

Operability

R504B

Chapter 4.13

Objectives

1. Recognize what is meant by the following terms in regard to the operability determination process:
 - a) Current Licensing Basis (CLB)
 - b) Fully Qualified
 - c) Specified Function (TS and/or CLB) including Mission Time
 - d) Reasonable Expectation
 - e) Support and Supported System

Objectives

1. Recognize what is meant by the following terms in regard to the operability determination process:
 - f) Non-Conforming Condition
 - g) Degraded Condition
 - h) Unanalyzed Condition
 - i) Operability
 - j) Functionality

Objectives

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.

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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.

Current Licensing Basis

The NRC requirements and the licensee's docketed commitments to ensure compliance with and operation within all applicable NRC requirements:

- a) NRC regulations in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 54, 55, 70, 72, 73, and 100 and appendices
- b) Commission orders
- c) License conditions
- d) Exemptions
- e) Technical Specifications
- f) Plant-specific design basis information defined in 10 CFR 50.2 and documented in the most recent UFSAR
- g) Commitments made in docketed licensing correspondence (such as licensee responses to NRC bulletins, Licensee Event Reports, generic letters, and enforcement actions)
- h) Commitments documented in NRC safety evaluations

UFSAR (10 CFR 50.34)

- All facilities must submit PSAR on application for CP describing, among other things:
 - Safety analysis
 - How it meets GDCs
 - Design basis of the SSCs at the facility
 - QA program
 - Proposed Tech Specs

UFSAR (10 CFR 50.34)

- Replaced by FSAR when granted OL:
 - Includes any changes from PSAR
 - Includes information contained in SER
- 10CFR50.59 allows facility to make changes to the facility as described in FSAR
- 10CFR50.71 requires FSAR to be updated periodically (changes, commitments, etc...)

Important to Safety

- Not specifically defined in the regulations (GL 84-01)
- Contained in the CLB (UFSAR)

Those Structures, Systems and Components (SSCs) that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public

This encompasses the broad class of plant features covered by the GDCs, that contribute in an important way to safe operation and protection of the public.

Examples: Fire protection equipment, ATWS equipment, Post-Accident Monitoring, etc...

Safety Related

- Subset of Equipment Important to Safety

Safety-Related (10 CFR 50.2) SSCs are relied upon during design basis events to:

- 1) Maintain integrity of RCS
- 2) Shutdown Rx and maintain it in a safe shutdown condition
- 3) Prevent/mitigate offsite exposures

SR function should be specified in UFSAR

Examples: Inject following a LOCA, Trip the reactor, form part of RCS or containment boundary, etc...

Engineered Safety Features (ESF)

- Subset of safety related SSC's which SPECIFICALLY function to mitigate the consequences of design-basis accidents. (10 CFR Part 50 requires ESF systems and components.)

Examples of typical ESF systems and components:

- containment
- control rod velocity limiter
- residual heat removal
- emergency core cooling
- containment heat removal
- containment atmosphere cleanup
- cooling water
- main steam line flow restrictors

Equipment Classification

- **Safety Related Equipment:**
 - Specific Safety Function
 - Design Criteria (Appendix A) including external events, seismic, single failure, etc...
 - QA Program (Appendix B)
 - Includes ECCS systems, ESF, IEEE Class 1E, ASME Code Class 1, 2 and 3 piping
- **Non-Safety Related/Important to Safety**
 - QA Program Appendix A, GDC 1
 - Changes evaluated under 10CFR50.59
 - Includes: Fire Protection, Seismic II/I, etc...
- **Non-Safety Related**

Classifying Equipment

All Plant Structures Systems and Components Described in UFSAR

SSCs Important to Safety

Safety Related SSCs



Technical Specifications

Part of the License

LCO required for equipment that meets one of the criteria below (10CFR50.36)

- Criterion 1. Instrumentation 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
- Criterion 3. An SSC that functions or actuates to mitigate a design basis accident or transient
- Criterion 4. An SSC which operating experience or PRA has shown to be significant to public health and safety

