

# END-POINT ASSESSMENT PLAN

Maintenance and Operations Engineering Technician

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## Overview

This end-point assessment plan is to accompany the Maintenance and operations engineering technician level 3 apprenticeship standard.

Maintenance and operations engineering technician covers 7 roles: electrical technician, mechanical technician, control and instrumentation technician, wind turbine technician, electrical system and process control technician, electromechanical technician, and plant operations technician. They will maintain the safety, integrity and effective operation of plant and equipment in one or more of the following Industries: the electricity generating environment, which may use a range of different fuels including coal, gas, nuclear, wind and other renewable sources; telecommunications power plants; oil and gas refining; nuclear waste reprocessing; processing and production of chemicals; pharmaceuticals; human and animal food; cosmetics; petrochemicals; sewerage; and the exploration and exploitation of oil and gas.

Electrical, mechanical, control and instrumentation, electrical system and process control, electromechanical and wind turbine technicians will undertake installation, testing, servicing, removal, replacement, maintenance and repair of a range of equipment, sometimes complex, as part of planned preventative and reactive maintenance programmes. They may also undertake decommissioning activities when plant is being removed from service.

Plant operation technicians will undertake the safe and efficient operation of complex integrated energy conversion and production plant and systems. These activities could include plant commissioning, isolation and testing, plant preparation, plant start-up and shut down, monitoring and controlling plant and dealing with critical operational problems.

Technicians will be responsible for the quality of their own work, possibly others' and ensuring the work is completed safely, meets stakeholder quality, time and budget requirements, whilst maintaining the efficient running of plant and equipment.

This plan outlines the end-point assessment that apprentices must successfully complete to achieve their apprenticeship. The Maintenance and operations engineering technician apprenticeship will typically take 36 - 42 months depending on the availability of assets and activities, with the end-point assessment taken in the last 6 months. Performance in the end-point assessment will determine the grade awarded: distinction, merit, pass or fail.

## End Point Assessment Gateway

Employers must satisfy themselves that apprentices are ready for their end point assessment. Apprentices must demonstrate that they meet the following criteria:

- achieved a minimum level 2 English and mathematics in line with the apprenticeship funding rules
- satisfactory completion of the formal training plan agreed with the apprentice by the employer
- sufficient evidence in the form of a portfolio to allow the apprentice to consistently demonstrate knowledge, skills and behaviours as described in the standard.

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 apprentice who fails to meet the conditions of the end point assessment.

## End-Point Assessment (final six months)

End-point assessment must be undertaken by an end-point assessment organisation (EPAO) that is on the apprenticeship provider and assessment register (APAR). EPAOs must appoint appropriately qualified and experienced assessors – termed ‘independent examiners’ and ‘technical experts’ to conduct the end-point assessment, as defined in this plan. Examiners must be independent for example, have no connection with the apprentice, their training provider or employer. Technical experts must also be independent, the only exception to this is where industry requirements restrict this such as nuclear and power generation; in these sectors each site is unique, with technical experts holding specific knowledge about the site, security permissions and operating procedures to comply with for example the Nuclear Legislation Act – Licence Condition Number 9, Health and Safety at Work Act and Electricity at Work Act. In these cases, the technical expert undertaking the observation may be recruited from the employer however, they must not have been involved in their training or line management and their assessment decisions must be countersigned by an independent assessor; in the case of disagreement the independent assessor has the casting vote.

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

Successful achievement of the end-point assessment will lead to final certification of the apprenticeship and demonstrate that the apprentice is a fully competent Technician.

It uses the following assessment tools and should be undertaken in this order:

- knowledge assessment (weighting 20%)
- a final observation of practical work (weighting 40%)
- a technical interview, based upon an evidence portfolio which will include all evidence of practical observations, progress reviews and work activities (weighting 40%)

See Annex A for details of which assessment method will be used to assess each element of the standard. Further details on each assessment tool are provided below.

### Knowledge assessment (Stage 1)

Apprentices will be required to complete a standardised knowledge assessment consisting of 30 multiple choice questions, which may be scenario based, to be taken under examination conditions.

