

# ASSESSMENT PLAN

## Utilities Engineering Technician

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## Contents

<b>Overview</b> .....	2
<b>Suggested Training and On-programme Assessment Plan</b> .....	3
<b>1. Induction - Entry skills development (Induction and remainder of year 1)</b> .....	3
<b>2. Knowledge learning (Years 1-2)</b> .....	3
<b>3. Workplace training (Years 2-4)</b> .....	3
<b>Work log</b> .....	3
<b>Suggested observation of behaviours and skills</b> .....	3
<b>Suggested training/development review meetings</b> .....	3
<b>End-point assessment (last three months)</b> .....	5
<b>Portfolio Assessment</b> .....	5
<b>Work log</b> .....	5
<b>Internal Standardisation</b> .....	6
<b>Knowledge Assessment</b> .....	6
<b>Final Decision Panel</b> .....	7
<b>Grading</b> .....	7
<b>Assessment organisations</b> .....	9
<b>External Quality Assurance</b> .....	9
<b>Professional Body Recognition</b> .....	10
<b>Implementation</b> .....	10
<b>Affordability</b> .....	10
<b>Manageability/Feasibility</b> .....	10

## Overview

This assessment plan is to accompany the Utilities Engineering Technician Level 3 apprenticeship standard, which has three specialisms: 'Mechanical,' 'Electrical' and 'Instrumentation, Control & Automation' (ICA). To successfully complete the apprenticeship and become a qualified Utilities Engineering Technician competence must be demonstrated in the standard's core and one of the specialism specific requirements.

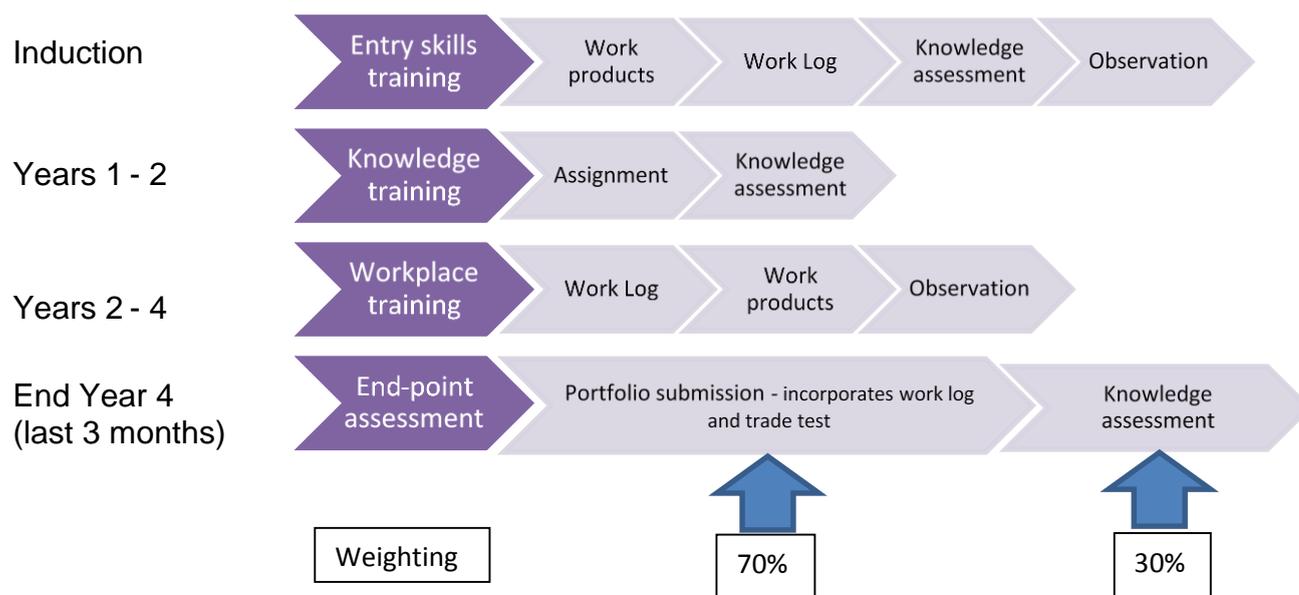
Utilities Engineering Technicians work in industries providing vital services where key responsibilities include protection of public health and protection of our environment. They install and maintain a vast range of complex equipment in industrial settings that include: Water or Waste Water Treatment works, Waste Management and Recycling facilities, Water Networks or Sewerage Networks. This equipment consists of items such as: valves, pipes, actuators, pumps, pressure vessels, filters, scrapers, stirrers and presses. To work effectively together requires complex power and control systems.

