General Electric Advanced Technology Manual

Chapter 4.13

Operability

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4.13 OPERABILITY

Learning Objectives:

1. Recognize what is meant by the following terms in regard to the operability determination process:
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   c. Specified Function (TS and/or CLB) including Mission Time
   d. Reasonable Expectation
   e. Support and Supported System
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2. Recognize what conditions would require an operability or functionality determination to be conducted and the steps in the determination process needed to evaluate and resolve the condition.

3. Recognize how unavailability and unreliability of Maintenance Rule systems are used to evaluate system performance and on-line/shutdown risk.

4. Recognize how unavailability and unreliability of specified systems are used in the NRC Performance Indicators to assess licensee performance.

4.13.1 Introduction

An inspector in the field will often become aware of issues involving equipment condition or quality. It is important for an inspector to know how such equipment issues affect important safety functions and regulatory requirements such as technical specifications and the maintenance rule. In this chapter, several commonly used methods of classifying plant structures, systems, and components (SSC's) will be discussed as well as the how that classification normally relates to functions specified in a plant's current licensing basis, technical specifications, maintenance rule and/or NRC performance indicators.

4.13.2 Classification of Plant Equipment

A nuclear power plant consists of many thousands of valves, instruments, components, etc. While all of this equipment is of concern to the licensee, only a subset of this is of regulatory concern to the NRC. This subset of plant components is normally specified in

the Updated Final Safety Analysis Report (UFSAR) as the basis for the licensing of the plant and will be referred to in this chapter as the plant's structures, systems, and components (SSC's).

4.13.2.1 Structures, Systems, and Components

Before a plant is licensed, it submits a safety analysis report to the NRC documenting the design features of the plant that ensure safe operation. The structures, systems, and components (SSC's) described in this report form, in part, the design basis for the plant and must be maintained and updated throughout the life of the plant. These SSC's are required to perform various functions. Some of these functions are directly related to safe operations. Some support the functioning of other SSC's and some are simply required not to interfere with a safety function. Because this report forms the basis for licensing the plant, it is part of what is generally referred to as the current licensing basis (CLB).

4.13.2.2 Current Licensing Basis

The CLB is the set of NRC requirements applicable to a specific plant, plus a licensee's docketed and currently effective written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis, including all modifications and additions to such commitments over the life of the facility operating license.

The set of NRC requirements applicable to a specific plant CLB include:

- NRC regulations in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 54, 55, 70, 72, 73, and 100 and appendices thereto
- Commission orders
- license conditions
- exemptions
- technical specifications
- plant-specific design basis information defined in 10 CFR 50.2 and documented in the most recent UFSAR (as required by 10 CFR 50.71)
- licensee commitments remaining in effect that were made in docketed licensing correspondence (such as licensee responses to NRC bulletins, Licensee Event Reports, generic letters, and enforcement actions)
- licensee commitments documented in NRC safety evaluations

SSC's may have one or more functions as defined by the CLB. For example, the reactor water cleanup system may have a safety function to isolate a containment penetration on high room temperature and a maintenance rule function to maintain primary water chemistry parameters within limits. The actual details of these functions are plant

specific and inspectors should familiarize themselves with key CLB documents for the plant to which they are assigned. This is important, as when a condition affecting the performance of an SSC is discovered, the inspector must determine if functions defined in the CLB are maintained and verify that the licensee takes appropriate action to protect public health and safety.

4.13.2.3 Safety-Related

One of the most common classifications of SSC's is the term safety-related. Though specific definitions vary throughout the industry, 10 CFR 50.2 defines safety-related SSC's as:

> *…those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:*
>
> *The integrity of the reactor coolant pressure boundary*
>
> *The capability to shut down the reactor and maintain it in a safe shutdown condition; or*
>
> *The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in § 50.34(a)(1) or § 100.11 of this chapter, as applicable.*

Thus, a subset of SSC's described in the UFSAR is normally considered safety-related and requires additional programs and procedures to ensure their functional capabilities and maintain their quality. This chapter will not discuss quality assurance (QA) programs in detail, but an inspector may find it useful to review a licensee's QA program and the SSC's scoped under 10 CFR 50 Appendix B for insight into a particular plant's SSC classification scheme. Additionally, many plants will provide details of component classifications in the UFSAR or a licensee specific procedure.

4.13.2.4 Important to Safety

Another commonly used term is "Important to Safety". The term is used in regulations (e.g., 10CFR50 Appendix A, 10CFR50.49, 10CFR50.59) to denote equipment that is relied on to ensure safe operation of the plant of which Safety-Related equipment is a subset.

