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3.3.0 Analysis of Technical Specifications – Unit 3

Learning Objectives:

1. Explain the significance of limiting conditions for operation in the areas of containment systems, plant systems, electrical power systems, refueling operations, design features, and administrative controls.
2. When given an initial set of operating conditions, use the format and content of the technical specifications to identify the applicable section from which to determine the appropriate plant and/or operator response.

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3.3.1 Introduction

This section is the third of four technical specification sections. This section presents the limiting conditions for operation (LCOs), bases for LCOs, and applications of requirements during different situations for the areas of:

- Containment systems,
- Plant systems,
- Electrical power systems, and
- Refueling operations.

The LCOs for these areas identify the minimum performance levels for equipment required to ensure safe operation. This section also discusses the design features and administrative controls sections of the technical specifications.

3.3.2 Containment Systems

3.3.2.1 Containment

The design basis for the containment is that the containment must withstand the pressures and temperatures of the limiting design-basis accident (DBA) without exceeding the design leakage rate. Limiting the containment leakage rate limits the rate of radioactive release to the environment resulting from accidents in which fission product activity is released to the containment atmosphere. The maximum allowable containment leakage rate, designated as L_a, is 0.10% of the containment air weight per day at the calculated peak containment pressure. Containment OPERABILITY is maintained by limiting leakage to $\leq 1.0\ L_a$, which is periodically verified in accordance with the Containment Leakage Rate Testing Program. Containment OPERABILITY is also demonstrated through verification of containment structural integrity in accordance with the Containment Tendon Surveillance Program. Requirements for both programs are contained in the administrative controls section of the technical specifications.

In addition, the containment air locks and containment isolation valves form parts of the containment pressure boundary. The OPERABILITY of each air lock, including OPERABILITY of both air lock doors and the interlock mechanism and compliance with air lock leakage criteria, thus supports the maximum allowable leakage design basis of the containment. Similarly, the OPERABILITY requirements for the containment isolation valves support the containment design basis by helping to ensure that the containment is isolated within the time limits assumed in the safety analyses.

3.3.2.2 Containment Pressure and Temperature

The upper limit on containment pressure and the limit on containment average air temperature are initial conditions used in the DBA analyses to establish the peak containment internal pressure and the peak containment structure temperature. Compliance with these limits ensures that the peak containment pressure and temperature resulting from the limiting DBA, a large loss of coolant accident (LOCA), remain less than the design values.

The lower limit on containment pressure is an initial condition of the safety analysis of an inadvertent actuation of the containment spray system, which establishes the minimum containment internal pressure (and thus the maximum external pressure load on the containment). Compliance with the lower containment pressure limit ensures that the containment internal pressure does not fall below the design value if this event should occur.

3.3.2.3 Containment Spray and Cooling Systems

The containment spray system and containment cooling system (containment air coolers) provide containment atmosphere cooling to limit post-accident pressures and temperatures in containment. The limiting DBA for peak containment pressure and temperature is a large LOCA. The worst-case single failure assumed for this event is the loss of one containment spray train. The analysis of this accident shows that the remaining operating containment spray and containment cooling trains provide sufficient cooling to keep the peak containment pressure and containment structure temperature within design limits. Compliance with the OPERABILITY requirements for these systems ensures that the necessary trains are available to mitigate the effects of the DBA, even with the worst-case single active failure.

OPERABILITY of the containment spray trains and the spray additive system ensures that at least one containment spray train and one spray additive train are available during an accident to scavenge iodine from the containment atmosphere and to maintain a sufficiently alkaline pH in the containment sump solution. The successful performance of these functions limits the amount of radioactive iodine that can be leaked from containment during and following an accident.

3.3.2.4 Hydrogen Mitigation Systems

OPERABILITY of the hydrogen mixing system minimizes the potential for local hydrogen burns. The hydrogen mixing system provides the capability for reducing the local hydrogen concentration to approximately the bulk average concentration.

3.3.3 Plant Systems

3.3.3.1 Steam and Feedwater System Valves

The main steam safety valves (MSSVs) provide overpressure protection for the secondary system and also provide protection against overpressurizing the reactor coolant pressure boundary by providing a heat sink for energy removal from the reactor coolant system (RCS) if the condenser is not available. The OPERABILITY of all MSSVs ensures that the secondary system pressure will be limited to ≤ 110% of design pressure when they are passing 105% of design steam flow. This capability is sufficient to cope with any anticipated operational occurrence (AOO) or accident; the limiting AOO is a full-power turbine trip without steam dump availability. Operation with less than the full number of MSSVs OPERABLE requires limitations on the allowable THERMAL POWER and the power range neutron flux - high trip setpoint.

