Heat Network Technical Assurance Scheme

New Build Heat Networks

Technical Specification

Substation

Phase 1: Feasibility

HNTAS-NB-TS-SS-P1

Version History

Revision	Notes	Date
V0.4	Draft issue	05/12/25

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.

Note on Phase 4: Operation (initial) and Phase 5: Operation (ongoing)

The New Build Technical Specification and Assessment Procedures Overview (Phase 0) documents indicate that there are separate New Build Code Documents for Phase 4: Operation (initial) and Phase 5: Operation (ongoing).

These documents have since been consolidated to reduce the number of Code Documents, so the Phase 4: Operation documents cover requirements for New Build networks during both initial and ongoing operation.

This change does not impact the assessment of New Build networks in operation, which still occurs:

- after 1 year of operation; and
- after 2 years of operation.

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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 Substation Element within a New Build Heat Network in Phase 1: Feasibility.

This document sits within a series of Technical Specifications for a Substation, 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 – New Build Heat Networks – Scheme Rules – Assessment Regime (HNTAS-NB-SR-XX-AS) document.

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Code Document Structure

Technical Specifications

Document Type	Element		Part/Phase				
			Overview	Phase 1: Feasibility	Phase 2: Design	Phase 3: Construction	Phase 4: Operation
			P0	P1	P2	P3	P4
Technical Specification	Energy Centre	EC	HNTAS-NB-TS-EC-P0	HNTAS-NB-TS-EC-P1	HNTAS-NB-TS-EC-P2	HNTAS-NB-TS-EC-P3	HNTAS-NB-TS-EC-P4
	District Distribution Network	DD	HNTAS-NB-TS-DD-P0	HNTAS-NB-TS-DD-P1	HNTAS-NB-TS-DD-P2	HNTAS-NB-TS-DD-P3	HNTAS-NB-TS-DD-P4
	Substation	SS	HNTAS-NB-TS-SS-P0	HNTAS-NB-TS-SS-P1	HNTAS-NB-TS-SS-P2	HNTAS-NB-TS-SS-P3	HNTAS-NB-TS-SS-P4
	Communal Distribution Network	CD	HNTAS-NB-TS-CD-P0	HNTAS-NB-TS-CD-P1	HNTAS-NB-TS-CD-P2	HNTAS-NB-TS-CD-P3	HNTAS-NB-TS-CD-P4
	Consumer Connection	CC	HNTAS-NB-TS-CC-P0	HNTAS-NB-TS-CC-P1	HNTAS-NB-TS-CC-P2	HNTAS-NB-TS-CC-P3	HNTAS-NB-TS-CC-P4
	Consumer Heat System	CH	HNTAS-NB-TS-CH-P0	HNTAS-NB-TS-CH-P1	HNTAS-NB-TS-CH-P2	HNTAS-NB-TS-CH-P3	N/A

Table 1: New Build Network Technical Specification structure

Scope

This document specifies the HNTAS Requirements for a Substation within a New Build Heat Network in Phase 1: Feasibility.

A Substation is defined as a connection between Distribution Networks, which contains an exchange of thermal energy (e.g. via plate heat exchangers), together with requisite ancillary equipment, or a connection between a Distribution Network and a single Consumer Heat System, where the instantaneous hot water system is greater than 70 kW and/or space heating system is larger than 20 kW.

A detailed definition of the Substation is contained within the Heat Network Technical Assurance Scheme – New Build Heat Networks – Technical Specification – Substation – Overview (HNTAS-NB-TS-SS-P0) document.

New Build Heat Networks

There is one stage within Phase 1: Feasibility, which is Stage 1: Concept Design. This is outlined in Figure 1.

