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Michael T. Lesar, Chief
Rulemaking and Directives Branch
Division of Administrative Services
Office of Administration
Mail Stop: TWB–05–B01M
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Subject: Comments on Request for Comment on Blending of Low-Level Radioactive Waste – 74 FR 62606; Docket ID NRC–2009–0520

Dear Mr. Lesar:

Energy*Solutions* is submitting the comments contained in the attachment in response to the subject notice.

We appreciate the opportunity afforded us to present our views to the staff last December and to participate in the workshop held on this topic. We applaud the Staff on the professional manner in which the workshop was conducted, in particular the thorough technical presentations provided by Staff. The discussions held during both sessions were useful in exploring the issues related to blending.

The comments we provided in those two forums fully represent our views on the topic of blending, as well as our answers to the thirteen questions posed in the subject Federal Register notice, and are incorporated by reference into this response. The comments provided herein do not differ in substance from the comments we provided verbally during the workshop and our December presentation. Rather, these comments summarize our views on the major issues associated with the topic, as well as addressing some additional points that were raised in or subsequent to the workshop.

Thank you again for this opportunity to comment. Questions regarding these comments may be directed to me at (240) 565-6148 or temagette@energysolutions.com.

Sincerely,

Thomas E. Magette, P.E.
Senior Vice President
Nuclear Regulatory Strategy

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add: J. Kennedy (JEK1)

6350 Stevens Forest Road, Suite 200 • Columbia, Maryland 21046
240.565.6200 • Fax: 410.290.8256 • www.energysolutions.com

Comments on Blending of Low-Level Radioactive Waste

The blending of low-level radioactive waste (LLW) is one component of a comprehensive LLW management strategy. Blending is one of several processing alternatives that are available to manage LLW. It is widely practiced by waste generators and independent waste processors not only in the nuclear power industry but other industries that generate LLW. NRC has acknowledged as much for many years in its promulgation of guidance. The NRC issued the *Branch Technical Position on Concentration Averaging and Encapsulation* (BTP)[1] to, among other things, "represent acceptable methods by which specific waste streams or *mixtures* of these waste streams may be classified." (Emphasis added.)

The NRC plays an important role in determining how blending should be regulated. The *Atomic Energy Act of 1954 as Amended* gives the NRC the authority to establish and enforce rules "...necessary or desirable in order to protect health and safety and minimize danger to life or property." It is important to recognize that there is nothing about blending that provides any unique, inherent threat to health and safety. In its ongoing review, we are confident that the NRC will conclude, consistent with its determinations over recent decades, that blending can be conducted safely.

In fulfilling its mission to protect health and safety, we fully support the ongoing effort by the NRC Staff to respond to the recent direction from the Chairman to prepare a vote paper to resolve the issues related to blending. Energy*Solutions* proposes that the appropriate resolution is for the NRC Staff to confirm and clarify its guidance regarding blending. While it is clear that the practice is allowed and accounted for in NRC regulations and guidance, the ongoing controversy demonstrates the need for the NRC to clearly articulate its position. In so doing, we respectfully request that the NRC consider the following comments.

1. Existing Regulations and Guidance – The NRC has affirmed through recent correspondence to Energy*Solutions*[2] and others[3, 4] that the blending of LLW is permitted under its existing regulations and guidance. No defensible argument has been presented that demonstrates there is a threat to health and safety from either blending or the disposal of blended waste. We see no rationale or justification for a change to the current guidance under which blending is permitted.

2. Clarification of Existing Guidance – While the NRC's most recent communication on the topic of blending is clear, this guidance is unwieldy. It is apparent that prior to this correspondence there was some confusion regarding the NRC's position and it would be prudent for the NRC to articulate this guidance by one of its routine, generic methods. We propose a two-fold approach to accomplish this objective:

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[1] January 17, 1995.

[2] Letter L. Camper to T. Magette, Blending of Low-Level Radioactive Waste, August 27, 2009.

[3] Letter L. Camper to J. DiCamillo and enclosure, NRC Staff Analysis of Studsvik's August 7, 2009, Comments on Blending October 30, 2009.

