are heat exchangers **always** required on complex systems?
 - No, Ofgem do not in general require heat exchangers on systems with complex metering. However, we do require **all plants on the heating system, whether eligible or ineligible for the RHI, to be metered**. So in general, all ineligible plant must be metered in addition to the eligible plant.
- Why might a heat exchanger make a difference?; or:
- What is significant in Example 8 in Appendix 1 of Vol.1: RHI Guidance Document?
 - In general, all ineligible plant must be metered, unless they are **effectively** isolated from the heating system, where the eligible technology is located. An example would be if the ineligible plant were not on the same heating system as the eligible installation. This could be the case as, for example, in our Guidance Example 8.

The situation is still contingent on the "point of heat use" being prior to any ineligible plant, and, crucially, **capable of being regarded as a separate heating system**. So in practice, we'd be looking for evidence that (a) a system was a separate, isolated heating system; (b) that no heat from any plant on this isolated heating system could

contribute to the heating system of which the eligible installation forms a part; and (c) that this separate, isolated heating system could be treated as an “eligible use”.

To satisfy Ofgem on point (b), as indicated in Example 8, we would expect the isolation to incorporate a non-return valve. Ofgem is currently considering other possible mechanisms of demonstrating isolation, and might update information on this in the future, but at this stage a non-return valve would be considered a necessary condition for the case of a concession based on “decentralised plant” to be considered.

On (c), for example, note that any heat use outside of a building (e.g. external pipework) would mean that this could not be treated as an eligible use, and therefore the distributed ineligible plant scenario would not apply.

3. What counts as a separate heating system or heat use?

See above on “decentralised plant”.

4. When are Heat Loss Calculations required?

If it is “unduly burdensome” to install heat meters on all of the eligible heat uses it may be possible to submit Heat Loss Calculations rather than installing additional heat meters. If you chose to go down this route, you would need to make a case for using this approach, and submit this, with the calculations, alongside your RHI application.

A Heat Loss Calculator is likely to be available from industry, and we will then be able to direct applicants to it.

5. Is my installation district heating?

An eligible installation supplying heat to an apartment building, or a network of pipes supplying heat from an eligible installation to a number of local households or businesses comes under the definition of district heating for the RHI. Further information on District and Community heating can be found in Chapter Four, Volume One of the Guidance document.

D. Metering eligibility and evidence

1. What meter evidence do I need to provide with my application?

We need to see evidence, for each heat meter, that it conforms to the Measuring Instruments Directive (MID) or equivalent, and that it is accurate to Class 2 (or better).

For further details on these specific points, see also the following two questions.

The evidence requirements will vary depending on whether the meter is:

- *a single “packaged” unit*, with all the components permanently attached together; or
- a heat meter with *separate sub-assemblies*, being a:
 - flow sensor;

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- matched pair of temperature sensors; and
- a calculator/digital integrator.

Note that, even if all the sub-assemblies were purchased at the same time from the same manufacturer, they will be regarded as separate components unless they were supplied as a single permanently attached unit (typically with the ‘display’ box directly attached to the pipe, and with one or two temperature probe leads ‘hard-wired’ into this box).

A summary of evidence requirements is presented in the following table:

Evidence requirements for Renewable Heat Incentive (RHI) heat meters

Type of Meter	Component	MID evidence	+	Accuracy requirement
Packaged heat meter	n/a	Photo of label showing “CE MXX XXXX” and <i>serial number</i>	+	Photo of label showing “Accuracy Class: 2”
		<u>OR</u> “Certificate of Conformity”		<u>OR</u> Test certificate stating accuracy class and serial number
Heat meter with separate components	Flow sensor	Photo of label showing “CE MXX XXXX” and <i>serial number</i>	+	Photo of label showing “Accuracy Class: 2”
		<u>OR</u> “Certificate of Conformity”		<u>OR</u> Test certificate stating accuracy class and serial number
	Temperature sensors (matched pair)	n/a*	+	n/a*
		Digital integrator/ Calculator		Photo of label showing “CE MXX XXXX” and <i>serial number</i>
		<u>OR</u> “Certificate of Conformity”		

Examples of what we need to see in the photos:

- CE MXX XXXX
- “Accuracy Class: 2”
 - [Note: **NOT** “Accuracy E1, M1” etc – E and M relate to electromagnetic and mechanical classes, but are not related to the accuracy of a meter or meter component]
- A serial number matching the RHI online application form

2. How do I prove that my heat meter meets the Class 2 accuracy requirement?

Ofgem require all heat meters to comply with the Class 2 accuracy requirement within EN 1434. Evidence in applications should explicitly illustrate that the heat meter adheres to the Class 2 accuracy standard. Often heat meter model brochures will not provide sufficient evidence, as they do not specify the accuracy standard.

Therefore Ofgem recommends that applications should also be supported by a photograph of the heat meter. The resolution of the image should be sufficient so that the accuracy class can be seen on the meter label, preferably also showing the opening meter reading (although this may need to be in a separate photo). The image should be uploaded to the further supporting evidence section of the application.

3. How do I prove that my heat meter meets the requirements of the Measuring Instruments Directive?

See table under Question 1 above.

