February 4, 2010

Comment [WL1]: Our most recent version was dated April 6,2010 although most of the changes from the February 4 Revision 5 version are minor. We've indicated our response to each comment on this Revision 5 version as shown below and, unless identified otherwise, have made the same change in the most recent version. This will provide a basis for discussion in the June 2 meeting.

GUIDANCE TO NRC/NRR/DSS/SRXB REVIEWERS FOR WRITING TI SUGGESTIONS FOR THE REGION INSPECTIONS

Blue is used for comments and guidance in preparing the communication to the Regions. Material in black may be used "as is" or you may modify it. Choose from material in Red as appropriate, modify it, or add anything else that you believe is needed. Green is used for licensee-specific information. This means that a color printer should be used if you want a hard copy of this communication.

The following should be a memo from Gregory Cranston, the SRXB Branch Chief, if to Region II and an attachment to an email from Gregory Cranston if to Regions I, III, or IV. Addressees are:

I Michael Balazik

II Binoy Desai, Chief, Engineering Branch 1, Division of Reactor Safety, Region II, cc to Robert Berryman, Senior Reactor Inspector, Engineering Branch 1, Division of Reactor Safety, Region II

III Ann Marie Stone, cc to Caroline Tilton, Nestor Feliz-Adorno,

IV Thomas Farnholtz, cc to Matthew Young,

Warren Lyon, Diana Woodyatt, Dave Beaulieu, the Project Manager (PM), and the PM's Branch Chief should be on cc for all communications.

Subject: TI 2515/177 Inspection of plant name

The attachment provides the NRR Reactor Systems Branch (SRXB) suggestions for the inspection of plant name using the guidance provided in Temporary Instruction (TI) 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems, (NRC Generic Letter 2008-01)"

ATTACHMENT

OFFICE OF NUCLEAR REACTOR REGULATION (NRR) REACTOR SYSTEMS BRANCH (SRXB) SUGGESTIONS FOR THE PLANT NAME INSPECTION USING THE GUIDANCE PROVIDED IN TEMPORARY INSTRUCTION (TI) 2515/177 (REFERENCE 1)

1 BACKGROUND

Section 1 summarizes the SRXB review approach and provides information inspectors may find useful for inspections.

1.1 SRXB Review Approach

Reference 2 described the coverage the NRC staff expected licensees to provide in their responses to Generic Letter (GL) 2008-01 (Reference 3). The initial SRXB review approach was to address all shortcomings via in-depth Requests for Additional Information (RAIs) followed by recommendations to the Regions to supplement Regional plans for TI inspection coverage. However, based on feedback from the Regions and other stakeholders, we modified the review process to focus on information needed to ensure plant operability with respect to finding and addressing voids (Reference 4). This should reduce regulatory burden and appropriately utilize Regional inspector practices and knowledge. Reference 2 continues to apply and may be used for guidance in conducting TI inspections,

We focused on the following when preparing RAIs:

a. Technical Specifications (TSs) and planned response to Technical Specifications Task Force (TSTF) documentation,
b. Surveillance requirements,
c. Procedures, and
d. Corrective action program (CAP).

This was done with the intent of establishing that any remaining issues are confirmatory and the Regions can select issues to be examined further via the TI inspection.

1.2 Operability Determination

Our review and the inspections are based on guidance provided in References 5 - 7 for assessing subject system operability. The objective is to "reasonably ensure that subject system operability" is achieved and a "reasonable expectation" test applies. This means that a high degree of confidence applies but absolute assurance is not necessary. The determination can be based on analyses, test or partial test, experience, and/or engineering judgment. This is particularly applicable to void transport, pump response to voids, and vortexing, as discussed in Sections 1.4 and 1.5, below, where sufficient information is not available for providing in-depth generic guidance. Consequently, a strong reliance on engineering judgment will be necessary to support an interim finding regarding operability for these issues until improved generic guidance can be developed. Final findings regarding operability will be more solidly based on analyses and tests and the need for engineering judgment will be diminished although there will likely remain circumstances where solidly based engineering judgment is acceptable.

Comment [jhr2]: M Dingler - Does this sentence suggest that improved guidance, we will require more rigor than engineering judgment?

Comment [WL3]: Presently available information that has been reviewed by NRC is not sufficient for long-term assessment in some circumstances and we expect significant improvement by early 2011 based in part on ongoing industry work. Consequently, more rigor will be required but there may still be circumstances where engineering judgement is needed. We've added a sentence to clarify the meaning.

1.3 The Meaning of "Full of Water"

There have been issues related to the meaning of "full of water" in TSs. Reference 8 concluded that "if the licensee can conclude through an operability determination that there is a reasonable expectation that the system in question can perform its specified safety function, the system piping can be considered filled with water such that the surveillance requirement is met." A condition where there is no void is described by such words as gas-free, free-of-gas, or water-solid.

1.4 Void Transport and Pump Response

There are numerous issues related to void size, void transport and pump response to voids. Reference 9 provides guidance that we will accept without further justification. This is intended to be conservative and an update is planned but we are waiting for information based on industry testing and analysis development activities. In the meantime, we suggest you use the following in place of the applicable information in Reference 9:

> Assessing operability requires addressing all aspects of the behavior. This includes but is not necessarily limited to:

1. Variation in pump flow rate and discharge head encountered.
2. Suction transport.
3. Pump ingestion.
4. Discharge effects
5. Behavior within the reactor coolant system including delay in delivery of water.

~~The pipe void criteria are not applicable to:~~

~~1. Configurations where an equivalent diameter is used, such as in an annulus.~~

~~2. With the exception of pipes with a circular cross section and 90° elbows that connect between horizontal and long vertical pipes without other close-by connections, such as Tees, the criteria only apply to geometries where the velocity is parallel to the pipe centerline unless qualifications are provided. [Comment: The industry will conservatively limit the allowable void volume prevent void transport redistribution and will apply the most conservative void limit from all the downstream configurations to the upstream suction header]~~

At low flow rates, gas may be assumed to not move in a pipe if the Froude Number, N_{FR}, is ≤ 0.31 and the average void fraction in a plane perpendicular to the pipe centerline, Φ, is ≤ 0.2, where:

$$N_{FR} = V \left[D\, g_c \left(\rho_L - \rho_g \right) / \rho_L \right]^{-1/2}$$

D = pipe diameter
V = liquid velocity based on total pipe flow area
g_c = gravitational acceleration ~~constant~~
ρ = density
subscript L indicates liquid
subscript g indicates gas

At higher flow rates, some gas may be transported at N_{FR} ≤ 0.65 and all gas will be carried out of a pipe with the flowing water if N_{FR} ≥ 2.0~~.5~~. Time to clear gas from a pipe for 0.65 < N_{FR} < 2.0~~5~~ is a function of Froude number as show below (flow rate and we are waiting for information from industry before addressing this.