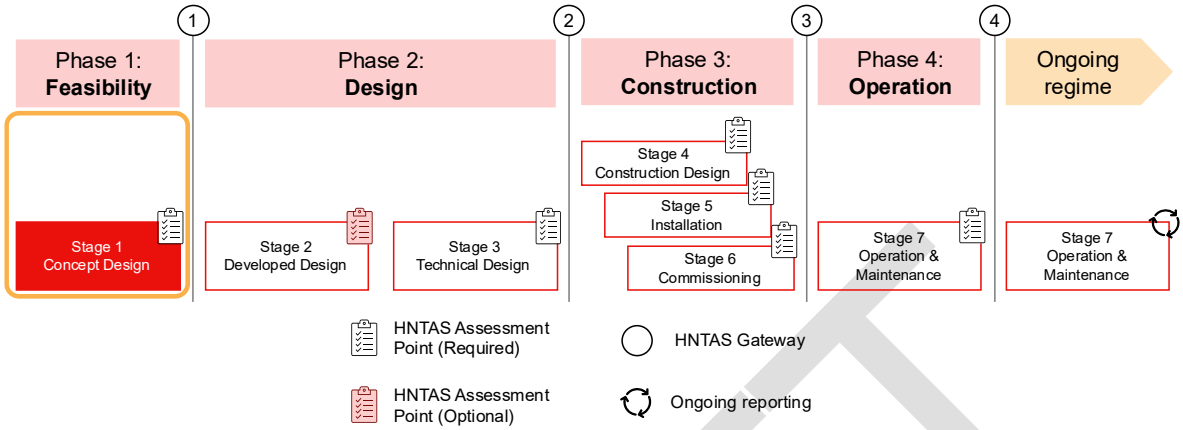

Figure 1: HNTAS New Build regime phases and stages

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 – New Build Heat Networks – Scheme Rules – Assessment Regime (HNTAS-NB-SR-XX-AS)
- Heat Network Technical Assurance Scheme – New Build Heat Networks – Technical Specification – Substation – Overview (HNTAS-NB-TS-SS-P0)

Informative references

The following informative references apply to this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- RIBA Plan of Work (RIBA, 2020)

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.

1. Requirements for Stage 1: Concept Design

1.1. Technical Requirements

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

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
1.1.1.	Peak heat demands, heat demand profiles and annual heat consumption shall be estimated in accordance with the applicable technical standard(s).	TS1 1.1.2 TS1 1.1.3 TS1 1.1.4 TS1 1.1.5 TS1 1.1.6 TS1 1.1.7 TS1 1.1.8 TS1 1.1.9 TS1 1.1.10 TS1 1.1.11 TS1 1.4.10 TS1 1.5.1 TS1 1.7.4	SS-S1-E01
1.1.2.	A phasing plan shall be developed in accordance with the applicable technical standard(s).	TS1 1.1.12	SS-S1-E10
1.1.3.	Operating temperatures shall be determined in accordance with the applicable technical standard(s).	TS1 1.2.8 TS1 1.4.1 TS1 1.4.2 TS1 1.4.3 TS1 1.4.4 TS1 1.4.6 TS1 1.4.7 TS1 1.4.8 TS1 1.4.9 TS1 1.4.10 TS1 1.4.11 TS1 1.4.12 TS1 1.8.4 TS1 1.8.5 TS1 1.10.1	SS-S1-E02
1.1.4.	Working pressures shall be assessed in accordance with the applicable technical standard(s). *Note: it is expected that this assessment is undertaken with consideration for the other Elements present in the Heat Network.*	TS1 1.6.1 TS1 1.6.2 TS1 1.6.3 TS1 1.6.5 TS1 1.16.1	SS-S1-E03

