

January 23, 2002

MEMORANDUM TO: Farouk Eltawila, Director, DSARE:RES  
THRU: Jack Rosenthal, Chief, SMSAB:DSARE:RES **/RA/**  
FROM: Sudhamay Basu, SMSAB:DSARE:RES **/RA/**  
SUBJECT: AVAILABILITY OF THE RESOLUTION OF PUBLIC COMMENTS ON  
DG-1087 (REVISION 1 TO REGULATORY GUIDE 1.78)

With the issuance of Revision 1 to Regulatory Guide 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," I am putting the attached document containing the resolution of public comments on DG-1087 (draft version of the revised guide) in ADAMS for public access.

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**RESOLUTION OF PUBLIC COMMENTS ON DG-1087 (RG-1.78, Rev. 1)**

Comment Number	Page/Sect./ Subject./ Para	Comment Sources	Comment	Resolution of Comment
1	General	NEI TVA PECo Winston & Strawn for NUBARG Exelon	<p>The Implementation Section of DG-1087 states:</p> <p><i>Except in those cases in which an applicant or licensee proposes an acceptable alternative for complying with specified portions of the NRC regulations, the method described in the revised guide reflecting public comments will be used in the evaluation of applications to renew operating licenses.</i></p> <p>The proposed language implies that a license renewal applicant would need to revise the plant licensing basis to adopt the revised regulatory guide. The [Implementation] statement is inconsistent with the 10 CFR Part 54 license renewal requirements.</p> <p>A licensee who voluntarily proposes to initiate system modifications consistent with its existing licensing basis should not be placed in a position of defending to the NRC staff a decision to not apply the updated regulatory guide.</p>	<p>A licensee who voluntarily seeks to modify its licensing basis through a license amendment is not protected by the Backfit Rule. Backfitting occurs only when the NRC imposes a new or changed position on a licensee, which is not the case when a licensee voluntarily seeks an amendment. The implementation language has been changed to reflect that the RG 1.78 will be used in the review of applications for license amendment and applications for construction permits, operating licenses, and combined licenses. Relevant text from the revised Implementation section is noted below.</p> <p><i>Except in those cases in which an applicant or a licensee proposes an acceptable alternative....., the methods in this revised guide ..... will be used to evaluate submittals from operating reactor licensees who voluntarily propose to initiate system modifications in support of license amendments. The guide will also be used to evaluate submittals in connection with applications for construction permits, operating licenses, and combined licenses, but not for license renewal if the current licensing basis is maintained.</i></p>

