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Comments of the Institute for Energy and Environmental Research (IEER) on the Transportation and Storage Draft (TSD) report of the Blue Ribbon Commission (BRC) published in June 2011

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The three subcommittee of the Blue Ribbon Commission has each published a draft report: transportation and storage,[1] disposal, and reactor and fuel cycle technologies. IEER is submitting comments on the Transportation and Storage Draft (TSD) report today, July 1, 2011. IEER expects to provide comments on the other two, especially on the reactor and fuel cycle technologies draft (RFCD) report, by about July 8, 2011. In the meantime, we refer the Reactor and Fuel Cycle Technologies Subcommittee to the comments provided by Arjun Makhijani to the full BRC on March 25, 2011. In particular, the Subcommittee needs to explain how it has taken into account the following issues in that slide presentation as well as in my verbal comments:

1. Whatever the future reactor development scenario, reprocessing spent fuel from existing reactors makes no economic, technical, resource, or nonproliferation sense.
2. $100 billion has been spent worldwide on the development of sodium-cooled reactors with no discernible learning curve. Why should more money be put in any sodium-cooled reactor or associated fuel cycle technology? How much is enough RD&D money for a nuclear technology?
3. No reprocessing technology has significant proliferation advantages when it comes to proliferant states and only modest advantages with respect to terrorist groups, according to an inter-lab study published by Brookhaven National Laboratory.[2] To imagine that there could be

[1] Transportation and Storage draft report, May 31, 2011 at http://brc.gov/sites/default/files/documents/draft_ts_report_6-1-11.pdf hereafter TSD; Disposal draft report, June 1, 2011 at http://brc.gov/sites/default/files/documents/draft_disposal_report_06-01-11.pdf hereafter DD; Reactor and Fuel Cycle Technology draft report, June 2011 at http://brc.gov/sites/default/files/documents/rfct_fullreport_rev20june11.pdf, hereafter RFTD.

[2] R.Bari, L-Y Cheng, J. Phillips, J. Pilat, G. Rochau, I. Therios, R. Wigeland, E. Wonder, M. Zentner. *Proliferation Risk Reduction Study of Alternative Spent Fuel Processing*. To be presented at the Institute of Materials Management (INMM) 50th Annual Meeting, Tucson, Arizona, USA, July 12-16,2009. Upton, NY: Brookhaven National Laboratory, July 2009. On the Web at http://www.bnl.gov/isd/documents/70289.pdf

such technologies and to recommend investment of very scarce resources in reprocessing surely requires a more detailed explanation that takes better account of this study.

We turn now to the Transportation and Storage Draft (TSD) report, which is the main topic of these comments. The "most important recommendation" of the TSD report is as follows:

> *The United States should proceed expeditiously to establish one or more consolidated interim storage facilities as part of an integrated, comprehensive plan for managing the back end of the nuclear fuel cycle. An effective integrated plan must also provide for the siting and development of one or more permanent disposal facilities.* [TSD p. iii]

We concur with the need for one or more permanent disposal facilities. As regards storage, the TSD recognizes that the recommendation for a consolidated offsite storage location is an old one. Attempts to establish one have failed over the last 30 years, at least so far. The Subcommittee's recommendation that a consolidated storage site be established "*expeditiously"* does not take sufficient account of this fact, though it is discussed briefly.

Specifically, the TSD notes that the Private Fuel Storage facility in Utah is has been stuck for many years despite having an NRC license. It also cites the fact that that the U.S. Department of Interior's Bureau of Indian Affairs (BIA) denied approval of the Goshute tribe's lease of the land on the ground that a storage site designated as "temporary" risked becoming a permanent repository site. The Subcommittee did not reconcile this reality with its recommendation that a consolidated storage facility be established "expeditiously."

The matter needs detailed analysis. The BIA's decision not to approve the lease for spent fuel storage was hardly an "arbitrary" decision in the technical and historical sense, though a federal court may have decided it was so in a legal sense. Specifically, the DOE and its predecessor agency, the Atomic Energy Commission, seem never to have met a repository site they did not like, starting with the now infamous Lyons, Kansas site, which was bristling with oil and gas drilling holes and ending with Yucca Mountain, a site with a geology so conducive to corrosion that the DOE claimed, implausibly (some would say laughably), that it would install thousands of "titanium drip shields" a century or more after putting the waste canisters into the repository. These "drip shields" should more properly have been called five-ton fig leaves that could not hide what is, in my view, the worst site that has been investigated in the United States for geologic disposal.[3] Indeed, the DOE's own models showed that the value of the geology in containing the waste once the engineered barriers gave way was pretty close to nil.[4]

While the legal aspects of the PFS may have been beyond the TSD's scope, the committee did not explore or analyze the technical reasonableness of the BIA's denial of lease approval in a historical context. That context not only includes the sorry history of AEC and DOE siting, but also the even sorrier history of repeated failures of the U.S. government to meet the letter and spirit of many of its treaty commitments to Native Americans, a problem that is by no means only in the past. A detailed analysis of these realities and history is the minimum necessary to

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[3] As noted, I support the development of a geologic disposal site and have long done so.

