Appendix - 2 *National Safety Requirements*

National Safety Requirements for Electric Power Facilities

Contents

National Safety Requirements for Electric Power Facilities

Part 1 General Rules

Chapter 1 Purposes

Article 1: Purposes

The National Safety Requirements articulates the technical requirements related to the safe installation and maintenance of the electric power facilities for the following purposes:

1. Prevention of Electric Shock or Fire

   Requires the installation of electric power circuit, grounding equipment for electric power facilities, etc. in order to prevent from electric shock or fire.

2. Prevention of Abnormalities and Protective Measures

   Articulates the fundamental concept for prevention of abnormalities of electric power facilities and which protective measures to use in response.

3. Prevention of Electric and Magnetic Obstacles

   Requires the prevention of electric and magnetic obstacles caused by electric power facilities.

4. Prevention of Power Supply Failure

   Requires the prevention of power supply failure caused by damage of electric power facilities.

5. Installation of Electric Power supply facilities that satisfy above 1 – 4.

   Based on the safety principle, technical requirements are stipulated for safety based on the kind of electric power facilities.

National Safety Requirements stipulates the fundamental concept of safety for electric power facilities. Conforming to the National Safety Requirements, electric power facilities are installed and maintained based on such standards

as the SNI (including PUIL), IEC, etc. as the detailed methods of facility installation and maintenance, or other forms of guideline for facility installation and maintenance.

Chapter 2 Coverage

Article 2: Coverage

Decisions are applied to any and all activities of the electric power supply business excepting the following areas.

- Activities related to nuclear power facilities
- Activities related to wind power facilities
- Activities related to photovoltaic facilities
- Activities related to hydropower facilities other than facilities designated under article 57 pertaining to the coverage of hydropower facilities
- Activities related to thermal power facilities other than facilities stipulated under article 85 regarding the coverage of thermal power facilities

Chapter 3 Definitions

Article 3: Terminology

(1) “PUIL2000” refers to the Mandatory standard of general requirements governing electrical installation in Indonesia

(2) The substation refers to the specific outside location where outside-transmitted electricity is retransmitted after undergoing transmutation via on-site transformers, rotary converters, rectifiers and other electric machinery.

(3) “Power Station” refers to the site where generators, motors, and other machinery are installed for the purpose of electricity generation.

(4) The “Communication line” refers to the wire used for communicating and includes the optical fiber cable.

Article 4: Classification of Voltage

(1) Low voltage: voltages of 1,000 V or less.

(2) Medium voltage: voltages over 1,000 V, but not more than 20,000 V.

(3) High voltage: voltages over 20,000 V, but not more than 230,000 V.

(4) Extra-high voltage: voltages over 230,000 V.

Chapter 4 Safety Principles

[Prevention of Electric Shock or Fire]

Article 5: Prevention of Electric Shock or Fire at Electric Facilities

Electric power facilities shall be installed so as to not cause any electric shock, fire, or other potential danger and/or damage to people and/or properties.

Article 6: Insulation of Electric Power Circuit

1. The electric power circuit shall be insulated from the ground. Insulation resistance shall satisfy the stipulation articulated in PUIL 2000.
2. The Electric power circuit shall maintain enough insulation strength according to its voltage level in consideration of a potential abnormal voltage occurring in the event of trouble.
3. The insulation performance between coils inside the current transformer installed for the purpose of meter reading / protective devices shall be considered so that the circuit will not cause any danger resulting from an insulation breakdown if an abnormal voltage occurs in the event of trouble.

Article 7: Prevention of Electric Conductor Breakage

Wires (including electric conductor, stays, ground wires, communication lines, or other lines) shall be properly installed so as to prevent disconnection during normal operations.

Article 8: Electric Conductor Connections

Electric conductors shall be connected so that the electric resistance of the conductor at the connection point is not increased, that the insulation performance does not decrease and/or disconnect during normal operations.

Article 9: Thermal Strength of Electric Equipment

Electrical equipment installed in the electric circuit shall be able to withstand self-generated heat during normal operations.

Article 10: Prevention of Danger in Medium-, High-, or Extra-High Voltage Electrical Equipment

1. Medium-, high- or extra-high voltage electric equipment shall be installed so as to prevent people other than operators from easily coming into physical contact with it.

2. High- or extra-high voltage switches, circuit breakers, lightening arresters, and other similar devices, which may generate arc discharge during their operation, shall be installed at a predetermined distance away from the wooden walls, ceilings, or other combustible articles so as to prevent fires, unless they are separated by a fire-resistant material.

Article 11: Grounding of Electrical Equipment

Grounding shall be conducted or other appropriate measures shall be taken at necessary sections inside the electrical facilities so as to prevent any electric shock, fire, or other potential harm and/or damage to people and/or properties due to abnormal voltage rises.

Article 12: Grounding Method for Electrical Equipment

Grounding for the electrical facilities shall be arranged so that the current can pass safely and securely through to the ground.

[Prevention of Abnormality and Protective Measures]

Article 13: Prevention of Transformer Fires at Medium-, High- and Extra High-Voltage Power Circuits

Transformers connected between the primary side of electric power circuits (medium-, high- and Extra High- voltage) and the secondary side of electric power circuits (low-voltage) shall grounded at appropriately determined points of the transformer concerned to prevent damage to the electrical facilities at the secondary side, electric shock, or fire resulting from contact with Medium-, high- and Extra High- voltage.

Article 14: Protective measures against Over-Current faults

The electric power circuit shall be provided with protection against over-current faults or other appropriate measures at necessary points so as to protect the electric conductor and electric equipment from overheating and burning caused by over-currents and to prevent fires.

Article 15: Protective measures against Ground fault

The electric power circuit shall be accompanied with ground fault protective devices or other appropriate measures so as to prevent any damage to the electric wires and/or electric equipment due to electric shock or fire in the event of unexpected ground subsidence.

[Prevention of Electric or Magnetic Obstacles]

Article 16: Prevention of Electric or Magnetic Interference in Electric Facilities

Electrical facilities shall be installed so that they do not cause any electric or magnetic interference to the function of other electrical facilities or other properties. Therefore the level of electric/ magnetic interference shall adhere the limits as stipulated in the associated technical standard.

[Prevention of Power Supply Failures]

Article 17: Prevention of Failures in Power Supply caused by Electric facilities

Medium- or High- voltage electrical facilities for power supply and utilization shall be installed so that if they become inoperable due to damage, their loss will not be a major obstacle to power supply flow being provided by the electric power utility.

[Prevention of Pollutions]

Article 18: Prevention of Pollutions

In order to prevent pollution, electric power facilities shall comply with the regulations pertaining to environmental protection in Indonesia.

Part 2 Installation of Electric Power facilities for Power Supply

Chapter 1 Power Network Facilities

1-1 Electric Network Facilities for Power supply

[Prevention of Electric Shock or Fire]

Article 19: Prevention of Electric Shock or Fire at Power Network

Electric lines shall be installed so as to prevent electric shock, fire or health problems to the people or facilities surrounding the corresponding network.

Article 20: Prevention of Electric Shock Caused by Overhead Electric Wires and Underground Electric Wires

1. For low-, medium-, high- or extra-high voltage overhead electric wires, insulated electric wires or cables having insulation performance corresponding to the voltage shall be used so as to prevent electric shocks.
2. For underground electric wires (referring to electric wires of underground electric lines; this shall apply hereafter), cables having insulation performance corresponding to the voltage shall be used so as to prevent electric shocks.

Article 21: Restricting Substation Entry to Operators

At substations, switchyards, or other similar sites where medium-, high- or extra-high-voltage electric machinery or buses are installed, signs shall be installed to notify people other than operators that the electric machinery, buses, and the like are hazardous. At the same time, appropriate physical measures shall be taken to prevent unauthorized persons from easily entering the premises.

Article 22: Prevention of Overhead Electric Power Line Pole/Tower Climbing

Appropriate measures shall be taken for the supports at the overhead electric power lines to prevent unauthorized persons from easily climbing them and receiving a potentially dangerous electric shock.

Article 23: Height of Overhead Electric Wires

1. Overhead electric wires shall be installed at a height that will not cause electric shocks due to contact or induction and will not obstruct traffic.

2. Stays shall be installed at a height that will not obstruct traffic.

Article 24: Protect workers from electrocution caused by overhead conductors connected to wires installed by others

1. Supports of the overhead electric power lines shall not be installed between electric wires and/or communication lines installed by others.
2. Overhead electric wires shall not be installed at the sandwiching supports of the overhead electric power lines, or at the overhead communication lines that have been installed by others.

Article 25: Prevention of Electric Shock by Electrostatic or Electromagnetic Induction from Overhead Electric Power Lines

1. Overhead electric power lines with medium-, high- or extra-high voltage shall be installed so that the electric field strength at 1 m from the ground surface is 5 kV/m or less, and that the electricity is diminished to the point where its presence cannot be felt by people due to a continuous static induction effect. Hence, they should be installed in fields, forests, or other places where only a few people come and go so as to prevent any harm to humans.
2. Overhead electric power lines with medium-, high- or extra-high voltage shall be installed so that they do not harm human bodies via then electromagnetic induction effect through communication lines (except for communication equipment utilized for maintenance).

[Prevention of danger to other conductors or objects]

Article 26: Prevention of abnormal contact of Electric Wires

When electric wires are close to or cross other electric wires or communication lines, or are installed on the same support as the other wires, they need to be installed so that they do not damage other electric wires or communication lines and do not cause any electric shock or fire due to abnormal contact resulting from physical touching or breakage.

Article 27: Prevention of Danger to Other Structures Caused by Electric Wires

When electric wires are close to or cross other structures or plants, they shall be installed so that they do not damage other structures or plants and do not cause any electric shocks or fire resulting from contact or disconnection.

Article 28: Prevention of Danger to Other Electric Wires and Structures Caused by Arc Discharge in the event of Underground Electric Wire Failure

When underground electric wires, electric wires installed along flanks, electric wires in tunnels, and other electric wires fixed to certain structures are close to or cross other electric wires, communication lines or tubes (referred to as “other wires;” this shall apply hereafter in this Article.), they shall be installed so that they do not damage other wires by arc discharge in the event of any failure.

Article 29: Danger Prevention at Overhead Electric Wires Due to Abnormal Voltage

1. If medium-, high- or extra-high-voltage overhead electric wires and low- or other class voltage overhead electric wires are installed on the same support, grounding shall be made or other appropriate measures shall be taken so that the electrical installations at the low or other class voltage ends are not damaged by incoming high voltages in the event of such an abnormality.

2. If low-voltage electric machinery is installed to its support above the electric wire of the medium-, high- or extra-high-voltage overhead electric power line for railcars, grounding shall be made or other appropriate measures shall be taken so as not to cause any faults at the electrical installations at the low-voltage end by incoming high voltage in the event of such an abnormality.

[Prevention of danger caused by collapse of supports]

Article 30: Prevention of Collapse of Supports (Towers/Poles)

1. Materials and structures of the supports for overhead electric power lines or overhead electric power lines for railways (including those related to the applicable stays when stays are installed) shall be arranged safely and prevent falling in consideration of the tensile load of electric wires supported by the applicable supports, wind pressure load, as well as meteorological changes, vibrations, shocks, or other external environmental influences usually assumed at the applicable installation site.

2. Supports of medium-, high- or extra-high-voltage overhead electric power lines shall be installed so that they would not fall via a chain reaction, by designing a safe structure or employing other means.

[Prevention of danger caused by high pressurized gas]

Article 31: Prevention of Danger Caused by Gas Insulated Facilities

Compressed air devices used in gas insulated devices and switches or circuit

breakers installed at substations, switchyards, or other similar sites shall be installed as follows.

(1) Materials and structures of the section subject to pressure shall be able to sufficiently resist the maximum pressure used and the materials themselves shall be safe.

(2) The air tank of the compressed air device shall be anti-corrosive.

(3) If the pressure rises, the compressed air device shall have a function that lowers the pressure before it reaches the maximum pressure used.

(4) The compressed air device shall have a function that automatically restores the pressure when the pressure in the main air tank lowers.

(5) The compressed air device shall have a function that detects abnormal pressure at an early stage.

(6) Insulation gas used in the gas-insulated device shall not be combustible, corrosive, or toxic.

[Prevention of dangerous installations]

Article 32: Installation Restrictions of Oil-immersed Switches

Switches, isolators, and circuit breakers using insulation oil shall not be installed at the supports of the overhead electric power line.

Article 33: Prohibition of Electric Power Line Installation on Cliffs

Electric power lines shall not be installed on cliffs.

[Prevention of electric or magnetic obstructions]

Article 34: Preventing Communication Facility Interference

1. Electric power lines shall be installed so as to not cause any radio wave interference that could seriously disrupt radio communication facilities.

2. Electric lines shall be installed so that they would not obstruct communications due to the induction effect on communication lines.

[Prevention of power supply failures]

Article 35: Prevention of Obstacles in Power Supply Caused by Damage to Substation Facilities

1. Fuel cells or storage batteries for normal service shall be provided with a device which, in the event of any abnormality that could largely damage applicable electric machinery or seriously obstruct general electricity utility power supply at the applicable electric machinery, automatically blocks it from the electric power circuit.

2. For medium-, high- or extra-high-voltage transformers or phase modifier equipment, appropriate measures such as installation of a certain device shall be taken so that, in the event of any abnormality that could largely damage the electric machinery or might seriously obstruct general electricity utility power supply, such abnormalities are automatically blocked from the electric power circuit.

Article 36: Mechanical Strength of Transformers

Transformers, phase modifier equipment, as well as the buses and insulators supporting them shall resist mechanical impact generated by short-circuit currents.

Article 37: Installation of Substations minus All-Time Monitoring

Substations, which are not monitored continuously at a power station (a substation) or on the premises of a power station (a substation) by a person who possesses the necessary knowledge and skills to operate a power station (a substation) shall be provided with, excluding an emergency power generator, measures to stop the system safely and securely in the event of any abnormality.

Article 38: Protection of Underground Electric Power Lines

1. Underground electric power lines shall be installed so that they resist the weight pressure from vehicles or other heavy objects and that they are protected from the influence of excavation work via planted signs indicating that the area has underground electric power lines laid there.

2. Fire protection measures shall be taken during the laying down of underground electric power lines to ensure a safe underground work environment.

Article 39: Prevention of Obstacles in Power Supply from Extra-high-voltage Overhead Electric Power Lines

1. Extra-high-voltage overhead electric power lines shall not be installed in the city area or other areas where many houses are located, unless they are installed so that damage to the applicable electric line resulting from fire in the applicable area will not seriously obstruct the general electricity utility power supply.

2. Horizontal distance between the extra-high-voltage overhead electric wire and a building shall be at least 4 m so that damage to the applicable electric wire resulting from fire at the applicable building will not seriously obstruct general electricity utility power supply.

3. When the extra-high-voltage overhead electric wire is installed below a building, roads, pedestrian bridges or other structures, the horizontal distance of separation shall be at least 4 m so that damage to the applicable electric wires caused by falling or the like of such structures will not seriously obstruct the general electricity utility power supply.

Article 40: Installation of Lightening Arrester for Medium-voltage, High-voltage and Extra-high-voltage Electric Power Circuits

To prevent damage to the electrical installations installed in the electric power circuit caused by lightening voltage, the following sections or other sections close to them in the applicable electric power circuit shall be provided with the lightening arrester or other appropriate measures, unless there is no damage concern of the applicable electrical installations due to lightening voltage.

1) Service entrances and exits for overhead electric wires at the power station, substations or other similar sites.

2) Medium, high and the extra-high voltage ends of the distribution transformer connected to the overhead electric power line accompanied by protective measures for safety such as installation of an over-current breaker.

3) The service entrance of the customer premises which receives power supply from medium-, high- or extra-high-voltage overhead electric power lines.

Article 41: Installation of Communication Tools for security purpose

1. Communication equipment for maintenance shall be installed among power stations, substations, switchyards, load dispatching centers (where instructions related to operation of the electric power system are provided), engineer office, and other sites which are required to prevent large obstacles in the general electricity utility power supply to assure safety.

2. Communication lines for maintenance shall be installed so that they will not damage the communication functions due to mechanical impacts, fire, and/or the like.

Article 42: Securing Communication Tools in the event of Disasters

Materials and structures of the supports where radio communication antennas or reflectors used as communication equipment for maintenance (hereinafter referred to as “Radio communication antennas” in this Article) are installed and shall be arranged so that the communication functions will not be affected due to falling in consideration of the wind pressure load. However, this provision shall not apply to the radio communication antennas utilized to monitor the situations around the electric power line and are installed on the supports of the overhead electric power line.

1-2 Electrical Facilities/Equipment for Electric Power Utilization

[Prevention of electric shock or fire]

Article 43: Prevention of Electric Shock or Fire caused by Wiring at Locations of Electric Power Utilization

1. The wiring shall be installed corresponding to the situations of the installation site and voltage so that it will not cause any electric shock or fire.
2. When movable wiring is connected with electric machinery, they shall be connected so that they will not cause any electric shock or fire due to poor connections.
3. Notwithstanding the provisions in Paragraph 1 and the preceding paragraph, high- or extra-high-voltage movable wiring shall not be installed to prevent any potential harm to humans if a person comes into contact with a live wire. It is connected to the electric machinery for which connection with movable wiring is indispensable.

Article 44: Electric Wires used at Location of Electric Power Utilization Prevention

1. Electric wires used for wiring (except for bare conductors) shall have possess a sufficient amount of strength and insulation power corresponding to the situations of the installation site and voltage so that they will not serve to cause any electric shock or fire.
2. Bare conductors shall not be used for wiring.

Article 45: Prevention of Electric Shock or Fires caused by Electrical Equipment/Appliances installed at the Locations of Electric Power Utilization

Electric equipment in the place of electricity utilization shall be installed so that the energized part is not exposed and that it does not generate heat, which would cause fires or be a danger to humans. However, this provision shall not apply if exposure of the live wire or installation of the heating section is indispensable for usage of the electric equipment, and it is installed so as not to cause electric shock, pose any potential harm to humans or cause fire.

[Danger Prevention from other wirings and/or obstacles]

Article 46: Prevention of Danger caused by Wiring to other wirings and facilities

1. Wiring shall be installed so that, when it is close to or crosses other wiring or communication lines, it will not cause any electric shock(s) or fire(s) due to abnormal contact.
2. Wiring shall be installed so that, when it is close to or crosses water pipes, gas pipes, or other similar articles, it will not damage these structures via electric discharges and not cause electric shocks or fires via these structures due to electric leakage or discharge.

[Protective measures against abnormalities]

Article 47: Protection of Wiring at Locations of Electric Power Utilization from Over-currents

Over-current protection devices shall be installed at appropriate locations so that it prevents over-heating that could lead to a fire breaking out inside the electric facilities. When more than one over-current protection device is utilized, protection coordination between this over-current protection is required to provide main and backup protection schemes.

Article 48: Protective measures against Ground faults at Locations of Electric Power Utilization

Grounding fault protection devices shall be installed so that they will not cause any facility damage and prevent electric shock or fire caused by the grounding fault. Other appropriate measures shall be taken if the initial measures cannot be employed.

Chapter 2 Generating Facilities (General Provision)

Article 49: Unauthorized Entry Restrictions

At power stations or other similar sites where medium-, high- or extra-high-voltage electric machinery or buses are installed, signs will be planted to notify people other than the operators that the electric machinery, buses, and/or the like are hazardous. At the same time, appropriate measures shall be taken to prevent such people from easily entering the premises.

Article 50: Installation of Hydrogen-cooled Generators

Hydrogen-cooled generators shall be installed as follows:

1. They shall be of an absolute airproof structure that effectively stops hydrogen leakage or does not allow air to come in.
2. The generator, tubes, and valves for hydrogen transmission shall possess sufficient amount strength to be able to resist the pressure generated in an explosion of hydrogen under atmospheric pressure.
3. They shall be designed so that if the hydrogen leaks from the shaft seal part of the generator, the leakage can be stopped or leaked hydrogen can be safely discharged outside.
4. They shall be designed so that hydrogen can be safely inputted and discharged respectively from inside and outside the generator.
5. A function to detect any abnormalities at the early stage and provide alerts.

Article 51: Prevention of Obstacles in Power Supply caused by Damages to Power Stations

In the event of any abnormality that could largely damage applicable electric machinery or seriously obstruct power supply to the applicable electric machinery, generators shall be provided with a device that automatically blocks it from the electric power circuit

Article 52: Mechanical Strength of Generators

1. Generators, as well as buses and insulators supporting them shall resist mechanical impacts generated by short-circuit currents.
2. Rotary section of the generator connected to the waterwheel shall resist the speed caused when the load is blocked and the rotary section of the generator connected to the steam turbine, gas turbine, or internal combustion engine

shall resist the speed achieved when the emergency speed governing device or other emergency stop device works.

3. The structure of generators shall provide sufficient mechanical strength to withstand the maximum vibration that may occur in the critical bearing or the shaft.

Article 53: Installation of Power Stations minus All-Time Monitoring

1. The following power stations shall not be installed unless they are monitored continuously by a person who possesses the necessary operational knowledge and skills and monitors at a power station or on the premises of a power station.

   (a) Power stations that require appropriate control in trouble cases in response to the status of abnormalities for preventing possible damage to human safety and property.

   (b) Power stations that may significantly disrupt public power supply in trouble situations.

   (c) Power stations in which abnormalities need to be identified immediately.

2. Power stations or substations, which are not monitored continuously at a power station (a substation) or on the premises of a power station (a substation) by a person possessing the necessary power station operational knowledge and skills (a substation) shall be provided with, minus an emergency power generator, measures to stop the system safely and securely in the event of an abnormality.

Article 54: Installation of Communication Tools for security purposes

1. Communication equipment for maintenance shall be installed among power stations, substations, switchyards, load dispatching centers (where instructions related to the operation of electric power systems are provided), engineer offices, and other sites which are required to prevent large obstacles in the power supply for general electricity utilities and to assure safety.

2. Communication lines for maintenance shall be installed so that they will not damage the communication functions due to mechanical impact, fire, or the like.

Article 55: Securing Communication Tools in the event of Disasters

Materials and structures of the supports where radio communication antennas or reflectors used as communication equipment for maintenance (hereinafter

referred to as “Radio communication antennas” in this Article) are installed and shall be arranged so that the communication functions will not be affected due to falling in consideration of the wind pressure load. However, this provision shall not apply if radio communication antennas to monitor the situations around the electric power line are installed on the supports of the overhead electric power line.

Article 56: Protection of Motors from Overload

Motors (excluding those with outputs of 0.2 kW or less) installed indoors shall be provided with appropriate measures such as the installation of an over-current circuit breaker, so that a fire will not erupt due to the burning of the applicable motor due to over-currents. However, this provision shall not apply if there is no concern that an over-current might burn the motor in consideration of the motor structure or load performance.

Chapter 3 Hydropower Facilities

3-1 General Provisions

Article 57: Scope of Application

1. This Chapter shall apply to facilities that will be installed for generating electricity by using hydropower as motive power.

2. The following dam-types are not covered in this Chapter.

   1) Dams with a height of more than 15 meters and a storage capacity of more than 100,000 cubic meters.

   2) Dams with a height of less than 15 meters and a storage capacity of more than 500,000 cubic meters.

   3) Dams specified by the Dam Safety Committee (KKB)

Article 58: Definition

The meanings of the terms used in this Chapter shall be as defined in the following applicable items:

1) The term “waterways” includes water intake facilities, the settling basin, the headrace, the head tank, the surge tank, the penstock (meaning a facility to directly introduce water from a head tank or a surge tank (or water intake facilities in case there is no head tank or surge tank) to the water turbines; hereinafter the same shall apply), and the tailrace.

2) The term “design flood level” of a dam refers to the maximum water level immediately upstream of the non-overflow section of the dam when water flows down the spillway at the discharge immediately upstream of the dam expected to occur at intervals of once in every two hundred years. For a dam with a height of less than 15 m, the design flood level refers to the maximum water level immediately upstream of the dam when a flood of water flows down the dam at the discharge immediately upstream of the dam determined from the hydrological or meteorological observation data based on the river basin of the dam.

Article 59: Protection Facilities

Dams, waterways, and any other places where a person may fall shall be provided with protection equipment such as the erection of fences, walls and/or signboards alerting people of the existing danger. However, this provision does not apply to places where the general public cannot have easy access due to the land condition or other reasons.

3-2 Dam

3-2-1 General Rules

Article 60: Dam

Dams shall be constructed in accordance with the following items:

1) The structure of a concrete gravity dam shall provide safety by taking into account the river conditions including water level and flow as well as the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, and the uplift pressure.

2) The structure of a fill dam shall create safety measures by taking into account the river conditions including the water level and flow as well as the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, and the pore pressure.

3) The structure of any other dam than the ones stated in the preceding items shall be constructed safely by taking into account the river conditions including the water level and flow as well as the dead load, water pressure, and other expected loads.

Article 61: Position of the Top of the Non-Overflow Section

The position of the top of the non-overflow section in the dam body shall be over the sum of heights of the design flood level and the applicable freeboard contingent on the type of dam and the presence of spillway gates.

Freeboard for the flood water level (minimum freeboard)

hw + ha + hi and yet 1 m or higher

where

hw : the wave height caused by wind

ha : 0.5 m if the dam has a spillway gate and 0 m if it does not

hi : 1 m for a fill dam and 0 m for a concrete dam

Article 62: Foundation Ground

The foundation of a dam shall be designed to provide the strength and water-tight qualities necessary for the stability of the dam.

Article 63: Concrete Materials for Dams

Concrete materials used for dams shall possess the following attributes:

1) Cement shall be set and become solid in a suitable manner to maintain quality.

2) Aggregates shall be hard and durable.

3) Aggregates, water, or admixtures shall not contain any acid, salt, organic material, or any mud that may prevent the proper setting of the concrete, substantially rust the reinforcing steel, or impede the adhesion between the concrete and steel reinforcement.

Article 64: Prevention of Water Leakage

The dam body and its contact with the foundation ground shall be designed so that it will pose no water leakage dangers.

Article 65: Spillways of Dams

1. To properly cope with floods, a spillway shall be provided on or around the dam body adhering to the following points:

   1) A spillway shall be provided around the dam body if the dam is a fill dam or on or around the dam body if the dam is of any other type.

   2) A spillway (except the gate) shall have stability against the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, uplift pressure, and temperature load as well as the loading by the water discharged from the spillway at the total discharge for the design flood level.

   3) The stress applied to the concrete structure of a spillway (except the gate) due to the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, uplift pressure, and the temperature load as well as the loading by the water discharged from the spillway at the discharge for the design flood level shall not exceed the maximum allowable stress of individual materials used in the concrete structure.

   4) Spillways shall be designed to allow for the safe discharge of water and to prevent the possibility adverse effects occurring with the dam and its surrounding areas when the water is discharged from the spillway at the discharge for the design flood level.

   5) Measures shall be taken to prevent something that would harm the function of the spillways from being mixed in the water.

2. Gates for the spillways specified in the preceding paragraph shall be installed possessing the following attributes:

   1) The gates shall be completely water-tight.

   2) The gate doors should easily open or close.

   3) Materials used for the gate doors shall possess the chemical components and mechanical properties as required by the doors.

   4) The stress applied to the gate doors due to the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic forces, buoyancy and the force of operating the doors shall not exceed the maximum allowable stress of individual materials used in the doors.

   5) No harmful vibration shall be caused by the doors.

   6) The doors shall be designed to have no buckling.

   7) The gates shall be designed to safely transfer the load applied to the gate doors to the dam body or other structure.

   8) The doors shall be able to be reliably stopped if a failure occurs when the door is in operation.

   9) Equipment that lets the operator know the operating condition of the doors shall be provided.

Article 66: Water Outlet Works Other Than Spillways

Water outlet works other than spillways shall be provided so as to prevent the possibility of having adverse effects on the dam or its vicinity.

3-2-2 Concrete Gravity Dam

Article 67: Strength of Dam Body

1. The compressive stress applied to the body of a concrete gravity dam due to the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, and the uplift pressure shall not exceed the maximum allowable compressive stress of the individual concrete materials used.

2. The tensile stress applied to the body of a concrete gravity dam (except the parts around the non-overflow section bolstered by a steel reinforcement against the tensile stress; the same shall apply in the next paragraph) due to the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, and the uplift pressure shall not exceed the maximum

allowable tensile stress of the individual concrete materials used, except for cases specified in the next paragraph.

3. The tensile stress applied to the dam body of concrete gravity due to the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic force, and the uplift pressure shall not be in the perpendicular direction in the upstream end of the dam body.

Article 68: Stability of Dam Body

A concrete gravity dam should possess enough stability to withstand potential internal sliding within the dam body as well external shifts that occur on the ground base.

Article 69: Construction of Dam Body

The body of a concrete gravity dam shall be constructed in adherence to the following points:

1) No harmful cracks in the concrete.

2) The construction of the dam body shall provide safety against the stress caused by stress concentration and/or temperature variations applied to parts around any opening made in the dam body such as the gallery, water outlet works, or the penstock.

3-2-3 Fill dams

Article 70: Dam Body Materials

1. The earth materials that are to be used in the body of a fill dam shall comply with the following points:

   1) The materials shall have the strength and water-tight qualities necessary for the stability of the dam.

   2) The materials shall not have expanding or shrinking characteristics that could harm the stability of the dam.

   3) The materials should not be capable of somehow metamorphosing into sludge.

   4) The materials shall not contain organic material nor be soluble in water.

2. Materials other than the earth materials used in the water impermeable wall of a fill dam shall have the water-tight qualities, strength, and durability necessary for its stability.

3. Materials other than earth materials used in parts of the dam body other than the for the water impermeable wall of the fill dam shall have the strength, durability, and permeability necessary for its stability.

Article 71: Stability of Dam Body

A fill dam shall have enough stability to withstand potential sliding within the dam body.

Article 72: Installation of Dam Body

The body of a fill dam shall be constructed adhering to the following points:

1) The water impervious wall of a fill dam shall meet the following requirements:

a) The position of the top of the water impervious wall shall be equal to or higher than the design flood level added by the applicable freeboard contingent on the presence of the spillway gate.

b) The water impervious wall shall not lose its imperviousness due to deformations or cracks.

c) There shall be no piping in the water impervious wall or at the contact points between the impervious wall and the ground foundations.

d) If earth materials are used for the water impervious wall, there should be no discharge of these materials from either the upstream or downstream faces of the impervious wall.

2) In a fill dam where almost all uniform materials are used in the dam body, the seepage line shall not intersect the downstream slope face of the dam body.

3) Any slope face of the dam body for a fill dam shall not be eroded by waves or rainwater.

Article 73: Construction Limitations of Water Outlet Works

No water outlet works or water channels shall be constructed in the body of a fill dam.

3-3 Waterways

Article 74: General

1. Waterways shall be provided in adherence of the following points:

   1) Any existing possibility that the waterways may be damaged by a flood or landslide must be eliminated.

   2) Where there is a possibility that water may flow into a water channel at a discharge equal to or more than the design discharge, the water channel shall be able to safely drain the flow.

   3) Any possibility that the waterways may be substantially damaged by the inflow of drifting wood, garbage, or soil must be eliminated.

   4) Concrete materials used in a water channel shall comply with the points articulated in Article 63.

   5) Any material other than the concrete materials used in a water channel shall possess the designated chemical composition and mechanical properties required of water channels.

   6) Regulating gates or gate valves, if installed, shall be in accordance with the following provisions:

      a) Regulating gates or gate valves shall be in accordance with the points articulated in paragraph 2 of Article 65 (except items 3) and 4)).

      b) The stress applied to the doors of regulating gates or gate valves due to the dead load, hydrostatic water pressure, dynamic water pressure, seismic force, and buoyancy shall not exceed the maximum allowable stress of individual materials used.

2. For hydro facilities utilized for power generation that fall within the electrical facilities for general use, waterways shall be provided so as to be able to safely handle surplus water without disturbing any house, field, road, or other property. However, this provision does not apply to those located in a place where there the possibility of disturbance is non-existent based on the nature of the terrain and/or other conditions surrounding the facilities.

Article 75: Water Intake facilities

Water intake facilities shall be constructed in adherence of the following points:

1) Water intake facilities shall possess the stability to withstand the dead load, hydrostatic water pressure, dynamic water pressure, mud pressure, seismic disturbances, uplift pressure and earth pressure. The stress caused by these

loads shall not exceed the maximum allowable stress of the individual materials utilized.

2) Water intake facilities directly connected to the main body of a pressure headrace or penstock shall be able to maintain good inflow conditions and constructed so that there is no possibility of adverse effects occurring that will affect the water channel or water turbines.

3) The water intake facilities shall possess a regulating gate or gate valve except where there is no possibility that the inflow into the water channel may increase the structure's design flow or more or where the water intake facilities withdraw torrent water.

Article 76: Settling basins

Settling basins shall be constructed in adherence of the following points:

1) Settling basins shall have enough stability to withstand the dead load, water pressure, seismic force, and earth pressure. The stress caused by these loads shall not exceed the maximum allowable stress of the individual materials used.

2) Settling basins shall have the capability to allow soil that may substantially damage the downstream water channels or water turbines to settle.

Article 77: Headraces

Headraces shall be constructed in adherence of the following points:

1) Headraces shall have enough stability to withstand the dead load, water weight, water pressure, seismic disturbances, earth pressure, superimposed loads, wind loads, temperature loads, and external pressure. The stress caused by these loads shall not exceed the maximum allowable stress of individual materials used.

2) Any possibility that water leakage may adversely affect any house, field, road, or other property shall be eliminated.

3) For unprotected tunnels or open channels, any possibility that falling rocks may cause substantial damage to the water channel or turbines must be eliminated.

4) Pressure headraces shall comply with the following provisions:

a) A pressure headrace shall be located below the hydraulic grade line for the lowest water level in the water intake facilities and surge tank.

b) Where the intake of torrent water merges into a pressure headrace, any possibility that the entrained air may cause substantial damage to the water channel or turbines must be eliminated.

c) Pressure headraces shall be designed to allow easy and reliable outflow of air during water filling and easy and reliable inflow of air during water drainage.

Article 78: Head Tanks

Head tanks shall be constructed in accordance with the following points:

1) Head tanks shall have enough stability to withstand the dead load, water pressure, seismic force, and earth pressure. The stress caused by these loads shall not exceed the maximum allowable stress of the individual materials used.

2) The inlet of the main body of a penstock shall be designed to maintain good inflow conditions and to ensure that there is no possibility of the penstock or water turbines being adversely affected.

3) A head tank shall have the capability to safely handle surplus water when all loads are shut down. However, this provision does not apply to where all facilities except the head tank have the capability to safely handle surplus water or where the facilities specified in paragraph 2 of Article 74 fall within those specified in the exception of the said Article.

