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Comment On: NRC-2010-0080-0009
NUREG-0654/FEMA-REP-1, Rev. 1, Supplement 3, Guidance for Protective Action Recommendations for General Emergencies; Draft for Comment

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Comment on FR Doc # 2010-11842

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General Comment

KLD Associates, Inc. is pleased to provide the attached comments on NUREG-0654/FEMA-REP-1, Rev. 1, Supplement 3.

Attachments

NRC-2010-0080-DRAFT-0037.1: Comment on FR Doc # 2010-11842

*SOWSI Review Complete
Template = ADM-013*

*E-RIDS = ADM-03
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July 30, 2010

Ms. Cynthia K. Bladey
Acting Chief, Rulemaking and Directives Branch
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: KLD Associates' Comments on NRC Proposed Draft NUREG -0654/FEMA-REP-1, Revision 1, Supplement 3, "Guidance for Protective Action Recommendations for General Emergencies," Docket ID NRC-2010-0080

Dear Ms. Bladey,

KLD is pleased to submit comments on the draft guidance entitled NUREG-0654/FEMA-REP-1, Rev. 1, Supplement 3, "Guidance for Protective Action Recommendations for General Emergencies" (Docket # NRC-2010-0080), which was posted in March 2010.

These comments are provided in two sections:

- Section 1 suggests revisions to the text.
- Section 2 provides extended commentary on such topics as the PAR Logic diagram, staged evacuation, ERPAs, and loss of power.

We thank you for taking the time to review our comments and hope that they will be helpful as you finalize the proposed guidance.

Respectfully Submitted,

A handwritten signature in cursive script, appearing to read 'Kevin P. Weinisch'.

Kevin Weinisch, PE
Program Vice President
Evacuation & Emergency Planning
KLD Associates, Inc.

A handwritten signature in cursive script, appearing to read 'Edward Lieberman'.

Edward Lieberman, PE
Chief Technical Officer
KLD Associates, Inc.

SECTION 1 – SUGGESTED EDITS TO TEXT

1. Page 1, 1st paragraph, line 8: ...than radial evacuation **under some circumstances**, providing a technical...
2. Page 1, paragraph above bulleted lines, line 3: ...various PAR strategies **under hypothetical conditions and assumptions** for each of...
3. Page 1, 2nd bullet: ...lateral evacuation (**if roadway network is conducive**)...
This clarifying text was included in paragraph 2 of Note 10 on page 20, and should be included here as well.
4. Page 2, 2nd bullet, line 2: ...strategies because it **may be** more protective than...
5. Page 2, 3rd bullet, line 1: ...considered because it **may be** more protective than...
6. Page 2, 3rd bullet, line 3: ...evacuation is not large **material**, the strategy decreases **can decrease** demand on offsite...
7. Page 2, 7th bullet, line 2: ...in special facilities **are not consistently** addressed within all...
8. Page 5, 1st paragraph, line 9: ...ERO may differ **from that used by operational shift personnel** reflecting the expectation...
9. Page 5, 2nd paragraph, line 2: ...diagram is simplified when the... *what does “simplified” mean? Relative to what? Did you mean “amplified” or “further defined”?*
10. Page 6, 1st paragraph, line 11: ...decision point for ~~increasing~~ **extending** protective actions after... *The word, “extending” is used consistently later in the draft – not “increasing”.*
11. Page 6, 2nd paragraph, line 2: ...decision process, the **ETE computed when 90 percent of the impacted population have evacuated is** the value... *NUREG-0654, App. 4 stipulates that separate ETE be computed for the general population and for special facilities/transit dependent population. The guidance should specify that the 90 percent ETE for the general population should be used for PAR determination.*
12. Page 7, last sentence: *Pennsylvania always does a 10-mile, 360 degree evacuation.*
13. Page 9, 3rd paragraph, 3rd sentence: *How were these travel speeds computed? In Volume I, the speeds were computed by dividing a 10 mile trip by the ETE to get average speed. This is not correct. For example, we recently computed an ETE for a low population density site of 2:20 for the 90th percentile for a full EPZ evacuation. Dividing 10 miles by this ETE would give an average travel speed of 4.3 mph. The average travel speed output by the model for this study is in excess of 40 mph. The 90th percentile ETE for this site, and for most other NPP sites, is dictated by mobilization time, not highway congestion. The referenced Volume III of Supplement 3 has not yet been released; an unreleased report cannot be used as a reference.*