Tech Spec Function

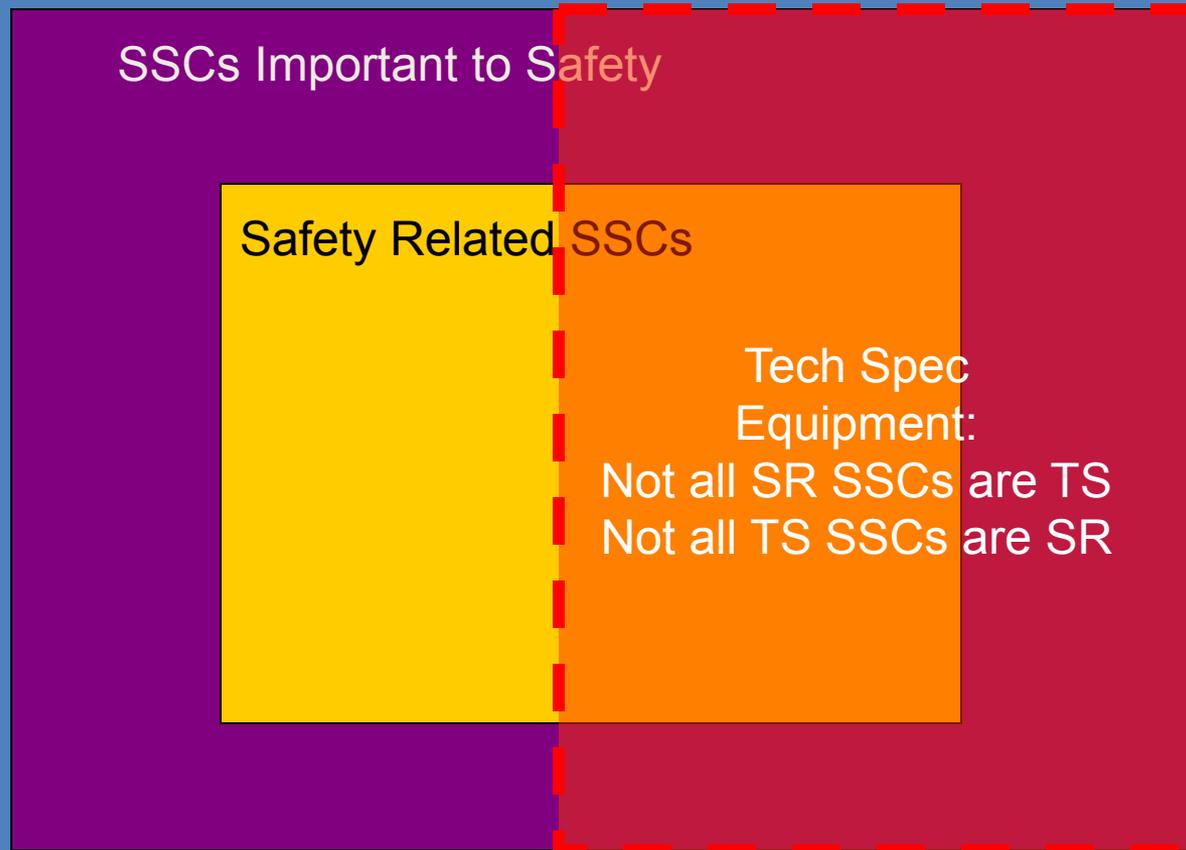
- Defined in TS Bases
- Minimum acceptance criteria often contained in the Surveillance Requirements

Examples:

- Containment Integrity (Containment Isolation, Containment Pressure and Temperature Control)
- Reactivity Control
- Reactor Coolant Heat Removal
- Reactor Coolant Inventory Control.

Classifying Equipment

All Plant Structures Systems and Components Described in UFSAR



Operability

- Guidance provided in IMC 0326
- Superseded IMC Part 9900 Technical Guidance (STSODP) and RIS 2005-20 in January 2014.
- Original guidance in GL 91-18, but terminology still widely used in the industry.
- Defines the term “Functionality”

Operability/Functionality

- “Operability” only applies when determining if TECH SPEC SSCs are capable of performing their TS function
- “Functionality” applies to all other SSCs (i.e., non-TS equipment) ability to perform their function as defined in CLB
- Unfortunately, the terms “operability” and “operability determination” are used instead of “functionality” throughout the industry.

Operability

Per Standard Tech Specs:

- Capable of performing specified (**per the TS**) safety function, and
- When all necessary attendant instrumentation, controls, normal or emergency power, cooling and seal water, lubrication and other auxiliary equipment that are required for the SSC are also capable of performing their related support functions.

Support/Supported System

Support System:

- Provides the “necessary attendant” operations or services to the Technical Specification system to maintain its operability.
- Can be explicitly included in the TS (service water, emergency diesels, ECCS instrumentation) or not (room ventilation systems, missile barriers)

Supported System:

- TS equipment that requires the support system for operability.