The OPERABILITY of the main steam line isolation valves (MSIVs) precludes the blowdown of more than one steam generator in the event of a steam line break, assuming that one MSIV fails to close on demand. This capability limits the break-induced mass and energy release to the containment (for steam line breaks inside containment) and positive reactivity addition to the core resulting from the uncontrolled RCS cooldown.

The OPERABILITY of the main feedwater isolation valves (MFIVs), main feedwater regulating valves (MFRVs), and MFRV bypass valves ensures redundant isolation of main feedwater flow to the steam generators following a steam line break or feedwater line break (FWLB). Closure of the MFIVs, or MFRVs and MFRV bypass valves, terminates feedwater addition to an affected steam generator and thereby limits the mass and energy release for a steam line break or FWLB inside containment. For a FWLB occurring upstream of the MFIVs or MFRVs, closure of these valves terminates the event.

The OPERABILITY of the atmospheric dump valves (ADVs) ensures the availability of a method for cooling the unit to residual heat removal (RHR) entry conditions when the preferred heat sink, the condenser, is not available. In accident analyses, the ADVs are assumed to be used by the operator to cool down the unit to RHR entry conditions for accidents accompanied by a loss of offsite power. For the recovery from a steam generator tube rupture (SGTR), the limiting event for the ADVs, the operator is required to perform a limited cooldown as a necessary step to terminate primary-to-secondary break flow into the ruptured steam generator. Three ADV lines are required to be OPERABLE to ensure that at least one ADV line is available to conduct a unit cooldown following an SGTR, in which one steam generator becomes unavailable and and a second ADV line on an unaffected steam generator fails.

3.3.3.2 Auxiliary Feedwater

The design basis of the auxiliary feedwater (AFW system) is to supply water to the steam generators to remove decay heat and other residual heat by delivering at least the minimum required flow rate to the steam generators at pressures corresponding to the lowest MSSV set pressure plus 3%. In addition, the AFW system must supply enough makeup water to replace the secondary water inventory lost as the unit cools to MODE 4 conditions. The required OPERABILITY of both AFW trains ensures the availability of the design RHR capability for all events, including the DBA (a feedwater line break), accompanied by a loss of offsite power and the worst-case single failure.

The condensate storage tank (CST) is the source of water for the AFW system. Safety analyses assume a CST inventory sufficient to remove decay heat for 30 minutes in MODE 3 and then to cool down the RCS to RHR entry conditions at the design cooldown rate, with steam relief to the atmosphere and a loss of offsite power. The required minimum CST volume exceeds the volume required by the safety analyses.

3.3.3.3 Cooling Water Systems

The component cooling water (CCW) and service water systems remove heat from safety-related components during normal operation and following accidents. In the event of a DBA, one CCW train and one service water train are required to remove the post-accident heat loads from the systems which they support. In MODES 1, 2, 3, and 4, both trains of each system are required to be OPERABLE to ensure that one train will operate, assuming the worst-case single failure coincident with a loss of offsite power. In MODES 5 and 6, the OPERABILITY requirements of these systems are determined by the systems that they support (there are no LCO OPERABILITY requirements for the CCW system or the service water system in MODES 5 and 6).

The design basis of the ultimate heat sink (UHS) is to provide a 30-day supply of cooling water in support of a safe shutdown of the unit from any conditions, so that the design-basis temperatures of safety-related equipment are not exceeded. For TTC Unit 2, this capability is provided by the Columbia River. In the event of a service water intake structure blockage, the cooling tower and cooling tower basin constitute the UHS. The LCO limits for the cooling tower basin ensure a cooling water supply (approximately 100 hours) adequate to support a normal shutdown and cooldown of the unit until makeup flow from the Columbia River to the cooling tower basin can be restored.

3.3.3.4 Ventilation Systems

The control room emergency ventilation system (CREVS) recirculates control room air and supplies makeup air through filters and adsorbers to provide airborne radiological protection for the control room operators. The system is designed to maintain the control room environment for 30 days of continuous occupancy after a DBA without exceeding a 5-rem whole-body dose or its equivalent to any part of the body. Requiring both trains of the CREVS to be OPERABLE ensures that at least one train is available to perform the system design function in the event of an assumed loss of offsite power and a worst-case single failure.