The assessment will be a 45minute electronic or paper-based question paper and will enable apprentices to demonstrate core technical knowledge across the Maintenance and operations engineering technician standard as detailed in Annex A. The questions will be determined and standardised by EPAOs in consultation with representative employers.

The apprentice will take the knowledge assessment in a suitably controlled environment in the workplace in the presence of an invigilator. The invigilator may be sourced from the employer but will be approved by EPAOs and must operate according to their guidance.

The test will be marked by an independent examiner appointed by an EPAO, following a marking guide produced by the EPAO. Independent examiners must be competent to a minimum of level 4 or equivalent in a relevant engineering discipline with a minimum 3 years' post qualification experience.

The knowledge assessment will be marked out of 100 marks, the score will provide points towards the final grade reflecting the weighting for this assessment method. Criteria for marking the knowledge assessment is shown in table 1.

### **Practical observation (Stage 2)**

Apprentices will complete a practical observation. The content of this practical observation will relate to the specific role they are working towards. The duration of this activity will typically be no longer than one day and the actual time allowed will be based on the comparable time that an industry competent worker would take to achieve successful task(s) completion; thus EPAOs will set the time allowed for observations in consultation with representative employers.

The observation will be managed and marked by an independent technical expert appointed by the EPAO, which may or may not be one of the independent technical experts who conducts the technical interview – see below. They must be currently working in the industry and occupationally competent at a minimum of level 3, or equivalent, with a minimum 3 years' post qualification experience.

The apprentice will be asked standardised questions from a set developed by EPAOs with opportunity for follow up questions as appropriate, to confirm their understanding of the rationale for actions taken and the choices made to complete the tasks. EPAOs will provide a standard template upon which to record the assessment outcomes.

This observation will provide the opportunity for the apprentice to synoptically demonstrate core and specific knowledge, skills and behaviours as detailed in Annex A, on actual plant and equipment in a realistic work situation. This will offer the opportunity to bring together and apply their learning. Apprentices will be assessed to confirm that they can apply their knowledge of plant and systems to safely perform maintenance and operational activities with minimum supervision.

The observation will be marked out of 100 marks, the score will provide points towards to the final grade reflecting the weighting for this assessment method. Criteria for marking the practical observation is shown in table 1.

### **Technical interview (Stage 3)**

As the final stage of the end-point assessment process, an independent technical expert will conduct a technical interview. Independent technical experts appointed by the EPAO must be currently working in the industry and be occupationally competent at a minimum of level 3 or equivalent, with a minimum 3 years' post qualification experience.

This interview will be based on the contents of the evidence portfolio, which may be compiled throughout the apprenticeship and finalised during the end-point assessment period. The evidence will be sufficient to demonstrate the apprentice can apply knowledge, skills and behaviours required as indicated in Annex A.

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The apprentice's manager or mentor will typically support the development of the evidence portfolio in accordance with company policy and procedures, although EPAOs will provide guidance on the content of the evidence portfolio.

The technical interview will test the currency, validity and coverage of the evidence presented in the evidence portfolio in relation to the knowledge, skills and behaviours shown in Annex A. It will consist of three scenario question areas synoptically examining knowledge, skills and behaviours. It will typically last two hours and a maximum of two and a half hours. The technical expert will use standardised questions from an agreed set of questions developed by the EPAO. Follow-up questions may be used to probe further into the detail in order to satisfy themselves of the depth of knowledge and skills. This interview will be conducted under controlled conditions. The apprentice responses will be documented by the independent technical expert.

The apprentice may choose to end the assessment method early. The apprentice must be confident they have demonstrated competence against the assessment requirements for the assessment method. The independent assessor or EPAO must ensure the apprentice is fully aware of all assessment requirements. The independent assessor or EPAO cannot suggest or choose to end the assessment methods early, unless in an emergency. The EPAO is responsible for ensuring the apprentice understands the implications of ending an assessment early if they choose to do so. The independent assessor may suggest the assessment continues. The independent assessor must document the apprentice's request to end the assessment early.