Employers in this sector are taking the opportunity afforded by the introduction of apprenticeship standards to radically re-model the approach to assessment. This capitalises on existing industry best practice while utilising end-point assessment aligned to Engineering Technician Registration requirements.

This plan outlines the end-point assessment that apprentices must successfully complete to achieve their apprenticeship. The apprenticeship will typically take up to 48 months, with the end-point assessment being taken in the final three months. Apprentices will be awarded a 'fail', 'pass' or 'distinction' based on their performance in the end-point assessment.

The employer group has also developed a suggested training plan which employers and training providers may use to develop skills, competence and knowledge. This is summarised below.

### Suggested training/assessment timescales and methods prior to the End Point Assessment



## Suggested Training and On-programme Assessment Plan

The suggested training and on-programme assessment plan of the apprenticeship can be divided into three distinct phases:

### 1. Induction - Entry skills development (Induction and remainder of year 1)

The aim of this phase should be to ensure apprentices are trained to work safely at all times. It should provide insight on employer and co-worker expectations and how and where the apprentice can seek guidance and support. Training modules may include Utility Safety Health and Environmental Awareness (Water) Scheme (SHEA) and First Aid, which are externally tested and standardised. The acquisition of these key skills provides a vital foundation for the apprenticeship.

### 2. Knowledge learning (Years 1-2)

To ensure development of the full range of knowledge required for this apprenticeship, it is suggested that a technical knowledge solution is developed by employers. Training should include engineering and maths relevant to the industry and set in that context; and provide the range of underpinning knowledge required to accelerate skills development and successfully tackle the end-point assessment. There are various routes to knowledge attainment, such as pre-existing Level 3 Engineering qualifications. Further development work by the water and utilities trailblazer group will respond to the employers' desire to develop an Industry Standard Knowledge Solution, which will become the industry's recognised qualification.

#### Suggested Technical Knowledge - Assessment activities may consist of:

- Assignments – written or practical work set, marked and graded against the specific module/options
- Knowledge assessments – set, marked and graded against the specific core modules and specific requirements

### 3. Workplace training (Years 2-4)

#### Suggested workplace training and development - Assessment activities may consist of:

- Work log – write-up of practical activities, of skills and competences (authorisation assessments)
- Observation – practical observation of work activity in terms of quality and behaviour
- Review meetings

### Work log

As the apprentice progresses through their training, they should build up evidence on the full range of skills, knowledge and behaviours required by the standard and be assessed on particular tasks or procedures or items of equipment - 'progressive authorisation assessments.' 'Safe isolation of operational equipment for maintenance' is one example of this type of progressive authorisation assessment, applicable to all Utility Engineering Technicians. It is industry practice that authorisation assessments are recorded in a work log. The work log must be sufficient to evidence the apprentice can apply skills, knowledge and behaviours required in a variety of tasks. Progress review documentation should also be included. The apprentice's supervisor will typically support the development of the work log in accordance with company policy and procedures, although the assessment organisation will provide guidance on the content of the work log. A summative assessment of the work log will form part of the end point assessment portfolio assessment – see below.

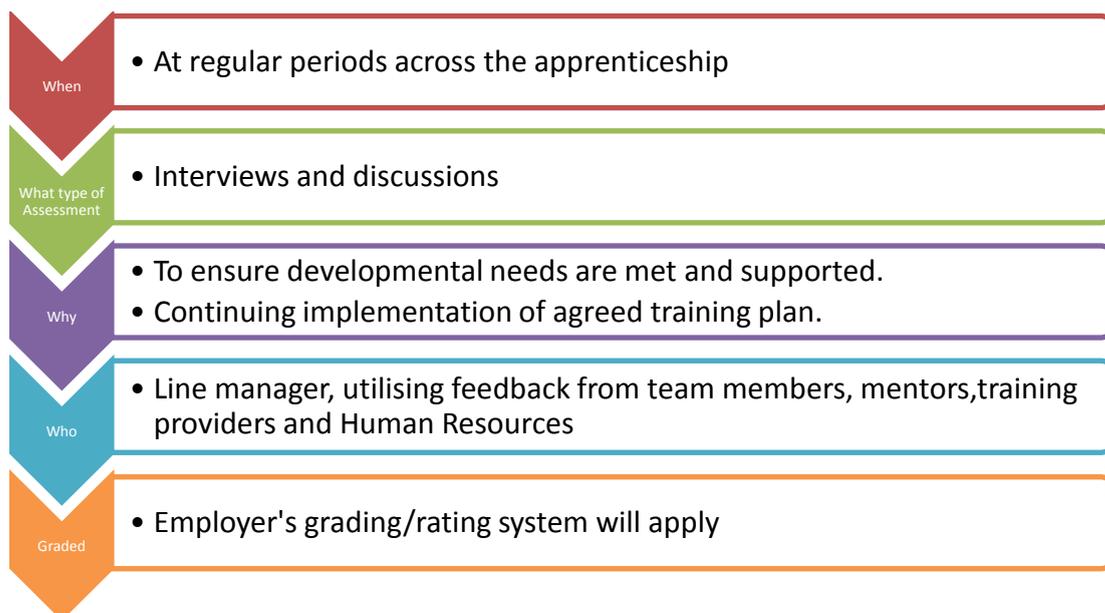
### Suggested observation of behaviours and skills

