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Renewable Heat Incentive Guidance

Metering Eligibility Requirements for Participants Accredited before 24 September 2013

Guidance

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Overview:

On 24 September 2013, a number of changes were made to the Renewable Heat Incentive as a result of the Renewable Heat Incentive Scheme (Amendment No. 2) Regulations 2013. One of the main amendments was to change the metering requirements. This amendment only affects applicants applying on or after 24 September 2013. Guidance for the new metering requirements are in Volume One and Two of the RHI guidance.

Participants accredited before 24 September 2013 must continue to meet the metering eligibility requirements outlined in the 2011 Regulations. **The metering eligibility requirements for the 2011 Regulations are in this guidance document.**

Contents

1. Metering eligibility requirements

Chapter Summary

This Chapter sets out the metering eligibility requirements for participants accredited before 24 September 2013. These include:

- The types of meters that are allowed for the RHI, and the technical requirements they must meet;
- The information relating to meters and metering arrangements which we will be asking for during the accreditation process;
- Where meters should be positioned, relative to the installation and heat uses, to ensure that measurements are relevant and accurate and that only eligible heat is claimed for;
- Ongoing requirements that relate to meters in use for RHI purposes.

1.1. In accordance with the Regulations, participants may only claim RHI support on eligible heat that is delivered by any heat-conveying liquid or steam.[1] Where heat is delivered from other sources, such as direct air heating, this is not eligible for RHI support. All eligible installations will therefore need one or more heat or steam meters to correctly measure the amount of renewable heat that is eligible for RHI support.

1.2. Information on metering for biomethane plants is provided in Volume One, Chapter Eight of the RHI guidance; the requirements set out in this document do not apply to such plants.

1.3. For installations with a capacity of 45kWth and below, the MCS installation company should be able to advise participants on how to comply with the technical metering requirements set out below (as applicable).

1.4. This document contains information that is necessarily technical. Appendix One, 'Meter placement examples', provides examples of how the metering requirements set out in this document could apply in certain situations. This is intended to assist with understanding of how technical requirements could apply in practice. These are illustrative examples only, and are not intended to be an exhaustive list of all possible system configurations. However, for each application for RHI support, we will apply the principles described below when assessing whether the metering arrangements for that heating system meet the RHI eligibility requirements.

1.5. Details of how to provide ongoing meter readings and heat output data to Ofgem are provided in Volume Two, Chapter Three of the RHI guidance. The ongoing obligations participants need to meet with respect to maintaining their meters can be found in section 'Maintenance of meters' in Volume Two, Chapter Two of the RHI guidance.

[1] Regulations, Part 2, Chapter 2, Regulation 12(1)

1.6. For the purposes of this document we refer to 'heat meters' for the measurement of heat transferred by any liquid, typically hot water or water and a mixture of other agents (such as ethylene glycol). Steam meters are covered separately in the 'Steam measuring equipment (steam meters) section' below. Where heat and steam meters are referenced in this document, it is assumed they meet the requirements set out in the Regulations.

Heat meters

What standard of heat meter is permissible for the RHI?

1.7. Where renewable heat is delivered by a heat conveying liquid, the Regulations require that all heat meters used for RHI purposes comply with Class 2 accuracy requirements, that is:

- comply with the relevant requirements set out in Annex I to the 2004 Measuring Instruments Directive (MID)[2] (2004/22/EC), and
- comply with the specific requirements listed in Annex MI-004 of the MID, and
- fall within accuracy Class 2 as defined in Annex MI-004[3].

1.8. There is an exception to this requirement for certain transitional CHP systems, please see the 'CHP systems currently registered on the CHPQA scheme' Section below for further details.

1.9. The MID sets out the requirements for a number of measuring instruments used for trade[4]. MID covers meters used to measure heat by heat conveying liquids, such as hot water, in a heat exchange circuit. MID requirements in Annex I include allowable errors (accuracy classes), durability, resistance to disturbances, and inscriptions and markings that may need to be fixed to the meter. It also sets out what information must be provided by the manufacturer for installation, operation and maintenance of the meter. For further information about the MID, please see the National Measurement Office website[5].

[2] http://www.bis.gov.uk/assets/bispartners/nmo/docs/legislation/legislation/mid/measuring-instruments-directive-text-from-oj.pdf
[3] Regulations, Part 1, Regulation 2, definition of 'class 2 heat meter'
[4] http://ec.europa.eu/enterprise/sectors/legal-metrology-and-prepack/documents/europ-standards/index_en.htm
[5] http://www.bis.gov.uk/nmo/technical-services/product-certification/MID/heat-meters

1.10. It will be a condition of accreditation that the heat meter(s) for your installation must not in any way be tampered with to affect the meter readings of the installation.

1.11. MID provides requirements for different accuracy classes of heat meter. The Government has concluded that a minimum of Class 2 requirements are applicable for the RHI, as set out in the Regulations[6,7].

1.12. To comply with the specific requirements in Annex MI-004 of the MID, all heat meters used for RHI purposes must comprise:

- a **flow sensor** (or meter) - a meter which determines the volume of fluid which has passed through a pipe within a given time period,

- a **matched pair of temperature sensors** (such as two thermocouples) - two temperature sensors that are calibrated together as a pair to make sure the temperature difference between the input and output of the system is measured to the stated accuracy level, and

- a **calculator/digital integrator** (though in some systems a Building Management System may take the place of the integrator) – a device which uses the information provided by the flow meter and the matched pair of temperature sensors to calculate the heat energy being transferred.

1.13. These above-listed components can be purchased together as an integrated meter. Alternatively, individual components, or sub-assemblies, can be brought together as a heat metering system. Where individual components are brought together as a heat metering system, the applicant must ensure that individual components are compatible. For example, a manufacturer of a calculator/digital integrator will advise on compatibility requirements for differing designs or sources of flow sensor and/or temperature sensors that meet the requirements set out above.

1.14. A heat meter comprising individual components which all meet or exceed (i.e. Class 1) Class 2 requirements would be accepted as meeting the requirements of a Class 2 meter (outlined above). However, if any component of the heat meter does not meet the Class 2 requirements, (e.g. the flow meter only meets the less accurate Class 3 requirements), the Class 2 requirements set out in the Regulations are not met.

[6] See for example, Regulations, Part 2, Chapter 3, Regulations 16 and 17.
[7] Meters that fall within accuracy class 1 as defined in Annex MI-004 of the MID and meet the other appropriate eligibility requirements are also appropriate for RHI purposes (as these requirements are stricter than those for Class 2).

1.15. Participants must ensure that any Class 2 heat meter used for RHI purposes is designed (and appropriately calibrated and properly installed) for the heat-conveying liquid used by the heating system.

What information needs to be supplied when applying for accreditation?

1.16. There are a number of routes for demonstrating that an integrated heat meter meets the eligibility requirements. As part of the RHI accreditation process, we will ask for evidence to demonstrate that the meter meets the Class 2 requirements, which may be provided in all or any of four different ways. This information will be required for each model of integrated meter used for RHI purposes.

1.17. The most straightforward method to demonstrate that the meter used for RHI purposes meets the eligibility requirements is to provide evidence that the meter has been submitted and shown to comply with MID MI-004 conformity assessment procedures. A digital photograph of the meter showing meter design details, its serial number and display of its 'M' and 'CE' markings and approval numbers affixed to it could be used. Alternatively, a copy of the manufacturer's declaration of conformity could be used.

1.18. We will also accept other methods of demonstrating compliance with Class 2 requirements. The alternative options are:

- A (pre-MID)[8] EEC type approval certificate showing compliance with Class 2 accuracy requirements, or a digital photograph with the meter showing the EEC approval markings and verification seals affixed to it; or

- A certificate from an independent test house accredited to ISO 17025 (heat meters) demonstrating compliance against the applicable European Standard (EN 1434: 2007 Parts 4 and 5) for Class 2 heat meters; or

- An International Organization of Legal Metrology (OIML) Class 2 Heat Meter Certificate of Conformity.

1.19. Where the meter components are purchased separately, we will ask for evidence that each component meets the requirements. This evidence could be manufacturer's documentation or conformity assessment/testing certificates, for example.

1.20. As part of the accreditation process we will also ask for:

[8] MID was implemented in GB on 30 October 2006. There is a 10 year transitional period for existing (pre-MID) approvals to continue to be manufactured and placed on the market.

1. each heat meter's **manufacturer and model** or, where the components are purchased separately, the manufacturer and model of the flow sensor;

2. each heat meter's **serial number** or, where the components of the meter are purchased separately, the serial number of the flow meter component;

3. a **brief description** of each meter, e.g. 'measures heat generated by biomass boiler' or 'measures heat being supplied to office block' allowing it to be identified on the system's schematic diagram (for further information about the schematic diagram, please see section 'Schematic diagram' below;

4. a **meter reading** for each meter, and the date on which that reading was taken;

5. the applicant's **confirmation** that all meters were installed in line with manufacturer's instructions (including any installation requirements required as part of the MID conformity assessment or other EEC, EN 1434 or OIML testing certificates, as appropriate) and that the metering system is appropriate for the measurement function (e.g. the possible flow rates of the fluid being measured fall between the maximum and minimum flow rate calibration range of the flow sensor or the temperature sensors are designed to measure the possible temperature range of the liquids) and was appropriately calibrated prior to use.

1.21. We may request a copy of the MID EC-type or design examination certificate or other EEC, EN 1434 or OIML testing certificates, where appropriate, for any heat meter used for RHI purposes. Where the components of the heat meter are purchased separately, the manufacturer and model of the temperature sensors and calculator/digital integrator, and the serial number of the calculator/digital integrator may also be requested.

1.22. All large or 'complex' installations that deliver heat by hot liquid will be required to provide an independent report that verifies the metering arrangements in place as part of the accreditation process. This will provide further information about the heat meters and the heating system, allowing us to verify that all the relevant eligibility criteria have been met. Please see the 'Independent report on metering arrangements' Section in this Chapter for further details of this report, and the RHI website for a template of the report[9].

1.23. In some systems the composition of the heat conveying liquid could vary over time. This may include some heating systems where a mixture (such as a water/ethylene glycol mix) will be topped up using liquid of a different composition (such as water). In these circumstances, the applicant must demonstrate that the meters installed will always meet the general eligibility conditions as outlined in this document. In reviewing such a position, Ofgem

[9] www.ofgem.gov.uk/rhi

will be mindful of any procedures in place to monitor and control the concentration of the heat conveying liquid and the regime for re-calibrating the meters where necessary to compensate for changes to heat transfer liquid composition. Applicants may also wish to consider alternative meter configurations, such as positioning the meter after the primary heat exchanger/primary heat loop, in order to remove the requirement to meter a heat conveying liquid of which the composition may vary over time. Note that this would not be permitted where such a configuration could result in a meter reading contributing to misreporting of the heat generated by the installation. For example, a meter to measure heat generated by the installation that was influenced by the heat generated by another plant would not be permitted.

Steam measuring equipment (steam meters)

What standard of steam meter is permissible for the RHI?

1.24. Where renewable heat is delivered by steam, the Regulations set out the requirements for 'steam measuring equipment' (hereafter referred to as steam meters).[10]

1.25. Steam meters used for RHI purposes must have, as a minimum, the following components continuously measuring the steam properties and calculating the cumulative steam energy that has passed through the measuring system as shown on the system's schematic diagram:

- A **flow meter** – a meter which determines how much fluid (steam) has passed through a pipe over a given time period;
- A **pressure sensor** – a device for measuring the pressure of steam flowing through the pipe;
- A **temperature sensor** – a device for measuring the temperature of steam flowing through the pipe;
- A **calculator/digital integrator**– a device which uses the information provided by the flow meter, temperature and pressure sensors to calculate the cumulative heat energy transferred through the pipe.

1.26. These components can be purchased together as an integrated meter or purchased separately.

1.27. The Regulations also require that all steam meters are capable of displaying the measured steam pressure and temperature, and the current mass flow

[10] Regulations, Part 1, Regulation 2, definition of 'steam measuring equipment'

rate and cumulative mass of steam which has passed through it since it was installed. To accommodate cases where cumulative readings may be reset during the calibration process, Ofgem will consider this to also include steam meters capable of displaying the measured steam pressure and temperature, and the current mass flow rate and cumulative mass of steam which has passed through it since it was installed or calibrated.

1.28. We expect that participants will install steam measuring equipment which is capable of delivering the levels of reliability and accuracy associated with accepted industry good practice. Where available, compliance with International, European or British Standards including ISO 5167 (orifice plates) is likely to be indicative of good practice, as is the use of methodologies provided in the Carbon Trust Good Practice Guide 018 or the CHPQA guidance notes (CHPQA guidance).[11]

What information about steam meters needs to be supplied when applying for accreditation?

1.29. As part of the accreditation process we will ask for:

- each steam meter's **manufacturer and model** or, where the components are purchased separately, the manufacturer and model of the flow meter component
- each steam meter's **serial number** or, where the components of the meter are purchased separately, the serial number of the flow meter component
- the date of the **most recent calibration** of the steam meter
- a **brief description** of each meter, e.g. 'measures steam generated by biomass boiler' or 'measures steam being supplied to sterilisation process' allowing it to be identified on the schematic diagram (for further information about the schematic diagram, please see the 'Schematic diagram' Section below)
- a **meter reading** for each meter, and the date on which that reading was taken
- the applicant's **confirmation** that all meters were installed in line with manufacturer's instructions and, where appropriate, that the metering system is appropriate for the measurement function (such as the flow rate and the

[11] http://chpqa.decc.gov.uk/guidance-notes/

calibration range of the temperature and pressure sensors) and calibrated prior to use.[12]

1.30. The most recent calibration dates and the manufacturer and model of the calculator/digital integrator, temperature and pressure sensors are expected to be available upon request.