Functionality

- Capable of performing its **specified function**, as set forth in the current licensing basis (CLB)
- Applicable to SSC's that warrant programmatic controls to ensure functionality is assessed and tracked
- May be part of ODP, Corrective Action Program or other mechanism

Examples:

- TRM equipment
- Fire Protection Equipment
- Maintenance Rule
- Emergency Plan equipment (TSC Diesel)

Example:

TS Equipment
**Emergency
Diesel
Generator**

Non-TS Support System
**Diesel Room
Ventilation System**

FUNCTIONALITY of the Ventilation System must be determined.

OPERABILITY of the EDG will need to be determined if the ventilation system is found not to be functional.

CLB Structure, Systems, and Components (SSCs)

SSC(s) is required to be operable by a Tech Spec LCO(s)

- Must satisfy operability requirements (prevent/mitigate design basis accidents, transients and anticipated operational occurrences) in accordance with CLB.
- Subject to operability determinations
- *Section 02.01.a of IMC 0326*

Affected SSC(s) provides support to a TS SSC(s)

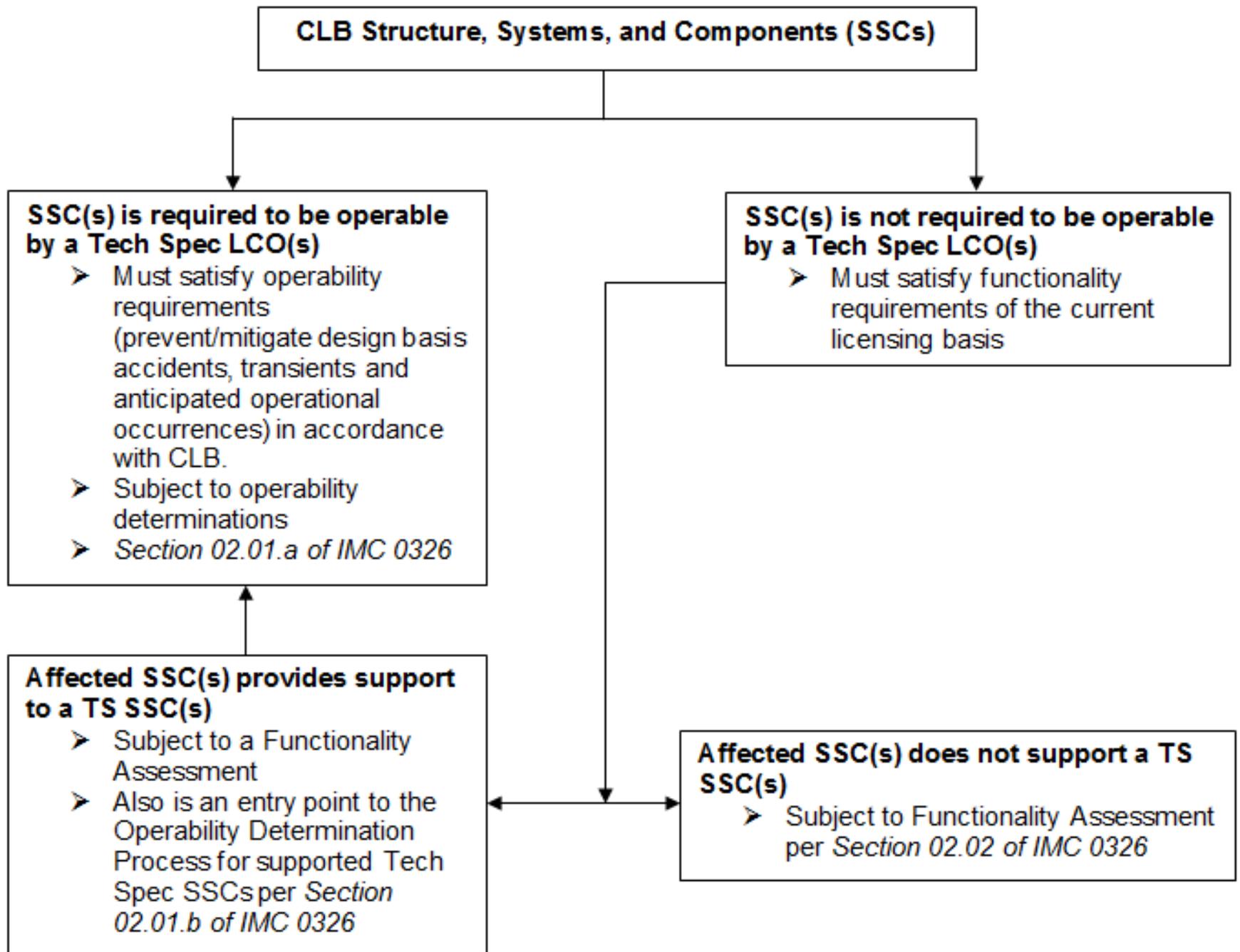
- Subject to a Functionality Assessment
- Also is an entry point to the Operability Determination Process for supported Tech Spec SSCs per *Section 02.01.b of IMC 0326*

