

50-280/281

# Classification of Selected Systems, Structures, and Components

Surry Power Station

May 4, 2001 Conference Call with NRC



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# Purpose

- To discuss and resolve open items resulting from an April 18, 2001 telephone conference with NRC/NRR regarding certain aspects of planned Surry Service Water System piping repairs
- To describe the process for determining the safety classification of systems, structures, and components
- To explain the basis for the classification of certain functions and components in the following systems and how they relate:
  - Surry Fuel Pool Cooling
  - Surry Component Cooling Water
  - Surry Service Water

# Classification Categories

- SSCs are classified based on how the functions of individual components meet the criteria in one of three categories:
  - Safety-related (SR)
  - Nonsafety-related with Special Quality/Regulatory Requirements (NSQ)
  - Nonsafety-related (NS)

# Classification Criteria

- **Safety-Related SSCs** are those that are relied upon to remain functional during and following design basis events to assure the following:
  - The integrity of the reactor coolant pressure boundary
  - The capability to shutdown the reactor and maintain it in a safe shutdown condition
  - The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines of 10CFR100.1
- **NSQ SSCs** are a subset of nonsafety-related components that have special quality/regulatory requirements, or are important to plant operations or special issues. They include:
  - Appendix R safe shutdown components and fire protection components that are not safety-related
  - Reg. Guide 1.97 (Rev. 3) Category 2 and 3 variables that are not safety-related
  - SSCs that are not safety-related but are required to withstand a seismic event
  - ATWS-related equipment
  - Equipment that controls radioactive releases or limits personnel exposures as part of normal operating requirements
- **NS SSCs** are those SSCs that have not been classified as either SR or NSQ

## Classification Criteria (cont.)

- Components classified as either SR or NSQ are collectively known as the “Q-List.” The Q-List is part of a larger database of plant SSCs known as the Equipment Data System (EDS) that also includes NS components
- There are approximately 107,000 components in the Surry EDS database including 54,000 components in the Q-List
- A system is typically described by the predominant function of the system. For example, the Surry component cooling water (CC) system is referred to as a safety-related system. From a functional viewpoint, of the 4,323 components in the system, 1937 components are classified safety-related, 2000 components are NSQ, and 386 components are nonsafety-related.

# Classification Process

- An accurate, complete, and up-to-date Q-List is critical to numerous daily decisions involving procurement, planning, maintenance, and modification activities. The UFSAR and the QA Topical Report clearly describe the Q-List as the vehicle by which the safety classifications of SSCs are managed and controlled.
- A specialized staff maintains the Q-List in accordance with the Appendix B Nuclear Design Control Program administrative controls
- Q-List components and their respective functions have been reviewed and classified on an on-going basis since the original Q-List was developed in the mid-1980's
- The classification process itself is evaluated as part of periodic audits and self-assessments
- Most changes in classification have occurred as a result of one or more major initiatives over the years intended to improve the adequacy and availability of design and licensing bases information. Those initiatives include the development of Design Basis Documents, the Integrated Review program, and an ongoing component-level review of the Q-List by Nuclear Configuration Management.

# Classification Process (cont.)

- Q-List components are classified utilizing an EDS Change Request (EDSCR) form. The component functions are identified (typically through a review of controlled drawings and other engineering documents) and compared against the classification criteria to determine their safety significance
- Particular importance is paid to the safety and regulatory impact of the proposed change
- Classification changes to or from safety-related status are reviewed by the QCRC
- The QCRC, or Q-List Classification Review Committee, is comprised of representatives of the various engineering disciplines, nuclear safety analysis, design basis documents, and Q-List staff who are responsible for conducting an independent, multi-disciplined review of the proposed change
- Upon approval by the QCRC, the revised classification is reflected in the Q-List

# 50.59 Applicability to Reclassifications

- The scope of 10 CFR 50.59 includes changes, test, and experiments to the facility or procedures as described in the UFSAR
- Administrative controls are in place (and reinforced through periodic training) to ensure that reviews of proposed changes extend beyond the UFSAR to include other current licensing bases documents
- The classification review process pays particular attention to the possibility that a proposed classification change may require prior NRC approval by requiring consideration of relevant safety and regulatory criteria
- To ensure that proposed classification changes do not inadvertently impact the UFSAR/CLB, a detailed safety/regulatory checklist applicable to safety-related Q-List changes has been developed, called the SREDC

## 50.59 Applicability (cont.)

- In order to complete the SREDC, the design and licensing bases of the affected component is reviewed and documented because detailed information regarding the classification of certain components may be found in a variety of design/licensing bases documents
- The SREDC is more than a cursory screening. It includes 17 specific questions related to the safety impact of the proposed change. The SREDC also includes 8 questions of a regulatory nature, 7 of which focus on the criteria involving whether a proposed change may require prior NRC approval (old “unreviewed safety question”).
- The SREDC is prepared/reviewed by a 50.59 qualified individual.
- This approach, which is tailored to the specific requirements of the classification change process, meets the requirements of 10 CFR 50.59