4) A spillway or spillway channel to be installed in accordance with the preceding point shall comply with the following provisions:

a) The spillway channel shall be designed to have no excessive negative pressure if the channel is a pipe type.

b) There shall be no possibility that the discharge of surplus water may adversely affect the spillway, spillway channel, houses, fields, or other property.

c) There shall be no possibility that the water level rising during the overflow of surplus water may adversely affect the headrace.

Article 79: Surge Tanks

Surge tanks shall be constructed in accordance with the following items:

1) Surge tanks shall have enough stability against the dead load, water's weight, water pressure, seismic force, earth pressure, wind load, and the temperature load. The stress caused by these loads shall not exceed the maximum allowable stress of the individual materials used.

2) The surge tanks shall be designed to have no water level acceleration variations, if such a phenomena occurs, it must be restored to its equilibrium state within a short period of time.

3) Any possibility that the water level variation may cause overflow or adversely affect the water channel or turbines in any of the events a) to c) listed below must be completely eliminated. However, this provision relating to overflow does not apply to where a spillway or spillway channel is provided to safely discharge surplus water in accordance with a) and b) of item 4) of Article 78.

   a) All loads are shut down.

   b) Loading is dramatically increased from a half load to a full load.

   c) For a pumped-storage power station, the input is shut off.

4) For a surge tank in a hydropower station for frequency regulation, any possibility that the water level variation caused by frequency fluctuations in the power grid that the power station belongs to may lead to damage of other property must be completely eliminated.

Article 80: Penstocks

Penstocks shall be constructed in accordance with the following items:

1) The stress applied to a penstock of different types as listed below due to their own applicable loads as described in the following shall not exceed the maximum allowable stress of the individual materials used.

Type of penstock	Load
Exposed type	Hydrostatic water pressure, maximum water pressure rise due to a combination of the water hammer and surging, dead load of the penstock pipe, temperature load, external pressure, weight of water in the penstock, seismic disturbances, wind load, and force applied by water stream in the penstock
Rock buried type	Hydrostatic water pressure, maximum water pressure rise due to a combination of the water hammer and surging, temperature load, and external pressure
Earth buried type	Hydrostatic water pressure, maximum water pressure rise due to a combination of the water hammer and surging, earth pressure, superimposed load, temperature load, external pressure and weight of water in the penstock

2) The main body of a penstock shall be able to safely withstand vibration, buckling, or corrosion.

3) A penstock shall be located below the hydraulic grade line for the lowest water level in the head or surge tank (or in the water intake facilities if no head or surge tank exists).

4) Ensure that no harmful leakage shall occur.

5) Anchor blocks shall be in accordance with the following provisions:

a) Anchor blocks shall reliably secure the main body of a penstock.

b) Anchor blocks shall have enough stability to withstand the dead load, the weight of the main body of the penstock, its accessories and water in the penstock, force applied by the water stream in the penstock, force caused by the water pressure applied to the reducers, seismic disturbances, superimposed loads, wind loads, and temperature loads. The stress caused by these loads shall not exceed the maximum allowable stress of individual materials used.

6) Supports shall be in accordance with the following provisions:

a) Supports shall have enough stability to withstand the dead load, the weight of the main body of the penstock, its accessories and water in the penstock, seismic disturbances, superimposed and wind loads. The stress caused by these loads shall not exceed the maximum allowable stress of the individual materials used.

b) The bearing parts of the supports shall be designed to allow the main body of the penstock to safely and smoothly adapt during expansion or contraction.

Article 81: Tailraces

1. The provisions of Article 77 (except the provisions a) and b) of item 4)) shall also apply to tailraces. However, the term “headrace” used in the Article shall be replaced with the new term “tailrace” and the term “pressure headrace” shall be replaced with new term “pressure tailrace.”

2. The outlet of a tailrace shall have enough stability to withstand the dead load, hydrostatic water pressure, dynamic water pressure, seismic disturbances, uplift pressure, and earth pressure. The stress caused by these loads shall not exceed the maximum allowable stress of the individual materials used.

3. Surge chambers for the pressure tailrace, if installed, shall be constructed in accordance with the provisions of Article 79.

3-4 Turbines and Underground Power Stations

Article 82: Turbines and Pumps

1. Water turbines or storage pumps for a pumped-storage power station shall be constructed in accordance with the following points:

   1) Any possibility that the water turbines or storage pumps for a pumped-storage power station could potentially be substantially damaged by the inflow of drift wood, garbage, or soil must be completely eliminated.

   2) Any part subject to water pressure shall be designed to withstand the maximum water pressure that occurs when the load or input is shut off.

   3) Any rotating part shall be designed to withstand the maximum speed that occurs when the load or input is shut off.

   4) Vibration that may damage the water turbines or storage pumps shall be prevented during operation.

   5) A facility for quickly interrupting the inflow or outflow of water shall be provided in water turbines or storage pumps. However, this provision does not apply to where such facilities are provided in the water channel or where the rotating parts of the water turbines are structurally safe until the runway operation of the turbines is stopped and any possibility that the water discharge to the downstream during the time may cause personal injury or property damage has been eliminated.

   6) Where an inlet valve is installed in a water turbine or a discharge valve is installed in a storage pump, such valves shall be in accordance with the following provisions:

      a) The inlet valve of a water turbine or the discharge valve of a storage pump shall be in accordance with the items (except item 4)) in paragraph 2 of Article 65.

      b) The stress applied to the gate door of the inlet valve of a water turbine or of the discharge valve of a storage pump due to the dead load, water pressure, and seismic disturbances shall not exceed the maximum allowable stress of individual materials used.

2. Oil pressure supply systems and air compressor systems intended to be used as hydro facilities for power generation shall be corrosion resistant and be durable enough to withstand pressure increases without breaking.

3. For power generation hydro facilities that fall within the category of general usage electrical facilities for hazard prevention against dangers caused by overspeed or other water turbine failures during operations, the facilities shall

have a system to automatically and reliably stop the water turbines in the event of such failures. However, this provision does not apply when the generators' capacity is below 500 kV A and the facilities that have a system for isolating the generators from the electrical circuit in the event of such a failure, are designed so that any rotating parts remain structurally safe until the runway operation is stopped and there is no possibility that the downstream water discharge during the time may be cause for personal injury or property damage.

Article 83: Construction of Underground Power Stations

Facilities that are intended to house water turbines and generators and are constructed underground shall be in adherence with the following points:

1) Concrete materials used in an underground power station shall be in accordance with the items of Article 63.

2) An underground power station shall have the stability to withstand dead loads, water pressure, seismic disturbances and earth or ground pressure. The stress due to these loads that is applied to parts of the concrete structure shall not exceed the maximum allowable stress of the individual materials used.

3-5 Storage and Regulating Reservoirs

Article 84: Storage and Regulating Reservoirs

Storage and regulating reservoirs shall be constructed in accordance with the following:

1) All possibilities of water leakage or landslides caused by the impoundment of water by installing a dam that may adversely affect houses, fields, roads, or other property must be eliminated.

2) Sand sedimentation shall not result in an increase in the water level of the reservoir as it may be hazardous to the dam or adversely affect the vicinity.

Chapter 4 Thermal Power Facilities

4-1 General Provision

Article 85: Scope of Application

This Requirement shall apply to all thermal power electrical facilities to be installed. [Including geothermal; the same shall apply hereinafter].

4-2 Boilers and Accessories

Article 86: Boiler Materials

Materials used in pressure parts for a vessel or pipe included in a boiler, independent superheater, steam accumulator (together refereed to as “boilers” hereinafter), or their accessories shall possess the chemical composition and mechanical strength to safely withstand possible chemical and physical impacts on the materials at the maximum working temperature.

Article 87: Structure of Boilers

The structure of pressure parts for boilers or their accessories shall as a safety measure possessing adequate durability to be able to withstand the maximum stress at the maximum working pressure or temperature. The stress applied to the pressure parts in this case shall not exceed the maximum allowable stress of the material used in the relevant parts.

Article 88: Safety Valves

Boilers and their accessories that may have overpressure shall be equipped with an appropriate safety valve to release excessive pressure. Such safety valves shall be installed so as to prevent the boilers or their accessories from overheating.

Article 89: Feed Water Supply Systems

1. Boilers shall be equipped with a feed water supply system to prevent thermal damage during operations at the maximum continuous rating.
2. Boilers shall be additionally equipped with a standby feed water supply system to prevent thermal damage to the boiler due to facility failure.

Article 90: Shutting Off Steam or Feed Water

1. The steam outlet of a boiler (excepting the steam outlet of safety valves or reheaters) shall be constructed so that it is capable of shutting off the steam outflow.
2. The feed water inlet of a boiler shall be constructed so that it is capable of quickly, automatically, and reliably shutting off the feed water inflow of feed water.

Article 91: Blow Down Systems

Circulation boilers shall be equipped with a blow down system to drain boiler water in order to prevent the concentration of boiler water and to allow for water-level adjustments.

Article 92: Instrumentation

Boilers shall be equipped with instrumentation for measuring the operating condition necessary in order to prevent facility damage.

4-3 Steam Turbines and Accessories

Article 93: Steam Turbine Accessory Materials

Materials used in the pressure parts of a vessel or pipe included in the steam turbine accessories shall have a chemical composition and mechanical strength to be able to safely withstand potential chemical and physical impact on the materials at the maximum working temperature.

Article 94: Structure of Steam Turbines

1. The structure of steam turbines shall possess a sufficient amount of mechanical strength to be able to withstand the rotation speed achieved when the emergency governor is actuated.
2. The structure of steam turbines shall possess a sufficient amount of mechanical strength to be able to withstand the maximum vibration that may occur in the critical bearing or shaft.
3. Bearings used for steam turbines shall be able to stably support the operating load and shall not be subject to abnormal wear, deformation, or overheating.

4. The critical speed of a steam turbine system combined with a generator and other rotators installed on the same shaft (or of a steam turbine that is installed on a shaft different from that used for the generator or other rotators) shall not be within the range between the minimum rotation speed obtainable with the governor and the rotation speed attained when the emergency governor is actuated. However, this provision does not apply when adequate measures have been taken to prevent the vibration at critical speed from interfering with the operations of the steam turbine.

5. The structure of pressure parts for steam turbines or their accessories shall provide adequate safety to be able to withstand maximum stress at the maximum working pressure or temperature. The stress applied to the pressure parts in this case shall not exceed the maximum allowable stress of the materials used in the relevant parts.

Article 95: Governors

Steam turbines shall be equipped with a governor to automatically control the steam's flow rate into the steam turbine in order to prevent continuous fluctuation of the rotation speed or output even with load variations. Such governors shall have the capability of maintaining the rotation speed attained after the shut down of the maximum load below the original speed at which the emergency governor was actuated.

Article 96: Alarm and Emergency Shutdown Devices

1. Steam turbines shall be equipped with a vibration-detection device. This device could potentially interfere with operations and cause the alarms to be triggered.

2. To prevent hazards caused by overspeed or other failures during operations, steam turbines shall be equipped with an emergency governor and/or other emergency shutdown devices that can automatically and quickly shut off the flow of steam into the steam turbines in the event of a failure.

Article 97: Pressure Relief Devices

Steam turbines and their accessories that may have overpressure shall be equipped with appropriate pressure relief devices.

Article 98: Instrumentation

Steam turbines shall be equipped with instrumentation for measuring the operating conditions necessary to prevent facility damage.

4-4 Gas Turbines and Accessories

Article 99: Materials of Gas Turbine Accessories

Materials used in pressure parts for a vessel or pipe included in accessories of gas turbines shall have the chemical composition and mechanical strength to safely withstand potential chemical and physical impact on the materials at the maximum working temperature.

Article 100: Structure of Gas Turbines

1. The structure of gas turbines shall provide adequate mechanical and thermal strength at the rotation speed reached when the emergency governor is actuated or at the gas temperature reached when the automatic fuel shut-off system is actuated after the gas temperature has substantially increased.
2. Bearings used for gas turbines shall be able to stably support the operating load and shall not be subject to abnormal wear, deformation, or overheating.
3. The critical speed of a gas turbine system including the generator and other rotators installed on the same shaft (or of a gas turbine that is installed on a shaft different from that for the generator or other rotators) shall not be within the range between the minimum rotation speed obtainable with the governor and the rotation speed attained when the emergency governor is actuated. However, this provision does not apply to where adequate measures have been taken to prevent the vibrations at critical speed from interfering with the operations of the gas turbine.
4. The structure of pressure parts for gas turbines or their accessories as a safety measure shall be durable enough to withstand maximum stress at the maximum working pressure or temperature. The stress applied to the pressure parts in this case shall not exceed the maximum allowable stress of the materials used in the relevant parts.

Article 101: Governors

Gas turbines shall be equipped with a governor to automatically control the flow of energy into the gas turbine to prevent continuous fluctuation of the rotation speed or output even with load variations. Such governors shall have the capability of maintaining the rotation speed attained after the shut down of the rated load below the speed at which the emergency governor is actuated.

Article 102: Emergency Shutdown Devices

1. Gas turbines shall be equipped with a vibration detection device that may interfere with operations causing the alarms to trigger.
2. To prevent hazards caused by overspeed or other failures during operations, gas turbines shall be equipped with an emergency governor and/or other emergency shutdown devices that can automatically and quickly shut off the energy flow of into the gas turbines in the event of a failure.

Article 103: Pressure Relief Devices

Gas turbine accessories that may have overpressure shall be equipped with appropriate pressure relief devices.

Article 104: Instrumentation

Gas turbines shall be equipped with instrumentation for measuring the operating conditions to prevent facility damage.

4-5 Internal Combustion Engines and Accessories

Article 105: Materials of Internal Combustion Engine Accessories

Materials used in pressure parts for a vessel or pipe included in the accessories of an internal combustion engine shall have the chemical composition and mechanical strength that will enable the internal combustion engine accessories to safely withstand potential chemical and physical impacts at the maximum working temperature.

Article 106: Structure of Internal Combustion Engines

1. The structure of internal combustion engines shall possess a sufficient amount of mechanical strength to be able to withstand the rotation speed achieved when the emergency governor is actuated.
2. Bearings used for internal combustion engines shall be able to stably support the operating load and shall not be subjected to abnormal wear, deformation, or overheating.
3. The structure of pressure parts for internal combustion engines or their accessories as a safety measure shall be durable enough to withstand the maximum stress at the maximum working pressure or temperature. The stress

applied to the pressure parts in this case shall not exceed the maximum allowable stress of the materials used in the relevant parts.

4. An adequate air supply inlet and exhaust outlet shall be properly provided for internal combustion engines that are installed indoors or in a place where the possibility of oxygen deficiency may occur.

Article 107: Governors

Internal combustion engines shall be equipped with a governor to automatically control the fuel flow rate into the internal combustion engine in order to prevent continuous fluctuations of the rotation speed or output even with load variations. These governors shall have the capability of maintaining the rotation speed attained after the shut down of the rated load below the speed at which the emergency governor is actuated.

Article 108: Emergency Shutdown Devices

To prevent the occurrence of hazards caused by overspeed or other failures during operation, internal combustion engines shall be equipped with an emergency governor and/or other emergency shutdown devices that can automatically and quickly shut off the fuel flow into the internal combustion engines in the event of a failure.

Article 109: Pressure Relief Devices

Internal combustion engines and their accessories that may be subject to overpressure shall be equipped with appropriate pressure relief devices.

Article 110: Instrumentation

Internal combustion engines shall be equipped with instrumentation for measuring the operating conditions necessary to prevent facility damage.

4-6 Liquefied Gas Facilities

Article 111: Definitions

1. The term "Liquefied Gas" shall refer to those liquids whose saturation pressure is over 0.2MPa at normal usage temperatures, or liquids whose saturation temperature is not more than 35 degree Celsius at 0.2MPa.

2. The term "Pipe line" shall refer to pipes and accessories installed outside of the plant that are utilized to transport fuels, gas, liquefied gas and/or a fire.

Article 112: Isolation Distance

1. The location of liquefied gas facilities shall be isolated so that distance between their exterior and the boundary of the power plants is sufficient enough to prevent hazards caused by gas leakage or liquefied gas or a fire.

2. Liquefied gas facilities, such as storage tanks, carburetor systems, pumps, compressors and gas holders shall be located with a designated separation distance based on its storage capacity, processing capacity or category of gas or liquefied gas. The distance between facilities' exterior and any building made available for use as residences, or buildings which can accommodate many persons such as school buildings, hospitals, markets, train stations and/or important cultural assets in order to prevent hazards caused by gas leakage, liquefied gas and/or a fire.

3. An isolated distance necessary for safety shall be provided between liquefied gas storage tanks, gasholders, and liquefied gas storage tanks to prevent hazards caused by gas leakage of gas, liquefied gas and/or a fire.

Article 113: Safety Zones

A power plant's Liquefied gas facilities equipped with a liquefied gas carburetor system shall be divided into groups by the type and size of the facilities and installed in an appropriate safety zone in order to prevent hazards caused by gas leakage, liquefied gas, and/or a fire. An isolated distance necessary for safety shall be provided between facilities.

Article 114: Installation Location of Facilities

1. Liquefied gas storage tank facilities that are installed around the exterior of dikes must maintain a distance necessary for disaster prevention activities excepting those that will not interfere with the prevention of gas leakage, liquefied gas or fire from spreading.

2. Where pipes or the whole or part of a liquefied gas storage tank is to be installed underground, such installations shall not be made in a place where they the facilities could be subject to danger resulting in damage or where gas leakage, liquefied gas or a fire may occur.

Article 115: Materials of Liquefied Gas Facilities

1. Materials used in the pressure parts of vessels or pipes included in liquefied gas facilities shall possess the chemical composition and mechanical strength to be able to safely withstand possible chemical and physical impacts on the materials at the maximum working temperature and shall also have flame retardant properties
2. Materials of supports of liquefied gas storage tanks or gas-holders shall have sufficient mechanical and chemical strength to withstand the load during service.

Article 116: Structure of Liquefied Gas Facilities

The structure of pressure parts for liquefied gas facilities or of the supports and foundation for liquefied gas storage tanks, gas-holders, or pipes shall be as a safety measure shall be durable enough to withstand the load during service and the maximum stress at the maximum working pressure or the maximum or minimum working temperature. The stress applied to the parts in this case shall not exceed the maximum allowable stress of the materials used in the relevant parts.

Article 117: Safety Valves

1. Vessels included in liquefied gas facilities shall be equipped with appropriate safety valves to prevent overpressure. Such safety valves shall be installed so that the blow-off gas from the actuated safety valves cannot cause a hazard.
2. Liquefied gas storage tanks shall have appropriate measures to prevent ruptures that occur under negative pressure.

Article 118: Gas Leakage Prevention

Liquefied gas facilities shall have appropriate measures to prevent hazards caused by the gas leakage or liquefied gas in the facilities.

Article 119: Electrostatic Removal

In liquefied gas facilities in which liquefied gas is charged, measures shall be taken to remove the electrostatic that builds up in the facilities that may ignite the gas.

Article 120: Fire Prevention & Extinguishing Systems

At liquefied gas facilities [limited to those in which combustible gas, combustible liquefied gas, oxygen or liquefied oxygen, toxic gas, or toxic liquefied gas is charged] appropriate fire prevention and extinguishing systems suitable for the size of the facilities shall be provided in appropriate locations.

Article 121: Instrumentation

Liquefied gas facilities shall be equipped with instrumentation for measuring the operating conditions necessary to prevent facility damage.

Article 122: Alarm & Emergency Shutdown Devices

1. Liquefied gas facilities shall be equipped with a device for detecting the presence of gas or liquefied gas and potential control equipment conditions that may interfere with the facilities' service and subsequently trigger the alarms.
2. For the purpose of hazard prevention during service failure at liquefied gas facilities, emergency shutdown devices capable of shutting off the outflow and inflow of gas or liquefied gas shall be installed at appropriate locations.
3. Gas compressors with external forced lubrication systems shall be equipped with a device that automatically stops the compressor when the compressor reaches an abnormally low lubricant level.

Article 123: Shut Off Devices

Major gas or liquefied gas outlets and inlets of liquefied gas facilities shall have a device to shut off the outflow or inflow of gas or liquefied gas.

Article 124: Gas Replacement

1. Parts of liquefied gas facilities in which gas or liquefied gas is charged shall be constructed so as to allow safe replacement of gas or liquefied gas with inert gas.
2. In case of disposal of toxic gas, parts of liquefied gas facilities shall be constructed to allow for safe disposal of the toxic gas.

Article 125: Signs

Liquefied gas storage tanks and gas-holders shall have signs placed on their body directly or at locations where they are readily visible indicating clearly that they are liquefied gas storage tanks or gas-holders.

Article 126: Thermal Insulation

Liquefied gas storage tanks and their supports shall be constructed to provide sufficient heat resistance and insulation against heat that may be applied to the facilities or shall have an appropriate cooling system suitable for the size of the facilities.

Article 127: Protection

1. Liquefied gas facilities that may be subject to damage or corrosion depending on the installation conditions shall be provided with protection measures to prevent such damage or corrosion.
2. Buried piping of liquefied gas facilities shall be provided with a measure to allow for quick shut-off of the inflow of gas into the piping in the event of an emergency, provided that the surrounding areas may be exposed via an excavation, and that the piping may be damaged resulting in gas leakage leading to hazard.

Article 128: Heating Section of Carburetors

1. The heating section of liquefied gas carburetors shall NOT be designed for direct fire usage for heating.
2. In the event that hot water in the heating section of liquefied gas carburetors may freeze, measures shall be taken to prevent such freezing.

Article 129: Odorization

Where gas [limited to combustible or toxic gas] is transported through piping, in principle, the gas shall be odorized so that human can easily detect its presence. However, this provision does not apply to those gases whose odor can be detected by humans when the blend ratio by volume of gas in the air is less than a thousandth.

4-7 Gasifier Facilities

Article 130: Isolation Distance

1. The location of gasifier facilities shall be isolated so that there is enough distance between their exterior and the boundary of the power plant to prevent hazards caused by gas leakage or fire.
2. Gasifier facilities shall be located with a designated separation distance based on allowable concentration of gas and gas throughput capacity of gasifier facilities. The distance between facilities' exterior and any building made available for use as residences, or buildings which can accommodate many persons such as school buildings, hospitals, markets, train stations and/or important cultural assets in order to prevent hazards caused by gas leakage, and/or a fire.

Article 131: Safety Zones

Gasifier facilities shall be divided into groups by the type and size of facilities and installed in an appropriate safety zone in order to prevent hazards caused by gas leakage or fires. A distance necessary to ensure safety shall be provided between the facilities.

Article 132: Materials of Gasifier Facilities

Materials used in the pressure parts for a vessel or pipe included in gasifier facilities shall have the chemical composition and mechanical strength to safely withstand possible chemical and physical impacts on the materials at the maximum working temperature.

Article 133: Structure of Gasifier Facilities

The structure of pressure parts for gasifier facilities as a safety measure shall be durable enough to withstand the maximum stress at the maximum working pressure or temperature. The stress applied to the parts in this case shall not exceed the maximum allowable stress of the materials used in the relevant parts.

Article 134: Safety Valves

Gasifier facilities that may be subject to overpressure shall be equipped with appropriate safety valves. Such safety valves shall be installed so that the blow-off gas from the actuated safety valves cannot cause a hazard or

overheat the gasifier facilities.

Article 135: Feed Water Supply Systems

1. Vessels included in the gasifier facilities shall be equipped with a feed water supply system to prevent thermal damage during continuous operations at the maximum gas yield.
2. Such vessels shall be additionally equipped with a standby feed water supply system to prevent thermal damage to the vessel due to facility failure.

Article 136: Shutting Off Steam or Feed Water

1. The steam outlet of a vessel included in the gasifier facilities (excepting the steam outlet of safety valves or reheaters) shall be constructed so that it is capable of shutting off the steam outflow.
2. The feed water inlet of a vessel included in gasifier facilities shall be constructed so that it is capable of quickly, automatically, and reliably shutting off the feed water flow.

Article 137: Blow Down Systems

Vessels included in the gasifier facilities shall be equipped with a system to drain water in order to prevent the concentration of water and to allow for water level adjustments.

Article 138: Gas Leakage Prevention

Gasifier facilities shall have appropriate measures to prevent the occurrence of hazards caused by gas leakage at the facilities.

Article 139: Electrostatic Removal

For gasifier facilities in which combustible gases are charged, measures shall be taken to remove accumulated electrostatic buildup that could serve as an ignition source for gas.

Article 140: Fire Prevention and Extinguishing Systems

At gasifier facilities [limited to those in which combustible gas, toxic gas or oxygen is charged], appropriate fire prevention and extinguishing systems suitable for the size of the facilities shall be provided in appropriate locations.

Article 141: Instrumentation

Gasifier facilities shall be equipped with instrumentation for measuring the operating conditions necessary to prevent facility damage.

Article 142: Alarm and Emergency Shutdown Devices

1. Gasifier facilities shall be equipped with a gas detection device that triggers off an alarm at the presence of sudden volatile substances.
2. In gasifier facilities, to prevent hazards caused by operational failures, emergency shutdown devices capable of quickly shutting off the outflow and inflow of gas shall be installed in appropriate locations.

Article 143: Gas Replacement

Parts of the gasifier facilities in which gas is charged shall be constructed to allow for the safe replacement of gas with “inert gas”.

4-8 Storage Facilities for Solid Fuel from Wastes

Article 144: Humidity Measuring Devices

Storage facilities for solid fuel mainly from combustible wastes (hereinafter referred to as “solid fuel from wastes”) of a closed structure shall be equipped with a device for continuously measuring and recording the humidity in order to maintain the fuel’s water content at an appropriate level. However, this provision does not apply when the possibility that the solid fuel from the wastes would abnormally generate heat or produce combustible gas is non-existent.

Article 145: Temperature Measuring Devices

Storage facilities for solid fuel from wastes of a closed structure shall have a device for continuously measuring and recording the temperature both around the heat-generating equipment and at positions where any abnormal heat may be detected. However, this provision does not apply when the possibility that the solid fuel from wastes would abnormally generate heat or produce combustible gas is non-existent.

Article 146: Gas Concentration Measuring Devices

In storage facilities for solid fuel from wastes of a closed structure, a device for continuously measuring and recording the concentration of oxygen, carbon monoxide, methane gas, and/or other combustible gases shall be installed to prevent such combustible gas from being concentrated reaching the lower explosive limit in places where such gas may be generated. However, this provision does not apply when there the possibility that the solid fuel from wastes would abnormally generate heat or produce combustible gas is non-existent.

Article 147: Ignition Prevention Device

1. In storage facilities for solid fuel from wastes of a closed structure, a device for quickly charging a sufficient quantity of nitrogen or other inert gases into the storage facilities to suppress any abnormal generation of heat or generation of combustible gas if detected shall be installed.
2. Where a ventilator is to be installed in such storage facilities as stated in the preceding paragraph, such a ventilator shall be installed so that the additional supply of oxygen produced thereby cannot support combustion.

Article 148: Fire Extinguishing Systems

In storage facilities for solid fuel from wastes of a silo type or other closed structures, a system for properly extinguishing the fire from the solid fuel's waste shall be installed.

4-9 Electrical Facilities for Thermal Power Plant

Article 149: Installation at Site with Danger of Explosion by Combustible Gas

Electrical installations installed at the site with combustible gas, flammable substance vapor or dust where an explosion may occur if conditions conducive to ignition exist, shall be installed so that they do not serve as a potential ignition source for explosions or fire during normal operation status.

Article 150: Installing Extra-high-voltage Electric Dust Collection Application Devices

Electric dust collectors needing a supply of extra-high voltage via extra-high voltage and electrical installations shall be installed outdoors so that they do not cause any electric shock or fire from the danger posed by the live part of

the applicable electrical installations.

Article 151: Installation of Electric Anticorrosion Facilities

Electric anticorrosion facilities shall be installed so that they do not cause any faults via stray current corrosion that is incurred at other structures.

Article 152: Prohibition of Installation of Electric Heating Equipment for Pipelines

Electric heating equipment for pipelines (which refers to all facilities that transport liquid using conduits or the like) shall not be installed at the sites where the danger of insulation performance deterioration due to dust/corrosive gas, or danger of fire/explosion due to combustible gas exists. However, this provision need not apply if appropriate measures are taken to prevent electric shocks, explosions, or fires.

4-10 Miscellaneous Provision

Article 153: Safety of Special Facilities

These thermal-powered facilities have been established for the purpose of generating electricity and with the exception of those specified in the preceding articles, as a safety measure shall be durable enough to withstand potential chemical and physical effects.

Appendix - 3 *Safety Rules (Japan's sample)*

Safety Rules (Japan's sample)

- The attached is an extract of *Safety Rules* developed by Tokyo Electric Power Company, Inc., Japan's largest power utility.
- The whole *Safety Rules* also comprise more specific information as appendix, such as:
  - Organizational structure with the positioning of Engineering Manager, description of responsibilities of each section
    (refer to Attachment-1.4, Slide 19 of the presentation);
  - Basic rules of construction, operation, and maintenance
    (refer to Attachment-1.4, Slide 20 of the presentation)
- In Japanese regulation, each power utility is obliged to develop its own *Safety Rules* that include the following 15 items:
  1. Relevant laws and regulations for Safety and managerial setup for observing *Safety Rules*;
  2. Assigned duties of each department and organizational structure;
  3. Scope of work of Engineering Manager as well as detailed descriptions, his/her authority and position in the organization;
  4. Educational activities on safety for the staff;
  5. Measures for systematica1ly implementing and improving safety-related works on power generating facilities;
  6. Procedures to develop, modify, approve and archive relevant documents for safety on power generating facilities;
  7. Status of abovementioned documents related to Safety Rules;
  8. Appropriate documentation/recording concerning safety;
  9. Patrol, inspection and investigation for safety;
  10. Operation and handling of electrical facilities for power utility;
  11. Procurement of equipment and services for power generating facilities;
  12. Conservation of power generating facilities that suspend operation for a long period;
  13. Measures to be taken in disaster or in other kinds of state of emergency;
  14. Periodical review of Safety Rules and necessary amendments;
  15. Other miscellaneous issues related to safety;

Safety Rules

Tokyo Electric Power Company, Inc.

Part 1 General Rules

Article 1: Purposes

These Safety Rules stipulate the fundamental issues concerning safety in the process of construction, maintenance, and operation of the electric power facilities (excepting nuclear power facilities) equipped by Tokyo Electric Power Company ("safety in the process of construction, maintenance, and operation of the electric power facilities" is hereinafter referred to as "safety of the electric power facilities") on purpose to keep public safety and secure operation of electric power facilities conforming to the Electric Power Utility Law.

Article 2: Coverage

These Safety Rules are applied to the safety management of any electric power facility equipped for electric power supply business (excepting nuclear power facilities) and electric power facility equipped for own use of electricity supervised together with abovementioned facilities (Those two types of facilities are hereinafter referred to as "TEPCO's electric power facilities") by engineering manager.

2 The liability borderlines between TEPCO's electric power facilities and the electric power facilities equipped by the others equal to the property borderlines except the case that there is a particular agreement for liability.

Article 3: Alteration of Safety Rules

These Safety Rules are to be reviewed regularly, made necessary improvements on, and altered in the cases below.

(1) When an amendment to Electric Power Utility Law and related laws and regulations is made;
(2) When alternation to the organization chart as attached to these Safety Rules is made;
(3) Or whenever any necessity to alter these Safety Rules takes place;

Part 2 Safety and Management Structure

Article 4: Observance of related ordinances

Items mentioned below shall be surely implemented in order to observe the related laws and regulations for securing safety of construction, maintenance, or operation of electrical facilities (hereinafter referred to as "related ordinances") and Safety Rules.

(1) The president shall stipulate the principles of conformance to related ordinances and set up the organizational structure to observe them.

(2) The departments responsible for executing operations shall present the related ordinances and give necessary education to its staff, referring to the basic functions stipulated in Article 5 under the principles of conformance to related ordinances.

(3) The departments responsible for evaluating the achievement in developing rules and organizational structure and for evaluating the observation of related ordinances and regulations (hereinafter referred to as “evaluation departments”) shall carry out the evaluation and give necessary instructions and advice.

(4) The evaluation departments shall report to the executive directors including the president on the achievement of development of rules and implementation structure and the observation of related ordinances.

(5) The executive directors including the president shall give necessary instructions to the departments responsible for executing operations according to the report from the evaluation departments.

Article 5: Basic Functions

Persons who are in charge of the tasks related to safety securing activities in TEPCO’s electric power facilities shall make effort to secure safety in TEPCO’s electric power facilities according to their roles in order to ensure the observance to the Electric Power Utility Law, related laws, and Safety Rules.

2 The president shall supervise the tasks related to safety securing activities of the chief of headquarter, the department directors of headquarter, and the branch managers.

3 The managers of headquarter and the department directors of headquarter support the president, supervise the tasks of the general manager of Transmission & Substations Construction Center, Transmission Department of Power Network Division, related to safety securing activities, and give assistance in the tasks related to securing safety in TEPCO’s electric power facilities.

In case the department directors manage the construction, he/she shall give instructions to the subordinates to implement the tasks related to securing safety in TEPCO’s electric power facilities. He/she shall follow the instructions of the engineering manager, which are necessary to maintain the security.

4 The branch managers and the general manager of Transmission & Substations Construction Center, Transmission Department of Power Network Division conduct the tasks related to securing safety in TEPCO’s electric power facilities giving instructions to their subordinates. He/she shall follow the instructions of the engineering manager, which are necessary to maintain the security.

5 The managerial staff shall be well informed of laws related to securing safety and the Safety Rules in order to observe them and conduct the tasks bellow in cooperation with related posts.

(1) Maintaining security of the public and the related staff

(2) Avoiding accidents in the facilities

(3) Following the instructions of the engineering manager, which are necessary to maintain the security.

(4) Giving instructions to the workers under his/her supervision

6 Workers shall conduct their tasks based on laws related to securing safety and the Safety Rules to maintain the security of TEPCO's electric power facilities, following the instructions of the engineering manager which are necessary to maintain the security and inquiring their managers of any questions arising about the execution of laws related to securing safety, etc.

7 Internal auditing division (Quality and Security Audit Department) shall evaluate through its audit whether laws related to securing safety and structure are organized, the Electric Power Utility Law, related laws, and Safety Rules are observed and executed, and shall give instructions and advice for improvement. The result of the audit shall be reported to the executive including the president.

Article 6: Safety Organization

The organizational setup related to safety in TEPCO's electric power facilities, division of duties, and command s of power feeding are indicated in the attached list 1 and 2.

Article 7: Selection of the Engineering Managers

As per the Article 43 of the Electric Power Utility Law, the following engineering managers shall be selected to supervise the safety of TEPCO's electric power facilities.