The technical interview will be marked out of 100 marks, the score will provide points towards to the final grade reflecting the weighting for this assessment method. Criteria for marking the technical interview is shown in table 1.

### Re-takes and re-sits

Re-takes and re-sits will only be available to apprentices who fail an end-point assessment element(s) they are not offered to apprentices wishing to move from pass to distinction. Apprentices may re-take or re-sit one or more elements within the six month end-point assessment period. Re-take or re-sits outside of the six-month end-point assessment period would require all elements to be re-assessed. Re-sits or re-takes will not be awarded a grade higher than pass. Apprentices must have a supportive action plan to prepare for the re-take or re-sit. Further re-takes or re-sits would be at the discretion of the employer following a 1:1 review with the apprentice to determine the suitability of the apprentice for further testing.

### End-point assessment organisation moderation

EPAOs will undertake moderation of independent examiner and technical experts' decisions through observations and examination of documentation on a risk sampling basis, for example a minimum of 20% for experienced examiners and technical experts and 100% for new examiners and experts or where inconsistencies have been identified or where the technical expert has been recruited from the employer due to site requirements. Results cannot be confirmed until moderation has been completed.

### Final Grade Decision

An independent examiner (as defined above), will combine the moderated grades from the knowledge test, practical observation and technical interview to determine the overall apprenticeship grade in line with the grading criteria below.

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## Grading Criteria

The apprenticeship will be graded distinction, merit, pass or fail. The final grade will be determined by collective performance in the three assessment tools in the end-point assessment. The weighting of the assessment methods is: 40% on the technical interview, 40% practical observation and 20% on the knowledge assessment. A points system relating to the mark achieved in each assessment tool, will determine if the apprentice has achieved a distinction, merit, pass or fail and is described below:

**Distinction** – minimum of 24 Points (10.5 Points in technical interview + 10.5 points in practical observation + 3 Points knowledge assessment). *An apprentice will only achieve a distinction if they have performed at distinction level in both the technical interview and practical observation*

**Merit** – minimum of 15.5 Points (7.0 Points the technical interview + 7 points in the practical observation + 1.5 Points knowledge assessment). *An apprentice will only achieve a merit if they have performed at merit level in both the technical interview and practical observation*

**Pass** – minimum of 8.5 Points (i.e. a minimum of pass in all 3 elements).

Knowledge Assessment %	Points	Grade	Practical Observation	Points	Grade	Technical Interview %	Points	Grade
85 – 100	4.5	Distinction	85 – 100	10.5	Distinction	85-100	10.5	Distinction
75 – 84	3	Merit	75 – 84	7	Merit	75- 84	7	Merit
60 – 74	1.5	Pass	60 – 74	3.5	Pass	60 - 74	3.5	Pass
≤59	0	Fail	≤59	0	Fail	≤59	0	Fail

**Table 1**

The following table outlines the scoring criteria that will be applied for each assessment method; detailed guidance will be developed by the EPAOs.

Annex A shows which elements of the standard will be assessed by each assessment method within the end-point assessment.

In order to be a competent worker all pass criteria needs to be achieved. Merit builds on the demonstration of pass criteria and distinction builds on both pass and merit.

End Point Element	Distinction Criteria	Merit Criteria	Pass Criteria	Fail Criteria
Knowledge Assessment	<b>Score 85% and Above</b>	<b>Score 75-84%</b>	<b>Score 60-74%</b>	<b>Score ≤59%</b>
Technical Interview	<b>Score 85-100</b>	<b>Score 75-84</b>	<b>Score 60-74</b>	<b>Fail ≤59</b>

