Heat Network Technical Assurance Scheme

Existing Heat Networks

Technical Specification

Energy Centre

Milestone 2

HNTAS-EX-TS-EC-M2

Version History

Revision	Notes	Date
V0.1	Draft issue	17/12/25

Disclaimer

The following HNTAS Code document is published in draft format. This document is intended to give the sector early sight of HNTAS requirements in their current stage of development for the purpose of facilitating sector understanding of the scheme.

Draft Code documents, including Technical Specifications and Assessment Procedures, have been reviewed and consulted on through a series of technical workshops with participation from a range of experts from across the heat network industry. The content of this document is still in development and subject to change. Requirements should not be considered as fixed at this stage.

Changes which may be made to this document in future include those to:

- reflect learnings from the New Build and Existing network pilot programmes;
- align with aspects of HNTAS which are subject to public policy consultation;
- align with new requirements in TS1 and MMS;
- align the terminology of this document with that used in other HNTAS documentation;
- rectify errors in this draft version; and
- improve clarity of contents.

The Key Failures set out in the draft Code documents have been identified as a specific area for review, to ensure that:

- all Key Failures enable a binary assessment;
- Key Failures are only included for genuine issues presenting major risks to KPIs, and that moderate or lower risks are considered via non-conformity processes; and
- Key Failures do not duplicate Technical Requirements unless there is a clear justification to do so.

DESNZ will be welcoming feedback on the information in this document via a change management process. This process will run in parallel to the HNTAS policy consultation and DESNZ invites stakeholders to engage with both, once they are open. You can sign up to receive updates on future detailed draft technical documents as they are published by contacting: heatnetworks@energysecurity.gov.uk.

Please be advised that this document references other HNTAS draft Code documents which have not yet been published. References to other documents will also be subject to change following the publication of updated standards. The final version of this document will be released before the launch of HNTAS.

Contents

Foreword

This Technical Specification forms part of the UK Government's Heat Network Technical Assurance Scheme (HNTAS, The Scheme) delivered by the Department for Energy Security and Net Zero, in partnership with the Scottish Government and Ofgem. The Department for Energy Security and Net Zero appointed FairHeat as technical author for this document.

The Scheme has been designed and developed in consultation with a range of experts across the Heat Network industry in the form of Technical Sub-Working Groups, culminating in a series of Technical Specifications and Assessment Procedures to facilitate the validation and verification of performance outcomes of Elements within a Heat Network.

This document specifies HNTAS Requirements for an Energy Centre Element within an Existing Heat Network required at Milestone 2.

This document sits within a series of Technical Specifications for an Energy Centre, which features within a wider Code documentation structure, as outlined in Table 1.

This Technical Specification has been issued in draft format and will be updated prior to scheme launch.

For further information on the use of this document within the Heat Network Technical Assurance Scheme, please refer to:

- the Heat Network Technical Assurance Scheme – Existing Heat Networks – Scheme Rules – Assessment Regime (HNTAS-EX-SR-XX-AS) document;
- the Heat Network Technical Assurance Scheme – Ongoing Regime – Scheme Rules – Replacement Regime (HNTAS-ON-SR-XX-RR) document.

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Shadow Code Management Committee

During the development of HNTAS, a Shadow Code Management Committee has been established, with representation from the Department for Energy Security & Net Zero (DESNZ), the Scottish Government, Ofgem and Heat Trust. The following items have been presented to, and approved by, this committee:

- Structure of Code documents for Existing Heat Networks
- Approach to Technical, Performance Monitoring and Data Protection and Smart Metering Requirements at each Milestone

- KPIs and thresholds at each Milestone

Code Document Structure

Technical Specifications

Document Type	Element		Milestone					
			Overview	Milestone 2	Milestone 3A	Milestone 3B	Milestone 4	Milestone 5
			M0	M2	M3A	M3B	M4	
Technical Specification	Energy Centre	EC	HNTAS-EX-TS-XX-M0	HNTAS-EX-TS-EC-M2	HNTAS-EX-TS-XX-M3A	N/A	HNTAS-EX-TS-EC-M4	HNTAS-NB-TS-EC-P4
	District Distribution Network	DD		HNTAS-EX-TS-DD-M2		N/A	HNTAS-EX-TS-DD-M4	HNTAS-NB-TS-DD-P4
	Substation	SS		HNTAS-EX-TS-SS-M2		N/A	HNTAS-EX-TS-SS-M4	HNTAS-NB-TS-SS-P4
	Communal Distribution Network	CD		HNTAS-EX-TS-CD-M2		N/A	HNTAS-EX-TS-CD-M4	HNTAS-NB-TS-CD-P4
	Consumer Connection	CC		HNTAS-EX-TS-CC-M2		HNTAS-EX-TS-CC-M3B	HNTAS-EX-TS-CC-M4	HNTAS-NB-TS-CC-P4

Table 1: Existing Network Technical Specification structure

Scope

This document specifies the HNTAS Requirements for an Energy Centre within an Existing Heat Network at Milestone 2.

Ongoing conformity with the requirements in this Code document shall also be maintained following the Milestone 2 assessment until conformity with Milestone 4 is demonstrated.

An Energy Centre is defined as a plant room that contains heat generation equipment; and/or equipment connecting to an energy source; or a Substation which contains heat generation equipment (e.g. building connection with heat pumps or top-up boilers).

A detailed definition of the Energy Centre is contained within the Heat Network Technical Assurance Scheme – Existing Heat Networks – Technical Specification – Overview (HNTAS-EX-TS-XX-M0) document.

References

Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- Heat Network Technical Standard (TS1) (HNTAS, 2025)
- Heat Network Metering and Monitoring Standard (MMS) (HNTAS, 2025)
- Heat Network Technical Assurance Scheme – Existing Heat Networks – Scheme Rules – Assessment Regime (HNTAS-EX-SR-XX-AS)
- Heat Network Technical Assurance Scheme – Ongoing Regime – Scheme Rules – Replacement Regime (HNTAS-ON-SR-XX-RR)
- Heat Network Technical Assurance Scheme – Existing Heat Networks – Technical Specification – Overview (HNTAS-EX-TS-XX-M0)

Informative references

There are no informative references in this document.

Terms and Definitions

For the purposes of this document, the terms and definitions given in the Heat Network Technical Assurance Scheme – Terms and Definitions (HNTAS-XX-TD) document apply.