Examples of what certificates are acceptable:

- “Certificate of conformity”
- **NOT** a “Type-examination certificate” [this relates to some of the technical requirements, and may be a precursor to a “Certificate of Conformity”, but is not enough by itself]

4. What are the requirements for meters measuring glycol, or other mixtures?

Ofgem administers the scheme in line with the RHI Regulations, which define heat meters as specified in Annex MI-004 of the Measuring Instruments Directive. We will, in general, require meters that conform to the Measuring Instruments Directive (MID) and meet Class 2 accuracy standards. As part of MID conformity, heat meters must be put into use such that the meter is “appropriate for the accurate measurement of consumption that is foreseen or foreseeable”. This includes provision that the rated operating conditions are appropriate, and this is expected to be determined by the distributor or the person legally designated for installing the meter (the “distributor/installer”).

In the case of non-standard heat-conveying liquid compositions (such as water/ethylene glycol or water/polypropylene glycol mixtures), for which meters have not been tested under recognised test standards which match the expected composition, Ofgem will be minded to regard as suitable any meter or sub-assembly, which:

- has been demonstrated to conform to the MID requirements for a standard liquid composition (such as water);
- would meet, for a standard liquid composition, the required MID and Class 2 accuracy requirements as set out in the RHI Regulations and Ofgem Guidance;
- has been endorsed by the manufacturer as being “appropriate and accurate” for specified non-standard liquid compositions or ranges;
- is placed on the market with these specified non-standard liquid compositions or ranges clearly communicated by the manufacturer (for example, through technical datasheets or other documentation supplied with the meter) so as to be readily available to distributor/installer; and
- is suitably specified and installed by a distributor/installer such that, when put into use, the meter is appropriate for the accurate measurement of consumption that is foreseen or foreseeable.

Due to the complications of correcting both the flow meter and integrator for the properties of the additive, Ofgem would not be minded to accept the use of combinations of sub-assemblies from separate manufacturers. In addition, we are aware of the difference in physical properties that can occur between different mixtures. By way of example, the physical properties of ethylene glycol and propylene glycol are substantially different at high concentrations. In light of these observations, Ofgem would expect the following properties of each of the components of the meter:

- temperature sensors: exactly as used in a MID approved heat meter or sub-assembly
- flow meter: provides output in units of either mass flow or volumetric flow capable of correction to the precise glycol nature and concentration (unless this is included with the heat integrator)
- heat integrator: that takes either the mass or volumetric flow from the above and combines it with the temperature difference to produce a heat flow which would meet the criteria of the MID, again allowing for the nature and concentration of the glycol.

Applicants may also wish to consider meter positions such that heat meters are installed after any collector loop. In this case, the liquid being measured is water rather than a water/glycol mixture.

Applicants should take care when installing meters that all components are correctly specified for the liquid being measured. For solar thermal, this will include careful consideration of whether the meter is installed to measure water, or a mixture such as water/ethyleneglycol.

5. Is there a list of Ofgem-approved meters?

Ofgem is not a standard-setting body for heat meters, and as such we do not endorse products, nor do we recommend particular manufacturers, distributors or suppliers. We continue to encourage meter manufacturers to provide evidence of how their meters meet the requirements set out in the RHI Regulations and Ofgem guidance, preferably within the documentation that accompanies a meter when sold, to assist prospective RHI applicants. Key eligibility requirements include that the meters conform to the Measuring Instruments Directive (MID), that they meet Class 2 accuracy, and that they are appropriately installed in line with manufacturer instructions.

6. What are the parts of a heat meter, and what evidence does Ofgem require for each part?

A heat meter is composed of:

- flow sensor;
- matched pair of temperature sensors; and
- a calculator/digital integrator.

Particularly for smaller systems, or for metering smaller individual heat loads, meters may be provided as a single packaged unit. In contrast, many larger meters consist of separate components, with each component chosen, specified for the particular conditions (pipe size, flow rates, temperature range) relating to that situation.

So heat meters may exist as:

- a single “packaged” unit, with all the components ***permanently attached together***; or
- a heat meter with separate sub-assemblies, being a:
 - flow sensor;
 - matched pair of temperature sensors; and
 - a calculator/digital integrator.

For evidence requirements, see Table in the earlier question.

7. Where can I get guidance on correct installation of my meter?

You should always seek to identify a suitable person to install any heat meter(s), including all meters that will be used for RHI purposes. A suitable person will:

- Be experienced in correct installation of heat meters;
- Have access to proper materials, training, and other sources of support.

As part of following best practice metering installation, a suitable installer should install meters in accordance with all the manufacturer’s instructions.

Your designer, heating system installer, contractor, or the author of an Independent Report on Metering Arrangements may be able to advise on a suitable individual or organisation to provide heat meter installation.

8. What about the requirements for flow meter positioning?

In general, we would be looking for meters to be installed according to manufacturer instructions.

Note that many flow sensors are only accurate when installed in particular orientations, configurations, or when sufficiently separate from common pipework components including bends, valves, and other fittings. Where these are addressed in manufacturer’s documentation, we would expect meters to be installed in order to comply with manufacturer instructions. Where no such stipulations were given by the manufacturer, Ofgem would expect industry best practice installation standards to be followed.