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<p>(100 Marks)</p>	<ul style="list-style-type: none"> <li>• justification of:             <ul style="list-style-type: none"> <li>○ maintenance and operational practices, processes and procedures covering a range of plant and equipment</li> <li>○ a range of methods to locate, and rectify faults on plant and equipment, with explanation of their recommended choice</li> </ul> </li> <li>• demonstration of excellent and thorough understanding of the relevant engineering theories and principles relative to their occupation</li> <li>• excellent knowledge and understanding of the impact of relevant industry health, safety and environmental working practices and regulations on their activities</li> </ul>	<ul style="list-style-type: none"> <li>• explains in detail, with supporting evidence, the range of required skills, knowledge and behaviours with particular emphasis on:             <ul style="list-style-type: none"> <li>○ Inclusion of the relevant engineering theories and principles relative to their occupation</li> <li>○ Demonstration of review and applicability of industry health, safety and environmental working practices and regulations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• provides correct information to describe their understanding of skills, knowledge and behaviours required to undertake their respective role competently, meeting technical experts requirements, with particular emphasis on:             <ul style="list-style-type: none"> <li>• understands and can describe the impact of their actions on plant, equipment and others.</li> <li>• demonstrates compliance with all company health, safety and environmental processes and policies as well as regulatory requirements</li> <li>• describes why policies and procedures are required</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• fails to provide all evidence to meet skill, knowledge and behavioural requirements as detailed in annex A</li> </ul>
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<p>Practical Observation (100 Marks)</p>	<p><b>Score 85-100</b></p> <ul style="list-style-type: none"> <li>• exemplary health and safety performance</li> <li>• identifies health and safety deficiency and provides solutions</li> <li>• consults and involves, people from team and other areas to achieve greater understanding</li> <li>• takes additional responsibility and autonomy to achieve high performance outcomes</li> <li>• through positive relationships is able to actively address conflict with positive outcomes</li> <li>• pre-empts risks prior to task commencement and puts actions in place to prevent them occurring</li> </ul>	<p><b>Score 75-84</b></p> <ul style="list-style-type: none"> <li>• works with others to identify areas for improvement and follows through on agreed implementation</li> <li>• demonstrates positive professional relationships with individuals to support specific issues</li> <li>• adapts the method and style of communications to changing circumstances and needs.</li> <li>• consistently demonstrates compliance and makes suggestions to reduce risks</li> </ul>	<p><b>Score 60-74</b></p> <ul style="list-style-type: none"> <li>• achieves practical activities as described in Annex A and meets the expectations of technical experts</li> <li>• follows policies and procedures; applies health and safety knowledge. Takes personal responsibility for own health, safety and security and that of anyone who may be affected by their actions</li> <li>• accuracy and finish of work meets company standards</li> <li>• effectively contributes to team success, and suggests valid ideas</li> <li>• speaks confidently when asked, listens to others and takes required action</li> <li>• demonstrates consistent application of</li> </ul>	<p><b>Fail ≤59%</b></p> <ul style="list-style-type: none"> <li>• fails to provide evidence to meet all skill and behavioural requirements</li> </ul>
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			<p>policies and procedures</p> <ul style="list-style-type: none"> <li>• consistently demonstrates compliance and proactively identifies workplace hazards</li> </ul>	
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### End-point Assessment Organisations

The model involves greater employer leadership in the apprenticeship development, implementation and operation, whilst maintaining a high level of scrutiny and assurance within a quality framework.

All EPAOs must be on the apprenticeship provider and assessment register (APAR).

EPAOs must work collaboratively to ensure standardisation in delivery of assessment services for the standard.

EPAOs must:

- provide end-point assessment guidance, where required and appropriate, to apprentices, employers and training providers in relation to the requirements of the knowledge assessment, practical observation, technical interview, evidence portfolio and marking of the end point components
- provide immediate guidance where end-point assessments need to be halted due to unforeseen circumstances for example system emergency, apprentice illness, so it is clear that an apprentice's grade will not be capped at a pass if they have to re-take or re-sit the end-point assessment for reasons beyond their control
- ensure independent technical experts make consistent and reliable assessment and grade judgements through moderation activity involving observations and examination of assessment records on a risk sampling basis, for example a minimum of 20% for experienced assessors and 100% for new assessors or where inconsistencies have been identified or where the technical expert has been recruited from the employer due to site requirements
- develop knowledge assessments to meet the needs of each specialised role. EPAOs must consult with representative technical experts when developing the knowledge assessment. EPAOs 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
- develop compensatory assessment for learners with special requirements to allow reasonable adjustments to be made to assess the knowledge, skills and competence of the apprentice through alternative assessment techniques. Whilst these will remove barriers to participation, they must be designed to ensure judgements are not compromised to health and safety and legal requirements