The spent fuel pool exhaust system (SFPES) directs air from the area of the spent fuel pool to the environment through filters and adsorbers to limit the airborne radioactive material discharged to the environment. The safety analysis of the design-basis fuel handling accident accounts for the filtration of airborne radioactive particulates and iodines by the SFPES. Requiring both trains of the SFPES to be OPERABLE ensures that at least one train is available to perform the system design function in the event of an assumed loss of offsite power and a worst-case single failure. In addition, one train is required to be operating during movement of irradiated fuel assemblies in the fuel handling building, when there is potential for damage to fuel assemblies.

3.3.3.5 Spent Fuel Pool

The spent fuel pool is divided into two separate and distinct regions. Region 1 is designed to accommodate new fuel with a maximum enrichment of 4.65 wt% U-235, or spent fuel regardless of the discharge fuel burnup. Region 2 is designed to accommodate fuel of various initial enrichments which have accumulated minimum burnups within the acceptable domain defined by the LCO for spent fuel assembly storage. Restricting the spent fuel assemblies stored in Region 2 to those which fall within the acceptable burnup domain ensures that the k_{eff} of the spent fuel pool remains less than 0.95, even with the conservatism that the pool is flooded with unborated water.

Although compliance with the LCO for spent fuel assembly storage provides assurance that the spent fuel remains in a subcritical configuration, accidents can be postulated which could increase the reactivity of the pool. The negative reactivity provided by the required spent fuel pool boron concentration compensates for the increased reactivity of the spent fuel storage configuration resulting from any postulated accident scenario. In accordance with this basis, the LCO for spent fuel pool boron concentration applies only until it is verified that spent fuel assemblies are properly stored following the last movement of assemblies within the spent fuel pool.

The minimum required spent fuel pool water level of 23 ft above the top of irradiated fuel assemblies provides shielding and minimizes the general area dose when the storage racks are filled to their maximum capacity. The minimum water level satisfies the assumptions concerning iodine decontamination factors following a fuel handling accident and limits the offsite doses from the accident to a small fraction of the 10 CFR 100 limits.

3.3.3.6 Secondary Specific Activity

The secondary coolant specific activity limit of 0.10 μCi/gm DOSE EQUIVALENT I-131, an assumed initial condition of the steam line break safety analysis, ensures that the resultant offsite radiation dose will be limited to a small fraction of 10 CFR 100 limits in the event of a steam line break.

3.3.4 Electrical Power Systems

3.3.4.1 Electrical Power Systems - Operating

The initial conditions of DBA and transient analyses in the Final Safety Analysis Report (FSAR) assume that engineered safety feature (ESF) systems are OPERABLE. The electrical power systems (AC and DC power sources, inverters, and AC and DC electrical distribution systems) are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded. The OPERABILITY of both trains of the electrical power systems in MODES 1, 2, 3, and 4 ensures the availability of the required power to shut down the reactor and to maintain it in a safe shutdown condition after an AOO or a postulated DBA. Requiring both trains to be OPERABLE ensures that at least one train of the electrical power systems is OPERABLE during accident conditions in the event of an assumed loss of all offsite power or all onsite AC power and a worst-case single failure.

To satisfy the OPERABILITY requirements, all emergency buses must be energized. The required operable power sources for the emergency buses include two physically independent circuits between the offsite transmission network and the onsite Class 1E electrical distribution system and two separate and independent diesel generators. A circuit between the offsite transmission network and the onsite Class 1E electrical distribution system consists of a line from the switchyard to an emergency bus. The switchyard is considered to be part of the offsite transmission network.

3.3.4.2 Electrical Power Systems - Shutdown

During MODES 5 and 6 and during movement of irradiated fuel assemblies, the required OPERABLE portions of the electrical power systems are reduced to those necessary to support equipment required to be OPERABLE in those MODES. Maintaining these electrical subsystems and components available ensures the availability of sufficient power to operate the unit in a safe manner to mitigate the consequences of postulated events during shutdown conditions and the availability of instrumentation and control capability for monitoring and maintaining the unit in a cold shutdown condition or refueling condition. To support these capabilities, the required OPERABLE AC sources are reduced to one qualified offsite circuit and one diesel generator.