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
1.1.5.	The lifecycle costs (CapEx, OpEx, RepEx) and revenues for all Substation components, including the Metering and Monitoring System, shall be assessed in accordance with the applicable technical standard(s) and used to inform design decisions.	TS1 1.7.13 TS1 1.7.17 TS1 1.12.2 TS1 1.15.1 TS1 1.15.2	SS-S1-E11 SS-S1-E12
1.1.6.	Substation equipment shall be selected in accordance with the applicable technical standard(s).	TS1 1.2.9 TS1 1.8.3 TS1 1.10.3	SS-S1-E04
1.1.7.	Substation equipment shall be sized in accordance with the applicable technical standard(s).	TS1 1.7.11	SS-S1-E05
1.1.8.	The hydraulic arrangement and controls intent of the Substation shall be outlined to ensure that KPIs can be achieved.	TS1 1.8.1 TS1 1.8.3 TS1 1.8.4 TS1 1.8.5	SS-S1-E06 SS-S1-E08
1.1.9.	A Resilience Strategy shall be developed in accordance with the applicable technical standard(s). *Note: it is expected that this assessment is undertaken with consideration for the other Elements present in the Heat Network.*	TS1 1.9.1 TS1 1.9.2	SS-S1-E14
1.1.10.	A repair and replacement strategy shall be developed in accordance with the applicable technical standard(s). The strategy shall include: • estimated timeframe for replacement of major plant and equipment within the Substation to support long-term planning; • consideration of long-term carbon-reduction implications of repair and replacement decisions.	TS1 1.15.2 TS1 1.15.3	SS-S1-E13
1.1.11.	A Water Quality Statement shall be produced in accordance with the applicable technical standard(s). *Note: it is expected that this is undertaken with consideration for the other Elements present in the Heat Network.*	TS1 1.11.1	SS-S1-E15

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
1.1.12.	Substation spatial requirements shall be determined in accordance with the applicable technical standard(s). Spatial requirements shall consider: 1. the space required for all equipment (heat generation, water treatment equipment, ancillary equipment, metering and monitoring equipment etc.); 2. maintenance requirements for all equipment; 3. equipment replacement requirements; 4. access and egress requirements; 5. requirements for insulation (ensuring enough space for required thickness); 6. Resilience Strategy requirements.	TS1 1.9.3 TS1 1.9.5 TS1 1.11.1 TS1 1.15.3	SS-S1-E07 SS-S1-E09
1.1.13.	The Technical Parameters Schedule shall be completed with accurate information and references to relevant documentation.		SS-S1-E16

Table 2: Technical Requirements for the Substation at Stage 1: Concept Design

1.2. Performance Monitoring Requirements

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

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
1.2.1.	A Metering and Monitoring Strategy shall be developed in accordance with the applicable technical standard(s).	TS1 1.12.1	SS-S1-E17
1.2.2.	The KPIs to be measured and reported for the Substation shall be identified. A KPI Schedule shall be produced as part of the Metering and Monitoring Strategy. The KPI Schedule shall contain: 1. the identified applicable KPIs to be measured and reported by the Metering and Monitoring System; 2. the thresholds for each KPI in operation (based on the level of information available at this stage); 3. the Monitoring Points required to measure each KPI.	TS1 1.12.1 MMS 4.1.12	SS-S1-E18
1.2.3.	The Monitoring Points required for measuring the applicable Substation KPIs shall be identified and included in a Monitoring Points Schedule, as part of the Metering and Monitoring Strategy. The Monitoring Points Schedule shall contain: 1. the required Monitoring Points to measure KPIs; 2. the location of each Monitoring Point (which identifies the applicable Element); 3. a unique ID code, which follows a determined naming convention.	TS1 1.12.1 MMS 4.1.13	SS-S1-E18 SS-S1-E19 SS-S1-E20

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
1.2.4.	Schematic(s) shall be produced which contain each Monitoring Point in the required location, each labelled with its unique ID code.	TS1 1.12.1 MMS 4.1.14	SS-S1-E06 SS-S1-E20

Table 3: Performance Monitoring Requirements for the Substation at Stage 1: Concept Design