General Design Criteria 1 requires that structures systems and components *important to safety* shall be designed, fabricated, erected and tested to quality standards commensurate with the importance of the safety functions to be performed. Generic Letter 84-01 was issued to clarify the use of the term. It states that "important to safety"

and "safety-related" are not synonymous terms as used in Commission regulations applicable to nuclear power reactors. The Quality Assurance program described in 10CFR50 Appendix B applies to only Safety Related equipment. Normal industry practice is generally acceptable for most equipment not covered by Appendix B. Nevertheless, in specific situations in the past where the Staff has found that quality assurance requirements beyond normal industry practice were needed for equipment "important to safety," they have not hesitated in imposing additional requirements commensurate with the importance to safety of the equipment involved. Specific examples where the NRC has imposed additional quality requirements include Fire Protection, ATWS, SBO and RG 1.97 post-accident monitoring instrumentation.

10CFR50.59 requires the licensee to evaluate malfunctions of equipment important to safety. The licensee must address not only safety-related equipment, but also other equipment that may be relied upon such that safety-related equipment performs its intended functions and equipment that can initiate accidents and transients. Generally, the equipment important to safety for a particular plant is determined as part of the licensing reviews and the malfunctions are evaluated in the FSAR to the extent that they affect plant safety.

10 CFR 50.49 defines “important to safety” in terms of the environmental qualification of electric equipment as encompassing safety-related components, non-safety related components whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions, and certain post accident monitoring equipment.

4.13.2.5 Engineered Safety Features

Standard Review Plan, NUREG-0800, Chapter 6 states that engineered safety features (ESF) are provided in nuclear plants to mitigate the consequences of design-basis or loss-of-coolant accidents. 10 CFR Part 50 requires that certain systems be provided to serve as ESF systems. Examples of typical ESF systems include containment systems, residual heat removal systems, emergency core cooling systems, containment heat removal systems, containment atmosphere cleanup systems, and certain cooling water systems.

While it is important to be familiar with the above terminology, an inspector should focus on how the licensee uses an SSC to meet regulatory requirements. That is, if an SSC performs a specific safety function or some other function specified in the regulations, it is the capability of that SSC to perform that function or the actions taken by the licensee following a loss or degradation of that function, which should be assessed.

4.13.3 Operability

The Improved Standard Technical Specifications define OPERABLE/OPERABLITY as:

> *A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).*

Additionally, to be operable an SSC must be capable of performing the safety functions specified by its design, within the required range of design physical conditions, initiation times, and mission times and meet all surveillance requirements (SR). An SSC that does not meet a SR function must be declared inoperable. For operability determination purposes, the mission time is the duration of SSC operation that is credited in the design basis for the SSC to perform its specified safety function. Operability applies to the subset of SSC's detailed by a specific plant's technical specifications (TS). Thus, the term operability will only be applied to the ability of TS equipment to perform its specified safety function.

4.13.3.1 Technical Specification Equipment

10 CFR 50.36 details the regulatory requirements for technical specifications (TS). They are to be derived from the UFSAR and include:

Safety limits - limits upon important process variables that protect against the uncontrolled release of radioactivity. If any safety limit is exceeded, the reactor must be shut down.

Limiting safety system setting - settings for automatic protective devices having significant safety functions. A limiting safety system must cause automatic protective action before a safety limit is exceeded. If an automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor.

Limiting conditions for operation – specify the lowest functional capability or performance levels of equipment required for safe operation. When a limiting condition for operation is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met. A technical specification limiting condition for operation must be established for each item meeting one or more of the following criteria:

Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.
Surveillance requirements - requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

Administrative controls - the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure operation of the facility in a safe manner.

4.13.3.2 Technical Specification Support and Supported Equipment

From the definition of OPERABLE in the Technical Specification, a TS SSC must have "all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function". The SSC's that perform important support functions for TS SSC's are known as "support" systems and the TS SSCs that rely on the support systems are called "supported" systems.

If a support system is specifically addressed in the Technical Specifications, LCO 3.0.6 normally will only require the utility to take the required actions for the support system and avoid having to take the required actions for the supported system (see Chapter 3.0, Technical Specifications, for additional detail). An example would be if an emergency diesel generator becomes inoperable, only the required actions for the diesel must be taken and the required actions for the low pressure injection or spray systems supported by the diesel, do not normally have to be taken.

If a TS SSC support system is not specifically addressed in the technical specifications and it becomes incapable of performing its support function, then the operability of the TS supported system must be determined. Thus, the functionality (discussed below) of non-TS support systems can directly affect the operability of TS systems.

4.13.4 Functionality

An SSC is functional or has functionality when it is capable of performing its specified function, as set forth in the CLB. Functionality does not apply to specified safety functions, but does apply to the ability of non-TS SSCs to perform other specified functions that have a necessary support function. Specified functions may be described in various elements of the CLB including the Updated Final Safety Analysis Report (UFSAR), technical requirements manual, emergency plan, fire protection plan, or various regulatory commitments.