M2. Requirements for Milestone 2

M2.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 2 shall be fulfilled.

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.1.	The O&M Manual shall be maintained in accordance with the applicable technical standard(s).	TS1 7.17.3 TS1 7.17.6	EC-M2-E01 EC-M2-E04
M2.1.2.	The Planned Preventative Maintenance (PPM) Schedule shall be produced and maintained in accordance with the applicable technical standard(s).	TS1 7.6.5 TS1 7.12.1 TS1 7.12.4 TS1 7.12.5 TS1 7.15.2 TS1 7.15.3 TS1 7.15.4 TS1 7.15.5 TS1 7.15.10 TS1 7.15.11 TS1 7.15.12 TS1 7.17.2 MMS 1.1.8 MMS 1.3.3 MMS 1.3.4 MMS 1.3.5 MMS 1.3.6	EC-M2-E02
M2.1.3.	All documentation and drawings shall be kept updated in accordance with the applicable technical standard(s).	TS1 7.12.2 TS1 7.17.6 TS1 7.17.8 MMS 4.1.2	EC-M2-E01 EC-M2-E04 EC-M2-E11 EC-M2-E24
M2.1.4.	All documentation and drawings shall be stored in a manner that facilitates easy access to organisations responsible for carrying out operation and maintenance activities in accordance with the applicable technical standard(s).	TS1 7.15.16 TS1 7.17.9	EC-M2-E10

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.5.	The Energy Centre, including the Metering and Monitoring System, shall be maintained in accordance with: • the O&M Manual(s); • the PPM Schedule; • any manufacturers requirements; and • the applicable technical standard(s).	TS1 7.6.1 TS1 7.6.2 TS1 7.6.3 TS1 7.6.4 TS1 7.6.5 TS1 7.12.4 TS1 7.12.5 TS1 7.13.1 TS1 7.14.5 TS1 7.14.6 TS1 7.15.1 TS1 7.15.2 TS1 7.15.10 TS1 7.15.11 TS1 7.15.12 TS1 7.17.2 MMS 1.1.8 MMS 1.3.3 MMS 1.3.4 MMS 1.3.5 MMS 1.3.6	EC-M2-E01 EC-M2-E02 EC-M2-E03 EC-M2-E04 EC-M2-E05
M2.1.6.	Where maintenance activities require that insulation needs to be removed, the insulation shall be refitted or replaced as soon as practically possible in accordance with the applicable technical standard(s). Where insulation is found to be wet, this shall be removed and replaced with new insulation in accordance with the applicable technical standard(s).	TS1 7.13.1	EC-M2-E02 EC-M2-E29
M2.1.7.	All Operatives responsible for carrying out operation and maintenance activities shall receive appropriate training in accordance with the applicable technical standard(s).	TS1 7.14.1	EC-M2-E06
M2.1.8.	All Operatives and Specialists responsible for carrying out operation and maintenance activities shall receive a site specific induction in accordance with the applicable technical standard(s).	TS1 7.14.2	EC-M2-E06
M2.1.9.	The Operating Risk Register shall be maintained in accordance with the applicable technical standard(s).	TS1 7.14.6 TS1 7.17.1	EC-M2-E09

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.10.	No earlier than 6 months prior to assessment, equipment and pipework condition in the Energy Centre shall have been determined, and remedial actions carried out where necessary in accordance with the applicable technical standard(s). Following assessment at Milestone 2, the condition of equipment and pipework in the Energy Centre shall be determined at least once per annum in accordance with the applicable technical standard(s).	TS1 7.16.1 TS1 7.16.2 TS1 7.16.3 TS1 7.16.4 TS1 7.16.5 TS1 7.16.8	EC-M2-E07
M2.1.11.	Where necessary, the destructive testing of pipework shall be carried out in accordance with the applicable technical standard(s).	TS1 7.16.6 TS1 7.16.7	EC-M2-E07
M2.1.12.	The Resilience Strategy shall be maintained in accordance with the applicable technical standard(s).	TS1 7.9.1 TS1 7.9.2 TS1 7.9.3 TS1 7.9.4	EC-M2-E08 EC-M2-E09
M2.1.13.	The Planned Preventative Maintenance (PPM) Schedule shall include activities that sufficiently maintain the water quality of the Heat Network in accordance with the applicable technical standard(s).	TS1 7.11.8 TS1 7.11.9 TS1 7.11.10 TS1 7.11.11 TS1 7.14.6 TS1 7.15.11	EC-M2-E02

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.14.	The Energy Centre water quality shall be maintained within the required KPI thresholds. Water quality sampling (and dosing of Chemically Treated systems) shall be carried out in accordance with the applicable technical standard(s). The applicable water quality KPIs shall be reported to HNTAS at the following intervals: • parameters measured via continuous monitoring shall be reported once per month; • parameters measured via laboratory testing of on site samples shall be reported in accordance with sampling frequency in the applicable technical standard(s). At the point of assessment, the following data shall be provided as a minimum: • for systems without continuous monitoring, a minimum of 2 sets of samples taken 3 months apart; • for systems with continuous monitoring, a minimum of 3 months of KPI data.	TS1 7.11.1 TS1 7.11.3 TS1 7.11.4	EC-M2-E14 EC-M2-E15
M2.1.15.	For Depleted Water systems, top-up water shall meet water quality parameter limits in accordance with the applicable technical standard(s). At the point of assessment, the following data shall be provided as a minimum: • for systems without continuous monitoring, a minimum of 2 sets of samples taken 3 months apart; • for systems with continuous monitoring, a minimum of 3 months of KPI data.	TS1 7.11.7	EC-M2-E16

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.16.	Water treatment records shall be kept detailing the: • sampling; • dosing (where applicable); and • the remedial actions carried out regarding water quality, in accordance with the applicable technical standard(s). Water quality records shall contain, for each parameter, a graphical representation where both the trend and limits can be observed.	TS1 7.11.5	EC-M2-E15
M2.1.17.	Where stagnant conditions occur in specific parts of the Energy Centre, circulation shall be established through these areas in accordance with the applicable technical standard(s).	TS1 7.11.12	EC-M2-E18
M2.1.18.	Installed equipment no longer in use shall be disconnected and drained in accordance with the applicable technical standard(s).	TS1 7.11.13	EC-M2-E04 EC-M2-E20

