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To: Blue Ribbon Commission on America's Nuclear Future (BRC)

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Subject: Comments on the BRC's Draft Report to the Secretary of Energy

I am pleased to have the opportunity to provide comments on this draft report; I provide them in an effort to improve the quality of the report, and hope that they are considered in that context. While I find little fault with the conclusions and recommendations presented in the report, I feel that the report itself has deficiencies in many areas; these include clarity, conciseness, consistency, accuracy, and openness. I hope that my comments will assist in correcting these deficiencies. In addition to trying to improve the quality of the Commission's report, I also point out some areas where I am skeptical of the practicality of the Commission's recommendation, and suggest some actions that might increase the practicality.

My comments are based on my experiences over nearly 60 years of activity in the nuclear arena, primarily in the areas of spent fuel reprocessing and waste treatment. Beginning over 30 years ago, those experiences included activities related to commercial fuel (and wastes therefrom) – in both laboratory and paper studies. Especially significant to this review of the Commission's draft report was my involvement in the editing and writing of a support document ("Technology for Commercial Radioactive Waste Management", DOE/ET-0028, May 1979) for an early environmental impact statement on the management of commercially-generated radioactive wastes (which is referenced in endnote 40 of the Commission's draft report). Another very pertinent involvement later on was in a systems study of possible partitioning and transmutation scenarios for disposal of radioactive wastes in Japan. Since my retirement, I have done consulting work for both governmental and commercial organizations involving studies related to the reprocessing of commercial spent nuclear fuel.

I have divided my comments into two categories; General and Specific. The numbers of the Specific Comments relate to the pages containing the materials that are commented on.

GENERAL COMMENTS

G-1) I don't believe that the Commission's activities (as described in this draft report, at least) were in complete conformance with the Commission's charter. I believe it to be likely that the

Commission received guidance other than that given in the charter. If that was indeed the case, I believe that such guidance (whether oral or written) should be described in the report – probably in Appendix A, along with the charter - so that the complete ground rules under which the Commission operated will be clear to everybody.

One example of the Commission's apparent non-conformance with its charter is its failure to address the very-pertinent question of whether or not to proceed with the licensing (and operation) of the Yucca Mountain repository. I see nothing in the Commission's charter to indicate that it should not address this question; if the Commission received other guidance, which was widely stated in the public press as being the case at the time the Commission was formed, that guidance should be included in the report. I feel that it was less-than- forthcoming of the Commission to say in this draft report that it did not render an opinion on the suitability of the Yucca Mountain site or on the request to withdraw the license application for Yucca Mountain because those were questions that "--- the Commission was not asked to consider ---.". The public perception at the time was (and still is) that the Commission was instructed not to consider Yucca Mountain, which is much different than saying that the Commission was not asked to consider Yucca Mountain. (see comment vi)

The report does contain at least one example of the Commission addressing a matter even though it was not asked (in the charter) to do so. This matter is International Issues (Section 11 of the report); there is no mention of this in the charter, other than possibly "Any such additional matters as the Secretary determines to be appropriate for consideration". If the Secretary did indeed determine that International Issues were appropriate for the Commission to address, that determination should be included in Appendix A along with the charter.

G-2) In order for any waste disposal approach to gain public (and legislative) approval, and in order to minimize confusion and confrontation during public hearings that must be an integral part of consent-based siting activities, I think it will be necessary to achieve a better-informed public (and better-informed legislators, and their staffs). A key step in accomplishing this will be to do a better job of presenting information to these people. Information presented should be not only technically accurate, but it should be presented clearly, concisely, and consistently. I believe that the Commission's report should set a high standard in this regard, and do not believe that this draft does so. I urge the Commission to do all it can to rectify that situation.