[4] See for instance the DOE's graphs prepared for the Nuclear Waste Technical Review Board in *Science for Democratic Action*, Vol. &, No. 3 May 1999, Institute for Energy and Environmental Research, at http://www.ieer.org/sdafiles/vol_7/7-3/yucca.html

make a case that a consolidated storage site could be built expeditiously. The TSD does not have such an analysis.

The likely outcome is that spent fuel will remain at reactor sites for decades unless it is moved to one or more Department of Energy (DOE) nuclear weapons sites. This would put the matter of commercial nuclear waste management right back in the lap of the DOE, whose unenviable record both in regard to its own waste (being much worse than that in the commercial sector, overall) and commercial repository development hardly needs further comment. Moreover, such a course would run counter to the thrust of the institutional recommendations of the draft Subcommittee reports – that the DOE should not be in the commercial spent fuel management business and that the Nuclear Waste Fund as well as spent fuel liabilities should be transferred to an entity independent of the DOE.

The TSD might have fulfilled its mandate to consider safety had it recommended dry hardened storage on site on an interim basis until the fuel could be moved offsite, in view of the handwriting on the wall that it will be decades before much or most or indeed, any of the spent fuel can be moved from the reactor sites. Instead the TSD used the ongoing analysis of the continuing Fukushima disaster to recommend another study by the National Academies to compare the safety of spent fuel pools and dry storage (on or offsite), saying that the latter "carry their own potentials [sic] costs and risks" (TSD, p. 21). In so doing, the TSD essentially sidelined the clear conclusion of the 2003 National Academies study that dry storage has "inherent safety advantages," (TSD, p. 20) recognizing of course that it can be done only for spent fuel that has been aged for a few years.

If anything the grim reality of Fukushima has shown in stark relief that severe spent fuel accidents are not just a theoretical item in risk assessment studies but a serious and present danger. Fukushima has also shown that the NRC's estimates of the probabilities of spent fuel pool accident probabilities (see NUREG-1353[5]) are far too low and that the NRC has not considered all mechanisms that could lead to severe spent fuel pool releases. For instance, all of the NRC scenarios for a spent fuel loss of coolant accident involve an instantaneous complete loss of spent fuel pool water. [6] This leaves out the possibility a slower leakage that would allow boiling in the pool and exothermic zirconium-steam reactions that produce hydrogen, followed by a hydrogen explosion. As another example, the NRC did not consider situations in which hydrogen originating in a reactor could lead to a spent fuel pool accident. Neither scenario needs more information or analysis from Fukushima that we had a few days into the accident to reinforce the conclusion that dry storage for aged fuel is by far the preferable, safer option.

In short, the events at Fukushima have shown the vulnerability of reactor spent fuel pools; the risks go far beyond those in NUREG-1353, which the NRC uses to assess such risks. Did the Transportation and Storage Subcommittee think that anything might emerge from the analysis of Fukushima that would negate these facts that are already clear? Did the Subcommittee think that anything from that analysis could conceivably result in a reversal of the conclusion already reached by the National Academies that dry storage was "inherently" safer? The TSD does not say.

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[5] *Regulatory Analysis for the Resolution of Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools"*, NUREG-1353, 1989

[6] NUREG-1353, p. 4-8.

It is abundantly evident that the Fukushima accident greatly reinforces the conclusion of the 2003 National Academies study that dry storage of aged spent fuel is inherently safer. By failing to recommend dry storage of all spent fuel aged about five years or more in dry storage, the Subcommittee has essentially deferred to the status quo conclusion of the NRC that dense spent fuel storage is safe enough. Such deference is unwarranted.

The Subcommittee notes that some of the recommendations of the National Academies, like rearranging spent fuel in the pools were carried out, but does not note that others were not. The TSD does not note that under the mandate of the 2003 study, the National Academies were prohibited from making a recommendation about dry storage. So that study did what it could – it noted that dry storage was safer. The subcommittee was under no such restraint and, sadly, it did not do what it should have.

The TSD should have analyzed the implications of the fact that some U.S. spent fuel pools, such as the one at Vermont Yankee, have more spent fuel in them than all four spent fuel pools at the four Fukushima stricken reactors put together. This was very important in light of the fact that NRC that has not ordered dry storage of all aged spent fuel in light of Fukushima. Indeed, the NRC should have done that long ago – in the wake of the 1997 Brookhaven study that estimated more than 140,000 cancer deaths and $700 billion (2010 dollars) in the worst case;[7] in the in the wake of 9/11, and if not at that time, then at least after the clear conclusion of the 2003 National Academies study that dry storage was safer.