SSC(s) is not required to be operable by a Tech Spec LCO(s)

- Must satisfy functionality requirements of the current licensing basis

Affected SSC(s) does not support a TS SSC(s)

- Subject to Functionality Assessment per *Section 02.02 of IMC 0326*



Availability/Reliability

- **Availability:** The time that a SSC is capable of performing its intended (maintenance rule or MSPI) function
- **Reliability:** A measure of the expectation (assuming that the SSC is available) that the SSC will perform its function upon demand at any future instant in time. Examples: Fail to start, fail to load (diesel) and fail to run.

May be done as part of CAP or mRule administrative process

Maintenance Rule

10 CFR 50.65 requirements for SSCs:

- Scoped equipment includes:
 - Safety-related SSCs and
 - Non safety-related SSCs
 - Relied on to mitigate accidents or transients or are used in the plant's EOP's
 - Whose failure could prevent SR SSCs from fulfilling their safety function
 - Whose failure could cause a reactor scram or actuation of a safety related system

Maintenance Rule

- Specific functions identified for each system
- PRA used to establish risk significance of each system
- 10CFR50.65 (a)(1) and (a)(2), monitor **Availability and Reliability** against established performance criteria to determine if PM program is effective.
- 10CFR50.65 (a)(4), **Availability** used to assess and manage risk & the need for risk management actions (RMAs) if required

Maintenance Rule

In the technical specification world, failure to meet the deterministic criteria of an SSC used to access the capability to perform the TS function is grounds for INOPERABILITY.

In the maintenance rule world, this same degradation and/or non-compliance may still leave the SSC AVAILABLE to perform the Maintenance Rule function

Likewise, in the maintenance rule world, the SSC may still be available to perform other functions not included in the TS (e.g., EOP) and be considered AVAILABLE for that function.

Example:

EDG is tagged out for maintenance

INOPERABLE for safety function (per TS)

UNAVAILABLE for Maintenance Rule function

Tags are cleared on EDG, but TS SR not yet done

Remains INOPERABLE per TS

May be considered AVAILABLE for Maintenance Rule and other programs (i.e. Performance Indicators)

NRC Performance Indicators

NRC PIs are used in the Reactor Oversight Process to assess plant performance and need for additional oversight.

- Safety System Functional Failures (SSFFs)
- Mitigating System Performance Indicator (MSPI)

Guidance contained in NEI 99-02

MSPI

MSPI: Evaluates the change in plant risk due to changes in Availability and Reliability beyond that assumed in PRA.

Identifies specific systems and specific functions for those systems:

- Diesels
- HPCI
- RCIC
- RHR (The function monitored is to provide suppression pool cooling).
- Service Water (The function monitored is cooling water to diesels and RHR HXs for suppression pool cooling)

MSPI

- Unavailability is the ratio of the hours the train/system was unavailable to perform its **monitored functions** (as defined by PRA success criteria and mission times) due to planned and unplanned maintenance or test during the previous 12 quarters while critical to the number of critical hours during the previous 12 quarters.

MSPI

- Unreliability is the probability that the train/system would not perform its **monitored functions**, as defined by PRA success criteria, for a 24 hour run, when called upon during the previous 12 quarters.

Unavailability/Unreliability analysis for MSPI may be done as part of ODP, CAP, maintenance rule process or NRC PI process.

SSFF

Safety System Function Failure (SSFF) is any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to:

- (A) Shut down the reactor and maintain it in a safe shutdown condition;
- (B) Remove residual heat;
- (C) Control the release of radioactive material; or
- (D) Mitigate the consequences of an accident.