(1) Engineering Manager for Electrical Facilities

(2) Engineering Manager for Dams and Channels

(3) Engineering Manager for Boilers and Turbines

2 Engineering managers shall be placed in the following business units, facilities, and positions in principle, given enough responsibilities and authority. They shall be selected from staff who does not engage directly in construction, operation, and maintenance (except the engineering manager for dams and waterways). A compatible person shall be selected in case there is no one appropriate for the post, on condition that sufficient measures are taken to enable him/her to conduct the tasks as an engineering manager.

Job Title	Facilities	Positions etc.
Engineering Manager	Headquarter (Distribution Construction Center, Construction Department)	Technical Manager
	Branch Offices	Deputy Branch Manager, Department Manager, or Technical Manager
	Power System Offices (Inawashiro, Matsumoto, Shinanogawa)	Deputy General Manager or Technical Manager
	Thermal Power Office Thermal Power Plant (Hirono)	Deputy Branch Manager, Department Manager, or Technical Manager
	Thermal Power Construction Offices	Deputy General Manager or Technical Manager
Engineering Manager for Dams and Waterways	Construction Department (Construction Office)	Technical Manager
	Water Power Plant (with dams higher than 15 meters, driving channel whose pressure is more than 392kPa, surge tanks, or discharge channel)	Technical Manager of Control Office, General Control Office
	Branch offices, Power System Offices (water power plants except the listed above)	Technical Manager of Branch Offices and Power System Offices
Engineering Manager for Boilers and Turbines	Thermal Power Plant	Deputy General Manager or Technical Manager
	Thermal Power Construction Office	Deputy General Manager or Technical Manager
	Island Offices	Deputy General Manager, Technical Manager, or Senior staff

Article 8: Selection of the Assistant of Engineering Manager

An assistant of engineering manager shall be selected, if needed, to support the tasks of engineering manager.

Article 9: Functions of Engineering Manager

Engineering managers shall supervise the safety in TEPCO's electric power facilities within his jurisdiction observing the laws and the Safety Rules. His/her tasks are specified as follows

(1) Giving necessary directions, instructions, and advice in planning safety securing activities in TEPCO's electric power facilities

(2) Giving directions, instructions, and advice to related staff if necessary for safety securing activities in TEPCO's electric power facilities

(3) Giving instructions and Supervising in the pre-operational voluntary inspections, welding

inspections, and periodical inspections designated by law (hereinafter referred to as “mandatory self inspections”)

(4) Attendance at the competent authorities’ inspections designated by law

(5) Attendance at the competent authorities’ pre-operational inspections and periodical inspections designated by law, or confirming to the record of the inspections

(6) Confirming the record predetermined to be inspected

Article10: Measures to be taken in Engineering Manager’s Absence

A substitute who conducts the tasks of engineering manager in his/her absence (hereinafter referred to as a “substitute”) shall be preliminary appointed.

2 The substitute shall faithfully conduct the engineering manager’s tasks in his/her absence.

Article 11: Measures to be taken in the Presence of Multiple Engineering Managers

Job descriptions shall be predetermined when more than one engineering managers are to be appointed in one business establishment.

Article 12: Dismissal of an Engineering Manager

An engineering manager shall be dismissed in case of a transfer, a retirement, or in the event of any of the following events.

(1) Said engineering manager is regarded as incompetent acting against the laws and the Safety Rules.

(2) Said engineering manager is regarded as incompetent because of a long-term business trip, an absence due to sickness, and so on.

Article 13: Arrangement of an Administrator for Security Control

An administrator for security control shall be arranged to be in charge of evaluation, instruction, and giving advice for improvement of TEPCO’s structure including rules related to safety securing activities in TEPCO’s electric power facilities.

Part 3 Education of Safety

Article 14: Contents and Measures of Education

Education and training covering the following contents shall be provided to staff that are engaged in safety securing activities in TEPCO’s electric power facilities in order to maintain safety.

(1) Items related to compliance with the Electric Power Utility Law, other concerned laws, and Safety Rules

(2) Items that contribute to acquiring and improving knowledge, techniques, and skills of safety securing activities in TEPCO’s electric power facilities.

(3) Items related to measures to be taken in case of accidents and emergencies, its drills,

and its trainings.

(4) Other items necessary for safety

2 Education programs to systematically implement the abovementioned education of safety shall be arranged, periodical evaluations of the effect of education and corresponding improvement in the programs conducted in parallel.

Part 4 Installation and Alteration of Electrical Facilities

Article 15: Confirmation of Notification

Regarding installation and alteration of electrical facilities, procedures shall be stipulated to confirm whether the construction is required a notification of the construction plan by the Electric Power Utility Law, and if the notification is required, whether the proper procedures have been taken in conformity to the Electric Power Utility Law.

Part 5 Patrols and Inspections

Article 16: Implementation of Patrols and Inspections

To maintain safety in TEPCO's electric power facilities, the following patrols and inspections shall be carried out, their results recorded as described to Article 28 and preserved for the required period.

(1) The patrols and inspections referred to in the attachment 3 shall be carried out in the purpose of maintaining TEPCO's electric power facilities as they comply with the laws and preventing accidents.

(2) Necessary patrols and inspections shall be carried out in case of accidents or any probable accidents.

(3) Necessary patrols and inspections shall be carried out in order to confirm the safety and compliance with safety requirements in or after the process of construction of TEPCO's electric power facilities.

Article 17: Implementation of Mandatory Self Inspections

Regarding TEPCO's electric power facilities that are required to have mandatory self-inspections, appropriate inspections shall be conducted following the properly established and documented procedures. Responsible persons necessary for each inspection shall be appointed to give instructions, supervise the inspection, and record the results to be preserved for the required period following Article 28.

2 In case the mandatory self-inspection is to be outsourced, conditions such as scope of work and measures of inspection shall be clarified in the specifications. Inspections of electrical facilities for power generation and likewise for the rest of the electrical facilities shall be judged their compliance with the specifications following Article 27.

Article 18: Countermeasures for the Results of Patrols and Inspections

In the event of detection of issues that violate safety requirements or need improvements to secure safety as a result of patrols and inspections of TEPCO's electric power facilities, emergency procedures shall be taken immediately followed by the study and implementation of permanent countermeasures.

Part 6 Operation of Electrical Facilities

Article 19: Basic Operation

TEPCO's electric power facilities shall be operated to expend all possible means to maintain sustainable power supply even in the abnormal circumstances regarding the following items.

(1) TEPCO's electric power facilities shall be operated properly with appropriate measures or procedures such as securing safety based on adequate knowledge of functions and handling methods of the equipment.

(2) In case of mutually related operations at power plants and substations, said operation shall be handled based on the instructions of power feeding except in emergencies.

2 Regarding the instructions of power feeding in the preceding article, the following items shall be considered.

(1) The group that is in charge of the instruction of power feeding shall have close contact with related groups to recognize the current situations of the power s.

(2) Instructions of power feeding shall be communicated accurately and promptly from the responsible group to the operating group.

Article 20: Operation in Dams

Operation in dams over the height of fifteen meters shall follow Article 47 in River act.

Article 21: Countermeasures in case of Accidents and other Abnormal Circumstances

In case of accidents or probable accidents in TEPCO's electric power facilities, current situations shall be reported immediately to the related groups and proper countermeasures shall be taken.

2 In case of accidents in TEPCO's electric power facilities, the following countermeasures shall be taken.

(1) Emergency measures shall be taken to prevent the damage from expanding and efforts for early restoration shall be made.

(2) The causes shall be probed as soon as possible to prevent the recurrence of the accident.

Article 22: Countermeasures in case of Disasters or other Emergencies

Countermeasures to secure safety of TEPCO's electric power facilities against typhoons, floods, storm surges, earthquakes, tsunamis, heavy snows, conflagrations shall be taken

following Article 39 of Disaster Countermeasure Basic Act, Article 6 of Act on Special Measures concerning Countermeasures against Large-scale Earthquake, Article 6 of Act on Special Measures concerning Promotion of Measures against Earthquake Disaster in the Tonankai and Tokai areas, and Article 6 of Act on Special Measures concerning Promotion of Measures against Earthquake Disaster in the Surrounding Area of Japan Trench and Chiyoda Trench.

Article 23: Securing Safety in case of Shutdown of Power Plants for a Considerable Period

In case of shutdown of power plants for a considerable period, safety in the utility shall be maintained according to the following items.

(1) Boilers, turbines, and other major equipments shall be inspected and repaired, performing necessary procedure of dust prevention, corrosion control, moisture prevention.

(2) Disasters shall be prevented by completely disposing of the remaining fuel in the equipment.

2 In case there are facilities still in operation while certain facilities in the same power plant are to be inactive for a considerable period, both areas shall be distinctly segregated, separating the connected apparatus.

3 At the resumption of operation, equipment shall be inspected to certify safety, going through a trial operation if necessary.

Part 7 Improvement of Safety of Electrical Facilities for power generation

Article 24: Documents for Safety and their perspective

Procedures of preparation, amendment, approval, preservation of documents related to construction, maintenance, or operation of electrical facilities for power generation shall be stipulated as “Administrative Provision of Rules and Manuals”.

2 Documents necessary for safety shall consist of three phases, which are Common Rules, Manuals of the Headquarters, Documents for Operation in the Branches. Manuals of the Headquarters shall basically consist of two manuals-Basic Manuals, which outline the operation at the headquarters and Operation Manuals, which precisely states each operation.

3 Basic manuals based on the Safety Rules shall be presented in attachment 5.

4 Documents necessary for safety shall be periodically reviewed and improved if necessary.

Article 25: Planning and Implementation of Safety

Regarding the safety related to construction, maintenance, or operation of electrical facilities for power generation, necessary plans shall be formulated to assist atic operation. When plans of operations are formulated, based on the directions (objectives) of safety rules, concrete objectives and s shall be established regarding inquiries by laws and both human and material resources.

Article 26: Evaluation and Improvement of Safety

Regarding activities for safety related to construction, maintenance, or operation of electrical facilities for power generation, surveys shall be made to check whether related plans and s are adequately prepared and whether they have achieved good results in conformity to the Electric Power Utility Law, other related laws, and the Safety Rules. Improvements (including developing preventive measures) shall be made based on the evaluations of the self-inspections. In such cases, plans shall be formulated taking human and material resources into consideration.

Appendix - 4 *Competency Standards for Engineering Manager*

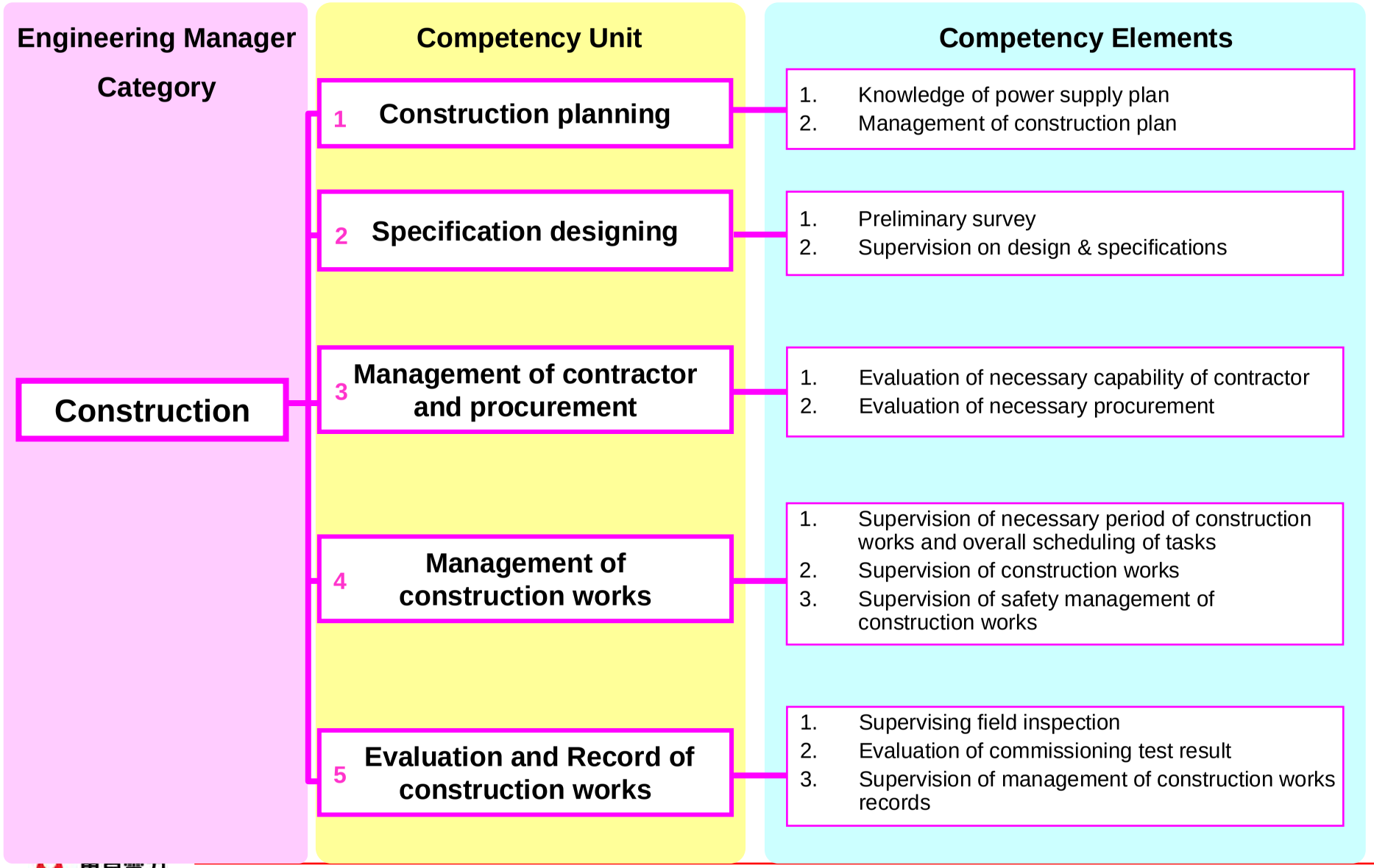
Hydropower Generation <Civil> (Construction)

Engineering Manager Category	Competency Unit	Competency Elements
Construction	1 Construction Planning	1. Knowledge of development planning 2. Management of construction plan
	2 Specification Designing	1. Preliminary survey 2. Supervision on design & specifications
	3 Management of Contractor and Procurement	1. Evaluations of necessary capability of Contractor 2. Evaluations of necessary procurement
	4 Management of Construction Works	1. Supervision of necessary period of construction works and overall scheduling of tasks 2. Supervising on construction works 3. Supervision on safety management of construction works
	5 Evaluation and Record of Construction works	1. Supervising field inspection 2. Evaluation of commissioning test result 3. Supervision of management of construction works records

Hydropower Generation <Mechanical & Electrical> (Construction)

Engineering Manager Category	Competency Unit	Competency Elements
Construction	1 Construction Planning	1. Knowledge of power supply plan 2. Management of construction plan
	2 Specification Designing	1. Preliminary survey 2. Supervision on design & specifications
	3 Management of Contractor and Procurement	1. Evaluations of necessary capability of Contractor 2. Evaluations of necessary procurement
	4 Management of Construction Works	1. Supervision of necessary period of construction works and overall scheduling of tasks 2. Supervising on construction works 3. Supervision on safety management of construction works
	5 Evaluation and Record of Construction works	1. Supervising field inspection 2. Evaluation of commissioning test result 3. Supervision of management of construction works records

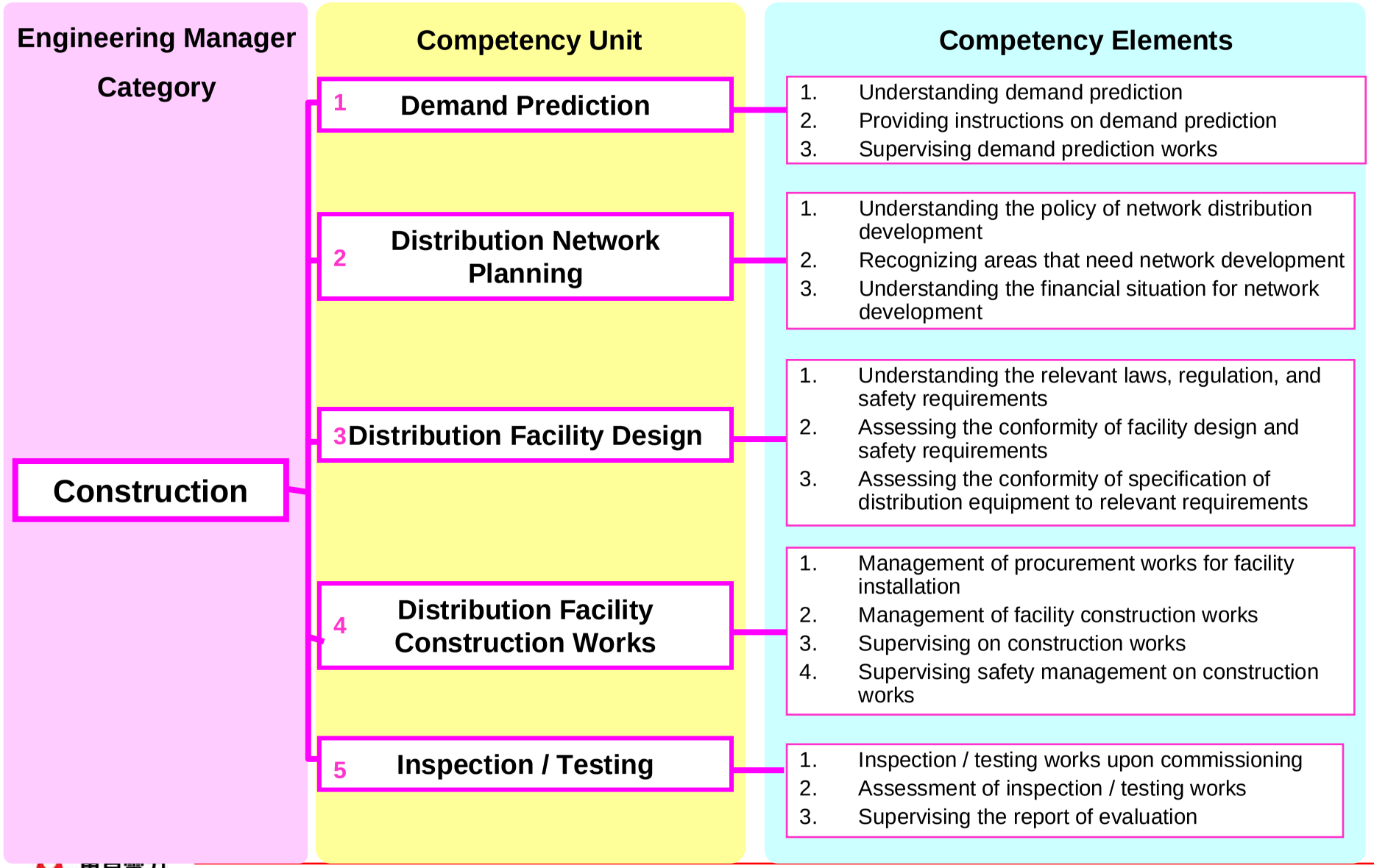
Thermal Power Generation (Construction)



Transmission & Substation (Construction)

Engineering Manager Category	Competency Unit	Competency Elements
Construction	1 Construction Planning of Transmission & Substation	1. Providing instruction on power supply plan 2. Providing instruction on the draft construction pla
	2 Specification designing of Transmission & Substation	1. Preliminary site survey for location and route 2. Supervising design & specifications on T&S
	3 Management of subcontractor and procurement	1. Supervising necessary period of construction works and overall scheduling 2. Supervising necessary capability of subcontractor 3. Supervising determining necessary procurement
	4 Management of T&S Construction works	1. Supervising determining necessary period of construction works and overall scheduling 2. Supervising on construction works 3. Supervising safety management of construction works
	5 Judging and evaluating T&S Construction works	1. Supervising field inspection 2. Judging and evaluate the critical points of commissioning test 3. Supervising the management of construction works records
	6 Specification designing of protection relays for T&S	1. Supervising design & specifications of protection relays for T&S 2. Configuration of protection relays

Distribution (Construction)



Hydro (Civil)
(Construction 1)
Construction Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Construction Planning of Hydropower (Civil) Plant
Description: This competency unit is related to development planning and construction planning on hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Knowledge of development planning of hydropower plant	1.1. Understanding of national power development policy 1.2. Understanding of long-term power supply schedule for demand 1.3. Understanding of overall development plan for the river concerned 1.4. Understanding of method of hydropower plant development process 1.5. Understanding of supply demand balance in the area 1.6. Knowledge of relevant divisions and organizations 1.7. Understanding of operating plan of the power plant
2. Management of construction plan	2.1. Understanding of period of construction works, total expenditure and facilities' configuration 2.2. Assessment of outline of construction plan 2.3. Knowledge of national safety requirements and relevant regulations 2.4. Knowledge of processing application of construction plan 2.5. Consideration of social and environmental issue related the project

Hydro (Civil)
(Construction 2)
Specification Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Specification designing of Hydropower (Civil) Plant
Description: This competency unit is related to preliminary survey and supervision on design & specifications of hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Preliminary survey	1.1. Supervising on implementation of environmental impact assessment 1.2. Understanding of related regulation and environmental restrictions 1.3. Assessment of the result of environmental impact assessment 1.4. Assessment of dam, location of powerhouse and route of waterways 1.5. Providing instruction on method and route of material transportation from technical and safety point of view
2. Supervision on design & specifications	2.1. Understanding of national safety requirements and national standard 2.2. Knowledge of material characteristic 2.3. Assessment of selection of facilities in conformity to operating plan 2.4. Assessment of estimated flood discharge and spillway design for the safety 2.5. Assessment of conformity of facilities to relevant safety regulations and requirements 2.6. Assessment of design values and basis of facilities 2.7. Judgment of introduction of equipments which is adopted new technology

Hydro (Civil)
(Construction 3)
Management of
Contractor & Procurement

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Contractor and procurement for Hydropower (Civil) plant construction

Description: This competency unit is related to the evaluation of necessary capability of Contractor and necessary procurement for hydropower (Civil) plant construction.

Competency Elements	Performance Criteria
1. Evaluation of necessary capability of Contractor	1.1. Knowledge of major contractor in electrical power sector 1.2. Understanding of experience and capability of contractor in electrical power sector and civil work for dam 1.3. Providing instruction on selection of contractor
2. Evaluation of necessary procurement	2.1. Knowledge of major manufacturer in electrical power sector and civil work for dam 2.2. Understanding of manufacturer's experience and application record of materials 2.3. Providing instruction on selection of manufacturer and materials

Hydro (Civil)
(Construction 4)
Management of
Construction Works

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Hydropower (Civil) plant Construction works
Description: This competency unit is related to the supervision on construction works including overall scheduling and safety management for hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Supervision of necessary period of construction works and overall scheduling of tasks	1.1 Understanding of necessary period of construction works 1.2 Understanding of planning of scheduled maintenance works with power interruption 1.3 Supervising on progress of construction work 1.4 Knowledge of relevant divisions and organizations 1.5 Providing instruction on adjusting the deviation of the actual status from the original plan
2. Supervising on construction works	2.1. Knowledge of installation methods 2.2. Knowledge of national safety requirements 2.3. Knowledge of relevant manufacturer and construction company 2.4. Providing instruction on prior consultation for work procedure 2.5. Assessment of installation condition based on national safety requirements
3. Supervision on safety management of construction works	3.1. Understanding of relevant safety guidelines and manuals 3.2. Knowledge of safety monitoring points 3.3. Providing instruction on safety management to subordinate and constructor

Hydro (Civil)
(Construction 5)
Evaluations & Records

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Evaluation and Records of Hydropower (Civil) Plant Construction works

Description: This competency unit is related to supervision on field inspection, evaluation of commissioning test results and records management for hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Supervising field inspection	1.1 Understanding of numerical criteria provided by safety regulations and requirements 1.2 Understanding of statutory inspection and inspection items 1.3 Understanding of inspection methods and procedures 1.4 Arrangement with supervisory authority 1.5 Providing instruction on corrective action in case of unsuitable result
2. Evaluation of commissioning test result	2.1. Understanding of national safety requirements, design value and basis 2.2. Assessment of conformity of inspection condition and results to national safety requirement and design value 2.3. Providing instruction on corrective action in case of unsuitable result
3. Supervision of management of construction works records	3.1. Understanding of necessary construction work records and period of keeping documents 3.2. Understanding of regulations and decree about records and storage 3.3. Management of construction records and proper storage

Power Engineers Competency Standard
Basic Group: Distribution
Group: Construction

Distribution
(Construction 1)
Demand Prediction

Unit Cord: xxxxxxxxxxxx
Unit Name: Demand prediction for distribution system development
Description: This competency unit is related to the demand forecasting for distribution network expansion planning.

Competency Elements	Performance Criteria
1. Understanding the demand prediction for distribution system development	1.1 Understanding the concept of demand prediction for network planning 1.2 Understanding how the result of demand prediction is applied for network planning
2. Providing instructions regarding the demand prediction	2.1 Providing instructions on demand prediction based on the data and information prepared for distribution network planning
3. Supervising the demand prediction works for network planning	3.1 Supervising the demand prediction process 3.2 Assessing the result of demand prediction for distribution network planning

Power Engineers Competency Standard

Basic Group: Distribution

Group: Construction

Distribution
(Construction 2)
Distribution Network Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Distribution Network Planning

Description: This competency unit is related to the knowledge, implementation capability regarding network planning.

Competency Elements	Performance Criteria
1. Understanding the distribution network planning process	1.1 Understanding the policy of distribution network development 1.2 Recognizing target areas for the development 1.3 Understanding the financial situation for network development
2. Assessing the distribution network planning	2.1 Assessing the new project of distribution network development plan 2.2 Assessing the cost and benefit analysis 2.3 Prioritizing the criteria of network development project
3. Providing instructions on distribution network planning	3.1 Providing instructions to review the project planning 3.2 Providing instructions to review the cost calculation 3.3 Providing information regarding the reasoning of project selection

Power Engineers Competency Standard
Basic Group: Distribution
Group: Construction

Distribution
(Construction 3)
Distribution Facilities Design

Unit Cord: xxxxxxxxxxxx
Unit Name: Distribution facilities design
Description: This competency unit is related to the knowledge and competency required for facility design.

Competency Elements	Descriptions of Competency Elements
1. Understanding the relevant laws, regulations, and safety requirements for facility design	1.1 Understanding the relevant laws, regulations, requirements, guidelines for facility design 1.2 Understanding the required specification to design the distribution facilities 1.3 Understanding the situation of site where distribution facility is located
2. Assessing the conformity of the design of distribution network and safety requirements	2.1 Assessing the conformity of the distribution network design to relevant laws, regulations, requirements, and guidelines. 2.2 Providing instructions about design of distribution facilities.
3. Assessing the conformity of specification of distribution equipment to relevant requirements.	3.1 Assessing the conformity of specification of distribution equipment to the relevant requirements. 3.2 Providing instructions about specification of distribution equipment

Power Engineers Competency Standard
Basic Group: Distribution
Group: Construction

Distribution
(Construction 4)
Distribution Facilities
Construction Works

Unit Cord: xxxxxxxxxxxx
Unit Name: Implementation of distribution facility construction works
Description: This competency unit is related to construction works of distribution facilities.

Competency Elements	Descriptions of Competency Elements
1. Management of procurement works for facility installation	1.1 Understanding the procurement process of construction works 1.2 Providing instructions on procurement of construction works
2. Management of facility construction works	2.1 Understanding the entire plan of construction works 2.2 Providing necessary instructions to proceed construction works appropriately 2.3 Managing the construction work scheduling
3. Supervising on construction works	3.1 Understanding basic rules for construction works 3.2 Providing instructions regarding the construction works in accordance with relevant laws / regulations
4. Supervising safety control on construction works	4.1 Understanding the basic rules for safety. 4.2 Providing instructions to proceed safe construction works 4.3 Supervising the implementation of safety construction works

Power Engineers Competency Standard
Basic Group: Distribution
Group: Construction

Distribution
(Construction 5)
Inspection and Testing

Unit Cord: xxxxxxxxxxxx

Unit Name: Inspection / testing of distribution facilities upon commissioning

Description: This competency unit is related to the supervising of commissioning / inspecting / testing for construction works.

Competency Elements	Descriptions of Competency Elements
1. Inspection / testing works upon commissioning	1.1 Understanding the inspecting/testing works 1.2 Understanding the necessity of inspecting/testing works in accordance with the relevant laws/regulations
2. Assessment of inspection / testing works	2.1 Assessing the conformity of facilities to relevant laws / regulations 2.2 Providing instructions on inspection / testing procedures 2.3 Providing instructions, if necessary, to comply with relevant laws / regulations
3. Supervising the report of evaluation	3.1 Supervising the report preparation for evaluation of commissioning works 3.2 Providing instructions on report preparations

Thermal power
(Construction 1)
Construction Planning
Supply Planning

Power Engineers Competency Standard

Basic Group: Thermal power Generation

Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Construction planning of Thermal power plant

Description: This competency unit is related to the power supply plan and construction planning on thermal power generation

Competency Elements	Performance Criteria
1. Knowledge of power supply plan	1.1 Understanding of national power development policy 1.2 Understanding of long-term power supply schedule 1.3 Understanding of method of Thermal power plant development process 1.4 Understanding of supply demand balance in the area 1.5 Knowledge of relevant divisions and organizations 1.6 Understanding of operating plan of the power plant
2. Management of construction plan	2.1 Understanding of period of construction works, total expenditure and configuration of facilities 2.2 Assessment of outline of construction plan 2.3 Knowledge of national safety requirements and related regulations 2.4 Knowledge of processing application of constructing plan 2.5 Consideration of social and environmental issue related the project

Thermal power
(Construction 2)
Construction Planning
Design / Survey

Power Engineers Competency Standard

Basic Group: Thermal power Generation

Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Specification designing of Thermal power plant

Description: This competency unit is related to designing of thermal power generation

Competency Elements	Performance Criteria
1. Preliminary survey	1.1 Supervising on implementation of environmental impact assessment 1.2 Understanding of related regulation and environmental restrictions 1.3 Assessment of the result of environmental impact assessment 1.4 Assessment of route of transmission lines and fuel pipe lines 1.5 Providing instruction on method and route of material transportation from technical and safety point of view
2. Supervision on design & specifications	2.1 Understanding of national safety requirements and national standard 2.2 Knowledge of material characteristic 2.3 Assessment of selection of facilities in conformity to operating plan 2.4 Assessment of safety interlock for facilities 2.5 Assessment of conformity of facilities to relevant safety regulations and requirements 2.6 Assessment of design values and basis of facilities 2.7 Judgment of introduction of equipments which is adopted new technology

Thermal power
(Construction 3)
Work Management
Contractor / Material Management

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of contractor and procurement for Thermal power plant construction

Description: This competency unit is related to the supervising capability of managing contractor and procurement.

Competency Elements	Performance Criteria
1. Evaluation of necessary capability of contractor	1.1 Knowledge of major contractor in electrical power sector 1.2 Understanding of experience and capability of contractor in electrical power sector 1.3 Providing instruction on selection of contractor
2. Evaluation of necessary procurement	2.1 Knowledge of major manufacturer in electrical power sector 2.2 Understanding of manufacturer's experience and application record of materials 2.3 Providing instruction on selection of manufacturer and materials

Thermal power
(Construction 4)
Work Management
Works/Safety Management

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Thermal power plant construction works
Description: This competency unit is related to the supervising on construction works and safety management.

Competency Elements	Performance Criteria
1. Supervision of necessary period of construction works and overall scheduling of tasks	1.1 Understanding of necessary period of construction works 1.2 Understanding of planning of scheduled maintenance works with power interruption 1.3 Supervising on progress of construction work 1.4 Knowledge of relevant divisions and organizations 1.5 Providing instruction on adjusting the deviation of the actual status from the original plan
2. Supervision of construction works	2.1 Knowledge of installation methods 2.2 Knowledge of national safety requirements 2.3 Knowledge of relevant manufacturer and construction company 2.4 Providing instruction on prior consultation for work procedure 2.5 Assessment of installation condition based on national safety requirements
3. Supervision of safety management of construction works	3.1 Understanding of relevant safety guidelines and manuals 3.2 Knowledge of safety monitoring points 3.3 Providing instruction on safety management to subordinate and constructor

Thermal power
(Construction 5)
Inspection/Evaluation

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Evaluation and Record of construction works for Thermal power plant
Description: This competency unit is related to evaluation and record of the construction works and assessment of inspection result

Competency Elements	Performance Criteria
1. Supervision of field inspection	1.1 Understanding of numerical criteria provided by safety regulations and requirements 1.2 Understanding of statutory inspection and inspection items 1.3 Understanding of inspection methods and procedures 1.4 Arrangement with supervisory authority 1.5 Providing instruction on corrective action in case of unsuitable result
2. Evaluation of commissioning test result	2.1 Understanding of national safety requirements, design value and basis 2.2 Assessment of conformity of inspection condition and results to national safety requirement and design value 2.3 Providing instruction on corrective action in case of unsuitable result
3. Supervision of management of construction works records	3.1 Understanding of necessary construction work records and period of keeping documents 3.2 Understanding of regulations and decree about records and storage 3.3 Management of construction records and proper storage

Hydro (mech. & elec.)
(Construction 1)
Construction Planning

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Mechanical & Electrical)

Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Construction Planning of Hydropower (mech. & elec.) Plant

Description: This competency unit is related to the power supply plan and construction planning on hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Knowledge of power supply plan	1.1. Understanding of national power development policy 1.2. Understanding of long-term power supply schedule for demand 1.3. Understanding of method of hydropower (mech. & elec.) plant development process 1.4. Understanding of supply demand balance in the area 1.5. Knowledge of relevant divisions and organizations 1.6. Understanding of operating plan of the power plant
2. Management of construction plan	2.1. Understanding of period of construction works, total expenditure and facilities' configuration 2.2. Assessment of outline of construction plan 2.3. Knowledge of national safety requirements and relevant regulations 2.4. Knowledge of processing application of construction plan 2.5. Consideration of social and environmental issue related the project

Hydro (mech. & elec.)
(Construction 2)
Specification Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Specification designing of Hydropower (mech. & elec.) Plant
Description: This competency unit is related to preliminary survey and supervision on design & specifications of hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Preliminary survey	1.1. Supervising on implementation of environmental impact assessment 1.2. Understanding of related regulation and environmental restrictions 1.3. Assessment of the result of environmental impact assessment 1.4. Assessment of location of powerhouse and route of transmission lines 1.5. Providing instruction on method and route of material transportation from technical and safety point of view
2. Supervision on design & specifications	2.1. Understanding of national safety requirements and national standard 2.2. Knowledge of material characteristic 2.3. Assessment of selection of facilities in conformity to operating plan 2.4. Assessment of safety interlock for facilities 2.5. Assessment of conformity of facilities to relevant safety regulations and requirements 2.6. Assessment of design values and basis of facilities 2.7. Judgment of introduction of equipments which is adopted new technology

Hydro (mech. & elec.)
(Construction 3)
Management of
Contractor & Procurement

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Contractor and procurement for Hydropower (mech. & elec.) plant construction

Description: This competency unit is related to the evaluation of necessary capability of Contractor and necessary procurement for hydropower (mech. & elec.) plant construction.