2	General	<p>NEI TVA PECo Exelon Winston &amp; Strawn for NUBARG</p> <p>J.J. Hayes</p>	<p>The proposed regulatory guide states that control room habitability evaluations should consider toxic gas release coincident with radiological consequences of a design basis accident. Typically plants are not designed for coincidental occurrence of two independent design basis events, unless the probability of both occurring simultaneously meets the risk parameter in Section 2, or one event is a result of the other. Protective measures for both accident types may be difficult to accomplish especially if these measures are mutually exclusive. This would be a change of the licensing basis and is not appropriate without a backfitting evaluation per 10 CFR 50.109.</p> <p>The directive should be that toxic gas release coincident with radiological consequences (all accidents and not just due to LOCA) <i>shall</i> be considered.</p>	<p>The RG 1.78 does not require existing plants to change their licensing basis with respect to control room habitability evaluations. Therefore, the RG does not constitute backfitting as defined in 10CFR50.104. Licensees who voluntarily seeks changes to their licensing basis are not protected by the Backfit Rule with respect to the subject matter of their request. Furthermore, while the commentator correctly states that simultaneous occurrence of two independent design basis events is not normally required, there is a probability, however small, of a toxic release event occurring coincident with a radiological release event such as LOCA. Consistent with risk informing the implementation of this guidance, the staff believes it is reasonable to evaluate the probability of these two events occurring coincidentally to determine if it is sufficiently small to meet the criteria for risk evaluation in Section 2. The text is modified to bring in this risk perspective.</p> <p>See the discussion above. Certainly, coincident release events should be accounted for. However, risk perspectives should also be brought to bear since the likelihood of coincident releases occurring is very small.</p>
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3	General	TVA NEI	The draft RG includes chlorine as one of the hazardous chemicals. Therefore, it is redundant to explicitly call out chlorine as one of the hazardous chemicals. Elimination of this explicit call out will avoid confusion.	The draft guide (with the exception of the Introduction) has been modified to reflect the suggested change. Reference to chlorine is retained in the Introduction to provide a context for merging Regulatory Guide 1.78 and Regulatory Guide 1.95.
4	2/B/-/2	NEI TVA PECo Exelon	The DG-1087 gives no guidance on asphyxiating chemicals other than the general statement that “asphyxiating chemicals need be considered only if their release results in displacement of a significant fraction of the control room air.” A table [similar to table 2] or a quantitative method should be provided to allow for determination of exempt weights of asphyxiating chemicals. Furthermore, a quantitative acceptance criterion is needed if analyses are required.	Determination of exempt weights is based on toxicity limits. For asphyxiating chemicals, NIOSH does not specify any toxicity limits. As such, exempt weights cannot be determined and specified. For the same reason, a quantitative acceptance criteria for air displacement cannot be specified. However, the language in the Reg. Guide has been modified making reference to the OSHA guidelines for a definition of the term “significant fraction.”
5	3/B/-/2	TVA	The draft RG utilizes two minutes after detection for taking protective measures. This timeframe should be allowed to increase if the IDLH exposure duration is 30 minutes, and it can be shown that the increased time is acceptable.	The two-minute timeframe is based on how long it takes to don a protective gear (SCBA/clothing). It is not justified to subject an operator to a hazardous environment any longer.
6	4/C/1.1/2	NEI, TVA PECo, Exelon	Footnote 1 should be included as part of Table 1.	Correction is made in the text.

7	4/C/1.1/4	TVA	The text in this paragraph relating to several chlorine containers is in conflict with the text in Section 3.2, Paragraph 6 relating to release of contents during an earthquake, tornado, or flood.	<p>The text in Section 1.1/Paragraph 4 on several containers is appropriate as written with the exception of being chlorine-specific. That reference is now eliminated.</p> <p>The text in Section 3.2/Paragraph 6 is commented on separately (see Comment No. 2) and its disposition is addressed there.</p>
8	4/C/1.2	J.J. Hayes	<p>The screening criteria for mobile sources should account for the magnitude of the source. While the frequency of the shipment may be low, consequences may be great and overcome the low frequency.</p> <p>As presented in the DG, the survey of mobile and stationary sources is only done once. That is insufficient in today's mobile and changing society. Surveys should be periodic and should be conducted in conjunction with the periodic radiological survey to determine potential receptors.</p>	<p>The frequency is based on transportation accident statistics, conditional spill probability given an accident, and accident rate. Implicit in the calculation is consideration of the magnitude of spill.</p> <p>Licensees are indeed encouraged to conduct periodic surveys of hazardous sources (stationary and mobile). Text is added in the guide to reflect this.</p>
9	4/C/1.2/3	NEI, TVA PECo, Exelon	The paragraph is applicable to both stationary and mobile sources and should be repeated under C1.1, or made into a separate section.	The paragraph is now incorporated into the next section and editorial modifications are made to address the concern.
10	5/C/Table 1	NEI, TVA PECo, Exelon  TVA	<p>Notes a, b, and c should be shown to apply on the right hand column. Modify the last 5 substances in the table to line up with their associated toxicity limits.</p> <p>The title of Table 1 should identify that the limits are the IDLH values.</p>	<p>The table has been formatted as recommended.</p> <p>The title of Table 1 is revised.</p>

