## TSC Category
Energy Management Operations

## TSC
Network Equipment Testing

## TSC Description
Conduct testing and commissioning of equipment to ensure functionality of protection systems and relays

## TSC Proficiency Description

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<th>TSC Proficiency Description</th>
<th>Level 1</th>
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<td>EPW-EMO-2012-1.1</td>
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<td>EPW-EMO-5012-1.1</td>
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<td>Assist in protection testing, set up equipment as per the standard operating procedures (SOPs) for routine testing and witness the pre-commissioning tests on protection systems at new substations or new circuits</td>
<td>Interpret test results of protection relays to identify any potential issues and/or equipment failures</td>
<td>Analyse network protection system faults and develop follow-up measures to resolve issues</td>
<td>Review protection philosophies, relay settings and procedures to reflect best practices and maintain optimal network equipment conditions</td>
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## Knowledge
- Organisational SOPs on the commissioning and testing of equipment
- Rules for control and safe operation of low and high voltage apparatus
- Equipment of electricity transmission and distribution protection relay systems
- Characteristics and potential dangers of protection system components
- Concepts of protection systems settings, schematics and specifications
- Types of testing and procedures for network equipment
- Principles of transmission and distribution protection systems
- Organisational standard operating procedures (SOPs) on the commissioning and testing of equipment
- Rules for control and safe operation of low and high voltage apparatus
- Components and operating principles of protection relays
- Concepts of settings, schematics and specifications of protection systems
- Fault calculation techniques
- Test equipment maintenance methods
- Network equipment testing and commissioning procedures
- Fault recording and interpretation
- Organisational standard operating procedures (SOPs) on the commissioning and testing of equipment
- Interpretation and application of rules for control and safe operation of low and high voltage apparatus
- Components, protection settings, schematics, specification and operating principles of transmission and distribution protection systems
- Test equipment and software used on protection systems
- Fault investigation methods
- Complex fault calculation techniques
- Types and locations of faults, such as sequence impedance networks and symmetrical and
- Interpretation and application of organisational standard operating procedures (SOPs) on the commissioning and testing of equipment
- Interpretation and application of rules for control and safe operation of low and high voltage apparatus
- Components, protection settings, schematics, specification and operating principles of transmission and distribution protection systems
- Industry developments, trends and best practices in network protection systems
- Organisational strategy and direction
- Test procedure effectiveness evaluation processes
### Abilities

- Assist in protection testing, including the setting up of different test equipment according to SOPs, safety and regulatory requirements
- Witness basic pre-commissioning tests on protection systems at new substations or new circuits
- Carry out routine tests on protection relays and interpret the results to identify any potential issues and/or equipment failures
- Witness pre-commissioning tests on protection systems at new substations or new circuits
- Carry out on-load commissioning of distribution feeder protection
- Assist in on-load commissioning of main protection
- Retrieve settings and other records from protection relays and fault recording devices
- Carry out tests on protection systems, including the use of complicated test equipment and software
- Carry out fault investigations on protection systems and recommend suitable follow-up measures
- Review results of pre-commissioning and witness commissioning tests on protection systems at new substations or new circuits
- Carry out commissioning of main protection systems after replacement and/or major servicing
- Analyse faults based on records of relay setting, fault recorder results retrieved
- Contribute to the resolution of complex issues pertaining to transmission and distribution protection systems
- Perform fault calculations including unsymmetrical and complicated faults
- Revise protection test procedures to reflect industry developments, trends and best practices
- Carry out complex fault investigations on protection systems and recommend suitable follow-up actions
- Lead network equipment testing teams and provide technical advice on issues in transmission and distribution protection systems
- Analyse complex faults based on records of relay setting, fault recorder results retrieved and/or test records
- Review protection philosophies, setup, technical specifications and relay settings for changing network conditions and/or new network equipment
- Review and introduce new protection relays and schemes based on network local needs

### Range of Application

Range of application includes, but is not limited to:

- Current transformer and/or voltage transformer (CT/VT) circuits
- Trip circuits
- Protection relays used in substations
  - Distance protection
  - Differential protection
  - Busbar protection
  - Main and backup protection
- Revise protection test procedures to reflect industry developments, trends and best practices
- Carry out complex fault investigations on protection systems and recommend suitable follow-up actions
- Lead network equipment testing teams and provide technical advice on issues in transmission and distribution protection systems
- Analyse complex faults based on records of relay setting, fault recorder results retrieved and/or test records
- Review protection philosophies, setup, technical specifications and relay settings for changing network conditions and/or new network equipment
- Review and introduce new protection relays and schemes based on network local needs