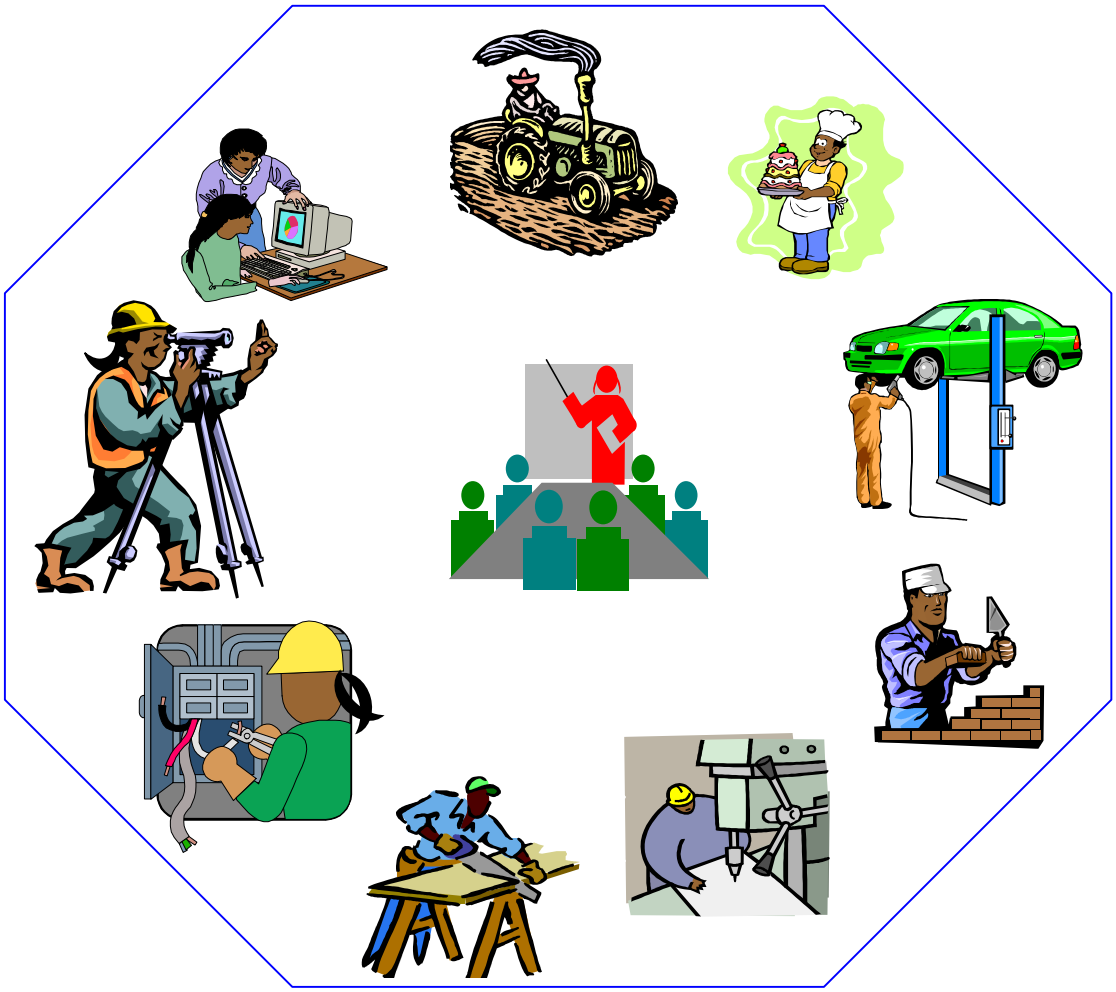
Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

POWER SYSTEM OPERATION

NTQF Level IV



Ministry of Education

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Introduction

Ethiopia has embarked on a process of reforming its TVET-System. Within the policies and strategies of the Ethiopian Government, technology transformation – by using international standards and international best practices as the basis, and, adopting, adapting and verifying them in the Ethiopian context – is a pivotal element. TVET is given an important role with regard to technology transfer. The new paradigm in the outcome-based TVET system is the orientation at the current and anticipated future demand of the economy and the labor market.

The Ethiopia Occupational Standards (EOS) is the core element of the Ethiopian National TVET-Strategy and an important factor within the context of the National TVET-Qualification Framework (NTQF). They are national Ethiopian standards, which define the occupational requirements and expected outcome related to a specific occupation without taking TVET delivery into account.