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.19.	No earlier than 6 months prior to assessment, an inspection shall have been undertaken by a competent individual or individuals within a team separate to the team responsible for Energy Centre O&M activities, in accordance with the applicable technical standard(s). The inspection shall check against conformity with Technical Requirements and ensure that Key Failures are not occurring. Where non-conformities are identified, the report shall outline what remedial actions are required to ensure future conformity. Any reports produced through this inspection shall be uploaded to HNTAS. Following assessment at Milestone 2, an inspection shall be undertaken at least once per annum in accordance with the applicable technical standard(s).	TS1 7.15.14	EC-M2-E21
M2.1.20.	Water quality equipment shall have been installed in accordance with the applicable technical standard(s).	TS1 3.11.14 TS1 3.11.15 TS1 3.11.16 TS1 3.11.17 TS1 3.11.19 TS1 3.11.22 TS1 3.11.27	EC-M2-E22
M2.1.21.	Working pressures shall have been calculated and determined, with risks mitigated where necessary, in accordance with the applicable technical standard(s). *Note: it is expected that this assessment has been undertaken with consideration for the other Elements present in the Heat Network.*	TS1 3.6.1 TS1 3.6.2 TS1 3.6.3 TS1 3.6.4 TS1 3.6.7 TS1 3.6.8 TS1 3.6.9 TS1 3.6.10 TS1 3.6.12 TS1 3.6.13 TS1 3.6.14	EC-M2-E23
M2.1.22.	The KPI Schedule shall be maintained with accurate information and references to relevant documentation.		EC-M2-E30

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.1.23.	The Technical Parameters Schedule shall be maintained with accurate information and references to relevant documentation.		EC-M2-E31

Table 2: Technical Requirements for the Energy Centre at Milestone 2

M2.2. Performance Monitoring Requirements

The applicable Performance Monitoring Requirements in Table 3 shall be fulfilled.

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M2.2.1.	The Metering and Monitoring Strategy shall be maintained in accordance with the applicable technical standard(s).	TS1 7.12.2 MMS 4.1.2	EC-M2-E24
M2.2.2.	The Automatic and Remote Monitoring System (ARMS) shall be specified in accordance with the applicable technical standard(s).	TS1 3.12.5	EC-M2-E25
M2.2.3.	Monitoring Points (including all thermal energy meters, utility meters, and sensors) shall be sized and specified in accordance with the applicable technical standard(s).	TS1 3.12.2 TS1 3.12.3	EC-M2-E26 EC-M2-E27 EC-M2-E28
M2.2.4.	Thermal energy meters shall be recalibrated (where necessary) in accordance with the applicable technical standard(s).	TS1 7.12.4 TS1 7.12.5 MMS 1.1.8 MMS 1.3.3 MMS 1.3.4 MMS 1.3.5 MMS 1.3.6	EC-M2-E24 EC-M2-E28
M2.2.5.	The Metering and Monitoring System shall calculate and report, at the required interval, each applicable Energy Centre KPI to HNTAS.		EC-M2-E12
M2.2.6.	The Energy Centre performance shall be within the required KPI thresholds at the point of assessment. A minimum period of 3 months worth of KPI data shall be provided at the point of assessment. Where performance deviates outside of KPI thresholds within the data provided, the Responsible Party shall outline the root cause(s) of this deviation, the remedial actions undertaken to restore the KPI to within required thresholds, and provide justification why each deviation will not impact future conformity with KPI thresholds.	TS1 7.8.1 TS1 7.8.2 TS1 7.8.3 TS1 7.8.6 TS1 7.12.6 TS1 7.17.4	EC-M2-E12 EC-M2-E13

Performance Monitoring Requirement	Applicable technical standard(s)	Evidence Requirement(s)
Following assessment at Milestone 2, the Energy Centre performance shall be monitored against the KPI thresholds. Where performance is outside of KPI thresholds for a reporting interval, the Responsible Party shall outline justification for this through a note uploaded to HNTAS. Where performance is outside of KPI thresholds for 3 consecutive reporting intervals, a detailed investigation shall be undertaken by a competent individual to diagnose the root cause issue and develop a plan for remedial actions as necessary. Any remedial actions taken to rectify issues with performance shall be recorded in the Maintenance and Remedial Action Log.		

Table 3: Performance Monitoring Requirements for the Energy Centre at Milestone 2

M2.3. Key Failures

The applicable Key Failures listed in Table 4 shall not be present.

Key Failure		Outcome to avoid	Evidence Requirement(s)
M2.3.1.	PPM personnel (or contracts) not in place and/or maintenance not scheduled at sufficient frequency, or not at all.	Maintenance not carried out on network, which could result in a reduction in performance of the Energy Centre and network. This could lead to KPI thresholds not being achieved.	EC-M2-E02
M2.3.2.	Operatives carrying out maintenance activities have not received sufficient, or any training specific to the network.	Lack of awareness of network requirements and characteristics. This could lead to false diagnosis of network issues, and/or incorrect maintenance activities carried out on the network, which impacts the longevity and performance of the network.	EC-M2-E06
M2.3.3.	Adjustments made to the control system which are either one of or combination of the following: • unjustified; • negatively impact on performance; • not recorded; and • not in accordance with the Description of Operation (unless justified for performance improvement).	Unnecessary changes to system performance which results in KPI thresholds not being achieved. Examples include: 1. an increase in temperature set point could lead to elevated heat losses from the system, and therefore may not meet the KPI threshold. 2. changes to pressure set point could lead to equipment being subjected to pressures outside of its permitted range, or air ingress to the system if the set point is decreased, leading to issues with water quality. 3. changes to pump controls could lead to Consumers not receiving heat at the terminal connections, or excessive energy	EC-M2-E03 EC-M2-E12 EC-M2-E13