- PI is number of SSFF in last 4 quarters
- Based on the system level
- May be done as part of ODP process, CAP process or reportability process (or combination)

Key Definitions

- **Degraded Condition**

- Qualification of an SSC or its functional capability is reduced (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.
- Physical condition problem

- **Nonconforming Condition**

- SSC fails to meet CLB or quality has been reduced due to improper design, testing, construction, or modification. Examples include failure to meet all code requirements, as-built configuration does not meet CLB or design inadequacy.
- Design or paperwork problem

- Not always a clear distinction (e.g., pipe leak)

Key Definitions

- **Unanalyzed Condition**

- 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.
- Examples:
 - a fire barrier relied on in the safe shutdown analysis is not installed
 - assumption used in ECCS analysis was non-conservative or incorrect
 - fuel assembly was loaded into the core at an unintended location

Key Definitions

- **Specified Function/Specified Safety Function**
 - specified capability described in the CLB
 - SSC may have multiple functions
 - SSC functions may be different depending on the program (TS, maintenance rule)
 - includes under which conditions it is credited
 - includes how long it is needed to function under those conditions (mission time).

Key Definitions

- **Presumption of Operability**

- Without information to the contrary, an SSC can be assumed to be operable based on previous verification of operability (surveillance or ODP).

- **Reasonable Expectation**

- Basis for operability: Based on the specific facts surrounding a system's condition, there is a high degree of confidence that the SSC can perform its TS function for the required mission time.

Key Definitions

- **Fully Qualified**

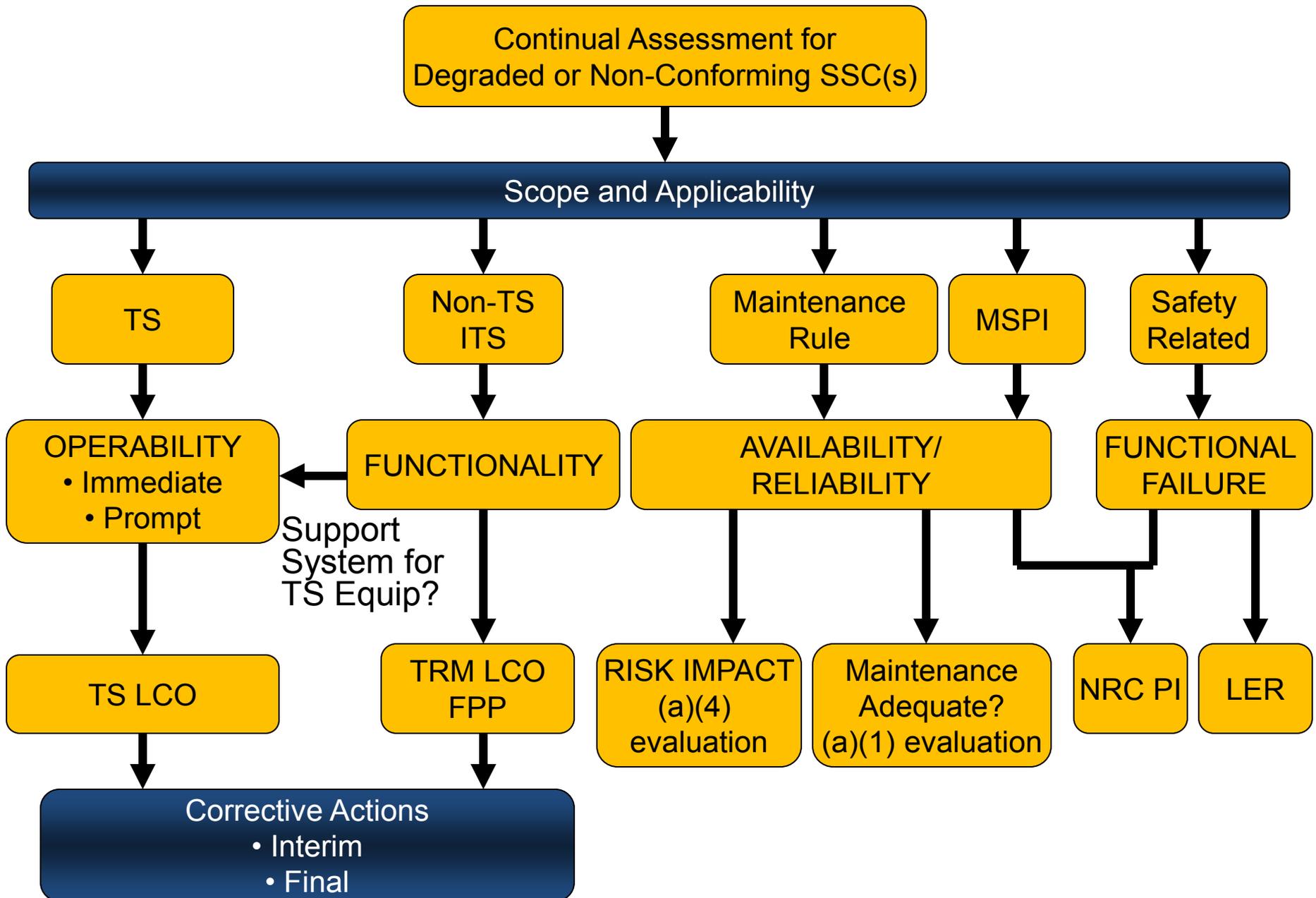
- SSC conforms to all aspects of its CLB, including all applicable codes and standards, design criteria, safety analysis assumptions and licensing commitments.
- Note that a loss of quality (i.e., not fully qualified) does NOT result in immediate failure to meet a specified function (e.g., EQ requirements, use of non-quality parts, use of instrumentation whose accuracy does not meet the code requirements, etc...), but does require an operability determination.