1.3. Key Failures

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

Key Failure		Outcome to avoid	Evidence Requirement(s)
1.3.1.	Inappropriate and/or inaccurate methodology used to estimate peak demand and annual heat consumption.	Oversized or undersized equipment, inaccurate CapEx model.	SS-S1-E01
1.3.2.	Inappropriate selection of temperature profiles given the end user requirements and Distribution Network requirements.	Network temperatures being set higher than necessary to deliver heat to consumers, resulting in higher heat losses and increased energy consumption.	SS-S1-E02
1.3.3.	Hydraulic breaks (e.g. plate heat exchanger) specified where not necessary for either contractual separation or pressure breaks.	Hydraulic breaks specified where not necessary, increasing complexity, CapEx, OpEx etc. Hydraulic breaks also result in increasing the network temperatures, increasing heat losses and heat generation temperature.	SS-S1-E03 SS-S1-E04 SS-S1-E06 SS-S1-E07
1.3.4.	Hydraulic breaks (e.g. plate heat exchanger) not specified when required for pressure breaks, specifically in tall buildings, resulting in high operating pressures within the system.	System pressures within network exceeding pressure ratings of equipment during operation. In addition, high operating pressures within dwellings causing health and safety risks.	SS-S1-E03 SS-S1-E04
1.3.5.	Inappropriate and/or inaccurate sizing of equipment.	Oversized or undersized equipment, which impacts CapEx, equipment turndown, layout requirements, resulting in space constraints during design stages.	SS-S1-E05
1.3.6.	Limited consideration given to controls intent during initial hydraulic design development and equipment selection.	Overcomplex or hydraulic design choices made a Stage 2 which limits changes or development of design into the Developed and/or Technical Design stage. Additionally impacts spatial assessment and CapEx model.	SS-S1-E08

Key Failure		Outcome to avoid	Evidence Requirement(s)
1.3.7.	Monitoring Points required to measure KPIs not identified at Concept Design stage, impacting the ability to accurately estimate spatial and access requirements.	Spatial footprints being developed which do not consider space and access requirements for expected Monitoring Points.	SS-S1-E06 SS-S1-E07 SS-S1-E18 SS-S1-E19
1.3.8.	Spatial requirements not accurately determined or inappropriate. Spatial requirements are to consider: 1. space required for all equipment (heat generation, water treatment equipment, ancillary equipment etc.); 2. maintenance requirements for all equipment; 3. equipment replacement requirements; 4. access and egress requirements; 5. requirements for insulation (ensuring enough space for required thickness); 6. requirements for disaster recover / Resilience Strategy.	As changes to spatial allocations are limited once into the Developed Design and Technical Design stages, the assessment at the Concept Design stage needs to be accurately undertaken to avoid underestimating spatial requirements, which then results in lack of space for equipment, installation requirements, maintenance requirements, access and egress, health and safety requirements.	SS-S1-E07 SS-S1-E09
1.3.9.	Insufficient consideration given to Resilience Strategy (how to supply heat in the case of failure of the Heat Network).	Impact spatial allocations at this stage. Want to avoid not having sufficient space allocated to enable temporary plant location in the case that it is required due to a failure of the Substation or Distribution Network.	SS-S1-E14

Table 4: Key Failures for the Substation at Stage 1: Concept Design

1.4. 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
SS-S1-E01	Peak and annual heat demand calculations and schedule	Methodology, calculations, data, and assumptions used to estimate peak and annual heat demands shall be provided. To include a schedule outlining the expected peak and annual heat demand for the Substation. For annual heat demands, rationale for occupancy patterns shall be outlined. Sensitivity analysis shall be provided where applicable.
SS-S1-E02	System operating temperature assessment	Report highlighting the operating temperature design criteria. This shall include rationale for the temperatures specified.
SS-S1-E03	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).
SS-S1-E04	Equipment selection assessment	Shall outline technical justification for selection of equipment within the Substation (e.g. indirect vs direct connections, DHW provision).
SS-S1-E05	Equipment sizing calculations	Calculations, methodology and assumptions used to estimate equipment sizing. Shall indicate equipment redundancy requirements.
SS-S1-E06	Schematic(s)	Substation schematic(s) to the detail expected at RIBA Stage 2 (RIBA, 2020) as a minimum. The schematic(s), or a separate schematic(s), shall include the locations of the Monitoring Points as required by the Metering and Monitoring Strategy, with the unique ID code included.