14. Page 9, 4th paragraph, last 2 sentences: *This is not true for all NPP sites. The ETE for some high population density sites exhibits a long tail due to congestion on some of the major evacuation routes, not because of longer mobilization times for some evacuees. Nevertheless, we agree with the recommendation to use the 90th percentile ETE for PAR determination.*
15. Page 10, line 3: ...Licensees ~~may~~ **should** perform a site-specific...
16. Page 13, 3rd bullet: *The ETE is the time needed to evacuate the area at risk, which in the worst case scenario would be the entire EPZ of about 10 miles. Recommend revising definition as follows: The estimated **elapsed** time needed to evacuate the **general** public from the ~~EPZ with a radius of about 10 miles (16 kilometers)~~ **designated area at risk within the EPZ** around each nuclear power plant.*
17. Page 13, at bottom, Add: *Definition of Shadow Evacuation*
18. Page 18, top of page, Notes 1: *The term, ERPA, is defined in the Glossary, then largely ignored subsequently. Statements about the "2-mile radius" and "2-5 mile downwind" do not mention that evacuation PARs are expressed in terms of ERPAs and that ERPA configurations do not neatly comply with radial distances. This topic needs to be recognized and discussed. (see App. A, 3.2). 2: No mention of PAR in the Logic Diagram for transit-dependents: schools, special facilities, residents without vehicles, homebound special needs population ... also, no mention of need to mobilize first responders. An extended or companion Logic Diagram should be considered.*
19. Page 18, Note 3, line 2: ...indoors, turn off **ventilation systems** (heating or air...
20. Page 19, Note 7, line 1: *NUREG-0654, App. 4 stipulates that separate ETE be computed for the general population and for special facilities/transit dependent population. The guidance should specify that the 90 percent ETE for the general population should be used for PAR determination.*
21. Page 19, Note 7, line 5: *Section 1.3 of the Pre-decisional Draft, "Criteria for Development of Evacuation Time Estimate Studies," indicates that at the minimum ten different scenarios should be considered in an ETE study, depending on the time of day, time of the week, time of year, weather and roadway conditions. In order to be consistent with the draft ETE guidance document, Note 7 should indicate that the OROs identify which scenario in the ETE study best describes the current conditions and then identify the ETE for that scenario, rather than focusing on daytime and nighttime ETE. The scenario should include special events, if applicable, at the time of the accident, as discussed in the next comment. See the discussion "Evacuation Scenarios" below.*
22. Page 19, Note 7, line 6: *Why shouldn't special events be considered? What if one of the units at the site is in a refueling outage and there are several hundred*

or thousand extra workers within the 2-mile radius? As noted above, the ETE for the specific scenario (including special events if applicable) should be used in the logic diagram. Furthermore, the PAR logic diagram itself could be influenced by the evacuation scenario. For example, an evacuation of the 2 mile radius under normal conditions may have an ETE which is determined by mobilization time, whereas an evacuation of the 2 mile radius during a special event may have an ETE which is determined by highway congestion. In the former case, staged evacuation would not be beneficial; in the latter case, it could be beneficial. Other examples can be presented to justify keying the PAR logic diagram to evacuation scenarios.