3.3.4.3 Diesel Support Systems

Sufficient stored diesel fuel oil and lubricating oil and a sufficiently charged diesel air start subsystem support diesel generator OPERABILITY. The required stored fuel oil and lubricating oil inventories for each diesel generator support seven days of full-load operation of the generator. The required starting air receiver pressure supports five successive diesel generator start attempts.

3.3.4.4 Battery Cell Parameters

Maintaining the battery cell parameters within the specified limits ensures the availability of the required DC power sources.

3.3.5 Refueling Operations

3.3.5.1 Boron Concentration and Unborated Water Isolation Valves

The limit on the boron concentrations of the RCS, the refueling canal, and the refueling cavity in MODE 6 prevents an inadvertent criticality by ensuring that the core k_{eff} remains ≤ 0.95 during fuel handling operations. The boron concentration limit is specified in the Core Operating Limits Report (COLR).

The LCO requiring that all unborated water sources be isolated from the RCS in MODE 6 prevents an unplanned boron dilution and the corresponding increase in core reactivity. With this requirement, a safety analysis for an uncontrolled boron dilution accident in MODE 6 is not required.

3.3.5.2 Nuclear Instrumentation

The required OPERABILITY of two source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in core reactivity. These monitors can alert the operator to abnormal conditions such as an improperly loaded fuel assembly. In MODE 6, there are no other direct means available for checking core reactivity.

3.3.5.3 Containment Penetrations

The LCO requiring containment penetration closure limits the potential escape paths for fission product radioactivity released within containment during a fuel handling accident. The containment penetrations treated by this LCO include the equipment hatch, the air locks, and ventilation penetrations providing direct access from the containment atmosphere to the outside atmosphere.

3.3.5.4 Residual Heat Removal and Coolant Circulation

One RHR loop is required to be in operation during MODE 6 to provide adequate decay heat removal and adequate mixing of borated coolant to minimize the possibility of criticality. With a water level of at least 23 ft above the top of the reactor vessel flange, only one RHR loop is required to be OPERABLE, because the volume of water above the vessel flange provides backup decay heat removal capability. Without a sufficient water volume above the vessel flange, a second RHR loop must be OPERABLE as a backup to the operating loop.

3.3.5.5 Refueling Cavity Water Level

The minimum required refueling cavity water level of 23 ft above the reactor vessel flange provides sufficient water to substantially retain the iodine fission product activity during a fuel handling accident. The minimum required water level allows a decontamination factor of 100 for iodine to be used in the fuel handling accident analysis and limits the offsite doses from the accident to less than 25% of the 10 CFR 100 limits.

3.3.6 Design Features

Design features are those features of the facility, such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety, and which are not covered by the technical specification sections devoted to safety limits, limiting safety system settings, LCOs, and surveillance requirements. Design features include the plant site, reactor core components, and fuel storage.

The reactor core contains 193 fuel assemblies, each of which contains uranium dioxide fuel rods clad with Zircaloy or ZIRLO. The reactor contains 53 control rod assemblies, which are composed of a silver-indium-cadmium alloy or hafnium.

Fuel storage facilities provide for the storage of new and irradiated fuel assemblies. The spent fuel storage racks are designed for a k_{eff} of less than 0.95 when flooded with unborated water. The spent fuel storage racks contain two sections: low density fuel storage racks with a nominal 10.5-in. center-to-center distance between fuel assemblies, and high density fuel storage racks with a nominal 9.15-in. center-to-center distance between fuel assemblies. The storage capacity of the spent fuel storage pool is 3006 fuel assemblies. The pool is designed to prevent draining below a height that maintains sufficient coverage of the fuel assemblies for cooling and limiting radiation exposure.

New fuel storage racks are designed for the storage of fuel assemblies enriched to 4.65 weight percent in U-235. A nominal center-to-center spacing of 21 in. ensures that a K_{eff} of 0.95 is not exceeded with the storage pit filled with unborated water.

3.3.7 Administrative Controls

Administrative controls are the provisions relating to organization and management, procedures, records, review and audit, and reporting necessary to assure operation of the facility in a safe manner. The administrative controls section includes requirements in the following areas.

3.3.7.1 Responsibility, Organization, and Staffing

The responsibility subsection of the administrative controls dictates that the Plant Superintendent is responsible for overall unit operation and that the Shift Supervisor is responsible for the control room command function.