This document details the mandatory format, sequencing, wording and layout for the Ethiopia Occupational Standard which comprised of Units of Competence.

A Unit of Competence describes a distinct work activity. It is documented in a standard format that comprises:

- Occupational title and NTQF level
- Unit title
- Unit code
- Unit descriptor
- Elements and Performance criteria
- Variables and Range statement
- Evidence guide

Together all the parts of a Unit of Competence guide the assessor in determining whether the candidate is competent.

The ensuing sections of this EOS document comprise a description of the occupation with all the key components of a Unit of Competence:

- chart with an overview of all Units of Competence for the respective level (Unit of Competence Chart) including the Unit Codes and the Unit Titles
- contents of each Unit of Competence (competence standard)
- occupational map providing the technical and vocational education and training (TVET) providers with information and important requirements to consider when designing training programs for this standards and for the individual, a career path

UNIT OF COMPETENCE CHART

Occupational Standard: Power System Operation

Occupational Code: EIS PSO

NTQF Level IV

EIS PSO4 01 0612 Maintain Quality Systems within the Team	EIS PSO4 02 0612 Monitor Compliance with OHS Policy and Procedures	EIS PSO4 03 0612 Monitor and Implement Environmental Plans and Procedures
EIS PSO4 04 0612 Respond to Critical Incidents	EIS PSO4 05 0612 Coordinate Network System	EIS PSO4 06 0612 Coordinate First Response Team Operation
EIS PSO4 07 0612 Interpret and Analyze Multi-Operation Protection Devices	EIS PSO4 08 0612 Develop HV Switching Programs	EIS PSO4 09 0612 Coordinate Team Activities
EIS PSO4 10 0612 Develop Contingency Plan	EIS PSO4 11 0612 Undertake Operations Commissioning/ Decommissioning	EIS PSO4 12 0612 Operate and Monitor System Equipment
EIS PSO4 13 0612 Commission Network Protection and Control Systems (Interdependent)	EIS PSO4 14 0612 Install and Configure Computer Operating System and Software	EIS PSO4 15 0612 Set up and Configure Basic Local Area Network
EIS PSO4 16 0612 Develop Enter and Verify Programs for Programmable Logic Controllers Using Ladder	EIS PSO4 17 0612 Develop Enter and Verify Programs in Supervisory Control and Data Acquisition Systems	EIS PSO4 18 0612 Use Engineering Application Software
EIS PSO4 19 0612 Control Permit to Work Operations	EIS PSO4 20 0612 Write Programs for Control Systems	EIS PSO4 21 0612 Plan and Organize Work
EIS PSO4 22 0612 Develop Individuals and Team	EIS PSO4 23 0612 Migrate to New Technology	EIS PSO4 24 0612 Utilize Specialized Communication Skills
EIS PSO4 25 0612 Establish Quality Standards	EIS PSO4 26 0612 Manage and Maintain Small/Medium Business Operations	EIS PSO4 27 1012 Manage Continuous Improvement System

Occupational Standard: Power System Operations Level IV	
Unit Title	**Maintain Quality Systems within the Team**
Unit Code	**EIS PSO4 01 0612**
Unit Descriptor	This unit deals with the skills and knowledge required to oversee compliance with performance indicators through the maintenance of quality systems within a team environment.

Elements	Performance Criteria
1. Formulate team aspects of the quality system	1.1 Team quality assurance requirements/targets are identified or modified from an analysis of enterprise needs 1.2 Team performance indicators, identified during team consultations, are agreed or referred to the appropriate party for approval in accordance with job requirements 1.3 Compatibility between total team and total individual performance indicators is effectively coordinate in accordance with job requirements 1.4 Site and team quality systems documentation is obtained, edited and summarized as required and made available to all members in accordance with job requirements 1.5 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training
2. Facilitate team quality systems	2.1. Team members are provided with encouragement and training in team quality systems matters in accordance with job requirements 2.2. The application of quality systems is monitored regularly both in the ***work***place and with customers in accordance with job requirements 2.3. Instances of inability to satisfy key performance indicators are recorded, investigated and referred totem mechanisms and appropriate authorities for remedial actions in accordance with enterprise procedures 2.4. Quality systems are regularly reviewed with the team to ensure their currency and continuing relevance in accordance with enterprise procedures 2.5. Team quality systems records are maintained and made available to interest parties in accordance with enterprise procedures

Variable	Range
Work may be affected by	• Local standards, occupational health and safety standards, Codes of practice, manufacturer specifications, environmental requirements and enterprise procedures.