4.13.5 Availability and Reliability

Availability is a measure of the time that a system has not been removed from service for maintenance such that it can perform its monitored function. Unavailability therefore, is ratio of the hours that a train or system has been removed from service to the hours it is relied upon by the CLB to perform that function. Unlike operability and functionality that only deals with the current capability of the system, availability track the cumulative time a system is unavailable for a period of time up to three years in some cases.

Reliability is a measure of the ability of a SSC to perform its specified function when called upon to do so. Even if a SSC is available, it can fail upon demand to start, to load (for a diesel generator) or to run. Unreliability then is the probability that a SSC would not perform its function (i.e., would fail) when called upon to do so.

Availability and reliability are other terms, like operability or functionality, used to designate the ability of an SSC to perform certain functions. They are normally defined by the licensee in reference to the requirements of a given program. For example, just as operability refers to the capability of an SSC to perform a TS required safety-function, availability/reliability refers to the capability of an SSC to perform a specific function as defined by the maintenance rule or performance indicators programs. Additionally, while operability is deterministic, availability is often determined using “real world” or best estimate conditions. Thus, if it is more likely than not that the system can perform its function; it will often be considered available, even when the TSs may require it to be declared inoperable. As an example, in many plants it is standard practice after diesel maintenance to declare the diesel available when maintenance tags have been cleared even though it can not be declared operable until after a successfully TS surveillance test. Another example would be when a TS SSC is declared inoperable due to removal of a barrier (e.g., missile protection, flood protection or fire barrier), but

the system may still be considered available even though it does not meet all its design bases.

The term “available” is unfortunately sometimes used in a deterministic fashion in technical specifications as well. In this case, it usually means “available for use, but not necessarily running”. For example, the section 3.4.9 in the BWR/4 standard technical specifications required action A.1 discusses verifying an alternate method of decay heat removal is available. In this case, “available” refers to a non-TS system that is capable of removing enough decay heat to maintain or lower reactor coolant temperature and can be placed in service if required. In this chapter, the term “available” will be used in reference to licensee maintenance rule and performance indicator programs.

4.13.5.1 Maintenance Effectiveness - 10CFR50.65(a)(1) and (a)(2)

10CFR50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", was developed to ensure that maintenance practices are adequate to ensure there is a reasonable assurance that specific SSCs are capable of fulfilling their intended functions. It is commonly referred to as the “Maintenance Rule (MR)”. Systems within the scope of the maintenance rule not only include safety related systems, but non-safety systems that function to mitigate an accident or transient, that are relied upon in the stations emergency operating procedures, that provide a support function to safety related equipment, or the failure of which could cause a scram or actuate a safety related system.

These identified systems within the scope of the Maintenance Rule are then evaluated using the plants PRA model to determine whether they are risk significant or not. Performance criteria is then developed that establishes the threshold to determine if the current maintenance practices are adequate to assure the system can perform its maintenance rule function when called upon to do so. For non-risk significant systems the performance criteria may be at the plant level (e.g., number of plant trips per year of operation caused by a failure in that system). Risk significant systems may track availability and/or reliability on a system, train or component level. Note that when a failure occurs, the unreliability (e.g., failure to start) is tracked and also the unavailability clock starts and unavailability hours will accrue, until the condition is corrected.

The maintenance rule (MR), 10 CFR 50.65 a(1) & a(2), requires that the licensee monitor SSC’s that perform certain intended functions and to take corrective action when needed to improve performance. If a system’s performance is adequate as demonstrated by meeting the performance criteria it is known as an (a)(2) system and no changes are required. If a system’s performance does not meet the performance criteria additional performance goal setting and monitoring is required and the system is placed in (a)(1) status. The system will remain in (a)(1) status until corrective actions are taken and performance returns to an acceptable level.

Each utility develops a Maintenance Rule Implementation guidance document which lists the systems within the scope of the rule, the specific MR functions that are tracked by the program and the associated performance criteria for each function. The program oversight is provided by the Maintenance Rule Expert Panel which includes members from Engineering, Maintenance and Operations Departments.

As part of the Reactor Oversight Program baseline inspections, resident inspectors inspect the maintenance rule program per Inspection Procedure IP 71111.12, Maintenance Effectiveness. It is important that inspectors are familiar with the program to determine which systems are within the scope of the program, that availability and reliability are appropriately determined and tracked, and that the implementation of the program complies with the regulation.

4.13.5.2 Maintenance Risk Assessment - 10CFR50.65(a)(4)

10 CFR 50.65 a(4) requires the licensee to assess and manage risk for a subset of these SSC's (and their intended functions) that have been shown via a risk-informed evaluation to be significant to public health and safety (i.e., risk significant). This risk assessment is required for both on-line maintenance and for outage periods as well.