The organization subsection states that lines of authority, responsibility, and communication are required in the form of organizational charts, functional descriptions of departments, and job descriptions of key personnel. These requirements are to be documented in the FSAR. This subsection also includes requirements pertaining to the minimum shift crew composition, absence of crew members, limits on overtime, and the presence and duties of certain key personnel.

The unit staff qualifications subsection provides the minimum qualifications for staff members.

3.3.7.2 Procedures and Programs

Procedures required to be established, implemented, and maintained include procedures recommended in Appendix A of Regulatory Guide 1.33 (administrative, general normal operating, system normal operating, off-normal, emergency, and radiological control procedures), emergency operating procedures required to implement the requirements of NUREG-0737 and its supplement, quality assurance procedures for effluent and environmental monitoring, procedures for implementation of the Fire Protection Program, and procedures for all programs specified in the administrative controls.

The following list provides brief descriptions of some of the more important programs required by the administrative controls:

- Offsite Dose Calculation Manual (ODCM): The ODCM contains the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program. The ODCM also contains radioactive effluent controls and radiological environmental monitoring activities.

- Radioactive Effluent Controls Program: This program conforms to 10 CFR 50.36a for the control of radioactive effluents and for maintaining doses to the public from radioactive effluents as low as reasonably achievable. This program includes limits on the capability of monitoring instrumentation, limits on concentrations of radioactive material in effluent releases, limits on doses to the public from releases beyond the site boundary, and requirements for the capability and use of effluent treatment systems.

- Component Cyclic or Transient Limit Program: This program provides controls for tracking cyclic and transient events to ensure that components are operated within the design limits provided in the FSAR.

- Pre-Stressed Concrete Containment Tendon Surveillance Program: This program provides controls for monitoring tendon degradation and the effectiveness of the corrosion protection medium for the tendons. Verification of containment structural integrity through performance of tendon surveillances supports containment OPERABILITY.

- Inservice Testing Program: This program provides controls for inservice testing of ASME Code Class 1, 2, and 3 components. The program includes requirements for testing frequencies.

- Steam Generator Program: Verification of tube integrity through performance of this program provides assurance that excessive tube leakage or catastrophic tube failure will not result from steam generator operation.
- Secondary Water Chemistry Program: This program provides controls for monitoring secondary water chemistry to inhibit steam generator tube degradation.
- Ventilation Filter Testing Program: This program ensures that filters perform as assumed in safety analyses.
- Explosive Gas and Storage Tank Radioactivity Monitoring Program: This program includes controls for potentially explosive gas mixtures contained in the gaseous waste processing system and for the quantities of radioactivity contained in gas and liquid storage tanks.
- Safety Function Determination Program: This program provides requirements for determining whether a loss of safety function exists when LCO 3.0.6 is entered and for other appropriate actions to be taken as a result of the support system inoperability and the corresponding exception to entering the conditions and required actions for the supported systems.
- Containment Leakage Rate Testing Program: This program implements leakage rate testing of the containment, including testing of the air locks, in accordance with NRC requirements. Verification of containment leak tightness through performance of this program supports containment OPERABILITY.

Some of these programs contain requirements which were included in LCOs and surveillance requirements in earlier versions of the technical specifications. For example, the Radioactive Effluent Controls Program and the Explosive Gas and Storage Tank Radioactivity Monitoring Program contain many of the requirements formerly included in LCOs for radioactive effluents and radiological environmental monitoring.

3.3.7.3 Reports

Also required by the administrative controls section are a variety of routine reports to the NRC. Many of the reports provide information determined through the performance of the programs described above.

One important report is the Core Operating Limits Report. The COLR is a plant-specific document that provides core operating limits for the current reload cycle. The COLR shifts the numerical limits associated with several LCOs to a separate document, thereby eliminating the need to submit a technical specification amendment for each core reload. The COLR affects the LCOs for control rod insertion limits, AXIAL FLUX DIFFERENCE, heat flux hot channel factor, nuclear enthalpy rise hot channel factor, moderator temperature coefficient, and refueling boron concentration. Plants which do not issue COLRs must continue to submit technical specification amendments.