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Implement OHS workplace procedures and practices including the use of risk control measures • Apply sustainable energy principles and practices • Local and/or international standards related to quality • Monitoring an d reviewing quality systems • Maintaining records and documentation
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • International standards related to quality • local standards related to quality • Quality management theory • Team quality systems and procedures including: responsibilities and prerogatives, documentation system including quality manual and quality plan, quality records processes, performance and achievement audits, • Elementary quality systems design processes • Communication procedures
Underpinning Skills	Demonstrates skills to: • Access, interpret and apply enterprise quality systems procedures and practices • Formulate elementary quality systems • Formulate quality practices for the team operations • Establish quality performance indicators for teams and site work • Conduct and analyze the results of quality systems audits • Co-ordinate the development and maintenance of team competence in quality systems • Co-ordinate the modification of team systems based on quality systems findings • Communicate effectively • Apply data analysis techniques and tools.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

Occupational Standard: Power System Operation Level IV	
Unit Title	**Monitor Compliance with OHS Policy and Procedures**
Unit Code	**EIS PSO4 02 0612**
Unit Descriptor	This unit deals with the skills and knowledge required to implement and monitor the organization's Occupational Health and Safety (OHS) policies, procedures and programs in the relevant work area to achieve and maintain OHS standards.

Elements	Performance Criteria
1. Provide information to the work group about Occupational health and Safety and the organization's policies, procedures and programs	1.1 Relevant provisions of ***Occupational Health and Safety legislation*** and codes of practice are accurately and clearly explained to the work group 1.2 Information on the organization's Occupational Health and Safety policies, procedures and programs is provided in a readily accessible manner and is accurately and clearly explained to the work group 1.3 Information about identified hazards and the outcome of risk assessment and risk control procedures is regularly provided and is accurately and clearly explained to the work group 1.4 Where appropriate, the teams and individuals roles and responsibilities within the team are identified, and, where required, assist in the provision of on-the-job training
2. Implement and monitor participative arrangements for the management of OHS	2.1. Organisational procedures for consultation over Occupational Health and Safety issues are implemented and monitored to ensure that all members of the work group have the opportunity to contribute 2.2. Issues raised through consultation are dealt with and resolved promptly, or referred to the appropriate personnel for resolution in accordance with workplace procedures for issue resolution 2.3. The outcomes of consultation over Occupational Health and Safety issues are made known to the work group promptly
3. Implement and monitor the organisations procedures for identifying hazards and assessing risks	3.1 Existing and potential hazards in the work area are identified and reported so that risk assessment and risk control procedures can be applied 3.2 Work procedures to control risks are implemented and adherence to them by the work group is monitored in accordance with workplace procedures
4. Implement and monitor the organisation's	4.1 Existing risk control measures are monitored and results reported regularly in accordance with workplace procedures

procedures for controlling risks	4.2 Inadequacies in existing risk control measures are identified in accordance with the hierarchy of control and reported to designated personnel 4.3 Inadequacies in resource allocation for implementation of risk control measures are identified and reported to designated personnel
5. Implement the Organisation's procedures for dealing with hazardous events	5.1 ***Workplace procedures*** for dealing with hazardous events are implemented whenever necessary to ensure that prompt control action is taken 5.2 ***Hazardous events*** are investigated to identify their cause in accordance with investigation procedures 5.3 Control measures to prevent recurrence, and minimise risks of hazardous events, are implemented, based on the hierarchy of control if within scope of responsibilities and competencies, or alternatively referred to designated personnel for implementation
6. Implement and monitor the organisation's procedures for providing OHS training	6.1 Occupational Health and Safety training needs are identified accurately, specifying gaps between Occupational Health and Safety competencies required and those held by work group members 6.2 Arrangements are made for fulfilling identified Occupational Health and Safety training needs in both on and off-the-job training programs in consultation with relevant parties
7. Implement and monitor the organisation's procedure for maintaining OHS records	7.1 Occupational Health and Safety records for work area are accurately and legibly completed in accordance with workplace requirements for Occupational Health and Safety records and legal requirements for the maintenance of records of occupational injury and disease 7.2 Aggregate information from the area's Occupational Health and Safety records is used to identify hazards and monitor risk control ***procedures*** within work area according to organisational procedures and within scope of responsibilities and competencies