23. Page 19, Note 8, line 3: ...elapsed, the PAR **can** be changed. Licensee...
24. Page 20, Note 9, line 4: radius is 2 hours or less... *the specification of a specific time of 2 hours seems unduly restrictive. A somewhat longer ETE may also justify immediate evacuation.*
25. Page 20, Note 9, lines 7 and 8: See comments 21 and 22 above.
26. Page 20, Note 9, line 9: completion is 3 hours or less... *again, a specific value is restrictive*
27. Page A-2, section 2.1, 2nd bullet, line 1: ...Identify the **ERPAs** that may be...
28. Page A-3, section 2.2: *See the comment on the Role of ERPAs, above.*
29. Page A-7, section 3.2, 3rd bullet: ...should get there (e.g., **along evacuation routes by personal vehicle, or follow instructions to access bus transport**).
30. Page A-8, section 3.3, line 1: ...to Supplement 3, **may be** the preferred initial protective action in response to a General Emergency **if** it is more...
31. Page A-8, section 3.3, last line: ...the possibility of **subsequent** evacuation, should...
32. Page A-9, section 3.5, 3rd bullet, 2nd line: ...to mobilize drivers, **buses and evacuees**.
33. Page A-9, section 3.5, 6th bullet: ...State ~~whether multiple~~ how many bus runs...
34. Page A-9, section 3.6, 1st bullet: ...Those in vehicles **or who can readily access a vehicle** when the order is issued (e.g. leave the EPZ, **travel home to unite the household members** or enter a... *A principal finding of NUREG/CR-6953, Volume II ("The NRC Public Telephone Survey"), is that the family prefers to evacuate as a unit. See discussion below "SIP When Away from Home".*
35. Page A-9, bottom: *Not all public and commercial buildings are suitable shelters. A cautionary note should be added here. See Section 4.2.1.*
36. Page A-11, last bullet: ...Contact senior centers, **libraries, health-related facilities, advocacy groups, and other organizations servicing special needs persons** in the EPZ...
37. Page A-12, section 4.2: line 1: ...the public will **be able to** maintain an awareness...

38. Page A-13, section 4.2.1, line 2: ...off **ventilating**, heating or air conditioning...
Also, need to add "as appropriate for the region and season" as you have done on the 3rd bullet on page A-6 and in Note 3 on page 18 as temperatures will be too high in some areas.
39. Page A-13, section 4.2.1, line 4: *Weather conditions, i.e. extreme heat, may also be an impediment to sheltering in place.*
40. Page A-14, 5th bullet, line 2: ...such as **taking needed medications and other essential personal items**, turning off heating...
41. Page A-14, bottom of page add bullet: **Information pertaining to pets.**
42. Page A-15, section 4.2.2.1, line 1: ...preferred protective action **may be** a staged evacuation...
43. Page A-15, section 4.2.2.2, 2nd paragraph, line 5: ...providing an expedient, **yet secure** means to release... *(A child cannot be released to an unidentified adult the child does not know!)*

SECTION 2 – EXTENDED COMMENTARY ON THE DRAFT EMERGENCY RESPONSE GUIDANCE

2.1 Staged Evacuation

The guidelines of appendix A, sect. 3.3, states that:

staged evacuation... is the preferred initial protective action in response to a General Emergency because it is more protective of public health and safety than other actions (NRC, 2007) [emphasis added]

Variations of the above statement appear repeatedly throughout the draft guidance material, and depend entirely upon the cited reference, NRC 2007 (NUREG/CR-6953, Vol.1). A review of this cited reference reveals that it is a hypothetical study which depends upon many embedded assumptions, some of which, in our opinion, fundamentally compromise the validity of the results. In short, the guidance material commits to an inflexible policy based upon the results of a hypothetical study of dubious merit. See Section 2 of the NEI White Paper, "Review of Predecisional Draft NUREG/CR-XXXX/SAND2009-XXXX-P: "Criteria for Development of Evacuation Time Estimate Studies,"" Revision 3, October 2009, which was submitted during the comment period for the aforementioned draft ETE guidance document, for additional discussion on the merit of the assumptions used in the cited reference.