Apprentices work in an environment where their safety, the safety of those around them and the equipment they work on are of paramount importance. Therefore, observation of behaviours and approach are an integral and developing part of the apprentice progression throughout the apprenticeship and should be assessed using existing supervisory practice and as part of the on-going assessment.

### Suggested training/development review meetings

It is suggested that training and assessment is agreed and documented in a personal training/development plan. Regular review meetings should be programmed to ensure training/development needs are met and supported. This could include additional training, or ways of accelerating learning, as required by the apprentice. This will typically be an interview with their line manager, but may include colleagues from Human Resources. Feedback from mentors and team members may be included to contribute towards individual personalised training/development plans. Review documentation should be included in the

apprentice's work log - see above.



## End-point assessment (last three months)

Successful achievement of the end-point assessment will lead to final certification of the apprenticeship and demonstrate that the apprentice is a fully authorised competent worker, who can work safely and confidently to maintain or repair a range of systems. It uses the following assessment tools:

- Portfolio Assessment, incorporating work log summative assessment and trade test documentation; marked by technical experts usually sourced from the apprentice's employer (Weighting 70%)
- Knowledge Assessment; independently marked by an assessment organisation (Weighting 30%).

The end-point assessment may be completed over a three month period to accommodate work scheduling and cost effective planning of resources.

Although the apprentice should only be recommended for end-point assessment when they are ready; employers should have a remediation process in place to support any candidate who fails to meet the conditions of the end-point assessment.

Further details on each assessment tool are provided below.

### Portfolio Assessment

The apprentice will submit a portfolio consisting of a work log typically developed during the last two years of the apprenticeship – see above, together with documentation from a trade test completed in the final three months. The portfolio provides the opportunity to demonstrate skills, knowledge and behaviours across the standard - core and specific requirements. The portfolio will be marked by a technical expert, using standardised criteria and documentation; recording coverage against the standard, highlighting any performance above or below and awarding a preliminary mark out of 100. Further information on the work log and trade test assessment is provided below.

**Technical experts** will be nominated by the apprentice's employer; they may come from within their own organisation or brought in if required from other employers or an assessment organisation. They will not have directly worked with the apprentice or participated in their learning and training. Technical experts must be able to demonstrate an appropriate level of competence i.e. training and experience to undertake the role and hold an assessor qualification. They must be 'approved' by the assessment organisation for the purposes of conducting elements of the end-point assessment. This sector is sensitive from a safety and regulatory perspective. This means decisions on competence have implications not only for individual safety, but also reputation and litigation. As a result judgements of competence and moderation are required to be by necessity reliable, rigorous and robust.

### Work log

A technical expert will review the apprentice's work log and undertake a summative assessment of competence against the standard's skills, knowledge and behaviours:

#### **Mechanical Engineers will need to demonstrate they can:**

- Carry out basic fabrication and welding of structures and components
- Use mechanical knowledge and skills to install, maintain and dismantle a wide range of complex plant, machinery and components
- Consult design specifications to analyse and calculate mechanical system parameters and rectification procedures.
- Test, service and repair mechanical equipment as part of planned preventative maintenance and/or reactive maintenance programmes
- Install and maintain mechanical components including motors, pumps and gearboxes, maintaining and replacing lubricants.
- Inspect and maintain condition monitoring equipment

#### **Electrical Engineers will need to demonstrate they can:**

- Test, service and repair electrical equipment as part of planned preventative maintenance and/or reactive maintenance programmes
- Install and connect electrical cables, switchgear, circuit breakers, motors, transformers and other associated equipment.
- Carry out electrical procedures on industrial low voltage systems (up to 1000V AC) operating switchgear, fuses, motor control centres, transformers, manual & automatically controlled drives and motors.
- Carry out basic fault diagnosis on Programmable Logic Controllers (PLCs) and Supervisory Control & Data Acquisition (SCADA) systems.