- appoint and approve independent technical experts for the purposes of conducting the practical observation and technical interviews and grading, based on a check of knowledge, experience and independence
- appoint and approve independent examiners to mark the knowledge assessment and provide the marking guidance, based on a check of knowledge, experience and independence
- provide training for independent examiners and technical experts in terms of the requirements of the operation and marking of the assessment tools and 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 documentation and guidance in relation to the end-point assessment for example, making reasonable adjustment, eligibility to enter end-point assessment and conflict of interest
- hold bi-annual standardisation events for technical experts and external examiners to ensure consistent application of the guidance
- ensure EPAO moderators are trained in assessment and assurance processes and undertake regular continuing professional development
- develop and manage a complaints and appeals procedure.

### External Quality Assurance

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

### Professional Body Recognition

The Institution of Mechanical Engineers (IMechE) and Institution of Engineering and Technology (IET) have supported the development of the apprenticeship standard and assessment plan. The current edition of the UK Standard for professional engineering competence (UK-SPEC) has been used as a guide throughout. The continuing support and guidance of this and other relevant professional bodies will ensure the apprentices who qualify in maintenance and operations engineering hold eligibility for registration as Engineering Technicians (EngTech).

This apprenticeship is designed to prepare the graduating apprentice to meet the standard required for the registration level of Engineering Technician as defined by the UK Standard for Professional Competence and may do so by submitting an application to their chosen Professional Engineering Institution.

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.

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## Implementation

### Affordability

The initial, indicative end point assessment costs are expected to be approximately 5% of the total apprenticeship costs.

### Manageability and Feasibility of the Standard and Assessment Plan

While we envisage a three year 'approval' cycle we also acknowledge that we need to be prepared to monitor and evaluate early adopters' reactions and performance to ensure manageability and feasibility. It is expected that there would be in the region of 120 new starts. This number is impacted by changes in the energy market.

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 Maintenance and Operations Engineering Technician requirements and 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 technical expert capability providing a pool of independent technical experts from which EPAOs can recruit.

Employers across the sector work collaboratively to share best practice and training and assessment resources.

Approved EPAOs will need to undertake work, in consultation with employers, to develop the end-point assessment.

## ANNEX A

### Assessment method by element of the standard – Maintenance and operations engineering technician

Key	Assessment method
TI	Technical interview
KT	Independent knowledge assessment
PO	Practical observation

Where elements have both assessment methods identified, it means that both assessment method will be used to ensure a synoptic approach is achieved

Core Technical Knowledge	EPA	
First principles relating to the operation and maintenance of appropriate plant and equipment	TI	KT
Relevant industry health and safety standards, regulations, and environmental and regulatory requirements	TI	KT
Maintenance and operational practices, processes and procedures covering a range of plant and equipment	TI	KT
The relevant engineering theories and principles relative to their occupation	TI	KT

Core Skills	EPA	
Comply with industry health, safety and environmental working practices and regulations		PO
Locate, and rectify faults on plant and equipment	TI	PO
Communicate with and provide information to stakeholders in line with personal role and responsibilities		PO
Read, understand and interpret information and work in compliance with technical specifications and supporting documentation	TI	PO
Prepare work areas to undertake work related activities and reinstate those areas after the completion of the work related activities		PO
Inspect and maintain appropriate plant and equipment to meet operational requirements	TI	PO
Assess and test the performance and condition of plant and equipment		PO