In addition to the assumptions discussed in the White Paper, the assumption of an EPZ population of 80,000 people, uniformly distributed throughout the EPZ (see page 33 of NUREG/CR-6953, Vol.1) is also questionable. A rough geographic information systems (GIS) analysis of the 2000 Census population within the 2 mile, 5 mile and 10 mile radii of all nuclear plants in the US was conducted. The EPZ does not strictly conform to the

10 mile radius due to the irregular boundaries of ERPA, so some of the population estimates in this analysis are understated due to the area of the EPZ that may lie beyond the 10 mile radius. Based on this analysis, there are only 10 sites in the US that have a 10 mile population of 84,000 or more people. Furthermore, uniform population distribution is not a valid assumption. An existing site in the southern US has approximately 70% of the EPZ population living between 5 and 10 miles in the northeastern quadrant of the EPZ. Also, a proposed new site in the south has 50% of the EPZ population residing within one ERPA which is approximately 8.5 miles north of the plant. Another existing plant in the south has 2 people residing within the 5 mile radius and approximately 190,000 living between the 5 mile radius and the EPZ Boundary. Nearly every existing site in the US shows a higher population density in the 5 to 10 mile area than within the 5 mile radius.

In contrast, we have performed several detailed studies of staged evacuations on existing NPP sites that have yielded results that contradict the conclusion that a staged evacuation is always "more protective", as cited above. These results have emerged from the execution of a detailed evacuation model that uses equilibrium assignment and traffic simulation to arrive at realistic results. These results may be summarized as follows:

1. The vast majority of actual sites exhibit relatively low population densities particularly in the immediate area (within 2 miles) of the NPP. At these sites, there is little or no traffic congestion that could materially delay the evacuation of those within 2 miles of the NPP, taking into account their mobilization times (see discussion, below). Therefore, for these cases, a staged evacuation would not benefit those who originate their trips within 2 miles of the NPP.
2. For the low population sites cited in item 1, requesting that those within the EPZ who are at a 2-5 mile distance from the NPP should shelter, would delay their departure from within the EPZ. Those downwind of the plume who Shelter In Place (SIP) would be subject to a potentially higher exposure to radioactive gases due to this delay, with no benefits afforded to their neighbors who initiate their trips from within 2 miles of the NPP.
3. The draft guidance material properly suggests that those who SIP use that time to prepare for a subsequent evacuation order. When that order is announced, all those who SIP will leave their residences within a very short time frame since they will have already prepared for the evacuation trip. The resulting congestion caused by this surge of departing evacuating trips will exacerbate the traffic conditions at distances of 2 to 5 miles from the NPP, thereby further extending their stay within the EPZ and increasing their potential for exposure to any releases. This behavior was not considered in the cited hypothetical study of reference (NRC 2007). If this population had been ordered to evacuate instead of

SIP, these trips would have been generated over a 2 to 3 hour mobilization time, thereby avoiding a surge of demand and mitigating congestion.

4. It is seen that a mandated staged evacuation that provides no benefits to those within 2 miles of the NPP, can have adverse outcomes in terms of extended public exposure to releases downwind.
5. No mention is made in the discussion of staged evacuation for those within the EPZ at a distance of 5-10 miles from the NPP. If those in the 5-10 mile region are advised to shelter at the same time that those within 2-5 miles shelter, then the latter group would be reassured as to their well-being if they SIP. On the other hand, if both 0-2 and 5-10 mile areas are advised to evacuate while those in 2-5 are advised to SIP, the response could be quite different. In the case where 2-5 and 5-10 mile areas SIP concurrently, what PAR applies for the 5-10 mile area when those within the 2-5 mile area are subsequently advised to evacuate? In any case, the guidance should document the PAR for the 5-10 mile residents.