# Classification v. Tech. Specs.

- For plants such as Surry that have customized Technical Specifications (i.e., issued in the early 1970's), there is variability in the relationship between SSCs' classification as safety-related and their inclusion in the Technical Specifications
- Criteria now exist in 10 CFR 50.36(c)(2) that define inclusion for TS LCO requirements. Although not an exact correlation with safety-related requirements, those criteria specify:
  - Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant boundary
  - 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
  - An SSC that is part of the primary success path and which functions or actuates to mitigate a DBA or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier
  - An SSC which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.
- As part of the conversion to Improved Technical Specifications, Surry's existing TS LCO on component cooling appears to be a candidate for relocation to the Technical Requirements Manual because it meets none of the four criteria above for inclusion

# Classification Changes Associated with Specific System Functions

# Chronology

- 1995 - 2000 An ongoing revision of the CC design basis document identified inconsistencies with system classifications
- 12/8/1997 Decay heat removal function of the spent fuel pool cooling system classified as NSQ
- 3/1/1999 Initiated component-level review of CC system
- 6/15/1998 Q-List updated to reflect revised classification
- 9/1/1999 Discovery of a through-wall leak on SW discharge piping servicing the D CCHX
- 10/22/1999 NRC advised of through-wall leak and of intent to perform ASME Code repair
- 12/15/1999 Heat transfer function of CCHX classified as NSQ.
- 3/27/2000 Q-List updated to reflect revised classification
- 4/26/2000 Re-classification of CCHX heat transfer function presented to Surry MRB
- 3/15/2000 Selected SW piping runs classified as NSQ
- 5/8/2000 Q-List updated to reflect revised classification
- 10/2/2000 NRC advised that assessment had concluded that SW piping was NSQ-Seismic and that a permanent non-ASME Code repair would be implemented

# Reclassification of Spent Fuel Pool System Decay Heat Removal Function

*The classification of the cooling (decay heat removal) function of the Spent Fuel Pool System was revised from safety-related to NSQ*

## Basis

- The determination was made during the development of system design basis documents that the original design bases for the system did not include a safety-related cooling function, nor did the system design meet the criteria for being classified as safety-related
- A classification change was implemented as part of a design change that re-powered the spent fuel pool pumps from the emergency busses to improve the reliability and capability of the system

# Component Cooling Water (CC) System Functions

## **Safety Related Functions**

1. Provide containment isolation capability such that the piping inside containment maintains its integrity and containment leakage from lines penetrating containment is sufficiently low following a DBA to maintain offsite and Control Room dose levels below regulatory limits.
2. Provide instrumentation to assess plant conditions for Reg. Guide 1.97 Category 1 variables

## **NSQ Functions**

1. Transfer heat from the residual heat removal system so that the units can be brought to cold shutdown to meet the requirements of Appendix R.
2. Provide heat transfer from the sampling system to the service water system to cool post-accident samples.
3. Provide instrumentation to assess plant conditions for Reg. Guide 1.97 Category 2 and 3 variables
4. Provide adequate heat transfer from hot containment pipe penetrations to the service water system to ensure long term integrity of the concrete surrounding the piping penetrations.

# Component Cooling Water (CC) System Functions

## **NSQ Functions (cont.)**

5. Provide computer inputs to satisfy emergency response facility requirements.
6. Transfer heat from the fuel pool cooling (FC) system such that the FC system can provide adequate spent fuel pool cooling.
7. Provide heat transfer from the RCP thermal barrier to prevent failure of the RCP seals in the event the charging system seal injection is lost. [Note: CC system piping inside containment is safety-related.]
8. Attenuate gamma and neutron radiation from fission and fission product decay from the reactor vessel in the neutron shield tank.

## **Nonsafety-related Functions**

1. Provide heat transfer from the RCP bearing lube oil coolers and stator coolers to the service water (SW) system
2. Provide heat transfer from heat exchangers in the charging system to the SW system
3. Provide heat transfer from the primary drains transfer tank cooler in the primary vents and drains system to the SW system
4. Provide heat transfer from heat exchangers and pump seals in the boron recovery system to the SW system

# Component Cooling Water (CC) System Functions

## **Nonsafety-Related Functions (cont.)**

5. Provide heat transfer from heat exchangers in the sampling system to the SW system
6. Provide heat transfer from the compressor seals in the gaseous waste system to the SW system
7. Provide heat transfer from the blowdown system steam generator recirculation coolers to the SW system
8. Provide heat transfer from the primary shield wall and the primary shield penetrations to the SW system.
9. Provide heat transfer from the containment instrument air compressors in the instrument and service air system to the SW system
10. Provide heat transfer from the residual heat removal system to the SW system
11. Provide adequate heat transfer from the control rod drive mechanism (CRDM) shroud cooling coils and containment recirculation air coolers in the containment air cooling system to the SW system
12. The CC system neutron shield tank shall provide adequate structural support and stabilization for the reactor vessel.