T = { V-gas / (Q X Φ)} + { V-system / Q }

Where T : The minimum time required to flush out voids
V-gas : Void volume
V-system : Downstream system water volume
Q : Dynamic flow rate
Φ : Void fraction as function of Fr.

No credit for dynamic venting for Fr less than 0.8
Φ = 0.01 for 0.8 ≤ Fr < 1.0
Φ = 0.02 for 1.0 ≤ Fr < 1.2
Φ = 0.10 for 1.2 ≤ Fr < 1.5
Φ = 0.30 for 1.5 ≤ Fr < 2.0
Φ = 0.50 for 2.0 ≤ Fr

Comment [WL4]: These are general comments and are not meant to mean that the pump void fraction criteria do not apply.

Comment [REB5]: RE Becse - I was under the impression that as long as the void fraction criteria at the pump was met, variations in flow and head were considered acceptable from an operability standpoint. Is this requirement in addition to or in lieu of the void fraction requirement? Further, does the NRC have a transient /steady state requirement to complement the void fraction criteria?

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Comment [WL6]: This is clarified by moving the discussion of pipe void criteria so that it follows the table and by other wording changes.

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Comment [WL7]: Change made

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Comment [WL8]: The 2.5 was a judgment call. I consider 2.0 to be equally acceptable. Change made.

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Comment [jhr9]: M Dingler - We need to clarify the list of information that the NRC wants and agree on a schedule to submit it.

Comment [jhr10]: Chris Brennan - We were not aware the NRC was waiting on anything from the industry to better define this position. As discussed at the NEI workshop in Savannah, as long as there is a sufficiently high Froude number to support movement of the bubbles (e.g. Nfr >= 1.0), then it is merely a function of time to ensure the entire system is swept clear of any voids. This will be purely a function of the velocity in the piping, and the length of the piping, but in most cases, would probably be only a minute or so. In most cases, flushing of these systems prior to declaring operability, is typically greater than 15 minutes. Section 1.12.2 of this document appears to lay out the correct requirements, and should suffice.

Comment [WL11]: Section 1.12.2 does not provide criteria. The information presented in yellow bold is the type of information that our inspectors can use when assessing licensee procedures. However, we need to understand the basis for the terms. And the second term assumes gas is carried through the rest of the system along with the water but the Purdue tests show this is incorrect for smaller Fr.

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Interim criteria we will accept without further justification for not jeopardizing operability of a subject system pump are:

Condition	Typical BWR Pumps Allowable Φ, %	Typical PWR Pumps Allowable Φ, %		
		Single Stage	Multi-Stage Stiff Shaft	Multi-Stage Flexible Shaft
Steady state (> 20 seconds), 40% ≤ Q/Q_{BEP} ≤ 120%	2	2	2	2
Steady state (> 20 seconds), Q/Q_{BEP} < 40% or >120%	1	1	1	1
Transient ≤ 5 seconds, 70% ≤ Q/Q_{BEP} ≤ 120%	10	7	20	10
Transient ≤ 5 seconds, Q/Q_{BEP} < 70% or >120%	5	3	5	5
Transient ≤ 20 seconds, 70% ≤ Q/Q_{BEP} ≤ 120%	4	5	20	5
Transient ≤ 20 seconds, Q/Q_{BEP} < 70% or >120%	3	5	5	5

where: Q = water volumetric flow rate
BEP = best efficiency point
Transient Φ is averaged over the specified time span
Instantaneous Φ < 1.5 times the listed value

Reference 9 also discusses net positive suction head (NPSH) considerations. These are no longer necessary since meeting the above requirements should also result in meeting NPSH requirements.

Licensees have provided plant-specific responses to address issues when gas was discovered that potentially rendered systems inoperable. Some of these involved extensive RELAP 5 analyses and scaled system mockup tests where we provided assessments to Regional / Resident Inspectors while not finding that the responses were generically acceptable. For example, Region I personnel, the licensee, and Fauske Associates did an in-depth evaluation of a void issue at Millstone 3 that provided sufficient information for the Region to conclude that historic operability had been acceptably confirmed. References 10 and 11 describe two phase, two component tests and RELAP 5 analyses of the tests, respectively. Fauske Associates and the licensee also used RELAP 5 to calculate behavior in the emergency core cooling system (ECCS) flow path at Millstone 3, but these reports are not readily available. We suggest contacting Wayne Schmidt (610-337-5315) at Region I if you need additional information. RELAP 5 has also been used to calculate two phase, two component behavior in the subject

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Comment [jhr12]: Chris Brennan - The highlighted cells in the following table contain data there were not originally contained within the NEI APC letter 09-20. Those cells were intended to remain blank, and interpolation from nearby cells is most likely not appropriate.

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Comment [REB13]: RE Becse - This table is not correct. It is inconsistent to require 3% VF at off nominal for 5 seconds and then allow for 5% VF at off nominal for 20 seconds. This is a typo that needs to be addressed.

Comment [WL14]: The typos have been addressed. We estimated values for the blanks in the industry version because our inspectors need specific guidance, not blanks. We will defend them until better substantiated numbers are available or new information shows them to be incorrect on the basis of informed judgment.

Comment [REB15]: RE Becse - What is the basis for the 7% and 3%. Where did these numbers come from? While they allow for more flexibility, does industry need to defend these numbers or is the NRC willing to defend these numbers?

Comment [HRE16]: The values in the NEI letter were developed from the existing analytical and experimental information and have been used by essentially all of the utilities in responding to the generic letter. The values highlighted in yellow should not be changed unless there is clear experimental evidence that change is warranted and needed.

systems at other facilities. There are at least seven cautions to observe in considering this approach:

1. RELAP 5 modeling is strongly influenced by the modeler who must have a demonstrated capability to fully understand the code and the necessary nodalization.