Certainly, there are cases (i.e. NPP sites and evacuation scenarios) where a staged evacuation could materially benefit "close-in" residents within 2 miles of the NPP. These material benefits could well justify a PAR that calls for a staged evacuation as described in the guidance materials. A relatively straightforward analysis can identify these cases where a staged evacuation is beneficial and to distinguish them from the [much larger number] of sites where such staging offers no benefits and which is counterproductive as described above. There is no need for the guidance to require inflexible procedures to be applied at sites where they do not apply and are unjustified. We therefore respectfully suggest that the following changes be introduced into the guidance materials:

1. Licensees shall be required to evaluate the benefits of staged evacuations and to quantify the optimal time for the SIP response. These benefits shall be expressed in terms of ETE reductions for close-in selected populations (within 2 miles and within 5 miles, separately and together), relative to no staging (i.e., immediate concurrent evacuation within 5 miles of the NPP).
2. Where staged evacuations are found to be effective, analyses should be undertaken to determine the optimal value of SIP time for those located between 2 and 5 miles. This optimal SIP time can be expressed in terms of ETE reductions for those within 2 miles, as well as in terms of minimizing the consequent ETE increases, if any, for those who SIP within 2-5 miles and then evacuate.
3. Where staged evacuation is effective in reducing ETE for the close-in population, develop a traffic control policy during each stage of the evacuation so that

personnel can be assigned optimally at Traffic Control Point (TCP) locations throughout the EPZ.

4. The results of this analysis should be shared with the OROs so that a coherent PAR logic diagram be developed which reflects the optimal site specific evacuation planning. This planning should reflect and support an optimal staged evacuation policy; if not beneficial (or is counterproductive), then staged evacuation should not be included in the PAR logic diagram or in the evacuation plan for those sites.
5. Certain criteria that appear in the draft guidance material should be identified as “approximate” or “advisory” instead of being presented as an absolute requirement. For example, the criterion of “2 hours or less” cited in Note 9 on page 20 should be softened to reflect the fact that this criterion usually depends on population mobilization time rather than on congestion on the highways, for the vast majority of NPP sites. As an example, the wording of the last sentence in the first paragraph of Note 10 is appropriate and recognizes that conditions may vary from one set of circumstances to another.

In summary, the guidance should require a site-specific rigorous analysis to quantify the benefits, if any, of staged evacuation; the PAR logic and procedures should reflect these analysis results.

2.2 The role of ERPAs in staged evacuation guidelines

All of the guidance pertaining to staged evacuation references areas expressed in terms of distance from the NPP: 0-2 miles and 2-5 miles. Yet, as indicated by the first bullet in section 3.2 in appendix A, evacuees are identified in terms of the ERPAs in which they reside or in which they are located at the time of the alert. It is widely recognized that ERPA geometries do not generally conform to circular or sector shapes.

Consider an ERPA whose shape includes a portion of the 0-2 mile area and extends through the 2-5 mile annular ring and beyond. In these circumstances, what is the proper PAR for the residents of this ERPA in the case of a staged evacuation: “immediate evacuation” (which applies to the 0-2 mile area portion of the ERPA) or “SIP” (which would apply to the 2-5 mile area portion)? Clearly, this disconnect between ERPA shapes and the distance descriptors now appearing in the guidance material is a potential source of confusion and ambiguity which needs to be addressed. We see two different approaches to address the ERPA issue that arises when a staged evacuation is found to be beneficial:

- Establish guidelines for assigning each ERPA to either the “evacuate immediately” area or to the “SIP, then possibly evacuate” area for EPZs with ERPA configurations that are “non-conforming” in the sense described above.

- For those sites where the current configuration of ERPAs is problematic relative to the need to support staged evacuation, consider the option of reconfiguring the ERPAs so that they better conform to the distance guidelines (0-2, 2-5 miles) as expressed in the current draft guidance. This approach would remove ambiguity but could be costly and could conflict with local preferences.

Of course, other approaches may be developed that prove to be more suitable. In any case, it is necessary for the PAR logic diagram to be clearly defined for each site and expressed in terms consistent with the ERPA specifications to avoid confusion on the part of the decision makers or on the part of the general public.