Variable	**Range**
In accordance with all relevant OHS legislation	• particularly general duty of care; • requirements for the maintenance and confidentiality of records of occupational injury and disease; • provision of information and training; • regulations and codes of practice relating to hazards resent in work area
In accordance with workplace procedures for	• housekeeping; consultation processes, whether general or specific to Occupational Health and Safety • training and assessment

inspection:	• specific hazard policies and procedures • Occupational Health and Safety information • Occupational Health and Safety record keeping • maintenance of plant and equipment • Purchasing of supplies and equipment
Hazardous events include	• accidents • fires and emergencies such as chemical spills or bomb scare
Procedures for dealing with hazardous events include	• evacuation • chemical containment • first aid procedures

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Implement OHS workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement • Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement • Evidence of understanding of hierarchy of control (the preferred order of risk control measures for most to least preferred, i.e. elimination, engineering controls, administrative controls and personal protective equipment) is required. • Evidence of understanding of the significance of other management systems and procedures for OHS is required. • Evidence of knowledge of literacy levels and communication skills of work group members and consequent suitable communication techniques is required.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Relevant OHS regulations • Relevant statutory legislation • Relevant enterprise/site safety procedures including identification of hazards and controlling of risks • Enterprise / site emergency procedures and techniques • Environmental legislation • Plant status • Participative arrangements including safety committees • Provision of OHS instruction to others • Maintenance of OHS records
Underpinning Skills	Demonstrates skills to: • Apply relevant OHS regulations • Apply relevant statutory legislation • Apply relevant enterprise/site safety procedures • Apply enterprise /site emergency procedures and techniques • Apply enterprise recording procedures

	• Locate and/or identify relevant plant and equipment • Identify plant status • Communicate effectively
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

Occupational Standard: Power System Operation Level IV	
Unit Title	**Monitor and Implement Environmental Plans and Procedures**
Unit Code	**EIS PSO4 03 0612**
Unit Descriptor	This unit deals with the skills and knowledge required to address the monitoring and implementation of environmental plans and procedures and the development of environmental procedures for the local work area.

Elements	Performance Criteria
1. Prepare to implement Environmental Plans and Procedures	1.1 Environmental plans and procedures are identified and examined in accordance with the work site or project requirements. 1.2 Environmental risks and impacts are identified for the ***specific project or work site***. 1.3 ***Environmental plans and procedures*** are selected in accordance with the specific project or work site requirements.
2. Implement Environmental plans and Procedures	2.1. Emergency procedures are implemented and ***environmental risks*** are controlled in accordance with project/site requirements appropriate activities are carried out in accordance with the environmental plan and procedures. 2.2. Environmental control procedures are implemented established and maintained, and risks mitigated in accordance with the project/site requirements.
3. Develop Site/Project Environmental Procedures	3.1 Specific needs for project/site environmental procedures are identified and assessed taking into account affected ***stakeholders*** and appropriate relevant data. 3.2 Specific project/site environmental procedures are developed and reviewed in accordance with appropriate relevant data.
4. Manage Environmental Incident	4.1 ***Environmental incidents*** are identified and controlled in accordance with the appropriate plans and procedures. 4.2 Environmental incidents are recorded and reported in accordance with the appropriate plans and procedures.
5. Monitor and report on the Applications of Environmental Plans and Procedures	5.1 The application of environmental plans and procedures are monitored and documented. 5.2 Environmental risks and incidents are reported in accordance with site/enterprise procedures. 5.3 Participation by the relevant workforce in reviews of environmental procedures is ensured and reported.

Variable	Range
Specific project/site may include	• hydro storage dams • canals, rivers • spillways • drainage sites • workshops • waste disposal sites • power stations • Maintenance sites
Issues, which broad environmental plans and procedures may address, include, but are not restricted to:	• National, State or local government • local government/regional development plans • water resources • industry/cross industry • business/enterprise cultural • heritage • conservation/flora/fauna • waste disposal • coastal protection • ground water protection • irrigation • salivation control • pollution/litter control • river/surface water systems • chemical management • biological control, i.e. blue green algae • Corporate or enterprise
Environmental risks may include:	• impact of mismanagement of chemicals • impact of mismanagement of biological agents • detrimental impact on limited water resources • spillage • waste disposal • detrimental impact • on water catchment areas (urban and non-urban) • detrimental impact on rivers, waterways and channels • unsatisfactory water and waste water treatment processes • unsatisfactory trade waste treatment and disposal processes poor construction processes • Planning deficiencies
Environmental legislation may include:	• Relevant federal by-laws; relevant State/Territory legislation • relevant local government by-laws • relevant government or quasi government policies and regulations
Incidents of environmental impact may include:	• emissions to air • releases to/of water • releases to land • vibration and noise