2. RELAP 5 does not correctly model such phenomena as the kinematic shock (waterfall) that may occur downstream of the elbow from a horizontal pipe to a vertical pipe and any conclusions must consider such inadequacies.

3. If pump modeling is an important component of the analysis, then pump modeling may be inadequately addressed.

4. There are questions regarding the correct modeling of vortex behavior associated with water level approaching the level of a drain pipe from a tank or the connection between a large pipe and a smaller suction pipe (see Section 1.5, below).

5. The wide variation of pipe geometries and the above considerations may necessitate that tests be conducted and compared to RELAP 5 calculations unless previously applicable comparisons have been performed.

6. Older versions of RELAP 5 do not have a two component (gas-liquid) analysis capability.

7. RELAP 5 predictions should be assessed with respect to basic behavior as addressed by such approaches as use of Froude number, bubble rise velocities, and, in some cases, tests that include applicable configurations.

At present, there is no acceptable generic methodology for assessing void size, transport behavior, and pump response to voids other than Reference 9 with the above modifications, and any extrapolations to conditions not addressed by this information should be addressed on a plant-specific basis. Many licensees reference industry documentation that is inconsistent with the above information and such references are not sufficient justification for operability or operating considerations. In conclusion, the best approach is one in which voids are prevented and, when voids are found, they should clearly be much smaller than a void that could challenge operability and generally should be removed unless removal is impractical. Further, any void that challenges operability must be removed or reduced so that it is clearly no longer a concern.

1.5 Vortexing

NRC inspectors are often encountering plant conditions where vortexing may result in entrainment of gas into systems that are required for plant operation or to respond to accident conditions. In assessing these conditions, they are finding that licensees may be relying on non-conservative analysis methodologies, yet the inspectors have little guidance upon which to base their assessments. Instead, they have found that several methodologies exist to determine whether a vortex will form and contradictory results have been obtained from the different testing methods, configurations evaluated, and interpretation and extrapolation of results. Likewise, inspectors have a difficult time in determining the amount of air entrainment due to vortexing and the effect on pumps. This has led to such situations as inconsistent assessment of vortices, challenging of previously reviewed vortex analyses, potential inappropriate selection of which methodology to use, and questions regarding the impact on pump operability. We plan to develop a formal position and generic guidance regarding vortex

Comment [jhr17]: Chris Brennan - This section seems to leave the reader with the impression that RELAP5 is the only alternative analytical method deemed acceptable to the NRC staff. This seems to be a much narrower interpretation than NRC RIS 2005-20 r1 would suggest, where other methods, such as GOTHIC, TRAC, TRACE, etc., could also be used. This section also seems to leave the reader with the impression that validation of the analytical model with respect to scale model tests is required, or at least a desirable element, which is not consistent with the guidance of NRC RIS 2005-20 r1, where its use is likened to an extension of "engineering judgment". This does not relieve the licensee of the burden to ensure the results adequately represent t ... [1]

Comment [WL18]: We did not mean to imply that other codes would not be acceptable ... [2]

Comment [jhr19]: Chris Brennan - This requirement is fully denoted in NRC RIS 2005-20, section C.4.b(6).

Comment [jhr20]: C. Brennan - This is true of many of the computer codes proposed for this application. RELAP5 and some others ca ... [3]

Comment [jhr21]: C Brennan - As mentioned earlier, this is not a requirement or recommendation of the NRC RIS 2005-20 ... [4]

Comment [jhr22]: M Dingler - Is it necessary to benchmark RELAP 5 with testing?

Comment [jhr23]: C Brennan - Older versions of RELAP5 have always had two component analysis capability. I believe ... [5]

Comment [WL24]: RELAP 5 was originally a two phase single component code.

Comment [jhr25]: C Brennan - Agreed, however, this is most likely appropriate for evaluation after the operability has been ... [6]

Comment [jhr26]: C Brennan - Actually, the reference 9 document is marked DRAFT, and as far as the industry is aware, has never ... [7]

Comment [WL27]: We agree in principle but note that the information is essentially internal guidance that has been made available to ... [8]

Comment [jhr28]: This statement seems unnecessarily strong based on the discus ... [9]

Comment [WL29]: wording changed.but used acceptable rather than adequate.

Comment [jhr30]: C Brennan - This is quite a bold statement , especially since this draft is intended to incorporate the basic premis ... [10]

Comment [WL31]: NEI 09-10 is better focused and more complete than any previous NEI document.

Comment [jhr32]: M Dingler - What do we plan to do to provide sufficient justification for operability?

Comment [WL33]: We're on a path to do that with such items as the simplified equation.

formation and acceptable analytical methods for assessing vortex formation by December, 2010, (TAC ME1306). In conclusion, the best approach is one in which plant operation prevents approaching conditions where vortexing can result in gas ingestion.

Comment [jhr34]: M Dingler – Will industry have an opportunity to submit comments on the new vortexing guidance?

Comment [WL35]: We intend to continue to work with industry as guidance is developed with an objective of achieving agreement regarding guidance consistent with the overall objective or reasonable assurance of operability.

Comment [HRE36]: Vortices are categorized as Types 1 through 6 with Type 1 being a surface dimple and Type 6 having a continuous gas core tha t extends into the suction port. To obtain a 1% void fraction in the suction flow, the diameter of the gas core needs to be at least 10% of the suction port diameter. This is only obtained with a Type 6 vortex. Much of the confusion arises because it is not clear that only a Type 6 vortex of this scale would challenge pump operation. This vortex guidance must be consistent with the NEI/NRC guidance on the allowable pump inlet gas volume fraction.

Comment [REB37]: RE Becse – If the guidance is generic, it needs to consider a number of scenarios as the formation of a vortex is highly dependent on surface conditions, geometry, etc. Also, HI categorizes vortex strength. Should agreement be obtained on what vortex strength is premissible? (i.e., Vortex strength ranges from surface dimple to air entraining vortices.).

1.6 Recent Nuclear Energy Institute (NEI) Guidance

NEI recently published Reference 12, “Guidelines for Effective Prevention and Management of System Gas Accumulation,” ML093130090. Although it does not provide significant information regarding gas movement and pump response to gas, it provides excellent coverage of many aspects of the issues addressed by GL 2008-01 and extends industry guidance to cover all systems where gas accumulation may be a concern. We recommend you read this document for background information before conducting the TI inspection.