# Reclassification of Certain CC System Functions

*The CC System function to remove heat via the spent fuel pool cooler was classified as NSQ.*

## Basis

The Fuel Pool System function to provide cooling (decay heat removal) to the fuel pool was classified as NSQ.

*The CC System function to transfer heat from the charging pump mechanical seals to ensure adequate operation of the charging pumps during plant operations was re-classified as nonsafety-related.*

## Basis

Engineering evaluations concluded that the CC fluid to the charging pump mechanical seal coolers could be eliminated because the process fluid (i.e., charging/safety injection) would not exceed the maximum design temperature of the seals (including the heat added from the pumps)

# Reclassification of Certain CC System Functions (cont.)

*The CC System function to transfer heat from the RCP thermal barrier to prevent failure of the RCP seals was re-classified as NSQ*

## Basis

Seal injection via the charging pumps provides the primary means for RCP seal cooling. A loss of offsite power is the only credible means of losing seal injection during a design basis event, but no seal failure is expected during the brief period required to power the emergency busses and restore seal injection. The only credible means of losing seal injection for an extended time is a station blackout or Appendix R event, both of which are classified as NSQ.

The CC System piping inside containment remains safety-related.

# Reclassification of Certain CC System Functions (cont.)

*The CC System function to provide cooling water for the non-accident unit during an accident on the other unit to meet the requirements of the fuel pool cooling System to maintain fuel pool temperature was re-classified as NSQ*

## Basis

The Fuel Pool System function to provide cooling (decay heat removal) to the fuel pool was classified as NSQ.

*The CC System function to provide cooling for the residual heat removal system was re-classified to NSQ for Appendix R events, and to nonsafety-related for non-fire-related events to correspond to the existing classification of the residual heat removal system.*

## Basis

Appendix R events are classified as NSQ. In the event of an RHR pump seal leak, the TS requirements for RCS make-up capability and redundant heat removal loops ensure that RCS inventory can be maintained and heat removal is available. In addition, Surry's licensing basis established hot shutdown as the safe shutdown condition.

# Service Water (SW) System Functions

## Safety Related Functions

1. Transfer heat from the recirculation spray system fluid to the ultimate heat sink so that containment can be adequately depressurized following a DBA.
2. Transfer heat from containment sump fluids to the ultimate heat sink such that the safety injection system can provide adequate core cooling following a DBA.
3. Provide cooling for the chemical volume and control system pump support systems such that pump performance requirements are maintained following a DBA.
4. Provide make-up flow to the circulating water system intake canal such that required flow from the canal can be maintained following a DBA.
5. Provide cooling for control room ventilation system air conditioning units such that control and relay room temperature can be adequately maintained following a DBA.
6. Provide instrumentation to assess plant conditions for Reg. Guide 1.97 Category 1 variables.
7. Provide containment isolation capability so that release of radioactive materials does not result in exposures in excess of Part 100 guidelines.