1.31. All installations that deliver heat by steam will be required to provide an independent report that verifies the metering arrangements in place as part of the accreditation process. This will provide further information about the steam meters and the heating system, allowing us to verify that all the relevant eligibility criteria have been met. Please see section 'Independent report on metering arrangements' below for further details of this report.

Additional information for systems with more than three RHI-relevant meters

1.32. Where a system has more than three RHI-relevant meters, we will also ask for a description of the metering arrangements relating to the eligible installation and heat uses. This should explain how the metering arrangement will enable the relevant heat output figures required for tariff calculation purposes to be determined. Further details about which figures are required are set out in Chapter Three, 'Provision of periodic data – heat output data and supporting meter readings', of Volume Two of the RHI guidance.

CHP systems currently registered on the CHPQA scheme

1.33. Where eligible CHP systems have a heat recovery system that was first commissioned on or after 15 July 2009, and the system was generating electricity only, using solid biomass or biogas, prior to 15 July 2009, the Regulations allow us to accept such a system's existing heat or steam meters for the RHI providing:

- the meters were installed prior to the date of commencement of the Regulations **and**

- the CHP system was registered under the CHPQA standard[13] prior to the date of commencement of the Regulations.[14]

1.34. In practice, this means that where such a CHP system has a pre-existing Class 3 heat meter(s) that is relevant for the RHI, they will be exempt from the requirement to have a Class 2 heat meter.

[12] Regulations, Part 2, Chapter 3, Regulation 20(2)
[13] http://chpqa.decc.gov.uk/
[14] Regulations, Part 2, Chapter 3, Regulation 19

1.35. All other RHI eligibility and ongoing requirements relating to metering set out in this document must be complied with. If a CHP system which benefits from the above exemption in relating to existing meters needs to install additional meters to meet the RHI metering requirements, e.g. if their existing meters are not appropriately located, the exemption will not apply and these additional meters will need to comply with **all** of the requirements set out in this document.

1.36. We may ask for evidence such as receipts, invoices or installer's documentation and CHPQA documentation to verify that the above criteria have been met.

Meter placement: simple and complex installations

1.37. This section sets out where meters need to be located in order to comply with the Regulations. The Regulations classify installations as either 'simple' or 'complex' for RHI metering purposes.[15] This classification in turn determines which quantities must be measured, and where meters must be located.[16] It also affects how payments are calculated, as set out in Chapter Two of this document.

1.38. Where more than one eligible installation is connected to the same heating system (e.g. a biomass boiler and a heat pump), each eligible installation must be metered separately to ensure that its renewable heat contribution can be measured for RHI payment purposes. Where an installation comprises multiple plants, it may be possible for the plants to share a meter for RHI purposes, please see the 'Shared meters' Section below for further information.

Is your installation 'simple' or 'complex' for RHI metering purposes?

1.39. If the answer to any of the questions below for **any** of the plants comprising your installation is 'Yes', then the Regulations require the installation to be classed as **complex** for RHI metering purposes.

- Is the plant a **CHP** system (a plant where power is generated and waste heat from the power generation process is recovered and used for eligible purposes)?

- Is heat generated by the plant delivered by **steam**?

[15] Regulations, Part 2, Chapter 3, Regulations 16 and 17
[16] Regulations, Part 2, Chapter 3, Regulations 16 and 17 & Part 5, Regulations 38 and 39

- Does the plant generate heat that is supplied to one or more **ineligible purposes?** (see Volume One of the RHI guidance, Chapter Six, for details of what constitutes an ineligible purpose)

- Is the heat generated by the plant used or generated within **more than one building**? (For avoidance of doubt, if heat is generated in one building and used in one or more different buildings, the answer to this question would be 'Yes'. In this case, the answer would be 'Yes' even if the heat is transported only a short distance, and/or is transported underground).

1.40. If the answer to all the questions above is 'No' for **all** plants comprising an eligible installation, then the installation will be classed as 'simple' for metering purposes, and for the calculation of payments as set out in Chapter Two, 'Periodic Support Payments', of this document.

1.41. Where an installation is comprised of multiple plants, it will be classed as 'complex' for RHI metering purposes where any of its component plants are classed as complex.

1.42. Whether an installation is classed as simple or complex for RHI metering purposes is illustrated in Figure 4 below.

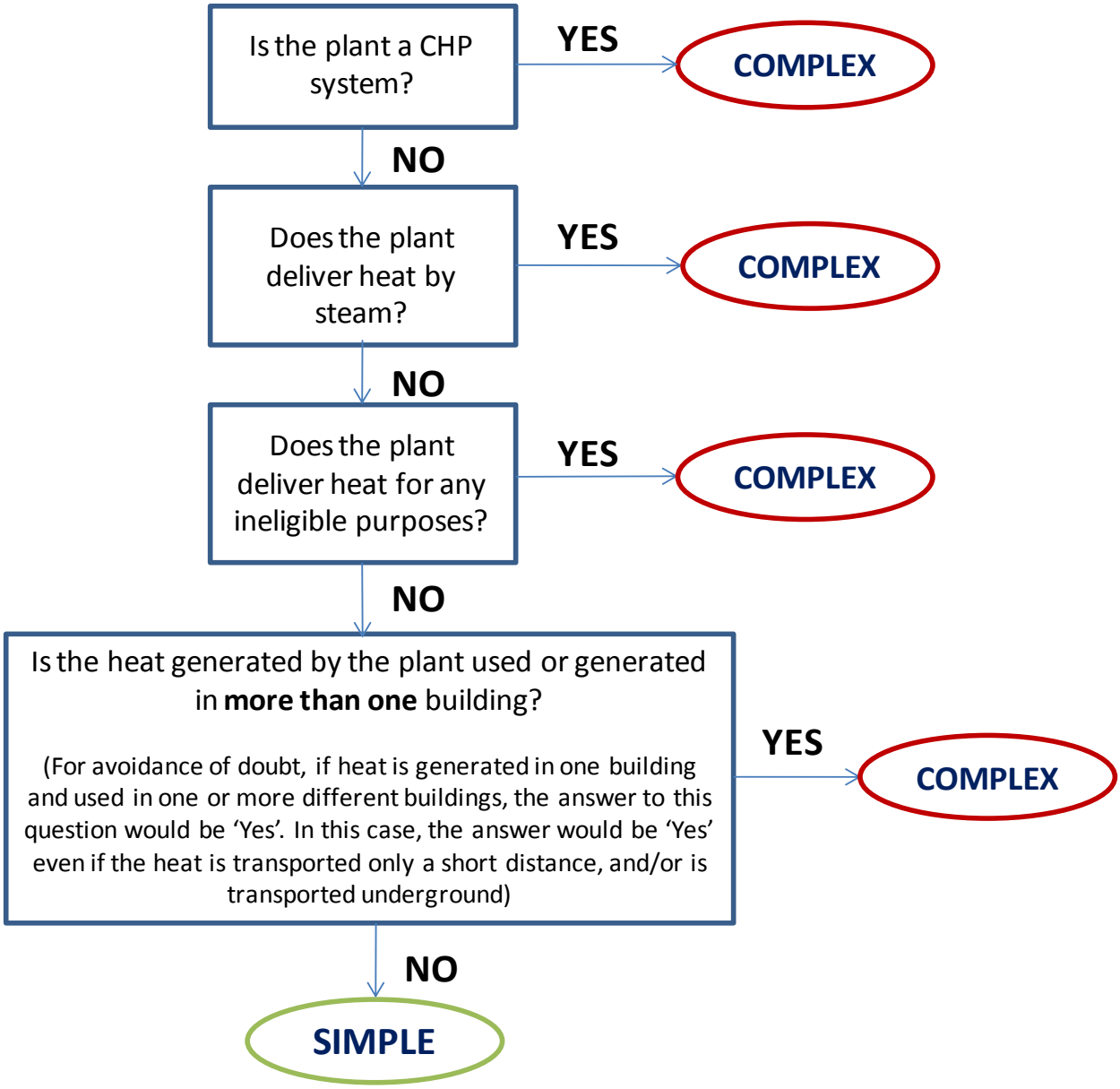

Figure 4: A flow chart illustrating whether a plant comprising all or part of an eligible installation would be classed as 'simple' or 'complex' for RHI metering purposes, in accordance with the Regulations. NB: Where an installation is comprised of multiple plants, it will be classed as 'complex' for RHI metering purposes where any of its component plants are classed as complex.

1.43. In order for the metering associated with the heat generating plant for which you are making an RHI application to be 'simple' the plant must be located in the same building as all the uses of the heat produced. If this does not apply i.e. heat is transported via external heat distribution pipework for use in

another building, the system will be classified as 'complex' for metering purposes. Note that 'building' is defined by Regulation 2 of the Renewable Heat Incentive Scheme Regulations 2011[17].

Meter placement for 'simple' installations

1.44. The Regulations allow simple installations to meter only the **renewable heat generated** by the eligible installation, and to receive RHI support on this amount.[18] This means that the heat meter measuring points must be positioned correctly to meter the heat generated by the eligible installation.[19]

1.45. The temperature sensors must be installed appropriately so that they measure accurately:

- the temperature of the liquid returning to the installation, **and**
- the temperature of the liquid as it leaves the installation, prior to entering any common pipework or vessels, such as a common header[20] or storage tank.

1.46. The pipe carrying the hot liquid flow **leaving** an installation is commonly referred to as the **flow** pipe; the pipe carrying the cool liquid flow **entering** an installation is commonly referred to as the **return** pipe. We use this terminology here. The (heat) flow meter must be located on either

- the return pipe where it directly enters the eligible installation **or**
- the flow pipe where it directly leaves the eligible installation.

1.47. The heat meter calculator/digital integrator must be correctly configured for the installed location of the flow meter and temperature sensors, as well as the properties of the heat conveying fluid.

1.48. Figure 1.1 in Appendix One provides an example of how the principles above would apply in practice.

1.49. Where an eligible installation is classed as simple for RHI metering purposes, the participant will receive RHI payment on the kWhth as measured by the class 2 heat meter(s) that measure heat generated by the eligible installation. For further information about how RHI payments are calculated, see Chapter Two 'Periodic Support Payments' of this document.

[17] Regulations, Part 1, Regulation 2
[18] Regulations, Part 2, Chapter 3, Regulation 16(2) and Part 5, Regulation 38
[19] As shown in Figure 4, an installation that is classed as 'simple' for RHI metering purposes cannot deliver heat by steam, and therefore steam meters would never be required.
[20] A 'common header' is the main pipe to which plants supply heat, and from which heat uses are supplied. A heating system may have multiple common headers.

Meter placement for 'complex' installations where the heat transfer medium is a liquid (i.e. not steam)

1.50. Any installation where heat is delivered by a liquid and which does not meet the 'simple' criteria outlined above will be classed as 'complex' for RHI metering purposes. This section describes the meter placement requirements for heating systems where the heat transfer medium is a liquid. The scenario where the heat transfer medium is steam is covered separately in the 'Meter placement for 'complex' installations where the heat transfer medium is steam' Section below.

1.51. For complex installations where the heat transfer medium is a liquid, heat meters will be required to directly measure three quantities for the heating system of which the installation forms part (hereafter referred to as 'the heating system'):

- The heat generated by the eligible installation, prior to any common pipework or vessels;
- the total heat generated by all plants supplying hot liquid to the heating system (this applies to all plants, whether they are eligible for the RHI or not); **and**
- the heat used for eligible purposes by the heating system.[21] This must not include any heat that is used for ineligible purposes. Examples of ineligible purposes are given in Volume One, Chapter Six, 'Heat uses' of the RHI guidance.

1.52. Where section 'CHP systems currently registered on the CHPQA scheme' does not apply, meters used to measure the quantities listed above must be class 2 heat meters or can be better (class 1 meters).

1.53. For all three quantities listed above, the flow meter component of the heat meter should be located on either:

- the return pipe directly entering the installation/heat generating plant(s)/eligible purpose **or**
- the flow pipe[22] directly leaving the installation/heat generating plant(s)/eligible purpose.

1.54. The temperature sensors must be placed so that they measure:

[21] Regulations, Part 2, Chapter 3, Regulation 17(2)
[22] The pipe carrying the hot water flow leaving an installation or heat use is commonly referred to as the flow pipe.

- the temperature of the liquid returning to the installation/heat generating plant(s)/eligible purpose, and

- the temperature of the liquid as it leaves the installation/heat generating plant(s)/eligible purpose.

1.55. Figure 1.2 in Appendix One, 'Meter placement examples', shows an example where the installation is classed as 'complex' for RHI metering purposes and the heat transfer medium is a liquid.

Metering heat where there are multiple buildings

1.56. Ofgem is required by the Regulations to make payment only for heat used for eligible purposes. Since heat lost in transportation between buildings is not an eligible purpose, such lost heat must not be included in any claim for payment. The simplest way to achieve this is to meter each building individually and it is therefore our firm expectation that participants should meter individual buildings.

1.57. However, in exceptional circumstances where it 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.

1.58. Where an applicant does not wish to meter buildings separately, we may instead be able to accept an approach where an agreed percentage is deducted from the eligible heat use figure to represent heat lost between buildings. We provide further information on possible methodologies via our website.

