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RHI Audit Report
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RICARDO-AEA

RHI Audit Report

Site: Personal information redacted by the RHI Inquiry
Reference No: Personal information redacted by the RHI Inquiry
Date: Tuesday 04 November 2014
Technology: Biomass

Executive Summary

A site audit was carried out by Ricardo-AEA on Tuesday 04 November 2014 at the Personal information redacted by the RHI Inquiry renewable heat installation, in/near Personal information redacted by the RHI Inquiry. RHI Reference number for the installation is Personal information redacted by the RHI Inquiry. The effective date for this installation is 07 March 2014.

The Renewable Heat Installation comprises a single 99kWth biomass boiler which provides heat to a poultry shed by way of 2 fan coil units. Backup heat is provided by gas heaters which provide space heating directly. These are not hydraulically linked to the biomass system. There are a total of 6 biomass systems on site, including this one (NIRHI numbers Personal information redacted by the RHI Inquiry).

The numbering of the Personal information redacted by the RHI Inquiry has changed since the original applications. The participant employed a consultant who allocated numbers to the houses which differed from that used by the farm. The change to the numbering system is to bring their names in line with that used by the farm. There is also confusion about the boiler serial numbers as these were allocated to the incorrect applications. This is listed as an observation below. As a result of these errors and others the participant has since hired a new consultant.

There have also been changes to the system configurations on site. Originally there were three biomass boilers. The participant found there to be insufficient heat and added three further boilers in order that the biomass boiler serves no more than one poultry house. There are now 6 hydraulically separate systems serving the site. The alteration work was reported to have been carried out in July and August 2014 and the participant has subsequently made Ofgem aware of the changes.

Ofgem wish to confirm that the biomass boiler is not hydraulically connected to any system other than that for Personal information redacted by the RHI Inquiry. The auditor confirmed that it is hydraulically separate from all other biomass boiler systems on site, however this system shares a fuel store with Personal information redacted by the RHI Inquiry.

Observations (including non-compliances) are summarised within the following table. Observations are highlighted within the body of the report for emphasis.

Summary of Auditor's Observations (including Non-compliances)

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No	Auditors Observations	Does observation constitute non-compliance? [Yes/No]	What remedial work is recommended to rectify this issue?	Reference to Ofgem Guidance (volume and section)
1	Installation nameplate gives different serial number <small>Personal information redacted by the RHI Inquiry</small> to that given on the application <small>Personal information redacted by the RHI Inquiry</small>	No	Participant to notify Ofgem of actual installation capacity (or serial number) as given on the nameplate via RHI.audit@ofgem.gov.uk . Ofgem to determine appropriate course of action.	Vol 1, Para 2.11
2	Commissioning certificate provided by participant provides a different commissioning date (12/02/2014) to that given on the application (07/03/2014).	No	Participant to confirm correct commissioning date via RHI.audit@ofgem.gov.uk . Ofgem to determine appropriate course of action.	Vol 1, Para 2.11
3	Biomass fuel records are kept of wood pellet deliveries to site, however the deliveries are for all six RHI installations at the site and so there are no individual records kept for each RHI installation.	Yes	Participant to keep records of fuel/feedstock use for each individual RHI installation at the site.	Vol 2, Para 4.4 Regulation 34 (a) Regulation 45 (1) and (2)
4	No records of meter readings were observed during audits	No	Participant to keep a written record of periodic meter readings to assist with error checking.	n/a
5	Minor inconsistencies noted between submitted schematic and actual installation arrangement. The schematic in the application incorrectly describes a single plant providing heat to both Poultry House 5 and 6, in addition the buffer vessel has not been declared on the schematic.	No	Participant to provide an amended schematic via RHI.audit@ofgem.gov.uk . Ofgem to determine appropriate course of action.	Vol 1, Para 7.90 / Para 7.91
6	In the heat loss calculation, the participant had assumed that the installation would operate for 41 hours per week on an average basis. Following discussion with the participant, the auditor understands that the installation operates for at least 168 hours per week.	Yes	Participant to amend Heat Loss Calculation to include correct number of operating hours. Ofgem to determine appropriate course of action.	n/a

Heat metering for the site was confirmed as having been designed and manufactured to comply with MID Class 2 (or equivalent) standards and no installation issues were noted



The site audit has resulted in an assurance rating of **Weak** on the basis that the above observations and non-compliances indicate moderate issues with eligibility which can be rectified within a reasonable timescale.