- **Indeterminate Operability**

- **No such thing**, either there is a reasonable expectation it can perform its safety function or it is inoperable.

Process of Resolving Issues

- Continual Assessment
- Determine Applicable evaluations
- Conduct the evaluations:
 - TS: Operability
 - Non-TS: Functionality
 - Maintenance Rule & MSPI:
Availability/Reliability
 - Reportability (SSFF, unanalyzed condition,
condition prohibited by TS, etc...)
- Corrective Actions
 - Interim and final



Continual Assessment

- Although SSCs have a presumption of operability/functionality, the status must be continually assessed.
- Continual Assessment
 - Re-evaluate operability/functionality based on system walkdowns, alarms, surveillances, engineering reviews, operating experience reports, QA audits, inspection findings, etc.
 - Notify OPS and enter in Corrective Action Program

Continual Assessment

- Operability/Functionality Determination Process needs to be entered if any of the following are discovered or suspected:
 - Degraded Condition
 - Non-Conforming Condition
 - Unanalyzed Condition

Operability Determination

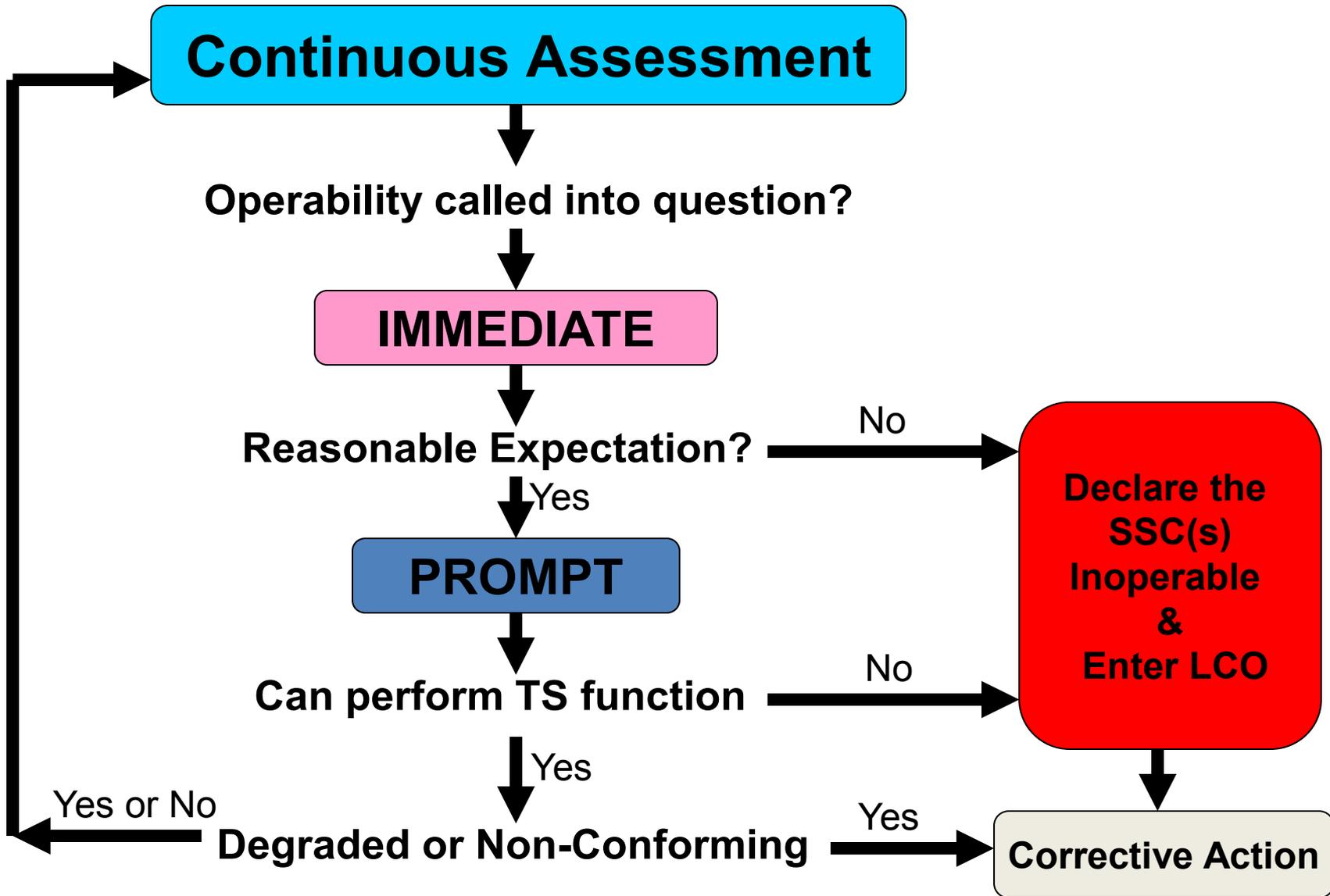
- Immediate Determination
 - By operations with help from other departments
 - Completed without delay with the best information immediately available
- Prompt Determination
 - Not required if declared Inoperable during Immediate Determination
 - Usually by Engineering
 - Follow-up to the immediate determination and supported by additional information and/or calculation
 - Timeliness commensurate with safety significance (normally within LCO allowed outage time)