**Instrumentation, Control & Automation Engineers need to demonstrate they can:**

- Use Instrumentation and Control Systems knowledge and skills to install, maintain and dismantle instruments, controllers, probes, attachments, cabling, meters and display units.
- Carry out telemetry outstation and internal system configuration
- Identify and resolve data quality and calibration issues
- Test, calibrate and validate fixed and portable analogue and digital instrumentation using approved procedures and standards.
- Repair, maintain, configure and calibrate field instrumentation, communication devices and associated equipment used in system and process control, such as Programmable Logic Controllers (PLC) and Supervisory Control & Data Acquisition (SCADA) systems

**Trade Test**

Apprentices will complete a practical assessment known as 'trade test' in the last three months, providing the opportunity to synoptically demonstrate core and specific skills, knowledge and behaviours. For example, the apprentice could be assigned a task to diagnose and rectify fault(s). The apprentice will need to apply the appropriate principles, procedures and knowledge and explain what and why they are undertaking a particular approach. They will be expected to select and use the appropriate equipment and tools, protect themselves and others from potential harm that can arise from their work, while ensuring other processes on site continue to function; effectively and efficiently maintaining production. The test will be awarded a pass or fail.

**Mechanical Engineers** can expect to be assessed on a range that could include pumps, motors, gearboxes, mixers, fluid power or pneumatic systems.

**Electrical engineers** can expect to be assessed on the cables, switchgear, fuses, motor control centres, circuit breakers, transformers, manual & automatically controlled drives and motors that power the mechanical systems listed above.

**Instrumentation, Control & Automation Engineers** can expect to be assessed on the probes, sensors, cabling, monitors, electronic controllers, telemetry, software or programmes that provide the control and automation function for the Electrical and mechanical systems listed above.

The assessment organisation will develop and hold a bank of trade tests covering core and specific requirements. Standardised documentation will be used to outline the test requirements, assessment criteria and to record decisions. An approved test will be released to the apprentice's employer on application, to be completed in the specified end-point period. Trade tests will be administered and marked by a technical expert, which may or may not be the same person as the technical expert who undertakes the portfolio review. The assessment report on the trade test must be included in the apprentice's portfolio.

**Internal Standardisation**

Internal quality assurance will ensure consistency, sufficiency, reliability and validity of portfolio assessment practice across all apprentices within the employer's organisation. The employer must hold a standardisation meeting to internally review the portfolio score, with the decision verified by a technical expert who is not involved in the marking of the trade test or initial portfolio review. In the event that there is no agreement on the score, the portfolio will be reviewed by an additional technical expert for a majority decision. A standardised decision form will record the score and the rationale for the judgement for submission to the final decision panel.

**Knowledge Assessment**

Apprentices will be required to complete a standardised knowledge assessment in the last three months that will be administered and marked by an independent assessment organisation. The assessment will enable apprentices to demonstrate knowledge across the Utilities Engineering Standard - core and specific requirements, as appropriate i.e. Mechanical, Electrical, Instrumentation Control and Automation (ICA). The assessment will be a multiple choice paper and taken by the apprentice under examination conditions. A pass will be a minimum of 70 per cent with a distinction for this element awarded to those with 90% or above. The outcome of the knowledge assessment will be submitted to the final decision panel.

## Final Decision Panel

Decision panels will consist of three people:

- Technical expert from apprentice's employer
- Technical expert independent of the apprentice and their employer i.e. not from their employer or training provider and
- Another technical expert independent of the apprentice and their employer or from a relevant professional body.

One of the independent panel members will act as chair of the panel. The decision panel will check all available evidence and discuss to enable the independent chair will make the final decision of whether to award a fail, pass or distinction. Therefore, someone independent of the apprentice and their employer will always determine the grade awarded. The assessment organisation will co-ordinate the final decision panels and observe and intervene where necessary to ensure they are operated in accordance with the guidance, ensuring comparable decisions consistently and comparably across panels and over-time.