	• disposal of waste • contamination of land • impact on communities • destruction of habitat • use of energy sources • waste generation processes and technologies • impact on culturally significant sites • may involve the implementation of emergency responses
Environmental management documentation may include:	• information on applicable environmental laws or other requirements • compliant records • training records • process information • process operational log books • inspection, maintenance and calibration records • relevant contractor and supplier information • incident reports; information on emergency preparedness and response • records of significant • environmental impacts • chain of custody and compliance records • Audit results; management reviews
Stakeholders may include:	• the enterprise • government (all levels) • industry – extractive, other utilities, manufacturing, etc. • community action groups; environmental conservation groups • land care groups • primary producers • the general community and individuals • ATSI groups

Evidence Guide	
Critical aspects of Competence	Assessment requires evidence that the candidate: • Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures • Apply sustainable energy principles and practices
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Relevant legislative requirements; standard operating procedures; environmental plans and procedures • Sedimentation and erosion control; risk assessment procedures • Rare and endangered plants; recording procedures • Reporting procedures • Monitoring procedures; identification of risks and impacts

	• Consultation procedures • Incident management procedures • Potential environmental risks and incidents • Disposal of dangerous and contaminated soils • Environmental auditing; concepts of due diligence • Principles of environmental protection • Endangered species and habitat protection • Environmental impact assessment • Control procedures for environmental risks and incidents • Waste management.
Underpinning Skills	Demonstrates skills to: • Apply control procedures at environmental risks and incidents • Access, interpret and apply relevant legislation and standard operating procedures • Assess environmental risks at the specific project/site • Apply environmental plans and procedures • Develop local workplace environmental procedures • Identify risks and impacts • Apply consultation processes • Manage environmental incidents • Conduct environmental audits • Apply due diligence • Monitor specific project/site • Identify possible cultural/heritage sites • Identify potential pollutants • Solve operational problems.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

Occupational Standard: Power System Operation Level IV	
Unit Title	**Respond to Critical Incidents**
Unit Code	**EIS PSO4 04 0612**
Unit Descriptor	This unit deals with the skills and knowledge required to respond to incidents of a critical nature that may impact on the operational effectiveness of the plant or system, endanger human life or property, or have an adverse impact on the environment.

Elements	Performance Criteria
1. Identify critical incident and consequences	1.1 ***Information and documentation*** to determine system status is assessed and evaluated in accordance with system requirements 1.2 Fault location is determined by establishing, monitoring and evaluating system configuration and operational pre-requisites in accordance with enterprise procedures 1.3 Fault information is collated in accordance with procedures to evaluate type and cause of failure 1.4 System limitations and performance, including location and external influences, are identified 1.5 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training
2. Stabilise the system/s	2. 1 Appropriate response techniques are identified and used in accordance with requirements. 2. 2 Appropriate personnel and external stake holders are consulted with in accordance with enterprise procedures prior to further action 2. 3 Implications of personnel and key stake holder actions are monitored and analysed 2. 4 System requirements are assessed, evaluated and controlled to maintain stability and system integrity 2. 5 Corrective actions to rectify abnormalities are implemented following analysis of data in accordance with system procedures
3. Restore the system	3.1 Specialised assistance is identified and attended to where required in accordance with enterprise procedures 3.2 Strategies to restore system integrity are identified, evaluated and communicated in accordance with procedures to ***appropriate personnel*** 3.3 Restoration strategy is undertaken, monitored, evaluated

	and adjusted in accordance with procedure
4. Review response to incident and instigate preventative procedure	4.1 Effectiveness of response is evaluated in accordance with system procedures 4.2 Stakeholder responses and perspective of incident are obtained, recorded and analysed 4.3 Alternative responses/contingencies are identified and assessed in accordance with system procedures 4.4 ***Incident*** and alternative preventive measures are documented in accordance with procedures 4.5 Improvements for managing future critical incidents are recommended and approved 4.6 Relevant findings are communicated to appropriate ***key stake holders***