An important step to improving the quality of the report would be an extensive overall review and re-write process using broadly-qualified reviewers/writers, so that clarity and consistency are improved – and inaccuracies are corrected (see comment 109 for a prime example of what I believe to be an inaccuracy that shouldn't have made it into this draft report, let alone into the final report). Some general examples of the kinds of things that should be done include:

- Making it clear up front in the report that the Commission's efforts were focused on spent fuel and high-level waste. The draft now repeatedly uses the term "nuclear waste" – which covers LLW as well as SNF and HLW – in discussions that are not pertinent to LLW. (It was not till Section 7.3 that it was made clear that the Commission's considerations did not include LLW.) (see comments xv,19, 72, and 75+)
- Be consistent in saying "spent fuel **and** high-level waste". The draft now says "spent fuel and **other** high-level wastes" (thus implying that spent fuel is considered to be a high-level waste) in several places (see comments 6, 18, 30-c, and 73)
- Don't speak of "actinide recycle" unless you are discussing recycle of uranium as well as transuranic elements; uranium is an actinide element. (comment 117, and elsewhere?)
- Don't speak of "Fukushima" one place, "Fukushima Daiichi" in another and "in Japan" somewhere else.
- Don't speak of "limiting the capacity of the first repository to 70,000 metric tons" (comment 22-b), or speak of "xxxx metric tons of spent fuel" (comment 10b), or (even worse) of "yyyy metric tons of uranium oxide" (comment 10a). Instead, use enough words to relate these quantities to the metric tons of uranium (MTU) involved.

Many/most of these problems result from use of "shorthand phrases" whose meaning may be clear to those who are knowledgeable in the field, but may not be clear to others - and can lead to erroneous conclusions being drawn by those who are less knowledgeable.

G-3) As a follow on to the previous comment – I hope that the Commission can do something to assure that future legislation will be written more clearly than (much of) the current legislation is. (See comment 22-a).

G-4) I am surprised and disappointed at the low technical content of this draft report. I had expected more – based largely, I guess, on comments that were being made when the Commission was being formed, such as:

- "There are reprocessing technologies that show great promise for energy recovery, cost reduction, waste reduction and proliferation resistance." (Page 66 of January 2010 issue of Nuclear News, quoting Secretary Chu from a speech in which he also mentioned the "blue ribbon panel" that he was forming).
- "It is the secretary of energy's judgment that scientific and engineering knowledge on issues relevant to disposition of high-level waste and spent nuclear fuel has advanced dramatically over the 20 years since the Yucca Mountain Project was initiated." (page 63 of April 2010 issue of Nuclear News, quoting from the DOE motion to the NRC to withdraw the license application for Yucca Mountain).

- The Commission's Charter, which calls for "Evaluation of existing fuel cycle technologies ---.", as well as "Options for safe storage of used nuclear fuel ---.", and "Options for permanent disposal of used fuel and/or high-level nuclear waste ---."

This draft report contains little technical depth in the areas of reprocessing and disposition of high-level waste and spent nuclear fuel - especially when compared to the depth of the discussions regarding other issues. For example, the report contains only about 12 pages in the "Advanced Reactor and Fuel Cycle Technologies" section, while the section on storage and transport (two well-developed technologies) contains about 20 pages. Also, the section on consent-based approach to siting contains about 16 pages, the section on a new organization contains about 11 pages, and the one on regulatory issues contains about 16 pages.

G-5) Another area that was covered surprisingly little in this draft report is that of low-level waste, especially that which is classified as "greater-than-class-C" (GTCC). The Commission's charter directs it to address "and materials derived from nuclear activities" as well as spent fuel and high-level waste. Yet, little attention is given to these (other) wastes other than in a brief discussion of waste inventories (comment 19) and another on classifications of waste (comment 110).

Disposal of GTCC LLW wastes in the same geologic repository as spent fuel and/or high-level waste has long been considered to be a reasonable approach – but I don't recall seeing any mention of that approach in this report. (see comment 30-b)

G-6) I think that the Commission's recommendation #2, to form a new, single-purpose organization to run a program for the transportation, storage, and disposal of (some, unfortunately not clearly-specified, portion of) nuclear waste, is a fine idea. However, I'm skeptical that such an organization will be able to be formed and operated in the manner such as the Commission has envisioned, given the current political climate in this country.

Examples of activities that make me wonder how effectively politics can be removed from the formation and operation of such an organization include; senate confirmations being held hostage in the pursuit of unrelated political agendas, and recent, apparently politically-motivated, activities of the chairman of the Nuclear Regulatory Commission [a supposedly non-political organization].

Unfortunately, I can offer no suggestion in this area except to hope for improved performance by our elected officials.