11	5/C/Table 1 & Section 3.1	NEI, TVA PECo, Exelon	<p>Imposition of the more restrictive limit of 10 ppm for chlorine in lieu of the current limit of 15 ppm or proposed limit of 30 ppm (per NUREG/CR-5669) invalidates the conclusions of the NRC Cost/Benefit Analysis. Since chlorine is one of the more widely used chemicals, a more restrictive limit has a fair probability of requiring more restrictive controls, such as lower trip setpoints for the chlorine monitors and hence more spurious alarms. Those more restrictive requirements would not result in any increased safety benefit.</p>	<p>The 30 ppm toxicity limit is based on NUREG/CR-5669 recommendations which, in turn, are based on dated information on toxicity limits. The current NIOSH pocket guide, based on more recent information on toxicity limits, specifies 10 ppm in conjunction with the use of a self-contained breathing apparatus with a full facepiece (SBSAF) which is considered in the DG-1087.</p> <p>The NRC cost/benefit analysis is not intended to reduce regulatory burden for each and every chemical species considered. Rather, it is intended to reduce burden in those cases where an unnecessary conservatism was imposed previously. If for some chemicals such as chlorine, the limits specified previously cannot be justified based on recent technical data, it is necessary to correct such limits.</p> <p>In view of the above explanation, no correction is made to the toxicity limit for chlorine..</p>
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12	6/C/Table 2 16/Appendix A/ Table	NEI, TVA PECo, Exelon	<p>The requirement to use Type C weights unnecessarily penalizes a control room (CR) with low or normal leakage, but no auto-isolation. Some control rooms are designed to meet Type A criterion, except for automatic isolation. A manual isolation is an appropriate action for chemicals that have low odor thresholds and are used at a plant. [Therefore] add another CR type (low or normal leakage and no auto-isolation) with allowable weights higher than the existing Type C or allow a further adjustment of Type C weights based on odor threshold. Also, it is unnecessary to duplicate the table in the text and in Appendix A.</p>	<p>Table 2 is intended to merely serve as an example of the weights of hazardous chemicals requiring consideration in control room evaluation. As such, Table 2 is eliminated from the text and retained in the appendix. The text has been supplemented with the language that refers to the table in Appendix A. The supplemental language also addresses the weight screening consideration in terms of a given air exchange rate rather than the control room type.</p>
		P.L. Lagus, Ph.D., CIH J.J. Hayes	<p>There does not appear to be any physical basis for air exchange values provided in Table 2. It is unlikely that many of the current crop of control rooms could possibly be of Type A (an air exchange rate of 0.015 per hour). References to Types A, B, and C should be eliminated and more realistic values of air exchange rates used. Also, Table 2 should clearly identify meteorological conditions and release configuration</p>	<p>See the disposition above.</p>
		J.J. Hayes		<p>It is done in terms of Pasquill stability classification.</p>
		NEI, TVA PECo, Exelon	<p>The ratios between the columns are not consistent. The table needs revision. Values in the columns should be either center justified or right justified.</p>	<p>The ratios in various columns have been revised, and values are typed center justified.</p>

13	6/C/2/1	NEI PECo Exelon	<p>The DG states, “Release events that have low probabilities (1E-06 or less) need not be considered further.....” Additional guidance is required on the definition of “release events.”</p> <p>The use of a specific risk cutoff point of 1E-06 is more restrictive than previous NRC guidance. The text should be revised to incorporate the position permitted in Standard Review Plan 2.2.3, “Evaluation of Potential Accidents” (Rev 2-81) .</p> <p>The phrase “since such events are not likely to result in an unacceptable level of risk does not make sense.</p>	<p>Clarification is provided in the text. A “release event” is meant to be one that has the potential to result in a significant concentration in the control room.</p> <p>The use of a specific risk cutoff point of 1E-06 is consistent with RG1.174. With the definition of “release events” clarified, this should not be viewed as more restrictive than previous NRC guidance.</p> <p>The sentence containing the phrase is modified and clarified.</p>
14	6/C/2	J.J. Hayes	<p>Failure to protect the control room operators may result in their death or impairment. Nowhere in the licensee’s PRA or the NRC assessment of risk is there factored into the assessment of the inability of the control room operators to perform their function. The proposed Regulatory Guide has inappropriately incorporated the issue of risk even though the staff was previously criticized by ACRS for not incorporating risk. How are the licensees to make use of risk information when requesting related license amendment?</p>	<p>Risk perspectives are incorporated into this Reg. Guide following the broad guidance in RG 1.174. Such perspectives are, in no way, to compromise the protection of control room operators from a toxic gas release event. In fact, the risk insight can be effectively utilized by the licensees to seek relief (through license amendment) in those cases where unnecessary burden may have been imposed by certain criteria in the original guide.</p>