NEI plans to revise Reference 12 during 2010 and will include void criteria and guidance. We are working with NEI and industry to achieve criteria that we will accept and, if successful, will replace the need for a separate NRC void criteria document. We also are investigating endorsing the revised document. We’ll keep you informed of progress in this area.

1.7 Accessible Versus Non-Accessible Locations and Surveillance Requirements

All locations are considered to be accessible unless actual environmental conditions constitute a hazard to personnel or are such that conducting the surveillance in the specific locations to be surveyed will result in an unacceptable dose. Surveillance locations in a posted high radiation area are considered to be accessible if the surveillance(s) are not in actual locations of significantly elevated radiation or surveillances in the posted area can be conducted without exceeding an acceptable dose. For example, suppose six locations are in a high radiation area, but only one location would result in an excessive dose and the other five can be completed with a minimal exposure to radiation. Then, the one location would be considered to be non-accessible and the other five would be accessible.

Consideration of such aspects as high environmental temperatures or local high temperatures that constitute a burn hazard also apply to determination of non-assessibility. However, the first consideration should be with respect to relocating the surveillance location and, if this is not practical, then the non-accessible location determination may be applicable.

Surveillance is required for all locations of concern unless it is acceptably determined that the surveillance is not necessary to reasonably ensure operability. However, the NRC staff will allow more flexibility in determination of operability for non-accessible locations with respect to consideration of such aspects as the likelihood that gas can accumulate in the locations of concern in contrast to the impact of gas at those locations.

1.8 Surveillance Frequency and Requirements

The NRC staff is studying general surveillance requirements as part of the TSTF evaluation but, for now, the scheduled surveillance frequency should be every 31 days unless a greater surveillance frequency has been justified. Typical considerations for a greater surveillance frequency could include such items as:

1. All potential sources of gas are monitored and trended and applicable parameters remain within specified limits. Potential monitoring may include but not be limited to

Comment [WL38]: We have not provided detail on this but have left it up to licensees. Is more detail desirable?

Comment [REB39]: What are the expectations for trending (e.g., log particular information, the use of SPC, etc.)?

such items as accumulator level and pressure, reactor coolant system (RCS) leakage, ECCS and residual heat removal (RHR) system piping pressure, RHR temperature versus saturation temperature when RHR is initiated or suction sources are changed, volume control tank pressure for unanticipated pressure drops, reactor coolant pump seal return flow rate for unanticipated increases, and level in tanks (if any) that are provided to accumulate gas from piping high points. Further, monitoring of locations where outgassing may occur when liquid passes from a high pressure region to one at lower pressure should be considered.

2. The piping is maintained at a pressure higher than that of any potential source of gas in-leakage, such as some of the ECCS discharge piping (e.g., accumulator and RHR discharge lines) in some Westinghouse ~~3-loop~~ designs, and no locations exist where outgassing may cause gas to accumulate during operation (e.g. partial pressure of dissolved gas from the VCT is far less than the accumulator pressure) ~~.~~

Potential sources of gas that should also be considered may include failure of level instruments to indicate correct level, leakage through one or a series of closed valves, vortexing, design deficiencies that may result in gas intrusion during accidents, keep-full system malfunctions, leaks in hydraulic dampeners, and cooling of an isolated section of piping that may cause a pressure decrease.

Any location that has the potential for a gas volume to be formed should be assumed to have an acceptance criterion of zero gas unless a criterion has been specifically determined for that location.

Monitoring is not required for those potential void locations (vented or unvented) where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system operability based on the maximum acceptable void volume, location, Froude number, or other technical basis. Further, Monitoring is not required for a potential void location that communicates with a bounding~~,~~ monitored potential void location in the same piping segment when the second location will show a void when the first location is full. However, any potential gas volume in unmonitored locations must be acceptably evaluated with respect to its potential contribution to the overall system response if gas accumulates in other locations. The evaluation must be documented and the total potential gas volume from such a location reduces the overall system acceptance criteria for that pipe segment. The process could require additional monitoring for these locations if gas is found at the bounding monitored potential void location. (Most material taken from Reference 12, which provides excellent insights for addressing gas concerns.)

The monitoring methodology should be documented. The documentation should include an assessment of the monitoring methodology accuracy and a justification of why the accuracy is sufficient to support a determination of operability.

Failure to meet a gas volume acceptance criterion shall require (1) immediate entry into the CAP, (2) an immediate operability determination, and (3) a decreased scheduled surveillance frequency that is sufficiently short to ensure that the affected locations will remain within acceptance criteria until the cause of the failure is corrected.

1.9 Surveillances Associated with Outage and Maintenance

Any system maintenance activity that will result in a reduction in fluid inventory of a fluid system

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Comment [WL40]: Wording changed but not completely as suggested.

Comment [WL41]: I have observed UT methods where the results were not good to even one significant figure but were described in statements such as the pipe was half full or 3/4 full yet when applied 3 significant figures were used. However, I generally agree with the comment that UT accuracy is generally better than the acceptance criteria. I have added tp the paragraph to more accurately reflect the intent.

Comment [jhr42]: C Brennan - Is the author suggesting that the measurement accuracy of UT methods be determined, or only those methods which are NOT UT methods? The accuracy of UT methods is generally accepted as being far greater than the accuracy of the operability criteria for pump ingestion provided earlier, against which these measurements are being compared. Granted, however, that NON UT methods may introduce significant uncertainty, relative to the acceptance criteria, in which case they should be quantified, and considered in the application of the acceptance criteria.

in the scope of gas accumulation management should be evaluated to determine the required fill, vent and verification inspection. The work processes should include provision for engineering review and evaluation of such evolutions. If the specific evolution has been previously evaluated and the fill, vent and verification requirement identified, then engineering review could be limited to verifying applicability.

Some of the potential sources of gas that are of concern with outage and maintenance practices are the same as identified in Section 1.8, above. Others that should be considered include procedure errors, failure to follow procedures, ineffective fill and vent, system draining and realignments,

Locations potentially affected by outages or maintenance operations are to be purged of gas and/or surveyed immediately upon completion of the activity and established to have no gas volumes that exceed gas volume acceptance criteria. A follow-up complete independent surveillance of potentially affected locations and adjoining locations should be accomplished within 31 days if the scheduled surveillance frequency is greater than 31 days to ensure that the post-outage or maintenance potential impacts have been addressed. The acceptance criteria for this second surveillance should be that no gas volume acceptance criteria will be exceeded and no significant gas accumulation will have occurred since the first surveillance that was conducted upon completion of the activity. Startup of selected pumps and observation of the transient discharge pressure is an acceptable second surveillance of pump discharge piping if (1) at least one week has passed since the first test, (2) this test was conducted previously with verification that the observed transient was consistent with the previously determined volume, (3) the second surveillance established, within the sensitivity of the test, that no gas accumulated since the first test, and (4) gas volumes are less than half the gas volume acceptance criteria.