Alternative approach where separate heating circuits are fed by a common distribution system

1.59. In general, for systems considered complex for metering purposes all plant supplying heat to the heating system must be metered for heat output. However, Ofgem is mindful that this requirement may be overly burdensome where certain conditions are met. One particular scenario might apply in the case of a building supplied from a district heating system via a heat exchanger, and where the building contains a back-up or supplementary boiler, the output of which is completely isolated from the main district heating circuit. An example of such a system is provided in Appendix One, Figure 1.8. To accommodate situations of this kind, we may consider proposals to measure the eligible heat delivered to this building using a single meter, where:

- Heat is supplied to a building via a heat exchanger, such that the building has a heat distribution system separate to the main distribution loop served by an installation; and

- There are no ineligible uses within the building; and
- The meter is capable of capturing only heat used for eligible purposes, i.e. it must not include any heat used for ineligible purposes; and
- It can be demonstrated that any heating plant(s) within the building make no contribution to providing heat for any use outside of the building which they serve.

1.60. In this case, the term in the tariff calculation formula for heat generated by all plants supplying heat to the same heating system of which the installation forms part, would not include heat generated by plants within this building. For more details on how payments are calculated, see Chapter Two of this document.

Meter placement for 'complex' installations where the heat transfer medium is steam

1.61. All installations where steam is the heat transfer medium are classed as complex for RHI metering purposes.[23] All steam meters used for RHI purposes must meet the technical requirements set out in the 'Steam measuring equipment (steam meters)' section above. Where heat is used for eligible purposes in more than one building, section 'Metering heat where there are multiple buildings' above applies.

1.62. The Regulations require steam meters to be positioned to measure:

- the heat generated in the form of steam by the eligible installation;
- the total heat generated in the form of steam by all plants supplying heat to the heating system;
- the heat in the form of steam used for eligible purposes by the heating system. This will require
    - a steam meter to measure the energy in the form of steam that is delivered to the eligible purpose, and

[23] Regulations, Part 2, Chapter 3, Regulation 17(1)

- heat meters or steam meters positioned to measure heat which is returned from the eligible purpose in the form of condensate, low pressure steam, or a two phase flow[24] of condensate and steam.[25]

1.63. We assume that the energy in the hot water delivered to the eligible installation and any ineligible plant(s) does not need to be metered, as the feedwater temperature for all plants will be the same.[26]

1.64. Where any combination of condensate, non condensable gases and steam are discharged, the steam meter(s) measuring steam delivered to an eligible purpose must be positioned such that they will not include heat lost via such discharges.

1.65. The previous paragraph would in general apply to devices including steam traps and blowdown valves. However, Ofgem is aware that well maintained steam traps and related devices may be an integral part of best practice system design. Where steam traps and related devices are well maintained and are appropriate to the system, Ofgem would not consider these devices to be an ineligible use for metering purposes. Ofgem may seek assurance, including through the Independent Metering Report (see section 'Independent Report on Metering Arrangements' below), that such devices are not inappropriate to the system, and are not poorly maintained.

1.66. Where steam is used for internal processes, such as feed water pre-heating, de-aeration or any other such returns to the installation, the steam meter(s) measuring steam delivered to the eligible purpose must be positioned such that they exclude steam used for these purposes. Where this is not possible, calculation of the amount of steam used for such purposes using metering by difference may be permitted, see the 'Metering by difference' section in this Chapter for further details. For further information about process internal heat, see Volume One, Chapter Six of the RHI guidance.

1.67. Often the fluid that returns from the eligible purpose will be a two-phase mixture of hot water and steam. We expect applicants to know the conditions of this returned fluid in order to determine whether a steam meter or heat meter is most appropriate for measuring its energy content. We may ask for evidence showing that the choice of meter is appropriate for the typical conditions of the returned fluid.

[24] A two-phase flow is one in which two phases flow simultaneously – in this case, the two phases are gas (steam) and liquid (water)
[25] Regulations, Part 2, Chapter 3, Regulation 17(2)
[26] As the heat generated by the eligible installation and the total heat generated by all plants that deliver heat to the heating system only appear in the tariff calculation formula as a ratio, the enthalpy difference between the steam and the feedwater cancels out in the tariff calculation formula. For further details of this formula, please see Chapter Five of Volume Two of this Guidance.

1.68. Where the returned fluid is wholly or primarily hot water, the heat meter should have one temperature sensor in the return pipe from the eligible purpose and use the datum used by the steam meters in place of the second temperature sensor. Typically this datum will be 0ºC.[27]

1.69. Where the fluid returned from the eligible use is wholly or primarily steam, additional temperature and pressure sensors must be located in the return pipe leaving the eligible purpose (in addition to a flow meter).

1.70. In line with industry good practice, we expect participants to return as much fluid from the eligible purpose as practically possible. We may ask for information or evidence to confirm this is the case.

1.71. Flow meters, pressure sensors, temperature sensors and calculators/digital integrators must be clearly marked on the schematic diagram. The schematic diagram must also show which meter components are used to derive the energy measured by particular steam meters, as shown in Figure 1.3 in Appendix One, 'Meter placement examples'.

Location of meters on boilers with heat recirculation

1.72. Ofgem is aware that boilers may be incorporated into a heating system in conjunction with a "back end loop", the function of which is to recirculate heat directly to the boiler while bypassing the main heating circuit or any further heating loads. Ofgem understands that this will be standard practice for certain boiler types, including biomass boilers. Ofgem would consider best practice system design to involve meter placement after the back end loop, in order to protect against recirculated heat being measured for the purposes of RHI payment calculations. An example of this meter placement is given as Example 2 in Appendix One. Ofgem will examine the body of evidence that emerges through the administration of the scheme, and may at a later date be minded to require meters to be placed after the back end loop in all cases.

Biogas-specific metering requirements[28]

1.73. Any heat generated by the plant, once it has passed the meter used to calculate the RHI payment (e.g. waste heat generated from the combustion of biogas), which is subsequently returned to the process of producing the biogas at the plant (for example, where hot water heats the digester), must be measured and deducted from the final RHI payment calculation. See above for details of the meters which are required to perform this calculation. We will ask at the accreditation stage how this fits in to the overall heat metering process at the plant. Due to the metering requirements, the heat will have to be transferred in the form of liquid or steam. Biogas plants are specifically

[27] See, for example, https://www.chpqa.com/guidance_notes/GUIDANCE_NOTE_23.pdf
[28] Regulations, Part 2, Chapter 3, Regulation 21

excluded from delivering hot air from the heat generating plant to the biogas production plant.[29]

1.74. Any other heat inputted into the production of the biogas at the biogas production plant must also be measured and deducted from the overall RHI payment calculation. For example, where water heated by a fossil fuel or renewable boiler is used to raise the temperature of an anaerobic digester, this must be measured and deducted. We will ask at the accreditation stage what these uses are and how they will be measured (they will need to comply with the standard class 2 heat meter requirements detailed above). When periodic information is provided each quarter, this needs to be entered on to the system and will be deducted from the overall payment.

1.75. The exception to this is when heat is contained in feedstock used at an anaerobic digestion plant (e.g. following pasteurisation of the feedstock). The heat in this feedstock does not need to be measured or deducted.

Shared meters

1.76. An eligible installation comprised of multiple component plants that use the same source of energy and technology may use one heat or steam meter to measure the heat generated by some or all the component plants, provided those plants are eligible to receive the same tariff, share the same tariff start date and tariff end date and providing that, in our opinion, a single meter is capable of measuring the required quantity.[30]

1.77. This section does not apply where additional RHI capacity is added to an installation (after the original installation has been accredited). For further details on additional capacity, please see Volume Two, Chapter Seven of the RHI guidance.

1.78. The shared meter approach allows plants using the same energy source and technology to be grouped together and metered by just one heat or steam meter. In practice, we will generally permit a shared meter where the heat generated by one or more of the plants comprising the eligible installation can be **directly** metered by a single heat or steam meter. For example, the return temperature sensor would need to be placed prior to any heat from other sources entering the heating system, and the flow temperature sensor after any pre-heating. Where such direct measurement is not possible, each plant will need to be metered individually.

1.79. Figure 1.4 in Appendix One, 'Meter placement examples', gives an example of how this might work in practice.

[29] Regulations, Part 4, Chapter 3, Regulation 34(h)
[30] Regulations, Part 2, Chapter 3, Regulation 18

1.80. It should be made clear on the schematic diagram and in the application for accreditation where an eligible installation is comprised of multiple component plants. See Volume One, Chapter Two, 'How to apply when you have multiple plants', of the RHI guidance for further information.

Installations in series

1.81. Where one eligible installation is used in series with another, for example a solar thermal installation preheats feed water to a biomass boiler, heat meters (or steam meters if appropriate) must be positioned to directly measure the heat generated by **each** installation and to allow measurement of the contribution made by **each** eligible installation to the total heat generated. An example is provided in Appendix One of this volume.

Metering by difference

1.82. In general, we will require direct measurement of the quantities described in the paragraphs above.[31] This is to ensure that measurements used for RHI payment purposes are accurate, as combining meter readings to obtain a quantity required for the RHI tariff calculation may affect the accuracy with which that quantity has been measured.

1.83. However, we recognise that in some circumstances direct measurement may not be possible and in those cases we will give consideration to measuring by difference on a case-by-case basis. For example, if a Class 2 heat meter measures quantity A and another Class 2 heat meter measures quantity B, then we may permit these measurements to be used to calculate the RHI-required quantity C, where "C = A – B".

1.84. We are most likely to grant permission for measuring by difference where there is good reason for not using direct measurement, and where measuring by difference can provide an acceptable level of accuracy. In this case, we would usually expect all relevant metering equipment to have been calibrated at the same time by the same person to reduce any calibration errors.

1.85. Any agreement we make to measuring by difference will be in writing, together with agreement as to the means of calculation.

Installation of meters

1.86. As part of their application for RHI accreditation, applicants will need to declare that all heat or steam meters (and meter components where these were purchased separately) to the best of their knowledge still conform to the manufacturer's specifications (e.g. they have not been modified in any

[31] The exception to this is the measurement of heat used in systems where heat is delivered by steam.

material way or, if repaired or refurbished, replacement parts were sourced from the original manufacturer) and still maintain relevant accuracy (i.e. within the class 2 or other eligibility requirements).

1.87. The applicant is also required to ensure that all meters and their associated components are then installed in accordance with the manufacturer's specifications (including any installation requirements required as part of the MID EC-type or design examination certificate or other EEC, EN 1434 or OIML testing certificates where appropriate). For example, manufacturers of flow meters often stipulate that the meter must:

- have a flow conditioner or be placed a defined number of upstream and downstream straight pipe diameters from any obstruction or plant to ensure that the meter is not affected by flow disturbances or perturbations

- have the temperature (and, where appropriate, pressure) sensors placed to ensure that the temperature or pressure measurement is that of the heat-conveying liquid or steam and is not affected by other factors, such as other heat sources or the pipework configurations.

1.88. As part of this, applicants must ensure that the meters installed are appropriate for the operating conditions of the heating system.

1.89. Participants should keep records of the relevant manufacturer's instructions and relevant installer's receipts/documentation as we expect these to be available upon request.

Schematic diagram

1.90. Applicants will be required to provide a schematic diagram of the installation and the heating system of which it forms part during the accreditation process. This diagram will form a key part of the application for accreditation.

1.91. This diagram will need clearly to show, as appropriate to the heating system of which the installation forms part:

- the relative positions of the eligible installation(s) (including any component plants), any ineligible plant(s), eligible heat use(s), any ineligible heat use(s) and heat rejection facility/facilities

- the relevant pipework connections between all plants within the eligible installation(s)

- the relevant pipework connections between all eligible installations, all ineligible plants and eligible or ineligible uses of heat, and

- the relative positions of the relevant heat and steam meters and their associated components as listed under sections 'Heat meters' and 'Steam measuring equipment (steam meters)' above.

1.92. With regards to metering arrangements, the schematic diagram (including a key) must clearly show for each meter used for RHI purposes, as appropriate:

- the meter sub components' positions, i.e. positions of temperature sensors, pressure sensors, flow meters and any flow conditioners/straighteners
- which measurements will be combined by the calculator/digital integrator to generate the meter reading
- the meter serial number as listed in the applicant's application for accreditation.

Independent report on metering arrangements

1.93. In accordance with Schedule 1 of the Regulations, where an installation

- has a capacity of 1MWth or above, or
- is classed as complex for RHI metering purposes,

we will require an independent report by a competent person demonstrating that the metering and measuring requirements imposed by Chapter 3 of Part 2 of the Regulations have been met[32] (the 'Report').

1.94. Please note that we generally will not require installations that have an installation capacity of 45kWth or below to submit the Report. However, we may require the Report for these installations if we are not satisfied by the other evidence provided at accreditation that the metering arrangements for the system meet the scheme requirements. Applicants applying for accreditation of plant with an installation capacity of 45kWth or below should therefore be prepared to provide such a Report, but the applicant may choose not to obtain this in advance of making his/her accreditation application.

1.95. A Report will also be required in the following scenarios:

- where additional RHI capacity[33] takes an accredited installation's capacity over 1MWth,

[32] Regulations, Schedule 1, paragraph 1 (2)(v)(v)
[33] 'Additional RHI capacity' is defined in the Regulations (Part 6, Regulation 43(2)) as a plant

- where additional RHI capacity takes an accredited installation's capacity over 45kWth and the installation is considered complex for RHI metering purposes,

- or where a change is made to the installation/heating system that results in an RHI-accredited installation moving from a simple to complex classification for RHI metering purposes.[34] It will be a condition of accreditation for all participants with accredited installations that should this third scenario arise, the participant will be required to produce an independent metering report for their accredited installation.