15	7/C/3/1	NEI, TVA PECo, Exelon	Clarify Section 3 to state that the implementation of protective measures for a particular chemical species is not required if the detail evaluation of control room habitability shows that the highest instantaneous concentration predicted in the control room is below the toxic limits shown in Table 1	Section 4 of the Reg. Guide discusses the protective measures. Clarification is provided in this section and not in Section 3.
16	7/C/3.1/3	NEI, TVA PECo, Exelon	The “case-by-case” basis guidance for addressing uncommon chemicals could result in inconsistent application of the regulatory guide.	The sentence containing the phrase is modified and clarified.
17	8/C/3.2	NEI PECo Exelon	If procedures are in effect to don respiratory protective equipment within 2 minutes for a <i>maximum concentration</i> accident, there is no need to analyze a <i>maximum concentration-duration</i> accident.	The criteria in Section 3.2 address accident types and release characteristics and not protective measures. It is true that the procedure to don respiratory equipment is based on a 2-minute limit of maximum concentration. This maximum concentration can be reached either through an instantaneous release or through a slow release accumulated over a long period. This is why an analysis of <i>maximum concentration duration</i> accident is needed.
18	8/C/Table 3	TVA	Change “toxicity limit” to “IDLH limit.”	“IDLH limit” is added in parentheses after “toxicity limit.”

19	8/C/3.2	J.J. Hayes	<p>It has been presumed that the chemical being released is not buoyant and that the exposure pathway is via the control room intake. Both assumptions may lead to a serious under estimation of the consequences of a toxic gas release. By assuming that the release is not buoyant, the release is really considered to be ground-level. However, if the chemical is buoyant, then the release may act as if it were from an elevated stack. Therefore, for some chemicals, a chemical source more distance than others may provide the greatest challenge. Similarly, the point of toxic gas entering the control room may not be the normal intake but rather adjacent areas which are quite removed from the control room intake and at a different elevation. It may be closer to the source and on the same plane rather than the presumed 15 meter spread. Integrity testing of control room envelopes has conclusively shown that the integrity which has been presumed in plant's licensing bases does not exist. In addition, toxic chemical may enter the nearest buildings and be conveyed to the control room envelope via the interactions of various ventilation systems.</p>	<p>There is no presumption in the guide that the chemical being released is not buoyant although not specifically stated. Text is now added in Section 3.2 and 3.4 specifically recognizing the buoyancy effect and providing guidance.</p> <p>It is true that the point of toxic gas entering the control room may not be the normal fresh air intake. It is also possible, depending on plant configuration, that the entry point may not be at a vertical elevation of 15 meter (elevation of fresh air intake). As far as the calculation of atmospheric dispersion is concerned, any elevation can be specified. If, indeed, the entry point is closer to the release point but removed from the control room envelope and at a different elevation, toxic gas will have a longer travel path before affecting the control room environment. The result will be a dilution effect. Likewise, if the entry point is through buildings (other than control room) nearest to the release point and the travel path to the control room is through various ventilation systems, there will be a dilution effect. With revisions made to the text in Section 3.3, there is no reference to a specific entry point.</p>
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22	10/C/3.3/2	NEI PECo Exelon	Use of wind tunnel testing results for dispersion estimates in lieu of models should be permitted on a case-by-case basis.	A case-by-case basis allowance may be subject to criticism as well. Wind tunnel test results are used anyway to validate dispersion models. Therefore, the value of this recommendation is not clear. As such, no modification is made to the text.
23	10/C/3.4/2	NEI, TVA PECo, Exelon	The paragraph refers to “outside air.” The term should be clarified. Also, delete “chlorine-“ leaving the sentence to imply any type of contaminant.	The term “outside air” is replaced by “atmospheric ambient air,” and the qualifier “chlorine-“ deleted.
24	10/C/3.4	J.J. Hayes	The guide should state that control room ventilation systems operating outside the control room envelope should be welded construction.	Indeed, such a design minimizes inleakage. The current text emphasizes that the ventilation system should have low-leakage construction without being specific to a construction method. This is in the spirit of making the guide less prescriptive and more performance-based. Thus, no change is made in the text.