Key Failure		Outcome to avoid	Evidence Requirement(s)
		consumption where pumps are placed into hand mode. 4. Adjustments not recorded may pose a lack of clarity to future operators and may result in incorrect or non-optimal operation and maintenance.	
M2.3.4.	Equipment unnecessarily in manual operation mode.	Energy Centre does not operate in accordance with the design intent and Description of Operation, which may result in KPIs not being met.	EC-M2-E03 EC-M2-E12 EC-M2-E13
M2.3.5.	Pressurisation unit not monitored and maintained in operation.	Frequent equipment failure, resulting in network downtime.	EC-M2-E03 EC-M2-E05 EC-M2-E07 EC-M2-E08 EC-M2-E14
M2.3.6.	Inspection of pump bellows not carried out.	Failure of pump bellows, leading to catastrophic outcomes such as major leaks and extended outages of the Heat Network.	EC-M2-E03 EC-M2-E12 EC-M2-E13
M2.3.7.	Equipment left in fault (e.g. boilers or pumps left in fault mode, causing redundancy of major plant to not be maintained).	Network not being operated and maintained in accordance with the Description of Operation. Redundancy removed from the network. Insufficient equipment available to deliver heat to the network, which could impact the security of heat supply to Consumers.	EC-M2-E03 EC-M2-E12 EC-M2-E13
M2.3.8.	Pump differential sensors left in fault.	Pumps respond incorrectly to variations in network demand, or do not respond at all. This could: • cause excessive network flow rates at periods of low heat demand, which unnecessarily increases parasitic energy consumption and network return	EC-M2-E03 EC-M2-E12 EC-M2-E13

Key Failure		Outcome to avoid	Evidence Requirement(s)
		temperature, which may cause KPIs not to; achieve their thresholds. • cause low network flowrates at periods of high demand, which may reduce the heat supplied to end Consumers and reduce Consumer comfort.	
M2.3.9.	Nuisance alerts and alarms, on the control system or Metering and Monitoring System, preventing the operating teams identifying and resolving genuine issues.	Nuisance faults becoming prevalent and frequent, making it difficult to capture actual faults within the Energy Centre. This could lead to failure of equipment and/or reduced performance, resulting in KPIs not being met.	EC-M2-E03 EC-M2-E12 EC-M2-E13
M2.3.10.	Alarms and alerts removed from the control system or Metering and Monitoring System without a suitable change management process engaged to facilitate this.	Removal of alerts and alarms without a change management process could result in necessary alerts and alarms being removed from the system, putting the network at increased risk of failure and may not alert operatives when failures are occurring.	EC-M2-E03 EC-M2-E04 EC-M2-E12 EC-M2-E13
M2.3.11.	Leaking and/or weeping items left unrectified.	Increased water consumption of the network, leading to issues with water quality and reduced equipment longevity. Insulation becoming wet, increasing the heat losses from the network, and increasing the likelihood of pipework corrosion.	EC-M2-E03 EC-M2-E14

Key Failure		Outcome to avoid	Evidence Requirement(s)
M2.3.12.	Exercising of ancillary equipment (e.g. isolation valves) not carried out.	Valve seizure due to being left in the same position for extended periods. This could lead to the valve needing replaced prematurely. Significant disruption to the network could be experienced during maintenance activities as a result of sections of the network not being able to be isolated.	EC-M2-E02 EC-M2-E03
M2.3.13.	Water quality sampling not undertaken in accordance with industry standards.	Unable to identify issues with water quality in the Energy Centre. This could lead to reduced equipment longevity and increased maintenance requirements for equipment.	EC-M2-E03 EC-M2-E14 EC-M2-E15
M2.3.14.	Water quality equipment not maintained (e.g. filters not replaced, strainers not cleaned).	Reduced efficiency of equipment due to poor water quality. Heat supply issues due to blocked strainers that have not been maintained.	EC-M2-E03 EC-M2-E14 EC-M2-E15
M2.3.15.	Equipment not properly decommissioned when no longer required.	A significant dead leg in the Energy Centre created, which could increase the risk of bacterial growth. This could reduce the water quality of the Energy Centre and lead to increased maintenance requirements.	EC-M2-E20
M2.3.16.	Insulation left damaged, wet, or not reinstalled following maintenance activities, including pipework and equipment.	Increased heat losses from the network due to damaged or wet insulation, or due to insulation being removed from pipework and not replaced. This could result in heat losses not achieving the KPI threshold.	EC-M2-E21
M2.3.17.	Monitoring Points not producing reasonable and expected data.	Unable to accurately monitor performance and risks falsely being able to achieve or not achieve KPI thresholds.	EC-M2-E12

Key Failure		Outcome to avoid	Evidence Requirement(s)
M2.3.18.	Monitoring Points not communicating with ARMS.	ARMS unable to extract, record and store data from Monitoring Point, and therefore KPIs cannot be calculated, and performance monitored.	EC-M2-E12
M2.3.19.	Monitoring Point faults not identified and rectified. This includes batteries not being replaced where battery powered meters are installed.	Unable to measure performance data required for KPIs.	EC-M2-E03 EC-M2-E12 EC-M2-E13
M2.3.20.	Faults with ARMS not identified and rectified (e.g. gateways faulty).	Unable to monitor performance - extract, record, and store data, or calculate and report on KPIs.	EC-M2-E03 EC-M2-E12 EC-M2-E13
M2.3.21.	Documentation not kept up-to-date (e.g. drawings not updated with changes to network, maintenance activities carried out not recorded, changes to control system where necessary not recorded, Condition Log not updated when equipment is replaced, risk register not updated).	Documentation not reflective of installed network and actual operation, which can lead to incorrect operation and maintenance of network.	EC-M2-E11
M2.3.22.	The condition of Heat Network equipment leaves the system with insufficient resilience.	Increased risk of equipment failure and increased risk of interruption to heat supply.	EC-M2-E07 EC-M2-E08
M2.3.23.	Resilience Strategy is not up-to-date and reflective of changes made to the Heat Network.	Increased likelihood of an interruption to heat supply and increased impact should that interruption occur.	EC-M2-E08
M2.3.24.	Inappropriate thermal energy meter installed.	Inaccurate measurement of performance data due to inappropriate specification or size of heat and/or utility meter.	EC-M2-E26

