Heat Network Technical Assurance Scheme

New Build Heat Networks

Technical Specification

Energy Centre

Phase 4: Operation

HNTAS-NB-TS-EC-P4

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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.

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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 an Energy Centre Element and is applicable to the following Heat Networks:

- A New Build Heat Network in Phase 4: Operation
- An Existing Heat Network between Milestone 4 and Milestone 5
- A Certified Heat Network in the Ongoing Regime

This document sits within a series of Technical Specifications for an Energy Centre, which features within a wider Scheme documentation structure, as outlined in Table 1, Table 2 and Table 3 below.

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

depending on the applicable Regime for the Heat Network.

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Authors

Lucy Sherburn (FairHeat)

Jake Adamson (FairHeat)

Gareth Jones (FairHeat)

Joseph Shanley (FairHeat)

Tom Burton (FairHeat)

Technical Sub-Working Group Members

Ghassan Beldawi (L&Q)

Beata Blachut (SAV)

Tom Brennan (AECOM)

Bruce Geldard (Metropolitan)

Thanos Gkouletsos (Switch2)

Ewan Jures (WSP)

Geoff Miller (SSE)

Pete Mills (Bosch/MEHNA)

Christopher O'Keeffe (Thermamech)

Soulla Paphitis (Danfoss)

Gavin Poyntz (Ramboll)

Peter Russett (FVB)

Dan Staunton (FairHeat)

Ricky Stevens (Orchard Plumbing)

Ewelina Szura (Anthesis)

Dave Turner (Camden Council)

Ruben Vos (Vattenfall)

David Wilkinson (Vital Energi)

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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

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 2: Existing Network Technical Specification structure

Document Type	Element		Ongoing Regime
Technical Specification	Energy Centre	EC	HNTAS-NB-TS-EC-P4
	District Distribution Network	DD	HNTAS-NB-TS-DD-P4
	Substation	SS	HNTAS-NB-TS-SS-P4
	Communal Distribution Network	CD	HNTAS-NB-TS-CD-P4
	Consumer Connection	CC	HNTAS-NB-TS-CC-P4

Table 3: Ongoing Regime Technical Specification structure

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Scope

This document specifies the HNTAS Requirements for an Energy Centre within:

- A New Build Heat Network in Phase 4: Operation
- An Existing Heat Network between Milestone 4 and Milestone 5
- A Certified Heat Network in the Ongoing Regime

The application of this document in each of these scenarios is detailed below.

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 – New Build Heat Networks - Technical Specification – Energy Centre – Overview (HNTAS-NB-TS-EC-P0) document and the Heat Network Technical Assurance Scheme – Existing Heat Networks – Technical Specification – Overview (HNTAS-EX-TS-XX-M0) document.

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New Build Heat Networks

Following the award of Certificate 1 after Stage 6: Commissioning, an Energy Centre in a New Build Heat Network must demonstrate compliance with the HNTAS Requirements of this Code Document for a period of 2 years to achieve compliance at the end of Phase 4.

There is one stage within Phase 4, which is Stage 7: Operation and Maintenance. This is outlined in Figure 1.

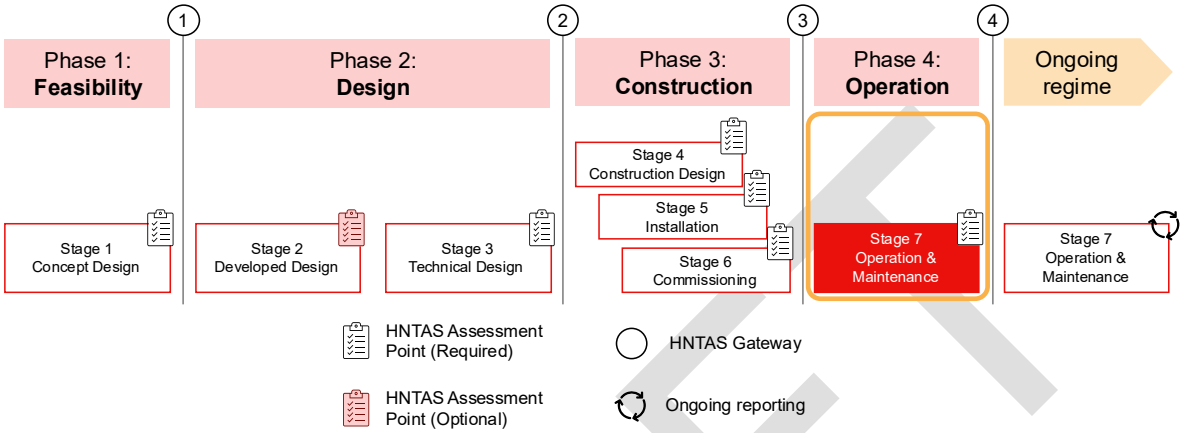

Figure 1: HNTAS New Build regime phases and stages

Existing Heat Networks

Following the successful assessment of an Energy Centre in an Existing Heat Network at Milestone 4, an Energy Centre must demonstrate compliance with the HNTAS Requirements of this Code Document for a period of 2 years to achieve compliance at Milestone 5.