Competency Elements	Performance Criteria
1. Evaluation of necessary capability of Contractor	1.1. Knowledge of major contractor in electrical power sector 1.2. Understanding of experience and capability of contractor in electrical power sector 1.3. Providing instruction on selection of contractor
2. Evaluation of necessary procurement	2.1. Knowledge of major manufacturer in electrical power sector 2.2. Understanding of manufacturer's experience and application record of materials 2.3. Providing instruction on selection of manufacturer and materials

Hydro (mech. & elec.)
(Construction 4)
Management of
Construction Works

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Construction

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Hydropower (mech. & elec.) plant Construction works
Description: This competency unit is related to the supervision on construction works including overall scheduling and safety management for hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Supervision of necessary period of construction works and overall scheduling of tasks	1.1 Understanding of necessary period of construction works 1.2 Understanding of planning of scheduled maintenance works with power interruption 1.3 Supervising on progress of construction work 1.4 Knowledge of relevant divisions and organizations 1.5 Providing instruction on adjusting the deviation of the actual status from the original plan
2. Supervising on construction works	2.1. Knowledge of installation methods 2.2. Knowledge of national safety requirements 2.3. Knowledge of relevant manufacturer and construction company 2.4. Providing instruction on prior consultation for work procedure 2.5. Assessment of installation condition based on national safety requirements
3. Supervision on safety management of construction works	3.1. Understanding of relevant safety guidelines and manuals 3.2. Knowledge of safety monitoring points 3.3. Providing instruction on safety management to subordinate and constructor

Hydro (mech. & elec.)
(Construction 5)
Evaluations & Records

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Construction

Unit Cord: xxxxxxxxxxxx

Unit Name: Evaluation and Records of Hydropower (mech. & elec.) Plant Construction works

Description: This competency unit is related to supervision on field inspection, evaluation of commissioning test results and records management for hydropower (mech. and elec.) plant.

Competency Elements	Performance Criteria
1. Supervising field inspection	1.1 Understanding of numerical criteria provided by safety regulations and requirements 1.2 Understanding of statutory inspection and inspection items 1.3 Understanding of inspection methods and procedures 1.4 Arrangement with supervisory authority 1.5 Providing instruction on corrective action in case of unsuitable result
2. Evaluation of commissioning test result	2.1. Understanding of national safety requirements, design value and basis 2.2. Assessment of conformity of inspection condition and results to national safety requirement and design value 2.3. Providing instruction on corrective action in case of unsuitable result
3. Supervision of management of construction works records	3.1. Understanding of necessary construction work records and period of keeping documents 3.2. Understanding of regulations and decree about records and storage 3.3. Management of construction records and proper storage

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Construction

T&S
(Construction 1)
Construction Planning
Supply Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Construction Planning of Transmission and Substation

Description: This competency unit is related to the power supply plan and construction planning on Transmission and Substation

Competency Elements	Performance Criteria
1. Providing instruction on power supply plan on T&S	1.1 Understanding national power development policy 1.2 Understanding long-term power supply schedule for demand 1.3 Understanding the method of T&S development process 1.4 Understanding supply demand balance in the area 1.5 Coordination with relevant divisions and organizations 1.6 Estimating power demand
2. Providing instruction on the draft construction plan of on T&S	2.1 Understanding construction outline such as period of construction works and total expenditure 2.2 Evaluating the draft construction plan and ordering the appropriate advise if needed. 2.3 Coordination with relevant divisions and organizations 2.4 Conducting the cost-benefit analysis 2.5 Considering social and environmental issue related the project

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Construction

T&S
（Construction 2）
Construction Planning
Design / Survey

Unit Cord: xxxxxxxxxxxx

Unit Name: Specification designing of Transmission and Substation

Description: This competency unit is related to designing of Transmission and Substation

Competency Elements	Performance Criteria
1. Preliminary site survey for location and route on T&S	1.1 Understanding variety of methods of work 1.2 Selecting appropriate area of workspace 1.3 Coordinating with relevant divisions and organizations 1.4 Analyzing proper route of transmission lines and location of substations 1.5 Negotiating with landowners in order to secure appropriate route of transmission lines and location of substations
2. Supervising design & specifications on T&S	2.1 Analyzing available transmission capacity of conductor 2.2 Analyzing strength for steel towers and foundation 2.3 Supervising on selecting appropriate substation types and suitable equipments(transformer / switchgear) 2.4 Supervising on selecting suitable connection and facility layouts 2.5 Judging the conformity of facilities to relevant safety regulations and requirements 2.6 Supervising of necessary period of construction works and overall scheduling of tasks 2.7 Judging the introduction of equipments which is adopted new technology

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Construction

T&S
(Construction 3)
Work Management
Contractor / Material
Management

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of subcontractor and procurement
Description: This competency unit is related to the supervising capability of managing subcontractor and procurement.

Competency Elements	Performance Criteria
1.Supervising necessary period of construction works and overall scheduling of tasks	1.1 Understanding necessary period of construction works 1.2 Understanding the planning of scheduled maintenance works with power interruption 1.3 Coordinating with relevant manufacturers and construction companies 1.4 Coordinating with relevant divisions and organizations 1.5 Providing instruction for adjusting the deviation of the actual status from the original plan.
2. Supervising necessary capability of subcontractor	2.1 Understanding main subcontractor in electrical power sector. 2.2 Understanding main capability of subcontractor in electrical power sector based on subcontractor's experience. 2.3 Judging the proper subcontractor based on subcontractor's experience. 2.4 Providing instruction on assessment for evaluating subcontractor. 2.6 Providing instruction for adjusting the deviation of the actual status from the original plan
3. Supervising necessary procurement.	3.1 Understanding main manufacturer in electrical power sector. 3.2 Judging the proper manufacturer based on manufacturer's experience. 3.3 Providing instruction on assessment sheets for evaluating manufacturer.

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Construction

T&S
(Construction 4)
Work Management
Works/Safety
Management

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of T&S Construction works
Description: This competency unit is related to the supervising on construction works and safety management of construction works.

Competency Elements	Performance Criteria
1. Supervising necessary period of construction works and overall scheduling of tasks	1.1 Understanding necessary period of construction works 1.2 Understanding the planning of scheduled maintenance works with power interruption 1.3 Coordinating with relevant manufacturer and construction company 1.4 Coordinating with relevant divisions and organizations 1.5 Providing instruction for adjusting the deviation of the actual status from the original plan.
2. Supervising construction works	2.1 Understanding necessary period of construction works 2.2 Understanding the planning of scheduled maintenance works with power interruption 2.3 Coordinating with relevant manufacturer and construction company 2.4 Coordinating with relevant divisions and organizations 2.5 Providing instruction for subordinate 2.6 Providing instruction for adjusting the deviation of the actual status from the original plan
3. Supervising safety management of construction works	3.1 Understanding relevant safety guidelines and manuals 3.2 Supervising safety management for preventing accidents by pointing list of works 3.3 Providing instruction for subordinate and constructor

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Construction

T&S
（Construction 5）
Inspection/Evaluation

Unit Cord: xxxxxxxxxxxx
Unit Name: Judging and evaluating T&S construction works
Description: This competency unit is related to the judging and evaluating the construction works and assessment capability of construction works.

Competency Elements	Performance Criteria
1. Supervising field inspection	1.1 Understanding numerical criterion provided by safety regulations and requirements 1.2 Assessing the conformity of inspection results 1.3 Providing instruction for subordinate, manufacturer and constructor 1.4 Judging the introduction of equipments which is adopted new technology 1.5 Providing appropriate instruction for solving problem, if it is not suitable results
2. Judging and evaluating critical points of commissioning test	2.1 Understanding national safety requirements 2.2 Assessing the conformity of inspection results 2.3 Judging the introduction of equipments which is adopted new technology 2.4 Providing appropriate instruction for solving problem, if it is not suitable results
3. Supervising the management of construction works records	3.1 Understanding the necessary construction works records and period for keeping documents. 3.2 Understanding the regulations and the degree about records and store. 3.3 Keeping these records and store them properly

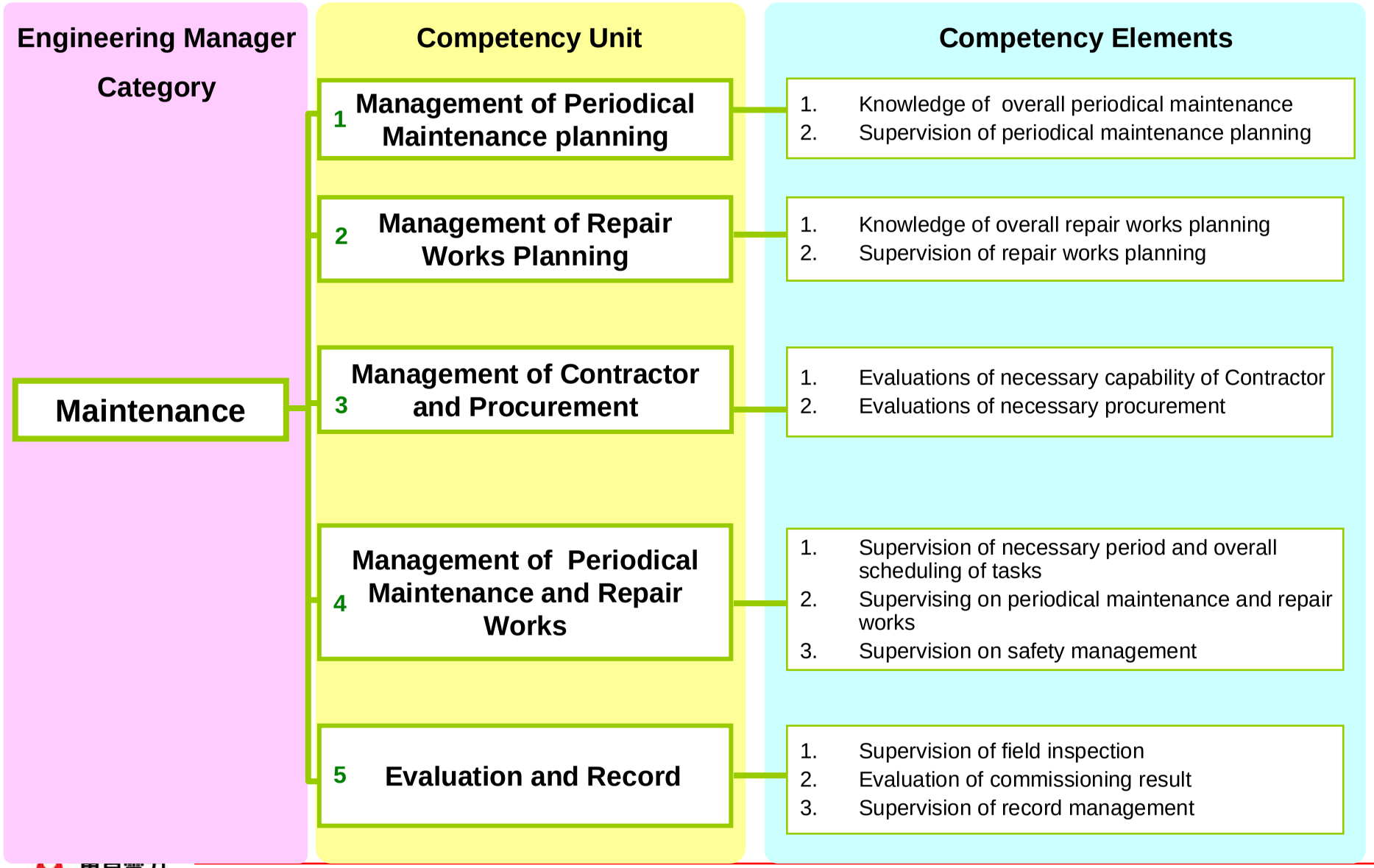
Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Construction

T&S
(Construction 6)
Protection relays
Design

Unit Cord: xxxxxxxxxxxx
Unit Name: Specification designing of protection relays for T&S
Description: This competency unit is related to the designing of protection relays for Transmission and Substation.

Competency Elements	Performance Criteria
1. Supervising design & specifications of protection relays for T&S	1.1 Understanding all types of protection relays and the specifications and functions of protection relays 1.2 Understanding zone of protection relays and the methodology of protection co-ordination 1.3 Coordination with relevant divisions and organizations 1.4 Supervising on selecting suitable protection relays 1.5 Judging the conformity of protection relays to relevant safety regulations and requirements 1.6 Supervising necessary period of construction works and overall scheduling of tasks 1.7 Judging introduction of equipments which is adopted new technology
2.Supervising configuration of protection relays	2.1 Understanding the specifications and functions of protection relays. 2.2 Supervising determining appropriate installation of protection relays taking into account coordination with other systems 2.3 Applying understanding of transformer overload and inrush current to the analysis of system fault and protection

Hydropower Generation <Civil> (Maintenance)



Hydropower Generation <Mechanical & Electrical> (Maintenance)

Engineering Manager Category	Competency Unit	Competency Elements
Maintenance	1 Management of Periodical Maintenance planning	1. Knowledge of overall periodical maintenance 2. Supervision of periodical maintenance planning
	2 Management of Repair Works Planning	1. Knowledge of overall repair works planning 2. Supervision of repair works planning
	3 Management of Contractor and Procurement	1. Evaluations of necessary capability of Contractor 2. Evaluations of necessary procurement
	4 Management of Periodical Maintenance and Repair Works	1. Supervision of necessary period and overall scheduling of tasks 2. Supervising on periodical maintenance and repair works 3. Supervision on safety management
	5 Evaluation and Record	1. Supervision of field inspection 2. Evaluation of commissioning result 3. Supervision of record management

Thermal Power Generation (Maintenance)

Engineering Manager Category	Competency Unit	Competency Elements
Maintenance	1 Management of Periodical Maintenance planning	1. Knowledge of overall periodical maintenance 2. Supervision of periodical maintenance planning
	2 Management of Repair Works Planning	1. Knowledge of overall repair works 2. Supervision of repair works planning
	3 Management of Contractor and Procurement	1. Evaluations of necessary capability of contractor 2. Evaluations of necessary procurement
	4 Management of Periodical Maintenance and Repair Works	1. Supervision of necessary period and overall scheduling of tasks 2. Supervising on periodical maintenance and repair works 3. Supervision on safety management
	5 Evaluation and Record	1. Supervision of field inspection 2. Evaluation of commissioning results 3. Supervision of record management

Transmission & Substation (Maintenance)

Engineering Manager Category	Competency Unit	Competency Elements
Maintenance	1 Patrol & Patrol Planning	1. Providing instruction on site patrol 2. Supervision on public announcement for preventing from accidents 3. Providing instruction on developing patrol plan
	2 Field Inspection Works and Inspection Planning	1. Assessing the conformity of inspection results 2. Providing instruction on inspection planning
	3 Planning of Repairing and Maintenance Works.	1. Supervision of repairing and maintenance plan 2. Supervision of investigation and designing 3. Providing instruction on the procedures of subcontracting and procurement for works
	4 Management of Repairing and Maintenance Works	1. Supervision of Safety management of works 2. Supervision of construction management of works 3. Supervision of process management of works
	5 Evaluation of Repairing and Maintenance Works	1. Providing instruction to be confirmed before and after initial charging and assessing the results 2. Supervision on evaluating the commissioning test 3. Supervision on preparing working records
	6 Inspection of protection relays	1. Judging the acceptance of inspection results 2. Providing supervision on regular inspection 3. Supervision on managiment of maintenance schedule
	7 Patrol of protection relays	1. Providing instruction on site patrol 2. Supervision on preparing necessary measures 3. Supervision on the management of site patrol schedule

Distribution (Maintenance)

Engineering Manager Category	Competency Unit	Competency Elements
Maintenance	1 Patrol Works	1. Providing instructions on site patrol 2. Assessing the results of patrol works
	2 Inspection Works	1. Providing instructions on inspecting methods 2. Assessing the results of inspecting works 3. Providing instructions on measures to be taken
	3 Maintenance or Repair Works	1. Providing instructions on maintenance or repair works 2. Supervising on maintenance or repair works 3. Assessing the conformity of facilities after works

Hydro (Civil)
(Maintenance 1)
Maintenance Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Periodical Maintenance Planning for Hydropower (Civil) Plant

Description: This competency unit is related to overall knowledge and supervision of planning on periodical maintenance of hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Knowledge of overall periodical maintenance	1.1. Understanding of category, contents, purpose of periodical maintenance, 1.2. Understanding of standard frequency and items of periodical maintenance for each equipment 1.3. Knowledge of National Safety Requirements and related regulations for periodical maintenance 1.4. Knowledge of Safety Rules and in-house manual for periodical maintenance 1.5. Confirming of implementation of periodical maintenance based on scheduled frequency and items
2. Supervision of periodical maintenance planning	2.1. Assessment of annual periodical maintenance plan 2.2. Understanding of period of periodical maintenance, total expenditure and configuration of facilities 2.3. Assessment of particular items and/or intervals of periodical maintenance decided with the maintenance and/or defect records or use environment of the equipment 2.4. Confirming of implementation of appropriate supplementary measure against excess of regular intervals for maintenance 2.5. Assessment of improvement in items and/or intervals of periodical maintenance based on the maintenance and/or defect records 2.6. Supervising on revision of Safety Rules at improvement in items and/or intervals of periodical maintenance 2.7. Supervising on revision of periodical maintenance plan by order of the regulatory authorities 2.8. Providing instruction on coordination for maintenance works which will impact on operation of power plant 2.9. Providing instruction on method and route of material transportation from technical and safety point of view

Hydro (Civil)
(Maintenance 2)
Repair Works Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Repair Works Planning for Hydropower (Civil) Plant
Description: This competency unit is related to overall knowledge and supervision of planning on repair works of hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Knowledge of overall repair works	1.1. Understanding of contents and purpose of repair works 1.2. Knowledge of facilities function and material characteristic 1.3. Understanding of current facility's condition and design value in order to assess the degradation 1.4. Knowledge of National Safety Requirements and related regulations for repair works 1.5. Knowledge of Safety Rules and in-house manual for repair works
2. Supervision of repair works planning	2.1. Understanding of period of repair works and total expenditure etc. 2.2. Assessment of repair methods against the defect 2.3. Assessment of contents of repair work based on the defect record 2.4. Providing instruction on coordination for repair works which will impact on operation of power plant 2.5. Providing instruction on method and route of material transportation from technical and safety point of view 2.6. Judgment of introduction of repair works which adopted new technology 2.7. Assessment of conformity of modification of dam, waterways and gate to national safety requirements and related regulations

Hydro (Civil)
(Maintenance 3)
Management of
Contractor & Procurement

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Contractor and Procurement for Periodical Maintenance and Repair Works of Hydropower (Civil) Plant

Description: This competency unit is related to the evaluation of necessary contractor's capability and necessary procurement for hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Evaluation of necessary capability of contractor	1.1. Knowledge of major contractor in electrical power sector 1.2. Understanding of experience and capability of contractor in electrical power sector 1.3. Providing instruction on selection of contractor
2. Evaluation of necessary procurement	2.1. Knowledge of major manufacturer in electrical power sector 2.2. Understanding of manufacturer's experience and application record of materials 2.3. Providing instruction on selection of manufacturer and materials

Hydro (Civil)
(Maintenance 4)
Management of Maintenance and Repair Works

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Periodical Maintenance and Repair Works for Hydropower (Civil) Plant

Description: This competency unit is related to the supervision on periodical maintenance and repair works including necessary period, overall scheduling of tasks and safety management for hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Supervision of necessary period and overall scheduling of tasks	1.1 Understanding of necessary period of periodical maintenance and repair works 1.2 Understanding of planning of outage with power interruption 1.3 Supervising on progress of periodical maintenance and repair works 1.4 Knowledge of relevant divisions and organizations 1.5 Providing instruction on adjusting the deviation of the actual status from the original plan.
2. Supervision of periodical maintenance and repair works	2.1. Knowledge of methods of periodical maintenance and repair works 2.2. Knowledge of National Safety Requirements 2.3. Knowledge of relevant manufacturer and contractor 2.4. Providing instruction on prior consultation for work procedure 2.5. Assessment of implementation condition of periodical maintenance and repair works based on National Safety Requirements
3. Supervision on safety management	3.1. Understanding of relevant safety guidelines and manuals 3.2. Knowledge of safety monitoring points 3.3. Providing instruction on safety management to subordinate and contractor

Hydro (Civil)
(Maintenance 5)
Evaluations & Records

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Evaluation and Records of Periodical Maintenance and Repair Works for Hydropower (Civil) Plant

Description: This competency unit is related to the supervision on field inspection, evaluation of commissioning results and record management for hydropower (Civil) plant.

Competency Elements	Performance Criteria
1. Supervising field inspection	1.1 Understanding of numerical criteria provided by safety regulations and requirements 1.2 Understanding of statutory inspection and inspection items after periodical maintenance and repair works 1.3 Understanding of inspection methods and procedures 1.4 Arrangement with supervisory authority 1.5 Providing instruction on corrective action in case of unsuitable result
2. Evaluation of commissioning results	2.1. Understanding of National Safety Requirements, design value and basis 2.2. Assessment of conformity of inspection condition and results to national safety requirement and design value 2.3. Providing instruction on corrective action in case of unsuitable result
3. Supervision of record management	3.1. Understanding of necessary records of periodical maintenance and repair works and period of keeping documents 3.2. Understanding of regulations and decree about records and storage 3.3. Management of records of periodical maintenance and repair works and proper storage

Power Engineers Competency Standard
Basic Group: Distribution
Group: Maintenance

Distribution
(Maintenance1)
Patrol Works

Unit Cord: xxxxxxxxxxxx
Unit Name: Patrol Works for Distribution Facilities
Description: This competency unit is related to the supervising capability of patrolling works.

Competency Elements	Work Capabilities
1. Providing instruction on site patrol	1.1 Understanding the patrolling works of distribution facilities 1.2 Providing instructions on planning the appropriate patrolling schedule 1.3 Providing instructions on assessment of patrolling results
2. Assessing the results of patrol works	2.1 Understanding records of patrolling works regarding the distribution facilities 2.2 Providing instructions on activities based on the patrol results 2.3 Assessing the conformity to relevant standards / regulations 2.4 Recognizing the weak points of distribution facilities obtained from patrolling works

Power Engineers Competency Standard
Basic Group: Distribution
Group: Maintenance

Distribution (Maintenance2) Inspection Works

Unit Cord: xxxxxxxxxxxx
Unit Name: Inspection Works for Distribution Facilities
Description: This competency unit is related to the supervising capability of patrolling works.

Competency Elements	Work Capabilities
1. Providing instructions on inspecting methods	1.1 Understanding the inspecting works of distribution facilities 1.2 Providing instructions on planning the appropriate inspecting schedule 1.3 Providing instructions on assessment of inspecting results
2. Assessing the results of inspecting works	2.1 Understanding records of inspecting works regarding the distribution facilities 2.2 Evaluating the inspecting results and understanding the condition of the facilities 2.3 Assessing the conformity to relevant standards / regulations 2.4 Recognizing the weak points of distribution facilities obtained from inspection results
3. Providing instructions and measures	3.1 Understanding the measures based on the inspecting results 3.2 Providing instructions on measures based on the inspecting results 3.3 Assessing the results of measures for inspection

Power Engineers Competency Standard
Basic Group: Distribution
Group: Maintenance

Distribution (Maintenance3) Maintenance and Repair Works

Unit Cord: xxxxxxxxxxxx

Unit Name: Maintenance and Repair Works for Distribution Facilities

Description: This competency unit is related to the supervising capability of maintenance and repair works.

Competency Elements	Work Capabilities
1. Providing instructions on maintenance and repair works	1.1 Understanding the maintenance and repair works for distribution facilities 1.2 Understanding the procedures of maintenance and repair works 1.3 Providing instructions on methods of works for maintenance and repairs 1.4 Assessing the conformity to the relevant standards / regulations
2. Supervising on maintenance and repair works	2.1 Understanding the each step of maintenance and repair works 2.2 Supervising on the maintenance and repair works 2.3 Providing necessary instructions on each step of works 2.4 providing instructions on safety control during maintenance and repair works
3. Assessing the conformity of facilities at the end of works	3.1 Assessing the conformity to the relevant standards/regulations after maintenance and repair works 3.2 Providing instructions and orders in case of power failure

Hydro (mech. & elec.)
(Maintenance 1)
Maintenance Planning

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Mechanical & Electrical)

Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Periodical Maintenance Planning for Hydropower (mech. & elec.) Plant

Description: This competency unit is related to overall knowledge and supervision of planning on periodical maintenance of hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Knowledge of overall periodical maintenance	1.1. Understanding of category, contents, purpose of periodical maintenance, 1.2. Understanding of standard frequency and items of periodical maintenance for each equipment 1.3. Knowledge of National Safety Requirements and related regulations for periodical maintenance 1.4. Knowledge of Safety Rules and in-house manual for periodical maintenance 1.5. Confirming of implementation of periodical maintenance based on scheduled frequency and items
2. Supervision of periodical maintenance planning	2.1. Assessment of annual periodical maintenance plan 2.2. Understanding of period of periodical maintenance, total expenditure and configuration of facilities 2.3. Assessment of particular items and/or intervals of periodical maintenance decided with the maintenance and/or defect records or use environment of the equipment 2.4. Confirming of implementation of appropriate supplementary measure against excess of regular intervals for maintenance 2.5. Assessment of improvement in items and/or intervals of periodical maintenance based on the maintenance and/or defect records 2.6. Supervising on revision of Safety Rules at improvement in items and/or intervals of periodical maintenance 2.7. Supervising on revision of periodical maintenance plan by order of the regulatory authorities 2.8. Providing instruction on coordination for maintenance works which will impact on operation of power plant 2.9. Providing instruction on method and route of material transportation from technical and safety point of view

Hydro (mech. & elec.)
(Maintenance 2)
Repair Works Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Repair Works Planning for Hydropower (mech. & elec.) Plant

Description: This competency unit is related to overall knowledge and supervision of planning on repair works of hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Knowledge of overall repair works	1.1. Understanding of contents and purpose of repair works 1.2. Knowledge of facilities function and material characteristic 1.3. Understanding of current facility's condition and design value in order to assess the degradation 1.4. Knowledge of National Safety Requirements and related regulations for repair works 1.5. Knowledge of Safety Rules and in-house manual for repair works
2. Supervision of repair works planning	2.1. Understanding of period of repair works and total expenditure etc. 2.2. Assessment of repair methods against the defect 2.3. Assessment of contents of repair work based on the defect record 2.4. Providing instruction on coordination for repair works which will impact on operation of power plant 2.5. Providing instruction on method and route of material transportation from technical and safety point of view 2.6. Judgment of introduction of repair works which adopted new technology 2.7. Assessment of conformity of safety interlock modification to National Safety Requirements and related regulation

Hydro (mech. & elec.)
(Maintenance 3)
Management of
Contractor & Procurement

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Contractor and Procurement for Periodical Maintenance and Repair Works of Hydropower (mech. & elec.) Plant

Description: This competency unit is related to the evaluation of necessary contractor's capability and necessary procurement for hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Evaluation of necessary capability of contractor	1.1. Knowledge of major contractor in electrical power sector 1.2. Understanding of experience and capability of contractor in electrical power sector 1.3. Providing instruction on selection of contractor
2. Evaluation of necessary procurement	2.1. Knowledge of major manufacturer in electrical power sector 2.2. Understanding of manufacturer's experience and application record of materials 2.3. Providing instruction on selection of manufacturer and materials

Hydro (mech. & elec.)
(Maintenance 4)
Management of Maintenance and Repair Works

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Periodical Maintenance and Repair Works for Hydropower (mech. & elec.) Plant

Description: This competency unit is related to the supervision on periodical maintenance and repair works including necessary period, overall scheduling of tasks and safety management for hydropower (mech. & elec.) plant.

Competency Elements	Performance Criteria
1. Supervision of necessary period and overall scheduling of tasks	1.1 Understanding of necessary period of periodical maintenance and repair works 1.2 Understanding of planning of outage with power interruption 1.3 Supervising on progress of periodical maintenance and repair works 1.4 Knowledge of relevant divisions and organizations 1.5 Providing instruction on adjusting the deviation of the actual status from the original plan.
2. Supervision of periodical maintenance and repair works	2.1. Knowledge of methods of periodical maintenance and repair works 2.2. Knowledge of National Safety Requirements 2.3. Knowledge of relevant manufacturer and contractor 2.4. Providing instruction on prior consultation for work procedure 2.5. Assessment of implementation condition of periodical maintenance and repair works based on National Safety Requirements
3. Supervision on safety management	3.1. Understanding of relevant safety guidelines and manuals 3.2. Knowledge of safety monitoring points 3.3. Providing instruction on safety management to subordinate and contractor

Hydro (mech. & elec.)
(Maintenance 5)
Evaluations & Records

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical &Electrical)
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Evaluation and Records of Periodical Maintenance and Repair Works for Hydropower (mech. & elec.) Plant

Description: This competency unit is related to the supervision on field inspection, evaluation of commissioning results and record management for hydropower (mech. and elec.) plant.

Competency Elements	Performance Criteria
1. Supervising field inspection	1.1 Understanding of numerical criteria provided by safety regulations and requirements 1.2 Understanding of statutory inspection and inspection items after periodical maintenance and repair works 1.3 Understanding of inspection methods and procedures 1.4 Arrangement with supervisory authority 1.5 Providing instruction on corrective action in case of unsuitable result
2. Evaluation of commissioning results	2.1. Understanding of National Safety Requirements, design value and basis 2.2. Assessment of conformity of inspection condition and results to national safety requirement and design value 2.3. Providing instruction on corrective action in case of unsuitable result
3. Supervision of record management	3.1. Understanding of necessary records of periodical maintenance and repair works and period of keeping documents 3.2. Understanding of regulations and decree about records and storage 3.3. Management of records of periodical maintenance and repair works and proper storage

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S
(Maintenance1)
Patrol Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Patrol & Patrol Planning

Description: This competency unit is related to the supervising capability of maintenance works including patrol & patrol planning of T&S facilities.

Competency Elements	Performance Criteria
1. Providing instruction on site patrol	1.1 Supervision on determining points of site patrol and on preparing necessary instruments and equipment for site patrol.
	1.2 Providing instruction on identifying the fault location
	1.3 Supervision on the investigation of abnormalities near the live lines and tree contact
2. Supervision on public announcement for preventing from accidents	2.1 Providing activities from environmental issues and troubles based on relevant environmental lows and regulations
	2.2 Negotiating with landowners in order to solve problems of environmental matter
	2.3 Supervision on public announcement for preventing from accidents on the public related to transmission line
	2.4 Proposing public announcement for preventing from accidents on the public
3. Providing activities on developing patrol plan	2.1 Supervision on planning special site patrol in appropriate timing
	2.2 Providing instruction on planning site patrol and keeping records of the results properly
	2.2 Judging the introduction of preventive maintenance method

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S
Maintenance2
Field Inspection

Unit Cord: xxxxxxxxxxxx

Unit Name: Field Inspection Works and Inspection Planning

Description: This competency unit is related to the supervising capability of maintenance works including field inspection and inspection planning of T&S facilities.

Competency Elements	Performance Criteria
1. Assessing the conformity of inspection results to safety requirements	1.1 Understanding necessary instruments and equipments to be prepared for inspection
	1.2 Identifying necessary process of inspection for each type of facilities
	1.3 Understanding the target criteria of inspection results to judge the acceptance of facilities
2. Providing instruction on inspection planning by assessing its conformity to relevant regulations	2.1 Supervision on preparing working records of high-level regular inspection and evaluation of inspection results
	2.2 Supervision of the management of old facilities to detect the potential of abnormalities and to judge taking preventive measures
	2.3 Supervision on planning regular inspection planning and keep its records properly
	2.4 Providing instruction and advices on inspection planning from the aspect of safety management and keeping records of the results properly

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S
Maintenance3
Planning of Repairing
Maintenance Works

Unit Cord: xxxxxxxxxxxx

Unit Name: Planning of Repairing and Maintenance Works.

Description: This competency unit is related to the supervising capability of planning and arrangement of repairing and maintenance works.

Competency Elements	Performance Criteria
1. Supervision of repairing and maintenance works planning	1.1 Supervision on managing old facilities to plan repairing works and to apply preventive measures
	1.2 Understanding constriction scale such as period of construction works and total expenditure
	1.3 Judging the introduction of trend management and analysis
	1.4 Supervision on planning of repairing and maintenance works in power interruption in coordination with other relevant divisions and organizations
2. Supervision of investigation and designing for repairing and maintenance works	2.1 Understanding equipments such as transformer and circuit breaker and every variety work methods
	2.2 Coordination with relevant divisions and organizations and providing instruction for subordinate
3. Providing instruction on the procedures of subcontracting and procurement works	3.1 Understanding necessary period of material procurement
	3.2 Coordination with relevant manufacturer and construction company
	3.3 Judging the introduction of new work methods

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S
(Maintenance4)
Management of
Repairing Works

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Repairing and Maintenance Works

Description: This competency unit is related to the supervising capability of safety, construction and process management of repairing and maintenance works.

Competency Elements	Performance Criteria
1. Supervision of safety management of repairing and maintenance works	1.1 Providing instruction on determining the area of power interruption taking measures for maintaining necessary clearance from hot wire
	1.2 Providing instruction necessary measures for high place works
	1.3 Providing instruction necessary measures for underground works
	1.4 Providing instruction necessary measures to maintain clearance in conducting works close to the public
2. Supervision of construction management of repairing and maintenance works	2.1 Providing supervision on protection treatment on underground facilities and earthing lines
	2.2 Providing supervise on the operation of construction machines
	2.2 Providing instruction on the judgment criteria for safety management
3. Supervision of process management of repairing and maintenance works	3.1 Supervision of determining necessary period of repairing and maintenance works and overall scheduling of tasks
	3.2 Supervision on repairing and maintenance works and providing instruction in case of big changeover from the original plan

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S (Maintenance5) Evaluation of Repairing Works

Unit Cord: xxxxxxxxxxxx

Unit Name: Evaluation of Repairing and Maintenance Works

Description: This competency unit is related to the supervising capability of evaluation of repairing and maintenance works including assessment and acceptance tests.