2.3 Mobilization Time

When a PAR to evacuate is communicated, the public responds by performing a sequence of preparatory activities which precede the evacuation trip. We refer to the aggregation of these activities as “Mobilization”; the total elapsed time needed to perform these activities takes the form of a mobilization time distribution.

Our studies have included telephone surveys of the population within each site’s EPZ; these have been undertaken, in part, to quantify the time required for each activity, in order to compile a realistic mobilization time distribution. For sites having EPZs with low population densities, analyses have shown that the 90-percentile ETE is influenced almost entirely by this mobilization time distribution; congested traffic conditions are generally limited and have little, if any, influence on ETE.

Despite the importance of mobilization time, the draft guidance material makes no mention of its influence on ETE and does not address the role of mobilization in the PAR determination logic!

It is recommended that the role of mobilization time on ETE and on the PAR logic be addressed. Also, the determination of the need for staged evacuation also depends, in large part, on mobilization time.

2.4 Evacuation Scenarios

Evacuation scenarios are defined in order to properly represent the changes in the evacuation environment due to the effects of day-of-week, time-of-day, season, weather and “special events”. These changes can be quite pronounced. For example, many NPPs adjoin bodies of water which attract large populations engaging in recreational pursuits during certain seasons, particularly on week-ends. In addition, inclement weather can affect highway capacity, thereby potentially influencing ETE.

It is entirely reasonable to expect that PAR logic that applies during the “off-season” could be inapplicable when large population changes occur. For example, there may

be no need for a staged evacuation during normal times, yet such a PAR may be advisable if the population increases, particularly if the increase takes place close to the NPP.

The need to consider these changing conditions in the form of Evacuation Scenarios for ETE analysis, has been well recognized for many decades. Yet, the draft guidance does not adequately discuss the changing conditions represented by these scenarios, and the need for responsive PAR procedures.

2.5 SIP When Away from Home

A comment was made at the evening session of the public meeting on April 13, 2010, that residents who are away from home at the time of the emergency should be advised to SIP and not to travel home. We believe that such an advisory is not justified for all, for the following reasons:

1. It is well established that the prevalent behavior among members of a household during emergencies is to “bond” together, and to respond to the situation as a family unit. This is supported by the findings of the NRC Public Telephone Survey (NUREG/CR-6953, Volume II). The recommended general message is contrary to this behavior and is likely to be largely ignored.
2. If the person away from home has the only household vehicle, then the message is tantamount to a request for this person to abandon the remaining members of the household by requiring them to seek mass transport services. Again, the message will likely be ignored.
3. Our surveys have revealed that even if a household has multiple vehicles and a vehicle is available at home for evacuation, about half of those households will await the return of the commuter before leaving on the evacuation trip. While an educational campaign could be successful in promoting the practice of not waiting for the returning commuter, such a campaign (which is recommended) will likely be only partially successful.
4. A message to SIP at a commercial site away from home (e.g., retail store, mall, office building) carries a separate set of risks. For such SIP to be effective, it is necessary to shut down the ventilation (heating, cooling) systems at these sites. While it is relatively easy to do this in individual residences, it can be difficult to shut down ventilation systems in commercial buildings. Such systems are often highly automated, requiring a building technician to override the programmed schedule.

Given all these concerns, we suggest that this advisory be reconsidered.

2.6 Loss of Power

The draft guidance does not mention the potential impact that the loss of electric power could have on emergency response activities. Since many, if not most of the communications and messages described in Sections 3 and 4 of App. A rely on power being available, the guidance should address alternative procedures in the event power is lost. For example,

- Would loss of power influence the PAR logic?
- How would communication of information and advisories (SIP, evacuate) be affected?
- Can power loss influence ETE?
- Can cell phones and smart phone apps compensate now and/or in the future?

A discussion of this topic should be addressed.

Also note that Sect. 6 of App. A on pg. A-20 is entitled, References, as is Sect. 6 of the main body on pg.15. These are two different sets of references identified as Section 6: it could confuse some readers.