1.10 Gas Volume Acceptance Criteria

If there is no specified gas volume acceptance criterion for a location where gas may potentially exist, then the acceptance criterion is that a water-solid condition shall exist.

As discussed in Section 1.4, above, gas volume acceptance criteria are of five types:

1. Pump Inlet void fractions
2. Criteria applicable to piping upstream of pumps that may result in voids entering a pump
3. Criteria applicable to water hammer and related issues
4. Criteria applicable to RCS behavior due to injected gas
5. Criteria applicable to containment response

And the only approved generic guidance that is applicable to Items 1 and 2 is the NRC Staff Criteria of Reference 9 as modified in Section 1.4.

Water hammer effects due to potential accumulated gas or vapor must be shown to be limited to a value that does not damage piping, pipe supports, or other system components. Further, the pressure surge associated with pump starts must not result in lifting of relief valves where system pressure exceeds reseat pressure and should not result in lifting relief valves under any conditions. Several reports have been received from industry that address water hammer under various conditions and the NRC staff is considering the available information. However, no single report has been received that addresses all aspects of water hammer that represents an industry position.

Comment [WL43]:

Comment [jhr44]: What is the basis for this prescriptive guidance, especially the time limits?

Comment [WL45]: This is based on judgement of an approach that should be acceptable for inspection purposes. Remember, this document is for the purpose of providing inspection guidance and is an internal document that was shared with industry as part of the working together process. We'll plan on discussing the paragraph in the June 2 meeting.

Comment [jhr46]: C Brennan - Again this guidance has never been officially reviewed and issued by the NRC for use by the industry or for internal use as far as we know. To present this statement in this manner is somewhat inconsistent with the intended endorsement of the industry positions referred to at the end of section 1.6.

Comment [WL47]: Sentence deleted.

Comment [jhr48]: What is the purpose of this phrase given the second phrase beginning after "and"? Doesn't the second part of the sentence encompass this condition?

Comment [jhr49]: C Brennan - We disagree with this limitation. If a relief valve lifts, the potential is that it may not reseat, either because the steady state pressure is higher than the reseat setpoint, of the valve has failed. In either case, if the licensee can demonstrate that the system, structure or component is capable of performing its intended safety function while accounting for the diverted flow, then in accordance with NRC RIS 2005-20 r1, the SSC is considered operable. It is incumbent on the licensee to review the system for this potential, and consider its potential in the determination of operability, but it is inappropriate to disqualify the SSC operability evaluation just because the relief valve may have lifted.

Comment [WL50]: I don't agree. However, the end of the sentence is unnecessary and has been eliminated.

Comment [jhr51]: M Dingler - we plan to submit a single report with a position on water hammer?

Comment [WL52]: Sentence was deleted as unnecessary and due to the implication that we expect a single report.

RCS response to injected gas generally entails consideration of the potential delay in injecting water upon demand and the effect of the injected gas on RCS behavior. The potential delay is generally small with respect to other delays associated with initiation of injection and the amount of injected gas is often small in comparison to the voids that exist due to other causes. In such cases, a qualitative evaluation is often sufficient to establish operational acceptability. No generic guidance is anticipated to be necessary to address Item 4.

The same conclusions generally apply to Item 5.

1.11 **Corrective Action Program** (Taken in part from Reference 12)

The CAP should be used to resolve identified deficiencies in procedures. The final system condition should be verified to meet acceptance criteria or be resolved by appropriate corrective action. Any voids found following completion of fill and vent activities should be recorded, tracked, and trended for evaluation of gas intrusion management effectiveness.
If the CAP is entered because of failure to meet an acceptance criterion, an immediate review should be conducted to identify other locations that are potentially affected by the observed gas intrusion mechanism and inspections should be performed at the locations identified by the review. Locations where gas continues to accumulate should be evaluated for possible remedies which could prevent or minimize future gas intrusion. This could be through plant modification or operating procedure and practice changes. An important aspect of correcting such conditions is to have a clear understanding of the gas intrusion mechanism. If changes cannot be made immediately to remedy these locations, then enhanced monitoring shall be implemented to identify early onset of gas accumulation.

Comment [WL53]: The objective should be to eliminate gas or, if this is impractical, to make gas accumulation as small as practical. If no evaluation is performed, then I believe the corrective action is deficient. Not changed.

Comment [jhr54]: M Dingler – Does this mean if we do not correct the condition we can be questioned for ineffective corrective action?

1.12 **Procedures** (Taken from Reference 12 with modifications)

Operating, testing and maintenance procedures should include warnings about potential gas intrusion and or accumulation for those evolutions that have been identified during the evaluations of the plant systems. For precursor conditions that are monitored, criteria for when action is required to evaluate gas intrusion should be included in procedures.

1.12.1 Fill and Vent Procedures

Fill and vent procedures should contain guidance on filling and venting methods to restore the systems as full based on the system configuration. Venting methods may include static venting through a valve, dynamic (flow induced) venting, and vacuum venting. Verification that the system piping is full of water following fill and vent is necessary.

Fill and vent procedures should:

1. Specify vent locations to support operating and maintenance activities, the venting method, and the criteria to determine when adequately filled.

2. Specify adequate steps that ensure the subject systems are free of accumulated gas and will perform their intended functions.

3. Be revised as necessary to incorporate operating experience and to control gas voids that may be introduced by maintenance and/or operational activities.

4. Be specific for the condition and alignment of the system at the time of the activity and any limitations on available vents from isolation boundaries.