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Document Control

Date	Description	Name	Signature
28/11/2014	DRAFT Issue 1 report raised	Seamus Rooney	
04/12/2014	Issue 1 reviewed and approved for release to Ofgem	Oliver Edberg	
30/12/2014	Issue 2 reviewed and approved for release to Ofgem	Oliver Edberg	

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1 Audit Planning and Preparation

1.1 INSTALLATION DETAILS

RHI no.	Installation Name	Location	Authorised signatory
Personal information redacted by the RHI Inquiry	Personal information redacted by the RHI Inquiry	Personal information redacted by the RHI Inquiry	Tom Forgrave

Technology Type	Installation Capacity [kW _{th}]	Audit Scale [Small/Medium/Large]	Metering Classification
Biomass	99kW _{th}	Medium	Complex

1.2 AUDIT PLANNING

Auditor 1 (Name)	Auditor 2 (Name) [Optional]	Date Site Notified	Date of Site Visit
Seamus Rooney		28 Oct 2014	04 Nov 2014

Have Ofgem Audit team advised specific issues to be addressed during the audit? If so detail these below

There have been significant alterations to the layout of the systems on site (e.g. external pipework lengths, poultry house numbering) and Ofgem wish to confirm that the individual installations are hydraulically separate.

2 Audit Commencement

2.1 SITE PERSONNEL PRESENT DURING VISIT

[To be completed by Auditor upon Commencement of Audit Visit]

	Name	Position	Tel No [Optional]	E-Mail [Optional]
1	Tom Forgrave	Owner	Personal information redacted by the RHI Inquiry	Personal information redacted by the RHI Inquiry

The authorised signatory (Tom Forgrave) **was** present during the audit visit.

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3 Technology Review

Instructions to Auditors

The following checks in Section 3 relate specifically to the eligible plant (e.g. biomass boiler, heat pump, solar thermal panels etc.). The auditor should refer to the documentary evidence contained within the audit pack which may include an Independent Report on Metering Arrangements (IRMA) for multiple installations. **It should be possible for the auditor to complete questions relating to the audit pack and IRMA prior to the audit visit.** The site visit can then confirm whether the situation on the ground matches the documentary evidence.

The auditor should clearly state whenever a discrepancy is identified between the documentary evidence and that encountered during the site visit.

Photographs should be included and referenced in appendices to help support observations where photographic evidence helps validate the point made.

3.1 ALL TECHNOLOGY CHECKS

3.1.1 Plant Overview

Review the information relating to the eligible plant given in the audit pack (including, where applicable, the IRMA) and confirm that various details are consistent throughout the audit pack and that these details match the installation found on site. These checks also investigate the connections of the plant to the heating pipework.

Ref	Check	Comments		
3.1.1.1	Cross-check installation heat capacity. Take photographic evidence of nameplate.	Audit Pack (application – HA120):	Audit Pack (commissioning certificate, MCS Certificate IRMA etc.)	Site visit:
		99kW _{th}	99kW _{th}	99kW _{th} – see photograph in appendix A
3.1.1.2	Cross-check make and model of generating plant	Audit Pack (application – HK120):	Audit Pack (commissioning certificate, MCS Certificate IRMA etc.)	Site visit:
		Make: Herz Model: Firematic	Make: Herz Model: Firematic	Make: Herz Model: Firematic
3.1.1.3	Cross-check serial number(s) of generating plant	Audit Pack (application – HK110):	Audit Pack (commissioning certificate, IRMA etc.)	Site visit:
		Personal information redacted by the RHI	Personal information redacted by the RHI	Personal information redacted by the RHI (see notes)
3.1.1.4	Confirm date of commissioning	Audit Pack (application – HC110):	Audit Pack (commissioning certificate, IRMA etc.)	Site visit:

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		07/03/2014	07/03/2014	12/02/2014 (see notes)
3.1.1.5	Confirm that plant has been suitably installed and commissioned	Confirmed. The auditor was able to inspect the installation and it was suitably installed and commissioned.		
3.1.1.6	Inspect equipment to confirm installation is being suitably maintained.	The applicant cleans the biomass boiler every 7 weeks and the boiler distributor services the boiler every 2,000 hours.		
3.1.1.7	Inspect installation to confirm that number of plant items match those given in scheme description	Confirmed. There is one biomass boiler only.		
3.1.1.8	Where installation consists of multiple component plant. Verify that component plants are of the same make and model, or if not, the same technology	n/a. There is one biomass boiler only.		
3.1.1.9	Confirm all generating plant connected to system and referenced as per system schematic	Confirmed. The biomass boiler is connected as described on the schematic		
3.1.1.10	Where installation includes a buffer vessel (accumulator). Identify whether buffer vessel has 2 ports or more than 2 ports. State the number of ports.	<u>Audit Pack (inc IRMA):</u>	<u>Site Visit:</u>	
		There is no buffer tank shown on the original schematic.	There is a buffer tank with are 4 ports in use (see notes).	
Notes				
<p>3.1.1.3 Cross-check serial number(s) of generating plant The serial number does not match that on the audit pack. The participant stated that the serial numbers for the first 3 boilers installed ([redacted]) were attributed to the wrong applications by the first consultant employed. This resulted in errors in the application related to the serial number and the commissioning date. The participant has since employed a different consultant.</p> <p>Observation: Installation nameplate gives different serial number (1200500153) to that given on the application (1301907256)</p> <p>Action: Participant to notify Ofgem of actual installation capacity (or serial number) as given on the nameplate via RHI.audit@ofgem.gov.uk. Ofgem to determine appropriate course of action.</p>				
<p>3.1.1.4 Confirm date of commissioning The boiler number declared does not match the application (see 3.1.1.3). The commissioning date provided was for the wrong boiler number meaning the commissioning date declared is incorrect.</p> <p>Observation: Commissioning certificate provided by participant provides a different commissioning date (12/02/2014) to that given on the application (07/03/2014). Action: Participant to confirm correct commissioning date via RHI.audit@ofgem.gov.uk. Ofgem to determine appropriate course of action.</p>				
<p>3.1.1.10 Where installation includes a buffer vessel (accumulator). The original application shows no buffer vessel installed on the system. On site a four port buffer vessel was identified within the boiler room (this was shown in the application HLC spreadsheet photographs). The location of the buffer vessel has no impact on eligible heat readings but Ofgem may wish to have this shown for completeness. This has no impact on eligible heat readings. Observation: Minor inconsistencies noted between submitted schematic and actual installation arrangement. The schematic in the application incorrectly describes a single plant providing heat to both Auxiliary House 5 and 6. In addition the buffer vessel has not been declared on the schematic. Action: Participant to provide an amended schematic via RHI.audit@ofgem.gov.uk. Ofgem to determine appropriate course of action.</p>				

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3.1.2 Eligible Heat Use

Perform paper-based check and walkdown of the distribution system connecting heat generating plant (eligible and ineligible) to heat users (eligible and ineligible)

Ref	Check	Comments
3.1.2.1	Identify mediums used to deliver heat to eligible purposes used (use ✓ to identify all that apply). Include a description of mediums used in notes section below. Direct hot air heating is not eligible	✓ Hot Water
		Steam
		Heat Transfer Oil
3.1.2.2	Identify eligible purposes for which heat is used (use ✓ to identify all that apply). Include a description of heat use in notes section below. Purposes other than those listed are not eligible and should be noted	✓ Space heating within a building
		Water heating within a building
		Process heating within a building
		Commercial cleaning other than in a building
		Commercial drying other than in a building
3.1.2.3	Where the eligible purpose(s) identified are within a building, confirm that the building(s) in which eligible heat uses occur meet the RHI definition of a building e.g. fully enclosed and permanent. Take photographs of relevant areas where this is not the case.	The auditor inspected the building and found it to be fully enclosed and permanent
3.1.2.4	Where appropriate, confirm through documentation and inspection that the building(s) where heat is used are not single domestic	Confirmed – the property is a poultry house.
3.1.2.5	Confirm all heat loads and users connected to system as described on system schematic	Confirmed.
3.1.2.6	Where the eligible purpose(s) identified are within a building and vents are present, check that the vents can be fully closed. If 'Yes' or 'N/A' (i.e. no vents exist) proceed to section 3.2. If 'No' vents cannot be fully closed answer question below.	Yes
3.1.2.7	Has the participant declared the vents to Ofgem and provided information to Ofgem? If 'Yes', please verify vents information has been correctly provided by completing section 3.1.3. If, 'No', then auditor to take photographic evidence and discuss with the participant what the purpose of the vents is.	n/a