For on-line risk assessment, many plants implement this requirement by tracking the availability of SSC's using an on-line risk model. This model tracks incremental changes in plant core damage probability (iCDP) when systems are unavailable and calculates how changes in risk significant SSC's affect the iCDP. Since most utilities do not have a shutdown PRA, outage risk is evaluated with a more deterministic approach. For example, if there are 5 redundant systems to makeup inventory to the RPV, the utility may increase the risk if one or more of these systems are unavailable. The risk for planned maintenance activities is evaluated prior to the maintenance and must be updated for any emergent equipment issues or based on external threats (e.g., tornado warning).

If the plant configuration (i.e., equipment unavailable during a specific period) causes risk to rise above a certain predefined level, the licensee will take risk management actions (RMAs) to minimize the risk. Most utilities assign a risk "color" to help alert the organization to an elevated risk situation (e.g., risk is Green if normal maintenance actions are adequate and Yellow, Orange or Red depending on the level of risk or extent that RMAs that need to be implemented). Risk management actions can include protecting redundant equipment, rescheduling certain maintenance activities, conducting more detailed pre-job briefings, assigning additional resources and oversight during the maintenance period and/or developing contingency actions and assigning responsibilities to specific individuals during the maintenance.

As part of the Reactor Oversight Program baseline inspections, resident inspectors inspect how the utility assesses and manages risk per Inspection Procedure IP 71111.13, Maintenance Risk Assessment. It is important that inspectors are familiar with the program to determine which systems are within the scope of the program, that the risk is appropriately determined and that risk management actions are implemented if needed to manage the risk.

4.13.5.3 NRC Performance Indicators

Performance indicators (PI's) are used by the reactor oversight process (ROP) to assess licensee performance. The Mitigating Systems Performance Indicator (MSPI) tracks the availability and reliability of specific SSC's and specific functions for those systems. MSPI availability, in some cases, is different than the MR availability for the same SSC. This, in part, may be due to a difference in scope or definition between the MSPI required functions and the MR intended functions. For example, the function monitored by the MSPI for decay heat removal is limited to suppression pool cooling where as the maintenance rule functions that are monitored for the RHR system would typically include LPCI injection and shutdown cooling in addition to SP cooling. In addition, the MSPI only tracks unavailability during critical hours where as the maintenance rule will track unavailability anytime the system is required to function. Therefore the unavailability for the high pressure coolant injection system may be different between these programs because the maintenance rule will require the system to be available any time RPV pressure is greater than 150 psig, while MSPI only tracks unavailability while the reactor is critical. The MSPI compares the core damage frequency (CDF) calculated by using the actual unavailability and unreliability values of the system to the CDF resulting from using the unavailability and unreliability values assumed in the station's PRA. When the difference in CDF exceeds specific thresholds, the indicator will change from Green to a higher classification (e.g., White, Yellow or Red).

Another NRC performance indicator is Safety System Functional Failures. This indicator counts the number of times a safety function is lost during the preceding year. This PI only counts loss of a safety function on the system level. Therefore the failure of a single train in a two-train system would not count while the unplanned failure of the single-train HPCI system does count against the indicator.

NRC inspectors periodically review PI data for accuracy per IP 71151, Performance Indicator Verification. They should review and understand the specific requirements for the PIs reviewed, including how availability and reliability are determined and tracked.

4.13.6 Resolution of Degraded or Non-conforming Conditions

One of the major benefits of in-field inspection, is the ability to observe and assess the condition of plant SSC's. When a condition is discovered that may affect the capability of an SSC to perform its defined function or functions, the licensee must take appropriate action to protect public health and safety. Part of this assessment will be to identify what functions (TS, TS-support, EP, Fire protection, MR, etc.) the SSC provides and whether the SSC can be considered operable, functional, or available to support these function.

The current guidance to NRC inspectors to assist in their review of licensee determinations of operability and resolution of degraded or nonconforming conditions is contained in NRC Inspection Manual Chapter 0326, "Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety". The remainder of this section describes the process for resolving degraded or non-conforming conditions contained in the Inspection Manual Chapter. Figure 4.13-1 illustrates that process.

Previous guidance was provided to the NRC and the industry under Generic Letter 91-18, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions". The Generic Letter has been superseded, but the term "GL 91-18 issue" is still used to describe degraded and non-conforming conditions throughout the industry.

4.13.6.1 Definitions

The current inspection manual chapter includes definitions for terms already discussed in this chapter including Current Licensing Bases, Operability and Functionality. It also defines other terms including:

Non-conforming Condition

A nonconforming condition is a condition of an SSC that involves a failure to meet the CLB or a situation in which quality has been reduced because of factors such as improper design, testing, construction, or modification.

The following are examples of nonconforming conditions:

a. An SSC fails to conform to one or more applicable codes or standards (e.g., the CFR, operating license, TSs, UFSAR, and/or licensee commitments).
b. An as-built or as-modified SSC does not meet the CLB.
c. Operating experience or engineering reviews identify a design inadequacy.
d. Documentation required by NRC requirements such as 10 CFR 50.49 is unavailable or deficient.