Operability Determination

Outcomes:

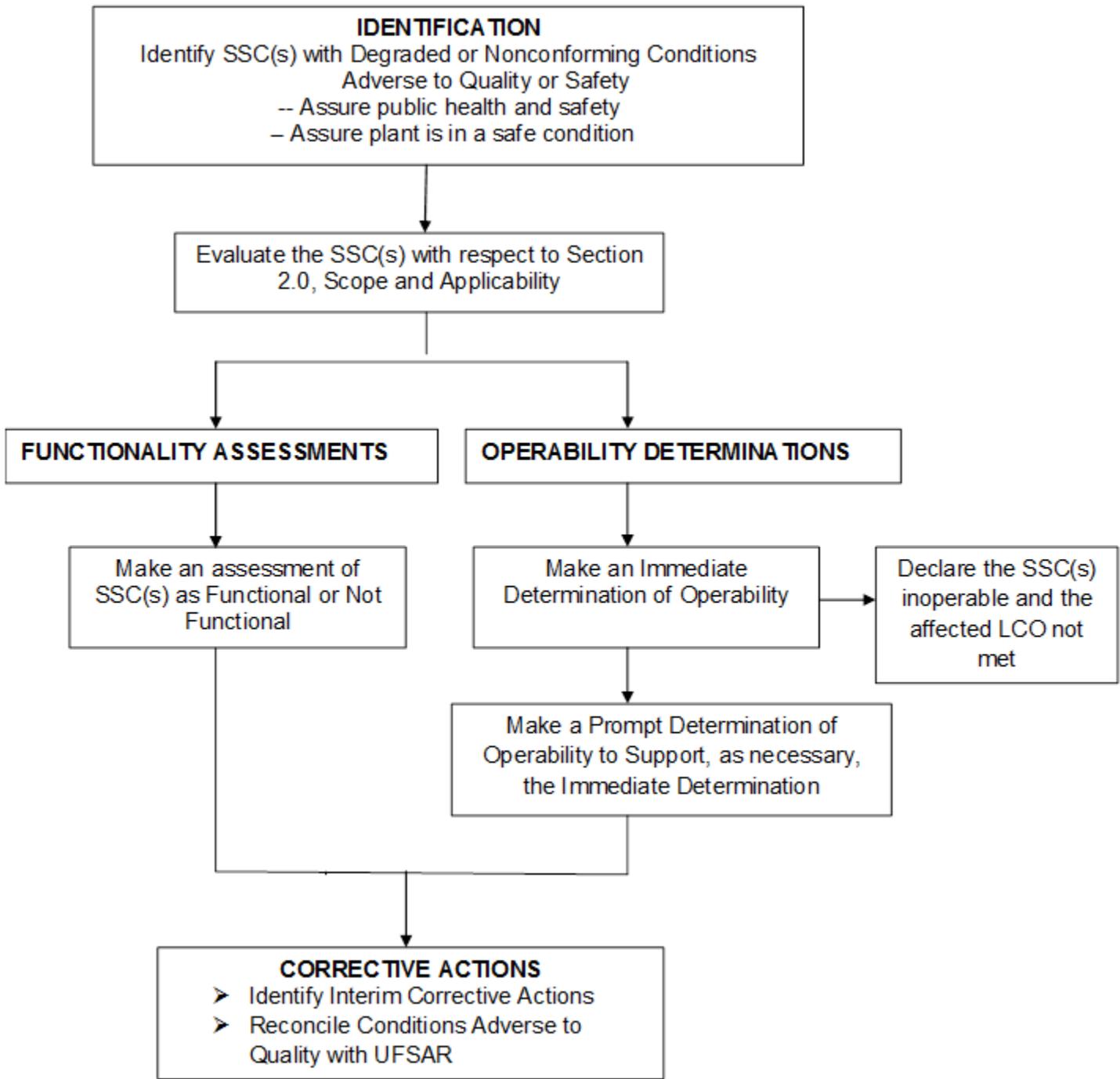
- Inoperable
 - LCO starts on time of discovery (when OPS declared it inoperable).
- Operable, but degraded or non-conforming
 - Normally determined during prompt ODP
 - In compliance with TS LCO despite condition
- Operable
 - No LCO entered