3.2 TECHNOLOGY SPECIFIC CHECKS

3.2.1 Solid Biomass

Ref	Check	Comments
3.2.1.1	Confirm plant is utilising <u>solid</u> biomass (state fuel(s) used); Cross-check for indications of the use of alternative fuels that have not been declared (especially fossil fuels)	<u>Audit Pack</u> (application – HG140):
		Wood pellets.
3.2.1.2	Confirm participant is maintaining suitable records regarding biomass fuel/feedstock purchase and use (see RHI Guidance Vol 2, Para 4.4)	See notes.
3.2.1.3	Confirm that participant is aware of Ofgem document <i>Guide to keeping records for participants using 100% biomass fuel</i> (updated June 2014). Note any feedback from the participant as to the usefulness of the guidance in notes section below	The auditor asked the participant who was not aware of the guidance document.

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3.2.1.4	For installation with an installed capacity under 45kW _{th} , confirm that the fuel supply is “100% biomass by energy content” by viewing fuel supply contract or letter from supplier (state evidence tabled).	n/a >45kW _{th} .
3.2.1.5	Does the installation have an FMS questionnaire? If Yes answer questions below, if no, then proceed to <i>Question 3.2.1.8</i>	No.
3.2.1.6	Check that use of fuel mirrors that given in the FMS questionnaire	
3.2.1.7	Verify that the procedures outlined within the FMS Questionnaire are being followed	
3.2.1.8	Does the installation utilise fossil fuels for permitted ancillary purposes? If Yes answer questions below, if no, then proceed to <i>Question 3.2.1.13</i>	No
3.2.1.9	Where use of fossil fuels is identified, confirm that their use is limited to permitted ancillary purposes (see RHI Guidance Vol 2, Para 4.14 onwards)	
3.2.1.10	Check how the quantity and energy content of the fuels used is recorded	
3.2.1.11	Check periodic fuel data submitted to Ofgem for a given period and trace back through site's own records to confirm data originates from plant	
3.2.1.12	Verify methods used for determining the proportion of fossil fuel used for ancillary purposes relative to total energy input.	
3.2.1.13	Does the installation utilise feedstock contaminated with fossil fuels? If Yes answer questions below, if no, then proceed to <i>Biomass Air Quality Checks</i> below.	No
3.2.1.14	Verify methods used for determining the level of fossil derived contamination in biomass relative to total energy input	
3.2.1.15	Check fuel processing facilities for evidence that contamination is as a result of the deliberate addition of fossil fuel to biomass, which is not permitted under RHI	
Notes		
<p>3.2.1.2 Confirm participant is maintaining suitable records regarding biomass fuel/feedstock purchase and use (see RHI Guidance Vol 2, Para 4.4) Records of deliveries to site, not individual systems. There are three pellet silos on site, each of which serve two RHI systems. This means that it is not possible to keep a record of deliveries to each individual RHI installation, an alternative approach will have to be found to record the amount of pellets used by each system. Non-compliance: Biomass fuel records are kept of wood pellet deliveries to site, however the deliveries are for all six RHI installations at the site and so there are no individual records kept for each RHI installation. Action: Participant to keep records of fuel/feedstock use for each individual RHI installation at the site.</p>		

4 Metering and schematic inspection

This section reviews the overall site schematic, IRMA if applicable and metering equipment. This is applicable to all technologies.