A report similar to the COLR is the Pressure and Temperature Limits Report (PTLR). The PTLR provides RCS pressure and temperature limits as well as RCS heatup and cooldown rate limits. The PTLR also provides the low temperature overpressure protection system lift settings for the pressurizer power-operated relief valves. The limits provided in this report change as the reactor vessel material toughness decreases due to neutron embrittlement, so the PTLR is updated and provided to the NRC for each reactor vessel fluence period. Updating the PTLR eliminates the need to submit technical specification amendments to incorporate new limits in the associated RCS LCOs.

3.3.8 Deviations From Technical Specifications

The NRC's final rule on the applicability of license conditions and technical specifications in an emergency is stated in 10 CFR 50.54(x). This rule states, "A licensee may take reasonable action that departs from a license condition or a technical specification (contained in a license issued under this part) in an emergency when this action is immediately needed to protect the public health and safety and no action consistent with license conditions and technical specifications that can provide adequate or equivalent protection is immediately apparent."

Unanticipated circumstances may occur during emergencies. These circumstances may require responses different from any considered by technical specifications during the course of licensing. These circumstances may not have been anticipated by the emergency procedures and may arise during emergencies involving multiple equipment failures or coincident accidents, in which procedures could be in conflict. The rule applies to those emergency situations where action is required immediately to protect the public and not to situations in which time allows for NRC amendments to licensee technical specifications.

10 CFR 50.72 requires that a licensee notify the NRC as soon as practical and within one hour of a deviation from technical specifications authorized by 10 CFR 50.54(x).

The language of the rule is permissive in nature. However, a licensee is responsible for operating its facility in such a manner as to protect the public health and safety. If, in an emergency, protective action is needed and no action consistent with the license that can provide adequate or equivalent protection is immediately apparent, the licensee is obligated to take the protective action that deviates from the license.

3.3.9 Exercises

Exercise 1

At 1:00 p.m. on May 15, with the unit at 3% power during a power ascension, two train A containment air cooler fans fail. Containment cooling train A is declared inoperable. It is later determined that the fans have failed due to excessive bearing wear. At 2:00 p.m. on May 19, with the unit at 45% power, a small leak from containment spray train B near the pump is discovered, and the train is declared inoperable. At 11 p.m. on May 19 (critical events curiously happen on the hour at this plant), with the unit still at 45% power, one of the air cooler fans is fixed, and containment cooling train A is declared operable.

1. Determine the LCO conditions and required actions which have been entered during this time period.
2. Determine whether the licensee has complied with all technical specification requirements.

Exercise 2

Suspicious of mistakes during recent bench testing of the MSSVs, a member of the plant maintenance staff consults the test records and finds that the following lift settings were verified for the tested valves:

MSSV	Lift Setting (psig)
PSV-2232	1245
PSV-2234	1260
PSV-2255	1240
PSV-2275	1270

Assume no adjustments were made and the valves were reinstalled.

The unit is operating at 87% power. State the actions to be taken in accordance with technical specification requirements.

Exercise 3

With the unit operating at 30% power, service water booster pump P-148B trips, and booster pump P-148D automatically starts (both pumps are train B pumps). Minutes later, pump P-148D also trips. It is determined that an improperly performed maintenance requirement has rendered both pumps inoperable.

Additionally, at the time both pumps are declared inoperable, the A train safety injection pump has been inoperable for 24 hours. Assume the required actions associated with the inoperable A train safety injection pump were in progress.

State the actions to be taken in accordance with technical specification requirements.

Exercise 4

During operation at 100% power, the normal supply breaker for bus #A1 opens. The A Emergency diesel generator started and loaded, as designed. The cause of the event is determined to be a faulty breaker. State the actions to be taken in accordance with technical specification requirements.

Exercise 5

During operation at 100% power, a power line problem results in the opening of a switchyard disconnect to the Rivergate substation. State the actions to be taken in accordance with technical specification requirements.

Exercise 6

During a refueling operation, an instrumentation and control technician requests permission from the shift supervisor to perform a retrofit modification to the power range nuclear instruments. To accomplish this change he will have to remove the instrument power fuses for all four power range instruments at the same time. (Hint: Removing the instrument power fuses from a power range instrument trips all bistables associated with that instrument.) Determine whether the shift supervisor should give permission for this work, and explain.