E. Independent Reports on Metering Arrangements

1. Do I need to submit an Independent Report on Metering Arrangements with my application?

You are required to submit an Independent Report on Metering Arrangements (or Independent Metering Report - IMR) as part for your application if your installation has a capacity of 1MWth or above, **or** is classed as **complex** for RHI metering purposes. Please note that we will generally **not** require an installation that has a capacity of 45kWth and below to submit an IMR in the first instance. However, we may require this if, in our view, the installation and associated heating system warrants the provision of such a report.

For further information on the IMR, and who we recommend an applicant uses to write it, please see Chapter Seven of Volume One of the Guidance document.

http://www.ofgem.gov.uk/e-serve/RHI/howtoapply/Documents1/RHI_Guidance_Document_Vol_One.pdf

The IMR can be found at our website:

http://www.ofgem.gov.uk/e-serve/RHI/howtoapply/Documents1/RHI_-_Independent_Report_on_Metering_Arrangements_-_Template_Pack.docx.

The author should complete it fully, including a schematic, and can delete the preceding guidance on its use prior to it being PDFd for upload to the RHI Register.

2. Do you have a list of persons who can provide the Independent Report on Metering Arrangements?

Ofgem does not provide a list of persons who are qualified to complete the Independent Metering Report (IMR). As a starting point, you may wish to consult with your installer, meter provider or system designer as one of these may be able to assist. The Building & Engineering Services Association (B&ES) [Martina Stocker; martina.stocker@b-es.org; 020 7313 4933] may be able to provide lists of individuals who they assert to be competent, independent and adequately insured. Other lists may also be available.

The competency criteria for the 'competent person' Ofgem recommend write this report for an applicant can be found in Chapter Seven, Volume One, paragraphs 7.97 – 7.104 of our Guidance document.

http://www.ofgem.gov.uk/e-serve/RHI/howtoapply/Documents1/RHI_Guidance_Document_Vol_One.pdf

All applicants are encouraged to review the IMR prior to its submission to ensure it is consistent with the rest of the application, and are reminded that they are responsible for the accuracy of all information submitted. They should bear this, and the guidance, in mind when selecting their IMR author.

3. Am I a suitable person to author an Independent Report on Metering Arrangements?

Ofgem has provided guidance, following consultation, on what qualifications and experience we would recommend an applicant looks for in an IMR author.

At present, mindful of the emerging nature of heat metering, Ofgem has interpreted

'competent person' to mean a person that meets all of the following criteria:

1. An experienced and suitably qualified engineer (at least HND or equivalent in an engineering discipline from a recognised academic institution);
2. Has demonstrable experience and expertise in flow measurement and heat/steam measurement systems demonstrated by training and development records;
3. Has a relevant background (involved in energy, utilities, building services, heating system design, heating system operation & maintenance);
4. Covered by Professional Indemnity Insurance of at least £1m (through employer or directly);
5. Is unbiased and impartial.

We will consider each case on its facts but we consider that a competent person is unlikely to be regarded as unbiased and impartial where, for example:

- He or she is, or is an employee, of the owner or heat user;
- He or she is related to the owner or heat user;
- He or she is contractually obliged to author Reports exclusively for a given owner;
- The submission of the Report could have a material impact on a significant portion of his or her income.

For avoidance of doubt, this would allow the designer or meter installer to complete the Report, where they were in a normal arms-length commercial relationship with the applicant, and the bullet points listed above did not apply.

Applicants should review the content and quality of the report, and be satisfied with it, before it is submitted as part of their RHI application, as this will be a key document in our review.

F. Initial meter readings

1. Do I need to provide meter readings on my application?

On your application you are required to submit meter readings, to provide a baseline for payments made under the scheme. These meter readings must be taken within 3 days of your application submission. Therefore, please make sure the date that your meter readings were taken is within this window **before** you submit your application. If they are not within 3 days, new readings will be needed, and your date of accreditation will be affected by this later date.

2. What units do my meter readings need to be in?

In accordance with the RHI regulations, your meter readings must be submitted in kWh. If your meter is displaying the heat output "in MWh", you should **either** request your installer to change the mode of your meter to display the reading in kWh, **or** refer to your heat meter manual for instructions on how to do this yourself.

It may not be possible to change the mode of your calculator. If this is the case, see the following question.

3. My meter readings are in MWh; how can I convert this into kWh?

It may not be possible to change the mode of your calculator (but see previous question on how to achieve this). If this is the case you will need to convert your meter reading into kWh by multiplying the entire display by 1000

e.g., if the meter reading is 138.21 MWh:

$$138.21 \times 1000 = 138,210 \text{ kWh}$$

G. Getting help with metering for the RHI

1. If I send in a copy of my specifications for my installation, can you tell me if I will be eligible?

In order to give you a definitive answer on the eligibility of your installation we will need to receive and assess your complete application for accreditation. Please consult the RHI Guidance Volumes One and Two for further detail on Ofgem's administration of the RHI - Chapter 7 of Volume 1 deals with metering requirements.