25	10/C/3.4/2,3	J.J. Hayes P.L. Lagus, Ph.D., CIH	<p>In Section 3.4, the use of a 1/8 inch differential pressure to calculate inleakage is suggested. No guidance is provided as to how one calculates inleakage. Control room envelope testing results have shown that such a test does not reflect actual inleakage. Note also that the ASTM Standard that deals with the use of pressurization testing (ASTM E779) explicitly states that one cannot obtain natural air exchange rates from pressurization measurement data. Thus not only is there no technically defensible calculational method to use a 1/8 inch pressure differential to obtain air exchange, there is no technically defensible measurement technique that will provide these data.</p> <p>At the very least, reference should be made to the ASTM standard that is presently used to characterize air inleakage rates under actual operating conditions of ventilation systems. Data obtained from periodic testing (or any type of testing) based on standardized techniques is preferable to data that are obtained using an ad hoc and unrealistic test such as is implied in the Draft Guide.</p>	<p>It is recognized that the use of a 1/8 inch differential pressure for air inleakage testing is an outdated technique. An effective method which has been utilized more recently and accepted by the staff to perform a test of envelope inleakage is ASTM E741-95, "Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution." The NRC is in the process of developing a separate Regulatory Guide on control room habitability testing. Additional guidance on control room inleakage determination will be provided in that Regulatory Guide. In the interim, the text on air inleakage testing in Section 3.4 has been modified to address the comment. The modification makes reference to standardized techniques.</p>
26	11/C/3.4/1	NEI, TVA PECo, Exelon	Delete the paragraph since it provides superfluous information about chlorine	The paragraph is deleted.
27	11/C/3.4/6	NEI, TVA PECo, Exelon	The phrase "for the particulate considered" should be deleted so the sentence refers generally to removal system.	The phrase is deleted.

28	11/C/4/1	NEI, TVA PECo, Exelon	Delete “automatically” in item 2 since manual isolation may also be acceptable for some control rooms.	The text is corrected.
29	11/C/4/1	NEI, TVA PECo, Exelon	Item 3 is not addressed in the following sections, unlike the statement “guidance for each of the above design features is provided below.”	Guidance for item 3 is provided in Section 3.4. The text in Section 4 is modified to reflect this.
30	11/C/4.1	NEI, TVA PECo, Exelon	The regulatory guide criteria should be that the control room is habitable, not that it is prevented from becoming contaminated. This section should be rewritten to require maintaining the concentration less than the toxic limit rather than prevention of contamination.	Indeed, the criteria address control room habitability and not the prevention of control room contamination. If the latter was the focus, then no toxic gas will be allowed to enter the control room. If the concern in the comment is that the detection criteria are too restrictive in terms of seismic and environmental qualifications or other design/installation requirements, that is addressed below in Comment 32 .  Text in Section 4.1 referring to the isolation time of local detectors is deleted. This should further address the concern expressed in the comment.
31	11/C/4.1	NEI, TVA PECo, Exelon  J.J. Hayes	Seismic qualification of detectors is unnecessary if chemicals that may affect the control room are stored in seismically qualified containers. Environmental qualification of the detectors is unnecessary; the detectors are acceptable as long as they are designed/purchased for their expected environment.  The term “expected environments” should be better defined. Are these hurricanes, tornadoes, etc. Or are they temperature, relative humidity, radiation fields?	Seismic qualification of detectors is still necessary for consideration of mobile sources. The text is revised to reflect this. The explicit statement on environmental qualification is deleted with the understanding that the phrase “expected environment” conveys the same meaning.  Expected environments are all those included in a plant’s licensing basis.

