Heat Network Technical Assurance Scheme

Existing Heat Networks

Technical Specification

Consumer Connection

Milestone 4

HNTAS-EX-TS-CC-M4

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 a Consumer Connection Element within an Existing Heat Network required at Milestone 4.

This document sits within a series of Technical Specifications for a Consumer Connection, 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 a Consumer Connection within an Existing Heat Network at Milestone 4.

Following demonstration of conformity with Milestone 4, ongoing requirements are set out in the Heat Network Technical Assurance Scheme – New Build Heat Networks – Technical Specification – Consumer Connection – Phase 4: Operation (HNTAS-NB-TS-CC-P4) document.

A Consumer Connection is defined as a connection between a Distribution Network (either District or Communal) and a single Consumer Heat System, where the instantaneous hot water system is ≤ 70 kW and/or the heating/cooling system is ≤ 20 kW.

A detailed definition of the Consumer Connection 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 – New Build Heat Networks – Technical Specification – Consumer Connection – Phase 4: Operation (HNTAS-NB-TS-CC-P4)
- 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.

M4. Requirements for Milestone 4

M4.1. Technical Requirements

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

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M4.1.1.	The O&M Manual shall be up-to-date in accordance with the applicable technical standard(s).	TS1 7.17.3 TS1 7.17.6	CC-M4-E01 CC-M4-E05
M4.1.2.	The Planned Preventative Maintenance (PPM) Schedule shall be in accordance with the applicable technical standard(s).	TS1 7.14.4 TS1 7.15.2 TS1 7.15.3 TS1 7.15.4 TS1 7.15.5 TS1 7.15.6 TS1 7.15.7 TS1 7.15.8 TS1 7.17.2	CC-M4-E02
M4.1.3.	All documentation and drawings shall be up-to-date in accordance with the applicable technical standard(s).	TS1 7.12.2 TS1 7.17.6 MMS 4.1.2	CC-M4-E01 CC-M4-E05 CC-M4-E12 CC-M4-E13
M4.1.4.	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	CC-M4-E11

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M4.1.5.	The Consumer Connection shall be maintained in accordance with: • the O&M Manual(s); • the PPM Schedule; • the Thermal Energy and Utility Meters Maintenance Strategy; • any manufacturers requirements; and • the applicable technical standard(s). A minimum of 6 months of evidence shall be provided to demonstrate this at Milestone 4.	TS1 7.6.1 TS1 7.6.2 TS1 7.6.3 TS1 7.6.4 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 7.15.6 TS1 7.15.7 TS1 7.15.8 TS1 7.17.1 TS1 7.17.2 MMS 1.1.8 MMS 1.3.3 MMS 1.3.4 MMS 1.3.5 MMS 1.3.6	CC-M4-E01 CC-M4-E02 CC-M4-E03 CC-M4-E04 CC-M4-E05 CC-M4-E06
M4.1.6.	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	CC-M4-E02 CC-M4-E15
M4.1.7.	All Operatives responsible for carrying out operation and maintenance activities shall have received appropriate training in accordance with the applicable technical standard(s).	TS1 7.14.1	CC-M4-E07
M4.1.8.	All Operatives and Specialists responsible for carrying out operation and maintenance activities shall have received a site-specific induction in accordance with the applicable technical standard(s).	TS1 7.14.2	CC-M4-E07
M4.1.9.	The Operating Risk Register shall be up-to-date in accordance with the applicable technical standard(s).	TS1 7.14.6 TS1 7.17.1	CC-M4-E10

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M4.1.10.	The Resilience Strategy shall be up-to-date in accordance with the applicable technical standard(s).	TS1 7.9.1 TS1 7.9.2 TS1 7.9.3 TS1 7.9.4	CC-M4-E09 CC-M4-E10
M4.1.11.	Where stagnant conditions occur in specific parts of the Consumer Connection, circulation shall have been established through these areas.	TS1 3.11.25 TS1 7.11.12	CC-M4-E18
M4.1.12.	Installed equipment no longer in use shall have been disconnected and drained in accordance with the applicable technical standard(s).	TS1 7.11.13	CC-M4-E05 CC-M4-E22
M4.1.13.	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 3.6.13 TS1 3.6.14	CC-M4-E19
M4.1.14.	Where applicable, it shall be demonstrated that all required Statements of Conformity have been obtained for any Assessed Works as per the Heat Network Technical Assurance Scheme – Ongoing Regime – Scheme Rules – Replacement Regime (HNTAS-ON-SR-XX-RR) document.		CC-M4-E26
M4.1.15.	The KPI Schedule shall be up-to-date with accurate information and references to relevant documentation.		CC-M4-E20
M4.1.16.	The Technical Parameters Schedule shall be up-to-date with accurate information and references to relevant information.		CC-M4-E21