5. Include the following:

    a. Use the appropriate fill source and fill location.

    b. Provide the proper sequencing of valve operations to maximize gas void removal. Vent sequencing from lower high points to the higher elevation high points should be accomplished unless a determination has been made that it is not necessary.

    c. Provide specific acceptance criteria for venting based on potential void locations and the duration of flow required for transfer of the void to the vent location.

    d. Include filling or backfilling instrumentation lines when applicable.

    e. Provide instructions related to system alignment and the minimum required flow rate to perform dynamic venting if necessary.

    f. Provide verification after fill and venting, and re-verification if additional venting is required so that the piping is sufficiently full.

    g. Document void identification and quantification information, including no void present.

    h. Use the CAP if verification identifies weaknesses in prior fill and vent activities.

1.12.2 Dynamic Venting

Use of dynamic venting is an effective means to remove gas from local high points and traps in piping. It involves pumping water through the system to force accumulated gas to a location that can be vented or removed. When static fill and vent efforts are not effective in removing all trapped gas during system restoration, procedures should provide for use of dynamic venting when it is allowed by the system configuration. Dynamic venting should be performed in accordance with written procedures that consider the following:

1. Acceptability of the location to which the gas will be transported

2. Effect of transporting voids through pumps

3. Required flow rate (Froude Number) to sweep the gas from the high point

4. Time that flow should be maintained to ensure sweeping the gas

1.12.3 Vacuum Fill

Vacuum filling may be an effective method for removal of trapped gas. Vacuum fill should be done in accordance with written procedures and appropriate evaluations of the effect of vacuum on the system should be performed and documented.

1.12.4 Verification

Fill and vent procedures should include requirements for verification of effectiveness and should include quantification of any remaining gas found. If the fill and vent is performed for system restoration following maintenance on an isolated portion of the system, verification should include quantitative inspection to find gas accumulation that may be transported outside the isolation boundary once the system is restored.

1.13 Applicable systems

For pressurized water reactors, applicable systems will typically include:

1. Safety Injection (SI) System or ECCS. This typically includes charging pumps, high pressure coolant injection (HPCI) system, low pressure injection (LPI) system, and SI accumulators where different licensees use different nomenclature that is not listed in this report for the same function.

2. RHR, DHR, or Shutdown Cooling (SDC) System. Different licensees use different designations. Configurations typically include reactor vessel (RV) cold leg and hot leg injection, suction from the RCS) and the containment emergency sump.

3. Containment Spray (CS) System.

4. Borated Refueling Water Storage System or its equivalent with respect to potential interactions with the ECCS. (Different licensees use different designations.)

5. Chemical and Volume Control System with respect to potential interactions with the ECCS.

For boiling water reactors, this will typically include:

6. Core Spray.

7. High Pressure Coolant Injection (HPCI).

8. RHR. Functions typically include suppression pool cooling, shutdown cooling, core spray, containment cooling, decay heat removal, alternate decay heat removal, drywell / wetwell spray, suppression pool spray, ECCS keepfill system, torus spray, and low pressure core spray, depending upon the plant and the licensee's designation of the system functions.

9. Other components of the ECCS.

2 INSPECTION GUIDANCE

The licensee has provided a response to GL 2008-01 that satisfies the GL objectives. (References 13, 14, etc) There are no open items that necessitate additional NRR/SRXB follow-up although SRXB plans to provide consultation to Regional or Resident Inspectors upon request. A confirmatory inspection that uses the guidance provided in Temporary Instruction (TI) 2515/177 is the only item that remains.

Selection of inspection items and the inspection depth is a Regional decision since Regional personnel have insights and knowledge that we do not possess at Headquarters, and the TI has been written to provide this flexibility. Our suggestions are based on a selective review of the licensee's responses to the GL and those responses may not fully cover the licensee's capabilities. Our suggestions are provided for your consideration and we have not attempted to cover all aspects of the TI. You should treat the suggestions as supplementary information that may not be necessary in light of your knowledge of the actual plant condition, and you should follow the TI in whatever depth you believe is appropriate.

In general, we suggest that your inspection in response to the TI

Select one of the following three:

be minimal since the licensee has provided an in-depth response to the GL that addresses the issues

or

be an in-depth inspection because the licensee's response to the GL resulted in many confirmatory items that need to be addressed. We suggest that most aspects of the TI be covered with consideration of the suggestions we provide below.

or

be based on selections from the TI guidance that you believe appropriate with consideration of the suggestions we provide below.

The following should be included in all inspection suggestions documents unless there are no commitments:

Verify that the licensee has completed or has acceptable plans for addressing commitments identified in the GL responses. We suggest that you plan to follow up to reasonably ensure outstanding commitments are acceptably addressed.

The following should be included in all PWR inspection suggestions documents:

Based upon the information we have reviewed, we suggest you consider including the following when planning the TI 2515/177 inspection:

Many PWR licensees have found that flashing can occur in RHR suction lines when initiating RHR while the lines are at an elevated temperature. Verify that the licensee has acceptably addressed this issue if applicable to its design and operation.

[Comment: steam bubbles do not transport like non-condensable, they collapse once submerge into the flow stream. Instant flashing will result in rapid temperature decrease as well. Upon a LOCA, pump suction pressure drops quickly, so does the temperature becasue T-sat follows the P-sat (h-liquid is approximately 200 BTU/lbm, at the same temperature, h-vap is more than 1100 BTU/lbm. It releases ~ 900 BTU/lbm). Since RHR pumps are located at a lower elevation, the hydrostatic head will keep the other RHR pump flooded at all time.]

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Comment [WL55]: Some of this wording has been added as a clarification for the inspectors.

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Depending on the information provided in the licensee's GL response and our review, the following should be considered for inclusion in our suggestions to the Regions:

- Verify that one or more procedures (1) include acceptable methods for determining void volume, (2) acceptably address a methodology for void removal, (3) have been covered in training, and (4) ensure that the licensee enters the CAP whenever voids are discovered following refill operations. TI Sections 04.01, 04.03, Reference 2 Sections 3.3.2, 3.5.1, 3.5.2, 3.5.3, 3.5.4

- Selectively verify the acceptability of the CAP process for addressing issues pertinent to GL 2008-01 and, if applicable CAP processes have been performed, then verify the acceptability of the licensee's response to the identified issues. TI Sections 04.01, 04.02, 04.03c5, 04.04; Reference 2 Sections 3.4.6, 3.6

- Verify the acceptability of the licensee's processes for monitoring and trending such parameters as void volumes, accumulator level and temperature, reactor coolant system (RCS) leakage, and ECCS discharge pressure and temperature to ensure that pre-cursor parameters are addressed and that entry into the CAP will be accomplished if acceptable trending criteria are not met. See Sections 1.8 and 1.9, above, for guidance. TI Sections 04.01, 04.02e

