### TSC Category
Energy Management Operations

### TSC
Electricity Network Operations Management

### TSC Description
Perform low, high and/or extra high voltage network operations and maintenance to ensure compliance to regulatory requirements and safety at sites and to optimise operations efficiency

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<tr>
<th>TSC Proficiency Description</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
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<th>Level 6</th>
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<td>EPW-EMO-2005-1.1</td>
<td>EPW-EMO-3005-1.1</td>
<td>EPW-EMO-4005-1.1</td>
<td>EPW-EMO-5005-1.1</td>
<td>EPW-EMO-6005-1.1</td>
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<td></td>
<td>Apply Low Voltage (LV) network operational and maintenance procedures at site under guidance and supervision</td>
<td>Administer various tests and checks during Low Voltage (LV) network operations and maintenance under supervision and guidance</td>
<td>Administer High Voltage (HV) or Extra High Voltage (EHV) network operations and maintenance and develop various contingency plans and standby arrangements for special events</td>
<td>Determine gaps in operations and maintenance procedures for process improvement and provide technical guidance on Low Voltage (LV), High Voltage (HV) or Extra High Voltage (EHV) operational problems</td>
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### Knowledge
- Types of LV distribution equipment
- Nomenclatures of the LV distribution equipment
- Types of maintenance programmes for LV distribution equipment
- Principles on power transmission and distribution
- Criteria for the uses of fuses and links
- Procedures for the control and safe operation of LV apparatus
- Procedures for installation of new LV distribution equipment
- Procedures for inspection and servicing of LV distribution equipment
- Types of worksite environments
- LV network configurations and reinforcement
- Types of power outages or disturbances
- Types of LV distribution equipment
- Types of cable faults in LV networks
- Causes of LV cable faults
- Method for testing the status of the LV cables using the test lamp or voltage detector
- Methods for proper isolation and tagging of faulty cables
- Cable insulation resistance test on a LV apparatus
- Fault resistance test with a multi-meter on a faulty LV cable
- Continuity test with a multi-meter on a LV cable
- Selection of appropriate test methods
- Proper setting-up of test equipment for pre-fault location
- Working principle of Pulse Echo test set.
- Types of Allen keys and locking systems
- Lockout and tagout schemes
- Types of tools and equipment used for operations and maintenance
- Rules for control and safe operation of HV and EHV apparatus
- Types of EHV transmission equipment or HV distribution equipment
- Characteristics of EHV or HV networks
- Operating principles for switchgear
- Operating principles for non-withdrawable types of switchgear
- Operating principles of Ring Main Units
- Operating principles of transformer tap changers
- Power system protection methods
- Communication channels with control
- Types of Allen keys and locking systems
- Lockout and tagout schemes
- Types of tools and equipment used for operations and maintenance
- Procedures for the control and safe operation of HV and EHV apparatus
- Types of EHV transmission equipment or HV distribution equipment
- Characteristics of EHV or HV networks
- Operating principles for non-withdrawable and non-withdrawable types of switchgear
- Operating principles of Ring Main Units
- Operating principles of transformer tap changers
- Power system protection methods
- Communication channels with control
### Abilities

| • Appropriate tools, measuring instruments and equipment | • Interpretation of reflected waveforms in the Pulse Echo test sets | • centres such as | centre such as |
| --- | --- | --- |
| • Types of cable faults in the LV network | • Proper usage methods of the surge generator sequence of the sectionalising method of fault location | • Electricity Service Centres (ESCs), Distribution Control Centres (DCCs), Power Control Centres and buddy systems | • Electricity Service Centres (ESC), Distribution Control Centres (DCC), Power Control Centres and buddy systems |
| • Safety precautions while working with LV distribution equipment | • Phasing out test procedures during cable jointing | • Approaches in attending to HV or EHV faults | • Approaches in attending to EHV and/or HV faults |
| | • Consequences of wrong phase sequence | • Methods to trace circuits or equipment that is affected by an outage | • Methods to trace circuits or equipment that is affected by an outage |
| | • Procedures for the control and safe operation of LV and High Voltage (HV) apparatus | • Types of faults in EHV and/or HV networks | • Types of faults in EHV or HV networks |
| | • Risk assessment and tool box meeting | • Causes of faults in EHV and/or HV networks | • Causes of faults in EHV and/or HV networks |
| | • Method for reinstatement of the affected sites upon completion of all work activities | • Methods for the identification of faulty cables | • Methods for the identification of faulty cables |
| | • Importance of good housekeeping | • Methods for the isolation of faulty cables | • Methods for the isolation of faulty cables |
| | • Importance of making post activity reports | • Planning for the restoration of supply | • Planning for the restoration of supply |
| | • Reporting protocols and guidelines | • Procedures for restoration of supply | • Procedures for restoration of supply |
| | | • Performance checks on the status of “network cuts” in HV networks | • Performance checks on the status of network cuts in the HV network |
| | | • Selection of appropriate alternative feeds | • Selection of the appropriate alternative feeds |
| | | • Procedures for performing closing and opening of network cuts | • Performing the closing and opening of network cuts |
| | | • Reporting protocols and guidelines | • Rules for control and safe operation of HV and EHV apparatus |
| | | • Contingency and response plan for Electricity Network Operations | • Reporting protocols and guidelines |
| | | | • Contingency and response plan for Electricity Network Operations |