G-7) The consent-based approach to siting recommended by the Commission also sounds good – but I remain skeptical of its practicality, too. I was already quite skeptical of the ability to gain universal acceptance among local, state, and tribal entities in order to proceed (see comment 70)

– and after I read endnote 120 of this draft report (describing how a congressional delegation of one state got a law enacted that created a wilderness area that prevented access to a proposed disposal site) I became even more skeptical. The current political climate in this country doesn't lead to optimism about this issue, either.

G-8) I think that the Commission's recommendations regarding the siting process should be expanded to including provisions of how to proceed if the consent-based approach does not succeed (comments 62 and 64) within a reasonable period of time (5 years, maybe?). Something has to be done to dispose of the waste; if a site has to be rammed down somebody's throat, that's the way it will have to be.

G-9) As an alternative to the consent-based siting approach, I wonder about the feasibility of building a disposal site on a remote island that is not governed by any state or tribe. If the U.S. does not now own such an island, I think they might be able to buy one at a lower cost than will be incurred during a protracted period of hearings, etc. (and costs resulting from expensive promises to local governments) to find a site in one of the 50 states that is agreeable to all the governments that are involved.

SPECIFIC COMMENTS (primarily on the sections covering areas in which I am knowledgeable)

(The numbers indicate the page of the draft report)

iv) I think that the next-to-last sentence, and footnote #2, should be worded differently (say "many U.S. ratepayers" instead of "U.S. ratepayers"?) to reflect the fact that not all ratepayers are paying the waste disposal fee. (If a utility has no nuclear-generated electricity, its ratepayers aren't paying the waste disposal fee.)

Also, the last sentence could be altered to include the thought that taxpayers are paying not only in "damage payments" to utilities, but also to cover the "defense waste share" of disposal facilities. Much of this "defense waste share" money has been wasted through policy shifts, etc.

vi) Lists three questions "that the Commission was not asked to consider", one of which is "Rendered an opinion on the suitability of the Yucca Mountain site or on the request to withdraw the license application for Yucca Mountain." Based on the news release at the time the Commission was formed, it seems to me that a more accurate wording would be "--- was asked not to consider ---." There is a big difference between not being asked to do something and being asked to not do something.

x-a) In the first paragraph here it is stated (correctly) that the U.S. inventory of spent nuclear fuel will soon exceed the amount that can be legally emplaced at Yucca Mountain until a second repository is in operation. It could also be pointed out here that, if the current law were changed, a much greater quantity of spent fuel could be emplaced at Yucca Mountain. (see comment x-b)

x-b) In the last paragraph the Commission advocates the elimination of the "current rigid legislative restriction that prevents an interim storage facility from operating earlier than a repository". So –why doesn't the Commission at least mention the possibility of eliminating the current legislative restriction on the capacity of Yucca Mountain (see comment x-a)?

xv) Recommendation number 2 (and, similarly, in other places) – "--- organization to develop and implement a --- program --- for the ---- and disposal of **nuclear waste** ---." It should be specified that the Commission is (apparently) really speaking only of SNF and HLW – not the totality of "nuclear waste".

6) Section 2.3.1, second sentence – appears to include spent fuel as a "high-level radioactive waste". This is not generally done in this report (and shouldn't be done here).

9) Section 3.1 – the figure and the text don't "jibe". The figure shows blocks for Mining, Milling, Conversion, Enrichment, and Fuel Fabrication – before the Reactor block. That's fine, BUT the first bullet of the text includes "Mining" under "Enrichment", which doesn't make sense to me – and I see no mention there of "Milling" or "Conversion".

10-a) First sentence says that uranium oxide is "cast" into pellets. "Casting" to me means pouring a molten material into a mold and cooling that; that is NOT what is done to make uranium dioxide fuel pellets.

10-b) Near the top of the page is "--- totaling approximately 100 metric tons of uranium oxide." The usual usage is metric tons of uranium (MTU), not metric tons of uranium oxide. Say instead " --- uranium oxide containing approximately 100 MTU."?

10-c) Near the middle of the page is "Approximately 50,000 metric tons of commercial spent fuel ---." Some could take this to mean spent fuel elements weighing 50,000 MT, others could take it to mean spent fuel elements containing 50,000 MT of fuel, still others could take it to mean spent fuel elements containing 50,000 MT of uranium. Say instead "Spent fuel containing approximately 50,000 MTU ---."?