Table 2: Technical Requirements for the Consumer Connection at Milestone 4

M4.2. Performance Monitoring Requirements

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

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M4.2.1.	The Metering and Monitoring Strategy shall be up-to-date in accordance with the applicable technical standard(s).	TS1 3.12.1 TS1 3.12.4 MMS 4.1.2	CC-M4-E13
M4.2.2.	The Thermal Energy and Utility Meters Maintenance Strategy shall be up-to-date in accordance with the applicable technical standard(s).	TS1 7.12.2 TS1 7.12.3 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 MMS 4.1.2	CC-M4-E03
M4.2.3.	The Automatic and Remote Monitoring System (ARMS) shall be specified in accordance with the applicable technical standard(s).	TS1 3.12.5	CC-M4-E27
M4.2.4.	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 TS1 5.12.1	CC-M4-E14 CC-M4-E28 CC-M4-E29
M4.2.5.	Thermal energy meters shall be maintained and 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	CC-M4-E13 CC-M4-E14
M4.2.6.	The Metering and Monitoring System shall calculate and report, at the required interval, each applicable Consumer Connection KPI to HNTAS.		CC-M4-E16

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M4.2.7.	The Consumer Connection 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 7.8.6 TS1 7.12.6 TS1 7.17.4	CC-M4-E16 CC-M4-E17

Table 3: Performance Monitoring Requirements for the Consumer Connection at Milestone 4

M4.3. Data Protection and Smart Metering Requirements

The applicable Data Protection and Smart Metering Requirements in Table 4 shall be fulfilled.

Data Protection and Smart Metering Requirement		Applicable technical standard(s)	Evidence Requirement(s)
M4.3.1.	The operation and maintenance of the Metering and Monitoring System shall allow system operators to comply with their obligations of data protection by design and by default in accordance with the applicable technical standard(s).	MMS 2.2	CC-M4-E23
M4.3.2.	The operation and maintenance of the Metering and Monitoring System shall allow system operators to comply with their obligations of secure data processing in accordance with the applicable technical standard(s).	MMS 2.3	CC-M4-E23 CC-M4-E24
M4.3.3.	The operation and maintenance of the Smart Metering/AMI system shall be in accordance with the applicable technical standard(s).	MMS 3.1	CC-M4-E25

Table 4: Data Protection and Smart Metering Requirements for the Consumer Connection at Milestone 4

M4.4. Key Failures

The applicable Key Failures listed in Table 5 shall not be present.

Key Failure		Outcome to avoid	Evidence Requirement(s)
M4.4.1.	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 Consumer Connection and network. This could lead to KPI thresholds not being achieved.	CC-M4-E02 CC-M4-E03
M4.4.2.	Operatives carrying out maintenance activities have not received sufficient 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.	CC-M4-E07
M4.4.3.	Adjustments made to the Consumer Connection Control system (e.g. DHW or space heating flow temperature set point) which are unjustified, or not in accordance with the design specification.	Unnecessary change to system performance which results in elevated return temperatures, leading to elevated heat losses from the system, and therefore may not meet the KPI threshold.	CC-M4-E04 CC-M4-E16 CC-M4-E17
M4.4.4.	Flushing bypasses, where installed, left open when should be closed.	Increased flowrates through the Consumer Connection, which could increase return temperatures and result in elevated energy consumption by the pumps. This may result in KPI thresholds not being achieved.	CC-M4-E04 CC-M4-E16 CC-M4-E17
M4.4.5.	Resilience Strategy not produced or is inadequate to mitigate the risks to heat supply.	Increased likelihood of an interruption to heat supply and increased impact should that interruption occur.	CC-M4-E09 CC-M4-E10

Key Failure		Outcome to avoid	Evidence Requirement(s)
M4.4.6.	Critical spares not procured and stored on a risk-based approach.	Increased duration of interruptions due to lack of spare parts procured, or parts not being readily available to procure. This could reduce consumer comfort and lead to KPI thresholds not being achieved.	CC-M4-E09 CC-M4-E10
M4.4.7.	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.	CC-M4-E04
M4.4.8.	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.	CC-M4-E16
M4.4.9.	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.	CC-M4-E16
M4.4.10.	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.	CC-M4-E03 CC-M4-E16 CC-M4-E17
M4.4.11.	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.	CC-M4-E03 CC-M4-E16 CC-M4-E17
M4.4.12.	Documentation not kept up-to-date (e.g. maintenance activities carried out are not recorded).	Documentation not reflective of the maintenance activities that has been carried out, which can lead to incorrect maintenance and operation of the Consumer Connection.	CC-M4-E04 CC-M4-E05