1.96. Further information about additional RHI capacity and simple and complex classifications can be found in Chapter Seven in Volume Two of the RHI guidance and this chapter respectively.

Who can write the Report?

1.97. In order to ensure the Report is of an appropriate standard, the Regulations require the Report to be completed by a 'competent person'.

1.98. 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.

1.99. Over time we will keep these criteria under review, and we may in future ask for further competence criteria to be met as the number and levels of qualification of people in the marketplace increases.

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which is—
(a) first commissioned after the date on which an accredited RHI installation ('the original installation') was first commissioned;
(b) uses the same source of energy and technology as the original installation; and
(c) supplies heat to the same heating system as that of which the original installation forms part.
[34] Regulations, Part 2, 36 (1)

1.100. Prospective participants may be required to demonstrate to our satisfaction that the competent person is, and is seen to be, 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.

1.101. 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.

1.102. As with the 'competent person' criteria, over time we will keep under review the above examples of persons we would consider unlikely to be regarded as unbiased and impartial.

1.103. In line with responses to our 2013 public consultation on the Independent Report on Metering Arrangements, we confirm for avoidance of doubt that we will not regard an owner of the installation as being independent[35]. The owner of an installation will therefore not be an appropriate person to produce the Report.

1.104. The competent person producing the Report must undertake a visit to the installation and complete the Report. Where this Report is required, applicants are responsible for ensuring it is carried out by a competent person who meets the criteria set out above. Trade bodies should be able to provide further advice if required.

What should the Report cover?

1.105. In order to ensure that all Reports are consistent and provide the information we require to confirm metering arrangements are appropriate for the RHI, we have developed a Report template. This template is available on the Ofgem

[35] For details see the summary of responses available in the document 'Renewable Heat Incentive (RHI): Updates to the Independent Report on Metering Arrangements (IRMA) template' published in August 2013 and available on the Ofgem website, www.ofgem.gov.uk/rhi

RHI website.[36] The competent person is required to follow this template as closely as possible and input one of the acceptable responses for each question, except in the comment boxes where they can comment freely.

1.106. The Report will cover the installation's metering arrangements for RHI purposes, including:

- whether meters and sensors are correctly positioned
- confirming that where any steam traps or related devices regarded as eligible for metering purposes are observed, there is no evidence that these are inappropriate to the system, inadequately maintained or inappropriately vented
- whether meters and sensors are installed in accordance with the manufacturer's instructions and, where relevant, any installation requirements required as part of the MID EC-type or design examination certificate or other EEC, EN 1434 or OIML testing certificates where appropriate
- whether meters and sensors meet the technical requirements set out elsewhere in this Chapter
- whether the system is configured so that any significant heat losses are accounted for by the meter and sensor positioning
- whether the schematic diagram is an accurate representation of the installation and the heating system of which it forms part.

1.107. The competent person must sign a declaration, confirming that they meet the competency criteria and that the information provided in the Report is accurate to the best of his or her knowledge.

What happens if Ofgem is not satisfied with the Report?

1.108. In order for the installation to be accredited to the RHI, those installations requiring a Report must have it satisfactorily completed and provided to Ofgem. If we are not satisfied with all or any portion of a Report, we will explain our concern to the applicant directly. For example, the Report should be completed on the template provided. If it is not, we will notify the applicant that the Report will not be reviewed until it is provided on the template. It is the applicant's responsibility to resolve any problems with the Report and resubmit a new or amended Report as appropriate. This may require the applicant to obtain further verification and sign off from the competent person who completed the initial Report.

[36] www.ofgem.gov.uk/RHI

2. Periodic Support Payments

Chapter summary

This chapter provides guidance on how we will calculate the periodic support payment which a participant is due in respect of a quarterly period, and how we will make periodic support payments. This chapter also outlines what actions by either you or Ofgem may impact on your payment schedule. As with the rest of this document, this chapter only applies to participants accredited before 24 September 2013.

Periodic Support Payments

2.1. RHI support will be delivered to participants in the form of quarterly periodic support payments (hereafter payments). These will be made over a number of years rather than as a single upfront payment. Payments will accrue from the accreditation date of an installation, or registration date for biomethane producers, and will be payable for 20 years.

2.2. The tariff levels for the different eligible technologies and the formulae to determine the payments have been set by the Government in the RHI Regulations. Ofgem is responsible for making payments to RHI participants based on the payment calculations set out in those Regulations. More information on the policy underpinning the tariff levels can be found in the DECC RHI Policy document, available at www.decc.gov.uk/RHI.

How payments are calculated

2.3. Once you are accredited under the RHI, a tariff level will be assigned for your installation based on the technology of the installation, and the size of the installation. If you are registered as a biomethane producer under the RHI, your payment calculation will be based on a separate formula. A table setting out the current tariff structure for all eligible technologies under the RHI can be found on the Ofgem website[37].

2.4. Payments for installations will broadly be calculated by multiplying the appropriate tariff, depending on the technology and size of the installation, by the amount of eligible heat generated in the relevant quarterly period. Payments for biomethane producers are based on the eligible volume of biomethane produced for injection in the period. We will determine how much eligible heat your installation has generated or the amount of biomethane you have produced

[37] www.ofgem.gov.uk/environmental-programmes/renewable-heat-incentive-rhi/tariffs-and-payments

from data which you will need to submit to Ofgem on a periodic basis ('periodic data').

Calculation for Simple Systems

2.5. For installations classed as simple systems, the payment calculation is straightforward.[38]

Payment = Tariff Level x Heat Generated by RHI Installation

Worked Example: Simple system

System type: ground source heat pump, capacity 10 kWth

Tariff rate, determined by regulations: £0.045 (4.5 pence)

Data submitted to Ofgem: amount of heat generated in that quarter 6,570 kWhth

Payment = Tariff level x Heat Generated by RHI Installation

= 0.045 x 6,570
= £295.65

2.6. In the case of biogas installations, the formula states that any heat delivered to the biogas production plant must be subtracted[39] from the heat produced figure before multiplying by the tariff rate.

Calculation for Complex Systems

2.7. For installations classed as complex systems, the payment calculation involves more terms[40] – this is to take account of any ineligible plants which are connected to the heating system of which the accredited RHI installation forms part and of any ineligible heat uses served by the system. This ensures that only eligible heat attributable to the eligible installation is supported.

$$\text{Payment} = \text{Tariff Level} \times \text{Eligible Heat Used on System} \times \frac{\text{Heat Generated by RHI Installation}}{\text{Total Heat Generated on System}}$$

[38] Regulations, Part 5, Regulation 38
[39] In the unlikely event that the heat delivered figure is greater than the heat produced figure, we would use a zero figure for the heat produced figure rather than having a negative payment
[40] Regulations, Part 5, Regulation 39

Worked Example: Complex system

System type: ground source heat pump, capacity 200 kWth

Tariff rate, determined by regulations: £0.032 (3.2 pence)

Data submitted to Ofgem:

- Amount of heat generated by RHI installation in that quarterly period: 160,000 kWhth
- Total amount of heat generated by all installations on system: 340,000 kWhth *(note: this implies a further 180,000 kWhth was generated by other ineligible plants in addition to the RHI installation)*
- All heat used on the system for eligible purposes: 290,000 kWhth

Calculation:

$$= \textit{Tariff Level} \times \textit{Eligible Heat Used on System} \times \frac{\textit{Heat Generated by RHI Installation}}{\textit{Total Heat Generated on System}}$$

$$= 0.032 \times 290{,}000 \times \frac{160{,}000}{340{,}000}$$

= £4,367

Complex System involving biogas

2.8. For complex systems involving biogas, the formula needs to take account of the heat delivered to the biogas plant which produced the biogas combusted in the quarterly period.

$$\text{Payment} = \text{Tariff Level} \times (\text{Eligible Heat Used on System} - \text{Heat to Biogas plant}) \times \frac{\text{Heat Generated by RHI Installation}}{\text{Total Heat Generated on System}}$$

2.9. There are additional elements to the payment calculation for some eligible technologies in particular circumstances. These additional calculation elements are explained below.

Payment calculations: Two tier tariff for small and medium biomass

2.10. A two tier tariff has been applied for small (<200kW) and medium (≥200kW but <1MW) scale biomass installations. As set out in the DECC RHI Policy Document, the intention of these "tiered" tariffs is to reduce any incentive for participants to generate heat excessively or wastefully in order to receive higher payments.

2.11. This tariff structure operates on a 12 month basis, starting with the date of accreditation or its anniversary. The Regulations specify that during that 12

month period, an initial amount of heat generated by the installation up to the equivalent of 1,314 hours of an installation's installation capacity will be payable at the (higher) Tier 1 tariff. Any further heat generated during that 12 month period will be payable at the (lower) Tier 2 tariff. At the start of the next 12 month period, the initial amount of heat will again be payable at the higher Tier 1 tariff.

Worked example: Medium scale biomass, simple system

System type: Medium biomass boiler, capacity 400 kWth

Tariff rate, determined by regulations: Tier 1 - £0.049 (4.9 pence)
Tier 2 - £0.02 (2.0 pence)

Tier threshold = 1,314 hours x 400 kWth = 525,600 kWhth

Quarter One

Submitted data: amount of heat generated in quarter = 310,000 kWhth

In this quarter the total heat generated is still below the tier threshold, so the Tier1 tariff applies to the entire output.

Payment = Tariff Level x Heat Generated by RHI Installation
= 0.049 x 310,000
= £15,190.00

Quarter Two

Submitted data: amount of heat generated in quarter = 290,000 kWhth

Now we need to take account of the cumulative heat generated in this year:
Cumulative heat: 310,000 + 290,000 = 600,000 kWhth

This heat figure has now breached the Tier threshold, so we need to do two calculations, with the initial units at Tier1 and the subsequent ones at Tier2.

Initial units = threshold – output end last period = 525,600 – 310,000 = 215,600 kWhth

Subsequent units = cumulative – threshold = 600,000 – 525,600 = 74,400 kWhth

(As a check, compare the total of these two figures with original data for quarter: 215,600 + 74,400 = 290,000 kWhth - which is correct)

Tier 1 Calculation: 0.049 x 215,600 = £10,564.40

Tier 2 calculation: 0.02 x 74,400 = £1,488.00
Combined total payment = £ 12,052.40

Quarter Three

Submitted data: amount of heat generated in quarter 300,000 kWhth

Now that the threshold has been passed, all heat is payable at Tier2

Payment = 0.02 x 300,000 = £6,000

Quarter Four would proceed on a similar basis to quarter three. But the next quarter would be the start of a new RHI year for that participant, and the cumulative total would be reset to zero with initial units in that year earning payments at the Tier 1 rate.

Worked Example: Medium scale biomass, complex system

System type: Medium biomass boiler, capacity 900 kWth

Tariff rate, determined by regulations: Tier 1 - £0.049 (4.9 pence)
Tier 2 - £0.02 (2.0 pence)

Tier threshold = 1,314 hours x 900 kWth = 1,182,600 kWhth

Quarter One Submitted data:
Heat Output from RHI Installation: 1,400,000 kWhth
Heat Output from all installations on the system: 2,650,000 kWhth
(ie implies a further 1,250,000 kWh from other installations)
Eligible Heat Use on the system: 2,500,000 kWhth

In this quarter the threshold has already been breached – so need to calculate amount at each tariff tier. Calculation of initial and subsequent heat must be based on heat generated by RHI installation (not total eligible heat on system).

Initial heat generated by RHI Installation = 1,182,600 kWhth
Subsequent heat generated by RHI Installation = Total this quarter – threshold = 217,400 kWhth

Calculation:

$$= \textit{Tariff Level} \times \textit{Eligible Heat Used on System} \times \frac{\textit{Heat Generated by RHI Installation}}{\textit{Total Heat Generated on System}}$$

Tier 1:

$$0.049 \times 2{,}500{,}000 \times \frac{1{,}182{,}600}{2{,}650{,}000}$$

= £54,667.36

Tier 2:

$$0.02 \times 2{,}500{,}000 \times \frac{217{,}400}{2{,}650{,}000}$$

= £4,101.89

Total = 54,667.36 + 4,101.89 = £ 58,769.25

Payment calculations: Solid biomass installations sized 1MW and above and municipal waste plants

2.12. For this scale of biomass plant, when contaminated biomass and/or ancillary fossil fuel is used, a 'qualifying percentage' or 'renewable percentage' of the fuel input needs to be calculated. This is referred to as 'pro rating' in the Regulations.

2.13. For details on how the energy content of the contamination can be measured, please see the 'Fuel Measurement and Sampling' section in Volume Two, Chapter Four of the RHI guidance.

2.14. The non-biomass portion of this qualifying percentage is then deducted from the payment made. So if for example the qualifying percentage is 88 per cent, the payment is multiplied by this percentage/ fraction to give a payment figure that has been adjusted for fossil fuel.

2.15. For an example of how the renewable percentage is calculated each quarterly period, see Table 2 in Volume Two, Chapter Four of the RHI guidance.

Payment calculation: Gasification / pyrolysis installations

2.16. Where the participant has declared upfront that feedstock contaminated with fossil fuel will be used in the accredited installation, the tariff payment is 'pro rated' to deduct the fossil fuel contamination in the feedstock.