- Similar usage of "metric tons of spent fuel" noted later on page 10 and on pages 13 and 15 (and elsewhere).

11) Second bullet – speaks of a component containing Pu and another component containing "fission products and so-called transuranic elements". Such wording seems to exclude plutonium from the "transuranic" category - but Pu **is** a transuranic element.

18) Near bottom – another instance where spent fuel is referred to as HLW ("remove all spent fuel and other HLW").

19) First paragraph, which addresses GTCC waste – for which DOE has statutory reponsibility for disposal. Two things that I feel should be included in this discussion:

- Substantial quantities of wastes in this classification will be produced in any commercial reprocessing/recycle activities that might occur.
- DOE's draft environmental impact statement on GTCC waste does **not** address the wastes from potential commercial reprocessing/recycle activities (or from an expansion of the number of reactors). (see comment 110)

Also, this would be a good place to make clear whether the Commission considers such wastes to fall under its purview (previous discussion has centered on HLW and spent fuel).

- Actually, it would be good to make this point clear more up front in the report.

22-a) Second paragraph of Section 3.4.2 says – "--- though not stipulated in the legislation itself, it was widely assumed that one of these sites would be located ---." I think it would be better to say "widely understood" than "widely assumed"; people were led to believe that the siting would go this way – which is different than people assuming that it would go this way.

This raises the issue of imprecisely-written legislation, and the difficulties that it can (and does) cause. I don't know what, if any, type of recommendation the Commission could make in this area. The NWPA will obviously have to be modified or revoked and/or new legislation must be passed for many of the Commission's recommendations to be implemented; perhaps the Commission could at least make a plea for more clarity in whatever legislation is implemented.

Another case of something that is widely understood or assumed, but not stipulated in the NWPA, is that a MTU of defense spent fuel or HLW does not equal a MTU of commercial spent fuel or HLW. This non-equality is sensible because of the much-lower burn-up (hence lower concentrations of fission products and transuranics) of defense fuel – but it seems strange that this was not stipulated in the NWPA. I know from personal experience that this non-stipulation has been a source of confusion for members of the public (and for office holders and their staffs).

22-b) Also in the second paragraph of Section 3.4.2, is "--- limiting the capacity of the first repository to 70,000 metric tons until ---." I know from experience that some members of the public (and [staff of?] elected officials) have taken this to mean that the capacity refers to the

weight of the waste being disposed rather than to the quantity of waste (regardless of its weight) resulting from irradiation (and reprocessing?) of 70,000 metric tons of uranium. (I also recall seeing wordings such as "70,000 metric tons of waste" in the Yucca Mountain EIS – which certainly has added to the confusion.)

27-a) First sentence – I don't think that "HLW" should be included here (I don't see how an increased abundance of uranium would lead to developing options for storage of HLW).

27-b) Second paragraph – I don't "get" the connection between the two sentences of this paragraph.

30-a) First sentence – says "The Commission was asked to recommend a better strategy ---." I don't see such a request in the Commission's charter; the charter says "new plan" (not "better strategy").

30-b) End of first paragraph – recommendation regarding "geological facilities for the safe disposal of spent fuel and high-level nuclear waste." I think that should be expanded to "potentially include" GTCC LLW.

30-c) First sentence of Section 4.1 – "Spent nuclear fuel and other high-level radioactive wastes ---." In most of this report, spent fuel and high-level waste are "separate categories"; I think that separation should be maintained in this discussion, too.

30-d) Last paragraph – I don't follow the logic of the reason given for the likelihood that at least some portion of the existing commercial SNF inventory will require permanent disposal (note that I'm not disputing that likelihood). The reason given is the lack of a cost-effective way to separate and transmute the most hazardous elements into short-lived or stable isotopes; that's more an argument for the need for permanent disposal capability than an argument for why some SNF will require permanent disposal even if some is handled differently (reprocessed).

42-a) Near bottom – discussion on transferring recently discharged fuel to a centralized storage facility in case on an accident. This discussion doesn't address the potential transportation problems with the hotter fuel – and I don't see it discussed in Section 5.6 (Transportation Issues), either. This provides one example of the unevenness of Section 5 (Storage and Transport ---), where much more attention (probably too much) is spent discussing storage than is spent (probably not enough) discussing transportation.