Competency Elements	Performance Criteria
1. Providing instruction on the items to be confirmed before and after initial charging and assessing the results	1.1 Understanding zone for trial line charging and indicators for evaluating of results
	1.2 Proposing announcement of zone for trial line charging
	1.3 Providing instruction of trial charging such as connecting and disconnecting
	1.4 Providing instruction to operators
2. Supervision on evaluating the commissioning test after completion of repairing and maintenance works	2.1 Understanding national safety requirements
	2.2 Assessing the conformity of inspection results
	2.3 Judging the introduction of new technology equipments
	2.4 Provide proper instruction for solving problem, if it is not suitable results
2. Supervision on preparing working records of repairing and maintenance works	2.1 Understanding indicators for evaluating of results
	2.2 Understanding necessary item for reporting
	2.3 Judging the introduction of necessary document management system

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S Maintenance6 Inspection of protection relays

Unit Cord: xxxxxxxxxxxx

Unit Name: Inspection of protection relays

Description: This competency unit is related to the supervising capability of inspection of protection relays.

Competency Elements	Performance Criteria
1. Judging the acceptance of inspection results	1.1 Understanding the specifications and functions of protection relays
	1.2 Understanding indicators for evaluating of results
	1.3 Evaluation of inspection results
	1.4 Provide proper instruction for solving problem, if it is not suitable results
2. Providing supervision on regular inspection	2.1 Identifying necessary process of inspection for each type of protection relays
	2.2 Providing instruction for subordinate
	2.3 Understanding indicators for evaluating of results and evaluation of inspection results
	2.4 Judging the introduction of necessary document management system
3. Supervision on the management of maintenance schedule	3.1 Understanding relevant safety regulations, rule and standards
	3.2 Identifying necessary process of inspection for each type of facilities
	3.3 Coordination with relevant divisions and organizations and providing instruction for subordinate
	3.4 Judging the introduction of trend management and analysis for protection relays and auxiliary

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Maintenance

T&S (Maintenance7) Patrol of protection relays

Unit Cord: xxxxxxxxxxxx

Unit Name: Patrol of protection relays

Description: This competency unit is related to the supervising capability of patrol of protection relays.

Competency Elements	Performance Criteria
1. Providing instruction on site patrol of protection relays	1.1 Understanding the specifications and functions of protection relays and identifying necessary process of patrol
	1.2 Supervision on determining points of site patrol and on preparing necessary instruments and equipment for site patrol.
	1.3 Judging the abnormality in vibration and overheat of analog relays taking into account their characteristic
	1.4 Judging the introduction of preventive maintenance method
2. Supervision on preparing necessary measures against troubles with protection relays	2.1 Understanding the methodology of protection co-ordination
	2.2 Coordination with relevant divisions and organizations and providing instruction for subordinate about switching network configuration
	2.3 Provide proper instruction for temporary counter-measure against accidents such as switching network configuration
3. Supervision on the management of site patrol schedule	3.1 Understanding relevant safety regulations, rule and standards
	3.2 Supervision on planning irregular site patrol in appropriate timing
	3.3 Coordination with relevant divisions and organizations and providing instruction for subordinate

Thermal power
(Maintenance 1)
Maintenance Planning

Power Engineers Competency Standard
Basic Group: Thermal Power Generation
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of periodical maintenance planning for Thermal power plant

Description: This competency unit is related to overall knowledge and supervision of planning on periodical maintenance of thermal power plant.

Competency Elements	Performance Criteria
1. Knowledge of overall periodical maintenance	1.1. Understanding of category, contents, purpose of periodical maintenance, 1.2. Understanding of standard frequency and items of periodical maintenance for each equipment 1.3. Knowledge of National Safety Requirements and related regulations for periodical maintenance 1.4. Knowledge of Safety Rules and in-house manual for periodical maintenance 1.5. Confirming of implementation of periodical maintenance based on scheduled frequency and items
2. Supervision of periodical maintenance planning	2.1. Assessment of annual periodical maintenance plan 2.2. Understanding of period of periodical maintenance, total expenditure and configuration of facilities 2.3. Assessment of particular items and/or intervals of periodical maintenance decided with the maintenance and/or defect records or use environment of the equipment 2.4. Confirming of implementation of appropriate supplementary measure against excess of regular intervals for maintenance 2.5. Assessment of improvement in items and/or intervals of periodical maintenance based on the maintenance and/or defect records 2.6. Supervising on revision of Safety Rules at improvement in items and/or intervals of periodical maintenance 2.7. Supervising on revision of periodical maintenance plan by order of the regulatory authorities 2.8. Providing instruction on coordination for maintenance works which will impact on operation of power plant 2.9. Providing instruction on method and route of material transportation from technical and safety point of view

Thermal power
(Maintenance 2)
Repair Works Planning

Power Engineers Competency Standard
Basic Group: Thermal Power Generation
Group: Maintenance

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of repair works planning for Thermal power plant
Description: This competency unit is related to overall knowledge and supervision of planning on repair works of thermal power plant.

Competency Elements	Performance Criteria
1. Knowledge of overall repair works	1.1. Understanding of contents and purpose of repair works 1.2. Knowledge of facilities function and material characteristic 1.3. Understanding of current facility's condition and design value in order to assess the degradation 1.4. Knowledge of National Safety Requirements and related regulations for repair works 1.5. Knowledge of Safety Rules and in-house manual for repair works
2. Supervision of repair works planning	2.1. Understanding of period of repair works and total expenditure etc. 2.2. Assessment of repair methods against the defect 2.3. Assessment of contents of repair work based on the defect record 2.4. Providing instruction on coordination for repair works which will impact on operation of power plant 2.5. Providing instruction on method and route of material transportation from technical and safety point of view 2.6. Judgment of introduction of repair works which adopted new technology 2.7. Assessment of conformity of safety interlock modification to National Safety Requirements and related regulation

Thermal power
(Maintenance 3)
Management of
Contractor & Procurement

Power Engineers Competency Standard
Basic Group: Thermal Power Generation
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of contractor and procurement for periodical maintenance and repair works of Thermal power plant

Description: This competency unit is related to the evaluation of necessary contractor's capability and necessary procurement for thermal power plant.

Competency Elements	Performance Criteria
1. Evaluation of necessary capability of contractor	1.1. Knowledge of major contractor in electrical power sector 1.2. Understanding of experience and capability of contractor in electrical power sector 1.3. Providing instruction on selection of contractor
2. Evaluation of necessary procurement	2.1. Knowledge of major manufacturer in electrical power sector 2.2. Understanding of manufacturer's experience and application record of materials 2.3. Providing instruction on selection of manufacturer and materials

Thermal power
(Maintenance 4)
Management of Maintenance and Repair Works

Power Engineers Competency Standard
Basic Group: Thermal Power Generation
Group: Maintenance

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of periodical maintenance and repair works for Thermal power plant

Description: This competency unit is related to the supervision on periodical maintenance and repair works including necessary period, overall scheduling of tasks and safety management for thermal power plant.

Competency Elements	Performance Criteria
1. Supervision of necessary period and overall scheduling of tasks	1.1 Understanding of necessary period of periodical maintenance and repair works 1.2 Understanding of planning of outage with power interruption 1.3 Supervising on progress of periodical maintenance and repair works 1.4 Knowledge of relevant divisions and organizations 1.5 Providing instruction on adjusting the deviation of the actual status from the original plan.
2. Supervision of periodical maintenance and repair works	2.1. Knowledge of methods of periodical maintenance and repair works 2.2. Knowledge of National Safety Requirements 2.3. Knowledge of relevant manufacturer and contractor 2.4. Providing instruction on prior consultation for work procedure 2.5. Assessment of implementation condition of periodical maintenance and repair works based on National Safety Requirements
3. Supervision on safety management	3.1. Understanding of relevant safety guidelines and manuals 3.2. Knowledge of safety monitoring points 3.3. Providing instruction on safety management to subordinate and contractor

Thermal power
(Maintenance 5)
Evaluations & Records

Power Engineers Competency Standard
Basic Group: Thermal Power Generation
Group: Maintenance

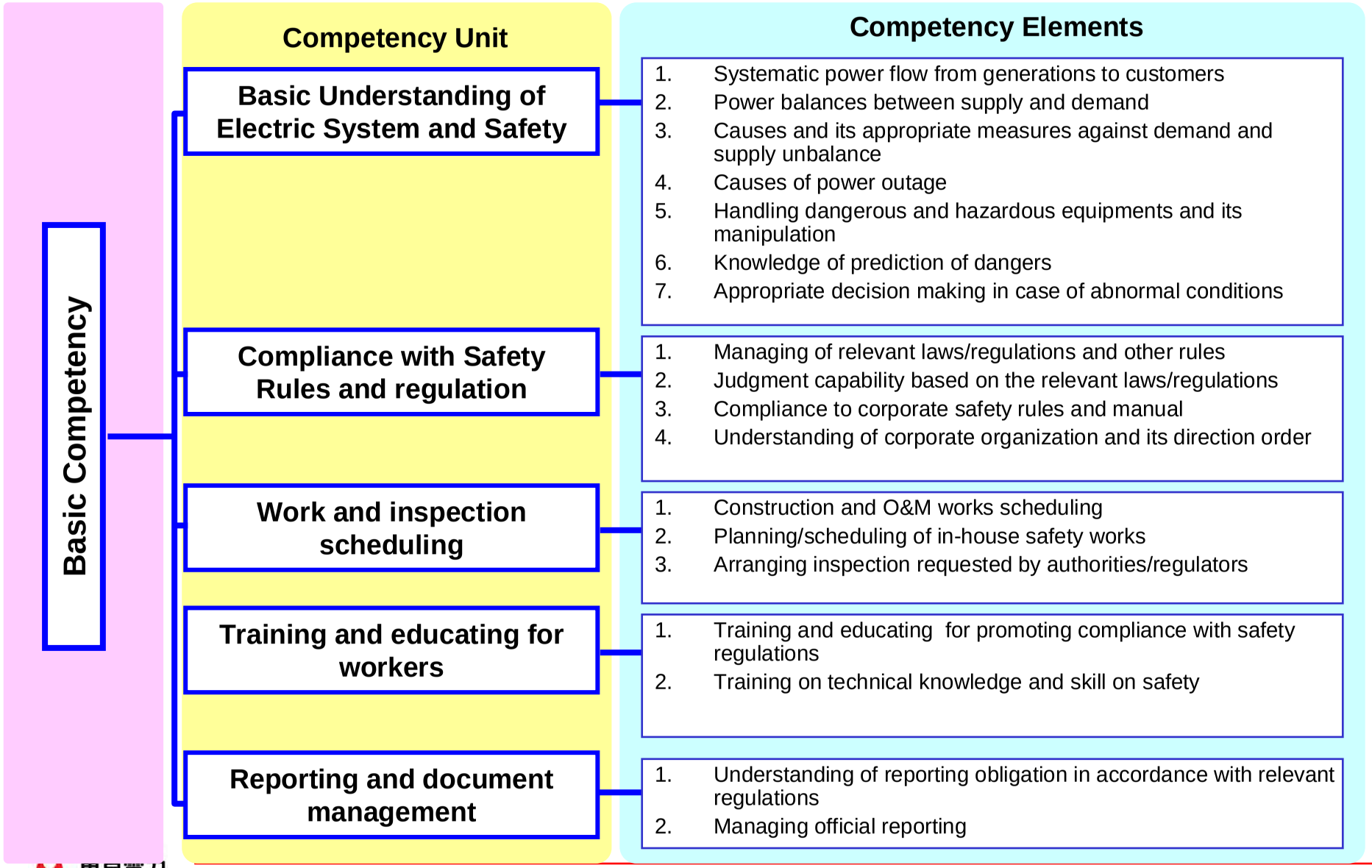
Unit Cord: xxxxxxxxxxxx

Unit Name: Evaluation and Record of periodical maintenance and repair works for Thermal power plant

Description: This competency unit is related to the supervision on field inspection, evaluation of commissioning results and record management for thermal power plant.

Competency Elements	Performance Criteria
1. Supervising field inspection	1.1 Understanding of numerical criteria provided by safety regulations and requirements 1.2 Understanding of statutory inspection and inspection items after periodical maintenance and repair works 1.3 Understanding of inspection methods and procedures 1.4 Arrangement with supervisory authority 1.5 Providing instruction on corrective action in case of unsuitable result
2. Evaluation of commissioning results	2.1. Understanding of National Safety Requirements, design value and basis 2.2. Assessment of conformity of inspection condition and results to national safety requirement and design value 2.3. Providing instruction on corrective action in case of unsuitable result
3. Supervision of record management	3.1. Understanding of necessary records of periodical maintenance and repair works and period of keeping documents 3.2. Understanding of regulations and decree about records and storage 3.3. Management of records of periodical maintenance and repair works and proper storage

Basic Competency



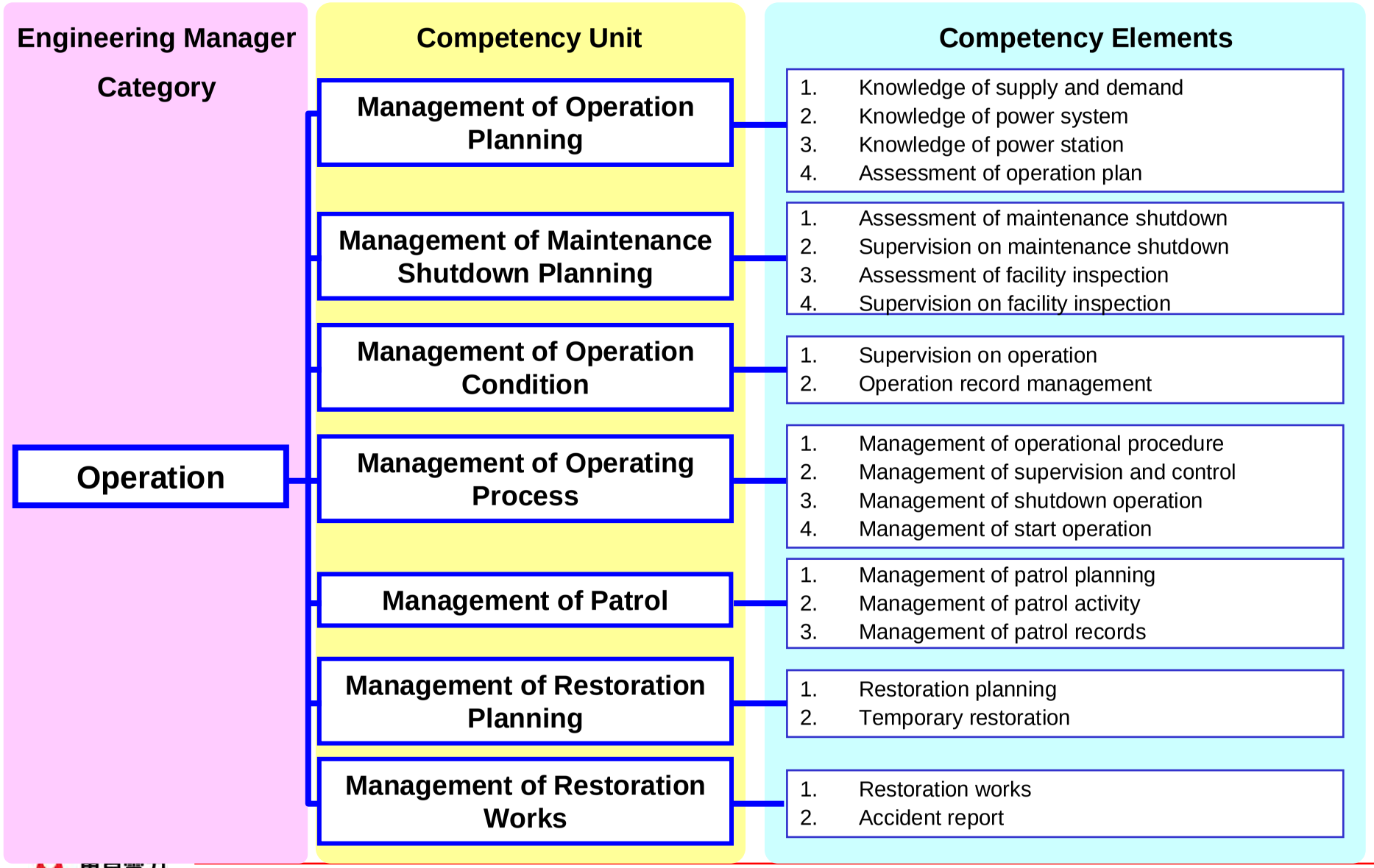
Hydropower Generation <Civil> (Civil)

Engineering Manager Category	Competency Unit	Competency Elements
Operation	Management of Operation Planning	1. Knowledge of dam operational management 2. Knowledge of relevant river system 3. Knowledge of power plant 4. Assessment of operation plan
	Management of Maintenance Shutdown Planning	1. Assessment of maintenance shutdown 2. Supervision on maintenance shutdown 3. Assessment of facility inspection 4. Supervision on facility inspection
	Management of Operation Condition	1. Supervision on operation 2. Operation record management
	Management of Operating Process	1. Management of Operational procedure 2. Management of supervision and control 3. Management of shutdown operation 4. Management of start operation
	Management of Patrol	1. Management of patrol planning 2. Management of patrol activity 3. Management of patrol records
	Management of Restoration Planning	1. Restoration planning 2. Temporary restoration
	Management of Restoration Works	1. Restoration works 2. Accident report

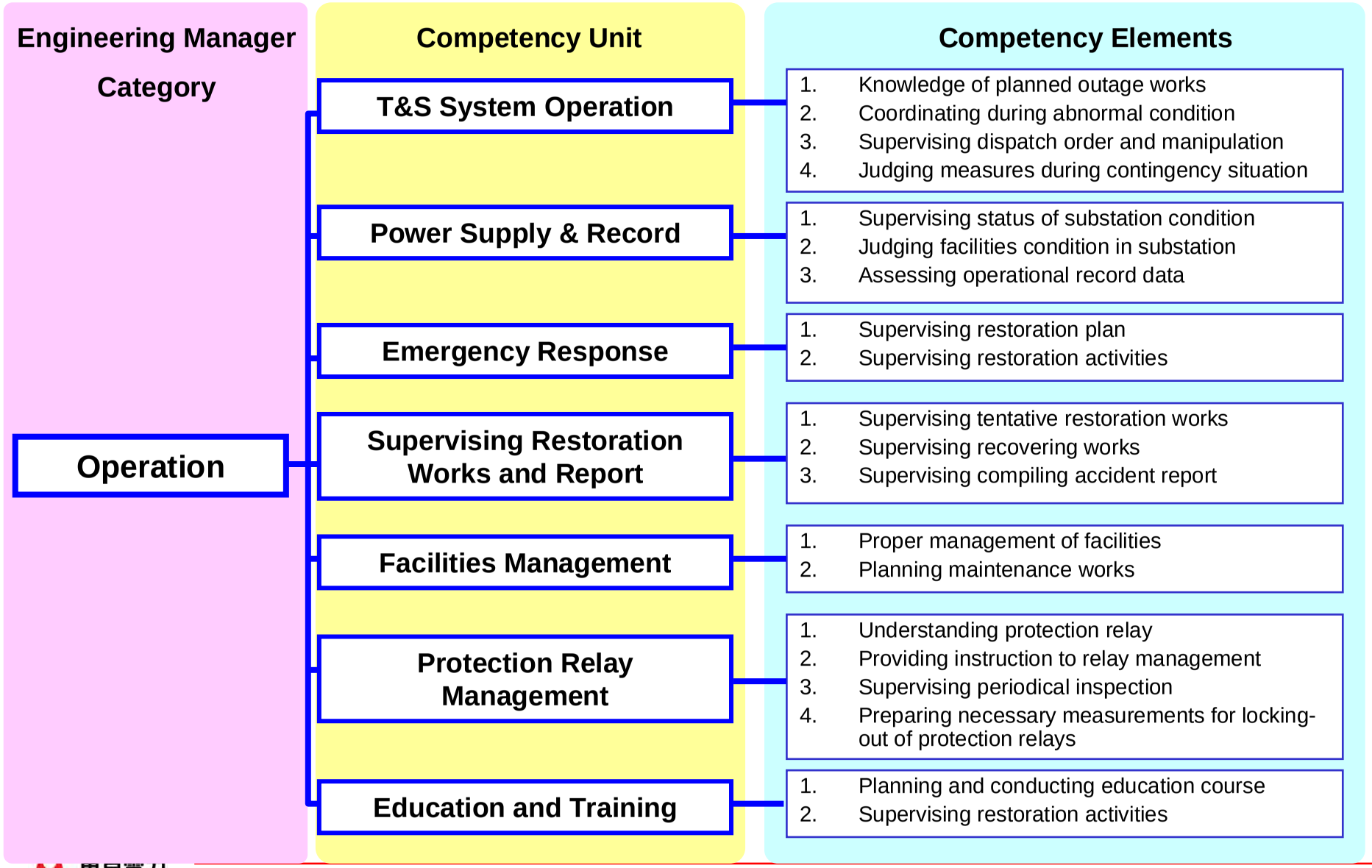
Hydropower Generation <Mechanical & Electrical> (Operation)

Engineering Manager Category	Competency Unit	Competency Elements
Operation	Management of Operation Planning	1. Knowledge of supply and demand 2. Knowledge of power system 3. Knowledge of power station 4. Assessment of operation plan
	Management of Maintenance Shutdown Planning	1. Assessment of maintenance shutdown 2. Supervision on maintenance shutdown 3. Assessment of facility inspection 4. Supervision on facility inspection
	Management of Operation Condition	1. Supervision on operation 2. Operation record management
	Management of Operating Process	1. Management of operational procedure 2. Management of supervision and control 3. Management of shutdown operation 4. Management of start operation
	Management of Patrol	1. Management of patrol planning 2. Management of patrol activity 3. Management of patrol records
	Management of Restoration Planning	1. Restoration planning 2. Temporary restoration
	Management of Restoration Works	1. Restoration works 2. Accident report

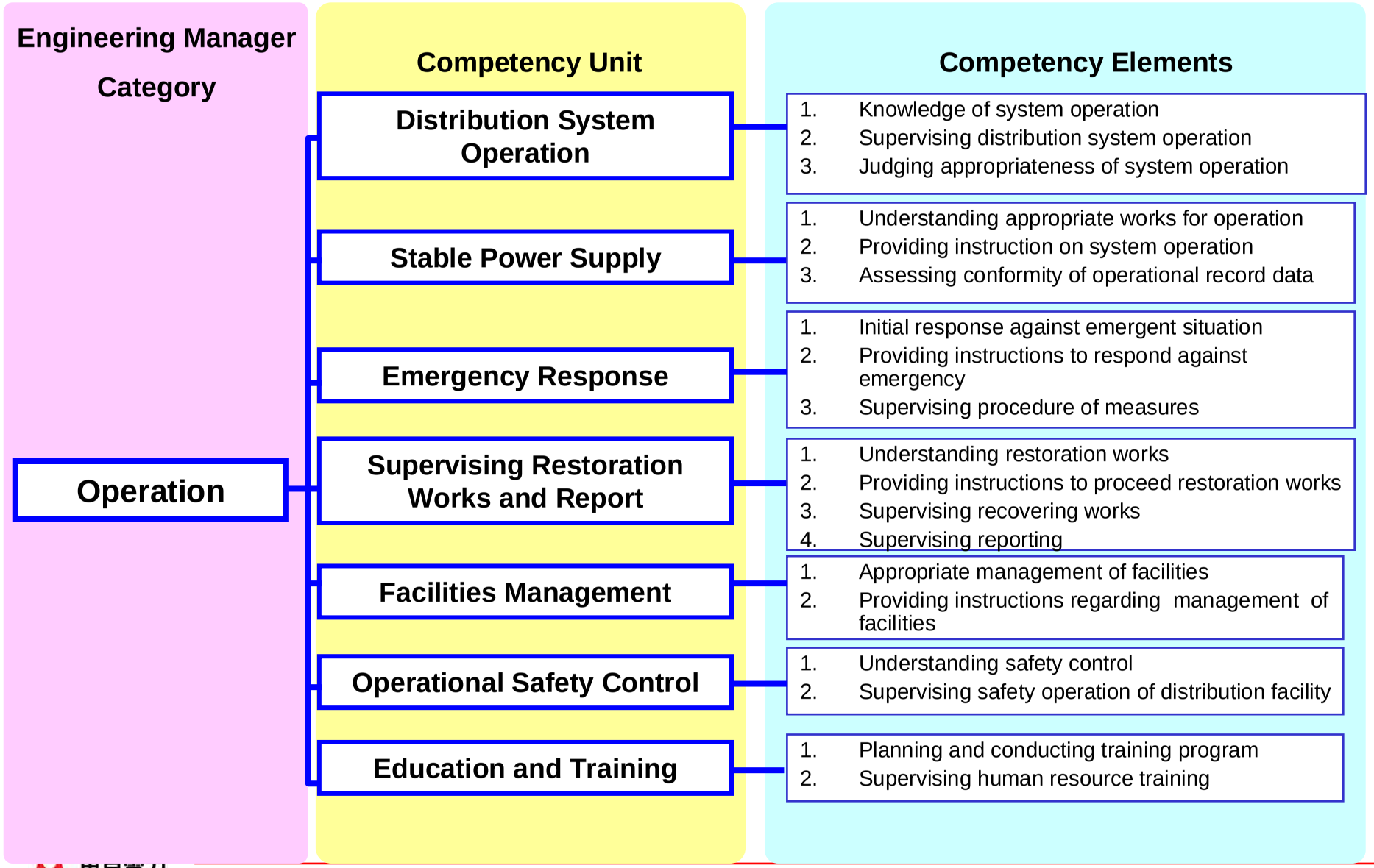
Thermal Power Generation (Operation)



Transmission & Substation (Operation)



Distribution (Operation)



Power Engineers Competency Standard
Basic Group: Basic Competency
Group: Basic Competency

Basic Competency 1
Basic Knowledge
Electric Power &
Safety

Unit Cord: xxxxxxxxxxxx
Unit Name: Basic Understanding of Electric Power System and Safety
Description: This competency unit is related to basic understanding of electric power system and safety

Competency Elements	Performance Criteria
1. Understanding the knowledge of systematic power flow from generations to customers	1.1 Understanding type, function and supply of generating fuel 1.2 Understanding transmission system voltage 1.3 Understanding distribution system voltage 1.4 understanding function of meter and service wire
2. Understanding the power balances between supply and demand.	Version 1: 2.1 Understanding load control of interconnection of transmission system 2.2 Understanding load control of interconnection of distribution system
	Version 2: 2.1. Understanding system balance between supply and demand 2.2. Understanding availabilities of supply for peak demand
3. Understanding the causes and its appropriate measures against demand and supply unbalance	3.1 Understanding the relationship of supply capacity and peak demand 3.2 Understanding peak load increase and generating capacity 3.3 Understanding maintenance schedule of each facilities Understanding real time operation of each facilities
4. Understanding the causes of power outage	4.1 Understanding the power supply during abnormal condition 4.2 Understanding the phenomena and causes of outage 4.3 Understanding power shortage because of generating collapse

5. Understanding the knowledge of handling dangerous and hazardous equipments and its manipulation	5.1 Understanding the basic knowledge of characteristic of electricity 5.2 Understanding the systematic knowledge of electric shock and dangerous factors 5.2 Understanding the prevention methods against electric Resistance, flammable items, explosion and electric induction etc.
6. Understanding the knowledge of prediction of dangers	6.1 Understanding how to stop workers and public accidents caused by electric power facilities 6.2 Understanding to predict dangers during electric works 6.3 Understanding the function of failsafe system
7. Appropriate decision making in case of abnormal condition	7.1 Understanding appropriate measurement in case of abnormal condition such as electric failures, fire, electric shock and other accident 7.2 Understanding the measurements to prevent from accident expansion and chain reaction

Power Engineers Competency Standard
Basic Group: Basic Competency
Group: Basic Competency

Basic Competency 2
Compliance with
Safety Rules

Unit Cord: xxxxxxxxxxxx
Unit Name: Compliance with Safety Rules and regulation
Description: Comprehensive knowledge of safety regulations on electric power facilities, ability to manage compliance to corporate safety rules and manuals on safety.

Competency Elements	Performance Criteria
1. Understanding and managing of relevant laws/regulations and other rules	1.1 Understanding the knowledge electric safety rules and managing it 1.2 Understanding the knowledge of relevant rules and regulation except electric facilities, such as fire protection, labor safety and other accidents
2. Judgment capability based on the relevant laws/regulations	2.1 Making judgment in conformity to relevant regulation on planning and design of construction, operation and maintenance of the electric facilities 2.2 Making judgment in conformity to relevant regulation on labors work condition and any other phenomena in electric fields
3. Compliance to corporate safety rules and manuals	3.1 Making judgment in conformity to corporate safety rule and manual on construction, operation and maintenance 3.2 Understanding penalty terms and impacts in case of the deviation of the regulation
4. Understanding of corporate organization and its direction order	4.1 Assessing the existing corporate organization from the point of facility safety operation 4.2 Giving suggestion and monitoring organization reform 4.3 Giving suggestion and monitoring the structure of direction order (dispatching)

Basic Competency 3
Work Scheduling

Power Engineers Competency Standard
Basic Group: Basic Competency
Group: Basic Competency

Unit Cord: xxxxxxxxxxxx
Unit Name: Work and inspection scheduling
Description: Assessing the work plan of construction and O&M, and planning of in-corporate inspection, site investigation.

Competency Elements	Performance Criteria
1. Construction and O&M work scheduling	1.1 Assessing the work scheduling of construction and O&M from the point of safety measurement 1.2 Giving suggestion and monitoring its proper scheduling 1.3 Visiting work site and making sure its appropriate work
2. Planning/scheduling of in-house safety works	2.1 Planning and scheduling site inspection to confirm the safety condition of the facilities 2.2 Advising its improvement in case of unsuitable condition,
3. Arranging inspection by authorities/regulators	3.1 When authorities / regulators conduct facilities inspections, arrange and coordinate them.

Basic Competency 4
Training and education

Power Engineers Competency Standard
Basic Group: Basic Competency
Group: Basic Competency

Unit Cord: xxxxxxxxxxxx
Unit Name: Training and educating for workers
Description: Providing training and education programs regarding safety and facilities proper operation.

Competency Elements	Performance Criteria
1. Training and educating for promoting compliance with safety regulations	1.1 Planning and conducting the education program about safety regulation for the workers 1.2 Enlightenment the safety consciousness to promote safety events 1.3 Conducting safety seminar after accidents to prevent from recurrence
2. Training on technical knowledge and skill on safety	2.1 Planning and conducting the education program about safety operation and manipulation of the facilities 2.2 Supervising and give suggestion to technical training of each facilities

Pewer Engineers Competency Standard
Basic Group: Basic Competency
Group: Basic Competency

Basic Competency 5
Reporting and
document management

Unit Cord: xxxxxxxxxxxx
Unit Name: Reporting and document management
Description: Supervision on the mandatory reporting based on evaluation of reports.

Competency Elements	Performance Criteria
1. Understanding of reporting obligation in accordance with relevant regulations	1.1 Supervising the contents of mandatory report and accidents report to authorities 1.2 Confirming format of document is suitable officially for regulation 1.3 Supervising and making sure the report should be done by the deadline and having responsibilities on the contents
2. Managing official reporting	2.1 Reviewing and evaluating the aforementioned report 2.2 If there are some revisions, he / she should order the alternation 2.3 Supervising proper storage of official documents

Power Engineers Competency Standard
Basic Group: Distribution
Group: Operation

Distribution
(Operation 1)

System Operation

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising the distribution system operation for stable power supply

Description: This competency unit is related to the distribution system operation for stable/reliable power supply based on the respective laws and regulations.

Competency Elements	Performance Criteria
1. Understanding the distribution system operation	1.1 Understanding the basic knowledge of distribution system operation. 1.2 Understanding the stable/reliable power supply 1.3 Understanding the basic knowledge of operational safety
2. Supervising the distribution system operating condition	2.1 Supervising the operating condition of distribution system 2.2 Supervising the supply area (outage or not) of distribution network 2.3 Understanding the weak point of distribution system (overloading, aging etc.)
3. Judging the appropriateness of distribution system operation	3.1 Assessing the distribution system condition (power flow, voltage level, flickers etc.) 3.2 Supervising the safety condition according to the regulation (environmentally, electrically)

Power Engineers Competency Standard
Basic Group: Distribution
Group: Operation

Distribution
(Operation 2)
Power Supply
& Record

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising the daily works of distribution operation

Description: This competency unit is related to the actual distribution operating daily works for stable/reliable power supply based on the respective laws and regulations.

Competency Elements	Performance Criteria
1. Understanding the appropriate daily works of distribution operation	1.1 Understanding the roles of daily works of distribution system operation.(Patrol, Investigation)
2. Providing the instruction on distribution system operation	2.1 Supervising the process of daily works regarding the system operation 2.2 Providing the necessary instructions to do appropriate daily works.
3. Assessing the conformity of distribution system operation	3.1 Understanding the SOP of distribution system operation 3.2 Understanding the safety rules of distribution system operation 3.2 Assessing the conformity of distribution system operation 3.4 Assessing the conformity of operation records to laws and regulations and identification of inappropriate cases

Power Engineers Competency Standard

Basic Group: Distribution

Group: Operation

Distribution
(Operation 3)
Emergency
Response

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising the distribution emergency response

Description: This competency unit is related to the emergency response to maintain stable/reliable power supply based on the respective laws and regulations.

Competency Elements	Performance Criteria
1. Understanding of initial response against emergent situation	1.1 Understanding the network situation under trouble 1.2 Grasping the power supply situation (outage area) anytime. 1.3 Understanding the possible measures to secure the safety. 1.4 Understanding the possible measures to do to find a problem
2. Providing instructions to respond against emergency	2.1 Selecting an optimal measures to do 2.2 Providing instructions regarding the measures to do against emergency (including finding a fault point) 2.3 Providing the instructions regarding the safety operation
3. Supervising the procedure of measures	2.1 Supervising the process of responding against emergency 2.2 Supervising the works of safety control

Power Engineers Competency Standard
Basic Group: Distribution
Group: Operation

Distribution
(Operation 4)
Restoration Works

Unit Cord: xxxxxxxxxxxx
Unit Name: Supervising the distribution system restoration works
Description: This competency unit is related to the distribution system restoration and analysis & reporting when the emergency situation.

Competency Elements	Performance Criteria
1. Understanding the restoration works	1.1 Understanding the restoration works (including rules of restoration) 1.2 Understanding the procedures of restoration (step by step) 1.3 Understanding the causes of problem 1.4 Understanding the each situation of restoration
2. Providing instructions to proceed restoration works	2.1 Providing the instructions to do restoration works properly. 2.2 Providing instructions regarding the appropriate method when needed.
3. Supervising the restoration works	3.1 Supervising the entire restoration works 3.2 Supervising the individual restoration works 3.3 Supervising situation of outage restoration 3.4 Supervising the safety of restoration works
4. Reporting of the situations	4.1 Understanding the analysis of trouble causes 4.2 Understanding the measures for preventing recurrence and the expansion of damages 4.3 Supervision on compiling detail report on the accident of distribution facilities 4.4 Reporting to an appropriate authority

Power Engineers Competency Standard
Basic Group: Distribution
Group: Operation

Distribution
(Operation 5)
Facilities
Management

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising the facility management

Description: This competency unit is related to the facility management, outage management for an appropriate operational management.