4.1.1 Schematic and metering inspection

The inspection of the schematic should focus on the heat metering components and accuracy of the site schematic

Ref	Check	Comments	
4.1.1.1	Confirm scheme compliant with any non-standard conditions relevant to their accreditation	<u>Audit Pack (inc IRMA):</u>	<u>Site Visit:</u>
		Not applicable no non-standard conditions apply to site.	Not applicable.
4.1.1.2	Confirm metering is configured in such a way to allow discrimination between heat from eligible and ineligible installations as well as heat supplied to eligible and ineligible uses	<u>Audit Pack (inc IRMA):</u>	
		Confirmed	
4.1.1.3	Check and confirm location of metering components as per system schematic and IRMA. Confirm that meter components have been installed in accordance with manufacturer's guidelines. <u>If there are any discrepancies take photographic evidence and note whether discrepancy was noted in IRMA.</u>	<u>Site Visit:</u>	
		The heat meter was observed to be between the biomass boiler and the buffer tank. Note as per previous observation against check 3.1.1.9 the buffer tank was not shown on the schematic.	
4.1.1.4	Check proximity of flow meters to pumps. Check pipework diameter and record distance between pump discharge and flow meter. State if not clearly separated by more than 10 pipe diameters. <u>Take photographic evidence where applicable.</u>	<u>Audit Pack (inc IRMA):</u>	<u>Site Visit:</u>
		Proximity of heat meters to pumps is not shown in the audit pack.	Heat meters were observed to be more than 10 pipe diameters from the nearest pump
4.1.1.5	Check for presence of heat rejection facility. Where heat rejection facility has been identified , confirm purpose of heat rejection facility with site staff	<u>Audit Pack (inc IRMA):</u>	<u>Site Visit:</u>
		There is no heat rejection facility present.	There is no heat rejection facility present
4.1.1.6	Where plant has been claimed to be removed , compare to schematic and IRMA to verify location of removed plant. <u>Take photographic evidence</u>	<u>Audit Pack (inc IRMA):</u>	<u>Site Visit:</u>
		No plant claimed removed.	No plant removed since most recent schematic.
4.1.1.7	Where plant has been claimed to be added , confirm presence of new plant. <u>Take Photographic Evidence. Cross check plant serial numbers</u>	<u>Audit Pack (inc IRMA):</u>	<u>Site Visit:</u>
		No plant claimed added.	No plant added.

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4.1.2 Metering Equipment

Heat Meters

Confirm that all heat metering instrumentation has been designed and manufactured to MID Class 2 (or equivalent) accuracy requirements. Note if the site has a large number of heat meters or it is not practical to take readings from all heat meters please comment on this in the notes section below.

Meter Tag	Description (Application – HI140x-1)	Item Type		Make and Model (Application – HI120x-1)	Serial Number (Application – HI130a-1)	Confirm designed and manufactured for MID Class 2 compliance [Use ✓] *	Last periodic data reading supplied by Ofgem 08/09/2014	Audit meter reading 04/11/2014
		Packaged Heat Meter	Heat Meter, Separate Components Calculator Flow Meter					
1	Personal information redacted by the RHI Inquiry	✓		Kamstrup A/S (see notes)	Personal information redacted by the RHI Inquiry	✓	378,580	475,700

* NB: Confirmation of this point does not consider whether the meter has been correctly installed. Refer to Check 4.1.1.3 for issues regarding heat meter installation.

Notes: (Detail documentation reviewed to confirm compliance with MID Class 2, include any other heat meter comments)

The heat meter installed onsite was observed to be a Kamstrup Multical 402. MID compliance was confirmed by the heat meter nameplate which stated compliance with MID class 2. The participant also provided calibration certificates for the heat meter.

Ref	Check	Comments	
		IRMA:	Site Visit:
4.1.2.1	Verify heat meter unit descriptions and serial numbers above against IRMA and situation on site	Confirmed	See notes
4.1.2.2	Check meters are capable of continuous operation and operating at the time of the visit	Confirmed, the auditor confirmed that the heat meter was operational at the time of the audit.	
4.1.2.3	Check for evidence of tampering or modification of the meters since installation or last calibration	There was no evidence of tampering of the heat meter. There have been alterations to the heat distribution pipework, however the heat meter has remained in its original location, unaltered.	

Notes:

4.1.2.1 Verify heat meter unit descriptions and serial numbers above against IRMA and situation on site: The heat meter is described as a Kamstrup A/S and the meter on site is a Kamstrup Multical 402. This matches the photograph of the heat meter in the audit pack. The serial number was confirmed to match that on the application.

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4.1.3 Heat meter readings

The auditor should refer to the above table of heat meter records (periodic data and onsite readings) for answering and supporting points made in this section.