2.17. Therefore the "renewable" percentage of the feedstock (i.e. 1 – contamination %) going into a gasification plant is multiplied by the payment each quarter to determine the final payment. For example, where the contamination percentage is 5 per cent, the payment would be multiplied by 95 per cent to determine the final payment.

2.18. No account is taken of any fossil fuel used for permitted ancillary purposes at the heat generating plant.

Payments for biomethane producers

2.19. Registered producers of biomethane have a separate payment calculation formula because heat is not generated in the biomethane injection process. Please see the tariff table on the Ofgem website[41] to view the tariff rate applicable to biomethane producers.

2.20. To calculate how much biomethane producers should be paid each quarterly period, five elements of data will be required. These elements are:

1) The volume and gross calorific value (GCV) of biomethane injected into the gas network

2) The GCV and volume of propane that was contained in the biomethane

3) Any heat supplied to the biomethane production process

4) Any heat supplied to the biogas production plant from an 'external' source (i.e. any source other than from the combustion of the biogas)

5) The contamination percentage (where the biomethane has been produced from contaminated feedstock that has gone through a gasification or pyrolysis conversion process). This figure will be deducted from 100 per cent to give the 'proportion of biomass contained in the feedstock' which is part of the payment calculation for biomethane producers.

2.21. Once registered, biomethane producers will be required to submit the above information regularly as periodic data. The payment due to a biomethane producer will be calculated by subtracting Items 2-4 in the above list from Item 1. This is then multiplied by the proportion of biomass contained in the feedstock.

2.22. Please see Volume Two, Chapter Nine of the RHI guidance for further information.

From what date do payments begin to accrue?

2.23. Payments are payable based on quarterly periods as calculated from the date of the accreditation of the eligible installation, or from the date of registration for

[41] www.ofgem.gov.uk/environmental-programmes/renewable-heat-incentive-rhi/tariffs-and-payments

biomethane producers. For example, if an installation was accredited or a biomethane producer registered on 25 January 2012, then the first quarterly period would be considered to run from 25 January 2012 - 24 April 2012. You will be advised of your payment schedule in a notice from Ofgem once your installation becomes accredited, or once you become a registered biomethane producer.

2.24. Payments will cease after a fixed period of 20 years from the date of accreditation for your installation, or from the date of registration for biomethane producers.

Index-linking of tariffs

2.25. The table of RHI tariffs will be updated on an annual basis, with the updated rates commencing on 1 April and ending on 31 March of the following year. The tariff for your installation will be adjusted by the percentage increase or decrease in the UK Retail Price Index (RPI)42 for the previous calendar year (the resulting figure being rounded to the tenth of a penny, with any twentieth of a penny being rounded upwards).

2.26. Where your quarterly period falls over two applicable tariff years (with part of the period falling before the RPI adjustment and part after the adjustment) then your quarterly payment will be calculated on a pro rata basis. Your payment will be calculated based on the number of days before and after the RPI adjustment on 1 April, and the appropriate tariffs which apply before and after that adjustment.

How the installation of additional plant or changes to the installation may affect your tariff rate

2.27. If you install additional equipment or alter an existing accredited installation, any change to the applicable tariff will only apply once we have accredited and approved the additional equipment or alteration to the installation. For further details see Volume Two, Chapter Seven of the RHI guidance.

2.28. If the additional equipment is installed within 12 months of the original equipment accreditation date then the tariff for the original installation would apply to the total capacity of the updated installation (except where the combined capacity exceeds the tariff threshold). The total payment period would also remain the same as the original equipment accreditation date. If the installation of additional equipment takes the combined capacity over a tariff threshold then the new tariff for the larger capacity will apply.

2.29. If the additional equipment is installed more than 12 months after the original equipment accreditation date, then the additional equipment would be metered separately, and have its own accreditation date. The applicable tariff for the

[42] For further information on the RPI, please see the Office of National Statistics website: http://www.statistics.gov.uk/default.asp

additional equipment would be based on the total capacity of the system (the capacity of the original installation and the additional equipment combined). Payments for the additional equipment will be made over a period of 20 years from the accreditation date of that equipment.

What actions may impact on your payment schedule

2.30. Please note that we will not make payments to you until:

- we are satisfied that the information given by the Authorised Signatory is accurate and the installation meets the necessary requirements of the RHI scheme
- the installation has approved meters in place and these are fully functional
- we have accredited the installation and you have received confirmation of accreditation from us.

2.31. We will calculate the amount owed to you for a quarterly period once you have submitted all the required periodic data (for further details see Volume Two, Chapter Three of the RHI guidance), and we have determined the amount of eligible heat generated by your installation (or, for biomethane producers, the eligible volume of biomethane produced).

2.32. We will review your periodic data submission and determine the amount of eligible heat generated for that quarterly period. We will then calculate the amount payable to you for the quarter as determined by your tariff, taking into account any additional debits, credits or deductions applicable to the payment (for example, due to previous overpayments or as a result of any sanctions which may have been imposed). Ofgem is not liable for any delays to payments however they have been caused and will not pay interest on any payments which may have been so delayed.

2.33. If your periodic data is submitted to Ofgem more than one month after the conclusion of the relevant quarterly period end, then your payment for that quarterly period may be delayed. If there are exceptional circumstances as to why you have submitted your required periodic data after the due date, you will need to provide supporting evidence for your claim. For further details, please see the 'Late data' section in Volume Two, Chapter Three of the RHI guidance.

2.34. We may raise a query on your periodic data submission and/or carry out an audit of your system. As a result of this review we may need to adjust the payment you are due or adjust the previous quarter's payment calculations. If you disagree with our decision on this matter then you may lodge a complaint with Ofgem or request a review of our decision. For further details see Volume Two, Chapter Twelve of the RHI guidance.

Adjustments to periodic support payments

2.35. We will amend the quarterly payment due to you for the quarterly period if there has been:

- an over-payment/s in (a) previous quarter/s
- an underpayment in (a) previous quarter/s
- if an error has been made
- if your payment is subject to a sanction (For further details see Volume Two, Chapter Ten of the RHI guidance).

2.36. If we are concerned that the conditions of the scheme are not being complied with we may apply a formal sanction, which could include:

- the suspension or withholding of a payment
- the revocation of accreditation or registration under the RHI scheme.

For further details on compliance, please see Volume Two, Chapter Ten of the RHI guidance.

Nominated bank account

2.37. We will pay the amount you are due to your nominated bank account by BACS transfer. Please note that it is a requirement of the RHI that the bank account you nominate to receive your payments be an account which accepts pound sterling deposits in the United Kingdom. Failure to nominate a suitable account may result in your payment being delayed until a bank account which meets the requirements of the RHI is provided to Ofgem.

2.38. It will be a condition of accreditation that only one bank account will be allowed for each RHI participant. Where a participant has more than one accredited installation under the scheme, then payments for all of the installations will be made to the nominated bank account.

Tariff lifetime in the circumstance of a change in ownership of an accredited installation

2.39. Please note that where an accredited installation is sold or transferred to a new owner, the new owner can only receive payments for the remaining period of the original tariff lifetime. For example, if an installation is sold five years and four months after being accredited to the RHI, then the new owner will be eligible to receive payments for the remaining fourteen years and eight months of the tariff lifetime.

2.40. For full details on requirements in the circumstance of a change in ownership of an accredited installation, please see Volume Two, Chapter Eight of the RHI guidance.

Appendices

Index

Appendix One – Meter placement examples

1.1. This Appendix provides examples of how the meter placement requirements outlined in Chapter One of this document could apply in practice. These are illustrative examples only. Meter configurations which divert from the arrangements described below may be permissible, but participants could need to provide technical justification of how the requirements in Chapter One are met by their alternative approach.

1.2. The information in this Appendix is additional information to that provided in Chapter One; the eligibility and other metering requirements set out in that Chapter still apply. When we refer to 'heat' and 'steam' meters below, we assume that they are meters that comply with all the relevant technical requirements set out in Chapter One.

1.3. Further information about when and how to provide periodic data, i.e. meter readings and heat output figures, to us can be found in Chapter Three of Volume Two of the RHI guidance. Information about how periodic data is used to calculate payments is in Chapter Two of this document.

1.4. In order to provide clarity on the meter positioning principles illustrated in this Chapter, the diagrams displayed here are inherently 'simplified schematics', and do not illustrate all of the detailed specifications necessary to meet the requirements for a schematic submitted as part of an RHI application. To give an indication of how some of the detail required for the schematic submitted for an application might be depicted, Example 8 (decentralised ineligible plant located on secondary heating circuits in separate buildings) has been annotated provided with a key, a table of meter specifications, and with buildings boundaries labelled and annotated.

1.5. The examples provided here show possible meter arrangements where:

1. An installation is classed as 'simple' for RHI metering purposes
2. An installation is classed as 'complex' for RHI metering purposes and the heat transfer medium is water
3. An installation is classed as 'complex' for RHI metering purposes and the heat transfer medium is steam
4. Multiple plants comprise one installation and share a single meter

5. Two eligible installations are connected in series (in this case, where one installation pre-heats the water that enters a second installation)

6. Hot water in a common storage tank is heated by both an ineligible plant (in this example, an electrical immersion heater) and an eligible installation

7. Reversible heat pumps generate both heating and cooling

8. Decentralised ineligible plant (in this example, fossil fuel boilers) are located on secondary heating circuits in separate buildings.

Example 1: Possible meter arrangement for an installation that is classed as 'simple' for RHI metering purposes

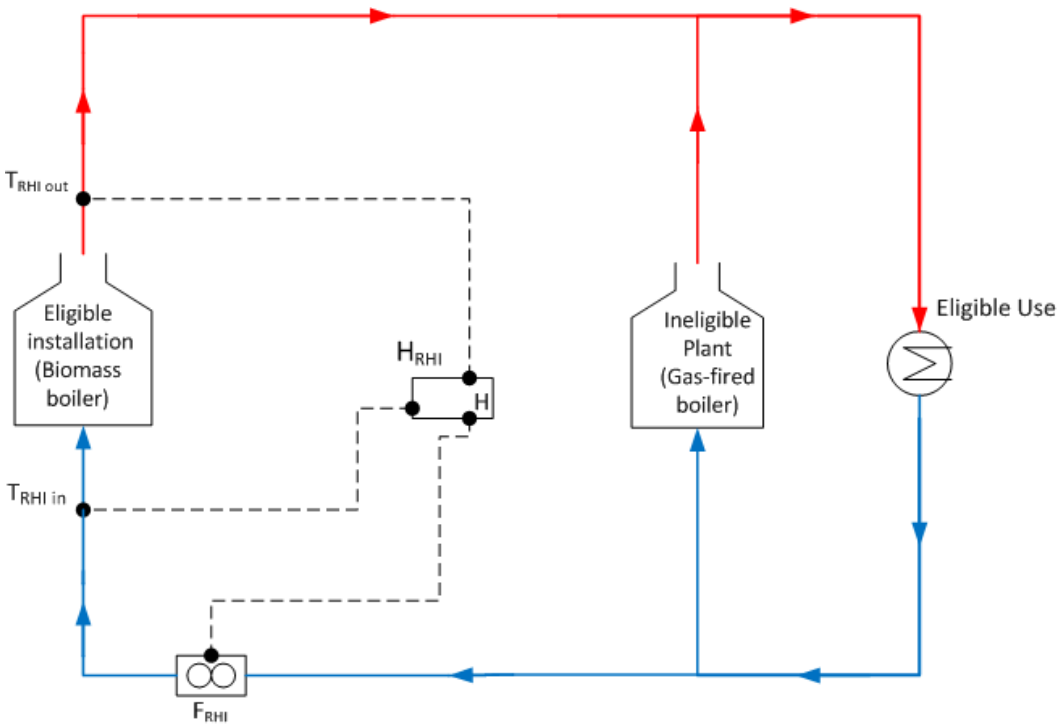
1.6. Figure 1.1 shows an example where a biomass boiler (eligible installation) and a back-up gas-fired boiler (ineligible plant) supply hot water to a single office building, which is then used for space heating purposes within that building only.

1.7. This installation is classed as 'simple' for RHI metering purposes because it is not a CHP system, does not deliver heat by steam and the heating system delivers heat only to eligible purposes within one building.

1.8. In this case, one heat meter, H_{RHI}, is required to measure the heat generated by the eligible installation, as shown below. This takes information from the temperature sensors $T_{RHI\ out}$ and $T_{RHI\ in}$ and the flow meter F_{RHI}.

1.9. The placement of the temperature sensors ensures that heat generated by the backup gas-fired boiler (ineligible plant) is not included in the meter reading used for RHI payment purposes.

1.10. The participant would need to supply the cumulative meter reading in kWhth as shown by the calculator/digital integrator to us in accordance with the timings and process set out in Chapter Three, 'Provision of periodic data – heat output data and supporting meter readings', of Volume Two of the RHI guidance. The participant would also need to use the cumulative meter readings to calculate the amount of renewable heat generated by the installation in the relevant period.



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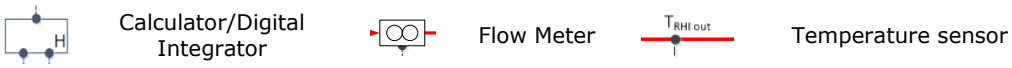


Figure 1.1: Illustration of eligible metering arrangement for a simple installation. The flow meter can be placed in either the flow or return pipe (red lines denote the hot 'flow' pipes, and blue lines indicate the cool 'return' pipes).