Certified Heat Networks

Following the award of Certificate 2, an Energy Centre shall maintain compliance with the HNTAS Requirements of this Code Document.

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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 – 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 – Energy Centre – Overview (HNTAS-NB-TS-EC-P0)
- Heat Network Technical Assurance Scheme – Existing Heat Networks – Technical Specification – Overview (HNTAS-EX-TS-XX-M0)
- Heat Network Technical Assurance Scheme – Existing Heat Networks – Technical Specification – Energy Centre – Milestone 4 (HNTAS-EX-TS-EC-M4)

Informative references

There are no informative references in this document.

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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.

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Key Performance Indicators

This document first becomes applicable for the Energy Centre Element once Certificate 1 is achieved through either the New Build assurance pathway or the Existing Network assurance pathway.

The KPI thresholds to be met by an Energy Centre as part of compliance with this Code Document are dependent on the assurance pathway taken to achieve Certification.

Refer to:

- the Heat Network Technical Assurance Scheme – New Build Heat Networks – Technical Specification – Energy Centre – Overview (HNTAS-NB-TS-EC-P0) document for the New Build Regime; or
- the Heat Network Technical Assurance Scheme – Existing Heat Networks – Technical Specification – Energy Centre – Milestone 4 (HNTAS-EX-TS-EC-M4) document for the Existing Regime,

for the detailed list of:

- Monitoring Points required for an Energy Centre;
- the data and minimum read frequency required from each Monitoring Point;
- the Monitoring Points to be used to measure KPIs; and
- the KPI thresholds to be met.

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7. Requirements for Stage 7: Operation and Maintenance

7.1. Technical Requirements

The applicable HNTAS Technical Requirements in Table 4 shall be fulfilled.

Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
7.1.1.	The O&M Manual shall be maintained in accordance with the applicable technical standard(s).	TS1 7.17.3 TS1 7.17.6	EC-S7-E01 EC-S7-E04
7.1.2.	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. MMS 1.1.8 MMS 1.3.3 MMS 1.3.4 MMS 1.3.5 MMS 1.3.6	EC-S7-E02
7.1.3.	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-S7-E01 EC-S7-E04 EC-S7-E11 EC-S7-E12
7.1.4.	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-S7-E10

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Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
7.1.5.	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-S7-E01 EC-S7-E02 EC-S7-E03 EC-S7-E04 EC-S7-E05
7.1.6.	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-S7-E02 EC-S7-E14
7.1.7.	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-S7-E06
7.1.8.	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-S7-E06
7.1.9.	The Operating Risk Register shall be maintained in accordance with the applicable technical standard(s).	TS1 7.14.6 TS1 7.17.1	EC-S7-E09

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Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
7.1.10.	At least once per annum, equipment and pipework condition shall be determined, and remedial actions carried out where necessary 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-S7-E07
7.1.11.	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-S7-E07
7.1.12.	Prior to a change in Designated Operator, the condition of pipework and equipment shall be determined in accordance with the applicable technical standard(s).	TS1 7.16.11	EC-S7-E07
7.1.13.	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-S7-E08 EC-S7-E10
7.1.14.	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-S7-E02
7.1.15.	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 standards(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; and • parameters measured via laboratory testing of on-site samples shall be reported in accordance with sampling frequency in the applicable technical standards(s).	TS1 7.11.1 TS1 7.11.3 TS1 7.11.4	EC-S7-E17 EC-S7-E18

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Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
7.1.16.	For Depleted Water systems, top-up water shall meet water quality parameter limits in accordance with the applicable technical standard(s).	TS1 7.11.7	EC-S7-E19
7.1.17.	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-S7-E18
7.1.18.	Where water quality parameters exceed defined KPI thresholds, or a trend of a water quality metric indicates a deterioration in water quality: • the reporting and sampling frequency shall increase; • a competent water treatment specialist shall be engaged; and • appropriate remedial actions shall be undertaken, in accordance with the applicable technical standard(s).	TS1 7.11.2 TS1 7.11.6	EC-S7-E17 EC-S7-E18 EC-S7-E20 EC-S7-E22
7.1.19.	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-S7-E21
7.1.20.	Installed equipment no longer in use shall be disconnected and drained in accordance with the applicable technical standard(s).	TS1 7.11.13	EC-S7-E04 EC-S7-E24