Variable	**Range**
Information and documentation sources may include:	• verbal or written communications • enterprise safety rules documentation • enterprise operating instructions • dedicated computer equipment • enterprise/site standing and operating instructions • enterprise log books • manufacturer operation and maintenance manuals • equipment and alarm manuals
Documentation may include:	• policy, procedure • standard operating instructions • contingency plans and emergency switching programs
Appropriate personnel, team members/other authorities may include:	• supervisor/team leader or equivalent • power plant operations personnel or equivalent • technical and engineering officers or equivalent • maintenance staff • other operating staff or equivalent • system controller • field operators and restricted operators • emergency personnel • network controllers/coordinators • generation controllers • plant operators • field operators • support staff • fire service • police • ambulance • emergency services • enterprise and site representatives

	• consumers • independent power producers
Types of incident may include:	• localized blackout • interconnected/isolated power system potential power system threat • accidents • life threatening situations • generation plant and auxiliary plant faults/failure and loss of network and generation components
Post incident debrief may be:	• probable fault/failure cause • strategic/contingency plan • environmental implications • economic factors • policy • procedure • training • safety factors • emergency switching programs
Liaison with key stake holders may be:	• system/network controllers/coordinators • oncoming shift change • field operators • support staff • asset centers • patrolmen • customers • other government bodies • co-generation authorities • generation plant operators • on call staff • police • fire and emergency services and • private systems

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Implement OHS workplace procedures and practices including the use of risk control measures • Apply sustainable energy principles and practices • Preparing for system stabilization • Stabilizing and restoring system operations • Coordination requirements • Identifying and responding to abnormal system operating conditions • Policies for system incident and follow up procedures • Generation/transmission capability limits • Impact of actions

Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Relevant occupational health and safety regulations • Relevant statutory legislation • Relevant enterprise/site safety procedures • Enterprise/site emergency procedures and techniques • Plant status • Relevant plant and equipment, it's locations and operating parameters • Enterprise recording procedures • System/network characteristics • Contingency plans • Supervisory, alarm, protection and control equipment • Switchgear operation • Load shedding principles • Communication principles • Control and data acquisition systems • Computers and software • Switching practices and procedures
Underpinning Skills	Demonstrates skills to: • Apply relevant occupational health and safety regulations • Apply relevant statutory legislation • Apply relevant enterprise/site safety procedure • Apply enterprise/site emergency procedures a techniques • Apply enterprise recording procedures • Manager and control system/network • Identify plant status • Communicate effectively • Apply data analysis techniques and tools • Identify and respond to abnormal system operating conditions • Plan and prioritize work • Co-ordinate the operation of system/network to maintain plant integrity, personnel safety, continuity of supply and optimum efficiency • Use diagrams, drawings and symbols • Apply stress management techniques • Direct and co-ordinate personnel • Select appropriate load shedding • Apply diagnostic techniques
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Power System Operation Level IV	
Unit Title	**Coordinate Network System**
Unit Code	**EIS PSO4 05 0612**
Unit Descriptor	This unit deals with the skills and knowledge required for the co-ordination of a network/system. Systems may be interconnected, remote or isolated.

Elements	Performance Criteria
1. Plan and prepare network operations	1.1 ***Information and documentation*** to determine network/system status is assessed and evaluated in accordance with system requirements 1.2 Network/***system*** and associated ***equipment*** operational pre-requisites are determined in accordance with enterprise/system procedures 1.3 Work priorities are determined to suit network circumstances in accordance with enterprise/system procedures 1.4 Network/***system limitations*** and performance due to location and external influences are identified 1.5 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training.
2. Co-ordinate network /system.	2. 1 Network/system is operated in accordance with enterprise/system operating procedures 2. 2 Network/system demand is monitored to maintain quality of supply standards in accordance with requirements and to maintain stability and system integrity 2. 3 Network/system load shedding sequence and priorities are monitored to ensure system integrity 2. 4 Corrective actions to rectify deviations are implemented following analysis of data in accordance with system procedures 2. 5 Resources required to meet system requirements are identified and co-ordinated in accordance with system procedures 2. 6 Where required, ***operations*** are carried out in consultation with ***team members***
3. Interpret and respond to network/ system faults or incidents	3.1 Causes of abnormal network/system operating conditions are identified by interpreting the ***technical and operational*** information in a logistical and sequential manner