[4] Letter L. Camper to S. Kirk and enclosure, NRC Staff Analysis of Waste Control Specialists' (WCS) September 22, 2009, Comments on Blending, October 30, 2009.

a. Consolidate the clarified guidance from the three letters in a Regulatory Issue Summary
b. Revise and reissue the BTP

The first step, issuance of a Regulatory Issue Summary, enables the NRC to simply and expeditiously communicate its guidance in a widely distributed, commonly used and understood format. It requires minimal effort and is appropriate given that all that is required is to provide the previously communicated guidance in a new format. The second step is appropriate given that the BTP addresses this topic and is ripe for updating.

No rule is necessary to address the issue. In Energy*Solutions*' view, because there is no health and safety issue that requires resolution, the issue does not rise to the level of a fundamental objective that should be addressed by regulation. Furthermore, it is allowed under and consistent with current NRC rules so there is no need for a change.

3. Limitations Imposed by Current Guidance – The current guidance, while allowing blending, discourages blending by stating that, "...wastes should not be intentionally mixed solely to lower the waste classification." However, this qualifier discouraging blending does *not* apply to blending of homogeneous media that results in "...worker dose reductions or operational efficiencies." We do not believe that any such qualifiers should be applied given that blending has not been shown to pose any inherent health and safety risk. Nonetheless, it can be readily demonstrated that blending does have associated benefits, including the two (operational efficiencies and worker dose reduction) cited in the guidance.

Operational Efficiencies – It is well established that there are significant costs associated with indefinite storage of LLW. As pointed out by Lisa Edwards of the Electric Power Research Institute in the workshop on blending, "Storage isn't free." She went on to note that disposal of LLW has significant advantages over storage. The principal purpose of blending is to enable waste to be shipped for processing and subsequent disposal that otherwise would require indefinite storage. The advantages that accrue to the generator would be gained by processing at another location; in the case of blending, a waste processor such as Energy*Solutions*. This is analogous to other waste processing techniques, virtually all of which are done at dedicated offsite facilities rather than at nuclear power plants.

Worker Dose Reduction – It is equally clear that worker dose can be reduced by shipping waste offsite rather than storing indefinitely. Energy*Solutions* has analyzed the dose incurred from the various steps in preparing waste for storage, placing and maintaining the waste in storage, and ultimately retrieving and shipping the waste for disposal. Our analysis of the actual dose incurred at six nuclear power plants indicated an increase of 130% in worker dose incurred in storing LLW when compared with immediately shipping the waste offsite. Furthermore, the dose saved at power plants will not merely be transferred to different workers at the processing facility. The waste processing facility is designed, constructed, and operated to safely and efficiently perform waste processing, which includes minimizing the dose to workers.

4. Consistency with NRC Policy – In addition to being consistent with current NRC rules and guidance, blending of LLW is also consistent with Commission policy. There has been a great deal of discussion of NRC's 1981 Policy Statement on Low-Level Waste Volume Reduction. However, as we have pointed out, there is no increase in the overall volume of waste to be disposed as a result of blending. All inputs to the process are LLW that will require licensed disposal. Furthermore, the objectives of the 1981 Policy Statement have been largely achieved: the generation of LLW in the nuclear power industry was reduced by orders of magnitude from the time of the policy statement through the year 2000. There is no evidence that substantial, additional cost-effective volume reduction opportunities are available to the industry.

In evaluating blending for consistency with its stated policies, NRC also should be mindful of its policies that state a clear preference for disposal of waste over storage of waste:

> "...waste should not be placed in contingency storage if the ability to dispose of waste at a licensed disposal site exists."[5]

In justifying its preference for disposal over storage, NRC cites the following concerns:

> "The shipping of waste at the earliest practicable time minimizes the need for eventual waste reprocessing due to possibly changing burial ground requirements, reduces occupational and non-occupational exposures and potential accident consequences..."

NRC has revisited and updated its guidance regarding the storage of LLW in recent years[6] as a result of the closure of Barnwell to out-of-compact waste; however it has not revoked its clearly stated preference for disposal over storage.

5. Blended Waste is not an Unanalyzed Waste Stream – It was suggested during the NRC workshop that the waste product from blending is a waste stream sufficiently different from that considered in the Part 61 environmental impact statement (EIS)[7] that it constitutes an unanalyzed waste stream. There has been no data collected or presented that justifies or supports this conjecture. There have, in fact, been many changes in the operation of nuclear power plants and liquid waste processing systems that have resulted in a resin waste stream that varies from that analyzed in the EIS. That, of course, has nothing to do with blending. Improvements in nuclear fuel cladding, steam generator tubes, and water chemistry have significantly reduced the amount of fission products found in the water processed today.