Competency Elements	Performance Criteria
1.Understanding the appropriate management of distribution facilities	1.1 Understanding appropriate distribution facilities based on a regulation / safety requirements 1.2 Understanding the facility conditions 1.3 Understanding an appropriate facility operation based on the regulation/requirements 1.3 Understanding the weak points of distribution facilities
2. Providing instructions regarding the management of distribution facilities	2.1 Providing instructions on appropriate management of distribution facilities (data management view points) 2.2 Providing instructions on efficient facility management (optimal operation) 2.3 Providing instructions to conform to the regulation regarding the facility operation

Power Engineers Competency Standard
Basic Group: Distribution
Group: Operation

Distribution
(Operation 6)
Operational Safety
Control

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising the operational safety control

Description: This competency unit is related to the safety management of an appropriate operational management.

Competency Elements	Performance Criteria
1. Understanding the safety control of operation	1.1 Understanding the safety requirements on electric power facilities 1.2 Understanding the safety control for distribution facility operation 1.3 Understanding the securing safety of facility operation
2. Supervising the safety operation	2.1 Supervising the safety of workers under operating duty 2.2 Providing instructions to let workers secure the facility safety 2.3 Providing instructions to improve the unsafe situation 2.4 Providing the educational instructions regarding the safety

Power Engineers Competency Standard
Basic Group: Distribution
Group: Operation

Distribution
(Operation 7)
Education &
Training

Unit Cord: xxxxxxxxxxxx
Unit Name: Implementing the educational & technical training
Description: This competency unit is related to the human resource training for safe and reliable operation.

Competency Elements	Performance Criteria
1. Planning and conducting training program	1.1 Planning the effective training program on system operation 1.2 Planning the safety education based on safety regulation 1.3 Conducting effective operating training for safety.
2. Supervising the human resource training	1.1 Supervising the training to recognize the technical level 1.2 Assessing the capability of trainee.

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Civil)

Group: Operation

Hydro (Civil)
(Operation 1)
Operation Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Operation planning

Description: This competency unit is related to the operation planning management about dam operational management, relevant river system, power plant and operation plan for hydropower plant.

Competency Elements	Performance Criteria
1. Knowledge of dam operational management	2.1. Knowledge of water level at the dam, intake and outflow discharge in the downstream
	2.2. Knowledge of dam operational management in normal condition
	2.3. Knowledge of countermeasures for flood
2. Knowledge of relevant river system	2.1. Understanding of role of hydropower plant in control of the relevant river system
	2.2. Understanding of characteristic of relevant river system
3. Knowledge of power plant	3.1 Understanding of facility configuration
	3.2 Understanding of characteristic of relevant power plant
	3.3 Understanding of operation permit matter of relevant power plant
4. Assessment of operation plan	4.1 Knowledge of statutory inspection, inspection items and period
	4.2 Understanding of maintenance plan for relevant power station
	4.3 Assessment of long term operation plan
	4.4 Assessment of monthly and yearly operation plan
	4.5 Arrangement with load dispatch division for operation plan

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Civil)

Group: Operation

Hydro (Civil)
(Operation 2)
Maintenance
Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of maintenance shutdown planning

Description: This competency unit is related to the maintenance shutdown planning management about assessment and supervision for maintenance shutdown and facility inspection for hydropower plant.

Competency Elements	Performance Criteria
1. Assessment of maintenance shutdown	1.1 Understanding of necessity and contents of maintenance works with shutdown
	1.2 Assessment of necessary outage duration and equipments for maintenance shutdown
2. Supervision on maintenance shutdown	2.1 Knowledge of relevant divisions and organizations to coordinate maintenance shutdown
	2.2 Supervision on shutdown management for maintenance work
3. Assessment of facility inspection	3.1 Understanding of necessity and contents of facility inspection
	3.2 Assessment of necessary inspection duration and equipments
	3.3 Assessment of organization for inspection
4. Supervision on facility inspection	4.1 Knowledge of relevant divisions and organizations to coordinate the inspection
	4.2 Supervision on operation management for inspection

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Civil)

Group: Operation

Hydro (Civil)
(Operation 3)
Management
Operating Condition

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of operating condition

Description: This competency unit is related to the operating condition management about supervision and records for hydropower plant.

Competency Elements	Performance Criteria
1. Supervision on operation	1.1 Understanding of facility's operating condition
	1.2 Understanding of target range and environmental restrictions
	1.3 Providing instruction for maintaining proper conditions of facilities
	1.4 Assessment of conformity of relevant regulations
	1.5 Providing instruction of countermeasure against nonconformity
	1.6 Supervision on schedule of facility renovation
	1.7 Assessment of organization for operation
	1.8 Assessment of countermeasure for human error
2. Operation record management	2.1 Understanding of operating record items
	2.2 Management of accountable records
	2.3 Assessment of storage condition of operation records

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Civil)

Group: Operation

Hydro (Civil)
(Operation 4)
Operation Process

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of operating process

Description: This competency unit is related to the operating process management about procedure, supervision, control, startup and shutdown for hydropower plant.

Competency Elements	Performance Criteria
1. Management of Operational procedure	1.1 Knowledge of operating methods
	1.2 Understanding of startup/shutdown operation for power plant
	1.3 Assessment of operational procedures
	1.4 Assessment of organization to confirm operational procedures
2. Management of supervision and control	2.1 Ability of fault detection with meter, indicator and alarm
	2.2 Supervising on operation under dispatching order in line with procedure in manuals
	2.3 Supervising on countermeasures against abnormal in line with procedure in manuals
3. Management of shutdown operation	3.1 Knowledge of relevant divisions and organizations to coordinate shutdown operation
	3.2 Knowledge of items of preliminary confirmation for shutdown operation
	3.3 Knowledge of items of confirmation after shutdown operation
	3.4 Knowledge of intake stop in the powerhouse and dam
4. Management of start operation	4.1 Knowledge of relevant divisions and organizations to coordinate startup operation
	4.2 Knowledge of items of preliminary confirmation for startup operation
	4.3 Knowledge of items of confirmation after startup operation
	4.4 Knowledge of intake restart in the powerhouse and dam

Hydro (Civil)
(Operation 5)
Patrol Management

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Operation

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Patrol
Description: This competency unit is related to the patrol management about planning, activity and records for hydropower plant.

Competency Elements	Performance Criteria
1. Management of Patrol planning	1.1. Assessment of items and interval for patrol based on results of past patrol and maintenance records
	1.2. Assessment of items for extraordinary patrol in case of disaster
	1.3. Supervision on investigation of accident
	1.4. Assessment of organization for patrol
2. Management of Patrol activity	2 .4. Understanding of target range
	2 .5. Supervision on countermeasures in the event of detection of abnormal condition
	2 .6. Assessing the results in accordance with safety requirements
3. Management of Patrol records	3.1 Understanding of items for patrol records
	3.2 Management of accountable records
	3.3 Assessment of storage condition of patrol records

Hydro (Civil)
(Operation 6)
Restoration
Planning

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Operation

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Restoration planning
Description: This competency unit is related to the initial response of the restoration activities when the emergency situations happened

Competency Elements	Performance Criteria
1. Restoration planning	1.1 Analysis of trouble
	1.2 Understanding of restoration work contents and procedures
	1.3 Organization of restoration team
	1.4 Providing instruction of restoration work plan
2. Temporary restoration	2.1 Understanding of facility's condition and configuration
	2.2 Grasping of impact area, relevant divisions and organizations
	2.3 Providing instruction on temporary restoration measures
	2.4 Publicity of countermeasures

Hydro (Civil)
(Operation 7)
Restoration
Works

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Civil)
Group: Operation

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Restoration works
Description: This competency unit is related to the restoration works and analysis and reporting when the emergency situations happened

Competency Elements	Performance Criteria
1. Restoration works	1.1 Understanding of restoration works contents
	1.2 Understanding of trouble cause and countermeasure
	1.3 Publicity of countermeasures
	1.4 Supervision on restoration work progress and installation conditions
	1.5 Supervision on countermeasures against recurrence
2. Accident report	2.1 Knowledge of relevant divisions and organizations to report
	2.2 Supervision on investigation of accident
	2.3 Supervision on compiling initial accident report
	2.4 Assessment of accountable term
	2.5 Management of application deadline

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Mechanical & Electrical)

Group: Operation

Hydro Power
(Operation 1)
Operation Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of Operation planning

Description: This competency unit is related to the operation planning management about supply and demand, power system, power station and operation plan for hydropower plant.

Competency Elements	Performance Criteria
1. Knowledge of supply and demand	1.1 Knowledge of frequency and voltage control
	1.2 Knowledge of supply and demand management in normal condition
	1.3 Knowledge of countermeasure for supply and demand balance tight
2. Knowledge of power system	2.1 Understanding of supply and demand role of relevant power station in the power system
	2.2 Understanding of supply and demand characteristic of relevant power system
3. Knowledge of power station	3.1 Understanding of facility configuration
	3.2 Understanding of characteristic of relevant power plant
	3.3 Understanding of operation permit matter of relevant power plant
4. Assessment of operation plan	4.1 Knowledge of statutory inspection, inspection items and period
	4.2 Understanding of maintenance plan for relevant power station
	4.3 Assessment of long term operation plan
	4.4 Assessment of monthly and yearly operation plan
	4.5 Arrangement with load dispatch division for operation plan

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Mechanical & Electrical)

Group: Operation

Hydro Power (Operation 2) Maintenance Planning

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of maintenance shutdown planning

Description: This competency unit is related to the maintenance shutdown planning management about assessment and supervision for maintenance shutdown and facility inspection for hydropower plant.

Competency Elements	Performance Criteria
1. Assessment of maintenance shutdown	1.1 Understanding of necessity and contents of maintenance works with shutdown
	1.2 Assessment of necessary outage duration and equipments for maintenance shutdown
2. Supervision on maintenance shutdown	2.1 Knowledge of relevant divisions and organizations to coordinate maintenance shutdown
	2.2 Supervision on shutdown management for maintenance work
3. Assessment of facility inspection	3.1 Understanding of necessity and contents of facility inspection
	3.2 Assessment of necessary inspection duration and equipments
	3.3 Assessment of organization for inspection
4. Supervision on facility inspection	4.1 Knowledge of relevant divisions and organizations to coordinate the inspection
	4.2 Supervision on operation management for inspection

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Mechanical & Electrical)

Group: Operation

Hydro Power (Operation 3) Management Operating Condition

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of operating condition

Description: This competency unit is related to the operating condition management about supervision and records for hydropower plant.

Competency Elements	Performance Criteria
1. Supervision on operation	1.1 Understanding of facility's operating condition
	1.2 Understanding of target range and environmental restrictions
	1.3 Providing instruction for maintaining proper conditions of facilities
	1.4 Assessment of conformity of relevant regulations
	1.5 Providing instruction of countermeasure against nonconformity
	1.6 Supervision on schedule of facility renovation
	1.7 Assessment of organization for operation
	1.8 Assessment of countermeasure for human error
2. Operation record management	2.1 Understanding of operating record items
	2.2 Management of accountable records
	2.3 Assessment of storage condition of operation records

Power Engineers Competency Standard

Basic Group: Hydropower Generation (Mechanical & Electrical)

Group: Operation

Hydro Power
(Operation 4)
Operation Process

Unit Cord: xxxxxxxxxxxx

Unit Name: Management of operating process

Description: This competency unit is related to the operating process management about procedure, supervision, control, startup and shutdown for hydropower plant.

Competency Elements	Performance Criteria
1. Management of Operational procedure	1.1 Knowledge of operating methods
	1.2 Understanding of startup/shutdown operation for power plant
	1.3 Assessment of operational procedures
	1.4 Assessment of organization to confirm operational procedures
2. Management of supervision and control	2.1 Ability of fault detection with meter, indicator and alarm
	2.2 Supervising on operation under dispatching order in line with procedure in manuals
	2.3 Supervising on countermeasures against abnormal in line with procedure in manuals
3. Management of shutdown operation	3.1 Knowledge of relevant divisions and organizations to coordinate shutdown operation
	3.2 Knowledge of items of preliminary confirmation for shutdown operation
	3.3 Knowledge of items of confirmation after shutdown operation
	3.4 Knowledge of earth connection
4. Management of start operation	4.1 Knowledge of relevant divisions and organizations to coordinate startup operation
	4.2 Knowledge of items of preliminary confirmation for startup operation
	4.3 Knowledge of items of confirmation after startup operation
	4.4 Knowledge of earth removal

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical & Electr
Group: Operation

Hydro Power
(Operation 5)
Patrol Management

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Patrol
Description: This competency unit is related to the patrol management about planning, activity and records for hydropower plant.

Competency Elements	Performance Criteria
1. Management of Patrol planning	1.1. Assessment of items and interval for patrol based on results of past patrol and maintenance records
	1.2. Assessment of items for extraordinary patrol in case of disaster
	1.3. Supervision on investigation of accident
	1.4. Assessment of organization for patrol
2. Management of Patrol activity	2.1. Understanding of target range
	2.2. Supervision on countermeasures in the event of detection of abnormal condition
	2.3. Assessing the results in accordance with safety requirements
3. Management of Patrol records	3.1 Understanding of items for patrol records
	3.2 Management of accountable records
	3.3 Assessment of storage condition of patrol records

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical & Elect
Group: Operation

Hydro Power
(Operation 6)
Restoration
Planning

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Restoration planning
Description: This competency unit is related to the initial response of the restoration activities when the emergency situations happened

Competency Elements	Performance Criteria
1. Restoration planning	1.1 Analysis of trouble
	1.2 Understanding of restoration work contents and procedures
	1.3 Organization of restoration team
	1.4 Providing instruction of restoration work plan
2. Temporary restoration	2.1 Understanding of facility's condition and configuration
	2.2 Grasping of impact area, relevant divisions and organizations
	2.3 Providing instruction on temporary restoration measures
	2.4 Publicity of countermeasures

Power Engineers Competency Standard
Basic Group: Hydropower Generation (Mechanical & Electri
Group: Operation

Hydro Power
(Operation 7)
Restoration
Works

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Restoration works
Description: This competency unit is related to the restoration works and analysis and reporting when the emergency situations happened

Competency Elements	Performance Criteria
1. Restoration works	1.1 Understanding of restoration works contents
	1.2 Understanding of trouble cause and countermeasure
	1.3 Publicity of countermeasures
	1.4 Supervision on restoration work progress and installation conditions
	1.5 Supervision on countermeasures against recurrence
2. Accident report	2.1. Knowledge of relevant divisions and organizations to report
	2.2. Supervision on investigation of accident
	2.3. Supervision on compiling initial accident report
	2.4. Assessment of accountable term
	2.5. Management of application deadline

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Operation

T&S
(Operation 1)
T&S System
Operation

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising operation planning and procedures of T&S

Description: This competency unit is related to operation planning and procedures of Transmission and Substation based on the respective laws and regulations.

Competency Elements	Performance Criteria
1. Understanding the knowledge of planned outage works on T&S	1.1 Understanding the works of planned outage 1.2 Understanding the safety measurements during planned outage
2. Coordinating with relevant divisions about works at planed outages and power interruptions	1.1 Coordinating promptly with relevant divisions and organizations to keep safety and minimize planned outage time 1.2 Coordinating promptly with relevant divisions and organizations to conduct works during planned power interruption
3. Supervising on dispatch order on substations and understanding its various function on the system	1.1 Understanding type, function and other knowledge of substation 1.2 Ability of supervising substation in normal / abnormal condition 1.3 Ability of supervising on proper dispatch order on substation in normal condition 1.4 Ability of supervising on proper dispatch order on substation to restore its power
4. Judging appropriate measures to deal with contingency and making necessary coordination with relevant divisions	1.1 Ability of judging appropriate measures such as supervision and monitoring during normal/abnormal condition of Substation 1.2 Coordinating necessary measures with relevant divisions to deal with contingency situation and solve its problem

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Operation

T&S
(Operation 2)
Power Supply
Operation Record

Unit Cord: xxxxxxxxxxxx

Unit Name: Operational management for stable power supply of T&S systems

Description: This competency unit is related to the operational management of Transmission and Substation and the supervision appropriate measurement for stable power supply.

Competency Elements	Performance Criteria
1. Supervising on the status of substation facility operation	1.1 Supervising power condition of substation facility operation and judging problems 1.2 If it is not suitable, decide appropriate countermeasures and provide proper instruction for stable power supply.
2. Judging the appropriate target range operating parameters according to the regulations	2.1 Understanding target range operating parameters in each facility 2.2 Understanding specific regulations related to operation of substation 2.3 If it is not suitable, decide appropriate countermeasures and provide proper instruction to operators
3. Assessing operational record and judging it suitable or not	3.1 Assessing the operation records of substation and evaluate these data. 3.2 Supervising on the safe condition according to the regulation(environmentally, electrically and mechanically) 3.3 Keeping these records and store them properly

T&S
(Operation 3)
Emergency Response

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Operation

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising and planning restoration activities during electric failures

Description: This competency unit is related to initial response of the restoration activities when the abnormal situations happened such as electric failures.

Competency Elements	Performance Criteria
1. Supervising restoration activities on T&S	1.1 Understanding the measurements against the electric failures and especially how to restore the power failures at initial stage 1.2 Providing proper instructions and directing operators to identify fault location 1.3 Understanding the know-how to investigate the failure causes and isolate the failure zone from power system 1.4 Understanding the prevention measures against cascade outage 1.5 Understanding safety and effective measurements for recovering to normal condition
2. Planning restoration activities on T&S	2.1 Preparing safe, efficient and speedy restoring plan 2.2 Dispatching and ordering the appropriate technicians to the site to restore the damaged facilities 2.3 Analyzing cause of power failures 2.4 Understanding preparing tools and alternative electric materials for restoring works

T&S
(Operation 4)
Restoration
Supervising
Reports

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Operation

Unit Cord: xxxxxxxxxxxx

Unit Name: Supervising restoration works during electric failures and report to authority

Description: This competency unit is related to the restoration works and analysis & reporting when the emergency situations happened such as electric failures.

Competency Elements	**Performance Criteria**
1. Supervising tentative restoration works on T&S	1.1 Understanding the proper tentative restoration measurements and ordering appropriate works to prevent from the extension of power outage area 1.2 Grasping the power supply situation and area in real time 1.3 Judging speedy the most appropriate measures considering the safety of workers
2. Supervising restoration works for recovering from electric faults on T&S	2.1 Understanding the method for recovering the normal electric system from electric faults 2.2 Supervising restoration works for system recovering from electric faults
3. Supervising compiling detail accident report to authority	3.1 Analyzing causes of power failure 3.2 Instructing measures to prevent from recurrence in future 3.3 Supervising detail report on the power failures including its causes and damages 3.4 Supervising proper condition of the tools and materials

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Operation

T&S
(Operation 5)
Operational management
Facilities Management

Unit Cord: xxxxxxxxxxxx
Unit Name: Facilities management and works scheduling of T&S
Description: This competency unit is related to the facility management, planned outage scheduling, and safety management for appropriate operational management

Competency Elements	Performance Criteria
1. Proper management of facilities by referring to facility data on T&S	1.1 Understanding actual facilities data in the site and its real time facilities condition 1.2 Understanding the most effective and economical facilities allocations 1.3 Understanding the week point of the power networks
2. Planning scheduled maintenance works with power interruption on T&S	2.1 Understanding the most suitable period and considering the most safety timing for planned outage for maintenance in the year 2.2 Negotiating and coordinating with relevant divisions about planned outage schedule

Power Engineers Competency Standard

Basic Group: Transmission and Substation

Group: Operation

T&S
(Operation 6)
Protection relay's
Management

Unit Cord: xxxxxxxxxxxx

Unit Name: Protection relay's Management and works scheduling of T&S

Description: This competency unit is related to the protection relay's management, planned outage scheduling, and safety management for appropriate operational management

Competency Elements	Performance Criteria
1. Understanding the function of protection relays	1.1 Understanding zone of protection relays and the methodology of protection co-ordination 1.2 Coordinating relevant divisions and organizations 1.3 Providing proper instruction for temporary counter measure against accidents
2. Providing instruction on facility management of protection relays	2.1 Understanding the theory of power system stability, voltage stability and power system reliability 2.2 Judging optimum condition of protection relays
3. Supervising periodical inspection according to historical records	3.1 Identifying necessary process of inspection for each type of facilities 3.2 Understanding indicators for evaluating of results 3.2 Judging the introduction of trend management and analysis
4. Preparing necessary measurements for locking-out of protection relays during planned power outages	4.1 Understanding the theory of power system protection 4.2 Understanding the planning scheduled maintenance works during planned power outages 4.2 Coordinating relevant divisions and organizations 4.2 Providing proper instruction for temporary counter measures against power failures

Power Engineers Competency Standard
Basic Group: Transmission and Substation
Group: Operation

T&S
(Operation 7)
Operational Management
Education/Training

Unit Cord: xxxxxxxxxxxx

Unit Name: Educational and training Management on T&S

Description: This competency unit is related to the educational and training management on T&S

Competency Elements	Performance Criteria
1. Supervision on planning and reporting on safety management on T&S	1.1 Planning safety education / training for company staff 1.2 Reporting the outline of these education/training to authorities 1.3 Encouraging the staff to have conscious for the safety
2. Planning and conducting technical training programs on T&S	2.1 Conducting OJT technical training for especially safety issue and safety works 2.2 Conducting simulation training on recovery works and measurement during accident

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Thermal
(Operation 1)
Operation Planning

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Operation planning
Description: This competency unit is related to the operation planning management about supply and demand, power system, power station and operation plan for thermal power plant.

Competency Elements	Work Capabilities
1. Knowledge of supply and demand	1.1 Knowledge of frequency and voltage control
	1.2 Knowledge of supply and demand management in normal condition
	1.3 Knowledge of countermeasure for supply and demand balance tight
2. Knowledge of power system	2.1 Understanding of supply and demand role of relevant power station in the power system
	2.2 Understanding of supply and demand characteristic of relevant power system
3. Knowledge of power station	3.1 Understanding of facility configuration
	3.2 Understanding of characteristic of relevant power plant
	3.3 Understanding of operation permit matter of relevant power plant
4. Assessment of operation plan	4.1 Knowledge of statutory inspection, inspection items and period
	4.2 Understanding of maintenance plan for relevant power station
	4.3 Assessment of long term operation plan
	4.4 Assessment of monthly and yearly operation plan
	4.5 Arrangement with load dispatch division for operation plan

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Thermal
(Operation 2)
Maintenance
Planning

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of maintenance shutdown planning
Description: This competency unit is related to the maintenance shutdown planning management about assessment and supervision for maintenance shutdown and facility inspection for thermal power plant.

Competency Elements	Work Capabilities
1. Assessment of maintenance shutdown	1.1 Understanding of necessity and contents of maintenance works with shutdown
	1.2 Assessment of necessary outage duration and equipments for maintenance shutdown
2. Supervision on maintenance shutdown	2.1 Knowledge of relevant divisions and organizations to coordinate maintenance shutdown
	2.2 Supervision on shutdown management for maintenance work
3. Assessment of facility inspection	3.1 Understanding of necessity and contents of facility inspection
	3.2 Assessment of necessary inspection duration and equipments
	3.3 Assessment of organization for inspection
4. Supervision on facility inspection	4.1 Knowledge of relevant divisions and organizations to coordinate the inspection
	4.2 Supervision on operation management for inspection

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Thermal
(Operation 3)
Management of
Operation Condition

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of operating condition
Description: This competency unit is related to the operating condition management about supervision and records for thermal power plant.

Competency Elements	Work Capabilities
1. Supervision on operation	1.1 Understanding of facility's operating condition
	1.2 Understanding of target range and environmental restrictions
	1.3 Providing instruction for maintaining proper conditions of facilities
	1.4 Assessment of conformity of relevant regulations
	1.5 Providing instruction of countermeasure against nonconformity
	1.6 Supervision on schedule of facility renovation
	1.7 Assessment of organization for operation
	1.8 Assessment of countermeasure for human error
2. Operation record management	2.1 Understanding of operating record items
	2.2 Management of accountable records
	2.3 Assessment of storage condition of operation records

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Thermal
(Operation 4)
Management of
Operation Process

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of operating process
Description: This competency unit is related to the operating process management about procedure, supervision, control, startup and shutdown for thermal power plant.

Competency Elements	Work Capabilities
1. Management of Operational procedure	1.1 Knowledge of operating methods
	1.2 Understanding of startup/shutdown operation for power plant
	1.3 Assessment of operational procedures
	1.4 Assessment of organization to confirm operational procedures
2. Management of supervision and control	2.1 Ability of fault detection with meter, indicator and alarm
	2.2 Supervising on operation under dispatching order in line with procedure in manuals
	2.3 Supervising on countermeasures against abnormal in line with procedure in manuals
3. Management of shutdown operation	3.1 Knowledge of relevant divisions and organizations to coordinate shutdown operation
	3.2 Knowledge of items of preliminary confirmation for shutdown operation
	3.3 Knowledge of items of confirmation after shutdown operation
	3.4 Knowledge of earth connection
4. Management of start operation	4.1 Knowledge of relevant divisions and organizations to coordinate startup operation
	4.2 Knowledge of items of preliminary confirmation for startup operation
	4.3 Knowledge of items of confirmation after startup operation
	4.4 Knowledge of earth removal

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Thermal
(Operation 5)
Management of
Patrol

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Patrol
Description: This competency unit is related to the patrol management about planning, activity and records for thermal power plant.

Competency Elements	Work Capabilities
1. Management of Patrol planning	1.1. Assessment of items and interval for patrol based on results of past patrol and maintenance records
	1.2. Assessment of items for extraordinary patrol in case of disaster
	1.3. Supervision on investigation of accident
	1.4. Assessment of organization for patrol
2. Management of Patrol activity	2.1. Understanding of target range
	2.2. Supervision on countermeasures in the event of detection of abnormal condition
	2.3. Assessing the results in accordance with safety requirements
3. Management of Patrol records	3.1 Understanding of items for patrol records
	3.2 Management of accountable records
	3.3 Assessment of storage condition of patrol records

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Thermal
(Operation 6)
Management of
Restoring Planning

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Restoration planning
Description: This competency unit is related to the initial response of the restoration activities when the emergency situations happened

Competency Elements	Work Capabilities
1. Restoration planning	1.1 Analysis of trouble
	1.2 Understanding of restoration work contents and procedures
	1.3 Organization of restoration team
	1.4 Providing instruction of restoration work plan
2. Temporary restoration	2.1 Understanding of facility's condition and configuration
	2.2 Grasping of impact area, relevant divisions and organizations
	2.3 Providing instruction on temporary restoration measures
	2.4 Publicity of countermeasures

Thermal
(Operation 7)
Management of
Restoration Works

Power Engineers Competency Standard
Basic Group: Thermal power Generation
Group: Operation

Unit Cord: xxxxxxxxxxxx
Unit Name: Management of Restoration works
Description: This competency unit is related to the restoration works and analysis and reporting when the emergency situations happened

Competency Elements	Work Capabilities
1. Restoration works	1.1 Understanding of restoration works contents
	1.2 Understanding of trouble cause and countermeasure
	1.3 Publicity of countermeasures
	1.4 Supervision on restoration work progress and installation conditions
	1.5 Supervision on countermeasures against recurrence
2. Accident report	2.1. Knowledge of relevant divisions and organizations to report
	2.2. Supervision on investigation of accident
	2.3. Supervision on compiling initial accident report
	2.4. Assessment of accountable term
	2.5. Management of application deadline

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG xxxx

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	**Engineering Manager for construction of thermal power plant**
Uraian Kualifikasi	Engineering Manager (Thermal power) shall supervise the safety construction and its works of thermal power facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance with Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Construction Planning & Designing (Thermal power)
	Construction works (Thermal power)

Unit Kompetensi Pilihan (minimal x dari xx)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	**Engineering Manager for operation of thermal power plant**
Uraian Kualifikasi	Engineering Manager (Thermal power) shall supervise the safety operation of thermal power facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance with Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Stable Power supply (Thermal power)
	Restoration of facilities from accident (Thermal power)
	Operational management (Thermal power)

Unit Kompetensi Pilihan (minimal x dari xx)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG xxxx

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	**Engineering Manager for maintenance of thermal power plant**
Uraian Kualifikasi	Engineering Manager (Thermal power) shall supervise the safety maintenance and its repairing works of thermal power facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance with Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Field inspection & Patrol (Thermal power)
	Repairing & Maintenance works (Thermal power)

Unit Kompetensi Pilihan (minimal x dari xx)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Construction of Hydropower (Civil)
Uraian Kualifikasi	Engineering Manager (Hydropower: Civil) shall supervise the safety construction and its works of Hydropower (Civil) facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Planning & designing (Hydropower: Civil)
	Construction works (Hydropower: Civil)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Operation of Hydropower (Civil)
Uraian Kualifikasi	Engineering Manager (Hydropower: Civil) shall supervise the safety operation of Hydropower (Civil) facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Power Supply (Hydropower: Civil)
	Restoration of facilities from accidents (Hydropower: Civil)
	Operational management (Hydropower: Civil)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Maintenance of Hydropower (Civil)
Uraian Kualifikasi	Engineering Manager (Hydropower: Civil) shall supervise the safety maintenance and its repairing works of Hydropower (Civil) facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Field inspection & patrol (Hydropower: Civil)
	Repairing & maintenance works (Hydropower: Civil)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Construction of Hydropower (Mechanical & Electrical)
Uraian Kualifikasi	Engineering Manager (Hydropower: Mechanical & Electrical) shall supervise the safety construction and its works of Hydropower (Mechanical & Electrical) facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Planning & designing (Hydropower: Mechanical & Electrical)
	Construction works (Hydropower: Mechanical & Electrical)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Operation of Hydropower (Mechanical & Electrical)
Uraian Kualifikasi	Engineering Manager (Hydropower: Mechanical & Electrical) shall supervise the safety operation of Hydropower (Mechanical & Electrical) facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Stable Power Supply (Hydropower: Mechanical & Electrical)
	Restoration of facilities from accidents (Hydropower: Mechanical & Electrical)
	Operational management (Hydropower: Mechanical & Electrical)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Maintenance of Hydropower (Mechanical & Electrical)
Uraian Kualifikasi	Engineering Manager (Hydropower: Mechanical & Electrical) shall supervise the safety maintenance and its reparing works of Hydropower (Mechanical & Electrical) facilities based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Field inspection & patrol (Hydropower: Mechanical & Electrical)
	Repairing & maintenance works (Hydropower: Mechanical & Electrical)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Construction of Transmission and Substation
Uraian Kualifikasi	Engineering Manager (T&S) shall supervise the safety construction and its works of T&S based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Planning & Designing(T&S)
	Construction works(T&S)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Operation of Transmission and Substation
Uraian Kualifikasi	Engineering Manager (T&S) shall supervise the safety operation of T&S based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Stable Power Supply(T&S)
	Restoration of electric facilities from accidents(T&S)
	Operational management(T&S)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Maintenance of Transmission and Substation
Uraian Kualifikasi	Engineering Manager (T&S) shall supervise the safety maintenance and its repairing works of T&S based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Field inspection & patrol(T&S)
	Repairing & maintenance works(T&S)

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	
Sertifikat Kualifikasi	
Judul Kualifikasi	Engineering Manager for Construction of Distribution Systems
Uraian Kualifikasi	Engineering Manager (Distribution System) shall supervise the safety construction and its works of distribution system based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Planning & Designing of distribution system
	Construction works of distribution system

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	KTL.xxx.xx.xxx.xx
Sertifikat Kualifikasi	V
Judul Kualifikasi	Engineering Manager for Operation of Distribution Systems
Uraian Kualifikasi	Engineering Manager (Distribution System) shall supervise the safety operation of distribution system based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Stable Power Supply of distribution system
	Restoration of distribution facilities from accidents
	Operational management of distribution system

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

KUALIFIKASI STANDAR KOMPETENSI

KUALIFIKASI STANDAR KOMPETENSI
TENAGA TEKNIK KETENAGALISTRIKAN
BIDANG PEMBANGKITAN TENAGA LISTRIK
SUB BIDANG OPERASI

Kode Kualifikasi	
Sertifikat Kualifikasi	
Judul Kualifikasi	Engineering Manager for Maintenance of Distribution Systems
Uraian Kualifikasi	Engineering Manager (Distribution System) shall supervise the safety maintenance and its repairing works of distribution system based on relevant laws, regulations and safety rules as the responsible manager, and shall provide necessary instruction to person concerned.