Degraded Condition

A degraded condition is one in which the qualification of an SSC or its functional capability is reduced. Examples of degraded conditions are failures, malfunctions, deficiencies, deviations, and defective material and equipment. Examples of conditions that can reduce the capability of a system are aging, erosion, corrosion, improper operation, and maintenance.

Fully Qualified

An SSC is fully qualified when it conforms to all aspects of its CLB, including all applicable codes and standards, design criteria, safety analyses assumptions and specifications, and licensing commitments. An SSC is considered “not fully qualified,” i.e., degraded or nonconforming, when it does not conform to all aspects of its CLB, including all applicable codes and standards, design criteria, safety analyses assumptions and specifications, and licensing commitments.

The SSCs that TS require to be operable are designed and operated, as described in the CLB, with design margins and engineering margins of safety to ensure, among other things, that some loss of quality does not result in immediate failure to meet a specified function. The CLB includes commitments to specific codes and standards, design criteria, and some regulations that also dictate margins. Many licensees add conservatism so that a partial loss of quality does not affect their commitments for design and operational margin. Loss of conservatism that is not credited in the CLB does not affect operability or functionality.

Unanalyzed Condition

Although not specifically defined in the IMC 0326, the term is used in the document. An unanalyzed condition is a condition which has not been considered or analyzed per the UFSAR or other portion of the CLB and thus its impact on public health and safety has not been determined. Some examples of unanalyzed conditions include: a fire barrier relied on in the safe shutdown analysis is not installed, an assumption used in ECCS analysis was non-conservative or incorrect, interconnecting floor drains were not considered in the internal flooding analysis, and a fuel assembly was loaded into the core at an unintended location.

Reasonable Expectation

The discovery of a degraded or nonconforming condition may call the operability of one or more SSCs into question. A subsequent determination of operability should be based on the licensee’s “reasonable expectation,” from the evidence collected, that the SSCs

are operable and that the operability determination will support that expectation. Reasonable expectation does not mean absolute assurance that the SSCs are operable. The SSCs may be considered operable when there is evidence that the possibility of failure of an SSC has increased, but not to the point of eroding confidence in the reasonable expectation that the SSC remains operable. The supporting basis for the reasonable expectation of SSC operability should provide a high degree of confidence that the SSCs remain operable. It should be noted that the standard of "reasonable expectation" is a high standard, and that there is no such thing as an indeterminate state of operability; an SSC is either operable or inoperable.

Specified Function/Specified Safety Function

The specified function(s) of the system, subsystem, train, component or device is that specified safety function(s) in the CLB for the facility. In addition to providing the specified safety function, a system is expected to perform as designed, tested and maintained. When system capability is degraded to a point where it cannot perform with reasonable expectation or reliability, the system should be judged inoperable, even if at this instantaneous point in time the system could provide the specified safety function.

4.13.6.2 Continuous Assessment

Once a system or component is established as operable/functional (e.g., by previously performed surveillances, or prior operability/functionality determinations), without information to the contrary, there is a presumption that it will remain operable/functional. However, reviewing the performance of SSCs and ensuring their operability/functionality is a continual process. Potential degraded or nonconforming conditions of SSCs may be discovered during many activities:

- Plant walkdowns and tours
- Engineering design reviews, including design basis reconstitution
- Examinations of records
- In service testing and inspection programs
- Maintenance activities
- Surveillances
- NRC inspections
- Quality assurance activities such as audits and reviews
- Operational experience reports
- Part 21 notifications
- Vendor reviews or inspections

When a potential degraded or nonconforming condition is identified, the licensee should take action without delay to confirm if an SSC is degraded or nonconforming. For

example, licensees should not wait to complete extensive evaluations before entering the condition into their problem identification/corrective action process.

Licensees should enter the process and alert the Operations Department staff on discovering of any of the following circumstances when the operability/functionality of any SSC described in CLB is called into question:

a. Degraded conditions
b. Nonconforming conditions
c. Discovery of an unanalyzed condition

4.13.6.3 Scope and Applicability

The licensee must determine which program or programs are applicable to the SSC with the degraded or con-conforming condition. If the SSC is explicitly included in the Technical Specifications a determination of operability is required. If the function of the SSC is included in the CLB, but it is not addressed in the TS, a functionality determination is required. If the SSC is covered under the maintenance rule then the availability and reliability of the system must be assessed and the condition's impact on plant risk should be evaluated. If the SSC is included in the Mitigating System Performance Indicators, then unavailability and/or unreliability of the system must be tracked. If the condition resulted in a safety system functional failure, then reportability and impact on NRC PI should also be evaluated.

4.13.6.4 Operability Determination

When a degraded, non-conforming or unanalyzed condition is identified that impact a Technical Specification related system, the licensee must assess the continued operability of any SSC affected by this condition. There can be no such thing as an indeterminate state of operability. If there is insufficient information to justify operability (i.e., the reasonable expectation that the system can perform its specified TS function is lost), the SSC must be declared inoperable and the applicable LCO entered.