Instead of boldly stepping in to fill a vast crevasse in public safety that has existed at least since 9/11, by the NRC's failure to order dry storage of aged spent fuel, the TSD has punted by pointing to an evaluation of the Fukushima disaster that will not be completed before the BRC finishes its work. Nothing in the Fukushima evaluation could diminish the strength of the 2003 National Academies conclusion about the inherent superiority of dry storage. It can only strengthen it.

Indeed, the TSD has done worse that punt. In making a highly uncertain consolidated storage its top recommendation, it has provided an ample excuse for continued dense storage of spent fuel in pools, which is the least safe of all the available options.

In this context, it is no surprise that the Subcommittee also punted on the recommendation of many commenters that it recommended Hardened On Site Storage (HOSS) of aged spent fuel, with hot spent fuel being stored in a low-density configuration in pools. The Subcommittee ducked the HOSS issue on the ground that there is a rulemaking process before the NRC on the topic at the present time.

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[7] R J. Travis, R E. Davis, E. J. Grove, M. A. Azarm, *A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants*, NUREG/CR-6451, Brookhaven National Laboratory, Upton, NY 11973, August 1997, Tables 4-1 and 4-2. The 1997 damage estimate was converted to 2010 dollars by IEER. Note that the estimated consequences of a worst-case PWR spent fuel accident are slightly greater than those of a comparable BWR spent fuel pool accident. All accidents were modeled for a densely populated area, but Indian Point and a few other plants were not included for consideration.

A rulemaking process is a legal matter. It does not and should not have prevented the Subcommittee from providing the full Commission with its opinion about what course would be the safest for protecting the public. Nothing in the BRC's charter creates an inhibition or a caveat that would oblige it to withhold an opinion on safety during a regulatory process. The NRC is not obliged to defer to the BRC and neither is the BRC obliged to defer to the NRC. Indeed, the BRC's charter is clear and succinct on this point and contains no caveats:

> Specifically, the Commission will provide advice, evaluate alternatives, and make recommendations for a new plan to address these issues, including:
>
> a) …
> b) Options for safe storage of used nuclear fuel while final disposition pathways are selected and deployed.[8]

We understand that there are taxpayer liabilities being incurred under DOE contracts with the utilities and that this was a principal reason for the Subcommittee to recommend offsite consolidated storage. But surely this cannot be an overarching factor, even in the present fiscal climate.

Nuclear power exists on government subsidies, most notably the nuclear industry's limitation on liability under the Price Anderson Act to about $12 billion. Why should taxpayers continue to bear the main liabilities from severe accidents which could amount to the hundreds of billions of dollars, if the industry will not make modest contractual concessions in the context increasing safety of onsite storage?

The BRC is free to point out that Congress could consider lifting the limitation on liability of the nuclear industry if the industry resists a reasonable solution to increase safety via HOSS while a geologic repository site is developed. That would make it a contractual two-way street for spent fuel. Taxpayers can pay penalties which will continue anyway) and nuclear power plant operators would try to get insurance. It would soon be clear that no insurance company would bet on continued wet storage of aged spent fuel in re-racked pool if it any would bet on the industry at all without Price Anderson's cap and the taxpayer assumption of most liability. The table can be set for a more sensible negotiation between taxpayers (via Congress and The Executive Branch) and the nuclear industry; it should include HOSS. Payments for HOSS could come from the Nuclear Waste Fund. Cost is one item in the BRC's charter; surely it should not be allowed to trump safety.

Fortunately, the TSD is only a draft Subcommittee report. The BRC can do better in its full draft report due near the end of July. Rather than a nuclear pig-in-a-poke in the form of consolidated offsite storage, the BRC draft report should unequivocally recommend the public the safer option of HOSS of all aged spent fuel and low density pool storage or the remainder. It should explore creative ways, such as the one recommended above, in which HOSS could be implemented expeditiously. It should note that it is under no obligation to defer to regulatory proceedings and go on to make its own judgments about the safest way to manage spent fuel while awaiting deep geologic disposal.

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[8] Blue Ribbon Commission on America's Nuclear Future: U.S. Department of Energy Advisory Committee Charter , January 2010.

In sum, the full BRC draft report should recommend Hardened On Site Storage of all spent fuel that is suitably aged and low density pool storage for the rest as the safest option, while the mess from three decades of a sorely mismanaged repository program is being cleaned up by the development of a suitable deep geologic repository program and disposal system.