Ref	Check	Comments
4.1.3.1	Confirm that participant keeps records of meter readings submitted to Ofgem. Also note any procedures or methods employed by the Participant to confirm that submitted meter readings are not erroneous.	The participant is not keeping records of heat meter readings. There is no error checking method in place (see notes).
4.1.3.2	Check whether reported heat output levels vary according to changes in demand (e.g. fall in summer due to less space heat demand). <i>(Comment if different message arises from periodic data to meter readings taken on site.)</i>	There are too few periods of data to perform this check, however it is not anticipated that the readings will fluctuate in a normal pattern as the heat load varies on a 42 day cycle.
4.1.3.3	For Fully Accredited Schemes. Take set of monthly or quarterly data reported to Ofgem and trace back through operator's own records to confirm that data originated from plant.	Could not perform check – there are no readings on site to inspect. See 4.1.3.1.
Notes:		
4.1.3.1 Confirm that participant keeps records of meter readings submitted to Ofgem. Also note any procedures or methods employed by the Participant to confirm that submitted meter readings are not erroneous.		
Observation: No records of meter readings were observed during audits Action: Participant to keep a written record of periodic meter readings to assist with error checking.		

The auditor should also perform the following assessment to determine whether reported heat generation from the installation is commensurate with the anticipated operating hours given in the application

Ref	Check	Value	
		Start Date	End Date
4.1.3.4	Using periodic data submissions, provide the start and end dates for the quarterly period with the greatest value for <i>heat generated by installation</i> (HGBI) in the last twelve months.	07/03/2014	09/06/2014
4.1.3.5	What was the value for <i>heat generated by installation</i> (HGBI) for this period (in kWh)?	212,120	
4.1.3.6	What was the duration of this period (in days)?	94	
4.1.3.7	Using the following expression, calculate <i>average weekly running hours</i> for the installation during this period: $[Average\ Weekly\ Running\ Hours = \frac{7x}{cd}]$ <p>Where: x is <i>heat generated by the installation</i>, in kWh c is the installation capacity of the installation, in kW_{th} d is the duration of the period, in days</p>	159 hours	
4.1.3.8	Compare the above result with the annual average weekly running hours given in the application (question HH130). Are these values similar, having taken into account any seasonal variation?	41 hours, see notes.	
4.1.3.9	Ask the operator what the average weekly running hours are for the installation during the heating season. Is the operator's response similar to the value given in the application (question HH130)?	The boiler is in use constantly – 168 hours per week, however it is shut off for one week in every 7 whilst the shed is cleaned.	
Notes:			

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4.1.3.8. Compare the above result with the annual average weekly running hours given in the application (question HH130). Are these values similar, having taken into account any seasonal variation? The application described average weekly running hours of 41 hours; however in reality it is greater at 159 hours. Indeed the project annual generation of 211,428kWh entered in the heat loss calculator is exceeded over the period March to June 2014 as stated in check 4.1.3.5 above. **Non-compliance:** In the heat loss calculation, the participant had assumed that the installation would operate for 41 hours per week on an average basis. Following discussion with the participant, the auditor understands that the installation operates for at least 168 hours per week.
Action: Participant to amend Heat Loss Calculation to include correct number of operating hours. Ofgem to determine appropriate course of action.

4.1.4 Heat Loss Calculations

Where metering does not account for heat distribution losses (i.e. metering is not positioned at point of use), participants will be expected to use determine extent of heat loss from external pipework.

Ref	Check	Comments
4.1.4.1.	Identify which situation applies with regards external pipework (use ✓ to identify only one option)	(a) No external pipework is present
		(b) External pipework is present. Heat meters are positioned to account for heat losses from that pipework.
		(c) External pipework is present. Heat meters are not positioned to account for heat losses from that pipework. A heat loss assessment has been submitted to Ofgem (included in audit pack)
		(d) External pipework is present. Heat meters are not positioned to account for heat losses from that pipework. A heat loss assessment has not been submitted to Ofgem.
If options (a) or (b) apply then proceed to Section 4.1.5. If option (c) applies then proceed to Check 4.1.4.2. If option (d) applies then describe and note pipework and/or metering positioning in notes section below. Take photographic evidence.		
Notes:		

Ref	Check	Comments
4.1.4.2.	Has the participant completed only Question 2(A) of the <i>heat loss assessment</i> ? If Yes answer questions below, if no, then proceed to 'Heat Loss Calculator' sub-section	No
4.1.4.3	Confirm that heating system comprises no sections of buried external pipework. Take photographs any buried pipework identified.	
4.1.4.4	Where the participant has completed 2(A)(a) Confirm that all individual lengths of external pipework are 10m or less in length.	