Key Failure		Outcome to avoid	Evidence Requirement(s)
M2.3.25.	No water meters on water top up connection to Heat Network.	Unable to monitor top up water and, therefore, leaks from the network, making the Heat Network less reliable and more susceptible to interruptions.	EC-M2-E22 EC-M2-E24
M2.3.26.	Pressurisation, expansion and/or vacuum degassing equipment is not installed as per manufacturers requirements. This includes not providing the required minimum separation distance between connections to the network and using the incorrect connections.	Pressurisation, expansion and/or vacuum degassing equipment not operating correctly, increasing the risk of outages and network downtime.	EC-M2-E22
M2.3.27.	Inadequate labelling of plant, ancillary equipment, and pipework.	Increased difficulty in knowing which equipment has been maintained and/or serviced in operation, which could lead to pieces of equipment not being maintained, resulting in premature failure. Inadequate labelling of pipework could present confusion throughout the network between flow and return pipework, which could result in pipework being plumbed incorrectly further downstream.	EC-M2-E21
M2.3.28.	Missing, unclear, or incorrectly labelled control system points and Monitoring Points physically on-site, within O&M documentation and on the ARMS. Examples include incorrect sensor naming and meter naming.	Difficulty in identification of control system points and Monitoring Points for future O&M operatives, risking the ability to be able to accurately measure performance and report on KPIs.	EC-M2-E01 EC-M2-E24

Key Failure		Outcome to avoid	Evidence Requirement(s)
M2.3.29.	Lack of appropriate isolation, vent and drain strategy.	Operator is unclear of required isolation, ventage and drainage requirements when conducting planned and unplanned remedial maintenance activities.	EC-M2-E02 EC-M2-E08
M2.3.30.	Inappropriate consideration of system working pressures, including: • incorrect calculation of system working pressures; • inappropriate mitigation of risks posed by system working pressures; • inappropriate equipment specified for system working pressures; and • lack of/inappropriate pressure safety system.	Increased risk posed by system working pressures, including: • exposure of personnel to high pressure water; • equipment failure; and • interruptions to heat supply.	EC-M2-E23
M2.3.31.	Differential pressure exceeding the differential pressure rating of equipment.	Increased risk posed by differential pressures, increasing the likelihood of equipment failure and inefficient/ineffective operation.	EC-M2-E23
M2.3.32.	Material installed/specified which is incompatible with the Water Quality Strategy.	Increased risk of corrosion, major leaks and interruptions to heat supply.	EC-M2-E22

Table 4: Key Failures for the Energy Centre at Milestone 2

M2.4. Evidence Requirements

The applicable Evidence Items listed in Table 5 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

Evidence Item		Detailed description and requirements
EC-M2-E01	O&M Manual	A completed O&M Manual shall be provided, which shall include any changes made to the O&M manual during operation.
EC-M2-E02	Planned Preventative Maintenance (PPM) Schedule	To include a schedule outlining the operation and maintenance plan for all equipment in the Energy Centre. Shall detail wherever Specialists or external bodies are required to carry out PPM activities.
EC-M2-E03	Maintenance and Remedial Action Log	To detail any operation and maintenance activities carried out on the Energy Centre. Shall detail the date the activity was carried out and the person that performed the activity. Shall outline any remedial actions carried out on the network as part of the operation and maintenance activity.
EC-M2-E04	O&M Change Log	Shall be a log of any changes made to the network during operation. This includes: • changes that result in the hydraulic arrangement deviating from previous; • changes to the spatial layout of the Energy Centre; • changes to the control system, set points or Description of Operation; • changes to the Resilience Strategy; • changes to the Operating Risk Register; • equipment that has been replaced; and • Monitoring Points that have been replaced. This is not to include activities noted in the Maintenance and Remedial Action Log for the general maintenance carried out on the Energy Centre.
EC-M2-E05	Equipment servicing certification	Shall include all servicing certification for each piece of equipment. Shall include certification at the frequency as required by the PPM Schedule. Shall include detail for each piece of equipment as required by the PPM Schedule.

Evidence Item		Detailed description and requirements
EC-M2-E06	Register of Operatives	To include a list of all personnel that carry out, or will carry out operation and maintenance activities on the Energy Centre. This shall include for each person: confirmation that the person has completed a site specific induction; • the activity(s) that the person has carried, or will carry out; • the training that the person has received in relation to the activity(s); • the relevant qualifications (where applicable) that the person has; and • the relevant experience that the person has.
EC-M2-E07	Condition Log	To include all basic asset data and condition data for Heat Network equipment within the Energy Centre, including: • asset name; • asset ID; • asset classification code; • asset classification description; • asset criticality; • asset maintainer; • asset location; • asset install date; • asset condition grade; • asset priority grade; • whether asset is beyond economic repair; • asset operational status; • date of last condition survey; and • remaining life expectancy (years).
EC-M2-E08	Resilience Strategy	Shall outline the Resilience Strategy for the Heat Network, including: • the redundancy and recovery measures implemented; • the disaster recovery plan; • the critical spares log; and • the plant replacement strategy. This shall contain the strategy in the case of loss of heat supply within the Heat Network, and design

Evidence Item		Detailed description and requirements
		items for resilience (for example, isolation valve locations, locations for temporary heat supply).
EC-M2-E09	Operating Risk Register	A project specific risk register which shall include all risks outlined and proposed approaches to eliminate during operation of the Heat Network, mitigate or manage these risks.
EC-M2-E10	Document Storage System Statement	Shall outline the system intended to be used for storing and accessing documentation related to the Heat Network. Shall outline any hierarchy of access to the storage system relative to the personnel carrying out operation and maintenance activities.
EC-M2-E11	Energy Centre drawings	As-built drawings of the Energy Centre with any necessary changes made during operation implemented. Shall include: • schematics; and • drawings (layout, plan, elevation).
EC-M2-E12	Reporting of KPIs	A minimum of 3 months worth of KPI data shall be reported to HNTAS at the point of assessment. Following assessment at Milestone 2, KPIs shall be reported to HNTAS at the required frequency. Where KPIs are outside of required thresholds for the reporting period, the Responsible Party shall upload a note justifying this discrepancy to HNTAS.
EC-M2-E13	KPI Remediation Report	Where any Energy Centre KPI is not within its required threshold for 3 consecutive reporting intervals, a report shall be produced which shall outline: • the findings of the investigation undertaken by a competent individual into the root cause issue of non-conformity; and • the remedial action(s) taken, or planned to be taken, for the KPI to return to within its required threshold. Where a diagnosis is not yet known, the report shall outline a plan for acquiring a diagnosis as to why the KPI has not achieved its threshold.
EC-M2-E14	Reporting of water quality KPIs	Water quality KPIs reported to HNTAS. At the point of assessment, the following data shall be provided as a minimum: • for systems without continuous monitoring, a minimum of 2 sets of samples taken 3 months apart shall be provided.