Example 2: Possible meter arrangement for an installation that is classed as 'complex' for RHI metering purposes and the heat transfer medium is water

1.11. Figure 1.2 shows a heating system where a biomass boiler (eligible installation) and a gas-fired boiler (ineligible plant) supply heat to a common heating system. The heating system supplies heat that is used for both an eligible purpose and an ineligible purpose. Further information about what constitutes an eligible/ineligible purpose can be found in Volume Two, Chapter Six, 'Heat uses', of the RHI guidance.

1.12. In this case, although the installation is not a CHP system and does not deliver heat by steam, heat is used for an ineligible purpose as well as an eligible purpose. This means that the installation is classed as 'complex' for RHI metering purposes.

1.13. Following the approach for complex metering outlined in Chapter One, three heat meters are required for RHI purposes. These need to be located to measure:

- the heat generated by the biomass boiler (eligible installation) – Meter H_{RHI}
- the total heat generated by both the biomass boiler and the gas-fired boiler – Meter H_{total}
- the heat used for eligible purposes – Meter $H_{eligible}$

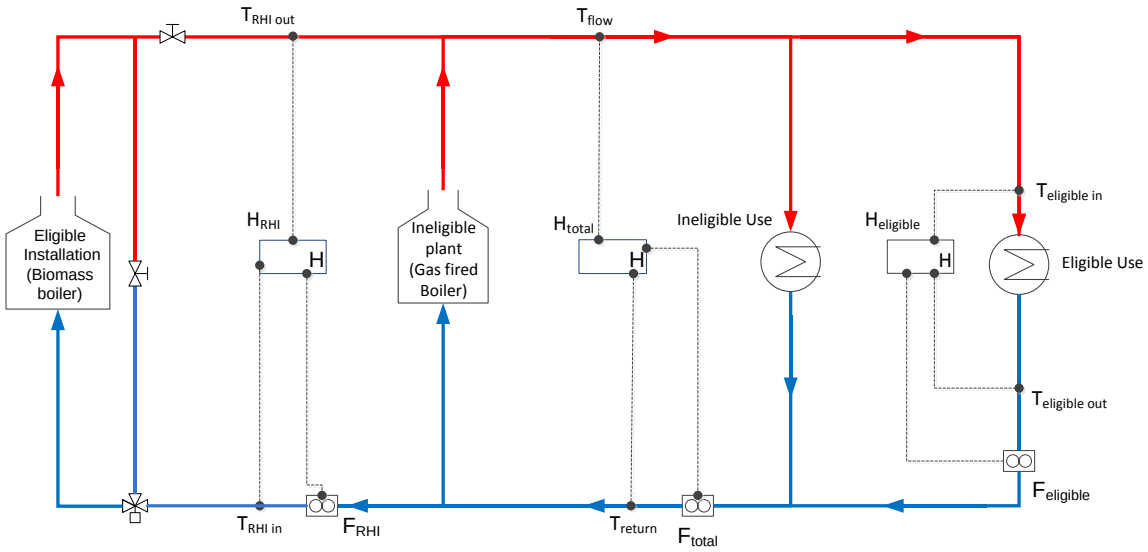
1.14. Figure 1.2 shows a possible meter arrangement. In this case, a participant would need to supply the cumulative meter reading in kWhth as shown by the calculator/digital integrator for each meter to us in accordance with the timings and process set out in Chapter Three of Volume Two of the RHI guidance.

1.15. This example schematic includes an illustration of the loop provided to recirculate heat directly to the boiler while bypassing the main heating circuit (sometimes referred to as the 'back end loop'). In line with Chapter One, the meter H_{RHI} has been located after the back end loop.

1.16. Denoting the cumulative meter reading at the start of a period by (1) and that at the end of the relevant period by (2), the participant would also need to use the cumulative meter readings to calculate (and provide us with):

- the total amount of renewable heat in kWhth generated by the installation during the relevant period = $H_{RHI}(2) - H_{RHI}(1)$,
- the total amount of heat from the heating system that was used for eligible purposes during the relevant period in kWhth = $H_{eligible}(2) – H_{eligible}(1)$, and
- the total amount of heat supplied to the heating system by both the eligible installation and the ineligible plant during the relevant period in kWhth = $H_{total}(2) – H_{total}(1)$.

1.17. Further information about how these figures are used to determine the payment amount for the relevant period can be found in Chapter Two of this document.



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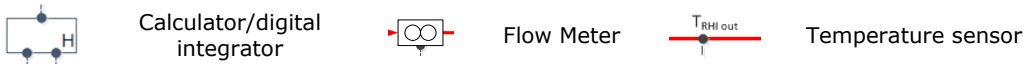


Figure 1.2: Illustration of possible metering arrangement for a complex installation where the heat transfer medium is a liquid. Note that the flow meter can be placed in either the flow or return pipe. Red lines denote the hot flow pipes, and blue lines indicate the cool return pipes.

Example 3: Possible meter arrangement for an installation that is classed as 'complex' for RHI metering purposes and the heat transfer medium is steam

1.18. Figure 1.3 shows an example where a biomass boiler and a back-up gas-fired boiler deliver steam to both an eligible purpose (carrying out a process) and an ineligible purpose (generating electricity). We assume here that condensate is returned from the eligible purpose in the form of hot water. The installation is classed as 'complex' for RHI metering purposes because the heat transfer medium is steam (and, in addition, heat is used for an ineligible purpose).

1.19. Steam generated by the installation is directed for feedwater treatment prior to the eligible use. This is classed as process internal heat, and is therefore not eligible for RHI support. For further information about process internal heat, please see Volume Two, Chapter Six of the RHI guidance.

1.20. In this example, the following meters would be required:

- Steam meter located to measure the heat generated in the form of steam by the biomass boiler. The flow meter must be placed in the flow pipe, along with the pressure and temperature sensors. This is meter S_{RHI} in the figure; this meter references the flow meter F_{RHI}, the pressure sensor P_{steam} and the temperature sensor T_{total} (as well as the datum temperature T_{datum}).

- Steam meter located to measure the heat generated in the form of steam by both the biomass boiler and the gas-fired boiler. This is meter S_{total} in the figure, which references the flow meter F_{total}, the pressure sensor P_{steam} and the temperature sensor T_{total} (as well as the datum temperature T_{datum}).

- Steam meter located to measure the heat in the form of steam delivered to the process (i.e. eligible purpose); this should not include any steam returned to the installation. This is meter $S_{eligible}$ in the figure, which references the flow meter $F_{eligible}$, the pressure sensor $P_{eligible}$ and the temperature sensor $T_{eligible}$ (as well as the datum temperature T_{datum}).

- Heat meter located after the process (i.e. eligible purpose) to measure the energy in the condensate returned from the process. In this case, a temperature sensor must be located in the return pipe from the process, and the other temperature used in the calculation made by the calculator/digital integrator should be the datum temperature used by the steam meters, which will typically be 0 degrees. The flow meter must be positioned prior to the condensate entering any common pipework or vessels. This is meter $H_{condensate}$ in the figure, which references the flow meter $F_{eligible}$ condensate, and the temperature sensor $T_{condensate}$ (as well as the datum temperature T_{datum}).

1.21. In this case, if lower grade steam had been returned from the eligible purpose (rather than hot water) the heat meter at point 4 above would be replaced by another steam meter. This would require a separate pressure and temperature sensor to be added in the return pipe leaving the eligible purpose.

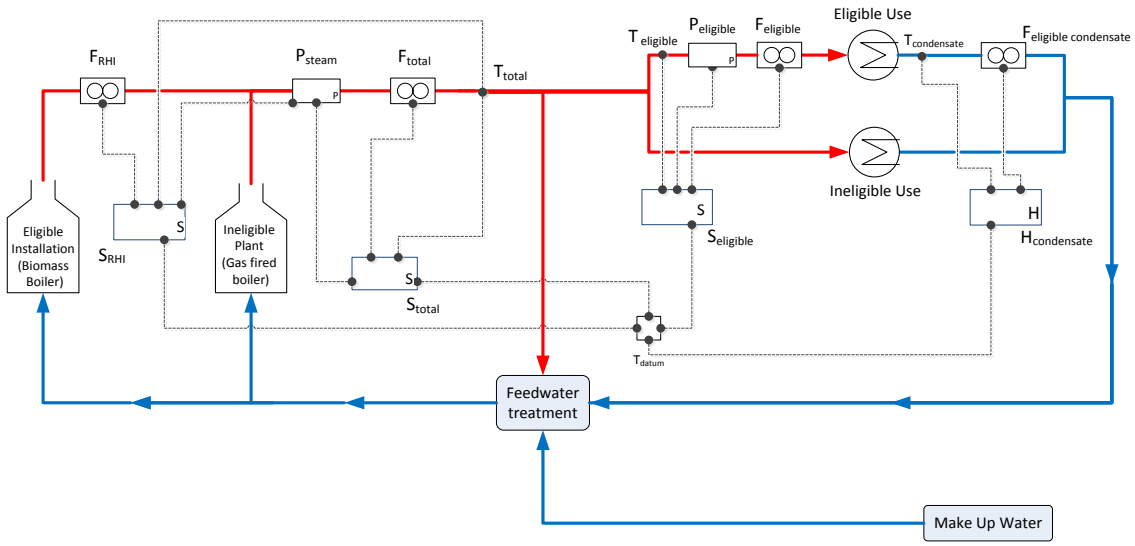
1.22. The steam meters S_{RHI} and S_{total} share a pressure and temperature sensor. We also assume that the feedwater temperature is the same for both the eligible installation and the ineligible plant, so that measurement of the energy contained in the feedwater is not required.

1.23. The participant would need to provide cumulative meter readings in kWhth as shown by the calculator/digital integrator for each meter to us in accordance with the timings and process set out in Chapter Three of Volume Two of the RHI guidance. Denoting the cumulative meter reading at the start of a period by (1) and that at the end of the relevant period by (2), the participant would also need to use the cumulative meter readings to calculate:

- the total amount of renewable heat generated by the installation during the relevant period in kWhth = $S_{RHI}(2) - S_{RHI}(1)$;

- the total amount of heat from the heating system that was used for eligible purposes during the relevant period in kWhth = $S_{eligible}(2) - H_{condensate}(2) - [S_{eligible}(1) - H_{condensate}(1)]$;

- the total amount of heat supplied to the heating system by both the eligible installation and the ineligible plant during the relevant period in kWhth = $S_{total}(2) - S_{total}(1)$.



Key

Steam meter calculator/digital integrator

Heat meter calculator/digital integrator

Flow meter

Steam pressure sensor

Temperature sensor

Figure 1.3: Illustration of possible steam meter (and component) placement for a heating system where an eligible biomass boiler and a gas-fired boiler deliver steam that is used for both an eligible and ineligible purpose. Condensate in the form of hot water is returned from the eligible purpose.

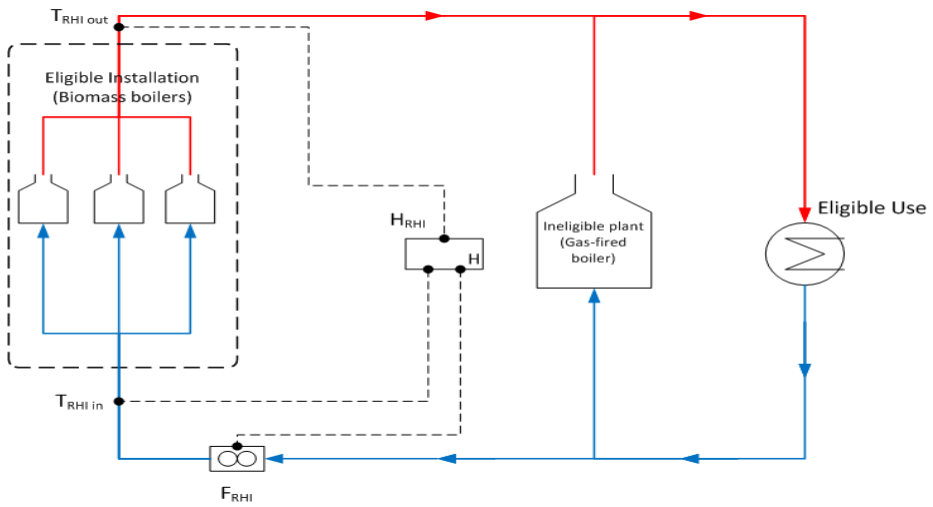
Example 4: Multiple plants comprising a single installation share a meter

1.24. Figure 1.4 shows an eligible installation comprised of three RHI-eligible biomass boilers supplying heat to a single heating system. In this example, the biomass boilers are considered as component plants which together make up one installation whose capacity is the sum of each individual boiler's capacity for RHI tariff purposes. They share the same tariff start and end dates.

1.25. The boilers are not CHP systems, and supply heat in the form of hot water for space heating in one office block. This is therefore a **simple** installation for RHI metering purposes, and so only the heat generated by the eligible installation needs to be measured. In this case, it is possible for all three boilers to be metered using one meter, H_{RHI}, providing that meter is placed:

- before the heat from the gas boiler enters the system, **and**
- before any heat is supplied from the system to the eligible use (space heating in this case).

1.26. As in Example 1, the participant would need to supply the cumulative meter reading in kWhth as shown by the calculator/digital integrator to us in accordance with the timings and process set out in Chapter Three of Volume Two of the RHI guidance. The participant would also need to use the cumulative meter readings to calculate the amount of renewable heat in kWhth generated by the installation in the relevant period.