The operability determination must evaluate the effect or potential effect of the degraded or nonconforming condition on the affected SSCs' ability to perform specified safety functions with the current condition and at the current point in time. Even if the SSC does not meet all design criteria (i.e., is not fully qualified), as long as there is a reasonable expectation that the SSC would be able to perform its specified safety functions if required, the SSC would be considered operable. For example, if the design of a component in the drywell is to be environmentally qualified to withstand 30 years of radiation exposure, but an error in the analysis only supports 15 years of exposure, it could be determined to be operable (but degraded or non-conforming) if there is a reasonable expectation that it would function given its current exposure. Likewise if the

design of a diesel generator requires the operation of a room cooler in order to be operable under all conditions and that cooler fails, the diesel may be considered operable (but degraded or non-conforming) if analysis can show that at the current outside air temperature the cooler is not required for the diesel to perform its specified function.

In some cases a degraded or non-conforming SSC can be determined to be able to perform its specified safety function (i.e., remains operable) if certain compensatory actions are taken. These compensatory measures can include manual actions, plant operating restrictions and/or installation of temporary equipment.

4.13.6.4.1 Immediate Determination

An immediate determination of operability should be made without delay using the best available information. This is normally performed by the on-shift operations staff with input from others as needed. Licensees should not postpone the determination until receiving the results of detailed evaluations. If a piece of information material to the determination is missing or unconfirmed, the licensee should declare the SSC inoperable. The immediate determination should document the basis for concluding that a reasonable expectation of operability exists. When a reasonable expectation of operability does not exist, the SSC should be declared inoperable.

4.13.6.4.2 Prompt Determination

A prompt determination of SSC operability is a follow up to an immediate determination of SSC operability. A prompt determination is warranted when additional information, such as supporting analysis, is needed to confirm the immediate determination. A prompt determination, when needed, should be done without delay. There is no explicit time limit for completing a prompt determination. Nevertheless, timeliness is important and should depend on the safety significance of the issue.

A prompt determination is not always necessary. For example if a component is declared inoperable and taken out of service for repairs, or sufficient information is available at the time of the immediate determination and new information or analysis will not impact the outcome, a prompt determination is not necessary.

Plant staff in other organizations (e.g., operations, engineering, and licensing) with expertise in the subject matter and appropriate knowledge of plant operations may prepare the prompt operability determinations. However, a senior licensed operator on the operating shift crew with responsibility for plant operations makes the declaration of operability on whether an SSC described in TSs is operable or inoperable.

4.13.6.5 Functionality Assessment

Functionality and operability are similar but separate concepts. Functionality applies to the ability of non-TS SSCs to perform other specified functions described in various elements of the CLB including the Updated Final Safety Analysis Report (UFSAR), technical requirements manual, emergency plan, fire protection plan, or various regulatory commitments. Licensees may use the same process for evaluating operability and functionality or may rely on another process (e.g., corrective action program).

It is appropriate to consider safety significance in determining the appropriate depth of a functionality assessment. Also, the effect of nonfunctional SSCs on compliance with other regulatory requirements (e.g., Appendix R, station blackout, ATWS, environmental qualification, maintenance rule) should be determined.

If a non-TS system that provides a support function to a TS system is found not to be functional, then an operability determination should be conducted on the TS supported system as described above.

4.13.6.6 Availability Assessment

Per the licensee's specific MR program and PI program, assessments of equipment availability should be made where appropriate. If a SSC that is considered in the unit's risk assessment is found to be inoperable/not functional, the risk level should be adjusted and risk management actions taken if required. Should a maintenance rule of MSPI system fails on demand or becomes unavailable, the unreliability and/or unavailability should be tracked.

4.13.6.7 Reportability Assessment

In addition to the above assessments of SSC capability to perform a given TS, CLB, or MR function, loss of function may be reportable per regulatory requirements such as those defined in 10 CFR 50.72 and 10 CFR 50.73. If a condition results in a loss of a safety function, it should be evaluated against the licensee's current reporting requirements to ensure that appropriate notifications to the NRC have been made and NRC performance indicator is updated.

One criterion for reporting to the NRC under 10CFR50.73 is a condition prohibited by Technical Specifications. In general, when the on-shift operations staff declares a SSC inoperable is when the TS LCO is not met and the required action completion time of the LCO starts. This is known as "time of discovery". However, if there is firm evidence that the condition had existed prior to it being identified (e.g., the condition was caused by improper maintenance conducted months ago) and the TS required actions had not

been completed within their allowed completion times, it would be reportable under a condition prohibited by technical specifications. To evaluate if a condition is reportable, utilities will conduct a “past-operability” determination as part of the corrective action process.