Evidence Item		Detailed description and requirements
		• for systems with continuous monitoring, a minimum of 3 months of KPI data shall be provided. Following assessment at Milestone 2, water quality KPIs shall be reported to HNTAS at the required frequency.
EC-M2-E15	Water quality sampling records	For each sample, shall include: • hydraulic location the sample has been taken from; • date the sample has been taken; and • result of sample for each water quality KPI. Trends in water quality KPIs over time shall be graphically represented.
EC-M2-E16	Top-up water sampling records	For Depleted Water systems, sampling records to ensure that top-up water meets water quality parameter limits. For each sample, shall include: • hydraulic location the sample has been taken from; • date the sample has been taken; and • result of sample for each water quality KPI.
EC-M2-E17	Evidence of water quality specialist engagement (where applicable)	Written evidence that a water quality specialist has been engaged to carry out operation and maintenance activities on the system where KPI thresholds have not been achieved.
EC-M2-E18	Evidence of circulation provision through stagnant areas	Shall contain justification of why it is technically infeasible to remove stagnant areas. Shall contain evidence that the control system temporarily enables circulation through these stagnant areas at appropriate intervals. For example, the regular change over of redundant equipment, or temporarily enabling circulation through pipework or equipment that would otherwise not be required.
EC-M2-E19	Water Quality Remedial Action Log	To detail any operation and maintenance activities carried out on the Energy Centre to remediate water quality. Shall detail the date the activity was carried out and the person that performed the activity. Shall outline any remedial actions carried out on the network as part of the operation and maintenance activity.

Evidence Item		Detailed description and requirements
EC-M2-E20	Evidence of equipment disconnection	Where equipment has been decommissioned, photographic evidence that equipment has been completely disconnected from the system.
EC-M2-E21	Annual Inspection Report	To outline the findings of the annual inspection. Shall include the current status of the control system in relation to the O&M manual.
EC-M2-E22	Evidence of water quality equipment installed	Commissioning certificates for water quality equipment installed within the Energy Centre. Where applicable, this shall outline the required design criteria for the equipment that required commissioning and the final commissioned value for each criteria.
EC-M2-E23	System Pressure Assessment	Assessment of working pressures in the system. Shall include: • calculation of the System Maximum Working Pressure; • calculation of the Local Maximum Working Pressure; • identification of the risks that arise as a result of calculated working pressures; • assessment of the likelihood and impact of the identified risk; • mitigation of the risks posed by working pressures (where appropriate).
EC-M2-E24	Metering and Monitoring Strategy	Shall contain a description of how data required to calculate KPIs will be measured, extracted, recorded, and stored at the required read frequency, how the raw data will be transformed, and how KPIs will be calculated and reported. The strategy shall also include: • schedule of KPIs; • schedule of Monitoring Points; • data flow diagram; • schematic with labelled Monitoring Points; and • Monitoring Point labelling strategy.
EC-M2-E25	ARMS Specification Conformity Statement	Shall contain evidence that the ARMS has been specified in accordance with the applicable technical standard(s).
EC-M2-E26	Evidence of Monitoring Point	Shall contain evidence of how each Monitoring Point has been specified in accordance with the applicable technical standard(s).

Evidence Item		Detailed description and requirements
	specification conformity	
EC-M2-E27	Meter sizing calculations	Shall outline the inputs, methodology and calculations used to size meters and applicable pipework.
EC-M2-E28	Thermal Energy Meter Records	Shall contain record of the installation and commissioning of thermal energy meters. This shall include: • meter make; • type; • serial number; and • year of install. Shall also contain record of the recalibration date of thermal energy meters or evidence of successful sampling and testing where required in accordance with the applicable technical standard(s).
EC-M2-E29	Photographic evidence of insulation replacement	Shall include photographic evidence of areas where insulation has had to be reinstalled or replaced following maintenance activities. Photographs shall be presented clearly with no blur.
EC-M2-E30	KPI Schedule	Shall contain all applicable KPIs to be met by the Energy Centre. Shall be complete with accurate up-to-date information and contain references to relevant documentation.
EC-M2-E31	Technical Parameters Schedule	Shall contain all applicable Technical Parameters for the Energy Centre. Shall be complete with accurate up-to-date information and contain references to relevant documentation.

Table 5: Evidence Requirements for the Energy Centre at Milestone 2

M2.5. Key Performance Indicators

Table 6 contains the Key Performance Indicators for an Energy Centre in an Existing Heat Network to be met at Milestone 2.

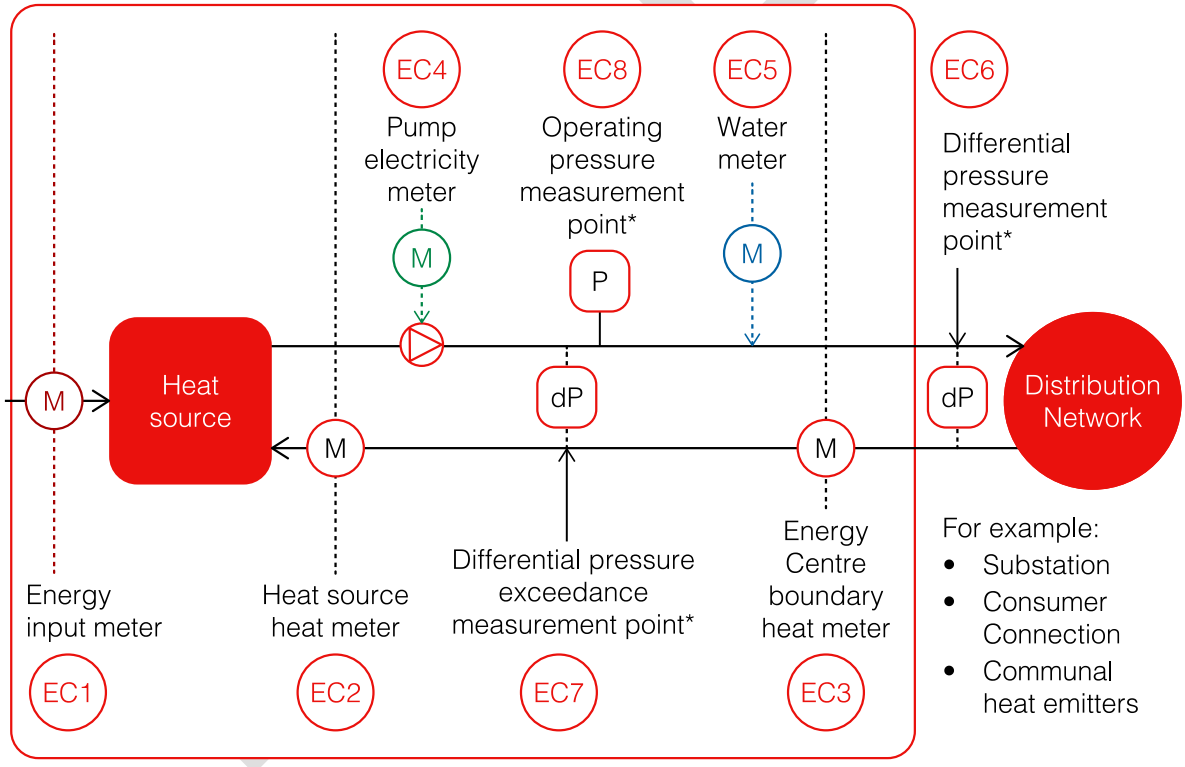
KPIs are split into two types:

1. Assessed KPIs: These are KPIs which are assessed against pre-determined thresholds throughout the Operation and Maintenance Phase in order to achieve and maintain HNTAS Certification.

2. Reported KPIs: These are KPIs which are not assessed against a pre-determined threshold through the Operation and Maintenance Phase, but still provide valuable information, so are to be reported in the same format.

The specific requirements in relation to the reporting of KPIs are included in the Performance Monitoring Requirements Section.

Figure 1 illustrates the required Monitoring Points for measuring Energy Centre KPIs. The Monitoring Points are also listed in Table 7, along with the data required from each Monitoring Point and the minimum read frequency. The Monitoring Points to be used to measure KPIs are illustrated in orange in Table 6.



*Location(s) to be identified by the designer

Figure 1: Diagram indicating required Energy Centre Monitoring Points

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-01	Automatic and Remote Monitoring System (ARMS) connectivity	Total number of days where Monitoring Points has connected to the ARMS within 24 hours of last connection.	(Number of Monitoring Point days) / (total Monitoring Points * total days in period) Number of Monitoring Point days = Σ number of days each Monitoring Point has connected to the ARMS within 24 hours of last connection.	Assessed KPI	≥ 99%	Monthly
EC-KPI-02	Energy Centre Monitoring Point data completeness	Number of total reads received in comparison to the total reads expected within the given [time period] for each Monitoring Point.	(Total number of reads recorded across [time period] / total reads expected across [time period]) x 100 Total reads expected = ∑ (Monitoring Point x frequency of Monitoring Point x [time period])	Assessed KPI	≥ 95%	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-03	Energy Centre Monitoring Points operational	Of the Monitoring Points which are connected to the ARMS (as per EC-KPI-01) and have complete data (as per EC-KPI-02), the number of which are operating as expected. Monitoring Points that are operating as expected will have (dependent on type of Monitoring Point): 3. No error codes (meters) 4. No negative readings (meters) 5. No signals outside of operating parameters (sensors)	Verification that each Monitoring Point is operating as expected. Measurement will be dependent on ARMS and may be automated.	Assessed KPI	100% of Monitoring Points, which are connected to ARMS (as per EC-KPI-01) and have complete data (as per EC-KPI-02)	Monthly
EC-KPI-04	Energy Centre unplanned interruptions	Number of unplanned interruptions reported per annum. An Energy Centre interruption is defined as an event causing:	Number of unplanned interruptions = ∑ (unplanned interruptions for given [time period]). *GUIDANCE: Responsible Party to*	Assessed KPI	≤ 4 interruptions per annum. Prorated and rounded down for a reporting frequency < 12 months e.g. ≤ 1 interruption for a 3	Previous 12 months Measured on monthly rolling basis Minimum measurement

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
		• The flow temperature at the Energy Centre boundary (EC3) to be below the minimum required flow temperature for more than 12 hours. • The differential pressure at the specified differential pressure measurement point(s) (EC6) (note this location may change during operation) to be below the minimum required differential pressure for more than 12 hours, due to an issue originating in the Energy Centre. An unplanned interruption is an interruption as defined above, where the Heat Network end user has not been provided with at least 48 hours written notice of such interruption.	*state the location of the differential pressure measurement point(s).*		month measurement period.	period of 3 months