In considering this issue, it is instructive to consider the contemporary resin waste stream. In order to compare the resin waste stream from today's reactors with that analyzed in the EIS, Energy*Solutions* reviewed the isotopic constituents of 542 liners from the nuclear power

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[5] Generic Letter 81-38, *Storage of Low-Level Radioactive Wastes at Power Reactor Sites*, November 10, 1981.

[6] Interim Low Level Radioactive Waste Storage at Reactor Sites, NRC Regulatory Issue Summary 2008-32, December 30, 2008.

[7] *Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste,"* U.S. NRC, September 1981; and *Final Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste,"* U.S. NRC, November 1982.

plants in the fleet of a large nuclear utility that were generated in the years 2003-2007. The result of this analysis shows that there are differences between the resin waste stream analyzed in the EIS and the contemporary nuclear power resin waste stream. Significantly, the relative abundance of Cs-137 in the contemporary resin waste stream is much lower than was projected in the EIS. For the resins analyzed, Cs-137 makes up approximately 15% of the activity for PWRs and 3% for BWRs, as opposed to 65% and 44%, respectively, considered in the EIS.

Additional data is available that indicates that the relative abundance of Cs-137 in contemporary resins is significantly lower than analyzed in the EIS. In a submittal to the State of Tennessee regarding its Processing Facility Erwin[8], Studsvik prepared an ALARA analysis using isotopic data for a single liner at the high end of the scale for the Class B and C liners that they thermally process each year. (The purpose of the submittal was to provide additional information to the State regarding their contingency plans in the event that "reformed residue" waste must be returned from Texas, where it is being stored. One of the contingencies analyzed is to shred the returned Class B and C waste and blend it with a combination of clean material and Class A waste in order to produce a Class A waste form for disposal.) The percent of total activity from Cs-137 for this liner is 2.7%.

Cs-137 isotopic concentration is important because Cs-137 can be a major dose contributor for a potential inadvertent intruder at a disposal site. It has been suggested that the classification of any blended resin waste would be driven by Cs-137 concentrations. However, as Energy*Solutions* has pointed out in each of the NRC meetings on blending, despite assertions to the contrary, Cs-137 is *not* always the controlling isotope in resin waste, blended or not. The resin data we discuss above directly supports this point.

NRC recently received a letter from Waste Control Specialists[9] purporting to demonstrate that there are potential impacts to an inadvertent intruder from disposal of blended waste that not only go beyond what was analyzed in the EIS, but that could result in a significant intruder dose. The analyses contained in this letter, however, are based on such unfounded assumptions as to be meaningless.

In its analysis, WCS describes a mathematical analogue of a waste form that could not possibly exist in reality. WCS created its hypothetical mathematical analogue of a Class A liner by taking a Class C liner, scaling the Cs-137 value down to the Class A limit, and then normalizing other nuclides by the same value. The initial step resulted in a reduction by a factor of roughly 60:1. WCS then further reduced the nuclide content of the mathematical analogue by a factor of 1.38 in order to account for the sum-of-fractions for remaining nuclides. The net result is a volumetric reduction of the initial waste of greater than 80:1.

We would note that throughout its description, WCS refers to this exercise as dilution (rather than blending), which is entirely accurate given that the only way one could produce a Class

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[8] Letter D. Tenney to J. Graves, Tennessee Department of Environment and Conservation, and enclosure, ALARA Review for HIC Return Scenario, October 31, 2008.

[9] Letter S. Kirk to L. Camper, Supplemental Information Regarding Potential Radiological Impacts to an Intruder Resident from blended Low Level Radioactive Waste, January 8, 2010.

A liner from the assumed starting point would be to dilute the resin waste with clean material. The reduction in concentration of the nuclides as described could not be achieved by blending in a real-world processing facility because mixing in Class A waste would also introduce additional radioactive isotopes. One would then have to further adjust the blended waste to account for the sum-of-fractions associated with the additional added activity. Thus, the 80 Class A liners that would be necessary to achieve a volumetric reduction of 80:1 would not be sufficient to achieve a Class A waste.