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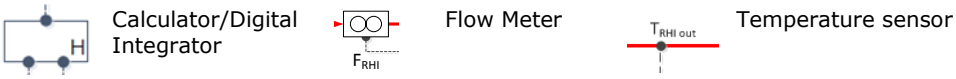


Figure 1.4: Illustrative example of a situation where a shared meter would be permitted. This installation would be classed as 'simple' for RHI metering purposes.

Example 5: Two eligible installations in series

1.27. In this example, a heat pump (eligible installation 1) pre-heats water delivered to a biomass boiler (eligible installation 2). Apart from this, this is the same system configuration as the heating system shown in Figure 1.2. Note that the owner or owners of the installation must apply for accreditation under separate RHI applications, and separate accreditation and ongoing obligations will be associated with each installation. Note that one implication of this is that separate schematic diagrams, appropriately annotated for each installation and indicating the plant for which RHI payments are being sought, should be submitted.

1.28. Both the heat pump and the biomass boiler are **complex** installations for RHI metering purposes, as the heating system of which they form part delivers heat to both an eligible purpose and an ineligible purpose. In this case, the following meters are required:

1. A heat meter to measure the heat generated by **each** eligible installation. In this example, a shared meter is not allowed because the installations use different energy sources and will therefore have different tariff rates. However, heat meters may reference common components to provide them with the required information for their heat calculations. In this example, the heat meters determining the heat generated by the biomass boiler and the heat pump both reference the temperature sensor '$T_{RHI\ interim}$' and the flow meter 'F_{RHI}'.

   The hot water generated by the heat pump is measured by a heat meter (H_{HP}), which uses the flow meter F_{RHI} and temperature sensors $T_{RHI\ in}$ and $T_{RHI\ interim}$ located in the heat pump's input pipe and in the output pipe **prior** to the hot water entering the biomass boiler respectively.

   The hot water generated by the biomass boiler is also measured by a heat meter (H_{BB}), which uses the flow meter F_{RHI} and the temperature sensors $T_{RHI\ interim}$ and $T_{RHI\ out}$ located in the biomass boiler's input pipe **after** the heat pump, and in the biomass boiler's output pipe **prior** to the hot water generated by the gas-fired boiler entering the heating system respectively.

2. A heat meter to measure the total heat generated by **both** the biomass boiler and the gas-fired boiler, H_{total}.

3. A heat meter to measure the heat used for eligible purposes, $H_{eligible}$.

1.29. The participant would need to supply the cumulative meter reading in kWhth as shown by the calculator/digital integrator for each meter to us **separately** for each eligible installation (i.e. one set of periodic data would be submitted for the heat

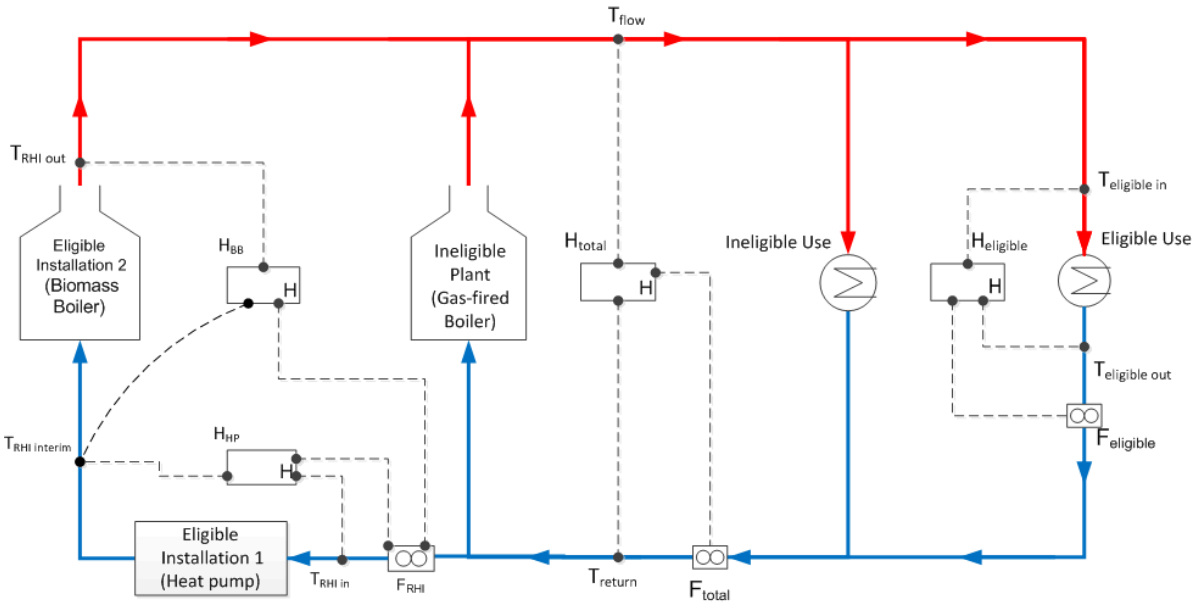
pump, and a separate set for the biomass boiler). For each installation, this information must be submitted in accordance with the timings and process set out in Chapter Three of Volume Two of the RHI guidance.

1.30. Denoting the cumulative meter reading at the start of a period by (1) and that at the end of the relevant period by (2), and assuming that the periods over which data is submitted are the same for both installations, the participant would need to use the cumulative meter readings to calculate:

- the total amount of renewable heat generated by that installation during the relevant period = $H_{HP}(2) - H_{HP}(1)$ for the heat pump or $H_{BB}(2) - H_{BB}(1)$ for the biomass boiler;

- the total amount of heat from the heating system that was used for eligible purposes during the relevant period = $H_{eligible}(2)-H_{eligible}(1)$, and

- the total amount of heat supplied to the heating system by both the eligible installations and the ineligible plant during the relevant period = $H_{total}(2) - H_{total}(1)$.



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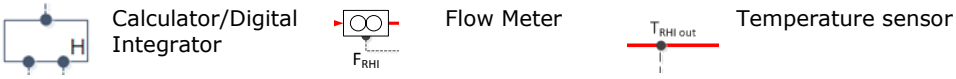


Figure 1.5: illustration of permissible heat meter locations for a system where a heat pump (eligible installation 1) pre-heats water delivered to a biomass boiler (eligible installation 2).

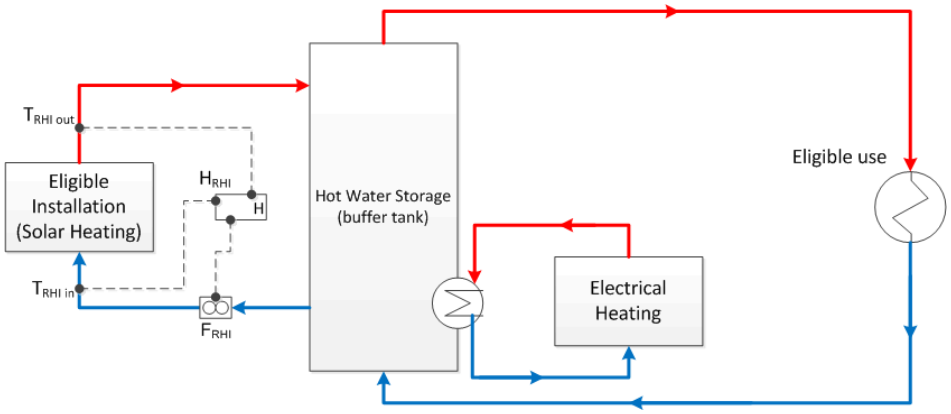
Example 6: Hot water in a common storage tank is heated by both an ineligible plant and an eligible installation

1.31. It is common, particularly in systems where hot water is generated by solar thermal installations and heat pumps, for hot water storage tanks to have the facility for direct heating from an electrical immersion heater.

1.32. This is permissible for the RHI, providing no heat generated by the immersion heater is included in meter readings provided to Ofgem for RHI purposes. This means that temperature sensors must be placed to measure hot water generated **prior** to entering the storage tank where the hot water is mixed with water heated by the immersion heater. This may mean that temperature sensors $T_{RHI\ in}$ and $T_{RHI\ out}$ must be placed on the flow and return pipes from the eligible installation.

1.33. A permissible configuration is shown in Figure 1.6 below. This installation is classed as simple for RHI metering purposes, as heat is supplied by hot water to two eligible uses (hot water and space heating) in a single school building (and the installation is not a CHP system and does not deliver heat by steam). Therefore, one heat meter, H_{RHI}, is required to measure the hot water generated by the solar thermal installation.

1.34. If the flow and return pipes from the solar thermal installation contain an ethylene glycol/water mixture or any other liquid, the Regulations require that the meter is appropriately calibrated for the properties of that liquid.



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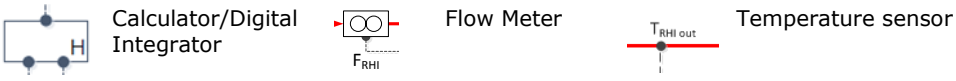


Calculator/Digital Integrator

Flow Meter

Temperature sensor

Figure 1.6: Illustration of permissible meter placements for a simple solar installation that feeds a hot water tank which is also supplied with heat by an electrical immersion heater.

Example 7: A reversible heat pump that generates both heating and cooling

1.35. Many heat pumps can operate in reverse to generate cooling in the warmer months. Such heat pumps are eligible for the RHI, but must be metered such that it is possible to calculate the cooling and heating generated separately. Only the heat generated by the heat pumps can be included in the meter readings submitted to Ofgem for RHI payment purposes.

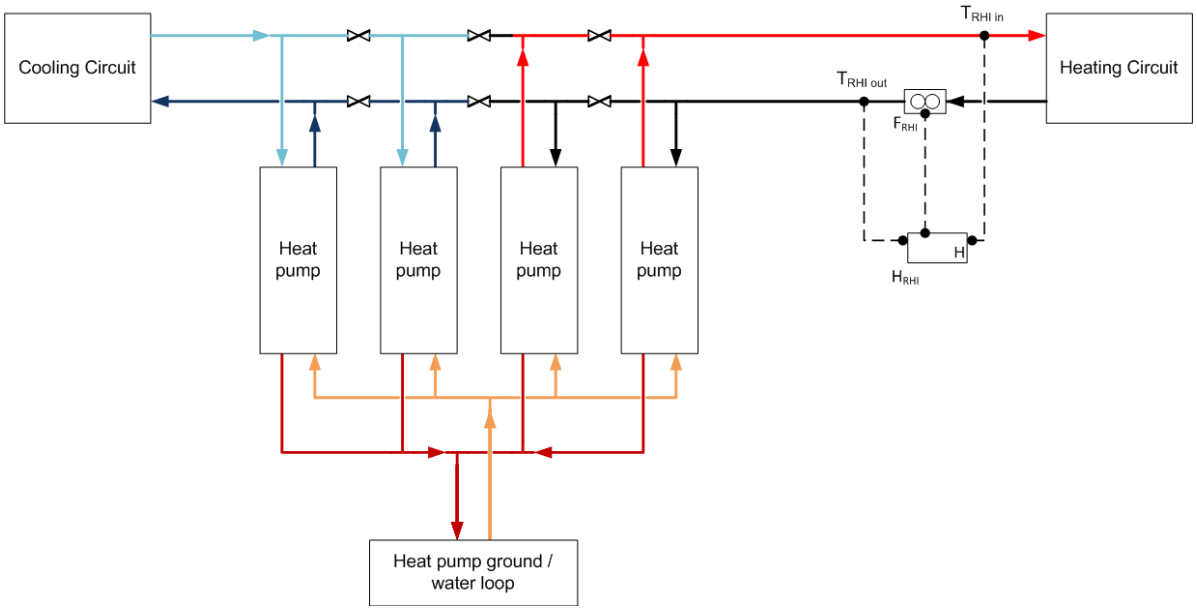
1.36. Some heat pump installations will operate on a 'sliding header'[43], as shown in Figure 1.7 below.

1.37. In this example, all heat is provided for hot water and space heating in one building, and so the installation is classed as simple for RHI metering purposes. The installation is comprised of four reversible ground source heat pumps which all have the same tariff start and end dates. Therefore, they may use a shared meter to measure the total heat generated by the installation, and so only one heat meter is required.

1.38. The flow meter can be placed in either the flow or return pipe. However, in this case the temperature sensors must be located in the flow and return pipes for the heating header to ensure that only heat that is eligible for the RHI is included in the meter readings provided for Ofgem for RHI payment purposes. If all the heat pumps in the installation are generating cooling, there should be no flow in the heating circuit as no eligible renewable heat is being generated.

1.39. Only heat recovered from the ground loops is eligible for RHI support. Any heat recovered from the cooling system and supplied to the heating system is ineligible for RHI purposes. This is because extracting heat from the cooling system is an efficiency measure; it is not heat from a renewable source. Any such heat must therefore be excluded from meter readings provided for RHI purposes, and meters must be positioned accordingly.

[43] In a system with both cold and hot headers (i.e. pipes into which the heat pumps can feed either cold or hot water), the sliding header is what determines which header the heat from the heat pump is feeding in to. The location of the header will change depending on the amount of heating vs. cooling that is required.