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-06	Energy Centre average flow temperature	Average flow temperature for given [time period] measured at the Energy Centre boundary (EC3).	Average flow temperature = ∑ (Flow temperature at each time point for given [time period])/ ∑(time points for given [time period])	Reported KPI	[expected average flow temperature]	Monthly
EC-KPI-07	Energy Centre average return temperature	Average return temperature for given [time period] measured at the Energy Centre boundary (EC3).	Average return temperature = ∑ (Return temperature at each time point for given [time period])/ ∑(time points for given [time period])	Reported KPI	[expected average return temperature range]	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-11	Energy Centre flow temperature uptime	The percentage of time flow temperature, measured at the Energy Centre boundary (EC3) is above the Minimum Required Flow Temperature. Minimum required flow temperature will be project specific and shall be set for each Energy Centre. Minimum required flow temperature of the network is the flow temperature required to deliver >45 °C DHW to outlets within Consumer Heat Systems, or is the minimum flow temperature required at the Energy Centre to deliver the minimum required flow temperature for the network it is supplying.	Uptime = ∑ (time points spent above minimum required flow temperature for given [time period])/ ∑ (time points for given [time period])	Assessed KPI	≥ 99% above [minimum required flow temperature]	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-12	Pressure differential uptime	The percentage of time the pressure differential spends above the minimum differential pressure set point at the specified differential pressure measurement point(s) (EC6).	Uptime = ∑ (time points spent above [Setpoint – 10%] for given [time period])/ ∑ (time points for given [time period]) *GUIDANCE: Responsible Party to state the location of the differential pressure measurement point(s).*	Assessed KPI	≥ 99% spent above [minimum differential pressure]	Monthly
EC-KPI-13	Maximum allowable differential pressure exceedance	The percentage of time the pressure differential spends below the maximum allowable differential pressure at the specified differential pressure exceedance measurement point (EC7).	Percentage time below maximum = 1 – [∑ (reads above maximum for given [time period]) / ∑ (reads for given [time period])] *GUIDANCE: Responsible Party to calculate threshold based on Network Pressure Assessment (EC-M2-E23).*	Assessed KPI	100% spent below [maximum allowable differential at the defined measurement point]	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-14	Maximum allowable operating pressure exceedance	The percentage of time the operating pressure spends below the maximum allowable operating pressure at the specified operating pressure measurement point(s) (EC8).	Percentage time below maximum = 1 – [∑ (reads above maximum for given [time period]) / ∑ (reads for given [time period])] *GUIDANCE: Responsible Party to calculate threshold based on System Pressure Assessment (EC-M2-E23).*	Assessed KPI	100% spent below [maximum allowable operating pressure at the defined measurement point]	Monthly
EC-KPI-15	Volume of top up water added to the network	Volume of top up water added to the network as percentage of total system pipework volume per [time period], measured at the Energy Centre water meter (EC5). Network may include other Elements, such as the Distribution Network pipework served by the Energy Centre.	Amount of top-up water = volume added measured in [time period] (m^3) / total system pipework volume (m^3)	Assessed KPI	≤ 0.17% of total [system pipework volume] per month.	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-16	Heat fraction	Proportion of total annual heat generation supplied by each heat source, measured at the Energy Centre heat source(s) (EC2). To be calculated for each heat source, where more than one heat source used.	Heat fraction of heat source = Total heat generated by heat source for a given [time period] (kWh) / Total heat generated by all heat sources for a given [time period] (kWh)	Reported KPI	[expected heat fraction]	Previous 12 months Measured on monthly rolling basis Minimum measurement period of 3 months
EC-KPI-17	Efficiency of each heat generation item or source	Heat generated by heat source, measured at the Energy Centre heat source (EC2) as a proportion of the input fuel energy, measured at the Energy Centre energy input (EC1), displayed as a percentage (%) per heat generation item. To be done as a combined source rather than individual modules of the same type of heat generation e.g. a bank of boilers or heat pump modules.	Efficiency = Heat source heat generation (kWh) for given [time period] / Heat source energy input at (kWh) for given [time period]. *GUIDANCE: Responsible Party to calculate the efficiency of each type of heat generation item. KPI to be calculated as a combined source rather than individual modules of the same type of heat generation. E.g. bank of boilers or heat pump modules.*	Reported KPI	[expected heat generation efficiency]	Previous 12 months Measured on monthly rolling basis Minimum measurement period of 3 months

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 2 KPI Threshold	KPI measurement frequency
EC-KPI-18	Network distribution pump energy	Total pump energy use (kWh) measured at the Energy Centre pump electricity meter (EC4) over the given [time period]. Applicable for network distribution pumps. Not applicable for equipment shunt pumps.	Total pump energy use (kWh) over given [time period]. *GUIDANCE: Responsible Party to calculate the expected annual pump energy use. Responsible Party to calculate the pump energy use thresholds at Milestone 2 based on the configuration of domestic and non-domestic connections.*	Assessed KPI	≤ [domestic threshold] + [non-domestic threshold] Domestic threshold: ≤ 500 kWh/year/dwelling Non-domestic threshold: ≤ 11,000 kWh/MW/year	Previous 12 months Measured on monthly rolling basis Minimum measurement period of 3 months

Table 6: Key Performance Indicators - Energy Centre and Milestone 2

M2.6. Monitoring Points

ID	Element	Monitoring Point	Data required at Monitoring Point	Minimum frequency of reads	Further comments
EC1	Energy Centre	Heat source energy input	Meter read (kWh) Note: Original measurement can be in different units (e.g. m^3). Conversion to be applied where different units for original measurement.	30 minutes	Energy (fuel) input for each type of heat source (e.g. gas, electricity). If there are multiple heat sources that use the same input energy, sub-metering shall be required to determine the energy input into each different heat source. For example, electric boilers and heat pumps will require separate electricity meters. Likewise, gas boiler and CHP will require separate gas meters.
EC2	Energy Centre	Heat source	Meter read (kWh) Instantaneous power (kW) Flow rate (m^3/h or l/s) Flow temperature (°C) Return temperature (°C) Volume (m^3 or l) Error Codes Note: Where used on ambient networks, meter shall be dual mode (heat and cool).	5 minutes	Required for each type of heat source. Not required for each individual module or a same heat source. For example, only one meter required per bank of heat pumps, boilers etc.

ID	Element	Monitoring Point	Data required at Monitoring Point	Minimum frequency of reads	Further comments
EC3	Energy Centre	Boundary	Meter read (kWh) Instantaneous power (kW) Flow rate (m^3/h or l/s) Flow temperature (°C) Return temperature (°C) Volume (m^3 or l) Error Codes Note: Where used on ambient systems, meter shall be dual mode (heat and cool).	5 minutes	Required at the boundary of the Energy Centre, to determine the total heat delivered to the Heat Network.
EC4	Energy Centre	Distribution pump set	Meter read (kWh)	30 minutes	Required to measure pump energy consumption. Required per pump set, rather than individual pumps when contained within pump set.
EC5	Energy Centre	Water meter	Volume (m^3 or l)	30 minutes	Required to measure volume of top-up water entering the network.

ID	Element	Monitoring Point	Data required at Monitoring Point	Minimum frequency of reads	Further comments
EC6	Energy Centre	Defined differential pressure measurement point	Differential pressure (kPa, bar)	5 minutes	Location is determined by the Designer on a project basis. Likely to be located externally to the Energy Centre at the index point(s) of the Distribution Network. Where this isn't the case, this differential pressure measurement may be within the Energy Centre (across the pumps).
EC7	Energy Centre	Defined differential pressure exceedance measurement point	Differential pressure (kPa, bar)	5 minutes	Location shall be determined by the Designer on a project basis.
EC8	Energy Centre	Defined operating pressure measurement point	Pressure (kPa, bar)	5 minutes	Location shall be determined by the Designer on a project basis.

Table 7: Minimum required Monitoring Points - Energy Centre and Milestone 2