Key Failure		Outcome to avoid	Evidence Requirement(s)
M4.4.13.	Documentation not adequately stored where it can be accessed by personnel carrying out operation and maintenance activities and/or documentation is not stored in a format where they can be updated.	Documentation cannot be accessed and/or updated by operation and maintenance personnel to reflect changes and/or maintenance activities that have been carried out on the Consumer Connection, which can lead to a lack of clarity on the current Consumer Connection status for future operation and maintenance activities.	CC-M4-E11
M4.4.14.	Inappropriate thermal energy meter installed.	Inaccurate measurement of performance data due to inappropriate specification or size of thermal energy and/or utility meter.	CC-M4-E14 CC-M4-E28 CC-M4-E29
M4.4.15.	Inappropriate consideration of system working pressures, including: • incorrect calculation of working pressures in the Consumer Connection; • 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.	CC-M4-E19

Table 5: Key Failures for the Consumer Connection at Milestone 4

M4.5. Evidence Requirements

The applicable Evidence Items listed in Table 6 shall be provided to demonstrate fulfilment with the Technical Requirements, Performance Monitoring Requirements, and avoidance of Key Failures.

Evidence Item		Detailed description and requirements
CC-M4-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.
CC-M4-E02	Planned Preventative Maintenance (PPM) Schedule	To include a schedule outlining the operation and maintenance plan for all equipment in the Consumer Connection. Shall detail wherever specialists or external bodies are required to carry out PPM activities.
CC-M4-E03	Thermal Energy and Utility Meter Servicing Strategy	To include a schedule outlining the operation and maintenance plan for all Consumer Connection thermal energy and utility meters
CC-M4-E04	Maintenance and Remedial Action Log	To detail any operation and maintenance activities carried out on all Consumer Connections. 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.
CC-M4-E05	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 Consumer Connection; • changes to the set points or operation of the Consumer Connection; • changes to the Resilience Strategy; • changes to the Operating Risk Register; and • equipment that has been replaced. This is not to include activities noted in the maintenance and remedial action log for the general maintenance carried out on the Consumer Connection.

Evidence Item		Detailed description and requirements
CC-M4-E06	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.
CC-M4-E07	Register of Operatives	To include a list of all personnel that carry out, or will carry out operation and maintenance activities on all Consumer Connections. 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.
CC-M4-E08	Condition Log	To include all basic asset data and condition data for all Heat Network equipment within the Consumer Connection, 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).

Evidence Item		Detailed description and requirements
CC-M4-E09	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 items for resilience (for example, isolation valve locations, locations for temporary heat supply).
CC-M4-E10	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.
CC-M4-E11	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.
CC-M4-E12	Consumer Connection Drawings	As-built drawings of the Consumer Connection with any necessary changes made during operation implemented. Shall include: • schematics; and • drawings (layout, plan, elevation).
CC-M4-E13	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.

Evidence Item		Detailed description and requirements
CC-M4-E14	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).
CC-M4-E15	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.
CC-M4-E16	Reporting of KPIs	A minimum of 3 months worth of KPI data shall be reported to HNTAS at the point of assessment. Where KPIs are outside of required thresholds for the reporting period, the Responsible Party shall provide a note justifying this discrepancy to the HNTAS.
CC-M4-E17	KPI Remediation Report	Where any Consumer Connection 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.
CC-M4-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, evidence that the control system circulates through Consumer Connections when they have not been used for extended periods of time. (e.g. "pay as you go" systems).