The hypothetical mathematical analogue does not even vaguely represent a waste that could be produced from an actual blending process. Energy*Solutions* specified in its application to the State of Tennessee for Resin*Solutions*, its proposed blending process, that the expected ratio of potentially greater than Class A resin to Class A resin that would be blended is between 1:5 and 1:7. It simply is not economically feasible to blend at ratios much higher than that. As has been stated by Energy*Solutions*, EPRI, and others, not all greater than Class A waste is suitable for blending. The unsuitability of the Class C liner used by WCS in the creation of its mathematical analogue is a good illustration of this point.

In addition to having described a hypothetical waste form that does not represent dewatered resin, WCS's analysis is further flawed by the description of a disposal process that is not practiced. The appropriate approach to evaluate the waste for disposal compliance is as emplaced, accounting for container, engineered features, and site-specific conditions, rather than by a hypothetical analysis that is not representative of the disposal methods used at any licensed facility in the United States. Disposal of a high-dose liner such as the hypothetical waste analogue at Energy*Solutions*' Clive site would be placed in the Containerized Waste Facility within a concrete caisson at least 5 meters below the top of the cover. The container and depth provide significant inherent protection for an intruder.

WCS suggests that its assumptions regarding disposal methodology are appropriate because they are consistent with NRC analyses from the Part 61 EIS and because it is reasonable to assume that the waste is treated like "...any other Class A waste," whatever that may refer to. The suggestion that there are no additional governing controls is both simplistic and misleading. Energy*Solutions* does not operate Clive in compliance with some imaginary standard; we operate it in compliance with the license issued by the state of Utah.

We believe that there are several other logic and methodological flaws in the WCS analysis, for example calculating an intruder dose and comparing it to the population dose standard, but we have not taken the time here to present an exhaustive critique. Rather, we have attempted only to identify the most fundamental flaws in the analysis, which clearly render it meaningless for any constructive purpose.

6. Relevance of EIS Analyses – Energy*Solutions* proposes that there is no value in attempting to evaluate changes from the analyses originally done in the Part 61 EIS on a piecemeal basis. As we have stated above, the waste stream analyzed in the EIS has changed since the time it was analyzed. There have been many other changes in the ensuing 30 years as well, most significantly in disposal techniques. The analyses in the EIS incorporate many conservative assumptions that ensure the conclusions reached in the EIS and the resulting regulatory standards in Part 61 continue to protect human health and safety.

Thus, we propose that any exercise to determine how, and if so to what extent, a blended waste stream deviates from that analyzed in the basis EIS is not a useful exercise. Far more meaningful would be to take credit for contemporary disposal techniques and the associated conservatism as documented by EPRI.[10] Furthermore, revisiting those analyses without also accounting for the advantages accruing from consideration of site-specific characteristics, rather than relying on the base case of the EIS, would not be meaningful.

7. Unanalyzed Environmental Impacts – In the January workshop, it was suggested that blending has other associated environmental impacts that bear formal analysis. There has, however, been no data presented to support this contention. While it is important to carefully consider potential impacts of legitimate concerns, the mere mention of their potential existence does not bestow such significance. There is no need merely to speculate as to how to proceed – there is ample guidance in the *National Environmental Policy Act* (NEPA) and the NRC's regulations for implementing the requirements of NEPA.[11] These regulations identify "Issuance or amendment of guides for the implementation of regulations in this chapter…" as an action on the list of categorical exclusions. In other words, the ongoing action to clarify guidance regarding blending need not be evaluated in either an environmental assessment or environmental impact statement.

8. Waste classification – Much has been said in the meetings hosted by the NRC regarding waste classification. We will not revisit those points here, except to reiterate that waste is properly classified only when ready for disposal. As we noted during our December presentation in answering question 7 from the subject Federal Register notice, NRC currently addresses classification in its regulations and no change is necessary. The requirements of 10 CFR 20 Appendix G explicitly address the issue of when to classify waste. Also worth reiterating is that this is not an administrative procedure, it is a regulatory requirement.

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[10] *Proposed Modification to the NRC Branch Technical Position on Concentration Averaging and Encapsulation*, Electric Power Research Institute, November 2008.

[11] 10 CFR 51.22(c)(16)