## Grading

Grading will be standardised to ensure consistency across the sector. The apprenticeship will be graded fail, pass and distinction. The final grade will be determined by collective performance in the end-point assessment's two assessment tools. The **weighting** of the apprenticeship is 70% on the portfolio which incorporates the work log and final trade test and 30% to the independent knowledge assessment. A points system will determine if the apprentice has achieved a pass or distinction and is described below:

**Pass** – Minimum 2 Points (1 Point Portfolio + 1 Point Knowledge Assessment)

**Distinction** – Minimum 8 Points and Maximum 10 Points

### Minimum Combinations:

- Portfolio 5 Points + 3 Points Knowledge Assessment = 8 Points
- Portfolio 6 points + 2 Points Knowledge Assessment = 8 Points
- Portfolio 7 Points + 1 Point Knowledge Assessment = 8 Points

Portfolio %	Points	Grade	Knowledge Assessment %	Points	Grade
<69	0	Fail	<69	0	Fail
70	1	Pass	70-79	1	Pass
71-74	2	Pass	80-89	2	Pass
75-79	3	Pass	90-100	3	Distinction
80 - 84	4	Pass			
85-89	5	Distinction			
90-94	6	Distinction			
95-100	7	Distinction			

To achieve a 'pass' the apprentice will be demonstrating competence across the standard. To achieve 'Distinction' the apprentice will be demonstrating performance over and above the standard. The following table outlines the scoring criteria that must be applied; detailed guidance will be developed by the assessment organisations.

<b>End Point Element</b>	<b>Fail Criteria</b>	<b>Pass Criteria</b>	<b>Distinction Criteria</b>
Portfolio	<p><b>Fail &lt;69%</b></p> <ul style="list-style-type: none"> <li>Portfolio lacks sufficient evidence and structure to demonstrate knowledge, skills and competency through the work log, progress reviews and progressive authorisation assessments across the standard</li> <li>Fail in the final trade test</li> <li>Poor application of knowledge in the work place</li> <li>Poor reasoning skills displayed on practical tasks</li> <li>Negative team working and interpersonal skills</li> <li>Subject to a company disciplinary procedure</li> </ul>	<p><b>Pass (70-84)</b></p> <ul style="list-style-type: none"> <li>Portfolio well-structured and contains sufficient and robust evidence to demonstrate knowledge, skills and competency across the standard through the work log, progress reviews and progressive authorisation assessments</li> <li>Pass in the final trade test</li> <li>Good application of knowledge in the work place</li> <li>Good critical reasoning skills displayed on practical tasks</li> <li>Good team working and interpersonal skills and ability to respect the opinion of others</li> </ul>	<p><b>Distinction (85-100)</b></p> <ul style="list-style-type: none"> <li>The portfolio demonstrates evidence which is over and above the requirements of the standard through the work log, progress reviews and progressive authorisation assessments.</li> <li>Pass in the final trade test</li> <li>Outstanding application of knowledge in the work place</li> <li>High level of critical reasoning skills displayed on practical tasks</li> <li>Outstanding team and interpersonal skills and the ability to respect the opinion of others</li> </ul>
Knowledge Assessment	Score <69%	Score 70-89%	Score 90% and Above

## Assessment organisations

The model involves greater employer leadership in the apprenticeship development, implementation and operation, whilst maintaining a high level of scrutiny and assurance with a Quality Framework.

The assessment organisation's primary role will be to ensure that all decisions are consistent, credible and undertaken with integrity, it will:

- provide documentation and guidance in relation to the requirements of the apprenticeship, log book, trade tests, marking of the portfolio, internal standardisation meetings and final decision panels
- monitor technical experts and provide remedial support to ensure consistency and reliability of judgements on a risk based basis, for example, those newly qualified
- develop a range of trade tests for the specialised role. Assessment organisations must consult with representative technical experts when developing trade tests. The assessment organisation must ensure that there is consistency and comparability in terms of the breadth and depth of each trade test assessment, to ensure assessments are reliable, robust and valid and ensure competency accord across the industry
- develop knowledge assessments to meet the needs of each specialised role. Assessment organisations must consult with representative technical experts when developing the knowledge assessment. The assessment organisation must ensure that there is consistency and comparability in terms of the breadth and depth of each knowledge assessment, to ensure assessments are reliable, robust and valid and ensure competency accord across the industry
- set the rules for any compensatory assessment
- co-ordinate the final decision panels and observe and intervene where necessary to ensure they are operated in accordance with the guidance
- approve technical experts for the purposes of conducting trade test assessments, portfolio review, internal standardisation and moderation panels based on check of knowledge, experience, assessment qualifications and independence
- provide training for technical experts in terms of the requirements of the apprenticeship and operation and marking of the assessment tools and initial grading
- provide training for technical experts in undertaking fair and impartial assessment and making judgements about performance and the application of knowledge and behaviours within a workplace setting
- provide training for final decision panel members, in terms of the panel operation and grading; and how to communicate the decisions
- Hold regular standardisation events for technical experts and panel members to ensure consistent application of the guidance
- Ensure assessment organisation staff are trained in assessment and moderation processes and undertake regular continuing professional development
- develop and manage a complaints and appeals procedure.