Evidence Item		Detailed description and requirements
CC-M4-E19	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; and • mitigation of the risks posed by working pressures (where appropriate).
CC-M4-E20	KPI Schedule	Shall contain all applicable KPIs to be met by the Consumer Connection. Shall be complete with accurate up-to-date information and contain references to relevant documentation.
CC-M4-E21	Technical Parameters Schedule	Shall contain all applicable Technical Parameters for the Consumer Connection. Shall be complete with accurate up-to-date information and contain references to relevant documentation.
CC-M4-E22	Evidence of equipment disconnection	Where equipment has been decommissioned, photographic evidence that equipment has been completely disconnected from the system.
CC-M4-E23	Data Protection Conformity Statement	Shall contain evidence of how the Metering and Monitoring System installed and in its current state complies with the organisation's data protection obligations in accordance with the applicable technical standard(s).
CC-M4-E24	Data Security Risk Assessment	Shall contain an assessment of the risks to the system, including the methods reasonably available to threat actors to identify individuals, in the context of their nature, capability and objectives. Shall include the controls implemented to address these risks, demonstrating that such risks have been reduced to an acceptable level.
CC-M4-E25	Smart Metering/AMI Specification Conformity Statement	Shall contain evidence of how the Smart Metering/AMI system installed and in its current state is in accordance with the applicable technical standard(s).
CC-M4-E26	Assessed Replacement Statement of Conformity	Evidence that, where required as per the Heat Network Technical Assurance Scheme – Ongoing Regime – Scheme Rules – Replacement Regime (HNTAS-ON-SR-XX-RR), applicable works have successfully completed assessment.

Evidence Item		Detailed description and requirements
CC-M4-E27	ARMS Specification Conformity Statement	Shall contain evidence that the ARMS has been specified in accordance with the applicable technical standard(s).
CC-M4-E28	Evidence of Monitoring Point specification conformity	Shall contain evidence of how each Monitoring Point has been specified in accordance with the applicable technical standard(s).
CC-M4-E29	Meter sizing calculations	Shall outline the inputs, methodology and calculations used to size meters and applicable pipework.

Table 6: Evidence Requirements for the Consumer Connection at Milestone 4

M4.6. Key Performance Indicators

Table 7 contains the Key Performance Indicators for a Consumer Connection in an Existing Heat Network to be met at Milestone 4.

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 Consumer Connection KPIs. The Monitoring Points are also listed in Table 8, 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 7.