4.13.6.8 Corrective Actions

Corrective actions should be taken in a timely manner to restore the SSC to a fully qualified condition. The timeliness of these actions should be commensurate with the risk significance of the issue (i.e., the more risk significant the condition, the more quickly the licensee should seek to resolve it).

An SSC that is determined to be operable but degraded or nonconforming is considered to be in compliance with its TS LCO, and the operability determination is the basis for continued operation. However, the degraded or non-conforming condition should be entered into the licensee’s corrective action program and should be corrected at the first available opportunity.

4.13.6.8.1 Interim Corrective Actions

The basis for continued operation should be frequently and regularly reviewed until corrective actions are successfully completed. SSCs that have been determined operable through an operability determination remain operable as long as the reasonable expectation of operability established by the operability determination remains valid.

When evaluating the effect of a degraded or nonconforming condition on an SSC’s capability to perform any of its specified safety functions, a licensee may decide to implement compensatory measures as an interim action until final corrective action to resolve the condition is completed.

For situations where substitution of manual action for automatic action is proposed for an operability determination, the evaluation of manual action must focus on the physical differences between automatic and manual action and the ability of the manual action to accomplish the specified safety function or functions. The physical differences to be considered include the ability to recognize input signals for action, ready access to or recognition of setpoints, design nuances that may complicate subsequent manual operation (such as auto-reset, repositioning on temperature or pressure), timing required for automatic action, minimum staffing requirements, and emergency operating procedures written for the automatic mode of operation. The licensee should have written procedures in place and personnel should be trained on the procedures before any manual action is substituted for the loss of an automatic action. The consideration of a manual action in remote areas must include the abilities of the assigned personnel

and how much time is needed to reach the area, training of personnel to accomplish the task, and occupational hazards such as radiation, temperature, chemical, sound, or visibility hazards.

4.13.6.8.2 Final Corrective Actions

A licensee's range of corrective action may involve:

(1) full restoration to the UFSAR described condition,

(2) a change to the licensing basis to accept the as-found condition as-is, or

(3) a modification of the facility or procedures other than restoration to the condition as described in the UFSAR.

If corrective action is taken to restore the degraded or nonconforming SSC to the UFSAR described condition, no 10 CFR 50.59 screening and/or evaluation is required. The 10 CFR 50.59 process applies when the final resolution of the degraded or nonconforming condition is to change the CLB (e.g., UFSAR description or analysis) or to make a change to the facility or procedures as described in the UFSAR. The 10 CFR 50.59 process evaluates whether the change can be made without NRC approval. Should it be determined that prior NRC approval is required, the licensee will submit a license amendment for consideration.

4.13.7 Summary

Improperly evaluated degraded and/or non-conforming conditions may result in continued operation with a structure, system, or component (SSC) that is not capable of performing its design function. Inspectors review operability determinations and functionality assessments to ensure that operability or functionality is properly justified and the component or system remains capable of performing its design functions, such that no unrecognized increase in risk has occurred. The current guidance to NRC inspectors to assist in their review of licensee determinations of operability and resolution of degraded or nonconforming conditions is contained in NRC Inspection Manual Chapter 0326, “Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety”.

The Manual Chapter defines a number of terms used in the process. Operability applies to only Technical Specification equipment’s capability of performing their specified safety function. Functionality applies to the ability of non-TS equipment to perform their functions described in the current licensing bases. Availability applies to the readiness of maintenance rule or MSPI equipment to perform their functions as described in these

programs. The maintenance rule uses availability and reliability of specified systems to evaluate the adequacy of the normal maintenance practices for those systems and the real-time risk (and the need for risk management actions) when certain system are unavailable. The MSPI is a performance indicator used by the NRC as part of the regulatory oversight program to help evaluate plant performance.

Assessing the operability and functionality is a continuous process. Although systems are presumed operable/functional information may become available that calls into question the ability to perform their specified functions. Degraded or non-conforming conditions can become apparent through normal plant operation, system walkdowns, surveillance testing, industry operating experience, or design reviews. When the ability of a system, structure or component to perform its specified function is called into question, the utility determines which program or programs the SSC fails under in order to properly evaluate the impact of the condition.

For Technical Specification equipment, an operability determination is conducted. An immediate determination is completed by operations to assess whether there is a reasonable expectation that the SSC can perform its specified function given the current information available. A prompt determination may then be required that would include more information gathering or analysis to support or refute the immediate determination.

For non-TS equipment, a functionality determination is conducted. For equipment that has a support function for TS equipment, if it is found to be non-functional, an operability determination should also be conducted for the supported TS equipment.

For equipment that the utility monitors for impact on risk, as availability evaluation is conducted to assess whether it is capable of its mitigating functions. If unavailable, the current risk assessment should be modified and additional risk management actions taken if needed.

For equipment within the scope of the maintenance rule or the MSPI, the unavailability and unreliability are assessed and tracked for impact on those programs.