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Technical Requirement		Applicable technical standard(s)	Evidence Requirement(s)
7.1.21.	Where it is proposed to change the Water Quality Strategy of a system between a Chemically Treated system and a Depleted Water system, this shall be reviewed in accordance with the applicable technical standard(s) prior to being implemented.	TS1 7.11.14 TS1 7.11.15	EC-S7-E23
7.1.22.	Where equipment or pipework is to be replaced, this shall be undertaken in accordance with: • the plant replacement strategy; • the applicable technical standard(s); and • the Heat Network Technical Assurance Scheme – Ongoing Regime – Scheme Rules - Replacement Regime (HNTAS-ON-SR-XX-RR) document.	TS1 7.6.1 TS1 7.6.2 TS1 7.6.3 TS1 7.6.4 TS1 7.11.13 TS1 7.17.10	EC-S7-E01 EC-S7-E04 EC-S7-E07 EC-S7-E08 EC-S7-E24
7.1.23.	An annual inspection shall be 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 compliance with Technical Requirements and ensure that Key Failures are not occurring. Where non-compliances are identified, the report shall outline what remedial actions are required to ensure future compliance. Any reports produced through this inspection shall be uploaded to HNTAS on an annual basis.	TS1 7.15.14	EC-S7-E25
7.1.24.	The KPI Schedule shall be maintained with accurate information and references to relevant documentation.		EC-S7-E26
7.1.25.	The Technical Parameters Schedule shall be maintained with accurate information and references to relevant documentation.		EC-S7-E27

Table 4: Technical Requirements for the Energy Centre at Stage 7: Operation and Maintenance

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7.2. Performance Monitoring Requirements

The applicable Performance Monitoring Requirements in Table 5 shall be fulfilled.

Performance Monitoring Requirement		Applicable technical standard(s)	Evidence Requirement(s)
7.2.1.	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-S7-E12
7.2.2.	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	EC-S7-E12 EC-S7-E13
7.2.3.	The Metering and Monitoring System shall calculate and report, at the required interval, each applicable Energy Centre KPI to HNTAS.		EC-S7-E15
7.2.4.	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.	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-S7-E15 EC-S7-E16

Table 5: Performance Monitoring Requirements for the Energy Centre at Stage 7: Operation and Maintenance

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7.3. Key Failures

The applicable Key Failures listed in Table 6 shall not be present.

Key Failure		Outcome to avoid	Evidence Requirement(s)
7.3.1.	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-S7-E02
7.3.2.	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-S7-E06
7.3.3.	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-S7-E03 EC-S7-E15 EC-S7-E16

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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.	
7.3.4.	Equipment unnecessarily placed into manual operation mode.	The Energy Centre does not operate in accordance with the design intent and Description of Operation, which may result in KPIs not being met.	EC-S7-E03 EC-S7-E15 EC-S7-E16
7.3.5.	Pressurisation unit not monitored and maintained in operation.	Frequent equipment failure, resulting in network downtime.	EC-S7-E03 EC-S7-E05 EC-S7-E07 EC-S7-E08 EC-S7-E17
7.3.6.	Pump bellows not regularly inspected.	Failure of pump bellows, leading to catastrophic outcomes such as major leaks and extended outages of the Heat Network.	EC-S7-E03 EC-S7-E15 EC-S7-E16
7.3.7.	Remedial action not taken to address equipment faults in timely manner (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-S7-E03 EC-S7-E15 EC-S7-E16
7.3.8.	Faults of pump differential sensors not rectified in timely manner.	Pumps respond incorrectly to variations in network demand, or do not respond at all. This could: 1. Cause excessive network flow rates at periods of low heat demand, which unnecessarily increases parasitic energy consumption and network return	EC-S7-E03 EC-S7-E15 EC-S7-E16

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Key Failure		Outcome to avoid	Evidence Requirement(s)
		temperature, which may cause KPIs not to achieve their thresholds. 2. Cause low network flowrates at periods of high demand, which may reduce the heat supplied to end consumers and reduce consumer comfort.	
7.3.9.	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-S7-E03 EC-S7-E15 EC-S7-E16
7.3.10.	Where alerts and alarms are removed from the control system or Metering and Monitoring System, failure to engage in a suitable change management process 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 alerts operatives when failures are occurring.	EC-S7-E03 EC-S7-E04 EC-S7-E15 EC-S7-E16
7.3.11.	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-S7-E03 EC-S7-E17