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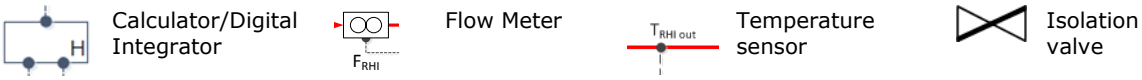


Figure 1.7: Illustration of permissible meter placement for a simple installation where four heat pumps deliver both heating and cooling on a sliding header. In this case, two heat pumps are supplying the heating circuit, and the other two are supplying the cooling circuit.

Example 8: Possible meter arrangement for an installation with decentralised ineligible plant (in this example, fossil fuel boilers) located on secondary heating circuits in separate buildings

1.40. Figure 1.8 shows a heating system where a biomass boiler (eligible installation) supplies heat to two separate buildings. As heat is used in more than one building, the installation is classed as 'complex' for RHI metering purposes.

1.41. In this case, the heating system supplies heat that is used for space heating each building, such that all heat use within each building is for eligible purposes. Further information about what constitutes an eligible/ineligible purpose can be found in Volume One, Chapter Six, 'Heat uses', of the RHI guidance.

1.42. Each building has its own heat exchanger taking heat from the common heating circuit supplied by the installation, and a gas-fired boiler (ineligible plant) used as a back-up boiler and to provide top-up heat as required. In this case, although the installation is not a CHP system and does not deliver heat by steam, heat is used in more than one building. This means that the installation is classed as 'complex' for RHI metering purposes.

1.43. Section 'Alternative approach where separate heating circuits are fed by a common distribution system' in paragraph 1.59 of this document may apply in a situation such as this, where separate heating circuits are fed by a common distribution system. We may consider proposals to measure the eligible heat delivered to this building using a single meter, where:

- Heat is supplied to a building via a heat exchanger, such that the building has a heat distribution system separate to the main distribution loop served by an installation; and

- There are no ineligible uses within the building; and

- The meter is capable of capturing only heat used for eligible purposes, i.e. it must not include any heat used for ineligible purposes; and

- It can be demonstrated that any heating plant(s) within the building make no contribution to providing heat for any use outside of the building which they serve.

1.44. In this case, the term in the tariff calculation formula for heat generated by all plants supplying heat to the same heating system of which the installation forms part, would not include heat generated by plants within this building. For more details on how payments are calculated, see Chapter Two of this document.

1.45. Assuming the above conditions are met, three heat meters are required for RHI purposes. These need to be located to measure:

- the heat generated by the biomass boiler (eligible installation) – Meter H_{RHI}

- the total heat used for eligible purposes by the 'main building' – H_A

- the total heat used for eligible purposes by the 'outbuilding' – H_B

1.46. Figure 1.8 shows a possible meter arrangement. In this case, a participant would need to supply the cumulative meter reading in kWhth as shown by the calculator/digital integrator for each meter to us in accordance with the timings and process set out in Chapter Three of Volume Two of the RHI guidance.

1.47. Denoting the cumulative meter reading at the start of a period by (1) and that at the end of the relevant period by (2), the participant would also need to use the cumulative meter readings to calculate (and provide us with):

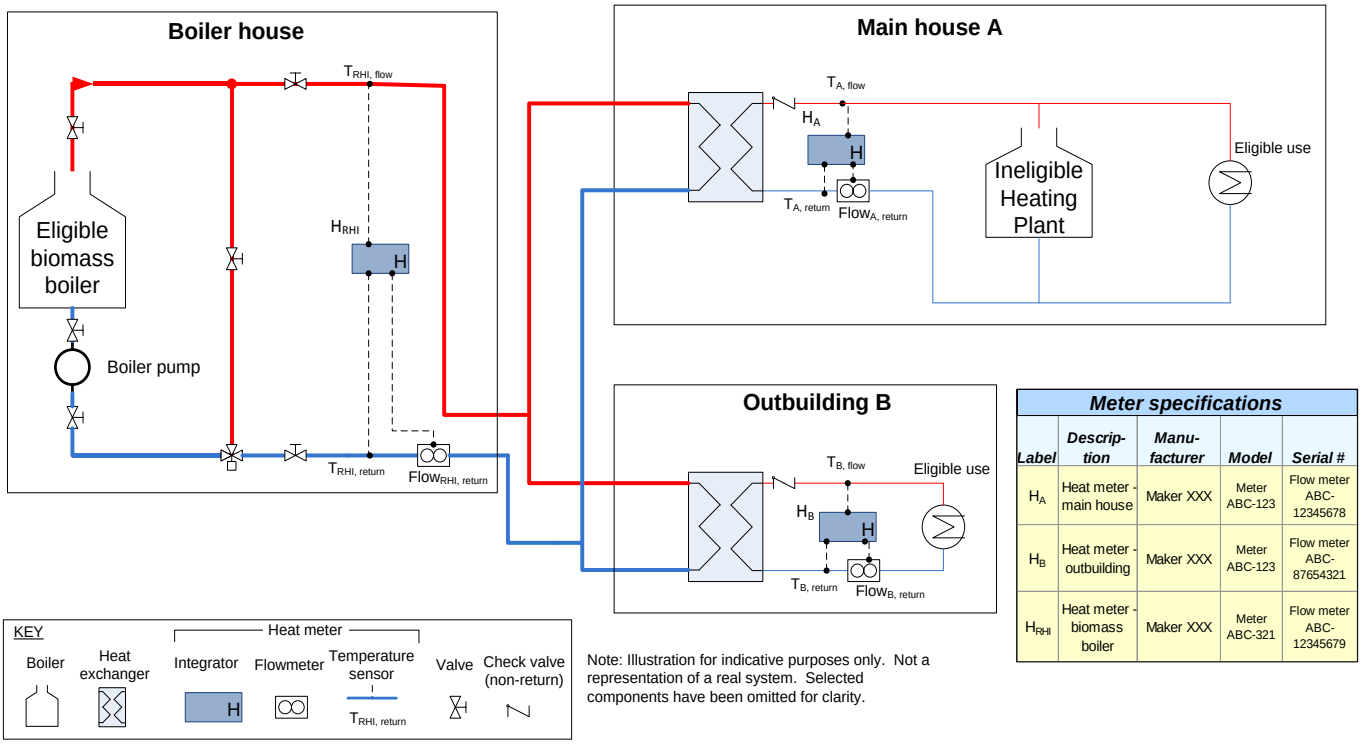
- the total amount of renewable heat in kWhth generated by the installation during the relevant period = $H_{RHI}(2) - H_{RHI}(1)$.

- the total amount of heat from the heating system that was used for eligible purposes during the relevant period in kWhth = ($H_A(2) - H_A(1)$) + ($H_B(2) - H_B(1)$), and

- the total amount of heat supplied to the heating system by both the eligible installation and the ineligible plant during the relevant period in kWhth = $H_{RHI}(2) - H_{RHI}(1)$.

1.48. Note that in this case, the total heat supplied to the system is equal to that supplied by the eligible installation, as there are no other plants supplying heat to the heating system. As these quantities are the same, the meter H_{RHI} will provide appropriate readings for both "heat generated by the RHI installation" and "total heat generated on the system" in the complex formula for payment. For more details on how payments are calculated, see Chapter Two of this document. Note that although these quantities are the same value, and this may in general result in a simplification of the tariff payment formula, it will still be necessary to provide a meter reading in order to meet the ongoing obligations of the scheme.

1.49. Further information about how these figures are used to determine the payment amount for the relevant period can be found in Chapter Two of this document.



Note: Illustration for indicative purposes only. Not a representation of a real system. Selected components have been omitted for clarity.

Meter specifications				
Label	Descrip-tion	Manu-facturer	Model	Serial #
H_A	Heat meter - main house	Maker XXX	Meter ABC-123	Flow meter ABC-12345678
H_B	Heat meter - outbuilding	Maker XXX	Meter ABC-123	Flow meter ABC-87654321
H_{RHI}	Heat meter - biomass boiler	Maker XXX	Meter ABC-321	Flow meter ABC-12345679

Figure 1.8: Illustration of possible metering arrangement for a complex installation where decentralised ineligible plants (in this example, fossil fuel boilers) are located on secondary heating circuits in separate buildings. Note that the flow meter can be placed in either the flow or return pipe. Red lines denote the hot flow pipes, and blue lines indicate the cool return pipes. This schematic has been annotated with a key, a table of meter specifications, and building names/boundaries, as discussed in Section 1.4 of this Appendix.

Appendix Two – Glossary of RHI terms

A

ACCREDITATION

In order to receive support under the RHI, an eligible installation will have to be accredited by Ofgem. Accreditation (which is defined in the Regulations) is the term that we use to denote admission by us of an applicant to the RHI once we determine that the installation meets the eligibility criteria of the scheme and that the application for accreditation is properly made.

ADDITIONAL RHI CAPACITY

Additional RHI capacity, which is defined in the Regulations, means a plant which is first commissioned after the date on which an RHI installation was first commissioned, uses the same source of energy and technology as the original plant and supplies heat to the same heating system.

ADDITIONAL PLANT

Additional plant means a heat generating plant which uses a different technology or source of energy to an existing accredited RHI installation but is connected to the same heating system as the accredited RHI installation.

ANCILLARY FOSSIL FUEL

Ancillary fossil fuel refers to the small amounts of fossil fuel necessary for the effective operation of the installation.

ANNUAL DECLARATION

The annual declaration is a confirmation that must be signed by the Authorised Signatory to confirm that the accredited RHI installation/registered biomethane producer has met the eligibility criteria and ongoing obligations of the scheme for the previous 12 months.

AUTHORISED SIGNATORY

An Authorised Signatory is a person who is authorised to open and use an account with the Ofgem RHI website or provide information by post, submit periodic data and complete the RHI annual declaration.

B

BIOENERGY

This term is used as shorthand for any of the following technologies: solid biomass, solid biomass from municipal waste, biogas, biomethane.

C

CHP

'CHP' is defined in the Regulations and refers to a Combined Heat and Power plant.

COMMISSIONED

This means, in relation to an eligible installation, that all tests required by industry standards for the installation to be able to deliver heat for the purpose for which it was installed have been completed. For a legal definition, please see the Regulations.

COMMON HEADER

This is the main pipe to which plants supply heat, and from which heat uses are supplied. A heating system may have multiple common headers.

COMPLEX INSTALLATION

A complex installation is any installation that is not considered simple.

F

FLOW PIPE

The pipe carrying the hot water flow leaving an installation or heat use is commonly referred to as the flow pipe.

FUEL MEASUREMENT AND SAMPLING (FMS)

The term 'fuel measurement and sampling' (FMS) refers to the way in which the renewable biomass proportions of input fuels are determined. By 'measurement', we mean determining the amount or quantity of a fuel (for example in tonnes or cubic meters). By 'sampling', we mean taking small sample amounts of fuel and testing them to determine specific properties such as their GCV.

I

INSTALLATION CAPACITY

The installation capacity is defined in the Regulations as the 'total installed peak heat output capacity of a plant' (which includes the 'total installed peak heat output capacity' of a single plant (installation) made up of two or more component plants).

K

KILOWATTS (kW)

A kilowatt is a measure of power i.e. the **rate** at which energy is transferred or converted. A kilowatt is equal to 1 kilojoule of energy transferred/converted each second.

KILOWATT-HOURS (kWh)

A kilowatt-hour is the measure of energy transferred or converted over a period of time. A kilowatt-hour is equal to the amount of energy generated by an installation with a power capacity of 1kW in an hour **or** an installation with a power capacity of 2kW in a half-hour etc.

N

NOMINATED INDIVIDUAL

An individual within an organisation nominated to act on the organisation's behalf in relation to the RHI.

O

ONGOING OBLIGATIONS

Ongoing obligations refer to the obligations that need to be met to remain accredited or registered to the scheme. The term is defined in the Regulations.

P

PARTICIPANT

A participant is defined in the Regulations as either the owner of an accredited RHI installation, a representative owner or a producer of biomethane who has registered with the Authority to receive the RHI. In practice this means that once the owner or representative owner of an eligible installation or a biomethane producer receives accreditation or registration respectively to the RHI scheme, he/she will be referred to as a participant in the RHI scheme.

PERIODIC SUPPORT PAYMENTS

RHI support will be delivered to participants in the form of quarterly 'periodic support payments', the term being defined in the Regulations.

PERIODIC DATA

Periodic data is the information participants will need to submit on a regular basis as an ongoing obligation, and in order for Ofgem to calculate the appropriate payment.

R

RENEWABLE HEAT INCENTIVE

The Renewable Heat Incentive is a Government environmental programme designed to provide long-term financial support to renewable heat installations to encourage the uptake of renewable heat.

RENEWABLE HEAT PREMIUM PAYMENT

The Renewable Heat Premium Payment is a separate, complementary grant scheme to the RHI. It will provide a one-off payment to eligible domestic generators of renewable heat for the interim period before eligible domestic generators will be able to apply for the RHI.

REPRESENTATIVE OWNER

Where there is more than one owner of an accredited RHI installation, the owner with the authority to act on behalf of all owners is referred to as the representative owner.

RETURN PIPE

The pipe carrying the cool liquid flow returning from an installation or heat use is commonly referred to as the return pipe.

S

SCHEMATIC DIAGRAM

The schematic diagram is an illustration of the installation and heating system for which RHI accreditation is being applied for.

SIMPLE INSTALLATION

A simple installation is an installation which is not a CHP system, does not deliver heat by steam, does not supply heat to an ineligible purpose, and where all the uses of the heat produced are in the same building as the heat generating plant .

T

THERMOCOUPLE

Electronic sensor for measuring the temperature of pipework at a given position.