The reportability of degraded and non-conforming conditions should also be evaluated. Some reporting criteria include conditions prohibited by technical specifications (post-operability determination may be required), safety system functional failures, and/or unanalyzed conditions.

Following the determination of operability/functionality, the degraded or non-conforming conditions must then be corrected. Interim corrective actions can include manual operator actions, temporary modifications to the plant or the imposition of plant operating restrictions. The final corrective actions can include full restoration to the current licensing basis (restore full qualification), changing the current licensing bases,

and/or changing the facility or procedures as described in the licensing bases (i.e., UFSAR).

4.13.8 References

1. IMC 0326: Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety

2. 10 CFR 50.2, Definitions

3. 10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

4. NEI 99-02, Regulatory Assessment Performance Indicator Guideline

5. NEI 97-04, Guidance and Examples for Identifying 10 CFR 50.2 Design Bases

6. NUMARC 93-01, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

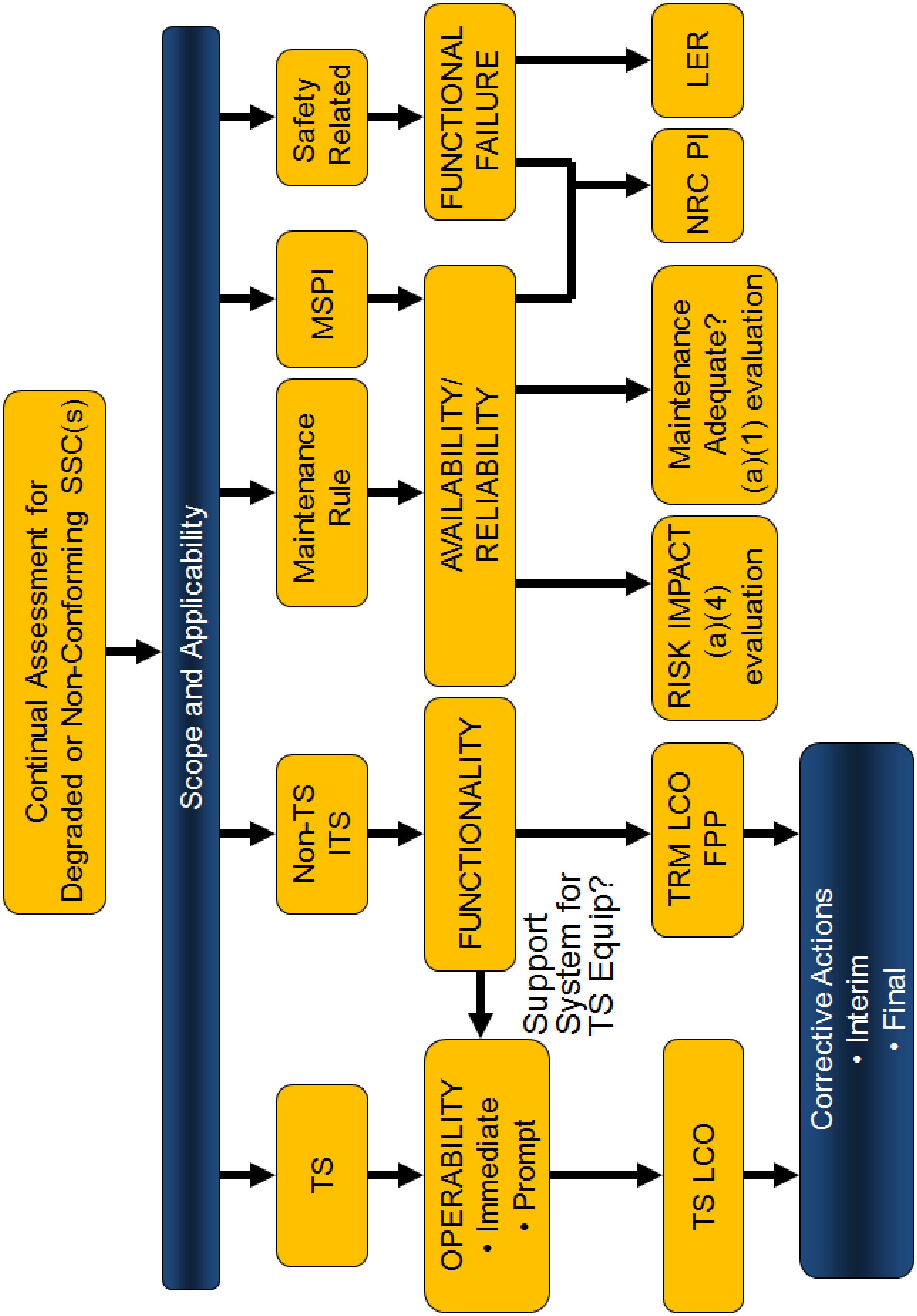

Figure 4.13-1 Process for Resolving Degraded and Non-Conforming Conditions