32	11/C/4.1/3	J.J. Hayes	The text should be revised to indicate that quick response detectors should be located in both normal intakes and emergency intakes. In addition, it may be appropriate, depending upon the design, to have a detector in the recirculation line.	The text has been revised.
33	11/C/4.1 & 4.2	NEI, TVA PECo, Exelon	Section 4.1 states that local detectors (control room intake) should have a very short isolation time such that the isolation damper closes before the gas gets from the detector to the damper. Section 4.2 specifies that the isolation time in most cases should be less than 10 seconds. These requirements are impractical and unnecessary.	Both Section 4.1 and Section 4.2 are revised to address the concern expressed in the comment.
34	11/C/4.1/4	NEI, TVA PECo, Exelon	Delete “automatically” since manual isolation may be acceptable.	The text is corrected.
35	12/C/4.2/4	NEI, TVA PECo, Exelon J.J. Hayes	Delete chlorine-specific reference since the guide should not be limited to onsite chlorine storage. Also, delete the paragraph since the information may be redundant (second sentence) or may imply new requirements which are not consistent with most current control room designs.	The paragraph has been deleted.
36	12/C/4.3/1	NEI, TVA PECo, Exelon	Delete “including chlorine” since hazardous chemical is all inclusive.	The text is corrected.

37	12/C/4.3/2	NEI, TVA PECo, Exelon	<p>The phrase, “meet the single failure criterion” lacks clarity. Redundancy could mean respirator = 2 x people. Separation could mean two separate storage cabinets. Protective clothing failure could mean two layers of clothing. Duration of a toxic chemical incident could mean that there is a long-term period requiring passive failures.</p> <p>A single toxic event should not prevent the utilization of these systems to respond to the event. Using single-failure criterion invokes other design considerations to go beyond the mere impact from a single toxic event.</p>	The paragraph is modified to clarify “single failure criterion.”
38	13/C/5/1	NEI, TVA PECo, Exelon	Many of the descriptions do not appear to be in the area of “emergency planning,” e.g., instrument sensitivity, maintenance, calibration, sensitivity, technical specifications on availability, etc. This type of information belongs in other procedures and programs such as the PM program, and the calibration program, etc.	The text is revised addressing the comment.
39	13/C/5/1	J.J. Hayes	The guide should specify that training be provided on the use of instruments and that there be emergency planning drills.	The text is revised addressing the comment.

40	13/D/2	NEI, TVA PECo, Exelon	The paragraph is imposing a new requirement on license renewal applicant without justification. The existing language implies that a renewal applicant would need to revise the licensing basis to adopt the revised regulatory guide. Furthermore, the revised regulatory guide does not address aging issues, and is therefore outside the scope of license renewal activities controlled by 10 CFR 50.54.	The Implementation language is revised to address the concern expressed in the comment.
41	16/Appendix A & Table 2	NEI, TVA PECo, Exelon	Whether or not the boiling point of the chemical is less than or greater than the ambient temperature is a significant factor that should be considered in determining the weight threshold. For example, a significantly smaller fraction of sulfuric acid will vaporize compared to chlorine since sulfuric acid is a liquid at ambient conditions.	The boiloff consideration is provided in Section 3.2. The weight threshold will indeed depend on the boiloff characteristic of a given chemical. The licensees are encouraged to factor this into their analysis. The language in Section 3.3 is modified to reflect this consideration.