Cross-check details provided in submitted Heat Loss Assessment¹ demonstrating the external pipework is 'properly insulated'. Conduct checks for up to four individual lengths of pipework.

¹ Included in audit pack
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		Pipe Section			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Section Name (from <i>additional pipework information sheet of heat loss assessment</i>)					
Confirm details given in heat loss assessment match situation found on site . [provide details from <i>additional pipework information sheet of heat loss assessment</i> and use ✓ to confirm a match, use ✖ to denote a mis-match and provide further details in the notes section]					
Is pipework above ground or buried?					
Temperature of fluid running through pipes (deg C)					
Pipe diameter (mm), excluding any insulation					
Where manufacturer heat loss declaration is being used , heat loss rate for pipework (in W/m)					
Where manufacturer heat loss declaration is <u>not</u> being used	Insulation Thickness (mm)				
	Insulation Thermal Conductivity (W/mK)				
	Surface Emissivity				
Confirm pipe section can be considered to be 'properly insulated' (above-ground pipe sections only).					
Confirm that details provided above result in the heat loss assessment calculator ² confirming that the pipework is 'properly insulated'					
Describe any issues with the condition of the insulation that may have an adverse impact on its performance (e.g. gaps in insulation or evidence of rainwater ingress)					
Notes					

Heat Loss Calculator

Review heat loss calculator with participant to confirm that it has been completed accurately. Note any potential discrepancies.

Notes:

² Question 1 in the heat loss assessment comprises a calculator that will determine whether a length of pipework will be 'properly insulated'. If the details given in the heat loss assessment match those found on site then the auditor can use the result given on the *additional pipework information sheet* of the heat loss assessment. If mis-matches are identified then the auditor will need to re-enter the actual details into Question 1 of the heat loss assessment and note down the result of the assessment.

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As previously reported against check 4.1.3.8 the reported operating hours and annual generation entered into the heat loss calculator appear to be underestimated, this will have an impact on the heat losses from the installation. This has been raised as a non-compliance against check 4.1.3.8 and should be amended by the participant.

Regarding the other parameters within the heat loss calculator, the heat meter is located between the biomass boiler and the buffer tank. Pipework runs from the buffer tank to the houses and part of this pipework is external. The distances entered into the heat loss calculator were confirmed to be correct for all lengths of pipework. In addition the auditor can confirm that the pipework arrangement ensures that the installation is hydraulically separate from the adjacent installation supplying

4.1.5 Use of Chemical Additives in Heat transfer fluid

Ref	Check	Comments
4.1.5.1	Is there evidence of the use of chemical additives (e.g. frost/corrosion inhibitors) known to influence the accuracy of heat meters ³ in sections of pipework where heat meter components are located? If Yes answer questions below, if no, then proceed to next section ⁴ .	No
4.1.5.2	For all meters affected, check that meters components have been appropriately calibrated or configured for the composition of the fluid in the system.	
4.1.5.2	Check with participant whether there is any risk of fluid composition changing over time (e.g. dilution due to addition of top-up water). Check what precautions have been implemented to either i) maintain fluid composition or ii) maintain meter calibration for changing fluid composition.	

4.1.6 Maintenance and Calibration

Discuss with site personnel measures that they have adopted to ensure that the metering equipment has been, and continues to be suitably maintained. Check meter's calibration procedure, schedule and certificates

Ref	Check	Comments
4.1.6.1	Check operator has a maintenance regime in place to ensure meters are routinely calibrated.	The participant is aware that the heat meters need calibrating every 10 years and will arrange for the installer to re-calibrate the heat meter at that time.

³ At the time of writing, chemicals known to effect meter accuracy are limited to glycol-group compounds (e.g. ethylene glycol or propylene glycol).

⁴ Answering 'Yes' identifies that glycol is present, 'No', that no inhibitor or a known non-glycol based inhibitor is present, 'Unknown' that the participant is not aware of what, if anything is present.