All assessment organisations must be on the Skills Funding Agency's Register of Apprentice Assessment Organisations (RoAAO). Assessment organisations must work collaboratively to ensure standardisation in delivery of assessment services for the standard e.g. hold cross-organisation standardisation events.

### External Quality Assurance

External quality assurance for this apprenticeship standard will be managed by the Institute for Apprenticeships.

## Professional Body Recognition

The development of the apprenticeship standard and assessment plan has been supported by a range of Professional Engineering Institutions: the Institute of Water; CIWEM; the Energy Institute; the IET; and the Institution of Mechanical Engineers. The UK Standard for Professional Engineering Competence (third edition) has been used as a guide throughout. The continuing support and guidance of these Professional Bodies will ensure eligibility for registration as Engineering Technicians on successful completion of the apprenticeship.

The Institute of Water has detailed the requirements for recognition of apprentices as Engineering Technicians. Completion of a simple application form, supported by a sponsor who is familiar with their work as a registered engineer, along with evidence that they have successfully completed the apprenticeship standard will enable apprentices be registered as an Engineering Technician.

Employers in the sector recognise the greater opportunity of continuing career development post-apprenticeship that Professional Registration offers. They are confident that retention and development of highly skilled apprentices will be enhanced by Engineering Technician Registration as it will encourage the employee to identify opportunities for career progression and take responsibility for their own professional development. In terms of building a competent, professional workforce this requirement to demonstrate Continuing Professional Development and the progression routes onward to Incorporated and Chartered Engineer are very attractive to employers and apprentices alike.

## Implementation

### Affordability

The initial, indicative **end-point assessment costs** is expected to be in the region of £2,700, approximately 6 percent of the total external apprenticeship costs. In addition, the skills and knowledge of the apprentices tested at the end-point assessment will be in a realistic environment using expensive, plant and materials that may be scrapped post assessment. This approach adds significant costs, not included above, to the process but is seen as essential to ensure authentic competence. The development work required will allow the best market solutions to emerge which satisfy employer requirements within the developing co-investment apprenticeship model.

The final decision panel will conform to a standardised process which will be independently assured with independent third party representation beyond the employer. This will ensure fairness and equality for all, while consistently delivering a holistic test of the accumulated knowledge of the apprentice. The standardised approach will ensure affordability.

### Manageability/Feasibility

There are sufficient technical experts/assessors both geographically and within the sector to meet the needs of end point assessment. These are mainly located in the work place and at the cutting edge of new technical developments within the sector. It is expected that there would be in the region of 100 new starts annually when established, supported by a final decision panel which will meet four times per year to meet demand. Employers want to supply the technical experts who will make the final judgements on grading of the apprentice to raise the standards and quality across the sector. While we envisage a three year 'accreditation' cycle (extending to five if no change looks to be required), we also acknowledge that we need to be prepared to monitor and evaluate early adopters reactions and performance to ensure manageability/feasibility.

To help with manageability, and afforded by the existence of knowledge specifications, a number of existing qualifications and training programmes can be mapped to the Utilities Engineering Technician Trailblazer requirements and approved as able to deliver the knowledge requirements for this apprenticeship. This also allows knowledge to be delivered via knowledge 'solutions' (including training programmes) rather than just qualifications.

Employers have some internal capability and links to external partners capable of delivering the required number of apprentices. Employers are expecting to increase the numbers of apprentices and are looking at ways to stagger intakes and make effective use of their internal resources. Employers across the sector work collaboratively to share best practice and training and assessment resources. Employers are planning to build their internal capacity and capability for assessment.