42-b) I think this discussion would be more fair if it admitted that transfer of fuel to a consolidated storage facility (even if one had been available) would not have been possible immediately after the Fukushima incident (and still might not be, months later, for that matter).

44) Here, and more of Section 5.3 (and Section 6.1) – uses the acronym "MRS"; that isn't consistent with the terminology used in other parts of the report.

46) Section 5.4 seems to me to have much more detail than is needed for this report – and on a matter that isn't nearly as important to the big picture as are many other matters.

This feeling prompts a more inclusive one, which is that lots of other information on current and past practices contained in several subsections of Section 5 might better be included in Section 3 (or in an appendix - or could be deleted). It seems to me that the level of detail in Section 5 is bogging down (and detracting from) the story that the Commission should be trying to convey.

53) Second bullet – "Do not reprocess spent fuel" is listed as one of the principles adopted for at-reactor storage "based on the urgent need to protect the public from the threats posed by the current vulnerable storage of commercial irradiated fuel." I don't understand how not reprocessing would protect the public from threats posed by at-reactor storage (if anything, wouldn't reprocessing reduce the threats posed by at-reactor storage – by decreasing the quantity so stored?).

59) This box (WIPP Transportation System) doesn't seem to belong here.

60) First sentence lists two sites. Second sentence says "of these two sites" – then gives a third name.

61) Last sentence of third paragraph ("Canada went through ---.") doesn't seem to belong here.

62) First paragraph of Section 6.3 – recognizes that some nations using an adaptive approach have not succeeded in identifying repository sites. What does the Commission recommend doing if that occurs in the U.S.?

64) Bottom - "--- selected with local- and state-level consent should require no additional approval ---." This indicates that either a local or a state government can veto a proposed site. Is that the Commission's intent? What happens if there is no local/state pairing that agrees to host a site? It seems to me that there has to be some provision covering that eventuality – even though it might be considered to have a low probability of occurring.

67) Here (and elsewhere?) the report speaks of negotiations between the federal government and states and tribes. I presume that "federal government" here means the proposed new waste management organization, as opposed to congress and administration? Should clarify?

70) I'm afraid that I don't share the optimism of the Commission in the success of the proposed consent-based approach. I can anticipate having states/tribes/local governments where their official support could change with each election. How then can progress be made?

72) First sentence - Again, is the term "nuclear waste" intended to include LLW (especially GTCC)? If not, the words should be changed.

73) First line – appears (presumably) to include SNF as HLW.

75+) Finally, here in Section 7.3, the report does something to clarify the scope of the recommended new waste management organization – that is, that it should address primarily (or solely; there's still confusion about that) spent fuel and high-level waste, and ignore low-level wastes. Examples of the confusion include:

- "--- **primary mission**, which is the safe management and disposal of SNF and high-level radioactive wastes." (first sentence of the section).
- " --- the task of developing and operating facilities for the storage, transportation, and disposal of HLW and spent fuel is sufficiently challenging ---- to warrant a **sole focus** on those activities." (first paragraph on page 76)
- Looking back at the Executive Summary, I see (page viii) "The **central task** of the new organization would be to ---- and final disposal of civilian and defense spent fuel and high-level nuclear waste ---."

The term "sole focus" should apparently not be used, as it is inconsistent with the other terms – and with the continued discussion. For example, another sentence in the first paragraph on page 76 says, with regard to waste management considerations that are integral to future fuel cycle developments (I assume they mean the possibility of reprocessing/recycle), says "--- the waste management system will have the flexibility to support such developments." That statement is inconsistent with the "sole focus" being on spent fuel and HLW.

Maybe words such as "--- sole **initial** mission/focus/task will be on the ---- of SNF and high-level waste, with flexibility built in to allow inclusion of other wastes that might require geologic disposal (e.g., GTCC LLW from reprocessing/recycling activities) as they might arise."?

90) Near end of first paragraph – "--- licensee could only pay out the money to the waste management organization as required to meet program needs." Should that be <u>trustee</u> rather than <u>licensee</u>?