Operability Determination



Functionality Assessment

- Functionality and operability are similar but separate concepts.
- Functionality may be assessed and documented through other plant processes (i.e. the corrective action process, maintenance rule process, NRC PI process)
- Safety significance should be considered when determining the appropriate depth of a functionality assessment



IDENTIFICATION

Identify SSC(s) with Degraded or Nonconforming Conditions Adverse to Quality or Safety
-- Assure public health and safety
- Assure plant is in a safe condition

Evaluate the SSC(s) with respect to Section 2.0, Scope and Applicability

FUNCTIONALITY ASSESSMENTS

OPERABILITY DETERMINATIONS

Make an assessment of SSC(s) as Functional or Not Functional

Make an Immediate Determination of Operability

Declare the SSC(s) inoperable and the affected LCO not met

Make a Prompt Determination of Operability to Support, as necessary, the Immediate Determination

CORRECTIVE ACTIONS
➤ Identify Interim Corrective Actions
➤ Reconcile Conditions Adverse to Quality with UFSAR

Availability Assessment

- For equipment within the scope of the maintenance rule or MSPI
- May be assessed and documented through other plant processes (i.e. the corrective action process, maintenance rule process, NRC PI process)
- Tracked for impact on (a)(1) status and MSPIs
- If part of the risk assessment, reevaluate risk and take RMAs as warranted

Reportability Assessment

- Normally separate program for evaluating reportability.
- Safety System Functional Failures reportable on a system level, both immediate notification and LER
- Unanalyzed condition that significantly degrades plant safety is reportable, both immediate notification and LER
- Condition prohibited by Technical Specification reportable as LER. May require a past-operability review if firm evidence that inoperability occurred prior to time of discovery.

Interim Corrective Action

- Operable/Functional, but degraded or non-conforming
 - Remains operable/functional despite condition as long as reasonable expectation persists and/or assumptions used in the ODP remain valid.
 - Corrective actions should be taken in a timely manner to restore the SSC to a fully qualified condition.
 - Tracked to ensure timely restoration (“at the first available opportunity”).

Interim Corrective Action

- Manual Actions
 - not allowed for LSSS actions
 - ability to recognize input signals for action
 - enough time available to take the action
 - procedural guidance available
 - training conducted
 - additional personnel required
 - area is accessible when action required (radiation levels, etc...)
 - requires 10CFR50.59 screening and/or evaluation

Final Corrective Action

- Restore to full qualification
- Change the CLB to reflect the current condition
 - Requires 10CFR50.59 evaluation and potentially licensing amendment
- Change the facility and/or procedures described in the UFSAR to accommodate the current condition
 - Requires 10CFR50.59 evaluation and potentially licensing amendment

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Questions?