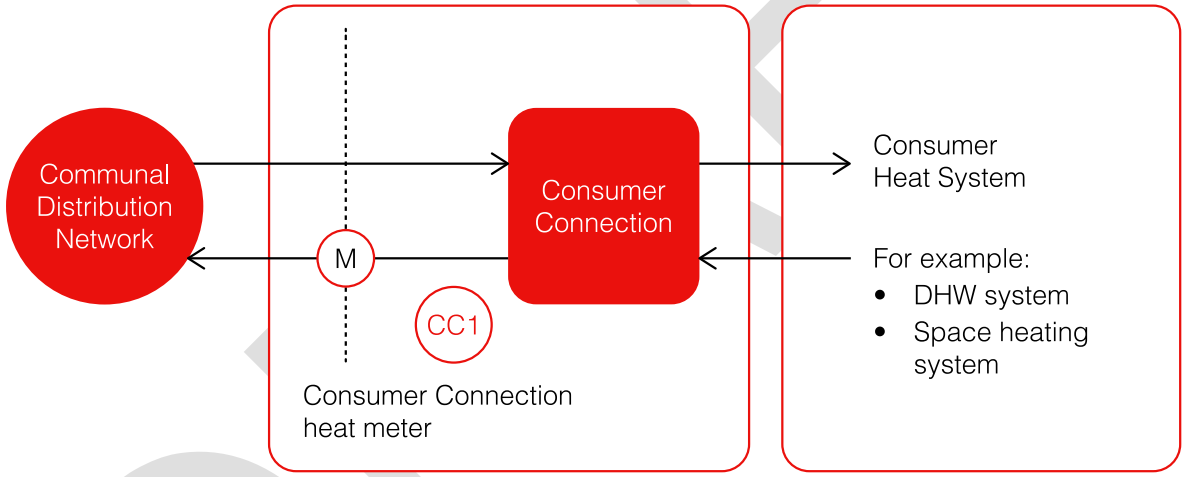

Figure 1: Diagram indicating required Consumer Connection Monitoring Points

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 4 KPI Threshold	KPI measurement frequency
CC-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 = ∑ number of days each Monitoring Point has connected to the ARMS within 24 hours of last connection.	Assessed KPI (assessed on a combined Consumer Connection basis)	≥ 90%	Monthly
CC-KPI-02	Consumer Connection 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 (assessed on a combined Consumer Connection basis)	≥ 85%	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 4 KPI Threshold	KPI measurement frequency
CC-KPI-03	Consumer Connection Monitoring Points operational	Of the Monitoring Points which are connected to the ARMS (as per CC-KPI-01) and have complete data (as per CC-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): 1. No error codes (meters) 2. No negative readings (meters) 3. 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 (assessed on a combined Consumer Connection basis)	100% of Monitoring Points, which are connected to ARMS (as per CC-KPI-01) and have complete data (as per CC-KPI-02)	Monthly
CC-KPI-04	Consumer Connection unplanned interruptions	Number of unplanned interruptions reported per annum for a Heat Network. A Consumer Connection interruption is defined as any reported issue at the Consumer Connection that leads to consumers not receiving heating or hot water for more than 12	Number of unplanned interruptions = $\sum$ (unplanned interruptions for given [time period]).	Assessed KPI (assessed on an individual Consumer Connection basis)	$\leq$ 3 interruptions per annum. Prorated and rounded down for a reporting frequency <12 months e.g. $\leq$ 0 interruption for a 3 month measurement period.	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 4 KPI Threshold	KPI measurement frequency
		hours, due to an issue originating in the Consumer Connection. Note this is not to include issues within the Consumer Heat Systems (e.g. a problem with the heating circuit), issues under the control of the consumer rather than the Heat Network operator, or issues originating in upstream Elements. An unplanned interruption is an interruption as defined above, where the network end user has not been provided with at least 48 hours written notice of such interruption.				
CC-KPI-05	Consumer Connection planned interruptions	Number of planned interruptions reported per annum for a Heat Network. A Consumer Connection interruption is defined as any reported issue at the Consumer Connection that leads to consumers not	Number of planned interruptions = $\sum$ (planned interruptions for given [time period]).	Assessed KPI (assessed on an individual Consumer Connection basis)	$\leq$ 1 interruption per annum.	Previous 12 months Measured on a monthly rolling basis Minimum measurement

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 4 KPI Threshold	KPI measurement frequency
		receiving heating or hot water for more than 12 hours, due to an issue originating in the Consumer Connection. Note this is not to include issues within the Consumer Heat Systems (e.g. a problem with the heating circuit), issues under the control of the consumer rather than the Heat Network operator, or issues originating in upstream Elements. A planned interruption is an interruption as defined above where notice has been given to the end user at least 48 hours prior to the interruption occurring.				period of 3 months

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 4 KPI Threshold	KPI measurement frequency
CC-KPI-06	Overall volume weighted average return temperature (VWART)	Consumer Connection return temperature weighted against volumetric flow rate, measured at the Consumer Connection Boundary (CC1).	$VWART = \frac{\sum(T_r \times q_r)}{\sum q_r}$ Where T = return temperature for each time recording (t) for given [time period], and q = flow rate for each time recording (t) for given [time period] or cumulative volume for each time recording (t) for given [time period].	Assessed KPI (assessed on an individual Consumer Connection basis)	≤ 50 °C To be assessed alongside CC-KPI-07. To comply, either or both of CC-KPI-06 and CC-KPI-07 shall meet the specified thresholds.	Monthly

KPI ID	KPI	KPI description	KPI measurement methodology	Assessed KPI or Reported KPI	Milestone 4 KPI Threshold	KPI measurement frequency
CC-KPI-07	Volume weighted average temperature difference (VWATD)	Temperature difference between the volume weighted flow temperature (VWAFT) and volume weighted average return temperature (VWART) at the Consumer Connection, measured at the Consumer Connection Boundary (CC1).	$VWATD = VWAFT - VWART$ $= \frac{\sum(T_f \times q_f)}{\sum q_f} - \frac{\sum(T_r \times q_r)}{\sum q_r}$ Where T = flow/return temperature for each time recording (t) for given [time period], and q = flow rate for each time recording (t) for given [time period] or cumulative volume for each time recording (t) for given [time period].	Assessed KPI (assessed on an individual Consumer Connection basis)	≥ 5°C To be assessed alongside CC-KPI-06. To comply, either or both of CC-KPI-06 and CC-KPI-07 shall meet the specified thresholds.	Monthly

Table 7: Key Performance Indicators - Consumer Connection and Milestone 4

M4.7. Monitoring Points

ID	Element	Monitoring Point	Data required at Monitoring Point	Minimum frequency of reads	Further comments
CC1	Consumer Connection	Boundary (intake)	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)	30 minutes	Shall be located on the intake boundary to the Consumer Connection. To measure heat delivered to the Consumer Connection. An example of this Monitoring Point would be a HIU thermal energy meter.

Table 8: Minimum required Monitoring Points - Consumer Connection and Milestone 4