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Key Failure		Outcome to avoid	Evidence Requirement(s)
7.3.12.	Ancillary equipment (e.g. isolation valves) not regularly exercised.	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-S7-E03
7.3.13.	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-S7-E03 EC-S7-E17 EC-S7-E18
7.3.14.	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-S7-E03 EC-S7-E17 EC-S7-E18
7.3.15.	Remedial actions not undertaken to fix water quality parameters trending towards, or outside of the permitted limits.	Reduced efficiency of equipment due to poor water quality. Increased likelihood of equipment failure, which would require increased maintenance.	EC-S7-E03 EC-S7-E17 EC-S7-E18 EC-S7-E20 EC-S7-E22
7.3.16.	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-S7-E24
7.3.17.	Water Quality Strategy changed without appropriate considerations for the implications on system water quality.	This could reduce the water quality of the Energy Centre and lead to increased maintenance requirements.	EC-S7-E23

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Key Failure		Outcome to avoid	Evidence Requirement(s)
7.3.18.	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-S7-E14
7.3.19.	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-S7-E15
7.3.20.	Monitoring Points not communicating with the ARMS.	ARMS unable to extract, record and store data from Monitoring Points, and therefore KPIs cannot be calculated, and performance monitored.	EC-S7-E15
7.3.21.	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-S7-E03 EC-S7-E15 EC-S7-E16
7.3.22.	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-S7-E03 EC-S7-E15 EC-S7-E16
7.3.23.	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-S7-E11

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Key Failure		Outcome to avoid	Evidence Requirement(s)
7.3.24.	Documentation not adequately stored where they 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. This includes being stored within the Energy Centre, electronically (where applicable) and retaining a backup version of documentation.	Documentation cannot be accessed and/or updated by operation and maintenance personnel to reflect changes that have been made to the Energy Centre, which can lead to a lack of clarity on the current Energy Centre status for future operation and maintenance activities.	EC-S7-E10
7.3.25.	Replacement of equipment not in accordance with performance and/or design data.	Risk of equipment installation that is not in accordance with the performance and/or original design criteria. This may result in an increased risk of equipment failure, causing Energy Centre and network outages, which could result in KPIs not being met.	N/A
7.3.26.	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-S7-E07 EC-S7-E08
7.3.27.	Resilience Strategy is not updated to reflect changes made to the Heat Network.	Increased likelihood of an interruption to heat supply and increased impact should that interruption occur.	EC-S7-E08
7.3.28.	Resilience Strategy is not reviewed following an unplanned interruption.	Increased likelihood of an interruption to heat supply and increased impact should that interruption occur.	EC-S7-E08

Table 6: Key Failures for the Energy Centre at Stage 7: Operation and Maintenance

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7.4. Evidence Requirements

The applicable Evidence Items listed in Table 7 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-S7-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-S7-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-S7-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-S7-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 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-S7-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.

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Evidence Item		Detailed description and requirements
EC-S7-E06	Register of Operatives	To include a list of all personnel that have carried, 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-S7-E07	Condition Log	To include all basic asset data and condition data for all 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-S7-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

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Evidence Item		Detailed description and requirements
		items for resilience (for example, isolation valve locations, locations for temporary heat supply).
EC-S7-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-S7-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-S7-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-S7-E12	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-S7-E13	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).

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Evidence Item		Detailed description and requirements
EC-S7-E14	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-S7-E15	Reporting of KPIs	KPIs 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-S7-E16	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-compliance; 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-S7-E17	Reporting of water quality KPIs	Water quality KPIs reported to HNTAS at the required frequency.
EC-S7-E18	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-S7-E19	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-S7-E20	Evidence of water quality specialist engagement	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.

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Evidence Item		Detailed description and requirements
	(where applicable)	
EC-S7-E21	Evidence of circulation provision through stagnant areas	For example, where areas have been identified that could be subject to stagnant conditions, evidence that the control system switches equipment on a regular basis, or temporarily enables equipment on a regular basis that would otherwise not be required (i.e. enabling circulation through peaking plant equipment during low heating demand season).
EC-S7-E22	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.
EC-S7-E23	Water Quality Transition Approach	To outline the design requirements necessary to facilitate a change in Water Quality Strategy between a Chemically Treated system and a Depleted Water system, where it is proposed to do so.
EC-S7-E24	Evidence of equipment disconnection	Where equipment has been decommissioned, photographic evidence that equipment has been completely disconnected from the system.
EC-S7-E25	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-S7-E26	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-S7-E27	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 7: Evidence Requirements for the Energy Centre at Stage 7: Operation and Maintenance

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