Unit Kompetensi Umum (must have)	
Kode Unit	**Judul Unit**
	Knowledge of electricity
	Compliance wiht Safety Rules
	Planning of Construction and O&M
	Training of Staff
	Reporting to Authorities

Unit Kompetensi Inti (must have)	
Kode Unit	**Judul Unit**
	Field inspection & patrol of distribution system
	Repairing & maintenance works of distribution system

Unit Kompetensi Pilihan (minimal 3 dari 11)	
Kode Unit	**Judul Unit**

Appendix - 5 *Handbook of New System for Improving Electrical Safety*

Buku Pegangan tentang Sistem Baru guna Peningkatan Keselamatan Instalasi Tenaga Listrik

Februari 2010

Departemen Energi dan Sumber Daya Mineral (DESDM)
Direktorat Jenderal Listrik dan Pemanfaatan Energi (DJLPE)

Japan International Cooperation Agency (JICA)

Daftar Isi

Ikhtisar Sistem Baru guna Peningkatan Keselamatan Instalasi Tenaga Listrik

Pertanyaan yang sering muncul (FAQs)

[National Safety Requirement]

Daftar Isi

Pertanyaan yang sering muncul (FAQs)

[Safety Rules]

[Engineering Manager System]

Daftar Isi

Pertanyaan yang sering muncul (FAQs)

[Engineering Manager System]

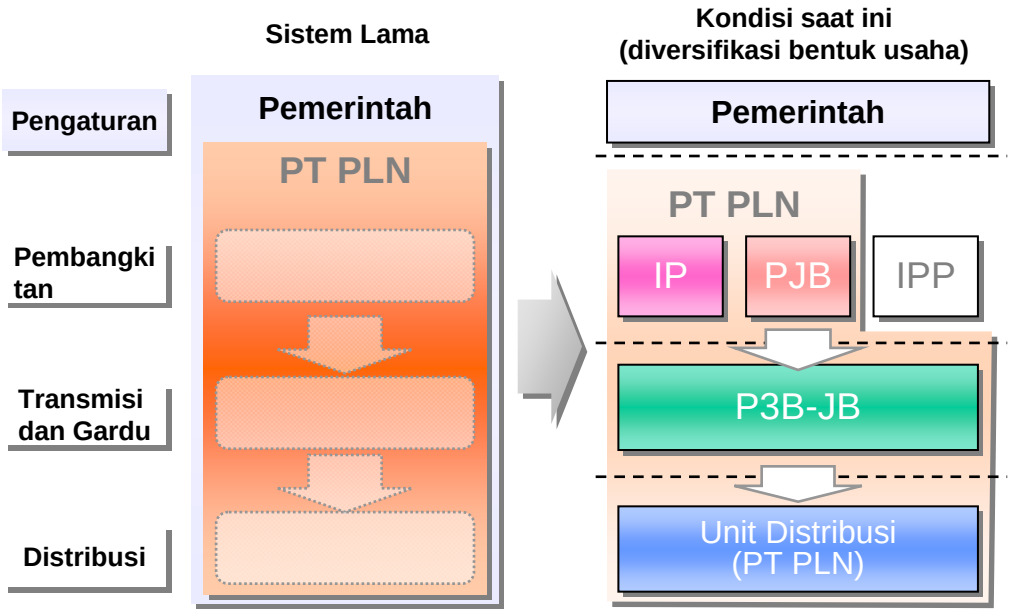
[Standar kompetensi untuk Engineering Manager]

Ikhtisar Sistem Baru guna Peningkatan Keselamatan Instalasi Tenaga Listrik

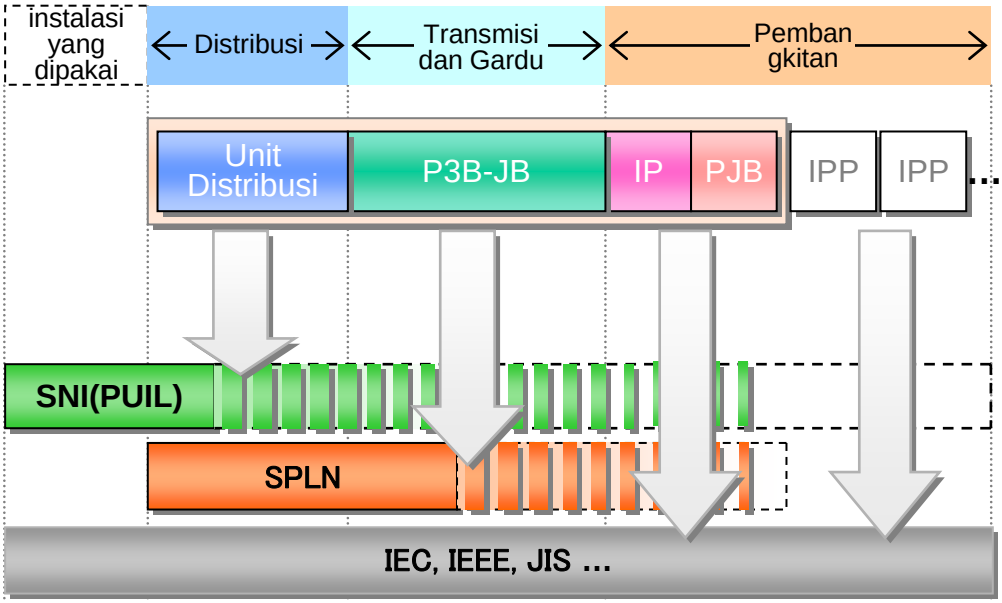
1. Kebutuhan penerapan sistem baru

- Sektor tenaga listrik Indonesia sedang mengalami transisi dari monopoli oleh PLN menuju bentuk yang dijalankan oleh berbagai pelaku usaha utama seperti diversifikasi unit PLN, masuknya pelaku usaha baru (IPP) ke pasar, dll.
- Dalam sistem yang berlaku saat ini berdasarkan UU Ketenagalistrikan (No.15/1985) tidak bisa mengakomodir perubahan struktur usaha seperti ini dengan baik. Tidak ada perubahan esensial sejak dulu di mana ketidakjelasan pembagian tugas antara pemerintah dan pelaku usaha, terutama dalam hal keselamatan instalasi tenaga listrik.
  - mewajibkan pemenuhan aturan terkait keselamatan instalasi tenaga listrik, namun kenyataannya aturan itu sendiri belum tertata dengan baik secara kongkrit dalam penjabaran atau aturan turunannya.
  - Karena itu, terbuka peluang yang cukup besar bagi pelaku usaha untuk menetapkan sendiri aturan terkait keselamatan instalasi (diskresi) sehingga pembagian tanggung jawab antara pemerintan dan pelaku usaha menjadi tidak jelas.
  - Masalah kongkrit yang muncul adalah sebagai berikut:
    - Dalam “PP”, instalasi tenaga listrik dituntut agar mengacu pada SNI namun SNI yang terkait dengan instalasi penyediaan tenaga listrik itu sendiri baru ada beberapa saja sehingga acuan yang harus diikuti ditetapkan berdasarkan kebijakan masing-masing pelaku usaha.
    - Patokan kuantitatif sebagaimana diatur di standar tidak disertai persyaratan dalam rangka menjaga keselamatan instalasi sebagai dasar pemikiran atau latar belakang penetapannya , maka sulit sekali menilai kelayakannya meskipun setiap pelaku usaha telah menetapkan sendiri dasar yang harus menjadi acuan mereka.
    - Dalam sistem saat ini tidak terdapat pemikiran bahwa dalam rangka menjaga keselamatan instalasi, diperlukan kerangka untuk monitoring apakah aturan pokok (kebijakan operasional) dalam menjalankan instalasi ditetapkan dan diterapkan secara tepat.
    - Tidak tersedianya standar kompetensi teknis dan sistem kualifikasi untuk mengevaluasi kemampuan para teknisi senior yang bertanggung jawab dalam keselamatan instalasi.

[Referensi] Perubahan struktural dalam sektor tenaga listrik (contoh: wilayah Jawa – Bali)



[Referensi] Kondisi penerapan standar teknis (contoh: wilayah Jawa – Bali)



2. Ikhtisar sistem baru

- Mengadopsi 3 sistem berikut dalam rangka peningkatan keselamatan instalasi tenaga listrik dengan berpijak pada poin-poin masalah yang ada dalam sistem yang berlaku saat ini.
  - "National Safety Requirements"

    Spesifikasi, yang diperlukan guna menjaga keselamatan instalasi, yang ditetapkan oleh pemerintah sebagai persyaratan minimum, terlepas dari standar teknis seperti apa yang diacu oleh setiap pelaku usaha dalam sektor tenaga listrik.
  - "Safety Rules"

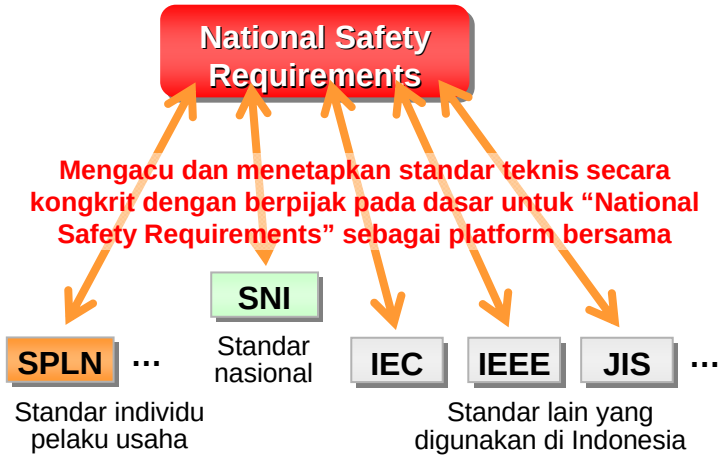
    Prinsip dasar, yang harus dipatuhi guna memelihara kondisi yang dituntut dalam "National Safety Requirements" di atas, terkait operasional instalasi tenaga listrik yang ditetapkan oleh setiap pelaku usaha dan dikirimkan pada pemerintah.
  - "Engineering Manager System"

    Menugaskan sejumlah teknisi yang diperlukan dan memiliki sertifikasi oleh setiap pelaku usaha sebagai penanggung jawab tugas keselamatan instalasi tenaga listrik.

    Ikhtisar tugas yang harus diemban oleh setiap Engineering Manager ditetapkan dalam aturan perundang-undangan, namun tugas dan tanggung jawab individu Engineering Manager ditetapkan dalam aturan keselamatan oleh setiap pelaku usaha.
- Dalam mengadopsi "Engineering Manager System" ini ditata pula standar kompetensi teknis untuk menentukan sertifikasi teknisi yang ditugaskan sebagai Engineering Manager.

3. National Safety Requirements

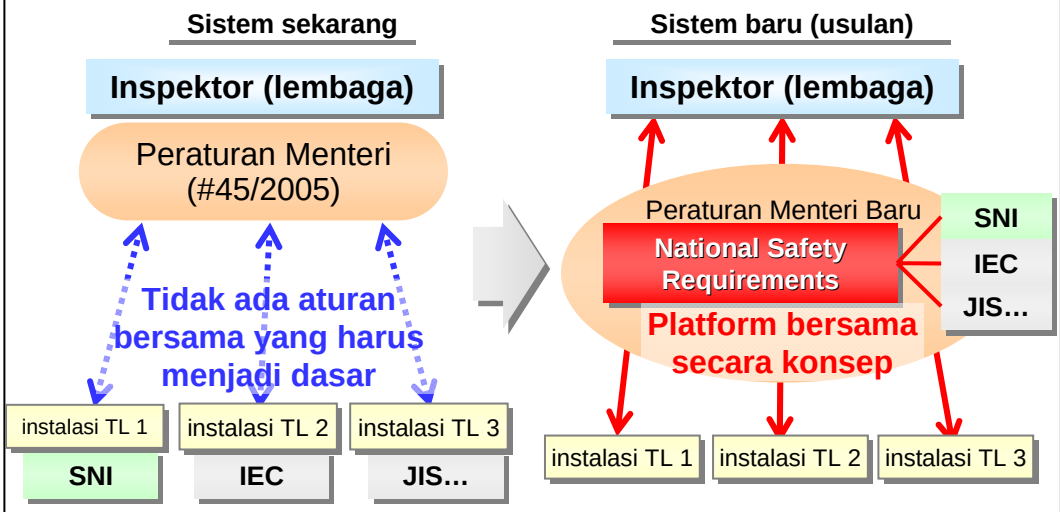
- Persyaratan minimum yang diperlukan guna memelihara keselamatan instalasi yang ditetapkan oleh pemerintah.
- Sekarang ini standar kuantitatif yang harus diterapkan dalam setiap instalasi tenaga listrik ditentukan oleh kebijakan setiap pelaku usaha. Sebagai persyaratan dasar dalam menerapkan standar-standar ini diberikan platform secara konseptual terkait spesifikasi yang harus dimiliki instalasi.
- Dengan terbentuknya SNI untuk pemasangan instalasi penyediaan tenaga listrik di masa depan, diharapkan adanya kerangka konsep sebagai asumsi dasar untuk keselamatan instalasi yang ditetapkan dalam National Safety Requirements.



- National Safety Requirements (usulan saat ini) tersusun atas 153 pasal, yang terdiri dari: - Bagian 1: Ketentuan umum: Pasal 1-18
  - Bagian 2: Pemasangan instalasi tenaga listrik
    - Bab 1 instalasi penyediaan tenaga listrik: pasal 19-48
      [instalasi untuk penyediaan tenaga listrik/pemasangan di titik pengguna tenaga listrik]
    - Bab 2 instalasi pembangkitan (ketentuan umum): pasal 49-56
    - Bab 3 instalasi PLTA: pasal 57-84
      [umum/bendungan/pipa air/turbin air/ dan pembangkit listrik bawah tanah/kolam penampung dan kolam penyesuai]
    - Bab 4 instalasi PLTU: pasal 85-153
      [umum/boiler dll/turbin uap/turbin gas/mesin pembakaran internal/instalasi gas cair/instalasi furnace gas/sarana penampung bahan bakar padat dari buangan bahan yang mudah terbakar sebagai bahan baku utama/instalasi listrik untuk pembangkitan tenaga uap/lain-lain]

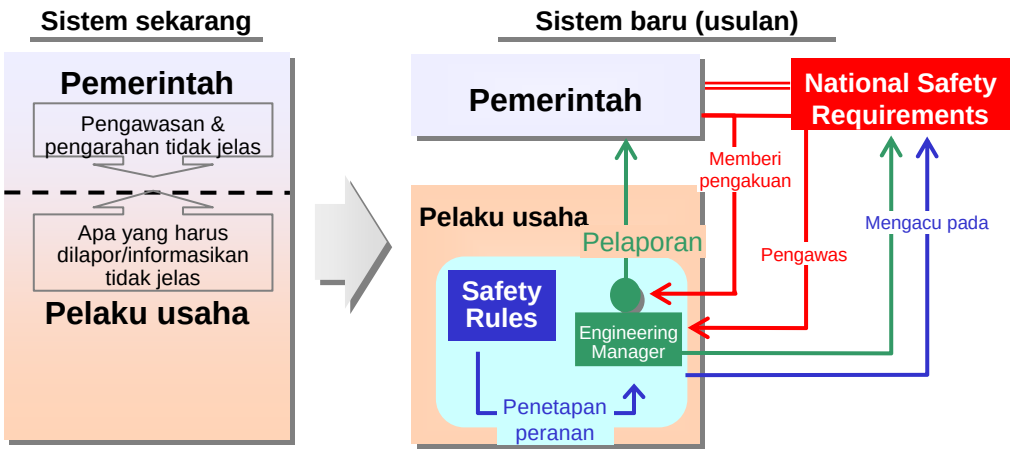
4. National Safety Requirements dan Sistem Inspeksi

- Dalam “Peraturan Menteri tentang Instalasi Ketenagalistrikan” No.45/2005 dan No.46/2006 yang berlaku saat ini, ditetapkan bahwa lembaga inspeksi yang ditentukan melaksanakan inspeksi instalasi tenaga listrik, dan dalam lampiran peraturan menteri yang sama dicantumkan daftar poin-poin yang harus diinspeksi secara kongkrit pada setiap jenis instalasi.
- Namun demikian, kriteria penilaian setiap poin yang harus diinspeksi tidak ditetapkan secara jelas sehingga sekarang ini ditetapkan berdasarkan standar teknis yang dipakai oleh pemilik (pengguna) instalasi serta berdasarkan apakah instalasi tersebut sesuai/tidak dengan aspek spesifikasi yang telah disiapkan oleh pembuat alat.
- Tersedianya standar penetapan bersama terkait spesifikasi instalasi antara inspektor dan pemilik (pengguna) instalasi melalui sistematisasi “National Safety Requirements” serta penempatan konsep tingkat tinggi dalam standar teknis individual. Sesuai/tidaknya standar teknis yang dijadikan dasar oleh pemilik (pengguna instalasi) dengan spesifikasi kinerja yang disiapkan oleh produsen peralatan pun dinilai dari sisi kesesuaian dengan “National Safety Requirements”.



5. Safety Rules

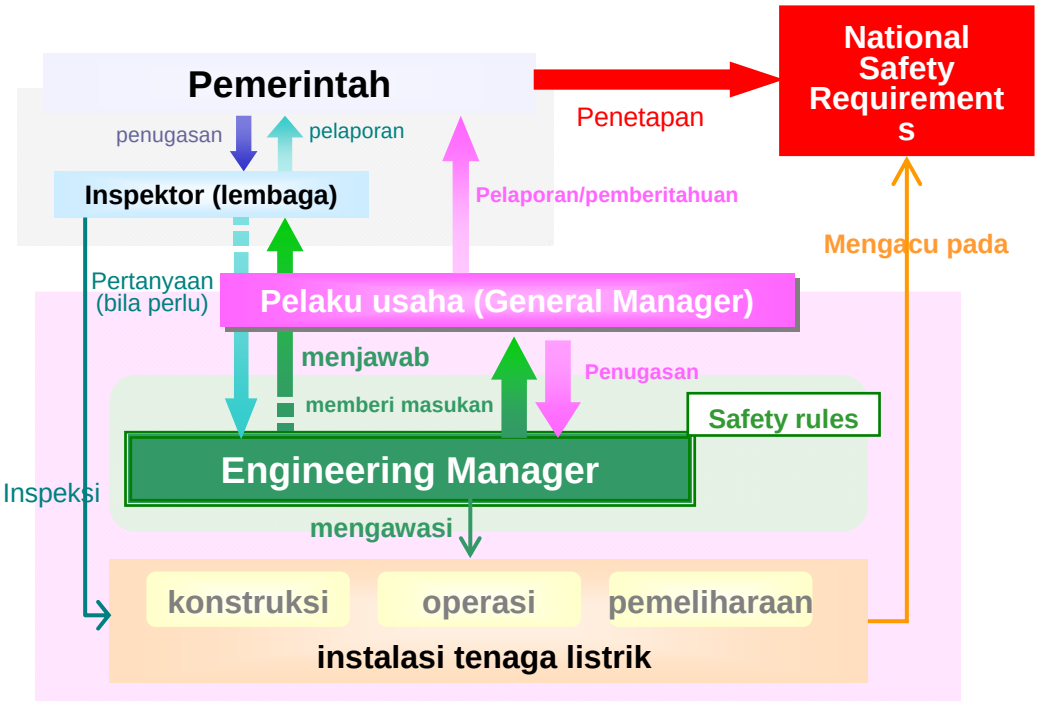
- Dalam menjaga keselamatan instalasi pada sistem yang berlaku saat ini tidak ditetapkan secara jelas apa yang harus diawasi dan diarahkan oleh pemerintah terkait tugas-tugas pelaku usaha, serta apa yang harus dilaporkan dan informasi apa yang harus diberikan oleh pelaku usaha kepada pemerintah. Dalam mengklarifikasi pembagian tanggung jawab antara kedua belah pihak sangat penting untuk berpijak pada poin pencegahan kecelakaan sebelum terjadi.
- Agar menjamin dilaksanakannya tugas harian untuk memelihara spesifikasi instalasi yang telah ditetapkan dalam “National Safety Requirements”, maka pengusaha menetapkan kebijakan dasar terkait operasional instalasi sebagai “Safety Rules”, serta diwajibkan memberikannya pada pemerintah.
- Pelaku usaha menetapkan dan melaksanakan dokumen internal seperti manual tugas lebih detil, dll berdasarkan “Safety Rules”



- “Safety Rules” secara garis besar tersusun atas 2 poin berikut ini.
  - Sistem organisasi & tanggung jawab guna memelihara keselamatan instalasi
  - Kebijakan dasar tentang tugas keselamatan instalasi
- Mewajibkan untuk menugaskan “Engineering Manager” sebagai pusat pengemban sistem organisasi dan operasional guna memelihara keselamatan instalasi.

6. Engineering Manager System

- Mewajibkan setiap pelaku usaha untuk menugaskan sejumlah “Engineering Manager” yang diperlukan sebagai penanggung jawab pengawasan dalam mengemban sistem organisasi dan tanggung jawab terkait keselamatan instalasi yang telah ditetapkan dalam “Safety Rules”.
- Jumlah “Engineering Manager” dan penempatan posisinya dalam pelaku usaha diserahkan pada kebijakan pelaku usaha, namun 1 unit usaha regional (1 lokasi pembangkit tenaga listrik atau unit transmisi/distribusi, dll) patokannya 1 orang.
- “Engineering Manager” bertugas mengawasi secara menyeluruh keselamatan instalasi dalam unit usaha yang menjadi tanggung jawabnya, sekaligus sebagai penanggung jawab umum atas laporan kepada pemerintah (plus inspektor dan lembaga).
- Yang ditugaskan sebagai “Engineering Manager” disyaratkan untuk memiliki sertifikat kompetensi tertentu (detil dapat dilihat pada halaman berikutnya).

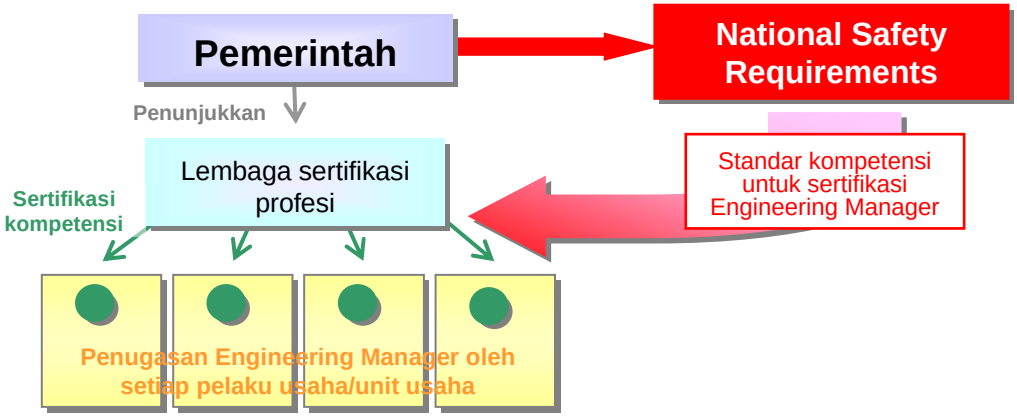


7. Tugas Engineering Manager

- Engineering Manager, selaku penasehat secara teknis, bertugas melaksanakan pengawasan menyeluruh terkait konstruksi, operasi, dan pemeliharaan instalasi yang menjadi tanggung jawabnya, serta memberikan masukan yang sesuai pada masing-masing manajer dan stafnya.
- Tugas utama sebagai berikut:
  - Tugas utama terkait konstruksi instalasi
    - Pengawasan terhadap rencana konstruksi instalasi;
    - Penilaian kesesuaian rancangan pada National Safety Requirements;
    - Investigasi lapangan selama konstruksi;
    - Investigasi prakomisioning
  - Tugas utama terkait operasi instalasi
    - Pengembangan rencana kerja tahunan tentang manajemen keselamatan;
    - Pengawasan penyampaian aplikasi/dokumen kepada instansi berwenang;
    - Pengawasan dan penilaian aturan keselamatan dan panduannya;
    - Perencanaan dan pelaksanaan diklat keselamatan
    - Partisipasi pada rapat terkait manajemen keselamatan
  - Tugas utama terkait pemeliharaan instalasi
    - Penilaian kondisi operasional instalasi (di lapangan)
    - Penilaian manajemen keselamatan
    - Pengawasan revisi kebijakan patroli lapangan
    - Penanganan kondisi ketidaknormal/kecelakaan/masalah
    - Kerjasama dengan inspektor dalam inspeksi wajib

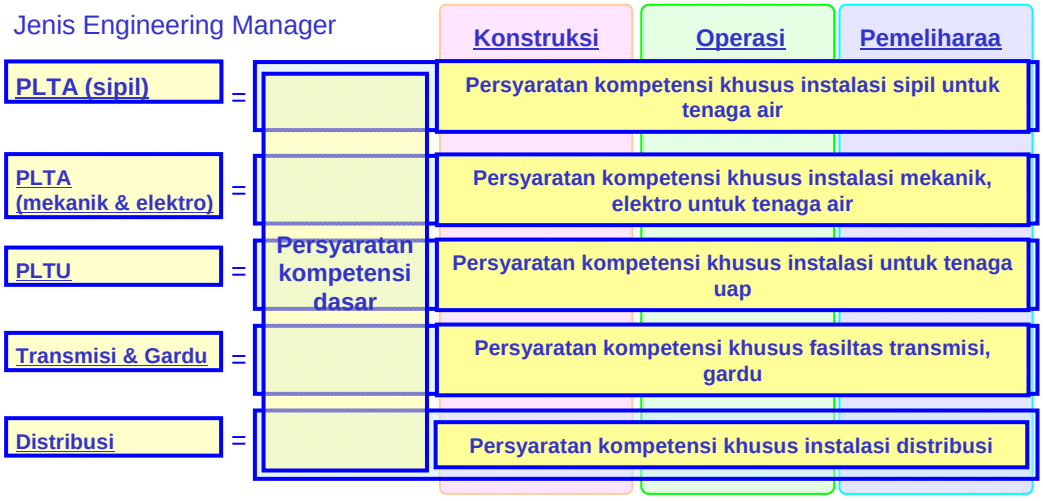
8. Standar Kompetensi Engineering Manager

- Dalam melaporkan penugasan Engineering Manager kepada pemerintah, pelaku usaha dituntut untuk menunjukkan kepemilikan sertifikasi kompetensi tertentu yang telah diterbitkan oleh lembaga sertifikasi yang ditunjuk pemerintah.
- Dalam hal ini, standar kompetensi teknis untuk sertifikasi Engineering Manager disiapkan oleh pemerintah. Standar ini tersistem dan berfokus pada penilaian terhadap pelaksanaan tugas-tugas pengawasan yang diperlukan guna memelihara keselamatan instalasi sebagaimana ditetapkan dalam “National Safety Requirements”.
- Lembaga sertifikasi yang ditunjuk oleh pemerintah menyiapkan sistem sertifikasi kompetensi berdasarkan standar ini.
- Di samping itu, lembaga pelatihan, seperti balai pelatihan DESDM, dalam rangka memajukan perolehan sertifikasi tersebut diharapkan menyediakan program pembinaan sumber daya manusia secara tepat.



8. Standar Kompetensi Engineering Manager (lanjutan)

- Sertifikasi kompetensi“Engineering Manager” terbagi atas 5 jenis (usulan saat ini)
  - PLTA (sipil)
  - PLTA (mekanik dan elektro)
  - PLTU
  - Transmisi, Gardu
  - Distribusi
- Menyiapkan standar kompetensi untuk masing-masing sertifikasi. Standar kompetensi tersusun atas “Persyaratan kompetensi dasar” yang dituntut dalam setiap jenis “Engineering Manager” dan “Persyaratan kompetensi khusus” yang khas untuk setiap instalasi yang menjadi obyeknya.
- “Persyaratan kompetensi dasar” tersusun atas 5 item yaitu pengetahuan dasar kelistrikan, kepatuhan pada aturan, penetapan rencana yang terkait dengan konstruksi-operasi-pemeliharaan, pelatihan staf, dan pelaporan pada lembaga terkait.
- “Persyaratan kompetensi khusus” tersusun atas 3 item yaitu persyaratan yang terkait dengan konstruksi instalasi, persyaratan yang terkait dengan operasi, dan persyaratan yang terkait dengan pemeliharaan.



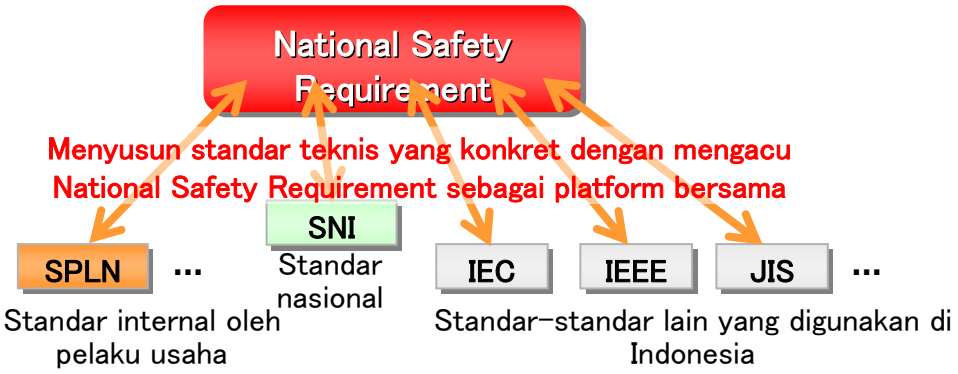
Pertanyaan yang sering muncul (FAQs)

Penjelasan berdasarkan dengan apa yang diusulkan oleh tim JICA

[National Safety Requirement]

Q1-1. Apakah perbedaan antara National Safety Requirements dan SNI?

- National Safety Requirement merupakan ketentuan yang berkaitan dengan kinerja yang diperlukan dalam rangka menjaga keselamatan instalasi ketenagalistrikan. Sedangkan, SNI merupapan ketentuan berupa spesifikasi konkrit untuk peralatan dll.
- Saat ini kriteria/patokan kuantitatif yang diterapkan untuk setiap instalasi ketenagalistrikan ditetapkan oleh masing-masing pelaku usaha. Sedangkan National Safety Requirement menyediakan platform bersama sebagai asumsi yang mendukung penerapan kriteria tersebut berkaitan dengan kinerja yang harus dijaga pada instalasi.



[National Safety Requirement]

Q1-2. Apakah National Safety Requirements ini merupakan aturan wajib sesuai peraturan menteri dll, ataukah aturan sukarela?

- National Safety Requirement diusulkan sebagai aturan wajib.
- Pasal 44 ayat (5) UU No.30/2009 mengatur kewajiban pemenuhan SNI untuk peralatan dan pemanfaat tenaga litsirik. Namun SNI hanya menetapkan spesifikasi peralatan secara konkret tetapi tidak menetapkan pemikiran yang melatarbelakangi ketentuan tersebut secara konseptual bagaimana seharusnya instalasi dipasang dan dipelihara dalam rangka menjaga keselamatan penyediaan tenaga listrik.
- National Safety Requirement menetapkan kinerja yang harus dipelihara pada instalasi. Standar teknis seperti SNI, standar internasional dll diacu atau disusun dengan prasyarat mengikuti National Safety Requirement ini.
- Di Jepang, pelaku usaha dapat diberi perintah perbaikan dalam hal menteri teknis(ekonomi, perindustrian dan perdagangan) menggangap instalasi TL tidak sesuai dengan ketentuan National Safety Requirement. Apabila pelaku usaha tetap tidak mengindahkan perintah tersebut, diberi sanksi denda paling tinggi 3 juta yen.

[National Safety Requirement]

Q1-3. Apakah National Safety Requirements ini merupakan aturan wajib sesuai peraturan menteri dll, ataukah aturan sukarela?

- National Safety Requriment merupakan ketentuan yang berkaitan dengan persyaratan kinerja ang diperlukan dalam rangka menjaga keselamatan instalasi TL. Standar teknis yang diacu selama ini tetap dapat diacu sepanjang spesifikasi standar teknis tersebutseperti SNI memenuhi ketentuan National Safety Requirement.
- Namun apabila standar teknis yang diacu dianggap ada bagian yang tidak memenuhi ketentuan kinerja sebagaimana diatur pada National Safety Requirement sepenuhnya, maka DESDM dapat memberi suatu pengarahan untuk perbaikan.Demikian juga dalam hal pemasangan instalasi TL yang baru.
- Rancangan National Safety Requirement yang diusulkan JICA Pada dasarnya sesuai dengan standar teknis yang sudah ada seperti SNI dll.

[National Safety Requirement]

Q1-4. Apakah National Safety Requirements tidak menetapkan instalasi pembangkit listrik tenaga nuklir sebagai obyeknya?

- Tidak termasuk instalasi PLTN. Alasannya:

1. Instalasi pembangkit tenaga listrik tenaga nuklir memerlukan persyaratan teknis yang canggih dan khusus dibandingkan instalasi pembangkit listrik lainnya sehingga di Jepang pun dibuat persyaratan teknis secara khusus/terpisah yang berbeda denga instalasi pembangkit listrik lainnya.
2. Saat ini di Indonesia tidak ada instalasi pembangkit listrik tenaga nuklir secara komersial. Kewenangan yang terkait dengan pengembangan teknologi tenaga nuklir dan penataan aturan hukum ada pada BATAN dan BAPETEN, bukan DESDM.

[National Safety Requirement]

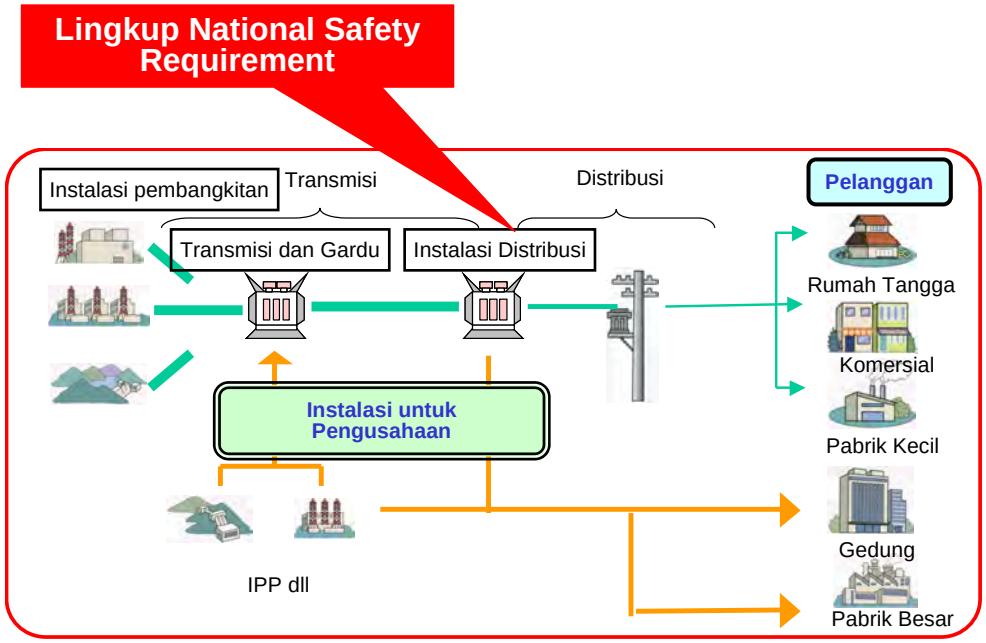
Q1-5. Apakah National Safety Requirements tidak menetapkan energi terbarukan, seperti instalasi pembangkit listrik panas bumi, angin, dan tenaga surya, dll sebagai obyeknya?

- Instalasi yang terkait dengan energi yang terbarukan belum dimasukkan ke dalam National Safety Requirements karena spesifikasi teknis untuk masing-masing instalasi masih berbeda secara signifikan dan peraturan mendasar yang harus diacu oleh seluruh instalasi tersebut masih sedikit.
- Meskipun demikian, persyaratan umum tenaga listrik yang terkait dengan seluruh instalasi pembangkit listrik tercakup dalam National Safety Requirements. Selain itu, instalasi yang terkait langsung dengan pembangkit listrik panas bumi, kecuali bagian sumur uap, pada prinsipnya sama dengan pembangkit listrik tenaga uap sehingga diacu pada aturan untuk pembangkit listrik tenaga uap.

[National Safety Requirement]

Q1-6. Apakah National Safety Requirements tidak menetapkan instalasi bertegangan menengah ke atas dan instalasi pemanfaatan bertegangan rendah sebagai obyeknya?

- Instalasi bertegangan menengah ke atas dan instalasi pemanfaatan bertegangan rendah menjadi obyek.
- National Safety Requirement meliputi semua instalasi ketenagalistrikan, khususnya pada ketentuan instalasi penyaluran (Bagian II, Bab 1).