- Verify the acceptability of the licensee's methodology for predicting void behavior and the impact on subject system operability. Pay particular attention to the licensee's determination of acceptable void volumes with respect to void volume, void transport, and pump response to voids. See Section 1.4, above, for guidance. The licensee should be consistent with the Reference 9 or the Section 1.4 criteria or should provide a justification for any differences. TI Sections 04.01, 04.02f, 04.03d; Reference 2 Sections 3.3.2, 3.4.3, 3.4.4

- Selectively verify the acceptability of the licensee's review relative to the plant configuration, walkdowns and commitments for planned walkdowns. TI General Guidance, TI Sections 04.02c and d, 04.04; Reference 2 Sections 3.4.5, 3.4.6, 3.4.7

- Selectively verify that the licensee has acceptably performed hardware modifications, such as installing additional vent valves in upper pipe elevations and that the vent valve installation process reasonably ensures that the opening inside the pipe is sufficiently close to the upper elevation of the pipe to accomplish the venting purpose. TI Section 04.04, Reference 2 Section 3.4.8

- If training is acceptably addressed, but interim training is not covered, then: Training is stated to be accomplished at a future date. Verify that the existing applicable training background ensures that personnel are aware of gas-related concerns and will respond accordingly. TI Section 04.02c, Reference 2 Section 3.7.

- If TSTF information, such as a commitment date, is not adequate, then: Verify that the licensee has committed to assess the technical specification task force (TSTF) traveler and to implement appropriate changes in TSs within one year or less of the TSTF being issued. TI Section 04.01, Reference 2 Section 3.3.4

- If "accessible locations" is based on a broad statement such as containment and posted high radiation areas rather than actual radiation or thermal access considerations, then:

Verify that the meaning of “accessible locations” is consistent with actual accessibility and that coverage of inaccessible locations is acceptable. TI Section 04.02c, Reference 2 Section 3.3.2

- If the licensee did not adequately identify the applicable systems, then: Verify that the licensee considers all systems that should be covered consistent with the GL. Select either the PWR or the BWR item that follows. For pressurized water reactors (PWRs) this will typically include:

    - Safety Injection (SI) System or ECCS. This typically includes charging pumps, the high pressure coolant injection (HPCI) system, the low pressure injection (LPI) system, and SI accumulators. (Different licensees use different nomenclature that is not listed in this report for the same function.)

    - Residual Heat Removal (RHR), DHR, or Shutdown Cooling (SDC) System. Different licensees use different designations. Configurations typically include reactor vessel (RV) cold leg and hot leg injection, suction from the reactor coolant system (RCS), and the containment emergency sump.

    - Containment Spray (CS) System.

    - Borated Refueling Water Storage System or its equivalent with respect to potential interactions with the ECCS. (Different licensees use different designations.)

    - Chemical and Volume Control System (CVCS) with respect to potential interactions with the ECCS.

    For boiling water reactors (BWRs) this will typically include:

    - Core Spray.

    - High Pressure Coolant Injection (HPCI).

    - Residual Heat Removal (RHR). Functions typically include suppression pool cooling, shutdown cooling, core spray, containment cooling, decay heat removal, alternate decay heat removal, drywell / wetwell spray, suppression pool spray, ECCS keepfill system, torus spray, and low pressure core spray, depending upon the plant and the licensee’s designation of the system functions.

    - Other components of the ECCS.

    TI General Guidance, Reference 2 Section 3.1

- With respect to surveillance frequency and requirements, see Sections 1.8 and 1.9, above, for guidance. If the licensee did not adequately address surveillances, then: Verify that areas not covered by TSs and TS Bases, such as not providing surveillance requirements (SRs) for ECCS suction piping and not ensuring a void assessment at high points that are not equipped with a vent, are identified and the process of ensuring adequate coverage is identified. See Sections 1.8 and 1.9, above, for guidance. and/or, if the licensee uses a surveillance frequency that is greater than every 31 days and it is not acceptably justified, then: Since the licensee uses a surveillance frequency of greater than 31 days, verify that the surveillance frequency is acceptably justified. See Sections 1.8 and 1.9, above, for guidance. TI Section 04.01, Reference 2 Section 3.3.2

- If the licensee did not adequately identify potential gas intrusion mechanisms, then: Verify that the licensee has addressed the potential gas intrusion mechanisms. Depending on the plant, these typically include such items as SI accumulators, the RCS, dissolved gas coming out of solution, gas issues associated with the containment emergency sump, the refueling water storage tank, gas issues that may be caused by level instrumentation error, valve leakage, and operations such as shutdown, restart, and maintenance. TI Section 04.02e, Reference 2 Section 3.4.2

3 REFERENCES

3.1 General References

1. **The Temporary Instruction:** "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Contain Spray Systems (NRC Generic Letter 2008-01)," Temporary Instruction 2515/177, ML082950666, June 9, 2009.

2. **NRR expectations for licensee GL responses:** Ruland, William H., "Preliminary Assessment of Responses to Generic Letter 2008-01, 'Managing Gas Accumulation in emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems,' and Future NRC Staff Review Plans," NRC letter to James H. Riley, Nuclear Energy Institute, ML091390637, May 28, 2009.

3. **The Generic Letter (GL):** "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," NRC Generic Letter 2008-01, ML072910759, January 11, 2008.

4. **Guidance for NRR Reactor Systems Branch (SRXB) reviews:** "July 2009 Review Guidance Update," ML092460591, July 17, 2009.

3.2 Guidance for assessing operability

5. "NRC Regulatory Issue Summary 2005-20: Revision to Guidance Formerly Contained in NRC Generic Letter 91-18, 'Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability,'" ML052020424, September 26, 2005.

6. "NRC Regulatory Issue Summary 2005-20, Rev. 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, 'Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming conditions Adverse to Quality or Safety,'" ML073440103, April 16, 2008.

7. "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming conditions Adverse to Quality or Safety," NRC Inspection Manual, Part 9900: Technical Guidance, Attachment to Reference 6, April 16, 2008.

8. **The Technical Specification meaning of "full:"** "Task Interface Agreement - Emergency Core Cooling Systems (ECCS) Voiding Relative to Compliance with

Surveillance Requirements (SR) 3.0.1.1, 3.5.2.3, and 3.5.3.1 (TIA 2008-03),” ML082560209, October 21, 2008.