<p>| • Identify the types of LV distribution equipment in power distribution systems | • Prepare tools, measuring instruments and equipment for pre-fault location tests on faulty LV cables in accordance with organisational Standard | • Clarify and acknowledge EHV or HV outages with the relevant personnel | • Review analysis to identify gaps in operations and maintenance procedures |
| • Interpret the nomenclatures on LV distribution equipment in accordance with | • Prepare the necessary tools, measuring instruments and equipment for carrying out the restoration of | • Prepare the necessary tools, measuring instruments and equipment for carrying out the restoration of | • Provide technical guidance to solve LV, HV or EHV-related operational problems |</p>
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<th>Range of Application</th>
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| Standard Operating Procedures (SOPs) | • Perform maintenance of LV distribution equipment in accordance with SOPs  
• Operate as a competent person in the maintenance of LV distribution equipment in accordance with SOPs  
• Apply appropriate electrical safety precautions whilst working with LV distribution equipment in different environments in accordance with SOPs  
• Conduct appropriate measurements of LV distribution equipment in accordance with SOPs  
• Report non-compliance of nomenclatures used on LV distribution equipment at worksites in accordance with SOPs |
| Operating Procedures (SOPs) | • Perform analysis of fault characteristics in accordance with operation and maintenance manuals  
• Perform the pre-fault location tests  
• Set-up the equipment for pin-pointing cable faults after pre-fault location  
• Perform the location of the faulty section of cable circuits by applying the sectionalising test method  
• Perform phasing out tests on LV cables in accordance with operation and maintenance manuals  
• Apply appropriate electrical safety precautions while working with LV distribution equipment in accordance with SOPs  
• Reinstate the affected equipment safely in accordance with SOPs  
• Complete and submit post activity reports showing the analysis of fault characteristics and position of the faulty cables  
• Collaborate with stakeholders to develop contingency plans based on possible scenarios that may occur during LV network operations  
• Liaise with stakeholders to develop contingency plans based on possible scenarios that may occur during LV network operations |
| EHV or HV outages in accordance to organisational Standard Operating Procedures (SOPs) | • Perform tracing of circuit breaker tripping or fuse blown-up to the source of the affected circuit or equipment in accordance with SOPs  
• Perform analysis of the protective relays of the affected circuits or equipment while tracing the faults  
• Perform tests on the affected circuits to identify faulty cables using established test methods in accordance with organisational SOPs  
• Perform the isolation of the identified faulty cable or equipment safely in accordance with SOPs  
• Perform the restoration of supply by selecting the appropriate alternative feed in the EHV or HV networks  
• Apply appropriate electrical safety precautions while working with EHV or HV transmission or distribution equipment in accordance with SOPs  
• Complete and submit post activity reports and communicate to relevant persons in accordance with SOPs  
• Liaise with stakeholders to develop contingency plans based on possible scenarios that may occur during EHV or HV network operations |
| Establish transmission or distribution key performance indicators | • Provide technical inputs for the development of transmission or distribution network policies  
• Integrate systems and work processes to drive performance and capabilities of transmission or distribution network systems  
• Formulate contingency guidelines and policies |

**SKILLS FRAMEWORK FOR ENERGY AND POWER**  
**TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT**

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Effective date: Oct 2018, Version 1.1
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- LV distribution equipment
  - LV Distribution Boards (LVB)
  - Overground Boxes (OGB)
  - Meter Room Box (MRB)
- Test-plugs, insulation resistance tester, multi-meter, clamp-on ammeter, voltage detector cum hot stick, approved discharge stick
- HV or EHV equipment
  - Load Break and Fuse Switches in Ring Main Unit (RMU)
  - Transformers
  - Switchgears
  - Fuses
  - Circuit Breakers