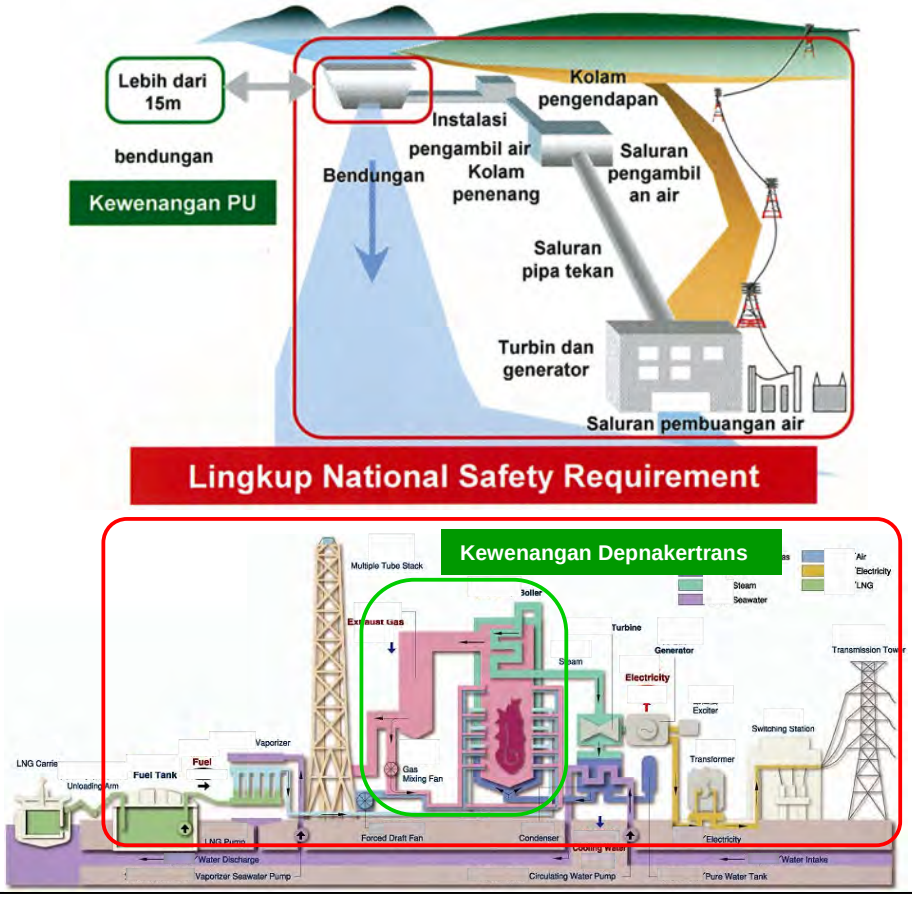


[National Safety Requirement]

Q1-7. Apakah instalasi (seperti pengelasan, bendungan besar, dll), yang diawasi lembaga pemerintah selain DESDM, tidak menjadi obyek dalam National Safety Requirements?

- Bendungan besar, pengelasan dll tidak termasuk. Alasannya:

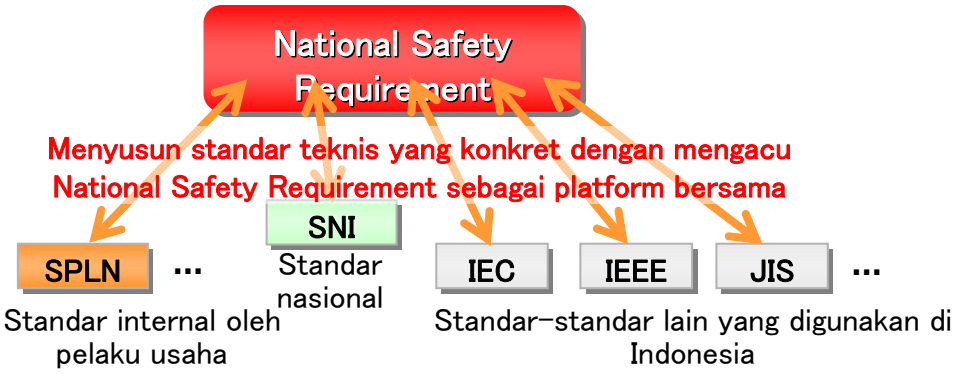
1. Menghindari terjadinya aturan yang timbang tindih untuk obyek yang sudah diatur bidang keselamatan oleh instalnsi lain misalnya bendunga besar (PU), pengelasan (Depnakertrans).
2. Namun instalasi boiler yang berkaitan dengan pembangkitan dilakukan pengawasan oleh DESDM dan Depnakertrans, maka termasuk pada lingkup National Safety Requirement.



[National Safety Requirement]

Q1-8. Dalam National Safety Requirements hanya sedikit ketetapan secara kuantitatif. Bukankah hal ini belum sempurna sebagai standar teknis?

- National Safety Requirement merupakan konsep umum atas persyaratan kinerja (platform bersama) yang berkaitan dengan spesifikasi yang harus dipelihara pada instalasi ketenagalitsrikan yang diatur oleh pemerintah. Oleh karena itu, persyaratan fungsional yang tidak mengandung angka secara kongkrit.
- SNI sebagai standar nasional atau IEC dll sebagai standar internatilnal mengatur spesifikasi detail termasuk angka kongkret yang dapat digunakan sebagai patokan.（Lihat hubungan dengan National Safety Requirement di bawah ini)



[National Safety Requirement]

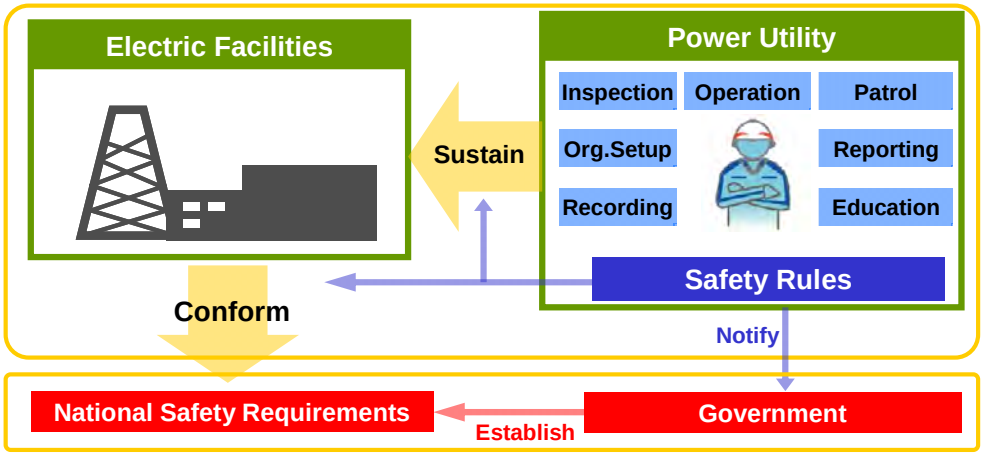
Q1-9. Apakah dalam National Safety Requirements tidak dipertimbangkan keselamatan terkait gempa bumi?

- Dalam National Safety Requirements dipertimbangkan pula penanganan untuk gempa bumi. Misalnya konstruksi aman yang mempertimbangkan kekuatan gempa bumi (Pasal 60) untuk kekuatan beban bendungan, dll.
- Namun demikian, metode perhitungan beban secara kongkrit ditetapkan dalam standar detil aturan penjabarannya.

[Safety Rules]

Q2-1. Bagaimanakah perbedaan antara National Safety Requirements dengan Safety Rules?

- National Safety Requirement merupakan persyaratan kinerja bagaimana seharusnya kondisi instalasi TL dalam rangka menjaga keselamatan umum melalui pengelolaan instalasi TL yang tepat.
- Sedangkan Safety Rules lebih berfukus pada kegiatan yang dilakukan oleh “manusia” apa yang harus di lakukan sehari-hari dalam rangka mencapai dan menjaga kondisi instalasi.



[Safety Rules]

Q2-2. Siapa yang menyusun Safety Rules

- National Safety Requirement ditetapkan pemerintah (DESDM), sedangkan Safety Rules pada prinsipnya ditetapkan oleh pelaku usaha.

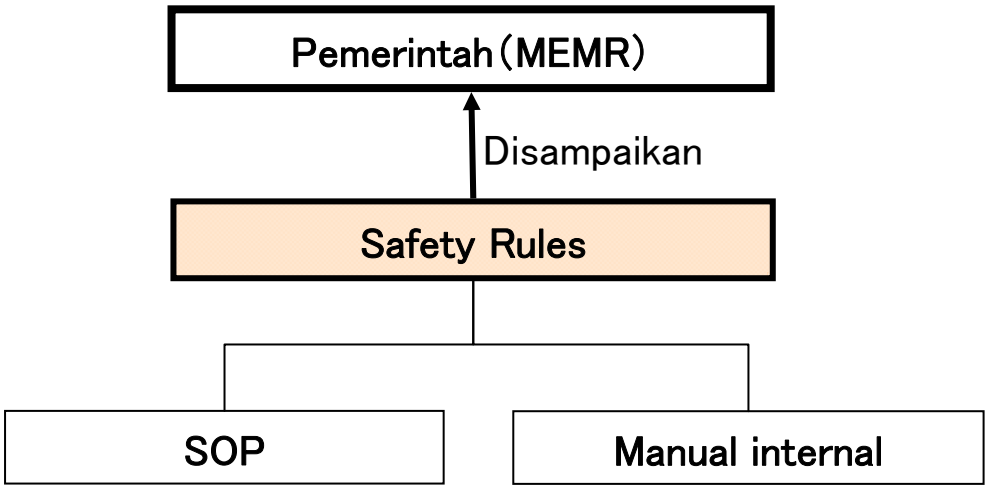
  Alasannya:

1. Safety Rules merupakan aturan dasar yang harus diikuti oleh pelaku usaha dalam konstruksi, operasi dan pemeliharaan yang bukannya diatur secara seragam oleh pemerintah harus disusun sesuai dengan instalasi yang diiliki dan metode yang digunakan oleh masing-masing pelaku usaha. Yang lebih rasional adalah setiap pelaku usaha yang memiliki instalasi berbeda yang menyusun masing-masing aturan dan disampaikan kepada pemerintah.
2. PLN, IPP skala besar sudah menyusun aturan internal dan manual operasional untuk instalasi yang dimiliki. Pengalaman tersebut dapat dimanfaatkan dalan penyusunan Safety Rules bagi setiap pelaku usaha.
3. Kebijakan pokok yang berkaitan dengan organisasi dan kelembagaan serta tugas di bidang keselamatan instalasi perlu disesuaikan dengan perkembangan teknologi, perubahan iklim usaha dll. Oleh karena itu Safety Rules sebaiknya disusun oleh pelaku usaha.

[Safety Rules]

Q2-3. Pemerintah menuntut pembuatan SOP sebagai kebijakan dasar pelaksanaan tugas. Bagaimanakah perbedaannya dengan Safety Rules?

- SOP(Standard Operation Procedure) merupakan prosedur operasional secara mendasar dalam tugas-tugas setiap bidang industri yang diatur Depnakertrans.
- Sedangkan Safety Rules menetapkan prinsip dasar tentang organisasi dan tanggungjawab serta tugas-tugas harian dalam dimensi konseptual yang merupakan deklarasi kepatuhan. Berbeda dengan SOP, substansi yang dideklarasikan di sini dievaluasi oleh DESDM apakah sesuai atau tidak dari sisi manajemen keselamatan, serta apakah substansi ini dipatuhi/tidak, dll.



[Safety Rules]

Q2-4. Terlepas dari pembuatan manual operasional tugas secara mandiri oleh pelaku usaha, apakah pelaku usaha dituntut untuk membuat dan melaporkan Safety Rules?

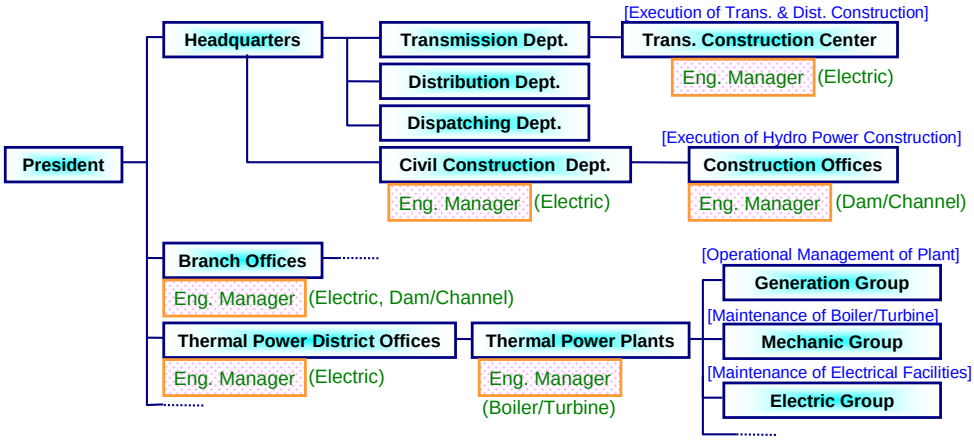
- Ya. Alasannya:

1. Manual operasional tugas yang dibuat secara mandiri oleh pelaku usaha merupakan dokumen pribadi milik setiap pelaku usaha dan tidak dikenai peraturan DESDM secara langsung.
2. Safety Rules menunjukkan dipatuhinya prinsip dan dilaksanakannya tugas yang terkait dengan keselamatan instalasi dengan melaporkan hal-hal yang sesuai dengan kebijakan dasar dan rangkuman manual operasional tugas ini kepada DESDM.
3. Manual operasional yang sudah ada dapat dimanfaatka dalam penyusunan Safety Rules.
4. Di Jepang kelalaian pelaku usaha untuk pendaftaran Safety Rules dikena sanksi denda paling tinggi 300 ribu yen.

[Safety Rules]

Q2-5. Apa sajakah hal-hal yang harus dimasukkan dalam Safety Rules?

- Secara garis besar terdiri dari 2 hal yaitu sistem organisasi guna memelihara keselamatan instalasi (terutama penempatan Engineering Manager, dll, klarifikasi pembagian tanggung jawab) serta kebijakan dasar tugas harian seperti teknik dan frekwensi pelaksanaan patroli, dll.
- Secara kongkrit sebagai berikut (usulan saat ini, detil sedang terus dipertimbangkan):
  - Sistem organisasi dan tanggung jawab untuk memelihara keselamatan instalasi
    - 1.1. Sistem organisasi pelaku usaha
    - 1.2. Tugas Engineering Manager dan posisinya dalam organisasi
    - 1.3. Kewenangan tugas setiap staf yang terkait dengan keselamatan instalasi
    - 1.4. Pelaksanaan diklat keselamatan bagi pekerja
  - Prinsip dasar terkait tugas keselamatan instalasi
    - 2.1. Konstruksi, operasi, dan pemeliharaan instalasi penyediaan tenaga listrik
    - 2.2. Inspeksi instalasi penyediaan tenaga listrik
    - 2.3. Pencatatan terkait keselamatan instalasi penyediaan tenaga listrik
    - 2.4. Laporan berkala dan laporan kecelakaan terkait instalasi tenaga listrik

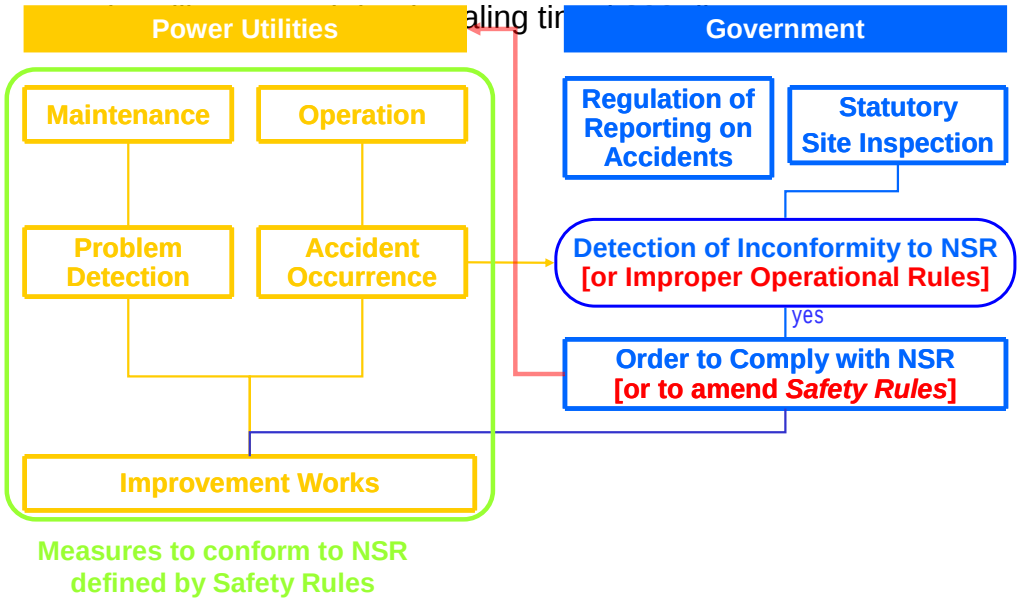


Conotoh organisasi

[Safety Rules]

Q2-6. Perintah perbaikan Safety Rules dari pemerintah kepada pelaku usaha dimungkinkan. Perintah seperti apakah ini?

- Pada dasarnya dihargai aturan yang ditetapkan secara mandiri oleh pelaku usaha karena aturan tersebut dianggap telah dipertimbangkan cukup untuk menjamin keselamatan instalasi.
- Namun demikian, apabila sering terjadi kecelakaan dan masalah terjadi pada pelaku usaha tersebut, perintah perbaikan akan dikeluarkan oleh DESDM agar meningkatkan frekwensi dan substansi inspeksi instalasi serta meningkatkan jumlah penempatan Engineering Manager.
- Di Jepang dalam hal pelaku usaha tidak mengindahkan perintah aling ti



[Safety Rules]

Q2-7. Dalam Safety Rules ditetapkan materi laporan kepada pemerintah terkait kecelakaan, dll. Apakah yang dilaporkan secara kongkritnya?

- Saat ini tidak ada ketentuan yang berkaitan dengan materi laporan. Oleh karena itu hal tersebut akan diatur didalam Safety Rules. Materi pelaporannya seperti berikut:

[Obyek yang harus dilaporkan]

- Luka atau kematian akibat sengatan listrik
- Kebakaran akibat listrik
- Kerusakan instalasi penyediaan tenaga listrik utama
- Kecelakaan besar seperti pemadaman luas dll

[Cara pelaporan]

- Pelaporan kecelakaan (laporan kilat) sesegera mungkin setelah kejadian dengan laporan yang detail
- Pelaporan berkala: Hasil akumulasi/klasifikasi kejadian dalam periode tertentu

[Engineering Manager System]

Q3-1. Sebutan “Engineering Manager” dan tugas yang dituntut terasa tidak sesuai. Bagaimana jika dibuatkan nama lain?

- Engineering Manager merupakan nama sementara yang diusulkan oleh JICA. Sejauh ini kami telah menerima berbagai komentar tentang perubahan nama dan sedang dipertimbangkan di internal DESDM. Maka sebaiknya sebutan ditetapkan oleh pihak Indonesia.

[Engineering Manager System]

Q3-2. Apakah Engineering Manager merupakan pengganti ataukah termasuk bagian dari inspektor pemerintah saat ini?

- Inspektor, selaku wakil pemerintah, adalah pihak yang mencari apakah kondisi instalasi terpelihara/tidak, sedangkan Engineering Manager, selaku wakil pelaku usaha, adalah pihak yang bertanggung jawab untuk memelihara keselamatan instalasi. Dengan demikian, posisi keduanya adalah berbeda.
- Justru saat inspektor melaksanakan inspeksi, yang menghadapinya dari pihak pelaku usaha adalah Engineering Manager sehingga keduanya bisa memiliki hubungan selaku counter-part yang terkait dengan tugas inspeksi.

[Engineering Manager System]

Q3-3. Apakah penugasan dan pelaporan Engineering Manager akan diwajibkan?

- Usulan dari JICA adalah sama dengan Jepang yaitu mewajibkan seluruh pelaku usaha yang terkait dengan konstruksi, operasi dan pemeliharaan “instalasi penyediaan tenaga listrik untuk kepentingan umum” agar menugaskan staf yang memiliki sertifikasi nasional sebagai Engineering Manager.
- Proyek kali ini tidak meliputi instalasi pembangkitan kepentingan sendiri dan instalasi pemanfaatan tenaga listrik bertegangan menengah ke atas. Namun sistem Engineering Manager untuk instalasi tersebut diharapkan disediakan pada masa yang akan datang.

[Engineering Manager System]

Q3-4. Apakah ada masa transisi dalam penerapan Engineering Manager System

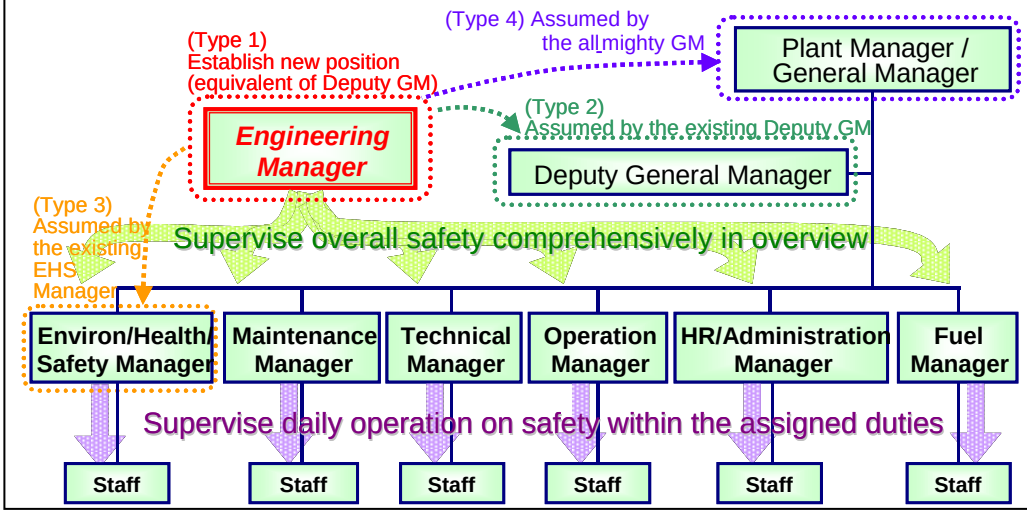
- Sebaiknya ada masa transisi agar meminimalisir kebingungan dalam implementasi dan sistem tersebut tersosialisasi secara optimal.
- Caranya, lingkup kewajiban pengangkatan Engineering Manager diterapkan secara bertahap. Misalnya pada awalnya hanya pada instalasi penting seperti pembangkit besar dari segi keselamatan. Setelah itu baru diperluas ke skala menengah dan kecil.

Tahapan	PLTA	PLTU	Transmisi	Distribusi	Inslatasi Pemanfaatan TL menengah ke atas	Genset
1	10MW atau lebih	100MW atau lebih	Jawa-Bali			
2	dibawah 10MW	dibawah 100MW	Luar Jawa-Bali	Jawa-Bali		
3			Pulau-pulau kecil	Pulau utama diluar Jawa-Bali	Jawa-Bali	Jawa-Bali
4				Pulau-pulau kecil	Luar Jawa-Bali	Luar Jawa-Bali

[Engineering Manager System]

Q3-5. Apabila Engineering Manager menangani pertanggungjawaban atas keselamatan instalasi, apakah ini berarti posisinya lebih tinggi dari manajer tertinggi (pimpinan pembangkit listrik, GM)?

- Posisi tidak ada kaitannya. Misalnya Engineering Manager(penanggungjawab teknis) dibawah General Manager (kecuali kedua posisi dirangkap satu orang), dia tetap dapat memberi perintah kepada General Manager tersebut dalam hal keselamatan.
- Penanggungjawab teknik berbeda perannya dengan General Manager sebagai penanggungjawab di 1 unit usaha.
- Peranan General Manager pada1unit usaha (pembangkit listrik, dll) dan Engineering Manager berbeda. Engineering Manager merupakan staf bawahan General Manager (kecuali bila keduanya dirangkap tugas oleh 1 orang yang sama).
- Peran utama General Manager adalah mengontrol manajemen organisasi sedangkan untuk memahami detil secara teknis terkait instalasi sulit secara jabatannya. Engineering Manager yang harus melengkapinya berfungsi sebagai technical advisor bagi General Manager.
- Tugas terhadap pihak eksternal secara teknis murni seperti respon, pelaporan, dll kepada inspektor pemerintah tentu saja dianggap akan lebih lancar apabila dilakukan oleh Engineering Manager.



[Engineering Manager System]

Q3-6. Ada pelaku usaha yang telah menempatkan manajer penanggung jawab keselamatan. Apakah ini berarti perintah untuk menetapkan posisi sebagai Engineering Manager baru sebagai tambahan?

- Apabila telah menempatkan manajer yang setaraf Engineering Manager, tidak perlu menempatkan lagi Engineering Manager baru.
- Namun demikian, pihak yang ditugaskan dalam posisi ini diharuskan memiliki sertifikasi nasional yang sesuai dan melaksanakan tugas yang diatur UU.

[Engineering Manager System]

Q3-7. Seberapa besarkah ruang lingkup tanggung jawab atau instalasi yang ditangani seorang Engineering Manager? Sebaiknya berapa orang Engineering Manager harus ditempatkan dalam 1 unit usaha?

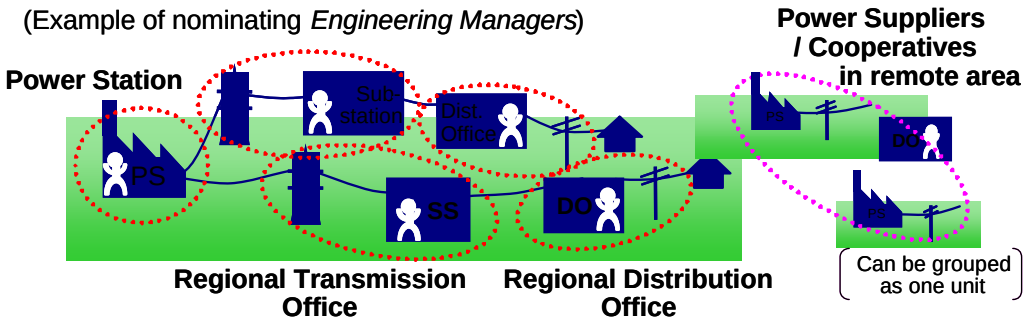
- Metoe penempatan tidak ditetapkan UU tetapi diatur oleh pelaku usaha dalam Safety Rules.
- Dalam metode penempatan Engineering Manager, dalam batas tertentu diserahkan pada kebijakan pelaku usaha itu sendiri, namun harus jelas tertulis dalam Safety Rules bagaimanakah penempatannya, dan sejauh mana ruang lingkup tugasnya.
- Bila DESDM menilai bahwa metode penempatan Engineering Manager tidak sesuai dengan ketetapan dalam Safety Rules, bisa menginstruksikan untuk merevisi Safety Rules.
- Sebagai patokan satuan unit usaha regional dimana seorang Engineerng Manager ditempatkan, seperti 1 titik pembangkit (memungkinkan beberapa titik pembangkit dijadikan satu lingkup dalam hal beberapa pembangkit sejenis terdapat di titik-titik berdekatan), unit usaha transmisi dan gardu atau distribusi di tingkat propinsi.

[Engineering Manager System]

Q3-8. Bila menempatkan Engineering Manager dalam suatu koperasi penyediaan tenaga listrik skala kecil, bukankah sulit menyediakan SDM yang dapat menanganinya?

- Bisa ditangani dengan membuat kontrak kerja dengan pihak luar yang memiliki sertifikasi sebagai Engineering Manager.
- Jadi, seorang Engineering Manager bisa pula menangani beberapa tempat dengan terikat kontrak dengan beberapa kelompok penyediaan tenaga listrik dan pelaku usaha beda pula, serta pelaku usaha skala kecil di pulau luar.

(Example of nominating *Engineering Managers*)



[Engineering Manager System]

Q3-9. Bila terjadi kecelakaan akibat kelalaian tugas Engineering Manager, atau setelah diinvestigasi ditemukan adanya hal tersebut, apakah akan diberlakukan sanksi?

- Bila DESDM menilai adanya masalah dalam pelaksanaan tugas yang diberikan kepada Engineering Manager, diberlakukan sanksi berupa pencabutan sertifikat Engineering Manager.
- Pelaku usaha yang telah menugaskan Engineering Manager tersebut harus menugaskan Engineering Manager baru sebagai penggantinya.

[Engineering Manager System]

Q3-10. Bagaimanakah menentukan honor bagi pihak yang telah ditugaskan sebagai Engineering Manager?

- Standar honor bagi Engineering Manager ditetapkan sesuai kebijakan pelaku usaha yang menugaskannya dan tidak diatur dalam regulasi secara khusus.

[Standar kompetensi untuk Engineering Manager]

Q4-1. Selain standar kompetensi untuk Engineering Manager yang diusulkan kali ini, apakah standar kompetensi untuk manajer lain (Operation Manager, Maintenance Manager etc.) tidak ditentukan?

- Tidak. Alasannya:

1. Proyek JICA kali ini akan menetapkan syarat kompetensi yang diperlukan oleh pihak yang terkait dengan tugas tersebut dengan mengusulkan pembuatan Engineering Manager System untuk memastikan posisi tanggung jawab terkait keselamatan instalasi.
2. Namun standar kompetensi Engineering Manager yang telah diusulkan kali ini dapat dijadikan acuan atau dasar dalam penyusunan standar kompetensi untuk manager umum lainnya.

Q4-2. Apakah standar kompetensi untuk inspektor pemerintah ditetapkan?

- Tidak. Alasannya

  1. Sebagaimana Q1, dalam proyek JICA kali ini masalah penetapan standar kompetensi untuk inspektor tidak menjadi target.

Q4-3. Ingin tahu jadwal pemberlakuan standar kompetensi

- Saat ini draft standar kompetensi yang telah diusulkan oleh JICA sedang dipelajari dan dipertimbangkan secara seksama oleh para pihak di Indonesia.
- Standar kompetensi yang telah diselesaikan akan dimintakan persetujuan kepada pemerintah, kemudian menetapkan lembaga sertifikasi dan menyiapkan sistem kualifikasi sehingga diperkirakan perlu mengerjakan desain sistem paling cepat pada akhir 2010.
- Detilnya akan dipertimbangkan oleh DESDM di kemudian hari.

[Standar kompetensi untuk Engineering Manager]

Q4-4. Ditetapkan bahwa harus menugaskan Engineering Manager yang telah memperoleh sertifikasi kompetensi. Bukankah sulit untuk mendapatkan sertifikasi kompetensi baru dengan cepat?

- Bila berfokus pada pelaksanaan sertifikasi dengan melakukan pengujian terhadap calon-calon dalam jumlah besar saat mengadopsi Engineering Manager System secara serentak, mungkin akan menimbulkan kebingungan.
- Bisa dilakukan dengan masa transisi misalnya melalui pemberian sertifikasi sementara di awal yang berlaku hanya beberapa tahun saja kepada mereka yang memiliki pengalaman tertentu, kemudian secara bertahap berpindah ke sertifikasi resmi melalui pengujian dll.
- Detilnya akan dipertimbangkan oleh DESDM di kemudian hari.

[Standar kompetensi untuk Engineering Manager]

Q4-5. Standar kompetensi yang telah diusulkan kali ini tampaknya dikhususkan pada syarat kompetensi secara teknis. Apakah kemampuan lain non-teknis, seperti kemampuan membimbing selaku manajer, dll tidak dipertanyakan?

- Standar kompetensi yang telah diusulkan kali ini ditetapkan dari poin untuk mengevaluasi apakah memiliki kemampuan yang mumpuni untuk melaksanakan tugas Engineering Manager yang ditetapkan dalam regulasi sehingga dikhususkan pada syarat teknis.

[Standar kompetensi untuk Engineering Manager]

Q4-6. Dalam mengemban tugas Engineering Manager, dituntut pengalaman kerja yang sesuai. Apakah boleh ditetapkan hanya berdasarkan ujian saja?

- Memungkinkan melalui ujian tulis atau pendidikan/pengalaman tertentu
- Dalam sistem sertifikasi teknisi di Jepang, persyaratan sertifikasi adalah “seseorang yang memiliki pendidikan, kualifikasi atau pengalaman di lapangan sebagaimana ditetapkan departemen teknis (ekonomi, perindustrian dan perdagangan)” atau “seseorang yang lulus ujian tulis”. Namun di Indoneisa bisa disesuaikan dengan sistem umum seperti pemastian pengalaman kerja, ujian lisan melalui wawancara, rekomendasi atasan, dll.
- Namun demikian, ujian tulis dianggap yang terbaik dalam mengevaluasi kemampuan secara obyektif sehingga ujian tulis diharapkan sebagai salah satu metode evaluasi. Tetapi mengingat pentingnya tugas Engineering Manager, maka tingkat kesulitan ujian harus diperketat.

[Standar kompetensi untuk Engineering Manager]

Q4-7. Siapakah yang melakukan sertifikasi kompetensi dalam standar teknis Engineering Manager?

- Organisasi sertifikasi yang melakukan sertifikasi kompetensi untuk standar teknis yang ada saat ini (IATKI、HAKIT、GEMA PDKB、HATEKDIS) dianggap sebagai calon yang paling mampu.
- Detilnya akan dipertimbangkan oleh DESDM di kemudian hari.

[Standar kompetensi untuk Engineering Manager]

Q4-8. Siapakah yang menetapkan standar sertifikasi untuk standar kompetensi Engineering Manager dan level lulus/tidaknya?

- Patokannya standar konpetensi. Implementasinya sedang dalam proses pertimbangan dan akan ditetapkan oleh DESDM dengan mempertimbangkannya bersama lembaga sertifikasi kompetensi dan para pihak terkait lainnya.

[Standar kompetensi untuk Engineering Manager]

Q4-9. Apakah standar kompetensi Engineering Manager ini berlaku tanpa batas waktu atau ada masa berlakunya ?

- Apabila telah diperoleh sekali akan menjadi sertifikasi permanen.
- Namun dalam hal si Engineering Manager dianggap bermasalah dalam melaksanakan tugas yang diberikan, DESDM memberi sanksi berupa pencabutan sertifikat.
- Disamping itu perlu disediakan acara pembekalan peningkatan kapasitas berupa penukaran dan penyedian informasi yang berkaitan dengan contoh kasus kecelakaan, tindakan proventif, perkembangan teknolgi dll melalui lokakarya, tinjauan lapangan dll.