9. **Void criteria the NRC staff will accept without further justification:** “Revision 2 to NRC Staff Criteria for Gas Movement in Suction Lines and Pump Response to Gas,” ML090560528, March 26, 2009. Note revisions are expected as additional information is obtained by industry and made available to NRR.

3.3 Additional references for void transport behavior

10. “Test Results for the Millstone-3 Gas-Water Transport Tests,” Fauske Associates, LLC, FAI/09-22, ML091170150, March, 2009.

11. “Post-Test Analysis of the FAI Millstone 3 RWST ¼ Scale Gas Entrainment Test,” Fauske Associates, Inc., FAI/09-44, Rev. 0, ML091910460, March 13, 2009.

3.4 Additional NEI guidance

Comment [jhr56]: C Brennan - Recommend the addition of the NEI APC letter 09-20, transmitted to the NRC in June 2009, as this is the only generic guidance available to licensees as we await the official review and release of the DRAFT rev 2 NRR/SRXB criteria.

Comment [WL57]: Reference added.

12. Riley, James H., “Issuance of NEI 09-10, Revision 0, Guidelines for Effective Prevention and Management of System Gas Accumulation,” Communication from NEI Director of Engineering, ML093130090, October 30, 2009.

3.5 Plant-Specific References

13.… GL 2008-01 licensee responses and any other applicable documents

Page 5: [1] Comment [jhr17]	Jim Riley	5/12/2010 2:55:00 PM

Chris Brennan - This section seems to leave the reader with the impression that RELAP5 is the only alternative analytical method deemed acceptable to the NRC staff. This seems to be a much narrower interpretation than NRC RIS 2005-20 r1 would suggest, where other methods, such as GOTHIC, TRAC, TRACE, etc., could also be used. This section also seems to leave the reader with the impression that validation of the analytical model with respect to scale model tests is required, or at least a desirable element, which is not consistent with the guidance of NRC RIS 2005-20 r1, where its use is likened to an extension of "engineering judgment". This does not relieve the licensee of the burden to ensure the results adequately represent the phenomenon being evaluated, but likewise does not require the same rigor with respect to model benchmarks that are required for application to "Design" in 10 CFR 50 Appendix B criterion 3.

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From NRC RIS 2005-20, r1 section C.4:

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"When performing operability determinations, licensees sometimes use analytical methods or computer codes different from those originally used in the calculations supporting the plant design. This practice involves applying "engineering judgment" to determine if an SSC remains capable of performing its specified safety function during the corrective action period. The use of alternative methods is not subject to 10 CFR 50.59 unless the methods are used in the final corrective action. Section 50.59 is applicable upon implementation of the corrective action."

Page 5: [2] Comment [WL18]	Warren Lyon	5/25/2010 2:22:00 PM

We did not mean to imply that other codes would not be acceptable. We have rewritten this section to address this. See the bolded comments in Revision 8.

Page 5: [3] Comment [jhr20]	Jim Riley	5/12/2010 2:55:00 PM

C. Brennan - This is true of many of the computer codes proposed for this application. RELAP5 and some others can model this, however it requires the use of RELAP5 nodes as a large number of "sub-volumes" within the pipe's cross section and length. This application is well outside of the validation for RELAP5 and other codes, and therefore, the licensee bears a much larger burden to demonstrate adequacy. To preemptively disqualify the modeling of this phenomenon for all computer codes is most likely inappropriate, especially if a licensee chooses to resort to CFD methods, and is able to provide adequate validation of the models. The caution, however, is appropriate, but may need to be generalized differently.

Page 5: [4] Comment [jhr21]	Jim Riley	5/12/2010 2:55:00 PM

C Brennan - As mentioned earlier, this is not a requirement or recommendation of the NRC RIS 2005-20 r1 guidance. Its presence in this document suggests that the absence of scale model testing to benchmark against invalidates the licensee's operability evaluation. Although desirable, test data for comparison purposes may not be available within the required Tech Spec action time (which may be as short as 72 hours) when the evaluation is being prepared. If the evaluation concludes that the system is operable, and the action is to remove the void at the next available opportunity, the award of a contract, construction of a suitable test facility, acquisition of test data, and evaluation of test results, may not be feasible prior to the restoration of the system to full operability.

Page 5: [5] Comment [jhr23]	Jim Riley	5/12/2010 2:55:00 PM

C Brennan - Older versions of RELAP5 have always had two component analysis capability. I believe what you are referring to is an error correction which is present in only the currently released version (RELAP5 Mod 3.3 Patch 03) which corrected the TRANSPORT of the non-condensibles through obstructions and against elevation heads. Previous versions, which all modeled gas-liquid, however had the propensity to collect, or hold-up, non-condensible gases at interfaces such as 90 degree elbows. This

C Brennan - Agreed, however, this is most likely appropriate for evaluation after the operability has been determined, rather than making it the necessary element of a relatively short Tech Spec Action time.

Page 5: [7] Comment [jhr26]	**Jim Riley**	**5/12/2010 2:55:00 PM**

C Brennan - Actually, the reference 9 document is marked DRAFT, and as far as the industry is aware, has never been formally reviewed and issued by the NRC. The accession number referenced is a public meeting notice, where the referenced document was discussed, but this is not its official transmittal to the public. The only publicly available guidance on this topic is NEI APC letter 09-20, which NRC is incorporating into this document.

Page 5: [8] Comment [WL27]	**Warren Lyon**	**5/25/2010 2:35:00 PM**

We agree in principle but note that the information is essentially internal guidance that has been made available to industry in the interim until official coverage can be prepared. We are on a path to accomplish this with plans to endorse NEI 09-10 and to write a regulatory guide.

Page 5: [9] Comment [jhr28]	**Jim Riley**	**5/12/2010 2:55:00 PM**

This statement seems unnecessarily strong based on the discussion at the Jan 5th meeting. How about replacing “are not” with “may not be adequate without”

Page 5: [10] Comment [jhr30]	**Jim Riley**	**5/12/2010 2:55:00 PM**

C Brennan - This is quite a bold statement , especially since this draft is intended to incorporate the basic premise of our NEI APC letter 09-20, and since the author alludes to this guidance in the last 3 sentences of section 1.6.