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Communicate, handover and confirm that the appropriate engineering process has been completed to specification	TI	PO
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Core Behaviours	EPA	
<b>Health and Safety</b> – follows health and safety policies and procedures and be prepared to challenge unsafe behaviour using appropriate techniques to ensure the protection of people and property when working alone and/or with appropriate supervision		PO
<b>Quality focused</b> – ensures that work achieves quality standard both occupationally and personally		PO
<b>Working with others</b> – has the ability to work well with people from different disciplines, backgrounds and expertise to accomplish an activity safely and on time		PO
<b>Interpersonal skills</b> – gets along well with others and takes into account their needs and concerns		PO
<b>Critical reasoning</b> – uses resources, techniques and obtained facts to develop sound solutions while recognising and defining problems	TI	
<b>Sustainability and ethical behaviour</b> – behaves ethically and undertakes work in a way that contributes to sustainable development		PO
<b>Risk awareness</b> – demonstrates high concentration, the desire to reduce risks, ability to be compliant and awareness of change, through regular monitoring and checking of information		PO

As part of the practical observation of skills, apprentices can expect to be assessed on one of the specific skill requirements for their role as detailed below.

Specific Skills – Electrical Technicians	EPA	
Position, assemble, install and dismantle electrical plant and equipment to agreed specifications	TI	PO
Carry out planned, unplanned and preventative maintenance procedures on electrical plant and equipment	TI	PO
Replace, repair and/or remove components in electrical plant and equipment and ensure its return to operational condition.	TI	PO
Diagnose and determine the cause of faults in electrical plant and equipment	TI	PO

Specific Skills – Mechanical Technicians	EPA	
Position, assemble, install and dismantle mechanical plant and equipment to agreed specifications	TI	PO
Carry out planned, unplanned and preventative maintenance procedures on mechanical plant and equipment	TI	PO
Replace, repair and/or remove components in mechanical plant and equipment and ensure its return to operational condition.	TI	PO
Diagnose and determine the cause of faults in mechanical plant and equipment	TI	PO

Specific Skills – Control and Instrumentation Technicians	EPA	
Position, assemble, install and dismantle plant and equipment to agreed specifications	TI	PO
Carry out planned, unplanned and preventative maintenance procedures on plant and equipment	TI	PO
Replace, repair and/or remove components in plant and equipment and ensure its return to operational condition	TI	PO
Diagnose and determine the cause of faults in plant and equipment	TI	PO
Calibrate and configure instrument and control systems	TI	PO

Specific Skills – Wind Turbines	EPA	
Install, assemble, commission and dismantle wind turbine plant and equipment, which will include pitch systems, yaw systems, switchgear, control systems to agreed specifications	TI	PO
Carry out planned, unplanned and preventative maintenance procedures on wind turbine plant and equipment including mechanical drive systems	TI	PO
Replace, repair and/or remove components in wind turbine plant and equipment and ensure its return to operational condition.	TI	PO
Diagnose and determine the cause of faults in wind turbine plant and equipment	TI	PO





Specific Skills – Electrical System and Process Control Technicians	EPA	
Position, assemble, install and dismantle integrated electrical apparatus, systems and process control equipment	TI	PO
Carry out planned, unplanned and preventative maintenance procedures on integrated plant and equipment	TI	PO
Replace, repair and/or remove components within integrated plant and equipment and ensure its return to operational condition	TI	PO
Diagnose and determine the cause of faults within integrated plant and equipment	TI	PO
Calibrate and configure integrated electrical apparatus, systems and process control equipment	TI	PO

Specific Skills – Electromechanical Technicians	EPA	
Position, assemble, install and dismantle integrated electromechanical power and control systems	TI	PO
Carry out planned, unplanned and preventative maintenance procedures on integrated plant and equipment	TI	PO
Replace, repair and/or remove components within integrated plant and equipment and ensure its return to operational condition	TI	PO
Diagnose and determine the cause of faults within integrated plant and equipment	TI	PO

Specific Skills – Plant Operations Technicians	EPA	
Carry out planned operating procedures on plant and equipment	TI	PO
Monitor the performance of the plant and equipment	TI	PO
Handover and accept responsibility for plant and equipment	TI	PO
Respond to contingencies	TI	