# Service Water (SW) System Functions

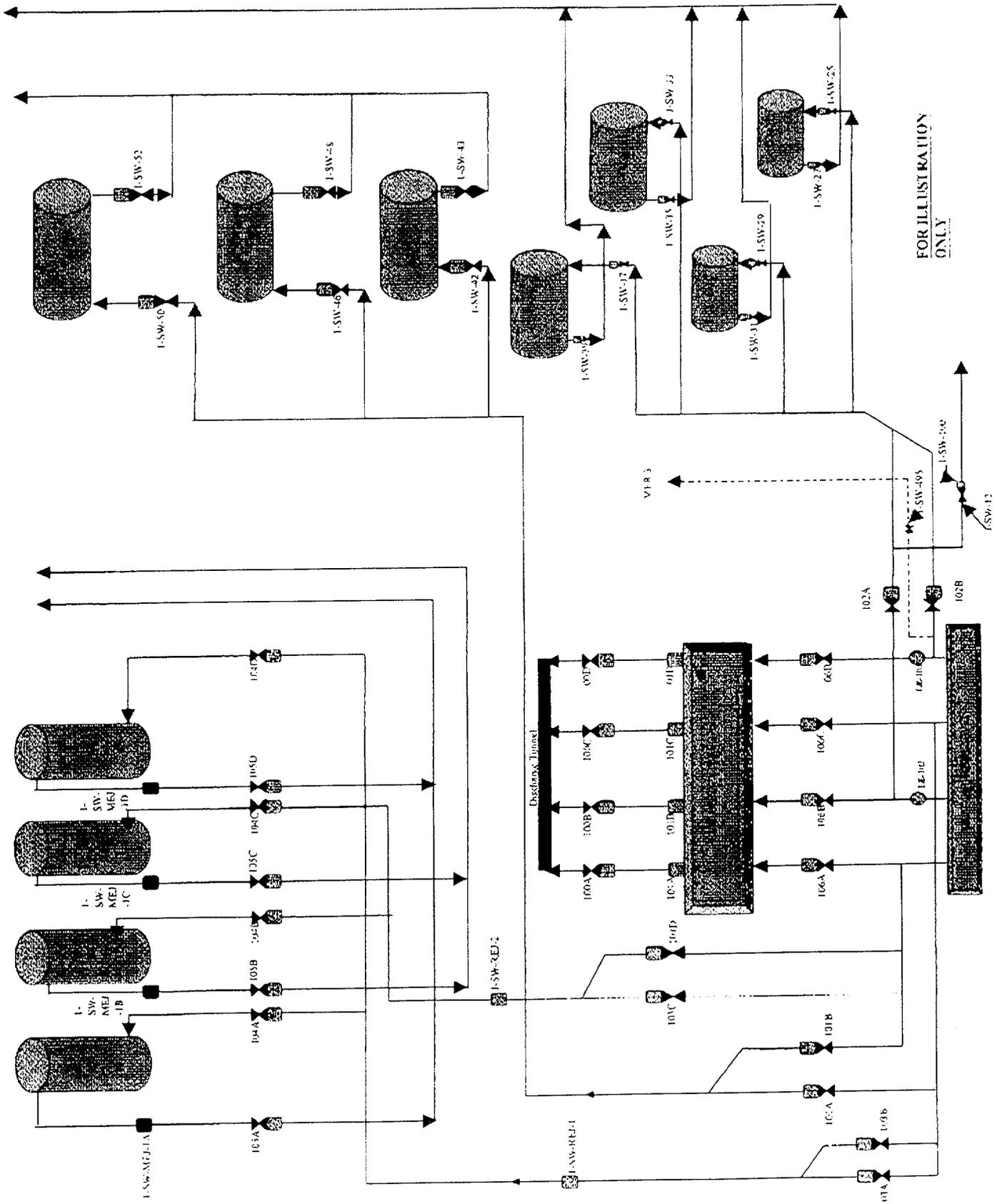
## NSQ Functions

1. Provide cooling for the CC system such that safe shutdown (hot shutdown) is attained following an Appendix R fire event.
2. Provide cooling for the control room air conditioning and pressurization system such that control room temperature is maintained during an Appendix R fire event or station blackout (SBO) event.
3. Provide make-up flow to the CW system intake canal such that required flow rate from the canal is maintained during an Appendix R fire event.
4. Provide cooling for the charging system pump support systems such that pump performance requirements are maintained following a high-energy line break, SBO or Appendix R fire events.
5. Provide instrumentation to assess plant conditions for Reg. Guide 1.97 Category 2 and 3 variables.
6. Provide computer inputs to satisfy emergency response facility monitoring requirements.
7. Provide make-up flow to the CW system intake canal such that required cooling water flow from the canal can be maintained following a hurricane or other natural phenomena.

# Service Water (SW) System Functions

## **Nonsafety-Related Functions**

1. Provide cooling for the CC system to ensure adequate removal of CC system heat loads.
2. Provide heat removal to ensure adequate operation of the station vacuum priming pumps (Unit 2 only).
3. Provide heat removal for the charging system to ensure adequate operation of the charging pumps.
4. Provide heat removal for the bearing cooling water system.
5. Provide heat removal for the chilled water system.



FOR ILLUSTRATION ONLY

# Reclassification of Certain SW System Functions

*Portions of Service Water system piping downstream of the CCHX discharge valves were re-classified as NSQ-Seismic.*

## Basis

The requirement to ensure Service Water flow to and from the CCHXs is no longer considered safety-related because the CCHX cooling function is not a safety-related function.

The safety-related function of the SW system pressure boundary to ensure adequate Intake Canal inventory for a design basis event is maintained to the last isolation valve. The seismic designation to NSQ maintains the analysis/structural boundary.

The SW piping downstream of the CCHX discharge valves that is classified NSQ-Seismic is being placed into the augmented inspection program.

Any postulated leakage at the reclassified piping interface is limited due to the short section not embedded. In an unlikely, but postulated catastrophic failure, the leak can be isolated via the CCHX discharge valves (which are safety-related).

There is no safety-related equipment in the area that would be rendered inoperable prior to isolating the leak.