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5 Audit visit close-out checklist

To be completed by Auditor prior to completing audit visit

	Check	Completed [✓/x]
1	Eligible plant and heat specific checks completed (Section 3.1)	✓
2	Technology Specific checks (Section 3.2)	✓
3	Metering and schematic inspection including heat meter readings (Section 4)	✓
4	Specific concerns raised by Ofgem have been addressed in investigations (See Section 1.2)	✓
5	<p>Auditor has all photographic evidence required. Photographic evidence included in the report are:</p> <ul style="list-style-type: none"> • Clarification of any specific issues requested by Ofgem • Nameplates of heat generating plant • Photographic evidence of any observations or non-compliances 	✓

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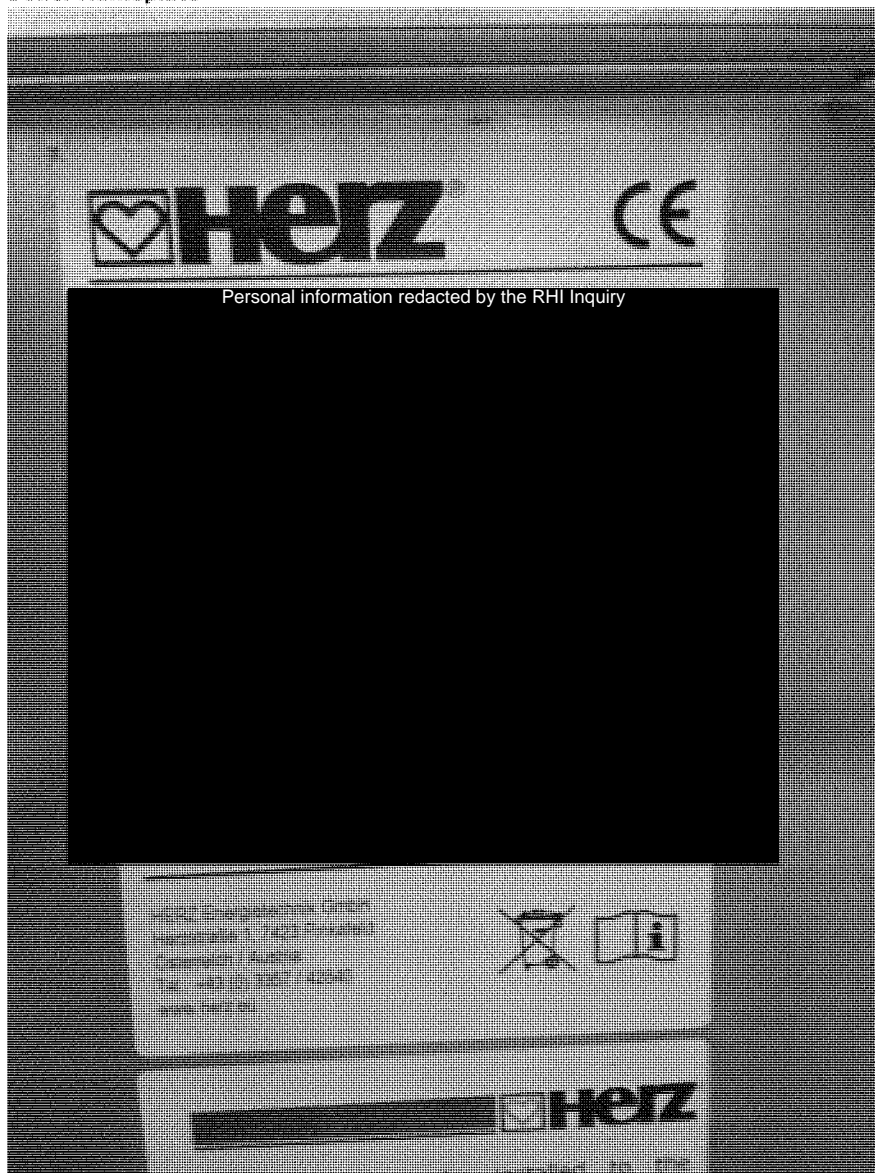
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Appendix A

Site Photographs

Boiler Nameplate



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Heat meter



END OF REPORT