93) Section 8.4 – says that the Disposal Subcommittee will investigate the question of co-mingling of defense and civilian wastes. Isn't it a bit late in the Commission's activities to start

doing that? Isn't a final report supposed to result from (modest) revision of a draft report (such as this) – rather than contain newly-introduced concepts?

107-a) Box – contains information on a subject that hasn't yet been discussed. Move it?

107-b) Box – "Transuranic wastes" do not exist in the NRC's waste classification system (NRC uses GTCC LLW instead). This classification pertains only to defense, non-SNF and non-HLW, wastes; such wastes are not germane to the Commission's activities and recommendations. This should be pointed out here!

109) Item #3 – I strongly question the accuracy of these two sentences – stating that DOE has recently classified waste streams bearing radionuclides such as tritium, carbon-14, krypton, and iodine-129 as HLW, and discussing significant ramifications that this classification will bring to reprocessing. I looked to reference 214 to verify what is said here, but couldn't access the cited revision (#4). I found nothing in Revision 3 of the cited report that verifies the statements made here in item #3. The title of the cited report (Engineering Alternative Studies for Separations:NEPA Data Input Report) doesn't suggest that it pertains to a DOE decision (though such a report could contain an incorrect interpretation of what DOE decided).

Saying "waste streams bearing radionuclides such as tritium, carbon-14, krypton, and iodine-129 are HLW", as in this draft report, makes no sense at all. Saying "waste streams containing concentrated radionuclides such as ---- shall be disposed of as if they were HLW." might make sense. Put another way, loaded traps/sorbents used to remove radionuclides from off-gas streams might be disposed of as if they were HLW (but that doesn't mean that they are HLW – or, even more unreasonably, that the off-gas stream itself is HLW, as is said in the second sentence of item #3). Revision 3 of the cited document does say (page 26) "The primary wastes include --- sorbed gaseous fission products ---."

Page 28 of Revision 3 of the cited report also says "Wastes that are produced upstream of the separations processes ---- are not high-level waste." Gaseous release of the cited radionuclides (with the possible exception of tritium) would most likely occur upstream of the separations processes.

In addition, even if DOE did make such a decision, what relevance would it have for NRC-licensed and –regulated reprocessing plants (as will be the case if recycling of commercial fuel is pursued)??? The thrust of this BRC report is on commercial and defense spent fuel and commercial waste, is it not?

110) Second bullet – says that DOE is currently developing an environmental impact for GTCC waste. That is true, but only for certain GTCC wastes; specifically excluded from the current

NEPA effort are wastes resulting from a further increase in the number of nuclear power plants and wastes resulting from potential nuclear fuel cycles involving advanced reactors or recycling of used fuel (page S-13 of the draft EIS). Thus, the wastes which I think the Commission is (or should be) considering are not covered by the currently-progressing EIS. (see comment 19)

114) First (full) paragraph, near the end – "--- to deal with at least a portion of the existing HLW inventory." Shouldn't that be "SNF inventory" (instead of "HLW inventory")?

117) Table 3 – "Fast-spectrum --- reactors capable of continuous recycle of actinides". Is that true for uranium, which is an actinide element? Say transuranics instead of actinides?

119-a) "Volume of waste" category uses terms not used elsewhere in this report – such as "repository waste", "secondary waste", and "near-surface wastes".

Also, the context indicates to me that the authors are using the term "secondary waste" to mean GTCC LLW; I believe that such usage is unusual (and should be avoided in this report).

119-b) Aren't the "repository space requirements" comments for the full recycle case too assumption specific? Don't the comparative values depend on the times of emplacement as well as on repository design and host medium?

Also – better wording would be "If Cs and Sr are also removed ---." Instead of "If Cs and Sr are then removed ---.? (Saying "then removed" implies an order of removal processes.)

120) First paragraph – says that "**funding** needs" for more developed technologies can be greater than for less-developed technologies – particularly in the case of technologies that are ready to be demonstrated. That's not what I think must be meant. Wouldn't it be better to say something like "**initial future funding** needs" can be greater?

124) First paragraph of Section 11.1 – "--- permanent loss of contaminated land ---." resulting from the Fukushima accident. Has that really been determined to be the case? How about potential loss instead of permanent loss?

126) Third line - "civil nuclear" should be changed to "civilian nuclear".