TECHNICAL SPECIFICATIONS UNIT 3 - EXERCISE 1 SOLUTION

1. Determine the LCO conditions and required actions which have been entered during this time period.

When containment cooling train A is declared inoperable, condition C of LCO 3.6.6 is entered. Required action C.1 requires restoration of the train to OPERABLE status within 7 days. When containment spray train B is declared inoperable, condition A LCO 3.6.6 is also entered. The required actions of condition A are the most restrictive. According to the basis for LCO 3.0.3.b, if a combination of conditions that exactly corresponds to the actual condition of the unit can be found, LCO 3.0.3 does not apply. If a combination of conditions warrants 3.0.3 entry, this will be specified in another condition (as in condition F of LCO 3.6.6.

2. Determine whether the licensee has complied with all technical specification requirements.

The required actions of conditions A and C have been met.

However, the unit made a transition from MODE 2 to MODE 1 at some point between May 15 and May 19. During this time LCO 3.6.6 was not satisfied. LCO 3.0.4 would only allow such a transition if performed in accordance with LCO 3.0.4.b. The mode change may have been acceptable.

TECHNICAL SPECIFICATIONS UNIT 3 - EXERCISE 2 SOLUTION

State the actions to be taken in accordance with technical specification requirements.

The MSSVs are required to have lift settings as specified in Table 3.7.1-2. The minimum and maximum allowable lift settings for the recently tested valves are as follows:

MSSV	Min. Lift Setting (psig)	Max. Lift Setting (psig)
PSV-2232	1164	1236
PSV-2234	1184	1256
PSV-2255	1194	1266
PSV-2275	1194	1266

The as-tested lift settings for PSV-2232, PSV-2234, and PSV-2275 exceed the maximum allowable lift settings. Condition B of LCO 3.7.1 applies. For 3 OPERABLE MSSVs per steam generator (PSV-2232 and PSV-2234 are on the same steam generator), a power reduction to ≤ 46% RTP is required within 4 hours, and a reduction of the power range neutron flux - high trip setpoint to ≤ 46% RTP is required within 36 hours.

TECHNICAL SPECIFICATIONS UNIT 3 - EXERCISE 3 SOLUTION

State the actions to be taken in accordance with technical specifications.

The basis for LCO 3.7.8 (service water system) states that an OPERABLE service water train has at least 1 OPERABLE service water booster pump. Since both of its booster pumps are inoperable, service water train B is inoperable, necessitating entry into condition A of LCO 3.7.8. Required action A.1 requires restoration of the train to OPERABLE status within 72 hours. Note 1 of required action A.1 requires that the applicable conditions and required actions of LCO 3.8.1 be entered for the diesel generator (B) made inoperable by inoperable service water train B.

Based on Required Action B.2 of LCO 3.8.1, the B train safety injection pump must be declared inoperable within 4 hours because the A train safety injection pump was already inoperable when the B train service water system was declared inoperable. This will require application of condition C of LCO 3.5.2.

If neither the service water train nor the SI pump are restored, it will be necessary to enter LCO 3.0.3 within 4 hours of the service water inoperability.

TECHNICAL SPECIFICATIONS UNIT 3 - EXERCISE 4 SOLUTION

State the actions to be taken in accordance with technical specification requirements.

Two qualified circuits between the offsite transmission network and the onsite Class 1E AC electrical power distribution system no longer exist (there is no circuit between offsite and the A train of the Class 1E system). Condition A of LCO 3.8.1 applies; the required actions associated with this condition must be taken. The circuit must be restored within 72 hours (required action A.3). Also, the inoperable offsite circuit necessitates declaring supported features inoperable if opposite-train redundant features are inoperable (required action A.2).

State the actions to be taken in accordance with technical specification requirements.

Although one of the connections between the switchyard and the utility's electrical grid has been lost, two qualified circuits between the offsite transmission network and the onsite Class 1E AC electrical power distribution system continue to exist (the switchyard is considered part of the offsite transmission network). LCO 3.8.1 is satisfied; no actions are required by the technical specifications.

Determine whether the shift supervisor should give permission for this work, and explain.

Removing the instrument power fuses from each power range instrument causes all of its associated bistables to trip, including the P-10 permissive bistable. If the instrument power fuses are removed from all four power range instruments simultaneously, then all four P-10 bistables will be tripped, and the two-out-of-four coincidence for the permissive will be satisfied. One of the functions of P-10 is the de-energization of both source range nuclear instruments. This would render both instruments inoperable (without power, they are obviously incapable of monitoring core reactivity) and require entry into conditions A and B of LCO 3.9.3. The shift supervisor should not give permission for this work; he should permit de-energizing only one power range instrument at a time.