Evidence Item		Detailed description and requirements
SS-S1-E07	Drawing(s)	Substation drawings to the detail expected at RIBA Stage 2 (RIBA, 2020) as a minimum. This shall include layouts, plan, and elevation drawings. The drawings, or a separate drawing, shall include the locations of the Monitoring Points as required by the Metering and Monitoring Strategy, with the unique ID code included.
SS-S1-E08	Controls Strategy	Shall include high-level description of the Substation controls intent.
SS-S1-E09	Substation spatial assessment	An assessment on spatial footprint of the Substation. This shall demonstrate that the allowed footprint accommodates the requirements of the Substation.
SS-S1-E10	Phasing Plan	Shall include which connections will be connected, by when, and how the heat demand will build up over time. Shall also outline considerations for temporary plant and space requirements. The Phasing Plan shall include the following: • phase name and description including the number of connections; • notable areas describing significant aspects of each phase, such as the use of temporary equipment for heat production or the connection of air-source heat pumps (ASHP) once all phases are complete. Considerations for temporary plants and space requirements should be outlined; • proposed heat on date for all connections shall be specified to show how heat demand will be built up overtime; • annual demand and peak load of each phase.
SS-S1-E11	Cost Model	A cost model and assessment which contains lifecycle costings (CapEx, OpEx, RepEx etc.) used to inform design decisions. All inputs and assumptions shall be outlined. This may be in the form of a techno-economic model.
SS-S1-E12	Parasitic Energy Consumption Calculations	Shall include the methodology, calculations, and assumptions used to estimate parasitic energy consumption for use within the operating model and cost model.
SS-S1-E13	Repair and Replacement Strategy	Shall include how repair and replacement is considered within the Heat Network to aid

Evidence Item		Detailed description and requirements
		justification of equipment selection, spatial requirements, and Substation location.
SS-S1-E14	Resilience Strategy	This shall include how resilience has been considered at this stage. This shall include redundancy strategy and indicative areas for resilience measures (e.g. suitable location temporary plant).
SS-S1-E15	Water Quality Statement	Shall include: • the type of water quality system to be followed; • preliminary selection of fill water source; • preliminary selection of the material of plant, equipment, and distribution pipework; • initial performance specification for water treatment and conditioning; and • a spatial assessment of the plant room considering the spatial dimensions and maintenance requirements for water quality equipment, transportation and storage of chemicals and equipment and plant room accessibility requirements.
SS-S1-E16	Technical Parameters Schedule	Schedule which outlines all technical parameters in one location, with reference to applicable documents.
SS-S1-E17	Metering and Monitoring Strategy	The Metering and Monitoring Strategy shall contain a high-level 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: 1. a KPI Schedule (item SS-S1-E18); 2. a Monitoring Points Schedule (item SS-S1-E19); 3. a Monitoring Points unique ID code naming methodology (item SS-S1-E20); 4. a Schematic with labelled Monitoring Points.
SS-S1-E18	KPI Schedule	A schedule of all KPIs required to be measured by the Metering and Monitoring System. The KPI Schedule shall contain: 1. the identified applicable KPIs to be measured and reported by the Metering and Monitoring System;

Evidence Item		Detailed description and requirements
		2. the thresholds for each KPI in operation (based on the level of information available at this stage); 3. the Monitoring Points required to measure each KPI.
SS-S1-E19	Monitoring Points Schedule	A schedule of all Monitoring Points required to measure KPIs. The Monitoring Points Schedule shall contain: 1. the required Monitoring Points to measure KPIs; 2. the location of each Monitoring Point (which identifies the applicable Element); 3. a unique ID code, which follows a determined naming convention.
SS-S1-E20	Unique ID code naming convention	Methodology used to label each Monitoring Point with a unique ID code.

Table 5: Evidence Requirements for the Substation at Stage 1: Concept Design